Minerals yearbook: Mineral industries of Europe and the U.S.S.R. 1989. Year 1989, Volume 3 1989

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MINERALS YEARBOOK

MINERAL INDUSTRIES OF

EUROPE AND THE U.S.S.R.

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

1989

UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel Lujan, Jr., Secretary

U.S. 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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Preface

This edition of the Minerals Yearbook records the performance of the worldwide minerals industry during 1989 and provides background information to assist in interpreting that performance. Content of the individual Yearbook 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, a chapter on survey methods used in data collection with a statistical summary of nonfuel minerals and a chapter on trends in mining and quarrying in the metals and industrial mineral industries is included.

Volume II, Area Reports: Domestic, contains chapters on the minerals industry of each of the 50 States and Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory. This volume also has a chapter on survey methods used in data collection, including a statistical summary of domestic nonfuel minerals.

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. The 1989 review is presented as five area reports and one world overview: Mineral Industries of Africa, Mineral Industries of Asia and the Pacific, Mineral Industries of Latin America and Canada, Mineral Industries of Europe and the U.S.S.R., Mineral Industries of the Middle East, and Minerals in the World Economy. This year's reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Mineral Perspectives Series quinquennial regional books, which will be discontinued. The Bureau of Mines continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Yearbook are welcomed.

T S Ary, *Director*

Acknowledgments

The Bureau of Mines, in preparing these Volume III Minerals Yearbook Reports, extensively utilized statistics and data on mineral production, consumption, and trade provided by various foreign government minerals 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 10 Regional Resource Officers assigned to minerals and petroleum reporting and by economic and commercial officers and other officials of the Department of State located in American Embassies worldwide. Their contributions are sincerely appreciated.

The text and production, structure of the mineral industry, and reserve tables of this volume were prepared by the respective country authors on the staff of the Division of International Minerals, Information and Analysis Directorate. The mineral export and import trade tables were prepared by the International Data Section of the Division of Statistics and Information Services, Information and Analysis Directorate.

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 to be construed as conflicting with or being contradictory of U.S. foreign policy.

George J. Coakley
Chief, Division of International Minerals

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Mr. Donald E. Buck is a country specialist in the Branch of Europe and the U.S.S.R. He joined the Bureau of Mines in 1988. Mr. Buck's work experience includes more than 16 years as a petroleum exploration geologist at Cities Service and Celeron Oil and Gas, Inc. He received his B.A. in Geology from Ohio Wesleyan University and an M.S. in Geology from the University of Southwestern Louisiana.

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THE MINERAL INDUSTRIES OF

EUROPE AND THE U.S.S.R.

By Staff, Branch of Europe and the U.S.S.R.

INTRODUCTION[1]

This section of the Minerals Yearbook reviews the minerals industries of 29 countries: the 12 nations of the European Community (Belgium, France, the Federal Republic of Germany (FRG), Italy, Greece, the Netherlands, Denmark/Greenland, Spain, Portugal, Luxembourg, the United Kingdom, and Ireland); 6 of the 7 nations of the European Free Trade Association (Sweden, Norway, Finland, Iceland, Austria, and Switzerland); Malta; the 8 Centrally Planned Economies of Eastern Europe (the German Democratic Republic (GDR), Poland, Yugoslavia, Albania, Hungary, Czechoslovakia, Romania, and Bulgaria); and the U.S.S.R.

Western Europe

Western Europe [loosely defined to include the 12 nations of the European Community (EC) and the 7 nations of the European Free Trade Association (EFTA)] is the single largest trading area and consumer of raw materials in the world. If Western Europe was at one time an important mining sector, it has now increasingly relegated the role of supplying minerals for its minerals processing industry to its ex-colonies in North and South America, Africa, and Australia. In this regard, Western Europe is the most important determinant of raw materials consumption (and thus raw materials production). There is an important reason for this since Western Europe lies somewhere between Japan at one extreme and the United States and the U.S.S.R. at the other extreme as regards the availability of natural resources.

The United States and the U.S.S.R. are rich in natural resources while Japan has virtually none. Western Europe, on the other hand, has a reasonable amount of natural resources— particularly in the southern part of the continent,—but has nowhere near the natural resource wealth of the United States and the U.S.S.R. Nonetheless, there is an inherent tendency to underestimate the importance of Western Europe in the world of minerals — both as a minerals processor and raw materials buyer. The reason for this is that Western Europe is generally thought of on the basis of individual nations rather than as a whole. Viewed in this limited context, Japan, the United States, and the U.S.S.R. appear to dominate the world economy. Viewed as one regional area, however, Western Europe includes the fourth (FRG), fifth (France), sixth (United Kingdom) and seventh (Italy) largest economies of the world, all bordering on one another. With the remaining 14 EC and EFTA countries, Western Europe, although smaller than the United States, is very close to the United States in gross domestic product and minerals production.

Although more limited in the availability of local low cost raw materials, however, the minerals industries of Western Europe, which see themselves as international entities rather than local enterprises have, in the past few years, restructured themselves and merged together such that they now represent increasingly powerful international entities. The British Steel Corp., which was denationalized several years ago, is swiftly becoming one of the most efficient steel producers in the world. Usinor-Sacilor, the nationalized French steel giant, has absorbed virtually all of the French steel industry and formed a significant number of joint ventures or acquired companies worldwide such that Usinor-Sacilor is now second only to Nippon Steel in steel production and is becoming an increasingly cost-effective producer. Germany's Thyssen and Krupp have historically been amongst the most efficient steel producers and are continuing this legacy. While many diversified minerals companies are shrinking in size or disappearing, Britain's RTZ, the world's largest diversified minerals company, is continuing to grow in size and importance. Finland's Outokumpu Oy, Belgium's ACEC-Union Minere, Germany's Metallgesellschaft, and France's Pechiney are all expanding, heartily acquiring or merging with smaller firms in related sectors.

It would be simplistic to say that 1989 was a watershed year for Western Europe because the official date wherein trade barriers across the community's borders will be eliminated will not occur until the end of 1992. The perception is increasingly becoming evident, however, that a major event is about to happen and more companies within and outside the community are increasingly seeking to make their positions in their respective industries stronger in what will be the world's largest market.

Eastern Europe

It was in 1987 that President Gorbachev first introduced his concepts of "glasnost" (openness) and "perestroika" (rebuilding) to the world. By 1989, the effects of glasnost were particularly being felt in the Eastern European Council for Mutual Economic Assistance (CMEA) nations which, gradually were pulling themselves away from Soviet political and economic domination and, more importantly, were allowed to do so by the Soviet regime.

In short order, plans were made for the absorption of the GDR into the FRG in late 1990, and Czechoslovakia, Poland, Hungary, and Bulgaria found themselves "granted" national independence. Yugoslavia, which had never been under Soviet domination, and Romania and Albania, which had been independent from Moscow for more than a decade, were all feeling increasing pressure to adopt market economies. As these countries opened themselves to Western observers the abuses that had occurred during central planning were revealed. Environmental pollution, particularly around lignite-rich Silesia (an area that extends across Poland, the GDR, and Czechoslovakia) and many parts of Romania, was found to have reached catastrophic levels. Furthermore, it was realized that the low productivity of the mining and metallurgical sectors in all these nations will eventually mean huge cutbacks

in personnel in order to make these industries competitive with those in market economies. Of the world's major steel producers, for example, Czechoslovakia produces more steel on a per-capita basis, than any other. Part of the reason for this is that Czechoslovakia has, in the last half century, produced a great deal of heavy military equipment for the Soviet Union and other East Bloc nations. With the trend toward independence presently taking place in eastern Europe, there will be less interdependence between these nations and the demand for Czechoslovakian steel production will drop significantly. This type of "readjustment" will need to take place throughout Eastern Europe and will have significant bearing on Western Europe's, as well as the rest of the world's, minerals supply and demand status.

U.S.S.R.

By virtue of its size, the U.S.S.R. is the world's largest source of raw materials. Because close to 80% of the U.S.S.R.'s hard currency is obtained from mineral resources (approximately 70% from the petroleum sector alone), the U.S.S.R., which does not presently have an internationally tradable currency, is seeking to expand production in the minerals sector in order to strengthen the ruble. In view of the present high level of production of minerals on the part of the U.S.S.R. and the potential for increased production, the effects of more liberal trade patterns between the U.S.S.R. and the market economies will have tremendous bearing on international mineral trade flows.

[1]Michel C. Frippel, Chief, Branch of Europe and the U.S.S.R., Division of International Minerals.

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

Barclays Bank International, London:
ABECOR Group Country Reports.
British Broadcasting Corp., Reading:
Summary of World Broadcasts (SWB).
British Geological Survey, Keyworth:
World Minerals Statistics, various issues.
British Sulphur Corp. Ltd., London:
Nitrogen, bimonthly.
Phosphorus and Potassium, bimonthly.
Sulphur, bimonthly.
Fairchild Publications, New York:
American Metals Market, daily.
Institution of Mining and Metallurgy, London:
Transactions, monthly.
Bulletin, monthly.
International Lead and Zinc Study Group, London.
International Monetary Fund, Washington, DC: International Financial Statistics, monthly and annual yearbook.
McGraw-Hill, Inc., New York:
Engineering and Mining Journal, monthly.
Miller Freeman Publications, San Francisco, CA: World Mining, monthly.
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Metallstatistik 1979-89.
Minemet Holding.
Mining Journal Ltd., London:
Mining Magazine, monthly.
Mining Journal, weekly.
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Nuova Samim, Rome:
Metalli Non Ferrosi Statistiche 1989.
Penn Well Publishing Co., Tulsa, OK:
International Petroleum Encyclopedia.
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Annuaire Statistique 1989.
Society of Economic Geologists, University of Texas, El Paso, TX: Economic Geology (and Bulletin), bimonthly.
United Nations Statistical Office, New York:
U.N. trade statistics.
U.S. Central Intelligence Agency:
World Factbook, annual.
U.S. Department of Commerce:
Bureau of the Census: trade statistics.
International Trade Administration:
Foreign Economic Trends and Their Implications for the U.S., International Marketing Information Series.
U.S. Department of Energy.
U.S. Department of the Interior, Bureau of Mines:
Mineral Commodity Summaries.
Minerals Yearbook, V. I, Metals and Minerals; V. III, Area Reports: International.
Minerals Facts and Problems.
Information Circular 8610; Summary of Mining and Petroleum Laws of the World (in five parts), part 4, Africa.
U.S. Joint Publications Research Service, Arlington, VA:
Foreign Broadcast Information Service Regional Publications, weekly.
World Bank, Washington, DC: Bank news releases.
World Bureau of Metal Statistics, London:
World Metal Statistics, monthly.

TABLE 1

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1989[1]

(Thousand metric tons unless otherwise specified)

	Iron and steel			Ferroalloying materials			Nonferrous metals					
							Aluminum		Copper		Lead	
	Iron ore, content basis	Pig iron	Crude steel	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite	Primary metal	Mine	Refined	Mine	Refined
Market economy countries:												
European Community (EC):												
Belgium	—	8,863	10,953	—	—	—	—	—	—	510	—	126
Denmark-Greenland	—	—	625	—	—	—	—	—	—	—	20	—
France	2,810	15,082	19,335	—	—	9	800	335	(3)	49	1	267
Germany, Federal Republic of	14	32,777	41,073	—	—	—	—	742	(3)	475	8	350
Greece	630	163	957	65	9	16	2,400	145	—	—	20	5
Ireland	—	—	324	—	—	—	—	—	—	—	32	12
Italy	—	11,740	25,000	—	6	—	17	220	—	83	17	185
Luxembourg	—	2,685	3,721	—	—	—	—	—	—	—	—	—
Netherlands	—	5,163	5,681	—	—	—	—	279	—	—	—	42
Portugal	6	377	762	—	—	—	—	—	104	6	—	7
Spain	2,120	5,535	12,765	—	—	—	—	352	27	166	74	125
United Kingdom	8	12,638	17,841	—	—	26	—	297	1	120	1	350
Subtotal	5,588	95,023	139,037	65	15	51	3,217	2,370	132	1,409	173	1,469
European Free Trade Association (EFTA):												
Austria	761	3,823	4,718	—	46	—	—	93	—	46	2	24
Finland	—	2,284	2,921	498	—	13	—	—	14	56	2	2
Iceland	—	—	—	—	—	—	—	85	—	—	—	—
Norway	1,532	240	679	—	—	55	—	863	16	35	3	—
Sweden	14,124	2,638	4,692	—	—	—	—	97	71	95	89	89
Switzerland	—	70	916	—	—	—	—	71	—	—	—	1
Subtotal	16,417	9,055	13,926	498	46	68	—	1,209	101	232	96	116
Total, market economy countries	22,005	104,078	152,963	563	61	119	3,217	3,579	233	1,641	269	1,585
Centrally planned economies:												
Eastern Europe												
Albania	460	350	135	1,000	—	5	—	—	16	13	—	—
Bulgaria	482	1,484	2,899	—	40	—	—	—	80	56	97	105
Czechoslovakia	440	9,911 1	5,465	—	1	4	—	33	5	27	3	26
German Democratic Republic	—	2,700	7,829	—	—	3	—	54	9	80	—	52
Hungary	—	1,954	3,356	—	84	—	2,700	75	—	6	—	—
Poland	2	9,488	15,094	—	—	2	—	48	436	390	47	81
Romania	647	8,255	14,415	—	65	—	313	269	25	39	38	60
Yugoslavia	1,305	2,896	4,500	2	39	3	3,252	331	105	151	100	119
Subtotal	3,336	37,038	63,693	1,002	229	17	6,265	810	676	762	285	443
U.S.S.R.	132,000	113,300	160,096	3,800	9,100	295	[5]5,685	2,200	640	1,000	440	465
Total, centrally planned economies	135,336	150,338	223,789	4,802	9,329	312	[4]11,950	3,010	1,316	1,762	725	908
Total, Europe and U.S.S.R.	157,341	254,416	376,752	5,365	9,390	431	[4]15,167	6,589	1,549	3,403	994	2,493
United States	37,413	50,977	88,852	—	w	(3)	w	4,030	1,498	1,954	419	1,205
World total	544,231	560,005	782,959	11,901	24,025	964	[4]106,061	17,980	8,887	10,727	3,395	5,903

See footnotes at end of table.

TABLE 1—Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1989[1]

(Thousand metric tons unless otherwise specified)

	Zinc		Industrial minerals						Mineral fuels				
									Coal			Petroleum (million barrels)	
	Mine	Refined	Cement	Nitrogen (N content of ammonia)	Phosphate rock (gross weight)	Potash K_2O equivalent	Salt	Sulfur (all forms)	Anthracite and bituminous	Lignite	Marketable natural gas (Mm_3)	Crude	Refined
Market economy countries:													
European Community (EC):													
Belgium	—	312	6,900	290	(2)	—	—	320	2,556	—	22	—	222
Denmark-Greenland	72	—	2,000	—	—	—	—	20	—	—	2,548	41	62
France	27	265	24,000	1,476	(2)	1,195	8,050	1,051	11,471	2,196	3,030	24	587
Germany, Federal Republic of	74	351	26,500	1,500	(2)	2,182	13,100	1,885	77,451	109,875	16,200	27	594
Greece	23	—	13,100	230	—	—	190	180	—	49,772	62	7	127
Ireland	169	—	1,600	400	—	—	—	—	43	—	2,330	—	9
Italy	38	259	36,500	1,446	—	152	4,385	830	1,599	—	16,300	31	683
Luxembourg	—	—	550	—	(2)	—	—	—	—	—	—	—	—
Netherlands	—	203	3,541	3,001	—	—	3,700	250	—	—	74,570	26	467
Portugal	—	56,000	175	—	—	—	125	258	—	—	—	—	64
Spain	265	257	24,500	552	—	841	3,100	1,235	19,124	17,372	1,150	8	429
United Kingdom	6	80	16,000	1,037	(2)	465	5,800	185	101,135	20	44,755	656	684
Subtotal	674	1,732	161,191	10,107	(2)	4,835	38,325	6,081	213,637	179,235	160,967	820	3,928
European Free Trade Association (EFTA):													
Austria[1]	7	—	4,800	445	—	—	646	—	—	2,244	1,275	8	63
Finland	58	163	1,500	50	—	—	—	585	—	—	—	—	74
Iceland	—	—	116	8	—	—	—	—	—	—	—	—	—
Norway	15	120	1,375	382	—	—	—	260	413	—	29,334	560	86
Sweden	164	—	2,200	—	160	—	—	400	—	—	—	—	135
Switzerland	—	—	5,461	35	—	—	—	4	—	—	40	—	23
Subtotal	254	283	15,452	920	160	—	646	1,249	413	2,244	30,649	568	381
Total, market economy countries	928	2,015	176,643	11,027	160	4,835	38,971	7,330	214,050	181,479	191,616	1,388	4,309
Centrally planned economies:													
Eastern Europe:													
Albania	—	—	800	80	—	—	70	—	—	2,400	700	10	9
Bulgaria	70	97	5,500	1,050	—	—	100	130	193	4,095	10	2	93
Czechoslovakia	8	—	10,888	770	—	—	88	77	25,071	93,908	865	1	125
German Democratic Republic	—	19	12,500	1,150	—	3,900	3,058	290	—	301,087	10,260	(3)	160
Hungary	—	—	3,900	750	—	—	—	11	2,127	17,902	6,849	13	67
Poland	184	177	15,000	2,200	—	—	5,700	5,090	177,628	71,816	5,368	1	123
Romania	55	42	14,000	2,600	—	—	5,000	270	8,294	53,043	32,000	70	180
Yugoslavia	90	119	8,560	680	—	—	—	428	293	70,210	2,871	31	187
Subtotal	407	454	71,148	9,280	—	3,900	14,016	6,296	213,606	614,461	58,923	128	944
U.S.S.R.	810	977	140,000	20,100	34,400	10,500	14,800	9,350	576,797	163,527	745,459	4,460	3,000
Total, centrally planned economies	1,217	1,431	211,148	29,380	34,400	14,400	28,816	15,646	790,403	777,988	804,382	4,588	3,944
Total, Europe and U.S.S.R.	2,145	3,446	387,791	40,407	[2]34,560	19,235	67,787	22,976	1,004,453	959,467	995,998	5,976	8,253
United States	288	358	71,268	12,546	48,866	1,595	35,291	11,592	811,287	78,416	490,185	2,779	5,654

See footnotes at end of table.

TABLE 1—Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1989[1]

(Thousand metric tons unless otherwise specified)

	Zinc		Industrial minerals						Mineral fuels				
									Coal			Petroleum (million barrels)	
	Mine	Refined	Cement	Nitrogen (N content of ammonia)	Phosphate rock (gross weight)	Potash K_2O equivalent	Salt	Sulfur (all forms)	Anthracite and bituminous	Lignite	Marketable natural gas (Mm_3)	Crude	Refined
World total	7,062	7,187	1,123,153	99,584	162,268	29,789	190,587	58,348	3,662,000	1,229,563	1,990,230	21,892	22,812

[1]Some of the individual entrees in this table may differ from those appearing in individual country production tables elsewhere in this volume owing to the inclusion in this table of data received at a later time.

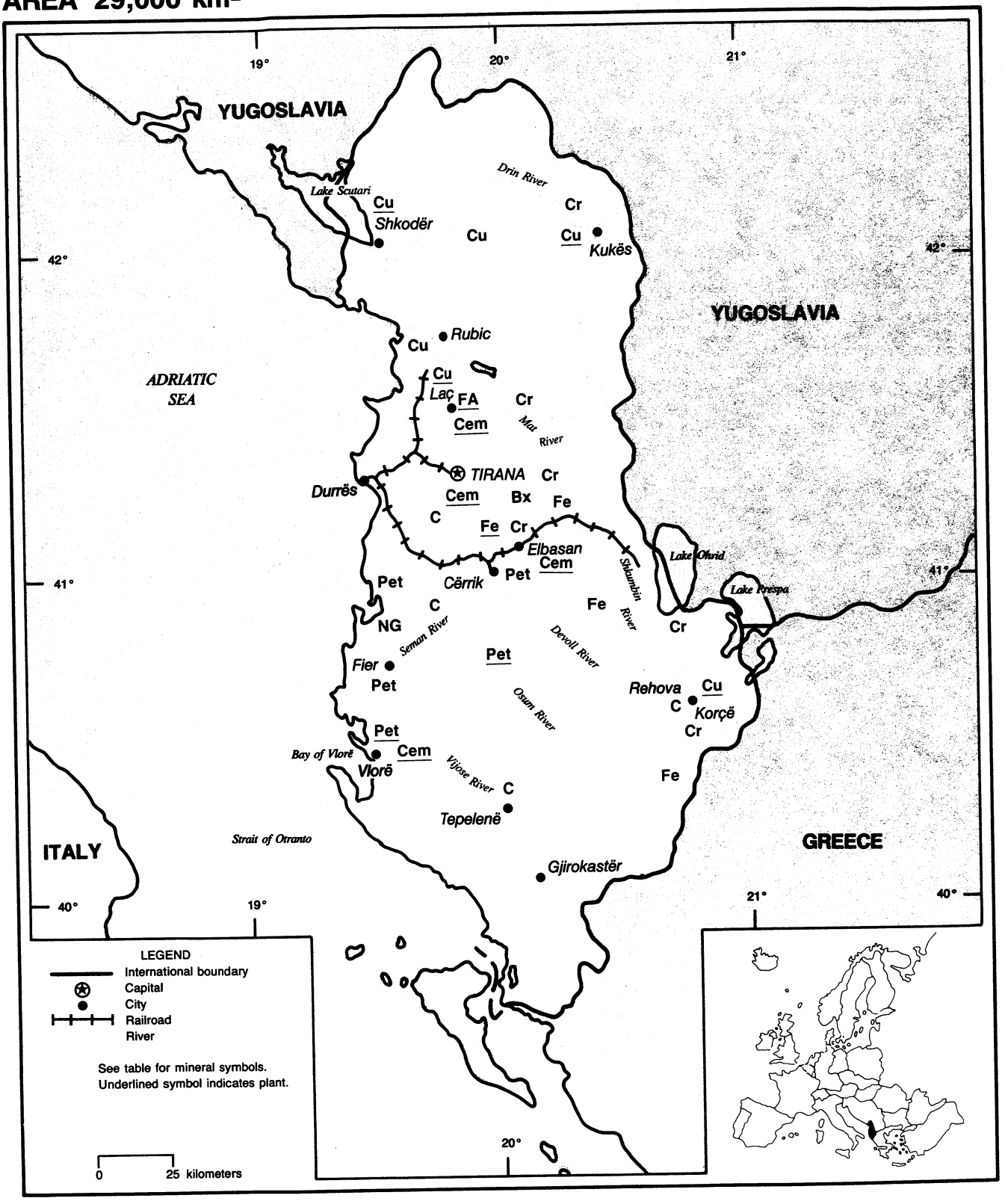
[2]In addition to the production of phosphate rock that is listed in this column, the world phosphate supply was augmented by the production of Thomas slag, a byproduct of pig iron production from phosphate iron ores. Thomas slag production, a modest yet significant component of Europe's phosphate raw material supply, was as follows in 1989, in thousand metric tons: Belgium—165; France—500; the Federal Republic of Germany—400; Luxembourg—550; European Community, market economy Europe, and Europe totals—1,665; world total—1,673. Thomas slag averages about 16% P_2O_5 content world phosphate rock production at 162,268,000 tons averaged slightly over 3 1/2% P_2O_5.

[3]Less than one-half of one unit.

[4]The Soviet supply of aluminum raw materials includes an estimated 4,600,000 tons of bauxite, an estimated amount of nepheline syenite equivalent to 880,000 tons of bauxite, and an estimated amount of alunite equivalent to 205,000 tons of bauxite; the bauxite equivalents of those ores have been included in the Soviet figure and in all appropriate totals.

ALBANIA

AREA 29,000 km² **POPULATION 3.2 million**



THE MINERAL INDUSTRY OF

ALBANIA

By Walter G. Steblez

In 1989, Albania's centrally planned economy and mineral industry had mixed results. Although both national income and industrial production registered increases compared with levels reached in 1988, they nevertheless fell short of planned targets.[1] Planned 1989 production targets were met by the copper and nickeliferous iron ore mining and processing industries as well as by the chemical fertilizer producers. However, continuing shortfalls in chromite mining and petroleum extraction, the country's chief sources of foreign exchange, constituted a serious problem for Albania's economy.[2] New facilities that were brought on-stream in 1989 included several chromite beneficiation plants, the first furnace at the country's second ferrochromium plant under construction at Elbasan, and a new sulfuric acid plant at the Lac copper smelter and refinery. Construction work reportedly continued at the Banje hydroelectric plant and the Fier urea plant.

GOVERNMENT POLICIES AND PROGRAMS

Albania's Government maintained a policy of strict economic central planning and total Government ownership and control of all means of agricultural and industrial activity. Foreign credit borrowing continued to be forbidden, severely limiting the availability of investment capital. Nevertheless, the Government continued to promote commercial and diplomatic contacts with Western European countries to end its self-imposed political isolation in Europe. Albania's foreign trade continued to be based on barter. Industrial machinery and equipment that could not be produced domestically, however, were imported for hard currency, which had been generated by spot sales of mineral commodities such as chromite and ferrochromium.

Albania has not provided officially published data on the country's economy with any regularity or consistency for about 20 years. Instead, official statistical handbooks, which were issued at 5-year intervals, surveyed the country's economic progress. Although planned output targets for selected industrial products and minerals are occasionally published, annual central plan results for mineral production generally are not reported. Chromite output for 1990 was planned to increase 25% over that of 1989; the production of copper, ferrochromium, and nickeliferous iron ore was planned to increase by 6%, 55%, and 7%, respectively.[3]

PRODUCTION

In 1989, Albania's mineral industry reportedly improved its performance in a number of areas, but production shortfalls of chromite and oil refinery products destined for exports continued, resulting in shortages of hard currency that was needed by industry to stimulate growth and promote modernization. Production bottlenecks in the mineral industry remained owing to such factors as low-grade equipment and shortages of spare parts and supplies. The practices of gauging production quantitatively only in terms of gross weight of output and on a nonconvertible currency basis have had a negative impact on Albania's mineral industry and economy in general. The former practice has allowed a high waste of resources in that enterprises tended to produce to the assigned tonnage-output level called for by the plan and not necessarily to the specific needs and specifications required by the end user. Output that was not be usefully consumed was usually either scrapped or wasted. The soft-currency (lek) values assigned to industrial products by the state do not necessarily reflect real relative costs but often represent priorities set within the centrally planned economy structure.

TRADE

Mineral export was the most significant element in Albania's foreign commerce. With a poor manufacturing base, Albania's sole means of acquiring imported machinery and equipment was mostly through exports of chromite, copper, ferrochromium, and nickeliferous iron ore. Consequently, Albania's economy was substantially dependent on world commodity price fluctuations. The country's highest value added exports consisted largely of ferrochromium and copper wire and cable.

In prior years, severe drought often resulted in shortfalls of electric power output generated by the country's hydropower plants. Shortages of water and electricity, in turn, resulted in marked decreases of production in the mineral sector. Lacking other sources of hard-currency revenue, Albania was forced to curtail imports, including those needed for modernization by the mineral sector. Imports of machinery and equipment also included spare parts needed for their operation.

About 45% of Albania's trade turnover was with centrally planned economy countries, and approximately 25% was with members of the European Community (EC).[4] Barter trade agreements concluded with centrally planned economy countries for 1990 included an agreement with Romania for exports of Albanian chromite, coal, copper wire, ferrochromium, and electricity in exchange for oilfield equipment, industrial machinery and equipment, and chemicals. An agreement with Bulgaria called for exports of Albanian copper wire, electricity, ferrochromium, nickeliferous iron ore, as well as consumer goods. Imports from Bulgaria would include coking coal, machinery, and equipment. Albania's barter trade agreement with the German Democratic Republic called for Albanian imports of a broad range of chemical products and agricultural machinery in exchange for chromite, copper wire, and agricultural products. Trade arrangements for 1990 with China covered exports of Albanian chromite, chromite concentrates, copper wire, and pig iron in exchange for coking coal, producer durables, and consumer goods. A trade

TABLE 1

ALBANIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989
Asphalt and bitumen, natural[3]	thousand tons	900	950	950	900	900
Bauxite		50,000	50,000	55,000	55,000	60,000
Cement, hydraulic	thousand tons	850	850	860	800	800
Chromium:						
Chromite, gross weight	do.	[4]1,100	1,200	1,200	1,000	1,000
Marketable ore	do.	825	850	830	750	610
Coal: Lignite	do.	2,195	2,200	2,100	2,100	2,200
Cobalt:						
Mine output, Co content[5]		600	650	650	650	600
Plant production, Co content[6]		—	—	—	350	500
Copper:						
Ore:						
Gross weight	thousand tons	1,010	1,100	1,100	1,100	1,100
Cu content		16,200	17,600	17,800	r15,000	16,000
Metal, primary:						
Smelter		12,600	13,700	14,000	14,500	14,500
Refined		11,500	11,700	12,000	13,000	13,000
Gas, natural, gross production[7]	million cubic meters	380	450	450	420	450
Iron and steel:						
Iron ore, nickeliferous:						
Gross weight		1,130,000	1,200,000	1,200,000	1,200,000	1,400,000
Fe content		376,000	400,000	400,000	400,000	470,000
Metal:						
Pig iron		300,000	300,000	300,000	300,000	350,000
Steel		120,000	130,000	130,000	130,000	135,000
Ferroalloys, ferrochromium		43,000	45,000	46,000	46,000	47,000
Nickel:						
Mine output, Ni content		9,600	9,700	r9,500	r10,000	11,000
Plant production, Ni content[8]		4,000	4,000	4,000	4,500	5,000
Nitrogen: N content of ammonia		r85,000	r90,000	r95,000	r100,000	110,000
Petroleum:						
Crude:						
Weight	thousand tons	1,400	1,500	1,500	1,600	1,600
Converted	thousand 42-gallon barrels	9,800	9,900	9,900	9,900	9,900
Refinery products		9,000	9,000	9,000	9,000	9,000
Salt		70,000	70,000	75,000	70,000	70,000
Sodium compounds, n.e.s.: Carbonate, calcined (soda ash)		31,000	33,000	31,000	30,000	30,000

rRevised.

[1]Table includes data available through June 1990.

[2]In addition to the commodities listed, a variety of industrial minerals and crude construction materials (common clay, quartz, olivinite, dolomite, titanomagnetite, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[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]Figures represent cobalt content of estimated production of commercially marketable cobalt salts produced within Albania from domestically mined nickeliferous iron ore.

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

[8]Figures represent the sum of nickel content of estimated production of marketable nickel carbonate (1985–89) and ferronickel (1988 and 1989) produced within Albania from domestically mined nickeliferous iron ore. The nickel content of the nickel carbonate is included here because it is used in the production of steel in the same way as is nickel oxide sinter produced elsewhere.

agreement with North Korea called for Albanian imports of magnesite and tin sheeting in exchange for Albanian chromite, rolled copper, and copper wire. The agreement with Vietnam called for exports of food and natural rubber to Albania in exchange for bitumen, copper wire, and pyrite concentrates.

STRUCTURE OF THE MINERAL INDUSTRY

Albania's mineral industry continued to be the largest sector of the country's overall industrial structure. Entirely state-owned and state operated, Albania's mineral industry has been administered by the Ministry of Industry and Mines, which maintained a policy of relative secrecy regarding the actual capacities of mineral producing and mineral processing facilities. Capacity data provided in table 2 have been based largely on production statistics published at 5-year

TABLE 2

STRUCTURE OF THE MINERAL INDUSTRY OF ALBANIA

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Ministry of Industry and Mines (Government, 100%)	Elbasan, 32 kilometers southeast of Tirana; Kruje, 20 kilometers northwest of Tirana; Shkodër, 85 kilometers northwest of Tirana; and Vlorë, 100 kilometers southwest of Tirana	1,200
Chromite	do.	Tropoje area, north Albania:	
		Kam Mine	76
		Kalimash Mine	200
Do.	do.	Martanesh area, east of Tirana:	
		Bulqizë Mine	450
		Batër Mines I and II	400
		Other mines: Klos in Martanesh; Katjel, near Prenjas; and Ternova at Piber	110
		Concentrator at Bulqizë, 35 kilometers northwest of Tirana	250
Copper:			
Ore	do.	Mines in northern Albania at Kukës, Gjergjan, Kurbnesh, and Tuci	1,200
Smelter	do.	Smelters in northern Albania at Kukës, Fierze-Rubik, Laç, and Shkoder	16
Ferrochromium[1]	do.	Plant at Burrel, 35 kilometers northeast of Tirana	48
Steel	do.	"Steel of the Party" metallurgical complex at Elbasan	150
Iron ore	do.	Prënjas Mine, 70 kilometers southeast of Tirana	550
Do.	do.	Guri i Kuq Mine, 24 kilometers east of Tirana	500
Do.	do.	Bitinska Mine, near Greek border	100
Coal lignite	do.	Maneze, Mezes, and Valias Mines in Tirana Durres area; Krabë Mine, 20 kilometers southeast of Tirana; Alarup and Cervnake Mines, in Pogradec area, 80 kilometers southeast of Tirana; Mborje-Drenovë Mine in Korcë area, 85 kilometers southwest of Tirana; and Memaliaj Mine in Tepelenë area, 110 kilometers south of Tirana	2,500
Natural gas	do.	Gasfields in southwest between Ballsh and Fier	[2]16,000
Petroleum:			
Crude	do.	Oilfields at Stalin, Marineze, and Patos in the southwest	[3]35,000
Refined	do.	Refineries: Ballsh, 85 kilometers southwest of Çerrik; and Stalin and Fier, south of Tirana	[3]33,000

[1]The new ferrochromium plant at Elbasan, upon completion, will have a rated output capacity of 38,000 metric tons per year.
[2]Million cubic feet per year.
[3]42-gallon barrels per day.

intervals in addition to data published in open sources.

COMMODITY REVIEW

Metals

Metal ores have been Albania's chief source of mineral wealth. Apart from the commodities reviewed in this section, Albania reported the existence of numerous undeveloped alluvial deposits of heavy sands containing zirconium and rare earths, as well as rutile and ilmenite.

Bauxite.—Albania's bauxite deposits are in the central part of the country, just east of Tirana, as well as in the Northern Alpine region near the Yugoslav border. Bauxite reserves were estimated at about 12 million tons. The largest deposit at Dajti contained approximately 8 to 9 million tons of reserves with an average grade of 39% to 40% Al_2O_3, 13% SiO_2, 6% S, 4% to 5% CaO, and 18.3% Fe_2O_3. Only 50,000 to 60,000 tons of bauxite per year are reportedly mined near Prenjas, in the Librazhd district. Because of a lack of domestic alumina refining and aluminum smelting capacity, this limited quantity of domestically mined bauxite has been entirely designated for export.

Chromite.—Albania's chromite mining operations were the most important component of its mineral industry. From the late 1970's through the 1980's, Albania has been a leading world producer and exporter of chromite, usually ranked second in terms of export and third in terms of production. In 1989, exports of chromite and ferrochromium continued to be vital earners of foreign exchange.

Although some chromite deposits and outcroppings can be found throughout Albania, the country's principal commercial chromite deposits are in the north-central and northern parts of the country in ultrabasic massifs in the Mirdite area. The mainly podiform ore is mined at seven mining districts, of which Bulqize and Batër, about 30 kilometers (km) northeast of Tirana, represent about two-thirds of Albania's total production capacity. Albanian ore grades range from 18% to 43% Cr_2O_3. Lumpy ores grading 39% to 42% Cr_2O_3 and concentrates grading from 50% to 53% Cr_2O_3 are designated for export. Albania's largest and richest chromite mine at Bulqize annually has produced between 450,000 and 500,000 tons of ore. About one-half of the ore was suitable for direct shipment; the balance was divided equally for beneficiation and for shipment as feedstock for the Burrel ferrochromium plant.

Chromite extraction has become more difficult because of the declining availability of ore suitable for open pit mining; the increasingly complex geological environment at underground mining operations, especially at the Bulqize mine; and the need for modern machinery and equipment. In early 1990, Government sources, without providing details, reported a production shortfall of more than 140,000 tons of chrome concentrates in 1989, which represented a significant 20% decline in the production of marketable ores and concentrates.[5] To bring marketable chromite production up to the level of 1988, the Government planned to raise the output of chromite by 25% in 1990. Late in 1989, Albanian authorities reported the construction of a new 700,000-ton-per-year beneficiation plant at Bulqize. When completed, the new concentrator would be able to process increasing amounts of lower grade ores from both the Bulquize mine and the nearby Batër mine.

Copper.—During the 1980's, Albania's output of copper ore has been about 1 million tons per year grading between 1.5% to 4% copper. All copper mining was done underground. With the exception of the Rehove Mine and beneficiation plant in southeastern Albania, copper is mined, processed, smelted, and refined largely in the northern part of the country. The largest copper mining and beneficiation complex at Fushe Arrez produced more than 320,000 tons of ore per year.

After beneficiation, copper concentrates are smelted at the Rubik and Gjegjan pyrometallurgical primary smelters. Refineries and rolling mills at Rubik and Shkoder produced copper wire, a large part of which was exported. Since Albania had few private telephones, only a limited amount of copper was consumed by the country's telecommunications industry.

Officially published 1989 central economic plan results indicated plan fulfillment for mine output of copper ore, copper wire, and cable manufacture.[6] Other events in 1989 included the start-up of a new sulfuric acid plant at the Laç copper smelter and the completion of feasibility studies for the construction of a new electrolytic copper refinery at Elbasan. Construction work on this facility was planned to begin in 1990. Facility expansion at the Shkoder copper wire plant was also planned to begin in 1990. Mine output of copper in 1990 was planned to increase by 6% over that of 1989. This increase would be based partly on the commissioning of several unspecified new mines.

Ferrochromium.—Albania's ferrochromium plant at Burrel produced about 38,000 tons of high-carbon ferrochromium for the export market from 105,000 tons of ore and concentrate using three 9-megawatt furnaces. Two additional furnaces were to be added at Burrel in 1990. In April 1989, Albania announced plans to build a second ferrochromium plant. This facility at Elbasan was designed to produce 38,000 tons of high-carbon ferrochromium from about 100,000 tons of ore and concentrates in three furnaces. One furnace was reportedly installed by yearend, and completion of the new facility was scheduled for 1990.

At midyear, the Albanian foreign trade organization, Mineralimpex, began negotiations with the ferroalloy producer Gesellschaft fur Elektrometallurgie (GfE) and its subsidiary Elektrowerk Weisweiler, both of the Federal Republic of Germany, with regard to a long-term marketing agreement to distribute Albanian ferrochromium in the Federal Republic of Germany. At yearend, an agreement was reached that would allow for the transfer of GfE's ferrochromium technology and know-how to Albania in return for a reliable supply of good quality Albanian ferrochromium. Reportedly, the agreement stipulated a minimum of 10,000 tons per year of ferrochromium. At the time the agreement was announced, it was not certain whether Albanian ferrochromium shipments would originate from Burrel or the newer Elbasan plant.

Nickeliferous Iron Ore.—Albania's reserves of iron ore were estimated at about 300 million tons. Yearly output has ranged from 1 to 1.2 million tons of ore, of which about one-half has been consumed at the Elbasan iron and steel works to produce pig iron, a small amount of steel, and salts of nickel and cobalt. The balance of the iron ore has been exported, largely to Bulgaria and Czechoslovakia. Over several decades, Czechoslovakia has been the largest consumer of Albanian nickeliferous iron ore with annual imports ranging from

200,000 to 350,000 tons of ore per year. Czechoslovakia has processed Albanian ore at its Sered refinery, where nickel and cobalt were extracted.

Deposits of commercial grade ore are in ultrabasic massifs, near Pogradec, in east-central Albania. The principal mines were at Prënjas, Guri i Kuq, and Bitinska. The largest mining operation at Prënjas produces about 600,000 tons of ore per year. The majority of Albanian ores are lateritic grading 35% to 45% Fe, 1.4% Ni, and 0.05% Co. The Bitinska deposit contains considerable reserves of lateritic ore as well as silicate ores, but only the lateritic material has been mined.

Nickel and Cobalt.—During the 1980's, the trade returns of market economy showed occasional shipments of small lots of nickel matte speiss and nickeliferous residues. Also, recent nonstatistical sources have been reporting the construction of a nickel and cobalt plant at Elbasan, in progress from about 1985 to 1989. The completion of the plant has been postponed over a number of years because of technical difficulties. However, it seemed fairly clear that some component of the Elbasan iron and steelworks or of the new nickel and cobalt plant has produced a commercially marketable grade of nickel carbonate for a number of years from lateritic nickeliferous iron ores. This product has been exported to countries where it is used in much the same way as nickel oxide sinter—as a direct additive product in steelmaking. The same facility(ies) presumably produced cobalt salts, at least during 1988 and 1989, which were also destined for the export market.

Industrial Minerals

Albania's industrial mineral deposits continued in early stages of development. In August 1989, Albanian officials indicated that future investment would be aimed at developing mines and constructing processing plants to exploit the country's deposits of asbestos, fluorite, kaolin, magnesite, phosphates, and quartz. Albania apparently produced sufficient amounts of sand gravel and dressed stone to meet the needs of its construction industry.

Mineral Fuels

Albania produced coal, hydroelectric power, natural gas, and petroleum, which, in prior years, in view of low domestic fuel consumption, allowed the country to be a net exporter of energy. Recently, owing to reduced hydropower output resulting from several years of drought, a general downturn in petroleum production, and increasing indigenous energy requirements, Albania's energy status has become very uncertain. Albania has mined only low-calorie lignite, which met most nonmetallurgical domestic needs. To meet the needs of its iron and steel and ferrochromium industries, coking coal must be imported. More than 30% of Albania's annual investment in industry has been allocated to the petroleum and natural gas sector.[7] Despite this effort, petroleum extraction generally has been in decline since 1979 because of depletion of existing reserves, the inability to discover new deposits, and the lack of modern oilfield equipment. The gas industry has had somewhat better results in regard to both production and exploration. Albania's oil and gas industry was in the west-central coastal area, near the towns of Fier, Ballsh, Divjake, and Stalin.

In August 1989, Albania reported a discovery of a new gasfield in the Vlore district. Apart from indicating that three wells were planned to be commissioned by the end of 1990, no details were provided concerning the size of the deposit. About 45% of Albania's natural gas was consumed as a feedstock and fuel by the the wood pulp and chemical fertilizer industries; 15% was consumed in electric power generation and municipal heating; and 10% was consumed by the iron and steel and nonferrous metals sectors.

Reserves

In accordance with the "Stalinist" model of centrally planned industrial development, since the early 1950's Albania has pursued the policy of attaining self-sufficiency at all costs. In Albania, as in other centrally planned economy countries, rigid directives to discover exploitable resources have often led to overevaluations of collected field data.

The system used to measure reserves in Albania, as in other centrally planned economy countries, was based on two cross-imposed classification schemes, one relating to the exploitability of the material in question and the other relating to the reliability of the information on the quantity of material in place. The first system was used to determine whether or not the deposit is suitable for exploitation given current technological capability and industrial need. The second classification related to the reliability of data gathered on the quantity of the mineral in situ. The second classification designated deposits into reserve categories A, B, and C1, where sufficient geological data has been obtained relative to the size of the deposit and its mineral grade. Reserve category A referred to deposits that are known in detail. The ore body boundaries were outlined by trenching, exploratory boreholes, or exploratory workings; the depositional environment, the proportion of different commercial grades of ore, and the hydrogeologic conditions of exploitation were ascertained. The quality and technological properties of the ore were determined in detail, assuring the reliability of projected beneficiation and production processes. Category B differed from A mainly in that fewer details were available concerning the distribution of ore grades within the deposit. Category C1 referred to reserves in place estimated by a sparse grid of exploratory boreholes or workings. These reserves could adjoin the boundaries of categories A and B; they could also be reserves of very difficult deposits where the distribution of mineral values cannot be ascertained even by a dense exploratory grid. The types, industrial grades, and quality of ore as well as the necessary beneficiation technology were tentatively established by means of laboratory analysis and/or by analogy with similar known deposits. The general conditions of exploitation and the hydrogeological environment of the deposit were known tentatively as well. Taking this into account, Albania's mineral resources in categories A+B+C1 are given in table 3.

TABLE 3

ALBANIA: APPARENT RESERVES OF MAJOR MINERALS

(Thousand metric tons unless otherwise specified)

Commodity	Reserve
Bauxite	12,000
Chromite, 20% to 39% Cr_2O_3	25,000
Cobalt, recoverable in ore	60
Copper, recoverable in ore	500
Iron, recoverable in ore	13,000
Nickel, recoverable in ore	900
Coal	58,000
Natural gas, billion cubic meters	20

Sources: Gornaya Entsiklopediya, V. I, Moscow; and Gazovaya Promyshlennost', Moscow, Dec. 1989.

INFRASTRUCTURE

Albania's inland system of ways and communications was composed of about 17,300 km of highways, railroads, and waterways. The railroad system consisted of 509 km of 1.435-meter standard-gauge track and 34 km of narrow-gauge single track. The road system consisted of 6,700 km of highways and main roads and 10,000 km of forest and rural roads. About 60% of all domestic cargo was transported by truck, 35% by rail, and 2% by coastal shipping along the Adriatic Sea and sections of Lake Shkoder, Lake Ohrid, and Lake Prespa. Nickeliferous iron ore mining areas at Prënjas and Guri i Kuq are linked by rail to processing centers at Elbasan. The copper mining district at Shkoder is also rail-linked to the copper smelter and refinery at Laç. Albania has a 1,630,000-kilowatt generating capacity, mostly from hydroelectric sources. The country's petroleum and natural gas sector had about 145 km of crude oil pipeline, 55 km of refinery products pipeline, and 64 km of pipeline for natural gas. Seaports were at Durrës, Shengjini, and Vlorë, but most bulk mineral cargoes were handled at Durrës.

OUTLOOK

Albania's mineral industry was labor-intensive and in need of large infusions of capital. As long as the centrally planned economic structure remains in place and alleged forced labor continues to be used in mining and other branches of heavy industry, the returns to the economy from all sectors of economic activity, including mining and mineral processing, will probably continue to diminish, and the country's standard of living will continue to decline. Albania has remained conspicuously behind other East European centrally planned countries in terms of both political and economic reforms. Barring any dramatic political and, hence, economic changes, Albania in the near term will only be able to significantly raise the production of high-carbon ferrochromium and nickel and cobalt salts. Although these and a number of other commodities should have ready markets in Western Europe, they would not be sufficient to cover outlays needed to modernize Albania's industry. Shortages of hard currency will also restrict needed imports of mineral commodities not only from market economy countries but also from centrally planned economy countries that are in transition to market economies. Although the production of construction materials appears to be adequate to meet current requirements, increased demand resulting from a major capital modernization and expansion would prove difficult to meet owing to a lack of quarrying equipment, trained personnel, and processing plants.

[1]Zeri i Popullit, Dec. 28, 1989, pp. 1–3.
[2]Reference cited in footnote 1.
[3]Reference cited in footnote 1.
[4]Financial Times, Feb. 20, 1990, p. 5
[5]Reference cited in footnote 1.
[6]Reference cited in footnote 1.
[7]Gazovaya Promyshlennost, Dec. 1989, p. 45.

OTHER SOURCES OF INFORMATION

Agency

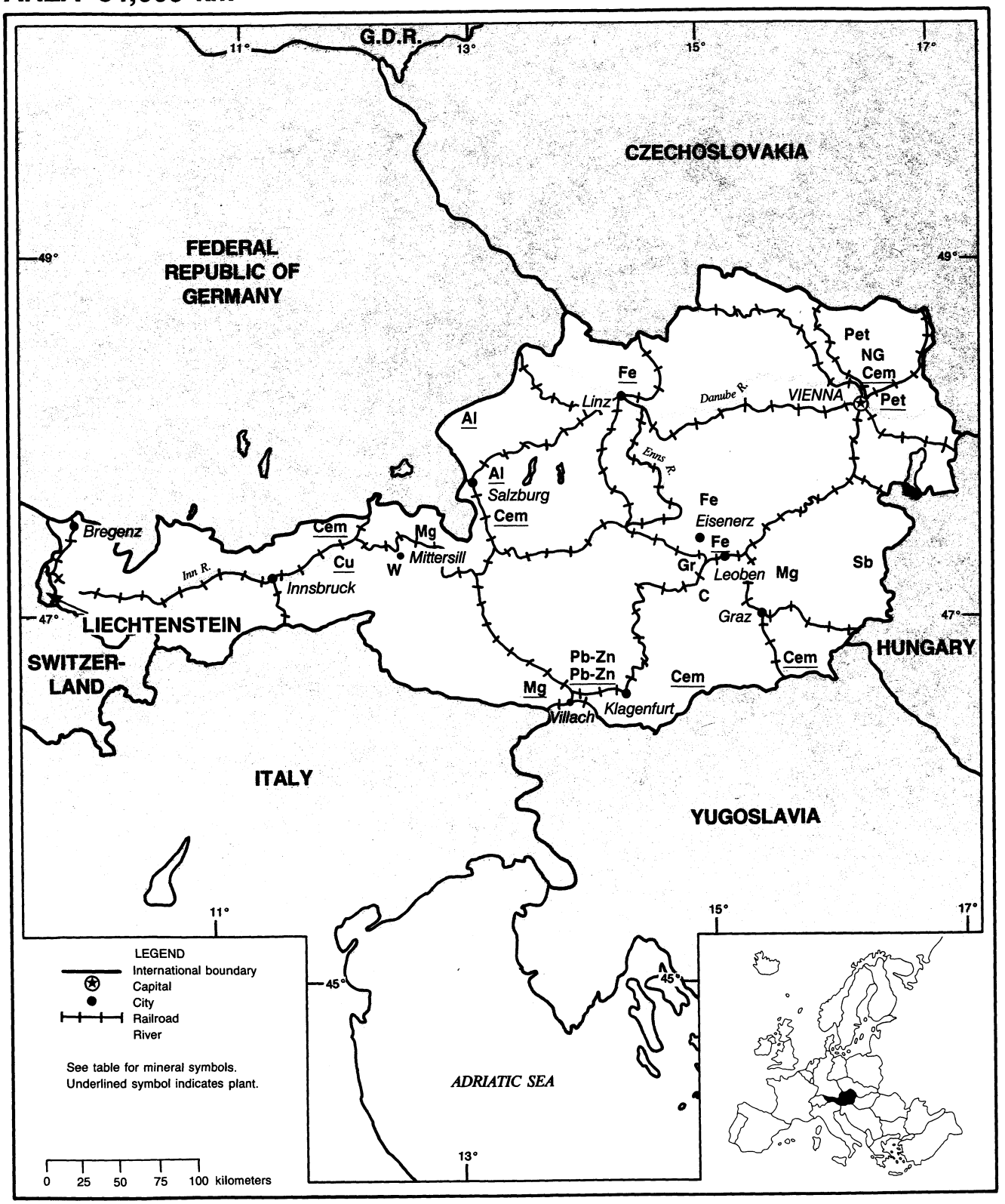
Ministria e Industrise dhe Minierave
(Ministry of Industry and Mines)
Tirana, Albania

Publications

Albania Today (Tirana), published monthly in English.
35 Vjet Shqiperi Socialiste (35 Years of Socialist Albania), (Tirana), a 5-year statistical report.

AUSTRIA

AREA 84,000 km² **POPULATION 7.5 million**



THE MINERAL INDUSTRY OF

AUSTRIA

By George A. Rabchevsky

Austria has a variety of mineral resources, including coal, graphite, iron ore, magnesite, and tungsten. In addition, steelmaking and the refining of antimony, germanium, lead, and zinc are important industries to the economy of the country.

GOVERNMENT POLICIES AND PROGRAMS

Mining and mineral processing facilities are regulated by the Supreme Mining Authority, a section of the Federal Ministry of Trade, Commerce, and Industry. Many mining operations and processing facilities are owned by the Government. Proprietorship is exercised by Austria's state holding company, Osterreichisch Industrieholding AG (OIAG), which also administers the major part of other nationalized enterprises. Because Austria depends on imports for about 75% of its mineral raw material requirements, the Government has a policy of funding exploration and research through the Ministry of Trade, the Ministry of Commerce and Industry, and the Ministry of Science and Research. All foreign investment ventures are regulated by the Government. Austria welcomes and promotes foreign direct investments that create new jobs, introduce high technology, and do not compete in sectors already judged to have excess capacity.

The fundamental mining law, known as Berggesetz 1975 BGB1, Nr. 259, was revised on October 1, 1975, and amended on January 1, 1982. The 1982 amendment increased production royalties for crude oil and natural gas, raised prospecting and mining fees, and regrouped some minerals within the four major product groups (legal classification).

TABLE 1

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS						
Aluminum metal:						
Primary		94,106	92,453	93,414	95,494	92,924
Secondary		21,100	24,700	19,800	29,400	[e]29,000
Total		115,206	117,153	113,214	124,894	[e]121,924
Antimony, mine output, Sb content of concentrate		477	514	322	228	350
Cadmium metal		52	52	26	26	49
Copper:						
Smelter, secondary		25,900	25,500	29,100	34,500	33,700
Refined:						
Primary		8,207	7,067	3,855	3,551	7,178
Secondary		34,966	32,579	32,924	38,378	39,089
Total		43,173	39,646	36,779	41,929	46,267
Germanium, Ge content of concentrate	kilograms	5,500	6,300	6,700	6,000	6,000
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	3,270	3,120	3,061	2,311	2,410
Fe content	do.	1,019	976	954	727	761
Metal:						
Pig iron	do.	3,704	3,349	3,451	3,665	3,823
Ferroalloys, electric-furnace[e]	do.	12	12	12	12	12
Crude steel	do.	4,660	4,292	4,301	4,560	4,718
Semimanufactures	do.	3,760	3,462	3,432	3,752	3,732

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS—Continued						
Lead:						
Mine output, Pb content of concentrate		6,129	4,662	5,246	2,281	1,571
Metal:						
Smelter:						
Primary		1,930	1,500	3,400	6,753	[e]6,500
Secondary		15,601	15,000	15,700	15,651	15,800
Total		17,531	16,500	19,100	22,404	[e]22,300
Refined:						
Primary[e]		10,000	6,000	6,800	[r]9,000	8,800
Secondary		15,500	19,000	16,000	16,000	[e]15,200
Total		25,500	25,000	22,800	25,000	[e]24,000
Manganese, Mn content of domestic iron ore		60,074	58,945	57,486	40,917	46,287
Tungsten, mine output, W content of concentrate		1,481	1,387	1,250	1,235	[e]1,250
Zinc:						
Mine output, Zn content of concentrate		21,704	16,290	15,735	17,051	[e]14,600
Metal, refined		25,000	24,000	24,300	23,900	26,102
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	4,560	4,569	4,522	4,763	4,749
Clay:						
Illite		212,678	268,451	275,921	280,369	242,767
Kaolin:						
Crude		500,844	444,852	444,927	485,011	492,417
Marketable		100,151	46,291	92,186	89,491	157,258
Other		49,161	33,037	12,961	52,102	6,855
Feldspar, crude		13,570	2,850	4,692	8,222	7,251
Graphite, crude		30,764	36,167	39,391	7,577	15,307
Gypsum and anhydrite, crude		693,993	701,749	664,452	721,745	625,433
Lime	thousand tons	1,301	1,275	1,378	1,545	1,622
Magnesite:						
Crude	do.	1,255	1,084	947	1,122	1,205
Sintered or dead-burned	do.	389	315	345	360	360
Caustic calcined	do.	75	73	58	67	60
Nitrogen: N content of ammonia[e]	do.	500	450	450	450	445
Pigments, mineral: Micaceous iron oxide		11,583	11,730	10,807	9,938	10,924
Pumice (trass)		6,981	5,808	6,922	7,359	8,130
Salt:						
Rock	thousand tons	1	2	1	1	1
In brine:						
Evaporated	do.	438	486	484	413	396
Other[e]	do.	254	215	180	[r]256	251
Total	do.	692	701	664	669	647
Sand and gravel:						
Quartz sand	do.	735	798	684	756	819
Other sand and gravel	do.	14,593	8,861	9,322	14,700	16,057
Total	do.	15,328	9,659	10,006	15,456	16,876

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Sodium compounds, n.e.s.:[e]						
Soda ash, manufactured	thousand tons	150	150	150	[r]145	150
Sulfate, manufactured	do.	50	55	[r]109	[r]118	120
Stone:[2]						
Dolomite	do.	1,291	1,308	1,406	1,521	1,645
Quartz and quartzite	do.	176	196	196	167	263
Other, including limestone and marble	do.	11,667	9,250	9,540	12,324	12,700
Total	do.	13,134	10,754	11,142	14,012	14,608
Sulfur:						
Byproduct:						
Of metallurgy		11,204	10,986	10,448	11,331	12,064
Of petroleum and natural gas		24,250	29,348	24,946	36,217	37,070
From gypsum and anhydrite		26,547	23,837	13,091	—	—
Total		62,001	64,171	48,485	47,548	49,134
Talc and soapstone		131,454	133,319	129,959	132,974	133,078
MINERAL FUELS AND RELATED MATERIALS						
Coal, brown and lignite	thousand tons	3,081	2,969	2,786	2,129	2,066
Coke	do.	1,751	1,744	1,727	1,744	1,771
Gas, natural:						
Gross	million cubic meters	1,164	1,112	1,167	1,265	1,323
Marketed	do.	[r]972	[r]921	968	1,062	[e]1,020
Oil shale		620	400	1,090	210	570
Petroleum:						
Crude	thousand 42-gallon barrels	7,999	7,783	7,410	8,196	8,075
Refinery products:						
Liquefied petroleum gas	do.	5,479	5,145	6,476	7,010	[e]6,000
Gasoline	do.	18,184	18,023	20,054	20,516	19,935
Kerosene and jet fuel	do.	1,452	1,381	1,546	1,772	2,226
Distillate fuel oil	do.	16,482	18,582	18,917	18,288	20,920
Lubricants	do.	604	1,591	—	—	—
Residual fuel oil	do.	16,040	13,530	12,411	12,027	[e]12,100
Bitumen	do.	1,363	1,427	1,382	1,425	1,487
Unspecified	do.	182	220	82	71	75
Refinery fuel and losses	do.	3,292	3,502	3,620	3,458	2,387
Total	do.	63,078	63,401	64,488	64,567	65,130

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1990.
[2]Excluding stone used by the cement and iron and steel industries.

TABLE 2

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	NA	11	—	Czechoslovakia 6; West Germany 3.
Alkaline-earth metals	NA	(2)	—	All to West Germany.
Aluminum:				
Ore and concentrate	277	135	—	West Germany 61; Italy 49; France 26.
Oxides and hydroxides	NA	402	—	West Germany 182; Italy 115.
Ash and residue containing aluminum	NA	65,850	—	Italy 48,106; West Germany 11,430; Spain 5,552.
Metal including alloys:				
Scrap	NA	46,911	—	Italy 22,557; West Germany 20,542.
Unwrought	39,447	44,894	—	West Germany 14,443; Italy 8,608; Belgium-Luxembourg 8,371.
Semimanufactures	113,955	126,127	1,676	West Germany 48,971; Italy 16,094; Switzerland 8,417.
Antimony:				
Ore and concentrate	NA	77	—	West Germany 74.
Oxides	NA	20	—	Egypt 10; Yugoslavia 9.
Metal including alloys, all forms	NA	3	—	Italy 1; Yugoslavia 1.
Arsenic: Metal including alloys, all forms	NA	1	NA	NA.
Bismuth: Metal including alloys, all forms	NA	(2)	—	All to Yugoslavia.
Cadmium: Metal including alloys, all forms	NA	20	NA	Mainly to United Kingdom.
Chromium:				
Ore and concentrate	NA	213	—	All to Italy.
Oxides and hydroxides	NA	8	—	Mainly to Yugoslavia.
Metal including alloys, all forms	NA	1	—	Mainly to West Germany.
Cobalt:				
Ore and concentrate	NA	33	—	All to Belgium-Luxembourg.
Oxides and hydroxides	NA	29	—	Belgium-Luxembourg 28.
Metal including alloys, all forms	NA	7	—	West Germany 5; Czechoslovakia 1.
Columbium and tantalum: Tantalum metal including alloys, all forms	NA	37	NA	Belgium-Luxembourg 17; West Germany 9; Japan 3.
Copper:				
Ore and concentrate	NA	96	—	West Germany 50; Belgium-Luxembourg 46.
Matte and speiss including cement copper	NA	16	—	All to Italy.
Oxides and hydroxides	NA	3	—	NA.
Sulfate	NA	52	NA	NA.
Ash and residue containing copper	NA	11,269	—	West Germany 6,240; Sweden 2,687; Belgium-Luxembourg 1,326.
Metal including alloys:				
Scrap	NA	25,360	—	West Germany 13,785; Italy 4,732; Hungary 2,206.
Unwrought	23,846	24,434	24	Italy 12,878; West Germany 9,233.
Semimanufactures	23,003	28,569	305	West Germany 9,021; Italy 6,229; France 3,378.
Gold: Metal including alloys, unwrought and partly wrought kilograms	NA	1,015	—	West Germany 668; Italy 189.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	67	(2)	—	NA.
Metal:				
Scrap	92,200	47,222	—	Italy 20,978; West Germany 15,864.
Pig iron, cast iron, related materials	7,016	10,462	—	Italy 7,220; France 1,247.
Ferroalloys	13,322	18,792	NA	NA.
Steel, primary forms	355,226	15,147	—	Italy 12,023; West Germany 1,533.
Semimanufactures:				
Bars, rods, angles, shapes, sections	338,882	370,815	3,122	West Germany 125,518; Italy 100,363; Switzerland 35,863.
Universals, plates, sheets	1,588,365	NA		
Hoop and strip	182,537	NA		
Rails and accessories	90,391	97,008	1,811	Switzerland 38,713; India 19,817; Denmark 11,074.
Wire	61,223	62,014	2,148	West Germany 31,255; Italy 9,445; Bulgaria 5,043.
Tubes, pipes, fittings	488,342	575,970	23,238	U.S.S.R. 241,232; West Germany 97,544; Italy 35,117.
Castings and forgings, rough	12,308	NA		
Lead:				
Ore and concentrate	1,022	—		
Ash and residue containing lead	NA	1,975	—	West Germany 1,649; Yugoslavia 227.
Metal including alloys:				
Scrap	NA	1,601	—	West Germany 1,086; Yugoslavia 472.
Unwrought	1,935	7,273	—	Italy 6,299; Switzerland 893.
Semimanufactures	25	29	—	Algeria 11; West Germany 9; Egypt 5.
Magnesium: Metal including alloys:				
Scrap	NA	469	—	West Germany 406; Belgium-Luxembourg 50.
Unwrought	NA	179	—	West Germany 131; Italy 24; Romania 20.
Semimanufactures	NA	2,029	NA	France 22; West Germany 21; unspecified 1,972.
Manganese: Oxides	NA	94	—	Yugoslavia 51; Italy 20; Denmark 14.
Mercury	NA	3	—	Yugoslavia 2; West Germany 1.
Molybdenum:				
Ore and concentrate	NA	1,380	—	Czechoslovakia 673; Italy 467.
Oxides and hydroxides	NA	4	—	NA.
Metal including alloys, all forms	NA	1,640	216	West Germany 723; United Kingdom 149.
Nickel:				
Matte and speiss	23	75	—	West Germany 48; Sweden 23.
Metal including alloys:				
Scrap	NA	123	—	West Germany 59; Switzerland 37.
Unwrought	2	98	—	Sweden 90; Yugoslavia 8.
Semimanufactures	488	626	1	West Germany 238; Belgium-Luxembourg 62.
Platinum-group metals:				
Waste and sweepings value, thousands	—	$1,333	—	Netherlands $691; France $492; United Kingdom $150.
Metals including alloys, unwrought and partly wrought do.	$5,851	$8,098	—	West Germany $5,839; United Kingdom $1,057; Sweden $472.
Rare-earth metals including alloys, all forms	NA	430	2	France 112; Norway 60; West Germany 45.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Selenium, elemental		NA	3	—	Mainly to Belgium-Luxembourg.
Silicon, high-purity	kilograms	NA	700	—	All to West Germany.
Silver:					
Waste and sweepings[3]	value, thousands	$5,943	$12,896	—	United Kingdom $9,394; West Germany $3,213.
Metal including alloys, unwrought and partly wrought	do.	$45,473	$24,720	—	West Germany $21,417; Switzerland $1,889.
Tin:					
Oxides		NA	1	—	NA.
Metal including alloys:					
Scrap		NA	10	—	All to West Germany.
Unwrought		26	47	—	Netherlands 35; West Germany 8.
Semimanufactures		43	53	1	Iraq 44; Czechoslovakia 4.
Titanium:					
Ore and concentrate		NA	2	—	NA.
Oxides		NA	952	—	West Germany 231; Italy 173; Iran 155.
Metal including alloys:					
Unwrought including scrap		NA	6,970	89	United Kingdom 3,828; Italy 1,924; Belgium-Luxembourg 700.
Semimanufactures		NA	28	—	Switzerland 17; West Germany 9; Czechoslovakia 2.
Tungsten: Metal including alloys, all forms		NA	1,119	29	West Germany 681; India 138; Israel 110.
Uranium and thorium: Oxides and other compounds	value, thousands	$965	$83	$34	France $16; United Kingdom $13.
Vanadium: Oxides and hydroxides		NA	494	—	U.S.S.R. 490; West Germany 4.
Zinc:					
Ore and concentrate		NA	21	—	All to West Germany.
Oxides		NA	2,177	—	West Germany 1,383; Hungary 355; Yugoslavia 239.
Blue powder		NA	112	—	Belgium-Luxembourg 48; West Germany 38; Iraq 30.
Ash and residue containing zinc		NA	2,166	—	France 1,426; West Germany 448; Belgium-Luxembourg 267.
Metal including alloys:					
Scrap		NA	2,399	—	Taiwan 1,058; West Germany 659; Belgium-Luxembourg 620.
Unwrought		4,704	7,066	—	Italy 5,150; Yugoslavia 761.
Semimanufactures		197	48	7	West Germany 10; Yugoslavia 6.
Zirconium:					
Ore and concentrate		NA	21	—	All to Yugoslavia.
Metal including alloys, all forms	value, thousands	NA	$7	—	All to Algeria.
Other:					
Ores and concentrates		888	24	—	NA.
Oxides and hydroxides		113,006	166	52	Yugoslavia 72.
Ashes and residues		NA	1,503	—	Switzerland 522; Belgium-Luxembourg 272.
Base metals including alloys, all forms		10,513	46	—	West Germany 41.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	172	158	—	West Germany 113; Yugoslavia 39.
Artificial: Silicon carbide	NA	59	—	Albania 34.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$59	[4]$7	—	NA.
Grinding and polishing wheels and stones	12,665	13,866	410	West Germany 2,751; Italy 1,537; France 1,164.
Asbestos, crude	—	28	—	Israel 20; West Germany 7.
Barite and witherite	3	10	7	NA.
Boron materials:				
Crude natural borates	100	228	—	Yugoslavia 204; West Germany 24.
Oxides and acids	NA	102	—	All to Yugoslavia.
Bromine	NA	[2]	NA	NA.
Cement	10,355	12,276	—	West Germany 7,554; Italy 2,707; Hungary 960.
Chalk	4,627	3,623	—	Hungary 2,554; Czechoslovakia 592.
Clays, crude:				
Bentonite	NA	34	—	West Germany 33; Hungary 1.
Chamotte earth	NA	473	—	West Germany 262; Denmark 144.
Fuller's earth	NA	8	—	NA.
Fire clay	NA	45	—	NA.
Kaolin	NA	48,568	—	Hungary 29,523; West Germany 11,487.
Unspecified	69,673	93	—	West Germany 48.
Cryolite and chiolite	3	26	—	France 20; Denmark 3.
Diamond, natural:				
Gem, not set or strung value, thousands	$444	$279	$5	Switzerland $165; Belgium-Luxembourg $31; West Germany $26.
Industrial stones do.	$248	$194	—	Yugoslavia $185; Poland $7; West Germany $2.
Dust and powder kilograms	NA	2	—	NA.
Diatomite and other infusorial earth	2,653	2,811	—	Hungary 881; Bulgaria 641; Yugoslavia 631.
Feldspar, fluorspar, related materials:				
Feldspar	—	17	—	NA.
Unspecified	33	37	—	NA.
Fertilizer materials:				
Crude, n.e.s.	6,894	330	—	Switzerland 169; West Germany 151.
Manufactured:				
Ammonia	NA	[2]	—	All to Yugoslavia.
Phosphatic	—	60,041	—	Czechoslovakia 60,036; Switzerland 5.
Potassic	—	23	—	Yugoslavia 20.
Unspecified and mixed	899,407	6,147	—	Hungary 6,009.
Graphite, natural	8,330	8,926	60	West Germany 3,600; Poland 2,613; Italy 1,280.
Gypsum and plaster	117,279	127,749	—	West Germany 125,506.
Iodine	NA	[2]	NA	NA.
Kyanite and related materials	NA	1	—	NA.
Lime	3,211	5,613	—	West Germany 5,206.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Magnesium compounds:				
Magnesite, crude	—	58	—	West Germany 24; Hungary 22.
Oxides and hydroxides	141,261	149,112	8,639	Venezuela 38,560; West Germany 36,054.
Mica:				
Crude including splittings and waste	371	651	11	West Germany 410; Italy 117.
Worked including agglomerated splittings	279	3,079	—	Yugoslavia 1,403; Czechoslovakia 1,080; West Germany 383.
Phosphorous, elemental	—	(2)	—	NA.
Pigments, mineral:				
Natural, crude	NA	6,899	121	United Kingdom 1,903; West Germany 1,502; Netherlands 706.
Iron oxides and hydroxides, processed	NA	3,975	324	France 1,130; West Germany 951; Taiwan 848.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$392	$1,670	$550	Hong Kong $559; West Germany $166.
Synthetic do.	$8,146	$9,753	$3,342	Egypt $1,851; West Germany $1,245.
Pyrite, unroasted	139	34	—	Czechoslovakia 15; Turkey 11; Italy 6.
Quartz crystal, piezoelectric kilograms	NA	2	—	All to West Germany.
Salt and brine	2,727	—		
Sodium compounds, n.e.s.: Sulfate, manufactured	NA	99,268	—	West Germany 22,609; Italy 19,989; Netherlands 8,292.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	156,472	81,518	—	West Germany 68,717; Italy 834.
Worked	39,393	32,343	560	West Germany 25,279; Switzerland 4,914.
Dolomite, chiefly refractory-grade	30,595	24,191	—	West Germany 22,537; Belgium-Luxembourg 504.
Gravel and crushed rock	772,816	701,676	—	West Germany 298,042; Switzerland 237,348; Italy 98,127.
Limestone other than dimension	724	4,034	—	Hungary 3,386; West Germany 690.
Quartz and quartzite	32	104	—	Italy 47; West Germany 27; Greece 24.
Sand other than metal-bearing	116,792	71,035	—	Switzerland 41,954; West Germany 27,192.
Sulfur:				
Elemental:				
Crude including native and byproduct	76	87	—	Hungary 55; Yugoslavia 24.
Colloidal, precipitated, sublimed	NA	50	—	Mainly to Yugoslavia.
Dioxide	NA	14	—	All to West Germany.
Sulfuric acid	NA	8,931	—	Italy 7,352; East Germany 1,001.
Talc, steatite, soapstone, pyrophyllite	120,177	115,565	22	West Germany 58,600; Italy 19,486.
Vermiculite, perlite, chlorite	NA	185	—	West Germany 159.
Other:				
Crude	12,317	11,811	506	West Germany 2,957; Italy 2,674; Turkey 1,257.
Slag and dross, not metal-bearing	93,622	107,556	—	West Germany 103,374.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	51	35	—	West Germany 13; Italy 9; Poland 8.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Carbon:					
Carbon black		NA	46	[2]	Yugoslavia 26; West Germany 9; Iraq 6.
Gas carbon		NA	[2]	—	All to East Germany.
Coal:					
Anthracite and bituminous		21	197	—	Yugoslavia 123; West Germany 23.
Briquets of anthracite and bituminous coal		72	25	—	All to Switzerland.
Lignite including briquets		4,433	3,665	—	West Germany 3,557.
Coke and semicoke		4,574	4,323	—	West Germany 4,271.
Peat including briquets and litter		14,983	21,438	—	Italy 15,743; West Germany 5,671.
Petroleum:					
Crude	42-gallon barrels	7	20	—	All to Switzerland.
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	82	19	—	Mainly to Italy.
Gasoline	do.	2,731	2,003	—	West Germany 2,002; Hungary 1.
Mineral jelly and wax	do.	46	4	—	Greece 1; West Germany 1.
Kerosene and jet fuel	do.	96	48	—	West Germany 29; Yugoslavia 13.
Distillate fuel oil	do.	35	11	—	West Germany 4; Romania 3.
Lubricants	do.	396	306	—	Czechoslovakia 104; Hungary 94; Turkey 21.
Residual fuel oil	do.	[2]	[2]	—	NA.
Bitumen and other residues	do.	19	10	—	West Germany 4; Switzerland 3; Algeria 1.
Bituminous mixtures	do.	30	86	—	Iran 49; Algeria 23; West Germany 11.
Petroleum coke	do.	2	—		

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Excludes diamonds.

TABLE 3

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	NA	6	—	United Kingdom 3; West Germany 2; Switzerland 1.
Alkaline-earth metals	NA	22	8	France 12.
Aluminum:				
Ore and concentrate	315,644	49,222	37	Australia 19,164; Guinea 15,741; China 6,240.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued				
Oxides and hydroxides	NA	306,972	5,187	West Germany 186,196; Hungary 50,076; Switzerland 28,230.
Ash and residue containing aluminum	NA	102,416	133	U.S.S.R. 71,977; Hungary 8,594.
Metal including alloys:				
Scrap	NA	56,043	389	U.S.S.R. 26,699; West Germany 10,705; Hungary 6,328.
Unwrought	81,133	108,266	154	West Germany 63,727; Norway 22,922.
Semimanufactures	63,506	68,729	10	West Germany 27,460; Italy 8,012; Belgium-Luxembourg 6,835.
Antimony:				
Ore and concentrate value, thousands	NA	$2,099	NA	NA.
Oxides	NA	115	NA	Belgium-Luxembourg 71; U.S.S.R. 16; West Germany 11.
Metal including alloys, all forms	NA	45	—	China 39; Belgium-Luxembourg 6.
Arsenic: Metal including alloys, all forms	NA	11	NA	NA.
Beryllium: Metal including alloys, all forms	NA	(2)	—	NA.
Bismuth: Metal including alloys, all forms	NA	8	—	United Kingdom 4; West Germany 2; Switzerland 1.
Cadmium: Metal including alloys, all forms	NA	1	NA	NA.
Chromium:				
Ore and concentrate	NA	58,712	—	Republic of South Africa 49,498; Cuba 5,290.
Oxides and hydroxides	NA	565	(2)	West Germany 324; U.S.S.R. 141.
Metal including alloys, all forms	NA	170	3	United Kingdom 60; U.S.S.R. 44; China 35.
Cobalt:				
Oxides and hydroxides	NA	28	—	Belgium-Luxembourg 10; Finland 10; West Germany 8.
Metal including alloys, all forms	NA	347	1	Zaire 125; Belgium-Luxembourg 85; Tanzania 70.
Columbium and tantalum:				
Ore and concentrate	NA	3169	—	Republic of South Africa 109; West Germany 35; Italy 18.
Metal including alloys, all forms, tantalum	NA	68	42	West Germany 17; Belgium-Luxembourg 7.
Copper:				
Ore and concentrate	52	30	—	Mainly from West Germany.
Matte and speiss including cement copper	—	14	—	Do.
Oxides and hydroxides	NA	50	—	Belgium-Luxembourg 20; West Germany 18.
Sulfate	NA	916	—	Italy 469; Hungary 304; Yugoslavia 80.
Ash and residue containing copper	NA	4,883	NA	West Germany 2,853; Hungary 926; Czechoslovakia 544.
Metal including alloys:				
Scrap	NA	49,652	1,796	U.S.S.R. 18,918; West Germany 14,998.
Unwrought	8,901	11,411	8	Belgium-Luxembourg 2,447; West Germany 2,332; unspecified 3,850.
Semimanufactures	79,027	86,457	39	West Germany 51,422; Italy 8,045; Belgium-Luxembourg 7,050.
Germanium: Metal including alloys, all forms value, thousands	NA	$13	—	Belgium-Luxembourg $11; West Germany $1.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Gold:					
Waste and sweepings	do.	—	$3	—	NA.
Metal including alloys, unwrought and partly wrought	kilograms	NA	11,930	394	Switzerland 9,063; West Germany 1,284.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	3,311	4,164	—	U.S.S.R. 1,473; Sweden 903; Canada 583.
Pyrite, roasted	do.	27	11	—	Yugoslavia 11.
Metal:					
Scrap		68,523	101,538	538	West Germany 57,292; Czechoslvakia 29,245.
Pig iron, cast iron, related materials		41,815	53,889	32	Canada 14,837; West Germany 14,748; U.S.S.R. 6,429.
Ferroalloys:					
Ferrocolumbium		NA	275	—	Brazil 154; Canada 50; West Germany 50.
Ferrochromium		NA	22,201	—	Yugoslavia 8,656; U.S.S.R. 6,886; Hungary 2,875.
Ferromanganese		NA	23,887	—	West Germany 12,298; Norway 9,376.
Ferromolybdenum		NA	191	—	United Kingdom 121; Netherlands 45.
Ferronickel		NA	1,305	—	Yugoslavia 817; Greece 487.
Ferrosilicochromium		NA	655	—	U.S.S.R. 379; Zimbabwe 207.
Ferrosilicomanganese		NA	6,907	—	Yugoslavia 2,204; Czechoslovakia 2,051; Norway 1,563.
Ferrosilicon		NA	21,452	—	Yugoslavia 6,579; Hungary 3,345; West Germany 2,990.
Ferrotungsten		NA	648	37	China 564; Hong Kong 46.
Silicon metal		NA	4,126	17	China 1,529; West Germany 911; Sweden 518.
Unspecified		63,502	2,132	44	West Germany 1,012; U.S.S.R. 621.
Steel, primary forms		162,192	222,418	2	West Germany 167,776; Hungary 32,588.
Semimanufactures:					
Bars, rods, angles, shapes, sections		342,458	389,235	51	West Germany 137,883; Italy 121,534.
Universals, plates, sheets		270,984	NA		
Hoop and strip		98,679	NA		
Rails and accessories		2,521	3,546	7	West Germany 2,394; Switzerland 369; Poland 313.
Wire		41,361	44,086	28	West Germany 14,909; Belgium-Luxembourg 14,673; Italy 6,673.
Tubes, pipes, fittings		241,058	222,331	64	West Germany 103,111; Italy 29,992; East Germany 12,947.
Castings and forgings, rough		14,482	NA		
Lead:					
Ore and concentrate		1,152	6,884	—	Spain 2,122; Canada 2,000; Poland 1,442.
Oxides		NA	1,154	—	West Germany 978; France 164.
Ash and residue containing lead		NA	592	—	Hungary 455; West Germany 72; Netherlands 65.
Metal including alloys:					
Scrap		NA	3,023	—	Poland 813; U.S.S.R. 775; Hungary 448.
Unwrought		31,476	36,714	—	West Germany 18,191; United Kingdom 7,359; Namibia 2,656.
Semimanufactures		825	925	(2)	West Germany 850.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lithium: Oxides and hydroxides		NA	34	26	West Germany 8.
Magnesium: Metal including alloys:					
Scrap		NA	76	—	West Germany 29; France 25; Denmark 22.
Unwrought		NA	2,858	1,240	France 846; Norway 343.
Semimanufactures		NA	380	—	West Germany 285; Italy 34.
Manganese:					
Ore and concentrate, metallurgical-grade		472	270	—	France 121; Yugoslavia 48; Netherlands 40.
Oxides		NA	542	20	France 384; Republic of South Africa 118.
Metal including alloys, all forms		NA	402	99	Republic of South Africa 90; Belgium-Luxembourg 64.
Mercury		NA	7	—	China 2; Norway 2; West Germany 1.
Molybdenum:					
Ore and concentrate		NA	9,542	4,821	West Germany 1,366; Belgium-Luxembourg 1,346.
Oxides and hydroxides		NA	2,852	NA	NA.
Metal including alloys:					
Scrap		NA	13	4	West Germany 8.
Unwrought		NA	44	24	West Germany 19.
Semimanufactures		NA	73	NA	West Germany 57; France 10.
Nickel:					
Ore and concentrate		—	191	—	U.S.S.R. 170; West Germany 21.
Matte and speiss		405	671	—	Netherlands 379; Canada 152.
Oxides and hydroxides		NA	5	—	Canada 3; West Germany 2.
Metal including alloys:					
Scrap		NA	626	228	Netherlands 172; West Germany 113.
Unwrought		2,815	2,735	44	Republic of South Africa 825; U.S.S.R. 376; 258.
Semimanufactures		580	709	36	West Germany 393; Sweden 177.
Platinum-group metals:					
Waste and sweepings	value, thousands	—	$30	—	Yugoslavia $28; Algeria $2.
Metals including alloys, unwrought and partly wrought	do.	$9,534	$11,926	$813	West Germany $4,421; France $3,059; U.S.S.R. $1,978.
Rare-earth metals including alloys, all forms		NA	111	—	U.S.S.R. 108; Norway 2.
Selenium, elemental		NA	28	NA	West Germany 2; unspecified 26.
Silicon, high-purity		NA	74	—	West Germany 72.
Silver:					
Waste and sweepings[4]	value, thousands	$142	$5	—	All from Hungary.
Metal including alloys, unwrought and partly wrought	do.	$33,499	$28,152	$15	West Germany $12,561; North Korea $10,347.
Tellurium and boron, elemental		NA	1	—	NA.
Tin:					
Oxides		NA	9	NA	West Germany 8.
Metal including alloys:					
Unwrought		512	500	—	West Germany 144; China 120; Brazil 56.
Semimanufactures		170	337	—	West Germany 319.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Titanium:					
Ore and concentrate		NA	809	—	Republic of South Africa 315; Australia 188; West Germany 180.
Oxides		NA	5,722	6	West Germany 2,690; Finland 937; United Kingdom 610.
Metal including alloys:					
Unwrought including scrap		NA	2,535	131	U.S.S.R. 2,552; United Kingdom 65.
Semimanufactures		NA	78	37	West Germany 27; United Kingdom 6.
Tungsten:					
Ore and concentrate		NA	1,249	—	China 709; Australia 504.
Oxides and hydroxides		NA	136	NA	NA.
Metal including alloys:					
Scrap		NA	696	83	West Germany 457.
Unwrought		NA	207	83	West Germany 53; China 27.
Semimanufactures		NA	22	—	West Germany 20.
Uranium and thorium:					
Oxides and other compounds	value, thousands	$13,112	$20	—	Sweden $19; Canada $1.
Metal including alloys, all forms		—	8	—	France 7.
Vanadium:					
Oxides and hydroxides		NA	2,258	106	Republic of South Africa 1,324; China 790.
Ash and residue containing vanadium		NA	21,137	—	Republic of South Africa 21,110.
Metal including alloys, all forms		NA	12	(2)	Central African Republic 8; Zaire 4.
Zinc:					
Ore and concentrate		16,688	15,326	—	Italy 15,275.
Oxides		NA	1,007	—	West Germany 849; France 76.
Blue powder		NA	1,570	—	Belgium-Luxembourg 707; Norway 559; West Germany 219.
Matte		NA	717	—	West Germany 361; Yugoslavia 153; Hungary 113.
Ash and residue containing zinc		NA	2,378	NA	West Germany 1,769; Hungary 177.
Metal including alloys:					
Scrap		NA	354	—	Hungary 141; West Germany 140; Italy 72.
Unwrought		10,282	16,243	—	Belgium-Luxembourg 5,962; West Germany 5,234; Yugoslavia 2,808.
Semimanufactures		4,980	4,361	1	West Germany 2,696; France 595; Yugoslavia 450.
Zirconium:					
Ore and concentrate		NA	1,836	—	Republic of South Africa 1,568; West Germany 219.
Metal including alloys:					
Unwrought including scrap		NA	64	14	Italy 50.
Semimanufactures	kilograms	NA	300	200	NA.
Other:					
Ores and concentrates		53,351	29	—	Republic of South Africa 11; unspecified 18.
Oxides and hydroxides		191,500	260	40	Belgium-Luxembourg 104; West Germany 48.
Ashes and residues		NA	14,468	3,713	West Germany 4,987; Netherlands 2,034.
Base metals including alloys, all forms		8,236	37	4	Belgium-Luxembourg 15; Denmark 8; West Germany 5.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		1,656	964	—	Italy 500; West Germany 183; Turkey 168.
Artificial:					
Corundum		NA	15,747	1,324	West Germany 5,985; Hungary 2,723; France 2,354.
Silicon carbide		NA	2,592	NA	West Germany 1,523; Italy 394; Norway 228.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$9,002	[5]$14	NA	NA.
Grinding and polishing wheels and stones		1,726	1,851	9	West Germany 800; Italy 396; Spain 187.
Asbestos, crude		17,749	14,858	11	Canada 9,632; Zimbabwe 3,562.
Barite and witherite		3,112	6,555	—	Turkey 3,598; West Germany 2,663.
Boron materials:					
Crude natural borates		17,523	14,915	1,925	Turkey 12,878.
Oxides and acids		NA	751	7	France 337; Italy 272.
Bromine		NA	78	—	Netherlands 56; France 22.
Cement		94,364	105,533	—	Yugoslavia 40,324; Poland 19,934; Italy 15,933.
Chalk		10,188	4,348	—	France 2,000; Italy 1,282; West Germany 1,006.
Clays, crude:					
Bentonite		NA	12,620	13	West Germany 7,312; Turkey 4,500.
Chamotte earth		NA	27,535	1,282	Czechoslovakia 18,344; West Germany 5,810.
Fuller's earth		NA	538	—	West Germany 496.
Fire clay		NA	20,140	153	West Germany 16,352; Czechoslovakia 2,688.
Kaolin		NA	140,887	3,708	West Germany 41,117; Czechoslovakia 33,755; Brazil 33,269.
Unspecified		198,278	43,746	130	West Germany 28,234; Czechoslovakia 11,971.
Cryolite and chiolite		191	220	—	All from Denmark.
Diamond, natural:					
Gem, not set or strung	value, thousands	$7,465	$10,881	$77	Israel $3,776; Belgium-Luxembourg $3,736; Netherlands $964.
Industrial stones	do.	$548	$1,061	$4	Taiwan $362; West Germany $267.
Dust and powder	kilograms	NA	901	630	Switzerland 98; West Germany 89.
Diatomite and other infusorial earth		13,049	14,342	1,163	Czechoslovakia 5,331; Denmark 2,622; France 1,865.
Feldspar, fluorspar, related materials:					
Feldspar		NA	4,767	—	Sweden 2,901; West Germany 1,420.
Fluorspar		NA	11,388	—	West Germany 8,363; Mexico 1,559; Italy 1,172.
Unspecified		18,635	50	—	NA.
Fertilizer materials:					
Crude, n.e.s.		366,170	2,719	1	West Germany 1,648; Hungary 512.
Manufactured:					
Ammonia		NA	52,432	1	West Germany 479; unspecified 51,906.
Nitrogenous		NA	204,636	2	France 53,359; West Germany 43,956; Czechoslovakia 37,624.
Phosphatic		NA	56,535	15	France 18,802; West Germany 12,072; Belgium-Luxembourg 10,619.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued				
Manufactured—Continued				
Potassic	NA	217,336	—	East Germany 86,368; West Germany 81,543; U.S.S.R. 41,294.
Unspecified and mixed	606,194	194,938	4,473	West Germany 68,145; Yugoslavia 47,018; Italy 29,452.
Graphite, natural	2,083	3,291	72	North Korea 1,316; China 1,098; West Germany 303.
Gypsum and plaster	12,381	10,517	16	West Germany 9,710; Italy 456.
Iodine	NA	4	—	Japan 3.
Kyanite and related materials	NA	2,213	106	Republic of South Africa 885; France 647; West Germany 304.
Lime	4,253	4,156	—	Yugoslavia 3,051; West Germany 631.
Magnesium compounds:				
Magnesite, crude	—	590	—	Greece 279; Hungary 176.
Oxides and hydroxides	108,652	136,280	64	Unspecified 123,429.
Sulfate	NA	13,004	—	West Germany 12,404; East Germany 600.
Mica:				
Crude including splittings and waste	221	426	—	Finland 107; West Germany 98; United Kingdom 70.
Worked including agglomerated splittings	246	272	13	France 150; Belgium-Luxembourg 62.
Nitrates, crude	NA	402	—	East Germany 200; West Germany 119; Poland 79.
Phosphates, crude	NA	328,113	28,026	Syria 206,181; Algeria 91,630.
Phosphorous, elemental	NA	4,251	—	Netherlands 4,090; West Germany 161.
Pigments, mineral:				
Natural, crude	NA	323	—	Spain 178; Morocco 84.
Iron oxides and hydroxides, processed	NA	4,584	3	West Germany 3,690; Spain 286.
Potassium salts, crude	NA	11,842	(2)	Mainly from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$3,844	$4,942	$274	West Germany $2,001; Switzerland $726; Thailand $596.
Synthetic do.	$1,764	$1,426	$614	Switzerland $340; Belgium-Luxembourg $141.
Pyrite, unroasted	655	746	(2)	Italy 520; West Germany 225.
Quartz crystal, piezoelectric value, thousands	NA	$67	$22	West Germany $24; Bulgaria $20.
Salt and brine	642	179	—	West Germany 86; France 71.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	NA	4,053	—	Yugoslavia 1,324; East Germany 1,146; West Germany 920.
Sulfate, manufactured	NA	4,179	—	All from West Germany.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	48,656	49,417	26	Italy 24,127; Republic of South Africa 8,660.
Worked	73,637	93,862	(2)	Italy 66,447; West Germany 12,242.
Dolomite, chiefly refractory-grade	9,969	5,166	—	West Germany 2,404; Italy 1,686; Yugoslavia 730.
Gravel and crushed rock	217,478	412,480	—	West Germany 204,181; Italy 109,983.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Limestone other than dimension		2,288	1,048	—	Yugoslavia 788; West Germany 245.
Quartz and quartzite		19,007	9,358	(2)	West Germany 7,859; Norway 721.
Sand other than metal-bearing		374,586	295,206	2	West Germany 201,015; Czechoslovakia 73,962.
Sulfur:					
Elemental:					
Crude including native and byproduct		82,590	87,995	—	Poland 36,207; Hungary 29,309; West Germany 22,044.
Colloidal, precipitated, sublimed		NA	242	—	West Germany 201; Poland 41.
Dioxide		NA	13,595	6	West Germany 13,581.
Sulfuric acid		NA	32,467	—	Hungary 18,260; West Germany 9,704; Czechoslovakia 3,387.
Talc, steatite, soapstone, pyrophyllite		10,698	8,178	—	India 4,265; China 2,155.
Vermiculite, perlite, chlorite		NA	40,051	38	Hungary 27,938; Greece 6,190; Republic of South Africa 4,492.
Other:					
Crude		74,109	33,465	1,546	West Germany 14,971; Hungary 4,859; Yugoslavia 4,522.
Slag and dross, not metal-bearing		25,859	31,829	—	Italy 16,791; West Germany 12,471.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,933	4,650	48	West Germany 2,354; Trinidad and Tobago 2,082.
Carbon:					
Carbon black	value, thousands	NA	$22,445	NA	NA.
Gas carbon	kilograms	—	100	—	NA.
Coal:					
Anthracite and bituminous	thousand tons	4,133	3,860	585	Poland 1,810; U.S.S.R. 742; Czechoslovakia 652.
Briquets of anthracite and bituminous coal	do.	22	11	—	West Germany 9; France 1.
Lignite including briquets	do.	494	386	—	East Germany 227; West Germany 146.
Coke and semicoke	do.	843	883	—	Czechoslovakia 296; Poland 156; Hungary 152.
Gas, natural: Gaseous	million cubic meters	4,584	3,763	—	U.S.S.R. 3,646; West Germany 117.
Peat including briquets and litter		66,864	77,731	—	West Germany 57,706; U.S.S.R. 12,155.
Petroleum:					
Crude	42-gallon barrels	46,536	41,787	—	Libya 13,511; U.S.S.R. 7,343; Algeria 5,665.
Refinery products:					
Liquefied petroleum gas	do.	NA	1,829	—	West Germany 570; Hungary 511; Czechoslovakia 333.
Gasoline	do.	4,368	5,593	—	Italy 1,868; Hungary 1,691; West Germany 1,142.
Mineral jelly and wax	do.	124	134	(2)	West Germany 51; Poland 40; Hungary 26.
Kerosene and jet fuel	do.	929	959	—	Hungary 518; West Germany 151; Czechoslovakia 148.
Distillate fuel oil	do.	2,985	7,485	(2)	Hungary 2,919; Czechoslovakia 2,189; West Germany 1,312.
Lubricants	do.	7,924	3,020	4	Czechoslovakia 1,230; Yugoslavia 856.
Residual fuel oil	do.	6,153	4,922	—	West Germany 2,616; Yugoslavia 1,184; Czechoslovakia 902.
Bitumen and other residues	do.	1,860	1,754	(2)	West Germany 881; Yugoslavia 410; Hungary 212.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Bituminous mixtures	42-gallon barrels	64	51	(2)	West Germany 28; Italy 11; Netherlands 7.
Petroleum coke	do.	571	641	145	West Germany 270; U.S.S.R. 115.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include vanadium.
[4]May include other precious metals.
[5]Excludes diamonds.

TRADE

A 32% increase in steel exports was offset by declines in exports of nonferrous metals.

STRUCTURE OF THE MINERAL INDUSTRY

Most mining and mineral processing enterprises were nationalized in the early postwar period. By 1989, the Government still controlled most of the mining and processing companies.

COMMODITY REVIEW

Metals

Aluminum.—Austria Metall AG, owned by OIAG, is virtually the only producer of aluminum in Austria. The company was building a smelter at Ranshofen, north of Salzburg, thus permitting it to double its capacity by 1990.

Antimony.—Antimony ore was mined at Schlaining in eastern Austria, near the Hungarian border. There was only one mine, which was operated by Bleiberger Bergwerks-Union AG. The antimony mineral occurs disseminated in graphite schists as small lenses and veins interbedded with limestone and chlorite schists. The antimony was used entirely by Bleiberger Bergwerks-Union AG's own chemical and metallurgical plant for the production of alloys and antimony derivatives.

Copper.—Austria Metall AG was the only producer of copper metal in Austria. The smelter at Brixlegg had a capacity of 50,000 tons of copper metal per year in 1989. All raw materials were imported primarily from Belgium, Luxembourg, and the Federal Republic of Germany. In 1988, in addition to copper metal, the Brixlegg smelter also produced 575 tons of nickel, 2,285 troy ounces of gold, and 619,770 ounces of silver.

Iron and Steel.—Iron ore was mined by Voest-Alpine Erzberg GmbH at Erzberg near Eisenerg and by Karntner Montanindustrie GmbH at Waldenstein. Production continued to decline. Iron ore was imported from Canada, Sweden, and the U.S.S.R. Voest-Alpine Stahl AG posted an operating profit from its steel operations of $287 million in 1989. Sales increased 14%, while production increased 10% to 4.57 million tons. The primary reasons for Voest's improved profitability were due to the more favorable world economic situation and the restructuring programs undertaken by the Austrian Government. Lintz plant reportedly began operating a new plastic coating line with a capacity of 160,000 tons per year. In 1991, Lintz will reportedly begin operating its second 210,000-ton-per-year hot-dip galvanizing line. Austria shipped about 100,000 metric tons of special steel (cold-rolled and hot-rolled coils) to the United States in 1989 and ceased exports of galvanized steel owing to high European demand.

Tungsten.—Scheelite was mined at Mittersill at a facility operated by Wolfram Bergbau-und Hutengesellschaft mbH. Most operations are underground. The mine is in a national park in the Salzburg mountains. Scheelite occurs in concentrations in hornblendite units, linked to metamorphic quartz veins and quartz-rich gneisses of Lower Paleozoic age. The mine produced close to 400,000 tons of ore in 1989. The ore was concentrated at Bergla, in Styria. About 85% of the concentrate was exported, mostly to European Community (EC) countries and to the U.S.S.R. Mittersill was one of only three European tungsten mines. The West German company Metallgesellschaft AG has reportedly acquired Voest's 47.5% interest in the mine and its refinery at Bergla, thus doubling its percentage of ownership in the operations. Teledyne Inc. owns the remaining 5%.

Industrial Minerals

Cement.—Austria has ample supplies of calcite, dolomite, and limestone to support a viable cement industry. The production of cement has been relatively stable for the past 5 years. Perlmooser Zementwerke AG was the largest cement producer in Austria. The company has

TABLE 4

AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Aluminum	Austria Metall AG (Voest-Alpine AG; OIAG)	Smelter at Ranshofen	135.
Do.	Salzburger Aluminium GmbH (Swiss Aluminum Ltd.)	Smelter at Lend	15.
Antimony	Bleiberger Bergwerks-Union AG	Mine at Stadt Schlaining	500.[1]
Cement	13 companies, of which the major ones are—	16 plants, including—	6,000.
	Perlmooser Zementwerke AG	Mannesdorf (Vienna), Rodaun, Kirchbichl, and Retznei	3,000.
	Gebr. Leube Portlandzementwerke	Gartenau	700.
	Zementwerke Eiberg	Eiberg	600.
	Wietersdorfer Zementwerke	Wietersdorf	600.
Coal	Graz-Koflacher Eisenbahn und Bergbaugesellschaft (Government)	Mines in Styria (Oberdorf, Zangtal, Karlschacht)	1,700.
Do.	Salzach-Kohlenbergbau GmbH	Mine at Trimmelkam	640.
Do.	Wolfsegg-Traunthaler Kohlenwerk AG (Government)	Two mines at Ampfelwang	510.
Copper	Austria Metall AG (Voest-Alpine AG; OIAG)	Refinery at Brixlegg	45.
Do.	do.	Smelter at Amstetten	40.
Graphite	Graphitbergbau Kaisersberg, Franz Mayr-Melnhof und Co. KG	Mines at Kaisersberg	15.
Do.	Industrie-und Bergbaugesellschaft Pryssok und Co. KG	Mine at Muhldorf	8.
Gypsum and anhydrite	Eight companies, of which the major ones are—		900.
	Erste Salzburger Gipswerks-Gesellschaft Christian Moldan KG	Mines and plants at Moldan, Revier Webing/Abtenau, and Revier Mossegg	300.
	Rigips Austria GmbH	Mine at Wienern, plant at Bad Aussee, and mine and plant at Puchberg	255.
Iron ore	Voest-Alpine AG (Government)	Mine at Eisenerz (Erzberg)	3,500.
Lead-zinc:			
Lead	Bleiberger Bergwerks-Union AG	Mine at Bleiberg ob Villach (concentrate)	8.
Do.	do.	Smelter at Arnoldstein (crude)	18.
Do.	do.	Refinery at Arnoldstein (primary)	18.
Zinc	do.	Mine at Bleiberg ob Villach	25.
Do.		Smelter at Arnoldstein	23.
Magnesite	The major companies are—	Six mines and six calcining plants, including—	1,300 crude. 450 sinter.
	Tiroler Magnesite AG (OAMAG)	Mine and plant at Hochfilzen	305 crude. 85 sinter.
	Radex-Austria AG	Mine at Millstatteralpe	300 crude.
	do.	Mine and plant at Radenthein	55 sinter.
	Veitscher Magnesitwerke AG (Franz Walek GmbH)	Mines at Hohentauern and Breitenau and plant at Trieben	500 crude. 250 sinter.
Natural gas	Osterreichische Mineralol-verwaltungs AG (Government)	Gasfields in Vienna Basin	850.[2]
Do.	Rohol-Aufsuchungs GmbH (Mobil Oil; Shell)	Gasfields in Upper Austria	680.[2]

[1]Metric tons per year.
[2]Million cubic meters per year.

three plants. The largest, at Mannesdorf near Vienna, has a 1-million-ton-per-year capacity.

Graphite.—Austria is one of the world's largest sources of high-grade graphite. Production ceased in the Niederosterreich Province in 1988, leaving Steiermark the only production region of graphite in Austria.

Gypsum and Anhydrite.—There were eight operational mines and plants distributed along the northern Dolomites. One of the main producers of domestic gypsum and anhydrite was Erste Salzburger Gipswerk Gesellschaft, Christian Moldan KG, which was operating a mine at Mooseg-Abtenau. About 80% of the gypsum and 85% of the anhydrite were produced from surface pits. Production has remained relatively constant for the past 5 years. Synthetic gypsum production was started in thermal powerplants by the desulfurization process.

Magnesite.—Radex-Austria AG is the major producer of crude magnesite, refractories, and caustic magnesia in Austria. Austria's other major magnesite producers were Veitscher Magnesitwerke AG, with mines at Breitnau and Hohentauern, and Tiroler Magnesite AG, with mines at Hochfilzen.

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. More than 90% of the rock salt was produced at Steinkogel, in Styria, and the rest at Hallein. Salt from brines was produced solely in the Salzburg area at Altensee, Hallstaat, Bad Ischl, and Hallein.

Talc.—There were four talc-producing operations in Austria with an estimated total production capacity of 150,000 tons per year. About 90% of the output was produced by Talkumwerke Naintsch GmbH, with headquarters north of Graz. Talcs de Luzenac SA of France owned 80% of the company. About 73% of talc was mined from open pit operations.

Mineral Fuels

Coal.—Graz-Koflacher Eisenbahn-und Bergbaugesellschaft provided 55% of Austria's coal; Salzach Kohlenbergbau, 27%; and Wolfsegg-Traunthaler Kohlenwerks AG, 18%. Graz-Koflacher mined the Karlschacht pit and the east open strip in Oberdorf. The Zanktal pit was closed in early 1989, and the Karlschact pit, in July 1990. Wolfsegg-Traunthaler's coal mining activities are expected to be phased out because of declining deposits and the impossibility of strip mining. Salzah Kohlenbergbau mined only the Tarsdorf-East strip because of flooding and sand cave-ins in other parts of the pit; the production in the pit dropped to 99,000 tons in 1989 from the previous 451,000 tons. Coal for thermal power stations was imported from Australia, China, and Poland.

Natural Gas.—Austria's proven and probable reserves of natural gas were about 13.9 billion cubic meters. Domestic production accounted for about 20% of Austria's consumption. Natural gas was produced by Osterreiche Mineralolverwaltungs AG, which accounted for about 55% of the country's total output, and by Rohol-Aufsuchungs GmbH, a Mobil and Shell oil subsidiary, which produced the remainder.

Petroleum.—Osterreiche Mineralolverwaltungs AG supplied about 80% of the oil consumed in Austria, and Rohol-Aufsuchungs Gmbh accounted for most of the rest. Two smaller companies had only marginal local importance.

INFRASTRUCTURE

Austria is totally landlocked, and, except for the Danube River, all transportation is by railroads and highways. The total Austrian road network covers about 66,000 miles. The Danube is the most important river connection between the Federal Republic of Germany (FRG) and the Black Sea. Ores, metals, coal, and coke made up more than 65% of the cargo shipped on the Danube River.

OUTLOOK

The official economic forecast calls for 3% real growth in 1990. Formal negotiations on Austria's application in the EC probably will not begin prior to 1993. The market-oriented reforms now taking place in Eastern Europe will have important reactions in the region.

OTHER SOURCES OF INFORMATION

Agencies

Bundesministerium fur Wirtschaftliche Angelegenheiten Oberste Bergbehorde-Roh-und Grundstoffe (Ministry of Economic Affairs, Commerce, and Industry, Supreme Mining Authority) Wien, Austria

Geologische Bundesanstalt (Federal Geological Survey) Wien, Austria

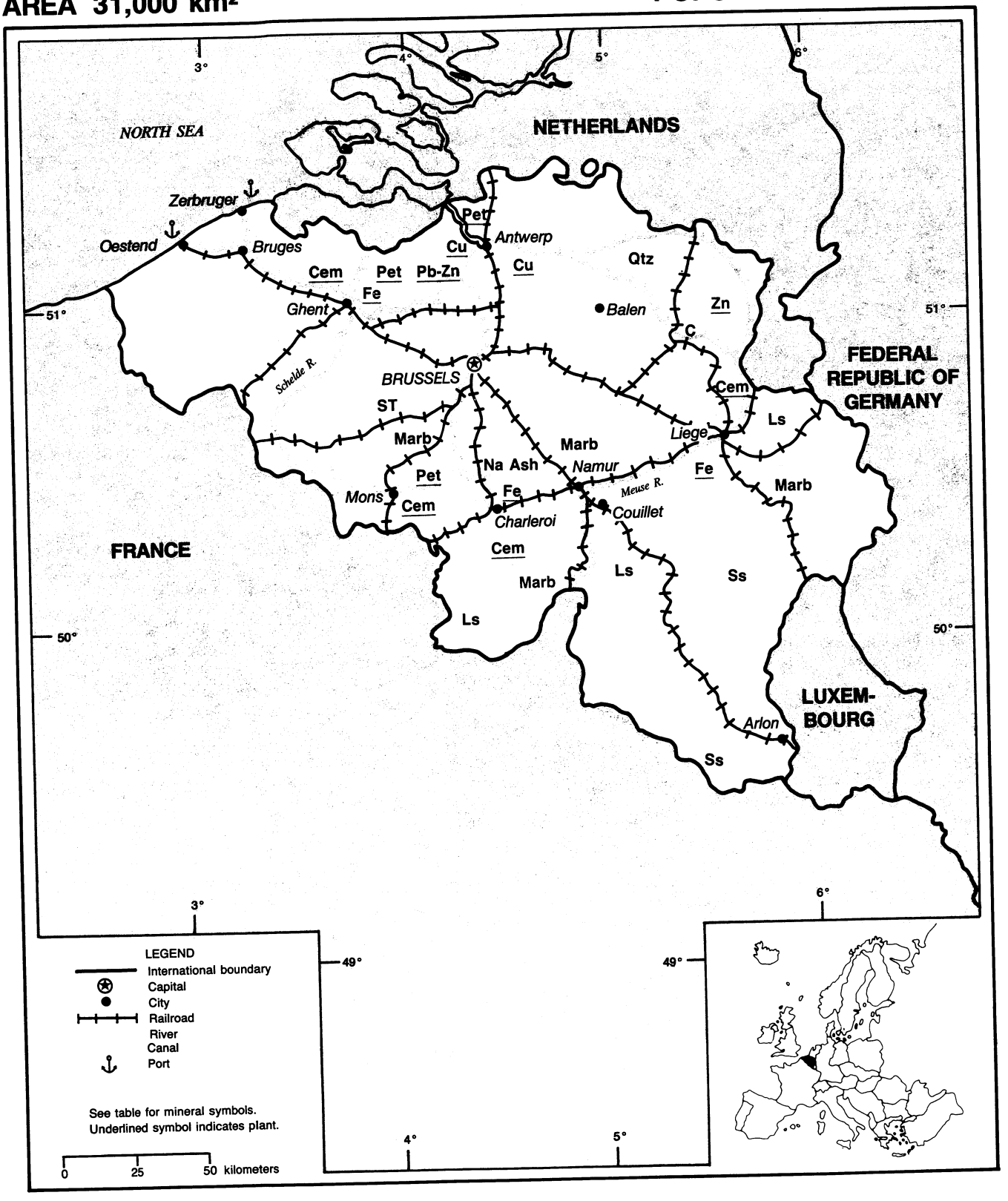
Publications

Osterreichisches Montan-Handbuch (Austrian Mining Handbook), Bundesministerium fur Handel, Gewerbe und Industrie, Sektion V/A, Oberste Bergbehorde-Grundstoffe, Wien, Austria, annual.

Statistisches Handbuch fur die Republik Osterreich (Austrian Statistical Handbook), Osterreichisches Statistisches Zentralamt, Wien, Austria, annual.

BELGIUM

AREA 31,000 km² **POPULATION 9.9 million**



BELGIUM-LUXEMBOURG

By George A. Rabchevsky[1]

BELGIUM

The mineral industry of Belgium is primarily devoted to processing imported raw materials, with ferrous and nonferrous metallurgy and petroleum refining the principal activities. Belgium remained an important supplier of iron and steel, copper, lead, zinc, and refined petroleum products to other European countries. Traditionally, Belgium has concentrated on mineral processing with domestic mine output limited to coal and quarry products.

Production

Belgium continued to rely on imported raw materials for the domestic production of antimony, bismuth, cobaltiferous materials, germanium, and selenium, in addition to the production of arsenic, cadmium, copper, gold, indium, iron, lead, nickel, niobium, palladium, platinum, rhodium, silver, steel, tantalum, tellurium, tin, and zinc. Coal and industrial minerals were the only commodities mined in Belgium.

Commodity Review

Metals.—Union Miniere SA was absorbed by Acec in July 1989. Acec acquired

TABLE 1

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum		3,908	5,196	6,300	7,464	[3]7,355
Arsenic, white[e]		3,000	3,000	3,500	3,500	3,500
Bismuth, metal[e]		610	1,000	865	795	800
Cadmium, smelter		1,252	1,374	1,308	1,836	1,790
Copper:						
Blister:[e]						
Primary		900	900	r100	r200	200
Secondary		114,200	105,000	r92,100	r93,200	93,400
Total		115,100	105,900	92,200	r93,400	93,600
Refined, primary and secondary, including alloys		455,460	457,776	475,908	504,333	510,000
Iron and steel:						
Pig iron	thousand tons	8,724	8,052	8,244	9,147	9,000
Ferroalloys: Electric furnace ferromanganese[e]	do.	90	87	90	95	95
Steel:						
Crude	do.	10,683	9,770	9,787	11,222	10,920
Semimanufactures	do.	8,072	7,358	7,417	7,417	7,200
Lead:						
Smelter:[e]						
Primary[4]		58,000	48,100	59,400	64,100	64,000
Secondary[5]		30,000	26,000	18,500	r22,000	22,000
Total		88,000	74,100	77,900	r86,100	86,000
Refined:						
Primary		75,300	64,500	71,100	83,200	80,000
Secondary		38,988	33,816	36,936	43,361	46,000
Total		114,288	98,316	108,036	126,561	126,000

See footnotes at end of table.

TABLE 1—Continued

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Selenium[e]		230	250	230	250	250
Tin: Secondary		2,304	2,712	3,900	4,972	5,000
Zinc:						
Slab:						
Primary		271,400	268,700	284,500	298,100	[3]274,100
Secondary (remelted zinc)		19,132	20,092	24,080	25,658	25,500
Total		290,532	288,792	308,580	323,758	299,600
Powder		32,568	32,196	32,556	37,708	39,000
Other, nonferrous: Precious metals, unworked n.e.s.[6]	thousand troy ounces	41,121	40,221	39,913	39,658	39,200
INDUSTRIAL MINERALS						
Barite[e]		40,000	40,000	40,000	35,000	40,000
Cement, hydraulic	thousand tons	5,537	5,760	5,689	6,451	6,900
Clays: Kaolin	do.	37	[e]40	[e]45	40	35
Lime and dead-burned dolomite: Quicklime	do.	1,812	1,788	1,764	1,892	1,900
Nitrogen: N content of ammonia	do.	388	306	269	365	290
Phosphates: Thomas slag, gross weight[e]	do.	[3]143	180	175	170	165
Sodium compounds:						
Soda ash		446,484	481,656	447,972	378,960	380,000
Sulfate[e]		260,000	265,000	260,000	255,000	255,000
Stone, sand and gravel:						
Calcareous:						
Dolomite	thousand tons	3,210	4,034	4,072	4,684	5,000
Limestone	do.	20,520	21,168	23,616	25,872	26,000
Marble:						
In blocks	cubic meters	684	1,068	672	576	650
Crushed and other		84	84	72	60	65
Petit granite (Belgian bluestone):						
Quarried	thousand cubic meters	563	452	515	959	1,350
Sawed	do.	41	48	53	64	65
Worked	do.	8	11	12	12	12
Crushed and other	do.	588	455	414	652	700
Porphyry, all types	thousand tons	3,413	3,308	3,464	3,395	3,400
Quartz and quartzite		266,839	[e]250,000	205,196	[e]205,000	200,000
Sandstone:						
Rough stone including crushed	thousand tons	1,864	1,998	1,990	2,248	2,260
Paving		10,224	8,400	9,912	13,152	13,500
Sand and gravel:						
Construction sand	thousand tons	6,576	6,252	7,260	8,988	9,200
Foundry sand	do.	576	552	588	595	600
Dredged sand	do.	1,235	913	928	788	750
Glass sand	do.	1,392	1,512	1,680	1,845	2,000
Other sand	do.	1,836	1,956	2,376	2,448	2,600
Gravel, dredged	do.	5,820	5,016	5,856	5,832	4,870
Sulfur, byproduct:[e]						
Elemental	do.	110	150	155	155	160
Other forms	do.	150	150	145	155	160
Total	do.	260	300	300	310	320

See footnotes at end of table.

TABLE 1—Continued

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		1,700	1,800	1,800	1,900	1,800
Coal: Bituminous	thousand tons	6,211	5,589	4,356	[e]2,500	2,250
Coke, all types	do.	5,964	5,136	5,232	5,544	3,200
Gas:						
Manufactured	million cubic feet	25,271	22,473	23,793	24,334	25,000
Natural[e]	do.	[3]1,847	1,300	1,350	1,400	1,350
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	4,890	11,830	12,457	13,135	13,500
Gasoline	do.	32,749	41,704	41,283	41,848	43,000
Naptha	do.	11,775	8,962	12,647	[e]12,200	12,250
Jet fuel and kerosene	do.	9,752	10,616	10,332	12,584	12,800
Distillate fuel oil	do.	54,727	70,742	67,687	68,416	69,000
Residual fuel oil	do.	24,230	48,726	51,771	43,746	43,400
Bitumen, asphaltic	do.	3,127	4,034	3,953	4,448	4,800
Other	do.	7,420	9,786	10,297	11,985	12,000
Refinery fuel and losses[e]	do.	7,434	10,320	10,516	10,660	10,800
Total	do.	156,104	216,720	220,943	219,022	221,550

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

[1]Table includes data available through June 1990.

[2]In addition to the commodities listed, Belgium produced a number of other metals and alloys 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]Known to include gold, silver, and platinum-group metals.

TABLE 2

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	39	95	(2)	West Germany 75; Zaire 10; France 7.
Alkaline-earth metals	64	347	—	France 305; West Germany 38.
Aluminum:				
Ore and concentrate	2,416	3,648	—	France 3,185; West Germany 239.
Oxides and hydroxides	1,101	1,202	—	West Germany 422; United Kingdom 295; France 232.
Ash and residue containing aluminum	14,514	NA		
Metal including alloys:				
Scrap	60,186	77,769	46	West Germany 26,129; France 23,701; Netherlands 19,430.
Unwrought	27,556	32,917	1	West Germany 17,959; Netherlands 5,208; France 3,567.
Semimanufactures	323,668	365,445	30,954	France 77,302; West Germany 66,012; Netherlands 54,311.
Antimony:				
Ore and concentrate	50	NA		
Metal including alloys, all forms	11	23	1	Zaire 10; West Germany 8; Honduras 2.
Arsenic: Oxides and acids	4	NA		

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Beryllium: Metal including alloys, all forms	value, thousands	$75	$9	—	Japan $4; France $2.
Cadmium: Metal including alloys, all forms		583	1,032	26	Japan 405; France 196; West Germany 193.
Cesium and rubidium: Metal including alloys, all forms	value, thousands	$2	NA		
Chromium:					
Ore and concentrate		85	1,484	—	France 1,433; Netherlands 50; Spain 1.
Oxides and hydroxides		91	106	—	Netherlands 30; West Germany 24; Spain 24.
Metal including alloys, all form		123	133	—	Venezuela 60; West Germany 45; United Kingdom 21.
Cobalt:					
Ore and concentrate		—	1	—	All to West Germany.
Metal including alloys, all forms		154	178	8	Czechoslovakia 34; West Germany 30; Bulgaria 27.
Columbium and tantalum:					
Ore and concentrate		4	[3]70	—	All to Algeria.
Ash and residue containing columbium and tantalum		955	NA		
Metal including alloys, all forms:					
Columbium (niobium)		18	NA		
Tantalum		4	15	9	West Germany 4; France 2.
Copper:					
Ore and concentrate		727	263	([2])	Australia 100; Spain 99; Netherlands 29.
Matte and speiss including cement copper		115	136	—	Netherlands 45; West Germany 25; Italy 24.
Oxides and hydroxides		1,389	NA		
Sulfate		7,044	NA		
Ash and residue containing copper		1,421	NA		
Metal including alloys:					
Scrap		32,485	46,016	751	Netherlands 15,974; West Germany 12,107; France 6,894.
Unwrought		258,183	7,850	45	West Germany 3,976; Italy 1,025; France 842.
Semimanufactures		266,765	280,536	163	West Germany 101,469; France 52,035; Netherlands 33,955.
Gallium, indium, thallium: Metals including alloys, all forms		31	NA		
Gold:					
Waste and sweepings	value, thousands	$5,662	NA		
Metal including alloys, unwrought and partly wrought	kilograms	16,278	NA		
Hafnium: Metal including alloys, all forms	value, thousands	$50	NA		
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite		2,771	6,758	20	France 5,276; West Germany 1,375; Mexico 60.
Pyrite, roasted		193,874	186,342	—	Spain 115,659; West Germany 32,589; France 18,485.
Metal:					
Scrap		704,546	912,987	1,959	France 209,266; Spain 170,624; Turkey 150,852.
Pig iron, cast iron, related materials		14,513	19,695	493	Netherlands 8,319; France 7,644; West Germany 2,319.
Ferroalloys:					
Ferroaluminum		33	NA		
Ferrocolumbium		911	NA		
Ferrochromium		2,118	3,651	—	West Germany 2,849; France 700.

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Ferroalloys—Continued					
Ferromanganese		21,297	24,332	—	France 9,219; West Germany 7,579; Sweden 3,100.
Ferromolybdenum		27,267	NA		
Ferronickel		55	513	—	Libya 250; Netherlands 148; Sweden 65.
Ferrosilicochromium		273	24	—	All to West Germany.
Ferrosilicomanganese		—	13,529	—	West Germany 6,176; France 4,351; Sweden 3,000.
Ferrosilicon		4,370	3,121	—	West Germany 1,808; France 705; United Kingdom 194.
Silicon metal		98	239	6	France 107; West Germany 100; Portugal 16.
Unspecified		1,085	1,973	18	West Germany 702; France 371; Sweden 358.
Steel, primary forms	thousand tons	3,420	665	53	West Germany 277; France 124; Italy 54.
Semimanufactures:					
Bars, rods, angles, shapes, sections	do.	2,574	2,750	308	West Germany 745; France 546; Netherlands 365.
Universals, plates, sheets	do.	5,055	NA		
Hoop and strip	do.	485	NA		
Rails and accessories	do.	98	97	24	France 20; India 11.
Wire	do.	292	492	77	West Germany 91; France 87.
Tubes, pipes, fittings	do.	401	520	19	France 90; Netherlands 86; U.S.S.R. 84.
Castings and forgings, rough	do.	13	NA		
Lead:					
Ore and concentrate		1	40	—	All to France.
Oxides		4,103	353	—	France 136; Netherlands 120; West Germany 25.
Ash and residue containing lead		3,548	NA		
Metal including alloys:					
Scrap		23,362	19,024	—	France 7,621; West Germany 2,925; Netherlands 2,634.
Unwrought		64,567	61,534	1,142	West Germany 16,835; Netherlands 12,197; France 6,825.
Semimanufactures		24,477	24,836	17	Netherlands 8,992; United Kingdom 6,115; France 5,037.
Lithium: Metal including alloys, all forms		(2)	NA		
Magnesium: Metal including alloys:					
Scrap		565	513	—	West Germany 271; United Kingdom 109; Italy 106.
Unwrought		58	211	—	West Germany 89; Netherlands 64; France 41.
Semimanufactures		3,671	2,010	(2)	West Germany 951; United Kingdom 893.
Manganese:					
Ore and concentrate, metallurgical-grade		737	1,431	—	West Germany 1,018; Spain 335.
Metal including alloys, all forms		1,760	1,778	(2)	West Germany 747; Norway 676; France 140.
Mercury		3	3	(2)	Burundi 1; Netherlands 1.
Molybdenum:					
Ore and concentrate		12,890	15,585	20	West Germany 3,637; United Kingdom 3,364; Switzerland 1,998.
Oxides and hydroxides		53	NA		
Metal including alloys:					
Unwrought including scrap		9	74	—	France 36; United Kingdom 28.
Semimanufactures		134	77	—	Netherlands 66; West Germany 10; France 1.
Nickel:					
Ore and concentrate		16	2,176	—	Netherlands 2,153; France 22.
Matte and speiss		9	11	—	Netherlands 9; Greece 2.
Oxides and hydroxides		37	NA		

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel—Continued					
Ash and residue containing nickel		2,209	NA		
Metal including alloys:					
Scrap		990	1,395	71	Netherlands 764; Finland 241; West Germany 239.
Unwrought		371	1,369	642	United Kingdom 249; West Germany 144.
Semimanufactures		317	526	1	France 172; Netherlands 162; United Kingdom 62.
Platinum-group metals:					
Waste and sweepings	value, thousands	$5,546	$7,968	—	United Kingdom $6,273; West Germany $1,144; Netherlands $551.
Metals including alloys, unwrought and partly wrought, all forms	do.	$74,047	$102,450	$50,703	United Kingdom $25,330; Netherlands $12,604.
Rare-earth metals including alloys, all forms		5	NA		
Rhenium: Metal including alloys, all forms	kilograms	400	NA		
Silicon, high-purity		(2)	NA		
Silver:					
Ore and concentrate	value, thousands	—	$90	—	United Kingdom $88; West Germany $1.
Waste and sweepings	do.	$2,727	$2,820	$2	United Kingdom $1,758; West Germany $539; Netherlands $441.
Metal including alloys, unwrought and partly wrought	do.	$198,256	$219,840	$36,840	United Kingdom $77,089; West Germany $53,765.
Tellurium and arsenic, elemental		78	[4]84	2	West Germany 25; United Kingdom 24; France 20.
Tin:					
Oxides		(2)	NA		
Ash and residue containing tin		1,607	NA		
Metal including alloys:					
Scrap		64	60	—	Netherlands 45; West Germany 15.
Unwrought		3,107	4,100	260	France 1,566; United Kingdom 815; West Germany 599.
Semimanufactures		100	192	—	West Germany 60; Netherlands 34; Switzerland 27.
Titanium:					
Ore and concentrate		875	62	—	Ireland 60; Argentina 1; Zaire 1.
Oxides		45,570	40,127	9,983	West Germany 11,945; France 1,759.
Metal including alloys:					
Unwrought including scrap		121	49	10	West Germany 17; United Kingdom 12.
Semimanufactures		92	207	(2)	West Germany 125; Italy 17; Ireland 15.
Tungsten:					
Ore and concentrate		—	2	—	All to Ethiopia.
Ash and residue containing tungsten		12	NA		
Metal including alloys:					
Unwrought including scrap		62	126	1	West Germany 40; United Kingdom 34; Netherlands 18.
Semimanufactures		135	79	7	Netherlands 71; France 1.
Uranium and thorium:					
Ore and concentrate		19	(2)	—	All to Netherlands.
Metal including alloys, all forms, uranium	value, thousands		—	$1	— Do.
Vanadium:					
Ore and concentrate		(2)	—		
Oxides and hydroxides		290	NA		
Ash and residue containing vanadium		3,095	NA		

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Vanadium—Continued				
Metal including alloys, all forms	(2)	28	—	All to France.
Zinc:				
Ore and concentrate	21,564	52,277	—	France 51,460; West Germany 817.
Oxides	7,744	6,706	21	France 3,002; West Germany 1,288; Italy 1,097.
Blue powder	18,615	23,679	20	West Germany 11,151; France 6,883; Switzerland 1,956.
Matte	4,277	NA		
Ash and residue containing zinc	46,476	NA		
Metal including alloys:				
Scrap	8,408	13,679	16	West Germany 4,875; France 3,402; Netherlands 2,157.
Unwrought	213,427	201,045	9,275	West Germany 59,915; France 26,524; Netherlands 14,342.
Semimanufactures	7,646	6,130	—	West Germany 4,206; France 632.
Zirconium:				
Ore and concentrate	28	509	—	Spain 206; West Germany 199; France 54.
Oxides	5	NA		
Metal including alloys:				
Unwrought including scrap	12	236	—	West Germany 226; France 7; Italy 3.
Semimanufactures	13	39	—	West Germany 17; France 16.
Other:				
Ores and concentrates	208	31	—	France 25; Hungary 6.
Oxides and hydroxides	2,019	3,587	384	West Germany 1,189; France 720.
Ashes and residues	37,791	165,621	86,036	France 25,931; Netherlands 25,015.
Base metals including alloys, all forms	—	39	9	France 9; West Germany 5; Japan 4.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	8,984	7,725	80	Netherlands 6,628; France 775.
Artificial:				
Corundum	2,661	2,782	25	France 1,600; West Germany 632; Netherlands 392.
Silicon carbide	3,071	NA		
Dust and powder of precious and semi-precious stones including diamond value, thousands	$10,008	$15,124	$1,633	Spain $2,902; Netherlands $1,432.
Grinding and polishing wheels and stones	2,812	4,169	18	France 1,752; Netherlands 1,328; United Kingdom 294.
Asbestos, crude	141	551	—	United Kingdom 267; Netherlands 192; Burundi 92.
Barite and witherite	64,985	51,297	—	West Germany 34,069; France 8,771; United Kingdom 5,393.
Boron materials:				
Crude natural borates	23,353	21,954	—	Netherlands 11,371; West Germany 9,336.
Elemental	29	NA		
Oxides and acids	129	258	—	France 95; Netherlands 74; United Kingdom 43.
Bromine	18	NA		
Cement thousand tons	2,718	2,867	5	Netherlands 1,517; West Germany 601; France 395.
Chalk	92,363	99,697	—	West Germany 58,397; Netherlands 15,150; Saudi Arabia 8,672.
Clays, crude:				
Bentonite	86	453	—	Netherlands 158; Zaire 151; West Germany 81.
Chamotte earth	250	NA		
Fuller's earth	82	NA		

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued					
Kaolin		41,019	77,279	—	Netherlands 46,237; West Germany 20,798; France 7,730.
Unspecified		2,388	4,616	—	West Germany 2,909; Netherlands 1,305.
Cryolite and chiolite		31	115	—	Netherlands 35; France 33; Italy 24.
Diamond, natural:					
Gem, not set or strung	value, thousands	$4,839,008	$6,132,136	$1,202,004	India $1,190,827; Spain $677,669.
Industrial stones	do.	$70,666	$82,924	$14,318	Japan $9,014; United Kingdom $8,564.
Diatomite and other infusorial earth		74,015	733	—	Netherlands 213; Kenya 95; Denmark 77.
Feldspar, fluorspar, related materials:					
Feldspar		45	6	—	Norway 4; Togo 2.
Fluorspar		—	3,069	—	West Germany 3,033; Ireland 24.
Unspecified		42	NA		
Fertilizer materials:					
Crude, n.e.s.		58,848	66,729	—	France 40,021; Netherlands 23,273.
Manufactured:					
Ammonia		51,995	72,168	—	France 46,361; West Germany 14,416; Netherlands 9,855.
Nitrogenous	thousand tons	2,696	2,458	97	France 1,251; West Germany 251; United Kingdom 126.
Phosphatic	do.	743	758	—	West Germany 369; France 335.
Potassic	do.	113	60	—	France 38; Netherlands 13.
Unspecified and mixed	do.	1,860	1,861	6	France 874; West Germany 170.
Graphite, natural		8	96	(2)	West Germany 51; United Kingdom 23.
Gypsum and plaster		131,438	128,391	6	Netherlands 110,166; France 9,463.
Iodine		21	NA		
Kyanite and related materials		43	NA		
Lime		607,687	674,097	—	Netherlands 556,794; West Germany 86,505.
Magnesium compounds:					
Magnesite, crude		534	994	—	West Germany 538; Netherlands 392.
Oxides and hydroxides		2,445	2,112	—	West Germany 884; France 702; Netherlands 408.
Sulfate		2,339	NA		
Mica:					
Crude including splittings and waste		13	928	—	France 346; Libya 300; Netherlands 165.
Worked including agglomerated splittings		1	163	77	Hong Kong 33; Japan 28.
Nitrates, crude		27,149	21,237	—	France 7,955; Netherlands 6,384; West Germany 4,013.
Phosphates, crude		30,822	19,305	—	France 9,969; West Germany 5,225; Netherlands 2,868.
Phosphorus, elemental		1	NA		
Pigments, mineral:					
Natural, crude		61	NA		
Iron oxides and hydroxides, processed		13,325	17,507	374	United Kingdom 6,336; West Germany 3,162; France 2,799.
Potassium salts, crude		1,024	530	—	Netherlands 377; France 78; West Germany 72.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$17,920	$19,326	$2,778	Sweden $4,597; West Germany $2,366.
Synthetic	do.	$4,153	$4,806	$1,360	Netherlands $890; Republic of Korea $587.
Pyrite, unroasted		130	265	—	Netherlands 204; Italy 23; Finland 20.
Quartz crystal, piezoelectric	value, thousands	$6	$36	—	Italy $16; unspecified $17.
Salt and brine		83,597	77,613	65	France 75,313; Netherlands 1,200.

See footnotes at end of table.

TABLE 2—Continued

BELGIUM-LUXEMBOURG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	597	334	1	Netherlands 241; United Kingdom 66; West Germany 20.
Worked	do.	50	49	(2)	West Germany 26; Netherlands 12; France 8.
Dolomite, chiefly refractory-grade	do.	1,313	1,346	—	Netherlands 641; France 331; West Germany 306.
Gravel and crushed rock	do.	8,745	8,655	—	Netherlands 4,900; France 3,362; West Germany 353.
Limestone other than dimension	do.	968	1,099	—	Netherlands 749; France 216; West Germany 133.
Quartz and quartzite	do.	294	254	(2)	France 244; West Germany 5; Netherlands 3.
Sand other than metal-bearing	do.	3,972	4,296	(2)	Netherlands 1,969; France 1,226; Italy 245.
Sulfur:					
Elemental:					
Crude including native and byproduct		32,077	19,892	10	United Kingdom 10,285; West Germany 4,560; France 1,802.
Colloidal, precipitated, sublimed		292	85	—	Argentina 41; Turkey 10; Italy 9.
Sulfuric acid		192,581	220,403	—	Netherlands 132,442; France 60,423; West Germany 22,222.
Talc, steatite, soapstone, pyrophyllite		53,838	64,112	22	United Kingdom 19,502; West Germany 9,946; Netherlands 8,475.
Vermiculite, perlite, chlorite		505	891	—	France 358; West Germany 225; Netherlands 180.
Other:					
Crude		457,886	424,033	108	Netherlands 382,755; France 29,099; West Germany 9,069.
Slag and dross, not metal-bearing	thousand tons	2,244	2,298	33	France 810; West Germany 608; Netherlands 590.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		86,634	13,381	—	Netherlands 9,885; France 3,101.
Carbon:					
Carbon black		4,877	2,563	592	France 427; Netherlands 237.
Gas carbon		(2)	NA		
Coal:					
Anthracite	thousand tons	113	122	—	France 91; Netherlands 9; West Germany 8.
Bituminous	do.	836	831	—	France 372; Netherlands 184; West Germany 171.
Briquets of anthracite and bituminous coal	do.	4	5	—	France 3; West Germany 1; Netherlands 1.
Lignite including briquets	do.	12	23	—	France 17; West Germany 3; United Kingdom 1.
Coke and semicoke	do.	649	887	194	West Germany 322; France 238.
Gas, natural: Gaseous	million cubic meters	2,108	994	—	Netherlands 514; France 439.
Peat including briquets and litter		31,429	62,196	—	France 53,784; Spain 2,428.
Petroleum:					
Crude	thousand 42-gallon barrels	41	109	—	West Germany 63; Netherlands 33; France 13.
Refinery products:					
Liquefied petroleum gas	do.	3,809	3,025	5	Netherlands 1,692; West Germany 568; France 324.
Gasoline	do.	37,631	35,590	3,298	Netherlands 10,479; West Germany 8,532; Switzerland 5,055.
Mineral jelly and wax	do.	13	48	(2)	Nigeria 5; France 4; Kenya 2.
Kerosene and jet fuel	do.	9,700	11,096	—	West Germany 3,247; Switzerland 1,611; United Kingdom 1,370.
Distillate fuel oil	do.	21,872	23,072	434	West Germany 7,343; France 7,059; Switzerland 2,531.
Lubricants	do.	2,673	2,416	(2)	Netherlands 632; West Germany 217; France 205.
Residual fuel oil	do.	50,496	51,162	6,562	Netherlands 11,241; West Germany 6,088.
Bitumen and other residues	do.	2,466	2,616	(2)	Netherlands 376; West Germany 91; France 89.
Bituminous mixtures	do.	101	116	—	West Germany 866; France 772; Netherlands 419.
Petroleum coke	do.	347	415	—	France 218; Netherlands 128.

NA Not available.
[1]Table prepared by P. J. Rotezel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]May include phosphorus and boron.

TABLE 3

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	90	60	21	West Germany 27; France 7.
Alkaline-earth metals	203	150	16	France 44; West Germany 28; Netherlands 19.
Aluminum:				
Ore and concentrate	26,534	37,841	—	Netherlands 21,081; China 10,586.
Oxides and hydroxides	32,871	32,890	2,613	West Germany 21,243; Netherlands 4,261.
Ash and residue containing aluminum	11,099	NA		
Metal including alloys:				
Scrap	90,872	112,80	52,886	France 41,769; West Germany 25,666; Netherlands 23,578.
Unwrought	315,514	355,137	1,044	Netherlands 214,458; West Germany 26,777.
Semimanufactures	119,054	147,545	582	West Germany 54,295; France 29,151; Netherlands 22,488.
Antimony:				
Ore and concentrate	6,086	NA		
Oxides	786	NA		
Metal including alloys, all forms	878	1,261	30	China 418; Hong Kong 262; Thailand 231.
Arsenic: Oxides and acids	61	NA		
Beryllium: Metal including alloys, all forms value, thousands	$125	$34	$17	West Germany $13; France $3.
Bismuth: Metal including alloys, all forms	2	5	—	United Kingdom 3; West Germany 1.
Cadmium: Metal including alloys, all forms	1,585	1,659	—	Netherlands 502; Spain 318; France 208.
Cesium and rubidium: Metal including alloys, all forms		2	NA	
Chromium:				
Ore and concentrate	2,581	3,404	—	Netherlands 2,847; France 414.
Oxides and hydroxides	809	647	1	West Germany 347; Romania 120; United Kingdom 91.
Metal including alloys, all forms	406	375	1	United Kingdom 115; Netherlands 113; France 67.
Cobalt:				
Ore and concentrate	(2)	21	—	Morocco 20; Netherlands 1.
Oxides and hydroxides	89	146	—	United Kingdom 61; Finland 48; Austria 28.
Metal including alloys, all forms	494	417	326	United Kingdom 67; Austria 10.
Columbium and tantalum:				
Ore and concentrate	1,845	3,578	83	Republic of South Africa 3,044; Canada 446.
Metal including alloys, all forms:				
Columbium (niobium)	3	NA		
Tantalum	36	55	11	West Germany 24; Austria 17.
Copper:				
Ore and concentrate	912	2,315	—	Morocco 711; Republic of South Africa 669; France 403.
Oxides and hydroxides	82	NA		
Sulfate	1,475	NA		
Ash and residue containing copper	80,285	NA		
Metal including alloys:				
Scrap	147,257	208,488	4,812	France 54,242; United Kingdom 40,808; Netherlands 36,485.
Unwrought	394,634	111,960	31	Zaire 60,194; Zambia 18,787; Republic of South Africa 14,569.
Semimanufactures	53,123	51,962	259	West Germany 27,389; France 9,275; Italy 5,927.
Gold:				
Waste and sweepings value, thousands	$2,398	NA		

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Gold—Continued					
Metal including alloys, unwrought and partly wrought	kilograms	45,013	NA		
Hafnium: Metal including alloys, all forms		(2)	—		
Iron and steel:					
Iron ore and concentrate, excluding roasted pyrite	thousand tons	18,386	20,252	12	Brazil 4,852; France 3,425; Mauritania 2,897.
Pyrite, roasted	do.	60	55	—	West Germany 52; Netherlands 3.
Metal:					
Scrap	do.	1,584	1,903	6	West Germany 845; France 611; Netherlands 413.
Pig iron, cast iron, related materials		142,859	271,227	16	France 132,525; Spain 55,780; West Germany 23,289.
Ferroalloys:					
Ferroaluminum		540	NA		
Ferrochromium		41,662	70,994	—	Republic of South Africa 27,281; Sweden 9,348; Italy 5,893.
Ferrocolumbium		366	NA		
Ferromanganese		59,332	64,233	98	France 21,566; Republic of South Africa 15,550; Norway 15,037.
Ferromolybdenum		906	NA		
Ferronickel		3,818	9,037	—	Dominican Republic 3,312; Colombia 2,386; Australia 1,154.
Ferrosilicochromium		2,774	2,455	—	West Germany 1,525; Netherlands 776; Poland 153.
Ferrosilicomanganese		47,411	44,216	—	Norway 19,652; Netherlands 7,967; France 7,128.
Ferrosilicon		31,098	31,674	—	West Germany 15,061; Norway 7,019; Netherlands 2,547.
Silicon metal		684	1,302	(2)	France 668; Netherlands 392.
Unspecified		5,027	35,500	13,900	U.S.S.R. 11,324; West Germany 3,867.
Steel, primary forms	thousand tons	1,133	1,703	—	France 508; West Germany 444; Netherlands 250.
Semimanufactures:					
Bars, rods, angles, shapes, sections	thousand tons	985	1,165	2	France 318; West Germany 316; Netherlands 205.
Universals, plates, sheets	do.	1,156	NA		
Hoop and strip	do.	147	NA		
Rails and accessories	do.	5	5	(2)	France 1; West Germany 1; Netherlands 1.
Wire	do.	72	98	(2)	West Germany 37; Netherlands 25; France 10.
Tubes, pipes, fittings	do.	293	320	2	West Germany 84; Netherlands 77; France 49.
Castings and forgings, rough	do.	46	NA		
Lead:					
Ore and concentrate		107,072	114,018	—	Peru 37,922; Australia 28,700; Greece 14,902.
Oxides		5,412	6,142	1	France 4,106; West Germany 1,858.
Ash and residue containing lead		42,299	NA		
Metal including alloys:					
Scrap		10,317	12,357	82	Netherlands 5,252; Ireland 1,693; Canada 1,490.
Unwrought		41,114	36,559	909	France 13,754; United Kingdom 10,189; West Germany 5,483.
Lithium:					
Oxides and hydroxides		225	NA		
Metal including alloys, all forms		1	NA		
Magnesium: Metal including alloys:					
Scrap		105	195	—	West Germany 104; France 68; Italy 20.
Unwrought		3,683	3,729	537	Netherlands 1,150; Yugoslavia 599.
Semimanufactures		754	788	122	Italy 328; West Germany 206.

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Manganese:					
Ore and concentrate, metallurgical-grade		75,548	232,668	—	Republic of South Africa 95,331; Brazil 57,352; Congo 54,730.
Oxides		2,371	1,956	270	Japan 1,107; France 303.
Metal including alloys, all forms		3,421	3,208	1,062	Netherlands 1,017; France 441.
Mercury		115	162	—	Spain 74; Netherlands 32; France 29.
Molybdenum:					
Ore and concentrate		24,787	28,512	4,861	Canada 7,709; Chile 5,264.
Oxides and hydroxides		180	NA		
Metal including alloys:					
Unwrought including scrap		115	108	(2)	United Kingdom 44; Austria 30; West Germany 21.
Semimanufactures		366	185	2	Netherlands 133; United Kingdom 32.
Nickel:					
Ore and concentrate		2,350	2,273	2,244	West Germany 29.
Matte and speiss		1,791	4,445	88	Netherlands 2,270; Australia 1,610; Canada 447.
Oxides and hydroxides		274	NA		
Ash and residue containing nickel		1,982	NA		
Metal including alloys:					
Scrap		628	1,390	63	West Germany 1,102.
Unwrought		6,647	9,366	—	U.S.S.R. 2,686; Republic of South Africa 1,884; Norway 1,394.
Semimanufactures		691	620	36	West Germany 259; Netherlands 171; United Kingdom 88.
Platinum-group metals:					
Waste and sweepings	value, thousands	$13,985	$20,074	—	Algeria $7,055; Netherlands $6,088; Sweden $2,147.
Metals including alloys, unwrought and partly wrought, all forms	do.	$22,355	$27,660	$733	United Kingdom $17,603; Netherlands $3,274; West Germany $2,416.
Rare-earth metals including alloys, all forms		34	NA		
Rhenium: Metal including alloys, all forms		(2)	NA		
Selenium, elemental		323	NA		
Silicon, high-purity		86	NA		
Silver:					
Ore and concentrate[4]	value, thousands	$6,680	$9,352	$1,924	Canada $4,271; Republic of South Africa $1,394; Netherlands $1,199.
Waste and sweepings	do.	$2,185	$2,767	$531	West Germany $1,382; Netherlands $714.
Metal including alloys, unwrought and partly wrought	do.	$159,992	$135,844	$14,256	Netherlands $116,925.
Tellurium, elemental		194	NA		
Tin:					
Ore and concentrate		35	54	—	All from Netherlands.
Oxides		20	NA		
Ash and residue containing tin		1,006	NA		
Metal including alloys:					
Scrap		238	646	—	Netherlands 329; United Kingdom 160; France 71.
Unwrought		2,148	2,750	61	Malaysia 715; Netherlands 383; Brazil 338.
Semimanufactures		237	201	26	Finland 106; West Germany 23.
Titanium:					
Ore and concentrate		132,705	102,107	—	Canada 85,141; Norway 10,615.
Oxides		5,498	6,440	303	West Germany 4,241; United Kingdom 944.

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Titanium—Continued					
Metal including alloys:					
Unwrought including scrap		634	1,481	975	Canada 279; West Germany 133.
Semimanufactures		243	158	18	West Germany 45; France 33; United Kingdom 28.
Tungsten:					
Ore and concentrate		14	25,043	—	Mainly from Mauritania.
Oxides and hydroxides		36	NA		
Ash and residue containing tungsten		1	NA		
Metal including alloys:					
Unwrought including scrap		97	126	6	United Kingdom 57; Austria 45; West Germany 12.
Semimanufactures		135	219	36	Netherlands 170.
Uranium and thorium:					
Ore and concentrate	value, thousands	$5	$90	—	All from Netherlands.
Metal including alloys, all forms:					
Uranium	do.	$39	$43	—	France $31; Netherlands $12.
Thorium	do.	$2	—		
Vanadium:					
Oxides and hydroxides		4,194	NA		
Ash and residue containing vanadium		12,087	NA		
Metal including alloys, all forms		(2)	(2)	(2)	
Zinc:					
Ore and concentrate		588,803	611,709	2,382	Canada 220,979; Peru 88,215; Mexico 60,391.
Oxides		8,886	8,059	99	Netherlands 2,873; France 2,824; West Germany 1,168.
Blue powder		1,096	1,696	7	West Germany 736; Netherlands 369; France 301.
Matte		507	NA		
Ash and residue containing zinc		66,364	NA		
Metal including alloys:					
Scrap		14,070	20,247	20	Netherlands 7,509; West Germany 5,579; France 5,217.
Unwrought		40,535	41,020	1	Netherlands 16,085; West Germany 14,271; France 6,067.
Semimanufactures		18,932	18,603	11	France 15,441; West Germany 2,258.
Zirconium:					
Ore and concentrate		2,522	3,719	20	Netherlands 2,805; West Germany 605.
Metal including alloys:					
Unwrought including scrap		62	79	30	France 44; West Germany 4; United Kingdom 1.
Semimanufactures		146	118	6	France 102; West Germany 7.
Other:					
Ores and concentrates		229,030	5,485	60	Bolivia 2,014; West Germany 766; Turkey 729.
Oxides and hydroxides		176	5,744	162	China 1,730; Republic of South Africa 1,479; France 629.
Ashes and residues		29,613	332,073	43,119	Italy 60,843; West Germany 59,110; United Kingdom 55,594.
Base metals including alloys, all forms		4	11	(2)	West Germany 9; Netherlands 1.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		15,290	12,225	80	Turkey 3,415; West Germany 3,222; Netherlands 1,553.
Artificial:					
Corundum		9,727	8,305	105	West Germany 2,824; France 1,609; Austria 980.
Silicon carbide		5,606	NA		

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Abrasives, n.e.s.—Continued					
Dust and powder of precious and semi-precious stones including diamond	value, thousands	$22,163	$28,244	$8,437	Ireland $15,660; United Kingdom $1,044.
Grinding and polishing wheels and stones		3,667	4,141	122	West Germany 1,262; Italy 777; Netherlands 555.
Asbestos, crude		27,358	20,507	18	Canada 13,749; Republic of South Africa 1,413.
Barite and witherite		7,084	7,694	—	West Germany 5,678; France 1,011; Netherlands 926.
Boron materials:					
Crude natural borates		43,155	31,283	361	Turkey 21,481; Netherlands 9,185.
Elemental		2	NA		
Oxides and acids		2,631	3,078	120	France 1,679; Italy 1,091.
Bromine		1,843	NA		
Cement		304,490	520,315	10	Netherlands 251,747; West Germany 149,015; Greece 98,115.
Chalk		154,644	177,437	1	France 154,423; Netherlands 22,747.
Clays, crude:					
Bentonite		19,893	37,102	27	Netherlands 14,678; Mexico 9,904; West Germany 9,598.
Chamotte earth		81,742	NA		
Fuller's earth		800	NA		
Kaolin		369,848	489,768	9,101	United Kingdom 251,707; Netherlands 119,815; West Germany 60,004.
Unspecified		241,735	340,769	3,246	Netherlands 153,930; West Germany 146,028.
Cryolite and chiolite		68	86	—	Denmark 30; Austria 24; West Germany 16.
Diamond, natural:					
Gem, not set or strung	value, thousands	$4,721,424	$5,903,404	$328,570	United Kingdom $1,986,197; Israel $501,334; India $434,989.
Industrial stones	do.	$85,236	$65,871	$20,403	Netherlands $8,117; India $7,015.
Diatomite and other infusorial earth		13,252	13,670	1,220	Denmark 7,269; France 2,630; Spain 1,930.
Feldspar, fluorspar, related materials:					
Feldspar		19,853	56,481	—	Norway 26,339; France 20,070; Netherlands 6,013.
Fluorspar		10,643	17,663	—	China 5,906; France 5,318; West Germany 3,273.
Unspecified		30,086	NA		
Fertilizer materials:					
Crude, n.e.s.		106,822	110,722	—	Netherlands 94,272; France 8,473.
Manufactured:					
Ammonia		5,458	5,944	—	Netherlands 4,499; West Germany 1,054.
Nitrogenous	thousand tons	951	971	246	Netherlands 239; West Germany 220.
Phosphatic	do.	76	65	—	Netherlands 16; Morocco 14; Tunisia 12.
Potassic	do.	1,380	1,294	9	West Germany 453; France 298; U.S.S.R. 236.
Unspecified and mixed	do.	569	477	76	West Germany 153; Netherlands 72.
Graphite, natural		824	578	—	West Germany 140; Japan 127; Netherlands 116.
Gypsum and plaster		585,121	695,734	322	France 376,413; West Germany 247,564; Netherlands 70,739.
Iodine		129	NA		
Kyanite and related materials		4,538	NA		
Lime		141,376	168,411	23	France 87,662; West Germany 78,814.
Magnesium compounds:					
Magnesite, crude		447	823	—	France 235; Netherlands 172; West Germany 101.
Oxides and hydroxides		18,363	21,514	194	Austria 3,350; France 2,870; Italy 2,794.
Other		27,058	NA		

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Mica:					
Crude including splittings and waste		5,963	1,169	20	France 563; United Kingdom 314; Netherlands 105.
Worked including agglomerated splittings		40	—		
Nitrates, crude		38,547	39,653	—	Chile 38,542; France 647.
Phosphates, crude	thousand tons	2,522	2,387	378	Morocco 1,393; Republic of South Africa 357,980.
Phosphorus, elemental		265	NA		
Pigments, mineral:					
Natural, crude		300	NA		
Iron oxides and hydroxides, processed		9,747	17,338	258	West Germany 15,762; France 525.
Potassium salts, crude		38,646	30,540	—	West Germany 19,219; France 5,423; East Germany 4,954.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$16,780	$19,200	$2,936	Thailand $3,199; West Germany $2,282.
Synthetic	do.	$8,077	$13,273	$1,426	Ireland $9,885.
Pyrite, unroasted		296,979	223,932	—	Spain 139,633; Norway 46,133; Finland 24,229.
Quartz crystal, piezoelectric	grams	42,010	—		
Salt and brine	thousand tons	1,295	1,061	(2)	Netherlands 677; West Germany 329.
Sodium compounds, n.e.s.: Soda ash		98,729	97,115	6,706	France 34,959; West Germany 33,955; Netherlands 21,133.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	226	174	2	France 53; West Germany 48; Republic of South Africa 23.
Worked	do.	125	149	(2)	France 37; Italy 33; Spain 24.
Dolomite, chiefly refractory-grade	do.	73	94	—	France 54; West Germany 16; Netherlands 15.
Gravel and crushed rock	do.	4,497	6,169	(2)	Netherlands 3,145; West Germany 1,131; United Kingdom 840.
Limestone other than dimension	do.	299	146	—	United Kingdom 91; Spain 32; France 18.
Quartz and quartzite	do.	70	91	(2)	West Germany 67; France 8; Netherlands 7.
Sand other than metal-bearing	do.	10,324	14,485	1	Netherlands 11,833; West Germany 1,967.
Sulfur:					
Elemental:					
Crude including native and byproduct		414,213	449,887	193,638	Netherlands 116,252; West Germany 49,093.
Colloidal, precipitated, sublimed		2,298	1,788	4	Netherlands 823; France 652; West Germany 308.
Dioxide		3,215	3,798	—	West Germany 2,210; France 926; Italy 350.
Sulfuric acid		770,076	834,573	—	West Germany 270,464; France 174,775; Netherlands 113,409.
Talc, steatite, soapstone, pyrophyllite		83,765	100,218	49,933	Australia 17,574; Spain 10,737.
Vermiculite, perlite, chlorite		46,648	55,266	—	Turkey 26,448; U.S.S.R. 14,803.
Other:					
Crude	thousand tons	1,903	1,627	18	France 775; West Germany 386; Spain 316.
Slag and dross, not metal-bearing	do.	490	641	(2)	Netherlands 298; France 214; West Germany 127.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		107,405	115,491	184	France 112,288; Netherlands 2,088.
Carbon:					
Carbon black		18,812	52,909	1,108	Netherlands 19,629; West Germany 13,644; France 13,272.
Gas carbon		28,449	NA		
Coal:					
Anthracite	thousand tons	1,215	1,021	—	West Germany 529; Republic of South Africa 168; Netherlands 134.
Bituminous	do.	8,536	10,355	5,087	Republic of South Africa 2,001; Australia 1,047.

See footnotes at end of table.

TABLE 3—Continued

BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Coal—Continued					
Briquets of anthracite and bituminous coal	do.	77	37	—	West Germany 30; France 4; Netherlands 3.
Lignite including briquets	do.	345	307	—	West Germany 282; West Germany 25.
Coke and semicoke	do.	1,933	2,321	34	West Germany 1,637; Netherlands 416; Poland 164.
Gas, natural:					
Gaseous	million cubic meters	9,306	7,340	—	Netherlands 4,621; West Germany 2,538; France 181.
Liquefied	thousand tons	1,182	2,299	—	Mainly from Algeria.
Peat including briquets and litter		184,092	279,804	—	Netherlands 217; West Germany 43.
Petroleum:					
Crude	thousand 42-gallon barrels	175,748	170,862	—	Iran 40,167; Saudi Arabia 26,619; United Kingdom 22,707.
Refinery products:					
Liquefied petroleum gas	do.	4,669	5,128	(2)	Netherlands 2,312; Norway 1,084; United Kingdom 918.
Gasoline	do.	21,420	24,026	1	Netherlands 14,501; United Kingdom 2,147; Spain 1,927.
Mineral jelly and wax	do.	148	171	4	West Germany 92; France 31; Netherlands 29.
Kerosene and jet fuel	do.	2,055	2,027	2	Netherlands 2,000; France 11.
Distillate fuel oil	do.	32,355	31,154	4	Netherlands 28,177; Italy 865; U.S.S.R. 796.
Lubricants	do.	4,155	3,896	135	France 1,342; Netherlands 938; United Kingdom 667.
Residual fuel oil	do.	46,489	50,787	6	Netherlands 20,539; U.S.S.R. 20,289.
Bitumen and other residues	do.	880	627	(2)	Netherlands 376; West Germany 91; France 89.
Bituminous mixtures	do.	101	116	2	France 67; Netherlands 28.
Petroleum coke	do.	2,062	1,741	1,330	Netherlands 316.

NA Not available.
[1]Table prepared by P. J. Rotezel.
[2]Less than 1/2 unit.
[3]May include vanadium.
[4]Includes other precious metals.

TABLE 4

BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year, unless otherwise specified)
Cement	Seven major companies, of which the largest are —	13 plants, including—	8,000, including—
Do.	SA des Cimenteries CBR Cementbedrijven NV (Societe Generale de Belgique, or SGB).	Plants at Lixhe, Mons/Obourg, Harmignies, Marchienne, and Ghent	(2,500)
Do.	SA Ciments d'Obourg	Plants at Obourg and Thieu	(2,640)
Do.	Others	Plants at Chercq/Tournai, Gaurain-Ramecroix, Antoing, Vaulx-Lez-Tournai, and Haccourt	(2,860)
Coal	NV Kempense Steenkolenmijnen	Open pits in northern Limbourg Province	3,000
Copper	Metallurgie Hoboken-Overpelt SA (SGB)	Smelter at Antwerp-Hoboken Refinery at Olen	50 500
Do.	La Metallo-Chimique SA	Smelter at Beerse Refinery at Beerse	100 60

See footnote at end of table.

TABLE 4—Continued

BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year, unless otherwise specified)
Dolomite	Carsambre SA Dolomeuse	Quarry at Floreffe	300
Do.	do.	Quarry at Marche les Dames	600
Do.	do.	Plant at Namur	37
Do.	SA de Marche les Dames	Quarries at Vezin and Sclaigneaux Andenne	300
Do.	do.	Plant at Vezin	35
Do.	SA des Dolomies de Marche-les-Dames	Quarry at Nameche	300
Do.	do.	Plant at Nameche, of which—	
Do.	do.	Soft-burned	500
		Dead-burned	200
Do.	SA Dolomies de Villers-le-Gambon	Quarry at Villers-le-Gambon	300
Lead	Metallurgie Hoboken-Overpelt SA (SGB)	Smelter at Antwerp-Hoboken	100
Do.	do.	Refinery at Antwerp-Hoboken	130
Petroleum, refined	Eight refineries, of which the major ones are—		[1]865,000, including—
Do.	Societe Industrielle Belge des Petroles SA (British Petroleum, United Kingdom)	Refinery at Antwerp	[1](330,000)
Do.	SA Esso NV	do.	[1](225,000)
	Texaco Belgium NV	Refinery at Ghent	[1](185,000)
	SA Chevron Oil Belgium NV	Refinery at Felny	[1](125,000)
Steel	Five companies, of which the major ones are—		15,000, including—
Do.	SA Cockerill-Sambre (Government, 98%)	Plants at Liege and Charleroi	(8,000)
Do.	Maritieme Staalnijver-heid NV (SIDMAR, 85%; ARBED in Luxembourg, 15%)	Plants at Ghent-Zelzate	(3,000)
Do.	Usines Gustave Boel NV	Plant at La Louviere	(1,500)
Do.	Forges de Clabecq	Plant at Clabecq	(1,300)
Zinc	Vieille-Montagne SA (SGB, 95%)	Smelter and refinery at Balen	200
	Metallurgie Hoboken-Overpelt SA (SGB)	Refinery at Overpelt	120

[1]42-gallon barrels per day.

75% of Metallurgie Hoboken-Overpelt SA (MHO) and 95% of Vieille-Montagne SA (VM) in December 1989.

The annual production capacities at MHO's plants in Hoboken and Olen are shown in table 5.

Aluminum.—Sidal NV, a subsidiary of Hoogovens NV (Netherlands), produced about 250,000 tons of aluminum semimanufactures, 200,000 tons of which was rolled products.

Cadmium.—VM produced 1,790 tons of cadmium in 1989, only slightly down from its historic high of the previous year. The decrease was attributed to reduced cadmium content in the zinc concentrates being processed.

Cobalt.—MHO was the world's largest processor of cobalt. In 1986, a plant was inaugurated at Olen using solvent extraction for the recovery of cobalt from European scrap, complex residues, and spent catalysts. This new plant was reported to have the capacity to produce 910 metric tons per year of cobalt, in the form of powders, oxides, and salts.

Copper.—MHO was Western Europe's largest producer of refined copper and the sixth largest in the world. The plant at Olen produced about 330,000 tons of refined copper, 380,000 tons of continuous cast and rolled copper wire rod, and 50,000 tons of blister copper. Olen's main customers were the European Economic Commission and the European Free Trade Association.

Lead.—Lead was produced at MHO's Hoboken plant. The annual capacity was 125,000 tons per year.

Steel.—Cockerill-Sambre SA, Belgium's largest steel company, almost wholly owned by the Walloon regional government (98.2%), produced about 4.45 million metric tons of raw steel. The company reported 1989 profits of $407 million, more than double 1988's results.

Arbed SA, a Luxembourg company, was Europe's fifth largest iron and steel producer. It was also active in Belgium in the production, sales, and trading of steel.

Zinc.—VM, founded 150 years ago, was one of the world's largest zinc refiners. VM operated a zinc mine in Sweden and zinc

LUXEMBOURG

AREA 2,600 km² **POPULATION 366,000 million**

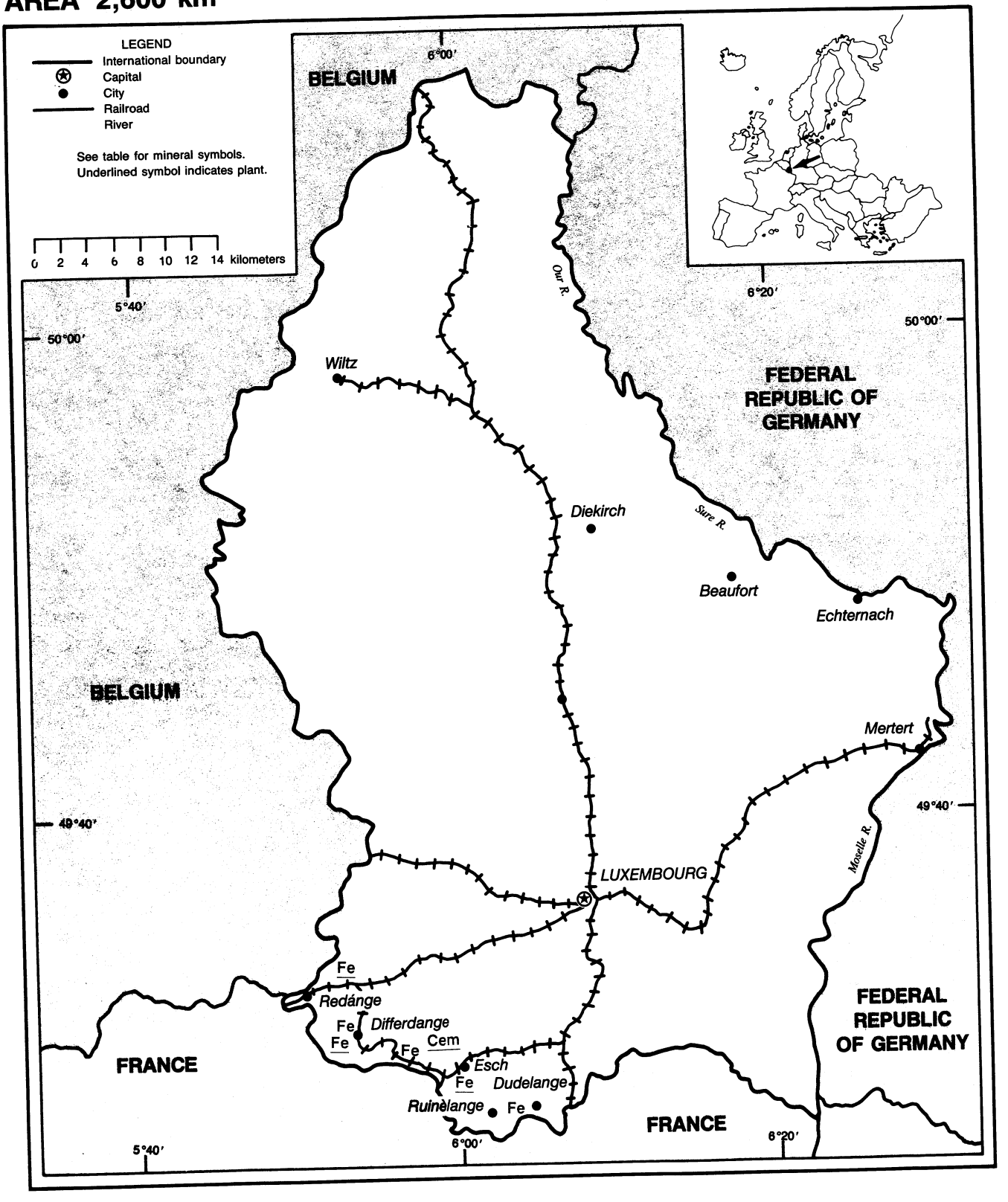


TABLE 5

BELGIUM: ANNUAL PRODUCTION CAPACITIES

Commodity	Capacity (metric tons)
Cobalt, metal powders, and oxides	8,700
Copper:	
Refined	330,000
Scrap	480,000
Gold	50
Indium	25
Lead, refined	125,000
Palladium	12
Platinum	5
Rhodium	0.5
Selenium	360
Silver	2,400
Tellurium	150

plants in Overpelt and Balen in Belgium, in Auby in France, and in Asturienne in Portugal. VM's 100% subsidiary, Union Mines Inc., operated the Union Zinc Inc. mines in the United States, in Gordonsville and Jefferson City, Tennessee. Union Zinc produced cadmium and zinc and recovered germanium in Gordonsville. The germanium was shipped to MHO's Olen plant in Belgium. Other sites in Europe provided 28% of ore needs; Canada, 27%; South America, 21%; and Africa and Southeast Asia, the rest.

***Industrial Minerals.*—Cement.**—Belgian cement production capacity was about 8 million tons per year. Production in 1989 was the highest to date. Cimenteries CBR SA, owned by Societe Generale, is one of the leading European cement producers.

Fumed Silica.—A fumed silica plant was being built in Puurs for W.R. Grace, a U.S. company. The plant was designed for the European Darex Div. of Grace Specialty Chemicals Co. to become operational in mid-1990. Production capacity was expected to be about 5,000 metric tons per year. Manufacturing was to take place using proprietary technology licensed from Nynaes Petroleum AB of Sweden. The main contractor was Bdger BV of The Hague, the Netherlands. Materials from Puurs would complement the company's existing SYLOID brand line of silica products and will be targeted at markets in North America and Asia.

Soda Ash.—Soda ash in Belgium was produced at Couillet, southeast of Namur.

Sodium Sulfate.—Belgium had two sodium sulfate producers: Tessenderloo Chemie SA, in Tessenderloo, and Union Chimique-Chemische Bedrijven (UCB), in Ghent. Tessenderloo accounted for about 90% of production of sodium sulfate as a byproduct of its Manheim operation. Annual capacity was quoted at 1 million metric tons per year. Sales were taken by the glass, detergent, and paper industries. UCB supplied only local detergent and glass markets with 24,000 metric tons per year of production.

***Mineral Fuels.*—Coal.**—The Borinage coal mining area in the Sambre-Meuse Valley lies in a narrow band across the center of Belgium from the French border through Mons, Charleroi, Namur, and Liege. Although many mines in the Kempenland Field have been worked out or abandoned as uneconomic, the Sambre-Meuse region provided most of the coking and slow-burning coal for domestic industry.

The Limburg coal mines were in the process of being phased out. The state-owned Kempense Steenkolenmijnen SA will close its last two mines, at Beringen and Zolder, in 1992. Coal mining was one of Belgium's five so-called "sectors." Until 1983, these national "sectors" enjoyed a privileged status and benefited from the central government's subsidies. In July 1983, the central government agreed that the national sectors would be regionalized, and all future financial support for them would have to be provided from the region's own resources. While there originally were two mining districts, one in Wallonia and one in Flanders, only two of Flanders' mines are still in operation today. In 1987, when the first mining retrenchment plan was implemented in Limburg, regional authorities affirmed that mining in the two remaining pits would continue until at least 1992.

Belgium's major coal consumers was shown in table 6.

In 1988, U.S. imports represented 45% of Belgium's total coal imports.

Natural Gas.—Distrigaz, 50% owned by the Government, controlled all aspects of natural gas in Belgium. Almost all of the country's gas requirements were satisfied by imports. Gas share of total energy use in Belgium was 15.2% in 1988.

Nuclear Power.—The seven nuclear powerplants in Belgium supplied about 65.5% of its electricity requirements.

TABLE 6

BELGIUM: MAJOR COAL CONSUMERS

Consumers	1988 consumption (million tons)
Coking works	7.3
Power stations	3.7
Domestic heating	1.0
Steel industry	.3
Other industries	.8
Total	13.1

Petroleum.—Belgium imported all of its crude oil for its four refineries. Fina Raffinaderij Antwerpen (Fina), in Antwerp, was the largest refinery in the country, with a through-put of about 306,000 barrels per calendar day, or 49% of the country's capacity. Production at the refinery was upgraded and diversified by the construction of new process plants. Petrofina, its subsidiary, operated six refineries on three continents.

Infrastructure

The Belgian National Railways operates 3,667 kilometers (km) of 1.435-meter standard-gauge track. The country has 103,396 km of highways and 2,043 km of inland waterways in regular commerical use. The country's major ports are Antwerp, Brugge, Gent, Oostende, and Zeebrugge. In addition, Belgium has 1,167 km of refined products pipeline, 161 km of crude pipeline, and 3,300 km of natural gas pipeline.

Outlook

The gradual cessation of the country's coal production is bound to increase Belgium's coal imports in the coming years. To the extent that prices are competitive and suppliers reliable, U.S. suppliers may find a growing market in Belgium.

LUXEMBOURG

Production

Steel production remained Luxembourg's only "smokestack" industry and accounted for just over 11% of the gross national product. The country ranked 30th in world steel production despite its small size. Minerals and metals were an important part of Luxembourg's foreign trade. Luxembourg was almost entirely dependent on foreign sources of raw materials.

TABLE 7

LUXEMBOURG: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic		295	389	509	563	550
Gypsum and anhydrite, crude[e]	metric tons	400	420	420	450	450
Iron and steel: Metal:						
Pig iron (including blast furnace ferroalloys)		2,754	2,650	2,305	2,521	2,685
Steel:						
Crude		3,945	3,705	3,301	3,661	3,720
Semimanufactures		3,878	3,771	3,481	4,000	4,200
Phosphates: Thomas slag, gross weight		701	620	542	664	680
Sand and gravel:						
Foundry sand	metric tons	1,500	—	—	([3])	—
Other sand except glass sand		594	616	760	780	780
Gravel		116	61	197	150	170
Stone: Construction:						
Crushed	thousand cubic meters	523	547	345	[e]400	380
Dimension:						
Rough cut	do.	14	15	16	[e]17	16
Facing	square meters	1,987	4,100	5,599	[e]4,000	4,500
Finished	cubic meters	1,212	707	[e]800	[e]900	900
Flagstone:						
Polished	square meters	707	400	—	—	—
Rough	metric tons	131	71	—	—	—
Slate slabs	thousand pieces	[4]536	335	—	—	—

[e]Estimated. [p]Preliminary.
[1]Table includes data available through July 1990.
[2]In addition to the commodities listed, dolomite, quartzite, refractory clays, and manufactured phosphatic fertilizers other than Thomas slag were produced, but data are not published, and information is inadequate to make reliable estimates of output levels.
[3]Revised to zero.
[4]In tons.

TABLE 8

LUXEMBOURG: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year, unless otherwise specified)
Cement	SA des Ciments Luxembourgeois (ARBED, 31%; SGB, 25%)	Plant at Esch-sur-Alzette	450
Ferroalloys	Continental Alloys SA (ARBED, 97%)	Plant at Dommeldange	9
Steel	Acieries Reunies de Burbach-Eich-Dudelange (ARBED) (SGB, 25%; Belgium Government, 31%; and others)	Plants at Dudelange, Esch-Schifflange, Esch-Belval, and Differdange	4,000

Trade

Luxembourg steel exports to the United States dominated trade with the United States.

Structure of the Mineral Industry

The mineral industry was dominated by one private steel company, Arbed, which had domestic and foreign subsidiaries, and part foreign ownership. The Ministry of Economics published annual statistics on the mining and minerals industry.

Commodity Review

Metals.—The iron and steel industry was the most important single industrial sector of the economy. The production and export of steel have traditionally played major roles in Luxembourg's economy.

Arbed, the only iron and steel producer in Luxembourg, earned a profit of $57 million for the accounting year, ending in mid-1989. Arbed's productivity, among the highest in the world, continued to improve. Luxembourg Government ownership in Arbed amounted to 31% of voting shares.

Industrial Minerals.—Industrial minerals for domestic consumption were the only minerals mined in Luxembourg. They included dolomite, gypsum, limestone, and sand and gravel. These industrial minerals were all mined by surface methods, in small pits and quarries, operated by small independent operators. Luxembourg imported all its requirements for fertilizers and other industrial minerals.

Mineral Fuels.—Luxembourg met virtually all of its energy needs through imports. Its only domestic source of energy was hydroelectricity. The country has three hydroelectric plants, one of them associated with a reservoir supplying water to most of the country. Only 1% of total solid fuel requirements was produced domestically, mostly from incineration of waste material. The steel industry accounted for more than 80% of total industrial energy demand. About 90% of imported coal went to the steel industry. Luxembourg did not have any oil refineries, and almost 90% of oil products was imported via Belgium. The rest were imported from other neighboring European countries. About 85% of natural gas was imported via Belgium. France supplied the remainder of the country's gas needs.

INFRASTRUCTURE

The Luxembourg National Railways operates 270 km of 1.435-meter standard gauge track. The country has 5,108 km of highways and 37 km of inland waterways. In addition, the country has a 48-km refined products pipeline. The major river port of this country is at Mertert.

OUTLOOK

For the near future, the level of Luxembourg's steel exports is expected to remain firm. In addition, Luxembourg is a potentially attractive market for U.S. products.

[1]Physical scientist, Division of International Minerals.

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Service Geologique (Geological Survey), Luxembourg, Luxembourg.

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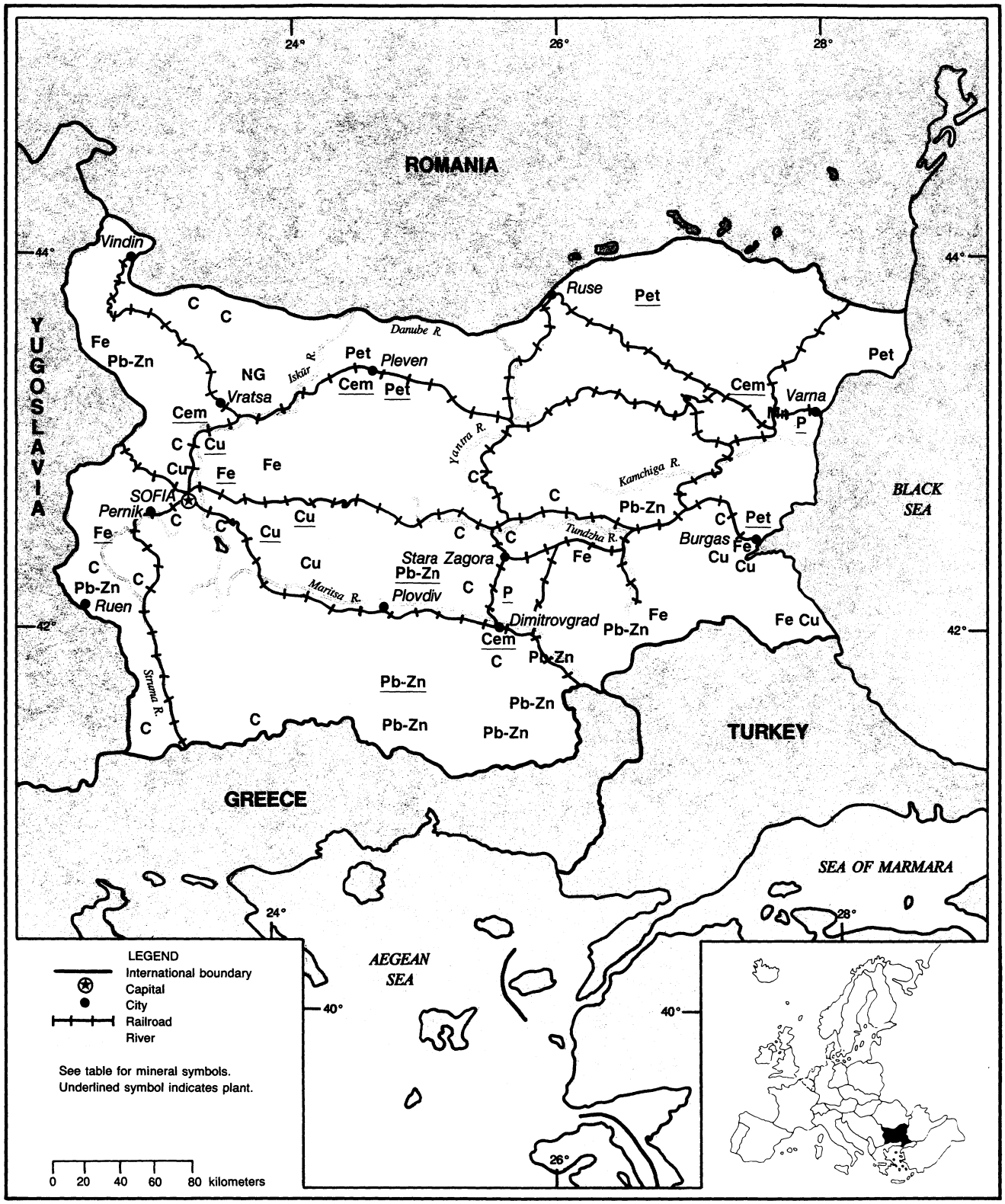
BULGARIA

AREA 112,000 km² **POPULATION 8.9 million**



THE MINERAL INDUSTRY OF

BULGARIA

By Walter G. Steblez

In 1989, Bulgaria appeared to be self-sufficient in the production of most nonferrous metals, but remained reliant on imports of coal, natural gas, and petroleum. Compared with that of 1988, industrial commodity output in 1989 grew only by 0.6% and the value of total industrial output by 1.1%. According to the 1989 index for the country's gross value of industrial output, the share of the year's total industrial production by the coal, chemical and petroleum refining, iron and steel, and nonferrous metals sectors amounted to 1.1%, 14.6%, 3.0%, and 2.6%, respectively. In 1989, the gross value output of the the coal industry declined slightly from the 1988 level, while those of the iron and steel and machine tool sectors declined by 2.5% and 1.2 %, respectively. However, a slight increase was reported by the nonferrous metals sector and a 1.1% increase by the chemical and petroleum refining sector.[1] The decline in the rate of growth of industry's gross value output from the levels reported for preceding years (above 4%) was attributed partly to the large-scale emigration of Bulgarian citizens of ethnic Turkish background during the year, which caused labor shortages in many sectors of the economy.

Also, the structural economic and political changes noted in several East European countries and the U.S.S.R. in 1989 strongly influenced the political and economic climate in Bulgaria, which, in November, culminated in the change of leadership in the ruling political party. Significantly, the sharpest decline in industrial output occurred during this period.

Although a substantial share of capital investment in 1989 was earmarked for raw material, energy, machine building, and chemical sectors of industry, a number of major projects remained uncompleted. These included the sixth reactor block of the Kozluduy Nuclear Powerplant and the Maritsa Iztok Thermoelectric Powerplant. The Obrochishte manganese mining and beneficiation complex was among the few projects that were completed during the year. Also noteworthy was the discovery of a new natural gas deposit at Lukovitsa.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued policies aimed at the decentralization and streamlining of the economy. Central planning would be abolished and replaced by market-oriented companies, and inefficient mining and mineral operations would be subject to closure. In January 1989, the Government issued Decree 56, which extended and summarized earlier restructuring policies. The provisions of this decree allowed the formation of companies and corporate entities from existing state-owned enterprises, which could operate under various forms of ownership and would be subject to bankruptcy. The new companies would be allowed to operate independently, without state subsidies and central plan directives, and would independently conduct foreign commercial transactions. However, the role of the state or the Government in the operation of these firms was not clearly defined by yearend.

PRODUCTION

Despite continued efforts to decentralize the economy through legislation and restructuring of individual enterprises, in 1989, the process of transition to new economic structures may have impeded industry's performance because of conflicts arising from newly emerging forms of economic activity and the traditional centrally planned structures. "Gross weight output" as a measure of production continued to be the standard used in industry, including the minerals sector. This allowed manufacturing enterprises to waste resources by gauging performance in terms of the gross weight of output measured in tons rather than meet the needs of the consumer.

Consequently, most manufactured products, including mining equipment, were heavier, less efficient, and often less reliable than comparable products in market economy countries. Transportation bottlenecks and stockpiles of unusable spare parts continued to impact adversely on both the old and the newly emerging economic entities.

TRADE

Approximately 80% of Bulgaria's total trade in 1989 was conducted with member countries of the Council for Mutual Economic Assistance (CMEA). Within the CMEA, 75% of Bulgaria's trade was conducted with the U.S.S.R. The U.S.S.R. remained a cornerstone in Bulgaria's mineral trade, meeting most of the latter's requirements for fossil fuels, iron ore, iron and steel products, ferroalloys, as well as a significant share of Bulgaria's aluminum import requirement. As high as this dependence was on CMEA countries in 1989, Bulgaria's trade within the CMEA bloc actually declined in terms of both imports and exports by 10.7% and 3.8%, respectively. Bulgaria's exports to market economy countries grew by almost 6% compared with those of 1988, while imports from these countries declined slightly. On balance, Bulgaria recorded a significant drop in the export of machinery and equipment as well as fewer exports of fuels, mineral raw materials, metals, and chemicals. Similarly, Bulgaria imported 15.1% less fuel, mineral raw materials, and metals than it did in 1988 and 16.8% fewer chemical products.[2]

In 1988, Bulgaria initiated its application for membership in the General Agreement on Tariffs and Trade (GATT) and updated its application in April 1989.

Although the country had had observer status at GATT since 1967, its application for full membership was based on economic reforms achieved by 1988–89 that the Government felt would allow it to accept the obligations imposed by

TABLE 1

BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Cadmium metal, smelter[e]		200	200	180	180	180
Copper:[e]						
Ore:						
Gross weight	thousand tons	10,200	10,000	11,500	12,500	[3]12,634
Cu content		39,000	38,000	44,000	47,000	48,000
Concentrate:						
Gross weight	thousand tons	194,000	190,000	220,000	290,000	[3]296,400
Cu content		33,000	32,000	35,000	37,000	[3]39,000
Metal, primary and secondary:						
Smelter		[r]50,000	[r]50,000	[r]55,000	[r]57,000	[3]57,000
Refined		[r]48,000	[r]48,000	[r]54,000	[r]55,500	[3]55,800
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	1,985	2,179	1,850	1,826	[3]1,613
Fe content	do.	607	661	559	528	[3]482
Iron concentrates	do.	917	986	990	629	600
Metal:						
Pig iron	do.	1,702	1,597	1,652	1,437	[3]1,484
Ferroalloys, electric furnace, all types[e]	do.	41	48	42	[r]47	45
Steel, crude	do.	2,944	2,965	3,045	2,875	[3]2,899
Semimanufactures, rolled	do.	3,325	3,347	3,225	3,320	[3]3,037
Lead:[e]						
Mine output, Pb content		[r]74,000	[r]74,000	[r]69,000	[r]69,000	[3]65,300
Concentrate:						
Gross weight		93,000	93,000	86,000	86,000	[3]81,400
Pb content		65,000	65,000	60,000	60,000	[3]57,000
Metal, refined, primary and secondary		110,000	112,000	105,000	105,000	[3]99,000
Manganese ore:						
Gross weight		38,000	37,000	38,000	35,000	61,000
Mn content		11,300	11,200	10,900	9,900	17,500
Molybdenum, mine output, Mo content[e]		190	190	200	200	190
Silver, mine output, Ag content[e]	kilograms	28,900	28,300	28,300	28,000	28,000
Zinc:[e]						
Mine output, Zn content		[r]56,000	[r]56,000	[r]56,000	[r]56,000	[3]55,600
Concentrate:						
Gross weight		79,000	79,000	79,000	79,000	79,200
Zn content		41,000	41,000	41,000	41,000	[3]41,000
Metal, smelter, primary and secondary		[r]88,000	[r]88,000	[r]87,000	[r]87,000	[3]86,800
INDUSTRIAL MINERALS						
Asbestos		400	300	400	300	300
Cement, hydraulic	thousand tons	5,296	5,702	5,494	5,535	5,500
Clays: Kaolin	do.	257	265	281	220	220
Gypsum and anhydrite:						
Crude	do.	388	395	306	401	450
Calcined		113	99	103	113	130

See footnotes at end of table.

TABLE 1—Continued

BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Lime: Quicklime	thousand tons	1,331	1,632	1,278	1,424	[3]1,434
Nitrogen: N content of ammonia	do.	1,138	1,091	1,070	[e]1,050	1,000
Pyrites, gross weight[e]	do.	153	187	185	185	180
Salt, all types	do.	89	91	92	103	[3]78
Sodium carbonate, calcined	do.	1,037	1,054	1,070	[e]1,100	1,100
Sulfur:[e]						
S content of pyrites		65,000	80,000	80,000	70,000	70,000
Byproduct, all sources		53,000	62,000	65,000	60,000	60,000
Total		118,000	142,000	145,000	130,000	130,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, marketable:						
Anthracite	thousand tons	83	80	71	65	65
Bituminous	do.	140	127	127	131	130
Brown	do.	5,385	5,119	5,220	4,762	4,700
Lignite	do.	25,272	29,896	31,401	29,189	30,000
Total	do.	30,880	35,222	36,819	34,147	34,895
Coke	do.	1,087	1,156	1,314	1,457	[3]1,350
Gas, natural, marketed[e]	million cubic meters	130	130	127	127	127
Petroleum, crude: As reported[e]	thousand tons	1,300	1,080	1,000	1,000	1,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Aug. 1990.
[2]In addition to the commodities listed, bismuth, chromite, gold, palladium, platinum, tellurium, uranium, barite, fluorspar, magnesite, and a variety of crude construction materials (common clays, sand and gravel, dimension stone, and crushed stone) are produced, but available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

GATT rules. Also, in 1989, Bulgaria's Debelt Co. signed a contract with Soyuzvneshstroyimport of the U.S.S.R. on the construction of several projects for the Krivoy Rog iron ore beneficiation complex. The contract's term was from 1989 to 1994.

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry.

COMMODITY REVIEW

Metals

Copper.—The chief event in the industry involved the continued development of the Asarel open pit operation at the Medet-Asarel mining and beneficiation complex. The Asarel mine was expected to produce about 5 million tons of low-grade ore by 1990, grading at about 0.38% copper. The mine would reach its planned capacity by 1994 to produce about 15 million tons of ore per year.[3]

Ferroalloys.—Owing to the decline in the supplies of manganese oxide ores and the high cost of processing manganese carbonate ores at yearend, Bulgaria ceased production of ferromanganese. Most of the country's needs for ferromanganese would be met by imports, mainly from the Elkem Co. of Norway in exchange for Bulgaria's exports of manganese ore to Elkem.

Iron Ore.—In view of both the decline in domestic iron ore output and ore grade, at yearend, Bulgaria announced plans to import high-quality ores to replace the domestically mined product. Although no details were provided concerning either the source of supply for the iron ore or when imports would begin, the announcement was a further indication that unprofitable and heavily subsidized operations would be subject to closure.

The reserves of the Krumovo and Martinovo mines were reportedly near exhaustion and were scheduled for closure by 1992. The Kremikovtsi mine, which supplied the Kremikovtsi Iron and Steel Works with concentrates, produced about 80% of the domestically mined ore. Moreover, the iron ore contained sufficient amounts of recoverable lead, which caused severe environmental problems. The lead was recovered only during the smelting process, together with some silver values, and was shipped to the Dimitur Blagoev lead and zinc smelter and refinery.

Lead and Zinc.—Lead and zinc ores were mined at four mining and beneficiation complexes in the Madan, Ossogovo, Plovdiv, and Ustrem areas. A relatively small quantity of lead was also produced

TABLE 2

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (all state-owned)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Wilheim Pieck Plant	Beli Izvor, Vratsa district, northeast of Sofia	1,290.
Do.	Reka Devnia	Devnia	1,825.
Do.	Zlatna Panega	Panega	1,300.
Do.	Others	Temelkovo, Dimitrovgrad, and Pleven	1,300.
Coal:			
Bituminous	Economic Mining and Power Combine (SMEK) Balkanbass	Balkan coal basin in central Bulgaria, northwest of Silven	445.
Do.	Committee on Geology and Mine Construction Trust	Dobrudja coal basin in northeast	(1).
Brown	SMEK Bobov Dol	Bobov Dol coal basin, western Bulgaria	2,200.
Do.	SMEK G. Dimitrov	Pernik coal basin, southwest of Sofia	4,000.
Do.	SMEK Balkanbass and Pirin	Pirin coal basin in western Bulgaria	900.
Lignite	SMEK East Maritsa	East Maritsa coal basin near the town of Zagora	25,000.
Do.	SMEK Marbas	Marbas coal basin	2,700.
Do.	SMEK G. Dimitrov	Pernik coal basin near Sofia	2,300.
Do.	SMEK Bobov Dol and Pirin	Bobov-Dol and Pirin coal basins, western Bulgaria	300.
Copper:			
Concentrate: Cu content	Medet-Asarel	Panagurishte, Pazardzhik district	25,000.
Do.	Chelopech	Srednogorie, Sofia district	5,000.
Do.	Bradtze	Malko Turnovo	2,000.
Do.	Elatzite	Srednogorie, Sofia district	24,000.
Do.	Rosen	Burgas, near the Black Sea	1,000.
Do.	Tsar Asen	Srednogorie, Sofia district	2,000.
Do.	Zidrovo	Burgas, near the Black Sea	500.
Metal:			
Cu refined	Georgi Damyanov	Srednogorie, Sofia district	120,000.
Iron ore	Kremikovtsi Iron and Steel Combine	Kremikovtsi	1,680.
Lead-zinc:			
Pb and Zn content of concentrate	Gorubso Mining and Beneficiation Complex (5 mining administrations, 19 mines)	Madan area	59,000 Pb. 47,000 Zn.
Do.	Madzarovo Mining and Beneficiation Complex	Near Plovdiv	3,000 Pb. 2,000 Zn.
Do.	Ossogovo Mining and Beneficiation Complex	Ossogovo area	3,000 Pb. 2,000 Zn.
Do.	Ustrem Mining and Beneficiation Complex	Ustrem	3,500 Pb. 800 Zn.
Metal:			
Pb refined	Dimitur Blagoev Smelter and Refinery	Plovdiv	65,000.
Do.	Georgi Dimitrov Smelter and Refinery	Kurdjali	60,000.
Zn smelter	Dimitur Blagoev Smelter and Refinery	Plovdiv	60,000.
Do.	Georgi Dimitrov Smelter and Refinery	Kurdjali	30,000.

See footnotes at end of table.

TABLE 2—Continued

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (all state-owned)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Manganese:			
Mn content of concentrate	Obrotchishte Mining and Beneficiation Complex	Varna district	16,000.
Natural gas	Ministry of Power Supply	Chiren field, in the northwest	([1]).
Petroleum:			
Crude	do.	do.	([1]).
Refined	Economic Trust for Petroleum Products	Refineries in Burgas, Pleven, Ruse	260,000.[2]
Steel, crude	Kremikovtsi Iron and Steel Works	Near Sofia	1,800.
Do.	Lenin Metallurgical Complex	Pernik (Dimitrov)	1,300.

[1]Insignificant capacity.
[2]Barrels per day.

as a byproduct of iron ore mining at Kremikovtsi.

Manganese.—In 1989, development continued at the Obrochishte underground manganese mine, near Varna. A new shaft was sunk, and mining was reportedly underway. Although the level of production at Obrochishte has been about 50,000 tons per year, when facility expansion is completed by 1991, the mine's capacity will reportedly be about 400,000 tons of ore per year. The carbonate ore grades at about 28% Mn and must be upgraded at the concentrator to 35% Mn.

The throughput capacity of the beneficiation plant reportedly will also be increased from 50,000 tons to 100,000 tons per year.

Industrial Minerals

Bulgaria produced a variety of industrial minerals that included bentonite, dolomite, fluorite, gypsum, kaolin marble, and perlite, largely for domestic consumption.

As restructuring of the economy progressed, there has been more openness in official sources on mineral deposits. Some of this new data included industrial minerals such as bentonite. Bulgaria's production of bentonite was reported at about 200,000 tons per year, produced largely at the "Propast-Dobrovoletz" mine and processing plant. The country's total reserves were given at about 58 million tons.[4]

Mineral Fuels

Natural Gas.—Reportedly, in September, specialists from the Plavan Geological Prospecting Enterprise confirmed a new gas deposit near the town of Lukovitsa. Exploration work at the site was conducted since 1988, and the newly discovered gasfield was considered an important addition to the country's domestic supply of natural gas.

Data on reserves and development plans were not released by yearend.

Nuclear Energy.—The fifth reactor block at the Kozloduy Nuclear Powerplant was officially put into operation in March. Rated at 1,000 megawatts, it was built with the assistance of the U.S.S.R. and the cooperation of other CMEA-member countries. However, the sixth reactor block, also scheduled to come on-stream during the year, was still under construction at yearend.

Reserves

Taking into account Bulgaria's transition to a market economy, the country's mineral reserves would have to be re-evaluated from the perspective of market economics. Reserves, as defined by market economies, are those mineral deposits that can be mined at a profit, under existing conditions with existing technology. In CMEA countries, including Bulgaria, the prior policies for centrally planned industrial development often had more to do with political than economic considerations. The chief principle of industrial development was to attain self-sufficiency at all costs. Centrally planned directives to discover exploitable resources may have resulted in possible overevaluations and other distortions of collected field data. Consequently, it will probably take Bulgaria a number of years to determine its real reserves from a market economy standpoint.

The system that was used to measure reserves was based on two cross-imposed classification schemes, one relating to the exploitability of the mineral in question, and the other, relating to the reliability of the information on its quantity and grade. The first system determined whether or not the deposit was suitable for exploitation, given the current technological capability and industrial need. The second classification related to the reliability of data gathered on the quantity of the mineral in situ. The second classification designated deposits into reserve categories A, B, C1, and C2 where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Bulgaria's mineral resources in categories A+B+C1 are given in table 3.

INFRASTRUCTURE

Bulgaria's inland system of ways and communications consisted of 43,161

TABLE 3

BULGARIA: APPARENT RESERVES OF MAJOR MINERALS

Commodity	Capacity (thousand metric tons)
Bentonite	58,000
Barite	30,000
Copper, contained in ore	5,000
Gypsum	200,000
Iron, contained in ore	71,000
Lead, contained in ore	1,500
Manganese, inferred content of ore	140,000
Zinc, contained in ore	1,200

kilometers (km) of railroads, highways, and waterways. The railroad system consisted of 4,049 km of 1.435-meter standard-gauge track and 245 km of narrow-gauge track. About 908 km of the total was double track, and 2,342 km was electrified. The highway system consisted of 33,397 km of hard-surface roads, including 228 km of superhighways, and 4,045 km of earth roads. There was also 470 km of inland waterways, with ports at Ruse, Vidin, and Lom on the Danube River. In 1989, freight haulage amounted to more than 77 million tons by rail, more than 31 million tons by truck, and 3.3 million tons by river carriage, or 2.6%, 4.4%, and 8.8%, respectively, below the levels achieved in 1988. The country's merchant fleet was composed of 108 ships totaling 1,240,204 gross register tons or 1,872,723 deadweight tons. These included 32 cargo, 2 container, 5 roll-on/roll-off ships; 16 petroleum, oils, and lubricant tankers; 2 railcar carriers; and 48 bulkers. In 1989, maritime freight haulage amounted to more than 25.5 million tons or 6.3% above the carriage level of 1988. The country's major ports were at Burgas, Varna, and Varna West. Bulgaria's pipeline system consisted of 192 km of crude petroleum pipe, 418 km of refined products pipe, and 1,400 km of pipe for natural gas. Pipeline carriage in 1989 amounted to just above 19 million tons, a decline of 12.7% from the level achieved in 1988.

OUTLOOK

Given years of official neglect of severe industrial pollution and associated health-related problems, short-term difficulties are envisaged for the nonferrous metal and iron ore mining and processing sectors, owing, in part, to arsenic and lead elements that have not been effectively contained during the industrial process. Several mining, processing, and smelting operations would either be closed or forced to reduce production pending the completion of cleanup operations. The longer term issue facing Bulgaria's mining industry is the necessity for reevaluating the country's mineral wealth using market economy criteria. If current Bulgarian assessment of the country's mineral wealth were to be validated through subsequent fieldwork, the low-grade copper, lead, and zinc and iron ores would unlikely be considered economic under foreseeable world market conditions. Bulgaria's gradual transition to full import reliance on iron ore was already contemplated in 1989. Manganese ore mining would appear to have the best future prospects considering the proximity of this large, albeit low- to medium- grade reserve, to the important industrial processing centers in the European Community.

[1]Rabotnichesko Delo, Jan. 30, 1990, pp. 4–5.
[2]Work cited in footnote 1.
[3]Mino Delo, May 1989, p. 4.
[4]Mino Delo, Sept.–Oct., 1990, p. 22.

OTHER SOURCES OF INFORMATION

Agencies

The Geological Institute of the Bulgarian Academy of Science
Sofia, Bulgaria
Lead and Zinc Company
Plovdiv, Bulgaria
Poilmet
Sofia, Bulgaria

Publications

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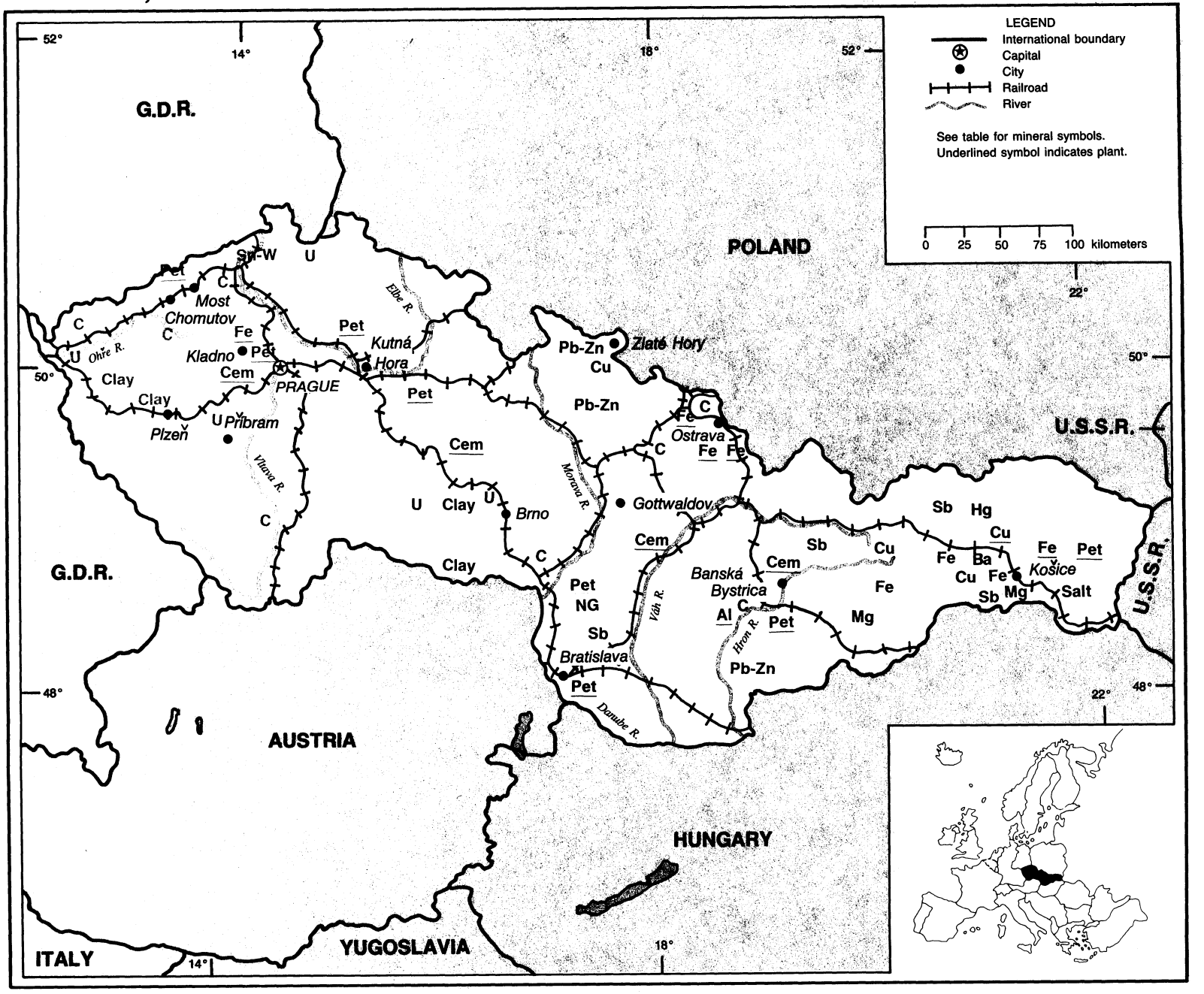
Mino Delo (Mining Issues), monthly.
Statisticheski Godishnik (Statistical Yearbook), annual.

CZECHOSLOVAKIA

AREA 128,000 km² **POPULATION 15.7 million**



THE MINERAL IDUSTRY OF

CZECHOSLOVAKIA

By Jozef Plachy

Fundamental political reforms swept Czechoslovakia in 1989. Events culminated in the collapse of the Communist government in November 1989 and the subsequent appointment of Vaclav Havel as the new president in January 1990.

In 1989, the gross domestic product (GDP) declined by an estimated 1.7% compared with the 1988 growth of 2.5%.[1] Persistently high energy and raw material consumption and slow application of new technologies contributed to this situation. Inflation in 1989 was officially between 1% and 2%, but, according to the Association of European Banks (ABECORD), 4% to 5% would have been a more accurate measure. While revenues increased by about 3%, the expenditure grew by only 1.6% versus the planned 4.6%.[2] Despite these cuts, price subsidies still accounted for $3.3 billion of budget spending, of which $90 million was used to subsidize the mining industry.[3] Foreign debt, in spite of these economic woes, remained at only $8 billion, 70% of which was accounted for by loans from western commercial banks. Allowing for foreign exchange reserves, net foreign debt amounted to less than $6 billion and, overall, this represents a comparatively low debt burden.[4]

GOVERNMENT POLICIES AND PROGRAMS

Owing to the poor performance of the economy under the eighth 5-year plan (started in 1986), the originally planned cumulative gross national product growth of 19% was revised to 13% to 14%.[5] Owing to the poor performance of the economy and possibly to political changes in East Europe, Czechoslovak leadership decided to introduce new economic measures starting January 1, 1990. The transitory new reform laws introduced in 1989 included legislation on state-owned enterprises, currency, exchange rates, banking, tax reform, joint venture, and realignment of the wholesale pricing structure. The aim of these changes was to create greater autonomy for individual enterprises and to improve efficiency, productivity, and profitability.

PRODUCTION

In comparison to world resources, the metallic ore deposits of Czechoslovakia are relatively poor. In 1989, the production of most metallic ores declined, mainly owing to a depletion of deposits at the existing mines. The largest decline was in production copper ore (53,000 tons), followed by zinc and lead, while production of iron ore showed a slight increase. Czechoslovakia is self-sufficient only in antimony, mercury, and uranium. With the exception of antimony, copper, and iron ores, all the ores and concentrates produced in Czechoslovakia are exported for refining. The biggest news item in 1989 in the mining industry was the discovery of gold near Mokrsko. The estimated gold content of the deposit is 100 to 150 tons.

The largest increase in production of industrial minerals in 1989 was registered by gypsum and anhydride (21,867 tons) followed by magnesite (11,214 tons). Change in production of other industrial minerals was less significant. Czechoslovakia is not only self-sufficient in many nonmetals (barite, kaolin, graphite, magnesite, etc.), but in many is a net exporter.

The largest change was recorded by the mineral fuel sector. The 1989 production of both brown coal and lignite declined by about 6% and that of natural gas by an estimated 16%, although production of crude oil remained basically the same as that in 1988. The decline of fuel production was caused mainly by the depletion of existing reserves and the social pressure to decrease air pollution.

TRADE

In 1989, engineered products made up more than one-half of exports, while 50% of imports was fuel and raw materials. Foreign trade with Communist countries and market economy countries in 1989 continued to be very unbalanced. Eighty-two percent of total exports to Eastern bloc countries was in machinery and equipment, while two-thirds of Czechoslovakia's imports was fuels and raw materials. Regarding trade with market economy countries, about one-half of Czechoslovakia's imports was in machinery and equipment, while exports were dominated by raw materials and semifinished products.[6]

One of the few areas where Czechoslovakia improved in 1989 was in the balance of trade and efficiency of foreign trade. Policies supporting self-sufficiency shifted to an emphasis on cost-effective, export-oriented trade. One consequence was a reduction in exports of lower valued raw materials and a rise in sales of metallurgical products with a higher value-added component. As a result, exports to industrialized market economy countries accelerated by an unprecedented 16.1% to $4.52 billion. Consequently, the balance of trade shifted from a deficit of $455 million in 1988 to a surplus of $72 million. Exports to the U.S.S.R. registered a first time fall of 7.6% to $4.43 billion, creating a bilateral surplus of $177 million.[7]

The entire bilateral trade with the United States in 1989 totaled $148 million, of which U.S. exports were $57 million and imports $91 million, less than a one-half of 1% decline in both imports and exports.[8]

TABLE 1

CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS						
Aluminum:						
Alumina		140,000	138,600	134,200	137,500	205,000
Aluminum ingot, primary		r31,725	33,078	32,366	31,435	32,576
Antimony, mine output, Sb content[e]		1,000	1,000	1,000	2,921	2600
Cobalt metal[e]		50	50	50	50	250
Copper:						
Mine output:						
Ore, gross weight		955,000	966,000	830,000	796,000	743,000
Concentrate, gross wieght		29,296	24,657	24,782	23,303	20,895
Cu content[e]		r5,500	r5,300	r5,300	r5,000	24,900
Metal:						
Smelter, primary[e]		10,200	r5,300	r5,300	r5,000	4,800
Refined, primary and secondary		26,414	26,182	27,202	27,076	26,920
Gallium metal[e]	kilograms	3,000	3,000	3,500	3,700	22,000
Gold metal[e]	do.	600	600	600	600	550
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	1,859	1,784	1,798	1,773	1,780
Fe content	do.	e490	r458	462	r e440	e400
Metal:						
Pig iron	do.	9,562	9,573	9,788	9,706	9,911
Ferroalloys, electric furnace	do.	161	160	161	162	166
Crude steel	do.	15,036	15,112	15,356	15,319	15,465
Semimanufactures	do.	12,700	12,745	12,950	12,999	12,974
Lead:						
Mine output:						
Concentrate, gross weight		5,244	5,700	5,612	5,429	5,351
Pb content		2,718	2,944	2,801	e2,800	e2,700
Metal, secondary		21,437	23,602	26,008	26,045	26,008
Manganese ore, gross weight[3]		950	900	900	—	—
Mercury		158	168	164	168	131
Nickel metal, primary[e]		4,500	r3,800	r3,800	r3,800	23,800
Silver[e]	kilograms	30,000	30,000	30,000	30,000	45,000
Tin:						
Mine output, Sn content		250	550	550	515	562
Metal, secondary		507	240	545	515	562
Tungsten, mine output, W content[e]		50	50	45	r50	50
Uranium[e]		2,300	2,300	2,300	2,300	22,300
Zinc:						
Mine output:						
Ore, gross weight		632,000	701,000	700,000	694,000	682,000
Concentrate, gross weight		14,441	13,265	13,662	13,870	14,137
Zn content[e]		7,300	26,700	7,000	7,000	7,000
Metal, secondary		r e1,000	r e1,000	1,143	1,357	1,296
INDUSTRIAL MINERALS						
Barite[e]		60,000	60,000	60,000	260,794	60,000
Cement, hydraulic	thousand tons	10,265	10,298	10,369	10,974	10,888
Clays:						
Bentonite[e]		30,000	30,000	30,000	30,000	30,000
Kaolin		548,000	546,101	697,000	685,958	698,000

See footnotes at end of table.

TABLE 1—Continued

CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Diamonds, synthetic[e]	carats	—	—	—	5,000	5,000
Fertilizer, manufactured:						
Nitrogenous, N content		525,870	614,340	596,409	596,420	603,848
Phosphatic, P_2O_5 content		310,334	307,021	277,041	313,009	295,643
Potassic, K_2O content		[e]100,000	[e]100,000	110,542	115,625	108,420
Mixed		[e]400,000	[e]400,000	427,095	478,001	410,631
Fluorite[e]		60,000	60,000	60,000	60,000	60,000
Fluorspar[e]		95,000	95,000	95,000	[r]95,000	95,000
Graphite[e]		[r]25,000	[2]25,254	25,000	25,000	25,000
Gypsum and anhydrite, crude		771,600	743,100	770,998	774,133	796,000
Lime, hydrated and quicklime	thousand tons	3,227	3,329	3,237	3,311	3,346
Magnesite, crude		654,000	666,000	671,000	630,786	642,000
Nitrogen: N content of ammonia		526,000	[r]760,220	775,640	771,100	796,800
Perlite		[e]44,000	41,443	41,997	43,390	[e]44,000
Pyrite, gross weight[e]		145,000	140,000	140,000	140,000	140,000
Salt		349,174	338,240	337,985	350,201	344,201
Silicon[e]		30,000	30,000	30,000	30,000	30,000
Sodium compounds, n.e.s.:						
Caustic soda		331,000	335,000	332,441	337,062	[e]340,000
Carbonate, manufactured		112,000	113,000	102,659	112,217	[e]110,000
Stone:						
Limestone and other calcareous stone	thousand tons	23,252	23,566	22,927	23,244	22,969
Quarry stone, not further described	thousand cubic meters	32,269	32,826	33,317	35,225	32,889
Sulfur:[e]						
Native		6,000	6,000	6,000	6,000	6,000
From pyrites		62,000	60,000	[2]38,000	60,000	50,000
Byproducts, all sources		[2]41,866	[2]42,193	40,000	40,000	40,000
Total		109,866	108,193	84,000	106,000	96,000
Sulfuric acid	thousand tons	1,297	1,292	1,264	1,249	1,142
Talc[e]		30,000	30,000	30,000	30,000	30,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	26,223	25,658	25,736	25,504	25,071
Brown and lignite	do.	102,315	102,738	101,986	99,919	94,263
Coke:						
Metallurgical	do.	8,112	8,005	8,351	8,349	8,130
Unspecified	do.	2,125	2,068	2,235	2,237	2,017
Fuel briquets from brown coal	do.	1,118	1,093	[e]1,000	1,128	1,147
Gas:						
Manufactured, all types	million cubic meters	7,500	7,245	7,270	6,782	[e]6,000
Natural, marketed[4]	do.	[e]700	[e]700	696	732	[e]730
Petroleum:						
Crude:						
As reported	thousand tons	123	142	147	142	147
Converted	thousand 42-gallon barrels	834	963	997	963	976
Refinery products[e]	do.	127,000	125,000	126,000	126,000	126,000

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

[1]Table includes data available through Sept. 1991. In addition to the commodities listed, arsenic, diatomite, dolomite, feldspar, illite, and zeolite 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.

STRUCTURE OF THE MINERAL INDUSTRY

In 1989, the mining and processing industry, like everything else, was Government owned. The nationalized mining industry was managed by the Federal Ministry of Energy and Mining, through regional ministries for the Czech and Slovak Republics. For better coordination, the mining industry was further divided according to either region (most of ore mining), commodity (magnesite), or a combination of both (coal).

The ore and fuel mining and processing industry's combined share of GDP in 1989 was about 13%. While the mining industry employed about 153,000 people, slightly less than 2% of the total work force, the minerals beneficiating and processing industry employed 163,000 people, slightly more than 2% of the work force.[9]

COMMODITY REVIEW

Metals

Aluminum.—Bauxite, imported from Hungary, is processed in Ziar nad Hronom, 145 km northeast of Bratislava. The plant, completed in 1953, has an estimated annual capacity of 100,000 tons of alumina and 60,000 tons of aluminum ingot. In 1989, Hungarian imports were augmented with bauxite, valued at $2.3 million, from Yugoslavia's Vlasenica Mine. The total imports from Yugoslavia in 1989 amounted to 244,000 tons of bauxite. Negotiations for additional delivery continued in 1989 between Czechoslovakia's metal trading firm Kerametal and Yugoslavia.

Antimony.—The Dubrava Mine, the largest producer of antimony ore, is in Central Slovakia, near Liptovsky Mikulas. In 1989, the almost 4-kilometer long vein produced 49,100 tons of ore, yielding 1,021 tons of antimony concentrate. The flotation recovery at the processing plant in Vajskova was approximately 90%. The proven and inferred reserves at this location amount to more than 300,000 tons of metal content of about 1.2% of antimony.

Copper.—One of the most important ore deposits in Czechoslovakia is the Zlate Hory copper and copper-lead-zinc sulfide deposits near the Polish border in North Moravia. The 1989 production of Zlate Hory I copper mine was 270,000 tons of ore of more than 0.4% metal content. The locally produced concentrate contained 19.8% copper. The copper ore reserves at this location amount to about 400,000 tons of proven reserves. The 7.46 million tons of reported reserves of copper-lead-zinc deposit at the Zlate Hory II location contains approximately 0.4% Cu, 0.8% Zn, 0.3% Pb, 15 grams per ton Ag, and 0.2 grams per ton Au. The 26,800 tons of ore produced in 1989 was processed into 797 tons of concentrate, with 10.7% Cu, 22.3% Zn, 6.4% Pb, 259 grams per ton Ag, and 2.1 grams per ton Au, and sent to the Federal Republic of Germany for further processing and refining.

A metallurgical plant is to be built in Bruntal, North Moravia, to process ore from Zlate Hory I & II and from Banska Stiavnica, Slovakia. The plant is to be completed by 1990.

Gallium.—With an estimated 1989 output of 3,800 kilograms, Czechoslovakia is one of the world's major producers of gallium metal. Production is anticipated to increase to 4,000 kilograms by 1990 in order to accommodate anticipated demand by manufacturers of high-speed gallium arsenide integrated circuits. Most of the gallium production from the aluminum refinery plant in Ziar nad Hronom is exported to Japan for refining.

Gold.—In 1988, the largest known gold occurrence in Czechoslovakia was discovered in Mokrsko-Celina, about 50 km southwest of Prague. Pribram Geological Institute (Geologicky Institut Pribram) determined that there is approximately 23 million tons of reserves at 2 grams per ton of gold, with associated electrum. The estimated yearly production could reach 4 to 5 tons of gold. The establishment of an open pit mine, planned for 1995, will require the clearing of 185 acres of agricultural land, 334 acres of forest, and the relocation of the village of Mokrsko.[10]

Iron Ore.—With the 1989 production of 731,000 tons of iron ore, the mining and processing enterprise in Nizna Slana contributed about one-half of the total iron ore production in Czechoslovakia. The 33 million tons of ore reserves contain 30% iron and about 2% manganese. The enterprise, 80 kilometers east of Kosice, produced 344,000 tons of concentrates and pellets with an iron content of 52.5% and 54.4%, respectively. The flotation recovery rate was 83.6% for concentrate and 69.1% for blast-furnace pellets.

Ore production from other mines—Rudnany II, Slovinky, Roznava, and Tajov—has declined as Czechoslovakia imported more than one-half million tons of iron ore from Brazil.

Lead.—Important lead-zinc polymetallic vein deposits are in Bohemia at Horni Benesov, Pribram, and Kutna Hora. The largest mine is in Horni Benesov, where 1989 production reached 235,000 tons of ore with metal content of about 0.5% lead and 1.2% zinc. This was processed into 1,820 tons of lead concentrate (50% Pb, 770 grams per ton Ag, 5.8 grams per ton Au) and 4,250 tons of zinc concentrate (46% Zn, 115 grams per ton Ag, 0.17 grams per ton Au). Reserves amount to more than 2.7 million tons of proven and inferred reserves.

The second largest producer of lead-zinc ore is in Banska Stiavnica-Hodrusa, Central Slovakia. The 1989 production of 188,000 tons of ore resulted in 2,836 tons of lead concentrate (52.4% Pb, 4.4% Cu, 456 grams per ton Ag, 23 grams per ton Au) and 4,266 tons of zinc concentrate (48.3% Zn, 0.37% Cd, 128 g/T Ag). Both concentrates are transported to West Germany for further processing and refining. Reserves at this location were determined to be more than 8 million tons of proven and inferred reserves.

Manganese.—Presently, manganese ore is not mined, except as a byproduct of iron ore mining. The largest byproduct producer is from the Rudnany II iron ore mine, which provides about 10% of consumption.[11] The largest potential domestic source of manganese is found in the waste from pyrite flotation in Chvaletice, 135 km east of Prague. There is also a possibility for manganese production in the western Carpathian Mountains.

Mercury.—With an annual production of 131 tons, Czechoslovakia is the third largest producer of mercury in Europe, after the U.S.S.R. and Spain. Rudnany I in central Slovakia is the largest Czechoslovakian producer, accounting for 80% of domestic consumption.[12] The equipment for processing was supplied by the

TABLE 2

CZECHOSLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies[1]	Location[2]	Capacity (thousand metric tons per year unless otherwise specified)
Aluminum	SNP Aluminum works	Ziar nad Hronom, central Slovakia	60
Antimony:			
Ore	Krasna Hora	Central Bohemia	NA
Do.	Liptovska Dubrava	Central Slovakia	50
Do.	Pezinok	West Slovakia	50
Smelter	Vajskova	Central Slovakia	2
Cement	Cizkovice, Hranice, Karlov Dvor, Lochkov, Pracovice, and Velary	Bohemia	3,500
Do.	Bystre, Malomerice, Mokra, Ostrava-Kunice, and Zahorie	Moravia	2,800
Do.	Banska Bystrica, Horne Srnie, Ladce, Lietavska Lucka, Stupava, and Turna	Slovakia	5,400
Clay, kaolin	Mines in Karlove Vary area	West Bohemia	450
Do.	Mines in Plzen area	Central Bohemia	150
Coal:			
Bituminous	Mines in OKD coal basin	Ostrava-Karvina, North Moravia	22,100
Do.	Mines in KD coal basin	Kladno, central Bohemia	3,000
Brown	Mines under SHD administration	Most, northwest Bohemia	61,200
Do.	Mines under HDB administration	Sokolov, west Bohemia	17,000
Do.	Mines under ULB administration	Prievidza, central Slovakia	6,800
Lignite	Mines under JLD administration	Hodonin, south Moravia	5,000
Copper:			
Ore	Slovinky, Hodrusa-Hamre, and Rudnany	Central Slovakia	500
Do.	Zlate Hory	North Moravia	300
Refinery	Krompachy	Central Slovakia	27
Galium	SNP Aluminum works	Ziar nad Hronom, central Slovakia	[3]4,000
Iron ore	Nizna Slana and Rudnany	Central Slovakia	1,600
Lead-zinc, ore	Horni Benesov and Zlate Hory	North Moravia	400
Do.	Banska Stiavnica	Central Slovakia	200
Magnesite	Mines under SMZ administration	East Slovakia	550
Mercury	Dubnik, Malachov, and Rudnany	Central Slovakia	[4]150
Nickel, smelter	Niklova Huta	Sered, south Slovakia	5
Natural gas	Gasfields around Hodonin	South Moravia	[5]25
Petroleum:			
Crude	Oilfields around Hodonin	do.	140
Refinery	Kolin, Kralupi, Pardubice, and Zaluzi	Bohemia	NA
Do.	Bratislava, Strazske, and Zvolen	Slovakia	NA
Tin, ore	Krasno (Stannum) and Cinovec	Northwest Bohemia	300

NA Not available.
[1]All mining companies are Government owned.
[2]Names and locations of mines and crude oil refineries are identical.
[3]Kilograms.
[4]Metric tons.
[5]Billion cubic feet.

West German firm of Mannesmann in cooperation with the Italian firm Delmonego. Other mines include the nearby Malachov Mine and Presov Mine in eastern Slovakia.

Nickel.—In 1989, there was no nickel mining in Czechoslovakia. However, low-grade lateritic nickel deposits at Kremze, near Ceske Budejovice, and nickel sulfide deposits at Stare Ransko, 90 km east from Prague, are of potential interest. In Slovakia, the Geological Institute of Spiska Nova Ves conducted exploratory work around Kosice. In the nickel vein, which varies in thickness from 1 to 19 meters, the content of NiO was 0.3% to 2.05%. It was established that the locality has, using the Soviet classification system, 17 million tons of reserves in category C2-inferred reserves.

The nickel refinery in Sered produces about 3,000 mt/a of electrolytic nickel from imported raw materials. Other prod-

ucts include nickel carbonate, nickel sulfate, and small amounts of nickel powder. All refinery output goes to the domestic market, with 95% going to the steel industry. About 70% of nickel in products is derived from Albanian ore, with the rest from concentrates from Albania and the U.S.S.R., oxide from Cuba, and a small amount of ore from New Caledonia.

Silver.—A new silver deposit was discovered in Roznava, central Slovakia, when the existing Maria iron ore shaft was closed because of ore depletion. Further exploration for iron ore uncovered a silver vein 1,200 meters long and 2.5 meters thick. The ore is composed of 34.36% iron, 0.93% copper, 0.62% tin, 0.012% mercury, and 198 grams per ton of silver. The Maria-Striebro deposit has a known reserve of 8 million tons of polymetallic ore. The Maria-Striebro deposit is presently accessed from the Maria shaft, but a new ore haulage shaft is being planned in order to simplify transportation.[13]

Steel.—With a 1989 production of 15.5 million tons, Czechoslovakia is one of the largest per capita crude steel producers of the world. In spite of the large output, the steel industry suffers from overstaffing and poor quality of products. Because of the environmental damage and inefficiency, the steel industry sources believe that during the next 5 years the production of crude steel will have to be cut by about 30%, and the remaining capacity will have to be modernized. Old open-hearth furnaces will be replaced by electric arc furnaces, continuous casting will be expanded, and the work force will have to be reduced by up to one-third.

Tin.—The Dubrava Mine in central Slovakia is the largest producer of tin ore in Czechoslovakia, equal to about 50% of domestic needs for tin metal. The system of veins is more than 5 km long with a tin content of 0.9% to 10%. The ore also contains an unspecified percentage of copper, gold, and silver. In 1988, a third flotation/tailings lagoon was built with a capacity of 940,800 cubic meters, which should last for 25 years given the present rate of tailing generation of the 55,000-ton-capacity processing plant.[14] A 49% metal concentrate was shipped to the German Democratic Republic for processing.

Uranium.—According to the West German NUKEM corporation, proven reserves of natural uranium amounted to 25,000 tons, and probable reserves are estimated at 100,000 tons. Output in 1989 reached 2,300 tons of uranium, and by 1995, is expected to drop to 1,500 tons.[15] As a result of high production costs, which are not covered by export returns, many of the current operations are not cost effective. Of the 11 mines and 3 enrichment plants in operation in 1989, only 2 mines and 1 plant will remain open by 1997.[16] The uranium industry, as is most of the mining industry in Czechoslovakia, is subsidized by the Government. Because the 1990 production is expected to decline by about 17%, subsidies should be reduced by about $36 million.[17] All the exploration work for further uranium deposits has ceased.

Zinc.—In the beginning of the 1980's, Geoindustria Jihlava found zinc-lead-copper-silver mineralization in Krizanovice, near Chrudin, east Bohemia. By 1986, research was completed and evaluated to reveal 3.7 million tons of reserves with content of 4.4% zinc, 0.52% lead, 0.1% copper, and 8.9 grams per ton of gold.

Industrial Minerals

Barite.—Until 1989, the only Czechoslovakian producer of barite was Rudnany II, where it is associated with iron ore. The vein is reportedly 6 to 30 meters thick and about 5 km long. The barite lenses are in the middle of a siderite vein. The newest mine was opened in 1989 in Krizanovice, Central Czechoslovakia. The 3.7 million tons of reserves at this location contain 18.6% of $BaSO_4$ and 4.4% Zn, 0.52% Pb, 0.1% Cu, and 8.5 grams per ton of silver.[18]

Graphite.—With an estimated 1989 production of 40,000 tons, Czechoslovakia is the fifth largest producer of natural graphite, providing about 6% of world production. Mining is concentrated in two areas. The production of fine, flaky graphite with at least 15% carbon is concentrated in southern Bohemia (Cesky Krumlov, Lazec, and Konstantin), while production of coarse foundry graphite with carbon content of 35% is established in northern Moravia (Stare Mesto).[19] The newest deposit of graphite was discovered near Velke Vrbo in northern Moravia. The deposit is estimated to be 780 meters long, at a depth of 100 to 125 meters.

Kaolin.—Czechoslovakia produced 698,000 tons of kaolin in 1988, primarily for export, and is Europe's fourth largest producer after the U.S.S.R, the United Kingdom, and the Federal Republic of Germany. The main source of kaolin is weathered granitoid rock in western Czechoslovakia, around Karlove Vary. Annual output of this region is approximately 580,000 tons, and reserves are estimated at 60 million tons.[20] Except for the Bohemia deposit, which is 80 meters deep and mined by the room-and-pillar method, all remaining deposits are mined in open pits.

Magnesite.—The main deposits of magnesite are in eastern Slovakia, in the 65-kilometer-long area between Kosice and Lucenec. The magnesium oxide content of the in situ ore in the lenses is about 43% with 5% to 9% Fe.[21] Of the total annual production of 642,000 tons, more than one-half was provided by mining enterprises in Jelsava. Proven minable reserves at this location are about 45 million tons compared with a total national reserve of 130 million tons.[22]

Additional mining enterprises are in Kosice (18% of total production), Lubenik (17% of total), and smaller enterprises in Podrecany and Burda-Poproc. The largest processing plants are in Mikova and Dubrava, under Jelsava management. Annually, about 730,000 tons of crude ore is processed with a 50% recovery rate.

Mineral Fuels

Coal.—In comparison with that of 1988, the 1989 total coal production declined by about 5%. While the number of workers and labor productivity declined slightly, average wages in 1989 remained virtually the same as those in 1988. Reserves in 1989 stood at 4.5 billion tons of bituminous coal and 5.5 billion tons of brown coal and lignite.[23] All bituminous coal production came from underground mines, while 85% of brown coal and lignite came from opencast operations. Owing to reduced subsidies and environmental concerns, the high proportion of coal in the total energy consumption is to be reduced and replaced by nuclear energy, expanded natural gas production, and increased crude oil imports.

Natural Gas.—The proportion of nat-

ural gas used in total consumption of primary energy is planned to be increased from almost 15% in 1990 to about 24% in the year 2005. Because the production of manufactured gas from coal is to be gradually reduced and finally ceased by the year 2000, the required 6-million-cubic-meter increase is to come from expanded production and higher imports of natural gas.[24] In addition to an estimated 750 million cubic meters of natural gas in 1989, Czechoslovakia produced an estimated 5,700 million cubic meters of manufactured gas, mainly coal gas. The capacity of underground storage of natural gas in Czechoslovakia is 2.4 billion cubic meters, with a daily output of 30 million cubic meters.[25] A new natural gas storage facility in Dolni Dunajovice, near Breclav, was put into operation in 1989 at a cost of $84 million. Its storage capacity is about 700 million cubic meters of natural gas.

Petroleum.—In 1989, two new fields were discovered near Hodonin, southern Moravia: one in Zdanice and the other in Gajany. According to the Central Institute of Research (Centralny Vyskumny Ustav), Czechoslovakia has only about 15 million barrels of crude oil reserves.

Nuclear Power.—In 1989, nuclear energy supplied 31% of electricity, a slight increase over that of 1988 (30.2%).[26] The third unit of the four 440-MW stations in Mochovce (South Slovakia) was under construction in 1989. It is the last power station using the 440-MW units. Three future plants, including one in Temelin where construction started in 1987, will use 1,000-MW units. By the year 2000, the planned 10,280-MW total capacity of nuclear power stations should cover more than one-half of electric consumption.

The construction of the Temelin nuclear power station and related 10 construction projects (1 of which is the Hnevkovice dam for cooling), was progressing according to schedule. The cost of the whole project, in southern Bohemia, is estimated to be about $3.5 billion, with the first unit expected to be operational by November 1992.

Reserves

The determination of quantities of mineral reserves of Czechoslovakia has been frequently influenced by political considerations. Often the profitability of an enterprise was a secondary consideration compared to increased employment opportunities, military considerations, favors to a local communist party member, etc. As the country moves toward the market economy system, many categories of reserves will have to be redefined. For example, what was officially called an "economic reserve" may become a "marginal economic reserve" and "marginal" may become "subeconomic."

INFRASTRUCTURE

The transportation infrastructure of Czechoslovakia is barely adequate. It consist of 13,106 km of railroads (22% two-track and 29% electrified) and 73,640 km of roads, of which only 527 km is highways. Of the 1,555 million tons of goods transported in 1989, 626 million tons was moved by public transportation (53% by trucks, 45% by railroads, 2% on barges), and 929 million tons was carried by company-owned vehicles. The overall 2% decline of freight tonnage in 1989 was shared equally by all modes of transportation.[27] In the mineral mining and processing industry, most of the short distance transportation is carried out by company-owned trucks. The long distance transportation, usually involving foreign trade, is carried out by a system of railroads and to a small degree by barges.

TABLE 3

CZECHOSLOVAKIA: RESERVES OF MAJOR MINERAL COMMODITIES

Commodity	Average grade content	Quantity [(metric tons) metal content unless otherwise specified]
Antimony	2.3% to 3% Sb	20
Barite	18.6% to 44% $BaSO_4$	2,000
Bentonite	NA	(gross weight) 3,000
Bituminous and anthracite	NA	4,500,000
Copper	0.6% to 0.9% Cu	120
Feldspar	NA	8,500
Fluorite	45% CaF_2	1,100
Germanium	NA	(gross weight) 4
Gold	2 grams per ton Au	[1]70
Graphite	20% C	650
Iron	32% to 36% Fe	14,400
Kaolin	NA	(gross weight) [e]85,000
Lead	1% to 1.3% Pb	550
Lignite and brown coal	NA	5,500,000
Lithium	NA	(gross weight) 250
Magnesite	43% MgO (5% to 9% Fe)	56,000
Manganese	15% Mn	450
Quartz and quartzite	97.2% SiO_2	4,200
Salt	NA	(gross weight) 32,000
Silver	12 to 15 grams per ton	[1]1,000
Talc	NA	(gross weight) 2,400
Tin	0.2% Sn	120
Tungsten	0.04% W	25
Uranium	NA	(gross weight) 25
Zinc	1.7% to 2.2% Zn	1,000

[e]Estimated. NA Not available.
[1]Metric tons.
Source: Ceskoslovenske Rudne Bane (Czechoslovakian Ore Mines) 1990, Bratislava, Mytna 23, Czechoslovakia.

OUTLOOK

The collapse of the Communist government in November 1989 created an opportunity for restructuring the national economy on principles of supply and demand; that is, changing the command economy to a market economy. The development of competitive, profitable, and environmentally safe enterprises will be a major concern. In the mineral industry sector, this will mean closing inefficient mining and processing plants, decentralizing decisionmaking, installing more efficient ore-processing machinery, and consequently reducing pollution. Financial subsidy for the mining industry is expected to decline from the originally planned level of $90 million to $73 million in 1990, with further reductions to $53 million in 1991 and $37 million in 1992.[28] Because of environmental concerns, the first mines slated for closure are coal mines, mainly open pit mines producing lignite and brown coal. Northern Bohemia and Moravia, with its heavy concentration of coal mining, power stations, and heavy industry plants, will be the most affected region.

The steel industry is expected to reduce annual raw steel production from 15.4 million tons per year in 1989 to 14.8 million tons in 1990 and 10 million tons in the year 2005, with an accompanying reduction in the work force of 45,000.[29] Additionally, the open-hearth furnaces, which produced 40% of steel in 1989, are expected to be gradually replaced by more efficient and less polluting oxygen and electric arc furnaces.[30]

Increased reliance on nuclear energy and improved energy conservation will compensate for the reduction of coal generated electric power.

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[1]U.S. Department of Commerce. Foreign Economic Trends and Their Implications for the United States, May 1990.

[2]Barclays Bank International, London. ABECOR Group Country Reports, July 1990.

[3]Where necessary, values have been converted from Czechoslovakian koruna (Kcs) to U.S. dollars at the rate of 15 Kcs=US $1.00.

[4]Work cited in footnote 2.

[5]The Journal of Commerce. Nov. 7, 1989, p. 4A.

[6]Hospodarske noviny (Economic News). Mar. 9, 1990, pp. 1-16.

[7]Work cited in footnote 5.

[8]Work cited in footnote 7.

[9]Federalni statisticky ustav. Statistika (Statistics). Apr. 1990, pp. 178-184.

[10]Mlada Fronta (Young Front). June 15, 1990, p. 7.

[11]Nakladatelstvi technicke literatury. Rudy (Ores). Dec. 1989, pp. 363-370.

[12]Work cited in footnote 11.

[13]Nakladatelstvi technicke literatury. Rudy (Ores). Feb. 1990, pp. 52-54.

[14]———. Jan. 1990, pp. 5-8.

[15]Hospodarske noviny (Economic News). June 8, 1990, p. 1.

[16]International Mining. May 1990, p. 62.

[17]Smena. Jan. 1990, p. 5.

[18]Rudy. Mar. 1990, pp. 77-80.

[19]Mining Annual Review. 1989, p. 520A.

[20]Industrial Minerals. Mar. 1981, pp. 20-35.

[21]Ceskoslovenske Rudne Bane (Czechoslovakian Ore Mines).

[22]International Mining. June 1990, p. 20.

[23]———. May 1989, p. 90.

[24]PLYN. Feb. 1990, pp. 41-49.

[25]Work cited in footnote 23.

[26]UHLI. Jan. 1990, pp. 1-3.

[27]1990 Statistical Yearbook of Czechoslovakia.

[28]Rudy. May 1990, pp. 115-118.

[29]Metal Bulletin. May 13, 1989.

[30]———. June 5, 1989.

OTHER SOURCES OF INFORMATION

Agencies

International Mining Service
Mytna 23
81242 Bratislava
Director: Jaroslav Malcharek

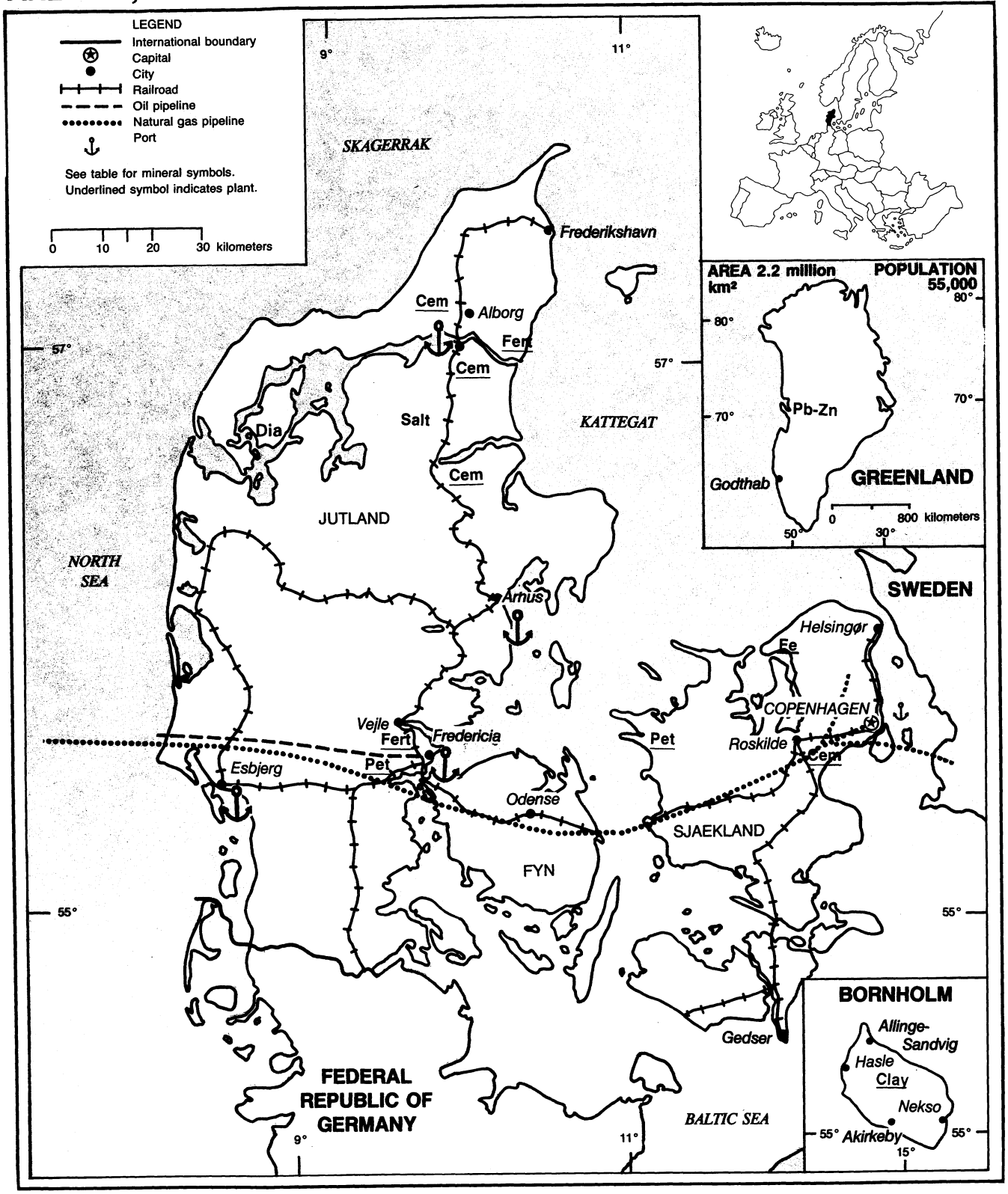
Ustredni Ustav Geologicky
Malostranske nam. 19
11821 Prague
Director: Vladimir Sattran

Slovensky Geologicky Ustav (Slovak Geological Survey)
Bukurestska 4
81762 Bratislava
Director: Jan Burian

Geofond
Kostelni 26
17021 Prague
Director: Jitka Bradacova

DENMARK

AREA 43,000 km² **POPULATION 5.1 million**



THE MINERAL INDUSTRY OF

DENMARK AND GREENLAND

By Donald E. Buck, Jr.

Denmark and Greenland have few mineral resources of their own and must import most minerals. Danish mineral production includes crude oil, natural gas, steel, and nonmetallic minerals. The lead-zinc mining operations at Black Angle Mine on Greenland are projected to cease in mid-1990 due to the depletion of economic ores. Exploration activities for gold and platinum are continuing in several localities on the island. Mineral consumption in Denmark and Greenland is modest in comparison with other European countries.

The Danish economy in 1989 showed signs of an economic upturn after 3 years of recession. The gross domestic product (GDP) increased 1% over that of 1988 to an estimated $114.8 billion,[1] and a 1.5% increase was expected in 1990. The Danish Government successfully limited wage increases, which reduced the inflation rate to less than 5%. This improved international competitiveness and the export trade balance. Swedish and Norwegian companies continued to invest in Denmark to obtain access to the 1992 Single Market.

Several mineral industries showed signs of improvement during the year, especially cement and petroleum. Denmark altered its offshore licensing policy to attract more participants to the Danish North Sea for oil and gas exploration. The reduction in state company participation and the abolishment of royalties resulted in a good licensing round. Oil discoveries in 1989 resulted in the addition of 131 million barrels of reserves. Natural gas reserves were decreased by 93 billion cubic feet. Denmark's oil reserves of 800 million barrels represents 4% of the Western European reserves. Natural gas reserves of 4.5 trillion cubic feet of gas represent 2% of the gas reserves.

GOVERNMENT POLICIES AND PROGRAMS

Mining and petroleum production are regulated by the Danish Ministry of Public Works under the Danish Subsoil Act of 1950, (revised in 1973). Originally, the Dansk Undergrunds Consortium (DUC) had a 50-year concession on the exploration and exploitation of hydrocarbons on Denmark's continental shelf. This concession was rewritten in 1980, and other companies were allowed to explore in the Danish North Sea.

The Danish Government and Greenland Landsstyre signed an agreement to alter the principles of the Mineral Resources System for Greenland. The negotiations, conducted between the Danish Minister of Energy and Greenland Home Rule Authorities, resulted in an agreement to equally share the first $71 million in revenues from mineral exploitation between Denmark and Greenland Landsstyre and to negotiate any income in excess of that amount. The company, Nunaoil A/S, owned jointly by both parties, was established to promote the advancement of industrial development of mineral resources in Greenland.

In August 1989, the Danish Government and the opposition entered into negotiations for adapting the economy to meet the adjustments required for the realities of the European Community (EC) Single Market. The radical restructuring involves a reduction in both personal and corporate income taxes and corporation taxes, encouraging private savings, entrepreneurial initiative, and new investments. Incentives to attract investors, the stimuli to encourage entrepreneurs, and methods to develop resources in the private sector that create jobs and provide economic growth are other goals of the economic discussions on reforms.

The Danish Government reduced the budget deficit from 10% in 1982 to 2.5% in 1989. The overall inflation rate of 5% was equal to that for imported raw materials and semimanufactured products. Holding wage increases down has been a major goal of the Government and has been made difficult because of the method of negotiating wages by the unions and employers' associations. Both groups realize the need to resolve the balance of payments problem and to increase the international competitiveness of Danish products.

The Government has placed a high priority on the elimination of the balance of payments deficit. At the end of 1988, the foreign debt, which until the mid-1980's was 50% denominated by the dollar, reached $40.5 billion. By the end of 1989, however, because of the Danish Government's efforts to reduce the dollar and yen share of the debt, the dollar accounted for only 22% of the foreign debt.

The Danish Ministry of Environment is fully committed to the Nooordwijk Declaration for reducing carbon dioxide (CO_2) emissions by the year 2000. The Danish Ministry of Energy, tasked with drawing up the feasibility study, indicated that through energy conservation, the CO_2 levels can be stabilized. The CO_2 emissions would be from all sources of energy generation and use of oil, gas, and coal.

PRODUCTION

Mineral production was primarily limited to limestone, chalk, and cement products and the production of petroleum resources in the North Sea. Production of North Sea oil and gas again increased to record highs, and importation of most mineral fuels continued to decline. The signing of a new gas sales contract with the Government-owned gas company was

TABLE 1

DENMARK: SALES OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic	thousand tons	1,739	2,029	1,887	1,681	2,000
Clays:						
Kaolin		13,000	10,404	9,304	39,324	40,000
Other		4,686	[e]6,000	[e]6,000	230	250
Cryolite[2]		17,900	18,000	17,200	[e]18,000	[e]18,000
Diatomaceous materials:						
Diatomite[e]		6,000	6,000	6,000	[e]6,000	[e]6,000
Moler		72,029	72,958	[e]66,000	[e]66,000	70,000
Gas, natural: Marketed	million cubic meters	1,099	1,905	2,427	2,689	2,550
Iron and steel:[2]						
Steel, crude	thousand tons	528	632	606	650	[3]625
Semimanufactures	do.	511	539	538	580	[3]619
Lead metal, including alloys, secondary[4]		4,503	[e]560	—	—	—
Lime, hydrated and quicklime	thousand tons	129	134	119	134	135
Peat	do.	39	48	[e]50	50	50
Petroleum:[2]						
Crude	thousand 42-gallon barrels	22,120	27,700	35,200	35,955	36,000
Refinery products:						
Bitumen	do.	521	347	400	364	400
Distillate fuel oil	do.	22,326	24,723	23,700	23,210	23,000
Gasoline	do.	10,226	11,110	11,100	12,112	12,000
Jet fuel	do.	1,017	1,525	1,100	2,322	2,300
Kerosene	do.	125	172	200	1,063	1,100
Liquefied petroleum gas	do.	1,506	1,863	2,000	1,682	1,700
Naphtha	do.	1,401	1,647	1,800	1,089	1,100
Refinery fuel and losses	do.	2,880	3,322	2,300	[re]3,000	3,000
Residual fuel oil	do.	12,256	13,792	15,500	16,584	17,000
Total	do.	52,258	58,501	58,100	61,426	61,600
Salt[2]	thousand tons	532	564	531	648	650
Sand, industrial	thousand cubic meters	1,368	1,629	[e]1,600	2,024	2,050
Sand and gravel[2]	do.	24,600	28,500	32,100	71,362	71,500
Sodium carbonate	thousand tons	114	117	[e]120	134	140
Stone:						
Crushed:						
Flint	thousand cubic meters	54	59	[e]60	7,456	7,500
Limestone:						
Agricultural	thousand tons	[r]1,883	[r]1,672	[e]2,000	1,795	1,800
Industrial	do.	142	153	[e]150	172	180
Chalk	do.	203	249	[e]250	1,664	1,700
Other	thousand cubic meters	1,275	1,365	[e]1,400	2,164	2,200
Dimension (mostly granite):	do.	156	213	[e]200	65	65
Sulfur, byproduct		7,376	12,810	[e]13,000	13,571	14,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 1990.
[2]Reported figure.
[3]Data represents production.
[4]Includes antimonial lead.

TABLE 1—Continued

GREENLAND: SALES OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
Cryolite, crude ore[2]		111,500	70,343	38,185	—	—
Lead: Concentrate, Pb content		17,800	16,200	20,500	23,120	[2]24,120
Silver: In lead concentrate, Ag content	kilograms	8,585	11,975	13,001	13,001	14,712
Zinc: Concentrate, Zn content		70,300	62,100	69,200	77,520	[2]71,500

[p]Preliminary.
[1]Table includes data available through June 30, 1989.
[2]Shipments.

TABLE 2

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		—	47	27	Sweden 17.
Alkaline-earth metals		—	1	—	All to Faeroe Islands.
Aluminum:					
Ore and concentrate		1	8	—	Norway 6; West Germany 2.
Oxides and hydroxides		197	155	44	United Kingdom 27; Sweden 25; West Germany 23.
Ash and residue containing aluminum		61	72	—	Finland 54; West Germany 18.
Metal including alloys:					
Scrap		25,186	26,645	18	West Germany 17,006; Netherlands 2,379; Belgium-Luxembourg 2,106.
Unwrought		12,653	10,974	—	West Germany 7,867; Sweden 1,533.
Semimanufactures		28,902	25,051	108	West Germany 8,163; Sweden 3,448; France 2,048.
Antimony: Metal including alloys, all forms	kilograms	200	100	—	All to West Germany.
Arsenic:					
Oxides and acids		10	—		
Metal including alloys, all forms	kilograms	—	100	NA	NA.
Beryllium: Metal including alloys, all forms	do.	(2)	(2)	NA	NA.
Bismuth: Metal including alloys, all forms	value, thousands	$11	$14	—	Norway $5; Sweden $5; Jordan $4.
Cadmium: Metal including alloys, all forms		—	14	—	Mainly to Iceland.
Cesium and rubidium: Metal including alloys, all forms	value, thousands	$4	—		
Chromium:					
Ore and concentrate		20	66	NA	NA.
Oxides and hydroxides		1	3	NA	NA.
Metal including alloys, all forms	value, thousands	$1	$18	—	Norway $9; Sweden $4; France $3.
Cobalt: Oxides and hydroxides		(2)	(2)	NA	NA.
Ash and residue containing cobalt		22	—		
Metal including alloys, all forms		—	5	—	West Germany 3; Sweden 1.
Columbium and tantalum: Tantalum metal including alloys, all forms		—	1	NA	NA.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Copper:					
Ore and concentrate		—	25	NA	NA.
Matte and speiss including cement copper		24	24	—	All to Italy.
Oxides and hydroxides		1	7	NA	NA.
Sulfate		3	1	NA	NA.
Ash and residue containing copper		1,056	1,959	—	Sweden 1,002; West Germany 782.
Metal including alloys:					
Scrap		18,858	23,799	(2)	West Germany 19,240; France 1,153.
Unwrought		1,727	704	—	West Germany 204; Portugal 108; Norway 97.
Semimanufactures		6,310	6,569	217	West Germany 2,852; Belgium-Luxembourg 703; United Kingdom 645.
Gold:					
Waste and sweepings	value, thousands	$7,169	$1,977	—	West Germany $1,076; United Kingdom $626.
Metal including alloys, unwrought and partly wrought	kilograms	391	683	NA	West Germany 257; Norway 131; Finland 128.
Hafnium: Metal including alloys, all forms	value, thousands	—	$1	NA	NA.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite		2,540	1,814	90	Netherlands 1,065; West Germany 570.
Pyrite, roasted		2,727	2,283	—	United Kingdom 2,032; West Germany 220.
Metal:					
Scrap		224,016	298,051	NA	West Germany 212,006; Sweden 43,235.
Pig iron, cast iron, related materials		506	337	—	Sweden 147; West Germany 117.
Ferroalloys:					
Ferroaluminum		62	—		
Ferrochromium		—	(2)	—	NA.
Ferrocolumbium		9	—		
Ferromanganese		—	2	—	All to Iceland.
Ferromolybdenum		—	(2)	—	NA.
Ferrotungsten		(2)	—		
Ferrovanadium		—	(2)	—	NA.
Ferrosilicon		23	470	—	West Germany 469; Netherlands 1.
Silicon metal	kilograms	46,700	600	NA	West Germany 500.
Unspecified	do.	—	100	—	NA.
Steel, primary forms		2,971	2,334	—	West Germany 1,411; Portugal 450.
Semimanufactures:					
Bars, rods, angles, shapes, sections		125,943	129,397	27	West Germany 44,037; United Kingdom 22,297; Sweden 22,043.
Universals, plates, sheets		370,561	NA		
Hoop and strip		32,871	NA		
Rails and accessories		470	1,473	—	West Germany 556; United Kingdom 469; Italy 164.
Wire		4,906	3,127	2	Belgium-Luxembourg 1,033; West Germany 988; Sweden 324.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal—Continued					
Semimanufactures—Continued					
Tubes, pipes, fittings		82,017	90,406	252	Sweden 33,529; West Germany 19,003; United Kingdom 13,731.
Castings and forgings, rough		35,350	NA		
Lead:					
Ore and concentrate		250	—		
Oxides		8	19	—	West Germany 9; Sweden 5; Kenya 3.
Ash and residue containing lead		56	10	—	NA.
Metal including alloys:					
Scrap		13,275	14,068	—	West Germany 6,583; Sweden 6,034.
Unwrought		348	1,306	—	United Kingdom 460; Sweden 314.
Semimanufactures		380	330	(2)	United Kingdom 230; Canada 39.
Lithium:					
Oxides and hydroxides	kilograms	400	700	NA	NA.
Metal including alloys, all forms	do.	500	—		
Magnesium: Metal including alloys:					
Scrap		299	79	44	United Kingdom 19; West Germany 16.
Unwrought		56	18	—	Mainly to West Germany.
Semimanufactures		13	35	NA	Sweden 8.
Manganese:					
Ore and concentrate:					
Metallurgical-grade		11	116	—	West Germany 86; Sweden 30.
Oxides		10	28	—	Belgium-Luxembourg 3; Hong Kong 3; Sweden 2.
Metal including alloys, all forms		2	15	—	Greenland 14; West Germany 1.
Mercury		7	4	—	United Kingdom 2; West Germany 1; Sweden 1.
Molybdenum:					
Ore and concentrate	kilograms	400	—		
Metal including alloys, semimanufactures		(2)	5	NA	Mainly to Norway.
Nickel:					
Ore and concentrate		—	574	—	West Germany 319; Sweden 255.
Matte and speiss		—	1	—	All to Finland.
Oxides and hydroxides		—	(2)	NA	NA.
Ash and residue containing nickel		345	94	—	NA.
Metal including alloys:					
Scrap		87	630	—	West Germany 356; Netherlands 186.
Unwrought		6	6	—	Netherlands 4; Switzerland 2.
Semimanufactures		48	59	13	Netherlands 41.
Platinum-group metals:					
Waste and sweepings	value, thousands	$3,023	$2,032	—	United Kingdom $990; Netherlands $707; West Germany $251.
Metals including alloys, unwrought and partly wrought:					
Palladium	grams	—	451	—	NA.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals—Continued					
Metals including alloys, unwrought and partly wrought—Continued					
Platinum	kilograms	55	290	—	Sweden 269.
Rhodium	grams	—	5,166	—	Sweden 5,146.
Iridium, osmium, ruthenium	do.	—	1	—	NA.
Unspecified	do.	2,395	—		
Rare-earth metals including alloys, all forms		(2)	—		
Selenium, elemental		1	21	—	Finland 20; Sweden 1.
Silicon, high-purity		NA	NA		
Silver:					
Ore and concentrate	value, thousands	—	$446	—	All to Iceland.
Waste and sweepings[3]	do.	$9,801	$10,116	$1	United Kingdom $4,385; Switzerland $3,609; West Germany $1,989.
Metal including alloys, unwrought and partly wrought	kilograms	38,537	53,058	NA	Sweden 31,707; France 5,206; Norway 4,061.
Tin:					
Oxides		—	(2)	NA	NA.
Ash and residue containing tin		109	140	—	Netherlands 17.
Metal including alloys:					
Scrap		200	390	—	Sweden 198; Netherlands 146.
Unwrought		125	48	—	Netherlands 24; Sweden 11; Italy 10.
Semimanufactures		7	184	(2)	Netherlands 125; Portugal 50.
Titanium:					
Oxides		76	630	18	West Germany 160; Sudan 100; Cyprus 85.
Metal including alloys:					
Scrap		12	9	—	All to West Germany.
Unwrought		4	(2)	—	Do.
Semimanufactures		21	7	NA	West Germany 3; Yugoslavia 2.
Tungsten: Metal including alloys:					
Scrap		62	—		
Unwrought		(2)	3	—	West Germany 2; Greenland 1.
Semimanufactures		6	5	NA	NA.
Uranium and thorium:					
Oxides and other compounds	kilograms	—	9	NA	NA.
Metal including alloys, all forms:					
Thorium		(2)	—	—	West Germany $24; Sweden $3.
Vanadium:					
Ash and residue containing vanadium		16	—		
Zinc:					
Ore and concentrate		245	10	—	All to Norway.
Oxides		31	54	—	Norway 35; Sweden 16.
Blue powder		136	61	—	Netherlands 15.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Zinc—Continued					
Matte		755	846	—	Norway 734.
Ash and residue containing zinc		1,963	1,717	—	Norway 1,575.
Metal including alloys:					
Scrap		5,035	5,482	—	West Germany 2,002; Taiwan 1,001; India 479.
Unwrought		279	96	—	West Germany 76; Norway 10.
Semimanufactures		109	117	—	Greenland 37.
Zirconium:					
Ore and concentrate		—	96	—	Sweden 76; Belgium-Luxembourg 20.
Oxides	value, thousands	$2	—		
Metal including alloys, semimanufactures	kilograms	100	200	NA	NA.
Other:					
Ores and concentrates		55	35	—	West Germany 25; Sweden 10.
Oxides and hydroxides		(2)	3	NA	NA.
Ashes and residues		315	299	—	NA.
Base metals including alloys, all forms		26	94	—	West Germany 53; United Kingdom 32; Netherlands 9.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		35	11	—	Mainly to Faeroe Islands.
Artificial:					
Corundum		(2)	2	—	Do.
Silicon carbide		1	(2)	NA	NA.
Dust and powder of precious and semiprecious stones excluding diamond	kilograms	—	195	—	All to Finland.
Grinding and polishing wheels and stones		2,309	1,444	2	Ethiopia 829; West Germany 135; Yemen (Sanaa) 135.
Asbestos, crude		166	120	—	Malaysia 116; Netherlands 4.
Barite and witherite		46	93	—	West Germany 61; United Kingdom 22; Iceland 6.
Boron materials:					
Crude natural borates		(2)	(2)	NA	NA.
Elemental	kilograms	200	—		
Oxides and acids		80	106	—	Sweden 42; Finland 41; Norway 16.
Bromine		21	(2)	NA	NA.
Cement		360,156	396,850	5,052	United Kingdom 49,578; unspecified 309,225.
Chalk		169,781	175,536	—	Finland 135,456; Sweden 23,066.
Clays, crude:					
Bentonite		17	68	—	Sweden 27; Norway 15; Greenland 8.
Chamotte earth		1	1	—	NA.
Fuller's earth		—	39	—	NA.
Kaolin		647	598	—	Sweden 187; West Germany 169.
Unspecified		3,385	4,862	(2)	West Germany 2,540; Sweden 758; Netherlands 686.
Cryolite and chiolite		14,009	21,304	NA	NA.
Diamond:					
Gem, not set or strung	carats	340	2,381	(4)	Belgium-Luxembourg 115.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diamond—Continued					
Industrial stones	carats	445	67	—	NA.
Dust and powder	value, thousands	[5]$1	—		
Diatomite and other infusorial earth		77,890	81,438	148	United Kingdom 24,063; West Germany 18,071; Netherlands 15,629.
Feldspar, fluorspar, related materials:					
Feldspar		[2]	[2]	—	All to Norway.
Fluorspar		—	48	—	All to France.
Unspecified		[2]	3	—	All to Norway.
Fertilizer materials:					
Crude, n.e.s.		70	88	—	Sweden 30; West Germany 27; Foeroe Islands 11.
Manufactured:					
Ammonia		5,836	319	—	United Kingdom 176; Sweden 62.
Nitrogenous		3,337	14,981	—	West Germany 6,965; Belgium-Luxembourg 6,336; Austria 1,170.
Phosphatic		35,855	66,821	—	Sweden 311; unspecified 66,216.
Potassic		68	2,638	—	Finland 2,200; West Germany 272.
Unspecified and mixed		640,219	585,328	—	United Kingdom 12,639; unspecified 550,187.
Graphite, natural		756	44	2	West Germany 40; Hong Kong 1.
Gypsum and plaster		3,886	4,716	NA	Sweden 4,269.
Iodine		144	—		
Kyanite and related materials		24	49	NA	NA.
Lime		12,652	12,710	—	Norway 10,590; Greenland 1,537.
Magnesium compounds:					
Magnesite, crude		—	[2]	NA	NA.
Oxides and hydroxides		9	6	—	Netherlands 5; Cote d'Ivoire 1.
Sulfate		—	3	NA	NA.
Mica:					
Crude including splittings and waste		4	3	—	Sweden 2.
Worked including agglomerated splittings		[2]	19	—	Syria 16; Belgium-Luxembourg 2.
Nitrates, crude		[2]	3	—	All to France.
Phosphates, crude		10,467	1,449	176	United Kingdom 1,089.
Phosphorous, elemental		46	—		
Pigments, mineral:					
Natural, crude		52	23	NA	NA.
Iron oxides and hydroxides, processed		242	264	11	United Kingdom 67; Sweden 55; Canada 27.
Potassium salts, crude		5	5	—	All to France.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	565	714	NA	Norway 9; West Germany 5; unspecified 515.
Synthetic	do.	37	9	—	NA.
Pyrite, unroasted		[2]	35	—	West Germany 18; Greenland 12; Finland 5.
Salt and brine		240,652	307,547	14	Sweden 199,606; Norway 88,590.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sodium compounds, n.e.s.:					
Soda ash, manufactured		66	10	—	Faeroe Islands 7; Iceland 2; Greenland 1.
Sulfate, manufactured		[6]373	20	—	NA.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		44,028	78,691	—	West Germany 77,795.
Worked		12,050	15,930	NA	West Germany 12,105; Sweden 1,441.
Dolomite, chiefly refractory-grade		145	122	—	Iceland 120; Saudi Arabia 1.
Gravel and crushed rock		480,371	517,498	54	West Germany 478,233; Norway 16,276.
Limestone other than dimension		82,281	130,125	4	West Germany 58,338; Sweden 32,174; Finland 19,214.
Quartz and quartzite		224	1,271	—	Sweden 390; West Germany 321; Greenland 258.
Sand other than metal-bearing		225,280	256,826	71	Sweden 188,770; West Germany 32,386; Norway 13,882.
Sulfur:					
Elemental:					
Crude including native and byproduct		4,209	7,750	—	West Germany 3,913; France 3,800.
Colloidal, precipitated, sublimed		2,415	2,254	—	Finland 2,203.
Dioxide		—	1	NA	NA.
Sulfuric acid		11,782	69,682	—	Netherlands 38,786; Belgium-Luxembourg 22,807; United Kingdom 7,705.
Talc, steatite, soapstone, pyrophyllite		79	81	—	Yugoslavia 25; Kenya 12; Norway 12.
Vermiculite, pertite, chlorite		45	47	—	Sweden 27; Norway 20.
Other:					
Crude		940	2,634	15	Greenland 75; Sweden 72.
Slag and dross, not metal-bearing		168,340	143,665	—	Norway 110,867; West Germany 32,164.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,076	434	—	Greenland 356; Sweden 42.
Carbon:					
Carbon black		24	24	—	West Germany 4; Sweden 3; Greenland 2.
Gas carbon		3	4	—	NA.
Coal:					
Anthracite		[2]	10,273	161	United Kingdom 10,113.
Bituminous		52,004	79,191	—	Sweden 61,413; Norway 7,447.
Briquets of anthracite and bituminous coal		20	[2]	—	All to Italy.
Lignite including briquets		74	[2]	—	All to Sweden.
Coke and semicoke		1,912	693	—	West Germany 691; Norway 1.
Gas, natural:					
Gaseous	million cubic feet	30,583	33,740	—	West Germany 17,832; Sweden 15,908.
Liquefied		—	13	—	All to Sweden.
Peat including briquets and litter		6,933	6,311	—	Netherlands 5,995.
Petroleum:					
Crude	42-gallon barrels	13,319	13,782	—	Sweden 7,511; Norway 4,638; United Kingdom 1,618.
Refinery products:					
Liquefied petroleum gas	do.	707	744	—	Sweden 326; Netherlands 220; United Kingdom 129.

See footnotes at end of table.

TABLE 2—Continued

DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Gasoline	42-gallon barrels	3,904	3,937	NA	Sweden 2,952; West Germany 729.
Mineral jelly and wax	do.	6	5	(2)	Sweden 4.
Kerosene and jet fuel	do.	54	2,160	51	Sweden 1,161; Netherlands 450.
Distillate fuel oil	do.	5,024	4,967	NA	Sweden 2,737; Greenland 790; West Germany 522.
Lubricants	do.	73	72	NA	Norway 20; Faeroe Islands 14; Iceland 12.
Residual fuel oil	do.	5,570	8,171	631	United Kingdom 3,831; Netherlands 1,100; West Germany 635.
Bitumen and other residues	do.	41	8	(2)	West Germany 5; Norway 1; Sweden 1.
Bituminous mixtures	do.	8	19	NA	Greenland 7; Sweden 5; West Germany 3.
Petroleum coke	do.	361	NA		

NA Not availaible.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Unreported quantity valued at $6,000.
[5]Includes precious and semiprecious stones.
[6]May include cadmium sulfate.

TABLE 3

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	(2)	16	1	Hungary 12; West Germany 3.
Alkaline-earth metals	(2)	133	NA	West Germany 131.
Aluminum:				
Ore and concentrate	1,024	1,414	—	China 1,005; West Germany 268.
Oxides and hydroxides	4,956	5,552	657	West Germany 2,567; United Kingdom 2,119.
Ash and residue containing aluminum	3,114	3,597	—	West Germany 3,474; Sweden 123.
Metal including alloys:				
Scrap	7,161	8,790	18	West Germany 4,833; Sweden 1,577; Norway 1,385.
Unwrought	27,833	30,149	9	Norway 12,829; West Germany 5,258; Sweden 4,680.
Semimanufactures	78,977	79,686	213	West Germany 22,205; Sweden 11,463; Belgium-Luxembourg 8,856.
Antimony:				
Oxides	72	79	—	United Kingdom 67; Belgium-Luxembourg 12.
Metal including alloys, all forms value, thousands	—	$9	—	United Kingdom $5; West Germany $2; Japan $2.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Arsenic: Oxides and acids		29	(2)	NA	NA.
Beryllium:					
Oxides and hydroxides		18	—		
Metal including alloys, all forms		(2)	2	—	All from West Germany.
Bismuth: Metal including alloys, all forms	value, thousands	$46	$41	—	United Kingdom $28; West Germany $6; Sweden $6.
Cadmium: Metal including alloys, all forms	do.	$22	$5	—	Belgium-Luxembourg $3; West Germany $2.
Cesium and rubidium: Metal including alloys, all forms	do.	$1	—		
Chromium:					
Ore and concentrate		667	698	—	West Germany 616; Finland 81.
Oxides and hydroxides		124	348	(2)	West Germany 280; Italy 55.
Metal including alloys, all forms		19	24	—	West Germany 17; Sweden 4; Italy 3.
Cobalt:					
Oxides and hydroxides		30	52	—	Belgium-Luxembourg 28; France 20.
Metal including alloys, all forms		21	23	—	France 10; Finland 6; Belgium-Luxembourg 4.
Columbium and tantalum: Metal including alloys, all forms:					
Columbium (niobium)	kilograms	100	—		
Tantalum	do.	200	200	NA	NA.
Copper:					
Ore and concentrate		—	780	—	West Germany 762; Sweden 18.
Matte and speiss including cement copper		(2)	50	—	Belgium-Luxembourg 24; Finland 22.
Oxides and hydroxides		723	794	60	West Germany 222; Italy 218; Norway 120.
Sulfate		1,552	1,653	NA	Belgium-Luxembourg 507; Netherlands 489; France 143.
Ash and residue containing copper		828	493	—	Norway 390.
Metal including alloys:					
Scrap		7,216	11,513	—	Sweden 6,845; West Germany 1,927.
Unwrought		1,941	1,608	—	United Kingdom 710; Sweden 636; West Germany 174.
Semimanufactures		37,375	37,736	34	West Germany 18,832; Sweden 8,232.
Gallium: Metal including alloys, all forms	kilograms[3]	100	100	NA	NA.
Germanium:					
Metal including alloys, all forms		(2)	(2)	—	NA.
Oxides		5	(2)	NA	NA.
Gold:					
Waste and sweepings	value, thousands	$483	$455	—	Norway $235; Sweden $172.
Metal including alloys, unwrought and partly wrought	kilograms	1,054	4,134	3	West Germany 3,341; Switzerland 426.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite		7,657	2,669	—	Sweden 2,593.
Pyrite, roasted		28,690	21,795	—	All from Norway.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap	89,288	116,737	1	West Germany 75,446; United Kingdom 28,495.
Pig iron, cast iron, related materials	82,329	118,427	5	U.S.S.R. 60,770; Poland 25,965; Brazil 10,250.
Ferroalloys:				
Ferroaluminum	533	—		
Ferrocolumbium	32	45	NA	Belgium-Luxembourg 33; United Kingdom 8.
Ferrochromium	63	47	—	West Germany 20.
Ferromanganese	1,284	1,500	—	Norway 1,162; West Germany 313.
Ferromolybdenum	9	2	—	NA.
Ferronickel	11	3	—	All from West Germany.
Ferrosilicochromium	11	—		
Ferrosilicomanganese	4,678	5,863	—	Norway 5,854.
Ferrosilicon	2,998	3,697	—	Norway 3,092; West Germany 373.
Ferrotitanium	2	402	—	Norway 400.
Ferrovanadium	34	6	—	Mainly to Belgium-Luxembourg.
Silicon metal	910	529	—	Norway 416; West Germany 113.
Unspecified	135	520	—	West Germany 221; Norway 188.
Steel, primary forms	135,828	18,473	(2)	Sweden 15,867; West Germany 1,610.
Semimanufactures:				
Bars, rods, angles, shapes, sections	325,712	343,502	61	Sweden 72,006; West Germany 67,010; United Kingdom 58,761.
Universals, plates, sheets	695,126	NA		
Hoop and strip	72,767	NA		
Rails and accessories	12,035	13,573	—	Austria 10,894; West Germany 1,380.
Wire	35,482	36,063	(2)	West Germany 11,792; Belgium-Luxembourg 8,966; Sweden 4,714.
Tubes, pipes, fittings	223,732	244,433	148	West Germany 97,840; Switzerland 16,139; Netherlands 16,134.
Castings and forgings, rough	5,435	NA		
Lead:				
Oxides	355	215	—	East Germany 110; West Germany 76; United Kingdom 25.
Ash and residue containing lead	—	111	—	All from Norway.
Metal including alloys:				
Scrap	323	152	—	Cyprus 50; Sierra Leone 38; Sweden 27.
Unwrought	15,408	8,630	—	Sweden 5,383; West Germany 2,335; United Kingdom 882.
Semimanufactures	4,855	4,895	(2)	West Germany 4,068; Yugoslavia 354.
Lithium:				
Oxides and hydroxides	40	128	NA	NA.
Metal including alloys, all forms	2	—		
Magnesium: Metal including alloys:				
Scrap	3	21	—	All from Sweden.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Magnesium: Metal including alloys—Continued					
Unwrought		285	114	—	Norway 112; Belgium-Luxembourg 1; United Kingdom 1.
Semimanufactures		155	134	41	Switzerland 28; Netherlands 23.
Manganese:					
Ore and concentrate: Metallurgical-grade		543	410	—	Netherlands 353; West Germany 47.
Oxides		1,051	1,121	—	Belgium-Luxembourg 366; Greece 336; Netherlands
Metal including alloys:					
Scrap		2	—		
Unwrought		8	37	—	NA.
Semimanufactures		7	20	—	NA.
Mercury		15	6	—	China 2; Sweden 2; Turkey 2.
Molybdenum:					
Oxides and hydroxides		42	42	NA	Netherlands 40.
Metal including alloys:					
Scrap		—	(2)	—	NA.
Unwrought		6	10	—	West Germany 5; United Kingdom 5.
Semimanufactures		2	7	NA	NA.
Nickel:					
Ore and concentrate		3	5	—	United Kingdom 3; Italy 1; Sweden 1.
Matte and speiss		8	455	—	All from West Germany.
Oxides and hydroxides	kilograms	100	1,400	NA	NA.
Metal including alloys:					
Scrap		4	22	—	Norway 21; Sweden 1.
Unwrought		248	141	—	Finland 71; United Kingdom 29; West Germany 13.
Semimanufactures		289	282	8	United Kingdom 169; West Germany 47; Norway 27.
Platinum-group metals:					
Waste and sweepings	value, thousands	$400	$318	—	Sweden $313.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	—	144	NA	Netherlands 80; Switzerland 35.
Platinum	do.	484	249	NA	Switzerland 112; Netherlands 60; West Germany 28.
Rhodium	do.	—	11	NA	Netherlands 5.
Iridium, osmium, ruthenium	do.	—	2	NA	NA.
Unspecified	do.	243	—		
Rare-earth metals including alloys, all forms	kilograms	100	6,800	NA	NA.
Rhenium: Metal including alloys, all forms		(2)	—		
Selenium, elemental		27	31	—	Netherlands 30; West Germany 1.
Silicon, high-purity		NA	51	21	Japan 11; West Germany 10.
Silver:					
Waste and sweepings[4]	value, thousands	$2,094	$2,237	—	Norway $1,454; Sweden $441; Finland 292.
Metal including alloys, unwrought and partly wrought	kilograms	96,760	111,733	NA	United Kingdom 39,637; Spain 31,383; West Germany 11,240.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Tellurium and arsenic, elemental		(2)	—		
Tin:					
Ore and concentrate		—	(2)	—	All from France.
Oxides		1	12	—	West Germany 6; United Kingdom 6.
Metal including alloys:					
Scrap		3	25	—	Sweden 22; United Kingdom 3.
Unwrought		235	250	(2)	West Germany 114; Netherlands 88; Zimbabwe 21.
Semimanufactures		95	335	(2)	United Kingdom 120; West Germany 108; Sweden 75.
Titanium:					
Oxides		8,431	5,606	(2)	United Kingdom 2,228; Norway 1,801; Finland 1,099.
Metal including alloys:					
Scrap		(2)	12	8	Japan 4.
Unwrought	kilograms	100	700	—	NA.
Semimanufactures		106	113	1	France 15; unspecified 86.
Tungsten:					
Oxides and hydroxides		(2)	(2)	NA	NA.
Ash and residue containing tungsten		415	—		
Metal including alloys:					
Scrap	kilograms	400	—		
Unwrought		1	1	(2)	West Germany 1.
Semimanufactures		16	6	NA	West Germany 3; France 1.
Uranium and thorium:					
Oxides and other compounds	kilograms	15	54	NA	NA.
Metal including alloys, all forms:					
Uranium	do.	389	—		
Vanadium:					
Ore and concentrate		—	10	—	All from Netherlands.
Oxides and hydroxides		22	15	NA	NA.
Metal including alloys:					
Unwrought		3	3	—	Mainly from Netherlands.
Semimanufactures		4	(2)	NA	NA.
Zinc:					
Oxides		3,129	3,539	97	West Germany 1,961; France 803; China 336.
Blue powder		856	1,263	—	Norway 617; Belgium-Luxembourg 349; West Germany 228.
Matte		1	—		
Ash and residue containing zinc		124	202	—	West Germany 192.
Metal including alloys:					
Scrap		474	898	—	Norway 558; West Germany 228.
Unwrought		12,677	14,213	—	Finland 6,582; Norway 5,586.
Semimanufactures		3,730	4,688	14	France 2,656; West Germany 1,630.
Zirconium:					
Ore and concentrate		228	27	—	West Germany 18; Netherlands 9.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zirconium—Continued				
Oxides	3	4	NA	NA.
Metal including alloys:				
Scrap	—	—		
Unwrought	—	10	—	Mainly from West Germany.
Semimanufactures	6	8	NA	NA.
Other:				
Ores and concentrates	82	[5]52	—	West Germany 37; Netherlands 10; Sweden 5.
Oxides and hydroxides	7	36	NA	West Germany 9.
Ashes and residues	15	170	—	NA.
Base metals including alloys, all forms	([3])	20	NA	West Germany 19.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	5,268	13,208	20	Iceland 11,828; West Germany 437.
Artificial:				
Corundum	340	295	—	Mainly from West Germany.
Silicon carbide	468	734	286.NA	Norway 421; West Germany
Dust and powder of precious and semiprecious stones including diamond kilograms	56	115	9	Switzerland 54; Ireland 29; Sweden 12.
Grinding and polishing wheels and stones	1,044	1,085	2	West Germany 384; Austria 286.
Asbestos, crude	4,381	1,078	—	Canada 1,017; West Germany 50.
Barite and witherite	17,379	13,030	—	Netherlands 6,026; Norway 5,925.
Boron materials:				
Crude natural borates	2,541	2,120	2,100	West Germany 20.
Elemental	—	([2])	NA	NA.
Oxides and acids	566	596	122	Italy 126; United Kingdom 120.
Bromine	104	52	NA	Israel 40.
Cement	102,993	151,655	2	East Germany 82,251; Poland 47,549; West Germany 12,582.
Chalk	14,672	13,198	([2])	West Germany 9,619; Austria 1,365.
Clays, crude:				
Bentonite	5,608	7,875	31	West Germany 5,455; United Kingdom 884.
Chamotte earth	3,125	4,435	485	France 3,343; West Germany 530.
Fuller's earth	540	691	72	United Kingdom 264; China 174.
Kaolin	28,310	24,776	1,656	United Kingdom 18,818; Brazil 1,437.
Unspecified	8,514	8,561	809	West Germany 6,755.
Cryolite and chiolite	41,045	1,223	—	Norway 1,200; Sweden 21; United Kingdom 3.
Diamond:				
Gem, not set or strung carats	7,790	26,178	NA	Belgium-Luxembourg 23,325; Switzerland 810.
Industrial stones do.	772	26,050	NA	Belgium-Luxembourg 21,812.
Diatomite and other infusorial earth	5,669	5,868	1,659	Iceland 2,433; France 706.
Feldspar, fluorspar, related materials:				
Feldspar	3,837	4,595	—	Norway 4,164; Sweden 403.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Feldspar, fluorspar, related materials—Continued				
Fluorspar	491	420	—	France 393.
Unspecified	1,058	9,055	—	Norway 8,951.
Fertilizer materials:				
Crude, n.e.s.	290	235	1	West Germany 158; Sweden 53.
Manufactured:				
Ammonia	389,560	348,941	8,044	West Germany 168,007; Trindad and Tobago 72,582; Netherlands 56,375.
Nitrogenous	246,234	263,133	(2)	Yugoslavia 48,508; East Germany 46,963; West Germany 45,490.
Phosphatic	7,570	7,420	—	Netherlands 4,966; Belgium-Luxembourg 2,250.
Potassic	279,528	260,796	25	West Germany 1,834; United Kingdom 758; unspecified 258,148.
Unspecified and mixed	537,212	510,562	23,619	Norway 271,139; Belgium-Luxembourg 38,637; Poland 34,458.
Graphite, natural	1,069	1,589	46	West Germany 1,423; Switzerland 59.
Gypsum and plaster	259,076	297,961	4	Spain 221,461; West Germany 73,581.
Iodine	27	4	NA	West Germany 3.
Kyanite and related materials	1,130	1,162	587	Netherlands 481.
Lime	16,178	15,029	—	West Germany 14,491.
Magnesium compounds:				
Magnesite, crude	31	1,315	25	China 1,003; Austria 109.
Oxides and hydroxides	10,180	14,147	19	China 6,615; Austria 3,572; Sweden 1,487.
Sulfate	53,732	50,355	—	East Germany 48,076; West Germany 1,180.
Mica:				
Crude including splittings and waste	206	237	—	United Kingdom 92; Norway 53; Sweden 28.
Worked including agglomerated splittings	63	50	(2)	Netherlands 18; Belgium-Luxembourg 14; France 8.
Phosphates, crude	234,464	270,370	—	Morocco 18,000; unspecified 252,301.
Phosphorous, elemental	NA	NA		
Pigments, mineral:				
Natural, crude	259	214	NA	Cyprus 131; Austria 74.
Iron oxides and hydroxides, processed	4,386	3,862	17	West Germany 3,080; Spain 305.
Potassium salts, crude	2,667	3	—	Mainly from France.
Precious and semiprecious stones other than diamond:				
Natural kilograms	10,622	14,165	NA	West Germany 6,793; United Kingdom 1,830.
Synthetic do.	40	27	5	NA.
Pyrite, unroasted	26	140	—	All from West Germany.
Quartz crystal, piezoelectric kilograms	12	48	—	Japan 44.
Salt and brine	297,250	171,771	32	West Germany 54,753; East Germany 36,658; U.S.S.R. 34,814.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	45,924	50,636	—	West Germany 23,089; Netherlands 12,229; East Germany 12,170.
Sulfate, manufactured	[6]33,434	2,565	NA	West Germany 1,292; Belgium-Luxembourg 992.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		205,817	251,956	(2)	Norway 184,630; Sweden 56,628.
Worked		50,169	59,393	(2)	Portugal 27,667; Italy 10,342; Sweden 9,493.
Dolomite, chiefly refractory-grade		37,648	46,392	—	Norway 25,329; Sweden 13,010; United Kingdom 4,084.
Gravel and crushed rock		1,084,743	1,260,378	33	Sweden 654,855; Norway 522,524.
Limestone other than dimension		176,286	223,026	—	United Kingdom 137,384; Sweden 77,610.
Quartz and quartzite		4,071	1,530	(2)	Sweden 709; Norway 419.
Sand other than metal-bearing		88,755	84,738	56	Belgium-Luxembourg 36,321; Sweden 25,130; West Germany 15,222.
Sulfur:					
Elemental:					
Crude including native and byproduct		48,289	72,788	36	West Germany 70,238; China 2,317.
Colloidal, precipitated, sublimed		142	87	—	West Germany 43; United Kingdom 28; France 16.
Dioxide		1,130	1,215	—	West Germany 846; Sweden 369.
Sulfuric acid		8,714	8,642	—	West Germany 8,296; East Germany 344.
Talc, steatite, soapstone, pyrophyllite		9,870	10,364	638	Finland 3,608; Norway 3,542; Sweden 948.
Vermiculite, perlite, chlorite		5,962	11,181	—	Republic of South Africa 8,249; Greece 1,540.
Other:					
Crude		13,382	9,564	1,628	Netherlands 3,092; Norway 2,109.
Slag and dross, not metal-bearing		133,080	141,268	—	Norway 56,249; Sweden 42,674; West Germany 42,101.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,574	29,996	165	Sweden 27,897; West Germany 1,174.
Carbon:					
Carbon black		4,332	4,292	313	Sweden 1,984; Netherlands 1,047.
Gas carbon		—	1	—	NA.
Coal:					
Anthracite	thousand tons	2	1,145	20	Poland 612; U.S.S.R. 147; Australia 119.
Bituminous	do.	12,053	9,160	2,726	Colombia 2,036; Poland 1,202.
Briquets of anthracite and bituminous coal		4,421	1	—	Mainly from France.
Lignite including briquets	thousand tons	26	15	—	East Germany 8; Australia 5; West Germany 1.
Coke and semicoke		51,386	56,614	5,234	Belgium-Luxembourg 13,615; United Kingdom 13,411; West Germany 6,159.
Gas, natural:					
Gaseous	million cubic feet	1	—		
Liquefied		—	21	—	Mainly from West Germany.
Peat including briquets and litter		29,273	35,662	—	Sweden 12,627; West Germany 10,492; U.S.S.R. 6,543.
Petroleum:					
Crude	42-gallon barrels	32,794	32,871	—	Kuwait 20,323; Norway 6,066; United Kingdom 3,680.
Refinery products:					
Liquefied petroleum gas	do.	603	376	(2)	Norway 176; Sweden 86; United Kingdom 50.
Gasoline	do.	5,837	5,326	8	Sweden 2,942; Kuwait 768; Netherlands 641.
Mineral jelly and wax	do.	90	97	1	West Germany 61; United Kingdom 8.

See footnotes at end of table.

TABLE 3—Continued

DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Kerosene and jet fuel	42-gallon barrels	4,857	4,840	174	United Kingdom 873; Netherlands 854; Kuwait 660.
Distillate fuel oil	do.	17,129	14,394	NA	Sweden 7,549; Norway 2,425; East Germany 834.
Lubricants	do.	2,809	1,030	7	U.S.S.R. 527; West Germany 176; Netherlands 105.
Residual fuel oil	do.	5,817	7,973	—	U.S.S.R. 2,980; United Kingdom 1,242; East Germany 1,142.
Bitumen and other residues	do.	1,453	1,083	(2)	West Germany 504; Sweden 249; Finland 198.
Bituminous mixtures	do.	15	19	(2)	West Germany 12; Netherlands 2; Belgium-Luxembourg 1.
Petroleum coke	do.	1,891	1,356	8	Unspecified 1,348.

NA Not available
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]Includes indium and thallium.
[4]May include other precious metals.
[5]Includes precious metals.
[6]May include cadmium sulfate.

thought to facilitate the planned development of North Sea petroleum resources.

TRADE

Danish exporters increased sales by 13% (to $27 billion) and were able to more effectively exploit foreign markets because of the economic reforms and policies enacted in 1988, as well as the general improvement in the international economy. U.S. exports to Denmark rose a projected 25% (to $2 billion) and resulted in a $200 million U.S. trade surplus. U.S. coal and aircraft accounted for a large portion of the trade surplus. The purchase of 3 million tons of coal from the United States represented 29% of the country's requirements and placed the United States first ahead of purchases from Columbia and Australia, which represented 25% and 13%, respectively, of Denmark's coal purchases. An agreement with the U.S.S.R. resulted in the purchase of Soviet natural gas as part of a countertrade agreement. In return, the Danes are to supply machinery and equipment for the Soviet cement industry.

STRUCTURE OF THE MINERAL INDUSTRY

The production of petroleum, calcium carbonate, and industrial minerals and the processing of these indigenous mineral resources are important to the economy of Denmark. The steel industry, based on scrap material for processing, and the imported lead-zinc ores are the other major mineral industries. The principal producing and processing companies in Denmark are listed in table 4.

COMMODITY REVIEW

Metals

The steel output from Denmark's sole steel company, Det Danske Stålvalseværk A/S, was reported to be 4% (25 tons) below the output in 1988, and the January 1990 output was reported down 20% from the previous year's January production. Production problems were reported from the new shaft furnace commissioned in the summer of 1988 and was one reason for the decrease. A second-generation furnace was constructed and completed by December 1989, and both have provided the energy savings anticipated in the design concept. Steelplate sales to the EC and Scandinavia combined increased 27,000 tons to a total of 421,000 tons over that of 1988. In November 1989, the company contracted to supply 20,000 tons of concrete reinforcing bars in connection with the Great Belt project for building bridge and tunnels under the Eastern Channel separating the Island of Zealand from the Jutland peninsula. Future company plans include the modernization of plant equipment, especially the trains and track in the scrap yards, to become more efficient and to meet the intensified market competition and product specifications of the EC Single Market. The company, recognizing environmental concerns, plans to continue the environmental safeguard programs around the facility.

Boliden A/B continued lead-zinc ore extraction at Nunngarat, thereby ensuring

TABLE 4

STRUCTURE OF THE MINERAL INDUSTRY OF DENMARK, INCLUDING GREENLAND

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	A/S Ålborg Portland-Cement-Fabrik (F.L. Smidth og Co. A/S)	Plant at Rørdal	2,400.
Chalk	A/S/ Faxe Kalkbrud (F.L. Smidth)	Mine at Sevns	30.
Diatomite (moler)	Skarrehage Molervaerk A/S (SKAMOL)	Mine on Fyr Island	70.
Do.	Dansk Moler Industri A/S	Mines on Fyr Island and Rabekke/Bornholm	60.
Kaolin	A/S Ålborg Portland-Cement-Fabrik	Mine and plant at Rønne	110.
Iron and steel	Det Danske Stalvalsevaerk A/S (DDS)	Frederiksvaerk	1,700.
Lead in ore	Greenex A/S	Mine at Marmorilik (Greenland)	Projected to close mid-1990.
Natural gas	Dansk Naturgas	Natural gas delivery system	
Petroleum:			
Crude	Dansk Undergrunds Consortium (DUC) A.P. Moller (39%), Royal/Dutch Shell (46%), Texaco A/S (15%)	Dan, Gorm, Skjøld, Rolf, and Tyra Oilfields	94,000[1].
Refined	Kuwait Petroleum Refining A/S	Gulfhavn (Sjaelland)	56,500[1].
Do.	Statoil A/S	Kalundborg (Sjaelland)	65,000[1].
Do.	A/S Dansk Shell	Fredericia (Jutland)	55,000[1].
Salt	Dansk Salt Co. (Akzo Zout Chemie NV, Netherlands; Kryolitselskabet Øresund A/S, Denmark)	Mine at Hvornum, processing plant at Mariager	1,780.
Silver in ore	Greenex A/S	Mine at Marmorilik (Greenland)	Projected to close mid-1990.
Zinc in ore	do.	do.	Projected to close mid-1990.

[1]Barrels per day.

production of lead and zinc concentrates through 1989 at its Black Angel Mine. No significant exploration was conducted because the company concentrated on the enhanced recovery of the remaining economic ore before the mid-1990 closing of the Black Angel Mine. The group of Corona Corp. and Platinova Resources Ltd., both Canadian companies, reported the discovery of a large gold deposit in the Kangerdlugssuaq area on the southwestern coast of Greenland. The preliminary results of the assay indicated the presence of gold, platinum, and palladium in the samples. In 1989, the companies spent $1 million drilling 11 holes to depths of 500 meters to evaluate earlier exploration on the property. According to company personnel, the preliminary results indicated the deposit could cover between 20 to 50 square kilometers (km^2). The group indicated plans to dig a tunnel to investigate the possibility of mining, which could commence in several years. The deposit is in a remote, harsh arctic climate, and the economic parameters have to be studied.

Industrial Minerals

Cement.—A/S Ålborg Portland-Cement-Fabrik, Denmark's only cement producer, had a 3% decline in cement sales on the domestic market to 1.27 million tons of cement. This was mainly because of a recession in the building industry compounded by increased imports from the German Democratic Republic. A/S Ålborg's export of 730,000 tons of cement was nearly double the volume of previous years. Increased gray cement sales to the United Kingdom were a major factor for this export increase. The company reported full capacity utilization of its gray and specialty cement capacities. FLS Industries A/S, a leading supplier of production equipment to the cement industry, purchased the Fuller Co., United States, in late 1989 for $75 million, increasing its world market share to more than 50%. The Fuller Co. and the wholly owned subsidy, F.L. Smidth & Co., formed in January 1989 by FLS Industries A/S to manage the Danish cement equipment business, will remain independent. However, both companies are to coordinate their market activities and resource utilization. FLS Industries A/S increased its research and development efforts to develop kilns with reduced sulfur dioxide and nitrogen oxide emissions, as well as reduced energy consumption.

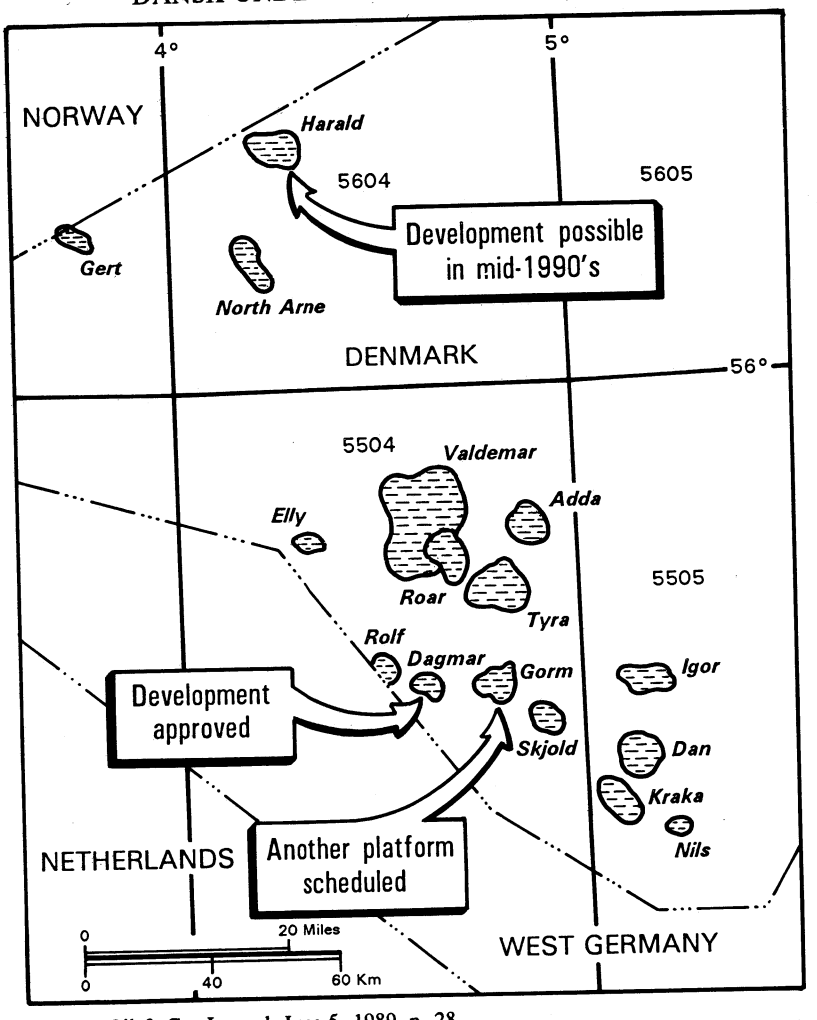
Diatomite.—The Danish producers of moler products, Skarrehage Molervaerk A/S and Dansk Moler Industri A/S, agreed to a product manufacturing agreement. Skarrehage Molerværk A/S will produce moler insulating brick and Dansk Moler Industri A/S will produce moler powder at their respective facilities, both of which are on the Isle of Fyr. Also, Skarrehage Molervaerk A/S invested $1.2 million in share capital through its subsidiary Molisol Products A/S in Dansk Moler Industri A/S. Both companies are to continue to operate separately.

Limestone.—The lime-limestone business for Faxe Kalk A/S improved during 1989 despite the domestic recession in the building industry. The increased requirements for the environmental safeguards

FIGURE 1

DENMARK: NORTH SEA FIELDS

DANSK UNDERGRÙNDS CONSORTIUM



Source: Oil & Gas Journal, June 5, 1989, p. 28.

on industry had increased the production of products designed for these markets. For example, the flue-gas desulfurization systems for the Danish power stations meant a marked increase in the sales of lime products.

Sand.—PV-Sand A/S of Pledsted, on the Jutland peninsula, is a leading supplier of resin coated sands to the Danish foundry industry. The company suffered a fire in February 1989 at its resin coating facility. The facility was destroyed and is being replaced at a cost of $7.5 million. Subsequently, the company was purchased by Ahlshell Mineral AB of Sweden, which sought to increase its share of the coated sand market in Scandinavia.

Jutland beach sands, 80 kilometers northwest of the harbour of Åalborg, are being studied by Morstral Minerals. The sands contain 25 minerals, including ilmenite, rutile, zircon, and monazite. Morstasl has been granted a concession for exploration of 30 square kilometers of the 100-square kilometer area.

Fertilizer Materials.—Superfos A/S sold its 35% interest in Superfos Godning A/S to Kemira Oy of Finland. The name given to the new subsidiary was Kemira Danmark A/S, which produces and markets sodium-phosphorous-potassium (NPK) and phosphorous-potassium (PK) fertilizers. The facility in Fredericia produces 800,000 metric tons per year (mt/yr) NPK fertilizers, 50,000 mt/yr calcium ammonium nitrate (CAN), 20,000 mt/yr feed phosphate, and superphosphate. The 400,000-mt/yr PK capacity at Fredericia was to be converted to NPK production at this complex because it uses the most modern technology for the NPK production. The plant at Norresundby produced PK fertilizers at a rated capacity of 350,000 mt/yr, and production should be increased with the product switch. The raw material for these operations was from Kemira's operations in Finland.

Dansk Landsbrugs Grovvarelskab (DLG), the Danish co-operative supplier of fertilizer, had to alter its operations as a result of changes in the European fertilizer market and to meet environmental constraints taking place in Europe. Product sources and plants owned jointly with different companies, such as Kemira Oy and Norsk Hydro AS, are changing as the market adjusts to declining demand and the sale of facilities to other companies. DLG has expanded its markets into neighboring Federal Republic of Germany as national boundaries become irrelevant in the fertilizer market.

The Danish fertilizer market is becoming increasingly more constrained by the Government as environmental awareness

increases. The animal fertilizer business is presently regulated as to the amount of manure per hectare, and the nitrogen consumption is expected to be restricted to one-half the present use of 500,000 mt/yr by 1991–92. Phosphate fertilizers are also under examination, and future DLG market strategies are going to be influenced by the environmental questions and resultant Government policies.

Mineral Fuels

Coal.—Denmark has depended entirely on imported solid fuels for its electrical energy and is one of Europe's significant steam coal importers. The two main purchasing entities, Elsam and Elkraft, combined for approximately 10 millon tons per year of coal imports. Elkraft imported 5.14 million tons in 1989, of which 1 million tons of low-sulfur U.S. coal was purchased as part of a 4-million-ton low-sulfur commitment by the company. Other coal suppliers were Canada, Colombia, Poland, and the U.S.S.R. Some of the Canadian coal was from the Province of Nova Scotia and was shipped in self-discharging vessels, making the offloading process more economical. Elsam purchased 5.5 million tons in 1988, with Colombia and the United States as the main sources. Elsam operated five 10,000-deadweight-ton barges to offload the ships and to transport the coal to inland users. Greater electrical supply competition from other sources, especially hydroelectric, was the result of the mild winter and high precipitation in Scandinavia. The result was the access to cheap imported power from other countries.

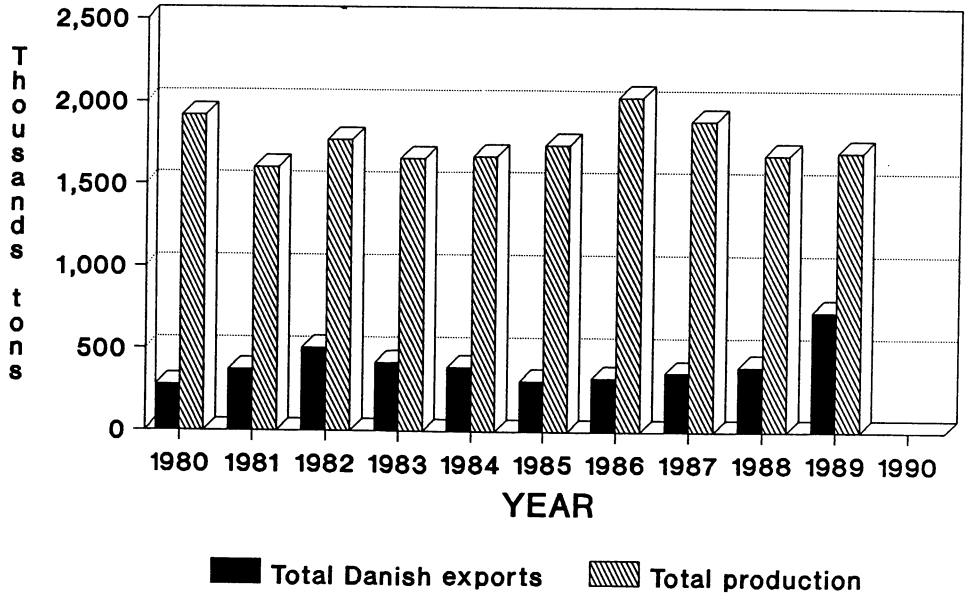
Natural Gas.—The third licensing round was held for tracts in the Danish North Sea. The tracts applied for were in the central graben area, where all discoveries have been made to date; in "linkage" areas; and in other offshore and onshore areas. Several Danish companies, Government and private, were participants in the application proceedings. The Government-owned Danish Oil and Gas Production Co. (DOPAS) was to participate in each consortium with a share of 10%, unless the area was in the central graben area; then DOPAS was to receive a 20% interest. Furthermore, the participation interest was fully carried unless the Danish Operator Co. (DANOP) is selected operator.

A large new gas contract was signed between the Dansk Undergrunds Consortium (DUC) and Dansk Naturgas, the state-owned natural gas company. The 20-year agreement will allow greater flexibility in the supply of gas from the Danish North Sea. The delivery of 38 trillion cubic meters of gas was to be built up from 2.5 billion cubic meters per year to 4.7 billion cubic meters per year and was valued at $2.5 to $3.9 billion dollars. This agreement will facilitate the development of Harold Field, formerly Lulu and West Lulu, and other fields offshore, which would meet domestic demands and allow for the export of gas to Sweden and the Federal Republic of Germany. A result of this agreement was the commitment to lay a pipeline that would permit the development of smaller fields, such as Krala and Valdemar, with reserves of 8 billion cubic meters of natural gas. (See map.)

Petroleum.—The planned extension of the oil pipeline to the Gert structure would allow the 120-million-barrel field to be developed. The Danish portion of the field straddling the boundary with the Norwegian offshore area was thought to contain approximately 50 million barrels of oil. The reserves are estimated at 860,000 barrels of oil and 122 billion cubic meters of natural gas, third among the Western European countries in oil

FIGURE 2

DENMARK: CEMENT INDUSTRY PRODUCTION AND EXPORTS



Source: US Bureau of Mines

reserves and sixth in gas reserves. In 1989, Danish production was 95,500 barrels of oil per day. DUC's operation consists of A.P. Moller (operator), 39%; Shell Olie og Gasundvinding Danmark BV, 46%; and Texaco A/S, 15%.

INFRASTRUCTURE

The main ports are Copenhagen, Århus, Åalborg, Esbjerg, and Fredericia. Coastal shipping, airports, roads, and railroads are well developed in Denmark. The Government has initiated a new transportation system called the Great Belt under the Eastern Channel that will improve the transportation system of the country. The first section is an 18-kilometer bridge and tunnel project to connect the Island of Zealand and the Jutland peninsula. The $3 billion project was to be completed in 1996, with the road system finished 3 years after the rail link. This first phase is part of a larger 60-kilometer project to connect Copenhagen, the capital of Denmark, and Malmo, Sweden, with the rest of Europe.

OUTLOOK

Denmark is one of the most environmentally sensitive countries in the world. Mineral resource companies will be required to meet cleaner and more stringent environmental codes. Because of their cultural compatibility, Sweden and Norwegian companies, looking for market access to the EC, will continue to focus on the Danish market for investment. The country may be forced by economic pressures to reform some Government policies to remain competitive in the EC Single Market of 1992.

[1]Where necessary, values have been converted from Danish krone (DKr) to U.S. dollars at the rate of DKr6.73 = US$1.00, the average for 1989.

OTHER SOURCES OF INFORMATION

Agencies

Danmarks Geologiske Undersøgelse (The Geological Survey of Denmark)
Thoravej 31
DK-2400 København, NV

Grønlandds Geologiske Undersøgelse, (Geological Survey of Greenland)
Øster Voldgade 10
DK-1350 København, NV

Ministry of Economic Affairs
Slotsholmsgape #12
DK-1216 København, NV

Ministry of Environment
Slotsholmsgape #12
DK-1216, København, NV

Ministry of Energy
Slotsholmsgape #1
DK-1216, København, NV

Publications

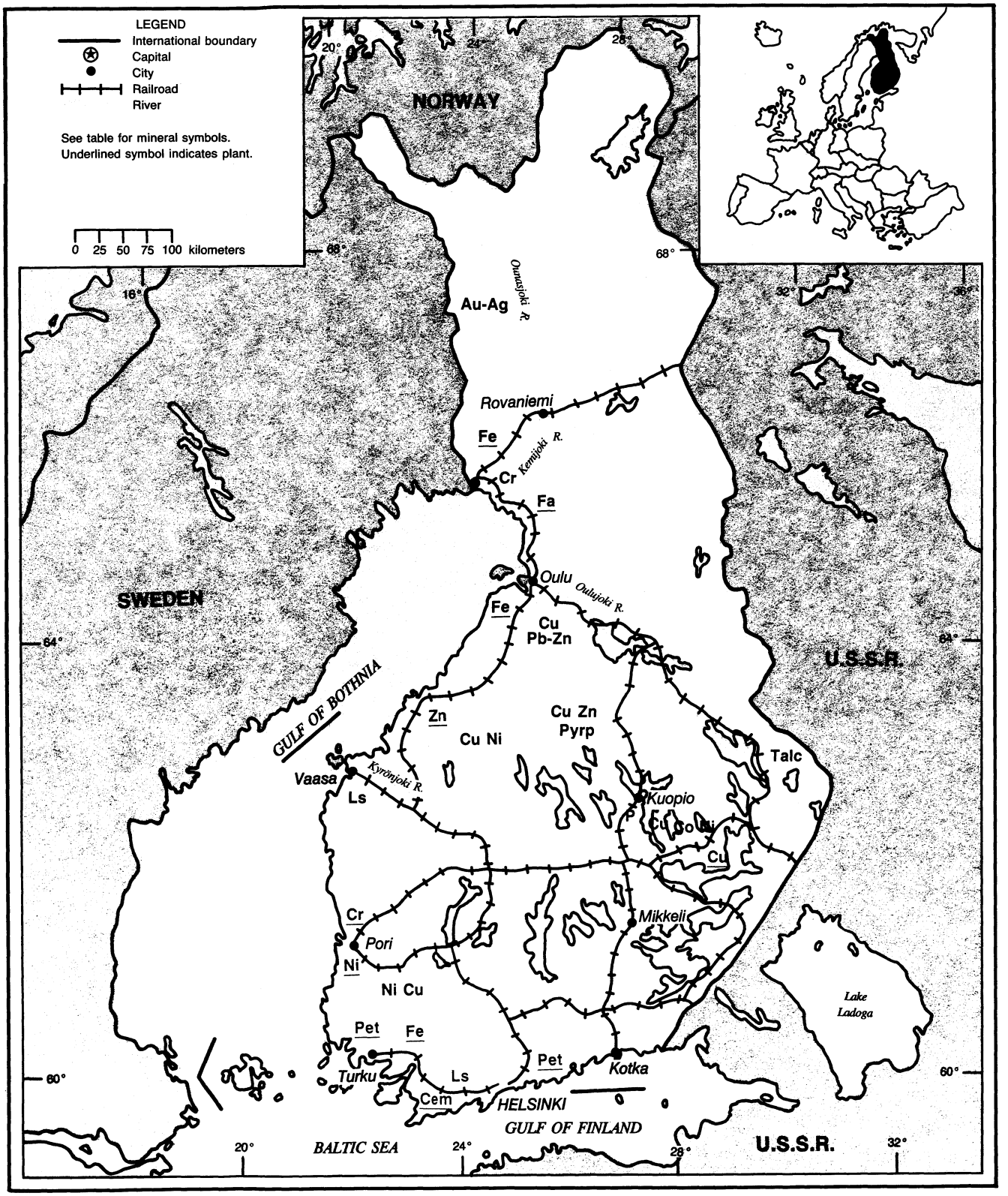
Varestatistik for Industri (Manufacturers Sales of Commodities), Office of Publications of Danish Statistics; published quarterly.

Statistisk Årbog (Statistical Yearbook).

Det Danske Stålvalseværk, Faxe Kalk, Kryolitselskabet øresund, FLS Industries, Skamol; annual reports.

FINLAND

AREA 337,000 km² **POPULATION 4.9 million**



THE MINERAL INDUSTRY OF

FINLAND

By Harold R. Newman

The Finnish mineral industry dates back more than 400 years. At that time, the country was one of Europe's major iron producers. Finnish mines today are, by international standards, small- to medium-size operations. The local mining industry must make do with the limited mineral resources available. The deposits mined are usually small in size and relatively low graded. Most of the mines that are now operating were started about 25 years ago. With the reduction of available raw materials, Finland has become more dependent on imported ores. The mining industry is only able to furnish 50% to 60% of domestic requirements for the metallurgical industry. Energy costs are another concern because almost all mineral fuels must be imported.

The Finnish economy, with a real 5% gross national product gain in 1989, had about the same growth as the previous year. Production was considered at full capacity, and the unemployment rate, at 3.5%, was the lowest in 15 years. The main potential problems for the economy were accelerating price increases, a deepening current account deficit, and weakening competitiveness of manufactures. The Consumer Price Index (CPI) rose at an annual rate of 6.6% in 1989.

GOVERNMENT POLICIES AND PROGRAMS

The Government has a long history of involvement with the mineral industry. Two state-owned companies, Outokumpu Oy and Kemira Oy, dominate the industry. In addition, the State Geologic Research Institute and the National Mineral Laboratory and Test Factory of the State Technological Research Center, together with the Finnish Government, are active in research and mineral exploitation in Finland and in foreign countries. The Government takes an active role in securing mineral requirements for its industry and is also active in promoting and assisting in the export of its highly developed mineral technology and mining equipment.

PRODUCTION

Output of metallic ores generally declined from the previous year. This trend was expected to continue with further shrinkage in 1990. Iron ore concentrates were not produced in 1989. Two metal mines closed, and two new mines started operations in 1989. At yearend, there were 48 mines in operation of which 11 were metal mines, 30 produced industrial minerals, and 7 produced rock aggregate.

TABLE 1

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
METALS						
Aluminum metal, secondary		21,000	22,200	25,700	29,900	27,989
Cadmium metal, refined		565	523	687	703	612
Chromium: Chromite:						
Gross weight:						
Lump ore[e]	thousand tons	327	450	338	450	353
Concentrate	do.	167	203	192	235	140
Foundry sand[e]	do.	12	15	13	15	5
Total	do.	506	r668	543	700	498
Cr_2O_3 content:						
Lump ore[e]	do.	88	95	91	95	92
Concentrate	do.	67	e75	e77	85	65
Foundry sand[e]	do.	6	5	6	10	5
Total	do.	161	e175	e174	190	162
Cobalt:						
Mine output, Co content		r720	627	190	(2)	—
Metal, refined, and salts		r1,427	1,348	r980	1,132	1,295

See footnotes at end of table.

TABLE 1—Continued

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
METALS—Continued						
Copper:						
Mine output, Cu content		27,897	25,987	20,398	20,200	14,459
Metal:						
Smelter		68,900	84,460	77,400	79,000	79,470
Refined		58,766	64,235	59,500	53,900	55,689
Gold metal	kilograms	595	1,172	e1,800	2,035	2,491
Iron and steel:						
Iron ore, marketable, all types:[3]						
Gross weight	thousand tons	1,122	973	896	e556	—
Fe content	do.	738	635	588	345	—
Metal:						
Pig iron	do.	r1,901	1,978	2,063	2,174	2,284
Ferroalloys, ferrochromium	do.	133	134	143	156	169
Steel, crude	do.	2,518	2,586	2,669	2,798	2,921
Semimanufactures, rolled	do.	2,063	1,997	2,025	2,300	2,452
Lead:						
Mine output, Pb content		2,422	1,980	e2,400	1,900	2,567
Refined, secondary		4,600	1,200	e1,200	e2,000	2,000
Mercury		125	146	144	131	159
Nickel:						
Mine output, Ni content		8,547	11,886	10,557	e11,699	10,480
Metal, electrolytic		15,656	17,791	15,392	15,721	13,355
Platinum-group metals:						
Palladium	kilograms	35	96	89	106	100
Platinum	do.	35	120	e120	54	60
Selenium metal	do.	14,038	5,693	23,638	25,073	27,969
Silver metal	do.	31,041	37,106	44,198	31,411	31,127
Vanadium: Mine output, V_2O_5 content		3,805	—	—	—	—
Zinc:						
Mine output, Zn content		60,606	60,351	55,100	63,900	58,430
Metal		160,377	155,397	r151,467	156,076	162,508
INDUSTRIAL MINERALS						
Barite		8,690	6,969	11,000	10,993	1,614
Cement, hydraulic	thousand tons	1,608	1,422	1,426	1,504	1,596
Feldspar		52,940	47,049	r51,632	56,200	54,581
Mica, flake[e]		—	—	5,000	5,000	5,000
Lime	thousand tons	252	261	271	260	224
Nitrogen: N content of ammonia		65,100	66,800	r70,000	42,630	41,600
Phosphate rock, apatite concentrate:						
Gross weight	thousand tons	512	527	553	584	580
P_2O_5 content	do.	178	185	195	215	211
Pyrite, gross weight	do.	493	547	621	615	730
Sodium sulfate[e]	do.	35	35	35	35	33

See footnotes at end of table.

TABLE 1—Continued

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
INDUSTRIAL MINERALS—Continued						
Stone, crushed:						
Limestone and dolomite:						
For cement manufacture	thousand tons	2,217	1,968	2,054	2,150	2,107
For agriculture	do.	1,453	1,108	1,203	1,072	1,188
For lime manufacture	do.	357	381	328	418	464
Fine powders	do.	313	330	397	455	579
Metallurgical	do.	26	13	[e]12	123	25
Total	do.	4,366	3,800	3,994	4,218	4,363
Quartz silica sand	do.	223	232	233	272	282
Sulfur:						
S content of pyrite	do.	248	276	313	300	938
Byproduct:						
Of metallurgy	do.	257	260	[e]230	240	230
Of petroleum	do.	[e]45	42	[e]40	47	41
Total	do.	550	578	[e]583	587	1,209
Sulfuric acid	do.	1,462	1,359	1,160	1,095	1,392
Talc	do.	319	284	[r]324	379	398
Titania concentrate: Ilmenite:						
Gross weight	do.	53	—	—	—	—
TiO_2 content	do.	24	—	—	—	—
Wollastonite		16,917	16,795	[r]16,000	26,000	31,400
MINERALS FUELS AND RELATED MATERIALS						
Peat:						
For fuel use[e]	thousand tons	[4]3,140	3,600	2,100	[r]3,200	3,200
For agriculture and other uses[e]	do.	[4]346	400	350	350	350
Petroleum refinery products	thousand 42-gallon barrels	72,500	65,300	73,400	72,000	74,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 1, 1990.
[2]Revised to zero.
[3]Includes approximately 30% of unused roasted pyrite (purple ore) from the Kokkola Works.
[4]Reported figure.

TRADE

Finland is an active member of the European Free Trade Association (EFTA). The Government was also engaged in negotiations with the European Community (EC) to create the European Economic Space (EES), which would allow Finland and some other European countries who are not members of the EC to trade within the EC with minimum restrictions. Finnish policymakers are acutely aware of the necessity to remain competitive when the 1992 EC single market becomes operational. Lack of export strength is a significant problem that the Government faced. After a real gain of 3.2% in 1988, Finnish exports showed no overall change in 1989. There was a 2% growth rate and an 18% price increase in the base-metals sector because world prices recovered strongly. Also, strong investment activity in European countries caused exports of metal manufactures and engineering industry products to rise by 3% in volume and 9% in value. The trade surplus of $1 billion[1] in 1986 had been reversed to a trade deficit of $1.3 billion in 1989.

Raw materials imported for the purposes of metallurgical processing and the share of imports in total requirements were as follows: iron ore concentrate, 100%; zinc concentrate, 55%; copper concentrate, 55%; and nickel matte and concentrate, 50%.

STRUCTURE OF THE MINERAL INDUSTRY

The major segment of Finland's mineral industry is Government owned. Two state-owned companies, Outokumpu Oy and Kemira Oy, dominated the mineral industry and produced almost one-half of

the ore extracted in Finland. Outokumpu is the country's largest mining and metallurgical company. Because of the decreasing availability of raw materials domestically, Outokumpu increased its investment abroad. It has 80 subsidiaries in more than 20 countries, and almost 90% of its sales were outside of Finland. About one-third of the company's sales are copper-related with the remaining consisting of steel, other metals, and engineering services. Other base-metal producers are: Rautaruukki Oy, which produces steel plate, welded steel tubes and beams; Ovako Steel AB, which produces long steel products; and Dalsbruk AB, whose line of production ranges from billets to rolled products and to special products.

Kemira, specializing in fertilizers and agriculture chemicals, is the largest chemical enterprise in Finland and one of the largest fertilizer producers in Europe. The company has also increased its foreign activities and now operates in 18 countries. Kemira's main exports were fertilizers, titanium dioxide, and viscose fibers. Another state-owned enterprise is Neste Oy, which operates Finland's petroleum refineries.

Two private companies, Oy Lohja AB and Oy Partek AB, are the major producers of industrial minerals.

Overall, there were about 65,000 persons employed in the mining and metal processing industry in Finland. Of these, about 860 are employed in mining and quarrying.

COMMODITY REVIEW

Metals

Chromium.—Outokumpu's Kemi Mine is Scandinavia's only chromite mine. The

TABLE 2

FINLAND: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Ammonia	Kemira Oy (Government)	Plant at Oulu	150
Cement	Oy Partek AB	Lappeenranta, Kolari, and Pargas.	1,400
Do.	Oy Lohja AB	Virkkala	1,000
Chromite	Outokumpu Oy (Government)	Mine at Kemi	420
Cobalt, metal	do.	Smelter at Kokkola	1
Copper, concentrate	do.	Mines at Hitura, Enonkoski, Polyhasalmi, Vammala, and Telkkala	86
Copper, metal	do.	Smelter at Harjavalta	75
Do.	do.	Refinery at Pori	60
Feldspar	Oy Lohja AB	Mine and plant at Kemio and Lohja	180
Ferrochrome	Outokumpu Oy	Smelter at Tornio	200
Gold	do.	Mine at Saattopra	[1]1,200
Do.	do.	Smelter at Pori	[1]1,350
Lead, concentrate	do.	Mine at Vihanti	5
Limestone	Oy Partek AB	Mines at Parainen, Kolari, Lappeenranta	1,500
Do.	Oy Lohja AB	Mines at Frejdbole, Karjaa, Sipoo	1,200
Mercury	Outokumpu Oy	Smelter at Kokkola	[1]76,000
Nickel, concentrate	do.	Mines at Hitura, Enonkoski, Telkkala, Vammala	150
Nickel, metal	do.	Smelter at Harjavalta	15
Petroleum, refined	Neste Oy (Government)	Refineries at Porvoo and Naantali	9,000
Phosphate, apatite	Kemira Oy (Government)	Mine at Siilinjärva	600
Selenium	Outokumpu Oy	Smelter at Pori	[1]20,000
Silver	do.	do.	[1]47,000
Steel	Rautaruuki Oy (Government)	Plants at Raahe and Hameenlinna	2,000
Do.	Oy Ovako AB	Plant at Imatra	600
Do.	Oy Dalsbruck AB	Plants at Dalsbruck, Kovenhar, and Aminnefors	850
Do.	Outokumpu Oy	Stainless steel plant at Tornio	100
Talc	Oy Lohja AB	Mine at Polvijärvi, Plant at Vuonos	150
Titanium dioxide	Kemira Oy	Plant at Pori	80
Do.	Oy Partek AB	Mine at Polvijärvi, Plant at Luikonlahti	100
Wollastonite	do.	Mine and plant at Lappeenranta	40
Zinc, concentrate	Outokumpu Oy	Mines at Vihanti, and Pyhäsalmi	150
Zinc, metal	do.	Smelter at Kokkola	160

[1]Kilograms per year.

mine, on the north coast of the Gulf of Bothnia, is one of the world's major chromite mines and has estimated reserves of 150 million tons. The Kemi deposits consist of chromite seams associated with a layered ultrabasic sill-like intrusion between a pegmatite granite massif and a large schist area. About one-third of the reserves can be extracted by open pit mining, the current mining method. The average content of the ore was reported to be 26% chromium trioxide (Cr_2O_3) with a reported chromium-iron (Cr-Fe) ratio of 1.55:1. A large portion of the Kemi Mine's output is used for the domestic production of charge-grade ferrochrome containing 52% chromium and 7% carbon.

Outokumpu started up a new fine-grained chromite sintering and pelletizing plant at the Tornio Works. The process is based on the Swedish LKAB steel belt sintering process for which a license was acquired by Outokumpu. The plant, built at Tornio, was the first application of a process of this kind to be used on chromite. The new sintering plant will double the pellet capacity from the current 150,000 tons per year to 300,000 tons per year and increase ferrochrome production by 25% to 200,000 tons per year. Almost all the ferrochrome produced is used at Outokumpu's stainless steel plant, which is also at Tornio.

Copper.—Outokumpu's oldest operation, the Keretti Mine, closed at midyear. The mine had been in production for almost 80 years. During that period, the amount of ore hoisted was 28.4 million tons from which 952,300 tons of copper, 246,000 tons of zinc, 63,300 tons of cobalt, 18,400 kilograms (kg) of gold and 241,900 kg of silver were extracted. The production of copper concentrates declined significantly, and the trend was expected to continue because no new mine development is scheduled in the future.

As a result of the limited availability of copper concentrates domestically, Outokumpu is expanding its foreign operations to ensure its metallurgical requirements are met. The company bid $25 million for the Zalvidar copper deposit in Chile. If the tender is accepted for the deposit, which contains an estimated 60 million tons of ore grading 1.6% copper, it would be developed by Outokumpu Resources Chile Ltda. Zalvida is a polymetallic deposit 5 kilometers (km) from the large Escondida copper deposit.

Outokumpu continues to export its technology. The company signed an agreement to build a copper electrolytic plant for the Philippine Associated Smelting and Refining Corp. on the island of Leyte. Outokumpu will also construct a mill to process copper oxide ore in northern Chile for Carolina de Michilla for a 15% stake in the mine-mill project.

Gold.—Outokumpu's Saattopora Mine, the company's first gold mine, is an open pit operation at Kittila in Finnish Lapland. The mine started operations in January 1989. Saattoporo is the second primary gold mine in Finland's history. The first mine was a short-lived venture that closed in the 1950's. Saattoporo's ore reserves were estimated to be 700,000 tons with an average estimated grade of 3.6 grams of gold per ton and 0.3% copper. The mining plan called for the mining of 308,000 tons of ore in 1989 increasing to 372,000 tons in 1990. This was expected to produce 998 kg and 1,205 kg of gold, respectively. The ore and waste were being excavated by a Finnish contractor, E. Hartikainen Oy. The ore was trucked 55 km to the Rautuvara concentrator, which was purchased in 1989 by Outokumpu from Rauturukki Oy. Exploration is continuing in areas around Saattopora because the current ore body has only 2 years of estimated reserves.

Iron and Steel.—There was no iron ore produced in Finland in 1989. Outukumpu reorganized its stainless steel segment, which will be known as Outokumpu Steel Oy. This independent corporation is composed of three sectors for the production of chrome, ferrochrome, and stainless steel and will be called Outokumpu Chrome Oy, Outokumpu Polarit Oy, and Oy JARO Ab, respectively.

The company is constructing three lines for annealing, cutting, and pickling at its stainless steel plant in Tornio. This project was estimated to cost $68 million and is scheduled for startup at the end of 1991. Also, Outokumpu invested $23 million in a sintering plant at its ferrochrome operation.

Rautaruukki Oy spent more than $100 million in 1989 on modernization and automation of its Raahe steelworks. The improvements were part of the company's plans to enable the steelworks to produce at its maximum capacity of 2 million tons per year. Production in 1989 was 1.9 million tons. Rautaruukki continued to expand its tube and pipe division. The company purchased Swedish tubemaker Wirsbo Bruks AB in late 1989 and was negotiating with Schmacke GmbH, a Federal Republic of Germany pipemaker, and Structo DOM Europe AB, a Swedish tubemaker, for the purchase of their respective facilities. Rautaruukki had nine mills in its tube and pipe division at yearend.

Nickel.—Production declined in 1989 as a result of an explosion at Outokumpu's Harjavalta nickel smelter. The facility resumed its normal production of 50 tons per day of nickel cathode after repairs were completed on the oxygen plant in mid-1989.

Outokumpu will form a joint venture with Australian Consolidated Minerals (ACM) to develop ACM's Mt. Keith nickel deposit in Western Australia. The deposit was estimated to contain 100 million tons of proven reserves of pentlandite ore averaging 0.63% nickel. The nickel concentrate produced from the open pit mine at Mt. Keith will be shipped to Outokumpu's facilities in Kokkola, Finland, where new facilities will be built to process the materials into ferronickel. The operation was expected to produce 20,000 tons per year of nickel in ferronickel form. The estimated cost of the project was $300 million and is scheduled to be operational in 3 years.

Outokumpu also initiated talks with the U.S.S.R. about a joint venture to develop a nickel mine on the Kola Peninsula. The mine site is about 80 km from Pechenga. The company was interested in a countertrade agreement whereby it would provide investment and technology to start the underground mine in return for payment in nickel and apatite ore to be processed at its nickel plant at Harjavalta.

Other Metals.—Exploration for nonferrous minerals— particularly copper, lead, zinc, and precious metals, mainly gold and platinum-group metals—was ongoing in 1989 by the Geological Survey of Finland and others. There was no exploration for iron ore deposits reported in 1989.

Industrial Minerals

The Geologic Survey of Finland reported its preliminary study of the Virtasalmi kaolin (china clay) deposit completed. According to the Survey's estimate, the deposit contained between

10 and 20 million tons of kaolin. Further studies were to be made on other sites in the area.

Exploration activities for other industrial minerals were mainly focused on limestone, soapstone, and wollastonite.

Mineral Fuels

Finland has one of the world's highest per capita energy consumption levels owing to its harsh climate and industrial structure. In 1989, total energy consumption increased almost 1% from the previous year to 29.9 million tons of oil equivalent (Mtoe).

Finland is totally dependent on imports of fossil fuels. About 42% of electricity production is generated by hydropower. Wood and wood-based fuel account for 15% of energy consumption. There are currently four operating nuclear reactors with a total capacity of 2,160 megawatts (MW). Consumption of oil as a primary energy source fell from 9.5 Mtoe to 9.3 Mtoe in 1989. Consumption of natural gas increased from 1.4 Mtoe to 1.9 Mtoe. Six new natural gas powerplants with a total capacity of 250 MW were completed in 1989. The U.S.S.R. is the main source of crude oil and oil products. All natural gas is imported from the U.S.S.R. and is fed into a 700-km long Finnish pipeline network from a compressor station north of Leningrad.

Neste Oy, 97.7% state owned, is the only refining company in Finland. It has two refineries in southern Finland with a total capacity of about 10 million tons of oil products per year. Neste is also involved in international oil exploration in the North Sea area where it has operated on a small scale since 1972. This region is very important to the company's activities.

Reserves

Neste has a 20% stake in a group of companies, which include Sun Oil of the United States, Gulf Canada, Idemitsu of Japan, and Cairn Energy Ltd. of the United Kingdom. The group was granted permission to explore for oil in the United Kingdom part of the North Sea in an area the group considered to be very promising. Neste is also involved in exploration efforts in Algeria, the United Arab Emirates, and the United States. The company's objective is to have one-third of its present oil needs or about 3 million tons annually covered by production from its own reserves by the end of the century.

INFRASTRUCTURE

There is an adequate railroad and road system. Finnish State Railways (VR) operates a total of 5,863 km of 1.524-meter gauge railroad, of which 480 km is multiple track and 1,445 km is electrified. There are about 103,000 km of roads, of which 35,000 km is paved. Including the Saimaa Canal, there is about 6,675 km of inland waterways of which 3,700 km is suitable for steamers.

OUTLOOK

Because Finland is dependent on maintaining export competitiveness and committed to increasing the value-added component of processing both domestic and imported raw materials, high standards of technology will be maintained.

Dwindling domestic reserves have forced the Finnish mining industry to look abroad and to develop new, more efficient production methods to remain competitive. This trend is expected to continue.

The Geologic Survey of Finland has an active data collecting program through mapping and resource-related studies and offers technical assistance. The Helsinki University of Technology has an active mineral resource research program. This should continue to be a significant benefit and encouragement to individuals and companies engaged in mineral resource activities.

TABLE 3

RESERVES OF MAJOR MINERALS

Commodity	Amount[e]
Chromium	38 million tons.
Cobalt	18,000 tons.
Gold	2,500 kilograms.
Nickel	40,000 tons.
Peat	350 million tons.
Phosphate rock	110 million tons.

[e]Estimated.

[1]Where necessary, values have been converted from Finnmarks (FIM) to U.S. dollars at the rate of FIM4.295 = US$1.00, the average value for 1989.

OTHER SOURCES OF INFORMATION

Agencies

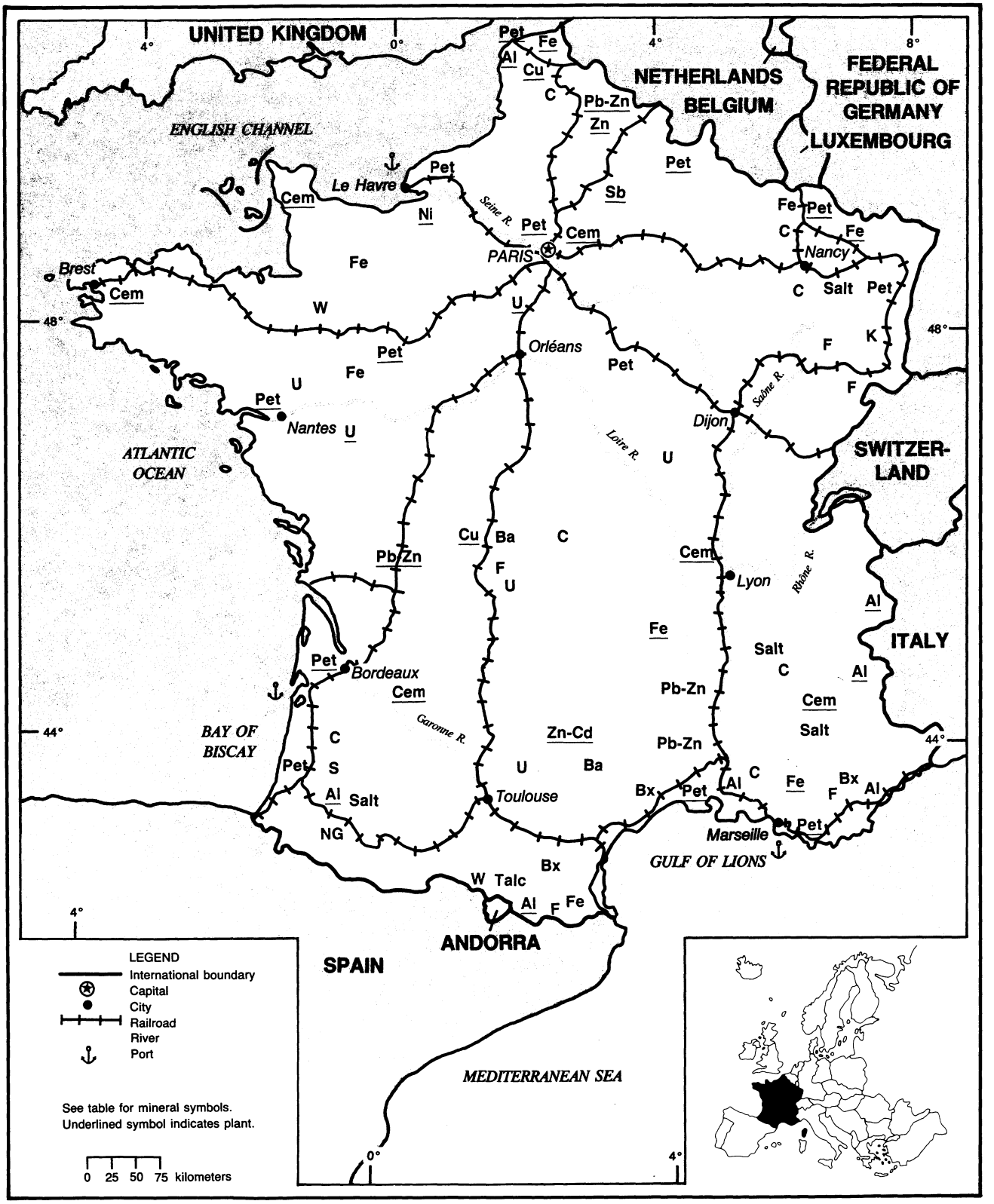
Central Statistical Office of Finland
SF-00101
Helsinki, Finland
Geologic Survey of Finland
SF-02150
Espoo, Finland
Helsinki University of Technology
Laboratory of Rock Engineering
SF-02150
Espoo, Finland
Ministry of Commerce and Industry
SF-00101
Helsinki, Finland

Publications

Bulletin of Statistics, Central Statistics Office, Company annual reports.
Finnish Mining Journal, Oulu.
Statistical Yearbook of Finland, Central Statistics Office.

FRANCE

AREA 552,000 km² **POPULATION 56 million**



THE MINERAL INDUSTRY OF

FRANCE

By Donald E. Buck, Jr.

France is one of the major European mineral producers. The traditional mineral industries in France have been in a state of transition over the past several years. The changing economic conditions in Europe have necessitated the rationalization of many traditionally strong French mineral industries, such as, coal, iron ore, steel, and uranium. Some industries have also had to adjust to a change in the state's economic policies. Cessation of large Government subsidies supporting uneconomic mineral operations and the depletion of resources, after years of intensive exploitation, have had a profound effect on a number of extraction operations in the French mineral industry. These changes have important implications for the future of France and the European Community (EC).

GOVERNMENT POLICIES AND PROGRAMS

The French Government has initiated policies to reduce the budget deficit, which has affected the mineral industry. At the same time, other economic policies are driven by the desire to reduce unemployment and improve French competitiveness, particularly as the advent of the single European market draws near. Efforts have been made to promote the private sector and to reduce the dependence of state-owned companies on subsidies. Some exchange controls have been eliminated and value added taxes have been reduced to bring these taxes in line with the EC norms. Many Government-controlled industries have made significant strides in preparing themselves for the impact of EC 1992.

PRODUCTION

The French mineral and metal industries reported good results for 1989. Several industries, such as bauxite, coal, iron ore, and uranium industries, have steadily undergone changes. The coal and iron ore industries were affected by cheaper foreign sources and the depletion of domestic resources. As a result, the Government was reducing the subsidies to these industries and closing high-cost or inefficient operations. Similarly, bauxite deposits were being depleted, and domestic companies were facing increasing foreign competition.

The uranium industry, which had been successful, had to reduce its operations by closing a number of mines and processing plants. This was because the electrical industry had built an excess of generating capacity and the export market for uranium had decreased. Another factor in the drop of uranium demand was the plummeting price for petroleum and the increased accessibility of natural gas from the North Sea and the U.S.S.R. Lower petroleum prices meant that fewer new plants were under construction and some nuclear plants were being closed.

TRADE

The trade deficit widened for France as the demand for imported goods increased, including mineral raw materials. Trade relations between the United States and France were excellent; bilateral trade totaled more than $25 billion. U.S. exports to France continued to increase, but at a slower rate than in the previous year. U.S. imports from France also increased at a slower rate, resulting in a trade deficit of $1.4 billion, down from the previous year's $2.6 billion. The trade of minerals and ores between the two countries was small.

TABLE 1

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	1,530	1,379	1,272	878	[3]660
Alumina:						
Crude	do.	734	884	866	720	[3]720
Calcined	do.	624	740	712	551	540

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Aluminum—Continued						
Metal:						
Primary	thousand tons	293	322	323	327	[3]335
Secondary	do.	170	173	196	211	215
Antimony: Metal, including regulus		7,333	6,822	7,100	6,093	[3]6,910
Arsenic, white[e]		8,000	10,000	10,000	10,000	10,000
Cadmium metal		337	431	400	355	[3]170
Cobalt metal including powder		123	[e]100	110	—	—
Copper:						
Mine output, Cu content		253	294	300	246	[3]300
Metal:						
Blister, secondary		7,000	6,100	7,000	8,500	10,000
Refined:						
Primary		23,500	[r]17,900	11,323	7,239	[3]16,300
Secondary[e]		20,200	[r]24,000	[r]28,000	[r]36,000	33,000
Total		43,700	[r]41,900	39,323	43,239	[3]49,300
Gold, mine output, Au content	kilograms	2,127	2,382	2,225	2,525	[3]2,600
Iron and steel:						
Iron ore and concentrates:						
Gross weight	thousand tons	14,681	12,436	10,852	9,983	[3]9,368
Fe content	do.	4,700	3,861	3,255	2,994	2,810
Metal:						
Pig iron	do.	15,426	13,708	13,267	14,800	[3]15,082
Ferroalloys:						
Blast furnace: Spiegeleisen and ferromanganese	do.	331	274	[e]296	300	[3]325
Electric furnace:						
Ferrochrome	thousand tons	[e]20	[e]1	1	18	18
Ferromanganese	do.	[e]35	22	23	27	27
Ferrosilicon	do.	[e]205	196	154	131	130
Silicon metal	do.	[e]70	[e]75	70	75	75
Other	do.	[e]120	77	59	59	79
Total	do.	781	[e]645	[re]603	610	654
Steel ingots and castings	do.	18,832	17,624	17,726	19,003	19,000
Semimanufactures	do.	17,234	15,343	[e]15,000	16,000	16,000
Lead:						
Mine output, Pb content		1,600	2,478	2,213	1,966	[3]1,100
Smelter:						
Primary		133,600	132,000	138,795	146,500	147,000
Secondary[e]		[3]12,200	12,500	12,000	15,000	20,000
Total		145,800	144,500	150,795	[e]161,500	167,000
Refined:						
Primary: Soft lead		133,600	132,000	138,795	146,511	147,000
Secondary:						
Soft lead		25,525	27,300	32,700	37,400	41,000
Lead content of antimonial lead		64,512	71,100	74,370	71,791	72,000
Total		223,637	230,400	245,865	255,702	260,000
Magnesium metal including secondary		13,800	13,376	13,600	13,800	[3]14,600
Nickel, metal		7,020	8,241	6,680	9,200	9,000
Silver:						
Mine output, Ag content:						
Lead and zinc concentrates	kilograms	21,492	21,057	21,150	24,074	[3]24,000

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Silver—Continued						
Mine output, Ag content—Continued						
Mixed copper, gold, silver concentrates	kilograms	4,915	4,821	4,665	6,220	5,000
Total	do.	26,407	25,878	25,815	30,294	29,000
Metal, Ag content of final smelter products	do.	25,856	[e]26,000	24,200	24,882	25,000
Tin, smelter output of solder and other alloys, secondary		3,074	2,912	2,532	2,635	2,600
Tungsten concentrate, W content		735	982	—	—	—
Uranium:						
Mine output, U content		3,752	3,737	3,321	3,385	3,100
Chemical concentrate, U_3O_8 equivalent		3,940	4,106	3,740	3,669	3,200
Zinc:						
Mine output, Zn content		40,572	39,534	31,339	30,900	25,000
Metal including secondary:						
Slab		285,600	289,500	249,340	274,000	[3]266,000
Dust[e]		[3]8,200	8,000	9,000	9,000	9,000
INDUSTRIAL MINERALS						
Barite		120,800	116,400	104,050	[e]100,000	100,000
Bromine, elemental[e]		20,000	19,000	20,000	20,000	18,000
Cement, hydraulic	thousand tons	22,219	22,596	23,560	25,300	25,000
Clays:						
Bentonite[e 4]		[3]14,900	10,000	10,000	10,000	10,000
Kaolin and kaolinitic clay (marketable)	thousand tons	1,510	1,350	[e]1,400	[e]1,400	1,400
Refractory clay, unspecified[e]	do.	[3]486	500	500	500	500
Diamonds, synthetic industrial	thousand carats	—	—	—	4,000	4,000
Diatomite	thousand tons	270	269	[r e]250	[r e]250	250
Feldspar, crude	do.	172	216	274	322	300
Fluorspar:						
Crude	thousand tons	562	497	374	313	300
Marketable:						
Acid and ceramic-grade	do.	160	148	134	133	133
Metallurgical-grade	do.	64	50	[e]50	50	50
Total	do.	224	198	184	183	183
Gypsum and anhydrite, crude	do.	5,286	5,259	5,409	5,628	5,400
Kyanite, andalusite, related materials	do.	57	51	50	[e]50	50
Lime: Quicklime, hydrated lime, dead-burned dolomite	do.	3,100	2,900	[e]3,000	3,089	3,000
Mica		10,084	10,834	[e]11,000	[e]11,000	11,000
Nitrogen: N content of ammonia[e]	thousand tons	[3]2,010	2,000	2,100	2,100	1,630
Pigments, mineral, natural: Iron oxides[e]		14,500	15,000	15,000	15,000	15,000
Phosphates: Thomas slag	thousand tons	1,165	855	768	555	500
Potash:						
Gross weight (run-of-mine)	do.	12,021	11,600	10,716	10,392	10,400
K_2O equivalent (run-of-mine)	do.	1,882	1,748	1,500	[e]1,400	1,400
K_2O equivalent (marketable)	do.	1,750	1,620	1,485	[e]1,350	1,400
Pozzolan and lapilli	do.	496	410	420	[e]400	400
Salt:						
Rock salt	do.	369	386	1,476	1,145	1,000
Brine salt (refined)	do.	1,154	1,125	1,070	[e]1,100	1,100
Marine salt	do.	1,423	1,610	1,627	1,435	1,500
Salt in solution	do.	4,167	3,963	3,663	3,973	4,000
Total	do.	7,113	7,084	7,836	7,653	7,600
Sodium compounds:[e]						
Sodium sulfate	do.	125	110	120	120	120

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Sodium compounds:[e]						
Sodium carbonate	thousand tons	900	750	780	780	780
Stone, sand and gravel:						
Limestone, agricultural and industrial[e]	do.	[3]7,002	6,000	6,000	7,000	7,000
Slate, roof	do.	60	57	60	[e]60	60
Sand and gravel:						
Industrial sands, total	do.	5,512	5,332	7,472	[e]7,500	7,500
Other sand and gravel, alluvial	do.	17,300	186,800	193,000	208,000	210,000
Sulfur, byproduct:						
Of natural gas	do.	1,400	957	883	725	647
Of petroleum	do.	161	193	188	225	239
Of unspecified sources[e]	do.	162	156	150	150	150
Total	do.	1,723	1,306	1,221	1,100	1,036
Talc:						
Crude		316,595	324,660	269,000	280,000	280,000
Powder		310,897	314,965	[e]260,000	[e]270,000	270,000
MINERAL FUELS AND RELATED MATERIALS						
Asphaltic material		40,942	37,817	[e]40,000	40,000	40,000
Carbon black[e]		200,000	175,000	180,000	180,000	180,000
Coal, including briquets:						
Anthracite and bituminous coal	thousand tons	15,124	14,394	13,694	12,139	[3]11,471
Lignite	do.	1,839	2,142	2,061	2,344	[3]2,168
Total	do.	16,963	16,536	15,755	14,483	[3]13,639
Briquets	do.	1,408	1,176	1,071	804	825
Coke, metallurgical	do.	8,691	8,258	7,470	7,305	7,200
Gas, natural:						
Gross	million cubic meters	7,808	5,964	5,890	4,644	4,406
Marketed	do.	5,419	4,217	4,106	3,207	3,073
Natural gas liquids	thousand 42-gallon barrels	6,840	5,245	4,171	3,882	[3]3,983
Peat[e]	thousand tons	191	220	[e]200	200	200
Petroleum:						
Crude	thousand 42-gallon barrels	19,252	21,482	23,610	24,776	[3]23,639
Refinery products:						
Liquified petroleum gas	do.	30,334	27,326	28,835	24,000	[3]20,112
Gasoline, all kinds	do.	141,950	140,637	141,620	127,140	[3]129,515
Jet fuel	do.	34,176	33,886	32,850	30,600	30,000
Kerosene	do.	481	376	365	400	[3]372
Distillate fuel oil	do.	217,989	214,165	193,450	200,150	[3]208,768
Heavy fuel oil	do.	89,636	85,227	86,140	77,000	[3]76,732
Other products	do.	53,164	51,189	46,355	45,000	[3]40,041
Refinery fuel and losses	do.	35,261	30,935	27,740	28,000	[3]26,537
Total	do.	602,991	583,741	557,355	532,290	532,077

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

[1]Table includes data available through Sept. 23, 1990.

[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 being 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 stone, but statistics on output are not available.

[3]Reported figure.

[4]Includes smectic clay.

TABLE 2

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	28	27	—	Nigeria 18; Kuwait 3.
Alkaline-earth metals	701	687	43	West Germany 188; Japan 81; Yugoslavia 69.
Aluminum:				
Ore and concentrate	187,433	13,487	—	Yugoslavia 5,000; Morocco 4,016; Netherlands 2,577.
Oxides and hydroxides	195,269	319,763	5,504	Italy 69,554; Jordan 34,739; West Germany 20,089.
Ash and residue containing aluminum	15,457	14,658	—	Italy 7,807; West Germany 3,565; Spain 2,666.
Metal including alloys:				
Scrap	109,206	160,811	650	Italy 64,034; Belgium-Luxembourg 36,837; West Germany 35,904.
Unwrought	119,282	113,140	669	Italy 33,629; West Germany 26,669; Belgium-Luxembourg 19,434.
Semimanufactures	335,079	348,110	28,696	West Germany 98,380; United Kingdom 51,019; Italy 33,420.
Antimony:				
Ore and concentrate	58	144	—	Japan 119; Spain 25.
Oxides	6,020	5,508	752	West Germany 1,319; Netherlands 666.
Ash and residue containing antimony	1,685	2,545	1,872	Japan 597; United Kingdom 56.
Metal including alloys, all forms	624	158	—	Belgium-Luxembourg 77; Sweden 44; Japan 20.
Arsenic:				
Oxides and acids	45	NA		
Metal including alloys, all forms	NA	128	—	Brazil 34; West Germany 28; Italy 20.
Beryllium: Metal including alloys, all forms	(2)	3	2	Morocco 1.
Bismuth: Metal including alloys, all forms	40	73	—	United Kingdom 44; Netherlands 18.
Cadmium: Metal including alloys, all forms	316	544	—	Belgium-Luxembourg 305; Netherlands 162; West Germany 27.
Chromium:				
Ore and concentrate	1,368	3,113	—	Italy 1,697; Spain 793; Belgium-Luxembourg 391.
Oxides and hydroxides	377	133	—	West Germany 45; Iraq 15; Congo 10.
Metal including alloys, all forms	1,659	2,205	838	West Germany 825; Sweden 53.
Cobalt:				
Ore and concentrate	33	—		
Oxides and hydroxides	31	33	4	Netherlands 15; Italy 6.
Ash and reside containing cobalt	377	117	—	Finland 77; Canada 20; United Kingdom 20.
Metal including alloys, all forms	583	597	75	Belgium-Luxembourg 103; United Kingdom 93; West Germany 89.
Columbium and tantalum: Metal including alloys, all forms: Tantalum	21	25	2	West Germany 7; Portugal 1.
Copper:				
Ore and concentrate	409	1,707	—	Italy 971; West Germany 666; Mali 31.
Matte and speiss including cement copper	436	578	—	West Germany 290; Belgium-Luxembourg 152; Italy 51.
Oxides and hydroxides	38	14	—	Tunisia 5; Congo 3; Republic of Korea 3.
Sulfate	191	825	—	Zaire 282; Belgium-Luxembourg 185; United Kingdom 124.
Ash and residue containing copper	13,540	14,960	—	Belgium-Luxembourg 11,320; Spain 1,332; West Germany 1,082.
Metal including alloys:				
Scrap	139,510	174,213	364	West Germany 59,191; Belgium-Luxembourg 53,611; Italy 37,654.
Unwrought	13,286	5,638	20	Belgium-Luxembourg 5,494; West Germany 57; Italy 50.
Semimanufactures	254,520	312,129	3,736	West Germany 80,145; Italy 74,489; Spain 43,885.
Germanium: Metal including alloys, all forms	10	17	9	Belgium-Luxembourg 5; United Kingdom 2.
Gold:				
Waste and sweepings value, thousands	$2,479	$2,431	$173	Belgium-Luxembourg $851; Canada $706; Switzerland $597.
Metal including alloys, unwrought and partly wrought kilograms	18,218	28,762	610	United Kingdom 11,818; Hong Kong 5,258; Switzerland 3,822.
Hafnium: Metal including alloys, all forms	2	3	3	

See footnotes at end of table.

TABLE 2—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	3,740	3,775	—	Mainly to Belgium-Luxembourg.
Pyrite, roasted		6	36	—	Taiwan 26; Netherlands 10.
Metal:					
Scrap		3,227,925	3,691,713	68	Italy 1,284,915; Spain 1,030,312; Belgium-Luxembourg 629,853.
Pig iron, cast iron, related materials		681,140	695,517	145,133	Belgium-Luxembourg 152,208; Italy 126,101.
Ferroalloys:					
Ferrochromium		16,784	48,364	16,198	West Germany 17,048; Belgium-Luxembourg 6,567.
Ferromanganese		21,077	31,963	17,392	Italy 3,320; Belgium-Luxembourg 3,232.
Ferromolybdenum		2,388	2,199	—	West Germany 841; Italy 662; Netherlands 546.
Ferronickel		6,353	3,720	—	Italy 1,768; Spain 1,374; West Germany 328.
Ferroniobium		4	17	—	Belgium-Luxembourg 15; West Germany 2.
Ferrosilicochromium		9	9	—	All to Belgium-Luxembourg.
Ferrosilicomagnesium		9,364	9,389	401	Italy 2,551; Spain 1,555; West Germany 1,710.
Ferrosilicomanganese		14,830	26,290	780	Belgium-Luxembourg 9,975; West Germany 7,805; Italy 2,286.
Ferrosilicon		54,392	46,945	696	West Germany 16,297; Italy 15,958; Japan 5,459.
Ferrosilicozirconium		1,939	1,809	385	Canada 710; West Germany 228.
Unspecified		22,818	30,140	5,936	West Germany 4,222; Japan 3,427.
Steel, primary forms		855,421	966,668	150,802	Belgium-Luxembourg 454,022; Italy 136,288.
Semimanufactures:					
Bars, rods, angles, shapes, sections	thousand tons	2,424	2,462	263	West Germany 661; Belgium-Luxembourg 330; Italy 275.
Universals, plates, sheets	do.	3,503	NA		
Hoop and strip	do.	474	NA		
Rails and accessories	do.	79	92	6	Inida 23; China 16; Italy 10.
Wire	do.	201	194	39	West Germany 47; Libya 15.
Tubes, pipes, fittings	do.	1,020	1,036	52	U.S.S.R. 310; West Germany 108; Netherlands 93.
Castings and forgings, rough	do.	78	149	NA	Belgium-Luxembourg 46; Sweden 8; Italy 4.
Lead:					
Ore and concentrate		25	23	—	Switzerland 17; Denmark 5.
Oxides		16,483	18,163	—	U.S.S.R. 4,819; Japan 4,622; Belgium-Luxembourg 4,153.
Ash and residue containing lead		12,892	5,265	—	Belgium-Luxembourg 2,678; Netherlands 1,496; West Germany 1,065.
Metal including alloys:					
Scrap		8,300	5,455	—	West Germany 1,836; Belgium-Luxembourg 1,165; Ireland 722.
Unwrought		80,931	75,874	2,298	West Germany 26,429; Belgium-Luxembourg 18,450; Italy 9,877.
Semimanufactures		1,442	1,604	3	Belgium-Luxembourg 391; United Kingdom 316; Italy 139.
Lithium: Oxides and hydroxides		36	100	—	West Germany 91; Algeria 5.
Magnesium: Metal including alloys: Scrap		284	490	—	Netherlands 290; West Germany 59; Italy 51.
Unwrought		6,375	7,144	22	West Germany 2,862; Italy 848; Austria 847.
Semimanufactures		2,335	1,411	13	West Germany 495; United Kingdom 444; Italy 378.
Manganese:					
Ore and concentrate, metallurgical-grade		107,070	95,584	—	Norway 86,784; Italy 4,967; Spain 1,311.
Oxides		542	1,009	—	Italy 365; Austria 216; Belgium-Luxembourg 170.
Metal including alloys, all forms		5,575	7,294	738	West Germany 3,308; Sweden 945.
Mercury		35	324	—	Italy 212; Netherlands 39; Belgium-Luxembourg 26.
Molybdenum:					
Ore and concentrate		2,115	1,267	—	Austria 988; Netherlands 179; Belgium- Luxembourg 100.
Ash residue containing molybdenum		—	226	—	Austria 202; Australia 18.

See footnotes at end of table.

TABLE 2—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Molybdenum—Continued					
Metal including alloys: Scrap		134	76	4	West Germany 33; Belgium-Luxembourg 18; United Kingdom 17.
Unwrought		48	75	—	West Germany 40; United Kingdom 13; Austria 10.
Semimanufactures		114	160	—	West Germany 38; India 21; United Kingdom 17.
Nickel:					
Ore and concentrate		28	—		
Matte and speiss		133	139	—	Belgium-Luxembourg 46; Netherlands 28; Italy 25.
Oxides and hydroxides		15	66	(2)	Belgium-Luxembourg 31; West Germany 23; Spain 6.
Ash and residue containing nickel		1,405	1,636	—	Netherlands 519; Belgium-Luxembourg 322; West Germany 272.
Metal including alloys:					
Scrap		2,866	4,582	550	West Germany 2,451; United Kingdom 408.
Unwrought		6,841	7,038	2,477	West Germany 2,116; Sweden 649.
Semimanufactures		6,122	6,379	492	West Germany 3,353; United Kingdom 1,467.
Platinum-group metals:					
Waste and sweepings	value, thousands	$3,792	$4,464	—	United Kingdom $1,541; Belgium-Luxembourg $1,462; Italy $1,075.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	3,957	—	Switzerland 1,357; Austria 1,032; Italy 369.
Platinum	do.	4,418	7,065	1,092	West Germany 3,354; Netherlands 829; Republic of Korea 798.
Rhodium	do.	NA	455	233	Netherlands 176; United Kingdom 21.
Iridium, osmium, ruthenium	do.	NA	24	—	West Germany 18; India 4; United Kingdom 1.
Unspecified	do.	7,067	—		
Rare-earth metals including alloys, all forms		131	30	—	United Kingdom 26; Japan 3.
Rhenium: Metal including alloys, all forms		1	NA		
Selenium, elemental		3	13	—	Lebanon 10; Morocco 1.
Silicon, high-purity		278	35	9	Japan 16; West Germany 7.
Silver:					
Ore and concentrate		NA	25	—	West Germany 24; Austria 1.
Waste and sweepings[3]	value, thousands	$7,861	$8,872	$25	Italy $3,729; Switzerland $1,613; United Kingdom $1,383.
Metal including alloys, unwrought and partly wrought	kilograms	568,826	529,104	606	United Kingdom 206,578; Switzerland 168,254; West Germany 48,104.
Tellurium, elemental		[4]251	129	9	Greece 43; West Germany 29; Norway 21.
Tin:					
Ore and concentrate		42	—		
Oxides		51	66	—	Netherlands 44; West Germany 16.
Ash and residue containing tin		169	87	—	West Germany 33; United Kingdom 27; Spain 25.
Metal including alloys:					
Scrap		300	468	—	West Germany 269; Belgium-Luxembourg 80; United Kingdom 72.
Unwrought		148	205	—	Netherlands 125; Belgium-Luxembourg 35.
Semimanufactures		169	139	8	Spain 25; Tunisia 15.
Titanium:					
Ore and concentrate		245	481	—	Poland 248; Senegal 100; Cote d' Ivoire 37.
Oxides		27,554	25,724	6,756	West Germany 6,434; Italy 2,674.
Ash and residue containing titanium		—	7,912	—	Italy 7,517; United Kingdom 354.
Metal including alloys:					
Scrap		490	1,459	237	United Kingdom 767; West Germany 260.
Unwrought		42	130	6	West Germany 46; Iraq 21; Netherlands 15.
Semimanufactures		349	554	41	West Germany 176; United Kingdom 99.
Tungsten:					
Ore and concentrate		242	99	48	West Germany 36; Netherlands 15.

See footnotes at end of table.

TABLE 2—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Tungsten—Continued				
Ash and residue containing tungsten	149	NA		
Metal including alloys:				
Scrap	225	203	—	West Germany 152; United Kingdom 36; Austria 9.
Unwrought	118	176	—	Netherlands 50; United Kingdom 52; West Germany 23.
Semimanufactures	15	62	1	Switzerland 15; United Kingdom 7; West Germany 7.
Uranium and thorium:				
Oxides and other compounds	3,680	2,184	521	West Germany 448; Japan 358.
Metal including alloys, all forms:				
Uranium	5,993	4,722	1,707	U.S.S.R. 1,355; West Germany 642.
Thorium	—	1	NA	NA.
Vanadium:				
Ore and concentrate	1	—		
Oxides and hydroxides	11	269	—	Belgium-Luxembourg 266; West Germany 2.
Ash and residue containing vanadium	96	529	383	West Germany 69; United Kingdom 67.
Metal including alloys:				
Unwrought including waste and scrap	(2)	4	4	
Semimanufactures	(2)	54	—	Belgium-Luxembourg 50; West Germany 4.
Zinc:				
Ore and concentrate	49,307	31,190	—	Italy 24,257; Belgium-Luxembourg 5,857; United Kingdom 516.
Oxides	19,464	21,059	312	West Germany 3,963; U.S.S.R. 3,003; Belgium- Luxembourg 909.
Blue powder	4,193	2,961	—	West Germany 1,600; Italy 446; Netherlands 308.
Matte	5,943	NA		
Ash and residue containing zinc	21,363	28,594	—	Belgium-Luxembourg 12,603; Spain 4,125; West Germany 3,734.
Metal including alloys:				
Scrap	12,234	23,086	43	Belgium-Luxembourg 5,800; Italy 4,951; Taiwan 4,505.
Unwrought	76,135	75,513	8,519	West Germany 23,282; Belgium-Luxembourg 7,659.
Semimanufactures	41,327	39,498	156	Belgium-Luxembourg 15,886; West Germany 13,431; Denmark 2,798.
Zirconium: Ore and concentrate, Other:	968	3,291	—	Spain 1,967; Italy 854; Netherlands 176.
Ores and concentrates	765	133	58	Austria 25; Switzerland 21.
Oxides and hydroxides	1,676	3,226	NA	West Germany 2,972; Belgium-Luxembourg 130.
Ashes and residues	21,864	23,733	56	Belgium-Luxembourg 12,506; West Germany 4,620; Sweden 3,237.
Base metals including alloys, all forms	362	3	3	NA.
Strontium and barium	107	118	18	United Kingdom 22; West Germany 21; Netherlands 20.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	2,553	2,415	2	Tunisia 465; Spain 284; Morocco 252.
Artificial: Corundum	21,794	23,582	930	Italy 5,068; West Germany 3,919; Spain 3,210. $134.
Grinding and polishing wheels and stones	8,458	7,951	789	Italy 1,321; United Kingdom 1,027; Netherlands 852.
Asbestos, crude	404	557	—	Senegal 95; Hungary 23; Reunion 11.
Barite and witherite	82,964	93,888	833	West Germany 88,282; Italy 2,536; Belgium-Luxembourg 1,008.
Boron materials: Crude natural borates	4,627	6,246	—	Spain 5,900; Belgium-Luxembourg 225.
Cement thousand tons	1,984	1,961	720	United Kingdom 392; West Germany 313.
Chalk	586,297	629,897	1,352	West Germany 244,085; Belgium-Luxembourg 119,315; Switzerland 49,876.
Clays, crude:				
Bentonite	7,420	9,006	—	Portugal 2,787; West Germany 1,734; Spain 1,266.
Chamotte earth or dinas earth	122,414	128,642	—	Italy 40,135; United Kingdom 29,439; West Germany 21,407.
Fire clay	NA	125,924	—	Italy 73,496; West Germany 29,290; Spain 4,590.
Kaolin	168,313	248,253	7	Italy 78,001; West Germany 57,347; Belgium-Luxembourg 35,187.

See footnote at end of table.

TABLE 2—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Cryolite and chiolite		56	128	1	Tunisia 51; Republic of South Africa 36; Spain 31.
Diamond, natural:					
Gem, not set or strung	carats	1,933,423	35,098	5,339	Switzerland 7,001; Belgium-Luxembourg 5,309.
Industrial	do.	184,013	179,120	69,773	Belgium-Luxembourg 39,100; Austria 27,000.
Unsorted	do.	6,574	7,931	—	Belgium-Luxembourg 7,840; Israel 58; Switzerland 18.
Dust and powder	kilograms	[5]1,913	167	6	Italy 68; Switzerland 27; United Kingdom 27.
Diatomite and other infusorial earth		31,741	36,309	—	West Germany 12,893; Italy 5,528; United Kingdom 2,835.
Feldspar, fluorspar, related materials:					
Feldspar		62,776	77,857	—	Spain 36,883; Belgium-Luxembourg 18,597; West Germany 15,612.
Fluorspar		47,047	38,564	—	Italy 17,910; West Germany 11,524; Belgium-Luxembourg 4,187.
Unspecified		27	57	—	Morocco 31; Netherlands 24.
Fertilizer materials:					
Crude, n.e.s.		48,931	79,826	46	West Germany 33,788; Belgium-Luxembourg 18,504; Switzerland 10,491.
Manufactured:					
Ammonia		245,354	93,568	—	Spain 24,333; Belgium-Luxembourg 10,650; United Kingdom 8,198.
Nitrogenous		565,602	702,270	20,324	Spain 127,945; Belgium-Luxembourg 91,002; West Germany 84,107.
Phosphatic		188,401	190,198	—	West Germany 77,952; Switzerland 46,192; Italy 28,522.
Potassic		438,915	531,597	19	Belgium-Luxembourg 291,670; Switzerland 40,635; West Germany 40,173.
Unspecified and mixed		657,622	564,079	18	West Germany 104,204; Spain 93,772; Switzerland 52,238.
Graphite, natural		567	616	5	Italy 140; Spain 16; Belgium-Luxembourg 8.
Gypsum and plaster	thousand tons	1,170	1,157	[2]	West Germany 619; Belgium-Luxembourg 384; Netherlands 60.
Iodine		75	69	—	Netherlands 41; United Kingdom 10; West Germany 6.
Kyanite and related materials		29	46,516	—	United Kingdom 31,973; West Germany 7,342; Belgium-Luxembourg 2,004.
Lime		294,483	400,304	—	West Germany 292,237; Belgium-Luxembourg 75,500; Guinea 18,008.
Magnesium compounds:					
Magnesite, crude		22,192	450	—	Belgium-Luxembourg 266; Switzerland 125; Portugal 39.
Oxides and hydroxides		20,613	21,685	—	Italy 5,142; West Germany 4,419; Belgium- Luxembourg 2,583.
Sulfate		565	930	—	Spain 755; Martinique 119.
Mica:					
Crude including splittings and waste		7,040	7,414	46	West Germany 2,498; United Kingdom 1,937; Spain 614.
Worked including agglomerated splittings		1,442	1,352	33	Hong Kong 325; West Germany 203; Switzerland 200.
Nitrates, crude		39	3	—	All to Tunisia.
Phosphates, crude		4,065	4,459	—	United Kingdom 2,657.
Phosphorus, elemental		2	—		
Pigments, mineral:					
Natural, crude		1,269	1,506	—	West Germany 554; Portugal 172; United Kingdom 120.
Iron oxides and hydroxides, processed		6,468	9,716	17	Italy 4,825; West Germany 1,227; Spain 809.
Potassium salts, crude		7	—		
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$45,872	$52,224	$7,957	Switzerland $33,242; United Kingdom $4,024.
Synthetic	do.	$18,215	$19,039	$1,295	Switzerland $12,425; West Germany $1,009.
Pyrite, unroasted		30	[2]	—	All to Saudi Arabia.
Salt and brine		600,747	514,074	259	Italy 249,017; West Germany 120,794; United Kingdom 32,222.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		249,801	NA		
Sulfate, manufactured		20,419	27,295	—	Italy 13,712; Spain 3,251; Nigeria 2,080.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	138	168	1	Belgium-Luxembourg 73; West Germany 34; Switzerland 28.
Worked	do.	75	84	6	Belgium-Luxembourg 33; West Germany 22; Switzerland 8.

See footnotes at end of table.

TABLE 2—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Dolomite, chiefly refractory-grade	thousand tons	73	93	(2)	Belgium-Luxembourg 55; Spain 8; West Germany 7.
Gravel and crushed rock	do.	9,056	10,864	8	West Germany 5,089; Switzerland 2,979; Netherlands 1,296.
Limestone other than dimension	do.	295	265	—	Norway 124; West Germany 118; Belgium- Luxembourg 19.
Quartz and quartzite	do.	9	6	—	Italy 4.
Sand other than metal-bearing	do.	3,858	4,365	(2)	West Germany 2,368; Switzerland 802; Italy 715.
Sulfur:					
Elemental:					
Crude including native and byproduct		474,341	546,783	380	United Kingdom 176,121; Tunisia 104,760; Algeria 96,965.
Colloidal, precipitated, sublimed		2,795	556	—	Italy 112; Spain 107; Belgium-Luxembourg 80.
Dioxide		1,698	2,294	—	Belgium-Luxembourg 900; West Germany 740; Sweden 589.
Sulfuric acid		237,825	247,595	—	Belgium-Luxembourg 172,493; United Kingdom 58,486; Ireland 4,846.
Talc, steatite, soapstone, pyrophyllite		111,685	141,420	4,271	West Germany 35,363; Netherlands 28,248; Switzerland 16,564.
Vermiculite, perlite and chlorite		406	1,155	—	Spain 578; Netherlands 165; Portugal 123.
Other:					
Crude	thousand tons	1,521	1,652	(2)	Belgium-Luxembourg 1,544; Switzerland 89; West Germany 10.
Slag and dross, not metal-bearing	do.	216	428	(2)	West Germany 256; Belgium-Luxembourg 147.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		109,510	28,408	NA	Algeria 7,232; Belgium-Luxembourg 6,066; Switzerland 3,569.
Carbon black		106,086	111,321	100	West Germany 33,248; Spain 26,373; United Kingdom 14,150.
Coal:					
Anthracite		33,038	38,351	—	Italy 11,218; United Kingdom 8,507; Belgium-Luxembourg 6,389.
Bituminous		718,673	1,644,505	—	Netherlands 709,623; West Germany 530,314; Norway 91,504.
Briquets of anthracite and bituminous coal		90,780	17,652	—	Italy 6,470; United Kingdom 5,188; Belgium-Luxembourg 4,408.
Lignite including briquets		1,599	664	—	Spain 578; Belgium-Luxembourg 86.
Coke and semicoke		438,280	633,618	69,145	West Germany 147,067; Norway 91,870.
Gas, natural: Gaseous	thousand cubic meters	523,000	245,775	—	Switzerland 136,705; Belgium-Luxembourg 101,798.
Peat including briquets and litter		3,861	3,338	—	West Germany 1,919; Oman 538; Belgium-Luxembourg 533.
Petroleum:					
Crude	thousand 42-gallon barrels	150	967	—	Netherlands 817; Belgium-Luxembourg 149; Austria 1.
Refinery products:					
Liquefied petroleum gas	do.	7,969	6,252	182	Italy 2,622; Spain 713; West Germany 646.
Gasoline, motor	do.	16,341	15,241	1,360	West Germany 3,995; Netherlands 2,346.
Naphtha	do.	1,071	1,275	—	United Kingdom 442; Netherlands 357; West Germany 204.
Mineral jelly and wax	do.	532	1,025	(2)	West Germany 364; Belgium-Luxembourg 348; United Kingdom 102.
Kerosene and jet fuel	do.	6,246	5,681	NA	NA.
Distillate fuel oil	do.	16,598	18,695	500	West Germany 8,586; United Kingdom 1,626.
Lubricants	do.	6,415	NA		
Residual fuel oil	do.	19,867	20,546	2,318	United Kingdom 5,048; Italy 4,549.
Bitumen and other residues	do.	1,593	1,535	NA	Spain 637; United Kingdom 240; West Germany 184.
Bituminous mixtures	do.	181	172	6	Algeria 44; Belgium-Luxembourg 37; Switzerland 22.
Petroleum coke	do.	85	4	1	Canada 1; West Germany 1.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May contain other precious metals.
[4]Includes arsenic.
[5]May include dust and powder of other precious and semiprecious stones.

TABLE 3

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	1,032	631	2	United Kingdom 341; West Germany 51.
Alkaline-earth metals	175	340	—	West Germany 77; Canada 67; U.S.S.R. 45.
Aluminum:				
Ore and concentrate	894,330	1,069,102	29	Guinea 743,816; Greece 171,383; China 54,478.
Oxides and hydroxides	145,793	267,147	1,771	Greece 134,252; Guinea 75,040; West Germany 32,271.
Ash and residue containing aluminum	15,391	16,545	—	West Germany 6,915; Italy 3,349; Belgium-Luxembourg 2,911.
Metal including alloys:				
Scrap	70,184	96,994	13,988	Belgium-Luxembourg 24,606; Netherlands 20,781; West Germany 14,451.
Unwrought	407,122	461,776	914	Norway 94,865; Netherlands 84,891; West Germany 62,491.
Semimanufactures	281,628	326,998	2,169	West Germany 109,144; Belgium-Luxembourg 75,167; Italy 26,449.
Antimony:				
Ore and concentrate	14,886	9,269	—	Bolivia 3,298; China 2,143; Australia 1,199.
Oxides	735	989	—	China 393; Belgium-Luxembourg 341; United Kingdom 100.
Ash and residue containing antimony	47	395	—	All from Spain.
Metal including alloys, all forms	2,821	1,080	(2)	China 553; Thailand 407; Turkey 60.
Arsenic:				
Metal including alloys, all forms	[3]120	71	(2)	China 66.
Oxides and acids	1,877	NA		
Beryllium:				
Oxides and hydroxides	(2)	5	(2)	Mainly from West Germany.
Metal including alloys, all forms	(2)	11	9	West Germany 1.
Bismuth: Metal including alloys, all forms	327	427	(2)	Belgium-Luxembourg 171; Peru 138; United Kingdom 80.
Cadmium: Metal including alloys, all forms	1,137	1,180	41	Belgium-Luxembourg 181; Netherlands 179; Finland 173.
Cesium and rubidium: Metals including alloys, all forms	(2)	NA		
Chromium:				
Ore and concentrate	24,771	80,910	—	Turkey 36,936; Albania 19,264; Republic of South Africa 13,273.
Oxides and hydroxides	7,155	7,167	7	United Kingdom 2,975; West Germany 2,764; Italy 1,188.
Metal including alloys, all forms	254	264	3	United Kingdom 185; Japan 31; West Germany 14.
Cobalt:				
Ore and concentrate	—	(2)	—	All from China.
Oxides and hydroxides	389	286	5	Belgium-Luxembourg 103; United Kingdom 88; Finland 58.
Ash and residue containing cobalt	197	—		
Metal including alloys, all forms	1,145	1,563	140	Zambia 473; Zaire 417.
Columbium and tantalum:				
Ore and concentrate	1	1	—	All from Republic of South Africa.
Ash and residue containing columbium and tantalum	5	32	—	NA.
Metal including alloys, all forms:				
Columbium	40	NA		
Tantalum	45	45	36	West Germany 3; Austria 2.
Copper:				
Ore and concentrate	93	4,566	(2)	Chile 4,496; Italy 25.
Matte and speiss including cement copper	20	5,446	63	Zaire 3,002; India 999; Australia 500.
Oxides and hydroxides	805	805	(2)	Italy 231; Belgium-Luxembourg 142; Mexico 96.
Sulfate	3,682	6,133	79	Italy 2,223; U.S.S.R. 1,041; Spain 586.
Ash and residue containing copper	2,601	5,793	—	Italy 2,640; Zimbabwe 774; Belgium-Luxembourg 763.
Metal including alloys:				
Scrap	43,973	52,634	236	United Kingdom 12,242; West Germany 11,603; Belgium-Luxembourg 7,189.
Unwrought	376,697	401,037	2,041	Chile 139,779; Belgium-Luxembourg 120,290; Zambia 33,103.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Copper:					
Metal including alloys:					
Semimanufactures		187,265	228,069	1,950	West Germany 70,816; Italy 65,427; Belgium-Luxembourg 51,851.
Germanium:					
Oxides		3	17	—	Italy 15; West Germany 1.
Metal including alloys, all forms		3	3	1	Belgium-Luxembourg 2.
Gold:					
Waste and sweepings	value, thousands	$6,400	$1,409	$159	Switzerland $303; Reunion $229; Hungary $208.
Metal including alloys, unwrought and partly wrought	kilograms	42,123	133,756	108,860	Philippines 7,579; Mexico 3,733.
Hafnium: Metal including alloys, all forms		4	(2)	(2)	
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	15,056	18,738	63	Brazil 5,493; Australia 4,684; Canada 2,828.
Pyrite, roasted		72,203	74,272	—	Spain 34,217; Italy 20,357; Belgium-Luxembourg 19,658.
Metal:					
Scrap		518,902	801,107	11,906	West Germany 386,941; Belgium-Luxembourg 192,535; United Kingdom 106,841.
Pig iron, cast iron, related materials		419,997	321,991	774	West Germany 210,926; Canada 34,700; United Kingdom 18,873.
Ferroalloys:					
Ferrochromium		195,858	181,102	41	Republic of South Africa 106,585; Sweden 19,771; Finland 16,915.
Ferromanganese		59,385	64,118	121	Republic of South Africa 20,693; Norway 17,588; West Germany 15,218.
Ferromolybdenum		2,422	2,093	—	Belgium-Luxembourg 783; United Kingdom 654; Austria 359.
Ferronickel		41,838	54,373	—	New Caledonia 33,827; Greece 8,242; Dominican Republic 5,635.
Ferrovanadium		919	1,103	—	Austria 424; Belgium-Luxembourg 366; West Germany 273.
Ferrosilicochromium		1,639	225	—	Zimbabwe 176; U.S.S.R. 49.
Ferrosilicomagnesium		NA	2,776	237	Norway 1,534; West Germany 779.
Ferrosilicomanganese		53,572	51,409	119	Norway 44,156; Belgium-Luxembourg 4,362; Brazil 1,102.
Ferrosilicon		45,944	57,591	54	Norway 28,039; West Germany 15,203; Italy 4,488.
Ferrosilicozirconium		NA	76	—	Brazil 60.
Ferrovanadium		919	1,103	—	Netherlands 352; Brazil 289; West Germany 231.
Silicon metal		9,454	12,931	1	Norway 5,100; Brazil 3,850; Sweden 1,456.
Unspecified		3,120	9,881	283	U.S.S.R. 2,075; United Kingdom 1,801; Italy 1,571.
Steel, primary forms		626,393	579,961	458	West Germany 253,624; Belgium-Luxembourg 120,157; United Kingdom 51,750.
Semimanufactures:[4]					
Bars, rods, angles, shapes, sections	thousand tons	2,326	2,720	1	Italy 743; West Germany 679; Belgium-Luxembourg 557.
Universals, plates, sheets	do.	2,521	NA		
Hoop and strip	do.	437	NA		
Rails and accessories	do.	41	37	(2)	Belgium-Luxembourg 22; United Kingdom 8; U.S.S.R. 5.
Wire	do.	273	309	(2)	Belgium-Luxembourg 87; West Germany 84; Italy 71.
Tubes, pipes, fittings	do.	657	760	1	Italy 272; West Germany 176; Belgium-Luxembourg 87.
Castings and forgings, rough	do.	46	NA		
Lead:					
Ore and concentrate		183,927	190,105	—	Republic of South Africa 71,200; Canada 28,897; Sweden 15,767.
Oxides		3,560	3,875	9	West Germany 3,447; United Kingdom 295.
Ash and residue containing lead		5,317	9,059	—	Australia 3,530; Poland 3,313; United Kingdom 946.
Metal including alloys:					
Scrap		20,641	21,444	—	Netherlands 7,846; Belgium-Luxembourg 7,133; Switzerland 4,069.
Unwrought		42,575	46,904	(2)	United Kingdom 207436; West Germany 12,203; Belgium-Luxembourg 7,417.
Semimanufactures		10,892	9,741	9	Belgium-Luxembourg 5,163; West Germany 3,779; United Kingdom 471.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Lithium:				
Oxides and hydroxides	416	388	48	China 157; West Germany 120.
Metal including alloys, all forms	7	NA		
Magnesium: Metal including alloys:				
Scrap	141	79	—	Netherlands 31; Switzerland 25; West Germany 7.
Unwrought	4,799	5,625	1,522	Norway 3,259; Spain 166.
Semimanufactures	664	567	14	Switzerland 171; West Germany 136; Italy 119.
Manganese:				
Ore and concentrate, metallurgical-grade	702,453	1,485,531	26	Gabon 1,263,614; Republic of South Africa 120,142; Australia 37,322.
Oxides	9,841	13,277	101	Netherlands 4,859; Belgium-Luxembourg 4,780; Greece 2,112.
Metal including alloys, all forms	2,124	2,198	58	Republic of South Africa 859; Belgium-Luxembourg 563; Netherlands 535.
Mercury	124	131	(2)	Spain 58; Finland 31; Netherlands 19.
Molybdenum:				
Ore and concentrate	8,632	9,614	5,719	Belgium-Luxembourg 1,462; Canada 848.
Oxides and hydroxides	157	140	2	West Germany 51; United Kingdom 44; Netherlands 12.
Ash and residue containing molybdenum	20	247	—	Italy 204; Netherlands 43.
Metal including alloys:				
Scrap	98	39	3	Belgium-Luxembourg 17; Austria 14.
Unwrought	19	38	6	United Kingdom 13; Austria 10; West Germany 9.
Semimanufactures	115	313	64	West Germany 84; United Kingdom 66.
Nickel:				
Ore and concentrate	—	33	—	Netherlands 24; United Kingdom 9.
Matte and speiss	11,697	14,021	—	New Caledonia 13,313; Canada 585; Norway 39.
Oxides and hydroxides	61	646	1	Canada 584; Australia 51.
Ash and residue containing nickel	864	955	223	Netherlands 402; Belgium-Luxembourg 158.
Metal including alloys:				
Scrap	580	837	100	United Kingdom 255; Netherlands 213.
Unwrought	27,591	25,062	277	U.S.S.R. 6,671; West Germany 4,339; Republic of South Africa 3,208.
Semimanufactures	5,728	12,834	8,243	United Kingdom 2,410; West Germany 1,245.
Platinum-group metals:				
Waste and sweepings value, thousands	$28,362	$15,273	$694	West Germany $6,380; Netherlands $2,910; Spain $1,590.
Metals including alloys, unwrought and partly wrought:				
Palladium kilograms	NA	4,028	260	Republic of South Africa 891; U.S.S.R. 669; Switzerland 657.
Platinum do.	5,430	6,343	1,908	Republic of South Africa 1,072; United Kingdom 1,063.
Rhodium do.	NA	512	54	United Kingdom 152; U.S.S.R. 203; Republic of South Africa 72.
Iridium, osmium, ruthenium do.	NA	22	2	United Kingdom 9; West Germany 6; China 3.
Unspecified do.	5,132	—		
Rare-earth metals including alloys, all forms	189	228	27	Austria 93; Brazil 70.
Rhenium: Metal including alloys, all forms	1	NA		
Selenium, elemental	95	48	3	Canada 18; United Kingdom 10; West Germany 7.
Silicon, high-purity	397	136	4	West Germany 67; Norway 22; Japan 16.
Silver:				
Waste and sweepings[5] value, thousands	$38,310	$25,778	$4,064	Spain $7,032; Netherlands $4,710; Switzerland $4,210.
Metal including alloys, unwrought and partly wrought kilograms	549,180	685,864	260,259	Morocco 115,007; United Kingdom 94,375.
Tellurium, elemental	NA	57	—	Belgium-Luxembourg 20; Philippines 18; West Germany 17.
Tin:				
Oxides	107	85	—	West Germany 34; United Kingdom 29; Italy 22.
Ash and residue containing tin	—	8,346	2	Switzerland 8,330; West Germany 14.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Titanium—Continued				
Metal including alloys:				
Scrap	4	4	—	United Kingdom 3; West Germany 1.
Unwrought	7,608	8,526	45	Malaysia 2,115; Indonesia 1,567; Belgium-Luxembourg 1,483.
Semimanufactures	291	410	2	West Germany 164; Netherlands 124; Belgium-Luxembourg 18.
Titanium:				
Ore and concentrate	132,943	246,404	8	Canada 140,401; Australia 64,491; Norway 22,130.
Oxides	4,670	5,387	51	Belgium-Luxembourg 1,557; West Germany 1,375; United Kingdom 905.
Ash and residue containing titanium	115,508	120,457	—	Canada 98,302; Norway 18,346; Republic of South Africa 3,660.
Metal including alloys:				
Scrap	171	168	72	West Germany 46.
Unwrought	845	1,613	58	Japan 1,086; U.S.S.R. 328; United Kingdom 65.
Semimanufactures	1,621	1,936	1,011	United Kingdom 455; Japan 299.
Tungsten:				
Ore and concentrate	38	17,175	—	All from Norway.
Oxides and hydroxides	18	24	—	All from Italy.
Metal including alloys:				
Scrap	72	28	—	West Germany 17.
Unwrought	106	133	9	West Germany 96; United Kingdom 12.
Semimanufactures	52	94	4	West Germany 36; Belgium-Luxembourg 29; United Kingdom 12.
Uranium and thorium:				
Ore and concentrate (monazite)	16,661	10,825	558	Australia 8,997; Republic of South Africa 599.
Oxides and other compounds	NA	152	9	U.S.S.R. 111; West Germany 13; Belgium-Luxembourg 10.
Metal including alloys, all forms:				
Uranium	17,833	17,637	1,689	Niger 5,582; Canada 3,154; Republic of South
Vanadium:				
Ore and concentrate	—	1	1	
Oxides and hydroxides	127	88	—	Belgium-Luxembourg 50; Republic of South Africa 33.
Ash and residue containing vanadium	—	22	NA	NA.
Metal including alloys:				
Scrap	(2)	53	(2)	Mainly from Belgium-Luxembourg.
Unwrought	111	88	—	All from West Germany.
Zinc:				
Ore and concentrate	512,826	524,161	—	Canada 149,696; Sweden 90,260; Peru 72,694.
Oxides	10,394	11,650	(2)	West Germany 3,098; Belgium-Luxembourg 3,081; Netherlands 2,174.
Blue powder	765	856	1	West Germany 541; Belgium-Luxembourg 310.
Matte	3,577	NA		
Ash and residue containing zinc	37,518	55,624	3,594	Belgium-Luxembourg 20,320; West Germany 16,700; United Kingdom 4,142.
Metal including alloys:				
Scrap	8,880	10,029	—	Belgium-Luxembourg 3,388; West Germany 2,365; Netherlands 2,004.
Unwrought	101,332	111,133	(2)	West Germany 31,777; Netherlands 29,885; Belgium-Luxembourg 26,812.
Semimanufactures	15,290	18,548	174	Belgium-Luxembourg 7,950; West Germany 6,854; Italy 1,263.
Zirconium:				
Ore and concentrate	49,120	45,761	579	Australia 38,100; Republic of South Africa 4,800; Italy 723.
Oxides	147	165	4	United Kingdom 92; West Germany 38; Netherlands 23.
Metal including alloys:				
Scrap	169	99	34	West Germany 25.
Unwrought	1	123	NA	NA.
Semimanufactures	86	85	51	Belgium-Luxembourg 13; West Germany 9.
Other:				
Ores and concentrates:				
Of base metals	37,184	9,916	NA	Bolivia 3,299; China 2,143; Australia 1,199.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Other—Continued				
Ores and concentrates:				
Of precious metals	4,313	1,226	—	Greece 1,000; Bolivia 201; West Germany 24.
Ashes and residues	23,239	9,397	74	Spain 6,464; Belgium-Luxembourg 1,994; Italy 284.
Base metals including alloys, all forms	1	22	NA	United Kingdom 8; West Germany 8; Belgium-Luxembourg 6.
Strontium and barium	NA	4,392	3	Morocco 4,344; U.S.S.R. 23.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	27,819	28,839	509	Turkey 22,317; Greece 1,819; Italy 1,603.
Artificial:				
Corundum	14,406	17,346	2,874	West Germany 4,651; Italy 3,361.
Silicon carbide	19,632	24,654	118	West Germany 6,706; Norway 5,598; Italy 2,797.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	[6]1,207	6	—	Ireland 5.
Grinding and polishing wheels and stones	11,162	13,176	180	Italy 3,497; West Germany 2,556; Belgium-Luxembourg 1,777.
Asbestos, crude	70,209	76,365	180	Canada 35,566; Italy 16,384; U.S.S.R. 15,885.
Barite and witherite	34,620	34,250	—	China 11,967; Belgium-Luxembourg 7,852; West Germany 5,996.
Boron materials:				
Crude natural borates	62,354	128,340	2,310	Turkey 121,403; Belgium-Luxembourg 3,322.
Elemental	4	6	—	West Germany 3.
Oxides and acids	1,852	3,176	282	Italy 1,576; West Germany 833; Turkey 299.
Bromine	5,801	6,967	18	Israel 5,368; United Kingdom 781; East Germany 601.
Cement	444,048	545,565	153	Belgium-Luxembourg 396,045; West Germany 75,634; East Germany 36,174.
Chalk	41,235	34,164	10	West Germany 24,051; Belgium-Luxembourg 9,326.
Clays, crude:				
Bentonite	77,629	114,725	9,383	Italy 54,116; Greece 28,310; West Germany 13,515.
Chamotte earth	3,141	22,084	838	West Germany 20,375; Czechoslovakia 798.
Fire clay	NA	3,387	126	West Germany 2,579; United Kingdom 301; Italy 292.
Fullers earth	1,045	1,142	206	United kingdom 672; West Germany 102.
Kaolin	340,205	373,662	71,170	United Kingdom 230,295; West Germany 22,583.
Unspecified	259,608	266,958	1,377	West Germany 194,883; Senegal 32,382; Spain 18,611.
Cryolite and chiolite	831	748	30	Denmark 686; Greenland 20.
Diamond, natural:				
Stones:				
Gem, not set or strung carats	378,114	450,940	9,899	Belgium-Luxembourg 223,711; India 108,097; Israel 49,060.
Industrial do.	283,344	359,900	67,457	Belgium-Luxembourg 83,573; Zaire 58,079.
Unsorted do.	10,031	47,454	1,256	India 24,769; Belgium-Luxembourg 17,263; United Kingdom 3,129.
Dust and powder kilograms	NA	1,427	685	Switzerland 402; Belgium-Luxembourg 166.
Diatomite and other infusorial earth	10,568	11,688	4,964	West Germany 3,166; Spain 2,247.
Feldspar, fluorspar, related materials:				
Feldspar	28,331	29,021	—	West Germany 20,158; Portugal 5,052; Spain 1,813.
Fluorspar	14,554	14,220	—	Spain 7,843; West Germany 5,485; United Kingdom 663.
Leucite, nepheline, nepheline syenite	41,865	36,043	583	Norway 27,562; Canada 3,776; Netherlands 4,021.
Fertilizer materials:				
Crude, n.e.s.	56,742	84,269	1	Belgium-Luxembourg 38,918; Netherlands 26,750; Italy 9,864.
Manufactured:				
Ammonia thousand tons	209	268	(2)	Trinidad and Tobago 87; Netherlands 50; Belgium-Luxembourg 47.
Nitrogenous do.	3,772	3,169	651	Netherlands 955; Belgium-Luxembourg 936.
Phosphatic do.	758	658	3	Belgium-Luxembourg 322; Morocco 113; Netherlands 90.
Potassic do.	1,362	1,151	3	United Kingdom 284; Canada 198; Israel 180.
Unspecified and mixed do.	1,821	2,029	117	Belgium-Luxembourg 812; Netherlands 302; Morocco 196.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Graphite, natural	5,865	5,707	146	China 2,319; West Germany 909; Austria 827.
Gypsum and plaster	159,127	229,331	299	West Germany 146,914; Switzerland 23,355; Belgium-Luxembourg 10,451.
Iodine	1,143	860	—	Japan 686; Chile 156; United Kingdom 34.
Kyanite and related materials	5,735	5,331	1,397	West Germany 1,893; Republic of South Africa 795.
Lime	88,376	110,240	3	West Germany 67,050; Belgium-Luxembourg 17,288; Spain 14,481.
Magnesium compounds:				
Magnesite, crude	117	5,844	1,821	Greece 2,906; West Germany 565.
Oxides and hydroxides	195,560	210,114	1,101	Greece 47,309; Spain 44,052; North Korea 35,075.
Sulfate	146,839	153,070	—	West Germany 115,480; East Germany 29,456; Belgium-Luxembourg 7,860.
Mica:				
Crude including splittings and waste	4,865	4,225	85	Morocco 1,723; India 1,672; Madagascar 170.
Worked including agglomerated splittings	336	291	2	Belgium-Luxembourg 132; Switzerland 54; China 30.
Nitrates, crude	8,002	11,544	—	Chile 8,850; West Germany 1,837; East Germany 544.
Phosphates, crude	3,754,538	3,655,051	753,889	Israel 928,624; Morocco 655,160.
Phosphorus, elemental	182	503	(2)	Italy 260; Switzerland 102; West Germany 45.
Pigments, mineral:				
Natural, crude	573	14,747	—	Spain 8,144; East Germany 3,811; West Germany 1,795.
Iron oxides and hydroxides, processed	33,775	42,497	635	West Germany 30,740; Belgium-Luxembourg 3,654; Italy 2,276.
Potassium salts, crude	84,235	58,260	—	U.S.S.R. 28,996; Spain 19,130; Israel 8,057.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$81,630	$93,372	$5,054	Switzerland $47,992; Thailand $15,210; United Kingdom $6,367.
Synthetic do.	$9,812	$7,347	$1,654	Switzerland $1,814; Mauritius $1,612.
Pyrite, unroasted	1,328	1,317	18	Italy 884; Spain 193; West Germany 142.
Salt and brine	169,382	181,248	113	Netherlands 43,333; Belgium-Luxembourg 42,179; West Germany 41,128.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	66,905	68,640	13,170	West Germany 16,931; Belgium-Luxembourg 14,645; Poland 13,656.
Sulfate, manufactured	r76,913	73,808	1,801	Belgium-Luxembourg 50,904; Spain 11,648; Austria 3,437.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	332,759	297,396	117	Republic of South Africa 44,869; West Germany 51,575; Italy 39,622.
Worked	353,914	420,848	21	Spain 225,161; Italy 127,403; West Germany 31,252.
Dolomite, chiefly refractory-grade	316,996	368,856	14	Belgium-Luxembourg 332,390; West Germany 16,839; Italy 16,347.
Gravel and crushed rock	3,688,277	4,281,344	62	Belgium-Luxembourg 3,459,702; United Kingdom 362,559; Norway 306,942.
Limestone other than dimension	176,962	187,241	(2)	Belgium-Luxembourg 186,750; West Germany 469.
Quartz and quartzite	322,520	299,166	386	Belgium-Luxembourg 278,502; Italy 7,632; West Germany 5,223.
Sand other than metal-bearing	1,949,276	2,049,562	227	Belgium-Luxembourg 1,370,779; United Kingdom 363,976; West Germany 157,838.
Sulfur:				
Elemental:				
Crude including native and byproduct	645,726	762,013	19,479	Poland 340,070; Canada 244,211; West Germany 112,864.
Colloidal, precipitated, sublimed	137	535	1	Algeria 400; Italy 44; Spain 38.
Dioxide	1,771	1,260	—	Sweden 535; Belgium-Luxembourg 377; Netherlands 242.
Sulfuric acid	189,394	166,896	1	Belgium-Luxembourg 64,872; Spain 37,153; West Germany 31,294.
Talc, steatite, soapstone, pyrophyllite	23,331	23,326	646	Belgium-Luxembourg 8,170; Italy 5,689; Austria 2,880.
Vermiculite, perlite, chlorite	70,242	92,101	28	Republic of South Africa 28,190; Turkey 18,952; Italy 17,539.
Other:				
Crude	3,417,115	3,510,146	856	Switzerland 3,049,386; Spain 158,850; Norway 151,776.
Slag and dross, not metal-bearing	2,440,033	2,490,686	4,033	West Germany 1,545,128; Belgium-Luxembourg 692,971; Canada 98,302.490.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,969	9,584	494	Belgium-Luxembourg 3,311; West Germanmy 2,508; Switzerland 1,067.
Carbon:					
Carbon black		102,863	113,674	1,255	West Germany 38,806; Netherlands 37,050; Spain 12,642.
Gas carbon		34	52	—	Mainly from West Germany.
Coal:					
Anthracite	thousand tons	997	1,988	104	Republic of South Africa 837; Australia 283; West Germany 262.
Bituminous	do.	12,058	10,597	3,731	Australia 3,215; West Germany 1,065.
Briquets of anthracite and bituminous coal	do.	77	85	(2)	West Germany 84; Belgium-Luxembourg 1.
Lignite including briquets	do.	141	125	(2)	West Germany 111; East Germany 12; Belgium-Luxembourg 2.
Coke and semicoke	do.	1,206	1,495	9	West Germany 696; Belgium-Luxembourg 237; Netherlands 214.
Gas, natural:					
Gaseous	million cubic meters	18,441	13,579	—	U.S.S.R. 2,426; Norway 1,610; Netherlands 1,012.
Liquefied	thousand tons	6,577	6,751	—	Mainly from Algeria.
Peat including briquets and litter		402,360	479,970	1	West Germany 219,792; Netherlands 123,040; Belgium-Luxembourg 60,723.
Petroleum:					
Crude	thousand 42-gallon barrels	374,749	488,649	—	Saudi Arabia 83,154; U.S.S.R. 70,308; United Kingdom 69,349.
Refinery products:					
Liquefied petroleum gas	do.	17,702	15,798	—	United Kingdom 6,578; Algeria 1,801; Saudi Arabia 1,458.
Gasoline and light oils	do.	75,892	42,579	155	U.S.S.R. 7,107; Spain 2,505; Greece 1,939.
Mineral jelly and wax	do.	332	597	93	Netherlands 193; West Germany 175.
Kerosene and jet fuel	do.	3,990	4,154	—	United Kingdom 1,219; Italy 954; Netherlands 500.
Distillate fuel oil	do.	82,463	84,056	7	U.S.S.R. 15,627; United Kingdom 14,884; Netherlands 9,169.
Lubricants	do.	1,905	1,353	58	Sweden 249; West Germany 199; Belgium-Luxembourg 194.
Residual fuel oil	do.	44,746	30,675	—	Iraq 4,400; Turkey 4,081; Syria 4,063.
Bitumen and other residues	do.	1,873	2,004	1	Belgium-Luxembourg 801; West Germany 504; Spain 440.
Bituminous mixtures	do.	50	53	(2)	Belgium-Luxembourg 17; West Germany 15; Switzerland 6.
Petroleum coke	do.	10,186	7,894	6,609	West Germany 423; United Kingdom 410.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]Includes tellurium.
[4]As a result of changes in the trade code classifications, data for 1987 and 1988 are not completely comparable.
[5]May include other precious metals.
[6]Includes diamond.
[7]Includes cadmium sulfate.

STRUCTURE OF THE MINERAL INDUSTRY

Government and private companies produce minerals, mineral products, conduct research, and explore domestically and internationally for new resources. Since 1981, when some of the major companies were nationalized, the Government has had to restructure some of these industries, notably the steel and coal in-dustries. The impact of the 1992 market resulted in numerous mergers, closures of operations, and cooperative ventures to seek to attain a competitive advantage. Some industries that have benefited greatly from Government assistance were experiencing a Government determined to reduce assistance for nonprofitable operations. Others were expanding as the previous Government programs resulted in exploitable opportunities, such as the availability of abundant and inexpensive electrical power.

The Government held significant financial interests in most of the mining, metallurgical, and energy companies in France. These included Societe Nationale Elf Aquitaine (Elf Aquitaine); Usinor-Sacilor SA.; Imetal S.A.; Pechiney; Charbonnages de France (CdF); Compagnie Generale des Matieres Nucleaires; and Bureau de Recherches Geologiques et Minieres (BRGM) and its subsidiary, Compagnie Francaise des Mines S.A.

TABLE 4

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Aluminium Pechiney (Government)	Plant at Gardanne, Bouches-du-Rhone Province	700.
Aluminum	do.	Aluminum smelters at—	
		Saint-Jean-de-Maurienne, Savoie Province	120.
		Noguères, Pyrénées Atlantiques Province	115.
		Lannemezan, Hautes-Pyrénées Province	63.
		Auzat, Ariège Province	44.
Antimony, metal	Société Nouvelle des Mines de la Lucette	Plant at Le Genest, Mayeene Province	10.
Barite	Barytine de Chaillac	Mine and plant at Chaillac, Indre Province	150.
	Société Industrielle du Centre	Mine at Rossignol, Chaillac, Indre Province	100.
Bauxite	Aluminium Pechiney (Government)	Mines in Hérault and Var Provinces	900.
	Société Anonyme des Bauxites et Alumines de Provence (S.A.B.A.P.)	Mine at Combecave, Var Province	400.
Cadmium	Compagnie Royale Asturienne des Mines.	Plant at D'Auby-les-Douai, Nord Province	[1]300.
Cement	Eight companies, of which the largest are—	80 plants, including—	23,233. including—
	Ciments La Farge France	15 plants	(7,815).
		Largest at St. Pierre-la-Cour	(1,160).
	Société des Ciments Franais	13 plants	(6,190).
		Largest at Gargenville	(1,100).
Coal	Charbonnages de France:		15.000. including—
	Basin de Paris	Mines and washeries	4,500.
	Bassin Nord-Pas-de-Calais	Mines and washeries in northern France	(1,500).
	Bassin de Lorraine	Mines and washeries in eastern France	(10,000).
Cobalt, metal	Société Métallurgique Le Nickel (SLN)	Plant at Sandouville, near Le Havre (treats New Caledonian nickel-cobalt ores)	[1]600.
Copper, metal	Compagnie General d'Electrolyse du Palais	Electrolytic plant: Palais-sur-Vienne, Haute Vienne Province	45.
	Société Française d' Affinage du Cuivre (Afficuivre)	Smelter at Poissy, Yvelines Province	11.
	Affinerie Sud-Ouest	Fire refinery at Toulouse	2.
Feldspar	Denain-Anzin Minraux S.A	Mine and plant at St. Chély d'Apcher, south of Clermont-Ferrand	55.
Ferroalloys	Société du Ferromanganese de Paris, Outreau.	Plant at Boulogne-sur-Mer	420.
	Pechiney Electrométallurgie (Pechiney, Government)	12 plants at Bellegarde 27 furnaces	387.
	Chromeurope SA	Plant at Dunkerque	25.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Fluorspar	Société d'Enterprises, Carrières et Mines, de l'Esterel (SECME)	Fonsante Mine near Adrets d'Esterel, Var Province	150.
	Denain-Anzin Mineéaux	Mine and plant at Escaro, Pyrénées-Orientales Province	120.
	Société Générale de Recherches et d'Exploitation Miniére (SOGEREM)	Open cast mine at Montroc, Tar Province	100.
	Comifluor S.A	Plant at Bastide-á-Olette, Pyrénées-Orientales Province	80 concentrate.
	Compagnie Miniere Dong Trieu	Mine at Lussac-les-Eglises	NA.
	Compagnie Française des Minérais d'Uranium (CFMU)	Mine at Autun in Saone-et-Loire	50.
Iron and steel: Iron ore	Bassin de Lorraine Aciéres Réunies de Burbach-Eich-Dudelange, (ARBED) and Usinor-Sacilor	Mines in eastern France	10,000.
	Bassin 1 de l' Ouest: Société Métallurgique de Normandie (SMN)	Mines in Normandy	500.
Steel	Usinor-Sacilor (Government, 72%)	Dunkerque	7,500.
		Fos-sur-Mer	4,200.
		Seramange	3,000.
	Unimétal, Unsinor-Sacilor (100%)	Gadrange, Neuves Maisons, Thonville, Montéreau, Garcenville, Trith-St.-Léper	8,432.
	Asocmétal, Unsinor-Sacilor (100%)	Dunkerque, Fos-Sur-Mer, Hagondange, St. Etienne	1,355.
Lead, metal	Société Miniére et Métallurgique de Penarroya	Imperial Smelter, Noyelles Godault	150.
Lead-zinc, ores	Société Miniére et Métallurgique de Penarroya SA	Mines and plants at Les Mailines, Near Granges, Gard Province.	50 (Pb).
		Saint-Salvy, Tarn Province	100 (Zn).
Magnesium metal	Société Française d'Electro-Metallurgie, Pechiney (100%)	Plant at Marignac, Haute Garonne	14.
Natural gas	Elf Aquitaine	Gasfield and plant at Lacq	[2]700,000.
Nickel	Société Métallurgique le Nickel (SLN)	Sandouville plant, near le Havre (treats nickel mattes from New Caledonia)	16.
Petroleum: Crude	Elf Aquitaine	Oilfields in Paris Basin	1,000.
Refined	Compagnie Française de Raffinage (Total)	Refineries at Gonfreville, Seine-Maritime Province, and La Mede, Bouches-du Rhone Province	[3]446,000.
	Shell-Française	Refineries at Petite Couronne, in Siene-Maritime Province	[3]285,300.
		Berre, Bouches-du-Rhone Province	[3]270,000.
	Elf-France	Refineries at Feyzin, Rhone Province	[3]119,000.
		Donges, Loire-Atlantique Province	[3]199,000.
		Grandpuits, Seine-et-Marne Province	[3]96,000.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum—Continued Refined—Continued	Société Française British Petroleum (S.F.B.P.)	Refineries at Lavéra, Bouches-du Rhône Province	[3]175,000.
	Esso S.A.F	Refineries at Fos-sur-Mer, Bouches-du Rhône Province	[3]237,000.
	Mobil Oil Française	Refineries at Gravenchon	[3]62,000.
	Cie. Rhenane de Raffinage (CRR)	Refinery at Reichstett, Bas-Rhin	[3]80,000.
Potash	Mines de Potasse d'Alsace S.A.	Mines at Amélie, Marie-Louise, and	1,750 (K_2O).
	(MDPA)	Théodore in Alsace	
Salt, rock	Compagnie des Salins du Midi et des Salines de l'Est (C.S.M.S.E.)	Varangeville mine at Saint-Nicolas-de-Port in Neurthe-et-Moselle Province	9,000.
Sulfur	Société Nationale Elf Aquitaine (SNEA)	Byproduct from natural gas desulfurization at Lacq, Aquitaine	3,000.
Talc	Talcs de Luzenac	Trumouns, near Ariège	400.
Uranium	Cogema, Compagnie Générale des Matires Nucleaires, (Government)	Mines at Limousin	[1]1,013 (U_3O_8).
		Vendée	[1]500 (U_3O_8).
		Hérault	[1]377 (U_3O_8).
Zinc metal	Compagnie Royale Asturienne des Mines (Belgium)	Electrolytic plant at Auby-les-Douai, Nord	115.
	Société des Mines et Fonderies de Zinc de la Vieille Montagne (SGB, Belgium)	Electrolytic plant at Viviez, Aveyron	110.

NA Not available.
[1]Metric tons per year.
[2]Million cubic feet per year.
[3]Barrels per day.

COMMODITY REVIEW

Metals

Alumina and Bauxite.—French bauxite production in 1989 continued to decline, totaling 660,000 tons for the year. In comparison, the bauxite output in 1980 was 1,921,000 tons. The depletion of ores and competition from cheaper foreign sources of raw and partially processed material has forced the reduction of production output. Furthermore, mines expected to close in the next few years were operated by Pechiney at Var and Herault and the mine owned by SA des Bauxites et Alumines de Provence at Blanquette, Var. The SA des Bauxites et Alumines operation was slated for closure in the early 1990's and had produced only approximately 200,000 metric tons per year (mt/yr) in recent years. The 125,000-mt/yr Societe des Bauxites de France operations were closed in 1988. Thus, at the beginning of 1990, the production capacity had decreased from approximately 1,300,000 mt/yr to almost one-half at 700,000 mt/yr in the past several years.

The closures of alumina refineries follow the pattern of the bauxite operations with the closure of the Aluminium Pechiney plant at La Barasse, Bouches-du-Rhone. The Gardenne plant, which was opened by Charles Bayer in 1893, remained the only operating refinery in France. Bauxite feedstock was purchased on the open market, as well as from the Aluminium Pechiney's Les Baux operations.

Pechiney changed the nature of the company's sales revenues by its purchase of American National Can, USA, in 1988. The North American market apparently became the largest sales market in 1989 for the company, with 72% of the total company sales. The acquisition also provided some mechanism for stabilization in the profit line for the company, removing some vulnerability to aluminum price fluctuations.

Pechiney had planned to close the Noueres smelter in southern France in 1991, replacing the capacity with the new smelter under construction in Dunkerque. The 75,000 mt/yr smelter was one of Pechiney's oldest and would require substantial funds to modernize and implement environmental safeguards on the plant. A strike that protested the closure of the plant and the loss of jobs resulted in a compromise agreement for 120 jobs at a planned foundry and canning facility. Other workers would be offered relocation to other facilities or early retirement.

Two aluminum smelters were reportedly planned for closure by 1991 owing to a production capacity replacement by

the 200,000 mt/yr smelter under construction at Dunkerque. In the fall of 1989, approval by the EC for the new plant and electrical agreement was granted just hours before Pechiney's threatened cancellation deadline. The agreement between Pechiney and Electricite de France (EDF) was for "at cost" electricity in exchange for an interest in the plant. British Steel had raised an objection to this plan, indicating the arrangement was an illegal form of state aid by providing power at an unfairly low price. The utility company had agreed to provide electricity at one-third the "normal" price until 1997 for a 49% stake in the project. After that time, the electricity costs would increase at 10% per year for the next 3 years an/or as profits from the smelter increased. The $850 million project was reportedly to be built and managed by Pechiney. EDF benefited from the arrangement by being able to utilize 5% to 8% of the excess power capacity from a nearby nuclear powerplant.

Antimony.—BRGM opened the new Brouzils mine in the Vendee region. Other domestic sources of the metal are from the Societe Metaleurope refining of lead-zinc at Noyelles-Godault, la Societe des Mines de la Lucette works at Genest, and la Societe Industrielle et Chimique de l'Aisne at Chauny. France imports most of the country's 4,500-mt/yr (metal) requirements from Bolivia and China. The imports of antimony products (ore, oxides, etc.) dropped 38.7%, from 14,886 tons to 9,125 tons in 1988.

Gallium.—France is the world's leading producer of gallium. Rhone-Poulenc S.A., the large French chemicals producer, continued to operate the world's largest gallium extraction plant at Salindres. This plant, with a capacity of 20 mt/yr of primary gallium, processes Bayer liquor from Pechiney's alumina refinery at Gardanne. The La Barrasse alumina refinery, before it closed in 1988, also supplied Bayer liquor to Salindres for processing. The gallium production capacity has been replaced by a new processing plant at Pinjarra, Australia. The Pinjarra plant receives Bayer liquor from the nearby Alcoa alumina refinery. The gallium is shipped to the Rhone Poulenc plant at Salindres, where it is further purified.

Gold.—Recently, gold mining in France has made a resurgence. Gold mineralization in the Bourneix region is associated with galena, arsenopyrite, and pyrite within the broad quartzitic lenses covering an area 15 to 20 kilometers in length. Of the operating mines, the underground operations at Bourneix and Laurieras produce the greatest tonnage of gold ore and highest gold content. Three smaller surface mines, Les Renartieres, Cros-Gallet Sud, and Les Fouilloux, truck their ores to the concentrator at Bourneix to increase recovery. This 60,000-mt/yr concentrator batch processes the ores depending on the ore source and gold content ore. To increase gold recovery, a new 35-metric-ton-per-hour concentrator was under construction and there were plans, pending environmental approval, for leaching and smelter facilities. The concentrating capacity, when the new concentrator is completed by the end of 1990, would be 150,000 mt/yr.

A new company, SA Cevenor, was formed to explore for gold in the Gard and Ardeche areas of France. INCO Ltd. of Canada, owning 67% of SA Cevenor was granted an exploration permit for an area of 38 square kilometers. INCO Ltd. was also expected to provide the $8.5 million for further exploration. Several old producing areas are to be analyzed, and feasibility studies were planned.

Iron Ore.—The famous iron ore beds of northern France stretch from Lorraine, France, northward into Belgium. The reserves assignable to the French sector have been projected to range from 935 million tons to more than 4 billion tons. However, for many years the high phosphorus and relatively low iron content of the ores has limited their desirability. With the development of the Thomas and Gilchrist smelting process, the ores have been economically mined for many years.

The recent decline in iron ore production can best be demonstrated by figure 1. Since 1960, the production from the French sector of the Lorraine Basin has dropped from more than 62 million tons of ore per year to 9 million tons in 1989. During this period, the active mines were reduced to seven. The iron content of the ore varies from 30% to 32%. The other two French iron ore-producing basins have followed a similar trend, dropping to small fractions of their previous production capacities. Owing to the increased use of highly mechanized equipment and through the use of Government subsidies, many mines have been kept in operation. In the past several years, the uneconomic mines were closing, and others are to be closed as the deposits are depleted. France's domestic producers are having a difficult time competing against foreign iron ore sources, which have higher grade ores and lower production costs.

Iron and Steel.—The state-owned steel company, Usinor Sacilor S.A., ranks second in crude steel production, with 22.9 million tons of crude steel produced in 1989. As a result of the consolidation of the French steel industry and of recent purchases of additional production facilities, the French company ranks behind the world's leading company, Japan's Nippon Steel, which produced 28.4 tons of steel in 1989. Usinor Sacilor S.A. won domestic awards in France, acquiring the most foreign companies (10), and for being the most environmentally aware company. The environmental award was for the company's achievements during the past 3 years for reducing the risk of industrial accidents, pollution, and for promoting environmentally aware policies. The other achievement was for the numerous acquisitions of worldwide steel facilities. Several of these purchases were for companies operating in the United States.

One of the U.S. companies purchased by Usinor Salicor S.A. for $570 million was the Jones & Laughlin Specialty Products Corp. (J&L). J&L, the second largest U.S. stainless steel producer, produced 270,000 tons of stainless steel, and sales accounted for approximately 22% of the U.S. stainless steel market. Other U.S. purchases included Georgetown Steel Corp. and Techalloy Co. More typical of the previous type of foreign investments Usinor Salicor S.A. made in the United States was the joint-venture agreement. For example, the joint venture between Bethlehem Steel Corp. and Calvin-Captain, a subsidiary of Usinor Sacilor S.A., involved making cast iron mill rolls.

Purchases in the European market by Unisor Sacilor S.A. included the Federal Republic of Germany steelmaker, Saarstahl; a 20% interest in the Cockerill subsidiary, Trefileries de Fontaine l'Eveque of Belgium; 51% of Alessio Tubi, an Italian small- diameter tube-maker; and CMB Acier, the Franco-British packaging steel producer.

Ferroalloys.—In May 1988, Pechiney Electrometallurgie completed the switch

from ferrosilicon to siliconmanganese at its Dunkerque plant. In the same coastal city, Usinor Sacilor S.A. announced plans to build a new manganese ferroalloy smelter. This new facility was expected to supply two-thirds of the company's ferromanganese requirements when completed at the end of 1991. Long-term contracts with Brazilian manganese producers were signed to supply approximately two-thirds of the plant's ore requirements for the 100,000-mt/yr ferromanganese operation.

The French ferrochrome subsidiary of Ferroaleaciones Espanolas SA increased production at the Chromeurope SA plant in Dunkerque. A second furnace was completed in 1989. This was a 16-megavolt- ampere (MV.A) furnace rated at 25,000 mt/yr. The first furnace, a 12-MV.A furnace, was producing approximately 18,000 mt/yr. Chromite ore for the new production was to be supplied by Albania and the Republic of South Africa. The nearby nuclear plants were to supply power under long-term power contracts. This Chromeurope SA facility represents the total ferrochrome production capacity in France, since the 1985 closing of the St. Beron ferrochrome plant in the Savoie region.

Societe Metallurgique Le Nickel (SLN), the third largest nickel producer, mines saprolite and laterite ores through its mining subsidiary Eramet-SLN from deposits in the French territory of New Caledonia. Previously, SLN had been interested in selling its New Caledonian ferronickel operations. However, in 1989, the company announced plans to invest from $140.5 million to $179.4 million over 5 years in this New Caledonian ferronickel operation. The investment was to increase nickel matte production from the Donaimbo nickel plant to between 53,000 and 56,000 mt/yr.

Lead.—Metaleurope S.A. operated one lead-zinc mine, at Les Malines. This mine was abandoned in 1989 with the depletion of reserves and after production had decreased to approximately 1,100 mt/yr. This mine closure ceased the domestic production of lead, since the Chessy mine near Lyon under development by Societe Miniere de Chessy would replace only the zinc production and not the lead. Imports from the Republic of Canada, Ireland, and the totalled 87,548 (46%) of the 190,536 tons of lead ores and concentrates imported into France.

Lithium.—The use of lithium in alloying with aluminum is becoming more important, especially in the aerospace and automobile industries. In France, the granites of Beauvoir contain high concentrates of barium, lithium, niobium, tantalum, and tin. Owing to the low grades of lithium in ores and the problems of separating the metal from the silica minerals, lithium metal recovery has been difficult. Also, at a concentration of approximately 7 kilograms of LiO2 per ton of rock, economic exploitation at these low concentrations make economic exploitation of the deposit difficult. The ores are processed at the Pombliere Saint Marcel refinery facility operated by Metaux Speciaux, which produces lithium and other chemical compounds.

Polymetallics.—The Bureau de Recherches Geologiques et Minieres (BRGM) signed an agreement with Aztec Mining Ltd., the Australian subsidiary of AMAX Inc. of the United States. Aztec agreed to purchase 24% of the $50 million polymetallic Chessy project near Lyon, France. The mining operator, Societe Miniere de Chessy, a subsidiary of BRGM, and the major owner, Coframines, another BRGM subsidiary, retained the remaining interest in the project. Exploration drilling has defined a deposit of 5.8 million tons of ore, with an additional potential for further production of 300,000 mt/yr for 15 years at 25,000 tons copper and 40,000 tons zinc per year. It has been reported that proven ores averaged 2.23% copper and 9.6% zinc. The delineation of the ore body indicated that mining was best suited to a highly mechanized method using the sublevel stoping. In thin zones, stoping is to be followed by cement backfilling, whereas, the room-and-pillar method was to be used for the thicker areas. The ore was to be crushed underground and transported to the surface via a 25% gradient conveyor for further processing. The BRGM pilot plant at Orleans indicated that 92% to 94% of the copper and zinc could be recovered. Copper flotation, followed by a pH change and then zinc flotation, leaves a residual product from which the pyrite and barite were to be recovered.

Uranium.—Cogema, the state-owned uranium mining company, was planning the closure of a number of mines in the country. In recent years, the pace of exploration has decreased and the projected future ore requirements have leveled off. The nuclear energy industry has ceased to expand, as it had in previous years. In fact, many projects worldwide have been halted or canceled. The company had equested permission from the French Ministry to construct a uranium oxide production facility at Tricastin to complement an existing plant at Tricastin

The La Crouzille uranium deposit discovered in 1948 was the first uranium mining operation in France. Other deposits in the southern part of the Massif Central and Massif Armoricain were discovered and developed later. The Division Miniere Vendee (DMV) is one of four divisions of Cogema and is the operator of the Vendee Mine. There are four underground mines, two open pits, and a 450,000-mt/yr processing plant, producing 650 tons metal content of uranium per year from this area. The Vendee mine was projected to close owing to the slump in ore prices and the low grade of ore. The deposit with estimated reserves of 3,000 tons has been in operation since 1953. Another area with potential production rates of 9,000 mt/yr of uranium metal, the Herault underground and surface operations, produce 1,000 tons of uranium metal per year by processing 400,000 tons of ore. The third operation is at Haute-Vienne, which produces 2,300 tons of uranium metal per year. The mine produces 600,000 tons of ore per year from veins in the Hercynian granites on the western side of the Massif Central. Total Compagnie Miniere France (TCMF) and Compagnie Francais Mokta (CMF), also subsidiaries of Cogema, have mining operations in France. One of TCMF's operations, Cherbois, was near Limoges around the Massif Central, and the other operation was at Bertholene in the Averyron area. Both operations produced a total of 400 tons of metal per year; the larger one being Cherbois, pro- at 365 mt/yr. This production rate was almost twice the size of Compagnie Mokta, which produced only 200 mt/yr.

Owing to the decline in the demand for uranium, several facilities are slated to The Piriac Mine, which produces a high of ore, was one operation slated to close of the high cost of extraction. Two other Chardon and La Commanderie, are also reported to be closed before the end of 1991.

Zinc..—Two companies operated primary zinc plants in France. The company, Societe des Mines et Founderies de

Zinc de la Vieille-Montagne (VM), Belgium, operates a zinc refinery at Auby-les-Douai with an annual capacity of 210,000 mt/yr of zinc. This electrolytic plant is the newest and most modern in Europe and was built at a cost of $70 million in 1987. The other company, Metaleurop S.A., operates a 100,000 ton-mt/yr Imperial smelter at Noyelles-Godualt, built in 1962.

The mines that operated in France were the lead-zinc mines at Les Malines (now closed) and at Noailhac-Saint Salvy. Only 26,700 tons of zinc metal was contained in the concentrates produced in 1989. However, in 1988 (the latest import data), imports of lead-zinc concentrates were 524,161 tons. Most of the imports, 312,650 tons (60%), were from Canada, Peru, and Sweden.

Industrial Minerals

Barite.—In recent years, the use of barite has decreased owing to the decline of the oil industry, which uses approximately 80% of the worldwide production. The largest user in France was the chemical industry, which was not as affected by the recent worldwide downturn in the petroleum industry. The Bertholene Mine, owned by Societe des Produits Chimiques de Vivez, (SPCV), has minable reserves to approximately 1993. SPCV opened a second barite mine, a small underground facility at Privezac, in the Vivez area, only 31 miles from the processing plant. This new mine has an ore grade of 65% to 70% BaSO4, which was similar to the existing mine and that of another mine scheduled to open in 1990. However, the production of 25,336 tons of concentrates for 1988 was 19% lower than the 1987 production.

Cement.—Lafarge Coppee SA and Societe Des Ciments Francais are the two largest cement producers in France. During the past several years, these two companies have been acquiring a number of companies within France. Each company has gained control of approximately one-third of the domestic market, leaving fewer than eight other companies for the final one-third. Lafarge Coppee SA strengthened its international holdings by purchasing the Swiss company Cementia AG. This purchase also gives Lafarge Coppee SA dominant share ownership of the Spanish company Ashland SA in which La Farge Copee additionally purchased another 20% interest. This acquisition raises the company's production capacity to approximately 46 million metric tons per year (Mmt/yr).

Fertilizer Materials.—France was the largest consumer of fertilizer in Europe, of which 97% was in the form of nitrogen and nitrogen compounds. The consumption of nitrogen fertilizers was 6 million tons during 1989 and did not increase from that of the previous year. This reflected a growing public awareness of environmental issues and the policy of the EC to restrict the use of fertilizer and overproduction in the agriculture sector.

Sud Fertilisants finalized their rationalization plans with the closure of the SSP unit in L'Oseraie in southeast France. Norsk Hydro Azote S.A. closed another SSP unit in Balaruc, a sulfuric acid plant in Sete and a granulator plant in L'Oseraie. The 250,000-mt/yr ammonia plant at Pierrefitte and the three plants at Ambares, producing nitric, phosphoric, and sulfuric acids, were reported to be closed. Other important domestic facilities were at Le Havre, Rouen, and Montoir, where the Norsk Hydro's primary products were urea, complex fertilizers, and ammonium nitrate.

Orkem, formerly called CdF Chimie, the state-owned chemicals company, was granted capital to fund an attempt to change the group's uneconomic performance. Then, after months of discussion, the French chemical industry, fourth largest in the world, was reorganized in an attempt to eliminate duplication of endeavors, the total fragmentation of Orkem, and to increase French chemical product competitiveness. The company's business was split between the two state-controlled oil companies, Elf Aquitaine and Total. Elf Aquitaine bolstered its fertilizer and petrochemical business with the assignment of the Orkem's chemical facilities and Elf Aquitaine's previous purchase of Pennwalt Corp. of the United States during 1989. The increased chemical sales elevated Elf Aquitaine from 14th to 7th largest chemical producer in the world.

The higher value added sectors of Orkem and the Elf Aquitaine subsidiary La Seignurie were transferred to Total-CFP and consisted of the adhesives, paints, acrylic, glass, and ink products business. Total's share of Orkem amounted to approximately $3.53 billion in assets. Total, like Elf Aquitaine, had also acquired companies earlier in the year. The companies purchased were Coates, the United Kingdom industrial inks producer, and Bostik, a U.S. adhesives group.

Unresolved questions on the Orkem asset realignment involved how these assets were to be purchased and how the payment would be made by both Total and Elf Aquitaine. The position of minority shareholders and payment of Orkem's debt were other issues to be resolved. This reshuffle of state-owned chemical industry assets was the most dramatic since the 1983 Atochem realignment to Total.

Fluorspar.—Societe Generale de Rechereches et d'Exploitions Minieres (Sogerem), a Pechiney subsidiary, controlled more than 60% of French fluorspar production. Two mines, Le Moulinal and Le Burc, produced 262,000 tons of fluorspar from vein deposits in the Tarn area in 1988; however, a third mine, Montroc, did not report production figures for 1988. The fluorspar vein deposits are found in Hercynian massifs, Massif Central, the Vosges, the axial zone of the Pyrenees, and the outer Alps. The Montroc concentrator has a 80,000 mt/yr acid-grade fluorspar capacity using the flotation separation process, while the Le Burg plant uses a gravity separation to process 35,000 mt/yr metallurgical-grade fluorspar. Another concentrator is owned by Societe Miniere de Trebas and has a capacity rated at 20,000 mt/yr acid-grade material. Pechiney's processing company, Comiflour SA, has a plant at Olette producing acid-grade fluorspar (97% CaF2) and electrical-grade fluorspar with approximately 45,000 Mt/yr of output. The Escardo Mine, owned by Denain-Anzin Mineraux, also ships approximately 90,000 tons from its surface operation to the Olette plant. The Societe Industrielle du Centre en Indre's mine at Rossignol and Societe des mines du Haut du Then's mine at Maxonchamp are two other fluorspar operations.

Gypsum.—France was one of Europe's largest producers of gypsum. Two-thirds of the production is from the Paris Basin. Four companies produce approximately 95% of the output. In recent years, France has reported increased sales of gypsum products to other European countries. The largest producer was SA de Materiel

de Construction, with 2.2 million tons of the 5 million tons produced in the country. The largest mine operated was the 1.3 Mmt/yr underground mine at Taverny.

Kaolin.—Kaolin deposits derived from the granite massifs in Brittany are the most actively mined in France. The largest mine appeared to be at Quessoy, operated by Societe Kaoliniere Armoricaine, with a capacity of 120,000 mt/yr. Another deposit in this northern area of Brittany is Plemet. In the southern part of the peninsula are the two operations at Ploemeur, with 75,000 mt/yr each, operated by Societe des Kaolins d'Arvor and Societe Nouvelle d'Exploitation des Kaolins de Morbihan. The 50,000 mt/yr operation in the northwest at Berrien is owned by Societe des Kaolins du Finistere and is used mostly in the paper and ceramics industries. Ball and refractory clays are produced in the Charante Basin to the southwest, producing more than 1 million tons of crude clay per year.

Magnesia.—Pechiney Electrometallurgie's plant in Chedds, Haute Savoie, produced approximately 30,000 mt/yr of electrofused magnesia used in the manufacture of high-quality magnesia-graphite refractory bricks for lining electric furnaces and steelworks.

Mica.—The country's three largest producers of mica have operations in Brittany. The mica produced is a byproduct of kaolin operations. Micarec, partially owned by Societe Nouvelle d'Exploitation des Kaolins du Morbihan, operates the kaolin deposit at Ploemuer, as does Kaolins d'Arvor SA, the second largest producer. Kaolins du Finisterre uses flotation at its Berrien deposit to process the mica.

Potash.—Mines de Potasse d'Alsace (MDPA) produced 10,387,136 tons of 15.52% K2O potash rock, which is concentrated to 62% potassium. In 1988, the production was 1,502,436 tons of refined product, down from that of the year before. Most of the potash production is used for agriculture, and based on estimated reserves, the French deposit will last into the next century. The French deposits in the Upper Rhine Valley are in the Mulhouse area where a Late Eocene graben was filled with two influxes of seawater. The latter surge of sea water in Early Oligocene time resulted in the deposition of two potash-rich beds. The strata were subsequently folded in the Pliocene into three different basins, the Wittelsheim and Munchausen in France and the Buggingen in Germany.

Rare Earths.—Rhone-Poulenc S.A. is one of the world's leading processors of rare earths. In recent years, there has been growth in the rare-earth market for yttrium, neodymium, samarium, and cerium. This growth is due to developments and applications in permanent magnets, electronics, and superconductivity products.

Salt.—France is the fourth largest European producer of salt. Approximately 2.6 million tons of crystallized salt was sold in 1989. The domestic capacity for all types of salt was projected to be 4.7 Mmt/yr, of which only 3.2 million tons was produced in 1989. Solar salt accounted for 59% of the capacity, and production is naturally concentrated along the Mediterranean coast and on the Island of Corsica.

Vacuum salt is produced at seven locations representing a capacity of 1.45 million tons. This method of production accounts for approximately 33% of national capacity. The largest operation is the 600,000 mt/yr facility operated by Cie. des Salins du Midi et des Salins de l'Est (CSME) at Varangeville in northeastern France.

Rock salt and brines are used to produce salt. However, the production of rock salt is small, and the brine output is not disclosed.

Talc.—The talc operations of Talc de Luzenac S.A. are important in the French and European markets. Borax Francais S.A., a subsidiary of RTZ Corp., purchased 49% of Talcs de Luzenac S.A., giving RTZ a total of 67% interest in Talc de Luzenac S.A. This purchase by RTZ Corp. and of other talc mining interests previously acquired by Talc de Luzenac has resulted in RTZ Corp. becoming one of the major talc producers in the world.

Mineral Fuels

Coal.—In the Midi-Pyrenees region in southern France, all underground mines have now been closed. In the northern producing regions, change also occurred, resulting in the reduced production capacity. However, a new open pit at Carmaux began production of 25,000 tons per year of coking coal destined for the steel mills in Lorraine and Fos areas of France. The mine operator, Les Houilleres du Bassin du Centre et du Midi, anticipates capacity will reach 500,000 tons in 1993. Also, the operator has indicated plans to build a $20 million washing facility at Carmaux to produce a better quality coal.

The first pit at Carmaux, Sainte Marie, is projected to recover 5 million tons of coal from the Sainte Marie shaft pillar. The overburden is being stripped away from the coal seams by bucket-wheel excavators. The deepest target seam is covered by approximately 100 meters of overburden. Mobile conveyor belts are to remove the waste rock, projected to total 70 million cubic meters of material. Underneath this Tertiary overburden, 180 meters of coal, which is divided into nine seams, will be mined. Later, the Tronqui shaft pillar with 10 million tons of reserves will be excavated in another open pit. These open pit operations represent the final phase of coal operations, which had been active in the region for centuries. When all of the underground mines are closed, these surface pits will represent the final recovery of coal.

Charbonnages de France (CdF) and the Electricite de France (EdF) announced plans to add a number of coal-fired generating plants to the electrical utility grid, which is composed mostly of nuclear plants. The objective was to develop a large, pollution-free, coal-fired electric generating plant utilizing the technology present in smaller plants. Initially, a 250-megawatt (MW) plant was anticipated, which could be upscaled to 600 MW in the future.

Nuclear Power.—The French nuclear industry ordered an 18-month program to inspect 14 of its newest plants for faults on several important metal components. The focus was on the new 1,300-MW pressurized water reactor, used to replace those in the first generation 900-MW power stations. Many of the nuclear plants were effected by the lack of water for cooling owing to the low rainfall. The lack of sufficient rainfall also reduced the amount of hydroelectric power generated. The result was that in 1990 France became an importer of electricity.

TABLE 5

FRANCE: RESERVES OF MAJOR MINERALS

(Million metric tons unless otherwise specified)

Commodity	Quantity[e]
Barite	2
Bauxite	5
Bromine	[1]1.6
Coal	284
Copper/zinc ore	27
Fluorspar	10
Iron ore	935
Potash	20
Sulfur	10

[e]Estimated.
[1]Million kilograms.

INFRASTRUCTURE

France has a very modern and well-developed infrastructure. The French National Railways (SNCF) operates 34,568 km of 1.435-meter standard gauge, of which 11,674 km was electrified. The system was one of the first recognized for the superfast trains. Similarly, the highways are extensive and modern for the transport of goods and services. The inland waterways are increasingly used to transport more goods; however, they always have been significant avenues of commerce with 6,969 km of the 14,932 km heavily used. The seaports most noted are as follows: Bordeaux, Boulogne, Brest, Cherbourg, Dunkerque, Fos-Sur-Mer, Le Havre, Marseille, Nantes, Rouen, Sete, and Toulon. Possibly one of the most significant infrastructure developments in recent times has been the Channel Tunnel Project.

OUTLOOK

One of the world's most developed economies, France was an advocate for the EC and the 1992 common market. The country has had to make considerable changes in the structure of the industries within the country, particularly those controlled by the state. Several state-owned companies have taken the initiative to become leaders with their industries and significant producers in the world markets. Others have additional adjustments under rationalization schemes proposed by the EC or the Government. The depletion of natural resources and/or the cessation of subsidies for uneconomic operations will have impacts on the local communities and their economies. France will have the advantage of plentiful electrical power to attract industrial facilities requiring a good work force and access to the significant markets in Europe.

[1]Where necessary, values have been converted from francs (f) to U.S. dollars at the rate of f6.38=US$1.00, the average rate in 1989.

[2]"Les Mines de Fer Francaises en 1989," Rapport d'Activite de La Chambre Syndicale des Mines de Fer de France, Paris, 1990.

OTHER SOURCES OF INFORMATION

Agencies

Ministere de la Recherche et de l'Industrei
(Ministry of Research and Industry)
Paris, France

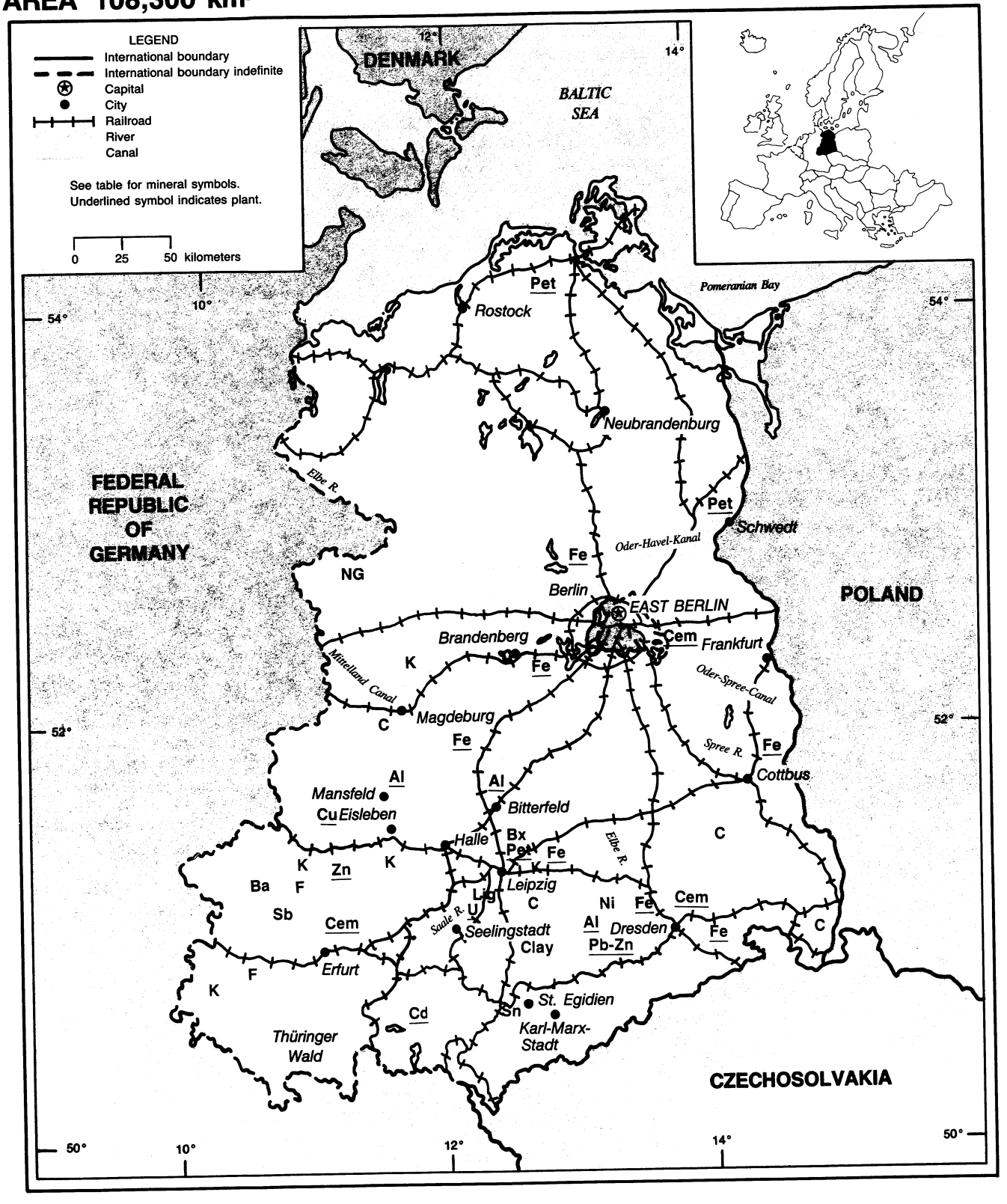
Bureau de Recherches Geologique et Minieres (Bureau of Geological and Mining Research)
Avenue de Concyr - BP 6009
45060 Orleans Cedex 2,
France

Publications

Annales des Mines (Mining Chronicle).
Annuaire de Statistique Industrielle (Industrial Statistics Yearbook).
Annual Reports: Imetal, Entreprise Miniere et Chimique, Total, Elf Aquitaine.
Les Mines de Fer Francaises en 1989.
L'Industrie Minerale (Mineral Industry).
Matieres Premieres Minerales.

GERMAN DEMOCRATIC REPUBLIC

AREA 108,300 km² **POPULATION 16.6 million**



THE MINERAL INDUSTRY OF THE

GERMAN DEMOCRATIC REPUBLIC

By George A. Rabchevsky

Of the member countries of the Council for Mutual Economic Assistance (CMEA), the German Democratic Republic (GDR) reportedly had the highest per capita gross national product. In the mining sector, lignite was the most significant contributor to the economy, followed by potash and rock salt. Mine output of copper, nickel, and tin continued to fall because of decreasing ore grades. Metals, minerals, and the mining industry were significant components of the country's national income. The GDR was the world's leading producer of lignite and the third largest producer of potash, accounting for approximately 25% of the world's lignite output and 11% of the world's output of potash. Other commodities, mined in quantities less important by world standards, included copper, nickel, silver, tin, and uranium ores, as well as chalk, fluorspar, gypsum, and salt. The GDR was dependent on imports of bauxite, iron, phosphates, and crude oil. The metallurgical industry has been expanded far beyond the domestic raw materials base, and this has resulted in heavy raw materials import demand. The GDR has already been well explored for mineral resources. Presently, prospecting is centered on further delineation of lignite deposits and on development of oil and gas resources.

Approximately 40% of the GDR's citizens live in areas where sulfur dioxide emissions are very high. Cities most seriously affected are Halle, Karl-Marx-Stadt, and Leipzig. Wastes from lignite, uranium, potash, and other mines are discharged directly into the Elbe River Basin.

Bitterfeld, between the Elbe and Saale Rivers, is the center of the GDR chemical industry. It is one of the most polluted areas in an industrial belt stretching from southern GDR through southern Poland to northern Czechoslovakia—a region that is responsible for much of the pollution damage throughout central Europe.

The Government of the Federal Republic of Germany (FRG) has pledged about $600 million in environmental aid to the GDR, including money to scrub smokestack exhausts, decrease the amount of lignite being burned, and extract mercury and other metals from water before they are discharged into the Elbe River.

PRODUCTION

Because of the depletion of domestic reserves, secondary raw materials and scrap continued to play a vital role in the production of ferrous and nonferrous metals. Minerals production declined slightly.

TRADE

The GDR reportedly signed a trade agreement with Yugoslavia under which the two countries will increase cooperation in the aluminum, copper, zinc, and titanium dioxide sectors. The GDR was reportedly planning to import 50,000 tons of aluminum per year from Yugoslavia.

STRUCTURE OF THE MINERAL INDUSTRY

The GDR's mining and mineral processing industry is centrally controlled by the Government and is headed by several ministries: Ore Mining, Metallurgy, and Potash; Coal and Energy; Geology; and Chemical Industries.

COMMODITY REVIEW

Metals

Aluminum.—There were two operating aluminum smelters and one aluminum metal products plant. Ore and concentrate were imported mostly from Hungary and Yugoslavia for domestic processing. About one-half of the country's aluminum metal requirement was imported, mostly from Hungary and Yugoslavia. About 30% of the metal was exported, primarily to the FRG.

Iron and Steel.—The iron and steel industry was the mainstay of the GDR's heavy industry. The U.S.S.R. supplied most of the iron ore requirements from the Krivoi Rog surface operations in the Ukraine. In 1989, the GDR steel industry showed modest drops in production mostly owing to the political upheaval that began in the summer. Production of pig iron dropped 2%, and steel fell 4%.

Nickel.—Mining of low-grade ores accounted for 1,500 tons nickel contained. All production was from two small surface mines near St. Egidien in the southeast of the country. There were three operating smelters whose output depended mainly on imported ores.

Precious Metals.—The GDR produces gold, palladium, platinum, rhodium, and silver at the plants shown in table 5.

Tin.—Tin ore was mined in small quantities at Altenberg and Ehrenfriedersdorf in the Erzgebirge area along the southeastern border. The smelter in Freiberg worked on low-grade, 8% to 12%, tin concentrates, producing 99.75% tin. The production of tin was not reported in official statistics.

TABLE 1

GERMAN DEMOCRATIC REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Alumina:						
For metallurgical use		46,695	46,350	50,880	64,000	60,000
For other use[e]		20,000	20,000	20,000	20,000	19,000
Metal:[e]						
Primary		60,000	61,000	62,000	[r]61,000	60,000
Secondary		52,000	52,000	52,000	55,000	52,000
Total		112,000	113,000	114,000	[r]116,000	112,000
Cadmium metal, primary[e]		15	18	18	[r]20	15
Copper:						
Mine output, Cu content[e]		12,000	11,000	11,000	[r]10,000	9,000
Metal:						
Smelter, primary		14,000	15,000	17,000	25,000	24,000
Refined, primary and secondary, including alloys		75,000	73,000	74,000	80,000	75,000
Iron and steel:						
Iron ore and concentrate	thousand tons	30	—	—	—	—
Fe content	do.	15	—	—	—	—
Metal:						
Pig iron	do.	2,578	2,738	2,755	2,786	2,700
Ferroalloys, electric furnace	do.	124	135	135	138	135
Steel, crude	do.	7,853	7,967	8,243	8,131	7,800
Semimanufactures (hot-rolled only)	do.	5,637	5,656	5,887	5,708	5,600
Lead:[e]						
Smelter, primary		20,000	20,000	18,000	20,000	20,000
Refined, all sources		55,000	[r]44,500	[r]49,100	[r]55,000	52,000
Nickel:						
Mine output, Ni content, recoverable		2,000	2,000	2,000	2,000	1,500
Metal, refined[e]		3,000	3,200	3,500	3,500	3,000
Silver, mine output, Ag content, recoverable	kilograms	41,057	41,057	41,057	40,000	38,880
Tin:[e]						
Mine output, Sn content, recoverable		2,800	2,800	3,000	[r]2,800	2,500
Metal, refinery output including secondary		3,300	3,300	3,400	[r]3,300	3,000
Zinc metal including secondary		17,000	17,000	18,000	21,000	19,000
INDUSTRIAL MINERALS						
Barite[e]		34,000	34,000	32,000	32,000	30,000
Boron materials: Processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content[e]		4,000	4,000	4,000	4,000	4,000
Cement, hydraulic	thousand tons	11,608	11,988	12,430	12,510	12,500
Chalk[e]	do.	40	40	40	40	35
Clay, kaolin:[e]						
Crude	do.	350	330	320	350	320
Marketable	do.	175	165	150	165	150

See footnotes at end of table.

TABLE 1—Continued

GERMAN DEMOCRATIC REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Fluorspar[e]	thousand tons	100	100	90	90	90
Gypsum and anhydrite:						
Crude[e]	do.	360	340	320	320	310
Calcined	do.	312	305	299	302	300
Lime and dead-burned dolomite	do.	3,567	3,545	3,378	3,479	3,400
Nitrogen: N content of ammonia	do.	1,206	1,193	1,176	1,156	1,150
Phosphate, P_2O_5 content	do.	299	309	291	285	280
Potash, marketable, K_2O equivalent	do.	3,465	3,485	3,510	3,510	3,200
Salt:						
Marine	do.	58	59	59	60	58
Rock[e]	do.	3,080	3,075	3,075	3,000	3,000
Total	do.	3,138	3,134	3,134	3,060	3,058
Sodium compounds, n.e.s.:						
Caustic soda	do.	667	638	577	627	600
Sodium carbonate	do.	884	885	893	914	900
Sodium sulfate	do.	172	181	179	180	175
Stone, sand and gravel:						
Crushed stone[e]	do.	15,000	15,000	14,500	14,500	14,000
Sand and gravel	do.	8,437	8,163	7,576	8,098	8,000
Sulfur:						
Byproduct:[e]						
Elemental	do.	80	75	75	75	70
Other forms	do.	250	240	240	240	220
Sulfuric acid	do.	883	883	867	799	750
MINERAL FUELS AND RELATED MATERIALS						
Coal, (lignite)	thousand tons	312,156	311,260	308,976	310,314	305,000
Coke: From brown coal:						
High-temperature	do.	2,497	2,509	2,487	2,506	2,400
Low-temperature	do.	3,185	3,092	2,743	2,941	2,800
Total	do.	5,682	5,601	5,230	5,447	5,200
Fuel briquets (from lignite)	do.	50,666	50,434	49,514	49,727	49,500
Gas:						
Manufactured	million cubic meters	7,780	7,958	8,104	7,485	7,450
Natural, marketed production[e]	do.	13,000	13,000	13,000	12,000	11,400
Petroleum:						
Crude[e]	thousand 42-gallon barrels	430	360	360	360	350
Refinery products:						
Gasoline	do.	36,567	36,792	39,783	40,498	40,000
Kerosene, jet fuel, distillate fuel oil	do.	49,216	49,013	49,458	48,832	48,500
Residual fuel oil[e]	do.	60,000	60,000	65,000	65,000	63,000
Lubricants	do.	3,346	3,317	3,365	3,539	3,400
Total[3]	do.	149,129	149,122	157,606	157,869	154,900

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

[1] Table includes data available through Oct. 1990.

[2] In addition to the commodities listed, gold, magnesium, peat, platinum-group metals, uranium, and a variety of construction materials were produced, but output was not reported, and available information was inadequate to make estimates of output levels.

[3] Total of listed products only.

TABLE 2

GERMAN DEMOCRATIC REPUBLIC: APPARENT EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	22	—		
Aluminum:				
Oxides and hydroxides	—	2,997	—	All to Japan.
Ash and residue containing aluminum	306	—		
Metal including alloys:				
Scrap	1,928	5,075	1,127	Netherlands 2,852; Austria 765.
Unwrought	369	2,497	220	Japan 1,794; Belgium-Luxembourg 475.
Semimanufactures	2,961	9,863	10	Yugoslavia 5,874; Sweden 2,056; Belgium-Luxembourg 922.
Antimony: Metal including alloys, all forms	—	10	—	All to Spain.
Cadmium: Metal including alloys, all forms	9	—		
Chromium: Oxides and hydroxides	20	—		
Cobalt:				
Oxides and hydroxides	—	5	—	All to Belgium-Luxembourg.
Metal including alloys, unwrought	6	—		
Copper:				
Matte and speiss including cement copper	21	—		
Oxides and hydroxides	5	—		
Metal including alloys:				
Scrap	61	120	—	Netherlands 99; Belgium-Luxembourg 21.
Unwrought	7,376	1,129	—	Austria 1,070; Thailand 58.
Semimanufactures	3,504	2,260	19	Hong Kong 986; Switzerland 601; Sweden 528.
Gold: Metal including alloys, unwrought and partly wrought kilograms	36	643	—	Japan 396; Italy 247.
Iron and steel: Metal:				
Scrap	11,208	15,799	—	Thailand 9,624; Netherlands 6,175.
Pig iron, cast iron, related materials	3,324	1,169	—	Jordan 821; Switzerland 244; Spain 98.
Ferroalloys:				
Ferromolybdenum	15	—		
Ferrosilicon	—	73	—	All to Belgium-Luxembourg.
Steel, primary forms	1,312	227,052	—	Taiwan 132,562; Belgium-Luxembourg 48,741; Morocco 13,341.
Semimanufactures:				
Bars, rods, angles, shapes, sections	184,871	383,815	14,800	Hong Kong 103,648; Taiwan 44,803; Switzerland 23,200.
Universals, plates, sheets	65,360	182,121	61,779	Switzerland 31,031; Taiwan 27,721.
Hoop and strip	183	258	8	China 147; Egypt 103.
Wire	244	6,008	—	Belgium-Luxembourg 3,869; Hong Kong 919.
Tubes, pipes, fittings	30,573	36,189	7,101	Austria 12,947; Taiwan 5,707.
Castings and forgings, rough	1,605	764	4	Switzerland 471; Egypt 158; Netherlands 131.

See footnotes at end of table.

TABLE 2—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Lead:				
Oxides	72	2,063	—	Yugoslavia 1,402; Sweden 317; Egypt 224.
Metal including alloys:				
Scrap	40	118	—	All to Austria.
Unwrought	4,955	116	—	Belgium-Luxembourg 105; Austria 11.
Magnesium: Metal including alloys, unwrought	—	25	—	All to Belgium-Luxembourg.
Mercury	35	—		
Molybdenum:				
Ore and concentrate, roasted	—	86	—	Sweden 78; Belgium-Luxembourg 8.
Oxides and hydroxides	—	51	—	All to Sweden.
Metal including alloys, semimanufactures	1	—		
Nickel:				
Ore and concentrate, Ni content	188	—		
Metal including alloys:				
Unwrought	7	31	—	Netherlands 25; Belgium-Luxembourg 6.
Semimanufactures	8	(2)	—	All to Mexico.
Platinum-group metals: Metals including alloys, unwrought and partly wrought kilograms	31	1	—	All to Italy.
Silver: Metal including alloys, unwrought and partly wrought do.	216,665	133,651	—	All to United Kingdom.
Tin:				
Ash and residue containing tin	11	—		
Metal including alloys, unwrought	—	35	—	All to Belgium-Luxembourg.
Zinc:				
Ore and concentrate	1,833	—		
Oxides	—	2,205	—	All to Norway.
Matte	224	—		
Ash and residue containing zinc	224	—		
Metal including alloys:				
Scrap	366	68	—	All to Denmark.
Semimanufactures	—	208	—	Yugoslavia 207; Austria 1.
Zirconium: Ore and concentrate	2	—		
Other: Ashes and residues	—	67,281	—	Norway 60,939; Austria 6,342.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	20	92	—	Mainly to Belgium-Luxembourg.
Artificial: Corundum	20	—		
Grinding and polishing wheels and stones	248	111	—	Egypt 35; Netherlands 31; Thailand 25.
Asbestos, crude	21	—		
Barite and witherite	52	20	—	All to Belgium-Luxembourg.
Boron materials: Oxides and acids	13	—		
Bromine	558	90	—	All to Switzerland.
Cement	[3]1,426,000	[3]1,375,000	—	United Kingdom 113,985; Sweden 83,411; Denmark 82,251.
Chalk	78	100	—	Austria 60; Sweden 40.

See footnotes at end of table.

TABLE 2—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Clays, crude:				
Kaolin	16,548	31,958	—	Netherlands 15,759; Yugoslavia 13,292; Austria 1,535.
Unspecified	4,794	4,266	—	Netherlands 3,058; Austria 1,208.
Feldspar	—	64	—	All to Belgium-Luxembourg.
Fertilizer materials:				
Crude, n.e.s.	23	—		
Manufactured:				
Ammonia	274	—		
Nitrogenous	564,964	741,263	233,619	China 309,452; Sweden 53,971.
Phosphatic	15,641	8,208	—	Netherlands 5,199; Austria 2,817; Denmark 192.
Potassic:				
K_2O content[3]	2,894,000	2,832,000	NA	NA.
Gross weight	NA	1,592,081	—	Yugoslavia 251,524; United Kingdom 178,693; Colombia 143,527.
Unspecified and mixed	406	17,999	—	China 15,569; Ireland 2,167; Belgium-Luxembourg 104.
Fluorspar	10,856	7,866	—	Netherlands 6,135; Belgium-Luxembourg 855; Yugoslavia 789.
Graphite, natural	—	335	—	Austria 280; Yugoslavia 55.
Gypsum and plaster	10,224	251,768	—	Sweden 213,810; Czechoslovakia 23,000; Netherlands 6,424.
Lime	56	129	—	All to Austria.
Magnesium compounds:				
Magnesite, crude	1,515	—		
Oxides and hydroxides	1,407	317	—	Austria 295; Belgium-Luxembourg 22.
Sulfate	96,524	49,778	100	Denmark 48,076; Netherlands 1,602.
Nitrates, crude	—	2,107	—	Netherlands 852; Sweden 584; Austria 200.
Pigments, mineral: Iron oxides and hydroxides, processed	60	213	—	Egypt 208; Spain 2; Turkey 2.
Precious and semiprecious stones other than diamond, natural kilograms	—	303	302	Portugal 1.
Salt and brine	61,063	277,520	75,644	Sweden 91,950; Denmark 36,650.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured	[3]337,000	[3]336,000	—	Czechoslovakia 65,000; Sweden 48,184; Denmark 12,170.
Sulfate including cadmium, manufactured	6,643	72,931	—	Denmark 48,646; Yugoslavia 23,879; Mexico 400.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	41	—		
Worked	2,052	1,857	—	Netherlands 1,747; Denmark 63; Spain 47.
Gravel and crushed rock	—	1,000	—	All to Netherlands.
Quartz and quartzite	—	25	—	All to Yugoslavia.
Sand other than metal-bearing	6,231	3,814	—	Yugoslavia 2,098; Austria 1,716.
Sulfur: Sulfuric acid	[3]7,500	[3]7,800	—	Czechoslovakia 655; Denmark 344.

See footnotes at end of table.

TABLE 2—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Talc, steatite, soapstone, pyrophyllite		—	1	—	All to Sweden.
Other:					
Crude		3,762	11,255	—	Belgium-Luxembourg 9,197; Austria 908; Japan 600.
Slag and dross, not metal-bearing		886	33	—	All to Sweden.
MINERAL FUELS AND RELATED MATERIALS					
Carbon black		940	171	—	Yugoslavia 125; Argentina 46.
Coal:					
Anthracite		—	8,876	—	Egypt 6,325; Iceland 2,351.
Bituminous		6,595	7,718	—	Sweden 6,000; Ireland 1,000; Austria 718.
Lignite including briquets		1,141,808	1,293,239	—	Czechoslovakia 977,800; Austria 227,712; Spain 78,967.
Coke and semicoke		210,675	94,522	—	Austria 43,531; Spain 29,946; Norway 16,503.
Peat including briquets and litter		128	—		
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	93	—		
Gasoline	do.	[3]5,644	[3]5,856	—	Sweden 374; Belgium-Luxembourg 15.
Mineral jelly and wax	do.	56	929	912	Austria 5; Denmark 3.
Kerosene and jet fuel	do.	219	—		
Distillate fuel oil	do.	[3]4,679	[3]6,6154	—	Sweden 2,846.
Lubricants	do.	[3]56	[3]35	—	Yugoslavia 5; Algeria 1.
Residual fuel oil	do.	[3]21,765	[3]16,164	463	Sweden 1,172.
Bitumen and other residues	do.	5	522	—	Spain 515; Austria 7.

NA Not available.

[1]Table prepared by staff, Section of International Data. Owing to the 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 exports. Unless otherwise specified, these data have been compiled from data published by the trading partners and the United Nations. Data exclude imports by the Federal Republic of Germany.

[2]Less than 1/2 unit.

[3]Source: Statistical Yearbook of the Members of Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Uranium.—In late 1989, some information dealing with uranium operations in the GDR was declassified by the country's Government. Uranium mining had been started by Soviet occupation forces in 1946 and, from 1954 on, was controlled by an East German-Soviet joint-venture organization. It operated six mines in the southern part of the country, east of Gera in the Erzegebirge mountains, as well as the "Works 102" concentrator plant in Seelingstadt, the only such facility in the GDR. The concentrate product has traditionally been exported to the U.S.S.R., purportedly for use in the production of nuclear powerplant fuel rods.

Industrial Minerals

Cement.—The GDR was virtually self-sufficient in cement. VEB Zement Kombinat was the sole producer, with about 32 cement plants throughout the country. Most of the limestone was mined in open pit quarries. Cement was exported to other CMEA countries, especially Hungary, and also to Egypt, the FRG, and Sweden.

Kaolin.—VEB Vereinigte Kemmlitzer Kaolinwerke, the major producer of kaolin in the GDR, managed about 15 surface mines. Most of the GDR's kaolin deposits were in the southeastern part of the country, between Leipzig and Dresden. The largest deposits were at Bortewitz, Brachwitz, Caminau, Kemmlitz, Pommlitz, Querbitzsch, and Seilitz.

Magnesia.—All of the GDR's magnesia was produced from magnesium-rich brines as a byproduct of potash mining and processing. VEB Kombinat Kali managed one plant at Sonderhausen and another at Teutschendal, with a combined approximate capacity of 30,000 tons per year.

Potash.—The GDR remained the third largest producer of potash in the world after the U.S.S.R. and Canada.

TABLE 3

GERMAN DEMOCRATIC REPUBLIC: APPARENT IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	2,499	3,784	—	All from Yugoslavia.
Oxides and hydroxides	—	3,018	—	Yugoslavia 2,997; France 21.
Ash and residue containing aluminum	22	—		
Metal including alloys:				
Scrap	—	31	—	Yugoslavia 22; Denmark 9.
Unwrought	25,455	26,610	—	Yugoslavia 24,110; Japan 1,794; Austria 353.
Semimanufactures	6,113	6,627	—	Yugoslavia 5,874; Norway 478; Austria 91.
Antimony: Oxides	47	58	—	France 56; Netherlands 2.
Cadmium: Metal including alloys, all forms	—	37	—	Japan 27; Belgium-Luxembourg 10.
Chromium: Ore and concentrate	[2]33,000	41,100	—	U.S.S.R. 33,000; Turkey 8,100.
Cobalt: Oxides	3	10	—	Mainly from Netherlands.
Columbium and tantalum: Metals including alloys, all forms: Tantalum	—	1	([3])	Mainly from United Kingdom.
Copper:				
Ore and concentrate	13,876	25,000	—	Sweden 20,840; Poland 4,160.
Matte and speiss including cement copper	24	—		
Oxides and hydroxides	8	11	—	Belgium-Luxembourg 10; Netherlands 1.
Metal including alloys:				
Scrap	5,106	3,111	—	Switzerland 1,206; Netherlands 979; Denmark 453.
Unwrought	16,619	36,426	29,422	Chile 6,000; Yugoslavia 1,879.
Semimanufactures	2,300	1,580	—	Yugoslavia 1,214; Austria 169; Norway 141.
Gold: Metal including alloys, unwrought and partly wrought kilograms	—	392	—	All form Japan.
Iron and steel:				
Iron ore and concentrate thousand tons	2,709	3,953	—	U.S.S.R. 2,178; India 699; Brazil 550.
Metal:				
Scrap	492,373	377,960	—	U.S.S.R. 201,900; United Kingdom 81,086; France 52,133.
Pig iron, cast iron, related materials thousand tons	[2]1,352	[2]1,292	—	U.S.S.R. 1,111; Algeria 2; Yugoslavia 1.
Ferroalloys:				
Ferrochromium	8	—		
Ferromanganese	821	1,645	—	All from Norway.
Ferromolybdenum	252	1	—	All from United Kingdom.
Ferrosilicomanganese	—	143	—	All from Sweden.
Silicon metal	67	1,088	—	All from Norway.
Unspecified	68,558	67,483	670	U.S.S.R. 66,407; France 401.
Steel, primary forms	272,404	74,762	—	Poland 74,724; Italy 24.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,898	2,886	—	Belgium-Luxembourg 1,939; Sweden 295; Italy 255.
Universals, plates, sheets	78,535	8,340	—	All from Poland.
Hoop and strip	25,379	22,901	—	France 15,785; Belgium-Luxembourg 6,094; Italy 874.

See footnotes at end of table.

TABLE 3—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Semimanufacturers—Continued				
Rails and accessories	[2]312,000	60	—	Spain 57; Sweden 3.
Wire	3,312	4,939	—	Belgium-Luxemoburg 3,781; France 582; Sweden 522.
Tubes, pipes, fittings	262,197	[2]314,000	1	U.S.S.R. 189,920; Poland 22,448; Japan 10,259.
Castings and forgings, rough	1,913	4	—	All from Switzerland.
Lead:				
Oxides	1	—		
Ash and residue containing lead	424	—		
Metal including alloys:				
Scrap	9,710	3,760	—	Belgium-Luxembourg 2,000; United Kingdom 1,688; Denmark 48.
Unwrought	1,100	11,303	—	Sweden 9,378; Belgium-Luxembourg 1,676; France 249.
Semimanufactures	697	1	—	All from Netherlands.
Magnesium: Metal including alloys:				
Unwrought	40	—		
Semimanufactures	1	—		
Manganese:				
Ore and concentrate, metallurgical-grade	81,000	89,146	—	U.S.S.R. 84,000; Netherlands 4,348; Morocco 780.
Oxides	—	71	—	All from Japan.
Mercury	335	112	—	All from Algeria.
Molybdenum:				
Ore and concentrate, roasted	178	276	—	Belgium-Luxembourg 196; Netherlands 80.
Oxides and hydroxides	92	97	—	All from Netherlands.
Metal including alloys, semimanufactures	22	10	—	All from Austria.
Nickel:				
Ash and residue containing nickel	984	—		
Metal including alloys:				
Unwrought	186	157	—	Belgium-Luxembourg 132; Norway 25.
Semimanufactures	2	18	—	Sweden 10; Netherlands 8.
Silver: Metal including alloys, unwrought and partly wrought kilograms	441	—		
Tin:				
Ore and concentrate	—	61	—	All from United Kingdom.
Metal including alloys, semimanufactures	10	8	—	All from Netherlands.
Titanium:				
Ore and concentrate	2,031	2,108	—	Do.
Oxides	4,521	4,648	—	Do.
Metal including alloys, semimanufactures	1	2	—	Netherlands 1; Sweden 1.
Tungsten: Metal including alloys, all forms	—	6	—	Netherlands 3; Austria 2; Italy 1.

See footnotes at end of table.

TABLE 3—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zinc:				
Ore and concentrate	4,110	6,265	—	Mexico 5,039; Ireland 1,226.
Oxides	20	20	—	All from France.
Blue powder	—	1	—	All from Belgium-Luxembourg.
Matte	25	—		
Ash and residue containing zinc	24	—		
Metal including alloys:				
Scrap	—	20	—	All from Netherlands.
Unwrought	24,198	5,718	—	All from Yugoslavia.
Semimanufactures	45	224	—	Yugoslavia 207; Belgium-Luxembourg 12; Sweden 3.
Zirconium:				
Ore and concentrate	775	1,563	—	All from Netherlands.
Oxides	15	—		
Other:				
Ores and concentrates	1,528	508	—	All from China.
Ashes and residues	1,171	2,370	—	All from Italy.
Base metals including alloys, all forms	3,009	100	—	All from China.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	44	115	—	Turkey 50; Netherlands 46; Belgium-Luxembourg 19.
Artificial:				
Corundum	—	22	—	All from Japan.
Silicon carbide	19	—		
Dust and powder of precious and semiprecious stones excluding diamond kilograms	111	3	—	All from Switzerland.
Grinding and polishing wheels and stones	171	153	—	Austria 146; France 3; Belgium-Luxembourg 2.
Asbestos, crude	4,249	128	—	All from Italy.
Cement	[2]18,800	[2]22,200	—	Sweden 76; Switzerland 2.
Clays, crude:				
Chamotte earth	337	—		
Kaolin	1,020	47	—	All from United Kingdom.
Unspecified	79	264	—	All from Spain.
Diamond, natural:				
Gem, not set or strung carats	841	13,509	—	Netherlands 13,435; Belgium-Luxemblurg 74.
Industrial stones do.	—	76,341	—	All from Belgium-Luxembourg.
Diatomite and other infusorial earth	1,718	1,893	—	All from France.
Feldspar	20,297	18,100	—	Norway 9,082; Portugal 6,973; Sweden 2,045.
Fertilizer materials: Manufactured:				
Ammonia	5,994	—		
Nitrogenous	27	—		
Phosphatic	26,448	89,075	—	Tunisia 47,525; Morocco 39,550; Sweden 2,000.
Gypsum and plaster	—	20	—	All from Italy.
Iodine	—	3,264	—	All from Sweden.
Lime	—	195	—	All from Austria.

See footnotes at end of table.

TABLE 3—Continued

GERMAN DEMOCRATIC REPUBLIC: APPARENT IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Magnesium compounds:				
Magnesite, crude	—	1,500	—	All from Turkey.
Oxides and hydroxides	33,611	560	—	Japan 500; Netherlands 59; Italy 1.
Sulfate	—	100	100	
Mica: Worked including agglomerated splittings	1	2	—	All from Switzerland.
Phosphates, crude thousand tons	1,167	1,229	—	U.S.S.R. 769; Morocco 191; Tunisia 11.
Pigments, mineral:				
Natural, crude	—	58	—	All from Austria.
Iron oxides and hydroxides, processed	—	20	—	Mainly from Belgium-Luxembourg.
Salt and brine	—	29	—	All from Denmark.
Sodium compounds, n.e.s.: Soda ash, manufactured	24	71	—	All from Yugoslavia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	115	1,396	—	Yugoslavia 1,348; Sweden 48.
Worked	158	60	—	Italy 56; Denmark 4.
Gravel and crushed rock	192	782	—	France 380; Yugoslavia 295; Italy 81.
Limestone other than dimension	—	3,140	—	All from United Kingdom.
Quartz and quartzite	28	979	—	All from Sweden.
Sand other than metal-bearing	649	68	—	Denmark 56; Yugoslavia 5; Sweden 3.
Sulfur:				
Elemental: Crude including native and byproduct	138,433	134,000	—	All from Poland.
Sulfuric acid	2,578	4,437	—	Poland 3,436; Austria 1,001.
Talc, steatite, soapstone, pyrophyllite	517	1,002	—	Austria 726; Egypt 272; Belgium-Luxembourg 4.
Vermiculite	43	—		
Other:				
Crude	5,728	4,562	—	China 4,108; Italy 313; Netherlands 141.
Slag and dross, not metal-bearing	55	297	—	All from Italy.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6	6	—	All from Sweden.
Carbon black	27,927	24,024	—	U.S.S.R. 15,214; Sweden 5,322; France 3,451.
Coal: Anthracite and bituminous thousand tons	[2]7,166	[2]5,802	—	U.S.S.R. 4,032; Poland 620; United Kingdom 2.
Coke and semicoke do.	[2]1,839	[2]1,886	—	U.S.S.R. 1,010.
Gas, natural: Gaseous million cubic meters	[2]7,002	[2]7,051	—	Mainly from U.S.S.R.
Petroleum:				
Crude thousand 42-gallon barrels	145,537	144,802	—	All from U.S.S.R.
Refinery products:				
Mineral jelly and wax do.	([3])	—		
Kerosene and jet fuel do.	—	3	—	All from Yugoslavia.
Distillate fuel oil do.	94	1	—	Mainly from Sweden.
Lubricants do.	[2]220	[2]350	—	Yugoslavia 4; Switzerland 2; Sweden 1.
Residual fuel oil do.	[2]196	—		

[1] Table prepared by staff, Section of International Data. 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 imports. Unless otherwise specified, these data have been compiled from data published by the trading partners and the United Nations. Data exclude exports by the Federal Republic of Germany.

[2] Source: Statistical Yearbook of the Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[3] Less than 1/2 unit.

About 75% to 80% of the output was exported. VEB Kalikombinat managed four potash combines and was also responsible for the country's sodium salt production operations.

The Werra potash combine has completed a 7-kilometer tunnel linking the Ernst Thaelmann and Wilhelm Pieck mines.

Mineral Fuels

Coal.—The GDR is the world's largest producer of lignite. Braunkohlenkombinat Bitterfeld and Braunkohlenkombinat Senftenberg are the two companies producing lignite. About 70% of the country's total energy and 85% of the electricity is lignite based. The 18 opencast mines in Senftenberg, the Cottbus district, Lausitz basin, produce about 200 million tons of lignite per year (60% of total production). There are 21 opencast mines in the Bitterfeld basin in the area of Halle and Leipzig. The ash content of the GDR's lignite reaches as much as 30%. Mining and burning of lignite has been responsible for extensive pollution problems in the two largest lignite basins—the Bitterfeld basin and the Lausitz basin. The GDR is planning to shut down many lignite mines and remodel many of its powerplants.

Nuclear Power.—The GDR has five operating nuclear power reactors. The share of nuclear energy in electricity production was 9.9%. The Greifswald No. 2 reactor was shut down on November 25 for repairs. There were plans to build three more units at Greifswald. That reactor supplied 2.5% of the GDR's electricity. The No. 5 reactor was also shut down. The closure of the Lubmin nuclear power station near Greifswald was also planned. The GDR has another operating nuclear power reactor in Rheinsberg, north of East Berlin.

INFRASTRUCTURE

The GDR, with close to 125,000 kilometers (km) of highways, more than 2,100 km of inland waterways, and more than 14,000 km of railroad track, has a fairly well-developed infrastructure. The

TABLE 4

GERMAN DEMOCRATIC REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (all state owned)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Elektrochemisches Kombinat	Plant at Lauta	80
Aluminum	do.	Smelter at Bitterfeld	55
Do.	do.	Smelter at Lauta	30
Do.	VEB Mansfeld Kombinat Wilhelm Pieck	Smelter at Eisleben	30
Barite	VEB Zinn und Spatgruben	Mines in Thuringian Forest area and Harz Mountains	50
Cadmium	VEB Mansfeld Kombinat Wilhelm Pieck	Smelter at Eisleben	[1]20
Do.	Electrowerke Weida	Smelter at Weida, Thuringia	[1]10
Cement	VEB Zement Kombinat	About 30 cement plants, of which the major ones are—	13,000
		Karsdorf	4,300
		Rudersdorf	2,800
		Bernburg-Dessau	2,700
		Deuna	2,000
Chalk	VEB Kreidewerke Rugen	Quarries on Rugen Island	50
Coal	VEB Braunkohlen-Kombinat Senftenberg	Lignite mines and plants at Delitzsch-Kreis and Groitzsch Dreieck area (more than 35 surface mines)	250,000
Do.	Jugend Lignit Kombinat	Mines in Cottbus district at Schlabendorf Sud, Schlabendorf Nord, Sees area, and Greifenhain	75,000
Copper	VEB Mansfeld Kombinat Wilhelm Pieck	Mines at Niederrob- lingen, Sangerhausen and Allstadt	12
Do.	do.	Smelter at Eisleben and Hettstedt	25
Do.	do.	Refinery at Eisleben	35
Do.	VEB Kupfer und Bleichwalzwerk Michael Niederkirchner (VVB Vesta, Leipzig)	Smelter at Ilsenburg in Harz	15
Do.	do.	Refinery at Ilsenburg	25
Do.	VEB Huttenwerk Kayser (VVB Alu, Potsdam—Bobelsberg)	Refinery at Berlin—Niederschoneweide	25
Fluorspar	VEB Zinn und Spatgruben	Mines in Thuringian Forest area and Harz Mountains; processing plant at Lengenfeld	100
Lead	VEB Buntmetall	Refinery at Freiberg	60
Do.	Freiberg Mining and Metallurgical Kombinat	Secondary smelting only at Freiberg	20
Do.	Huttenwerk Halsbrucke	Smelters at Halsbrucke and Muldenhuttten	24
Nickel	VEB Mansfeld Kombinat Wilhelm Pieck	Smelters at Mansfeld and Eisleben	2
Do.	Huttenwerk St. Egidien	Smelter at Aue	1.5
Petroleum	The major ones are—		[2]480,000
	VEB Leuna-Werke "Walter Ulbrecht"	Refinery at Leuna	[2]225,000
	Schwed Petrochemical Kombinat	Refinery at Schwed	[2]180,000

See footnotes at end of table.

TABLE 4—Continued

GERMAN DEMOCRATIC REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (all state owned)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Potash	VEB Kombinat Kali; manages 4 potash combines, including—	Facilities under VEB Kombinat Kali—	4,000 (K_2O)
	Kalibetrieb Sud-Harz	Mines and plants at Rossleben, Sondershausen, Sollstedt, Menteroda/Volkenroda, Bleicherode, and Bischofferode	1,310
	Kalibetrieb Zielitz	Mine and plant at Zielitz and Wolmirstedt	1,100
	Kalibetrieb Werra	Mines and plants at Unterbreizbach, Merkers, and Dornoff	1,090
	Kali und Steinsalzbetrieb Saak	Mine at Saak	500
Steel	VEB Maxhutte, Bergbau-und Huttenkombinat	Plant at Unterwellenborn	2,000
Do.	VEB Eisenhuttenkombinat Ost	Plant at Eisenhuttenstadt	1,800
Do.	VEB Stahl-und Walzwerk Brandenburg	Plants at Brandenburg	1,500
Do.	Hennigsdorf Stahl Kombinat, Stahl-und Walzwerk Wilhelm Florin	Plant at Hennigsdorf	1,200
Tin	VEB Bergbau-und Huttenkombinat Albert Funk	Mines and processing plants at Altenberg, Sadisdorf, and Ehrenfriedersdorf	3.5
Do.	do.	Smelter and refinery at Freiberg	4.0
Zinc	VEB Buntmetall	Refinery and smelter at Freiberg	30

[1] Metric tons per year.
[2] 42-gallon barrels per day.

TABLE 5

PRECIOUS METALS PLANTS IN THE GERMAN DEMOCRATIC REPUBLIC

Plants	Location	Products produced
VEB Berliner Metallhutten-und Halbzeugwerke	Berlin	Gold wire, palladium metal, platinum semis.
VEB Buntmetall	Freiberg	Refined silver.
VEB Bergbau-und Huttenkombinat Albert Funk	Halsbrucke	Refined gold, palladium metal, refined platinum, rhodium metal, refined silver.
Hoppegarten	Near Berlin	Refined gold, refined silver.
VEB Mansfeld Kombinat Wilhelm Pieck	Eisleben	Refined silver.

country also has crude oil pipelines exceeding 1,300 km and natural gas pipelines totaling 2,150 km.

OUTLOOK

The monetary and economic union of the two Germanys is scheduled to take effect in the latter half of 1990. Although the measure will enable East Germans to exchange GDR currency for FRG marks, it is expected to cause some GDR enterprises to fail, creating a temporary surge in unemployment. Unemployment, officially recorded at less than 1%, is certain to balloon as state companies dismiss workers and begin the restructuring process.

OTHER SOURCES OF INFORMATION

Agencies

Bundesministerium fur Erzbergbau Metallurgie und Kali
(Ministry of Ore Mining, Metallurgy, and Potash)
East Berlin, German Democratic Republic

Bundesministerium fur Kohle und Energie
(Ministry of Coal and Energy)
East Berlin, German Democratic Republic

Bundesministerium fur Geologie
(Ministry of Geology)
East Berlin, German Democratic Republic

Zentrales Geologisches Institut
(Central Geological Institute)
East Berlin, German Democratic Republic

Publications

Statistisches Jahrbuch der Deutschen Demokratischen Republik
(Statistical Annual of the German Democratic Republic), East Berlin.

Statistisches Taschenbuch der Deutschen Demokratischen Republik
(Statistical Handbook of the German Democratic Republic), East Berlin; published annually by Staatliche Zentralverwaltung fur Statistik.

FEDERAL REPUBLIC OF GERMANY

AREA 248,900 km² **POPULATION 61.4 million**

THE MINERAL INDUSTRY OF THE

FEDERAL REPUBLIC OF GERMANY

By George A. Rabchevsky[1]

The Federal Republic of Germany's (FRG) real gross national product (GNP) increased 4% in 1989, its highest growth rate since 1976. Industry worked at close to 90% capacity, a level not reached since 1970. The inflation rate remained at about 3% per year. Total employment in 1989 reached its highest level in the Federal Republic's 40-year history.

The FRG was the largest producer of steel and potash in Western Europe and the second largest (after Italy) producer of cement. The country remained the largest producer of copper and zinc metal in Western Europe and was the second largest producer of cadmium and lead. The precious metals and steel industries played an important role in the domestic sectors of the country's economy. Overall, the German mining industry has seen a continuous decline in mining. In 1989, the FRG had two operating metal mines, primarily lead and zinc. The Rhine-Ruhr region was dominated by the coal, metalworking, and steel and iron industries. North Rhine-Westphalia was the most industrialized State in the country. However, since 1980, the Ruhr lost more than one-third of its jobs in iron and steel, about one-quarter in the coal mining jobs, and slightly less in machine tool industry. New jobs were created in the electronics, chemicals, printing, and energy sectors.

The nonferrous metals recycling industry in the FRG showed considerable growth. Secondary materials accounted for about 45% in aluminum, 45% in copper, and more than 65% in lead.

Metallgesellschaft AG (MG) is one of the largest European metals companies, operating in raw materials, plant construction, chemicals, and automotive manufacturing.

On June 28, the Federal Cabinet approved a legislative proposal dealing with hazardous waste disposal. The new "technical instructions on hazardous waste" amends existing waste management legislation by adopting stricter control mechanisms. The new legislation contains a catalogue of 350 types of waste classified as hazardous. The regulations cover, in particular, paint and varnish diluents, galvanization sludges containing cyanide, caustic copper-etching solutions, and wastes containing arsenic. The FRG has an annual waste output of about 220 million tons, of which 5 million tons is classified as hazardous waste.

GOVERNMENT POLICIES AND PROGRAMS

Until recently, there was no single national mining law in effect for the FRG. The General Prussian Mining Law of June 24, 1865, was the most extensive and most important. The Federal Mining Law, which took effect on January 1, 1982, is administered by local mining boards, which in turn are subject to the ministers of economics of the various States. The 1982 law, which replaced various State laws, regulates exploration and the exploitation of all natural resources and includes health and safety and environmental regulations. Prospecting and development are subsidized by the Government loans. A new law on venture-capital corporations, unternehmungs-beteiligungs- gesellschaften (UBGG), went into effect at the beginning of 1987. The law was designed to provide an entry to the stock market for medium-sized enterprises.

PRODUCTION

The FRG has had a long history of mining and metals production. Although there is a plentiful supply of coal, potash, and salt, the country is not rich in metallic ore deposits. Changing world trade and political patterns and technologies have somewhat altered traditional smokestack industries, gradually resulting in mine closures. Copper, lead, pyrite, and zinc mining have dropped significantly during the past decade. Nevertheless, the production of refined metals and industrial minerals continued to prosper, with some fluctuations caused by world markets. The FRG continued to be one of the world's major producers, processors, and consumers of minerals and metals. Much of the metal raw material had to be imported to maintain the processing industry.

TRADE

Exports of all minerals, metals, and fuels by the FRG in 1989 amounted to about $36 billion, while imports were at $52 billion. About 40% of the GNP came from exports. German exports in real terms rose by 12% in 1989 to an estimated $344 billion, while imports registered slower growth of 7.5% to about $314 billion. Exports of goods and services made up more than one-third of the GNP. The largest increase in sales has been with the European Economic Commission (EC). The share of Comecon[2] in FRG trade was less than 5%, while the EC accounted for more than 70% of FRG's total trade. The FRG trade with developing countries rose considerably in 1989. Both exports to and imports from developing countries increased 14%.

In 1989, the U.S. trade deficit with the FRG was about $8 billion. The FRG was the United States fifth largest export market in 1989, amounting to about $16.9 billion. U.S. imports from the FRG totaled $24.8 billion.

Metallgesellschaft AG (MG) has been trading with the German Democratic Republic for more than 30 years. The company concluded a joint venture with AHB Chemie, Berlin, known as MG-Chemiehandel, for foreign trade in industrial raw materials.

MG raised its stake in MIM Holdings Ltd. of Australia to 10.4% from 4.1%. For several years, the two companies have cooperated in several ventures and have held stakes in each other's companies (MIM owns 3% of MG). Both companies also had stakes in Norddeutsche Affinerie AG (copper) and in Ruhr-Zink GmbH (zinc).[3]

Mineralimpex of Albania and FRG's ferroalloys producer, Gesellschaft fur Elektrometallurgie mbH (GFE), have begun negotiations to conclude a long-term marketing agreement for the distribution of Albanian high-carbon ferrochrome in the FRG. GFE has cooperated with Albania for many years.

Thyssen AG has been negotiating with some 30 GDR companies. Thyssen Edelstahlwerke AG proposed to provide assistance in restructuring the GDR steel industry. Leybold AG, based in Hanau, a subsidiary of the Degussa Group, is establishing contacts with the GDR. Although Leybold recently completed the construction and startup of an electric arc furnace at the Brandenburg Works, the company acknowledged it will be several years before East German industry is ready to tackle the high-technology areas in which Leybold specializes.

Other FRG international companies involved in minerals and/or metals projects in 1989 included Bayer AG, which supplies the various plants with chromite from its own mines in the Republic of South Africa, Brazil, and the Philippines, and Exploration und Bergbau GmbH, which mines uranium oxide and produces yellow cake in Canada from one of the world's largest uranium mines, in Key Lake, Saskatchewan. Urangesellschaft mbH and Interuran GmbH are also involved in uranium mining in Australia, Namibia, and Niger.

TABLE 1

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite, gross weight		275	410	—	—	—
Alumina	thousand tons	1,657	1,560	1,313	1,163	[2]1,174
Metal:						
Primary	do.	745	765	738	744	[2]742
Secondary:						
Alloyed	do.	415	441	470	517	[2]546
Unalloyed	do.	44	39	53	47	[2]34
Cadmium metal, smelter		1,095	1,218	1,125	1,159	[2]1,208
Copper:						
Mine output, Cu content		857	834	1,482	693	[2]119
Metal:						
Smelter:						
Primary		152,400	161,900	165,000	171,500	180,000
Secondary		94,600	76,700	42,700	50,000	75,900
Total		247,000	238,600	207,700	221,500	255,900
Refined including secondary:						
Electrolytic		330,034	339,053	308,069	336,450	[2]375,781
Fired-refined		84,131	[r]82,865	91,753	89,999	[2]99,381
Total		414,165	[r]421,918	399,822	426,449	[2]475,162
Gold: Mine output, Au content[e]	kilograms	37	37	26	16	16
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	1,034	717	247	70	102
Fe content	do.	309	212	68	10	14
Metal:						
Pig iron	do.	31,531	29,018	28,517	32,453	[2]32,777
Blast furnace ferromanganese, spiegeleisen, ferrosilicon	do.	205	256	196	274	[2]305
Electric furnace ferroalloys	do.	171	206	172	207	[2]231
Steel, crude	do.	40,497	37,134	36,248	41,023	[2]41,073
Semimanufactures	do.	28,919	27,540	27,437	30,385	[2]31,699

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Lead:						
Mine output, Pb content		20,496	16,736	18,844	14,264	7,300
Metal:						
Smelter:						
Primary		109,674	111,092	113,600	126,358	[2]116,079
Secondary		246,586	255,529	226,778	218,739	234,633
Total		356,260	366,621	340,378	345,097	[2]350,712
Refined:						
Primary		181,000	182,100	167,600	176,600	181,800
Secondary		175,300	184,500	172,800	168,500	168,000
Total		356,300	366,600	340,400	345,100	349,800
Nickel metal including secondary[e 3]		700	—	—	—	—
Platinum[e]	kilograms	68	56	62	68	68
Silver:						
Mine output, Ag content	thousand kilograms	[r]38	28	31	31	9
Metal including secondary[e]	do.	638	622	684	622	650
Tin metal including secondary[e]		1,000	[2]346	250	[r]150	300
Zinc:						
Mine output:						
Zn content		117,600	103,700	98,900	75,625	63,900
Zn content, recoverable		95,505	84,786	80,542	61,619	[2]53,700
Metal, unwrought, unalloyed:						
Primary		339,876	344,319	348,188	309,879	[2]297,514
Secondary		27,887	26,622	29,313	42,537	[2]45,305
Total		367,763	370,941	377,501	352,416	[2]342,819
INDUSTRIAL MINERALS						
Abrasives: Artifical corundum		91,506	88,447	84,576	88,253	[2]91,806
Barite		171,269	201,565	173,356	165,317	[2]144,106
Bromine[e]		[2]3,077	2,500	2,500	2,500	3,000
Cement and clinker:						
Cement (excluding clinker)	thousand tons	25,758	26,580	25,268	26,215	[2]28,499
Clinker	do.	599	599	872	948	[2]1,300
Clays:						
Bentonite	do.	[e]169	179	167	197	[2]200
Fire clay, excluding klebsand	do.	5,384	5,534	5,810	6,585	6,800
Kaolin, marketable	do.	410	512	588	673	[2]777
Bleaching	do.	1,595	1,319	269	300	300
Fuller's earth	do.	701	680	677	670	665
Other (schieferton)	do.	75	80	93	120	90
Diatomite and similar earth, marketable		48,427	49,432	47,206	47,184	47,000
Feldspar, marketable		261,400	247,498	310,447	308,776	310,000
Fluorspar, marketable:						
Acid-grade		74,824	79,951	76,681	69,940	67,050
Metallurgical-grade		8,314	8,883	[e]8,520	[re]7,770	7,450
Total		83,138	88,834	85,201	77,710	74,500
Graphite:						
Crude		20,958	23,226	17,255	15,769	14,000
Marketable[4]		12,798	13,233	9,891	9,666	7,000
Gypsum and anhydrite, marketable	thousand tons	2,367	1,896	1,707	1,743	1,850
Lime (hydrated), quicklime, dead-burned dolomite	do.	6,845	6,476	6,111	6,801	[2]7,033
Nitrogen, N content of ammonia	do.	1,908	1,570	1,931	1,824	[2]1,749

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Phosphates: Thomas slag-based fertilizer, P_2O_5 content	thousand tons	67	54	[e]50	[e]45	45
Pigments, mineral, natural		15,764	11,365	10,003	8,143	6,500
Potash, K_2O equivalent:						
Crude, marketable	do.	88	85	84	71	[2]80
Chemically processed	do.	2,495	2,076	2,115	2,219	[2]2,102
Total	do.	2,583	2,161	2,199	2,290	[2]2,182
Pumice:						
Crude and washed	do.	690	612	580	265	[2]330
Marketable[e]	do.	207	215	205	[r]95	[2]115
Pyrites, marketable concentrate, gross weight	do.	512	471	412	313	200
Quartz, quartzite, glass sand:						
Quartzite	do.	346	339	290	297	[2]300
Quartz sand, ground	do.	304	317	316	333	[2]338
Quartz sand, unground and glass sand	do.	7,021	6,557	6,128	5,793	[2]6,018
Salt, marketable:						
Rock and other[5]	do.	9,654	12,498	12,862	11,900	12,500
Marine[6]	do.	3,426	604	604	547	600
Sodium compounds:						
Soda ash	do.	1,412	1,442	1,448	1,404	[2]1,443
Sulfate, synthetic	do.	139	163	164	175	[2]172
Stone, sand and gravel:						
Dimension stone[7]	thousand cubic meters	254	257	264	291	[2]314
Limestone, industrial	thousand tons	40,403	40,267	41,059	44,402	[2]48,075
Crushed and broken stone	do.	94,072	101,189	99,755	104,183	[2]111,213
Slate	do.	28	[e]25	22	27	[2]21
Basalt lava and lava sand	do.	7,544	7,657	8,023	[e]8,050	8,060
Calcite	do.	2	—	—	—	—
Grinding stone[e]	cubic meters	40	40	45	45	45
Sand and gravel	thousand tons	131,014	142,555	137,050	146,289	[2]158,249
Sulfur, byproduct:						
Of metallurgy[e]	do.	320	300	300	310	315
Of natural gas	do.	964	998	1,029	952	1,050
Of petroleum[e]	do.	200	190	210	205	210
Unspecified[e]	do.	[r]285	[r]285	[r]285	[r]280	310
Total[e]	do.	[r]1,769	[r]1,773	[r]1,824	[r]1,747	1,885
Talc including talc schist	do.	21	22	20	20	[2]13
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		387,134	383,666	361,982	379,999	[2]401,853
Coal:						
Anthracite and bituminous	thousand tons	82,396	80,801	76,300	73,304	[2]71,428
Lignite	do.	120,667	114,310	108,799	108,563	[2]110,081
Total	do.	203,063	195,111	185,099	181,867	[2]181,509
Coke, metallurgical	do.	22,331	22,254	19,674	18,274	[2]18,384
Fuel briquets:						
Of anthracite and bituminous coal	do.	1,511	1,199	1,001	825	[2]723
Of lignite	do.	4,068	3,630	3,188	2,526	[2]2,214
Gas:						
Manufactured (excluding that from petroleum refineries):[8]						
Blast furnace	million cubic meters	5,002	4,525	4,365	5,007	5,231
Coke oven	do.	5,312	5,381	4,723	4,392	4,455

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Gas—Continued						
Natural, gross	million cubic meters	14,459	13,865	15,871	14,783	14,650
Peat:						
Agricultural use	thousand tons	1,516	2,017	2,002	2,123	[2]1,580
Fuel use	do.	284	246	240	232	[2]232
Petroleum:						
Crude	thousand 42-gallon barrels	29,650	29,015	27,447	28,437	[2]27,231
Refinery products:						
Liquefied petroleum gas	do.	25,462	23,270	24,963	26,483	[2]24,998
Gasoline, motor	do.	173,293	166,054	160,072	167,613	[2]172,690
Jet fuel (including aviation gasoline)	do.	13,797	14,140	14,774	[re]16,000	17,000
Kerosene	do.	364	543	473	426	[2]318
Distillate fuel oil	do.	256,691	259,668	242,517	273,305	[2]254,550
Residual fuel oil	do.	69,117	65,468	58,355	57,582	[2]46,294
Lubricants	do.	10,656	9,988	9,961	10,418	[2]10,585
Bitumen	do.	17,076	16,915	16,259	16,257	[2]16,930
Unspecified[e]	do.	52,299	46,576	[r]48,981	[r]56,476	54,194
Refinery fuel and losses	do.	46,557	46,403	45,682	46,543	[2]40,537
Total	do.	665,312	649,025	622,037	671,103	638,096

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 1991.
[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]Rock only for 1985.
[6]Marine and other for 1985.
[7]Incomplete data.
[8]Other types of manufactured gas may be produced but production data are not reported and available information is inadequate to make reliable estimates.

TABLE 2

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals[2]	8,869	7,175	NA	NA.
Alkaline-earth metals	48	161	9	France 71; Belgium-Luxembourg 33; Spain 17.
Aluminum:				
Ore and concentrate	3,238	55,378	—	Sweden 22,123; France 12,643; Belgium-Luxembourg 10,143.
Oxides and hydroxides	491,171	540,397	25,505	Austria 144,639; Italy 78,096; Netherlands 60,995.
Ash and residue containing aluminum	18,705	29,242	—	France 5,925; Netherlands 4,519; Spain 3,845.
Metal including alloys:				
Scrap	134,984	141,019	177	Netherlands 41,026; Italy 36,770; Belgium-Luxembourg 22,967.
Unwrought	331,989	321,638	2,611	Austria 63,293; France 59,045; Italy 50,229.
Semimanufactures	563,898	648,062	30,408	France 101,951; Italy 64,461; Netherlands 57,590.
Antimony:				
Ore and concentrate	—	214	—	Mainly to Netherlands.
Oxides	803	822	104	Switzerland 139; Italy 136.
Metal including alloys, all forms	57	236	1	Italy 184; Belgium-Luxembourg 41.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Arsenic:				
Oxides and acids	284	257	19	United Kingdom 102, France 60; Belgium-Luxembourg 35.
Metal including alloys, all forms	NA	9	1	Yugoslavia 7; Spain 1.
Beryllium:				
Oxides and hydroxides value, thousands	$1	$22	—	Austria $20; Romania $2.
Metal including alloys, all forms kilograms	2,424	1,148	—	United Kingdom 940; Netherlands 123.
Bismuth: Metal including alloys, all forms	147	144	1	United Kingdom 80; Netherlands 23; Italy 21.
Cadmium:				
Oxides and hydroxides	23	—		
Metal including alloys, all forms[3]	990	836	NA	Netherlands 20; Iraq 13; unspecified 795.
Cesium and rubidium: Metal including alloys, all forms value, thousands	$101	—		
Chromium:				
Ore and concentrate	11,392	14,419	—	France 2,968; Austria 2,683; Netherlands 2,631.
Oxides and hydroxides	NA	14,860	2,279	France 2,405; Italy 1,276.
Metal including alloys, all forms	143	189	—	Belgium-Luxembourg 44; Bahrain 32; United Kingdom 30.
Cobalt:				
Oxides and hydroxides	40	37	—	Austria 10; Spain 9; Netherlands 5.
Ash and residue containing cobalt	300	199	25	United Kingdom 79; Canada 61.
Metal including alloys, all forms	1,182	1,233	NA	France 117; Netherlands 102; unspecified 634.
Columbium and tantalum:				
Ore and concentrate	6	95	36	Netherlands 29; United Kingdom 21.
Ash and residue containing columbium and tantalum	415	223	223	
Metal including alloys, all forms:				
Columbium (niobium)	113	NA		
Tantalum	92	115	37	Belgium-Luxembourg 32; United Kingdom 15.
Copper:				
Ore and concentrate	(4)	5,944	—	Spain 5,850; Italy 93.
Matte and speiss including cement copper	194	7	—	France 3; Netherlands 3; Switzerland 1.
Oxides and hydroxides	2,049	1,357	—	Denmark 243; Sweden 174; Netherlands 130.
Sulfate	1,332	r 1,779	NA	NA.
Ash and residue containing copper	15,785	19,328	—	Austria 5,049; Belgium-Luxembourg 4,657; Republic of South Africa 2,904.
Metal including alloys:				
Scrap	96,068	120,924	944	Italy 40,552; Belgium-Luxembourg 21,725; Netherlands 21,343.
Unwrought	68,546	60,919	1,452	France 10,433; Netherlands 9,458; Belgium-Luxembourg 7,052.
Semimanufactures	498,327	532,771	34,600	France 71,560; Italy 60,699; Austria 53,604.
Gallium: Metal including alloys, all forms	19	[5]24	1	United Kingdom 12; Japan 5.
Germanium:				
Oxides	9	7	—	Japan 4; France 2; Netherlands 1.
Metal including alloys, all forms	6	4	(4)	United Kingdom 3.
Gold:				
Waste and sweepings value, thousands	$2,961	$2,318	—	United Kingdom $736; Belgium-Luxembourg $618; Switzerland $528.
Metal including alloys, unwrought and partly wrought kilograms	33,901	45,607	596	Switzerland 17,207; Italy 4,474; Belgium-Luxembourg 4,210.
Hafnium: Metal including alloys, all forms value, thousands	$7	$50	—	Italy $47; Netherlands $3.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	5,808	20,202	—	Austria 17,738; Netherlands 831; France 535.
Pyrite, roasted	19,028	17,525	—	Belgium-Luxembourg 17,329.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap thousand tons	4,218	4,597	(4)	Italy 1,727; Belgium-Luxembourg 788; Netherlands 775.
Pig iron, cast iron, related materials	524,394	422,376	1,144	France 213,732; Italy 63,011; Netherlands 34,491.
Ferroalloys:				
Ferroaluminum	59	NA		
Ferrochromium	54,346	44,635	10,816	France 6,854; Sweden 6,232.
Ferrocolumbium	484	927	2	France 355; Belgium-Luxembourg 285; Italy 207.
Ferromanganese	66,420	80,714	15,574	France 14,820; United Kingdom 8,643.
Ferromolybdenum	196	214	—	Belgium-Luxembourg 60; Netherlands 30; Sweden 19.
Ferronickel	226	1,067	—	Belgium-Luxembourg 743; Switzerland 274.
Ferrosilicochromium	4,346	3,979	—	Belgium-Luxembourg 1,560; Sweden 1,397; Italy 388.
Ferrosilicomanganese	3,715	5,482	—	Belgium-Luxembourg 2,468; Switzerland 833; France 698.
Ferrosilicon	64,345	80,556	1,016	France 21,033; Belgium-Luxembourg 15,358; Italy 14,822.
Ferrotitanium	636	1,211	8	Sweden 593; Belgium-Luxembourg 199; France 110.
Ferrotungsten	78	33	—	Belgium-Luxembourg 11.
Ferrovanadium	3,020	2,963	5	Sweden 478; United Kingdom 339; Italy 280.
Silicon metal	7,700	7,654	455	Italy 2,442; France 1,747; Austria 1,153.
Unspecified	8,186	12,115	630	United Kingdom 1,372; France 1,072; unspecified 7,776.
Steel, primary forms thousand tons	4,415	1,819	376	France 316; Austria 228.
Semimanufactures:				
Bars, rods, angles, shapes, sections do.	2,843	3,141	157	France 650; Netherlands 636; Belgium-Luxembourg 322.
Universals, plates, sheets do.	5,999	NA		
Hoop and strip do.	1,304	NA		
Rails and accessories	122,080	145,975	13,636	Italy 42,673; India 22,762; Netherlands 22,116.
Wire	294,832	327,408	18,011	France 84,357; Netherlands 59,335; Belgium-Luxembourg 39,011.
Tubes, pipes, fittings thousand tons	3,257	3,445	189	U.S.S.R. 1,177; Netherlands 347.
Castings and forgings, rough	135,443	NA		
Lead:				
Ore and concentrate	10,770	4,729	—	France 4,721; Brazil 8.
Oxides	19,429	22,051	158	Netherlands 5,170; Sweden 3,624; U.S.S.R. 2,575.
Ash and residue containing lead	8,383	2,708	—	Belgium-Luxembourg 938; United Kingdom 787; France 488.
Metal including alloys:				
Scrap	11,604	9,725	—	Netherlands 7,637; Poland 1,573.
Unwrought	86,093	89,833	2,110	Italy 16,459; Austria 13,453; Czechoslovakia 8,432.
Semimanufactures	20,661	22,502	691	France 4,992; Denmark 4,176; Belgium-Luxembourg 2,565.
Lithium:				
Oxides and hydroxides	909	712	—	Netherlands 200; United Kingdom 197; France 142.
Metal including alloys, all forms	49	NA		
Magnesium: Metal including alloys:				
Scrap	1,191	2,350	442	Netherlands 706; Italy 473.
Unwrought	471	875	—	Austria 231; Sweden 199; Netherlands 135.
Semimanufactures	1,257	1,370	4	Netherlands 276; France 258; Belgium-Luxembourg 201.
Manganese:				
Ore and concentrate, metallurgical-grade	2,171	2,934	—	France 1,052; Spain 753; Czechoslovakia 450.
Metal including alloys, all forms	460	407	—	Bahrain 114; Netherlands 110; Finland 32.
Mercury	138	73	5	Indonesia 10; Yugoslavia 7
Molybdenum:				
Ore and concentrate	3,417	2,213	20	Austria 1,183; Netherlands 409; Czechoslovakia 276.
Oxides and hydroxides	761	566	37	Austria 150; Sweden 147; France 94.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Molybdenum—Continued					
Ash and residue containing molybdenum		1,265	529	—	Austria 138; United Kingdom 71; Taiwan 50.
Metal including alloys:					
Unwrought including scrap		803	822	120	Japan 173; Sweden 167.
Semimanufactures		46	52	2	Austria 17; Brazil 9; Hungary 3.
Nickel:					
Ore and concentrate		11	77	—	Denmark 30; Austria 24; Switzerland 9.
Matte and speiss		1,187	1	1	
Oxides and hydroxides		95	88	—	Austria 42; Belgium-Luxembourg 18; Spain 13.
Ash and residue containing nickel		5,506	8,451	13	Canada 2,160; Austria 2,132; Finland 1,391.
Metal including alloys:					
Scrap		6,492	9,989	880	Sweden 5,789; Netherlands 1,258; Belgium-Luxembourg 1,083.
Unwrought		9,426	9,357	355	France 3,533; Netherlands 3,206; Italy 583.
Semimanufactures		11,029	11,669	3,057	France 1,493; Italy 1,076.
Platinum-group metals:					
Waste and sweepings	value, thousands	$1,060	$2,363	$491	Switzerland $675; United Kingdom $650.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	5,192	8,490	1,239	Brazil 1,127; Netherlands 772.
Platinum	do.	12,587	14,439	1,051	Switzerland 5,462; Japan 2,578; Netherlands 1,372.
Rhodium	do.	NA	291	55	Netherlands 59; Brazil 28.
Iridium, osmium, ruthenium	do.	NA	559	101	Netherlands 228.
Unspecified	do.	4,421	—		
Rare-earth metals including alloys, all forms		13	6	1	Finland 1; France 1.
Silver:					
Waste and sweepings[6]	value, thousands	$7,148	$10,360	—	Belgium-Luxembourg $4,094; Austria $2,849; United Kingdom $2,690.
Metal including alloys, unwrought and partly wrought	kilograms	1,218,780	1,221,181	10,087	Austria 119,704; Sweden 97,474; Switzerland 91,180.
Tellurium, elemental		[7]11	6	—	France 3.
Tin:					
Ore and concentrate		—	(4)	NA	NA.
Ash and residue containing tin		1,132	3,531	—	United Kingdom 3,452; Netherlands 47.
Metal including alloys:					
Scrap		276	282	—	Netherlands 149; United Kingdom 45; Belgium-Luxembourg 37.
Unwrought		1,903	1,559	30	United Kingdom 461; Yugoslavia 168; Belgium-Luxembourg 157.
Semimanufactures		1,295	1,724	22	Austria 353; Italy 303; France 171.
Titanium:					
Ore and concentrate		3,842	3,746	—	Hungary 1,595; France 867; Austria 562.
Oxides		42,323	39,783	15,373	Taiwan 3,910; U.S.S.R. 2,595.
Ash and residue containing titanium		36	128	—	All to Belgium-Luxembourg.
Metal including alloys:					
Scrap		307	1,467	233	United Kingdom 1,034.
Unwrought		28	171	—	United Kingdom 69; Belgium-Luxembourg 45; France 19.
Semimanufactures		521	517	(4)	Italy 130; Denmark 81; France 59.
Tungsten:					
Ore and concentrate		—	79	—	Mainly to Netherlands.
Oxides and hydroxides		192	151	1	Austria 84; Japan 23; Bulgaria 20.
Ash and residue containing tungsten		368	182	—	Austria 162; Republic of South Africa 20.
Metal including alloys:					
Scrap		705	455	64	Austria 140; Sweden 104; United Kingdom 79.
Unwrought		376	81	3	Austria 35; Japan 16.
Semimanufactures		143	498	5	Romania 20; Brazil 19; unspecified 309.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Uranium and thorium:				
Ore and concentrate	9,338	3	—	All to Czechoslovakia.
Oxides and other compounds	881	555	—	France 402; U.S.S.R. 112; United Kingdom 41.
Metal including alloys, all forms:				
Uranium	4	NA		
Vanadium:				
Oxides and hydroxides	504	447	NA	NA.
Ash and residue containing vanadium	667	195	15	United Kingdom 89; Sweden 44; Belgium-Luxembourg 24.
Metal including alloys:				
Scrap	1	(4)	—	All to Japan.
Unwrought	311	369	9	Japan 146; United Kingdom 128; France 86.
Semimanufactures value, thousands	$13	$117	—	North Korea $45; France $28; Austria $19.
Zinc:				
Ore and concentrate	103,006	72,066	—	Belgium-Luxembourg 25,355; France 21,029; Netherlands 16,296.
Oxides	26,321	23,804	476	U.S.S.R. 3,900; Belgium-Luxembourg 3,863; France 2,708.
Blue powder	6,585	7,195	—	Switzerland 1,220; Netherlands 1,116; United kingdom 955.
Matte	6,203	6,397	491	Italy 1,176; United Kingdom 954; France 909.
Ash and residue containing zinc	66,594	116,776	—	Sweden 39,432; Belgium-Luxembourg 34,263; France 16,759.
Metal including alloys:				
Scrap	17,993	29,468	—	Taiwan 11,057; Belgium-Luxembourg 7,545; Netherlands 3,568.
Unwrought	104,233	117,514	7,220	France 28,012; Italy 23,898; Belgium-Luxembourg 13,676.
Semimanufactures	24,369	25,340	83	France 5,894; Italy 3,365; Netherlands 2,577.
Zirconium:				
Ore and concentrate	15,287	7,913	—	Czechoslovakia 1,300; France 1,255; Poland 995.
Oxides	446	381	59	Italy 153; Belgium-Luxembourg 41.
Metal including alloys:				
Scrap	52	59	32	France 25.
Unwrought	16	13	—	Sweden 3; Netherlands 1; Switzerland 1.
Semimanufactures	7	6	1	France 2; Belgium-Luxembourg 1.
Other:				
Ores and concentrates	(4)	6	6	
Oxides and hydroxides	472	576	7	Japan 107; United Kingdom 79.
Ashes and residues	82,076	76,486	40	Belgium-Luxembourg 66,009; Netherlands 7,946.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	308,668	293,020	46	Netherlands 260,980; Switzerland 23,802.
Artificial:				
Corundum	51,186	46,281	2,674	Austria 6,196; France 5,006; United Kingdom 4,579.
Silicon carbide	27,105	33,469	NA	NA.
Dust and powder of precious and semiprecious stones including diamond	5	[8]8	NA	Mainly to Czechoslovakia.
Grinding and polishing wheels and stones	16,172	17,164	930	France 2,624; United Kingdom 1,607; Netherlands 1,292.
Asbestos, crude	1,219	1,194	—	France 903; Switzerland 84.
Barite and witherite	31,725	35,858	234	France 10,617; Belgium-Luxembourg 5,489; Sweden 4,255.
Boron materials:				
Crude natural borates	240	115	—	Yugoslavia 75; Belgium-Luxembourg 25.
Elemental	9	8	1	France 3; Japan 1.
Oxides and acids	567	535	—	Austria 83; France 52; Netherlands 50.
Bromine	219	7	—	Denmark 4; Romania 1.
Cement thousand tons	1,834	2,314	(4)	Netherlands 1,536; United Kingdom 314.
Chalk	63,108	104,432	10	Finland 48,567; Sweden 31,044; Netherlands 13,230.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude:					
Bentonite		31,097	43,387	17	France 10,250; Austria 7,145; Belgium-Luxembourg 6,888.
Chamotte earth		31,484	72,144	—	France 21,298; Netherlands 11,606; Belgium-Luxembourg 9,933.
Fuller's earth		3,373	3,801	—	Netherlands 3,473; Denmark 110.
Fire clay	thousand tons	1,527	1,771	—	Italy 1,099; Netherlands 275; France 193.
Kaolin		134,927	191,558	42	Austria 71,795; Italy 60,340; Switzerland 17,592.
Unspecified		411,071	235,891	88	Netherlands 138,230; Belgium-Luxembourg 58,675; Italy 18,384.
Cryolite and chiolite		73	156	60	Italy 65; Netherlands 8.
Diamond, natural:					
Gem, not set or strung	carats	173,268	186,461	6,562	Belgium-Luxembourg 47,558; Hong Kong 35,295; Switzerland 21,401.
Industrial stones	do.	320,800	302,117	131,920	Belgium-Luxembourg 31,665; Greece 28,400.
Dust and powder	kilograms	NA	9,247	468	Italy 6,640; Switzerland 601.
Diatomite and other infusorial earth		1,409	2,273	34	France 627; China 229; Netherlands 214.
Feldspar, fluorspar, related materials:					
Feldspar		27,329	29,131	49	France 17,474; Switzerland 3,694; Netherlands 2,417.
Fluorspar		20,463	24,897	—	Austria 10,892; France 4,913; Belgium-Luxembourg 3,443.
Unspecified		149	520	—	Spain 408.
Fertilizer materials:					
Crude, n.e.s.		119,089	32,838	—	Netherlands 14,870; Switzerland 5,719; Austria 3,886.
Manufactured:					
Ammonia		421,544	435,399	—	Denmark 160,151; United Kingdom 114,189; France 51,027.
Nitrogenous	thousand tons	1,642	1,483	80	Belgium-Luxembourg 419; Netherlands 192; Spain 112.
Phosphatic		67,328	81,769	(4)	Netherlands 35,691; France 18,151; Austria 12,279.
Potassic	thousand tons	2,297	2,317	82	Belgium-Luxembourg 526; India 295; United Kingdom 155.
Unspecified and mixed	do.	1,238	944	1	Belgium-Luxembourg 308; France 133; Italy 84.
Graphite, natural		9,269	9,112	130	Italy 2,096; France 983; Bulgaria 950.
Gypsum and plaster		377,440	411,861	22	Netherlands 107,884; Belgium-Luxembourg 86,903; Switzerland 59,585.
Iodine		71	123	—	Italy 24; Netherlands 13; India 12.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		6,899	3,439	—	France 1,187; Netherlands 781; Spain 513.
Mullite		NA	2,935	—	Italy 866; United Kingdom 862; France 368.
Lime		453,176	480,318	1	Netherlands 313,956; France 70,514.
Magnesium compounds:					
Magnesite, crude		204	3,024	—	France 678; Austria 565; Netherlands 488.
Oxides and hydroxides		55,929	62,622	119	France 38,456; Italy 6,671
Sulfate		462,171	456,193	17,013	France 124,206; Malaysia 66,445; Singapore 43,301.
Mica:					
Crude including splittings and waste		1,342	1,286	2	France 388; Netherlands 186; Belgium-Luxembourg 130.
Worked including agglomerated splittings		233	243	6	United Kingdom 42; Italy 34; Hong Kong 21.
Nitrates, crude		1	25,854	887	France 4,136; Republic of Korea 3,947; Austria 3,229.
Phosphates, crude		2,989	5,189	—	Austria 3,199; Switzerland 1,750.
Pigments, mineral:					
Natural, crude		1,260	2,455	385	Switzerland 1,584; United Kingdom 207.
Iron oxides and hydroxides, processed		149,861	158,482	8,096	France 23,964; Italy 14,265.
Potassium salts, crude		47,958	43,017	—	Belgium-Luxembourg 18,726; United Kingdom 17,897; Netherlands 5,454.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	342,827	474,161	23,230	Hong Kong 151,946; China 129,413; India 43,840.
Synthetic	do.	40,315	29,780	2,185	Switzerland 14,024; Japan 7,840.
Pyrite, unroasted		1,400	1,318	—	Austria 236; Sweden 152; Switzerland 141.

See footnotes at end of table.

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Quartz crystal, piezoelectric	kilograms	186	3,802	11	Japan 3,262; Switzerland 127; Thailand 119.
Salt and brine	thousand tons	2,146	2,061	(4)	Belgium-Luxembourg 1,422; Sweden 79.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		428,432	316,768	231	Netherlands 48,731; Denmark 23,232; France 17,966.
Sulfate, manufactured		77,988	76,496	NA	NA.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		663,385	386,074	85	Netherlands 303,796; Switzerland 49,405.
Worked		51,575	67,058	1,110	Belgium-Luxembourg 13,946; Austria 12,133; Switzerland 10,779.
Dolomite, chiefly refractory-grade		90,393	85,803	172	Netherlands 33,507; Belgium-Luxembourg 13,861; France 13,029.
Gravel and crushed rock	thousand tons	12,072	12,370	(4)	Netherlands 9,237; Switzerland 1,806; Belgium-Luxembourg 932.
Limestone other than dimension		62,774	52,313	—	Netherlands 35,291; Belgium-Luxembourg 11,505; Switzerland 3,324.
Quartz and quartzite		56,343	148,450	130	Netherlands 55,146; Belgium-Luxembourg 51,493; Italy 13,601.
Sand other than metal-bearing	thousand tons	7,922	8,594	1	Netherlands 5,740; Belgium-Luxembourg 1,969; Switzerland 532.
Sulfur:					
Elemental:					
Crude including native and byproduct		764,328	697,106	1	Netherlands 216,179; France 133,862; United Kingdom 123,418.
Colloidal, precipitated, sublimed		200	235	30	France 62.
Dioxide		26,206	22,073	—	Austria 12,558; Netherlands 3,513; Belgium-Luxembourg 2,331.
Sulfuric acid		831,810	641,889	22	Netherlands 298,508; Belgium-Luxembourg 189,553; United Kingdom 99,174.
Talc, steatite, soapstone, pyrophyllite		7,840	5,488	8	Netherlands 1,438; Yugoslavia 1,226; Switzerland 377.
Vermiculite, perlite, chlorite		9,346	15,993	—	Netherlands 7,702; Belgium-Luxembourg 5,898.
Other:					
Crude	thousand tons	1,739	1,183	(4)	Netherlands 661; Belgium-Luxembourg 241; France 165.
Slag and dross, not metal-bearing	do.	3,814	4,168	(4)	Netherlands 2,405; France 1,434.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		4,436	3,642	—	Austria 1,739; Sweden 524; Denmark 290.
Carbon black		136,851	136,665	3,493	France 39,276; Austria 16,803; Belgium-Luxembourg 13,814.
Coal:					
Anthracite	thousand tons	NA	1,073	—	Belgium-Luxembourg 533; France 249; United Kingdom 158.
Bituminous	do.	5,623	3,628	(4)	France 1,062; Belgium-Luxembourg 1,032; Italy 986.
Briquets of anthracite and bituminous coal		322,056	311,340	—	United Kingdom 159,592; France 86,949; Belgium-Luxembourg 29,238.
Lignite including briquets		895,894	793,051	—	Belgium-Luxembourg 289,368; Austria 147,305; Italy 146,621.
Coke and semicoke	thousand tons	2,652	3,552	63	Belgium-Luxembourg 1,671; France 762.
Gas, natural, gaseous	million cubic meters	1,877	1,412	—	Switzerland 981; Austria 137.
Peat including briquets and litter	thousand tons	1,369	1,776	(4)	Netherlands 1,067; France 209; Italy 154.
Petroleum:					
Crude	thousand 42-gallon barrels	9	146	(4)	Mainly to Netherlands.
Refinery products:					
Liquefied petroleum gas	do.	4,973	5,976	(4)	Netherlands 2,419; Italy 1,193; France 837.
Gasoline	do.	7,980	11,842	31	Switzerland 5,355; Netherlands 2,345; Belgium-Luxembourg 1,238.
Mineral jelly and wax	do.	1,385	1,553	46	France 168; Republic of South Africa 151; Netherlands 148.
Kerosene and jet fuel	do.	11,817	13,065	1	Switzerland 824; Denmark 213; unspecified 11,653.
Distillate fuel oil	do.	6,565	13,130	265	Switzerland 8,636; France 1,791; Austria 1,220.
Lubricants	do.	3,269	2,669	5	United Kingdom 438; Netherlands 367; Belgium-Luxembourg 321.
Residual fuel oil	do.	13,067	14,902	896	Austria 2,765; France 1,997; unspecified 5,447.
Bitumen and other residues	do.	3,167	3,203	(4)	Austria 966; Switzerland 705; Denmark 475.
Bituminous mixtures	do.	145	150	(4)	Netherlands 35; Switzerland 24; Austria 22.
Petroleum coke	do.	1,896	2,459	(4)	Netherlands 932; France 479; Austria 292.

See footnotes at end of table.

NA Not available.
[1]Table prepared by P. J. Roetzel. Excludes exports to the German Democratic Republic.
[2]Includes selenium and elemental phosphorus.
[3]Includes rhenium.
[4]Less than 1/2 unit.
[5]May include indium and thallium.
[6]May include other precious metals.
[7]Includes arsenic.
[8]Excludes diamond.

TABLE 3

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	2,010	2,222	2	France 1,448; United Kingdom 736.
Alkaline-earth metals	423	508	72	France 174; China 102.
Aluminum:				
Ore and concentrate thousand tons	2,879	2,577	2	Guinea 962; Sierra Leone 686; China 138.
Oxides and hydroxides	865,046	958,247	1,879	Australia 286,405; Italy 181,076; Jamaica 158,049.
Ash and residue containing aluminum	52,709	50,860	566	Netherlands 14,622; Austria 8,883; Norway 4,909.
Metal including alloys:				
Scrap	205,285	283,217	3,996	Netherlands 80,740; United Kingdom 40,326; France 36,452.
Unwrought	710,255	785,945	5,032	Norway 232,685; United Kingdom 81,185; Brazil 67,348.
Semimanufactures	396,890	454,150	3,179	France 96,263; Belgium-Luxembourg 64,660; Netherlands 56,432.
Antimony:				
Ore and concentrate	319	—		
Oxides	4,792	4,922	64	France 1,551; China 1,156; Belgium-Luxembourg 1,009.
Metal including alloys, all forms	1,398	1,727	—	China 1,184; U.S.S.R. 164; Turkey 100.
Arsenic:				
Oxides and acids	254	1,374	—	France 1,292; Japan 33.
Metal including alloys, all forms	NA	34	—	Netherlands 14; China 11; Sweden 6.
Beryllium:				
Oxides and hydroxides value, thousands	$12	$32	$12	United Kingdom $15; China $2.
Metal including alloys, all forms	1	6	1	Finland 3; Belgium-Luxembourg 2.
Bismuth: Metal including alloys, all forms	689	659	—	China 137; United Kingdom 78; Hong Kong 37.
Cadmium:				
Oxides and hydroxides	660	—		
Metal including alloys, all forms	511	658	65	Belgium-Luxembourg 186; Australia 108; Netherlands 92.
Cesium and rubidium: Metal including alloys, all forms value, thousands	$13	—		
Chromium:				
Ore and concentrate	258,912	272,541	80	Republic of South Africa 157,145; Turkey 53,182; Albania 33,494.
Oxides and hydroxides	2,633	2,970	239	China 1,471; United Kingdom 526; Poland 362.
Metal including alloys, all forms	1,145	1,347	40	Japan 441; France 279; U.S.S.R. 218.
Cobalt:				
Ore and concentrate	—	4	—	All from Finland.
Oxides and hydroxides	311	383	6	Belgium-Luxembourg 155; Finland 134; United Kingdom 65.
Ash and residue containing cobalt	148	394	—	Austria 150; Netherlands 99; France 55.
Metal including alloys, all forms	2,476	2,773	117	Zaire 1,623; Norway 246; France 155.
Columbium and tantalum:				
Ore and concentrate	[2]1,142	NA		
Ash and residue containing columbium and tantalum	2,245	16,604	895	Malaysia 10,986; Thailand 1,577; Spain 974.
Metal including alloys, all forms:				
Columbium (niobium)	18	[3]36	32	Switzerland 2.
Tantalum	177	202	129	Belgium-Luxembourg 23; United Kingdom 14.

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Copper:				
Ore and concentrate	435,670	553,600	140,216	Papua New Guinea 134,408; Poland 85,008.
Matte and speiss including cement copper	12,064	12,892	—	France 5,235; Spain 4,076; Australia 1,494.
Oxides and hydroxides	1,481	1,634	183	Belgium-Luxembourg 569; Italy 568; United Kingdom 201.
Sulfate	8,168	8,117	—	Czechoslovakia 1,708; France 1,655; Netherlands 1,183.
Ash and residue containing copper	29,143	33,724	5,783	Italy 9,530; Netherlands 3,009.
Metal including alloys:				
Scrap	248,301	295,278	24,970	Netherlands 56,655; France 55,424; United Kingdom 47,443.
Unwrought	481,742	510,286	3,950	Chile 119,269; Poland 91,699; Zaire 59,766.
Semimanufactures	265,111	281,384	1,466	Belgium-Luxembourg 98,257; France 72,247; Italy 24,030.
Gallium: Metal including alloys, all forms	13	[4]16	1	United Kingdom 5; France 3; Belgium-Luxembourg 2.
Germanium:				
Oxides	1	9	1	Austria 6; U.S.S.R. 1.
Metal including alloys, all forms kilograms	4,800	3,200	200	Belgium-Luxembourg 1,400; United Kingdom 1,100; Japan 300.
Gold:				
Waste and sweepings value, thousands	$108,878	$120,268	—	Cuba $25,731; Sweden $8,203; Switzerland $7,027.
Metal including alloys, unwrought and partly wrought kilograms	78,855	165,883	1,485	Switzerland 62,605; Republic of South Africa 22,129; Spain 21,823.
Hafnium: Metal including alloys, all forms do.	1,100	1,200	900	France 300.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	39,583	45,169	25	Brazil 19,512; Sweden 5,651; Liberia 5,441.
Pyrite, roasted	66,713	102,327	—	Belgium-Luxembourg 45,188; Sweden 31,248; Norway 25,041.
Metal:				
Scrap thousand tons	1,189	1,407	15	Netherlands 447; France 344; Denmark 200.
Pig iron, cast iron, related materials	319,216	294,933	151	Canada 85,950; Brazil 69,014; France 25,012.
Ferroalloys:				
Ferroaluminum	579	NA		
Ferrochromium	326,009	362,980	—	Republic of South Africa 192,798; Zimbabwe 38,562; Finland 19,453.
Ferrocolumbium	2,401	2,532	—	Brazil 2,333; United Kingdom 123; Belgium-Luxembourg 76.
Ferromanganese	98,155	109,638	392	Norway 40,065; France 35,356; Republic of South Africa 17,471.
Ferromolybdenum	5,679	7,044	101	United Kingdom 2,930; Belgium-Luxembourg 1,680; France 809.
Ferronickel	62,913	82,134	435	Greece 29,584; New Caledonia 25,681; Brazil 8,344.
Ferrosilicochromium	14,047	20,807	—	Zimbabwe 11,785; Greece 1,892; Sweden 1,184.
Ferrosilicomanganese	114,859	124,442	—	Norway 61,238; Republic of South Africa 23,944; Brazil 13,281.
Ferrosilicon	192,887	208,000	393	Norway 106,627; France 15,751; Italy 10,613.
Ferrotitanium	4,603	5,434	21	United Kingdom 3,896; Belgium-Luxembourg 463; U.S.S.R. 439.
Ferrotungsten	641	1,323	—	China 1,143; United Kingdom 64.
Ferrovanadium	1,771	2,068	36	Belgium-Luxembourg 1,424; Austria 393.
Silicon metal	74,343	76,627	414	Norway 30,105; France 10,168; China 7,189.
Unspecified	8,940	22,293	5,351	France 5,920; U.S.S.R. 3,526.
Steel, primary forms thousand tons	2,019	1,129	(5)	United Kingdom 285; Belgium-Luxembourg 276; Netherlands 180.
Semimanufactures:				
Bars, rods, angles, shapes, sections do.	4,044	4,479	2	Italy 869; Belgium-Luxembourg 726; France 652.
Universals, plates, sheets do.	3,767	NA		
Hoop and strip	659,249	NA		
Rails and accessories	11,593	24,966	3	Poland 10,498; Belgium-Luxembourg 5,157; Austria 2,910.
Wire	311,539	371,076	448	Belgium-Luxembourg 91,136; Czechoslovakia 58,002; France 54,771.
Tubes, pipes, fittings thousand tons	984	1,108	1	Italy 262; France 128; Netherlands 124.
Castings and forgings, rough	60,487	NA		

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lead:					
Ore and concentrate		226,010	235,441	—	Canada 58,609; Sweden 29,339; Ireland 28,754.
Oxides		10,229	5,497	23	Netherlands 2,644; France 1,427.
Ash and residue containing lead		27,731	25,915	2,206	Australia 5,736; Czechoslovakia 4,518; Belgium-Luxembourg 3,049.
Metal including alloys:					
Scrap		44,995	30,396	795	Denmark 6,439; Netherlands 4,985; Canada 3,183.
Unwrought		103,347	110,135	18	United Kingdom 40,170; France 24,676; Belgium-Luxembourg 16,039.
Semimanufactures		4,219	4,904	—	Belgium-Luxembourg 2,994; United Kingdom 1,013.
Lithium:					
Oxides and hydroxides		1,515	1,631	393	China 272.
Metal including alloys, all forms		22	NA		
Magnesium: Metal including alloys:					
Scrap		5,658	2,676	—	Sweden 826; Belgium-Luxembourg 432; Austria 324.
Unwrought		24,167	24,144	5,284	Norway 9,370; France 3,039.
Semimanufactures		5,748	6,880	1,628	Austria 1,681; Turkey 1,551.
Manganese:					
Ore and concentrate, metallurgical-grade		378,627	514,446	—	Republic of South Africa 310,776; Australia 95,123; Brazil 78,279.
Oxides		3,951	6,935	39	Japan 3,364; Belgium-Luxembourg 1,098; Ireland 1,080.
Metal including alloys, all forms		5,488	7,150	747	Republic of South Africa 3,134; France 1,497; China 1,077.
Mercury		343	256	—	Algeria 108; China 83; Spain 24.
Molybdenum:					
Ore and concentrate		16,305	17,329	6,875	Belgium-Luxembourg 3,163; Netherlands 2,472.
Oxides and hydroxides		107	544	51	Netherlands 281; Belgium-Luxembourg 103; United Kingdom 87.
Ash and residue containing molybdenum		245	214	4	Australia 66; Bulgaria 47; Hungary 36.
Metal including alloys:					
Scrap		423	679	—	Austria 424; United Kingdom 63; Netherlands 61.
Unwrought		57	75	38	France 22; United Kingdom 8.
Semimanufactures		348	517	149	Austria 275; France 64.
Nickel:					
Ore and concentrate		57	88	—	Netherlands 28; Denmark 26; France 25.
Matte and speiss		13,104	14,584	25	Australia 12,372; Canada 1,722.
Oxides and hydroxides		280	331	—	Canada 126; Finland 74; Australia 55.
Ash and residue containing nickel		1,167	1,565	56	Netherlands 565; France 202; Belgium-Luxembourg 159.
Metal including alloys:					
Scrap		6,987	11,775	2,429	Switzerland 3,168; France 2,116.
Unwrought		57,247	56,245	294	U.S.S.R. 23,344; Norway 7,726; Canada 5,839.
Semimanufactures		7,704	7,893	795	France 3,553; United Kingdom 1,935.
Platinum-group metals:					
Waste and sweepings	value, thousands	$70,295	$68,342	$11,196	Netherlands $10,391; Hungary $4,870.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	17,081	27,461	3,259	U.S.S.R. 7,451; United Kingdom 6,171; Switzerland 5,325.
Platinum	do.	23,836	21,430	409	Republic of South Africa 9,589; Switzerland 4,133; United Kingdom 2,673.
Rhodium	do.	NA	995	29	Netherlands 290; United Kingdom 258; U.S.S.R. 206.
Iridium, osmium, ruthenium	do.	NA	2,156	59	Republic of South Africa 1,276; United Kingdom 789.
Unspecified	do.	5,127	—		
Rare-earth metals including alloys, all forms		138	143	9	Austria 53; Brazil 53; United Kingdom 19.
Rhenium: Metal including alloys, all forms	value, thousands	$50	NA		
Silicon, high-purity		27	31	1	United Kingdom 9; Sweden 6; France 5.

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Silver:					
Ore and concentrate[6]	value, thousands	$43,028	$18,137	$2,493	Canada $7,770; Chile $2,839.
Waste and sweepings	do.	$140,570	[7]$136,691	$69,674	Mexico $12,549; Netherlands $5,608.
Metal including alloys, unwrought and partly wrought	kilograms	1,365,896	1,381,315	20,321	United Kingdom 353,675; Belgium-Luxembourg 247,196; Sweden 138,439.
Tellurium, elemental		[8]111	62	—	United Kingdom 34; Belgium-Luxembourg 22; U.S.S.R. 4.
Tin:					
Ore and concentrate		144	3,780	—	Canada 3,741; Burundi 38.
Oxides		57	93	—	United Kingdom 34; France 33; Italy 14.
Ash and residue containing tin		2,932	3,107	598	United Kingdom 751; Netherlands 520.
Metal including alloys:					
Scrap		365	351	43	France 58; Netherlands 39.
Unwrought		19,303	21,315	106	Brazil 5,407; United Kingdom 3,235; Thailand 2,442.
Semimanufactures		93	145	2	Belgium-Luxembourg 41; United Kingdom 32; Netherlands 27.
Titanium:					
Ore and concentrate		483,428	470,349	4,340	Norway 247,596; Canada 143,809; Sri Lanka 27,950.
Oxides		19,086	24,865	1,168	Belgium-Luxembourg 10,277; France 6,160; United Kingdom 3,479.
Ash and residue containing titanium		239,571	180,028	—	Canada 179,998; Poland 20; United Kingdom 10.
Metal including alloys:					
Scrap		307	687	85	France 262; United Kingdom 91; U.S.S.R. 89.
Unwrought		1,931	3,302	108	Japan 645; unspecified 2,300.
Semimanufactures		823	1,065	324	Japan 338; United Kingdom 222.
Tungsten:					
Ore and concentrate		3,454	4,105	—	China 2,632; Netherlands 278; Thailand 227.
Oxides and hydroxides		68	307	32	China 275.
Ash and residue containing tungsten		201	152	25	Thailand 63; Belgium-Luxembourg 28.
Metal including alloys:					
Scrap		719	683	89	Australia 133; France 122.
Unwrought		647	44	2	Austria 35; Denmark 2.
Semimanufactures		97	714	67	Austria 498; France 27.
Uranium and thorium:					
Ore and concentrate	value, thousands	$1	—		
Oxides and other compounds		2,551	1,183	2	France 713; Republic of South Africa 333; Australia 136.
Metal including alloys, all forms:					
Uranium		3	NA		
Thorium	value, thousands	$222	NA		
Vanadium:					
Ore and concentrate		15	NA		
Oxides and hydroxides		1,554	1,623	77	China 1,313; Republic of South Africa 216.
Ash and residue containing vanadium		1,159	1,465	NA	Italy 1,105; Netherlands 128.
Metal including alloys:					
Scrap		5	([5])	NA	NA.
Unwrought		35	59	39	Republic of South Africa 19.
Semimanufactures	value, thousands	$13	$75	$54	United Kingdom $21.
Zinc:					
Ore and concentrate		664,023	604,455	4,022	Canada 271,804; Peru 57,202; Sweden 53,354.
Oxides		14,111	16,092	16	Netherlands 3,811; France 3,711; Belgium-Luxembourg 1,333.
Blue powder		13,049	14,261	—	Belgium-Luxembourg 10,522; Norway 1,655; France 1,617.
Matte		7,290	6,956	—	Netherlands 3,427; France 1,591; Belgium-Luxembourg 878.
Ash and residue containing zinc		40,758	34,948	718	United Kingdom 4,907; Italy 4,851; Czechoslovakia 3,564.

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Metal including alloys:				
Scrap	16,546	28,916	474	Netherlands 9,300; Italy 5,318; Belgium-Luxembourg 4,745.
Unwrought	171,215	193,047	25	Belgium-Luxembourg 59,734; Netherlands 53,520; Norway 29,143.
Semimanufactures	30,084	31,097	2,356	France 16,139; Yugoslavia 3,591; Netherlands 3,110.
Zirconium:				
Ore and concentrate	58,895	56,192	4,285	Australia 29,514; Republic of South Africa 18,445.
Oxides and hydroxides	506	1,009	23	France 547; United Kingdom 275.
Metal including alloys:				
Scrap	1	4	1	United Kingdom 2.
Unwrought	20	22	2	France 8, United Kingdom 5; Netherlands 3.
Semimanufactures	404	375	160	France 156; Sweden 40.
Other:				
Ores and concentrates	NA	443	37	Netherlands 315; Mexico 87.
Oxides and hydroxides	1,436	4,212	32	France 3,372; Belgium-Luxembourg 591.
Ashes and residues	4,470	9,862	1,223	Brazil 3,277; Republic of South Africa 1,499.
Base metals including alloys, all forms	—	16	1	United Kingdom 5; France 3; Belgium-Luxembourg 2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	80,207	65,752	622	Greece 42,805; Iceland 8,473; Italy 7,295.
Artificial:				
Corundum	27,838	35,852	1,114	U.S.S.R. 6,026; Austria 4,402; Yugoslavia 4,369.
Silicon carbide	69,475	66,286	62	Norway 12,901; Italy 3,752; U.S.S.R. 3,265.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	[9]494,746	492,149	491,207	Switzerland 183; Japan 72.
Grinding and polishing wheels and stones	9,214	9,859	69	Austria 2,585; Netherlands 2,124; Italy 1,294.
Asbestos, crude	55,412	44,584	123	Canada 24,098; Italy 10,115; Zimbabwe 3,526.
Barite and witherite	188,871	215,033	—	France 84,234; China 47,899; Belgium-Luxembourg 34,331.
Boron materials:				
Crude natural borates	40,395	51,127	—	Turkey 50,243; Netherlands 387; Netherlands 251.
Elemental value, thousands	$40	$319	$303	Switzerland $14.
Oxides and acids	22,046	23,419	1,920	France 8,962; Italy 6,231; Argentina 2,059.
Bromine	5,913	5,153	—	Israel 4,763; France 2,238; United Kingdom 73.
Cement thousand tons	1,349	1,524	([5])	Belgium-Luxembourg 577; France 318; Poland 172.
Chalk	281,000	251,083	—	France 179,394; Belgium-Luxembourg 59,979.
Clays, crude:				
Bentonite	119,113	187,642	31,272	Greece 88,613; Spain 23,750.
Chamotte earth	26,355	33,124	—	France 17,937; Republic of South Africa 6,659; Czechoslovakia 3,926.
Fuller's earth	10,809	12,065	1,588	United Kingdom 9,242; France 345.
Fire clay	139,034	130,844	7,615	France 44,613; Czechoslovakia 38,950; United Kingdom 21,510.
Kaolin	864,836	942,608	133,011	United Kingdom 478,077; Czechoslovakia 142,298.
Unspecified	125,036	92,211	3,722	Czechoslovakia 35,863; Netherlands 23,077; France 10,295.
Cryolite and chiolite	1,400	2,350	50	Greenland 1,196; Denmark 1,085.
Diamond, natural:				
Gem, not set or strung carats	573,144	615,792	5,236	Belgium-Luxembourg 229,461; India 172,736; Israel 65,349.
Industrial stones do.	1,155,651	983,250	113,185	Republic of South Africa 324,446; Belgium-Luxembourg 273,509.
Dust and powder kilograms	NA	12,239	9,546	Ireland 2,087; Switzerland 124.
Diatomite and other infusorial earth	39,326	37,903	3,733	Denmark 14,545; France 13,703.
Feldspar, fluorspar, related materials:				
Feldspar	62,300	66,710	—	Norway 22,776; Italy 16,731; France 14,068.

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Feldspar, fluorspar, related materials—Continued					
Fluorspar		174,618	230,638	2,300	Republic of South Africa 98,494; China 36,806; Morocco 23,591.
Unspecified		77,174	73,744	—	Norway 60,553; Netherlands 12,923.
Fertilizer materials:					
Crude, n.e.s.		48,893	56,142	466	Netherlands 33,621; France 17,084.
Manufactured:					
Ammonia		252,369	270,018	2	Netherlands 192,921; Austria 28,675.
Nitrogenous	thousand tons	2,741	2,461	7	Netherlands 857; Belgium-Luxembourg 255; Austria 237.
Phosphatic		607,955	563,743	28	Belgium-Luxembourg 380,297; France 105,105; Netherlands 34,496.
Potassic		76,253	109,182	—	Israel 56,007; France 38,318; United Kingdom 9,290.
Unspecified and mixed	thousand tons	1,834	1,914	113	Austria 229; Denmark 198; Netherlands 195.
Graphite, natural		30,504	30,264	—	China 17,041; Austria 3,362; Madagascar 1,407.
Gypsum and plaster		751,223	712,765	—	France 575,853; Canada 125,951.
Iodine		1,088	917	297	Japan 356; Chile 246.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		80,554	71,640	10,321	Republic of South Africa 50,804; France 6,638.
Mullite		NA	59,769	56,621	United Kingdom 2,594; Hungary 309.
Lime		353,235	459,669	—	France 278,622; Belgium-Luxembourg 81,820; Poland 66,501.
Magnesium compounds:					
Magnesite, crude		6,089	18,405	—	China 12,076; Greece 3,072; Netherlands 1,783.
Oxides and hydroxides		362,024	440,801	1,049	China 73,340; North Korea 59,826; Netherlands 55,859.
Sulfate		1,193	600	3	Netherlands 459.
Mica:					
Crude including splittings and waste		14,771	15,617	185	India 8,034; France 2,370; United Kingdom 2,325.
Worked including agglomerated splittings		654	640	15	Belgium-Luxembourg 277; France 166; Austria 65.
Nitrates, crude		3,397	5,909	—	Chile 3,071; Poland 814; Belgium-Luxembourg 793.
Phosphates, crude	thousand tons	1,445	1,158	496	Republic of South Africa 204; Morocco 158.
Phosphorus, elemental and selenium		23,150	29,171	NA	NA.
Pigments, mineral:					
Natural, crude		2,160	2,765	—	Austria 1,436; Netherlands 399; France 385.
Iron oxides and hydroxides, processed		21,735	25,953	1	Belgium-Luxembourg 4,976; Italy 2,277; Netherlands 2,074.
Potassium salts, crude		154	187	—	Netherlands 90; Belgium-Luxembourg 74; Italy 24.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	1,171,263	1,150,713	60,302	Brazil 589,567; Republic of South Africa 208,810; Madagascar 139,698.
Synthetic	do.	30,082	27,161	2,565	Switzerland 14,022; Bulgaria 6,646.
Pyrite, unroasted		150,525	159,233	—	Finland 101,492; Yugoslavia 42,598; Norway 6,059.
Quartz crystal, piezoelectric	kilograms	5	7,969	5,746	Japan 1,720; Austria 329.
Salt and brine		710,037	723,628	165	Netherlands 552,931; France 118,379.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		109,497	114,193	17	Netherlands 68,241; Poland 14,705; Yugoslavia 10,225.
Sulfate, natural and manufactured		54,104	7,847	73	Belgium-Luxembourg 2,703; Spain 1,474; Austria 1,442.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		684,649	609,473	154	Sweden 99,703; Austria 71,683; France 70,654.
Worked	thousand tons	1,006	1,122	—	Italy 498; Portugal 285; Spain 74.
Dolomite, chiefly refractory-grade		270,677	360,732	—	Belgium-Luxembourg 299,231; Norway 24,649; Austria 19,532.
Gravel and crushed rock	thousand tons	7,383	8,715	—	France 4,588; Norway 1,153; Denmark 817.
Limestone other than dimension	do.	1,068	1,024	(e)	Austria 594; Belgium-Luxembourg 251; France 103.
Quartz and quartzite		60,942	47,325	911	Yugoslavia 13,380; Netherlands 10,891; Belgium-Luxembourg 9,782.
Sand other than metal-bearing	thousand tons	3,242	3,386	2	France 2,622; Netherlands 245; Belgium-Luxembourg 197.

See footnotes at end of table.

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental:					
Crude including native and byproduct		214,142	176,187	29,217	Canada 116,906; Poland 13,687.
Colloidal, precipitated, sublimed		1,204	614	3	France 384; United Kingdom 163; Algeria 108.
Dioxide		11,225	11,202	—	Switzerland 4,540; Poland 3,051; Netherlands 1,192.
Sulfuric acid		120,333	157,910	—	Netherlands 103,027; Switzerland 19,247; Belgium-Luxembourg 16,431.
Talc, steatite, soapstone, pyrophyllite		155,536	173,702	2,868	Austria 53,814; France 34,942; Finland 22,108.
Vermiculite, perlite, chlorite		121,405	112,456	402	Greece 76,662; Hungary 14,443; Republic of South Africa 11,079.
Other:					
Crude	thousand tons	1,482	1,263	11	Norway 568; Spain 250; United Kingdom 99.
Slag and dross, not metal-bearing	do.	1,335	1,627	6	France 560; Belgium-Luxembourg 502; Netherlands 122.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		19,015	23,071	9,144	Trinidad and Tobago 9,027; Netherlands 3,463.
Carbon black		78,191	81,374	2,225	France 32,403; Netherlands 23,310; Italy 4,975.
Coal:					
Anthracite		27,423	75,489	868	Republic of South Africa 52,239; Norway 11,648.
Bituminous	thousand tons	8,140	7,093	265	Republic of South Africa 2,690; Poland 1,879; France 565.
Briquets of anthracite and bituminous coal		1,779	3,750	—	Netherlands 2,854; Belgium-Luxembourg 729.
Lignite including briquets	thousand tons	2,187	1,905	—	Czechoslovakia 1,896; Belgium-Luxembourg 3.
Coke and semicoke		808,611	887,434	71,381	Belgium-Luxembourg 338,937; Czechoslovakia 145,657; France 136,811.
Gas, natural: Gaseous	million cubic meters	48,841	48,140	—	Netherlands 17,828; U.S.S.R. 16,313; Norway 8,365.
Peat including briquets and litter		110,594	130,324	—	Netherlands 77,134; U.S.S.R. 36,295; Austria 5,873.
Petroleum:					
Crude	thousand 42-gallon barrels	496,812	531,009	—	United Kingdom 139,682; Libya 85,214; U.S.S.R. 43,762.
Refinery products:					
Liquefied petroleum gas	do.	11,756	9,806	2	Netherlands 2,321; Norway 1,521; Belgium-Luxembourg 1,503.
Gasoline	do.	104,822	108,681	272	Netherlands 45,905; U.S.S.R. 14,980; United Kingdom 11,840.
Mineral jelly and wax	do.	1,882	2,143	314	France 318; U.S.S.R. 299.
Kerosene and jet fuel	do.	19,099	20,753	101	Netherlands 15,982; Belgium-Luxembourg 2,481.
Distillate fuel oil	do.	162,277	129,729	27	Netherlands 65,956; U.S.S.R. 18,587; France 7,048.
Lubricants	do.	3,445	3,215	311	France 807; United Kingdom 608; Netherlands 508.
Residual fuel oil	do.	45,634	37,633	32	Netherlands 12,137; Belgium-Luxembourg 5,454; Sweden 3,402.
Bitumen and other residues	do.	1,977	1,819	(5)	Belgium-Luxembourg 736; Netherlands 560; Hungary 163.
Bituminous mixtures	do.	116	340	5	Hungary 144; France 99; Netherlands 56.
Petroleum coke	do.	7,170	6,908	5,952	United Kingdom 421; Netherlands 233.

NA Not available.
[1]Excludes imports from the German Democratic Republic. Table prepared by P. J. Roetzel.
[2]Includes other ores.
[3]Includes rhenium.
[4]Includes indium and thallium.
[5]Less than 1/2 unit.
[6]Includes other precious ores.
[7]May include other precious metals.
[8]Includes arsenic.
[9]Includes diamond.

STRUCTURE OF THE MINERAL INDUSTRY

There were about 1,450 operating mines, quarries, and drilling rigs in the FRG, more than one-half of them underground. Mining and mineral processing are controlled by a few large, privately owned companies with interests in many business sectors and investments abroad. Mineral fuels and steel producers operated in close cooperation with Government, industry, and labor unions. Research and development are also coordinated with the Government. The Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften

und Rohstoffe) in Hannover provides mineral information and participates in exploration and development. The Ministry of Industry publishes statistics on mining and production through the Statistisches Bundesamt, an office of the Ministry in Wiesbaden.

TABLE 4

FEDERAL REPUBLIC OF GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Vereinigte Aluminium-Werke AG (Viag AG)	Smelters at Stuttgen, Toging, Stade, and Lunen	385
Do.	Leichtmetall-Gesellschaft mbH (Alusuisse Deutschland GmbH, 50.21%; Aluminium-Walzwerke Singen GmbH, 48.25%; other, 1.54%)	Smelter at Essen-Borbeck	130
Do.	Hamburger Aluminium-Werk GmbH (VAW, 33.3%; Austria Metall AG, 33.3%; Reynolds Aluminium Deutschland, Inc., USA, 33.3%)	Smelter at Hamburg	100
Do.	Hoogovens Aluminium GmbH (Hoogovens Groep BV)	Smelter at Vorde	77
Alumina	Vereinigte Aluminium-Werke AG (Viag AG)	Plant at Schwandorf	[1]120
Do.	Aluminium Oxid Stade GmbH (VAM, 50%; Reynolds Aluminium Deutschland, Inc., Zweigniederlassung Hamburg, 50%)	Plants at Stade and Innwerke	700
Do.	Martinswerke GmbH (Alusuisse Deutsch-land GmbH)	Plant at Bergheim	[1]350
Cement	37 companies, of which the major ones are-	68 plants	35,000, including-
Do.	Heidelberger Zement AG	Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kiefersfelden, and others	9,000
Do.	Dyckerhoff AG Neubeckum, and others	Plants at Amoneburg, Gollheim, Neuwied,	6,500
Do.	E.Schwenk, Zementwerke KG	Plants at Allmendingen, Mergelstetten, and Karlstadt	4,000
Do.	Anneliese Zementwerke AG	Plants at Ennigerloh-Nord, Ennigerloh-Sud, Geseke, and Paderborn	3,500
Coal	Four companies, of which the major ones are-	About 50 mines, including—	195,000, including-
Do.	Ruhrkohle AG (Veba AG, 37.1%; BGE Beteiligungs--Gesellschaft fur Energieunternehmen mbH,21.9%; Societe Nouvelle Sidechar, 8.3%, Thyssen Stahl AG, 12.7%; others 20%), which includes-	21 mines in Ruhr Basin	(54,000)
Do.	Bergbau AG Niederrhein	7 mines	(21,000)
Do.	Bergbau AG Lippe	9 mines	(20,000)
Do.	Bergbau AG Westfalen	5 mines	(13,000)
Do.	Saarbergwerke AG (Government, 74%; State of Saarland, 26%)	5 mines in Saar Basin	(11,000)
Copper	Norddeutsche Affenerie AG (Degussa AG, 30%; Metallgesellschaft AG, 35%; Mount Isa Mining Holdings (Deutschland) GmbH, 35%)	Smelter and refinery at Hamburg	290
Do.	Huttenwerke Kayser AG	Smelter and refinery at Lunen	120
Lead	Sachtleben GmbH (Metallgesellschaft AG)	Meggen mine at Lennestadt	3
Do.	Preussag AG Metall (Preussag AG)	Mine at Bad Grund	5
Do.	Preussag-Boliden-Blei GmbH (Preussag AG)	Smelter and refinery at Nordenham	120
Do.	Berzelius Metallhutten GmbH (Metallgesellschaft AG)	Smelter and refinery at Duisburg and Binsfeldhammer	90
Do.	Norddeutsche Affinerie AG (Degussa AG, 35%; Metallgesellschaft AG, 35%; Mount Isa Mining Holdings (Deutschland) GmbH, 35%)	Refinery at Hamburg	40
Do.	Metaleurop Weser Blei GmbH (Metaleurope SA, France)	Refinery and smelter at Nordenham	113
Lignite	Rheinische Braunkohlenwerke AG (Rheinisch-Westfalisches Elektrizitatswerk AG)	Mines at Garzweiler, Fortuna/Bergheim, Zukunft/Inden, and Hambach	105,000
Do.	Braunschweigische Kohlen-Bergwerke AG (PreussenElektra AG, 99.9%)	Mines at Alversdorf, Helmstedt, and Schiningen	4,000
Natural gas	Brigitta Erdgas und Erdol GmbH, and Elwerath Erdgas und Erdol GmbH (Deutsche Shell AG, 50%; Esso AG, 50%)	Plants at Grossenkneten and Clenze	[2]9,500

See footnotes at end of table.

TABLE 4—Continued

FEDERAL REPUBLIC OF GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Natural gas—Continued	Mobil Erdgas-Erdol GmbH	Plants at Scholen	[2]4,000
Do.	Other 10 companies	Plants at Duste, Rutenbrock, and others	[2]2,000
Petroleum: Crude	The largest companies are—	6 areas with about 85 oilfields	[3]80,000, including-
Do.	Elwerath Erdgas und Erdol GmbH (see above)	West of Ems River	[3](30,000)
Do.	Wintershall AG (BASF AG)	Weser-Ems Rivers	[3](21,000)
	Deutsche Texaco AG (Rheinisch-Westfalisches Elektrizitatswerk AG)	Elbe-Weser Rivers	[3](20,000)
Refined	About 25 companies, of which the largest are—	About 30 refineries	[4]2,000 including-
Do.	Deutsche Shell AG (Royal Dutch/Shell Gruppe)	Refineries at Godorf, Hamburg, and Monheim	[4](280)
Do.	Esso AG (Exxon Corp., New York)	Refineries at Cologne, Karlsruhe, and Ingolstadt	[4](260)
Do.	Ruhr Oel GmbH (Petroleos de Venezuela SA, 50%; Veba Oel AG, 50%)	Refinery at Gelsenkirchen	[4](220)
Do.	OMV AG (Osterreichische Industrieholding AG Wien, 85%; Government, 15%)	Refinery at Karlsruhe	[4](150)
Potash	Kali und Salz AG (BASF AG, 75.5%)	Mines at Bergmannssegen-Hugo, Niedersachsen-Riedel, Salzdetfurth, Sigmundshall, Hattorf, Neuhof-Ellers, and Wintershall	2,300 (K_2O)
Salt	Kali und Salz AG	Mines at Bad Friedrichshall-Kochendorf, Braunschweig-Luneburg, Heilbronn, Riedel, Stetten, and Wesel (Borth)	15
Steel	About 18 companies, of which the majors are-	About 26 plants	45,000, including-
Do.	Thyssen Stahl AG	Plants at Duisburg, Hattungen, Krefeld, Written, and Oberhausen	(13,000)
Do.	Stahlwerke Peine-Salzgitter (Salzgitter Huttenwerk AG)	Plants at Salzgitter and Peine	(5,000)
Do.	Krupp Stahl AG (Fried.Krupp GmbH)	Plants at Bochum, and Rheinhausen	(5,000)
Do.	Hoesch AG	Plants at Dortmund (4,500)	
Do.	Klockner-Werke AG (Klockner Stahl GmbH)	Plants at Bremen, and Osnabruck	(4,000)
Zinc	Ruhr-Zink GmbH (Metallgesellschaft AG, 50%; M.I.M. Holdings Deutschland GmbH, 50%)	Refinery at Datteln	145
Do.	Metaleurop Weser Zink GmbH (Metaleurop SA, France)	Refinery at Nordenham	120
Do.	Berzellius Metallhutten GmbH (Metallgesellschaft AG)	Smelter at Duisburg	85

[1]Alumina capacity for nonmetallurgical uses.
[2]Million cubic meters.
[3]42-gallon barrels per day.
[4]Thousand 42-gallon barrels per day.

COMMODITY REVIEW

Metals

Aluminum.—Although the FRG is devoid of economic bauxite deposits, the country ranked 10th in the world and 3d in Europe after the U.S.S.R. and Yugoslavia in the production of alumina. This output, based wholly on imported bauxite, coupled with additional and substantial imports of alumina, serves not only as the raw material base for the country's primary aluminum industry, but also for a major alumina chemical industry, reputedly third only to those of the United States and Japan.

One key component of this alumina industry is Martinswerk GmbH, based in the town of Bergheim near Cologne. This firm is a subsidiary of the FRG company Lonza-Werke GmbH, which itself is the chemicals subsidiary of the Swiss-multinational aluminum products group, Alusuiss SA. Martinswerke has been involved in the alumina industry since 1914, and its plant, sited near lignite fields that provide the firm with its energy, has an annual capacity of 350,000 tons of pure Al_2O_3. Although the firm's markets are primarily in Europe, it sells specialty aluminas around the world, particularly in the United States and the Far East.

Vereinigte Aluminum-Werke AG (VAW) is also an important producer of alumina. This firm reportedly continued to rank as the largest producer of alumina trihydrate in Europe, but at midyear announced termination of production of tabular alumina at its Nabwerke, Schwandorf plant, thereafter stressing output of

other specialty aluminas for ceramic and refractory applications and maintaining output of metallurgical-grade calcined alumina. VAW's annual capacity was rated at 430,000 tons on a 100% Al_2O_3 basis. The company's bauxite supply was principally from Australia and Guyana, and its energy supply was derived from a local household waste burning plant in order to keep energy costs as low as possible.[4]

The FRG ranked second to Norway among Western European primary aluminum-producing countries. The country's overwhelmingly dominant primary aluminum producer was Viag AG, through its subsidiary, VAW. The parent firm, Viag, is the smallest of the FRG's three large electric power utility firms and is also a producer of chemicals and paper. Aluminum operations accounted for about 24% of Viag's income and provided employment for more than 9,400.

The FRG's secondary aluminum output reached a new high in 1989; recycling efforts made the FRG one of the most effective recycling nations. The secondary aluminum industry, until fairly recently characterized by a large number of independent ingot producers, has altered in the past few years toward fewer and larger companies. Reportedly, each year, this industry has been generating 250,000 tons of salt slags as a result of producing aluminum from scrap, but because of environmental considerations, it soon will be no longer permissable to dispose of this material in dumps.[5]

The FRG's aluminum consumption increased almost 4.7% to 1.29 million tons in 1989.

Copper.—The FRG, with meager copper reserves, remained the leading producer of refined copper in Western Europe and ranked sixth in the world in refinery output after the United States, Chile, the U.S.S.R., Canada, and Zambia. Somewhat more than one-half of the country's refined output was derived from ores and concentrates, all but a tiny fraction mined indigenously. More than 37% of the 621,000 tons of concentrates imported in 1989 was from Papua New Guinea; 19% originated in the United States, 18% was obtained from Portugal, and 12% from Peru. Portugal was tapped for the first time in this year, as the Neves Corvo mine came on-line as a major producer. This source seemed likely to at least partly displace Papua New Guinea well into 1990 owing to operational difficulties at the Bougainville Mine that stemmed from terrorist attacks during 1989.

The supply of copper smelted in West Germany chiefly from imported concentrates was augmented by the import of 55,586 tons of unrefined copper. Imports came from Chile (27%), the Republic of South Africa (26%), and Peru (16%), as well as by secondary production from domestic and imported scrap to provide raw materials for the production of more than 475,000 tons of refined copper, including more than 273,000 tons from scrap. Domestic refined copper output, however, still fell short of domestic requirements, and imports of unwrought refined copper totaled about 452,000 tons, further supplemented by receipts of more than 133,000 tons of continuous cast rod. Of the total refined copper thus available in 1989, almost 45,000 tons was exported as unwrought refined copper, and more than 168,000 tons was exported in the form of continuous cast rod. With appropriate additions and subtractions due to trade in less significant forms of unwrought copper and for changes in stocks, apparent consumption of refined copper totaled slightly more than 854,000 tons, 7% higher than that in 1988, a record high.

The Federal Republic's leading copper refinery was Norddeutsche Affinerie AG (NA), with an aggregate annual electrolytic refined copper capacity of 290,000 tons (primary and secondary) in its Hamburg plant. This capacity included the new tankhouse opened in July of 1989, with an annual capacity of up to 170,000 tons. NA's total work force was reduced 2.7% to 2,854 during the year ending 30 September 1989.[6]

The FRG's second-ranked copper refiner was Huttenwerke Kayser AG. This firm's smelter and refinery at Luneu had an annual capacity of 120,000 tons of electrolytically refined copper. The roster of major FRG copper producers included the firm Kabelmetal at Osnabruck, with an annual smelter capacity of 90,000 tons, and Felten & Guilleaume Carlwerke AG, with its 9,000-ton-per-year smelter and fire refinery at Koln-Mulheim.

Iron and Steel.—Virtually all of FRG's iron ore supply is imported. Receipts totaled more than 47 million tons ore, concentrates and agglomerates, excluding roasted iron pyrites in 1989.

Although precise figures on the sources of these imports cannot be provided owing to prevalent statistical reporting practices, it is evident that Brazil provided about two-fifths of the total, Australia about one-fifth, and Canada and Sweden roughly one-tenth each. The roster of significant suppliers was rounded out by Liberia and the Republic of South Africa, with somewhat under one-tenth each. The difficulty in precisely assessing source country market shares for West German ore imports lies in the fact that about 60% of total receipts is landed in the Netherlands and transshipped to the FRG. This material is credited to the Netherlands in official FRG trade reports. However, examination of the reported origin of Netherlands imports makes possible the foregoing approximations.

FRG's inconsequential domestic iron ore production was obtained from the Wohlverwahrt-Mammen mine, owned by Barbara Rohstoffbetriebe GmbH. About 255 persons were employed by the iron ore industry, but these included employees operating the Konrad open pit that was serving as a radioactive waste dump and others readying the Leonie pit for closure.

Based chiefly on the imported ore and on scrap arisings and imports, the Federal Republic of Germany was able to produce more than 41 million tons of steel, maintaining its position as the world's fifth-ranked producer, following the U.S.S.R., Japan, the United States, and China. Indeed, indigenous scrap arisings were so large as to provide for an overall net export of iron and steel scrap totaling more than 3.6 million tons in 1989.

Thyssen Stahl AG, with steel production of about 11.6 million tons in 1989, was the world's eighth steel producer; Hoesch AG, Krupp Stahl AG, and Peine-Salzgitter AG produced more than 4 million each; and Mannesmann AG and Klckner produced more than 3 million tons each. Of all steel produced, about 90% is continuous cast, compared with a world average of 60%. West Germany also produces more tons of flat than long products. Some companies stopped producing long products completely. Two-thirds of FRG's finished steel is now sold as flat products. A number of companies, such as Thyssen Edelstahlwerke in Krefeld, devoted their production to special steels, thus comprising 22% of Germany's steel output by weight and 27% by value. The FRG was the second largest exporter

of steel in the world after Japan. The FRG was the world's second largest importer of steel, after the United States.

Thyssen reported a record profit of $439 million for the 1989 fiscal year. The company's business year was the best since the company was founded in 1953. The profits of the steel division represent an increase of 21% from the previous year's results. Sales were up 17%, with the specialty steel sector up 31%. Thyssen's exports accounted for 48% of its earnings, about 47% of which went to developing countries. Thyssen exported about 450,000 tons of steel to the United States in 1989.[7]

Thyssen's oxygen steel plants are at Beeckerwerth, Bruckhausen, and Ruhrort, which are also equipped with continuous casters. The company operates nine blast furnaces, five of which are at Hamborn, along with a coking plant producing 40% of Thyssen's coke. The largest blast furnace, 13.6 meters inner diameter, is in Schwelgern. Heavy plate is produced at the Huttenheim plant. In Oberhausen, Thyssen has one 120-ton electric arc furnace and a continuous billet caster with six strands. Thyssen operates two hot strip mills in Duisburg. The wide hot strip mill at Beeckerwerth is currently being modernized. Flat steel accounts for more than 80% of the finished products. Coated materials account for one-half of the cold-rolled production of 4 million tons per year.[8]

Thyssen Edelstahl AG, the special steel division, increased its profits by 63%, but expects a downturn in 1990. The company's worldwide sales rose by 29%.

Thyssen Stahl has formed a committee to examine relations with the GDR steel industry, including a joint venture in cold rolling at the VEB Bandstahlkombinat, and the cold-rolling mill at Oranienburg near Berlin. Thyssen Stahlunion imports basic steel products from the GDR and other East bloc countries and in turn exports flat and long products to them from the FRG, through its subsidiary Auffermann GmbH in Dusseldorf.[9]

Hoesch AG, based in Dortmund, subdivided and expanded some of its nonsteel operations into high-performance companies. About one-half of the company's turnover was contributed by steel sales. In 1989, the company produced about 4 million tons of crude steel.

Lead and Zinc.—There were two operating metal mines in West Germany, both producing lead and zinc, with some copper, silver, and pyrite. The two mines employed about 760 workers. The Meggen mine, in the suburbs of Lennestadt, is owned and operated by Sachtleben Bergbau GmbH, a wholly owned subsidiary of MG. The underground Meggen mine produces primarily lead, zinc, and pyrite concentrates. The lead concentrates, grading approximately 43% lead, are processed at Duisburg, about 125 kilometers from the mine. The zinc concentrates, about 54% zinc, are processed at MG's Datteln plant, about 160 kilometers from the mine.

The Bad Grund mine, about 75 kilometers southeast of Hannover, is owned by Preussag AG Metall. The Bad Grund underground mine produced lead and zinc concentrates and some copper and silver.

In 1989, FRG mine production of lead was equal to only about 2% of the country's lead consumption and was less than 7% of primary lead production. The remaining 93% of primary lead output was derived from imported concentrates. Almost 67% of total refined lead output was secondary lead—that is, it was obtained from the processing of scrap. The country had three plants classified as primary plants [one of which utilizes the Imperial Smelting Process (ISP)] and six secondary lead refineries.

The FRG output of refined lead was equal to more than 90% of the country's domestic lead requirements, which totaled about 375,000 tons; the balance was made up by imports of lead metal.

In the case of zinc, FRG's mine output was equivalent to slightly more than 16% of the nation's consumption and 25% of its primary zinc output. Imported concentrates provided the remaining 75% of primary zinc production, and this primary zinc output represented about 65% of the country's zinc consumption of more than 452,000 tons. Domestically produced secondary zinc provided about 10% of the 1989 consumption, and thus, imports of zinc metal represented a little less than 25% of the total consumed.

Refined zinc was produced by two electrolytic plants and one ISP plant. The secondary smelter at Datteln, using the vertical retort process, produces zinc metal mainly for use in chemicals. Other secondary smelters, brass manufactures, and plants remelt secondary materials to augment the supply. Imports of unwrought refined zinc exceed exports by a factor of 1.6 to 1.

The construction of a new emission-free Queneau-Schumann-Lurgi (QSL) lead smelter by "Berzelius" Metallhutten GmbH in Binsfeldhammer was proceeding on schedule.

In 1989, MG signed a contract with East Germany to modernize the lead smelter at Freiberg.

Ruhr-Zink GmbH is jointly owned by MG and MIM (Deutschland), both in Frankfurt, a wholly owned subsidiary of MIM of Australia. Ruhr-Zink began work on the expansion of its smelting capacity of zinc from 140,000 to 200,000 tons per year by the extension of the tankhouse and the introduction of a modern pressure leaching process. Another construction project started at Ruhr-Zink's plant in Datteln was a zinc pressure leach plant. Ruhr-Zink's plant was designed mostly by Sherritt Gordon Ltd. of Alberta, Canada, and Lurgi GmbH. Ruhr will be the third licensee of the Sherritt Zinc Pressure Leach process. The pressure leach plant capacity will be 50,000 tons per year of zinc. The plant is to startup in the fourth quarter of 1990 and will reportedly comply with all environmental regulations in the FRG.[10]

Grillo-Werke AG (GW) operated one of Europe's largest manufacturing plants in Goslar for zinc oxide and zinc powder for batteries. MG held a 25.1% stake in GW, headquartered in Duisburg. GW had a 33.5% share in Rheinzink GmbH in Datteln.

B.U.S Berzelius Umwelt-Service AG is a holding company for its subsidiary B.U.S Metall GmbH. The company reprocesses wastes from the filter systems of steel and nonferrous metal plants to recover metals such as lead and zinc. The holding company has recently become publicly owned. B.U.S Metall produced 22,000 tons of zinc-rich oxide in its Waelz kiln in Duisburg from 55,000 tons of steel mill dust. B.U.S (Berzelius Umwelt-Service GmbH) was formed in 1987 by MG to develop the recycling of all secondary materials other than scrap, particularly dusts and sludges. At its plant in Duisburg, steel plant flue dusts are pelletized and fed to a Waelz kiln to produce high-zinc oxide. This is then briquetted and the briquettes supplied to the plant's Imperial Smelting furnace for smelting into metallic zinc. The capacity of the plant was for treating 55,000 tons per year of dry dust to produce about 14,000 tons of zinc, 2,000 tons of lead, and 3 tons of

cadmium in the form of oxide.

Nickel.—On March 16, MG in Frankfurt agreed to sell its two-thirds interest in VDM Nickel-Technologie AG to Krupp Stahl AG in Bochum. Krupp Stahl, the steelmaking unit of Fried. Krupp GmbH, owned one-third of Vereinigte Deutsche Nickelwerk AG (VDM) in 1988. VDM, headquartered in Werdohl, was renamed as Deutsche Nickel AG, producing nickel alloys and semis. The nickel company employed about 1,800 workers. VDM has three operations—rolling mills at Werdohl and Altena, and a melting plant at Unna. At Barenstein, the company manufactures nickel wire, for use in electronics.[11] The company became the world's leading producer of semifinished nickel products and aluminum flat heat regenerators and is, reportedly, the world's second largest coin blank producers. The company's production capacity was a total of 30,000 tons per year of materials and more than 200 different alloys for superalloy nickel products and special steels. Semifinished nickel products account for 65% of the company's total output. VDM imports its nickel raw material from Inco, Falconbridge, and Sherritt Gordon in Canada and from a number of other companies. The company sells about one-half of its nickel and special steel products within the FRG, more than 20% to other EC countries and 10% to the rest of Europe, more than 10% to North and Central America, and the remainder is sold in the Far East and Africa. In November, VDM announced it was acquiring Precision Rolled Products of Reno, Nevada, which produces nickel-, cobalt-, and titanium-base products. VDM had a 20% stake in Special Metals Corp., New Hartford, NY, and was reportedly seeking to buy an existing mill or build a new one in the United States to roll nickel-base alloys.[12]

Precious Metals.—Domestic gold and silver mine production in the FRG is very limited. Total production of silver was about 460 kilograms, of which 98.5% came from imported ores. Secondary production from refining scrap totaled 700 kilograms. About 1.5 million kilograms of refined silver and silver products was imported, 311 kilograms of which came from Belgium and 550 kilograms from the United Kingdom. Exports totaled 35 million ounces, 310 kilograms of which was destined to the United Arab Emirates.[13]

Degussa AG is active worldwide in the fields of chemicals, precious metals, specialty steels, and pharmaceuticals, with sales of about $8 billion. Precious metals remained of special importance to Degussa since 1873. Degussa operated four gold refineries, in the FRG, the Netherlands, Canada, and Singapore. Degussa also operated three precious-metal refineries in New Jersey, the United States, in Sao Paulo, Brazil, and in Vienna, Austria. The Jewelry Metal Business Section at Pforzheim developed the 22-carat Aurum Plus alloy for high-grade gold jewelry. Degussa also developed cadmium-free gold solders. The largest proportion of its business overseas is in North America, about 25% from precious-metals trading, employing about 2,600 people. The total work force of Degussa was about 33,700 people, of which 22,310 were in the FRG.

Industrial Minerals

Barite.—About 70% of FRG's barite production is used in the manufacturing of barium salts such as carbonate, nitrate, and sulfate. Barite is produced in three mines. The Clara barite and fluorspar mine, owned by Sachtleben Bergbau AG, produces material used as a precursor in barium carbonate and lithopones. The Dreislar barite mine, also owned by Sachtleben, also produces chemical-grade barite. The Wolkenhuegel barite mine is owned jointly by MG and Kali und Salz AG and produces high-quality bleached filler and extender-grade barite chiefly for the paint industry. About 175 people were employed in the barite industry.

Cement.—West Germany is the second largest producer of hydraulic cement in the EC after Italy. There are about 35 cement companies in the FRG, operating about 65 plants. A number of plants are planning improvements in operations. Heidelberger Zement Ag, the largest company, continues to upgrade its plants with the addition of high-pressure grinding rolls. Anneliese Zementwerke AG is adding 160-ton-per-hour high-pressure grinding rolls at its plants in Paderborn and Geseke; a 135-ton-per-hour high-efficiency separator and a 100-ton-per-hour throughput separator for cement are being added at the Geseke plant. Several other plants are adding high-pressure grinding rolls and high-efficiency separators.[14]

Clays.—There are about 150 small-and medium-sized clay mines in West Germany. About one-half of Germany's high-quality refractory and ceramic clays is produced in the Rhineland-Palatinate area. Production in Bavaria is concentrated in the Oberfalz.

Bentonite is almost exclusively mined from 40 locations in Bavaria. Sud-Chemie AG in Moosburg is the largest bentonite producer in Western Europe. The second largest company is Erbsloeh-Geisenheim GmbH, in Geisenheim. About 30% of FRG bentonite production is exported for use by the drilling, construction, foundry, agricultural, and water purification industries.

About 75% of West German kaolin is mined in Bavaria. The country additionally imports about 55% to 65% of high-quality paper-coating-grade kaolins, even though it is the second largest producer of kaolin in Western Europe after the United Kingdom. Amberger Kaolinwerke GmbH is the largest producer, with mines in Hirschau-Schnaittenbach in Bavaria. The FRG kaolin industry employs approximately 1,650 people.

Fluorspar.—Fluorspar is produced in two mines. The Clara mine at Oberwolfach is operated by Sachtleben, the second mine, Kaeferstelge in Pforzheim-Würm, is owned by Fluss und Schwerspatwerke Pforzheim GmbH. The mines provided about 26% of the country's annual consumption. The production continued to fall because of reserve depletion.

Graphite.—Graphitwerk Kropfmühl AG, headquartered in Hauzenberg, is the only graphite mining and processing company in the FRG. The company also operates a processing plant at Werk Wedel in Holstein. Richard-Anton KG, in Graefelfing, Munich, 50% owned by Graphitwerk, operates three production plants in Hagen, Manheim, and Obernzell. About one-half of the company's production went into the refractory industry, mostly in Europe. Production at the Kropfmühl mine has been falling in recent years because of declining reserves, but the mine remains the EC's only working graphite mine.

Gypsum.—West Germany is a major European producer of crude gypsum. The largest producer in Germany is Gebr. Knauf Westdeutsche Gipswerke GmbH, accounting for more than two-thirds of

the gypsum production. The company operated 11 mines in Bavaria and 6 in Baden-Wurttemberg, Hesse, Saarland, and Lower Saxony. The second largest FRG producer is Rigips Baustoffwerke GmbH, operating mines in Baden-Wurttemberg and Lower Saxony. There are 15 other companies in the FRG engaged in the mining and processing of gypsum.

Potash.—The FRG is the world's fourth largest potash producer. Kali und Salz AG, a subsidiary of BASF, is the only operator of potash mines and plants in the country. Rock salt is also mined at the Bergmannssegen-Hugo and the Salzdetfurth mines. The production of potash in the FRG has been relatively unchanged for the past 5 years because of the continued weak demand for potash fertilizer and a considerable fall in prices. Three mines in Hesse produced 73% of FRG's potash, and five mines in Lower Saxony produced the remainer. About 7,000 people were employed in the potash industry in 1989.

Pumice.—The Koblenz-Neuwieder-Becken region, southeast of Bonn, is the only pumice deposit in the FRG. Pumice is mined in the FRG from a large number of small operations. In 1978, more than 150 small-scale companies were directly involved in the industry; currently, about 100 enterprises are operating in the production and processing of pumice. Of these, about 60% produce pumice and scoria; the rest produce pumice only. The manufacture of lightweight concrete blocks is increasingly responsible for the greatest share of pumice output in Neuwied. In 1978, the FRG was one of the world's largest producers of pumice and scoria. But now, good quality deposits have been severely depleted. The FRG imports pumice mainly from Greece, Italy, and Iceland.[15]

Refractories.—The increased demand for fused magnesia, for use in refractory and electrical applications, prompted a number of expansions. The Troisdorf plant, operated by Huls Troisdorf AG, has been expanding in stages during the 1980's to a current capacity of 20,000 tons per year.[16] RATH Fasertechnik Vertriebs GmbH announced plans to build a plant in Monchengladbach to produce extremely pure high-temperature fibers for refractory markets, adjacent to an existing RATH plant. The polycrystalline fibers have an alumina content of 80% to 95% and can be used at temperatures of up to 1,800C.[17]

Salt.—There are about 15 companies mining the country's enormous reserves of salt. Almost one-half of production is extracted from three mines working the Zechstein deposits in the north; the largest is the Borth Mine in North Rhine-Westphalia. In the south, mines are extracting salt from the Triassic Middle Muschelkalk strata. The Sudwestdeutsche Salzwerke AG is the major brine salt and rock salt operator, producing about 50% of the FRG's rock salt. At Berchtesgaden, brines were evaporated in the Bad Reichenhall salt plants. The Kali und Salz AG employed about 2,235 people.

Soda Ash.—Solvay & Cie. announced a proposed restructuring of its assets in the FRG, including the establishment of a new holding company, Solvay Deutschland GmbH (SD). SD will reportedly acquire the parent company's 57.7% stake in Deutsche Solvay-Werke AG, thus controlling 89.7% of Kali-Chemie AG. Deutsche Solvay and Kali-Chemie are important producers of soda ash through their plants at Heilbronn and in Rheinberg. There were two other soda ash producers in the FRG in 1989. Chemische Fabrik GmbH produces 300,000 tons per year of both light and dense soda ash from its plant in Cologne. Chemische Fabrik is a 100% subsidiary of Kali und Salz AG. The Mathes und Weber GmbH, a subsidiary of Henkel AG, produces about 280,000 tons of soda ash from its plant at Duisburg.[18]

Mineral Fuels

The three largest utilities companies, the Rheinisch- Westfalisches Elektrizitatswerk AG (RWE), Veba AG, and Viag AG, have withdrawn from the Wackersdorf nuclear waste reprocessing plant. The withdrawal from Wackersdorf was the first step toward a complete withdrawal from reprocessing. Lower Saxony has the only nuclear waste storage facility at Gorleben, and negotiations were underway for a second site at Salzgitter. The three companies have spread into several different energy markets and industries they know well—such as aluminum, chemicals, and paper—because of high energy consumption.

RWE, whose biggest recent acquisition was Deutsche Texaco AG, is the purest utility company with energy accounting for about two-thirds of sales and most of the rest in chemicals and construction. Veba has less than one-third of sales in energy, including the highest proportion of nuclear plants; the rest came from chemicals, trade and transport, and now, with the acquisition of a controlling stake in Feldmuhle Nobel AG, from the paper industry. Veba was also pulling out of the Wackersdorf project. Viag, privatized in 1988, was the smallest of the three utilities. There have been no significant management changes since the privatization. Viag, having the highest proportion of hydroelectricity, was least dependent on imported energy raw materials. Electricity prices remained high by international standards, especially in northern Germany. Germany's electricity tariff structure makes it impossible for Viag to provide lower rates to its energy intensive aluminum, chemicals, and paper interests.[19]

Carbon, Black.—In the past 3 years, Degussa AG became the world's second largest supplier of carbon black. By acquiring 8 production facilities in Western Europe, Africa, and the United States from 2 previous U.S.-based companies (Phillips Coal Inc. and Ashland Oil Co.), Degussa has increased its production capacity to more than 750,000 tons per year, with manufacturing operations at a total of 10 plants. Plans for further expansion are concentrated at Degussa plants in France, Italy, Sweden, and the United States.

Coal.—Deposits of hard coal are concentrated largely in the Aachen and Ruhr areas (Nordrhein-Westfalen) and in the Saar. The coal seams in the Ruhr are more than 90 meters deep. West of Cologne, and to a lesser extent in Hessen and Bavaria, deposits of lignite are 100 meters deep and are usually surface mined. Ninety percent of the lignite was mined in the Rhineland, while 4% came from Helmstedt and 1% from Hessen. Lignite was primarily used as fuel in power stations. About 140,000 people were employed by the coal industry in 1989, of which 94,400 miners worked in the underground mines.

Ruhrkohle AG (RA) was reorganized at the end of the year. On January 1, 1990, there will be two coal-producing companies— Ruhrkohle Niederrhein AG (RN) with headquarters in Duisburg, and

Ruhrkohle Westfalen AG (RW) with headquarters in Dortmund. Those companies will replace the three previous companies—Bergbau AG Lippe (BAL), Bergbau AG Niederrhein (BAN), and Bergbau AG Westfalen (BAW). RN took over the mines from BAN, mines operated by Leopold/Wulfen and Westerholt, as well as coking plants owned by RA. RW took over the remaining mines.

Natural Gas and Petroleum.—With the increasing importance of natural gas and petroleum because of the decline in coal production, the FRG has become largely dependent on energy imports. The FRG was one of the largest importers of natural gas in the world, mostly from Denmark, the Netherlands, Norway, and the U.S.S.R. Libya and the U.S.S.R. were the leading sources of FRG's crude oil imports.

Deposits of natural gas occur mainly in the northwest, in the area between the Ems and Weser Rivers and around the mouth of the Ems in Niedersachsen.

Petroleum deposits are mainly in Emsland in Niedersachsen (Lower Saxony) and on the coast of Schleswig-Holstein. Reserves of crude oil are limited, and production has stagnated for years. About 3.5% of domestic petroleum was produced for its required consumption.

INFRASTRUCTURE

The FRG has a well-developed and intensely utilized network of highways (466,305 km), railroads (31,443 km), inland waterways (5,222 km), and canals. There are five major seaports. The largest, at Wilhelmshaven, handles vessels up to 250,000 deadweight tons. The Port of Hamburg was the second largest container port in Europe.[20] Hamburg topped the list of ore handling ports in the FRG in the first 9 months of 1989 with about 5.5 million tons. The Ruhr is connected to the export harbor at Rotterdam, the Netherlands, by Rhine River barge links, rail, and pipelines (pipeline: crude oil, 2,343 km; refined products, 3,446 km; natural gas, 95,414 km). The Rhine, Europe's greatest inland waterway, flows to the North Sea through the Netherlands after passing Cologne and Dusseldorf, just to the west of the Ruhr. Rich in coal and formerly in iron, the Ruhr is the FRG's greatest center of heavy industry, such as steel, machinery, oil refining, chemicals, glass, ceramics, textiles, and other manufactures. Imported petroleum comes through Wilhelmshaven, and natural gas is imported by pipeline from the Netherlands and the U.S.S.R.

OUTLOOK

Many observers believe the dramatic break-down of the Berlin Wall and inner-German borders will help Germany's growth prospects in the 1990's. German exports in 1990 should increase at a real rate of 7.0% to 7.5% as the movement toward a single European market after 1992 continues to fuel foreign demand for German capital goods. Imports are expected to increase at a slightly higher rate than exports.

The mining, quarrying, and minerals and metals production activities will remain about the same, with some expansions. Expansion abroad will be emphasized, and some companies will be reorganized. Under its energy program, the FRG will continue to spend less for nuclear energy and to increase its support for research on renewable energy sources.

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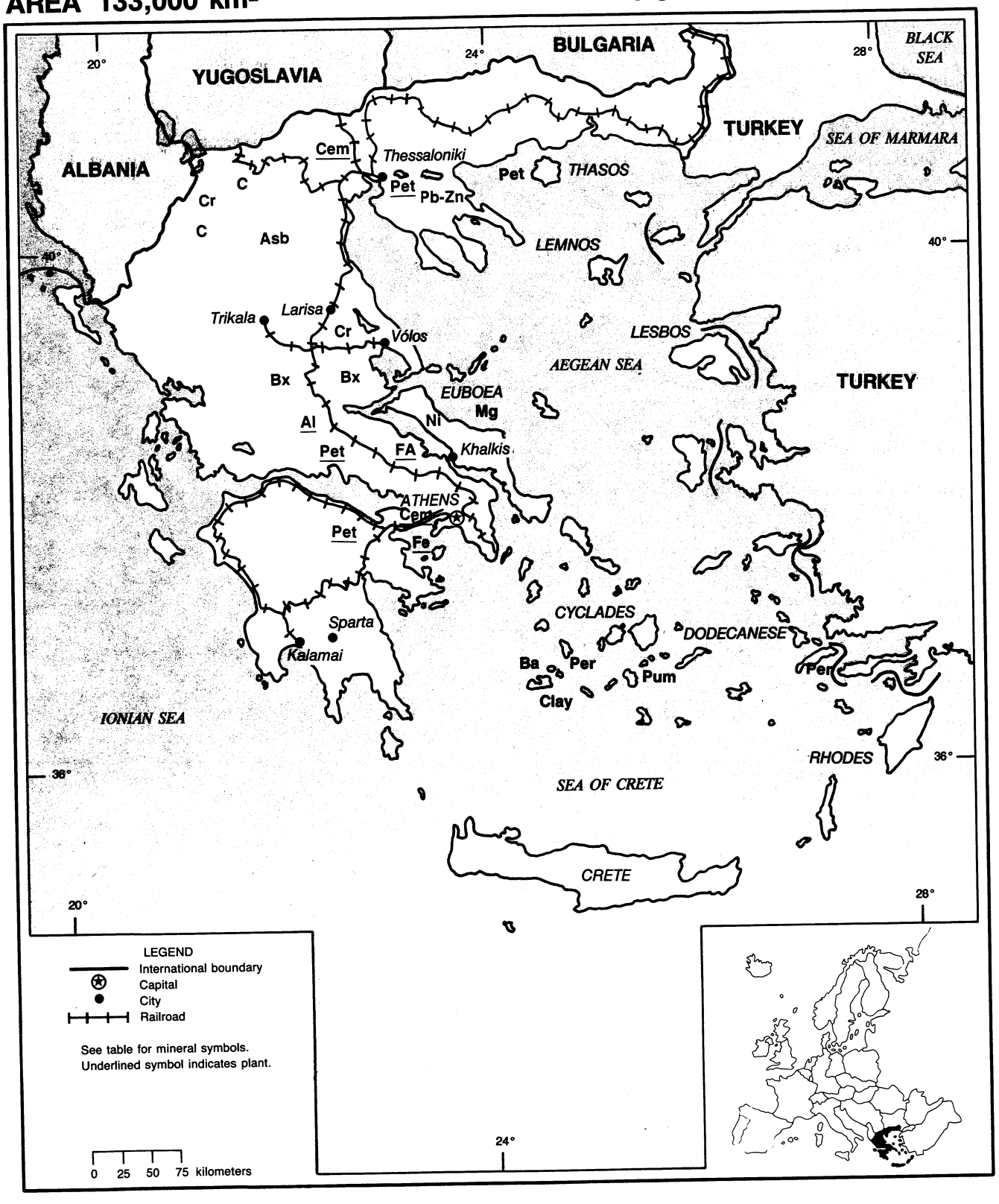
GREECE

AREA 133,000 km² **POPULATION 10.0 million**



THE MINERAL INDUSTRY OF

GREECE

By Walter G. Steblez

In 1989, Greece continued to be a leading world producer of bentonite, emery, magnesite, and pumice and an important European producer of alumina, bauxite, cement, chromite, ferrochromium, ferronickel, gypsum, and mixed sulfide ores. The country's economy was stagnant in 1989, with both the gross domestic product (GDP) and industrial production growing only slightly during the year. The rate of inflation reached 14.8% by yearend or about treble the European Community (EC) average during the same period. Also, the mineral industry's share of the country's economy amounted to approximately 5% of the GDP.

Greece's continuing economic difficulties, marked by a high public-sector deficit (19% of the GDP), delayed the implementation of a number of state-promoted mineral industry projects. These included a Greek-Soviet alumina project, the installation of a plant for gold extraction, and an ongoing feasibility study for establishing a domestic stainless steel operation. The chief event in the country's minerals and mineral fuels sectors was the discovery of a second natural gasfield near Thessalonika.

GOVERNMENT POLICIES AND PROGRAMS

From 1981 to 1989, Greece's Government, administered by the Pan-Hellenic Socialist Movement (Pasok), promoted policies aimed at expanding the public sector of the country's economy. Nationalization of ailing companies became the main method to achieve this end. Companies operating at a loss were subject to takeover by the Government to be operated as public-sector enterprises. In some cases, alleged improprieties concerning the transfer of corporate funds abroad were used to justify nationalization, despite court rulings favorable to targeted companies such as Heracles General Cement S.A. Nationalization was also justified by the Government through the use of wage and price controls. This, in turn, caused corporate operating losses. During the 1981-89 period, companies in the country's minerals industry that were brought into the public sector included the Financial-Mining Industrial and Shipping Corp. (Fimisco of the Scalistiris Group), involved in chromite and magnesite mining and processing; Heracles General Cement S.A., the country's largest cement producer; and Societe Miniere et Metallurgique de Larymna (Larco of the Bodossakis Group), involved in the production of ferronickel. During the same period, the Government also sought to attract foreign investment. In the mineral industry, this effort was directed largely at the alumina, bauxite, lignite, and steel sectors. The results, however, were not generally successful. Many investors had expressed concern with regard to the Greek investment climate because of periodic reversals of Government regulations, efforts to nationalize large sectors of industry, and structural impediments to business activity.

A resulting economic decline, marked by high public-sector spending and a rapid drop in productivity, took place in the 1980's. During this period, Greece also came under increasing pressure from the EC to comply with EC policies concerned with issues of investment reciprocity among the member states. The lack of reciprocity prevented EC nationals from participating equitably in many sectors of Greece's economy, including the mineral industry. However, the urgency to conform to EC policies was dictated as much by the planned 1992 unified EC market deadline as by criticism of Greece for noncompliance with the Treaty of Rome provisions, especially in respect to Greece's petroleum market and mining policies. To rectify these and other problems, in 1985, Greece's Pasok Government initiated a 2-year stabilization program aimed at addressing issues such as high inflation and stimulation of economic growth. Despite initial successes in curbing inflation and decreasing public-sector borrowing requirements, by 1989, most negative economic structural problems remained. These included a large public sector, accounting for about 70% of the GDP; a highly regulated labor market that restricted layoffs and redeployment of personnel; and a tax system that continued to inhibit private-sector investment.

In view of these issues, the EC extended the deadline for Greece's full compliance with EC directives to December 31, 1989, with the provision that if the country's economic conditions do not sufficiently improve by this deadline, an extension would be allowed until December 1992.

In 1989, a new Government was formed by the New Democracy Party in coalition with the Left Alliance. The policies of the new Government sought to reduce the public sector's deficit, which was approaching 22% of the GDP; decentralize the economy; and reinvigorate the private sector.

A separate issue arose during the year involving a proposal by the Greek Government to the EC to establish a common EC mining policy. The Government of Greece argued that although the EC had acquired significant reserves of minerals, especially nonferrous metallic ores, through the accession of Ireland, Greece, Portugal, and Spain to the EC, the Community had not extended to its mining industries the same protection under rules of preference that had been accorded the manufacturing and other sectors. According to Greek representatives to the EC, the EC mining industry had been subjected to unfair competition from third countries because of state-subsidized low prices on similar products in those countries. The proposed common EC mining policy reportedly would seek to support sales of EC-mined minerals, both within the Community and in Eastern Europe and the U.S.S.R. It would establish funding for research and training within the EC's mining industry as well as allow for enhanced credit to mining companies. However, the major industrial countries in the EC sought to maintain the lowest possible prices for raw materials because

only a relatively small percentage of their mineral needs can be produced domestically. Therefore, the EC Commission referred specific problematic points of the proposal to appropriate agencies within the EC, leaving acceptance and formulation of a common mining policy a moot issue for 1989.

PRODUCTION

In 1989, Greece's mineral industry showed only slight gains in the output of metals, as well as slight declines in industrial minerals production. The country's mineral industry, reportedly, had revenues amounting to about US$3 billion, for which state-owned and private sectors accounted for 54% and 46%, respectively. The industry also came under the negative impact of higher costs and lower prices, largely owing to environmental constraints recently placed on the industry and a decline of world prices of most metals. Construction delays of major projects in the energy and nonferrous metals sectors had a negative affect on production as well.

TRADE

Despite expectations of increased market opportunities after Greece joined the EC in 1981, the reverse appears to have occurred. According to a study published by the Organization for Economic Co-Operation and Development (OECD), in which the latest trade data are available, Greece's exports of ores and metals for the 1985-87 period declined by 32% compared with the period from 1979 to 1981. Imports of the same categories of goods during these periods remained constant. Similarly, exports of fuels declined by 21%, while fuel imports declined by only 8%. These trends may reflect both internal factors such as the nationalization of large sectors of the mineral industry, causing litigations in domestic and foreign courts and depressing the industry's business climate, and external factors such as the need for EC processing industries to obtain the least expensive sources of raw materials supply from areas outside the Community.

TABLE 1

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	2,341	2,230	2,472	2,443	[3]2,576
Alumina, gross weight	do.	[r]248	[r]307	518	515	[3]521
Metal:						
Primary		125,222	124,400	126,750	150,801	[3]148,000
Secondary[e]		7,000	7,000	7,000	7,000	7,000
Chromite:						
Run-of-mine ore		214,031	217,979	211,599	180,836	[3]185,000
Marketable products:						
Direct-shipping ore[e]		15,000	16,000	16,000	[r]14,000	15,000
Concentrate		58,948	60,063	63,825	49,535	[3]56,000
Iron and steel:						
Iron ore and concentrate, nickeliferous:[4]						
Gross weight	thousand tons	2,245	[re]1,600	1,032	1,573	[3]2,013
Fe content	do.	920	[re]650	423	640	820
Metal:						
Pig iron[e]	do.	140	160	160	160	160
Ferrochromium		34,436	38,260	40,000	44,000	[3]45,000
Ferronickel		[e]63,800	10,324	[e]5,000	44,000	[3]54,000
Steel, crude	thousand tons	985	[e]890	950	[re]950	950
Lead:						
Mine output, Pb content		19,752	20,873	[e]20,600	23,060	[3]22,700
Metal:						
Smelter, primary		13,800	15,800	700	15,100	5,700

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Lead—Continued						
Metal—Continued						
Refined:						
Primary[5]		13,700	r15,700	700	13,100	35,600
Secondary		—	e3,600	2,000	2,000	31,400
Total		13,700	e19,300	e2,700	15,100	37,000
Manganese:						
Ore, crude:						
Gross weight		29,820	32,585	19,010	17,830	18,000
Mn content		8,946	10,759	6,277	5,900	6,000
Concentrate:						
Gross weight		5,085	4,560	4,024	3,725	4,000
Mn content		2,478	2,234	1,932	1,825	1,960
Nickel:						
Ni content of nickeliferous iron ore[e 6]		22,000	14,400	9,202	14,200	318,100
Ni content of alloys		15,952	2,581	1,100	13,131	316,097
Silver: Mine output, Ag content		51	54	52	61	60
Tin metal, secondary[e]		40	40	40	40	40
Zinc mine output, Zn content		21,107	22,257	20,700	21,200	324,600
INDUSTRIAL MINERALS						
Abrasives, natural: Emery		7,729	7,500	7,500	7,500	5,000
Asbestos:						
Ore	thousand tons	3,705	3,927	3,384	4,000	34,500
Processed		46,811	51,355	60,134	71,000	372,500
Barite:						
Crude ore		3,283	2,227	4,800	e5,000	31,250
Concentrate		3,283	2,305	2,227	1,407	31,180
Cement, hydraulic	thousand tons	13,669	13,341	13,168	13,053	312,535
Clays:						
Bentonite:						
Crude		1,054,234	1,317,825	1,250,000	730,501	3587,000
Processed		239,861	352,587	360,831	502,537	3408,000
Kaolin:						
Crude		89,833	141,210	127,395	144,634	367,000
Processed		7,449	3,532	4,163	5,720	4,975
Fluorspar, grade unspecified[e]		335	150	200	200	200
Gypsum and anhydrite[e]		3467,794	500,000	500,000	500,000	450,000
Magnesite:						
Crude	thousand tons	846	944	841	847	850
Dead-burned		239,837	248,114	222,807	237,595	230,000
Caustic-calcined		94,866	126,069	119,096	124,140	120,000
Nitrogen: N content of ammonia		243,125	241,310	re254,000	re263,000	250,000
Perlite:						
Crude		239,768	357,347	360,831	361,849	3288,000
Screened		161,161	184,148	208,352	211,404	3158,000

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Pozzolan (Santorin earth)	thousand tons	938	1,005	814	358	500
Pumice		620,328	860,047	779,885	752,525	700,000
Pyrites, gross weight		173,262	150,245	148,972	130,129	[3]126,999
Salt, all types[e]	thousand tons	[3]195	150	150	150	150
Silica (probably silica sand)[e]		38,000	38,000	38,000	38,000	35,000
Sodium compounds:[e]						
Carbonate		1,000	1,000	1,000	1,000	900
Sulfate		9,000	8,000	7,000	7,000	6,000
Stone: Marble[e]	cubic meters	150,000	150,000	150,000	150,000	150,000
Sulfur:						
S content of pyrites	thousand tons	77	66	[e]70	[e]70	70
Byproduct of petroleum[e]	do.	5	5	5	5	5
Natural gas[e]	do.	125	135	135	135	135
Total[e]	do.	207	206	210	210	210
Talc and steatite		1,725	1,731	1,507	1,587	1,600
MINERAL FUELS AND RELATED MATERIALS						
Coal including briquets:						
Lignite	thousand tons	35,962	37,976	43,100	48,091	[3]51,700
Lignite briquets[e]	do.	120	110	120	120	120
Coke:[e]						
Coke oven	do.	300	305	305	305	300
Gashouse	do.	15	16	18	19	16
Gas:						
Manufactured, gasworks[e]	thousand cubic meters	425	425	425	1,784	1,784
Natural[e]	million cubic meters	[3]62	62	62	[r]84	84
Petroleum:						
Crude	thousand 42-gallon barrels	9,655	[e]9,500	8,798	8,043	[3]6,568
As reported	thousand metric tons	1,342	[e]1,320	1,223	1,118	[3]913
Refinery products:						
Gasoline	do.	16,592	[e]15,000	23,650	20,596	[3]27,821
Jet fuel	do.	10,984	[e]11,000	13,024	15,968	[3]13,976
Kerosene	do.	302	[e]300	193	202	[3]116
Distillate fuel oil	do.	24,521	[e]25,000	28,758	28,407	[3]27,848
Residual fuel oil	do.	27,279	[e]28,000	39,460	40,080	[3]35,211
Lubricants	do.	822	[e]800	[e]800	1,281	1,200
Other	do.	3,461	[e]3,500	[e]3,500	3,700	3,600
Refinery fuel and losses	do.	3,899	[e]4,000	[e]4,000	4,620	4,500
Total	do.	87,860	[e]87,600	[re]113,385	114,854	114,272

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

[1]Table includes data available through July 1990.

[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]Reported figure.

[4]Ni content is also reported under "Nickel."

[5]Includes antimonial lead and hard lead.

[6]Also includes Co content.

STRUCTURE OF THE MINERAL INDUSTRY

Although Greece's mineral industry in the 1980's helped the expansion of the public sector, a reversal of this trend was already discernible in 1988 and 1989. Internal and external pressures mounted to increase efficiency within the industry and bring it in line with the EC's 1992 single market integration policies. The most notable example of this trend has been the continuing attempt to privatize (through auction) Larco, Greece's sole ferronickel producer.

In 1989, Greece's major private companies in the mineral industry were Aluminium de Grece S.A., a subsidiary of Pechiney of France; the Bodossakis Group (mixed sulfides and lead and zinc concentrates); the Eliopolis Kyriacopoulos Group (barite, bauxite, bentonite, and perlite); Magnomin General Mining Co. S.A. (magnesite and dead-burned magnesite); and the Titan Cement Co. S.A.

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 projects controlled by ETVA included the Project Studies and Mining Development Corp. S.A., which was responsible for research and the production of marble and quartz through its affiliates Hellenic Marbles S.A. and Hellenic Industrial Minerals (ELVIOR). ETVA also controlled 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 phosphoric and sulfuric acids. Other ETVA-controlled interests were Hellenic Alumina S.A., charged with the construction of the new alumina plant with Soviet cooperation, and Porcel, a subsidiary for the development and subsequent operation of the Drama feldspar deposit and potassium-feldspar processing plant. ETVA also held a 40% interest in the Hellenic Industrial Mining & Investment Co. (HIMIC). Other investors in HIMIC were the National Bank of Greece and the National Mortgage Bank of Greece. HIMIC's operations included Hellenic Ferroalloys S.A. (ELSI), the country's sole producer of ferrochromium and chief chromite mining concern, as well as the Messolonghi Saltworks. 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 S.A., Greece'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 exploration for petroleum and natural gas as well as for the production of these fuels.

COMMODITY REVIEW

Within the EC, Greece became a potentially important new source of raw

TABLE 2

GREECE: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina[1]	Aluminium de Grèce S.A (60% owned by Pechiney of France)	Aspra Spitia and Distomon in Boeotia	600
Aluminum	do.	do.	145
Asbestos	Asbestos Mines of Northern Greece S.A. [controlled, by Hellenic Industrial Development Bank; (ETBA) Government owned]	Mines at Zidani, near Kozani, north-central Greece	110
Do.	do.	Plants at Zidani	100
Barite	Silver and Baryte Ores Mining Co. (Eliopoulos-Kyriacopoulos Group)	Milos Island	10
Bauxite	Bauxites Parnasse Mining S.A. (Eliopoulos-Kyriacopoulos Group)	Open pit and underground mines in Parnassos-Ghion area	2,000
Do.	Eleusis Bauxites Mines, Mining-Industrial and Shipping Inc.	Mines near Eleusis, Lamia, Itea, and Kymi	300
Do.	Elikon Bauxites-G. Barlos S.A.	Mines at Elikon	360
Do.	Aluminium de Grèce (A.G.); subsidiaries: Delphi-Distomon S.A. (opencast and underground mines) Hellenic Bauxites of Distomon S.A. (underground mines), and Delphi Bauxites S.A. (opencast mines)	Delphi-Distomon area	500

See footnotes at end of table.

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Bentonites:			
Crude	Mediterranean Bentonite Co. (subsidiary of Industria Chimica Carlo Laviosa S.p.A., Italy)	Milos Island	300
Do.	Mykobar Mining Co. S.A. (subsidiary of Dresser Industries, Inc., U.S.)	do.	120
Do.	Silver and Baryte Ores Mining Co.	do.	350
Processed	do.	Plants at Adamas Bay, Aghia Anna, and Vouthia Bay	470
Cement	Halkis Cement Co.	Micro-Vathi plant, west-central Euboea	3,000
Do.	"Halyps" Cement S.A.	Paralia Aspropyrgou plant, Athens	450
Do.	Heracles General Cement Co. (Government owned)	Milaki plant at Euboea (Old Piraeus plant used for clinker grinding)	2,000
Do.	do.	Olympos plant at Volos, east central Greece	4,000
Do.	Titan Cement Co. S.A.	Eleuis plant, Athens region	1,000
Do.	do.	Kamari plant, Boeotia	2,400
Do.	do.	Patras plant, northern Peloponnesus	1,400
Do.	do.	Salonica plant, Salonica	1,300
Chromite	Financial-Mining Industrial and Shipping Corp.-Fimisco (Scalistiris Group)	Tsigeli mines near Volos, east-central Greece. (Refractory grade chromite)	11
Do.	Hellenic Ferroalloy S.A. (Government)	Skoumtsa mines at Xeralivados, east-central Greece	350
Do.	do.	Concentrator at Skoumtsa	110
Coal, lignite	Public Power Corp. (DEH) (Government)	Aliveri Mine, Euboea Island	420
Do.	do.	Megalopolis Mine, central Peloponnesus	7,000
Do.	do.	Ptolemais Mine, near Kozani	28,000
Ferroalloys:			
Ferrochrome	Hellenic Ferroalloy S.A. (Government)	Tsigeli near Volos, east-central Greece	45
Ferronickel, Ni content	Hellenic Mining & Metallurgical Co. of Larymna (LARCO) (Government owned; formerly, Société Minière et Métallurgique de Larymna of the Bodossakis Foundation)	Larymna Metallurgical Plant	16
Lead:			
Metal in concentrate	Hellenic Chemical Products and Fertilizer Co. Ltd. (Bodossakis Group)	Kassandra mines, northeast Chalkidiki	31
Smelter	Greek Metallurgical & Mining Co. of Lavrion SA (EMMEL) (97% Government owned through HIMIC and ETBA; formerly, Compagnie Francaise des Mines du Laurium of Penarroya)	Laurium and Attica, near Athens	25
Magnesite, concentrate	Financial-Mining-Industrial and Shipping Corp. (FIMISCO, S.A., Government-owned through HIMIC/ELEBME, formerly owned by the Scalistiri Group)	Kakavos mines at Mantoudhi and Euboea Island	350
Do.	Mining Trading & Manufacturing Ltd. (Papastratis Group)	Mines near Mantodhi, north Euboea Island	75
Do.	Grecian Magnesite Ltd.	Mines at Yerokini and Kastri at Chalkidiki, northern Greece	200

See footnotes at end of table.

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Magnesite, concentrate—Continued	Magnomin S.A. General Mining Co. (A subsidiary of Oesterreichisch-Amerikanische Magnesit AG-OEAMAG of Austria, a part of General Refractories, Inc. of the United States)	Vavdos mines, Chalkidiki	48
Manganese (battery grade MnO_2 concentrate)	Eleusis Bauxite Mines (Government-owned through HIMIC) and Christoforrides Mining Co.[2]	Brama, northern Greece	1
		Neochorion in Chalkidiki	5
Natural gas	Public Petroleum Co. (DEP) (Government)	Prinos offshore gasfield and oilfield	[3]4,416
Nickel, ore	Société Minière Metallurgique de Larymna (LARCO) (Bodossakis Group, but now 80% Government ownership)	Agios Ioannis mines near Larymna	500
Do.	do.	Mines at Euboea	2,500
Perlite	Silver and Baryte Ores Mining Co. (Eliopoulos-Kyriacopoulos Group)	Milos Island	300
Do.	Sarides General Enterprises S.A.	do.	300
Do.	Milopan S.A.	do.	100,000
Do.	Peletico Hellas S.A. (A subsidiary of Peletico Ltd. of Cyprus)	do.	20,000
Petroleum, refined	Hellenic Aspropyrgos Refinery S.A.	Aspropyrgos	[4]95,000
Do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	[4]140,000
Do.	Petrola Hellas S.A.	Eleusis	[4]100,000
Do.	Thessaloniki Refining Co. A.E.	Thessaloniki	[4]76,000
Steel, crude	Halyvourgia Thessalias S.A. (A subsidiary of Manessis Bros. and Voyatzis S.A. (65%); the balance, 35% owned by state-owned National Investment Bank for Industrial Development-NIBID; operates two 35-ton electric-arc furnaces)	Steelworks at Volos	1,500
Do.	do.	do.	300
Do.	do.	do.	200
Do.	Halyvourgiki, Inc. (private; two blast furnaces and basic oxygen converter - 2,000,000 tons per year taken off-line in 1982; currently operating three 100-ton electric arc furnaces)	Steelworks at Eleusis	1,200
Do.	Helleniki Halivourgia S.A. (Operates two 55-ton electric furnaces)	Steelworks at Aspropyrgos	400
Do.	Metallurgiki Halyps S.A. (private; operates two 50-ton Asea electric-arc furnaces)	Steelworks at Almyros, near Volos	300
Do.	Sidenor S.A., also known as Halivorgia Voviou Ellados S.A. (formerly, Steelworks of Northern Greece S.A.; (Joe Samonides/Mn consultant currently operates two 50-ton and two 30-ton electric-arc furnaces Memphis, Tennessee)	Steelworks at Nea Maguisia, near Thessaloniki	350
Zinc in concentrate	Hellenic Chemical Products and Fertilizer Co. (Bodossakis Group)	Kassandra mines, northeast Chalkidiki	25

[1]The Greek-Soviet alumina project to build a 600,000-ton-per-year refinery at Aghia Efthymia will come on-stream in the 1990's. It will be owned and operated by Hellenic Alumina S.A., a subsidiary of the Government-owned ETBA. Port facilities are to be built at this site on the Gulf of Corinth in Boeotia.
[2]Christoforrides plans to increase capacity from 5,000 to 30,000 tons per year of MnO_2 with the future addition of a new grinding mill and concentrator.
[3]Million cubic feet per year.
[4]Barrels per day.

materials. According to 1988 world production data, Greece was the second largest world producer of bentonite, emery, perlite, and pumice and the fifth largest producer of magnesite. The country was the only European producer of ferronickel, using domestically mined ores.

Metals

Aluminum and Bauxite.—Greece continued to be a significant European producer of bauxite, with principal deposits at Distomon Elikon, Ghiona, Itea, and Parnassos, which are north of the Gulf of Corinth. Bauxites Parnasse Mining S.A. remained the country's largest producer of bauxite, with an average annual output of about 1.5 million tons. In 1989, Bauxites Parnasse and other producers promoted modernization and expansion of their production capacities in anticipation of the 1.3-million-ton-per-year feed requirements of the planned Greek-Soviet alumina plant at Boeotia. Bauxites Parnasse reportedly began production at a new bauxite deposit in Euboea and initiated modernization of its mines at Itea. However, progress on the construction of the 600,000-ton-per-year alumina plant was delayed because of difficulties that the Government of Greece faced to secure necessary funding.

Late in the year, the Government of Greece stated that the future of the project would depend on the willingness of the EC to provide financial assistance. The EC, however, rejected appeals to finance the plant, indicating that its decision was final. Plans to proceed with the construction of the alumina plant were not annulled, but its proposed completion by 1992 did not appear to be likely.

In 1989, the EC, through its Integrated Mediterranean Program, allocated $2.5 million to Bauxites Parnasse to improve the company's infrastructure and working conditions. The EC also informed the Government of Greece that the Government plan to capitalize debts owed by the state-owned Eleusis Bauxites Mines amounted to a subsidy and was in violation of Article 92 of the Treaty of Rome.

Chromite.—Chromite was mined by two companies: Financial Mining Industrial and Shipping Corp., which produced refractory-grade chromite, and ELSI, which produced metallurgical-grade ore and ferrochromium. ELSI was the most important chromite producer, with 5.5 million tons of measured reserves of chromite and 3 million tons of inferred reserves. Additionally, the company claimed a 6-million-ton reserve base.

ELSI's mining operations were based at Skoumtsa in the Vourinos area in north-central Greece, where chromite had been found to occur in podiform deposits within ultramafic massifs.

The Skoumtsa ore body, the largest of approximately 200 occurrences of chromite in the area, was found to consist of lenses, which vary in thickness from 2 to 10 meters. The deposit has two fault zones, and, in 1987, exploratory drilling revealed a continuation of the ore body at a 300-meter depth from the main fault. Three underground mines have produced about 250,000 tons of crude ore feedstock annually for the Skoumtsa beneficiation plant, which was designed to produce about 80,000 tons of concentrate (47% to 49% Cr_2O_3) and 30,000 tons of lumpy ore each year. The ore and concentrate were shipped to ELSI's ferrochromium plant at Tsingeli in the Volos area.

In 1989, work progressed on the development of ELSI's second mining and beneficiation complex in northern Vourinos. The new complex was planned to produce about 100,000 tons of concentrates and 20,000 tons of lumpy ore annually. The development of ELSI's Domokos Mines also was reported near completion. The Domokos operation would produce approximately 80,000 tons of hard lumpy ore per year, grading at about 40% Cr_2O_3. The ore would be consumed directly at the Tsingeli ferroalloy plant. To accommodate the anticipated increase in the mine output of chromite, ELSI announced plans to raise its ferrochromium production capacity from 45,000 tons per year to more than 100,000 tons per year by installing a second furnace at the Tsingeli plant.

Iron and Steel.—The chief issues in the iron and steel industry in 1989 concerned the future of Metallurgiki Halyps S.A and a decision to formulate further studies for the construction of a stainless steel plant in the country.

Metallurgiki Halyps S.A. ceased operations in 1988 because of financial problems, which the company claimed resulted partly from the public sector's tardiness in paying for goods and services provided by the company. In 1989, the company's status remained undecided amid negotiations to sell the company and a Government proposal to nationalize it.

As a producer of both ferrochromium and ferronickel, Greece has had a long-standing interest in developing a stainless steel component in its steel industry. A feasibility study on stainless steel production in Greece conducted in 1986 concluded that the industry would be competitive because of both the availability of domestic raw materials and increasing domestic consumption. However, in 1989, despite the continued interest of the U.S.S.R. and other foreign parties as participants in the project, its estimated cost of about $220 million remained beyond the resources of the interested parties.

Nickel.—Larco, the country's sole producer of lateritic nickeliferous iron ore and ferronickel, continued to have administrative and organizational problems. In February, the Greek Government "auctioned" Larco to itself, which in effect transferred the company from state-owned bank control to the state-owned Business Reconstuction Organization. However, the National Bank of Greece, Larco's principal shareholder and creditor, initiated court action to retain its claim on Larco's debt. By yearend, Larco's organizational structure remained to be settled.

Industrial Minerals

Bentonite.—To promote exports of Greek bentonite to Austrian and German markets, in 1989, Bauxites Parnasse expanded its foreign commercial operations by forming an affiliate in the Federal Republic of Germany in joint venture with Industrie Kohle A.G. The new affiliate, International Bentonite Co. (IBECO), will process, store, and market bentonite from deposits belonging to Bauxites Parnasse on the Island of Milos.

Cement.—In 1989, Greece's largest cement companies, Heracles General Cement Co. and Titan Cement S.A., reported increased exports to the United States and western Europe, which balanced an export decline to traditional markets in the Middle East. Additionally, both companies benefited from favorable prices during the year. However, the country's third largest producer, Halkis Cement Co., continued to operate at a loss, which forced the company's management to seek out foreign buyers and negotiate with creditors to avoid bankruptcy.

Magnesite.—Greece's magnesite industry continued to face stiff competition from China and North Korea. During the year, Greek magnesite producers appealed to the EC to take action against alleged magnesite dumping by China and North Korea. However, both the European Court and the EC Council of Ministers rejected the Greek petition for import protection. Magnomin S.A. General Mining Co. and Grecian Magnesite Ltd. remained financially healthy and were able to compete with magnesite shipped to the EC, but FIMISCO and its affiliates continued to operate at a loss, while Mining Trading & Manufacturing Ltd. (Papastratis Group) was forced to declare bankruptcy.

Mineral Fuels

Lignite.—In 1989, the PPC finalized a 10-year development plan (1990-99) whose main aim was to reduce the country's consumption of oil in electric power generation. The plan provides for greater reliance on domestically mined lignite that would be used in concert with hydroelectric and other sources of power. The 10-year plan calls for the construction of new a lignite-burning electric powerplant as well as the development of new strip mines to provide the fuel. Several oil-fired plants would be converted to natural gas use as well. In 1989, lignite accounted for the generation of about 80% of the country's electricity, while hydropower and oil each accounted for approximatly 10%.

Natural Gas.—In August, a new deposit of natural gas was discovered near Thessloniki, which was also near a similar deposit found in 1988. Tests showed that the deposit could produce up to 400,000 cubic meters of natural gas per day. Also, because of the deposit's proximity to the projected route of the Greek-Soviet pipeline, the gas can be added to the gas that would be imported eventually from the U.S.S.R. However, the central issue concerned the gas industries infrastructure. The construction of liquid natural gas terminals, pipelines, and other facilities was seriously behind schedule owing to the country's political transition away from Pasok Government policies and a shortage of funds. The planned imports of natural gas from the U.S.S.R. for 1991 and from Algeria for 1992 would have to be held in abeyance until the matter is resolved.

Reserves

Greece has sufficient reserves of bauxite, chromite, lead and zinc, and a wide range of industrial minerals to satisfy many of the country's domestic and export needs well into the 21st century.

INFRASTRUCTURE

Greece's inland system of ways and communications was composed of 41,497 kilometers (km) of highways, railroads, and waterways. The railroad system consisted of 1,565 km of 1.435-meter standard-gauge track, 892 km of 1.000-meter-gauge track, and 22 km of 0.750-meter narrow-gauge track. The road system consisted of 16,090 km of paved roads and 13,676 km of crushed stone and gravel roads. The country also had 5,632 km of improved earth and 3,540 km of unimproved earth roads. Greece's 80-km system of inland waterways consisted of three coastal canals and three unconnected rivers. In addition, Greece's petroleum sector had a 26-km pipeline system for crude petroleum and a 547-km system for refined products.

With major ports at Piraeus and Thessaloniki, Greece's merchant marine fleet consisted of 954 ships totaling 36,858,545 deadweight tons. The merchant fleet included 164 cargo, 18 container, and 20 roll-on/roll-off cargo ships. There also were 182 tankers for petroleum, oils, and lubricants; 10 tankers for chemicals; 10 for liquefied gas; and 20 tankers designated for both ore and oil. The merchant fleet also had 407 bulkers and 15 specialized bulkers.

TABLE 3

GREECE: RESERVES OF SELECTED MINERALS

Commodity	Million metric tons unless otherwise specified[1]
Asbestos (fiber content)	4
Barite	4
Bauxite	750
Chromite	16
Iron	70
Lead, content of ore	0.7
Lignite	3,570
Manganese, content of ore	2
Magnesite	50
Nickel, content of ore	2
Perlite	200
Pyrite	6
Sulfur	800
Zinc	1.3

[1]Measured and inferred reserves.

OUTLOOK

Greece, Ireland, Portugal, and Spain, all relatively new members of the EC, form an important raw material and/or industrial grouping of countries within this organization. The large industrialized EC countries had largely depleted their mineral raw material resources and have relied heavily on imports to meet the needs of their processing and fabricating industries. In 1989, EC manufacturing interests continued their reliance on mineral sources of supply from outside areas, largely because of cheaper prices for raw material in these areas as well as the different rates of integration of the new member countries in EC economic structures. Although Greece became a member of the EC significantly earlier than both Portugal and Spain, the country remained further behind them in terms of acceding to EC regulations. The uncertain investment climate in the country's mineral industry will continue as long as Greece's policies run counter to EC regulations and directives, especially in regard to Greece's large subsidized public sector and lack of investment reciprocity in the country's mineral industry.

OTHER SOURCES OF INFORMATION

Agencies

The Institute of Geology and Mineral Exploration (IGME)
70 Messoghion St.
608 Athens, Greece

Project Studies and Mining Development Corp. S.A. (GEMEE)
15 Valaoritou St.
106 71 Athens, Greece

Hellenic Industrial and Mining Investment Co. (HIMIC)
3 Korai St.
105 64 Athens, Greece

Hellenic Industrial Development Bank
18 El Venizelou St.
196 72 Athens, Greece

National Investment Bank for Industrial Development
14 Amalias Ave.
192 36 Athens, Greece

Public Power Corp.
30 Halkocondyli
104 32 Athens, Greece

Public Petroleum Corp.
119 Kifissias Maroussi
151 24 Attica, Greece

Bauxites Parnasse Mining Co.
21a Amerikis St.
106 72 Athens, Greece

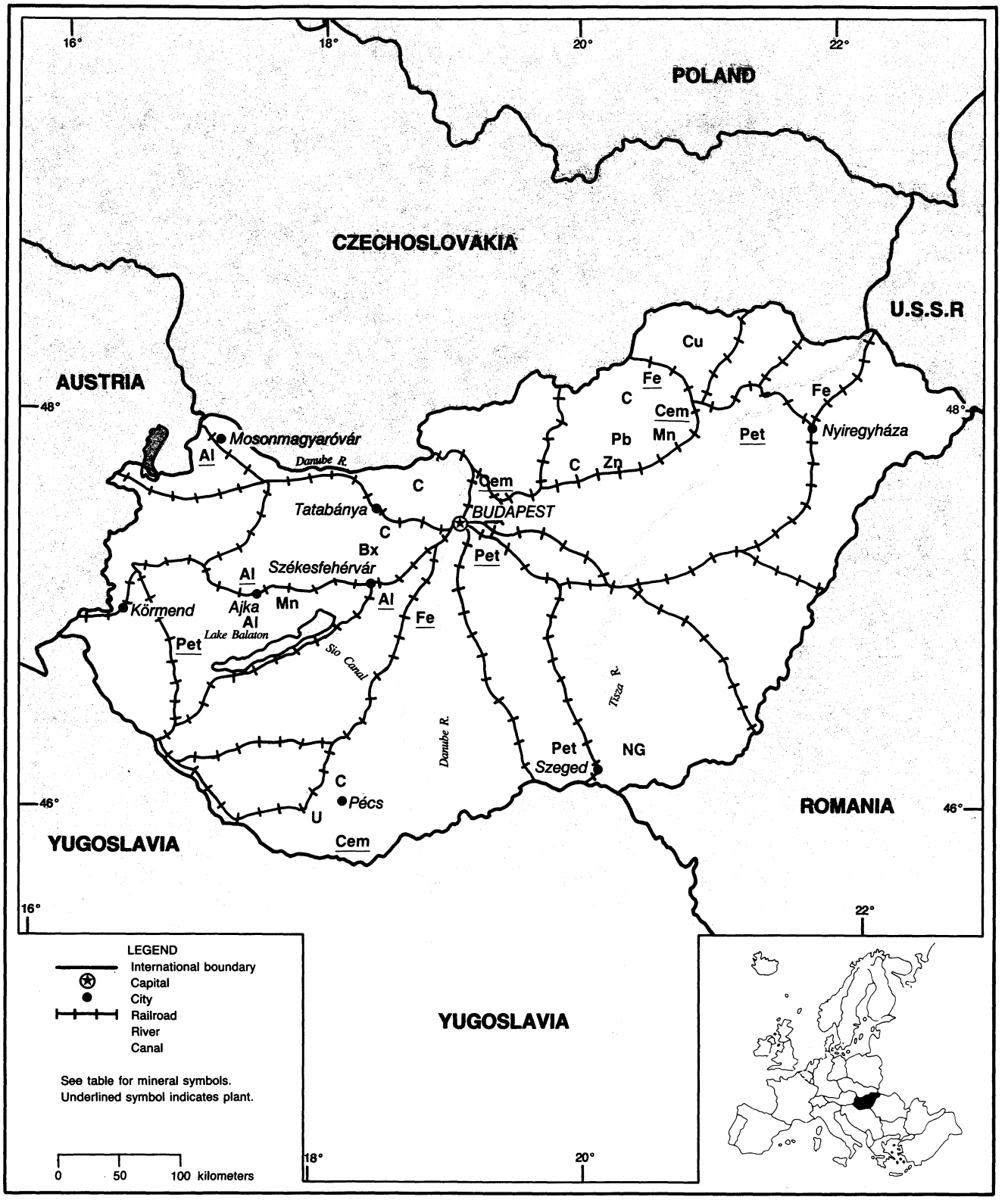
Aluminium de Grece SAIC
1-3 Sekeri
106 71 Athens, Greece

Publications

Statistiki Epeteris Tis Ellados (Statistical Yearbook of Greece), Athens.

HUNGARY

AREA 93,000 km² **POPULATION 10.7 million**



THE MINERAL INDUSTRY OF

HUNGARY

By Walter G. Steblez

Hungary's mineral industry in 1989 showed moderate declines in all areas of activity except in the petroleum sector owing largely to extensive rationalization and partial privatization. The country's gross domestic product, measured in constant forints, declined by almost 2% in 1989 compared with that of 1988, while the value of industrial production fell by 3% during this period. The mining sector showed a slight decline for the months of January to November compared with the same period in 1988.[1] Hungary continued to depend on imports for almost all metallic minerals and mineral fuels. The bauxite and aluminum industries, however, continued to be important to the country's economy, making Hungary a significant European producer of these commodities.

The year 1989 was a major political and economic transition period for the country. New political parties emerged for the first time in more than 40 years. The former Socialist Workers Party, which managed the country's centrally planned economy since 1948, effectively disbanded and reformed itself into the Social Democratic Party with a platform similar to those of other social democratic parties in Western Europe. Free elections were scheduled for early 1990.

Hungary continued to promote decentralization and private ownership in the economy. In November, a decision to open a stock exchange after a hiatus of 40 years was announced. The exchange would be the first to open and operate in a Council for Mutual Economic Assistance (CMEA) member nation. Initial operations would handle bond transactions in early 1990 as a first step toward formally opening the Budapest Stock Exchange in March 1990. Reportedly, the exchange would be a self-governing organization with income derived from members' contributions, quotation fees, commissions, and other services. Moreover, the First Hungary Fund Ltd., an investment fund with assets in excess of $80 million, was founded at yearend to promote joint ventures and the country's growing private sector. The fund was organized as a partnership between the National Bank of Hungary, the International Finance Corp., and Canadian and U.S. investment firms.[2] Significant events in the mining industry in 1989 included closure plans for mines in the bauxite, coal, and uranium sectors because of economic as well as environmental considerations. Also, Hungary's cement industry announced plans to form joint ventures and partnerships with Swiss and West German firms.

GOVERNMENT POLICIES AND PROGRAMS

The Hungarian Government's main economic goal in 1989 was to accelerate the transformation of the country's planned economy into a market economy. To achieve this, the Hungarian Parliament approved a law on corporate association in October 1988 permitting new forms of ownership that included limited liability firms and joint stock companies. Additional legislation also allowed full foreign ownership of Hungarian enterprises, as well as tax incentives and wage and price exemptions for joint ventures in key sectors of the economy.

The Government also planned to remove most of the country's remaining central economic controls by January 1990, which would open the domestic market to imports from non-CMEA sources of fuels and basic raw materials. In past years, Hungary excluded imports of fuels and most raw materials from market economy areas because of bilateral trade agreements for commodities that were within the framework of CMEA.[3] In 1990, energy costs are to be brought more in line with world market prices; coal mining would be continued only if it would become competitive. Subsidies to other mining and mineral-related areas also would be gradually eliminated.

The Hungarian Government's economic forecasts for 1990 showed slight declines in the gross domestic product and industrial production compared with those achieved in 1989. Exports to market economy countries were expected to increase by between 8% and 9%, while imports from these countries were expected to rise by 5% to 6% compared with 1988 levels. Similarly, exports to nonmarket economy countries would decline by 20% and imports from them by 4% during this period.[4]

Policies addressing issues of economic decentralization and political pluralism in Hungary and other East European countries stood at the forefront of events in 1989. However, the impact of past centrally planned industrial and mining policies on the environment became more widely known, causing concern both regionally and globally, especially in light of the nuclear powerplant accident in 1986 at Chernobyl in the U.S.S.R.

Reportedly, more than one-third of Hungary's population has been exposed to air pollution that significantly exceeded international standards. Since the inception of centrally planned industrial policies, little concern has been afforded to controlling sulfur dioxide emmissions from industrial facilites burning brown coal.

Environmental problems concerning the country's water supply were also made public. Drinking water was seriously contaminated by arsenic in certain areas, and supplies of ground water were depleted from aquifers near a number of underground bauxite and coal mines owing to intensive mine dewatering. This affected nearby agricultural and resort areas. Hungarian underground bauxite mines have been operating in a karstic limestone environment, substantially below the water table. Some West European experts estimated that it would take at least 20 years to elevate East European industries to Western environmental standards at a cost of about $200 billion for the entire region.[5]

Late in 1989, Hungary and the U.S. Environmental Protection Agency agreed to create a Regional Environmental Center for Central and Eastern Europe, headquartered in Budapest, to serve all

East European countries as an independent network for the collection and dissemination of environmental data. Operating funds for the center initally would be provided by the United States and Hungary, but subsequent contributions were expected from participating countries and organizations. The application of new clean coal technologies as part of the modernization program at coal consuming industries in Hungary and other East European countries was expected to abate the sulfur component of flue gases by as much as 60% and also reduce the nitrogen oxide component.[6]

PRODUCTION

There was a production downturn in many sectors of the country's mineral industry that reflected both more realistic output targets than those set in prior years and a greater fluidity in the labor force that allowed workers to seek employment in more lucrative sectors of the economy. Hungary's mineral industry continued to be state owned and operated. However, the Hungarian Government's restructuring policies also created opportunities for operational changes that would allow the setting up of joint ventures with foreign companies as well as private ownership opportunities.

TRADE

The decision to reorient the country's trade toward market economy countries and to decrease soft-currency commercial transactions within the CMEA bloc was the chief trade issue in 1989. At yearend, a Hungarian Government reform committee on trade recommended making the European Community (EC) Hungary's main trading partner, urging greater ties to the EC through companies and financial institutions.

At the same time, Hungary held discussions with the U.S.S.R. and Poland about changing their trade accounting system from a nonconvertible ruble clearing system to a hard-currency accounting basis. This would create the possibility for CMEA trading partners to select more products, including capital goods and raw materials, from developed and developing market economy countries at competitive world prices. In the long term, hard-currency accounting would act as a further incentive to modernize their industrial structures.[7] The U.S.S.R. continued to be Hungary's chief supplier

TABLE 1

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	2,815	3,022	3,101	2,593	2,700
Alumina, gross weight, calcined basis	do.	798	856	858	873	870
Metal:						
Primary		73,859	73,877	75,500	74,692	75,000
Secondary		23,300	23,000	[e]24,000	[e]24,000	24,000
Total		97,159	96,877	[e]99,500	[e]98,692	99,000
Copper, metal:[e]						
Smelter, secondary		100	100	100	100	100
Refined including secondary		12,800	12,800	12,500	[r]19,220	19,000
Gallium, metal	kilograms	2,800	4,062	4,103	[e]4,100	4,100
Gold, mine output, Au content[e]	do.	620	620	600	600	600
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	311	—	—	—	—
Fe content	do.	75	—	—	—	—
Metal:						
Pig iron:						
For steel industry	do.	2,007	1,987	2,051	2,054	1,950
For foundry use	do.	88	67	56	39	50
Total	do.	2,095	2,054	2,107	2,093	2,000
Ferroalloys:[e 3]						
Ferrosilicon		9,000	9,000	10,000	10,000	9,000
Silicon metal		2,000	2,000	2,000	2,000	2,000

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Iron and steel—Continued						
Metal—Continued						
Ferroalloys—Continued						
Other		2,000	2,000	2,000	1,000	1,000
Total		13,000	13,000	14,000	13,000	12,000
Steel:						
Crude	thousand tons	3,647	3,715	3,621	3,583	3,300
Semimanufactures, rolled only	do.	2,863	2,898	2,831	2,793	2,500
Lead:[e]						
Mine output, Pb content		700	—	—	—	—
Metal, refined, secondary		100	100	100	([4])	—
Manganese ore:						
Run of mine:						
Gross weight		115,334	106,009	125,634	110,908	105,000
Mn content[e]		22,000	20,000	24,000	24,000	21,000
Concentrate:						
Gross weight		63,000	63,000	78,000	80,983	75,000
Mn content[e]		18,900	18,900	25,000	[5]25,915	24,000
Vanadium, metal[e]		300	300	300	300	300
Zinc:[e]						
Mine output, Zn content		2,200	—	—	—	—
Metal, smelter, secondary		600	600	[5]1,565	[5]1,374	1,500
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	3,678	3,846	4,153	3,873	3,900
Clays:						
Bentonite:						
Raw		59,853	79,888	98,331	118,573	110,000
Processed		44,431	47,504	52,828	53,250	50,000
Kaolin:						
Raw		29,038	29,837	33,289	34,851	34,000
Processed		6,485	6,032	5,179	5,329	5,300
Gypsum and anhydrite[e]		[r]20,000	[r]20,000	[r]104,400	[r]117,845	115,000
Lime, calcined	thousand tons	801	831	831	851	850
Nitrogen: N content of ammonia	do.	791	811	786	[e]800	750
Perlite		94,460	109,360	112,410	120,562	120,000
Pyrites, gross weight[e]		7,000	—	—	—	—
Refractory materials, n.e.s.:						
Chamotte products	thousand tons	153	132	116	109	110
Chrome magnesite products	do.	39	42	53	33	35
Sand and gravel:						
Gravel	thousand cubic meters	8,529	8,179	8,269	7,769	8,000
Sand:						
Common[e]	do.	400	400	400	400	400
Foundry	thousand tons	560	519	631	648	650

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Sodium compounds:						
Hydroxide (caustic soda)		193,719	201,684	201,167	201,784	200,000
Sulfate[e]		10,000	10,000	9,000	9,000	9,000
Stone:						
Dimension, all types	thousand tons	5,718	5,966	5,537	5,217	5,300
Dolomite	do.	1,158	1,146	1,086	1,005	1,100
Limestone	do.	7,418	7,469	7,282	7,091	7,100
Quartzite	do.	37	33	30	42	40
Sulfur:						
From pyrite[e]		2,000	1,000	1,000	1,000	1,000
Byproduct, elemental, all sources[e]		9,000	10,000	10,000	10,000	10,000
Total[e]		11,000	11,000	11,000	11,000	11,000
Sulfuric acid		520,338	539,775	573,323	512,374	515,000
Talc[e]		17,000	16,000	15,000	13,000	12,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		[e]500,000	[e]550,000	572,117	552,334	550,000
Carbon black[e]		5,000	5,000	5,000	5,500	5,500
Coal:						
Bituminous	thousand tons	2,639	2,325	2,360	2,255	2,100
Brown	do.	14,016	13,821	13,261	12,986	12,100
Lignite	do.	7,387	6,983	7,223	5,634	5,800
Total	do.	24,042	23,129	22,844	20,875	20,000
Coke:						
Coke oven:						
Metallurgical	do.	492	547	669	547	590
Other[e]	do.	160	150	150	150	150
Total[e]	do.	652	697	819	697	740
Gashouse[e]	do.	160	160	160	[r]302	210
Total coke	do.	812	857	979	999	950
Fuel briquets	do.	1,722	2,006	2,134	2,302	1,980
Gas:						
Manufactured	million cubic meters	335	230	151	52	50
Natural, marketed	do.	7,456	7,022	7,126	6,272	6,000
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	3,800	3,700	[5]5,540	5,500	5,500
Liquefied petroleum gas	do.	3,500	3,400	[5]2,444	2,400	2,400
Peat, agricultural use[e]	thousand tons	70	75	70	70	70
Petroleum:						
Crude:						
As reported	do.	2,012	2,005	1,876	1,947	2,000
Converted	thousand 42-gallon barrels	13,641	13,594	12,977	13,025	13,380
Refinery products:[6]						
Gasoline, including naphtha	do.	22,644	24,310	25,321	24,352	23,800
Kerosene and other light distillates[e 7]	do.	[r]1,837	[r]140	[r]450	[r]4,263	4,300
Distillate fuel oil	do.	[r]24,618	26,088	26,147	19,672	19,500

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Residual fuel oil	thousand 42-gallon barrels	16,970	15,664	17,296	11,608	11,500
Lubricants[e]	do.	1,000	1,000	[5]1,519	1,500	1,400
Liquefied petroleum gas[e]	do.	1,000	1,000	1,000	1,000	1,000
Asphalt and bitumen[e]	do.	3,800	3,600	[5]3,466	3,500	3,400
Paraffin and petrolatum[e]	do.	250	250	[5]346	350	300
Total[e]	do.	[r]72,119	[r]72,052	[r]75,545	[r]66,245	65,200

[e]Estimated. [p]Prelimary. [r]Revised.
[1]Table includes data available through May 1990.
[2]In addition to the commodities listed, diatomite 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]Hungary is believed to produce some blast furnace ferromanganese.
[4]Revised to zero.
[5]Reported figure.
[6]Excludes refinery fuel and losses.
[7]Data derived by subtracting reported motor gasoline and white spirit data from reported light refinery products total.

of raw materials and fuels. However, owing to economic difficulties in the U.S.S.R., shortfalls of scheduled petrochemical feedstock deliveries to Hungary during the summer seriously affected the country's chemical industry, which was to receive these shipments. Similarly, in early October, shortfalls of scheduled Soviet exports to Hungary were noted for coal, coke, crude petroleum, electricity, and iron ore.

STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 2 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Although total exports of Hungarian aluminum showed continued growth in 1989, the largest share of export growth was to market economy countries. Compared with that of 1988, Hungarian exports in 1989 to Western markets valued in dollars rose by 34.2%, with total sales amounting to $354.6 million. About 45% of all sales were for hard currency.[8]

In 1989, one of the major events in the industry was the decision by the Hungarian Aluminum Trust (Hungalu) to close down the lucrative Nyirad bauxite mine by 1990. This action was prompted by pressures from regional environmental groups that were concerned with the excessive removal of water from the karst strata at the Nyirad Mine, which had threatened the resort areas at nearby Lake Heviz. The mine closure would reduce Hungalu's reserves by 2 million tons of high-grade bauxite, which the company would have to replace by imports and the development of new mines. Hungalu indicated that it would reemploy most of the workers at the Nyirad operation at the company's other operations; the remaining mine work force would be retrained or offered early retirement. Hungalu also planned to continue imports of high-grade Guinean bauxite.

Bauxite imports for 1989 and 1990 were expected to amount to about 150,000 tons for each year, but subsequent imports would increase to between 200,000 and 300,000 tons per year at an annual cost of more than $10 million. Another environmentally related issue was Hungalu's plan to reconstruct potlines at the company's primary aluminum smelting facilities at Inota and Tatatbánya using Japanese Sumitomo technology. The renovated and environmentally safer furnaces were scheduled for completion in 1994 at a cost of $33.3 million. Hungalu's management also indicated that, to remain competitive in the mid-1990's, the aluminum industry would have to invest between $47 and $56 million each year until 1993 and that subsidized domestic prices for aluminum should be reduced or abolished, which would allow even greater hard-currency exports.

In 1989, the Governments of Hungary and the U.S.S.R. continued negotiations on the renewal of their alumina for aluminum agreement that was scheduled to expire at the end of 1990. According to the existing 1985–90 agreement, Hungary was to supply 530,000 tons of aluminum oxide; 5,000 tons of semimanufactured products, food, and consumer goods; and some producer durables per year to the U.S.S.R. in exchange for 205,000 tons of primary metal.

Owing to a shortage of electric power, Hungary was able to produce only small amounts of primary metal compared with the country's total output of bauxite and alumina. By yearend, the negotiations remained inconclusive because of differences between the two sides concerning the kind of goods that Hungary would ship to the U.S.S.R. to compensate for the value differential between the proposed exchanges of alumina and aluminum.[9]

TABLE 2

STRUCTURE OF THE MINERAL INDUSTRY OF HUNGARY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Magyar Aluminiumipari Tröszt (MAT) (Hungarian Aluminum Corp.) (Government, 100%)	Ajka Timföldgyár plant, about 120 kilometers southwest of Budapest, near Lake Balaton	450
Do.	do.	Almasfuzitö Timföldgyár plant, near the Czechoslovak border, 63 kilometers northwest of Budapest	350
Do.	do.	Moson-Magyarovar plant, in northwest corner of Hungary, about 12 kilometers from Austrian and Czechoslovak border	75
Aluminum, primary	do.	Ajka plant, about 120 kilometers southwest of Budapest, near Lake Balaton	27.5
Do.	do.	Inota plant, near Varpalota, 75 kilometers southwest of Budapest	46.0
Do.	do.	Tatabánya plant, Tatabánya	17.0
Bauxite	Bakony Mining Enterprise and Nyirád Darvastó and Halimba mining complexes (MAT) (Government, 100%)	Bakony District, extending roughly 100 kilometers northeast along Lake Balaton	1,900
Do.	Fejér County mining enterprise (MAT) (Government, 100%)	Fejér County, Vértes District, about 60 kilometers south of Budapest	1,060
Cement	Cement es Mészmüvek	Bélapátfalva, near Miskolc, 125 kilometers northeast of Budapest	1,200
Do.	do.	Beremend, 45 kilometers south of Pécs	1,100
Do.	do.	Hejöcsaba, 150 kilometers northeast of Budapest	1,600
Do.	do.	Lábatlan, 20 kilometers north of Tatabánya	500
Do.	do.	Selyp, 50 kilometers north of Budapest	60
Do.	do.	Tatabánya, 80 kilometers west of Budapest	500
Do.	do.	Vác, 50 kilometers north of Budapest	1,200
Coal:			
Bituminous and lignite	Magyar Szénbányászati Tröszt (MSZT) (Hungarian Coal Mining Trust) (Government, 100%)	Tatabánya and Oroszlány coal mining region, 45 kilometers west of Budapest	8,957
Do.	do.	Mecsek coal mining region, near Pécs and Komló, north of the Yugoslav border	3,100
Do.	do.	Borsod coal mining region, 130 kilometers northeast of Budapest	5,200
Lignite	do.	Thorez opencast mine at Visonta, 80 kilometers northeast of Budapest	7,000
Manganese ore	do.	Urkut manganese ore mines, 120 kilometers southwest of Budapest	160
Natural gas	National Petroleum and Gas Industrial Trust (Government, 100%)	Szeged and Algyö gasfields, southern Hungary	[1]151,960
Do.	do.	Hajduszoboszó gasfield, 180 kilometers east of Budapest	[1]49,440
Do.	do.	Smaller gasfields: Szánk, Kardoskut, Békés, Berefurdö, and others	[1]38,740
Petroleum:			
Crude	do.	Szeged-Algyö field, near Romanian-Yugoslav border; 50% of total capacity	[2]7

See footnotes at end of table.

TABLE 2—Continued

STRUCTURE OF THE MINERAL INDUSTRY OF HUNGARY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Petroleum—Continued			
Refined	National Petroleum and Gas Industrial Trust:		
	Danube Petroleum Refining Co. (Government, 100%)	Százhalombatta	[2]54.8
Do.	Tisza Petroleum Refining Co. (Government, 100%)	Leninaváros	[2]21.9
Do.	Zala Petroleum Refining Co. (Government, 100%)	Zalaegerszeg	[2]3.7
Steel	Dunaujváros (Danube Steel Works) (Government, 100%)	60 kilometers south of Budapest	1,400
Do.	Ozd Metallurgical Works (Government, 100%)	120 kilometers northeast of Budapest	1,100
Do.	Lenin Metallurgical Works (Government, 100%)	Diosgyör, 145 kilometers northeast of Budapest	1,300

[1]Million cubic feet per year.
[2]Million barrels per year.

Hungary's aluminum industry also produced gallium and vanadium as a byproduct of alumina refining at the Ajka refinery and smelter.

Copper.—Following Hungary's failed negotiations with the U.S.S.R. to develop and operate jointly the Recsk copper ore deposit, a Hungarian Government official in July indicated that talks with 21 foreign companies interested in the Recsk Mine development project were at an initial stage. The Hungarian Government planned to maintain the Recsk site on a care-and-maintenance basis at least until the early months of 1990. The deep-lying Recsk ore body in the Matra Mountains, was found to contain between 172 and 175 million tons of copper ore grading 1.12% copper and 20 million tons of polymetallic ore grading 4.22% lead and 0.93% zinc, along with smaller quantities of gold, molybdenum, and silver.

Geological investigations determined the area of mineralization to be about 10 square kilometers. Porphyritic copper was found to occur over a 2-square-kilometer area with a peripheral mineralization of pyrite and chalcopyrite. The survey also showed the surrounding area as a polymetallic mineralization.[10] Copper mining at Recsk began in 1926 and ended in 1976 because of the depletion of near surface deposits. During this period, the Recsk copper-gold mine reportedly produced 3 million tons of gold-bearing copper ore.[11]

Iron and Steel.—In 1988, following recommendations by Swedish and other foreign consultants, the Government of Hungary decided to actively promote the restructuring of the country's steel industry. Although by CMEA standards Hungary had significantly progressed toward restructuring its iron and steel sector, in 1989, it was decided to raise continuous casting within the range of 85% to 90% from 64% registered in 1988. The steel industry's restructuring policies indicated that subsidies would be abolished and that the country's iron and steel producers would operate as independent companies with independent decision-making capability, relative to all foreign commercial transactions.

Additionally, the industry's total production capacity and labor force would be reduced on the one hand, and, on the other, joint ventures and the use of modern technology would be encouraged to make products competitive in the market. Accordingly, late in the year, Hungary's Ozd Metallurgical Works and Metallgesellschaft AG and Korf AG of the Federal Republic of Germany agreed to transform Ozd steelworks into a shareholding company. The two German firms will each own 25% of the Ozd enterprise, renamed Ozder Stahl AG. The new company would retain all of the old Ozd enterprise's assets, except those designated for closure, which would include open-hearth and blast furnaces as well as several mills. Capacity would be reduced from the 1989 level of 1 million tons per year of crude steel to about 650,000 tons per year. The agreement also called for the plant engineering firm, Korf Lurgi, a jointly owned subsidiary of both Korf and Metallgesellschaft, to install a more efficient furnace, as well as to modernize the new company's remaining facilities.

Also, late in the year, the Lenin iron and steelworks at Diosgyoer decided to regroup into a joint-stock company in January 1990. The company's new name would be Dimag Ltd.

Dimag would supervise the operation of 18 limited companies, of which 7 would be involved in the steel production and 11 would operate in the service sector. Reportedly, the restructuring program at Dimag Ltd. would involve a reduction in the output of pig iron from 1,100,000 to less than 900,000 tons per year. The proportion of higher value steel production would increase from 20% to 50% of total steel output by 1993, while energy costs would be reduced by raising continuous casting to 80% of output. Moreover, two older founderies and possibly a rolling mill would be decommissioned. In 1990, Dimag's planned exports to Western Europe were expected to be about at the same level achieved in 1989

in terms of value or about $65 to $70 million worth of steel products.

Hungary's third steel producer, the Dunaujváros iron and steelworks (now, Dunaferr) at Dunaujvaros, also sought joint ventures with unnamed Austrian and U.S. companies during the year. Dunaferr's restructuring program, announced early in 1989, included provisions to produce thin coil at its 800,000-ton-per-year hot strip mill, modernize its cold reduction mill, and overhaul three continuous slab casters with the assistance of French and Finnish firms.

The company's capacity for finished products was planned to increase by 300,000 tons per year, largely for the output of galvanized steel, tinplate, and plate for heavy truck manufacture. Furthermore, a sixth stand at the hot-rolling mill would be installed by the end of 1990.

The achievements of the steel industry in 1989, as a whole, were considered to be successful: total sales grew by 15% compared with those of 1988 and hard currency exports rose by 14% during this period. At the same time, the output of pig iron and steel was 5% below the output levels of 1988. Rolled steel declined by about 8%, largely because of the discontinuation of exports to CMEA bloc countries. Employment in the steel industry also fell to 41,000 workers from 52,800 in 1988.

Uranium.—At midyear, Hungary's Ministry of Industry announced plans to cease all uranium mining in the Mecsek Mountains because of increasingly difficult geological conditions as well as the determination that income from potential sales in the market would cover only one-third of the production costs. However, uranium mining could continue under a joint venture or some other subsidy-free operating arrangement.

Uranium mining at Mecsek has been carried out for 33 years under a Hungarian-Soviet uranium agreement. Under this agreement, all information concerning production and reserves was to be kept secret. All of the uranium ore was sent to the U.S.S.R. for processing, and a seperate agreement stipulated that the U.S.S.R. would be resposible for providing Hungary's Paks nuclear reactor with nuclear fuel. As with exports of Soviet petroleum and natural gas to Hungary and other CMEA countries, the value of Hungarian uranium shipped to the U.S.S.R. for processing was based on a 5-year world price average. Although uranium production data from the Mecsek operation remained a secret, reportedly, the mine produced uranium equal to the fuel needed to power the 1760-megawatt (MW) Paks reactor, and ore reserves would last another 30 years at the 1989 production rate.

Uranium ore was mined at depths ranging from 800 to 1,000 meters, which required considerable Government subsidies to allow operations at these depths. In view of the Hungarian Government's decision to end all subsidies, to continue operations, geologists at the Mecsek Ore Mining Co. (MEV) explored for uranium ore deposits at shallow depths, which would reduce mining costs by 30% to 70%.

In November, the management of MEV announced plans to set up joint ventures with foreign investors. Reportedly, firms from the Federal Republic of Germany (FRG), France, and the United States expressed interest in MEV's proposals that involved short contracts as well as longer term agreements on purchases of uranium concentrates at daily quoted prices. The foreign firms also expressed interest in mining cooperation agreements with MEV. Unless means can be found to revitalize MEV's operations, mining would end by 1991.[12]

Industrial Minerals

Cement.—In November, it was announced that Hungary's cement industry would form a series of partnerships with Austrian, Swiss, and FRG cement interests. The foreign firms would contribute a total of $46 million and would purchase, on average, about one-third of the shares or assets of new companies formed from Hungary's restructured cement industry. Cement and lime production also received subsidies from the Government to cover losses from operations in prior years, but, as in other cases, subsidies to the cement industry would be abolished.

Nitrogen.—In October, the Government of Hungary announced plans to sell the Pet nitrogen enterprise at a public auction because of the company's losses, which accumulated to about $108 million. The Pet enterprise produced about one-half of the country's nitrogenous fertilizers and about one-third of its phosphatic fertilizers. The enterprise's operations, however, were to continue until the sale would be completed.

Mineral Fuels

Coal.—In November, Hungarian officials indicated that Hungary's coal production was expected to decline from about 21 million tons in 1989 to about 18 million tons by the year 2000 owing to mine closures from depletion, difficult geological conditions, reductions in industrial coal consumption, as well as environmental considerations. Additionally, the coal industry's total losses amounted to about $500 million, which further impacted on its ability to compete in the market. The main argument to maintain coal mining at all was the need to use coal for coal-powered electric power stations, which were built to use domestic resources. Moreover, the use of domestic coal would avoid short-term hard-currency expenditures on imported coal.

The chief event in the coal industry in 1989 was the decision by the Hungarian Government to close the Mecsek coal mine after 65 years of operation. This decision, as well as that to close the area's uranium mine, would effectively end mining in this district. The plan to close the mine was based largely on the results of restructuring in the steel industry, where plans to expand the country's annual output of crude steel to 5.2 million tons by 1990 were dropped.

Substantial investments were made in prior years to raise the output of coking coal at Mecsek to 900,000 tons per year to meet the steel industry's old planned targets. However, Hungary's steel industry decided to maintain steel production at about 3.5 million tons per year, and, instead, concentrate on making higher value steels and use higher quality raw materials such as pelletized iron ore concentrates. Consequently, enterprises like Dunaferr, which were major users of Mecsek coal, significantly reduced their consumption of coal from the mine in 1989, especially in view of the coal's high-sulfur content. There were, however, discussions between Mecsek Mine officials and Poland's mining and engineering enterprise, Budex, to jointly operate the Mecsek's Istvan shaft to continue the production of coking coal, as well as to form a joint venture to upgrade the mine's operation with new equipment. Although no firm agreements were reached by yearend, in December, Hungary's Ministry of Industry decided to place the Mecsek Mine on a care-and-maintenance basis at an annual cost of

$800,000 until operations could be resumed in the future.

Natural Gas and Petroleum.—Hungary remained a net importer of petroleum and natural gas with almost all of its needs met by Soviet exports. In 1989, shortfalls of deliveries of Soviet petroleum and refinery products prompted a decision by the Hungarian Government to purchase an additional 250,000 tons of crude oil and 30,000 tons of gasoline for hard currency in January 1990.[13]

To ensure adequate supplies of natural gas, Hungary participated at a number of development projects in the U.S.S.R.'s natural gas and petroleum sectors. One of the more significant of these projects was the construction of refineries, a gas processing plant, and a pipeline at the Tengiz oilfield, near the Caspian Sea. Although Hungarian officials pointed to economic losses connected with these projects, they also noted that the Hungarian-Soviet energy agreements would continue into the foreseeable future because of cheaper costs involved in transporting Soviet natural gas and petroleum compared with products from the world markets.

Nuclear Energy.—The main issues concerning the nuclear industry in 1989 involved locating a suitable storage area for medium- and low-level nuclear waste from the the country's sole installation, the reactor at Paks, and the construction of additional nuclear reactors. By yearend, the issue of nuclear waste disposal remained usettled, and the Paks management planned to appeal to the Ministry of Welfare and Health and the Council of Ministers to grant permits to build a storage facility near the village of Ofalu in southern Hungary.

Electricite de France (EDF) proposed a joint venture with the Paks nuclear power station to build two 1,000-MW reactor blocks that would add to Paks's rating of 1,760 MW. The proposal would have the French company provide 70% of the financing in hard currency, while Hungary would finance the balance in forints. Hungary would repay EDF over a 20-year period with supplies of electric power. The French company also indicated that the first 1,000-MW block could start operations by 1997, and the second block would follow 18 months later. One block would be connected to the West European grid, the second to Hungary's domestic grid. Moreover, EDF would supply the fuel and take back spent fuel rods for reprocesing or disposal. The French proposal was under serious consideration by the Hugarian Government at yearend because the French offer would not place Hungary under any obligation to independently seek sources of hard-currency financing.[14]

Reserves

Taking into consideration Hungary's transition to a market economy system, the country's mineral reserves would have to be reevaluated from the perspective of market economics. Reserves, as defined by market economies, are those mineral deposits that can be mined at a profit under existing conditions with existing technology. In CMEA countries, including Hungary, the prior policies for centrally planned industrial development often had more to do with political considerations than real economic sense. The chief principle of industrial development was to attain self-sufficiency at all costs. Centrally planned directives to discover exploitable resources may have resulted in possible overevaluations of collected field data. Consequently, it would probably take Hungary a number of years to determine its real mineral reserves from a market economy standpoint.

The system that was used to measure reserves was based on two cross-imposed classification schemes, one relating to the suitability of the material in question for exploitation and the other relating to the reliability of the information on the quantity of material in place. The first system determined whether or not the deposit was exploitable, given current technological capability and industrial need. The second classification related to the reliability of data gathered on the quantity of the mineral in situ.

The second classification designated deposits into reserve categories A, B, C1, and C2, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade.[15] Taking this system into account, Hungary's major mineral resources in categories A+B+C1 are provided in table 3.

TABLE 3

HUNGARY: APPARENT RESERVES OF MAJOR MINERALS

Commodity	Million metric tons unless otherwise specified
Bauxite	124.
Copper content of ore	1.9.
Manganese ore	18.2.
Lead, content of ore	.8.
Zinc, content of ore	0.2.
Coal, bituminous	86.3.
Coal, brown and lignite	3193.3.
Natural gas	126.7 million cubic meters.
Petroleum	158.
Bentonite	15.9.
Kaolin	15.7.
Perlite	18.1.

INFRASTRUCTURE

Railways carry about two-thirds of Hungary's mineral freight. The railroad network consists of 7,770 kilometers (km) of track, of which 7,513 km is 1.435-meter standard-gauge track. Inland waterways, mainly composed of the Danube River and its tributaries, transport some mineral freight to maritime ports on the Black Sea in Romania at Galati and Braila. Hungary also has maritime port access on the Baltic Sea in Poland at Gdansk and Gdynia, as well as at Rostock in the German Democratic Republic. The country's pipeline network consists of a 1,204-km line to carry crude oil, a 600-km line for refinery products, and a 3,800-km pipeline for natural gas. Also, Hungary's highways had a total length of 130,000 km, of which 29,701 km were part of the national highway system. The total net installed electric generating capacity as of 1987 amounted to 6,629,000 kilowatts (KW), of which 4,940,000 KW were generated by thermal electric generating plants, 1,643,000 KW by nuclear powerplants, and 46,000 KW by hydroelectric power facilities.

OUTLOOK

Hungary's present mineral industry was developed largely on the basis of centrally planned industrial development requirements. Its reevaluation from the rationale of the market would, for the short-term, create certain dislocations, including mine and plant closures. On the

other hand, the addition of capital investment for advanced technology and know-how to the country's remaining market oriented enterprises in the mineral industry should result in fairly competitive operations. Also, in view of Hungary's skilled and technically literate work force, the mineral industry would have lower wage rates than West European competitors while approaching or attaining similar quality standards.

Hungary's aluminum industry most likely will rely less on domestic raw materials and more on imported bauxite. In the 1990's, energy and environmental issues could act as constraints to the mineral industry's development.

Although additional nuclear powerplant capacitites would allow Hungary's aluminum industry to smelt more of its domestically produced alumina and rely less on barter arrangements with the U.S.S.R., the possible environmental hazards associated with nuclear power and coal fueled industries must be resolved politically before final policy decisions could be made as to their long-term use. Joint ventures with foreign companies and privatization would continue for the foreseeable future.

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[12]———. Nov. 2, 1989 (MTI 2036 Gmt, Oct. 13, 1989).
[13]———. Dec. 14, 1989, p. A8 (MTI 1447 Gmt, Dec. 14, 1989).
[14]———. Dec. 21, 1989, p. A9 (MTI 1357 Gmt, Dec. 8, 1989).
[15]Strishkov, V. V., and W. G. Steblez. The Chromium Industry of the U.S.S.R. BuMines Mineral Issues, 1985, 35 pp.

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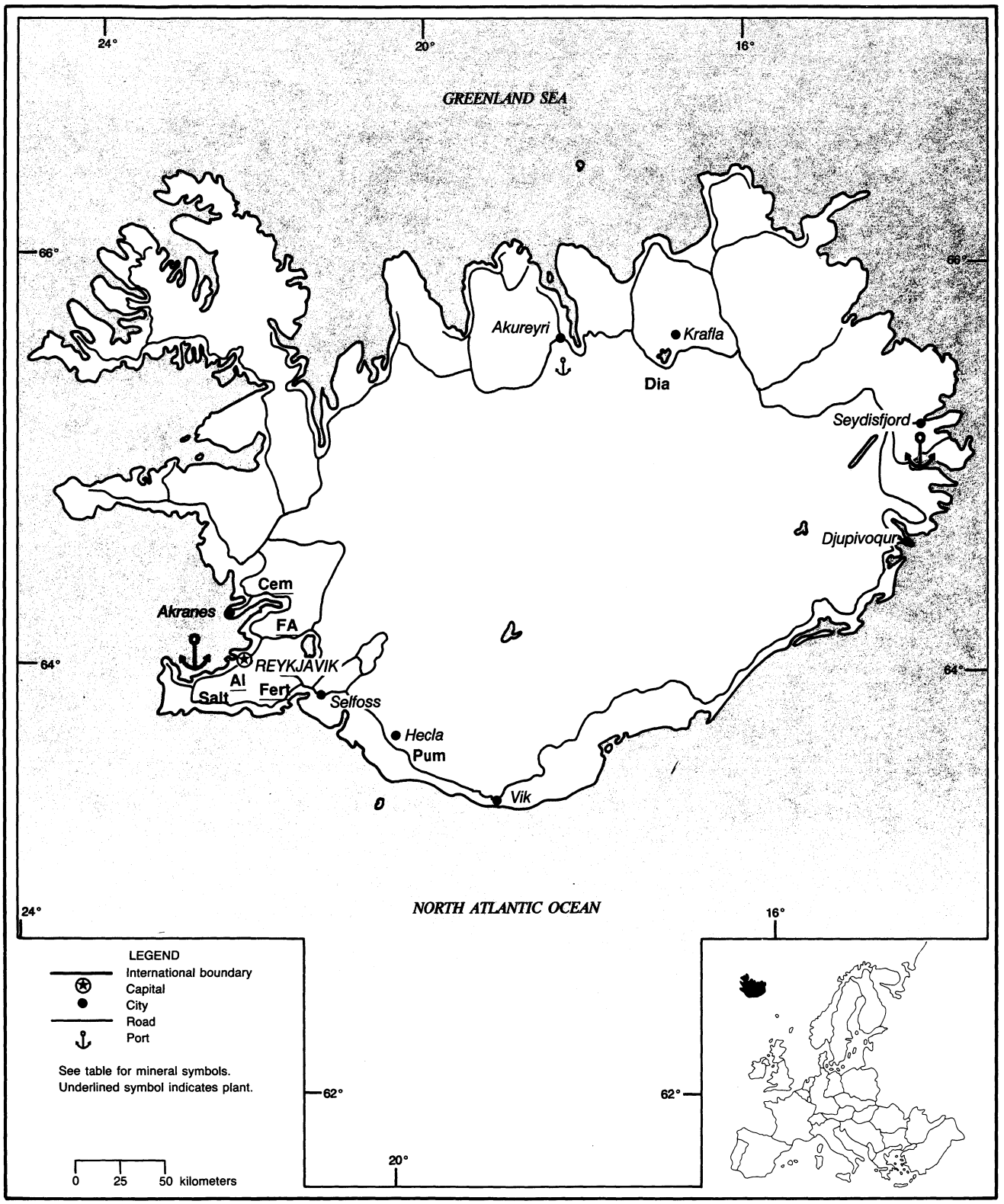
ICELAND

AREA 103,000 km² **POPULATION 252,000**



THE MINERAL INDUSTRY OF

ICELAND

By Harold R. Newman

Iceland, a volcanic island of some 103,000 square kilometers in area, has abundant hydroelectric and geothermal energy. As part of the Mid-Atlantic Ridge, Iceland has an almost exclusive igneous geologic structure and lacks a significant mineral resource base. The consumption of minerals and fuels is small. The country's economy is mostly dependent on a single resource, which is the fishing industry. Fishery products account for about 70% of exports and are a major influence on economic performance.

Economic growth decline continued throughout 1989 with the gross domestic product falling by an estimated 2.5% compared with that of 1988. Total gross domestic product in 1989 was $5.3 billion.[1] Profitability of the primary aluminum, ferrosilicon, and cement industries continued because of continued low-energy costs, strong markets, and the real depreciation of the króna.

The signing of a moderate wage settlement with the Icelandic Federation of Labor and the Employment Federation, a drop in nominal interest rates by the commercial banks, and a 23% devaluation of the króna was expected to reduce inflation from the 20% to 30% level to a single digit and lead to a more balanced economy.

GOVERNMENT POLICIES AND PROGRAMS

Both private and Government-owned enterprises exist in the mineral and mineral processing industry. Prospecting and mining rights are controlled by the Ministry of Public Works under the amended Mining Law of 1906. Mineral information is collected by the Museum of Natural History and the Iceland Geologic Survey. The national and municipal Governments, directly and through the banking system and investment funds, control a large share of the financial resources available to business firms in Iceland.

The Icelandic Energy Marketing Unit (IEMU) was set up in 1988 as a joint venture between the Ministry of Industry and Energy and the National Power Co. (Landsvirkjun). IEMU's continuing mandate includes market research into possible large-scale energy buyers, feasibility studies for power intensive industries, and energy sales to ventures in Iceland or export of power by underwater cable. Three partly or wholly foreign owned power intensive projects, Icelandic Aluminium Co. (ISLA), Icelandic Alloys Ltd., and Kisilidjar Corp., bought one-half the energy production of the National Power Co. The company has an installed hydroelectric power capacity of 4,200 gigawatt hours. Foreign companies in the mineral industry and elsewhere are being approached by IEMU to develop major industrial projects based on the comparative advantages of competitive energy costs and important geographic location by virtue of Iceland's position in the European Economic Space.

PRODUCTION

Production of aluminum and ferrosilicon continued to increase. Cement sales decreased by almost 11% because of a decline in construction activity. The value of 1989 exports was $1,400 million, which was a slight drop over that of 1988. Iceland's most important market was the United Kingdom, with the United States, second.

TRADE

Some $352 million of industrial goods was exported, of which $165 million was primary aluminum, $43 million was ferrosilicon, and $6 million was diatomite.

STRUCTURE OF THE MINERAL INDUSTRY

Iceland's mineral industry consists mainly of one privately owned aluminum plant and a 55% Government-owned ferrosilicon plant, both of which use imported materials. The aluminum industry employs 690 persons and the ferroalloy industry employs 185 persons. Labor is unionized. The Government also owns and operates a cement plant and a salt plant.

COMMODITY REVIEW

Metals

Iceland's main mineral commodities produced were aluminum and ferrosilicon. Production of aluminum at ISAL continued to be profitable as the world market for aluminum remained strong. Although quality and quantity continues to improve at the plant, ISAL's main disadvantage is logistics. An aluminum producer in the Federal Republic of Germany can offer prospective European buyers delivery in 2 weeks while ISAL has a 5-week delivery time. However, reasonable energy costs in Iceland are a definite advantage at a time when these costs are rising on the continent.

Alumax Co. of the United States accepted an invitation extended by the Government of Iceland, Hoogovens Aluminium of the Netherlands, and Gränges Aluminium of Sweden to join the Atlantal project talks, which involve the possible construction of a 200,000 ton aluminium smelter in Iceland. The joint-venture equity split contemplated would provide either 30% or 40% interest to Alumax with Granges and Hoogovens sharing the remaining interest equally, with construction to begin in 1991.

The proposed smelter would require construction of a new power station on the east coast of Iceland and enlargement of the Burfell powerplant in the south. Power requirements of the new smelter were estimated at 300 megawatts. One of the advantages of the project for Alumax is that it would offer the U.S.-based company a tariff-free ticket into the European Community (EC) in 1992 and afterwards.

Alusuisse, the parent company of ISAL, was one of the original participants

TABLE 1

ICELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Aluminum metal, primary[2]		73,403	75,929	83,485	82,034	85,000
Cement, hydraulic[3]	thousand tons	114	111	127	134	116
Diatomite		29,388	22,897	22,897	25,142	26,000
Iron and steel: Ferrosilicon		60,328	66,787	60,184	70,051	72,000
Nitrogen: N content of ammonia		7,532	7,980	9,039	8,812	8,000
Pumice and related volcanic material:						
Pumice		56,000	52,500	58,792	65,444	60,000
Scoria		[e]375	[e]375	271	351	300
Salt		1,350	704	1,830	[e]2,000	2,000
Sand:						
Basaltic	cubic meters	5,500	[e]5,000	5,400	2,300	2,100
Calcareous, shell	thousand cubic meters	100	129	115	135	125
Sand and gravel	do.	4,150	4,088	4,816	[e]4,200	4,400
Silica dust[4]		[3]7,873	13,886	12,131	[e]14,234	12,240
Stone, crushed:						
Basaltic	thousand tons	80	77	114	91	90
Rhyolite		25,755	23,114	22,700	28,300	26,000

[e]Estimated. [p]Preliminary.
[1]Table includes data available through May 31, 1990.
[2]Ingot and rolling billet production.
[3]Sales.
[4]Byproduct of ferrosilicon.

TABLE 2

ICELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
Abrasives, n.e.s.: Corundum, emery, pumice, etc.		58,771	65,444	36	United Kingdom 31,916; Denmark 12,447; Norway 11,380.
Aluminum:					
Ash and residue containing aluminum		14	—		
Metal including alloys:					
Scrap		—	86	—	Netherlands 62; Denmark 10; Norway 8.
Unwrought		89,081	81,071	—	Switzerland 31,623; West Germany 21,275; United Kingdom 20,374.
Semimanufactures		—	302	—	Mainly to Switzerland.
Cement	kilograms	—	200	—	All to Greenland.
Copper: Metal including alloys, scrap		—	267	—	Denmark 150; Netherlands 111; West Germany 6.
Diatomite and other infusorial earth		23,214	25,840	—	West Germany 6,830; Italy 3,050; Denmark 2,420.
Fertilizer materials: Manufactured:					
Nitrogenous		4	—		
Unspecified and mixed		9	—		
Iron and steel: Metal:					
Scrap		7,668	4,507	—	Netherlands 4,500; Denmark 7.
Ferrosilicon		71,656	73,236	17,191	West Germany 21,251; Japan 19,176.
Lead: Metal including alloys, scrap		—	144	—	All to Netherlands.
Petroleum refinery products: Distillate fuel oil	42-gallon barrels	—	2,141	—	All to Norway.

See footnote at end of table.

TABLE 2—Continued

ICELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
Salt and brine	—	300	—	Denmark 210; United Kingdom 90.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	271	—		
Gravel and crushed rock	—	352	—	West Germany 222, Denmark 56; Netherlands 47.
Zinc: Metal incuding alloys, scrap	—	47	—	All to Netherlands.
Other: Base metals including alloys, scrap	845	—		

[1]Table prepared by P. J. Roetzel.

TABLE 3

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	—	(2)	(2)	
Alkaline-earth metals	—	(2)	(2)	
Aluminum:				
Ore and concentrate kilograms	100	—		
Oxides and hydroxides	142,335	140,525	—	Mainly from Australia.
Metal including alloys:				
Unwrought	29	42	—	United Kingdom 41; Norway 1.
Semimanufactures	1,442	1,357	45	West Germany 348; Norway 296; Belgium-Luxembourg 124.
Antimony: Metal including alloys, all forms	—	(2)	—	All from Sweden.
Cadmium: Metal including alloys, all forms	—	(2)	—	All from West Germany.
Chromium:				
Oxides and hydroxides kilograms	500	4,400	—	West Germany 2,000; Netherlands 2,000.
Metal including alloys, all forms	—	(2)	—	Mainly from France.
Cobalt: Oxides and hydroxides value, thousands	$1	$1	—	NA.
Copper:				
Ore and concentrate	60	90	—	All from West Germany.
Matte and speiss including cement copper	—	(2)	(2)	
Oxides and hydroxides	—	13	NA	West Germany 10.
Sulfate	—	(2)	NA	NA.
Metal including alloys:				
Unwrought	4	7	(2)	Mainly from Denmark.
Semimanufactures	218	611	5	Poland 300; West Germany 84.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$174	$199	$46	Switzerland $42; Denmark $29.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel:					
Iron ore and concentrate, excluding roasted pyrite		17,162	22,682	—	All from Norway.
Metal:					
Pig iron, cast iron, related materials		381	74	8	Sweden 40; West Germany 16.
Ferroalloys:					
Ferromanganese		(2)	1	—	Mainly from Norway.
Ferrosilicon		(2)	(2)	—	All from Japan.
Ferrovandium		—	(2)	(2)	
Silicon metal		—	26	—	Norway 25; Finland 1.
Unspecified		9	8	8	
Steel, primary forms		1,236	133	(2)	Sweden 73; Netherlands 29; Denmark 19.
Semimanufactures:					
Bars, rods, angles, shapes, sections		23,663	23,375	336	Poland 7,965; Norway 5,720.
Universals, plates, sheets		14,889	NA		
Hoop and strip		1,085	NA		
Rails and accessories		13	75	—	United Kingdom 43; Belgium-Luxembourg 11.
Wire		321	343	1	Belgium-Luxembourg 156; Finland 71.
Tubes, pipes, fittings		6,628	11,672	157	Finland 3,523; West Germany 2,309; Netherlands 2,240.
Castings and forgings, rough		280	NA		
Lead:					
Oxides		13	11	—	West Germany 6; Sweden 3; East Germany 2.
Metal including alloys:					
Scrap		10	—		
Unwrought		297	188	—	Denmark 120; United Kingdom 59; Belgium-Luxembourg 8.
Semimanufactures		56	34	—	West Germany 16; Belgium-Luxembourg 11.
Magnesium: Metal including alloys:					
Scrap		—	(2)	—	All from France.
Unwrought		30	29	—	Mainly from Norway.
Semimanufactures		(2)	1	—	Mainly from Italy.
Manganese: Oxides		6	(2)	—	All from United Kingdom.
Mercury	kilograms	100	100	—	Mainly from West Germany.
Molybdenum: Metal including alloys, unwrought including scrap	value, thousands	—	$230	—	All from Denmark.
Nickel:					
Oxides and hydroxides		—	(2)	NA	NA.
Metal including alloys, semimanufactures	kilograms	2,000	400	—	United Kingdom 200; West Germany 100; Norway 100.
Platinum-group metals:					
Waste and sweepings	value, thousands	—	$3	—	All from Denmark.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	—	$81	—	Switzerland $69.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals—Continued					
Metals including alloys, unwrought and partly wrought—Continued					
Platinum	value, thousands	—	$120	$4	Netherlands $48; Switzerland $37; West Germany $14.
Iridium, osmium, ruthenium	do.	—	$440	—	All from United Kingdom.
Unspecified	do.	$181	—		
Selenium, elemental		—	(2)	—	All from United Kingdom.
Silver:					
Waste and sweepings[3]	do.	—	$280	—	All from Denmark.
Metal including alloys, unwrought and partly wrought	kilograms	900	500	(2)	Denmark 100; Sweden 100.
Tellurium, elemental		—	(2 4)	—	All from Denmark.
Tin: Metal including alloys:					
Scrap		1	—		
Unwrought		(2)	(2)	—	All from United Kingdom.
Semimanufactures		5	4	—	Denmark 2; West Germany 1; United Kingdom 1.
Titanium:					
Oxides		484	508	—	United Kingdom 372; West Germany 111.
Metal including alloys, semimanufactures		—	(2)	—	All from West Germany.
Tungsten: Metal including alloys, all forms	value, thousands	$4,000	$885	$395	United Kingdom $300; Sweden $185.
Uranium: Oxides and other compounds		—	(2)	—	All from West Germany.
Zinc:					
Oxides		10	9	3	West Germany 4; Netherlands 1.
Blue powder		14	5	—	Denmark 4; Netherlands 1.
Metal including alloys:					
Scrap		3	—		
Unwrought		92	131	—	Norway 69; Belgium-Luxembourg 36; West Germany 24.
Semimanufactures		11	51	—	Norway 21; France 16; Belgium-Luxembourg 7.
Other:					
Oxides and hydroxides		—	2	NA	NA.
Ashes and residues		—	(2)	(2)	
Base metals including alloys, all forms		2	(2)	NA	NA.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		98	41	—	Italy 18; Netherlands 13; Norway 10.
Artificial:					
Corundum		1	7	—	Mainly from Denmark.
Silicon carbide		—	1	—	All from Norway.
Grinding and polishing wheels and stones		40	28	2	Netherlands 7; West Germany 4; Switzerland 2.
Barite and witherite		32	14	—	West Germany 8; Netherlands 4; Denmark 2.
Boron materials: Oxides and acids	kilograms	500	1,000	—	Mainly from Denmark.
Bromine		—	(2)	—	NA.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cement		158	2,184	—	Belgium-Luxembourg 1,971; United Kingdom 73.
Chalk		290	260	—	Norway 96; United Kingdom 80; Switzerland 45.
Clays, crude:					
Bentonite		NA	60	—	United Kingdom 57; West Germany 1.
Chamotte earth		NA	62	NA	United Kingdom 40.
Fuller's earth		NA	(2)	—	All from Denmark.
Fire clay		NA	30	NA	United Kingdom 29.
Kaolin		NA	34	15	United Kingdom 17; Denmark 2.
Unspecified		511	171	20	United Kingdom 134.
Cryolite and chiolite		—	100	—	Mainly from Denmark.
Diamond, natural:					
Gem, not set or strung	value, thousands	$84	$42	—	Belgium-Luxembourg $33; Switzerland $6.
Industrial stones	do.	$12	$66	—	Belgium-Luxembourg $46; Netherlands $13.
Diatomite and other infusorial earth		2	7	NA	Denmark 6.
Feldspar	kilograms	300	300	NA	NA.
Fertilizer materials: Manufactured:					
Ammonia		5,071	3,470	—	France 3,052; Norway 361.
Nitrogenous		667	1,919	—	West Germany 1,755; Norway 137.
Phosphatic		1,535	1,421	—	All from Sweden.
Potassic		9,162	5,950	—	East Germany 5,300; France 650.
Unspecified and mixed		9,076	12,509	2	Netherlands 12,436.
Graphite, natural		15	31	—	United Kingdom 26; France 5.
Gypsum and plaster		6,684	9,993	6	Sweden 9,532; East Germany 405.
Iodine		—	1	—	NA.
Lime		512	318	3	United Kingdom 149; West Germany 144.
Magnesium compounds:					
Magnesite, crude		13	(2)	—	Mainly from West Germany.
Oxides and hydroxides		—	5	—	Mainly from United Kingdom.
Mica:					
Crude including splittings and waste		16	11	—	Norway 10.
Worked including agglomerated splittings		(2)	(2)	—	NA.
Nitrates, crude		88	60	—	United Kingdom 43; Denmark 10.
Phosphates, crude		16	3	—	Norway 2; West Germany 1.
Pigments, mineral:					
Natural, crude		—	(2)	—	NA.
Iron oxides and hydroxides, processed		49	35	—	Denmark 16; West Germany 6.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$12	$24	—	West Germany $14; Belgium-Luxembourg $4.
Synthetic	do.	$14	$7	—	West Germany $6; Denmark $1.
Pyrite, unroasted		—	2	2	
Salt and brine		103,442	67,923	1	Spain 30,394; Tunisia 29,278.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Sodium compounds, n.e.s.:				
Soda ash, manufactured	1,189	962	—	Poland 453; France 326; West Germany 70.
Sulfate, manufactured	121	135	NA	Sweden 124.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	217	228	—	Portugal 77; China 70.
Worked	1,093	469	—	Italy 312; Portugal 66.
Dolomite, chiefly refractory-grade	957	348	—	Norway 311.
Gravel and crushed rock	12,419	66	—	Italy 31; Sweden 10.
Limestone other than dimension	151	141	—	All from Denmark.
Quartz and quartzite	87,347	118,796	45	Spain 93,879; Norway 24,328.
Sand other than metal-bearing	372	401	1	United Kingdom 108; Sweden 66; Denmark 64.
Sulfur:				
Elemental:				
Crude including native and byproduct value, thousands	$500	$2,325	—	All from West Germany.
Colloidal, precipitated, sublimed	3	25	—	Mainly from Denmark.
Sulfuric acid	78	380	—	Norway 279; Denmark 49; Netherlands 47.
Talc, steatite, soapstone, pyrophyllite	89	89	4	Norway 79; Sweden 3.
Vermiculite	1	1	—	Mainly from United Kingdom.
Other:				
Crude	75	16	—	Finland 9; Sweden 5; Denmark 1.
Slag and dross, not metal-bearing	333	(2)	—	All from Sweden.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	29	86	(2)	West Germany 59.
Carbon black	(2)	1	—	Mainly from Denmark.
Coal:				
Anthracite	40,409	42,564	36,313	East Germany 2,551.
Bituminous	19,510	23,603	10,355	United Kingdom 13,248.
Briquets of anthracite and bituminous coal	22	10	—	All from Norway.
Lignite including briquets	5	(2)	—	All from West Germany.
Coke and semicoke	31,977	26,515	—	Norway 16,211; United Kingdom 4,153; East Germany 3,807.
Peat including briquets and litter	238	290	—	Finland 113; Sweden 73; Netherlands 46.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	11	13	(2)	Sweden 9; Denmark 3.
Gasoline do.	1,023	1,062	—	U.S.S.R. 476; Netherlands 463.
Mineral jelly and wax do.	3	2	(2)	United Kingdom 1.
Kerosene and jet fuel do.	806	536	NA	Netherlands 527; Norway 8.
Distillate fuel oil do.	2,133	2,020	NA	U.S.S.R. 1,293; Netherlands 581.
Lubricants do.	47	50	(2)	Netherlands 17; Denmark 12; Belgium-Luxembourg 10.
Residual fuel oil do.	528	601	NA	Mainly from U.S.S.R.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum refinery products—Continued					
Bitumen and other residues	thousand 42-gallon barrels	102	90	—	Sweden 82; Belgium-Luxembourg 8.
Bituminous mixtures	do.	2	2	(2)	Denmark 1; United Kingdom 1.
Petroleum coke	do.	1	—		

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes boron.

TABLE 4

ICELAND: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facility	Capacity (thousand tons per year)
Aluminum	Icelandic Aluminum Co. (ISAL) (Alusuisse, Switzerland)	Plant at Straumsvik	88
Cement	Sementsverksmidja Rikisins (Government)	Plant at Akranes	130
Diatomite	Kisilidjar Corp. (Government 52%, Manville Corp. 48%)	Mine at Lake Myvatn	27
Ferrosilicon	Icelandic Alloys Ltd. (Government 55%, Elkem AS, 30% Sumitomo Corp. 15%)	Plant at Grundartangi	55
Salt	Reykjanes Geo-Chemicals (Government)	Plant at Svartsengi	6
Pumice	Eldberg Ltd. BM Valla Ltd.	Mines at Hecla	200

in the Atlantal project talks. The company withdrew from the talks and announced it had decided to increase the capacity of its ISAL facilities to 96,000 tons per year from the present 88,000 tons per year. Also, a direct casting line is under construction that would enable ISAL to process all its annual production into rolled slab. This rolled slab commands a premium price on the market compared to the ingot, ISAL currently produces.

Icelandic Alloys had a good business year in 1989. The company returned about an $8 million operating profit. This was the second year in a row that the operation returned a good profit following considerable losses in 1981–83. The company was able to reduce long-term debts and pay off short-term operating loans. Icelandic Alloys maintained full production during the year with most of the output going to customers with long-term contracts.

Reserves

Iceland has a small reserve base and used imported materials to produce most of its goods. Aluminum and ferrosilicon are produced from imported materials, and the cement plant uses dredged sea shells, locally available rhyolite, and imported gypsum to produce cement.

INFRASTRUCTURE

Minerals are transported in bulk through the ports of Reykjavik, Akureyri, Hafnarfjordhur, and Seydisfjordhur. The road network is 12,000 kilometers long; however, paved roads total only 200 kilometers. There are no railroads.

OUTLOOK

The Icelandic economy is heavily dependent on the fishing industry, which accounts for about 70% of export earnings. In the absence of other natural resources, the economy is highly vulnerable to changing world fish prices. To counteract this, the Government is pursuing a program to develop the country's hydroelectric power potential. Along with this, power intensive industries are being invited to look at possibilities of establishing plants in Iceland. The aim of the Government is to develop a power intensive industry in step with a buildup in power generating facilities.

[1]Where necessary, values have been converted from Icelandic krónas (IKr) to U.S. dollars at the rate of IKr55.00 = US$1.00, the average exchange rate in 1989.

OTHER SOURCES OF INFORMATION

Agencies

Central Bank of Iceland
Kalkofrisvegur 1
150 Reykjavik

Icelandic Geodetic Survey
Laugavegur 178
105 Reykjavik

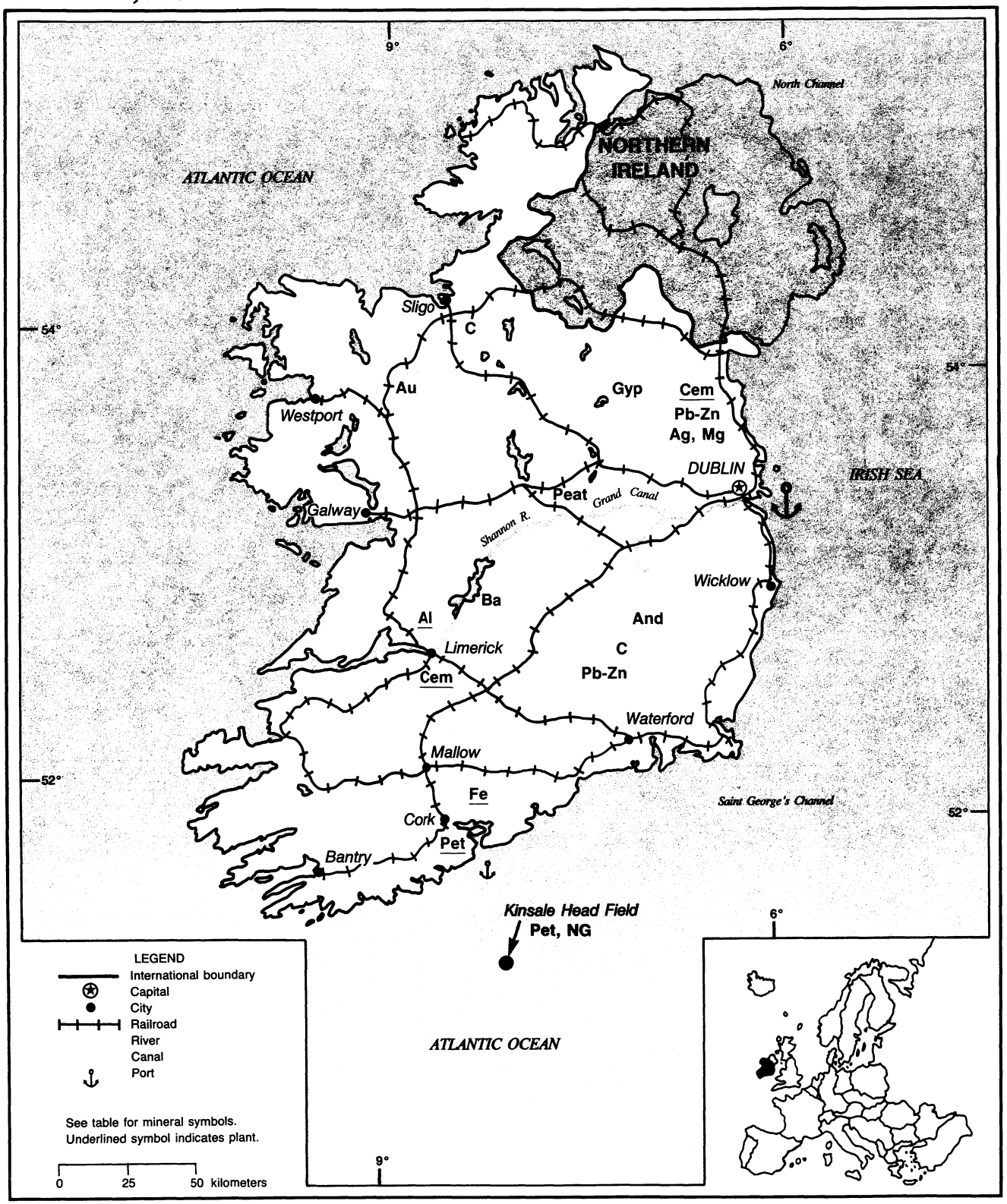
Ministry of Industry
Arnarhvall
150 Reykjavik

Publications

Company annual reports:
Icelandic Alloys Ltd., Grundar tangi, 301 Arkanes.
Icelandic Aluminium Co. (ISAL), P.O. Box 244, 222 Hafnarfjördur.

IRELAND

AREA 69,000 km² **POPULATION 3.6 million**



THE MINERAL INDUSTRY OF

IRELAND

By Harold R. Newman

Ireland was one of Europe's major producers of zinc and a significant producer of alumina, barite, peat, and lead in 1989. The country produced about 18% of the total zinc mine production and about 12% of total lead production in Western Europe. Although the range of minerals exploited has been limited, exploration activity continued to increase with the main emphasis on gold. The country's mineral processing industry was relatively small, as was the consumption of mineral resources.

Ireland's economy continued to improve in 1989. Output performance and private-sector employment increased, whereas inflation declined to a record low level for recent years, and the balance of payments continued into surplus. The gross domestic product grew by about 4%. The Irish economy has shown a very creditable performance in the past few years.

GOVERNMENT POLICIES AND PROGRAMS

As a member of the European Community (EC), Ireland is a full participant in the program to complete the single European market by the end of 1992.

To assist peripheral and less-developed regions within the EC, the EC has agreed to double by 1992 the "structural funds" available for development. In March 1989, Ireland submitted its 5-year development plan to the EC for review. The plan called for development spending of about $13.7 billion[1] over 5 years, including $5 billion from the EC structural fund and $3.3 billion from the private sector. The Government planned to use these funds primarily for infrastructure projects, including roads, port and airport facilities, and telecommunications. Also slated for investments under the EC program were indigenous energy development and energy diversification.

The Government was in the process of finalizing comprehensive environmental regulations in relation to mining. The effect of the regulations will be to perform detailed environmental impact assessment studies for mining development. Thresholds and criteria to determine the environmental significance of developments will be incorporated in the regulations prior to issuing mining licenses. This was in response to the EC Directive on Environmental Impact Assessment that required projects in the extractive industry, including mining of minerals and ores, be subjected to an assessment of their environmental impact before development consent is granted.

PRODUCTION

Ireland's base metal production, centered mainly on Tara Mines Ltd.'s zinc-lead mine near Navan, County Meath, continued strong. Industrial mineral production, including barite and gypsum, also continued. The largest barite deposit at Ballynoe, near Silvermines, was being changed from open pit to underground operations. There was significant natural gas production from an area off the southern coast of Ireland near Cork. Production from the fields was being carefully managed to extend the life of the area.

TRADE

Ireland's trade sector continued to perform well in 1989. Exports of goods and services grew by more than 10% in volume, whereas imports rose by 11%. Exports of industrial goods were particularly strong, posting an increase of 12% over that of 1988. As a result, the trade surplus grew from $3.1 billion in 1988 to $3.2 billion in 1989.

Ireland has made considerable progress in its participation in efforts to create a single European market by the end of 1992. This was particularly evident in the removal of barriers to trade in goods. Although Ireland was supportive of the single market effort and European economic integration, it has drawn attention to special needs and problems that integration may present to peripheral and less developed regions. EC measures most likely to impact on Ireland's interests are fiscal harmonization and proposals for economic and monetary union.

STRUCTURE OF THE MINERAL INDUSTRY

Ireland has been traditionally a rural-based economy, and farm products contributed more than 30% of the total export value. However, economic strategy during the past several years has concentrated on building an indigenous industry, including mineral resource development. Under the Minerals Development Acts 1940 to 1979, the Minister for Energy was empowered to grant licenses and mining rights for prospecting as well as subsequent development. Most mineral exploration and development is subject to state regulation. The Geologic Survey of Ireland is responsible for the development of mineral information as well as technical management of the state mineral licensing and leasing system. The Survey also provided technical assistance to the exploration and mining industry.

Ireland is fortunate in respect to mineral resources and has a proven geological potential for a variety of minerals. In 1989, the country was a world-ranked producer of barite, lead, and zinc. There was interest in gold exploration. Direct Government aid was essentially limited, although aid was being considered through the EC in the form of an exploration subsidy repayable only in the event of a discovery and limited to nonenergy minerals. Employment in mining and quarrying, including turf, was about 8,000.

COMMODITY REVIEW

Metals

Alumina.—Aughinish Alumina Ltd. (AAL) continued with its $10 million

TABLE 1

IRELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Alumina	thousand tons	555	686	784	843	865
Iron and steel: Steel, crude	do.	203	208	220	271	260
Lead:						
Mine output, Pb content		34,600	36,400	33,800	32,500	32,100
Metal, refined, secondary		9,000	10,200	9,600	[e]10,000	10,000
Silver, mine output, Ag content	thousand kilograms	8,585	8,149	7,185	5,590	7,247
Zinc, mine output, Zn content		191,600	181,700	177,000	173,200	168,800
INDUSTRIAL MINERALS[2]						
Barite	thousand tons	214	128	70	83	85
Cement, hydraulic	do.	1,457	1,398	1,448	1,685	1,600
Gypsum	do.	304	289	284	326	300
Lime		84,800	87,600	77,000	96,800	111,300
Magnesia[e 3]	thousand tons	75	65	70	—	—
Nitrogen: N content of ammonia	do.	338	355	399	415	386
Sand and gravel[4]	do.	6,749	6,550	5,564	6,163	7,400
Stone and other quarry products:						
Limestone[4]	do.	9,337	7,865	6,970	9,680	8,874
Other[4 5]	do.	2,411	2,041	1,953	1,615	1,967
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite and bituminous	do.	57	54	45	42	43
Gas, natural: Marketed	million cubic feet	85,200	59,300	58,900	71,230	70,000
Peat:						
For agricultural use	thousand tons	96	97	81	[e]85	80
For fuel use:						
Sod peat[6]	do.	786	782	410	1,147	1,053
Milled peat[7]	do.	1,884	3,928	6,765	3,230	6,714
Total	do.	2,670	4,710	7,175	4,377	7,767
Peat briquets	do.	492	460	505	378	530
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	186	302	255	210	225
Naphtha	do.	126	378	387	245	250
Gasoline, motor	do.	2,694	2,762	2,528	1,850	2,000
Distillate fuel oil	do.	3,255	3,788	3,945	3,160	3,000
Residual fuel oil	do.	3,166	3,744	3,556	3,075	2,800
Refinery fuel and losses	do.	365	685	390	400	400
Total	do.	9,792	11,659	11,061	8,940	8,675

[e]Estimated. [p]Preliminary.

[1]Table includes data available through Mar. 31, 1990.

[2]Ireland also produces significant quantities of synthetic diamond and 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 AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	5	3	—	All to United Kingdom.
Aluminum:				
Oxides and hydroxides	741,487	901,093	3,525	Norway 400,925; United Kingdom 243,284; West Germany 91,758.
Metal including alloys:				
Scrap	8,468	11,147	58	United Kingdom 6,572; Japan 1,330; France 1,269.
Unwrought	1,475	1,902	—	United Kingdom 1,901; Netherlands 1.
Semimanufactures	2,389	3,103	60	United Kingdom 1,717; France 348.
Arsenic: Oxides and acids	1	—		
Bismuth: Metal including alloys, all forms	(2)	—		
Chromium: Oxides and hydroxides	—	10	—	All to United Kingdom.
Cobalt:				
Oxides and hydroxides	21	18	—	All to Finland.
Metal including alloys, all forms	95	—		
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	(2)	—		
Tantalum	—	36	—	All to United Kingdom.
Copper:				
Sulfate	16	—		
Ash and residue containing copper	209	—		
Metal including alloys:				
Scrap	9,783	10,121	59	West Germany 2,922; Belgium-Luxembourg 2,506; Netherlands 1,847.
Unwrought	209	280	—	United Kingdom 110; West Germany 80; Italy 21.
Semimanufactures	3,375	991	2	United Kingdom 585; France 126; Italy 110.
Gold:				
Waste and sweepings value, thousands	$1,714	$2,283	NA	NA.
Metal including alloys, unwrought and partly wrought do.	$57	$37	NA	NA.
Iron and steel:				
Metal:				
Scrap	26,249	32,429	—	United Kingdom 24,280.
Pig iron, cast iron, related materials	97	56	—	United Kingdom 43; Switzerland 7.
Ferroalloys:				
Ferromanganese	9	—		
Silicon metal	21	—		
Unspecified	16	2	—	Mainly to Denmark.
Steel, primary forms	290	936	38	United Kingdom 479; Belgium-Luxembourg 332.
Semimanufactures:				
Bars, rods, angles, shapes, sections	198,955	227,746	19	United Kingdom 107,403; West Germany 27,387; France 27,033.
Universals, plates, sheets	6,720	7,270	—	United Kingdom 6,972.
Hoop and strip	510	—		

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal—Continued					
Semimanufactures—Continued					
Rails and accessories		130	2,853	—	Sudan 2,030; United Kingdom 821.
Wire		1,000	2,163	258	United Kingdom 1,175; France 458.
Tubes, pipes, fittings		5,167	6,219	7	United Kingdom 5,858; Netherlands 128.
Castings and forgings, rough		118	1,770	5	United Kingdom 1,554.
Lead:					
Ore and concentrate		56,218	49,516	—	West Germany 21,443; France 13,798; Spain 6,022.
Oxides		—	1	—	All to United Kingdom.
Ash and residue containing lead		62	—		
Metal including alloys:					
Scrap		3,761	3,651	—	United Kingdom 1,554; Belgium-Luxembourg 1,204; Malaysia 441.
Unwrought		83	353	—	All to United Kingdom.
Semimanufactures		6,850	8,095	—	United Kingdom 7,988.
Magnesium: Metal including alloys:					
Scrap		6	47	—	Japan 40; West Germany 7.
Unwrought		(2)	9	—	All to United Kingdom.
Semimanufactures		2	—		
Manganese: Oxides		42	406	—	West Germany 212; United Kingdom 188.
Molybdenum: Metal including alloys, unwrought		6	—		
Nickel: Metal including alloys:					
Scrap		208	330	—	United Kingdom 286; West Germany 32.
Unwrought		7	260	100	United Kingdom 90; Switzerland 54.
Semimanufactures		228	274	28	Switzerland 90; United Kingdom 85.
Platinum-group metals:					
Waste and sweepings	value, thousands	$192	—		
Metals including alloys, unwrought and partly wrought	kilograms	r10,354	2,006	—	United Kingdom 1,985.
Silver:					
Waste and sweepings	value, thousands	$1,636	[3]$1,648	$4	United Kingdom $846; West Germany $695.
Metal including alloys, unwrought and partly wrought	do.	$107	$135	$12	West Germany $57; United Kingdom $40.
Tin:					
Ore and concentrate		—	1,000	—	All to Belgium-Luxembourg.
Oxides		480	—		
Ash and residue containing tin		88	—		
Metal including alloys:					
Scrap		2,132	1,495	—	United Kingdom 1,485; West Germany 10.
Unwrought		129	31	—	All to United Kingdom.
Semimanufactures		102	143	—	United Kingdom 141; West Germany 2.
Titanium:					

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Titanium—Continued				
Oxides	1	35	—	United Kingdom 26; Netherlands 9.
Metal including alloys:				
Scrap	19	NA		
Semimanufactures	6	NA		
Tungsten: Metal including alloys:				
Scrap	5	NA		
Unwrought	3	NA		
Semimanufactures	(2)	NA		
All forms	—	6	(2)	United Kingdom 5.
Uranium and thorium: Metal including alloys, all forms:				
Uranium	—	(2)	(2)	
Thorium	(2)	NA		
Zinc:				
Ore and concentrate	352,778	347,856	—	Belgium-Luxembourg 147,119; Italy 113,545; West Germany 29,509.
Oxides	40	43	—	Netherlands 40.
Blue powder	176	NA		
Ash and residue containing zinc	179	NA		
Metal including alloys:				
Scrap	88	432	—	United Kingdom 305; Belgium-Luxembourg 105.
Unwrought	73	—		
Semimanufactures	5	789	—	Belgium-Luxembourg 745; France 44.
Zirconium: Metal including alloys, semimanufactures	1	—		
Other:				
Oxides and hydroxides	19	53	—	NA.
Ashes and residues	54	1,245	37	United Kingdom 589; West Germany 289; Netherlands 213.
Base metals including alloys, all forms	—	222	42	Finland 83; United Kingdom 41.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	31	14	—	United Kingdom 11; Netherlands 3.
Artificial:				
Corundum	—	25	—	United Kingdom 14; France 10.
Silicon carbide	1	—		
Dust and powder of precious and semiprecious stones including diamond value, thousands	$5,826	$71,147	$6,833	Japan $27,709; Republic of Korea $19,114.
Grinding and polishing wheels and stones	43	74	25	United Kingdom 14; Japan 13.
Asbestos, crude	42	78	—	All to United Kingdom.
Barite and witherite	77,707	69,969	—	United Kingdom 37,655; Norway 25,670; Nigeria 3,000.
Cement	270,873	491,043	NA	United Kingdom 490,953.
Chalk	48	24	—	All to United Kingdom.
Clays, crude:				

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued					
Bentonite		209	28	—	United Kingdom 22; Senegal 6.
Dinas earth		—	1	—	All to United Kingdom.
Kaolin		—	36	—	United Kingdom 29; Italy 7.
Unspecified		109	54	—	All to United Kingdom.
Diamond:					
Gem, not set or strung	carats	208	—		
Industrial stones	do.	—	[4]710,000	NA	NA.
Fertilizer materials:					
Crude, n.e.s.		280	882	—	All to United Kingdom.
Manufactured:					
Ammonia		103,626	157,619	—	United Kingdom 127,222; Spain 19,829.
Nitrogenous		318,106	377,357	20,379	United Kingdom 120,763; West Germany 73,887; France 58,389.
Phosphatic		48	48	—	All to United Kingdom.
Potassic		560	322	—	Do.
Unspecified and mixed		39,490	21,548	—	United Kingdom 21,547.
Graphite, natural		38	31	—	All to United Kingdom.
Gypsum and plaster		51,916	56,015	—	Do.
Iodine		10	NA		
Kyanite and related materials		4	—		
Lime		5,245	2,742	—	All to United Kingdom.
Magnesium compounds:					
Magnesite, crude		—	381	—	Spain 249; United Kingdom 132.
Oxides and hydroxides		8,514	97,322	NA	NA.
Unspecified		—	1,631	—	United Kingdom 1,234; Spain 378.
Mica: Worked including agglomerated splittings		[2]	—		
Nitrates, crude		24	83	—	All to United Kingdom.
Phosphates, crude		1,126	937	—	France 824; United Kingdom 113.
Phosphorous, elemental		1	—		
Pigments, mineral:					
Natural, crude		—	5	—	All to United Kingdom.
Iron oxides and hydroxides, processed		—	49	—	United Kingdom 48.
Potassium salts, crude		28	180	—	All to United Kingdom.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$192	$17	—	Italy $9; United Kingdom $7; Greece $1.
Synthetic	do.	$2	$543	—	Belgium-Luxembourg $494; France $27.
Salt and brine		1,234	754	—	United Kingdom 743; Netherlands 10.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		—	15	—	All to United Kingdom.
Sulfate, manufactured	kilograms	200	NA		
Stone, sand and gravel:					
Dimension stone:					

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Dimension stone—Continued					
Crude and partly worked		1,023	28,746	26	United Kingdom 28,625; Netherlands 40.
Worked		8,859	8,002	2,330	United Kingdom 3,436; France 832.
Gravel and crushed rock		457,982	510,240	—	United Kingdom 375,500; West Germany 130,540; Iceland 4,200.
Limestone other than dimension		238	2,148	—	United Kingdom 2,089; Belgium-Luxembourg 59.
Quartz and quartzite		604	428	2	United Kingdom 388; France 20.
Sand other than metal-bearing:					
Silica		—	34	—	All to United Kingdom.
Other		339	506	—	Do.
Sulfur:					
Elemental: Crude including native and byproduct		4	3,504	—	Do.
Sulfuric acid		283	146	—	United Kingdom 145.
Talc, steatite, soapstone, pyrophyllite		—	20	—	All to United Kingdom.
Vermiculite		3	—		
Other:					
Crude		58	156	—	All to United Kingdom.
Slag and dross, not metal-bearing		168	52	—	Do.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	57	—	Do.
Carbon: Carbon black		252	33	14	United Kingdom 11; Italy 8.
Coal:					
Anthracite		1,799	5,407	—	All to United Kingdom.
Bituminous		48,323	25,048	—	Do.
Briquets of anthracite and bituminous coal		—	530	—	Do.
Lignite including briquets		971	25	—	Do.
Peat including briquets and litter		273,046	348,401	38	United Kingdom 269,325; France 64,130.
Petroleum:					
Crude	42-gallon barrels	147,644	—		
Refinery products:					
Liquefied petroleum gas	do.	97,602	75,272	—	United Kingdom 74,959.
Gasoline	do.	572,347	407,057	—	Netherlands 335,971; United Kingdom 71,051.
Mineral jelly and wax	do.	1,125	1,905	(2)	Netherlands 818; West Germany 260; United Kingdom 236.
Kerosene and jet fuel	do.	96	—		
Distillate fuel oil	do.	3,588	38,695	—	United Kingdom 36,845; Nigeria 895.
Lubricants	do.	36,610	18,172	NA	United Kingdom 12,579; West Germany 2,051.
Residual fuel oil	do.	3,506,310	3,251,912	749,310	United Kingdom 1,905,612; France 199,514.
Bitumen and other residues	do.	103	—		
Bituminous mixtures	do.	739	551	—	All to United Kingdom.
Petroleum coke	do.	27	—		

[r]Revised. NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Major destinations by value are United States, $153,000; Italy, $21,000; and Japan, $17,000.

TABLE 3

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	26	NA		
Alkaline-earth metals	9	NA		
Unspecified	—	144	10	United Kingdom 124.
Aluminum: Ore and concentrate thousand tons	1,440	1,747	—	Guinea 1,743; China 3.
Oxides and hydroxides	4,234	4,355	469	United Kingdom 2,571; West Germany 655.
Metal including alloys: Scrap	395	588	73	United Kingdom 352; Belgium-Luxembourg 50.
Unwrought	2,252	2,812	(2)	United Kingdom 1,955; Norway 597.
Semimanufactures	39,518	38,099	510	United Kingdom 20,800; West Germany 5,586.
Antimony: Oxides	63	—		
Metal including alloys, all forms	(2)	—		
Arsenic: Oxides and acids	37	—		
Beryllium: Metal including alloys, all forms	(2)	(2)	(2)	
Bismuth: Metal including alloys, all forms	(2)	—		
Cadmium: Metal including alloys, all forms	2	—		
Chromium: Ore and concentrate	3,010	13	—	Netherlands 12; United Kingdom 1.
Oxides and hydroxides	236	50	1	United Kingdom 45.
Metal including alloys, all forms	10	—		
Cobalt: Ore and concentrate	1	—		
Oxides and hydroxides	7	7	(2)	Finland 6; United Kingdom 1.
Metal including alloys, all forms	132	—		
Columbium and tantalum: Tantalum metal including alloys, all forms	3	7	6	United Kingdom 1.
Copper: Ore and concentrate	—	37	—	All from United Kingdom.
Oxides and hydroxides	1	—		
Sulfate	1,162	NA		
Ash and residue containing copper	22	—		
Metal including alloys:				
Scrap	86	127	—	United Kingdom 122.
Unwrought	186	551	2	United Kingdom 227; Norway 173; Belgium-Luxembourg 99.
Semimanufactures	19,872	23,851	131	United Kingdom 9,419; Belgium-Luxembourg 6,289; France 2,446.
Gold:				
Waste and sweepings value, thousands	$16	$3	NA	NA.
Metal including alloys, unwrought and partly wrought do.	$6,599	$7,178	NA	NA.
Hafnium: Metal including alloys, all forms	(2)	—		
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	40	11	—	Netherlands 10; United Kingdom 1.
Pyrite, roasted	1,418	1,543	—	Sweden 1,470; United Kingdom 73.
Metal:				
Scrap	148,594	179,594	—	United Kingdom 152,271; France 26,191.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal—Continued					
Pig iron, cast iron, related materials		1,118	4,418	22	U.S.S.R. 2,750; United Kingdom 1,594.
Ferroalloys:					
Ferroaluminum		2	—		
Ferrochromium		10	—		
Ferromanganese		187	22	—	West Germany 20; United Kingdom 2.
Ferromolybdenum		3	—		
Ferrosilicochromium		21	—		
Ferrosilicomanganese		838	—		
Ferrosilicon		2,406	—		
Silicon metal		277	NA		
Unspecified		2	3,882	17	Norway 3,161; United Kingdom 621.
Steel, primary forms		8,767	5,264	9	United Kingdom 3,506; France 522.
Semimanufactures:					
Bars, rods, angles, shapes, sections		126,910	154,852	121	United Kingdom 97,627; Spain 27,362.
Universals, plates, sheets		134,871	183,754	77	United Kingdom 134,511; Finland 10,960.
Hoop and strip		20,485	—		
Rails and accessories		4,385	1,961	—	United Kingdom 1,715; West Germany 202.
Wire		20,549	20,464	241	United Kingdom 8,562; France 4,154; Belgium-Luxembourg 2,803.
Tubes, pipes, fittings		42,986	68,506	207	United Kingdom 36,624; Netherlands 8,565.
Castings and forgings, rough		2,538	7,067	223	United Kingdom 2,578; West Germany 1,389; France 1,040.
Lead:					
Ore and concentrate		(2)	1	—	All from United Kingdom.
Oxides		2,597	3,161	—	United Kingdom 2,980; Netherlands 180.
Metal including alloys:					
Scrap		8,473	10,139	290	United Kingdom 6,617; France 1,055; Netherlands 1,018.
Unwrought		1,297	1,030	—	United Kingdom 931; Belgium-Luxembourg 57.
Semimanufactures		999	336	(2)	Belgium-Luxembourg 172; United Kingdom 119; Netherlands 45.
Lithium: Metal including alloys, all forms		(2)	—		
Magnesium: Metal including alloys:					
Unwrought		91	89	87	United Kingdom 2.
Semimanufactures		140	199	89	Canada 80; United Kingdom 23.
Manganese:					
Ore and concentrate, metallurgical-grade		26,343	27,467	—	Ghana 26,891; Brazil 402.
Oxides		218	443	4	United Kingdom 324; Belgium-Luxembourg 74; West Germany 41.
Metal including alloys, all forms		18	—		
Mercury	kilograms	1,400	7,000	4,000	United Kingdom 3,000.
Molybdenum:					
Oxides and hydroxides		(2)	—		

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Molybdenum—Continued				
Metal including alloys:				
Semimanufactures	3	NA		
All forms	—	(2)	2	NA.
Nickel:				
Matte and speiss	2	1	—	All from West Germany.
Oxides and hydroxides	3	—		
Metal including alloys:				
Scrap	1	29	21	United Kingdom 8.
Unwrought	398	515	95	United Kingdom 394.
Semimanufactures	613	974	554	United Kingdom 263; West Germany 133.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$5,178	$2,641	$813	United Kingdom $1,664.
Rare-earth metals including alloys, all forms	2	—		
Silicon, high-purity	(2)	—		
Silver:				
Waste and sweepings[3] value, thousands	$16	$93	—	United Kingdom $90; West Germany $3.
Metal including alloys, unwrought and partly wrought do.	$4,301	$5,271	$1,229	United Kingdom $3,013.
Tellurium and arsenic, elemental	2	NA		
Tin:				
Oxides	20	—		
Ash and residue containing tin	2	—		
Metal including alloys:				
Scrap	(2)	44	—	All from United Kingdom.
Unwrought	95	70	1	United Kingdom 68.
Semimanufactures	873	237	2	United Kingdom 212; Norway 18.
Titanium:				
Ore and concentrate	58	—		
Oxides	1,791	1,553	1	West Germany 550; United Kingdom 408; France 365.
Metal including alloys, semimanufactures	43	—		
Tungsten:				
Ore and concentrate	38	—		
Ash and residue containing tungsten	(2)	—		
Metal including alloys:				
Scrap	—	NA		
Unwrought	2	NA		
Semimanufactures	5	NA		
All forms	—	8	6	United Kingdom 1.
Uranium and thorium: Metals including alloys, all forms value, thousands	—	$16	$16	
Vanadium: Oxides and hydroxides	1	—		
Zinc:				
Ore and concentrate	42	102	—	All from United Kingdom.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Oxides	1,008	1,178	39	United Kingdom 850.
Blue powder	90	—		
Ash and residue containing zinc	36	—		
Metal including alloys:				
Scrap	393	188	—	United Kingdom 167; Belgium-Luxembourg 21.
Unwrought	1,603	1,877	—	United Kingdom 870; Netherlands 576; Belgium-Luxembourg 225.
Semimanufactures	444	78	1	United Kingdom 72.
Zirconium:				
Ore and concentrate	58	—		
Oxides and hydroxides	70	—		
Metal including alloys, semimanufactures	12	—		
Other:				
Ores and concentrates	20	130	—	United Kingdom 41; Belgium-Luxembourg 40; West Germany 20.
Oxides and hydroxides	248	846	59	United Kingdom 399; Netherlands 347.
Ashes and residues	(2)	20	—	Mainly from Netherlands.
Base metals including alloys, all forms	1	[3]128	NA	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	601	629	2	United Kingdom 481; Turkey 82.
Artificial:				
Corundum	152	231	5	United Kingdom 169; West Germany 57.
Silicon carbide	26	—		
Dust and powder of precious and semiprecious stones including diamond value, thousands	$8,964	$7,118	$6,836	United Kingdom $124.
Grinding and polishing wheels and stones	577	3,679	14	United Kingdom 3,216; Italy 210.
Asbestos, crude	5,045	5,752	53	Canada 3,843; Zimbabwe 1,514.
Barite and witherite	2,652	4,737	NA	United Kingdom 4,382.
Boron materials:				
Crude natural borates	98	—		
Elemental	7	—		
Oxides and acids	180	152	(2)	France 124; United Kingdom 26.
Bromine	112	NA		
Cement	93,867	114,101	—	United Kingdom 43,321; Spain 32,039; East Germany 26,729.
Chalk	3,721	1,439	—	France 821; United Kingdom 499; Belgium-Luxembourg 108.
Clays, crude:				
Bentonite	997	NA		
Chamotte earth	1,562	NA		
Fuller's earth	228	NA		
Kaolin	4,206	NA		
Unspecified	7,369	13,450	333	United Kingdom 13,026.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cryolite and chiolite		2	28	—	All from United Kingdom.
Diamond:					
Gem, not set or strung	carats	7,900	—		
Industrial stones	do.	15,858	[4]1,660,000	NA	NA.
Diatomite and other infusorial earth		224	149	132	United Kingdom 10.
Feldspar, fluorspar, related materials:					
Feldspar		80	NA		
Fluorspar		19	NA		
Unspecified		3,569	6,866	—	Norway 5,690; United Kingdom 1,176.
Fertilizer materials:					
Crude, n.e.s.		1,584	1,462	—	United Kingdom 1,439.
Manufactured:					
Ammonia		663	263	—	United Kingdom 198; West Germany 59.
Nitrogenous		333,361	312,418	—	Netherlands 102,003; West Germany 77,310; Belgium-Luxembourg 64,281.
Phosphatic		127,282	106,328	5,728	Sweden 30,264; Netherlands 26,716; Morocco 15,892.
Potassic		301,828	221,974	11,910	West Germany 123,015; East Germany 27,573; Netherlands 19,573.
Unspecified and mixed		656,796	661,469	38,561	United Kingdom 263,996; Netherlands 168,477.
Graphite, natural		29	11	[2]	West Germany 5; United Kingdom 5.
Gypsum and plaster		8,244	6,884	—	United Kingdom 6,163; West Germany 527.
Iodine		61	NA		
Kyanite and related materials		293	NA		
Lime		1,577	1,520	—	United Kingdom 1,519.
Magnesium compounds:					
Magnesite, crude		—	NA		
Oxides and hydroxides		18,842	NA		
Sulfate		123	NA		
Unspecified		—	27,371	[2]	China 12,530; United Kingdom 7,991; Greece 3,360.
Mica:					
Crude including splittings and waste		127	207	30	United Kingdom 83; Norway 39.
Worked including agglomerated splittings		42	44	18	United Kingdom 24.
Nitrates, crude		51	107	—	United Kingdom 87; West Germany 18.
Phosphates, crude		2,183	1,495	—	France 698; West Germany 639; United Kingdom 159.
Phosphorous, elemental		19	—		
Pigments, mineral:					
Natural, crude		86	—		
Iron oxides and hydroxides, processed		2,373	2,605	47	West Germany 2,134; United Kingdom 351.
Potassium salts, crude		—	20	—	All from United Kingdom.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$288	$780	$2	United Kingdom $696; Switzerland $35.
Synthetic	do.	$103	$2	—	Singapore $1; United Kingdom $1.
Pyrite, unroasted		6	—		

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Salt and brine	105,570	94,940	54	United Kingdom 45,421; West Germany 21,791; Spain 10,206.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	18,492	22,426	2	United Kingdom 15,865; Poland 3,485; Netherlands 3,074.
Sulfate including cadmium, manufactured	1,312	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8,077	6,340	34	Republic of South Africa 1,250; Zimbabwe 1,100; Italy 1,015.
Worked	7,622	8,189	2	Italy 3,157; United Kingdom 2,123; Spain 1,678.
Dolomite, chiefly refractory-grade	1,317	1,939	—	United Kingdom 1,480; Netherlands 411.
Gravel and crushed rock	223,088	243,973	—	United Kingdom 243,341; France 500.
Limestone other than dimension	23,686	13,992	—	United Kingdom 13,970.
Quartz and quartzite	278	61	(2)	Portugal 60.
Sand other than metal-bearing	128,097	159,682	21	United Kingdom 111,149; Belgium-Luxembourg 44,622.
Sulfur:				
Elemental:				
Crude including native and byproduct	318	295	9	West Germany 150; United Kingdom 112.
Colloidal, precipitated, sublimed	39	85	—	All from United Kingdom.
Sulfuric acid	80,930	74,166	2	Norway 46,904; United Kingdom 19,321.
Talc, steatite, soapstone, pyrophyllite	1,654	1,647	176	Belgium-Luxembourg 456; Italy 341; United Kingdom 289.
Vermiculite	2,695	NA		
Other:				
Crude	4,911	8,559	55	United Kingdom 4,156; Republic of South Africa 1,701; Italy 1,460.
Slag and dross, not metal-bearing	3,475	5,566	500	Belgium-Luxembourg 2,869; United Kingdom 2,131.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,217	1,869	53	United Kingdom 1,692.
Carbon:				
Carbon black	4,758	4,906	11	United Kingdom 4,625; Netherlands 168.
Gas carbon	22	—		
Coal:				
Anthracite thousand tons	74	97	1	Republic of South Africa 46; United Kingdom 29; Netherlands 12.
Bituminous do.	2,861	3,361	1,523	Poland 650; United Kingdom 384.
Briquets of anthracite and bituminous coal do.	—	11	—	West Germany 9; United Kingdom 2.
Lignite including briquets do.	13	7	—	West Germany 4; United Kingdom 2.
Coke and semicoke	7,079	5,604	—	United Kingdom 5,314.
Gas, natural:				
Gaseous million cubic feet	—	2	—	NA.
Liquefied	—	24	—	NA.
Peat including briquets and litter	4,722	1,198	—	United Kingdom 1,121; France 56.
Petroleum:				
Crude thousand 42-gallon barrels	11,149	9,812	—	All from United Kingdom.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	1,445	1,194	—	United Kingdom 1,118.
Gasoline	do.	5,139	5,197	[2]	United Kingdom 5,082; Belgium-Luxembourg 84.
Mineral jelly and wax	do.	30	27	1	United Kingdom 18; West Germany 5.
Kerosene and jet fuel	do.	3,188	3,428	[2]	United Kingdom 2,744; U.S.S.R. 683.
Distillate fuel oil	do.	7,064	7,604	[2]	United Kingdom 6,801; U.S.S.R. 649.
Lubricants	do.	360	325	6	United Kingdom 286; Greece 15.
Residual fuel oil	do.	8,685	5,075	—	United Kingdom 3,113; France 829; Denmark 466.
Bitumen and other residues	do.	521	498	[2]	United Kingdom 447; Belgium-Luxembourg 28.
Bituminous mixtures	do.	21	17	[2]	United Kingdom 16; Canada 1.
Petroleum coke	do.	379	123	121	Netherlands 2.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Major sources by value are United States, $1,000; United Kingdom, $1,063,000; and Belgium-Luxembourg, $310,000.

TABLE 4

IRELAND: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons per day unless otherwise specified)

Commodity	Major operating companies (ownership)	Location of main facility	Capacity[1]
Alumina	Aughinish Alumina Ltd. (Alcan Aluminum Ltd., 65%; Billiton Aluminum (Ireland) Ltd., 35%)	Aughinish Island, County Limerick	800
Barite	Magcobar Ireland Ltd. (Dresser Minerals International, Inc.)	Silvermines, County Tipperary	240
Cement	Irish Cement Ltd. (Cement Roadstone Holdings PLC)	Plants in Limerick and Platin	2,000
Lead-zinc	Tara Mines Ltd. (Outokumpu Oy)	Mine at Navan, County Meath	215
Natural gas	Marathon Oil Co. (Government, 100%)	Kinsale Head Field, Celtic Sea	[2]75,000
Peat	Bord Na Mona (Government Peat Board)	Production mainly in flat midlands	4,200
Petroleum, refined	Irish Refining Co. (Government, 100%)	Refining at Whitegate, near Cork	[3]56,000
Steel	Irish Steel Ltd. (Government, 100%)	Plant at Haulbowline, near Cork	150

[1]Thousand metric tons unless otherwise specified.
[2]Million cubic feet.
[3]Barrels per day.

expansion plan to increase the capacity of its plant from the initial and current 800,000 tons per year to 1 million tons per year by 1991. The refinery was designed so that production could be doubled and trebled if the world market for alumina improves sufficiently. The refinery continued to operate beyond its rated capacity as it has been doing since 1987. AAL's continued efforts to reduce costs and improve productivity along with improved markets and better prices for alumina has achieved financial success for the company.

Gold.—Exploration for gold continued at a high level throughout 1989. Ireland is widely recognized as a base metal province; but, until recently, its gold resources have not been regarded as important. Exploration successes included the discovery in various locations of significant economic amounts of gold, estimated at 23,250 kilograms. Most activity was reported to be focused on four

districts in the Caledonides that are known to contain significant gold mineralization. Rocks of Caledonian age are the major hosts for known gold deposits in Ireland. These districts are Avoca and Clontibret in the paratectonic Caledonides, in the east of Ireland. The other two districts occur in the west of Ireland, south Mayo in the paratectonic Caledonides and Connemara in the orthotectonic Caledonides. The first minable gold deposit was discovered by Ennex International in Northern Ireland; however, mine development has been delayed because of the local security situation. Ennex has been unable to secure a permit from the Government for the use of explosives. Two other discoveries have been made in County Mayo by Burmin PLC and Glencar PLC.

Burmin was applying for planning permission for its underground mine at Lecanvey. The project consisted of two quartz veins, although additional gold-bearing veins have been intersected. The deposit was reported to contain an estimated 248,000 tons of probable and 250,000 tons of possible ore grading 1.5 grams of gold per ton. Production was planned to start in 1991. Glencar reported favorable results from its gold project at Cregganbaun where three zones of gold mineralization had been reported. The mineralization appeared to be related to a quartz porphyry intrusion within a zone of ultramafic rocks.

In other areas, Ovaca Gold PLC reported discovering a gold-bearing structure more than a 1.5 kilometers long by 110 meters wide with assays showing 0.5 gram of gold per ton. At year's end, there was no determination of ore quality or quantity. Another gold find that was reported to have commercial potential was on the island of Innisturk, south of the County Mayo coast, by Navan Resources PLC. The company considered the deposit to have significant mineralization. Initial assays of a quartz vein averaged 0.02 kilograms of gold per ton. Exploration efforts were continuing to define the ore body.

Celtic Gold PLC signed an agreement with a RTZ Corp. PLC subsidiary, Riofinex, which covered prospecting licenses in County Wicklow and County Wexford. This brought Celtic's total license coverage in southeast Ireland to about 574 square kilometers. Celtic had already located several areas containing alluvial gold.

Lead and Zinc.—In mid-1989, the Irish Government sold its 25% share of Tara Mines Ltd. to Outokumpu Oy, the Finnish state mining concern, for $50 million. Outokumpu acquired its original 75% share in 1986 from the Canadian company Tara Exploration and Development Ltd. The mine at Navan is one of the largest lead-zinc producers in Europe and has had an annual output of 180,000 tons of zinc and 35,000 tons of lead in concentrates.

Conroy Petroleum and Natural Resources PLC announced discovery of a third lead-zinc zone at its Galmoy Project in County Kilkenny. The deposit, named the K zone, is near the previously discovered CW and G ore bodies that contain estimated minable reserves of 6.7 million tons of ore grading 11% zinc and 1% lead. The limits of the Galmoy deposits remained undefined. The ore thus far discovered could be reached by a shallow decline to a depth of about 100 meters. With an initial production forecast of 60,000 tons per year of zinc in concentrates, the Galmoy mine could be the largest new zinc producer in Europe. Reserves were considered sufficient for a 12-year mine life. Conroy's exploration license covered about 230 square kilometers, and the company felt there was a good possibility of defining additional reserves.

At Bula Mines Ltd., the future of the undeveloped lead-zinc ore body was still in doubt at yearend. Bula continued in its legal battle with an insurance claim of $450 million against the Irish Government and Tara Mines over delays in starting Bula. The legal battle was not expected to be resolved before the end of 1990.

Steel.—Irish Steel Ltd. announced its 1988-89 results, which showed its first substantial profit in several years. Strong EC steel demand resulted in an increase in sales and exports of finished products.

Negotiations were continuing at yearend between Korf AG of the Federal Republic of Germany and the Government of Ireland to sell 100% of Irish Steel, which is the only steel producer in Ireland, to Korf AG. The financial package was reported to include an immediate payment of $17.1 million and a subsequent payment of $25.6 million. In addition, Korf would maintain present employment levels and upgrade the minimill substantially. In turn, the Government would write off more than $60 million of Irish Steel's debt. Irish Steel has received more than $200 million in state aid since 1975.

Industrial Minerals

Navan Resources PLC reported that testing of bulk samples of its Tomduff andalusite deposit was favorable. Processing could liberate up to 98% of contained andalusite within a size fraction of 2.8 millimeters to 10 millimeters. This is consistent with industry standards. Navan was continuing with a feasibility study to develop the project. North West Exploration Ltd.'s new gypsum mine in Cavan County was to start production in late 1990 if permitting is approved. The project was estimated to contain 3 million tons of gypsum and would be the first new mine startup in Ireland in several years. Ireland produced significant quantities of synthetic diamonds; however, output was not quantitatively reported, and information was not available to make reliable estimates of production.

Mineral Fuels

Coal production was mainly semibituminous high-ash coal from the Connaught Field, which was used for electricity generation. Anthracite production from the Leinster Field has been very limited since the closure of the Rossmore Mine in 1986. Marathon Petroleum confirmed reports of a new gas find off the southern coast of Ireland. The new structure was about 13 kilometers north of the Kinsale Gasfield, the country's only producing gas source. Natural gas flowed from the new well at a rate of 29 million cubic feet per day. This rate could be a significant addition to the current production of 70 billion cubic feet per year from the Kinsale Field.

TABLE 5

IRELAND: RESERVES OF MAJOR MINERALS

Commodity (ore)	Amount[e 1]
Barite	1.5
Lead	2
Zinc	5
Natural gas	[2]1.5

[e]Estimated.
[1]Million tons unless otherwise specified.
[2]Trillion cubic feet.

INFRASTRUCTURE

Ireland has a good network of roads supplemented by a Government-owned railroad. There are the deepwater ports of Cork and Dublin and 10 secondary ports. Most mine sites are easily accessible and no more than 160 kilometers from a deepwater port.

OUTLOOK

Ireland has a proven geologic potential for a variety of minerals. The challenge of the mineral industry is to turn recent exploration successes into producing mines. The mineral industry is expected to utilize the opportunities created by the boom in gold exploration, an emerging risk-capital market in Dublin, and renewed interest from multinational companies to continue mineral developments.

The Geological Survey of Ireland has had an active data-collecting program through mapping and resource-related studies and offers technical assistance. This should continue to be a significant benefit and encouragement to companies engaged in mineral resource activities.

[1]Where necessary, values have been converted from Irish pounds (I£) to U.S. dollars at the rate of I£1 = US$1.42, the average for 1989.

OTHER SOURCES OF INFORMATION

Agencies

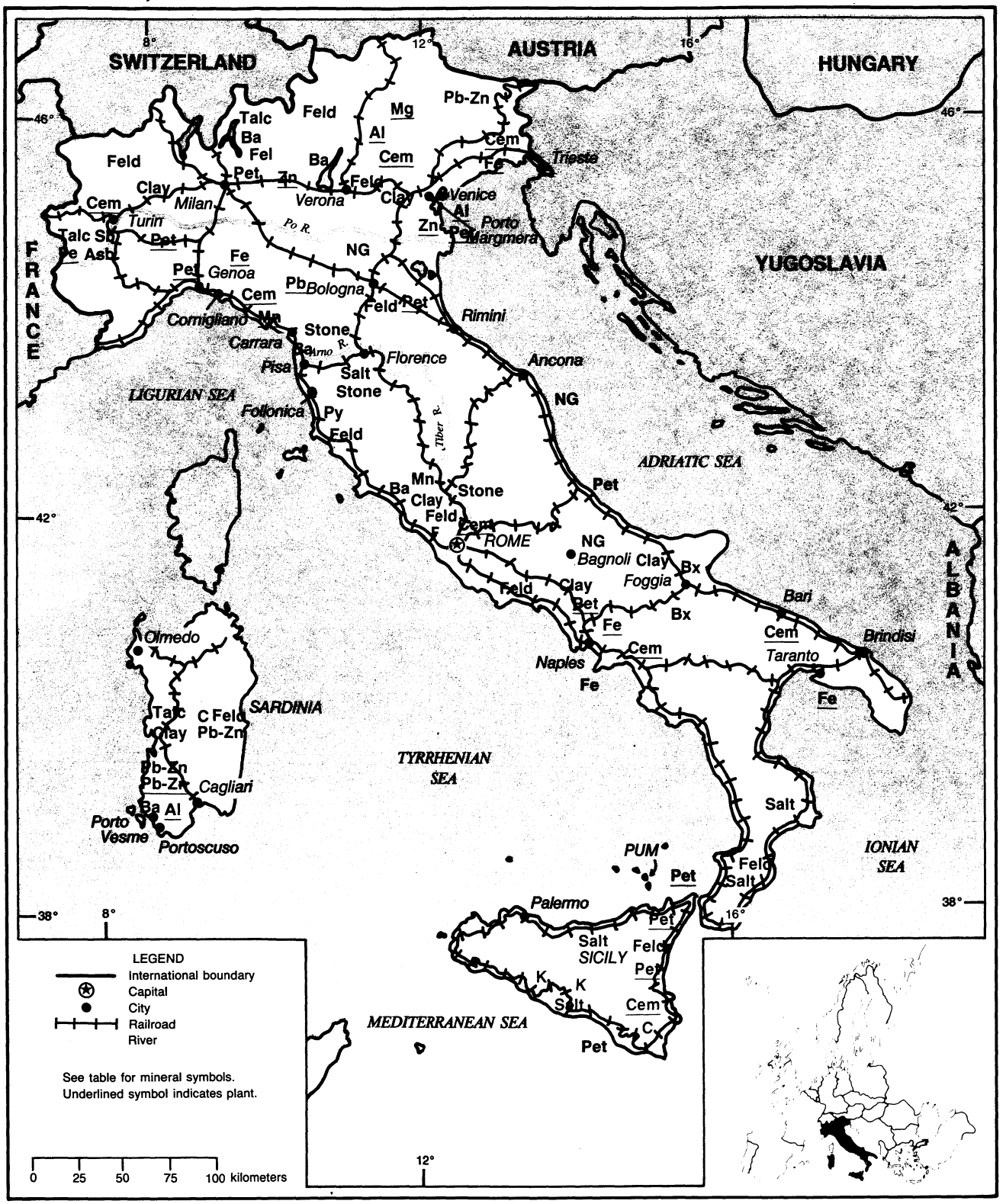
Department of Industry and Commerce
Dublin Geologic Survey of Ireland
Dublin, Ireland

Publications

Central Statistics Office, Dublin:
Statistics Bulletin.
Central Bank of Ireland, Dublin:
Quarterly Bulletin.

ITALY

AREA 301,300 km² **POPULATION 57.7 million**



THE MINERAL INDUSTRY OF

ITALY

By George A. Rabchevsky[1]

Italy is an important processor of raw materials and a significant consumer and exporter of mineral and metal semimanufactures and finished products. In 1989, Italy produced one-half of the world's dimension stone, one-half of the world's pumice, and 30% of the world's feldspar. The country was the world's sixth largest steel producer, second only to the Federal Republic of Germany (FRG) in Western Europe, and the sixth largest cement producer in the world and the largest in Western Europe. In addition, mine production of asbestos, barite, bentonite, cement, fluorspar, lead and zinc, magnesite, potash, salt, and talc were of international significance.

GOVERNMENT POLICIES AND PROGRAMS

The basic mining legislation of Italy is Royal Decree No. 1443 of July 29, 1927, as amended by Act No. 1360 of November 7, 1941. This law vests ownership of subsoil minerals in the state. With certain limitations, quarried minerals are the property of the private landowner. Petroleum activities are governed by law No. 6 of January 1957, as amended by title II of law No. 613 of July 21, 1967. Ente Nazionale Idrocarburi (ENI)/Societa per la Ricerca Mineraria e la Valorizzazione delle Risorse del Sottosuolo (RIMIN), the Government's oil and gas corporation, was instituted by law No. 136 of February 1953. Foreigners are permitted to explore, own, and operate mines; however, foreign companies must incorporate under Italian laws. Royalties, in addition to assessments levied by the Government on the basis of landholdings, are not specified by law but are negotiated with concessionaires. Ownership of liquid and gaseous hydrocarbons is also vested in the state. Concessionaires are required to turn over 9% of all of extracted liquid and gaseous hydrocarbons to the state or pay an equivalent sum.

A new law, No. 752, regulating mining in Italy was approved by the Parliament on June 10, 1982. In general, the law strengthens involvement of the Government in the mineral industry. It provides that basic exploration for minerals will be carried out at the state's expense by ENI/-RIMIN, while in operational exploration the state will finance 70% of the total exploration costs. If exploration leads to production, the concessionaire will have to reimburse the state for its contributions, starting after the property has been in production for 3 years. Strategic mines will be kept operational at the Government's expense. In addition, ENI/RIMIN will also be reimbursed up to 70% of its expenses for exploration abroad. No stockpiling programs are underway in Italy except normal industrial stocks and stocks of crude oil for 90 days of consumption.

A new mining law and policy is presently under discussion at the Italian Parliament, partly confirming traditional issues and introducing new provisions for restructuring mining and environmental protection acts. The law is expected to be enacted in 1990 and cover the period 1989-91.

PRODUCTION

There was a slight overall growth in the extractive industries in Italy in 1989 over those of 1988. In 1989, bauxite, lead, magnesium, manganese metallic, and zinc ores were mined in the country.

STRUCTURE OF THE MINERAL INDUSTRY

The primary minerals administrative agency is the Direzione Generale delle Miniere, which also collects mineral statistics.

COMMODITY REVIEW

Metals

Lead and Zinc.—Italy's lead and zinc concentrate production came from the Ente Nazionale Idrocarburi/Societa Italiana Miniere (ENI/SIM) mines in Sardinia. Five mines were operational in Sardinia: Masua, Monteponi, San Giovanni Rotondo, San Benedetto, and Montevecchio. Another, Raibl, was in the Venezia region.

Magnesium.—The only operating magnesium mine in Italy is located at Dosseni. The mine is run by the Societa Italiana Magnesio S.p.A. About 62,500 tons of concentrate was produced in 1988, and 64,500 tons in 1989. The smelter is in Bolzano.

Pyrite.—Pyrite was mined almost exclusively by the Societa Solmine S.p.A. from the Compiano and Niccioleta Mines. Societa EDEM S.p.A. produced small amounts of pyrite in its Val de Castello Mine.

Steel.—Italy is, after the FRG, the second largest Western European steel producer. About one-half of Italian steel was produced by private enterprise and the rest by the Government-owned sector. Almost all flat products were produced by the state-owned sector. Private companies produced mostly long products. Effective January 1, 1989, the Italian Government put into effect a restructuring of the nationalized Italian steel industry. With some modifications, Ilva S.p.A. replaced Societa Finanziaria Siderurgica S.p.A. (Finsider) as the Government "holding company." With crude steel production at 11.4 million tons, Ilva was the eighth largest steel producer in the world in 1989 and fourth in the European Economic Community

(EC). The restructuring includes the closure of the hot-rolling plant at Bagnoli, near Naples. Ilva will absorb Italsider, Terni, Deltasider, and Dalmine. Flat products are to be produced at Taranto, Sestri, Novi Ligure, Turin, Racconigi, and Parica and long products at Piombino and Condove. Specialty steels are to be produced at Terni, Turin, and Aosta.

The second largest steel company in Italy was Riva S.p.A., with production of about 3.5 million tons in 1989. The company produced about 1 million tons of steel at its Cornigliano works and about 2.5 million tons at its electric steelmaking plants.

TABLE 1

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Alumina		555,319	618,374	699,635	708,158	700,000
Bauxite		—	—	16,557	17,125	17,000
Metal:						
Primary		221,055	242,632	232,600	221,644	220,000
Secondary		282,000	301,000	335,000	[e]335,000	330,000
Antimony:						
Mine output, Sb content		495	305	86	24	—
Oxides, gross weight[2]		1,039	715	879	731	[3]603
Bismuth metal		54	66	43	32	30
Cadmium metal, smelter		526	411	320	705	710
Copper:						
Mine output, Cu content		130	—	—	—	—
Metal, refined, all kinds		64,300	[r]65,400	65,000	75,400	83,300
Iron and steel:						
Metal:						
Pig iron	thousand tons	[r]12,063	[r]11,916	11,335	11,349	11,740
Ferroalloys:						
Blast furnace:						
Ferromanganese		50,111	48,002	19,469	27,169	27,500
Spiegeleisen		1,001	1,151	491	251	300
Silicon pig iron (10% to 12% Si)		686	968	[e]1,000	[e]1,000	1,000
Electric furnace:						
Ferrochromium		57,654	55,939	59,045	77,123	77,500
Ferromanganese		17,166	11,653	17,067	12,286	12,500
Ferrosilicon		[r]74,616	62,799	47,075	51,131	55,000
Silicomanganese		64,858	66,083	75,192	[r e]75,000	75,000
Silicon metal		17,812	18,904	[r e]19,000	[r e]18,000	19,000
Other		15,862	14,022	[r e]14,500	[r e]14,500	15,000
Total		[r]299,766	279,521	[r e]252,839	[r e]276,460	282,800
Steel, crude	thousand tons	[r]23,898	[r]22,883	22,859	23,760	25,000
Semimanufactures:						
Wire rods	do.	2,256	2,293	2,419	2,671	2,700
Sections	do.	7,135	3,223	3,488	4,145	4,200
Plates and sheets	do.	5,062	9,748	9,898	10,035	10,100
Hoop and strip	do.	526	735	706	801	810
Railway track material	do.	280	264	293	317	320
Ingots, semimanufactures, solids for tubes	do.	1,198	1,073	801	789	800
Castings and forgings	do.	326	341	341	403	410
Other	do.	[r]2,011	[r]1,550	2,601	2,912	3,160
Total	do.	[r]18,794	[r]19,227	20,547	22,073	22,500

See footnotes at end of table.

TABLE 1—Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Lead:						
Mine output, Pb content		15,622	11,119	11,994	16,503	[3]17,544
Metal, refined:						
Primary		29,538	29,333	62,285	72,204	[3]74,205
Secondary		96,700	101,700	111,400	111,600	112,000
Magnesium:						
Mine output, Mg content		9,831	9,046	8,805	6,878	[3]7,096
Metal, primary		7,863	12,417	7,626	5,436	[3]5,469
Manganese, mine output:						
Gross weight		8,621	6,396	3,802	9,701	9,700
Mn content		2,586	1,689	1,141	2,538	2,575
Silver metal	kilograms	71,572	56,338	82,031	91,562	[3]96,037
Zinc:						
Mine output, Zn content		45,438	26,303	33,099	37,150	[3]43,258
Metal, primary		215,644	229,397	247,000	242,117	[3]259,481
INDUSTRIAL MINERALS						
Asbestos		136,006	115,208	118,352	94,549	[3]54,500
Barite		128,356	114,132	81,643	85,650	[3]75,640
Bromine[e]		600	450	450	450	400
Cement, hydraulic	thousand tons	36,677	[r]35,938	37,257	37,000	36,500
Clays, crude:						
Bentonite	do.	304	300	313	301	220
Refractory excluding kaolinitic earth	do.	400	381	375	454	[3]559
Fuller's earth	do.	30	31	39	39	44
Kaolin	do.	60	35	57	71	72
Kaolinitic earth	do.	26	21	22	19	20
Diatomite[e]		30,000	27,000	27,000	28,000	25,000
Feldspar		1,115,575	1,237,058	1,188,700	1,367,776	[3]1,350,733
Fluorspar:						
Acid-grade		95,450	90,900	77,800	81,700	[3]66,600
Metallurgical-grade		56,762	54,536	56,600	58,157	[3]59,679
Total		152,212	145,436	134,400	139,857	[3]126,279
Gypsum	thousand tons	1,281	[r]1,245	1,215	1,300	1,250
Lime, hydrated, hydraulic and quicklime	do.	[r]3,946	[r]3,601	3,894	[r e]3,900	3,900
Nitrogen: N content of ammonia	do.	[r]1,215	1,553	1,435	[r e]1,400	1,300
Perlite[e]		80,000	73,000	70,000	70,000	71,000
Pigments, mineral: Iron oxides, natural[e]		850	875	[r]850	[r]850	850
Potash, crude salts:						
Gross weight	thousand tons	1,701	1,261	1,403	1,577	[3]1,730
K_2O equivalent	do.	205	158	178	197	152
Pumice and related materials:						
Pumice and pumiceous lapilli	do.	[e]750	[e]700	725	730	700
Pozzolan[e]	do.	5,000	4,500	5,000	5,000	4,500
Pyrite, all types, gross weight	do.	690	761	690	774	[3]836
Salt:						
Marine, crude[4]	do.	570	574	571	680	685
Rock and brine	do.	3,176	3,433	3,694	3,609	[3]3,501

See footnotes at end of table.

TABLE 1—Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Sand and gravel:[e]						
Volcanic sand	thousand tons	110	100	100	100	100
Silica sand	do.	4,400	4,200	4,300	4,300	4,500
Other sand and gravel	do.	122,000	123,000	122,000	123,000	124,000
Sodium and potassium compounds:						
Caustic soda		10,311	10,427	12,162	[e]11,000	10,500
Sodium carbonate[e]	do.	[r]617	[r]590	[r]612	[r]612	615
Sodium sulfate[e]	do.	80	75	80	[r]127	130
Stone:						
Dimension:[e 5]						
Calcareous:						
Alabaster and onyx	do.	20	20	20	20	25
Marble in blocks:						
White	do.	1,500	1,600	1,600	1,600	1,650
Colored	do.	1,800	1,800	1,800	1,800	1,900
Schist (calcareous)	do.	500	500	500	500	500
Travertine	do.	1,100	1,100	1,100	1,100	1,150
Tufa	do.	5,000	4,500	4,500	4,500	5,000
Other:						
Gneiss	do.	300	300	300	300	300
Granite	do.	2,500	2,500	2,500	2,500	2,500
Lava, basalt, trachyte	do.	7,000	8,000	8,000	8,000	8,000
Porphyry	do.	1,200	1,200	1,200	1,200	1,200
Sandstone	do.	1,800	1,800	1,800	1,800	1,800
Slate	do.	120	120	120	120	120
Tuff, volcanic	do.	5,900	5,800	5,800	5,800	5,800
Crushed and broken:						
Dolomite[e]	do.	900	850	850	850	900
Limestone[e]	do.	120,000	110,000	110,000	110,000	120,000
Marl for cement	do.	11,458	10,574	[e]11,000	[e]11,000	10,500
Serpentine[e]	do.	1,500	1,500	1,500	1,500	1,500
Quartz and quartzite[e]	do.	300	250	250	250	250
Strontium minerals: Celestite		4,611	4,667	177	—	—
Sulfur:						
Gross weight of ore	thousand tons	5	—	—	—	—
Recovered as elemental and in compounds:						
Elemental from ore	do.	1	—	—	—	—
S content of pyrite	do.	280	309	40	39	30
Byproduct, oil refining[e]	do.	10	10	10	10	15
Byproduct, other sources[e]	do.	190	175	180	180	175
Total	do.	481	494	[r e]230	[r e]229	220
Talc and related materials		129,614	151,206	150,718	158,722	[3]146,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bituminous rock, natural		88,700	65,889	71,429	56,907	60,000
Carbon black[e]		150,000	155,000	156,000	155,000	155,000
Coal:						
Lignite	thousand tons	1,892	1,573	1,642	1,600	[3]1,500
Subbituminous (Sulcis coal)		18,773	13,708	15,356	48,408	49,000

See footnotes at end of table.

TABLE 1—Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coke, metallurgical	thousand tons	[r]7,410	[r]6,213	5,893	5,884	5,900
Gas, natural	million cubic meters	14,245	15,963	16,324	16,634	[3]16,978
Natural gas liquids[e]	thousand 42-gallon barrels	3360	400	400	400	400
Petroleum:						
Crude	do.	16,024	17,230	26,625	32,784	[3]31,197
Refinery products:						
Liquefied petroleum gas	do.	19,964	21,274	28,314	30,712	31,000
Gasoline, all kinds	do.	124,617	131,538	137,989	139,102	142,000
Naphtha	do.	27,175	33,932	18,921	15,806	20,000
Jet fuel	do.	9,400	11,336	11,056	14,128	15,000
Kerosene	do.	17,042	27,729	28,760	30,349	32,000
Distillate fuel oil	do.	169,499	203,046	190,946	188,685	200,000
Residual fuel oil	do.	146,087	156,916	156,090	156,783	157,000
Other	do.	43,988	45,150	46,263	49,287	47,000
Refinery fuel and losses	do.	36,735	29,407	37,443	45,367	46,000
Total	do.	594,507	660,328	655,782	670,219	690,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Nov. 1990.
[2]Antimony content is 83% of gross weight.
[3]Reported figure.
[4]Does not include production from Sardinia and Sicily estimated at 200,000 tons annually.
[5]Output of limestone and serpentine for dimension stone use is included with "Stone: Crushed and broken."

TABLE 2

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	697	534	8	Spain 324; France 66.
Alkaline-earth metals	13	161	—	India 74; France 24; Saudi Arabia 24.
Aluminum:				
Ore and concentrate	21,141	14,332	—	Turkey 11,941; France 717.
Oxides and hydroxides	590,823	402,607	90	Netherlands 155,689; Yugoslavia 79,065; United Kingdom 59,865.
Ash and residue containing aluminum	6,704	5,054	—	West Germany 3,245; France 1,052.
Metal including alloys:				
Scrap	6,049	8,044	27	France 3,952; West Germany 3,162.
Unwrought	51,635	38,336	22	France 8,484; West Germany 7,792; Japan 5,274.
Semimanufactures	142,445	162,482	2,603	West Germany 48,543; France 26,252; Spain 10,099.
Antimony:				
Oxides	79	36	—	Yugoslavia 20; West Germany 13; Turkey 3.
Ash and residue containing antimony	1,200	—		
Metal including alloys, all forms	3	9	—	France 2; Switzerland 2; United Kingdom 2.
Arsenic:				
Oxides and acids	5	37	—	Yugoslavia 36; Switzerland 1.
Metal including alloys, all forms	[2]50	—		

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Beryllium:				
Oxides and hydroxides	33	6	—	All to Greece.
Metal including alloys, all forms	(3)	7	—	United Kingdom 4; West Germany 3.
Bismuth: Metal including alloys, all forms	79	22	—	West Germany 11; United Kingdom 6; Netherlands 5.
Cadmium: Metal including alloys, all forms	221	559	1	Netherlands 402; Belgium-Luxembourg 108.
Cesium and rubidium: Metal including alloys, all forms	14	NA		
Chromium:				
Ore and concentrate	2,053	13,474	—	Greece 9,832; Yugoslavia 1,755; Austria 1,488.
Metal including alloys, all forms	302	26	1	West Germany 14; France 6; Turkey 4.
Cobalt:				
Ore and concentrate	—	25	—	All to France.
Oxides and hydroxides	1	213	—	France 77; United Kingdom 63; Belgium-Luxembourg 43.
Metal including alloys, all forms	82	100	15	West Germany 33; France 23.
Columbium and tantalum:				
Ore and concentrate	—	24	—	All to Belgium-Luxembourg.
Metal including alloys, all forms:				
Columbium (niobium)	1	4 13	13	
Tantalum	16	4	—	Mainly to West Germnay.
Copper:				
Ore and concentrate	—	520	—	West Germany 207; France 196; Belgium-Luxembourg 91.
Matte and speiss including cement copper	751	155	1	Switzerland 35; West Germany 32; Austria 25.
Oxides and hydroxides	1,941	2,002	—	West Germany 552; Denmark 295; Spain 244.
Sulfate	NA	7,938	669	France 2,517; West Germany 1,499; Netherlands 825.
Ash and residue containing copper	5,617	23,074	—	Belgium-Luxembourg 13,403; West Germany 5,262; Sweden 2,050.
Metal including alloys:				
Scrap	16,476	19,410	8	West Germany 10,837; Belgium-Luxembourg 3,866; France 2,543.
Unwrought	9,430	21,354	399	West Germany 4,115; France 3,595; United Kingdom 3,499.
Semimanufactures	144,547	165,593	2,933	France 62,389; West Germany 24,780; Spain 15,644.
Gallium, indium, thallium: Metals including alloys, all forms	10	32	11	Japan 17; United Kingdom 3.
Germanium:				
Oxides	13	16	2	France 11; Japan 3.
Metal including alloys, all forms	NA	5	1	France 3; United Kingdom 1.
Gold:				
Waste and sweepings value, thousands	$312	$1,201	$2	West Germany $611; Switzerland $506.
Metal including alloys, unwrought and partly wrought kilograms	30,561	11,732	990	Switzerland 6,309; Greece 1,502; West Germany 1,174.
Hafnium: Metal including alloys, all forms value, thousands	—	$7	—	All to France.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	382	285	—	West Germany 107; Israel 98; Switzerland 60.
Pyrite, roasted	45,296	20,848	—	France 18,037; Greece 2,631.
Metal:				
Scrap	15,700	27,578	431	West Germany 12,285; France 9,648; Belgium-Luxembourg 3,040.
Pig iron, cast iron, related materials	29,020	48,476	945	Spain 8,571; Belgium-Luxembourg 6,779.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Ferroalloys:				
Ferroaluminum	214	NA		
Ferroboron, ferrocobalt	22	NA		
Ferrochromium	18,210	25,194	3,322	West Germany 7,419; France 7,323; Belgium-Luxembourg 4,783.
Ferrocolumbium	721	89	—	West Germany 20; Hungary 20; Japan 20.
Ferromanganese	3,606	5,117	1,660	West Germany 1,662; France 1,286.
Ferromolybdenum	21	—		
Ferronickel	191	3	—	France 2; Sweden 1.
Ferrosilicochromium	1,295	1,438	34	West Germany 564; France 528; Belgium-Luxembourg 230.
Ferrosilicomanganese	9,856	3,288	479	West Germany 1,713; Republic of South Africa 308.
Ferrosilicomagnesium	1,944	NA		
Ferrosilicon	10,122	16,950	102	West Germany 7,987; France 3,911; Belgium-Luxembourg 1,694.
Ferrotitanium	2,253	1,518	126	Japan 419; West Germany 324; France 276.
Ferrotungsten	107	34	—	Japan 21; West Germany 13.
Ferrovanadium	74	—		
Silicon metal	6,165	5,021	—	West Germany 3,746; Switzerland 354.
Unspecified	3,482	4,711	978	Republic of South Africa 458; Switzerland 402.
Steel, primary forms	860,360	169,837	1,510	France 49,568; West Germany 47,391.
Semimanufactures:[5]				
Bars, rods, angles, shapes, sections	2,361,147	2,604,499	13,966	West Germany 864,739; France 726,301; Switzerland 233,254.
Universals, plates, sheets	1,494,704	NA		
Hoop and strip	233,952	NA		
Rails and accessories	12,645	66,226	46	Turkey 48,303; Zaire 6,750; Switzerland 6,397.
Wire	243,871	266,913	3,868	France 72,145; Switzerland 56,118; West Germany 46,037.
Tubes, pipes, fittings	2,016,157	1,699,027	93,327	U.S.S.R. 423,867; France 272,724; West Germany 269,861.
Castings and forgings, rough	43,124	NA		
Lead:				
Ore and concentrate	16,512	15,764	—	Greece 8,400; Bulgaria 3,418; Spain 2,500.
Oxides	2,216	6,674	—	U.S.S.R. 3,787; Algeria 2,682.
Ash and residue containing lead	16,786	12,721	22	Canada 9,151; Belgium-Luxembourg 3,377.
Metal including alloys:				
Scrap	153	698	—	France 656; West Germany 23.
Unwrought	20,494	41,333	1,981	United Kingdom 10,953; Turkey 7,671; Egypt 6,130.
Semimanufactures	1,001	533	23	Libya 130; France 90; Belgium-Luxembourg 69.
Lithium:				
Oxides and hydroxides	8	7	—	Greece 5; Switzerland 1; United Kingdom 1.
Metal including alloys, all forms	17	NA		
Magnesium: Metal including alloys:				
Scrap	407	266	14	West Germany 214; Belgium-luxembourg 26.
Unwrought	4,125	4,038	—	West Germany 2,473; Switzerland 688.
Semimanufactures	211	682	20	Belgium-Luxembourg 238; West Germany 192; Finland 100.
Manganese:				
Ore and concentrate, metallurgical-grade	484	667	—	France 626; West Germany 24.
Oxides	300	175	—	Belgium-Luxembourg 85; Bulgaria 80.
Metal including alloys, all forms	38	34	—	Denmark 21; France 5; Switzerland 5.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Mercury	55	38	—	France 25; Netherlands 12; Yugoslavia 1.
Molybdenum:				
Oxides and hydroxides	—	3	—	France 2; Netherlands 1.
Metal including alloys:				
Scrap	24	24	—	All to West Germany.
Unwrought	10	—		
Semimanufactures	2	156	—	West Germany 87; France 22; New Zealand 20.
Nickel:				
Ore and concentrate	—	23	—	All to West Germany.
Matte and speiss	3	21	—	West Germany 14; Greece 4; Netherlands 2.
Oxides and hydroxides	107	—		
Ash and residue containing nickel	127	427	—	Finland 129; Austria 112; France 96.
Metal including alloys:				
Scrap	281	600	76	West Germany 440; France 61.
Unwrought	401	843	—	United Kingdom 563; West Germany 104; Netherlands 72.
Semimanufactures	1,333	934	23	West Germany 201; United Kingdom 149; France 148.
Platinum-group metals:				
Waste and sweepings value, thousands	$11	$7,150	$2	West Germany $5,053; Switzerland $1,981.
Metals including alloys, unwrought and partly wrought:				
Palladium kilograms	NA	407	167	Switzerland 100; United Kingdom 76.
Platinum do.	1,223	1,202	15	United Kingdom 669; Switzerland 259; France 139.
Rhodium do.	NA	255	—	France 143; United Kingdom 70; West Germany 41.
Iridium, osmium, ruthenium grams	NA	200	—	All to Sweden.
Unspecified kilograms	2,105	—		
Rare-earth metals including alloys, all forms	138	780	51	United Kingdom 398; Taiwan 234.
Rhenium: Metal including alloys, all forms	10	NA		
Selenium, elemental	1	108	—	West Germany 99; Belgium-Luxembourg 7; Spain 1.
Silicon, high-purity	91	175	119	West Germany 26; Japan 25.
Silver:				
Ore and concentrate	—	61,700	17,500	Belgium-Luxembourg 24,000; Japan 20,000.
Waste and sweepings[6] value, thousands	$33	$592	$116	United Arab Emirates $158; West Germany $81.
Metal including alloys, unwrought and partly wrought kilograms	29,214	970,684	482	Switzerland 945,827; France 11,581.
Tin:				
Ore and concentrate	—	99	—	Mainly to United Kingdom.
Oxides	254	227	24	Spain 72; Netherlands 46; United Kingdom 30.
Ash and residue containing tin	131	1	—	All to Greece.
Metal including alloys:				
Scrap	72	61	—	Netherlands 46; Belgium-Luxembourg 15.
Unwrought	131	182	2	Yugoslavia 61; Netherlands 43; Algeria 26.
Semimanufactures	148	112	(3)	Yugoslavia 29; West Germany 27; United Kingdom 15.
Titanium:				
Ore and concentrate	31	1,280	—	United Kingdom 878; Yugoslavia 204; France 168.
Oxides	987	2,344	81	Libya 537; France 459; Netherlands 436.
Metal including alloys:				
Scrap	59	176	34	United Kingdom 65; West Germany 37; Austria 35.
Unwrought	11	131	15	Austria 64; Greece 18.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Titanium—Continued				
Metal including alloys—Continued				
Semimanufactures	39	154	3	France 93; Brazil 19.
Tungsten:				
Ore and concentrate	—	52	—	West Germany 28; Spain 24.
Oxides and hydroxides	9	—		
Metal including alloys:				
Scrap	47	75	17	Belgium-Luxembourg 34; Switzerland 14.
Unwrought	160	3	—	France 2; West Germany 1.
Semimanufactures	8	53	(3)	Austria 32; France 10; Sweden 6.
Uranium and thorium:				
Ore and concentrate value, thousands	$97	$13	—	West Germany $10; United Kingdom $2.
Oxides and other compounds do.	$513	$781	—	France $768; West Germany $6.
Metal including alloys, all forms:				
Uranium	2	NA		
Thorium	2	NA		
Vanadium:				
Ore and concentrate	—	12	—	All to West Germany.
Oxides and hydroxides	7	523	—	Turkey 500; France 23.
Ash and residue containing vanadium	657	3,161	1,530	West Germany 1,631.
Metal including alloys, semimanufactures	(3)	3	2	Sweden 1.
Zinc:				
Ore and concentrate	14,900	21,310	—	Austria 15,081; Yugoslavia 5,140.
Oxides	7,565	8,367	—	U.S.S.R. 2,660; France 1,911; West Germany 1,840.
Blue powder	691	553	—	France 131; Austria 9; West Germany 108.
Matte	564	259	—	France 143; West Germany 51; Netherlands 41.
Ash and residue containing zinc	7,751	15,215	—	West Germany 5,778; Belgium-Luxembourg 3,816; France 1,883.
Metal including alloys:				
Scrap	6,540	4,742	—	West Germany 3,921; France 182.
Unwrought	60,060	52,338	9,675	U.S.S.R. 20,800; France 6,686.
Semimanufactures	6,321	1,174	1	West Germany 375; Rwanda 212; Somalia 89.
Zirconium:				
Ore and concentrate	11,137	9,321	—	Spain 2,689; Hungary 2,257; Turkey 1,696.
Oxides	27	15	—	All to Venezuela.
Metal including alloys:				
Scrap	69	10	5	France 5.
Unwrought	6	161	(3)	Venezuela 126; France 19.
Semimanufactures	69	57	7	Israel 22; Switzerland 12.
Other:				
Ores and concentrates	1,886	7573	—	Greece 350; Austria 120.
Oxides and hydroxides	31	319	19	France 108; Venezuela 86; Spain 27.
Ashes and residues	27,818	18,289	—	Canada 8,183; Belgium-Luxembourg 4,435; East Germany 2,370.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	83,845	40,260	1,554	United Kingdom 20,761; West Germany 7,870.
Artificial:				
Corundum	10,806	11,324	844	France 3,307; Austria 1,062; Australia 946.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1] (Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued				
Artificial—Continued				
Silicon carbide	12,067	14,383	212	West Germany 3,945; France 2,624; Republic of Korea 1,340.
Dust and powder of precious and semiprecious stones including diamond kilograms	231	[8]196	12	Yugoslavia 60; Spain 50; Mexico 39.
Grinding and polishing wheels and stones	25,105	27,223	1,221	Saudi Arabia 3,867; France 3,491; West Germany 2,076.
Asbestos, crude	51,541	50,743	240	France 12,993; West Germany 9,716; Spain 4,946.
Barite and witherite	1,741	9,989	1,120	Libya 7,421.
Boron materials:				
Crude natural borates	1,084	1,620	—	Indonesia 1,000; Yugoslavia 134.
Elemental	4	(3)	—	All to Netherlands.
Bromine	5	7	—	All to Spain.
Cement	375,004	357,347	842	Switzerland 148,067; Libya 45,171; Algeria 32,885.
Chalk	5,455	3,848	—	Belgium-Luxembourg 2,463; Switzerland 966; Saudi Arabia 214.
Clays, crude:				
Bentonite	24,155	37,172	42	France 14,334; Netherlands 6,200; Norway 6,000.
Chamotte earth	1,202	449	—	Switzerland 437; Belgium-Luxembourg 10.
Fire clay	—	630	37	France 354; Turkey 87.
Fuller's earth	44	4	—	Egypt 2; Greece 2.
Kaolin	29,833	39,249	—	France 34,749; Tunisia 2,399.
Unspecified	9,940	2,330	—	Tunisia 619; Switzerland 539; France 329.
Cryolite and chiolite	55	178	—	Tunisia 84; Switzerland 46; West Germany 35.
Diamond, natural:				
Gem, not set or strung carats	250	18,928	240	Switzerland 14,445; France 4,050.
Industrial stones do.	5,083	10,786	10	Belgium-Luxembourg 8,710; Yugoslavia 1,307.
Dust and powder kilograms	NA	731	200	Algeria 140; Mexico 89.
Diatomite and other infusorial earth	2,942	2,538	—	Austria 785; Yugoslavia 599; Switzerland 336.
Feldspar, fluorspar, related materials:				
Feldspar	29,632	34,717	—	West Germany 21,953; Switzerland 6,368.
Fluorspar	37,732	19,574	8,426	Norway 8,250; United Kingdom 2,300.
Unspecified	980	161	—	Indonesia 80; Austria 50; Albania 23.
Fertilizer materials:				
Crude, n.e.s.	17,761	15,292	60	France 7,840; Switzerland 2,993; United Arab Emirates 1,189.
Manufactured:				
Ammonia	74,792	80,806	18	Greece 23,880; Israel 21,296; Spain 13,949.
Nitrogenous	1,162,703	1,136,989	73,181	Greece 225,154; Spain 144,055; Turkey 131,291.
Phosphatic	5,008	463	—	Somalia 115; Switzerland 112; Kuwait 85.
Potassic	58,637	76,455	—	Japan 18,000; Algeria 17,800; Greece 16,293.
Unspecified and mixed	711,688	699,984	33	France 243,402; West Germany ,850.
Graphite, natural	343	394	(3)	France 123; West Germany 113; U.S.S.R. 54.
Gypsum and plaster	13,287	13,272	3	Switzerland 10,532; Greece 648.
Iodine	4	10	—	All to West Germany.
Kyanite and related materials:				
Andalusite, kyanite, sillimanite	NA	1,272	—	West Germany 506; Turkey 400; United Kingdom 260.
Mullite	NA	65	—	France 61; United Kingdom 4.
Unspecified	1,431	—		
Lime	23,190	19,277	—	Switzerland 17,949; France 348.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Magnesium compounds:				
Magnesite, crude	713	3,307	—	Spain 1,150; Netherlands 628; France 495.
Oxides and hydroxides	99,852	108,283	2,800	West Germany 37,101; Austria 18,795; Netherlands 14,183.
Sulfate	44	—		
Mica:				
Crude including splittings and waste	241	783	—	Libya 500; Japan 86; Belgium-Luxembourg 65.
Worked including agglomerated splittings	184	162	46	France 44; Sweden 25.
Nitrates, crude	236	466	20	Algeria 168; Greece 64; West Germany 50.
Phosphates, crude	577	828	5	West Germany 322; Netherlands 117; Zambia 72.
Pigments, mineral:				
Natural, crude	759	372	—	Switzerland 71; France 61; Somalia 59.
Iron oxides and hydroxides, processed	8,171	9,475	27	France 2,021; United Kingdom 1,593; West Germany 1,353.
Potassium salts, crude	(3)	28	(3)	Austria 22; West Germany 5.
Precious and semiprecious stones other than diamond:				
Natural kilograms	2,742	645	88	West Germany ; Thailand 68.
Synthetic do.	1,092	8,029	484	Tunisia 3,039; Panama 1,159; Morocco 1,135.
Pyrite, unroasted	4,883	5,458	198	West Germany 2,870; France 974; Austria 760.
Quartz crystal, piezoelectric kilograms	(3)	8	—	All to Sudan.
Salt and brine	613,394	358,350	95,268	Sweden 77,337; Netherlands 48,716.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	64,728	47,158	—	Greece 20,459; Israel 12,248; Algeria 10,856.
Sulfate, manufactured	r14,084	6,867	—	Bulgaria 2,260; Egypt 2,023; Lebanon 620.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	405,271	401,716	10,601	West Germany 62,864; Japan 55,152; Spain 46,150.
Worked	1,677,000	1,965,000	252,000	West Germany 509,000; Saudi Arabia 192,000.
Dolomite, chiefly refractory-grade	25,956	36,387	—	France 16,769; Switzerland 8,629; West Germany 3,912.
Gravel and crushed rock	925,914	933,235	4,446	Switzerland 352,814; Kuwait 105,345; Belgium-Luxembourg 85,099.
Limestone other than dimension	294	701	—	Japan 263; Austria 22; Switzerland 106.
Quartz and quartzite	18,034	14,267	51	France 7,138; West Germany 3,780.
Sand other than metal-bearing	151,069	214,772	35	Switzerland 192,102; U.S.S.R. 12,209.
Sulfur:				
Elemental:				
Crude including native and byproduct	450	979	—	Romania 523; Yugoslavia 188; France 113.
Colloidal, precipitated, sublimed	49	279	—	France 252; Spain 13.
Dioxide	662	572	—	Belgium-Luxembourg 300; Spain 138; Israel 83.
Sulfuric acid	206,071	260,916	15,467	Turkey 100,900; Spain 47,628.
Talc, steatite, soapstone, pyrophyllite	40,473	42,327	81	West Germany 18,982; France 5,695; United Kingdom 4,947.
Vermiculite, perlite, chlorite	55,486	39,177	—	United Kingdom 32,564; France 5,829.
Other:				
Crude	8,435	12,586	203	Switzerland 2,875; Yugoslavia 1,622; Brazil 1,304.
Slag and dross, not metal-bearing	159,035	82,592	7	Greece 41,467; Yugoslavia 33,615.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,972	14,973	—	United Kingdom 4,950; Austria 4,142; Switzerland 2,611.
Carbon:				
Carbon black	61,991	67,556	98	Yugoslavia 11,970; France 11,578; Austria 10,844.

See footnotes at end of table.

TABLE 2—Continued

ITALY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Carbon—Continued					
Gas carbon		—	46	—	France 36; Iraq 5.
Coal:					
Anthracite		638	333	—	West Germany 205; France 91.
Bituminous		14,949	84,296	56,600	Romania 16,665; Tunisia 8,250.
Briquets of anthracite and bituminous coal		24	64	—	All to France.
Lignite including briquets		148	—		
Coke and semicoke		146,250	191,281	34,274	Austria 37,515; Tunisia 22,447.
Gas, natural: Gaseous	thousand cubic meters	59	1,523	—	Israel 1,481; United Kingdom 31; Egypt 10.
Peat including briquets and litter		158	181	—	West Germany 79; France 62; Netherlands 24.
Petroleum:					
Crude	thousand 42-gallon barrels	4,219	4,266	1,430	Spain 2,278; West Germany 554.
Refinery products:					
Liquefied petroleum gas	do.	2,158	2,277	147	Libya 531; Syria 299; France 253.
Gasoline	do.	42,421	37,102	9,726	France 7,184; Switzerland 3,992.
Mineral jelly and wax	do.	17	32	(3)	Netherlands 6; West Germany 4; Nigeria 4.
Kerosene and jet fuel	do.	14,598	13,613	1,652	Japan 1,211; France 1,116.
Distillate fuel oil	do.	25,540	19,217	330	France 6,903; Switzerland 2,287; Tunisia 1,450.
Lubricants	do.	4,872	4,350	199	West Germany 376; Argentina 318.
Residual fuel oil	do.	18,372	22,402	7,599	France 2,614; Libya 1,399.
Bitumen and other residues	do.	348	416	(3)	Switzerland 183; Austria 149; France 47.
Bituminous mixtures	do.	50	45	(3)	Libya 16; Switzerland 7; Austria 3.
Petroleum coke	do.	231	181	(3)	Austria 140; France 36.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]May include tellurium.
[3]Less than 1/2 unit.
[4]Includes rhenium.
[5]Due to changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[6]May include other precious metals.
[7]Includes precious metals.
[8]Excludes diamond.
[9]May include cadmium sulfate.

TABLE 3

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		4,901	3,942	(2)	West Germany 2,679; France 847.
Alkaline-earth metals		47	153	18	France 65; West Germany 21; Netherlands 21.
Aluminum:					
Ore and concentrate	thousand tons	1,381	1,407	—	Australia 667; Guinea 641.
Oxides and hydroxides		336,473	330,008	2,248	Guinea 96,555; West Germany 76,128; France 66,774.
Ash and residue containing aluminum		108,042	94,940	—	Austria 43,561; U.S.S.R. 36,288; France 11,230.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued				
Metal including alloys:				
Scrap	159,706	183,881	6,611	France 58,451; West Germany 36,846; Austria 24,170.
Unwrought	376,924	417,408	892	Netherlands 135,707; Yugoslavia 72,503; West Germany 56,283.
Semimanufactures	170,106	199,426	3,807	West Germany 65,136; France 31,133; Austria 16,012.
Antimony:				
Ore and concentrate	166	155	—	Morocco 105; China 50.
Oxides	1,669	2,066	5	France 717; Belgium-Luxembourg 478; China 236.
Ash and residue containing antimony	563	108	—	All from Canada.
Metal including alloys, all forms	154	578	—	Netherlands 373; West Germany 131; Turkey 60.
Arsenic:				
Oxides and acids	592	539	—	France 276; Belgium-Luxembourg 187.
Metal including alloys, all forms	[3]91	71	—	Netherlands 33; China 21; Sweden 17.
Beryllium:				
Oxides and hydroxides	21	20	—	All from Belgium-Luxembourg.
Metal including alloys, all forms	1	1	(2)	Mainly from West Germany.
Bismuth: Metal including alloys, all forms	60	93	—	United Kingdom 47; West Germany 30; Netherlands 9.
Cadmium: Metal including alloys, all forms	[3]91	83	—	Finland 36; West Germany 23; Netherlands 11.
Chromium:				
Ore and concentrate	218,974	308,141	—	Albania 157,282; U.S.S.R. 80,291; Republic of South Africa 31,728.
Oxides and hydroxides	2,084	1,867	2	West Germany 1,222; United Kingdom 341.
Metal including alloys, all forms	223	373	4	Austria 190; United Kingdom 116; Switzerland 25.
Cobalt:				
Ore and concentrate	—	48	—	Austria 24; West Germany 24.
Oxides and hydroxides	290	412	3	Belgium-Luxembourg 243; Finland 109; United Kingdom 43.
Metal including alloys, all forms	613	521	12	Belgium-Luxembourg 166; United Kingdom 69; France 44.
Columbium and tantalum:				
Ore and concentrate value, thousands	—	$11	$1	United Kingdom $9.
Metal including alloys, all forms:				
Columbium (niobium) do.	$285	[4]$1,172	$1,053	West Germany $106.
Tantalum do.	$968	$1,311	$850	Austria $321; France $55.
Copper:				
Ore and concentrate	3,597	1,310	—	France 1,117; Spain 99; West Germany 93.
Matte and speiss including cement copper	559	520	—	Chile 199; Norway 95; West Germany 88.
Oxides and hydroxides	320	845	575	Norway 172.
Sulfate	454	1,407	—	Bulgaria 614; Yugoslavia 300; Romania 200.
Ash and residue containing copper	13,757	6,915	89	Albania 5,876; Yugoslavia 855.
Metal including alloys:				
Scrap	134,278	136,701	2,732	West Germany 41,084; France 35,815; United Kingdom 20,516.
Unwrought	401,025	398,363	4,446	Chile 150,404; Zambia 41,659; Peru 29,047.
Semimanufactures	181,822	212,162	1,499	France 69,277; West Germany 58,620.
Gallium, indium, thallium: Metals including alloys, all forms	29	1	(2)	Mainly from United Kingdom.
Germanium:				
Metal including alloys, all forms value, thousands	$296	$209	—	Belgium-Luxembourg $195; West Germany $14.
Oxides	(2)	1	—	All from West Germany.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Gold:				
Waste and sweepings value, thousands	$655	$684	—	Switzerland $577; France $70; Malta $37.
Metal including alloys, unwrought and partly wrought kilograms	199,403	350,830	3,270	U.S.S.R. 131,761; Republic of South Africa ,599; Switzerland 89,286.
Hafnium: Metal including alloys, all forms	(2)	(2)	—	All from West Germany.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	16,523	16,197	77	Brazil 5,348; Liberia 2,778; Mauritania 2,212.
Pyrite, roasted	29	27	—	Liberia 22; West Germany 5.
Metal:				
Scrap thousand tons	4,911	5,058	115	West Germany 1,791; France 1,262; U.S.S.R. 520.
Pig iron, cast iron, related materials	604,446	942,240	231	U.S.S.R. 307,322; Algeria 132,245; France 103,384.
Ferroalloys:				
Ferroaluminum	1,465	NA		
Ferroboron, ferrocobalt	282	NA		
Ferrochromium	93,266	90,768	20	Republic of South Africa 27,537; Zimbabwe 23,055; Finland 11,104.
Ferrocolumbium	1,155	1,165	—	Brazil 709; West Germany 199; United Kingdom 139.
Ferromanganese	89,408	89,017	—	France 38,816; Republic of South Africa 24,994.
Ferromolybdenum	1,958	2,485	—	Austria 912; France 629; United Kingdom 489.
Ferronickel	21,329	20,539	—	New Caledonia 6,920; Colombia 4,360; Dominican Republic 2,556.
Ferrosilicochromium	1,706	1,487	—	U.S.S.R. 959; West Germany 429.
Ferrosilicomanganese	28,627	38,195	—	Norway 17,456; Republic of South Africa 6,499; Yugoslavia 5,975.
Ferrosilicon	59,002	60,112	—	France 16,927; West Germany 14,821; Norway 13,790.
Ferrotitanium	830	805	—	United Kingdom 597; Belgium-Luxembourg 89.
Ferrotungsten	264	229	—	Netherlands 190; Belgium-Luxembourg 25; Austria 14.
Ferrovanadium	827	1,086	—	Austria 617; West Germany 295; Belgium-Luxembourg 139.
Silicon metal	18,382	14,737	253	France 4,456; Norway 2,542; West Germany 1,841.
Unspecified	1,814	7,886	191	France 3,710; West Germany 1,390; Spain 720.
Steel, primary forms thousand tons	3,768	1,961	1	Brazil 540; United Kingdom 232; U.S.S.R. 189.
Semimanufactures:[5]				
Bars, rods, angles, shapes, sections do.	1,373	1,534	(2)	West Germany 308; France 281; Yugoslavia 248.
Universals, plates, sheets do.	1,964	NA		
Hoop and strip	203,985	NA		
Rails and accessories	39,856	65,720	40	Netherlands 13,305; West Germany 8,611; Belgium-Luxembourg 8,351.
Wire	92,984	115,855	46	Yugoslavia 31,988; Belgium-Luxembourg 26,244; West Germany 17,019.
Tubes, pipes, fittings	411,749	526,874	34,108	West Germany 118,256; France 98,131; Yugoslavia 70,676.
Castings and forgings, rough	17,769	NA		
Lead:				
Ore and concentrate	70,867	96,713	—	Canada 41,489; Spain 14,901; Australia 14,107.
Oxides	627	674	9	West Germany 437; United Kingdom 119.
Ash and residue containing lead	799	2,063	—	Albania 1,200; Tunisia 739; Switzerland 124.
Metal including alloys:				
Scrap	18,507	16,160	—	U.S.S.R. 9,694; Switzerland 5,010.
Unwrought	109,620	116,604	127	Morocco 27,041; West Germany 16,367; Mexico 11,445.
Semimanufactures	2,471	1,987	3	West Germany 679; Belgium-Luxembourg 605; United Kingdom 262.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Lithium:					
Oxides and hydroxides		395	383	—	West Germany 274; China 70.
Metal including alloys, all forms		45	NA		
Magnesium: Metal including alloys:					
Scrap		663	901	—	West Germany 440; Belgium-Luxembourg 149; Netherlands 145.
Unwrought		2,143	2,870	1	Norway 840; France 808; Netherlands 629.
Semimanufactures		642	183	3	Netherlands 64; France 55; Switzerland 30.
Manganese:					
Ore and concentrate, metallurgical-grade		452,653	264,330	—	Gabon 130,369; Brazil 88,950; Republic of South Africa 17,330.
Oxides		3,892	4,175	8	Belgium-Luxembourg 2,288; France 732; Netherlands 533.
Metal including alloys, all forms		1,837	2,676	99	Morocco 950; Republic of South Africa 498; France 481.
Mercury		144	189	(2)	Netherlands 68; China 59; Algeria 18.
Molybdenum:					
Ore and concentrate		2,870	2,803	430	Netherlands 1,597; Chile 418.
Oxides and hydroxides		32	173	60	Austria 40; West Germany 32.
Metal including alloys:					
Scrap		32	(2)	—	All from Austria.
Unwrought		1	2	—	Mainly from West Germany.
Semimanufactures		162	160	41	Austria 39; West Germany 35.
Nickel:					
Ore and concentrate		1	3	—	All from Netherlands.
Matte and speiss		6,743	6,973	—	Australia 2,910; Netherlands 1,227; Cuba 1,222.
Oxides and hydroxides		440	108	—	Cuba 69; Finland 15; Canada 9.
Ash and residue containing nickel		43	264	—	Malaysia 263; Spain 1.
Metal including alloys:					
Scrap		220	117	18	West Germany 58; Finland 23.
Unwrought		16,465	16,942	30	U.S.S.R. 4,620; Republic of South Africa 2,143; Netherlands 2,108.
Semimanufactures		2,978	3,308	465	West Germany 1,201.
Platinum-group metals:					
Waste and sweepings	value, thousands	$43,091	$16,151	$4,562	Yugoslavia $4,702; Greece $1,573.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	69,968	149	France 56,864; Switzerland 10,373; United Kingdom 1,621.
Platinum	do.	3,246	10,533	31	Switzerland 7,493; Japan 984; West Germany 805.
Rhodium	do.	NA	345	1	West Germany 197; United Kingdom 142.
Iridium, osmium, ruthenium	do.	NA	1,251	336	West Germany 512; Republic of South Africa 271.
Unspecified	do.	4,025	—		
Rare-earth metals including alloys, all forms		67	69	18	Netherlands 21; Austria 15.
Rhenium: Metal including alloys, all forms	value, thousands	$5	NA		
Selenium, elemental		28	20	(2)	China 6; Canada 4; United Kingdom 4.
Silicon, high-purity		18	1,513	(2)	West Germany 931; Norway 314; France 251.
Silver:					
Waste and sweepings[6]	value, thousands	$1,503	$24,809	$11,522	United Kingdom $5,788; France $3,388.
Metal including alloys, unwrought and partly wrought	kilograms	807,111	658,024	18,532	Switzerland 303,114; West Germany 144,337; Mexico 76,789.
Tellurium, elemental	value, thousands	NA	$84	$11	Canada $39; United Kingdom $17.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METAL—Continued				
Tin:				
Ore and concentrate	24	—		
Oxides	6	7	—	All from West Germany.
Ash and residue containing tin	27	—		
Metal including alloys:				
Scrap	8	3	—	All from West Germany.
Unwrought	6,581	6,662	—	Malaysia 3,810; Indonesia 1,143.
Semimanufactures	409	415	3	West Germany 242; United kingdom 68.
Titanium:				
Ore and concentrate	125,250	48,568	—	Canada 46,941; Republic of South Africa 1,489.
Oxides	26,889	21,955	85	West Germany 6,390; United Kingdom 5,791; France 2,677.
Ash and residue containing titanium	77,930	84,753	—	Republic of South Africa 62,815; Canada 5,500; France 4,222.
Metal including alloys:				
Scrap	2,701	2,751	602	Austria 2,047.
Unwrought	83	116	63	United Kingdom 25; Spain 20.
Semimanufactures	466	805	74	Japan 508; West Germany 126.
Tungsten:				
Ore and concentrate	155	41	—	West Germany 21; Austria 20.
Oxides and hydroxides	(2)	13	—	All from Austria.
Metal including alloys:				
Scrap	(2)	3	(2)	Sweden 2; West Germany 1.
Unwrought value, thousands	$620	$116	$25	France $53; United Kingdom $18.
Semimanufactures	48	74	41	France 12; United Kingdom 9.
Uranium and thorium:				
Oxides and other compounds value, thousands	$3,999	$1,364	$18	West Germany $733; United Kingdom $504; Sweden $109.
Metal including alloys, all forms:				
Uranium	6	NA		
Thorium value, thousands	$4	NA		
Vanadium:				
Ore and concentrate	5	—		
Oxides and hydroxides	95	84	—	United Kingdom 40; West Germany 23; Netherlands 20.
Ash and residue containing vanadium	1,538	805	—	Austria 756; Yugoslavia 49.
Metal including alloys:				
Scrap	1	—		
Unwrought	12	(2)	—	All from West Germany.
Semimanufactures	9	—		
Zinc:				
Ore and concentrate	441,883	429,578	—	Canada 120,578; Ireland 107,821.
Oxides	9,119	9,631	—	France 4,548; West Germany 2,118.
Blue powder	2,541	2,214	—	West Germany 568; France 508; Norway 498.
Matte	10,397	8,982	—	Italy 4,526; Switzerland 1,754; West Germany 1,413.
Ash and residue containing zinc	6,981	17,465	18	West Germany 11,530; Spain 5,131.
Metal including alloys:				
Scrap	5,086	9,631	—	France 4,548; West Germany 2,118; Switzerland 860.
Unwrought	79,852	71,160	100	West Germany 21,899; Belgium-Luxembourg 12,906; Netherlands 8,731.
Semimanufactures	5,195	6,705	(2)	West Germany 3,678; France 1,584; Finland 660.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Zirconium:				
Ore and concentrate	78,234	82,675	361	Australia 70,652; Republic of South Africa 8,875.
Oxides	341	451	4	France 210; West Germany 177; Netherlands 46.
Metal including alloys:				
Scrap	13	34	5	West Germany 24; France 5.
Unwrought	8	26	18	France 6; West Germany 2.
Semimanufactures	10	222	1	Argentina 100; Malaysia 100.
Other:				
Ores and concentrates	1,629	2,850	—	Australia 1,599; Tunisia 1,200.
Oxides and hydroxides	513	697	(2)	Belgium-Luxembourg 303; West Germany 226; France 67.
Ashes and residues	9,101	4,641	51	Yugoslavia 3,669; Switzerland 255.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	34,812	35,596	106	Turkey 25,685; Greece 9,371.
Artificial:				
Corundum	34,297	33,470	707	Austria 10,504; Yugoslavia 6,908; France 4,858.
Silicon carbide	15,831	30,187	—	France 8,021; West Germany 7,593; Norway 6,160.
Dust and powder of precious and semiprecious stones including diamond kilograms	4,149	7,145	—	West Germany 431; Zaire 360; France 161.
Grinding and polishing wheels and stones	4,135	4,385	42	France 1,133; Austria 895; United Kingdom 485.
Asbestos, crude	48,864	46,165	340	Canada 31,871; Zimbabwe 5,756; Greece 5,480.
Barite and witherite	42,985	39,936	1	Peru 10,373; Turkey 10,004; India 6,017.
Boron materials:				
Crude natural borates	143,974	124,700	490	Turkey 122,145; Israel 1,000.
Elemental	1	(2)	—	All from West Germany.
Oxides and acids	9,622	11,215	828	Turkey 4,768; France 2,603; Chile 1,356.
Bromine	2,140	2,228	—	Israel 2,168; Czechoslovakia 35.
Cement thousand tons	765	1,889	(2)	Greece 1,054; Yugoslavia 623; Cyprus 111.
Chalk	10,602	12,760	—	France 12,567; Austria 86.
Clays, crude:				
Bentonite	39,228	52,110	2	Greece 34,331; Morocco 7,425.
Chamotte earth	66,637	64,601	100	France 37,141; West Germany 11,876; Czechoslovakia 10,011.
Fuller's earth	2,143	3,554	803	Spain 2,078; Algeria 260.
Fire clay	NA	124,302	7	France 69,576; West Germany 54,461.
Kaolin	684,532	673,009	187,528	United Kingdom 243,525; France 70,257.
Unspecified thousand tons	1,161	1,293	(2)	West Germany 1,123; United Kingdom 78; France 61.
Cryolite and chiolite	536	1,237	—	Denmark 933; France 166.
Diamond, natural:				
Gem, not set or strung carats	231,400	1,981,707	17,242	India 784,488; Belgium-Luxembourg 636,978; Israel 199,241.
Industrial stones do.	169,003	316,734	1	Belgium-Luxembourg 307,855; United Kingdom 7,594.
Dust and powder kilograms	NA	8,755	1,258	Switzerland 3,933; West Germany 2,443.
Diatomite and other infusorial earth	5,883	7,213	785	France 5,754.
Feldspar, fluorspar, related materials:				
Feldspar	10,917	22,773	1,182	Brazil 6,850; West Germany 4,334; Sweden 2,830.
Fluorspar	67,317	63,197	—	France 17,331; Tunisia 15,095; Morocco 8,870.
Unspecified	26,503	28,366	52	Norway 14,005; Canada 11,178; Netherlands 2,831.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials:					
Crude, n.e.s.		4,042	5,493	16	France 2,180; West Germany 1,444; Pakistan 516.
Manufactured:					
Ammonia		206,266	330,121	—	U.S.S.R. 202,935; Trinidad and Tobago 48,565.
Nitrogenous		543,626	428,273	164	Austria 115,485; Netherlands 79,383; West Germany 69,904.
Phosphatic		246,691	222,255	—	Israel 96,762; Tunisia 80,274; France 28,814.
Potassic		764,403	762,326	1,791	Israel 208,493; U.S.S.R. 117,848; West Germany 109,824.
Unspecified and mixed	thousand tons	1,019	961	221	Tunisia 188; Jordan 69.
Graphite, natural		7,464	6,739	20	West Germany 2,259; Brazil 1,554; China 1,169.
Gypsum and plaster		16,657	29,498	1,946	West Germany 8,814; Greece 7,179; Syria 7,100.
Iodine		727	991	17	Japan 515; Chile 411.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		NA	23,259	1,110	Republic of South Africa 15,149; Spain 5,024.
Mullite		NA	2,639	992	West Germany 894; United Kingdom 473.
Unspecified		21,308	—		
Lime		7,715	10,266	—	Yugoslavia 9,426; West Germany 438.
Magnesium compounds:					
Magnesite, crude		12,965	28,772	19	Turkey 17,853; Greece 5,210.
Oxides and hydroxides		82,721	77,456	385	China 15,673; Austria 11,514; Greece 11,102.
Sulfate		2,970	3,727	—	East Germany 1,861; West Germany 1,854; Austria 12.
Mica:					
Crude including splittings and waste		1,128	1,761	103	France 553; Austria 523.
Worked including agglomerated splittings		634	597	20	France 217; Belgium-Luxembourg 141; Japan 92.
Nitrates, crude		3,632	8,131	—	Chile 6,195; East Germany 840.
Phosphates, crude	thousand tons	1,303	1,164	206	Morocco 359; Israel 237.
Phosphorous, elemental		153	188	—	Romania 100; France 88.
Pigments, mineral:					
Natural, crude		379	446	11	Austria 168; Cyprus 159; Spain 43.
Iron oxides and hydroxides, processed		23,300	27,243	385	West Germany 19,741; France 4,595.
Potassium salts, crude		4,632	1,587	—	France 1,539; West Germany 48.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	65,650	31,090	225	Thailand 12,068; Taiwan 5,957; Brazil 2,797.
Synthetic	do.	13,300	15,611	1,507	Thailand 6,986; U.S.S.R. 2,406; Switzerland 1,891.
Pyrite, unroasted		102,513	117,634	—	U.S.S.R. 61,273; Norway 26,900; Albania 13,700.
Quartz crystal, piezoelectric	kilograms	1,010	679	—	Japan 421; Belgium-Luxembourg 169; West Germany 48.
Salt and brine		882,193	706,134	—	France 252,198; Netherlands 225,693; Egypt 95,665.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		52,571	84,039	—	Austria 40,582; Turkey 13,375; Yugoslavia 12,539.
Sulfate, manufactured		[8]77,682	43,201	3,098	France 13,791; Austria 12,733; West Germany 4,651.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	1,104	1,472	9	Spain 338; Brazil 249; Republic of South Africa 144.
Worked		13,394	15,937	50	Portugal 3,217; Greece 2,768; Yugoslavia 2,122.
Dolomite, chiefly refractory-grade		2,084	3,990	18	West Germany 1,447; Netherlands 804; Austria 754.
Gravel and crushed rock		27,201	49,201	24	France 26,586; Yugoslavia 12,417; West Germany 4,655.
Limestone other than dimension		703	513	—	West Germany 438; Netherlands 50; Sweden 25.

See footnotes at end of table.

TABLE 3—Continued

ITALY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued				
Quartz and quartzite	102,109	100,162	93	Switzerland 40,601; Spain 25,095; Greece 18,135.
Sand other than metal-bearing thousand tons	964	1,096	1	France 605; Belgium-Luxembourg 240; West Germany 115.
Sulfur:				
Elemental:				
Crude including native and byproduct	283,843	264,761	14	Saudi Arabia 93,074; Poland 65,780; Iraq 39,327.
Colloidal, precipitated, sublimed	1,201	1,111	(2)	West Germany 656; Yugoslavia 270; France 131.
Dioxide	753	—		
Sulfuric acid	65,461	59,337	(2)	Spain 41,346; Yugoslavia 9,353; Austria 6,951.
Talc, steatite, soapstone, pyrophyllite	32,429	37,059	64	Austria 17,431; France 8,405; China 4,612.
Vermiculite, perlite, chlorite	43,043	46,874	10	U.S.S.R. 18,410; Turkey 10,310; Republic of South Africa 8,916.
Other:				
Crude	67,883	78,870	3,107	Spain 25,535; U.S.S.R. 11,984; West Germany 7,463.
Slag and dross, not metal-bearing	8,544	15,949	8	France 8,062; Yugoslavia 3,985.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,001	2,551	728	France 1,737.
Carbon:				
Carbon black	28,102	28,245	1,584	France 12,756; West Germany 4,534; Spain 1,942.
Gas carbon	—	(2)	—	All from Belgium-Luxembourg.
Coal:				
Anthracite thousand tons	144	2,853	1,148	Republic of South Africa 1,453.
Bituminous do.	19,844	15,957	8,106	Republic of South Africa 2,932; Australia 2,219.
Briquets of anthracite and bituminous coal	6,642	7,003	—	France 6,466; West Germany 537.
Lignite including briquets	131,325	146,362	40	West Germany 142,085; East Germany 3,541.
Coke and semicoke	246,229	204,319	6,021	France 59,632; Netherlands 41,943; West Germany 32,706.
Gas, natural: Liquefied	NA	123,344	(2)	Libya 121,731.
Peat including briquets and litter	212,283	261,213	67	West Germany 178,919; Netherlands 34,455; U.S.S.R. 22,713.
Petroleum:				
Crude thousand 42-gallon barrels	498,144	471,912	804	Libya 144,205; U.S.S.R. 60,349; Egypt 56,457.
Refinery products:				
Liquefied petroleum gas do.	3,049	15,004	126	Algeria 5,489; France 2,149; United Kingdom 1,442.
Gasoline do.	31,470	29,689	7	Iraq 5,065; Kuwait 4,337; Saudi Arabia 4,154.
Mineral jelly and wax do.	323	253	7	West Germany 48; Hungary 36; Netherlands 29.
Kerosene and jet fuel do.	1,073	909	(2)	Libya 625; Turkey 139; France .
Distillate fuel oil do.	47,036	42,415	3	Romania 15,599; Libya 5,598; Algeria 4,608.
Lubricants do.	1,227	1,215	59	Netherlands 326; France 174; Greece 162.
Residual fuel oil do.	151,801	141,019	725	U.S.S.R. 44,199; Kuwait 14,060; Iraq 12,932.
Bitumen and other residues do.	3,039	2,101	1,048	Spain 388; Yugoslavia 380.
Bituminous mixtures do.	10	18	(2)	Yugoslavia 5; France 4; United Kingdom 3.
Petroleum coke do.	12,917	11,588	9,631	U.S.S.R. 889.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include tellurium.
[4]Includes rhenium.
[5]Due to changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[6]May include other precious metals.
[7]Excludes diamond.
[8]May include cadmium sulfate.

TABLE 4

ITALY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Eurallumina s.p.A. (Comalco, 37.5%)	Plant at Portoscuso, Sardininia	650
Do.	Aluminia S.p.A. (Efim)	Plant at Porto Marghera, Venice	150
Aluminium	do.	Smelters at Porto Vesme, Sardinia; at Fusina, in Venice	200
Do.	Sava-Alluminio Veneto S.p.A. (MCS)	Smelters at Porto Marghera, Venice; at Fusina, in Venice	100
Asbestos	Amiantifera di Balangero S.p.A.	Mine at Balangero, near Turin	100
Barite	Bariosarda S.p.A. (Ente Mineraria Sarda)	Mines at Barega, and Mont'Ega, in Sardinia	100
Do.	Edem S.p.A. (Government)	Mines at Val di Castello, in Lucca	20
Do.	Edemsarda S.p.A. (Soc. Imprese Industriali)	Mines at Su Benatzu, Sto Stefano, and Peppixeddu, in Sardinia	20
Do.	Minieraria Baritina S.p.A.	Mines at Marigole, Monte Elto, and Primaluna, near Milan	20
Cement	52 companies, of which the largest are—	97 plants, of which the largest are—	45,000 including
Do.	Italcement-Fabbriche Riunite Cemento S.p.A.	19 plants, of which the largest are Calusco, Monselice, and Collefero	(16,003)
Do.	"Cementir"-Cementerie del Tirreno S.p.A.	Plants at Arquasta Scivia, Livorno, Maddaloni, Napoli, Spoleto, and Taranto	(6,250)
Do.	Unicem S.p.A.	Plants at Guidonia, Lugagnano, Morano, Piacenza, S'Arcangelo di Romagna, and Settimello	(4,630)
Copper, refined	Nuova Samim S.p.A. (ENI)	Refineries at Porto Marghera and Pieve Vergonte	46
Do.	Europa Metalli-LMI S.p.A.	Refineries at Campo Tizzoro, Fornaci di Barga, and Villa Carcina	26
Do.	Chimet S.p.A.	Refinery at Arezzo	13
Feldspar	At least five companies, of which the largest are—		1,500, including
Do.	Maffei S.p.A.	Surface mines at Pinzolo, Sondalo, and Campiglia Marittima; underground mine at Vipiteno	(200)
Do.	Miniera di Fragne S.p.A.	Surface mine at Alagna Valsesia	(60)
Do.	Sabbie Silicee Fossanova S.p.A. (Sasifo)	Surface mine at Fossanova	(30)
Lead-zinc ore	Nuova Samim S.p.A. (ENI)	Mines at Masua, Monteponi, San Giovanni, San Benedetto, in Sardinia; at Raibl, in Venetto region	60
Do.	Others		10
Lead metal	Nuova Samim S.p.A. (ENI)	Smelter at San Gavino, and an Imperial Smelter at Porto Vesme, in Sardinia	85
Zinc metal	Pertusola Sud S.p.A.	Plant at Crotone	175
	Nuova Samim S.p.A. (ENI)	Plants at Porto Vesme, in Sardinia; and Porto Marghera, near Venice	125
Lignite	Ente Nazionale per L'Energia Elettrica (ENEL)	Surface mines at	2,000
Magnesium metal	Societa Italiana Magnesio S.p.A. (Indel)	Plant at Bolzano	7
Marble white	A number of companies, including—	Quarries mostly at Carrara and Massa	2,000 including
Do.	Mineraria Marittima Srl	Quarry at Carrara	(500)
Do.	Industria dei Marmi Vicentini S.p.A.	Quarries in the Carrara area	(300)
Do.	Figaia S.p.A.	do.	(100)
Petroleum:			
Crude	Ente Nazionale/Idrocarburi (ENI)	Oilfields: Offshore Sicily and in the Adriatic sea; onshore in Po River Valley	[1]90
Refined	do.	About 30 refineries	[1]2,000
Potash ore	Industria Sali Potassici e Affini per Aziono S.p.A.	Underground mines at Corvillo, Pasquasia, Racalmuto, and San Cataldo, in Sicily	1,300
Do.	Sta Italiana Sali Alcalini S.p.A.–Italkali	Undergound mines at Casteltermini and Pasquasia, in Sicily	700
Pumice	Pumex S.p.A.	Quarries on the Lipari Island, north of Sicily	650
Do.	Sta Siciliana per l'Industria ed il Commercio della Pomice di Lipari—Italpomice S.p.A.	do.	200
Pyrite	Solmine S.p.A.—Sta Lavorazione Minerali e Derivati S.p.A. (Samin 51%; Agip Sp.A. 49%)	Underground mines at Campiano and Niccioleta	900
Salt rock	Sta Italiana Sali Alcalini S.p.A.–Italkali	Underground mines at Petralia, Racalmuto, and Realmonte in Sicily	4,000

See footnote at end of table.

TABLE 4—Continued

ITALY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Steel, crude	Solvay S.p.A.	Underground mines at Buriano, Pontteginori and Querceto in Tuscany	2,000
Do.	Ilva S.p.A. (Government)	34 steel plants	13,000
Do.	Riva S.p.A.	About 5 plants	5,000
Do.	Others	Various locations	10,000
Talc	Talco e Grafite Val Chisone S.p.A.	Mines at Pinerolo, near Turin, and at Orani in Sardinia	120
Do.	Industria Mineraria Italiana S.p.A.	Mine at Largone Predaccia	20
Do.	Talco Sarda S.p.A.	Mine at Orani in Sardinia	20

[1]Thousand 42-gallon barrels per day.

Industrial Minerals

Asbestos.—Amiantifera di Balangero S.p.A. is the only company in Italy producing asbestos. The San Vittore Mine is the largest and only significant asbestos producer in Western Europe. The open pit mine is in the village of Balangero near Lonzo.

Barite.—There were four barite-producing companies in Italy: Bariosarda S.p.A., owned by Ente Mineraria Sarda, with mines at Barega, Mont'Ega, and Monte Tamara in Sardinia; Edem S.p.A., Government-owned, with mines at Val di Castello, Lucca; Edemsarda S.p.A., with mines at Su Benatzu, Sto Stefano, and Peppixeddu in Sardinia; and Mineraria Baritina S.p.A., with mines at Marigole, Monte Elto, and Primaluna, east of Milan. The production of barite has decreased from 128,000 tons in 1985 to less than 76,000 tons in 1989.

Cement.—Italy is Western Europe's largest cement producer and the world's sixth largest cement producer. In 1989, EniChem Anic S.p.A.'s plant at Ragusa completed its conversion from wet- to dry-process operation. New, high-pressure grinding rolls were installed at several Italian plants, including Cementeria di Begliano S.p.A. in Rassina, Fedelcementi S.p.A. in Galatina, Colacem S.p.A. in Gubio, and Cementizillo S.p.A. in Este.

Clays and Refractory Materials.—Unimin S.p.A., with production facilities in Massa, Carrera, is the largest supplier of raw materials for the abrasive and refractory markets in Italy. The Massa operation is served by the local transport infrastructure, being about 50 kilometers (km) by road from the town of Pisa, 1.5 km from the deep-sea port of Marina di Carrera, and 1 km from the main north-south highway and has its own rail loading station. Calcining trials are being undertaken by Unimin for abrasive-grade bauxite from the Weipa deposit operated by Comalco Ltd. in Australia. Unimin is based in Milan and forms part of the Minermet SA trading group in Switzerland. Unimin imports bauxite from China (for monohydrate) and Brazil (for trihydrate), kyanite from Brazil, flint clay and kaolin from China, and andalusite from the Republic of South Africa.

Feldspar.—Italy is the world's largest producer of feldspar. The following mines were operating in 1989: Silex Sarda in Sardinia, Silana in Calabria, and the Giustino Mine. Other mines were at Dervio and Vibo Valentina.

Fluorspar.—Production of fluorspar in Italy has been decreasing since 1984. There remained six mines in operation in 1989: two in Sardinia, operated by Mineraria Sulcis S.p.A., at Genna Tres Montes, and Muscadroxiu; and four in the Latium/-Lazio area—Soricom S.p.A. operated the mine at Pianciano, and IPIM S.p.A. operated mines at Prato del Casone and Acquaforte e Valentano.

Potash.—The production of potash has continued to increase in the past 4 years. All potash undergound mines are in Sicily.

Pumice.—Italy produces one-half of the world's pumice. The Mediterranean island of Lipari is the focus of the Italian pumice industry. The rock is a highly vesicular pumice, composed almost entirely of glass with little weathered, altered, or devitrified material. A sample typically contains 71% SiO_2, 13% Al_2O_3, and close to 2% Fe_2O_3. Two companies in Italy quarry pumice for world markets—Italpomice S.p.A. and Pumex S.p.A. Pumex is Italy's largest producer, with 650,000-ton capacity. The company quarries the Mount Pelato deposit on Lipari.

Salt.—Italy's three major salt producers are Italkali Societa Italiana, Amministrazione Autonoma dei Monopoli de Stato, and S.p.A. Ing. Luigi Conti-Vecchi. Salt was produced at seven areas in Italy. Italkali, in Sicily, is a major producer of salt rock, with underground mines at Racalmuto and Realmonte in Agrigento, Petralia in Palermo, and Pasquasia in Enna. In addition, Solvay S.p.A. operated mines in Tuscany at Buriano, Ponteginori, and Querceto. Compart S.p.A. operated the Timpa del Salto salt brine chamber at Calabria. The Timpa del Salto subsided in 1989, suspending production in 1989 for several months. The production more or less remained unchanged for the past 18 years.

Stone (Dimension).—Ornamental and dimension stone have been produced in Italy for more than 2,000 years. There are estimated to be between 3,000 to 4,000 dimension stone quarries throughout the country. The production of marble, the most famous dimension stone product, occurs in the town of Carrara in Tuscany, the Lazio region, Lombardy, the Po Valley, Puglia, Sicily, and Venetia. About one-half of the output was in block form.

Forty-five percent of the marble produced was exported.

Mineral Fuels

With indigenous resources scarce and relatively difficult to exploit, foreign operations are central to Italy's state oil company's, Azienda Generali Italiana Petroli-Miniere S.p.A. (AGIP), strategy. AGIP's parent is Ente Nazionale Idrocarbons (ENI), the state minerals and oil holding corporation. AGIP and its associate companies operate Italy's onshore and offshore oil holdings. ENI's energy sector accounts for about 80% of the group's sales volume.

Italy relies heavily on imported energy, satisfying 80% of total demand with purchases from abroad. Italy spent about $16.5 billion in purchasing coal, gas, oil, and electricity from foreign suppliers in 1989.

Italy's Atomic Energy Commission was set up in the late 1950's to undertake research and licensing activities in the field of nuclear power. Following the Chernobyl accident, the Italian Government decommissioned three operational nuclear reactors and stopped work on the nearly completed powerplant near Rome. In 1989, there were two operating nuclear plants. At that time, it was planned that all new power stations would be constructed using coal, oil, or methane fuel.

Coal.—Domestic production of lignite in Italy is based in two mines, the Pietrafitta and Santa Barbara open pit mines, operated by the State Energy Corp., ENEL, for use in domestic electricity generation. The only operational sub-bituminous coal mine in Italy is located in Sulcis, Sardinia, owned by the Carbosulcis S.p.A. of the ENI group. Italy is heavily dependant on imports to meet its coal requirements.

Geothermal Energy.—Most of Italian geothermal energy is traditionally produced in the Larderello and Monte Amiata areas in Tuscany.

Natural Gas and Petroleum.—Natural gas supplied almost 25% of Italy's total energy needs. More than one-quarter of Italy's gas supplies was imported from Algeria through the Trans-Mediterranean gas pipeline, carrying natural gas from Algeria across Tunisia, under the Sicily Straits, to Sicily and the remainder of Italy. The U.S.S.R. also supplied one-quarter of Italy's gas supplies by pipeline through Czechoslovakia and Austria.

INFRASTRUCTURE

Italy has a total of 19,927 km of railroad track, of which 15,982 km is 1.435-meter Government-owned standard gauge. Highways total 294,410 km. The country has 1,703 km of crude oil pipelines, 2,148 km of refined products pipelines, and 19,400 km of gas pipelines. The country's major ports are Ancona, Augusta (Sicily), Cagliari (Sardinia), Genoa, La Spezia, Livorno, Naples, Palermo (Sicily), Piombino, Porto Foxi (Sardinia), Taranto, Trieste, and Venice.

OUTLOOK

The Italian Government's forecast is for 5% growth. Italy seeks to reduce the persistent trade deficits that Italy runs with Eastern European countries, particularly suppliers of oil, gas, and other natural resources such as the U.S.S.R. and Romania. As the 1992 date for a unified European Market nears, Italy is making an effort not only to align its economic policies with those of other major EC economies, but also to implement a series of reforms to enable Italian business to meet new European standards and compete effectively.

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[1]Physical scientist, Division of International Minerals.

OTHER SOURCES OF INFORMATION

Agencies

Ministero dell' Industria, del Commercio e dell' Artiginato (Ministry of Industry, Commerce and Small Business)
Rome, Italy.

Direzione Generale delle Miniere (General Directorate of Mines)
Rome, Italy.

Corpo delle Miniere (Bureau of Mine Inspection)
Rome, Italy.

Publications

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Annuario Statistico Italiano (Italian Statistical Yearbook).

Bolletino Mensile di Statistica (Monthly Bulletin of Statistics).

Relazione sul Servizio Minerario e Statistica delle Industrie Estrative in Italia (Report of the Mineral and Statistical Service of the Extractive Industries), annual.

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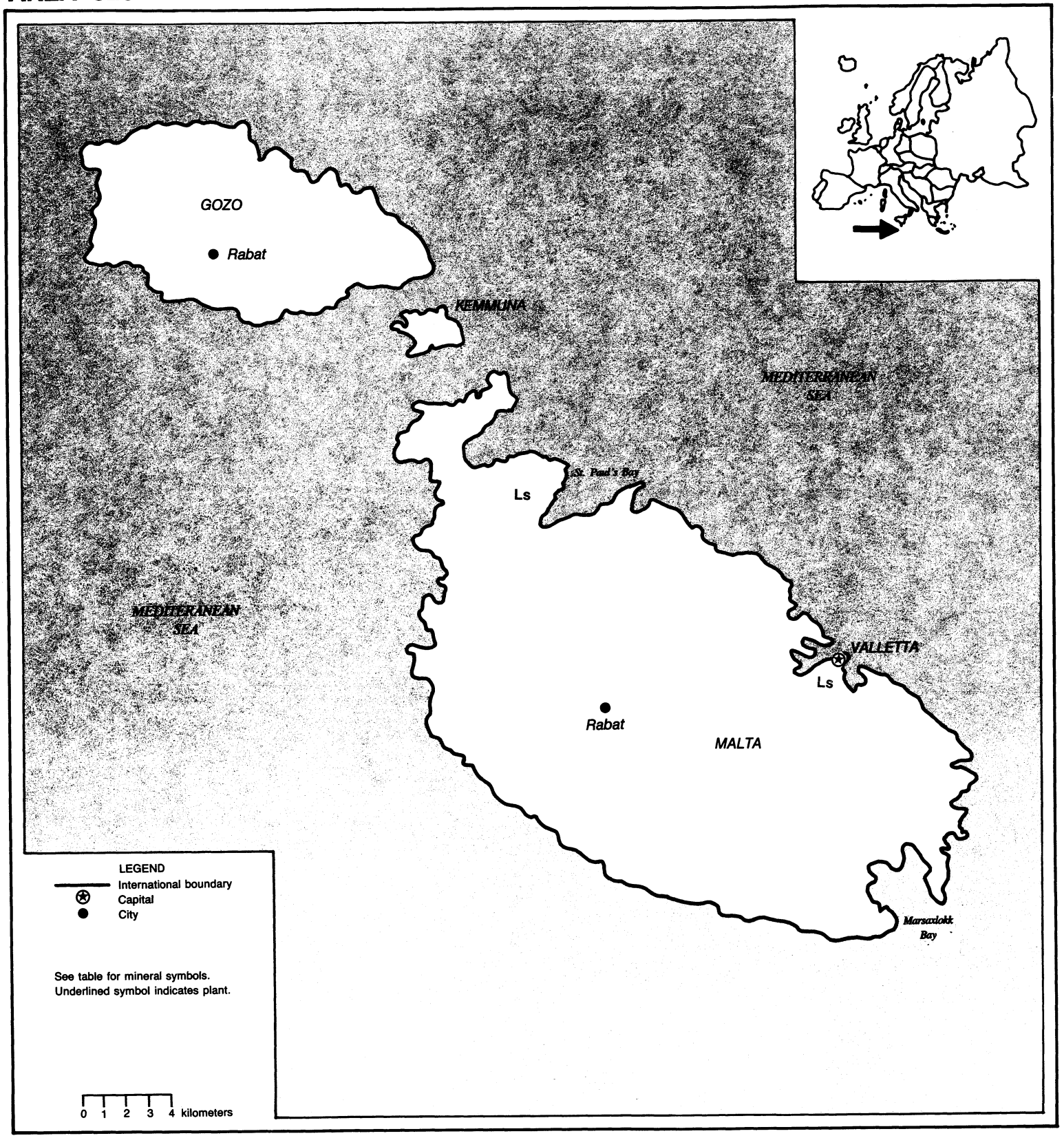
Statistica Annuale del Commercio con l'Estero (Annual Foreign Trade Statistics).

L'Industria Mineraria (Minerals Industry), monthly.

MALTA

AREA 320 km² **POPULATION 357,000**



THE MINERAL INDUSTRY OF

MALTA

By Jozef Plachy

In 1989, the year of the 25th anniversary of Maltese independence, the Government of Prime Minister Eddie Fenech-Adami provided the framework for increased foreign investment in manufacturing, the development of a major offshore business center, and the creation of a free port. All new offshore companies will be eligible for a special low tax rate of 5% and exemption from currency exchange restrictions. To facilitate economic growth, most of the 17% increase in total Government expenditures was invested in a massive program to upgrade the country's infrastructure.[1]

The mineral industry of Malta continued to play a very minor role in the overall economy of the country. The only important mineral extracted was limestone for domestic construction and manufacture of lime. The only other mineral produced in Malta was salt. However, both lime and salt had to be augmented by imports to meet domestic demand. All other minerals needed were imported. In 1989, the quarrying, construction, and oil drilling industries collectively employed 5,065 people, less than 4% of the labor force. However, the more than 3% increase in employment by the minerals sector helped to lower the unemployment rate from 4% in 1988 to 3.7% in 1989. In 1987, according to the latest information available, there were 2,224 companies in Malta with a gross output of $129 million. Of this, the 38 quarrying establishments provided a gross output of $8.6 million, including $3 million in wages and salaries.[2]

Malta is currently an associate member of the European Community (EC). The Government intends to submit a

TABLE 1

MALTA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[p]	1989[e]
Lime	cubic meters	5,500	5,500	5,500	5,500	5,500
Limestone	thousand cubic meters	700	650	600	600	600
Salt	metric tons	100	100	100	100	100

[1]Table includes data available through Aug. 13, 1990.

TABLE 2

MALTA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Aluminum: Metal including alloys:					
Scrap		835	959	—	Italy 930; West Germany 20; Netherlands 9.
Unwrought	value, thousands	$290	$2,018	—	Nigeria $1,584; Italy $223; Cyprus $211.
Semimanufactures	do.	$5,463	$5,187	—	Italy $4,635; West Germany $387; Libya $79.
Copper: Metal including alloys:					
Scrap		r380	688	—	Italy 395; West Germany 109; Belgium-Luxembourg 60.
Semimanfactures	value, thousands	—	$4	—	All to United Kingdom.
Iron and steel: Metal:					
Scrap		10,566	9,803	—	Italy 9,265; United Kingdom 409; Netherlands 54.
Pig iron, cast iron		—	1	—	All to Czechoslovakia.
Semimanufactures:					
Bars, rods, angles, shapes, sections	value, thousands	—	$5	—	Libya $4; Czechoslovakia $1.
Universals, plates, sheets	do.	—	$1	—	All to Italy.

See footnotes at end of table.

TABLE 2—Continued

MALTA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel: Metal—Continued					
Semimanufactures—Continued					
Wire	value, thousands	$17	$51	—	Ireland $32; United Kingdom $16; Austria $2.
Tubes, pipes, fittings	do.	—	$46	—	Italy $39; Libya $7.
Castings and forgings, rough	do.	$317	$1,134	—	Algeria $620; U.S.S.R. $301; Belgium-Luxembourg $202.
Lead: Metal including alloys:					
Scrap		(2)	401	—	United Kingdom 260; Italy 141.
Semimanufactures	value, thousands	—	$2	—	All to Italy.
Nickel: Metal including alloys:					
Scrap		4	11	—	West Germany 6; United Kingdom 5.
Semimanufactures	value, thousands	—	$1	—	All to West Germany.
Silver: Metal including alloys, unwrought and partly worked	do.	—	$2	—	Do.
Tin: Metal including alloys, scrap		(3)	2	—	All to United Kingdom.
Zinc: Metal including alloys:					
Scrap		29	40	—	Italy 22; United Kingdom 18.
Blue powder	value, thousands	$3	—		
Other: Ashes and residues	do.	$8	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Grinding and polishing wheels and stones	do.	$905	$1,011	—	West Germany $465; Australia $218; Yugoslavia $217.
Cement	do.	—	$1	—	All to Tunisia.
Clays, unspecified		—	1	—	All to Saudia Arabia.
Diamond: Natural: Gem, not set or strung	value, thousands	$3,580	$1,903	—	All to Belgium-Luxembourg.
Fertilizer materials:					
Crude, n.e.s.		(4)	2,339	—	United Arab Emirates 2,239; Italy 100.
Manufacutured: Ammonia	value thousands	—	$18	—	All to West Germany.
Stone, sand and gravel: Dimension stone, worked	do.	$35	$48	$2	France $29; United Kingdom $14; Italy $3.
Sulfur: Sulfuric acid	do.	—	$2	—	All to Libya.
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Lubricants	do.	r$739	$706	—	Italy $5; United Kingdom $1; bunkers $699.
Nonlubricating oils	do.	—	$5	—	All to United Kingdom.
Bitumen and other residues	do.	$54	$4	—	All to Saudi Arabia.
Unspecified	do.	$12,188	—		

rRevised.
[1]Table prepared by W. L. Zajac.
[2]Unreported quantity valued at $81,000.
[3]Unreported quantity valued at $3,000.
[4]Unreported quantity valued at $18,000.

TABLE 3

MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides	value, thousands	$49	$68	—	Ireland $51; Netherlands $11; United Kingdom $5.
Metal including alloys:					
Scrap		101	457	12	China 364; United Kingdom 63; Cyprus 17.
Unwrought	value, thousands	$1,078	$5,103	—	Italy $2,305; Netherlands $1,081; West Germany $510.
Semimanufactures	do.	$10,875	$11,182	$49	Italy $8,668; Netherlands $585; United Kingdom $563.
Arsenic: Metal including alloys, all forms	do.	—	$2	—	West Germany $1; Italy $1.
Chromium: Oxides and hydroxides	do.				
Copper: Metal including alloys:					
Unwrought	do.	$20	$1	—	All from Italy.
Semimanufactures	do.	$1,870	$2,412	$40	United Kingdom $1,283; West Germany $421; Italy $171.
Iron and steel:					
Iron ore and concentrate: Pyrite, roasted		(2)	2	—	All from Yugoslavia.
Metal:					
Scrap		329	—		
Pig iron, cast iron, related materials		(2)	16,255	—	Greece 10,212; Albania 5,005; Italy 420.
Ferroalloys:					
Ferromanganese		(2)	16,138	—	United Kingdom 15,784.
Unspecified		—	40,920	—	United Kingdom 22,450; France 18,180.
Steel, primary forms		(2)	5,821	—	United Kingdom 2,478; Greece 2,190; Itlay 1,130.
Semimanufactures:					
Bars, rods, angles, shapes, sections	value, thousands	$4,478	$7,697	$1	United Kingdom $4,187: Italy $1,414; Belgium-Luxembourg $1,239.
Universals, plates, sheets	do.	$7,988	$8,503	$1	West Germany $3,154; Belgium-Luxembourg $1,339; Spain $921.
Hoop and strip	do.	$182	$208	—	West Germany $65; Italy $60; Belgium-Luxembourg $35.
Rails and accessories	do.	$13	—		
Wire	do.	$1,580	$1,788	—	Italy $558; Denmark $345; Poland $259.
Tubes, pipes, fittings	do.	$4,596	$5,862	$2	Italy $1,829; United Kingdom $1,315; Greece $631.
Castings and forgings, rough	do.	$103	$36	—	Czechoslovakia $20; Belgium-Luxembourg $10; United Kingdom $4.
Lead:					
Oxides	do.	$137	$112	—	United Kingdom $66; West Germany $46.
Metal including alloys:					
Unwrought		(2)	111	—	All from United Kingdom.
Semimanufactures	value, thousands	$72	$66	—	United Kingdom $42; Japan $19.
Magnesium: Metal including alloys, semimanufactures	do.	$3	$2	—	All from West Germany.
Manganese: Oxides	do.	—	$1	—	All from Netherlands.
Mercury	do.	$1	$3	—	All from United Kingdom.
Molybdenum: Metal including alloys, all forms	do.	—	$9	$9	

See footnotes at end of table.

TABLE 3—Continued

MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel: Metal including alloys:					
Matte and speiss		—	2	—	All from West Germany.
Unwrought	value, thousands	$104	$2	—	Do.
Semimanufactures	do.	$509	$257	$1	West Germany $191; United Kingdom $41; Greece $24.
Silver: Metal including alloys, unwrought and partly wrought	do.	$197	$251	—	West Germany $178; United Kingdom $73.
Tin: Metal including alloys:					
Unwrought	do.	$1	—		
Semimanufactures	do.	$864	$1,789	—	United Kingdom $1,152; Italy $459; France $117.
Titanium: Oxides	do.	$666	$1,030	$218	United Kingdom $351; West Germany $195.
Tungsten: Metal including alloys, all forms	do.	$27	—		
Uranium and/or thorium: Metals including all forms	do.	$1	$6	—	All from United Kingdom.
Zinc:					
Oxides	do.	$59	$54	—	Netherlands $44; Norway $6; West Germany $3.
Metal including alloys:					
Scrap		29	—		
Unwrought	value, thousands	$105	$258	—	Belgium-Luxembourg $145; United Kingdom $57; France $56.
Semimanufactures	do.	$104	$105	$1	Belgium-Luxembourg $49; United Kingdom $25; West Germany $13.
Other:					
Ores and concentrates	do.	$1	—		
Base metals including alloys, all forms	do.	$11	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	do.	$263	$122	$7	West Germany $34; Turkey $28; Greece $27.
Artificial: Corundum	do.	$45	$40	—	Yugoslavia $36; Italy $3; United Kingdom $1.
Dust and powder of precious and semiprecious stones including diamond	do.	$12	$75	—	United Kingdom $71; Ghana $2.
Grinding and polishing wheels and stones	do.	$803	$834	$3	Italy $362; West Germany $147; Yugoslavia $143.
Barite and witherite	do.	$4	$10	—	United Kingdom $9; West Germany $1.
Boron materials: Oxides and acids	do.	$2	$7	—	Italy $4; France $2.
Cement		158,984	182,364	—	U.S.S.R. 96,194; Bulgaria 52,512; Czechoslovakia 14,701.
Chalk	value, thousands	$90	$84	—	United Kingdom $50; France $16; Switzerland $8.
Clays, crude		567	517	—	United Kingdom 354; Italy 89; West Germany 23.
Cryolite and chiolite	value, thousands	$9	$4	—	All from Yugoslavia.
Diamond:					
Gem, not set or strung	do.	$3,429	$2,917	—	Ghana $1,399; Angola $923; Sierra Leone $214.
Industrial stones	do.	$7	$64	—	United Kingdom $51; Ghana $12.
Diatomite and other infusorial earth	do.	$65	$45	—	Italy $22; West Germany $13; United Kingdom $6.
Feldspar, fluorspar, related materials	do.	—	$1	—	All from Italy.

See footnotes at end of table.

TABLE 3—Continued

MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials: Manufactured:					
Ammonia	value, thousands	$20	$32	—	France $11; United Kingdom $11; Belgium-Luxembourg $6.
Nitrogenous		2,199	1,929	—	Italy 1,749; West Germany 108; Belgium-Luxembourg 46.
Phosphatic		(2)	10	—	Belgium-Luxembourg 8; United Kingdom 2.
Potassic		(2)	11	—	United Kingdom 8; Belgium-Luxembourg 3.
Unspecified and mixed		333	334	—	West Germany 200; United Kingdom 51; France 36.
Graphite, natural	value, thousands	—	$3	—	All from Italy.
Gypsum and plaster	do.	$45	$59	$2	Spain $38; West Germany $9; Italy $5.
Lime		(2)	350	—	United Kingdom 345; Netherlands 5.
Magnesium compounds	value, thousands	$1	$6	—	Italy $3; Norway $1; United Kingdom $1.
Mica:					
Crude including splittings and waste	do.	$27	$5	—	United Kingdom $4; Norway $1.
Worked including agglomerated splittings	do.	—	$3	—	All from United Kingdom.
Nitrates, crude	do.	—	$32	—	All from Belgium-Luxembourg.
Phosphates, crude	do.	—	$1	—	All from United Kingdom.
Pigments, mineral:					
Natural, crude	do.	$6	$9	—	Do.
Iron oxides and hydroxides, processed	do.	$22	$24	—	Denmark $7; United Kingdom $7; Netherlands $5.
Precious and semiprecious stones other than diamond:					
Natural	do.	$13	$12	$3	Switzerland $3; West Germany $2.
Synthetic	do.	$8	$4	$2	West Germany $2.
Pyrite, unroasted		7	—		
Salt and brine	value, thousands	$100	$248	—	United Kingdom $169; West Germany $38; Tunisia $38.
Sodium compounds, n.e.s.: Soda ash, manufactured		78	20	—	All from United Kingdom.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value, thousands	$2,589	$3,118	—	Italy $3,116; Belgium-Luxembourg $1.
Worked	do.	$30	$22	—	Italy $11; Belgium-Luxembourg $4; India $2.
Dolomite, chiefly refractory-grade	do.	$1	—		
Gravel and crushed rock	do.	$828	$878	—	Italy $865; Sweden $5; Belgium-Luxembourg $4.
Quartz and quartzite	do.	$8	$4	—	Belgium-Luxembourg $3; United Kingdom $1.
Sand other than metal-bearing	do.	$77	$123	—	United Kingdom $95; Italy $23.
Sulfur:					
Elemental: Collodial, precipated, sublimed		81	39	—	Italy 38; United Kingdom 1.
Dioxide	value, thousands	—	$2	—	All from Italy.
Sulfuric acid	do.	$82	$237	—	Italy $151; Netherlands $72; United Kingdom $13.
Talc, steatite, soapstone, pyrophyllite	do.	$87	$84	$1	Italy $25; China $20; Norway $19.
Other:					
Crude	do.	$8	$10	$2	United Kingdom $6; Austria $1.
Slag and dross, not metal-bearing	do.	$8	$5	—	All from Greece.

See footnotes at end of table.

TABLE 3—Continued

MALTA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		501	—		
Carbon black	value thousands	$299	$365	$2	Italy $126; West Germany $96; Canada $79.
Coal:					
Anthracite and bituminous		(2)	191,579	—	Spain 76,800; United Kingdom 75,858; West Germany 38,921.
Briquets of anthracite and bituminous coal		(2)	38	—	Australia 32; United Kingdom 6.
Coke and semicoke		(2)	15	—	All from Italy.
Peat including briquets and litter		(2)	350	—	United Kingdom 158; Netherlands 93; Ireland 84.
Petroleum refinery products:					
Mineral jelly and wax	value, thousands	$448	$501	$1	Hungary $265; United Kingdom $98.
Lubricants	do.	$3,207	$4,254	$81	United Kingdom $1,277; Belgium-Luxembourg $1,154; Italy $1,067.
Bitumen and other residues	42-gallon barrels	34,542	69,762	—	Spain 56,522; Austria 12,059; United Kingdom 1,169.
Bituminous mixtures	value, thousands	$413	$133	—	Italy $41; United Kingdom $31; Greece $29.

[1]Table prepared by W. L. Zajac.
[2]Unreported quantity.

formal application to the EC for full membership by the end of 1990. Full membership would be of considerable benefit, especially in the area of trade.

In 1989, Malta's balance of trade showed some improvement. Imports rose by 15%, from $152 million in 1988 to $175 million in 1989. The largest category of imports (61% of the total) consisted of industrial equipment and supplies, while consumer goods were second with a 22% share of total imports. Exports and reexports increased 25% in 1989, from $80 million in 1988 to $99.9 million.

To take advantage of the special financial incentives being offered to foreign investors, a new trading and brokerage company, EXALCO Ltd., was established at the beginning of 1989. The company specializes in aluminum ingot, billet, and scrap. Exalco's plan is to purchase uncut billet from external sources. The metal will be processed—cut, formed, and heat treated—and then marketed in Europe, with Italy as a primary target. The company's potential suppliers of primary metal include Minemet, Elders Exsud, and Inespal. The final feasibility study for this project is presently being carried out.[3]

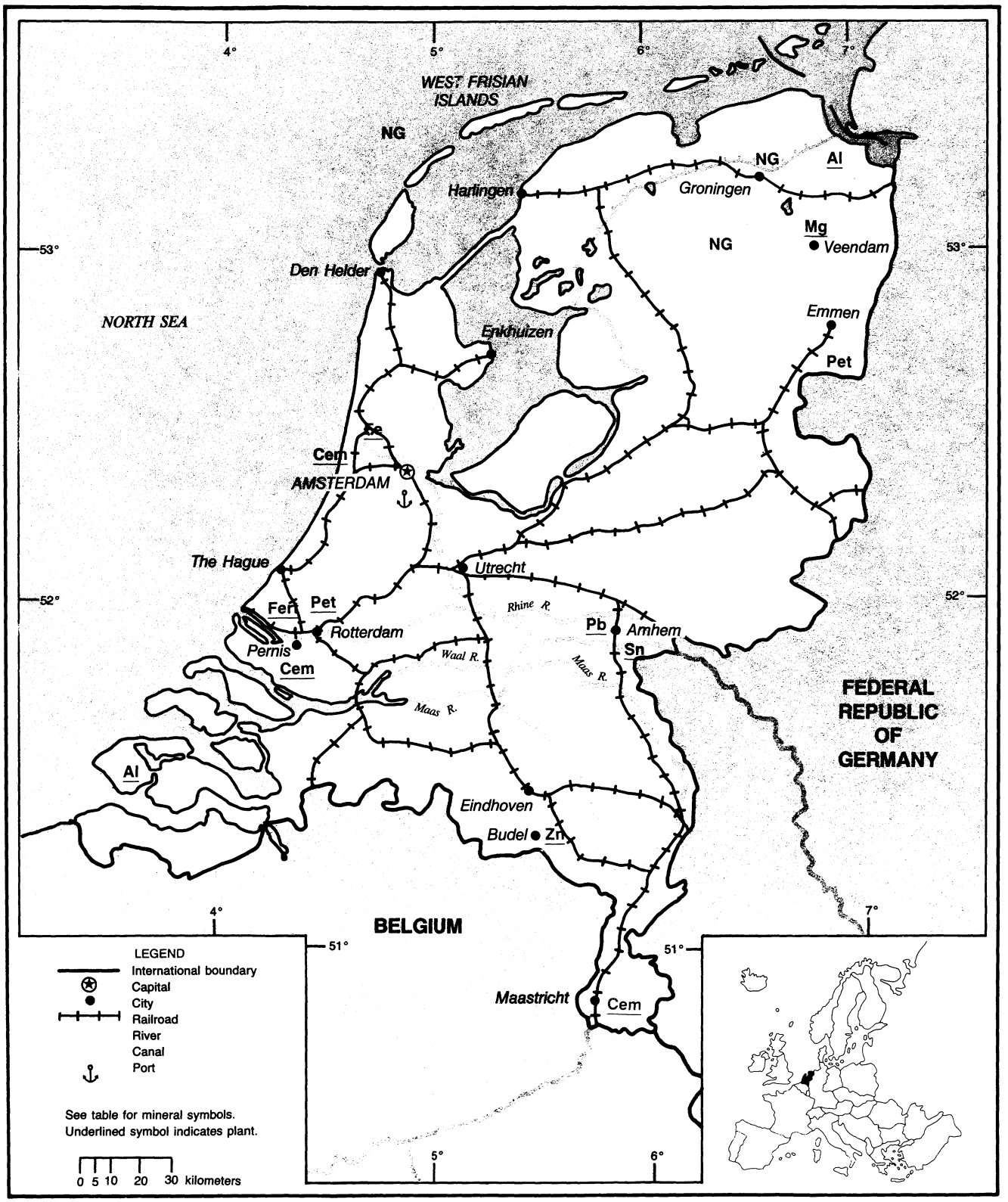
In May 1989, the Government announced that it will soon issue licenses for oil drilling in Maltese territorial waters. This covers a 15,250-square-kilometer area south of Malta.

During the previous year, a number of companies submitted proposals for oil exploration concession rights. One of the companies in contention was American Oil Co. (Amoco).

[1]The Wall Street Journal, Apr. 11, 1989 pp. 7-9.
[2]Abstract—An Annual Statistical Review, 1989, published by The Central Office of Statistics, Malta.
[3]Metal Bulletin No. 7420, Sept. 28, 1989, p. 9.

NETHERLANDS

AREA 34,000 km² **POPULATION 14.8 million**



THE MINERAL INDUSTRY OF

THE NETHERLANDS

By Donald E. Buck, Jr.

The Netherlands is the leading and a significant producer of natural gas in Northern Europe. The mining industry is small and restricted mostly to the mining of industrial minerals. The country's mineral importance is owing to its location and its importance as a processing center for minerals and metals from imported raw materials (see table 1). The redistribution of these products and transshipment of these materials to the interior portion of the continent constitutes a large portion of the industrial and economic base for the country (see tables 2 and 3). The growth of the industries in The Netherlands is therefore dependent on the economic vitality of the other major European economies.

The gross domestic product grew at an estimated 4.5% because of a strong demand in private consumption, growth in investments for plants and equipment, and strength in the export market. The Government's policy to control wage increases and to reduce the budget deficit has meant that the inflation rate of approximately 1% was held in check. Taxes, personal and corporate, were also stabilized. Corporate investment was estimated to be more than 5% ahead of last year's rate, despite higher interest rates. However, new programs initiated by the Government, especially on the environment, will need a source of funding.

GOVERNMENT POLICIES AND PROGRAMS

The Netherlands is one of the leading environmentally concerned countries in Europe. The source of most of the pollution is from industries in neighboring countries either blown in or transported into the country by the rivers. The Rhine River contains hazardous chemicals and transports toxic silts originating from plants in the interior of the continent. These silts must be disposed of by landfill dumping so as not to pollute the coastal sea. With one-third of the country's area covered by water and a substantial population, the country has taken a lead position in the European Community (EC) on environmental issues.

The National Environmental Plan, proposed by the Government, is aimed at drastically reducing all pollution levels over the next 20 years by 70% to 90% and is projected to cost more than $175 billion.[1] This blueprint for preserving the ecosystems is one of the most comprehensive proposals in Europe. However, the plan is supposedly dependant on low energy prices, the conservation of energy, and development of new environmentally safe industries. The first supplement to this plan is the proposed reduction of carbon dioxide (CO_2) emissions by 8% and is to be financed by a levy against CO_2 emissions, costing industry a projected $75 million in the first year. This burden by the "green taxes" on the country's industries, already the second highest burdened country in Europe, is going to impact the competitive and advantageous positions of the industries and economics of the country.

PRODUCTION

The metal and mineral industries maintained a high production rate during the year as economic expansion continued in the country and in the EC. The approximate 5% increase in demand for steel in Europe was because of continued construction activities and general economic growth. Other base metals were also strong, especially aluminum, which was produced at full capacity. Primary tin increased 30%, while zinc decreased slightly. Nitrogen content in ammonia continued with strong growth for the fourth year, while other segments of the fertilizer industry were experiencing over production and competition from imports. Production of crude and refinery products changed little from last year's rate, while natural gas increased slightly. The recycling of material is gaining both impetus and importance in the Netherlands. For example, 53% of the country's national consumption of glass is recycled. As companies are required to comply with environmental constraints, the reduction in competitiveness and production levels may be forecast as plants are modified or closed.

TRADE

The value of exports grew 13% in the first quarter of 1989 over the same period in 1988, contributing to a $2.6 billion accumulated trade surplus for the first three quarters of 1989. This is a 25% increase over that of 1988, and the trade account surplus was estimated to be $5.5 billion for 1989. For the United States, the Netherlands is the eighth largest export market in the world and the third largest in Europe, before France. The United States exports to The Netherlands grew at 17.6%, while imports from that country grew at only 3.3%.

The major mineral commodities imported into The Netherlands were as follows: aluminum ores, coal, iron ores, lead-zinc ores, and petroleum. The aluminum oxides and hydroxides imported into The Netherlands in 1980 (see figure 1) were approximately 50% from the EC countries of Greece and France. In 1988, the last year import/export data are available, the information indicates that the raw material sources have changed to the Caribbean countries of Suriname and Jamaica as a result of the lower cost of raw materials. The importation of zinc ores, however, has changed little during the same time period, with only slight variations in the percentages from each country (see figure 2). Oil imports have steadily increased since the low mark in 1982, when only 279 million barrels of oil was imported. Although the production has increased from 8.7 million barrels in 1980 to a high in 1988 of 30 million barrels of oil (see figure 3), the importation of petroleum for the country's petrochemical and industrial needs exceeded 300 million barrels, ten

TABLE 1

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
METALS						
Aluminum metal:						
Primary		250,603	265,768	275,939	278,198	279,243
Secondary		62,315	96,794	101,403	115,866	130,158
Cadmium metal		598	565	e517	528	505
Iron and steel:						
Ore sintered (from imported ore)	thousand tons	3,737	3,706	3,682	3,935	4,042
Metal:						
Pig iron	do.	4,819	4,628	4,575	4,994	5,163
Steel, crude	do.	5,517	r5,286	5,082	5,518	5,681
Semimanufactures	do.	4,868	4,799	4,709	5,043	5,100
Lead metal, refined, secondary[e]		25,000	33,000	35,700	38,000	42,000
Tin metal, refined:						
Primary		6,033	5,104	3,834	3,478	4,529
Secondary[e]		204	200	180	180	190
Zinc (slab), primary		201,712	196,156	207,111	211,019	202,962
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,911	3,100	2,929	3,100	3,541
Nitrogen: N content of ammonia	do.	2,386	2,185	2,287	2,699	2,906
Salt, all types	do.	4,154	3,763	3,979	3,693	3,756
Sand, industrial	do.	19,988	22,841	22,274	25,999	25,647
Sodium compounds, n.e.s.:[e]						
Soda ash, synthetic	do.	380	380	380	400	400
Sulfate, synthetic	do.	45	45	45	50	50
Sulfur:						
Elemental byproduct:[e]						
Of metallurgy	do.	—	—	—	125	125
Of petroleum and other forms	do.	250	250	211	210	119
Total	do.	250	250	211	335	244
Sulfuric acid, 100% H_2SO_4	do.	1,508	1,209	1,043	1,144	e1,150
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		103,000	104,700	105,500	107,500	114,000
Coke, metallurgical	thousand tons	2,971	2,867	2,736	2,908	2,898
Gas:						
Manufactured[3]	million cubic meters	7,534	7,700	9,216	9,445	10,016
Natural, gross	do.	80,719	74,037	74,247	65,601	71,715
Natural gas liquids	thousand 42-gallon barrels	4,221	4,221	4,278	3,707	e3,800
Peat[e]	thousand tons	450	400	400	300	300
Petroleum:						
Crude	thousand 42-gallon barrels	27,734	34,046	29,243	30,056	26,073
Refinery products:						
Liquefied petroleum gas	do.	22,562	25,230	27,457	26,576	30,357
Gasoline, motor	do.	53,049	60,189	62,254	68,757	70,890
Naphtha	do.	50,133	65,986	75,944	93,866	88,710
Jet fuel	do.	27,800	30,808	31,120	38,408	42,848
Kerosene	do.	3,550	4,658	3,891	4,720	4,123

See footnotes at end of table.

TABLE 1—Continued

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

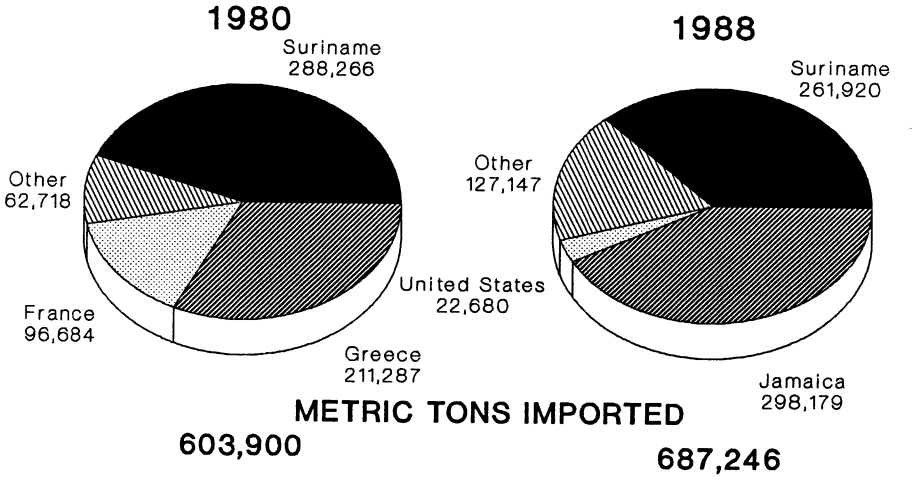
(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Distillate fuel oil	thousand 42-gallon barrels	111,303	147,305	133,549	137,488	129,521
Residual fuel oil	do.	85,901	85,901	92,154	95,464	93,720
Lubricants	do.	5,544	5,117	5,000	5,712	6,223
Bitumen	do.	4,242	5,048	4,545	4,721	4,938
Total[4]	do.	364,084	430,242	435,914	475,712	471,330

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 1990.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, stone, and gravel) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.
[3]Coke oven and blast furnace gas only.
[4]Total of listed products only; other products not included; refinery fuel and losses included in listed products.

FIGURE 1

IMPORTS OF ALUMINUM OXIDES AND HYDROXIDES



Source: U.S. Bureau of Mines

times greater than the production of crude.

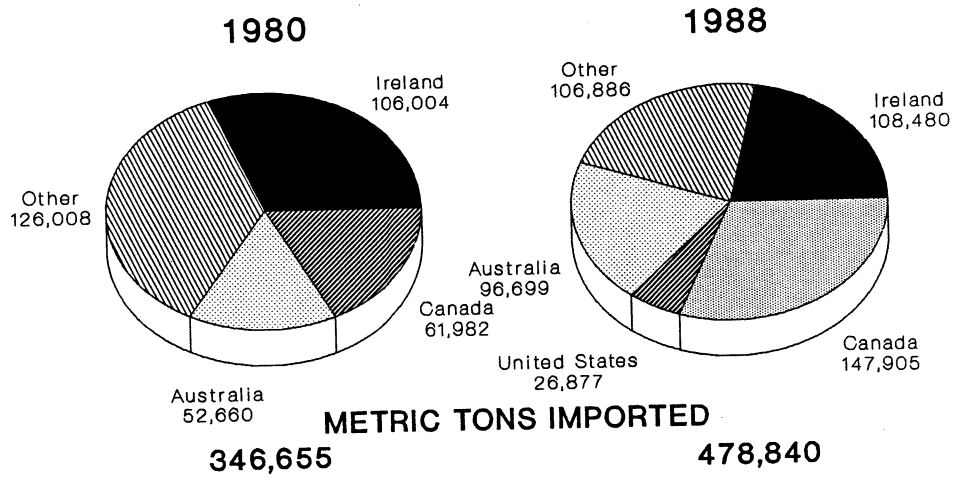
The ports of the Netherlands are important to the overall economy of the country and the economies of countries in the interior of the continent. All of the coal for the domestic steel industry and for the electric generating plants in the Netherlands must be imported. The raw material requirements by inland countries, for example, iron ore for the steel industry of the Federal Republic of Germany, has increased the tonnage handled by the ports. The port of Rotterdam handles more than one-half of the seaborne tonnage trade imports for the Federal Republic of Germany at approximately 85 million tons. Ores were the largest volume of material handled at more than 30 million tons, and oil products were more than 20 million tons (150 million barrels of oil and products). In 1987, the impact of coal handling added approximately $1.00 to the value of coal and $1.50 to transshipment of the product. The port of Rotterdam alone adds $750 million to the national income from products imported and exported through the port.

STRUCTURE OF THE MINERAL INDUSTRY

Most Netherlands companies are privately held (see table 4), and many have international holdings. The Government rarely intervenes and readily accepts

FIGURE 2

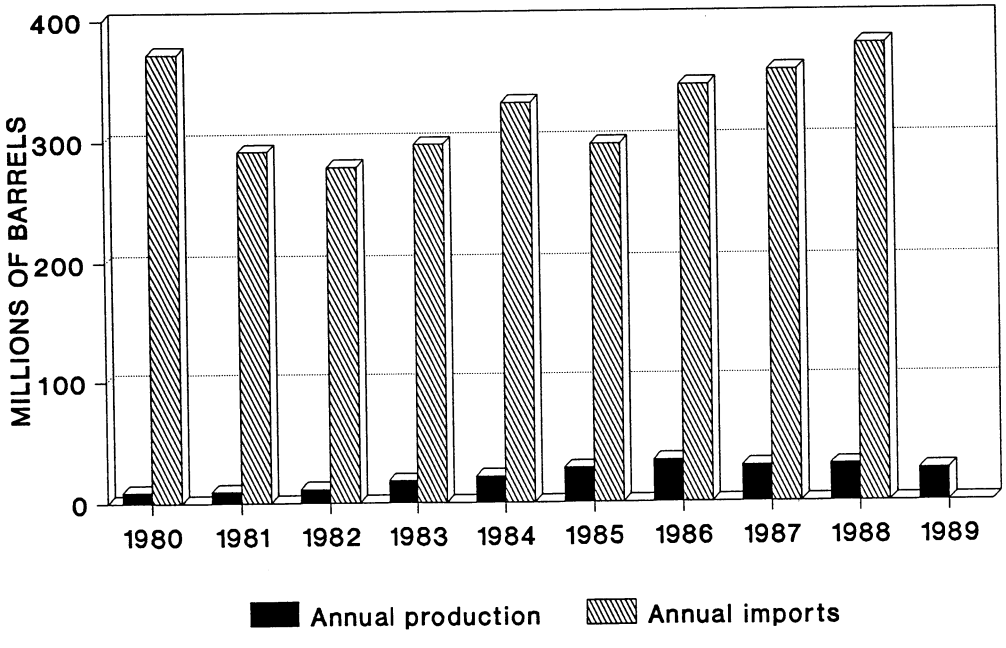
IMPORTS OF ZINC ORES AND CONCENTRATES



Source: U.S. Bureau of Mines

FIGURE 3

THE NETHERLANDS OIL STATUS DOMESTIC AND IMPORTS



Source: U.S. Bureau of Mines

TABLE 2

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$15	$40	—	West Germany $25; France $12; Brazil $3.
Aluminum:				
Ore and concentrate	9,283	17,913	—	Belgium-Luxembourg 9,276; West Germany 3,363; United Kingdom 2,201.
Oxides and hydroxides	62,039	89,054	90	West Germany 49,805; United Kingdom 14,471.
Ash and residue containing aluminum	11,872	20,414	NA	West Germany 15,284; Spain 3,531.
Metal including alloys:				
Scrap	105,385	138,871	637	West Germany 73,280; Belgium-Luxembourg 23,029; France 20,754.
Unwrought	314,389	329,786	791	Belgium-Luxembourg 143,013; France 83,008; West Germany 58,004.
Semimanufactures	134,063	139,199	445	West Germany 53,252; Belgium-Luxembourg 21,449; France 20,171.
Antimony:				
Oxides	453	467	20	West Germany 180; Belgium-Luxembourg 76; France 76.
Metal including alloys, all forms	—	45	—	All to West Germany.
Arsenic: Metal including alloys, all forms	[2]56	24	NA	NA.
Bismuth: Metal icnluding alloys, all forms	17	30	NA	West Germany 13; United Kingdom 5; Israel 3.
Cadmium: Metal including alloys, all forms	842	703	5	United Kingdom 174; Belgium-Luxembourg 172; France 170.
Chromium:				
Ore and concentrate	28,005	31,902	—	West Germany 12,568; France 7,677; Belgium-Luxembourg 2,724.
Oxides and hydroxides	342	338	36	West Germany 110; France 75; Belgium-Luxembourg 62.
Cobalt:				
Oxides and hydroxides	123	41	—	East Germany 10; France 4; Portugal 4.
Metal including alloys, all forms	39	47	—	United Kingdom 20; Spain 11; Sweden 7.
Columbium and tantalum: Metal including alloys, all forms	15	11	7	West Germany 4.
Copper:				
Ore and concentrate	17	200	NA	France 150; Belgium-Luxembourg 29.
Matte and speiss including cement copper	60	92	80	Portugal 8.
Oxides and hydroxides	125	124	NA	West Germany 39; Venezuela 13; Taiwan 11.
Sulfate	2,370	5,331	NA	Belgium-Luxembourg 1,740; West Germany 1,302; France 778.
Ash and residue containing copper	6,789	8,423	—	Belgium-Luxembourg 4,451; West Germany 2,874.
Metal including alloys:				
Scrap	83,853	96,744	58	West Germany 45,636; Belgium-Luxembourg 35,910.
Unwrought	7,371	6,772	1,199	West Germany 3,855; United Kingdom 678.
Semimanufactures	56,046	61,401	18,326	West Germany 11,122; Untied Kingdom 6,644.
Gallium, indium, and thallium: Metal including alloys, all forms	2	9	[3]	France 7; United Kingdom 1.
Germanium: Oxides	[3]	[3]	—	All to West Germany.
Gold:				
Waste and sweepings value, thousands	$18,383	$18,222	—	West Germany $14,299; Switzerland $2,876.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Gold—Continued				
Metal including alloys, unwrought and partly wrought kilograms	2,556	23,293	NA	Belgium-Luxembourg 18,316; Switzerland 3,623.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	104,917	222,780	—	West Germany 214,448.
Pyrite, roasted	263	110	—	Australia 60; Belgium-Luxembourg 50.
Metal:				
Scrap thousand tons	2,226	2,650	2	West Germany 452; Belgium-Luxembourg 449; India 406.
Pig iron, cast iron, related materials	11,182	4,432	—	Belgium-Luxembourg 4,020.
Ferroalloys:				
Ferrochromium	7,159	—		
Ferromanganese	1,125	112	—	Belgium-Luxembourg 50.
Ferromolybdenum	224	387	—	France 188; West Germany 100; Belgium-Luxembourg 56.
Ferrosilicochromium	—	90	—	All to Malaysia.
Ferrosilicomanganese	279	303	—	West Germany 278.
Ferrosilicon	1,224	363	36	West Germany 208; Belgium-Luxembourg 54.
Ferrotitanium	2,294	1,375	—	West Germany 601; Sweden 321; Japan 216.
Ferrovanadium	—	58	—	U.S.S.R. 32; West Germany 19.
Silicon metal	3,249	3,708	—	France 2,368; West Germany 1,221.
Unspecified	325	1,118	—	Belgium-Luxembourg 1,097.
Steel, primary forms thousand tons	2,250	2,285	282	Belgium-Luxembourg 386; West Germany 290; Italy 285.
Semimanufactures:				
Bars, rods, angles, shapes, sections	593,940	640,083	9,724	West Germany 275,642; Belgium-Luxembourg 199,245.
Universals, plates, sheets thousand tons	1,786	2,132	141	West Germany 499; Belgium-Luxembourg 464; United Kingdom 279.
Hoop and strip	108,723	—		
Rails and accessories	31,871	28,089	(3)	Italy 18,420; Iran 4,760; West Germany 2,402.
Wire	75,324	64,871	503	Belgium-Luxembourg 21,873; France 15,242; West Germany 14,634.
Tubes, pipes, fittings	415,406	507,945	10,654	West Germany 130,228; Belgium-Luxembourg 77,080; United Kingdom 71,957.
Castings and forgings, rough	19,024	41,626	864	West Germany 13,615; Belgium-Luxembourg 12,285; United Kingdom 9,272.
Lead:				
Oxides	4,644	4,932	8	West Germany 2,890; United Kingdom 901; Yugoslavia 388.
Ash and residue containing lead	5,340	2,997	—	Belgium-Luxembourg 1,235; West Germany 1,216; United Kingdom 495.
Metal including alloys:				
Scrap	16,173	20,917	—	France 7,573; Belgium-Luxembourg 6,153; West Germany 4,582.
Unwrought	22,622	16,113	—	West Germany 10,236; United Kingdom 1,475; Belgium-Luxembourg 1,375.
Semimanufactures	3,087	3,217	3	Belgium-Luxembourg 835; United Kingdom 679; Norway 640.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Lithium: Oxides and hydroxides		—	17	NA	France 12.
Magnesium: Metal including alloys:					
Scrap		1,032	1,165	498	West Germany 272; United Kingdom 205.
Unwrought		5,430	6,212	—	West Germany 3,033; United Kingdom 1,445; Turkey 1,047.
Semimanufactures		44	106	—	Italy 63; United Kingdom 23.
Manganese:					
Ore and concentrate, metallurgical-grade		51,917	57,035	—	Belgium-Luxembourg 9,524; West Germany 9,261; Republic of South Africa 5,708.
Oxides		—	560	—	France 305; West Germany 126; Belgium-Luxembourg 90.
Metal including alloys, all forms		1,100	1,313	NA	France 587; Switzerland 165; West Germany 134.
Mercury		50	96	1	France 21; West Germany 21; Spain 17.
Molybdenum:					
Ore and concentrate		8,694	15,953	95	United Kingdom 4,136; West Germany 3,009; Austria 1,730.
Oxides and hydroxides		1,455	2,211	NA	Austria 1,307; West Germany 454.
Metal including alloys:					
Scrap		9	38	—	West Germany 23.
Unwrought		31	9	2	West Germany 7.
Semimanufactures		382	219	6	Belgium-Luxembourg 136; West Germany 23.
Nickel:					
Matte and speiss		2,986	NA		
Oxides and hydroxides		NA	NA		
Ash and residue containing nickel		3,196	3,877	NA	Austria 1,164; West Germany 626; Finland 533.
Metal including alloys:					
Scrap		3,433	6,740	71	Finland 4,710; Sweden 801.
Unwrought		650	400	—	West Germany 167; Austria 52; Italy 40.
Semimanufactures		354	506	1	West Germany 318; France 30.
Platinum-group metals:					
Waste and sweepings	value, thousands	$37,402	$33,084	—	West Germany $13,467; France $9,427; Belgium-Luxembourg $6,983.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	—	423	8	West Germany 207; France 86; Denmark 60.
Platinum	do.	1,233	1,560	4	West Germany 934; Belgium-Luxembourg 155; Italy 117.
Rhodium	do.	—	51	—	France 21; Belgium-Luxembourg 11; West Germany 8.
Iridium, osmium, ruthenium	grams	—	7,830	—	Denmark 3,277; Belgium-Luxembourg 3,143.
Unspecified	kilograms	534	—		
Selenium, elemental		37	29	NA	Japan 9; West Germany 6; United Kingdom 6.
Silver:					
Waste and sweepings[4]	value, thousands	$13,225	$9,432	$33	West Germany $4,978; United Kingdom $1,388; France $1,240.
Metal including alloys, unwrought and partly wrought	kilograms	93,456	113,272	359	West Germany 67,288; France 15,554.
Tellurium, elemental		—	2	NA	Mainly to United Kingdom.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Tin:					
Ore and concentrate		—	77	—	Belgium-Luxembourg 33; United Kingdom 19; Austria 17.
Oxides		16	15	NA	West Germany 6; Belgium-Luxembourg 3; United Kingdom 3.
Ash and residue containing tin		1,018	700	—	West Germany 466; United Kingdom 178.
Metal including alloys:					
Scrap		197	380	3	Belgium-Luxembourg 249; United Kingdom 74; West Germany 54.
Unwrought		2,488	1,909	—	West Germany 585; Spain 467; France 295.
Semimanufactures		768	789	1	West Germany 338; France 154; United Kingdom 69.
Titanium:					
Ore and concentrate		67,335	55,234	—	West Germany 9,096; France 6,358; U.S.S.R. 5,700.
Oxides		3,588	1,970	—	France 148; West Germany 128; unspecified 1,477.
Metal including alloys:					
Scrap		—	70	—	United Kingdom 49; West Germany 19.
Unwrought		—	13	NA	Mainly to West Germany.
Semimanufactures		48	21	1	France 8; Belgium-Luxembourg 3; United Kingdom 3.
Tungsten:					
Ore and concentrate		82	165	—	All to West Germany.
Metal including alloys:					
Scrap		348	266	251	Sweden 10.
Unwrought		9	32	7	West Germany 19; Austria 5.
Semimanufactures		456	300	13	Belgium-Luxembourg 181; West Germany 33.
Uranium and thorium:					
Oxides and other compounds	kilograms	10,163	7,128	220	United Kingdom 2,926; West Germany 2,750; Sweden 1,164.
Metal including alloys, all forms	value, thousands	$5	$22	—	All to United Kingdom.
Vanadium: Oxides and hydroxides		—	6	—	All to Yugoslavia.
Zinc:					
Ore and concentrate		—	863	—	Belgium-Luxembourg 758.
Oxides		NA	NA		
Blue powder		598	617	—	Belgium-Luxembourg 368; West Germany 77.
Matte		2,640	2,153	NA	West Germany 1,954.
Ash and residue containing zinc		15,663	15,325	NA	Belgium-Luxembourg 6,657; Mexico 3,077; West Germany 2,511.
Metal including alloys:					
Scrap		17,542	23,652	—	West Germany 10,463; Belgium-Luxembourg 7,627; Taiwan 2,503.
Unwrought		185,077	183,641	9,518	West Germany 54,154; United Kingdom 45,889; France 30,393.
Semimanufactures		5,702	6,242	8	West Germany 3,062; France 1,409; Belgium-Luxembourg 824.
Zirconium:					
Ore and concentrate		23,788	14,742	18	West Germany 4,053; Belgium-Luxembourg 2,781; East Germany 1,563.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Zirconium—Continued					
Oxides		34	38	—	East Germany 30.
Metal including alloys:					
Scrap		—	33	—	All to United Kingdom.
Semimanufactures	value, thousands	$55	$106	—	West Germany $54; France $49.
Other:					
Ores and concentrates		199	570	—	West Germany 435; Belgium-Luxembourg 108.
Oxides and hydroxides		11	186	NA	France 80; West Germany 21; Italy 19.
Ashes and residues		8,681	3,867	43	United Kingdom 931; West Germany 662; Belgium-Luxembourg 515.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		9,343	6,958	107	Thailand 1,815; United Kingdom 715; Belgium-Luxembourg 616.
Artificial:					
Corundum		195	1,318	—	Republic of South Africa 536; West Germany 385; Sudan 100.
Silicon carbide		NA	NA		
Dust and powder of precious and semiprecious stones including diamond	kilograms	116	—		
Grinding and polishing wheels and stones		6,430	7,925	4	West Germany 2,243; United Kingdom 1,638; France 1,058.
Asbestos, crude		238	79	—	Denmark 40; West Germany 16.
Barite and witherite		62,765	80,545	369	United Kingdom 47,132; West Germany 17,237; Denmark 5,973.
Boron materials:					
Crude natural borates		38,335	35,881	—	Belgium-Luxembourg 2,230; unspecified 30,396.
Oxides and acids		731	1,018	NA	NA.
Bromine		686	724	—	France 339; Belgium-Luxembourg 114; West Germany 108.
Cement		419,677	481,388	146	Belgium-Luxembourg 251,312; West Germany 141,019; United Kingdom 43,758.
Chalk		19,163	23,698	—	Belgium-Luxembourg 22,239.
Clays, crude:					
Bentonite		28,045	39,936	—	Belgium-Luxembourg 15,015; West Germany 13,321.
Chamotte earth		726	1,316	—	West Germany 1,015; Belgium-Luxembourg 204.
Fuller's earth		991	—		
Kaolin		143,393	140,380	—	Belgium-Luxembourg 95,414; West Germany 28,208.
Unspecified		128,666	177,105	5	Belgium-Luxembourg 133,609; West Germany 40,410.
Cryolite and chiolite		211	167	—	West Germany 164.
Diamond:					
Gem, not set or strung	carats	515,368	394,534	59,461	Switzerland 187,246; Israel 32,590.
Industrial stones	do.	1,023,087	898,393	84,322	Belgium-Luxembourg 179,376; Switzerland 173,055; Hong Kong 148,515.
Dust and powder	kilograms	—	17	—	Japan 6; Denmark 4.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diatomite and other infusorial earth		831	586	—	Belgium-Luxembourg 258; Lebanon 66.
Feldspar, fluorspar, related materials:					
Feldspar		1,364	1,216	—	France 938.
Fluorspar		461	1,863	—	Spain 703; Hungary 487; Belgium-Luxembourg 376.
Unspecified		18,659	24,786	—	West Germany 12,875; Belgium-Luxembourg 4,731; France 4,067.
Fertilizer materials:					
Crude, n.e.s.		144,703	161,175	—	Belgium-Luxembourg 96,918; West Germany 35,150; France 28,446.
Manufactured:					
Ammonia	thousand tons	1,013	1,142	—	Belgium-Luxembourg 297; United Kingdom 221; West Germany 195.
Nitrogenous	do.	4,217	4,150	351	France 1,034; West Germany 854.
Phosphatic	do.	381	315	(3)	United Kingdom 89; France 88; West Germany 43.
Potassic	do.	74	109	(3)	West Germany 54; Belgium-Luxembourg 46.
Unspecified and mixed	do.	1,309	1,415	(3)	France 310; West Germany 240; United Kingdom 199.
Graphite, natural		514	1,283	—	West Germany 624; France 262.
Gypsum and plaster		109,923	84,611	—	Belgium-Luxembourg 78,362; West Germany 4,957.
Iodine		6	7	—	West Germany 3; Belgium-Luxembourg 1.
Kyanite and related materials		3,186	927	—	West Germany 550; United Kingdom 185; France 120.
Lime		4,044	3,229	—	Belgium-Luxembourg 1,595; West Germany 458.
Magnesium compounds:					
Magnesite, crude		2,260	2,224	—	West Germany 1,558; Belgium-Luxembourg 178.
Oxides and hydroxides		34,614	37,570	1,190	West Germany 22,738; France 2,606.
Sulfate		1,049	622	—	West Germany 400.
Mica:					
Crude including splittings and waste		1,671	997	—	Norway 157; France 129; Belgium-Luxembourg 128.
Worked including agglomerated splittings		9	32	—	Saudi Arabia 25; Italy 2.
Nitrates, crude		302	1,148	—	West Germany 841; Belgium-Luxembourg 105.
Phosphates, crude		137,637	158,586	—	West Germany 146,890; Norway 5,937.
Phosphorus, elemental		NA	NA		
Pigments, mineral:					
Natural, crude		230	493	—	West Germany 317.
Iron oxides and hydroxides, processed		7,224	7,341	905	West Germany 2,194; France 1,645.
Potassium salts, crude		56	—		
Precious and semiprecious stones other than diamond:					
Natural	kilograms	2,144	2,650	—	West Germany 1,259.
Synthetic	do.	1	30	(5)	Hong Kong 9.
Pyrite, unroasted		6	39	—	France 17; Saudi Arabia 16.
Salt and brine	thousand tons	2,659	2,777	(3)	Belgium-Luxembourg 677; unspecified 2,012.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		137,743	160,298	—	West Germany 68,278; Belgium-Luxembourg 21,281.
Sulfate, manufactured		10,944	16,308	NA	West Germany 4,055; Belgium-Luxembourg 2,000; France 1,927.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	24	33	(3)	West Germany 27; Belgium-Luxembourg 4.
Worked	do.	78	64	(3)	West Germany 42; Belgium-Luxembourg 16.
Dolomite, chiefly refractory-grade	do.	22	24	—	Belgium-Luxembourg 13; West Germany 7.
Gravel and crushed rock	do.	2,337	3,272	(3)	Belgium-Luxembourg 3,018; West Germany 188.
Limestone other than dimension	do.	—	5	—	Mainly to Belgium-Luxembourg.
Quartz and quartzite	do.	13	21	(3)	Belgium-Luxembourg 7; West Germany 7.
Sand other than metal-bearing	do.	8,456	10,576	14	Belgium-Luxembourg 10,204; West Germany 271.
Sulfur:					
Elemental:					
Crude including native and byproduct		95,299	92,946	—	Belgium-Luxembourg 84,950; West Germany 6,737.
Colloidal, precipitated, sublimed		—	41	—	Belgium-Luxembourg 30; France 5; Italy 5.
Dioxide		327	2,257	NA	West Germany 1,286; Belgium-Luxembourg 308; France 242.
Sulfuric acid		228,516	190,639	—	Belgium-Luxembourg 96,740; West Germany 85,558.
Talc, steatite, soapstone, pyrophyllite		12,066	12,810	106	West Germany 5,004; Belgium-Luxembourg 4,987; Italy 1,540.
Vermiculite, perlite, chlorite		2,814	2,319	—	West Germany 1,878.
Other:					
Crude		343,915	239,411	183	Belgium-Luxembourg 94,562; West Germany 71,170; France 40,265.
Slag and dross, not metal-bearing		702,724	578,076	1,129	Belgium-Luxembourg 305,041; West Germany 113,897; France 43,884.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		14	1,521	—	Belgium-Luxembourg 1,391.
Carbon black		105,922	110,891	—	France 37,189; West Germany 23,660; Belgium-Luxembourg 19,892.
Coal:					
Anthracite	thousand tons	292	331	—	United Kingdom 123; Belgium-Luxembourg 88; West Germany 41.
Bituminous	do.	1,747	1,416	—	United Kingdom 429; Belgium-Luxembourg 366; West Germany 199.
Briquets of anthracite and bituminous coal	do.	1	3	—	Belgium-Luxembourg 3.
Lignite including briquets		1,336	585	—	West Germany 422; Belgium-Luxembourg 132.
Coke and semicoke		903	899	22	Belgium-Luxembourg 381; France 231; United Kingdom 114.
Gas, natural:					
Gaseous	million cubic feet	1,126,610	982,070	—	West Germany 554,898; Italy 178,243; Belgium-Luxembourg 131,500.
Peat including briquets and litter		352,933	462,135	10	Belgium-Luxembourg 220,479; France 100,900; West Germany 74,780.
Petroleum:					
Crude	42-gallon barrels	6,984	6,341	—	United Kingdom 6,035; West Germany 299.

See footnotes at end of table.

TABLE 2—Continued

NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	9,999	6,904	86	West Germany 2,319; Belgium-Luxembourg 2,002; Italy 742.
Gasoline	do.	87,116	90,406	10,106	West Germany 45,942; Belgium-Luxembourg 12,297.
Mineral jelly and wax	do.	620	764	11	West Germany 216; France 175; United Kingdom 136.
Kerosene and jet fuel	do.	24,105	29,721	182	West Germany 18,028; United Kingdom 2,537.
Distillate fuel oil	do.	129,244	119,643	2,141	West Germany 62,707; Belgium-Luxembourg 27,541; France 8,952.
Lubricants	do.	4,993	5,041	10	Belgium-Luxembourg 903; West Germany 488.
Residual fuel oil	do.	84,475	79,167	3,822	Belgium-Luxembourg 18,155; United Kingdom 10,187; West Germany 9,560.
Bitumen and other residues	do.	1,798	1,847	—	West Germany 578; Norway 397; Belgium-Luxembourg 391.
Bituminous mixtures	do.	219	266	(3)	West Germany 203; Belgium-Luxembourg 32.
Petroleum coke	do.	396	NA		

NA Not available.
[1]Table prepared by P.J. Roetzel.
[2]May include tellurium.
[3]Less than 1/2 unit.
[4]May include other precious metals.
[5]Undisclosed quantity valued at $7,000.

TABLE 3

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	125	150	(2)	France 74; West Germany 66.
Alkaline-earth metals	20	39	—	France 22; Canada 15.
Aluminum:				
Ore and concentrate	141,702	160,273	3,395	Greece 132,398; China 10,812.
Oxides and hydroxides	647,137	687,246	22,630	Suriname 298,179; Jamaica 261,920.
Ash and residue containing aluminum	9,975	14,954	NA	West Germany 6,290; Belgium-Luxembourg 4,997; United Kingdom 1,207.
Metal including alloys:				
Scrap	81,662	105,655	1,691	West Germany 36,062; Belgium-Luxembourg 18,719; Saudi Arabia 8,857.
Unwrought	145,536	167,731	1,648	Norway 52,505; West Germany 34,025; U.S.S.R. 16,179.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued				
Metal including alloys—Continued				
Semimanufactures	149,573	171,408	2,381	Belgium-Luxembourg 53,624; West Germany 51,858.
Antimony:				
Oxides	1,652	1,805	43	France 646; Belgium-Luxembourg 431; China 218.
Metal including alloys, all forms	45	111	NA	Switzerland 45; China 20; Hong Kong 15.
Arsenic:				
Oxides and acids	106	[3]2,137	NA	United Kingdom 1,548; France 576.
Metal including alloys, all forms	[4]58	38	NA	NA.
Beryllium: Metal including alloys, all forms value, thousands	$379	$544	$155	West Germany $388.
Bismuth: Metal including alloys, all forms	25	28	NA	Belgium-Luxembourg 15; Bulgaria 8.
Cadmium: Metal including alloys, all forms	115	102	NA	West Germany 60; France 14.
Chromium:				
Ore and concentrate	17,229	34,477	—	Republic of South Africa 28,885; Finland 3,061.
Oxides and hydroxides	1,569	1,696	498	West Germany 538; United Kingdom 442.
Metal including alloys, all forms	82	155	NA	West Germany 56; France 31; Japan 29.
Cobalt:				
Oxides and hydroxides	372	321	26	Belgium-Luxembourg 164; Finland 99.
Metal including alloys, all forms	156	24	1	Belgium-Luxembourg 9; United Kingdom 6; West Germany 3.
Columbium and tantalum:				
Metal including alloys, all forms:				
Columbium (niobium)	3	—		
Tantalum value, thousands	$185	$129	$5	West Germany $66; Austria $56.
Copper:				
Ore and concentrate	373	570	2	Australia 480.
Matte and speiss including cement copper	150	7	—	West Germany 5; Belgium-Luxembourg 2.
Oxides and hydroxides	598	743	116	United Kingdom 181; Italy 152.
Sulfate	5,239	8,879	NA	U.S.S.R. 2,692; Poland 2,322; West Germany 1,398.
Ash and residue containing copper	2,338	3,348	NA	West Germany 1,608; Cuba 470.
Metal including alloys:				
Scrap	62,487	57,453	805	West Germany 22,745; Belgium-Luxembourg 14,999.
Unwrought	25,124	23,166	223	U.S.S.R. 11,199; West Germany 3,592; Canada 2,142.
Semimanufactures	101,851	106,075	574	West Germany 45,729; Belgum-Luxembourg 36,316; France 10,281.
Gallium, indium, and thallium: Metal including alloys, all forms	[2]	4	—	West Germany 3; Belgium-Luxembourg 1.
Germanium:				
Oxides	1	2	[2]	Belgium-Luxembourg 1; West Germany 1.
Metal including alloys, all forms	1	—		
Gold:				
Waste and sweepings value, thousands	8,212	$3,809	—	Belgium-Luxembourg $3,176; Denmark $393.
Metal including alloys, unwrought and partly wrought kilograms	3,621	3,936	6	United Kingdom 1,649; West Germany 1,086; Belgium-Luxembourg 369.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	7,049	7,562	(2)	Brazil 2,521; Australia 1,532; Norway 1,086.
Metal:				
Scrap do.	1,014	769	3	West Germany 522; Belgium-Luxembourg 149.
Pig iron, cast iron, related materials	56,641	71,897	1,339	West Germany 15,673; Brazil 15,144; U.S.S.R. 13,375.
Ferroalloys:				
Ferroaluminum	325	—		
Ferrocolumbium	53	63	—	Brazil 55; West Germany 8.
Ferrochromium	7,988	1,913	—	Belgium-Luxembourg 733; West Germany 719; Sweden 248.
Ferromanganese	14,274	18,764	20	France 7,916; Norway 7,545; West Germany 2,177.
Ferromolybdenum	278	459	—	United Kingdom 421.
Ferronickel	67	109	—	Sweden 100.
Ferrosilicochromium	56	83	—	West Germany 42.
Ferrosilicomanganese	6,987	7,261	—	Republic of South Africa 4,163; Norway 2,042.
Ferrosilicon	4,847	7,340	—	West Germany 3,663; Norway 1,434.
Ferrotitanium	2,425	1,599	—	U.S.S.R. 1,484.
Ferrovanadium	54	113	—	Belgium-Luxembourg 66; West Germany 38.
Silicon metal	5,629	6,914	NA	Norway 3,068; China 2,142; Brazil 1,170.
Unspecified	1,055	1,841	—	West Germany 888; France 627; United Kingdom 195.
Steel, primary forms	368,484	558,032	75	West Germany 207,998; Belguim-Luxembourg 192,262; Italy 70,140.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,303	1,574	(2)	West Germany 651; Belgium-Luxembourg 381; France 179.
Universals, plates, sheets do.	1,170	1,645	(2)	West Germany 654; Belgium-Luxembourg 602.
Hoop and strip	270,632	—		
Rails and accessories	40,317	37,609	—	West Germany 23,891; France 6,066; Belgium-Luxembourg 4,536.
Wire	98,541	112,794	151	West Germany 54,934; Belgium-Luxembourg 37,848.
Tubes, pipes, fittings	577,466	729,378	3,450	West Germany 365,463; France 94,010; Belgium-Luxembourg 90,408.
Castings and forgings, rough	20,699	29,908	154	West Germany 13,588; Belgium-Luxembourg 6,998; United Kingdom 2,279.
Lead:				
Ore and concentrate	—	1	—	All from Sweden.
Oxides	5,230	4,929	—	West Germany 4,234; France 552.
Ash and residue containing lead	2,227	2,346	—	France 1,549; West Germany 340.
Metal including alloys:				
Scrap	14,021	19,317	91	West Germany 9,523; Cuba 4,967; Belgium-Luxembourg 3,248.
Unwrought	36,022	34,684	—	Belgium-Luxembourg 15,228; France 7,408; United Kingdom 6,150.
Semimanufactures	10,465	10,978	1	Belguim-Luxembourg 9,152; West Germany 1,182.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lithium:					
Oxides and hydroxides		68	65	14	West Germany 28; China 17.
Metal including alloys, all forms		2	—		
Magnesium: Metal including alloys:					
Scrap		1,044	979	55	West Germany 457; France 274; Sweden 125.
Unwrought		6,659	7,597	5,771	Norway 1,048.
Semimanufactures		270	397	77	West Germany 250.
Manganese:					
Ore and concentrate:					
Metallurgical-grade		124,983	53,425	20	Australia 21,942; Gabon 17,748; Congo 12,566.
Oxides		330	663	234	Belgium-Luxembourg 244; West Germany 136.
Metal including alloys, all forms		1,710	2,203	677	Hong Kong 550; Republic of South Africa 12.
Mercury		83	104	—	Norway 30; West Germany 28; Italy 12.
Molybdenum:					
Ore and concentrate		15,985	17,697	11,991	Mexico 2,515.
Oxides and hydroxides		27	10	NA	West Germany 9.
Metal including alloys:					
Scrap		7	6	—	Belgium-Luxembourg 4; France 2.
Unwrought		95	76	20	West Germany 51.
Semimanufactures		100	81	6	Belgium-Luxembourg 66.
Nickel:					
Ore and concentrate		3	94	—	United Kingdom 24; West Germany 20.
Matte and speiss		128,174	NA		
Oxides and hydroxides		145	196	NA	Albania 24; Belgium-Luxembourg 24; Sweden 18.
Ash and residue containing nickel		1,746	2,025	325	West Germany 631; France 340.
Metal including alloys:					
Scrap		2,773	3,138	282	West Germany 946; Belgium-Luxembourg 362; Canada 360.
Unwrought		1,917	1,534	41	Belgium-Luxembourg 751; United Kingdom 217; Norway 161.
Semimanufactures		1,146	1,002	58	United Kingdom 384; West Germany 265; France 105.
Platinum-group metals:					
Waste and sweepings	value, thousands	$2,036	$2,306	—	Belgium-Luxembourg $762; Denmark $721; West Germany $585.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	—	2,280	891	U.S.S.R. 964; West Germany 153.
Platinum	do.	891	1,158	20	West Germany 343; Switzerland 303; United Kingdom 195.
Rhodium	do.	—	30	—	France 26; West Germany 4.
Iridium, osmium, ruthenium	do.	—	155	—	Republic of South Africa 103; West Germany 48.
Unspecified	do.	2,356	—		
Rare-earth metals including alloys, all forms		14	1	NA	NA.
Selenium, elemental		12	30	—	Belgium-Luxembourg 15; Canada 9; West Germany 4.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Silicon, high-purity	22	21	NA	Mainly from West Germany.
Silver:				
Ore and concentrate value, thousands	—	$35	—	West Germany $35.
Waste and sweepings[5] do.	$272	$905	$2	Belgium-Luxembourg $303; Finland $220; Iran $180.
Metal including alloys, unwrought and partly wrought kilograms	126,605	136,982	9,159	United Kingdom 53,413; West Germany 28,571; Spain 24,006.
Tellurium, elemental	—	4	—	Belgium-Luxembourg 3.
Tin:				
Ore and concentrate	5,593	5,608	27	United Kingdom 3,718; Zaire 1,337.
Oxides	222	230	NA	United Kingdom 126; France 44; Italy 41.
Ash and residue containing tin	462	978	23	Brazil 347; Belgium-Luxembourg 142; Iceland 136.
Metal including alloys:				
Scrap	444	309	—	West Germany 176; Italy 42; France 40.
Unwrought	3,113	3,298	—	United Kingdom 1,512; Brazil 516; Belgium-
Semimanufactures	78	112	1	West Germany 73; Belgium-Luxembourg 33.
Titanium:				
Ore and concentrate	64,455	79,837	—	Australia 32,555; Sierra Leone 23,489; Republic of South Africa 10,757.
Oxides	6,860	8,474	252	France 1,686; United Kingdom 1,644; West Germany 1,589.
Metal including alloys:				
Scrap	76	68	16	West Germany 47.
Unwrought	65	183	NA	U.S.S.R. 110; United Kingdom 60.
Semimanufactures	203	102	20	West Germany 42; United Kingdom 21.
Tungsten:				
Ore and concentrate	380	436	—	Portugal 420.
Oxides and hydroxides	6	4	—	Mainly from West Germany.
Metal including alloys:				
Scrap	32	54	NA	Belgium-Luxembourg 18; United Kingdom 11; Switzerland 10.
Unwrought	437	275	254	West Germany 17.
Semimanufactures	86	94	3	Belgium-Luxembourg 75; Austria 7.
Uranium and thorium:				
Ore and concentrate value, thousands	—	$1	—	All from United Kingdom.
Oxides and other compounds	1,791	1,619	—	Canada 578; United Kingdom 797; West Germany 244.
Metal including alloys, all forms value, thousands	—	$1	—	All from France.
Vanadium:				
Oxides and hydroxides	11	13	NA	West Germany 9; Belgium-Luxembourg 4.
Zinc:				
Ore and concentrate	439,522	478,840	26,870	Canada 147,905; Iceland 103,480; Australia 96,699.
Oxides	3,414	3,864	72	West Germany 1,780; China 598; Belgium-Luxembourg 542.
Blue powder	2,274	2,638	—	West Germany 1,116; Norway 886; Belgium-Luxembourg 449.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Matte	220	777	NA	Belgium-Luxembourg 372; West Germany 304.
Ash and residue containing zinc	21,533	21,280	NA	Belgium-Luxembourg 17,075; West Germany 3,243.
Metal including alloys:				
Scrap	7,788	4,176	—	Belgium-Luxembourg 2,083; West Germany 1,178.
Unwrought	27,948	37,415	—	Belgium-Luxembourg 16,236; West Germany 10,702; Finland 4,104.
Semimanufactures	5,656	5,590	—	West Germany 3,156; France 993; Belgium-Luxembourg 912.
Zirconium:				
Ore and concentrate	29,927	27,707	289	Republic of South Africa 13,341; Australia 9,377; Malaysia 2,405.
Oxides	52	43	3	West Germany 22; United Kingdom 16.
Metal including alloys:				
Scrap	—	24	20	France 4.
Unwrought	7	—		
Semimanufactures	[6]5	—		
Other:				
Ores and concentrates	95	—		
Oxides and hydroxides	150	162	2	Taiwan 56; Belgium-Luxembourg 41; West Germany 25.
Ashes and residues	49,866	48,489	123	Canada 46,157; West Germany 1,752.
Base metals including alloys, all forms	10	5	3	France 1; Norway 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	287,053	279,928	41	West Germany 267,898; Turkey 9,658.
Artificial:				
Corundum	7,426	9,306	1,256	West Germany 3,919; United Kingdom 979.
Silicon carbide	2,457	2,319	10	West Germany 2,022.
Dust and powder of precious and semiprecious stones excluding diamond kilograms	[7]265	10	—	Belgium-Luxembourg 4.
Grinding and polishing wheels and stones	4,843	5,367	75	France 1,956; West Germany 1,176; Belgium-Luxembourg 489.
Asbestos, crude	8,718	6,594	73	Canada 3,624; Greece 864; U.S.S.R. 806.
Barite and witherite	88,147	107,033	—	China 95,256; Morocco 6,600.
Boron materials:				
Crude natural borates	54,474	54,326	24,806	Turkey 17,175; Belgium-Luxembourg 11,407.
Oxides and acids	2,375	3,952	1,396	France 1,382; Italy 507.
Bromine	8,267	9,332	—	Israel 8,561.
Cement thousand tons	2,994	3,458	([2])	West Germany 1,700; Belgium-Luxembourg 1,533.
Chalk	93,544	101,991	—	France 45,757; West Germany 39,975; Belgium-Luxembourg 13,754.
Clays, crude:				
Bentonite	67,407	85,396	11,806	Greece 61,166.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued					
Chamotte earth		17,196	20,022	6,033	West Germany 10,884; France 2,962.
Fuller's earth		5,451	11,534	60	West Germany 8,209; United Kingdom 1,681; Spain 1,175.
Fire clay		—	51,603	489	West Germany 44,972; France 4,493.
Kaolin		471,362	465,546	67,506	United Kingdom 148,405; Spain 67,062.
Unspecified		553,100	463,638	433	West Germany 437,594; United Kingdom 9,172.
Cryolite and chiolite		238	449	—	Denmark 347.
Diamond:					
Gem, not set or strung	carats	621,084	735,620	38,033	Panama 261,961; Belgium-Luxembourg 163,771; Iceland 74,264.
Industrial stones	do.	788,194	848,112	108,466	United Kingdom 361,580; Belgium-Luxembourg 200,430; Iceland 131,606.
Dust and powder	kilograms	—	146	—	Belgium-Luxembourg 138.
Diatomite and other infusorial earth		22,034	20,749	2,981	Denmark 15,824.
Feldspar, fluorspar, related materials:					
Feldspar		14,425	11,203	—	Norway 7,674; West Germany 2,048; Italy 1,106.
Fluorspar		30,330	35,963	—	Spain 13,301; East Germany 6,135; Mexico 5,240.
Unspecified		45,425	63,155	27	Canada 47,190; Norway 15,522.
Fertilizer materials:					
Crude, n.e.s.		159,095	203,347	1	West Germany 173,910; Belgium-Luxembourg 27,523.
Manufactured:					
Ammonia		12,387	22,529	2	Belgium-Luxembourg 9,752; West Germany 5,514.
Nitrogenous		762,730	519,934	16	West Germany 134,074; Belgium-Luxembourg 102,901; Spain 68,044.
Phosphatic		217,047	169,049	30	Israel 105,129; West Germany 34,812; Belgium-Luxembourg 20,025.
Potassic		578,763	593,408	18	Israel 245,070; West Germany 126,589; U.S.S.R. 72,756.
Unspecified and mixed		223,624	240,080	365	Belgium-Luxembourg 101,413; Norway 35,207; West Germany 32,669.
Graphite, natural		1,726	2,306	16	China 1,814; West Germany 350.
Gypsum and plaster		509,309	547,509	36	West Germany 269,909; France 115,274; Belgium-Luxembourg 109,513.
Iodine		355	547	—	France 43; West Germany 14.
Kyanite and related materials		5,017	5,636	76	Republic of South Africa 3,835; West Germany 879; France 658.
Lime		841,330	924,078	—	Belgium-Luxembourg 566,995; West Germany 356,341.
Magnesium compounds:					
Magnesite, crude		2,582	12,284	—	China 9,152; Greece 1,089.
Oxides and hydroxides		59,406	75,357	357	China 36,338; Greece 16,135.
Sulfate		31,986	31,146	—	West Germany 28,974; East Germany 1,602.
Mica:					
Crude including splittings and waste		2,775	2,142	313	Canada 716; India 317.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Mica—Continued					
Worked including agglomerated splittings		47	45	7	Belgium-Luxembourg 11; West Germany 9.
Nitrates, crude		26,864	19,291	—	Chile 10,007; Belgium-Luxembourg 9,284.
Phosphates, crude	thousand tons	2,212	2,460	954	Morocco 826; Israel 316.
Phosphorus, elemental		111	182	NA	Mainly from West Germany.
Pigments, mineral:					
Natural, crude		716	857	—	Austria 539.
Iron oxides and hydroxides, processed		12,004	11,281	79	West Germany 9,619.
Potassium salts, crude		5,672	6,229	—	West Germany 6,150.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	28,967	24,248	8,001	Brazil 7,000; West Germany 4,419.
Synthetic	do.	18,364	8,788	5,646	Japan 2,693.
Pyrite, unroasted		302	411	—	West Germany 234.
Salt and brine		285,188	247,647	27	Belgium-Luxembourg 109,639; West Germany 47,531; Italy 24,090.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		53,126	50,253	(2)	West Germany 47,049; Poland 1,616.
Sulfate, manufactured		45,756	19,482	NA	Belgium-Luxembourg 9,841; West Germany 7,113; Spain 2,003.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	1,382	804	(2)	West Germany 507; Belgium-Luxembourg 236.
Worked	do.	81	89	1	Italy 40; Belgium-Luxembourg 12; Portugal 11.
Dolomite, chiefly refractory-grade	do.	840	757	—	Belgium-Luxembourg 620; West Germany 56.
Gravel and crushed rock	do.	17,713	18,239	(2)	West Germany 11,453; Belgium-Luxembourg 4,839.
Limestone other than dimension	do.	550	654	—	Belgium-Luxembourg 642.
Quartz and quartzite	do.	43	59	(2)	West Germany 43; Norway 12.
Sand other than metal-bearing	do.	7,775	8,221	1	West Germany 6,239; Belgium-Luxembourg 1,784.
Sulfur:					
Elemental:					
Crude including native and byproduct		237,546	171,058	—	West Germany 158,917; Poland 9,161.
Colloidal, precipitated, sublimed		248	398	—	United Kingdom 224; West Germany 127.
Dioxide		5,519	2,421	—	West Germany 1,867; Belgium-Luxembourg 552.
Sulfuric acid		693,119	823,988	2,191	West Germany 325,663; Belgium-Luxembourg 119,296; Poland 106,039.
Talc, steatite, soapstone, pyrophyllite		59,100	78,801	1,653	France 23,633; Sweden 10,381; China 9,626.
Vermiculite, perlite, chlorite		9,183	14,391	—	Greece 9,993; Republic of South Africa 2,246; West Germany 1,766.
Other:					
Crude	thousand tons	968	1,053	1	West Germany 494; Belgium-Luxembourg 472.
Slag and dross, not metal-bearing	do.	1,468	1,770	(2)	West Germany 1,161; Belgium-Luxembourg 607.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,996	3,656	690	Belgium-Luxembourg 2,597; West Germany 353.

See footnotes at end of table.

TABLE 3—Continued

NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Carbon:					
Carbon black		17,752	22,040	3,190	West Germany 12,918.
Coal:					
Anthracite	thousand tons	322	401	6	Republic of South Africa 285; China 43; West Germany 39.
Bituminous	do.	12,266	14,767	4,505	Australia 4,494; Republic of South Africa 1,295.
Briquets of anthracite and bituminous coal	do.	3	6	—	Belgium-Luxembourg 5.
Lignite including briquets	do.	94	73	—	West Germany 69; East Germany 3.
Coke and semicoke	do.	341	378	36	West Germany 88; Poland 59; Belgium-Luxembourg 49.
Gas, natural:					
Gaseous	million cubic feet	75,198	89,773	—	All from West Germany.
Peat including briquets and litter	thousand tons	1,120	1,282	(2)	West Germany 1,186; Finland 37.
Petroleum:					
Crude	thousand 42-gallon barrels	357,029	378,182	—	Iran 76,307; United Kingdom 48,622; Saudi Arabia 48,062.
Refinery products:					
Liquefied petroleum gas	do.	16,453	21,277	(2)	United Kingdom 7,015; Algeria 6,623; Belgium-Luxembourg 2,241.
Gasoline	do.	25,296	33,306	794	Kuwait 8,179; United Kingdom 3,410; U.S.S.R. 2,187.
Mineral jelly and wax	do.	435	369	16	West Germany 141; France 79; United Kingdom 37.
Kerosene and jet fuel	do.	1,573	1,096	25	Belgium-Luxembourg 454; United Kingdom 203; Kuwait 155.
Distillate fuel oil	do.	47,871	38,118	22	U.S.S.R. 23,964; Kuwait 9,547.
Lubricants	do.	2,208	2,181	104	Belgium-Luxembourg 496; France 431; West Germany 306.
Residual fuel oil	do.	23,991	27,555	42	U.S.S.R. 12,061; Belgium-Luxembourg 8,063.
Bitumen and other residues	do.	775	655	(2)	Belgium-Luxembourg 405; West Germany 247.
Bituminous mixtures	do.	197	173	1	Belgium-Luxembourg 127; West Germany 33.
Petroleum coke	do.	2,526	3,014	1,274	West Germany 767; Norway 494.

NA Not available.
[1]Table prepared by P.J. Roetzel.
[2]Less than 1/2 unit.
[3]Includes sulfur trioxide.
[4]May include tellurium.
[5]May include other precious metals.
[6]Includes rhenium.
[7]Includes diamonds.

recommendations and decisions of the EC. The Government's ownership of the chemical company, DSM Industries NV, is being reduced through privatization. The Government has a small percentage ownership in key industries such as aluminum, steel, gas distribution, and offshore petroleum operations. The Geological Survey compiles data on the mining and mineral industry and advises the Minister on the status of reserves. The Directorate of Mines of the Ministry of Economic Affairs regulates mining and petroleum operations.

COMMODITY REVIEW

Metals

Aluminum.—The two aluminum divisions of Hoogovens were combined into

TABLE 4

NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facility	Capacity (thousand metric tons per year unless otherwise noted)
Aluminum	Aluminium Delfzijl NV Aluminium BV	Smelter at Delfziji	96
Do.	Pechiney-Nederland NV (Pechiney, 85%; H. Douglas, 15%)	Smelter at Vlissingen	170
Cadmium	Kempensche Zink-Maatschappij (Zincs de la Campine BV) (Billiton International Metals BV, 50%; Australian Mining and Smelting Co., 50%)	Plant at Budel-Dorplein	650
Cement	Eerste Nederlandse Cement	Plant at Maastricht	2,700
Do.	Cement Fabriek-IJmuiden BV	IJmuiden	1,400
Do.	Cement Fabriek-Rozenburg BV	Rozenburg	920
Do.	Cement Fabriek-Aluminum Co. America (Aluminum Co. of America)	Botlek	200
Lead	Hollandse Metallurgische Industrie Billiton BV (Billiton International Metals BV)	Refinery at Arnhem	35
Natural gas	Nederlandse Aardolie Mij (NAM) (Dutch Shell, 50%; Esso, 50%)	Groningen, Leevwarden, and other onshore gasfields, and several offshore wells in the North Sea	[1]71
Petroleum:			
Crude	do.	Approximately 480 oil-producing wells, including—North Sea Fields—Helm, Helder, Horn, Kotter Logger Rijn	[2]83,700
Do.	do.	Onshore Fields—Schoonebeek, Berkel, Ysselm, Wassenaar, et. al.	[2]18,100
Refineries:	Seven companies, of which the major ones are—		[2]1,700,000
	Shell Nederland Raffinaderij BV	Refinery at Pernis	[2]493,000
	BP Raffinaderij Nederland	Refinery at Rotterdam	[2]476,000
	Chevron Petroleum Maatschappij (Nederland) BV	Refinery at Pernis	[2]272,000
	Esso Nederland BV	Refinery at Rotterdam	[2]238,000
Steel	Hoogovens (Hoogovens Group BV) 80.5% (Government, 13.6; City of Amsterdam, 5.9%)	Plant at IJmuiden	5,400
Zinc	Kempensche Zink-Maatschappij (Zincs de la Campine BV) (Billiton International Metals BV and Australian Mining and Smelting Co.)	Plant at Budel	200

[1]Billion cubic meters per year.
[2]Barrels per day.

the management company of Hoogovens Aluminium BV. This company is responsible for the synergetic activities of the individual operating companies at the plants in Federal Republic of Germany, Hoogovens Aluminium GmbH (Hogal), and in the Netherlands. The division was subdivided into four groups: (1) primary smelters; (2) rolling and extrusion plant at Sidal; (3) Coblenz and Vogt rolling and extrusion plants, Federal Republic of Germany; and (4) foil plants. The headquarters for the company is located in Amstelveen.. Presently, the company's two primary smelters only provide 50% of the company's raw aluminum requirements. To meet the increasing demand for primary aluminum, Hoogovens Groep elected to participate in the Alouette Project in Canada. The company will receive a 20% share in production, equivalent to a projected 43,000 tons of primary aluminum, when the smelter is completed in 1992. Furthermore, the company is involved in a feasibility study related to a proposed smelter on Iceland, called the Atlantal Project. Both of these projects are in areas where the environmental regulations might not be as strict as in the Netherlands. The Aluminum

Div. in the Netherlands spends approximately $10 million on environmental programs.

Cadmium.—The fertilizer plant at Vlaardingen, owned by Windmill Holland A/S, produces 12 tons per year of a high-cadmium-content gypsum byproduct, resulting from the production of phosphoric acid. A $22-million project was initiated to reduce the cadmium content in the gypsum waste product by 95% and by 50% in the phosphate product. However, the equipment was not expected to be installed and operational until 1994. The Government target was for production levels to be reduced to 0.6 ton per year of gypsum byproduct from plants owned by Windmill Holland NV at Vlaardingen and by Kemira Oy at Pernis.

Iron and Steel.—For Hoogovens IJmuiden BV, the increased steel production and an 11% price hike resulted in the company posting $206.4 million in revenues. The company also signed an agreement to modernize its No. 7 blast furnace at the estimated cost of $138 million over the next few years. The preparatory work will take until early 1991, after which the No. 7 furnace will be shut down for several months for refractory relining and design changes to associated facilities.

The liquid metal production of more than 5 million tons at IJmuiden was transported from the blast furnace to two steel furnaces between 500 to 1500 meters away by 450-ton torpedo ladles. However, the use of calcium carbonate for desulfurization causes skull buildup on the torpedoes, which increases maintenance. In 1985, new lining bricks made of bauxite-silicon carbide-carbon (ACS bricks)[2] were installed in one of the torpedo ladles for analysis. The new ACS bricks reduced the refractory consumption from 1.1 kilograms per ton to 0.3 kilogram per ton. The cost benefits of the ACS brick markedly improved after 600 heats over the previously used insulating bricks. In the range of 1,100 to 1,200 heats, the cost per ton of hot metal shipped dropped 50% as compared with the use of bauxite bricks. Furthermore, the operational availability of the ladles increased from 65% to 90% the improved performance of the ACS bricks with a decrease in required maintenance. A new facility was completed in 1989 to manufacture ACS bricks at the Hoogovens' brickplant D.S.F.

A 250,000-ton-per-year (tpy) capacity Galvalume plant was initiated in early 1990 at the IJmuiden plant. The initial production rate was projected to be 155,000 tpy. Three-quarters of the Galvalume production is presently utilized by the construction industry; however, the company has indicated it plans to promote the use of the corrosion resistant metal in other industries.

The Environmental Control Department at IJmuiden has spent $322 million on environmental projects around the steelworks at IJmuiden. An agreement was reached with the authorities in the Province of North Holland whereby the company is to reduce the emissions of dust and other substances that cause acid rain.

Lead.—The Highlands Metallurgische Industrie Billiton BV (HMIB) plant in Arnhem produces approximately 25,000 tons of lead and 3.8 tons of tin from imported ores. The plant's secondary refinery is efficient, and it is operating near capacity. The HMIB lead production from the Netherlands accounted for 17.5% of Billiton's worldwide production.

Magnesium.—Magnesia production of approximately 100,000 tons was from mined salts by the deep solution method at Veendam in the northern Netherlands. Noodelijke Zoutuinning NV and Magnesia International NV, both owned by Billiton Refractories Inc., produced refractory-grade magnesium oxide at the plant and accounted for a large portion of the 152,000 tons of magnesium produced worldwide by Billiton BV.

Molybdenum.—The Climax Molybdenum BV, a division of Amax Inc., operates a 9,100-ton-per-year plant at Zozenburg. This plant produced molybdic oxides and other materials for the steel industry by processing concentrates imported from mines in the United States.

Tin.—Billiton's new tin smelter at Arnhem was started in late 1989; however, because of mechanical problems in the feeding system, the plant was closed for design modifications. The plant was projected to be operational in the spring of 1990 and was designed to start processing 10,000 tons per year of tin concentrates. Lower grades of tin concentrates (20% to 40% contained metal) are to be used in the new furnace, and the plant is to increase the processing tonnage to 14,000 tons when the plant is fully operational. In 1989, the older rotary furnace treated more than 9,000 tons of 40% to 70% tin concentrates, producing 3,500 tons of primary metal. Another advantage of the new plant, utilizing the Csiro process, is that the silicate slag will be environmentally safe and can be used for such purposes as road slag without the environmental damage caused by sodium solution leaching from the slag. Billiton has indicated that the lower range of concentrates will allow the company to produce primary tin instead of solder and remain competitive against the Far Eastern smelters, which use higher grade concentrates. The old furnace might be utilized for lead smelting to increase that capacity at the complex.

Hoogovens Groep BV held discussions with the Norwegian tin-plate producer Norsk Jern Holding A/S regarding the possible acquisition of a minority interest in the company. The Norwegians were thought to desire collaboration with an established EC steel producer with excellent technical expertise in the EC market. For Hoogovens, the venture would benefit its packaging steel operations and have an established market for its hot-rolled coil steel. Norsk Blikkvalseverk uses approximately 130,000 tons of hot-rolled coil, which it presently purchases from various European producers.

Nederlandse Onttinningsfabriek, a subsidiary of Hoogovens Greop BV, is studying the feasibility of utilizing a pyrolysis process to recycle tin from discarded cans. Six million tons of household and trade wastes are generated annually in the Netherlands. The company, in partnership with Vuil Afvoer Maatschappij (VAM), developed the facility to recycle and recover the tin from these wastes.

Zinc.—The Billiton smelter at Budel processes imported ores. In 1988, the 478,840 tons of ore was imported from Canada (147,905 tons), Ireland (103,480 tons), and Australia (96,699 tons). The smelter produced 202,962 tons of zinc in 1989, making The Netherlands one of the major zinc importers and smelters in Europe.

Industrial Minerals

Fertilizer Minerals.—The 1,360-ton-per-day Rozenburg ammonia plant was designed and built in 1967, a few years after the discovery of Netherlands natural gas. Esso (Exxon Chemical Co.) operated

this single-train ammonia plant, which was one of the largest in the world. Since 1982, the ammonia capacity has been increased to 1,700 tons per day. In 1985, the complex was acquired by Kemira Oy of Finland and was further enlarged to include single-train nitric acid, urea, calcium ammonium nitrate, and urea ammonium nitrate production capacities. Over the years, energy conservation at the plant has been one of the key targets of the operators. Energy conservation has kept the plant operating competitively in the declining Western European market.

Salt.—Akzo NV is modernizing its 20-to 50-year-old salt processing plant at Hengelo. The new largely automated plant costing $46.7 million will be completed in 1992. Seventy percent of the salt production is used for industrial purposes, and 30% for specialty uses. Akzo NV operates a 2-million-ton-per-year plant at Delfzil, Netherlands, and plants in Denmark and the Federal Republic of Germany.

Silica.—Akzo NV and PQ Corporation, the United States, formed a 50-50 joint venture for the production and marketing of silica-base products in Europe. The headquarters for the company is to be located in Winschoten, the Netherlands, and will use the existing producing facilities of both companies in Austria and Sweden.

Silicon Carbide.—Elrktroschmelzwerk Delfzijl (ESD), Delfzijl, started desulfurization of emissions at its silicon carbide plant. The designed process is to reduce the sulfur dioxide emissions by 90% and to process the sulfur from the emissions into liquid sulfur at the rate of 2,000 tons per year. The sulfur emissions are to be cut from ESD's own electric powerplant. The new plant conforms to the National Environmental Policy Plan regarding the sulfur emissions. ESD produces 60,000 tons per year of silicon carbide from clean sands and petroleum coke, which are heated to 2,500° C for 7 days.

Mineral Fuels

The breakdown of the energy use in the Netherlands for 1989 was as follows: natural gas, 51%; oil, 35%; coal, 12%; and nuclear, 2%. In 1988, the Netherlands imported a total of 378 million barrels of oil and, of that, imports from the U.S.S.R. totaled 43 million barrels of crude (16.4) and petroleum products (26.6).

Natural Gas.—In the past several years, the Netherlands' offshore has become the second most active drilling area with the highest discovery percentage in the North Sea. To date, the total number of wells drilled is more than 750 wells, and more than 475 of those wells are listed as field wells. The more shallow water depth of the Dutch offshore permits lower costs for exploration and exploitation than in other areas of the North Sea. The extensive pipeline infrastructure expedites the time between the discovery of a field and the marketing of economical reserves. The infrastructure also allows for the development of smaller fields. The Government's policy of promoting the development of smaller fields and of keeping the gas volumes in Groningen field in reserve has facilitated the negotiation of new gas contracts to be finalized more rapidly than in other North Sea producing countries. In 1989, there were several discoveries which could be potentially significant for the Netherlands.

The Nederlandse Aardolie Mij. (NAM), jointly owned by Royal Dutch/Shell Group and Esso, announced a discovery in Block Q/16A, offshore from The Hague. This is the first significant discovery in the South Holland area and the projected production rate is 1 million cubic meters per day (m^3/d).

Ste. Nationale Elf Aquitaine, Petroland BV, tested a 500,000 m^3/d gas discovery in Block K/6, which is close to an existing producing facility. In offset Block K/5A, Petroland BV tested a well at 1 million m^3/d on the northwest-southeast Rotliegendes trend, extending the gas producing basin from the United Kingdom sector into the Netherlands area. This is the second potentially commercial prospect in the relatively unexplored area of the North Sea.

Mobil Producing Netherlands Inc. completed an appraisal well in their evaluation of P/12 Southwest and P/12 Central. This sixth well tested at the combined rate of 793,000 m^3/d from two zones. The production will use the infrastructure on the Mobil operated field P/6, almost 24 miles to the north.

Unocal Netherlands Inc. (80%) and Nedlloyd Energy BV (20%) planned to start production from Haven field in Block Q1 in late 1989. The production from the Vlieland sandstone at about 1,981 meters is projected to reach 4,000 barrels of oil per day.

NAM and Petroland BV let a contract to lay the 259-kilometer, "36-in," $45 million Northern Offshore Gas Transmission Pipeline (NOGAT) from four new fields, F/3, F/15, L/2, and L/12-15, to the shore facilities at Den Helder. The production is projected to start in 1992 at the rate of 48 million cubic meters per year. The reserves of the four fields are estimated at 50 billion cubic meters plus associated liquids.

N.V. Nederlandse Gasunie is responsible for the managing of the gas reserves and the gas energy supply in The Netherlands. The total gas sold in 1989 was 73.6 billion cubic meters,[4] an 11% increase over that of 1988. The natural gas source breakdown is as follows: 39% from Groningen; 23% Netherlands onshore fields; 35% Netherlands sector of the North Sea; and 3% imports from Norway. The Netherlands policy is to give priority to the smaller fields and to use the large reserves and production capacity of Groningen Field as a peak load source of gas. The sales of gas in 1989 to industrial customers supplied directly by Gasunie was 11.6 billion cubic meters and to power stations was 8.7 billion cubic meters, an increase of 2.9 billion cubic meters of gas over that of 1988. The total projected use of natural gas in power generation was estimated at 17 billion cubic meters. Export sales increased from 26.6 billion cubic meters in 1988 to 32.9 billion cubic meters in 1989. The Federal Republic of Germany increased their imports of Netherlands gas from 14.7 billion cubic meters in 1988 to 17.9 billion cubic meters in 1989, and Netherlands gas was reported to account for 30% of the gas market in that country.

Petroleum.—The production of oil since 1980 has increased from 8,724 thousand barrels of oil to 26,073 thousand barrels of oil in 1989. In recent years, the production has declined from its peak in 1986 of 34,046 thousand barrels. The decrease in oil production was the result of the depletion of older onshore fields, many of which were generally found in the mid-1950's, offset by the production start-up from the approximately six offshore fields in the mid-1980's. Of the 83,700 barrels of oil per day production, approximately 75% is from those offshore fields. The onshore production from Schoonebeek field accounts for approximately one-half of the onshore production and is reported to have cumulative production of more than 230 million barrels of oil since its discovery in 1944.

The petroleum refining capacity of the Netherlands, estimated at 1.4 million barrels of oil daily from seven refineries, will be rationalized by the merger of refinery operations at the British Petroleum (BP) plant at the Europoort and the Texaco plant at Pernis. British Petroleum is reported to close a 100,000-barrel-per-day (bbl/d) crude distillation plant. The estimated combined capacities of 644,000 bbl/d reflects a capacity of 437,000 bbl/d from the BP refinery and 207,000 bbl/d from Texaco's refinery. The management company, Rijnmond Raffinaderij, owned 65% by BP and 35% by Texaco, will be able to operate the combined operations of the two refineries more efficiently even though they are 25 kilometers apart.

A 4-year, $400-million contract on the Shell refinery at Pernis was completed. The Hycon residue hydrocracker unit uses Shell technology for demetalizing, desulfurizing, and hydrocracking very heavy residuals.

Reserves

The oil reserves for the Netherlands are 206 million barrels of oil, and gas reserves are estimated at 63 trillion cubic feet (1730 billion cubic meters), second in Western Europe behind Norway at 81 trillion cubic feet. The gas reserves represent approximately 1.5% of the world's reserves. The estimated sustainable production rate of the gas is 25 years. The resources of the other indigenous minerals are less defined and subject to the economics and timely application of the material. Brine solutions, limestone, salt, and sand are the major mineral resources for the country.

INFRASTRUCTURE

Rotterdam, located on the Rhine, is the world's largest and busiest seaport. The port is a major redistribution center for petroleum products and other mineral industries located in the heartland of the continent. Thus, the country has developed an elaborate processing industry of raw materials for transshipment to other locations or for final processing in the Netherlands. The products and services are provided to the rest of the continent by an efficient system of waterways and canals, as well as by roads, pipelines, and railroads, all of which are well developed. Other ports, such as Amsterdam, Delfzijl, Den Helder, IJmuiden, and Vlissingen, have important mineral and metal industries associated with them.

OUTLOOK

The use of natural gas from the Netherlands is expected to increase, requiring the development of new fields and infrastructure to meet those demands. Gasunie is designing new pipelines to the discoveries in the South Holland area of the offshore Netherlands North Sea (offshore from The Hague). Several discoveries were thought to contain 100 to 200 billion cubic feet of gas. The high caloric gas will require blending with nitrogen before it can be suitable for the injection into the pipeline system carrying Groningen gas. Therefore, compression stations, nitrogen separation plants, and pipeline alterations are being designed to accommodate the new gas. Salt caverns at Veendam are to be constructed to store natural gas underground. Gasunie is studying the consequences of the 1992 single market for standardization requirements that would affect their industry.

[1]Where necessary, values have been converted from the Netherlands guilder (f.) to U.S. dollars at the rate of f.2.14 = U.S.$1.00, the average for 1989.

[2]New Refractories for Torpedo Ladles. Hoogovens Groep Bulletin 2, June 1989, p. 7.

[3]N.V. Nederlandse Gasunie 1989 Annual Report, p. 9.

OTHER SOURCES OF INFORMATION

Agencies

Rijks Geologische Dienst
(Geological Survey of the Netherlands)
Spaarne 17
Postbus 157
2000 AD Haarlem.
The Netherlands

Ministrie van Economische Zaken
Inspecteur-Generaal der Mijnen
(Ministry of Economic Affairs, Inspector General of Mines)
P.O. Box 90
2280 AB Rijnswijk
Netherlands tel: (070) 956500.

Centraal Bureau voor de Statisdtiek
Prinses Beatrixiaan 428
Postbus 959
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The Netherlands tel: (070) 3694341.
fax: (070)3877429

Publications

Annual reports:
Amsteredam-Rotterdam Bank N.V.
Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V.

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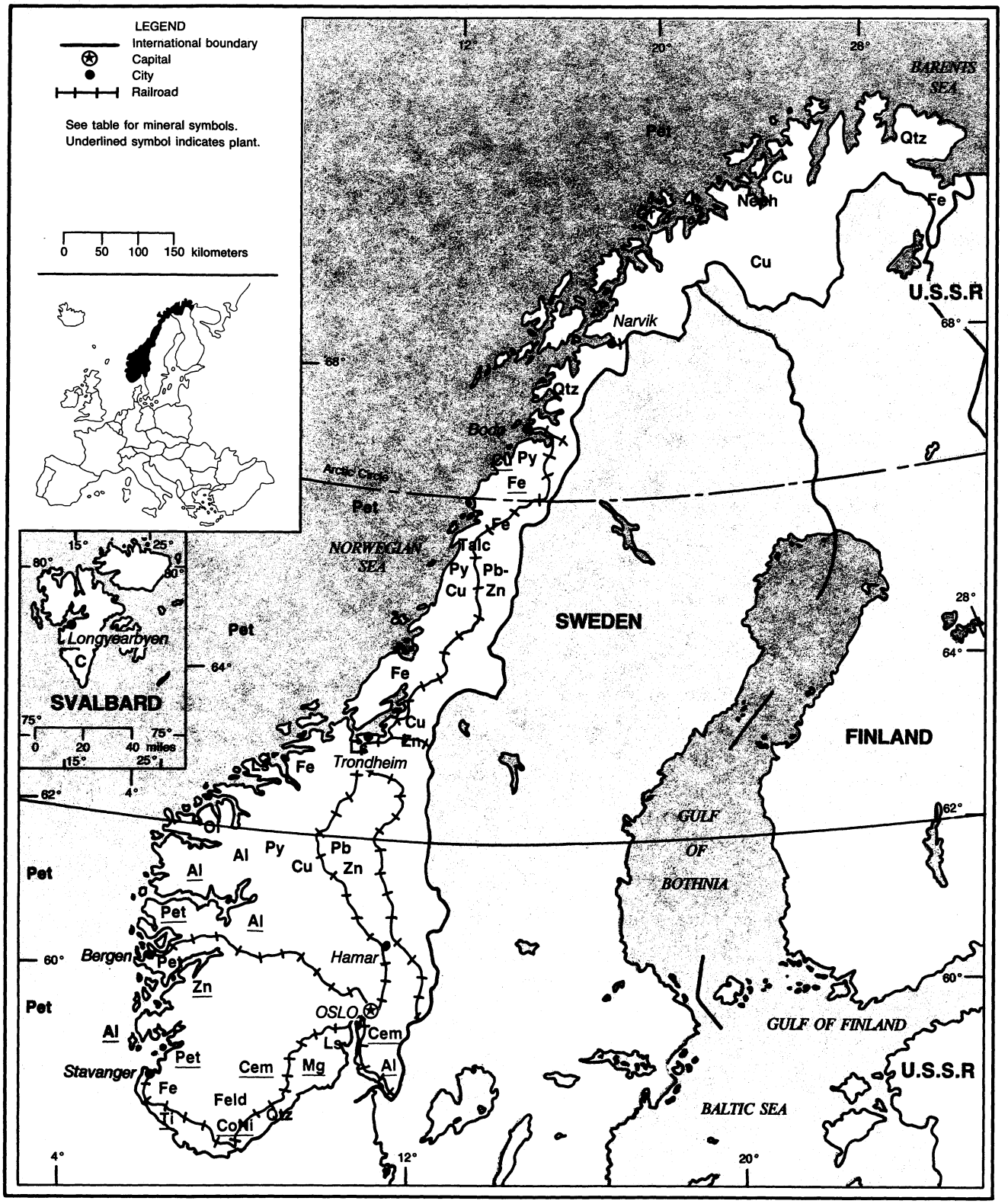
Maandstatistiek van de industrie.

N.V. Koninklijhke Nederlandsche Petroleum Maatschappij (Royal Dutch/Shell).

N.V. Nederlandse Gasunie.

NORWAY

AREA 324,000 km² **POPULATION 4.2 million**



THE MINERAL INDUSTRY OF

NORWAY

By Donald E. Buck, Jr.

The Norwegian minerals industry contributes significantly to the economy of Norway. The backbone of this industry is energy related. Inexpensive hydroelectric energy is readily available and is utilized in the production of metals such as aluminum, magnesium, nickel, and silicon whose production is particularly energy intensive. Furthermore, the discovery and development of petroleum and natural gas resources in the North Sea in the past 20 years has increased the importance of Norway's energy-related base, permitted Norway to develop an important petrochemical industry, and greatly increased Norway's mineral-related exports.

GOVERNMENT POLICIES AND PROGRAMS

The Government has maintained a policy of controlled development of North Sea petroleum resources. The state has operational control in offshore fields and onshore facilities through the state-owned oil company Den norske stats olijeselskap a.s. (Statoil).

PRODUCTION

Crude oil production increased substantially in 1989, whereas natural gas production increased only slightly. Output of ferroalloys increased in response to strong European demand during a period wherein the Norwegian steel industry was rationalized and restructured by the Government. Aluminum and magnesium were produced at near capacity levels, and both production and imports of cement increased in response to increased demand by the domestic construction industry. Olivine output continued to increase in 1989 in response to increased demand.

STRUCTURE OF THE MINERAL INDUSTRY

The Norwegian Government has historically exerted significant control on the petroleum and other natural resource industries of the country. In recent years, however, the Government, in search of greater efficiency, has privatized many operations. Notable examples are Norsk Jern A/S and Norsk Hydro A/S, which were both rationalized and privatized in the past year.

COMMODITY REVIEW

Metals

Aluminum.—Aluminum production reportedly reached record capacity utilization levels of 98% at Elkem A/S's Norwegian plants. Elkem is a 50% partner with Aluminum Co. of America (Alcoa) in two plants in Norway and one in the Netherlands. Modernization of the Mosjoen works was completed in 1989. Aggregate aluminum production at the Mosjoen and Lista plants in 1989 was 194,600 tons—close to the 198,000-ton estimated capacity. The feedstock requirements for the aluminum foundries is reported to be 267,000 tons of aluminum and is being met by the purchase of billets from other producers.

Aluminum production from Norsk Hydro's four wholly owned and two partially owned aluminum plants in Norway provided 60% of the company's requirements for primary aluminum. The 625,000 tons of primary aluminum was produced in the form of rolling slabs, billets, and other shapes. These were utilized in the company's semifabricating plants in 10 countries—mainly in Western Europe.

To meet the company's raw material requirements, Norsk Hydro purchased a 35% interest in the Alpart refinery in Jamaica and a 20% interest in Friaco, which owns a 51% interest in the Friguia refinery in Guinea, Africa. The 350,000 tons of alumina from Jamaica and 120,000 tons from Guinea provide Norsk Hydro with an in-house supply of 470,000 tons of alumina. The Alpart refinery is evaluating the possibility of increasing production capacity by 30%. Norsk Hydro also has an interest in bauxite deposits in Brazil, with long-term contracts that supply Norsk Hydro with alumina.

Norsk Hydro used 218,000 tons of aluminum in its extrusion plants. This was a 1.5% increase in extrusion production over that of 1988, with most of the increase coming from plants in Norway and central Europe. The new extrusion plant in Ulm, Federal Republic of Germany, is expected to be completed in 1990 and add 10,000 tons of additional production capacity to the company.

Norsk Hydro has reportedly continued to reduce emissions from its smelters. However, environmental authorities stipulated that emissions of fluorides at the Sunndal plant need to be reduced 50% during the next 4 years. Emission limits for the Årdal plant are to be announced in the near future.

Ferroalloys.—Norsk Ferrokrom A/S and Norsk Ferro A/S have modernized the Norsk Jern pig iron operations at Mo i Rana. Two old reduction furnaces were replaced by new ferrochrome furnaces. The two new furnaces, built by the Macalloy Corp., will have a total capacity of 100,000 tons per year of high-carbon ferrochrome. One of the new furnaces was started up in September 1989. The second furnace will reportedly start up by the end of the year. Both furnaces will be producing a 62%-chromium, high-carbon ferrochrome. The chief supplier of chromite will be Turkey, with additional imports from Albania, India, and the U.S.S.R.

The Norwegian Government has exempted Elkem from a unilateral trade ban with the Republic of South Africa owing to the company's manganese ore requirements. The company, which has been conducting surveys into alternate sources, announced a joint venture with Brazil's Produtos Metalurgicos S.A. to develop manganese ore deposits in the Carajas region of Brazil. Elkem would reportedly own 40% of the project.

In another manganese ore deal, Elkem disclosed that it had concluded a $154 million[1] agreement with Bulgarian state-owned companies for the purchase of

TABLE 1

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
METALS						
Aluminum:						
Primary		742,686	725,813	806,092	864,190	863,354
Secondary[e]		[2]6,004	6,000	6,000	6,000	6,000
Cadmium, smelter		159	154	147	169	207
Cobalt		1,637	1,574	1,576	1,951	1,946
Copper:						
Mine output, Cu content		18,969	21,887	21,984	15,877	16,497
Metal, primary plus secondary:						
Smelter		37,828	35,202	29,701	31,729	34,980
Refined		31,074	30,457	29,386	31,729	34,980
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	3,497	[r]3,659	3,140	2,644	2,358
Fe content	do.	2,321	2,377	2,040	1,718	1,532
Metal:						
Pig iron	do.	596	564	365	367	240
Ferroalloys:						
Ferromanganese		267,670	195,257	191,992	361,345	220,591
Ferrosilicomanganese		256,457	223,490	237,277	232,501	270,305
Ferrosilicon (75% basis)		397,776	352,572	336,168	380,976	398,744
Total		921,903	[r]771,319	765,437	974,822	889,640
Steel, crude	thousand tons	958	836	837	869	678
Semimanufactures, rolled	do.	664	687	[e]700	[e]700	[e]556
Lead, mine output, Pb content		3,597	3,366	3,100	2,801	3,188
Magnesium, primary		54,704	56,864	56,907	50,317	49,827
Nickel:						
Mine output, Ni content		425	438	496	[e]500	780
Metal, primary		37,513	38,202	44,565	52,547	54,886
Platinum-group metals[3]	kilograms	1,371	[r]1,654	[e]1,555	[e]1,555	[e]1,555
Silicon metal[e]		[2]105,552	100,000	90,000	90,000	100,000
Zinc:						
Mine output, Zn content		27,352	27,508	22,164	17,783	15,023
Metal, primary		92,762	90,475	116,468	121,156	120,404
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	1,343	[r]1,750	1,639	1,428	1,375
Feldspar		80,095	87,257	[e]90,000	[e]90,000	[e]90,000
Gallium[e]	kilograms	—	—	1,000	1,000	1,000
Gold[e]	do.	[r]900	[r]933	933	933	933
Graphite		2,684	—	—	—	1,800
Lime, hydrated, and quicklime[e]	thousand tons	100	100	100	100	100
Mica, flake[e]		4,000	3,000	3,000	3,000	3,000
Nepheline syenite	thousand tons	227	218	242	262	262
Nitrogen: N content of ammonia	do.	458	300	347	424	467
Olivine sand	do.	1,989	2,537	1,912	[e]2,000	2,000
Pyrite	do.	395	380	358	304	244

See footnotes at end of table.

TABLE 1—Continued

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Stone, crushed:[e]						
Dolomite	thousand tons	[2]555	550	550	550	550
Limestone	do.	[2]3,827	4,000	4,000	4,000	4,200
Quartz and quartzite	do.	[2]775	800	800	800	800
Sulfur:						
Pyrite, S content	do.	193	181	179	152	122
Byproduct of:						
Metallurgy	do.	60	67	[e]85	[e]80	[e]75
Petroleum[e]	do.	[2]10	13	10	10	13
Total	do.	263	261	[re]274	[re]242	[e]210
Talc, soapstone, steatite[e]	do.	100	100	100	100	100
Titania:						
Ilmenite concentrate	do.	736	804	852	898	930
TiO_2 content	do.	327	357	378	398	412
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	507	437	448	275	413
Coke, all grades	do.	313	313	284	161	[e]50
Gas, natural:						
Gross	million cubic meters	34,041	31,690	34,437	31,520	31,860
Marketable[4]	do.	27,839	27,555	30,472	[e]30,586	26,054
Marketed[5]	do.	25,431	23,477	28,263	28,405	23,789
Peat:[e]						
For agricultural use	thousand tons	30	30	30	30	30
For fuel use	do.	1	1	1	1	1
Petroleum:						
Crude[6]	thousand 42-gallon barrels	276,700	295,700	344,000	397,947	560,252
Natural gas liquids	do.	16,440	21,720	22,470	27,230	22,707
Refinery products:						
Naphtha	do.	3,834	3,618	4,419	3,363	4,504
Gasoline	do.	11,466	10,548	12,248	11,968	14,917
Kerosene	do.	5,906	5,549	6,402	5,786	6,682
Distillate fuel oil	do.	26,811	27,199	33,756	32,764	34,072
Residual fuel oil	do.	4,942	5,934	6,973	8,032	11,102
Other	do.	3,897	3,380	4,050	[e]4,200	[e]4,300
Refinery fuel and losses	do.	4,277	3,823	3,795	[e]4,000	[e]4,000
Total	do.	61,133	60,051	71,643	[re]70,113	[e]79,577

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 15, 1990.
[2]Reported figure.
[3]Data represent exports, part of which may be derived from imported materials.
[4]Gross less gas reinjected and flared.
[5]Reported as total methane sales.
[6]Excluding natural gas liquids. The crude oil entry in 1985 Norway chapter included natural gas liquids content.

TABLE 2

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,400	2,273	—	All to Sweden.
Oxides and hydroxides	17,764	16,241	NA	United Kingdom 9,791; Yugoslavia 3,386; Switzerland 2,605.
Metal including alloys:				
Scrap	38,156	50,536	NA	West Germany 19,989; Netherlands 9,882; Sweden 8,387.
Unwrought	757,615	754,663	181	West Germany 191,185; Netherlands 111,324; Italy 108,183.
Semimanufactures	100,430	109,905	3,277	United Kingdom 25,943; Sweden 15,081; West Germany 12,823.
Antimony: Ore and concentrate	—	8,605	NA	NA.
Arsenic: Metal including alloys, all forms	80	613	NA	West Germany 498; Italy 40.
Beryllium: Metal including alloys, all forms	(2)	—		
Cadmium: Metal including alloys, all forms	135	140	NA	United Kingdom 80; Sweden 34; Belgium-Luxembourg 20.
Chromium:				
Ore and concentrate	5	32	NA	NA.
Oxides and hydroxides	1	2	NA	NA.
Metal including alloys, all forms	—	(2)	NA	NA.
Cobalt:				
Oxides and hydroxides	—	1	NA	NA.
Metal including alloys, all forms	1,613	1,738	615	Netherlands 400; Japan 260.
Copper:				
Ore and concentrate	115,880	71,858	—	Finland 46,194; West Germany 18,269; Sweden 7,396.
Matte and speiss including cement copper	(2)	—		
Oxides and hydroxides	3,513	3,075	NA	NA.
Sulfate	123	—		
Ash and residue containing copper	3,108	3,831	—	Republic of Korea 1,996; Sweden 1,168; Spain 499.
Metal including alloys:				
Scrap	9,683	10,709	NA	West Germany 4,624; Denmark 1,710; Belgium-Luxembourg 1,548.
Unwrought	30,865	10,236	NA	Sweden 4,326; West Germany 2,938; Finland 2,932.
Semimanufactures	2,794	33,507	913	Sweden 8,211; United Kingdom 6,525; West Germany 6,183.
Germanium: Metal including alloys, all forms	—	(2)	NA	NA.
Gold:				
Waste and sweepings value, thousands	$1,179	$500	NA	Switzerland $156; West Germany $151; Denmark $127.
Metal including alloys, unwrought and partly wrought troy ounces	23,341	22,377	NA	France 9,517; Sweden 7,973; West Germany 2,797.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	2,530	1,757	38	United Kingdom 845; West Germany 298; France 196.
Pyrite, roasted do.	28	36	NA	Denmark 21; Finland 3.

See footnotes at end of table.

TABLE 2—Continued

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal:					
Scrap		11,897	21,373	NA	West Germany 7,917; Netherlands 2,952; Sweden 2,317.
Pig iron, cast iron, related materials		14,453	31,211	2,602	United Kingdom 10,272; Denmark 6,612; Sweden 6,217.
Ferroalloys:					
Ferrochromium		4	—		
Ferromanganese		176,850	204,475	38,436	West Germany 35,160; United Kingdom 26,256.
Ferrosilicomanganese		215,810	199,570	2,864	West Germany 58,268; France 38,637; Belgium-Luxembourg 19,060.
Ferrosilicon		334,761	365,882	14,740	West Germany 110,592; Japan 82,074; United Kingdom 51,368.
Silicon metal		81,066	75,163	3,052	West Germany 30,406; United Kingdom 11,707; Japan 6,948.
Unspecified		11,125	13,313	NA	United Kingdom 2,006; West Germany 1,838; France 1,495.
Steel, primary forms		122,410	70,102	NA	NA.
Semimanufactures:					
Bars, rods, angles, shapes, sections		399,127	NA		
Universals, plates, sheets		149,237	NA		
Hoop and strip		20,059	NA		
Rails and accessories		3,012	NA		
Wire		10,047	NA		
Tubes, pipes, fittings		61,442	NA		
Castings and forgings, rough		3,965	NA		
Lead:					
Ore and concentrate		6,026	4,378	—	All to West Germany.
Oxides		—	(2)	NA	NA.
Metal including alloys:					
Scrap		8,308	9,080	NA	Sweden 7,802; Ireland 622; United Kingdom 217.
Unwrought		35	30	NA	NA.
Semimanufactures		3	41	NA	NA.
Magnesium: Metal including alloys:					
Scrap		149	118	NA	West Germany 93.
Unwrought	value, thousands	$150,645	$132,660	NA	NA.
Semimanufactures		1,202	1,633	1,585	United Kingdom 28; Sweden 21.
Manganese: Ore and concentrate, metallurgical-grade		5	10,000	—	All to France.
Mercury	76 pound flasks	2,118	1,828	NA	Netherlands 1,799.
Nickel:					
Ore and concentrate		8,991	6,914	NA	Finland 6,549.
Matte and speiss		(2)	—		
Oxides and hydroxides		—	24	—	All to West Germany.
Metal including alloys:					
Scrap		91	86	55	NA.
Unwrought		44,125	50,789	19,491	Netherlands 8,544; Japan 5,176.

See footnotes at end of table.

TABLE 2—Continued

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Nickel—Continued				
Metal including alloys—Continued				
Semimanufactures	859	26	NA	Sweden 7; Denmark 2.
Platinum-group metals:				
Waste and sweepings value, thousands	NA	$326	—	All to United Kingdom.
Metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	26,267	19,810	—	United Kingdom 8,295; Japan 5.498; West Germany 4,437.
Unspecified do.	37,263	30,961	NA	United Kingdom 16,526; West Germany 5,530; France 4,887.
Rare-earth metals including alloys, all forms	73	1	—	Mainly to United Kingdom.
Selenium, elemental	NA	2	NA	NA.
Silicon, high-purity	NA	3	NA	Mainly to Denmark.
Silver:				
Waste and sweepings value, thousands	$3,381	$4,845	NA	West Germany $3,036; Denmark $1,399; United Kingdom $356.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,040	872	NA	Sweden 401; Finland 217; West Germany 154.
Tin: Metal including alloys:				
Scrap	21	26	NA	Sweden 14.
Unwrought	5	3	NA	NA.
Semimanufactures	22	3,617	NA	Poland 3,399; United Kingdom 132; Greece 49.
Titanium:				
Ore and concentrate	715,915	692,879	NA	NA.
Oxides	6,740	3,084	1,586	Sweden 672; Zimbabwe 216.
Metal including alloys: Semimanufactures	NA	16	NA	Mainly to Sweden.
Tungsten: Metal including alloys, semimanufactures	(2)	(2)	NA	NA.
Uranium and thorium: Metal including alloys, waste and scrap	3	NA		
Zinc:				
Ore and concentrate	7,185	4,796	—	All to West Germany.
Oxides	3,358	4,171	NA	United Kingdom 2,391; West Germany 684; Republic of Korea 516.
Blue powder	NA	8,676	NA	NA.
Ash and residue containing zinc	347	166	NA	NA.
Metal including alloys:				
Scrap	590	1,083	NA	United Kingdom 244; Sweden 222.
Unwrought	106,196	100,844	24,779	West Germany 28,797; United Kingdom 21,708.
Semimanufactures	7,779	1,667	NA	Sweden 788; Denmark 219; Netherlands 191.
Zirconium: Metal including alloys, all forms	NA	16	NA	NA.
Other:				
Ores and concentrates	NA	8,605	NA	NA.
Ashes and residues	22,485	3,555	NA	Netherlands 1,127; United Kingdom 763; West Germany 607.

See footnotes at end of table.

TABLE 2—Continued

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Other—Continued				
Base metals including alloys, all forms	29	441	NA	West Germany 20.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	63	35	NA	NA.
Artificial:				
Corundum	6	3	NA	NA.
Silicon carbide	60,208	74,821	NA	NA.
Dust and powder of precious and semiprecious stones including diamond kilograms	6	18	NA	NA.
Grinding and polishing wheels and stones	516	544	NA	Sweden 140; Finland 122; West Germany 45.
Barite and witherite	22,613	10,574	NA	Denmark 5,360; United Kingdom 3,920.
Boron materials: Crude natural borates	1	—		
Cement	865	949	NA	Sweden 550.
Chalk	(2)	9	NA	NA.
Clays, crude:				
Bentonite	NA	12	NA	NA.
Chamotte earth or dinas earth	NA	2	NA	NA.
Kaolin	NA	3	NA	NA.
Cryolite and chiolite	2	22	NA	NA.
Diamond:				
Gem, not set or strung value, thousands	$228	$174	NA	Belgium-Luxembourg $148.
Industrial stones do.	—	$13	NA	NA.
Dust and powder do.	NA	$51	NA	NA.
Diatomite and other infusorial earth	11	36	NA	NA.
Feldspar, fluorspar, related materials:				
Feldspar	74,953	69,059	NA	West Germany 21,640; United Kingdom 12,050; East Germany 9,082.
Leucite, nepheline, nepheline syenite	256,005	253,947	NA	Netherlands 68,738; United Kingdom 57,752; West Germany 44,310.
Fertilizer materials:				
Crude, n.e.s.	—	284	35	United Kingdom 70; Netherlands 26.
Manufactured:				
Ammonia	NA	5	NA	NA.
Nitrogenous	NA	700	NA	Sweden 433; Indonesia 216.
Potassic	NA	972	951	NA.
Graphite, natural	56	24	NA	NA.
Gypsum and plaster	19	131	NA	NA.
Iodine	NA	1,158	NA	Denmark 723.
Kyanite and related materials	NA	1	NA	NA.
Lime	8,015	11,230	NA	Liberia 6,548; Lebanon 3,500.
Magnesium compounds:				
Magnesite, crude	NA	161	NA	NA.
Oxide	NA	3,332	NA	NA.

See footnotes at end of table.

TABLE 2—Continued

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Meerschaum, amber, jet		NA	266	NA	NA.
Mica:					
Crude including splittings and waste		1,916	1,946	NA	Netherlands 754; West Germany 425; Sweden 165.
Worked including agglomerated splittings		(2)	(2)	NA	NA.
Nitrates, crude	value, thousands	NA	$307	NA	NA.
Phosphates, crude		2,400	5,960	NA	NA.
Phosphorus, elemental		80	—		
Pigments, mineral:					
Natural, crude		NA	1	NA	NA.
Iron oxides and hydroxides, processed		28	16	NA	NA.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	3,306	5,811	NA	NA.
Synthetic	do.	—	1	NA	NA.
Pyrite, unroasted		108,080	92,688	—	West Germany 61,080; Turkey 24,352; Italy 7,257.
Salt and brine		1,377	1,427	NA	Sweden 779.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		9	—		
Sulfate, manufactured		13	68	NA	NA.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		113,906	179,468	1,333	Italy 53,250; United Kingdom 40,900; France 31,463.
Worked		16,116	16,737	NA	Netherlands 13,212; Sweden 1,035; Belgium-Luxembourg 632.
Dolomite, chiefly refractory-grade		182,161	185,692	NA	NA.
Gravel and crushed rock		4,333,300	4,526,332	270,064	West Germany 1,535,862; Denmark 682,366; United Kingdom 576,864.
Limestone other than dimension		10,832	25,682	NA	United Kingdom 8,224; Belgium-Luxembourg 6,380; Denmark 4,470.
Quartz and quartzite		47,401	12,585	NA	Iceland 11,637.
Sand other than metal-bearing		18,437	139,919	NA	Netherlands 118,055; Belgium-Luxembourg 10,955; United Arab Emirates 766.
Sulfur:					
Elemental:					
Crude including native and byproduct		739	800	—	All to United Kingdom.
Colloidal, precipitated, sublimed		2,799	1,124	—	All to Sweden.
Dioxide		8,509	9,362	NA	Sweden 8,605.
Sulfuric acid	value, thousands	$7,755	$8,572	NA	NA.
Talc, steatite, soapstone, pyrophyllite		45,100	41,090	NA	Netherlands 8,783; West Germany 8,532; United Kingdom 8,364.
Vermiculite, perlite and chlorite		—	62	NA	NA.
Other:					
Crude		2,176	266	NA	NA.
Slag and dross, not metal-bearing		57,211	74,395	NA	France 32,303; Japan 13,576; Belgium-Luxembourg 10,578.

See footnotes at end of table.

TABLE 2—Continued

NORWAY: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,425	220	NA	NA.
Carbon black		19	302	NA	NA.
Coal:					
Anthracite		7,893	12,438	NA	West Germany 10,018; United Kingdom 1,870; India 549.
Bituminous		195,346	168,378	—	West Germany 118,802; France 49,576.
Briquets of anthracite and bituminous coal		NA	74,125	NA	NA.
Coke and semicoke		159,252	90,756	NA	Sweden 42,019; Finland 25,319; Iceland 12,534.
Gas, natural:					
Gaseous	million cubic feet	982,576	980,912	—	United Kingdom 377,437; West Germany 266,911; France 181,069.
Liquefied	cubic feet	NA	52,800	NA	NA.
Peat including briquets and litter		2,618	13,532	NA	United Kingdom 5,636; West Germany 5,222; Spain 1,767.
Petroleum:					
Crude	thousand 42-gallon barrels	310,762	358,089	7,531	United Kingdom 211,615; Netherlands 37,271; Sweden 30,860.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

TABLE 3

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		NA	121	NA	West Germany 88; Austria 20; Sweden 11.
Alkaline-earth metals		NA	235	NA	China 175; France 38; United Kingdom 12.
Aluminum:					
Ore and concentrate		5,792	14,746	NA	Greece 13,322; French Guiana 1,249.
Oxides and hydroxides	thousand tons	1,645	1,564	79	Suriname 376; Ireland 350; Australia 248.
Metal including alloys:					
Scrap		1,417	2,085	NA	Sweden 905; Denmark 517; Venezuela 180.
Unwrought		57,146	90,195	2,514	Romania 37,441; U.S.S.R. 17,140; West Germany 14,723.
Semimanufactures		36,518	31,725	176	West Germany 9,433; Sweden 7,158; Belgium-Luxembourg 2,407.
Antimony:					
Ore and concentrate		NA	30	NA	NA.
Oxides		NA	155	NA	United Kingdom 123; France 16.
Metal including alloys, all forms		55	10	NA	NA.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Arsenic: Metal including alloys, all forms	NA	20	NA	NA.
Beryllium:				
Ore and concentrate	NA	4,024	—	All from West Germany.
Metal including alloys, all forms	21	2	NA	NA.
Bismuth: Metal including alloys, all forms	NA	3	NA	NA.
Cadmium: Metal including alloys, all forms	NA	(2)	NA	NA.
Chromium:				
Ore and concentrate	760	558	NA	Finland 271.
Oxides and hydroxides	191	NA		
Metal including alloys, all forms	39	17	NA	NA.
Cobalt:				
Oxides and hydroxides	1	33	NA	NA.
Metal including alloys, all forms	1	2	NA	NA.
Columbium and tantalum:				
Ore and concentrate	NA	1	NA	NA.
Tantalum metal including alloys, all forms	(2)	(2)	NA	NA.
Copper:				
Ore and concentrate	NA	53	NA	NA.
Matte and speiss including cement copper	27	12	NA	NA.
Oxides and hydroxides	42	61	28	Belgium-Luxembourg 27.
Sulfate	2,032	1,088	NA	Hungary 535; U.S.S.R. 483.
Metal including alloys:				
Scrap	309	71,509	71,259	Sweden 203.
Unwrought	2,940	6	NA	NA.
Semimanufactures	28,466	28,321	335	Sweden 7,726; Belgium-Luxembourg 7,541; West Germany 5,004.
Germanium: Metal including alloys, all forms	NA	(2)	NA	NA.
Gold:				
Waste and sweepings value, thousands	$1,864	$1,555	NA	Sweden $1,517.
Metal including alloys, unwrought and partly wrought troy ounces	17,811	22,120	772	West Germany 12,860; Sweden 5,337; Switzerland 1,447.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	20,637	193,657	NA	Sweden 193,175; Spain 408.
Metal:				
Scrap	32,528	163,664	NA	West Germany 155,470; United Kingdom 2,341; Denmark 1,956.
Pig iron, cast iron, related materials	6,798	5,260	NA	Sweden 2,113; United Kingdom 1,017; Spain 783.
Ferroalloys:				
Ferrochromium	652	719	NA	Sweden 609; West Germany 58.
Ferromanganese	3,130	2,001	NA	France 1,000; United Kingdom 1,000.
Ferromolybdenum	52	61	NA	United Kingdom 19; Austria 18.
Ferrosilicochromium	NA	4	NA	NA.
Ferrosilicomanganese	2,401	2,691	—	West Germany 2,550; Spain 141.
Ferrosilicon	630	1,477	NA	Brazil 600; Spain 441; Switzerland 253.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Ferroalloys—Continued				
Ferrotitanium	8	NA		
Ferrotungsten	6	NA		
Ferrovanadium	30	NA		
Silicon metal	30	356	NA	China 295; Hong Kong 50.
Unspecified	208	334	97	France 31; United Kingdom 22.
Steel, primary forms	146,636	NA		
Semimanufactures:				
Bars, rods, angles, shapes, sections	257,836	NA		
Universals, plates, sheets	450,386	NA		
Hoop and strip	36,082	NA		
Rails and accessories	10,784	NA		
Wire	18,497	NA		
Tubes, pipes, fittings	191,699	NA		
Castings and forgings, rough	5,575	NA		
Lead:				
Ore and concentrate	NA	4	NA	NA.
Oxides	79	314	NA	West Germany 253.
Metal including alloys:				
Scrap	10	54	NA	NA.
Unwrought	13,468	10,165	NA	Sweden 8,397; United Kingdom 1,509; West Germany 128.
Semimanufactures	1,664	1,252	NA	Netherlands 596; West Germany 542; Sweden 32.
Lithium: Oxides and hydroxides	NA	(2)	NA	NA.
Magnesium: Metal including alloys:				
Scrap	73	9	—	All from Belgium-Luxembourg.
Unwrought	1,385	2,241	1,004	U.S.S.R. 1,029; Netherlands 67.
Semimanufactures	44	61	36	United Kingdom 24.
Manganese:				
Ore and concentrate, metallurgical-grade	628,173	847,235	NA	Gabon 304,356; Republic of South Africa 292,430; Australia 110,101.
Oxides	1,523	1,134	NA	Netherlands 1,044.
Metal including alloys, all forms	1,641	1,263	210	Belgium-Luxembourg 765; Netherlands 125.
Mercury 76-pound flasks	232	116	NA	NA.
Molybdenum:				
Oxides and hydroxides	NA	20	NA	United Kingdom 19.
Metal including alloys, semimanufactures	NA	7	NA	West Germany 5.
Nickel:				
Ore and concentrate	25	253	NA	NA.
Matte and speiss	92,110	119,055	10	Canada 62,712; Botswana 46,184; U.S.S.R. 7,000.
Oxides and hydroxides	NA	165	NA	Finland 159.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel—Continued					
Metal including alloys:					
Scrap		11	27	NA	Mainly from United Kingdom.
Unwrought		64	19	NA	Sweden 9; West Germany 4.
Semimanufactures		264	190	8	West Germany 66; United Kingdom 46; Sweden 20.
Platinum-group metals:					
Waste and sweepings	value, thousands	NA	$4,800	NA	Sweden $2,834; Netherlands $1,956.
Metals including alloys, unwrought and partly wrought:					
Palladium	troy ounces	NA	17,522	NA	U.S.S.R. 6,687; Switzerland 4,244; West Germany 2,797.
Platinum	do.	NA	4,919	804	United Kingdom 1,704; Switzerland 932.
Rhodium	do.	NA	707	NA	West Germany 96.
Iridium, osmium, ruthenium	do.	NA	(2)	NA	NA.
Unspecified	do.	25,270	257	NA	NA.
Rare-earth metals including alloys, all forms		NA	282	54	United Kingdom 82; Sweden 65.
Selenium, elemental		NA	21	NA	NA.
Silicon, high-purity		NA	356	NA	China 295; Hong Kong 50.
Silver:					
Waste and sweepings[3]	value, thousands	$5,584	$2,843	NA	Sweden $1,773; Finland $366; Turkey $177.
Metal including alloys, unwrought and partly wrought	thousand troy ounces	1,902	1,768	NA	Sweden 710; West Germany 618; United Kingdom 243.
Tin: Metal including alloys:					
Scrap		—	2	NA	NA.
Unwrought		481	502	NA	Netherlands 180; Japan 122; United Kingdom 94.
Semimanufactures		177	210	NA	France 62; West Germany 54; Sweden 45.
Titanium:					
Ore and concentrate		1	25	NA	Mainly from Finland.
Oxides		777	1,789	NA	West Germany 1,017; United Kingdom 437; Belgium-Luxembourg 121.
Metal including alloys, semimanufactures		NA	38	2	Netherlands 11; West Germany 7; United Kingdom 7.
Tungsten: Metal iincluding alloys, semimanufactures		NA	6	NA	United Kingdom 1.
Uranium and thorium:					
Oxides and other compounds	value, thousands	NA	$115	NA	Sweden $102.
Metal including alloys, all forms		1	NA		
Vanadium: Oxides and hydroxides		NA	(2)	NA	NA.
Zinc:					
Ore and concentrate		171,939	99,332	—	Sweden 65,731; Canada 15,918; Greenland 10,052.
Oxides		2,728	2,932	NA	East Germany 2,205; West Germany 369; Sweden 188.
Blue powder		NA	87	NA	West Germany 56.
Ash and residue containing zinc		17,754	17,904	NA	Sweden 16,019; Denmark 1,886.
Metal including alloys:					
Scrap		3,959	1,722	NA	Sweden 980; Denmark 674.
Unwrought		855	510	NA	West Germany 197; Finland 179; Sweden 85.
Semimanufactures		812	966	NA	France 286; Sweden 250; West Germany 181.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Zirconium: Metal including alloys, all forms	NA	220	NA	West Germany 144.
Other:				
Ores and concentrates	26,462	4,054	NA	West Germany 4,024.
Ashes and residues	309,046	282,884	NA	West Germany 177,937; East Germany 60,939; Denmark 27,508.
Base metals including alloys, all forms	87	(2)	NA	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	18,507	12,021	70	Iceland 11,380; West Germany 252; France 84.
Artificial:				
Corundum	825	612	NA	West Germany 404; France 102.
Silicon carbide	94	1,165	29	Czechoslovakia 789; West Germany 302.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$27	$63	NA	NA.
Grinding and polishing wheels and stones	955	855	1	Austria 190; Sweden 160; Netherlands 135.
Asbestos, crude	11	NA		
Barite and witherite	111,194	162,357	8,043	Morocco 125,559; Ireland 22,640.
Boron materials:				
Crude natural borates	10	470	NA	Poland 459.
Oxides and acids	374	739	NA	France 405; Turkey 216; Netherlands 100.
Cement	592,881	370,158	NA	Sweden 194,353; West Germany 56,936; Belgium-Luxembourg 43,570.
Chalk	8,783	7,528	NA	Denmark 4,242; Sweden 2,571; France 314.
Clays, crude:				
Bentonite	NA	23,362	2,366	Greece 11,955; Italy 5,751.
Chamotte earth or dinas earth	NA	7,898	NA	France 3,971; Czechoslovakia 3,217; United Kingdom 662.
Fire clay	NA	7,995	NA	Sweden 4,047; United Kingdom 2,934; Czechoslovakia 798.
Kaolin	NA	88,665	207	United Kingdom 83,456; Czechoslovakia 3,576; France 544.
Cryolite and chiolite	3,674	4,127	NA	Denmark 3,973.
Diamond:				
Gem, not set or strung value, thousands	$4,000	$3,016	NA	Belgium-Luxembourg $2,005; United Kingdom $485; India $153.
Industrial stones do.	$23	$183	NA	Belgium-Luxembourg $73.
Dust and powder do.	NA	$63	NA	NA.
Diatomite and other infusorial earth	2,020	1,835	221	Iceland 948; Denmark 273.
Feldspar, fluorspar, related materials:				
Feldspar	82	1,362	NA	Canada 1,279.
Fluorspar	46,804	48,942	NA	NA.
Fertilizer materials:				
Crude, n.e.s.	3	637	NA	Sweden 598.
Manufactured:				
Ammonia	144,551	130,677	69,301	U.S.S.R. 34,317; Netherlands 16,030.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued				
Manufactured—Continued				
Nitrogenous	[4]22,162	40,678	NA	Sweden 35,440; Poland 1,827; Netherlands 1,601.
Phosphatic	1,793	1,746	NA	Sweden 1,573.
Potassic	305,527	353,169	NA	France 80,055; West Germany 67,032; Spain 61,780.
Unspecified and mixed	45,443	NA		
Graphite, natural	233	61	NA	NA.
Gypsum and plaster	230,805	259,529	NA	Spain 198,727; Sweden 33,244; France 23,182.
Iodine	NA	943	NA	Netherlands 674; Chile 153; Japan 114.
Kyanite and related materials	322	377	NA	West Germany 353.
Lime	27,797	29,822	NA	Denmark 21,157; Sweden 6,575; United Kingdom 1,274.
Magnesium compounds:				
Magnesite, crude	9,292	5,866	NA	China 2,331; Austria 1,763; Czechoslovakia 1,101.
Sulfate	61,204	NA		
Other	NA	2,283	NA	Sweden 1,179; China 752; United Kingdom 122.
Meerschaum, amber, jet	NA	8,363	NA	Sweden 6,037; Spain 1,763; West Germany 215.
Mica:				
Crude including splittings and waste	1,882	3,227	NA	India 2,060; Indonesia 900.
Worked including agglomerated splittings	55	99	NA	Switzerland 29; France 25; United Kingdom 7.
Nitrates, crude value, thousands	NA	$5,233	NA	Netherlands $4,956; West Germany $122; Sweden $64.
Phosphates, crude	475,426	512,188	100,917	Sweden 130,416; Morocco 114,533.
Phosphorus, elemental	8	11	NA	NA.
Pigments, mineral:				
Natural, crude	NA	8	NA	NA.
Iron oxides and hydroxides, processed	[r] 3,135	2,794	NA	West Germany 2,678; Denmark 48.
Potassium salts, crude	NA	223	NA	NA.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$714	$530	$63	Belgium-Luxembourg $139; West Germany $77.
Synthetic do.	[r]$59	$86	NA	NA.
Pyrite, unroasted	—	29,164	—	Finland 26,950; Faroe Islands 2,214.
Salt and brine	596,368	470,547	78	Netherlands 254,685; Tunisia 58,130; Denmark 39,580.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	47,552	43,602	NA	Poland 16,400; Netherlands 9,085; West Germany 6,891.
Sulfate, manufactured	7,146	6,170	NA	Sweden 5,199; Finland 356; West Germany 180.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	9,963	8,875	NA	Sweden 3,297; Portugal 1,698; Finland 1,587.
Worked	22,723	21,689	NA	Portugal 13,478; Sweden 3,363; Italy 2,588.
Dolomite, chiefly refractory-grade	9,372	13,575	NA	Sweden 8,110; United Kingdom 4,829; West Germany 235.
Gravel and crushed rock	74,000	68,329	NA	Sweden 59,340; Denmark 3,537; West Germany 2,490.
Limestone other than dimension	208,991	201,494	NA	France 124,145; United Kingdom 61,723; Sweden 9,602.
Quartz and quartzite	641,980	644,219	NA	Spain 347,766; Sweden 293,088; Belgium-Luxembourg 2,974.

See footnotes at end of table.

TABLE 3—Continued

NORWAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued				
Sand other than metal-bearing	200,223	202,218	731	Belgium-Luxembourg 135,492; Sweden 45,871; Denmark 14,070.
Sulfur:				
Elemental:				
Crude including native and byproduct	3,371	3,503	NA	Sweden 3,375; West Germany 89.
Colloidal, precipitated, sublimed	30	42	NA	Netherlands 31.
Dioxide	4,126	13,113	NA	Sweden 13,045.
Sulfuric acid	149	315	NA	NA.
Talc, steatite, soapstone, pyrophyllite	6,207	11,192	NA	China 4,024; Finland 2,477; Switzerland 1,848.
Vermiculite, perlite and chlorite	NA	1,444	NA	Greece 1,100; U.S.S.R. 220.
Other:				
Crude	9,993	8,363	NA	Sweden 6,037; Spain 1,763; West Germany 215.
Slag and dross, not metal-bearing	175,095	107,033	NA	Denmark 102,430; Netherlands 3,950; United Kingdom 260.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	92	1,205	37	Sweden 418; United Kingdom 312; Denmark 153.
Carbon:				
Carbon black	5,223	5,334	94	Sweden 3,174; Netherlands 1,090; United Kingdom 652.
Gas carbon	NA	2,034	NA	United Kingdom 2,031.
Coal:				
Anthracite	NA	110,264	34,107	West Germany 44,879; United Kingdom 23,332.
Bituminous	NA	40,248	NA	Belgium-Luxembourg 39,939; Sweden 278.
Briquets of anthracite and bituminous coal	18,918	707	NA	United Kingdom 689.
Lignite including briquets	10	22	NA	NA.
Coke and semicoke	503,677	548,076	2,500	United Kingdom 227,284; France 104,709; West Germany 99,141.
Gas, natural: Liquefied	NA	29,718	NA	United Kingdom 28,868; Sweden 838.
Peat including briquets and litter	16,624	16,764	NA	Sweden 16,374; Finland 289.
Petroleum:				
Crude thousand 42-gallon barrels	19,547	8,805	NA	Denmark 4,239; Mexico 1,619; United Kingdom 1,445.
Refinery products:				
Liquefied petroleum gas value, thousands	$117,700	NA		
Gasoline, motor thousand 42-gallon barrels	5,235	NA		
Mineral jelly and wax do.	68	NA		
Kerosene and jet fuel do.	2,071	NA		
Distillate fuel oil do.	6,998	NA		
Lubricants do.	695	NA		
Residual fuel oil do.	3,693	NA		
Bitumen and other residues do.	3,436	NA		
Bituminous mixtures do.	88	NA		
Petroleum coke do.	1,684	NA		

[r]Revised. NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Excludes unreported quantity of urea valued at $5,176,000.

TABLE 4

NORWAY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Aluminum	Norsk Hydro AS (Government, 30%)	Smelter at Årdal, Sunndalsøra, Karmoy, and Højanger	677.[1]
Do.	Elkem AS	Smelter at Mosjøen, Lista	170.
Do.	Sor-Norge Aluminium AS (Norsk Hydro, 50%; Swiss Aluminium, 50%, Switzerland).	Smelter at Husnes	72.
Cadmium	Norzink AS (Boliden AB, 50%; Sweden, Rio Tinto Minerals Ltd., 50%; United Kingdom)	Smelter at Odda	150.[1]
Cement	Norcem AS	Plants at Dalen and Kjøpsvik	2,300.
Coal	Store Norske Spitsbergen Kulkompani AS (Government)	Mines at Longyearbyen and Svea, both on Svalbard Island	350.
Cobalt	Falconbridge Nikkelverk AS (Falconbridge Nickel Mines Ltd., Canada)	Smelter at Kristiansand	2.
Copper:			
Ore, metal content	A/S Bidjovagge Gruber (Outokumpu Oy, Finland)	Mine at Bidjovagge	3.
Do.	Foldal Verk AS (Outokumpu Oy, Finland)	Mine at Hjerkinn, Dovre	5.
Do.	Grong Gruber AS (Outokumpu Oy, Finland)	Mine at Røyrvik	8.
Do.	AS Sulitjelma Gruber (Government, 100%)	Mine at Fauske	8.
Metal	AS Sulitjelma Gruber (Elkem)	Smelter at Sulitjelma	9.
Do.	Falconbridge Nikkelverk AS (Falconbridge Nickel Mines Ltd., Canada)	Refinery at Kristiansand	30.
Ferroalloys	Elkem AS	Plants at Svelgen, Kristiansand, Porsgrunn, Straumen, Kopperå, Orkanger, and Sauda	245.
Do.	Fesil Group (Ila og Lilleby Smelterverker AS, AS Hafslund, AS Bjølvefossen)	Plants at Finnsnes, Sarpsborg, Trondheim, Meraker, and Ålvik	200.
Do.	Tinfoss Jernverk	Plants at Notodden and Kvinesdal.	70.
Gold	A/S Bidjovagge Gruber (Outokumpu Oy, Finland)	Mine at Bidjovagge	850.[2]
Graphite	AS Skåland Grafitverk	Mine on Senia Island	40.
Iron ore	AS Sydvaranger (Government)	Mine at Sør-Varanger	2,300.
Do.	AS Norsk Jernverk (Government)	Mine at Mo i Rana	1,200.
Lead in ore	AS Bleikvassli Gruber (Outokumpu Oy, Finland)	Mine at Hemnes	4.
Lime	Hylla Kalkverk (Franzefoss Bruk)	Verdal/Trondheim	100.
Do.	AS Norsk Jernverk	Plant at Mo i Rana	48.
Do.	Mjoendalen Kalkfabrik	Plant at Åsen/Drammen	7.
Magnesium	Norsk Hydro AS (Government, 30%)	Smelter at Porsgrunn	50.
Natural gas	(See Petroleum)	(See Petroleum)	28,700.[3]
Nickel, metals and products	Falconbridge Nikkelverk AS (Falconbridge Nickel Mines Ltd., Canada)	Smelter at Kirstiansand[4]	50.
Nickel in ore	Titania AS (N.L. Industries, Inc., U.S.)	Mine at Sokndal	1.
Petroleum, crude	Phillips Petroleum Co. Norway (operator), 36.96%; Norske Fina A/S, 30%; Norsk AGIP A/S, 13.0%; Elk Aquitaine Norge A/S, 8.904%; Norsk Hydro Produksjon A.S., 6.7%; others, 5.2%.	Ekofisk area (Ekofisk, West Ekofisk, Cod, Tor, Albuskjell, Edfisk, and Edda)	357,000.[5]
Do.	Den Norske Stats Oljeselskal A.S. (Statoil), 42.05%: Mobil Exploration Norway A/S, 12.614%; Norske Conoco A/S, 8.41%; Esso Norge A.S., 8.41%; A/S Norge Shell, 8.41%.	Statfjord Field	163,000.[5]

See footnotes at end of table.

TABLE 4—Continued

NORWAY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Petroleum, crude—Continued	British Petroleum Co. (operator), 57.5%, and Conoco, 25%; Statoil, 12.5%; Pelican, 5%.	Ula Field	70,000.[5]
Do.	Statoil (operator), 85%; Norsk Hydro, 9%; Saga Petroleum, 6%.	Gullfaks Field	360,000.[5]
Do.	Den Norske Stat Oljeselkap A.S., 65.04%; Norsk Hydro Produksjon A.S., 13.75%; Saga Petroleum A.S., 8.61%; others 12.6.[6]	Oseberg Field	240,000.[5]
Titanium	K/S Ilmenittsmelter (United States)	Titanium dioxide plant at Frederikstadt	25 (TiO_2).
Do.	Titania AS (N.L. Industries, Inc., United States)	Ilmenite mine at Sokndal	850 (ore).
Zinc:			
Ore, metal content	Folldal Verk AS (Outokumpu Oy, Finland)	Mine at Dovre	10.
Do.	AS Bleikvassli Gruber (Outokumpu Oy, Finland)	Mine at Hemnes	5.
Do.	Grong Gruber AS (Outokumpu Oy, Finland)	Mine at Røyrvik	5.
Metal	NorZink AS (Boliden AB, Sweden, 50%; Rio Tinto Minerals Ltd., 50%, United Kingdom)	Smelter at Odda	90.

[1]Metric tons per year.
[2]Kilograms per year.
[3]Million cubic meters.
[4]Treats Canadian matte.
[5]42-gallon barrels per day.
[6]Fact Sheet, The Norwegian Continental Shelf, 1990, The Royal Ministry of Petroleum and Energy, 1990.

manganese ore during a 5-to 7-year period. As part of the arrangement, Elkem was reportedly to supply furnace technology as well as air pollution filter technology to Bulgaria. In return for manganese ore purchases on the part of Elkem, the Bulgarian Government agreed to purchase approximately 25,000 tons of ferromanganese per year from the company.

Gallium.—Elkem's gallium plant, which obtains gallium from processed dust from Elkem's aluminum plants, is at Bremanger, on Elkem's ferrosilicon smelter site. The 5-ton-per-year 99.999%-gallium metal plant was operating at one-half capacity in 1989 due to decreased demand in "five nines" purity gallium in favor of seven and nine nines purity metal.

Gold.—The Bidjovagge gold-copper mine, on the northern tip of Norway, was discovered in 1952 by a Swedish company and confirmed by the Geological Survey of Norway in 1965. A/S Bidjovagge Gruber was formed to mine the copper deposit until the shares of the company were sold to Outokumpu Oy in 1984. The mine is considered to be primarily a gold mine. The gold is confined to the lenses in Precambrian greenstone zones. Recent recoveries have been 1 to 4 grams of gold per ton of ore and 1% to 2% copper. Annual production is reportedly 800 to 900 kilograms of gold and 3,000 tons copper from 300,000 to 350,000 tons of ore processed.

Magnesium.—Norsk Hydro has attained strong positions in the dominant magnesium markets of the Western World. The company continued the modernization and the refurbishing of the Porsgrunn plant during 1989. In spite of an electrical fire, which temporarily damaged the plant in late summer 1989, the work has resulted in improved productivity. Substantial sums were invested at the plant to limit the emissions of chlorinated hydrocarbons, as mandated by stricter environmental laws, which resulted in the closure of 10,000 tons of capacity. A new process for the treatment of air emissions has been developed, and the plant will be modernized to meet these new Government limits. When the modernization and antipollution devises are installed, the company reportedly plans to increase production to 60,000 tons per year. Magnesium powder consumption for desulfurization purposes in iron and steel production is continuing to increase.

Nickel.—A/S Nikkel og Olivin signed a long-term contract to supply nickel concentrates to Outokumpu in Finland. Outokumpu's Harjavalta smelter will reportedly be supplied with ores from the Ballangen ore deposit. Production from this deposit is to begin at the end of 1989. The delivery rate was projected to increase from 15,000 tons per year to 30,000 tons in the second year of production of low-grade Ni ores (0.4% to 0.7%).

Tin.—The Norwegian tinplate company Norsk Blikkvalseverk A/S and the Dutch steel company Hoogovens negotiated an arrangement to produce tinplate at the tinplate and electrical sheet

works in Bergen, Norway. This plant produced 130,000 tons in 1989.

Zinc.—British Petroleum's 50% interest in Norzink A/S was sold to RTZ Corp. in 1989. Norzink reported zinc sales of 119,425 tons during the year. A total of 12,290 tons of secondary zinc was processed by the company, resulting in the output of 10,099 tons of zinc pigments.

Industrial Minerals

Cement.—Norcem A/S produced about 1.41 million tons of cement in 1989, down 144,000 tons from the year before. Cement production is from two plants, Dalen in the south and Kjøopsvik in the north. The Dalen plant capacity was increased to 1 million tons in the past 3 years, and the Kjøopsvik plant, modernized with state assistance, is expected to have a capacity of 500,000 tons.

Fertilizers.—A new bulk storage unit for complex fertilizer and new loading facilities were completed at Posrsgunn in 1989. In addition, a 700,000-ton-per-year capacity nitric acid plant has been scheduled for Posrsgunn that will enable the production of additional complex fertilizer and calcium nitrate.

Ilmenite.—The ilmenite smelter at Tyssedahl, which had suffered a furnace burn-through in September 1988, resumed production in 1989. The newly formed company, K/S Ilmenittsmelterverket 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.

The approximately 350,000-ton-per-year ilmenite concentrate from the Titania mine at Tellnes results in the production of 220,000 tons of slag and 110,000 tons of iron. The slag, low in chromium and vanadium, is in high demand because the demand for TiO_2 pigments has increased.

Olivine.—Norwegian olivine producers account for 60% of Western World production of that mineral. Two of Norway's top olivine producers are A/S Olivin and Nor-Mineral A/S. Olivin's deposit in the Aaheim area of Norway has estimated reserves of 2 billion tons of 90% to 95% olivine covering 6.5 square kilometers. Most of the production comes from two open pits. The southern pit produces 1.3 million tons and is slightly harder material than the northern pit. The northern pit produces approximately 400,000 tons of larger grained and more friable rock material than the southern operations.

Nor-Mineral operations at Byggja are a few kilometers south of Olivin's operations. The mine is an underground room-and-pillar mine. The company, a subsidiary of Bjorum Trading A/S, mines 600,000 tons per year. Ore is transported from an adit just above sea level to a crushing plant several kilometers down the fjord and loaded onto ships of up to 60,000 deadweight tons.

Mineral Fuels

In the 12th License Rounds, phase B, 13 blocks covered by 9 production licenses were awarded on the Norwegian Continental Shelf. Three of these licenses, covering six blocks, were allocated in the Barents Sea, and six licenses, covering seven blocks, were on Haltenbanken. The 13th License Round was announced, and the final date for application was in September 1990.

Drilling activity increased slightly in 1989, but was still depressed compared to earlier years. Of the 11 rigs working in the Norwegian offshore, 5 were drilling exploration wells, 5 in appraisal, and 1 in development. During 1989, 28 wells were drilled in Norwegian waters, with 8 delineation and 20 exploration wells initiated. It was reported that of the 20 exploration wells, 3 found hydrocarbons and 11 were defined as dry. The three discoveries were in the North Sea. Out of the 20 exploration wells drilled, 17 were on structures that had not been previously tested.

The Norwegian Parliament, The Storting, did not receive any requests for new Plans for Development and Operations (field development approval) from the petroleum industry in 1989. A revised plan for development of Sleipner East was approved by The Storting in November 1989.

In March 1990, The Storting decided to approve development of Brage Field, and another field, Statfjord East and Statfjord North, is expected to be discussed in the fall of 1990. By the end of 1989, 7 fields were under development and 19 other prospects were under evaluation for development. To date, the total investment, excluding exploration and onshore-based activities, was reported to be $4.2 billion, and exploration expenses were $725 million.

The 20 fields on the Norwegian Shelf produced approximately 103.6 million tons oil equivalent of product, which equates to approximately 539 million barrels of oil, 22 million barrels of condensate, and 28.7 trillion cubic meters of gas. The 7.5% cutback on production imposed by the Government was in effect during the year, resulting in approximately 90,000-barrels-per-day reduction in output. This amount was offset by increased production from older fields and new fields coming on-stream. Two new fields, Gyda and Hod, are expected to come on-stream in 1990.

Natural Gas.—In December 1989, Ruhrgas and Thyssengas indicated they wished to exercise two volume options under the Troll Contract. Also signed that month was an agreement to begin gas deliveries 3 years sooner, moving the initial delivery date from 1996 to 1993. Starting in 1993, the gas volumes would reportedly escalate to an annual volume of 25 billion cubic meters by the end of the century, with most of the gas coming from the Sleipner East Field initially. Troll gas production would reportedly begin in 1996, and deliveries would continue until the year 2020.

Petroleum.—Two more oil platforms started production in late 1989. Five other projects were under development. In 1989, Norwegian production reached 1.5 million barrels per day (bbl/d). The increase of close to 300,000 bbl/d came mainly from three fields: 250,000 bbl/d from the Oseberg Field, 50,000 bbl/d from the Gullfaks Field, and 20,000 bbl/d from the Ekofisk Field.

Den norske stats olijeselskap AS (Statoil) commissioned the Veslefrikk Field, which was projected to produce between 65,000 and 70,000 bbl/d.

British Petroleum Norway Ltd. U.A. completed the first stage of work on the Gyda Field by installing the components

of the platform in preparation for production to commence in July 1990. The production is to build rapidly to 60,000 bbl/d of petroleum and 1 million cubic meters per day of natural gas. The Gyda Field, 30 kilometers south of the Ula Field and north of Ekofisk center in the North Sea, was declared commercial in October 1988 by its operator, British Petroleum Norway Ltd. U.A. The field has estimated reserves of 190 million barrels of petroleum and 6 billion cubic meters of natural gas.

Statoil reportedly wants to undertake a $420 million project to lay a new 258-kilometer 51-cm condensate line to Karsto gas terminal, north of Stavanger. The pipeline capacity would be approximately 200,000 bbl/d to account for the possible development of West Sleipner Field. Interests in this development are, reportedly, Statoil, 50%; Esso, 40%; and Norsk Hydro, 10%.

A/S Norske Shell reportedly received approval from the Norwegian Government to develop the estimated 90,000 bbl/d Draugen Field in the Haltenbanken area. Norsk Conoco is proceeding with plans to develop the Heidrun Field in the same area. If the Government approves the project, the Heidrun Field could begin production in 1995. This field is the northernmost and in the deepest water in Europe (more than 400 meters). Blocks 6507/7 and 6507/8 are 204 km off the Norwegian coast and only 133 km from the Arctic Circle. The tension legged platform designed for the field would have a capacity of 220,000 bbl/d and a substantial gas production capacity. If Norsk Conoco receives approval from the Norwegian Government in 1990, the field could begin production as early as 1995. The problem stalling approval is how to best utilize and handle the gas production from the field. One alternative is to develop the proposed Midgard Gasfield, thereby providing additional reserves, which would justify the construction of a gas pipeline to shore. This gas would provide gas to Norway and Sweden. Another proposal is to reinject the gas into the same or another adjacent field. Lastly, an onshore mid-Norway plant utilizing the gas, such as a methanol plant was proposed. The Heidrun Field interests are as follows: Norsk Conoco, 18.1%; Statoil, 75% (operator when the filed is placed on production); Neste Petroleum, 5%; Norsk Hydro, 1%; and Det Norske Oljeselskap as, 0.6%.

Reserves

Proven North Sea crude oil reserve estimates were increased by 9% to close to 10 billion barrels, including natural gas liquids (NGL). The reserve estimates of North Sea natural gas were increased slightly to 2.3 trillion cubic meters. About 60% of the North Sea oil reserves was in the Statfjord, Gullfaks, Oseberg, Snorre, and Ekofisk Fields, in order by volume. Discovered resources in the Haltenbanken area of the Norwegian Sea, northwest of Trondheim, were estimated to be 2.3 billion barrels of petroleum and NGL and 309 billion cubic meters of natural gas.

Resources in the Tromsoflaket area of the far northern Arctic coast were estimated to be 232 billion cubic meters. Total Norwegian gas resources appeared sufficient to last at least to the middle of the 21st century.

Reserves for many of the other minerals have been depleted after years of mining. The notable exception is the reserves of olivine, which are substantial.

INFRASTRUCTURE

The land transportation system of Norway is better developed in the southern portion of the country. The northern half of the country is bisected by many fjords, and arctic conditions hinder transportation, especially in the winter. Norway's roads are adequate to transport goods, although more than one-half of the 79,540 km of roads is gravel or unpaved. The railroad system with 4,223 km of standard-gauge track, is almost completely electrified, with only 96 km of double track. Oslo, Bergen, Kristiansand, Stavanger, and Trondheim are important ports and are in the southern portion of the country. Petroleum pipelines from the North Sea fields make landfall at Kårstø and Sture.

The Statpipe consists of a 910-km-long pipeline system with two riser platforms and a terminal at Kårstø. Rich gas from Statford and Gulfaks is shipped to Kårstø, where the gas is fractionated and the dry gas returned to the riser at Block 16/11 and on to Emden, Federal Republic of Germany. Heimdal Field is tied into the system via a 90-cm pipeline to Block 16/11. The gas from Veslefrikk and Gulfaks II Fields is to be phased in during 1990. In 1993, the dry gas from Sliepner and Troll Fields is to be added to the system, as well as the condensate from Sleipner Field. The rich gas pipeline to Kårstø has a 9-billion-cubic-meter capacity. The 13-billion-cubic-meter capacity line from 16/11 and Ekofisk Complex is for dry gas transport. This system capacity may be increased by installing additional compression equipment.

Oil from Oseberg Field is transported through the 70-cm, 132-km Oseberg Transport System line to Sture. The pipeline was completed in December 1988, and the oil was the first landed in Norway from offshore fields. An agreement was made to transport oil from Veslefrikk and Brage Fields via Oseberg A Field. This pipeline has a 600,000-bbl/d capacity and a 5,000,000-barrel storage capacity.

Pipelines to the United Kingdom, Belgium, and the Federal Republic of Germany transport offshore Norwegian production to shore. Norpipe connects the Ekofisk Field with the gas market on the European Continent and an oil terminal in the United Kingdom. The 455-km, 91-cm gasline terminates in Emden, Federal Republic of Germany. The Frigg Transportation system consists of two 81-cm, 362-km pipelines terminating in St. Fergus, Scotland. The Zeepipe ia a planned 102-cm gasline to be built from Troll and Sleipner Fields to Zeebruggle, Belgium, and is expected to be operational in 1993.

OUTLOOK

The production of petroleum and natural gas will continue to be an important part of the mineral economy of Norway. The export of these products, either primary or processed, will provide substantial income and be a source of employment for the country. Aluminum, ferroalloy, and magnesium production will also continue to be important to the country's economy. Mining, except for a few commodities, will decrease as reserves are depleted or domestic costs render the local resources uncompetitive with foreign supplies.

[1]Where necessary, values were converted from Norwegian kroner (NKR) to U.S. dollars at the rate of NKR 6.90 = US $1.00, the average for 1989.

TABLE 5

NORWAY: RESERVES OF MAJOR MINERALS

Commodity	
Copper-zinc ore	27 million metric tons
Iron ore	935 million metric tons
Nepheline syenite	300 million metric tons
Olivine	2 billion metric tons

Petroleum field	Initially recoverable			Remaining		
	Oil (million barrels)	Gas (billion cubic meters)	NGL (million barrels)	Oil (million barrels)	Gas (billion cubic meters)	NGL (million barrels)
Albuskjell	62.9	22.0	13.5	20.1	8.5	4.2
Brage	290.6	3.5	290.6	3.5	—	—
Cod	17.6	7.0	5.2	.3	1.1	—
Draugen	427.7	5.0	—	427.7	5.0	—
Edda	38.4	2.3	2.1	15.1	0.5	—
Ekofisk	1,736.0	150.0	135.2	788.8	83.0	73.8
Eldfisk	471.8	58.0	48.9	201.9	42.0	29.1
Frigg	.3	107.0	—	—	3.5	—
Gullfaks	1,446.7	16.0	22.9	1,247.3	14.0	20.8
Gyda	195.0	3.0	26.0	195.0	3.0	26.0
Heimdal	36.5	36.0	—	20.8	22.6	—
Hod	25.2	0.9	3.1	25.2	0.9	3.1
Murchison	12.0	0.3	4.2	13.8	—	—
Nord øst-Frigg	0.6	11.0	—	—	1.6	—
Odin	0.6	33.0	—	—	14.7	—
Oseberg	1,484.4	79.0	62.4	1,348.6	79.0	62.4
Sleipner øst	119.5	51.0	104.0	119.5	51.0	104.0
Snore	666.4	5.8	28.1	666.7	5.8	28.1
Statfjord	2,547.5	48.0	156.0	1,125.9	35.6	116.5
Tommeliten	40.3	18.4	10.4	32.1	16.6	9.4
Tor	169.8	18.0	20.8	58.5	8.3	9.4
Troll	257.9	1,288.0	—	257.9	1,288.0	—
Ula	421.4	4.6	35.4	312.6	3.4	26.0
Valhall	333.4	10.0	34.3	194.4	6.0	22.9
Veslefrikk	226.4	3.0	13.5	223.3	3.0	13.5
Vest Ekofisk	81.8	28.0	15.6	9.4	4.5	2.1
øst Frigg	—	7.5	—	—	5.9	—
30/6 Gamma Nord	8.2	7.1	—	8.2	7.1	—
Total	10,882.4	2,023.4	741.6	7,603.7	1,718.1	551.3

Source: Information based on the Fact Sheet, The Norwegian Continental Shelf, 1990, The Royal Ministry of Petroleum and Energy Ministry, 1990.

OTHER SOURCES OF INFORMATION

Agencies

Statistisk sentralbyrå
Postboks 8131 Dep.
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The Royal Ministry of Petroleum and Energy
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Publications

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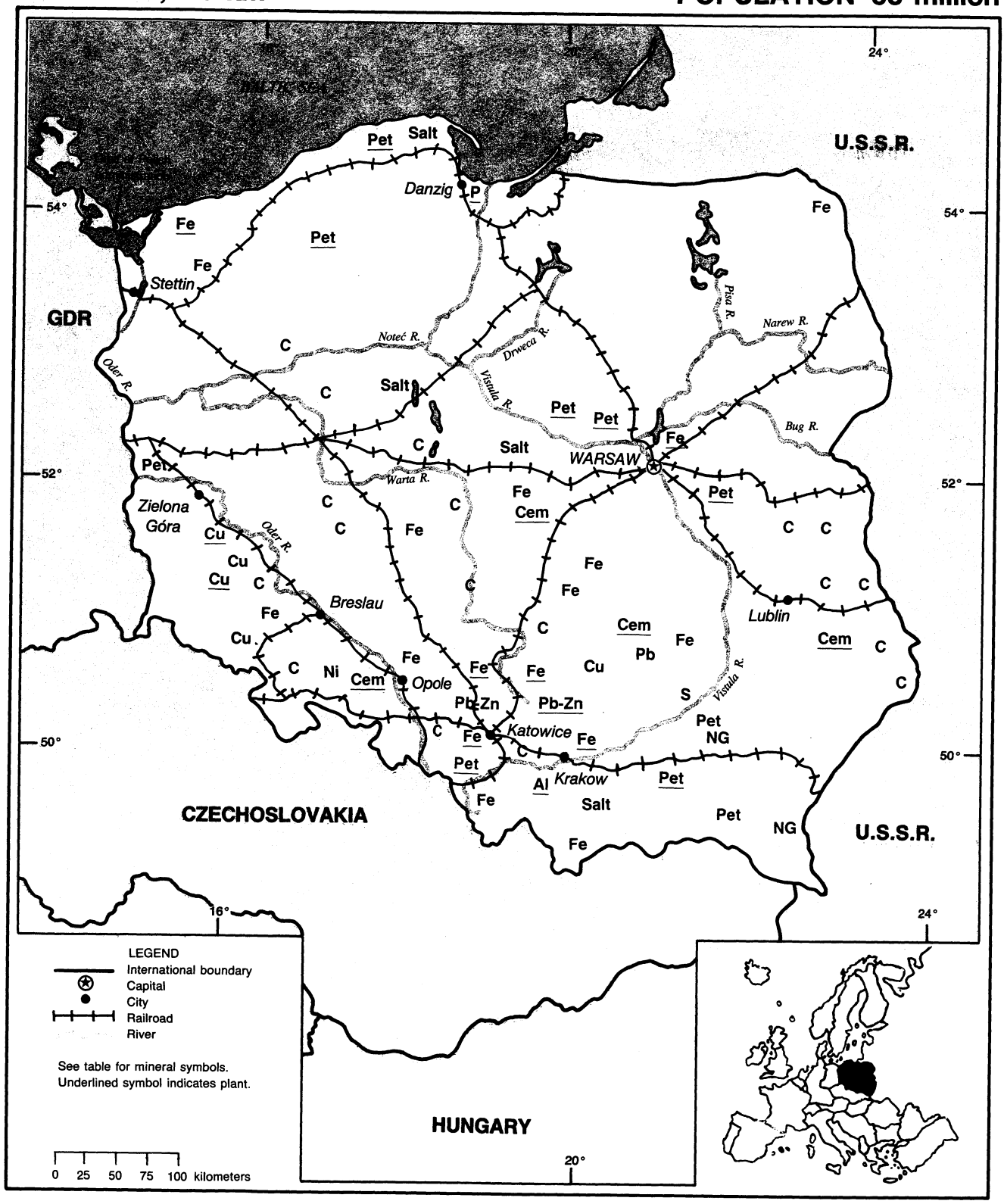
POLAND

AREA 312,000 km² **POPULATION 38 million**



THE MINERAL INDUSTRY OF

POLAND

By Walter G. Steblez

In 1989, Poland remained a major world producer of coal, copper, and sulfur. The country was also an important European producer of lead, salt, silver, and zinc. During the year, Poland exemplified the term "economy in transition." This term has been applied to those centrally planned member countries of the Council for Mutual Economic Assistance (CMEA) seeking ways to tranform their economies to a market-based system. Roundtable talks between Poland's emerging political forces and its ruling political party resulted in the legalization of the Solidarity Trade Union, the election of a new Parliament, and the creation of new institutions, necessary for a political democracy.

The restructuring of the country's political system was accompanied by economic reforms that encouraged private enterprise and decoupled state-owned enteprises from central planning. By yearend, there were more than 11,000 private enterprises in operation. State-owned enterprises were granted autonomy in respect to both production and trade. However, during this transition period, the country had to confront both high inflation and a decline in overall industrial performance.[1]

The value of total industrial production reportedly declined by 2% compared with that of 1988. The value of output by the fuel industry sector declined by 7.2% with hard coal and lignite declining 7.7% and 2.7%, respectively. Similarly, metals production declined 5.5%. In the minerals industry, projects that were completed during the year included installation of the No. 4, 760-ton-per-year coking plant at the Kotowice steelworks and facility expansion at the Belchatow coal mine and Mazowsze petroleum refinery.[2]

GOVERNMENT POLICIES AND PROGRAMS

Poland's Government aimed its efforts at reorganizing the country's economy and prioritizing its domestic policies. The legacy of the country's former central planning system left the country with large, inefficient heavy industries and severe industry-generated pollution problems. Countrywide air pollution has been the result of Poland's use of coal and lignite for nearly 80% of its energy needs. Coal consumed domestically was high in both sulfur and ash content, and inefficient powerplants burned coal at twice the volume required for comparable quantities of energy by their counterparts in Western Europe. In industrial areas such as Kracow, the situation was compounded by additional point sources of pollution. The Nowa Huta integrated steelworks near Kracow have reportedly large amounts of noxious gases and about 100,000 tons of soot containing cadmium, carbon monoxide, flourine compounds, hydrocarbons, lead, and sulfur dioxide emitted into the environment annually. Only 19% of the country's water resources was reported to be suitable for human and animal use. The water in most of Poland's rivers was considered unsuitable for industrial use because of its corrosive effect on machinery and equipment. The pollution of the country's riverine system was attributed largely to coal mines, which daily discharge about 9,000 tons of salts into the Vistula and Oder Rivers.

Reportedly, Poland's annual losses from environmental pollution amounted to $3.4 billion, or about 10% of the country's national income.[3] At yearend, Poland's Ministry of Environmental Protection Forestry and Natural Resources announced plans to shut down polluting enterprises if they take no action to reduce emissions. The Government also set a goal to halve the maximun permissible level of sulfur dioxide emissions by the country's steel and other industries. However, owing to the difficult task of restructuring the country's political and economic system, a more concrete environmental program was not developed by the end of the year.

PRODUCTION

In 1989, the decline in the output of copper, lead, steel, sulfur, zinc, and a number of other mineral commodities was largely the result of a sharp decline in employment in these sectors, which led to the adoption of double-shifts at many enterprises. Production line closures were also reported because of environmental concerns. Other factors that had an adverse effect on production included shortages of scrap and a drop in imports of ferroalloys, iron ore, and other raw materials. Declining productivity in most branches of the minerals industry accounted for the decline in coal output for the year.

TRADE

In 1989, the growth rate of Poland's total exports and imports declined slightly. The value of total exports to CMEA-member countries increased by 1.7% compared with those of 1988, while total imports from the CMEA market fell by 6.9%. During the same period, exports to market economy countries rose 1.8%, while imports increased 5.7%. Within the CMEA, the U.S.S.R. continued to be Poland's major supplier of metals, iron ore, petroleum, and natural gas.

Among Poland's major mineral commodity exports in 1989, only cement and coke registered export growth during the year, with foreign sales increasing by 7.1% and 11.5%, respectively. The largest share in the export growth of coke was in sales for hard currency. On the other hand, exports of bituminous coal, copper, rolled steel, sulfur, and zinc fell by 10.4%, 2.4%, 6.9%, 6.6%, and 30%, respectively. Significantly, in 1989, Poland began to decentralize foreign trade. Firms and enterprises were allowed to independently transact foreign commerce. By the end of the year, there were more than 3,000 enterprises conducting trade abroad.

TABLE 1

POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum metal, primary		47,000	47,500	47,500	47,700	[3]47,800
Cadmium metal, primary[e]		600	620	620	600	500
Copper:						
Mine output, Cu content, recoverable[e]		431,000	434,000	[r]438,000	437,000	384,000
Metal:						
Smelter, including secondary[e]		390,000	400,000	410,000	410,000	380,000
Refined, including secondary		387,000	388,000	390,000	401,000	[3]390,000
Gold:[e]						
Mine output, Au content, recoverable	thousand kilograms	35	35	35	30	30
Metal, smelter[4]	kilograms	180	180	180	177	175
Iron and steel:						
Iron ore and concentrate, gross weight	thousand tons	11	9	6	6	[3]7
Metal:						
Pig iron	do.	9,807	10,574	10,476	10,264	[3]9,488
Ferroalloys:[e]						
Blast furnace	do.	83	83	85	80	75
Electric furnace	do.	177	176	180	175	175
Steel:						
Crude	do.	16,126	17,144	17,145	16,873	[3]15,094
Semimanufactures:						
Rolled excluding pipe	do.	11,845	12,340	12,410	12,424	[3]11,272
Pipe	do.	992	1,027	1,038	1,054	[3]971
Lead:						
Mine output, Pb content, recoverable		[e]53,000	[e]53,500	48,800	49,000	[3]47,000
Metal, smelter		87,300	88,300	89,500	90,700	[3]78,200
Silver, mine output, Ag content, recoverable	thousand kilograms	831	829	831	1,063	[3]1,003
Zinc:						
Mine output, Zn content		187,000	185,000	[e]184,000	[e]184,000	184,000
Metal, refined, including secondary		180,000	179,000	177,000	174,000	[3]164,000
INDUSTRIAL MINERALS						
Barite		91,000	77,100	73,100	63,100	65,000
Cement, hydraulic	thousand tons	15,000	15,831	16,100	16,984	[3]17,100
Clays and clay products:						
Crude:						
Bentonite[e]	do.	75	75	75	80	70
Fire clay	do.	980	1,076	1,104	1,032	1,000
Kaolin	do.	48	49	[e]49	[e]59	50
Products[e]	do.	550	600	600	600	550
Feldspar[e]		60,100	57,200	55,000	50,000	50,000
Gypsum and anhydrite, crude[5]	thousand tons	973	1,107	1,127	1,097	1,100
Lime, hydrated and quicklime	do.	4,124	[r]4,108	4,265	4,430	[3]4,421
Magnesite, crude		19,200	20,900	22,300	23,900	23,000
Nitrogen: N content of ammonia	thousand tons	1,812	2,124	2,177	2,338	2,200
Salt:						
Rock	do.	1,198	1,222	1,234	1,247	1,200

See footnotes at end of table.

TABLE 1—Continued

POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Salt—Continued						
Other	thousand tons	3,660	4,197	4,934	4,932	3,500
Sodium compounds, n.e.s.:						
Carbonate (soda ash)	do.	939	963	930	956	[3]1,005
Caustic soda (96% NaOH)	do.	431	445	440	463	[3]452
Stone: Dolomite	do.	3,025	3,333	3,390	3,422	4,000
Sulfur:						
Native:						
Frasch	do.	4,326	4,437	4,410	4,411	4,400
Other than Frasch	do.	550	457	556	589	500
Total	do.	4,876	4,894	4,966	5,000	4,900
Byproduct:[e]						
From metallurgy	do.	170	170	170	150	150
From petroleum	do.	30	30	25	[r]30	20
Total	do.	200	200	195	[r]180	170
From gypsum[e]	do.	20	20	22	20	20
Total sulfur	do.	5,096	5,114	5,183	5,200	5,090
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	191,642	192,080	193,010	193,015	[3]178,000
Lignite and brown	do.	57,800	67,257	73,200	73,500	[3]71,800
Total	do.	249,442	259,337	266,210	266,515	[3]249,800
Coke:						
Coke oven	do.	16,000	16,400	17,100	17,100	[3]16,550
Gashouse[e]	do.	620	610	610	610	600
Total[e]	do.	16,620	17,010	17,710	17,710	17,150
Fuel briquets, all grades	do.	1,010	1,309	[r]1,379	1,460	[3]1,436
Gas:						
Manufactured:[e]						
Town gas	million cubic meters	223	182	176	[r]133	[3]109
Coke oven gas	do.	5,912	6,140	6,468	[r]6,593	[3]6,456
Natural, marketed	do.	[r]6,390	[r]5,824	[r]5,781	5,713	[3]5,368
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	75	80	80	80	70
Propane and butane	do.	50	60	60	60	50
Peat: Fuel and agricultural[e]		200,000	200,000	250,000	200,000	200,000
Petroleum:						
Crude:						
As reported	thousand tons	194	167	149	163	[3]136
Converted	thousand 42-gallon barrels	1,439	1,239	1,105	1,209	[3]1,009
Refinery products[6]	do.	98,469	100,086	115,020	120,648	[3]122,513

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

[1]Table includes data available through Aug. 26, 1990.

[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.

STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 2 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1989.

COMMODITY REVIEW

Metals

Copper.—In May, 20,000 miners at Kombinat Gornoczo Hutniczy's (KGHM) Lubin Polkowice Rudna and Sieroszowice Mines went on a week-long strike. Represented by two unions, the miners demanded a 5-day work week and a pay increase to compensate the growing inflation. KGHM management indicated that a workweek reduction from 6 to 5 days without increasing output to compensate for the 1 day reduction would result in a copper mining and smelting production decline of 18%. To maintain current levels of production on a 5-day-work-week basis would entail hiring an additional 10,000 workers. Although all of the miners' demands were not met, a tentative agreement was reached that would allow a 30% increase in base salary, a 30% increase in bonuses, and a 100% increase in special pay rates for work on weekends and holidays. Losses during the strike amounted to an estimated 700,000 tons of ore. Other events in the industry included the planned closure of the Konrad Mine in 1989. The impact of the mine's closure on the industry would be minimal because only 7,000 tons of recoverable metal per year has been supplied by the mine in recent years.

The development of the Sieroszewice Mine continued in 1989, but at a slower rate, commensurate with KGHM's ability to fund the work. Reportedly, high interest rates paid by the company for past development projects had limited investment funds available for this mine. Also, KHGM and Poland's foreign trade

TABLE 2

POLAND: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Aluminum:			
Primary	Huta Aluminium	Konin	50.
Secondary	do.	do.	20.
Coal:			
Bituminous	Hard Coal Association in Liquidation State Coal Agency	71 mines at Upper Silesian Basin, Lower Silesian Basin, and Lublin Basin	200.
Lignite	State Coal Agency	4 open pit mines at Turow, Belchatow, Konon, and Adamow	75,000.
Copper:			
Concentrate	Kombinat Gorniczo Hutniczy Miedzi (KGHM)	Mines and concentrators at Konrad, Lubin, Polkowice, Rudna, and Sieroszowice	1,900.
Metal, refined	do.	Smelters at Glogow I, Glogow II, and Legnica	430.
Ferroalloys	Ministry of Industry	Plants at Laziska, Bobrek, Siecznice, and Pokoj, producing FeMn, FeSiMn, FeSi, FeCr, FeW	270.
Lead-zinc:			
Concentrate	do.	Nonferrous Metals Association (mines and concentrators at Bolelaw, Olkuz-Pomorzany, and Trzebionka)	125 Pb. 225 Zn.
Metal:			
Pb, refined	do.	Smelters and refineries at Miasteczko Slaskie, Szopienice, and Orzel Bialy	115.
Zn, refined	do.	Smelters and refineries at Boleslaw, Silesia, and Szopienice	145.
Natural gas	Ministry of Mining and Energy	Gasfields at pre-Carpathian foothills, Carpathian Mountains Lowlands, near Ostrow Wielkopolski, Poznan, and Trzebnica, north of Wroclaw	6,000.[1]

See footnotes at end of table.

TABLE 2—Continued

POLAND: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Petroleum:			
Crude	Ministry of Mining and Energy	Oilfields northern lowlands, near the Baltic Sea; sub-Carpathian and Carpathian Mountains	1.4.[2]
Refined	do.	Refineries at Glinik, Mariampolski, Jasto, Jealicze, Warinsky, Czechowice, Gdansk, etc.	125.[2]
Salt, all types	Ministry of the Chemical Industry	Main mines at Inowroclaw, Klodowa, and Wapno in central Poland	6,500.
Silver	Zaklady Metalurgiczne Trzebinia	Refined from doré produced by the Szopienice Pn-Zn smelter/refinery largely from KGHM supplied slimes	1.
Steel	Ministry of Metallurgy	Main facilities include integrated ironworks and steelworks at Krakow, Katowice, and Warsaw	18,000.
Sulfur	Ministry of the Chemical Industry	Kopalne i Zaklady Przetworcze Siarki im. M. Howotki "Siarkopol" at Tarnobrzeg operates the Grzybow Jeziorko and Machow mines	5,700.

[1]Million cubic meters.
[2]Million barrels per year.

organization, Impexmetal, indicated a change in trade policy that would abolish long-term contracts. A trade policy based on short-term contracts would give these enterprises greater flexibility in the world market.

Iron and Steel.—Environmental and facility expansion concerns at Poland's Nowa Huta integrated steelworks near Kracow were major issues during the year. Owing to severe pollution generated by the steel mill, it was announced at yearend that production at this facility would be reduced from 4.3 to 3.0 million tons per year as of January 1, 1990. Reportedly, the production cutback would not result in any unemployment because of existing chronic personnel shortages.

Despite relatively good pay, workers have been leaving the operation because of severe health and safety problems associated with the facility. At the same time, facility expansion at Nowa Huta included the installation of a new 200,000-ton-per-year electrogalvanizing unit, scheduled for operation in 1991, and the modernization of the steelwork's coking plant. Three modern coking units would replace all 12-year-old coke ovens by the early 1990's. To abate pollution, progress was also made during the year at the steelwork's steam-generating plant, where 11 of the plant's 14 smokestacks were fitted with electrostatic precipitators. The last three smokestacks were to be similarly equipped in 1991.

Lead and Zinc.—Three mines near Silesia were the country's chief producers of lead-zinc ore. Smaller in size compared with the copper deposits, Poland's lead-zinc deposits have been mined to an increasing extent in a difficult geological environment. The ore was mined using the room-and-pillar method, with drilling and loading operations 85% and 100% mechanized, respectively. The metal content of the ore had been gradually declining, and production was hardly able to meet domestic needs. To maintain or increase present production levels, a substantially greater amount of ore would have to be mined, which would require large capital investments. Additional capital for this sector would be difficult to obtain because, unlike the copper industry, Poland's lead-zinc operations required large state subsidies.

Nickel.—Mining at Poland's only nickel deposit at Szklary in Silesia ceased in 1984, owing largely to declining ore grades. The nickel silicate ore is associated with irregularly weathered palaeozoic serpetinites. The average grade of ore was 0.7% Ni, 10% to 15% Fe, and 0.04% Co.

Industrial Minerals

In 1989, Poland's sulfur-mining industry announced plans to reduce the level of emissions of compounds containing sulfur into the atmosphere. These emissions contained an estimated annual sulfur content of about 2.8 million tons. Sulfur was mined in the Tarnobrzeg area. About 10% of the sulfur was extracted from the Machow open pit mine; the balance came from the Jeziorko and Grzybow Mines using a modified Frasch process.

Mineral Fuels

Coal.—In 1989, domestic consumption of hard coal increased despite Government efforts to promote energy conservation and encourage more coal for export. The year's production decline was due largely to work slowdowns and several stoppages by miners demanding shorter hours and greater benefits.

Another major problem for the industry during the year was the need to modernize the country's coal ports.

Although modernization of the coal handling facilities at Gdansk was reportedly well advanced, similar work at the major coal ports of Szczecin and Swinoujscie was not begun.

Petroleum.—In August, exploration carried out near Bialograd resulted in the discovery of petroleum at a depth of 3,800 meters. Subsequently, the Polish Oil and Gas Co. signed an exploration agreement with the U.S. firm Amoco to jointly study existing geological and geophysical data covering a 30-million-acre area between the northwest coast and southeastern parts of the country.

Reserves

Taking into account Poland's efforts at transition to a market economy, the country's mineral reserves would have to be reevaluated from a market economy perspective. As defined by market economies, reserves are those mineral deposits that can be mined at a profit under existing conditions with existing technology. In CMEA countries, including Poland, the prior policies for centrally planned industrial development often had more to do with political than economic considerations. Centrally planned directives to discover exploitable resources may have resulted in possible overestimations and other distortions of collected field data. Consequently, it will probably take Poland a number of years to establish its real mineral reserves from a market economy standpont.

The system that was used to measure reserves was based on two cross-imposed classification schemes, one relating to the exploitability of the mineral in question, and the other relating to the reliability of the information on its quantity and grade. The first system determined whether or not the deposit was suitable for exploitation, given the current technological capability and industrial need. The second classification related to the reliability of the data gathered on the quantity of the mineral in situ. The second classification designated deposits into reserve categories A, B, C1, and C2, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Poland's mineral resources in categories A+B+C1 are given in table 3.

INFRASTRUCTURE

Poland's inland system of ways and communications consisted of 331,129 kilometers (km) of railroads, highways, and waterways. The railroad system consisted of 24,333 km of 1.435-meter standard-gauge, 397 km of 1.524-meter broad-gauge, and 2,515 km of narrow-gauge track. Of the total railroad system, 8,986 km was double tracked, and 10,000 km was electrified. The highway system consisted of 130,000 km of improved hard-surface roads, 24,000 km of unimproved hard-surface roads (crushed stone, gravel), 100,000 km of earth roads, and 45,887 km of various urban roads. Poland had 3,997 km of navigable rivers and canals, with ports at Gliwice on Kanal Gliwice, Wroclaw on the Oder, and Warsaw on the Vistula. In 1989, freight haulage by rail amounted to 385.7 million tons—9.9% less than that in 1988. About 520 million tons of freight was transported on public roads, a decline of 14.3% from the carriage level of 1988. This decline was attributed largely to the decrease in shipment to the construction and building materials industry. During the year, Poland's merchant fleet decommissioned 13 ships and commissioned 6 new vessels. By yearend, the country's merchant fleet consisted of 249 ships, with a total of 4,061 thousand deadweight tons, a 1.2% decline compared with that of 1988.

Sea transport of freight in 1989 amounted to 28.3 million tons, a decline of 8.2% compared with that of 1988. This was due to a decline in both the country's foreign trade and international transit freight. The country's major seaports were Gdansk, Gdynia, Szczecin, and Swinoujscie. Additionally, in 1989, Poland had 4,500 km of pipeline for natural gas, 1,986 km of pipeline for crude petroleum, and 360 km of pipeline for refined products.

TABLE 3

POLAND: APPARENT RESERVES OF MAJOR MINERALS

Commodity	Quantity (thousand metric tons)
Barite	5,500
Coal:	
Bituminous	63,000,000
Lignite	13,000,000
Copper, recoverable in ore	25,000
Iron ore	1,700
Lead, contained in ore	6,000
Nickel, contained in ore	14,000
Rock salt	650,000,000
Sulfur	500,000
Zinc, contained in ore	12,000

OUTLOOK

Owing to the difficulties involved during the country's transition to new legal, political, and economic structures, near-term policies appear to be aimed at maintaining recent levels of operation at state-owned heavy industries to ensure maximum interim employment. As new employment opportunities are created in Poland's emerging market economy, there will be fewer reasons to continue operating large-scale inefficient industries, including sectors within the country's mineral industry. In 1989, there was already a noticeable decline in employment within the coal and nonferrous ore mining and steel industries.

The output of crude steel should decline substantially in the next few years as the nation rationalizes its production efforts, while, at the same time, the output of higher value specialty steels and higher value materials, in general, should rise. The country's coal, copper, lead, zinc, and sulfur industries, because of their developed infrastructures and operations and relatively well ensured mineral resources, should continue their mining and processing activity (with improved pollution controls) well into the future. The absolute output in these industries may decline, but solely in response to market requirements rather than those of the the country's former central planning authorities.

[1]Rzeczpospolita, Feb. 1, 1990, pp. 3–5.
[2]Work cited in footnote 1.
[3]Radio Free Europe, Report on Eastern Europe, V. I, No. 35, Aug. 1990, p. 27.

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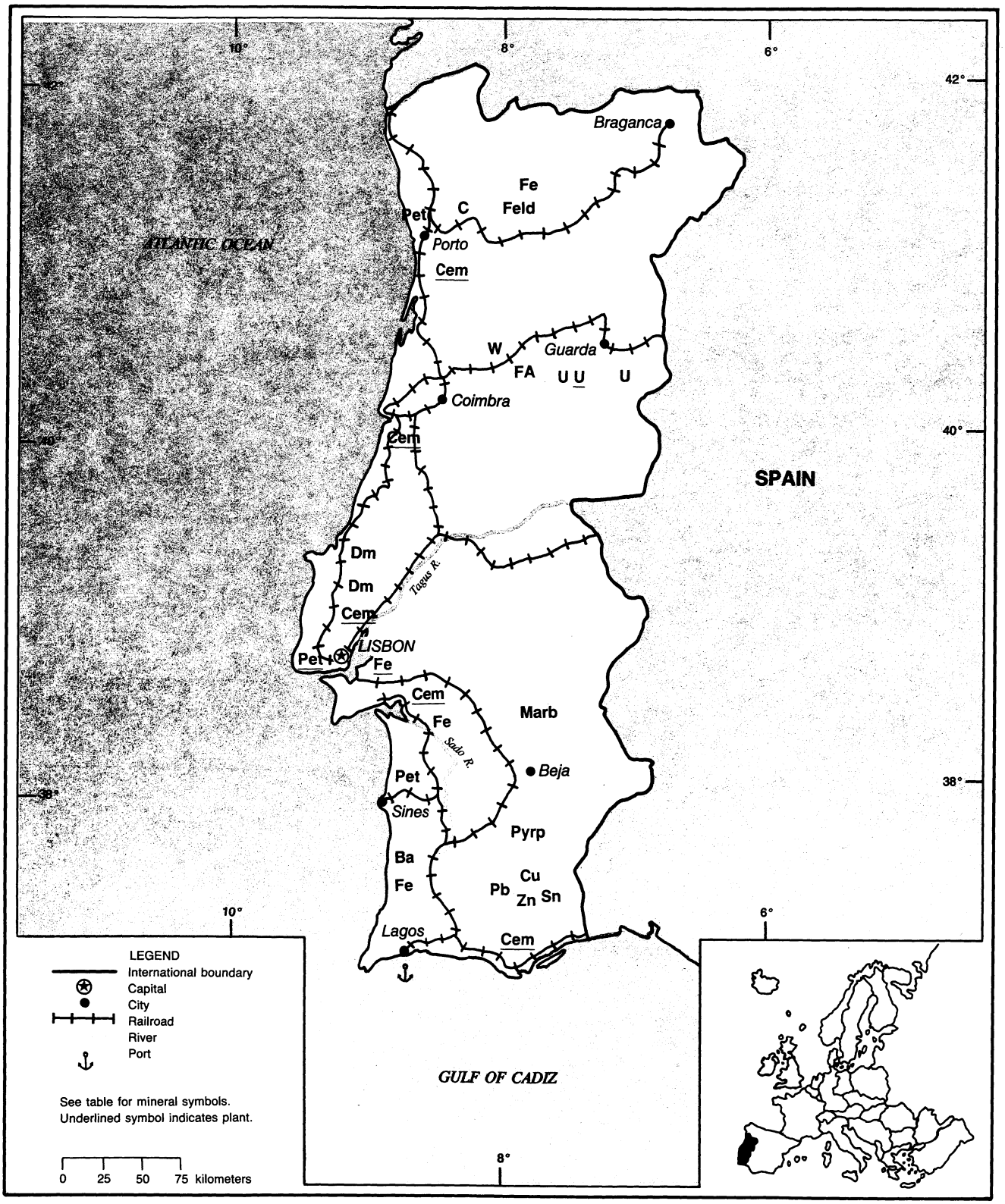
PORTUGAL

AREA 91,640 km² **POPULATION 10.5 million**



THE MINERAL INDUSTRY OF

PORTUGAL

By Harold R. Newman

Portugal, whose land area includes a portion of the Iberian peninsula, is in one of the most mineralized areas of Western Europe. The Iberian peninsula has a diverse mining history that goes back to Phoenician times, and its abundant mineral resources were one of the considerations that precipitated the Roman conquest of the region.

The mineral resource industry of Portugal is modest by world standards; however, the industry is undergoing important changes with the continued development of the rich copper and tin deposit at Neves-Corvo. When the mine reaches full production of 150,000 tons per year of copper in concentrate and 5,000 tons per year of tin in concentrate in 1991, it will represent a major increase in European copper and tin production. Production of ferroalloys and tungsten are also significant to the world economy.

The country posted a reported overall growth of 5% with investment gaining 9% as a result of interest rate cuts and numerous tax and financial incentives tied to Portugal's European Community (EC) accession. Annual inflation reached 12.6%, more than twice the EC average.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued with legislation that privatized many public companies. Among those to be privatized was Cementos de Portugal (CIMPOR), the big cement producer. The privatization issue is part of a broader program to restructure the Portuguese economy from one that is state-controlled to one that is market-driven.

Portuguese and foreign investors are both showing considerable interest in companies that the Portuguese Government is privatizing. It was estimated that foreigners make up more than one-half the running on the Lisbon bourse, where trading was returning to pre-1987 crash levels of between $6 million[1] and $7 million per session. The Government limited foreign ownership to 10% of a privatized company. The same restriction applies to Portuguese individuals or enterprises. A 2,000 share limit was also set on the amount that investment or pension funds could buy. The limit on share holdings may be raised as the advent of the single European market in 1992 raises questions about all constraints on foreign share holdings in EC companies.

Portugal is also addressing its nationalized industries in other ways. It is spending an estimated $1.5 billion to restructure and streamline the national steel corporation, Siderúrgia Nacional, to meet the EC's steel industry quotas and regulations.

PRODUCTION

Sociedade Mineira de Neves-Corvo S.A.R.L. (Somincor) continued to produce copper and tin at the Neves-Corvo Mine. Piritas Alentejas S.A.R.L. was the largest producer of pyrite, Siderúrgia Nacional produced iron and steel, Beralt Tin and Wolfram Ltd. remained a significant tungsten producer, and Cimentos de Portugal was an important producer of cement. With the exception of copper, ferroalloys, dimension stone, tin, and tungsten, production of minerals and related materials was significant only domestically.

TRADE

In 1988, the latest year for which complete data were available, Portugal's major markets were France, the Federal Republic of Germany, and the United Kingdom, while its major suppliers were the Federal Republic of Germany, Spain, and France. Overall, EC countries accounted for about 72% of exports and 66% of imports in 1988, which were somewhat higher than the previous year. The growth in exports was attributed to the continued devaluation of the escudo against other EC currencies while imports rose owing to strong demand for EC consumer goods and light machinery. Portuguese trade with Spain increased dramatically because of mutual tariff and nontariff liberalization. Coal was still the most important mineral resource exported by the United States to Portugal, almost all of which was used at the national electric company's (EDP) coal-fired plant at Sines. The United States supplies the majority of coal consumed, although competition from other producers is increasing.

STRUCTURE OF THE MINERAL INDUSTRY

By world standards, the mineral industry of Portugal is modest; however, the country is becoming a significant producer of copper and tin as Somincor's Neves-Corvo Mine comes on-stream. The mine is considered to be one of the richest copper deposits in the world and, when fully developed, will be the largest copper mine of any type in Europe.

Most of the large mineral resource companies are owned or controlled by the Government; however, there are some privately owned operations. The Government is engaged in efforts to privatize some state-owned industries, which include mineral resource companies.

Ownership of minerals is vested in the Government by the Constitution. Any person, Portuguese or foreigner, may explore for and, if a mineral deposit is found, apply for a concession. The Directorate of Mines and Geological Services of the Ministry of Industry regulates the mineral industry and collects statistics. About 50,000 people are employed by the mineral industry, including mining and processing.

TABLE 1

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Arsenic, white		204	176	218	[e]160	180
Beryl concentrate, gross weight		2	—	4	4	4
Columbite and tantalite concentrates,	gross weight	2	6	—	—	—
Copper:						
Concentrate:						
Gross weight		1,183	865	800	42,483	[2]411,836
Cu content		261	184	100	3,739	98,017
Metal:[e]						
Smelter:						
Primary		2,600	3,000	2,000	2,500	688
Secondary		2,000	3,000	2,000	2,000	2,000
Total		4,600	6,000	4,000	4,500	2,688
Refined, primary		4,500	5,300	5,300	6,000	6,000
Gold, mine output, Au content	kilograms	288	192	248	267	295
Iron and steel:						
Iron ore and concentrate:						
Gross weight:						
Hematite and magnetite		46,910	22,412	9,142	[e]10,000	8,000
Manganiferous		26,300	28,200	18,316	23,300	[2]13,178
Total		73,210	50,612	27,458	[re]33,300	21,178
Fe content:						
Hematite and magnetite		2,017	9,413	[e]4,000	8,296	1,106
Manganiferous		8,502	9,447	[e]5,000	1,957	[2]4,689
Total		10,519	18,860	9,000	10,253	5,795
Metal:						
Pig iron	thousand tons	423	429	435	445	377
Ferroalloys:						
Ferromanganese[e]		48,000	20,000	27,250	23,450	[2]13,170
Silicomanganese[e]		25,000	10,000	—	—	—
Ferrosilicon[e]		9,000	5,000	—	—	—
Silicon metal[e]		11,000	7,000	—	—	—
Ferrotungsten		151	17	—	—	—
Total[e]		93,151	42,017	—	1,000	1,000
Crude steel	thousand tons	665	708	530	802	722
Lead: Refined, secondary[e]		7,000	6,000	6,500	6,500	6,500
Manganese: Mn content of iron ore		1,768	2,087	2,059	1,782	1,800
Silver, mine output, Ag content	kilograms	[r]622	[r]529	755	877	815
Tin:						
Mine output, Sn content		263	197	64	81	89
Metal, primary and secondary		408	194	22	58	62
Titanium, concentrates:						
Gross weight		227	232	141	59	111
Content of TiO_2		114	116	70	30	55
Tungsten, mine output, W content		1,755	1,637	1,205	1,382	[2]1,746
Uranium concentrate: U content		105	109	142	189	152

See footnotes at end of table.

TABLE 1—Continued

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Zinc: Smelter, primary		5,900	5,700	5,800	[e]6,000	5,000
INDUSTRIAL MINERALS						
Barite		1,094	120	660	1,740	1,729
Cement, hydraulic	thousand tons	5,364	5,444	[e]5,800	5,900	6,000
Clays:						
Kaolin		80,097	54,841	66,736	71,200	58,297
Refractory		240,000	[e]250,000	[e]240,000	50,253	50,000
Diatomite		1,600	2,120	2,880	2,070	2,990
Feldspar		29,011	33,740	40,729	51,903	65,854
Gypsum and anhydrite		[e]250,000	[e]230,000	—	338,029	300,000
Lime, hydrated and quicklime[e]		200,000	200,000	200,000	200,000	200,000
Lithium minerals: Lepidolite		130	—	—	14,600	18,264
Nitrogen: N content of ammonia		154,000	118,000	153,900	190,500	151,000
Pyrite and pyrrhotite (including cuprous)	gross weight	[e]356,000	327,966	279,061	244,175	199,018
Salt:						
Rock		463,001	450,908	513,203	535,942	583,670
Marine[e]		214,000	110,000	[2]123,000	100,000	100,000
Total[e]		677,001	560,908	636,203	[r]635,942	683,670
Sand[e]		5,000	5,000	5,000	5,000	5,000
Sodium compounds, n.e.s.:[e]						
Carbonate		150,000	155,000	160,000	155,000	155,000
Sulfate		50,000	52,000	55,000	52,000	55,000
Stone:[e]						
Basalt	thousand tons	65	65	65	[2]87	80
Calcareous:						
Dolomite	do.	160	100	100	[2]105	100
Limestone, marl, calcite	do.	11,000	10,000	10,000	[2]15,418	15,000
Marble	do.	500	500	500	[2]672	700
Diorite	do.	1,600	1,600	1,600	1,600	1,500
Gabbro	do.	50	50	50	50	50
Granite	do.	4,200	4,200	4,200	[2]7,071	7,000
Graywacke	do.	1	1	1	[2]28	20
Ophite	do.	50	50	50	[2]64	60
Quartz	do.	130	130	130	[2]11	9
Quartzite	do.	600	600	600	[2]568	600
Schist	do.	50	50	50	[2]105	100
Slate	do.	100	100	100	[2]27	50
Syenite	do.	75	75	75	[2]23	25
Sulfur:						
Content of pyrites		155,000	144,000	120,000	111,344	115,000
Byproduct, all sources[e]		4,000	5,000	5,000	[r]3,000	3,000
Total[e]		[r]159,000	149,000	125,000	[r]114,344	118,000
Talc		4,998	4,141	7,702	7,187	[2]8,063
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand tons	234	[r]212	254	241	258

See footnotes at end of table.

TABLE 1—Continued

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coke, metallurgical	thousand tons	275	280	160	[e]160	160
Gas, manufactured[e]	million cubic feet	[2]5,111	4,700	4,800	4,800	4,800
Petroleum refinery products:						
Liquefied petroleum gas	do.	2,819	3,577	[e]3,500	[e]3,600	3,600
Gasoline	thousand 42-gallon barrels	7,174	10,632	[e]8,500	[e]8,900	9,000
Jet fuel	do.	4,150	5,111	[e]4,900	[e]4,700	5,000
Kerosene	do.	225	227	[e]220	[e]230	225
Distillate fuel oil	do.	14,509	16,550	[e]16,800	[r]17,500	17,000
Residual fuel oil	do.	17,796	17,289	[e]15,600	[e]16,200	16,000
All other products	do.	6,520	10,389	[e]8,800	[e]9,300	9,000
Refinery fuel and losses	do.	1,748	3,995	[e]3,900	[e]4,100	4,000
Total	do.	54,941	67,770	[e]62,220	[e]64,530	63,825

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 1990.
[2]Reported figure.

TABLE 2

PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Cimentos de Portugal (Cimpor) (Government, 100%)	10 plants, various locations	6,000
Coal	Empressa Carbonifera de Duro S.A.S.L.	Mine at Pajao	250
Copper	Sociedade Minera de Neves-Corvo S.A.R.L. (Somicor) (Government, 51%; RTZ Corp. 49%)	Neves-Corvo Mine near Castro Verde	150
Diatomite	Sociedade Anglo-Portugesa de Diatomite Lda.	Mines at Obidos and Rolica	5
Feldspar	A. J. da Fonseca Lda.	Seixigal Quarry, Chaves	10
Ferroalloys	Electrometalurgia S.A.R.L. (Eurominas)	Plant at Setubal	100
Petroleum, refined	Petroleos de Portugal, (Petrogal) (Government, 100%)	Refineries at Lisbon, Orto, and Sines	[1]300,000
Pyrite	Piritas Alenejanas S.A.R.L. (Government, 100%)	Mines at Aljustrel	500
Steel, crude	Siderúrgia Nacional S.A.R.L. (Government, 100%)	Ironworks and steelworks at Seixal and Maia	1,000
Tin	Sociedade Minerera de Neves-Corvo S.A.R.L. (Somicor) (Government, 51%; RTZ Corp., 49%)	Neves-Corvo Mine near Castro Verde	5
Tungsten	Beralt Tin and Wolfram (Portugal) Ltd. (Government, 100%)	Mine and plant at Panasqueira	1,600
Uranium	Empresa Nacional de Uranio (ENU) (Government, 100%)	Mines and plant at Guarda	[2]170
Zinc, refined	Quimigel E.P. (Government, 100%)	Electrolytic plant at Barreiro	11

[1]Barrels per day.
[2]Tons per year.

COMMODITY REVIEW

Metals

Copper.—The Neves-Corvo Mine continued production in 1989. Somincor, the operating company, is 51% Government-owned through the Portuguese Mineral Development Agency (EDM). The minority partner is RTZ Corp, a United Kingdom company, which owns 49% of the joint venture.

The Neves-Corvo complex consists of four proven ore bodies: Graca, reported to be averaging 10% copper; Corvo, ranging from 7% to 10% copper; Neves, averaging 1% copper; and Zambujal, a complex sulfide ore of copper, lead, and zinc. Zinc is also associated with the other three deposits, reportedly averaging 10% in the Graca ore body.

The mine is designed to produce 1.3 million tons of raw ore per year, which was expected to yield 150,000 tons of copper in concentrate per year. The estimated life of the mine, based on proven reserves, is 22 years. Total investment in the project was estimated to be $400 million.

Outokumpu Oy, a Finnish company, was investigating the feasibility of building a copper smelter and refinery in Portugal. Outokumpu, with a consortium of private Portuguese companies, was engaged in a two-phase study. The first phase will investigate viability and detailed design of the project. If the results of the first phase of the project are positive, Outokumpu will proceed with project implementation, which was expected to take 4 years. The proposed site of the smelter site would be near the natural harbor of Sines.

Outokumpu also entered into an agreement with Somincor for the purchase of copper concentrates. Starting in 1990, Outokumpu will purchase 110,000 tons per year of concentrates from the Neves-Corvo operation for a period of 12 years. These concentrates will furnish about 25% of the feed for Outokumpu's Harjavalta smelter in Finland.

Ferroalloys.—A Brazilian ferroalloy producer, Italmagnesio Group, formed a subsidiary in Portugal. The new company, Novas Fornas de Beira Alta Lda. (Forbel), will restart eight ferroalloy and calcium carbide furnaces that were formerly operated by Cia Portuguesa de Fornos Electico (CPFE). These furnaces were shut down by CPFE in 1986 because of a steep rise in energy costs that made the operation unprofitable. Forbel leased the CPFE facility for a 10-year period. [The plant operates at a full capacity of 30,000 tons per year of ferrosilicon 75%, 20,000 tons per year of ferromanganese and ferrosilicomanganese, and 24,000 tons per year of calcium.]

Forbel hopes to supply the domestic market with material that is currently being imported from Spain and France and export the remaining production to other EC countries and Eastern Europe. Although Forbel's energy cost is higher than the equivalent cost in Brazil, the company views the Portuguese project as a way of increasing its market share in the EC and benefiting from the EC tax-free import system. Forbel could ship material from its Brazilian operation for further processing at its plant in Portugal without incurring further custom or tax duties.

Iron and Steel.—The Portuguese iron and steel operation was nationalized in 1975 and continues to function as a public entity incorporated as Siderúrgia Nacional (SN). The main goal of the company is to ensure its viability beyond the transition period of 1991, as mentioned in Portugal's Act of Accession to the EC. Achievement of this requires a reorganization of SN's financial situation and a modernization plan for the production plants to ensure that SN will be competitive within an open market in the EC.

Plant modernization is designed to improve product quality, reduce production costs, increase energy efficiency, and undergo a rationalization of personnel, about 40%. Plans for these improvements were submitted to the EC Commission in 1985. In 1989, the Commission agreed to loan $1.3 million to SN to assist in its modernization plans at its Seixal and Maia plants. The loan was approximately 65% of what SN required to complete its restructuring plans. The remainder of money required would be made available by the Government. None of the monies would be used to increase capacity. Plans include improvements to the hot blast stoves and coke batteries, the addition of a new continuous caster with ladle metallurgy, changes to the continuous mill in coiled and straight products, and improvements in the section mills to increase yields and reduce costs.

Tin.—Somincor's new tin processing plant continued under construction at yearend. The estimated completion date is mid-1990. The facility includes a tin concentrator made up of coarse ore storage; crushing, grinding, tabling, flotation, filtration, and loadout facilities, and a 5-kilometer-long tailings pipeline. Plant capacity is 5,000 tons per year of tin in concentrate, which should make Portugal one of the world's top 10 tin producers. Somincor stated it would produce two grades of concentrate: one with a grade of 50% to 55% tin and one with a lower 30% to 40% grade. Also, although plant capacity was 5,000 tons per year, recovery levels would fluctuate from year to year because of the complex nature of the ore body.

Tungsten.—Beralt Tin and Wolfram (Portugal) Ltd. was the only producer of tungsten in 1989. The company was investing in development work at its Panasqueira Mine near Fundao. The work is to improve efficiency and increase the life of the mine beyond the current estimate of 5 years. Most of the work was directed toward accessing lower levels where proven reserves were estimated to be sufficient for a 40-year mine life at the current production rate of 1,500 tons per year of tungsten in concentrate.

Industrial Minerals

Demand for cement continued, while the building and construction industry maintained its levels of activity. CIMPOR, the leading cement producer, announced its intention to sign an agreement with Ciments Francais of France to create a joint-venture company, PREFASA, to develop industrial concrete activities in Portugal.

The dimension stone industry continued as a very important segment of the mining industry in terms of value. Marble is the most valuable of the stone products and accounts for about 70% of stone production. The main area for marble mining is the district of Evora.

Mineral Fuels

Coal accounts for about 4% of total energy consumption. Although there are some domestic reserves, most coal is imported. There is a growing demand for coal because the electricity sector is switching away from oil. There are no gas reserves and no nuclear powerplants. Hydropower accounts for about 45% of

electricity generation. There are plans to increase generating capacity from the current 2,800 megawatt (MW) to 4,000 MW by 1991.

Construction was nearly complete on the four-unit, coal-fired powerplant at Sines. When completed, the station will have a capacity of 1,200 MW. Another four-unit, 1,200-MW, coal-fired station is to be built at Pego. The first unit is scheduled to be on-line in 1992. Domestic production of coal is relatively low, and Portugal is dependent on imported energy sources.

TABLE 3

PORTUGAL: RESERVES OF MAJOR MINERALS

Commodity (ore)	Amount[e] (million tons)
Copper	32.5
Lead	5.0
Tin	3.0
Zinc	3.5

[e]Estimated.

INFRASTRUCTURE

The transportation network includes 3,613 kilometers of railroad, most of which is operated by the state-owned Portuguese Railroad Co. Most of the trackage is single-track, 1.665-meter gauge, of which about 15% is electrified. Portugal has about 74,000 kilometers of usable highways, of which 84% is paved. Goods are also moved by waterborne coastal shipping. Major seaports are Lisbon, Oporto, Ponta Delgada, and Sines.

OUTLOOK

With the discovery and development of major sulfide deposits in the south, mineral resources are an important concern of the Government. Tax incentives and other stimuli should encourage further interest by mineral resource companies, which in turn should cause discovery and development of other mineral resources and modernization of existing industries. In the short term, however, Portugal is expected to remain a net importer of mineral-related products, especially mineral fuels.

[1]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc145.95=US$1.00, the average exchange rate for 1989.

OTHER SOURCES OF INFORMATION

Agency

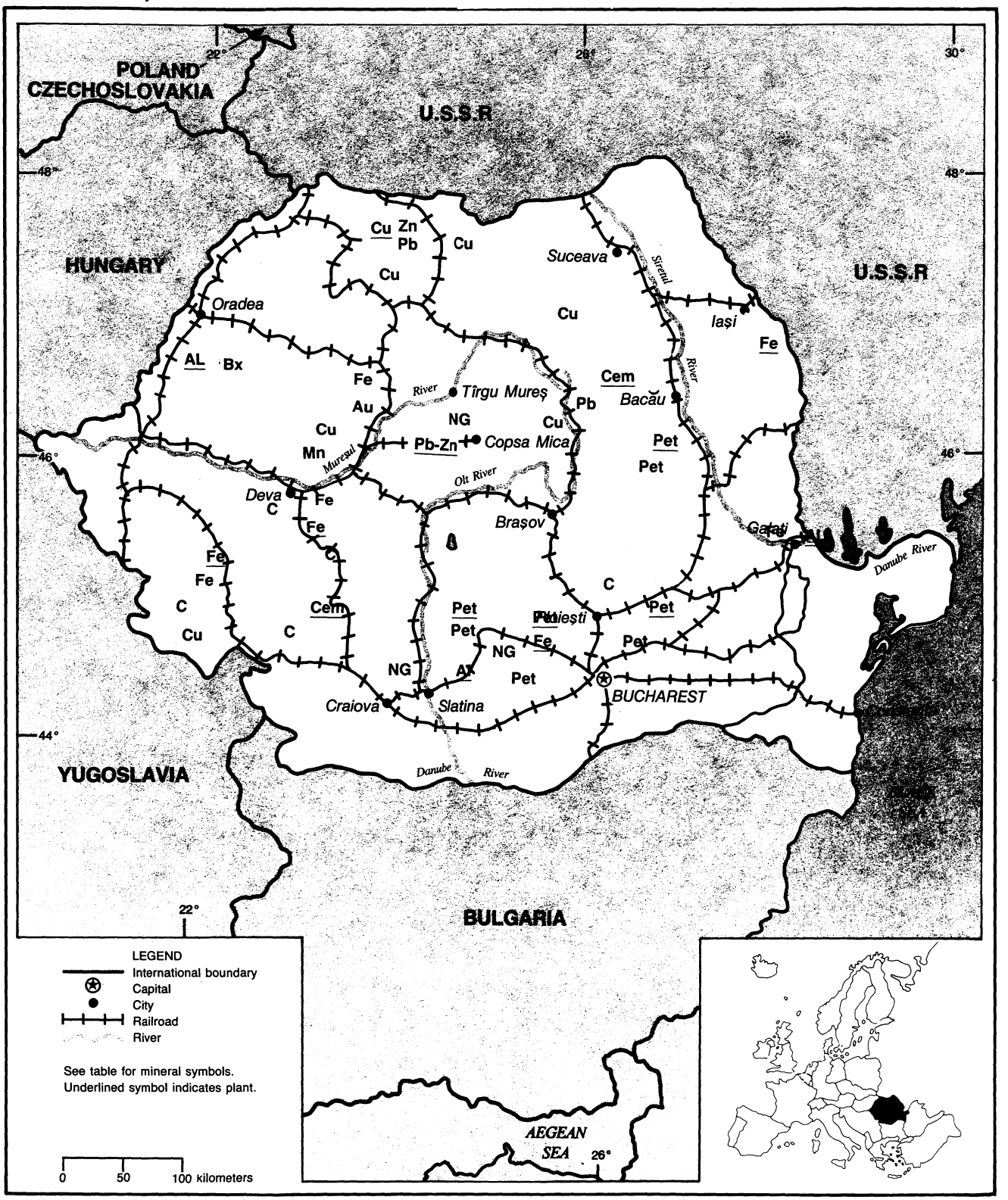
Ministry of Industry, Energy, and Exports
General Direction of Geology
Av. António José de Almeida
1078 Lisboa Codex, Lisbon

Publications

Ministry of Industry, Energy, and Exports, Lisbon:
Bulletin of Industrial Statistics, monthly.
Bulletin of Statistics, monthly.
Bulletin of Mines, quarterly.

ROMANIA

AREA 238,000 km² **POPULATION 23.4 million**



THE MINERAL INDUSTRY OF

ROMANIA

By Donald E. Buck, Jr.

Operations by Romania's mineral industry in 1989 seemingly were little affected by the fall of the country's Government in that year. This, however, may well have been true only because the Government change did not come about until December. Available information suggests that small reductions in activities in some sectors of the mineral industry were probably balanced by modest gains elsewhere.

The change in Government, however, with a shift toward a market-oriented economy, portended significant changes in the mineral industry at some point in the future. Such changes, conceivably, could be not only in the scale of operations, but in the very nature of activities carried out, as well as in trading partners for both imports and exports of mineral commodities.

Prior to this change in Government, Romania had been successful at both expanding exports and limiting imports to finance the country's debt repayment program. But this was achieved through drastic economic measures, which caused hardships throughout the country. One of the most imposing problems has been the lack of sufficient energy to fulfill both the needs of industry and the population. The lack of electricity is reported to have curtailed the full production capacity of industries. The new Government has already indicated a desire to improve trade relations and promote foreign investment opportunities. Priorities have been given to increasing imports, modernizing the industrial sector, increasing the availability of consumer goods, and increasing energy supplies for both residential heating and industrial usage.

Official Romanian 1988 statistical data on economic performance indicate that national income grew by only 3.2%, sharply down from the previous year's announced growth of 4.8% and 1986's 7.3%. Romania's centrally planned economy was continually affected by shortfalls in raw materials, spare parts, and energy, reducing both industrial production and growth in the national income. Romania's economic and political policies have led to isolation from both the Western industrialized world and its neighbors. In addition, the depletion of raw materials has increased the country's dependence on the U.S.S.R. for basic resources.

GOVERNMENT POLICIES AND PROGRAMS

The Romanian economic problems, in part, relate back to the Ceauşescu Government's desire that heavy industries be built to supply the export markets, even though these heavy industries were dependent on imported raw materials. The new Government has indicated the possibility of altering the economic development, challenging the former policies and priorities. Government officials are thought to want to promote expansion of light industries and the rationalization and modernization of heavy industries. The Government also has indicated that it no longer emphasizes exports; instead it tries to create a self-reliant economy. A policy of slow reforms and measured change to the economy is indicated by general statements by officials of the new Government.

PRODUCTION

Romania's mineral industry, state owned and operated, has not previously disclosed accurately yearly production figures for many of the commodities produced. In 1990, the Government supplied figures for 1989 production of a number of commodities (see table 1), reflecting substantial changes from previous estimates of production. Copper, lead, and zinc production reported is more than previous estimates, while barite, bauxite, feldspar, and talc are lower. As the country adjusts to the economic and trade pressures of the other Eastern bloc countries and to the need for Western European countries assistance, more information on production statistics are expected to become available. Economic performance from the first quarter of 1990 indicates that the marketable industrial output was 81% of last year's. The production of copper, lead, steel, and zinc for the first 2 months of 1990 were all reported to be between 20% and 30% lower than in 1989.

TRADE

Under the former Government, the stable trade relationship with the United States was threatened by the cancellation of the most-favored-nation status. When the Romanian Government had refused to cease its alleged human rights abuses, the most-favored-nation trading status with the United States was terminated.

From the prospective of Romania's trade surplus, the largest hard-currency surpluses in 1988 were earned by Italy with $753 million and the United States with $478 million. The trade surplus with Romania's "Big Four" Western trade partners, the Federal Republic of Germany, France, Italy, and the United States, generated only 51.3% of Romania's 1988 hard-currency trade surplus. This was down sharply from 81% for 1987 and 91% for 1986. The total trade surplus from the 24 Organization for Economic Cooperation and Development (OECD) countries is only $2.71 billion or 68% of hard-currency surplus acclaimed by

TABLE 1

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite, gross weight		460,000	500,000	480,000	435,400	[3]345,200
Alumina, calcined, gross weight		548,000	555,000	584,000	620,000	[3]611,000
Ingot including alloys:						
Primary		247,000	253,000	260,000	265,600	[3]269,100
Secondary		18,000	16,000	15,000	[e]15,000	15,000
Total		265,000	269,000	275,000	[r e]280,600	284,100
Bismuth, mine output, Bi content[e]		80	80	75	65	65
Cadmium metal, smelter[e]		[r]55	[r]55	[r]50	[r]48	46
Copper:						
Mine output, Cu content[e]		[r]33,000	35,000	38,000	40,000	[3]42,912
Metal:						
Smelter:						
Primary[e]		[3]32,963	[r]35,000	[r]38,000	[r]40,000	42,900
Secondary[e]		[r]1,000	[r]1,000	[r]1,000	[r]1,000	1,500
Total[e]		33,963	36,000	39,000	41,000	44,400
Refined:						
Primary[e]		39,000	40,900	39,500	40,000	42,900
Secondary[e]		3,000	3,100	3,000	3,000	5,100
Total[e]		42,000	[r]44,000	42,500	43,000	48,000
Gold, mine output, Au content[e]	kilograms	2,020	1,870	1,870	1,870	2,020
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	2,287	2,431	2,281	[r e]2,400	[3]2,482
Content (26% Fe)	do.	595	632	595	[r e]624	[3]645
Metal:						
Pig iron	do.	9,212	9,329	8,673	[r 3]9,502	9,500
Ferroalloys:[e]						
Ferrochromium		44,000	44,000	42,000	42,000	42,000
Ferrosilicon		50,000	51,000	50,000	50,000	50,000
Ferromanganese		80,000	82,000	81,000	80,000	80,000
Silicomanganese		39,000	40,000	39,000	40,500	40,000
Silicon metal		3,800	4,500	4,500	4,500	4,400
Steel:						
Crude	thousand tons	13,975	14,276	13,885	14,496	[3]14,415
Semimanufactures:						
Castings and forgings, finished	do.	1,337	1,336	[e]1,400	[e]1,300	1,300
Pipes and tubes	do.	1,513	1,565	[r 3]1,394	[e]1,500	[3]1,360
Rolled products	do.	9.900	10,207	[r 3]9,675	[e]9,500	[3]10,263
Lead:						
Mine output, Pb content[e]		[r]34,300	[r]36,300	[r]30,200	[r]32,800	[3]37,679
Smelter, primary		42,600	45,500	37,700	38,000	41,100
Refined:						
Primary[e]		[r]42,600	[r]45,500	[r]37,700	[r]38,000	41,100
Secondary[e]		[r]6,000	[r]6,000	[r]5,486	[r]6,000	3,900
Total		48,600	51,500	43,186	44,000	45,000
Manganese:[4]						
Ore, gross weight[e]	thousand tons	250	250	250	[r]235	[3]219

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Managanese—Continued						
Concentrate:						
Gross weight	thousand tons	68	67	68	r60	348
Mn content[e]	do.	19	19	19	r17	12
Silver, mine output, Ag content[e]	metric tons	25	r23	r20	23	26
Zinc:						
Mine output, Zn content[e]		43,000	43,000	r40,000	r42,000	354,467
Metal, smelter, primary and secondary		53,000	53,000	51,000	50,000	49,500
INDUSTRIAL MINERALS						
Barite[e]		r25,000	r25,000	r25,000	r25,000	325,250
Cement, hydraulic	thousand tons	12,238	14,216	13,583	e14,000	14,000
Clays:[e]						
Bentonite		180,000	185,000	180,000	180,000	180,000
Kaolin		410,000	410,000	400,000	400,000	400,000
Diamonds, synthetic industrial	thousand carats	—	—	—	5,000	5,000
Diatomite[e]		r60,000	r65,000	r55,650	r55,000	349,975
Feldspar[e]		r70,000	r70,000	r65,000	r65,000	359,960
Fluorspar[e]		20,000	20,000	18,000	18,000	18,000
Graphite[e]		12,000	12,000	12,000	12,000	310,000
Gypsum[e]		1,620	1,600	1,600	1,600	1,400
Lime	thousand tons	3,717	3,959	3,936	e4,000	4,000
Nitrogen: N content of ammonia	do.	2,880	3,041	2,788	e2,800	32,700
Pyrites, gross weight[e]	do.	930	975	850	930	3897
Salt:						
Rock salt[e]	do.	1,900	2,000	2,000	2,000	3,365
Other	do.	e3,119	3,355	r3,395	e3,400	33,306
Total	do.	5,019	5,355	r5,395	r5,400	36,771
Sand[e]	do.	2,500	2,500	2,500	2,450	2,400
Sodium compounds, n.e.s.:						
Caustic soda	do.	814	846	817	821	820
Sodium carbonate, manufactured, 100% Na_2CO_3 basis	do.	836	895	894	918	890
Sulfur:[e]						
S content of pyrites	do.	r370	r390	r340	r370	3359
Byproduct, all sources	do.	r380	r410	r350	r380	3375
Total	do.	r750	r800	r690	r750	3734
Sulfuric acid	do.	1,835	1,971	1,693	1,825	1,800
Talc[e]		65,000	64,000	r55,000	r50,000	345,638
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		108,593	105,802	88,790	e90,000	85,000
Coal:						
Run-of-mine:						
Anthracite and bituminous	thousand tons	10,472	11,074	11,693	11,700	38,294
Brown	do.	834	858	897	870	3844
Lignite	do.	38,513	39,400	43,109	50,600	352,200
Total	do.	49,819	51,332	55,699	63,170	61,338
Washed (produced from above):						
Anthracite and bituminous:						
For coke and semicoke production	do.	2,963	3,276	3,474	9,160	6,450

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERALS FUELS AND RELATED MATERIALS—Continued						
Coal—Continued						
Washed (produced from above)—Continued						
Anthracite and bituminous—Continued						
For other uses	thousand tons	5,694	5,420	5,625	2,540	1,884
Brown	do.	784	810	846	r840	800
Lignite	do.	37,140	38,012	41,579	r48,800	50,350
Total	do.	46,581	47,518	51,524	r58,800	57,600
Coke:						
Metallurgical	do.	4,743	5,088	5,326	5,228	5,000
Other	do.	439	582	500	e500	500
Total	do.	5,182	5,670	5,826	re5,728	5,500
Fuel briquets (from brown coal)[e]	do.	750	750	750	750	750
Gas, natural:[5]						
Gross:						
Associated	million cubic meters	11,708	12,608	12,117	11,900	11,600
Nonassociated	do.	27,196	26,763	25,301	24,900	25,400
Total	do.	38,904	39,371	37,418	36,800	37,000
Marketed[e]	do.	31,000	31,500	29,900	29,400	29,500
Petroleum:						
Crude:						
As reported	thousand tons	10,718	10,125	9,504	10,896	9,237
Converted	thousand 42-gallon barrels	81,028	76,545	71,850	82,374	69,832
Refinery products[e]	do.	169,300	185,500	184,000	185,000	185,000

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

[1]Includes data available through May 1990.

[2]In addition to the commodities listed, antimony, asbestos, and a variety of crude construction materials are produced, and molybdenum may have been produced as a byproduct of copper from 1987 on, 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]Reporting change from cubic feet to cubic meters.

Romania. The result was either an overstatement of the trade surplus, a shift in the trade pattern for the country, or a change in the reporting procedure.

The U.S.S.R. had signed a 1990 protocol with Romania to deliver 50 million barrels of oil, 8 billion cubic meters of natural gas, 5.65 billion kilowatt hours of electricity, 4.3 million tons of iron ore, and more than 1 million tons of blast furnace feed and coking coal. The U.S.S.R. later indicated that it would deliver an additional 1 million tons of coal, 1.8 billion cubic meters of gas, and 576,000 megawatt hours of electricity, considerable quantities of steel and aluminum rolled goods, nonferrous metals and other products in exchange for Romanian engineering goods, cement, and other goods.

STRUCTURE OF THE MINERAL INDUSTRY

The production of a wide range of minerals and metals are important to the economy of Romania. The depletion of some raw material deposits and the absence of other mineral resources sufficient to sustain the established mineral industry of Romania are problems faced by the new Government. For example, the aluminum industry must import three-quarters of the bauxite necessary for the two alumina refineries. The 14-million-ton-per-year steel production is dependant upon the importation of most of the iron ore required for the industry. The Government built petroleum refineries with the primary crude processing capacity of 255 million barrels of oil per year. At best, 90% of the capacity was utilized and, with high refinery losses, the projected product recovery was substantially lower. At times, 40% of the crude processed was imported, where the value of imported crude was more than the value of the first refining product. This imbalance resulted in a loss of $77 millon between 1982 and 1989, when 681 million barrels of crude was processed for export.

The country's lack of electrical power to fulfill the national needs resulted in an emphasis to build powerplants. In 1986, the Ministry of Electric Power had a total capacity of 20,899 megawatts and production of 75.5 billion kilowatt hours. In recent years, oil-fired generating plants have been replaced with low-grade coal

TABLE 2

ROMANIA: STRUCTURE OF MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (all state owned)	Location of main facilities	Annual capacity
Alumina	Ministry of Metallurgical Industry	Plant at Oradea, near Hungarian border	270
Do.	do.	Plant at Tulcea, Danube Delta	270
Aluminum, primary	do.	Slatina Aluminum Enterprise, 120 kilometers west of Bucharest	270
Barite	Ministry of Mines	Ortra mine, Rosia Montana, southwest of Cluj	100
Bauxite	do.	Oradea-Dobresti Mining Complex, near Hungarian border	350
Cement	Ministry of Industrial Construction	Tasca-Bicaz plant, near Piatra Neamt	[3]3
Do.	do.	Cimpulung plant, about 60 kilometers north of Pitesti	[3]2
Do.	do.	Medgidia plant, west of Constanta	1,000
Do.	do.	Pieni plant, 20 kilometers north of Tirgoviste	600
Coal:			
Bituminous	Ministry of Mines	Valea Jiului Mining Complex, near Hunedoara	[3]10
Lignite	Ministry of Mines, Oltenia Mining Complex, including Rovinari Mining Enterprise	Jiu Valley, Oltenia County, north of Craiova	[3]20
Do.	Ploesti Mining Complex	About 50 kilometers north of Bucharest	8,700
Copper:			
Ore (concentrate)	do.	Baia Mare, Baia-Sprie, and Cavnic mines, northwest area near U.S.S.R. border; Rosia Montana, Noud, Borsa, Balan, and Lesul-Ursului mines—in east-west arc along Carpathian range; Rosia Poieni mines; and Moldova Noua mines, southwest near Danubian border with Yugoslavia	180
Metal	Ministry of Metallurgical Industry Metallurgical Enterprise for Nonferrous Metals	Baia Mare, in northwest near U.S.S.R. and Hungarian borders	35
Do.	do.	Zlatna smelter, Apuseni, in northwest Romania	13
Ferroalloys	Ministry of Metallurgical Industry	Complex at Tulcea	280
Iron ore	Ministry of Mines	Mining complex at Hunedoara, in west-central Romania	[3]1
Do.	do.	Resita Mining Complex, southwestern Romania, near Yugoslav border	660
Do.	do.	Napoca-Cluj Mining Complex, northwestern Romania on the Somesul River	990
Lead in ore	do.	Baia Mare Mine, near U.S.S.R. and Hungarian borders	24
Do.	do.	Balan Mine, 50 kilometers southwest of Piatra Neamt	10
Lead metal	Ministry of Metallurgical Industry, Uzina Chimica Metallurgica	Smelter at Copsa Mica, central Romania, on the Tirnava Mare River	42
Natural gas	Ministry of Petroleum and Gas	Tirgu Mures Field at Tirgu Mures, north-central Romania	[1]996,000
Do.	do.	Ploesti Field, 50 kilometers north of Bucharest	[1]249,000
Petroleum, crude	do.	Ploesti-Teleajen, Pitesti, and Tirgoviste Fields, in Prahova Valley around Bucharest; Bacau Field at Bacau, east-central Romania near the Siretul River; and West Carpathian Field, southeast Carpathian Range, between the west bank of the Olt River and Tirgu Jiu	[2]250,000
Petroleum products	do.	Refineries at Brazi, Pitesti, Suplacu, Bacau, Borzesti, Brosov, Cimpina, Darmanesti, G. Gheorghiu Dej-Onesti, Ploesti, Telajen, and Navodari	[2]533,000
Steel	Ministry of the Metallurgical Industry: Galati Steel Complex	Danube River, north of Braila, near the U.S.S.R. border	[3]10
Do.	Hunedoara Steel Complex	West-central Romania, near Calan	[3]4
Do.	Resita Steel Plant	Southwestern Romania, about 20 kilometers southwest of Caransebes	[3]1
Do.	Calarasi Steel Plant	Near the Bulgarian border close to the Danube	600
Zinc in ore	Ministry of Mines, Baia Mare Mining Complex	Baia Mare, near the U.S.S.R. and Hungarian borders	60
Zinc metal	Ministry of Metallurgical Industry, Uzina Chimica Metalurgica	Imperial Smelter at Copsa Mica, Tirnava River, central Romania	66

[1]Million cubic feet per year.
[2]Barrels per day.
[3]Million metric tons per year.

plants. The premier construction program for electric generating capacity in progress is the complex of five 600-megawatt pressurized heavy-water nuclear reactors built by Canadian interests at Cernavoda. Another plant was planned in Transylvania; however, it has been delayed several times from the original initial construction date of 1990. In Moldavia, a Soviet-designed nuclear reactor complex of three 1,000-megawatt Soviet blocks had been planned, but was scrapped because it was considered too costly and less efficient than the Canadian designed plant under construction.

Many small hydroelectric plants are under construction to provide electricity and irrigation water. The Government plans to increase utilization of hydroelectric potential from the current 30%. The previous Government had initiated other water projects, such as canals that were designed and planned to connect Bucharest to the Danube River and to the Black Sea. The Danube River to Black Sea portion was completed 5 years ago and has an estimated traffic volume of 7 million tons per year. At present, the Port of Constanta on the Black Sea, which is the termination point for the whole planned canal project, has a 20,000-ton-per-day turnover capacity. The new Government, in April 1990, had indicated that many of the larger projects were to be canceled or reduced in scope. The Danube-Jiu-Olt-Arges hydropower system, a gigantic project, has been limited to the 23-kilometer Draganesti-Olt-Arges canal, which can be finished in 1 year. The Danube-Bucharest canal was abandoned as too large an investment for the possible return on investment. However, the 11 billion lei investment already spent might be used for flood control.

COMMODITY REVIEW

Metals

Aluminum.—The production of aluminum is heavily dependent on imported raw materials as domestic production of bauxite continues to decline. Three-quarters of the domestic bauxite requirement is imported, with the majority of imports coming from Greece and Yugoslavia. There are two alumina plants, one at Orades near the Hungarian border and the other at Tulcea on the Danube River. Domestic bauxite production is refined at Oradea and imported bauxite at Tulcea. Total aluminum production has continued to increase despite the reported shortages in electricity and decreasing bauxite production.

Copper.—Copper was one of the commodities for which mine production data were provided in 1989 by the Romanian officials for the first time in a number of years. Ore output was recorded as 12,495,000 tons, grading only 0.3% copper and 2% to 4% sulfur. From this ore, concentrates were produced, reportedly containing 42,912 tons of copper with a grade range of 15% to 20% copper, thus suggesting a range of 215,000 tons to 286,000 tons gross weight for concentrate output.

The reported 1989 output level was considerably higher than the level previously estimated for prior years and led to revisions of the estimates for 1985-88 inclusive. The increase in Romanian output over this 5-year period was evidently, to a significant extent, the result of the opening of Rosia Poieni copper mine and beneficiation complex in the Apuseni Mountains of southwest Romania. This facility, with a design capacity to process at least 9 million tons of low-grade ore annually, could well be one of the largest nonferrous metal mines in Europe in terms of volume of ores handled and certainly the dominant Romanian source of copper. However, the very low grade of ore raises questions as to its economic viability in a market economy setting.

Iron and Steel.—With a domestic iron ore production equivalent to only about 4.5% of its steel output, Romania remained heavily dependent on imports of iron ore as the principal source of iron raw materials. In 1989, the U.S.S.R. remained the country's leading source of imported iron-bearing materials, providing about 6.5 million tons. This figure, however, was lower than that of the previous year for the third year in a row. Soviet exports totaled 9.1 million tons in 1986, 8.1 million tons in 1987, and 7.7 million tons in 1988. The material supplied by the U.S.S.R. was of two types, ore (possibly including concentrate) and pellets; receipts of pellets have been remarkably consistent since the early 1980's, averaging about 3.3 million tons per year. Other source countries have included a number of the world's leading iron ore exporters, but the relative importance of these other sources has varied considerably from year to year. In 1989, India ranked highest, with approximately 2.8 million tons, followed by Brazil with about 1.6 million tons and Venezuela with 1 million tons. In 1988, however, India again ranked behind the U.S.S.R., but with only 1.7 million tons, and it was followed by Liberia with 1.1 million tons, Brazil with 904,000 tons, and Venezuela with 606,000 tons. Among other notable suppliers in recent years have been Canada, Spain, and Australia; the latter country was expected to loom larger as a source of supply in the future owing to the 1988 agreement reached with Hancock Mining of Australia for 5.3 million tons of ore during a 12-year period. To assist in ensuring an adequate ore supply, the Romanians built at least three ore carriers, of which the first, the 165,000-deadweight-ton Comanesti entered service in 1989. The second, the Casrbunesti, underwent sea trials in the fall of 1989, and the third, the Cazanesti, was nearing completion at yearend.

The country's 14-million-ton steel industry was concentrated in the 10-million-ton-per-year Combanat Siderurgic Galati plant at the confluence of the Danube, Siret, and Prut Rivers. At least 16 other plants of one type or another have been reported, ranging from the Hunedoara and Resita integrated iron and steel plants through the Tirgoviste ferroalloy and alloy steel plant to a variety of sites equipped only with rolling mills.

To maintain Romania's steel output level at about 14 million tons per year, a scrap supply averaging about 4.5 million tons per year has been necessary. The origin of this supply remains conjectural. There have been no indications of deliveries of any significant quantities of scrap from market economy countries; thus, it must be presumed that the scrap supply has consisted of material of domestic origins and imports from centrally planned economy countries that have not reported such trade.

Lead and Zinc.—As previously noted under production, the release of 1989 mine output statistics for lead and zinc by Romanian official sources led to revisions in Bureau of Mines estimates of production for prior years. Output of lead-zinc ore was reported as 6,998,554 metric tons containing 0.5% to 0.8% lead and 1.2% to 2% zinc. From this ore, approximately

209,300 tons of lead concentrates grading 18% lead and 181,6000 tons of zinc concentrates grading 30% zinc were produced. Presumably, the Baia Mare mining complex remained the country's principal source of mine lead and sole significant source of mine zinc, with the Balan mine providing most, if not all, of the additional supply of mine lead. These lead-zinc concentrates are smelted at the Uxina Chimica Metalurigia Imperial smelter in Copsa Mica.

Molybdenum.—The release of data on Romanian mine production by the country's Ministry of Mines unfortunately did not include any information on its recovery, if any, of molybdenum. As early as September 1987, a "molybdenum recovery unit" (not further described) was reportedly placed in operation at the Moldora Nova copper mine in the Caras Severin District. Whether this facility was of the nature of a pilot plant or a full-scale industrial operation is not evident, and both its operational status and capacity have gone unreported.

Industrial Minerals

Romania's production of barite, bentonite, diatomite, feldspar, graphite, gypsum, kaolin, and limestone were projected to be sufficient to meet domestic needs. The country's cement production capacity has been reported to be 20 million tons per year, but of that, 4 million tons was from older plants slated for closure. There are additional plants capable of producing 1 million tons of wet process cement. These plants have a relatively higher level of energy consumption, required to make the speciality cements.

Synthetic diamonds are produced at the DACIA factory in Bucharest. Several types are produced for domestic and export markets. The synthetic diamonds are embedded in resin or metal binders for grinding, boring, and honing of metals and other materials. The estimated production is 5 million carats per year.

Mineral Fuels

Coal.—The Ceauşescu Government had intended to increase the production of coal from 60 million tons in 1988 to 100 million tons per year by the early 1990's. However, unrest in the country resulted in a reported first quarter 1990 production level of only 95% of the 1989 levels. There have been a number of reasons for the decrease in production, including the use of some mine employees the miners in support of the new Government and the possible loss of production from mine accidents.

To meet the great coal demand in the country, Romania imports approximately 10% of its requirements for its steel industry, electric generating, and industrial uses. The domestic output of anthracite and bituminous coal had been emphasized in recent years; however, the resources are limited. The lignite resources are larger, and the exploitation of these deposits have been receiving increasing attention from the Government.

Two production units were started at the Farcasesti Mine in the Rovinari Field and the Cernisoara-Bistrita Mine in the Vilcea Field. Efforts are being made to bring bigger investment projects into service. Measures are being taken to attract cooperation of foreign companies that specialize in highly efficient mining equipment and coal mining technologies. New mines are scheduled to be opened in the Jiu Valley at Moldova Nous, Rosia Poiena, Valea and Faget-Rodna. The Jiu Valley district is the most important mining area of Romania, supplying the largest portion of the country's coal and lignite. During the past several years, efforts to mechanize coal operations and increase efficiency were undertaken at Alunu and Copaceni in North Berbesti. Also, at the Motru-Jilt Mine, new equipment was utilized to increase production capacity. New mines at Pinoasa in Romania's southern Motru Rovinari coalfield and at Motru-Vestmin, as well as other mine expansions underway at Medinti, Vilcea, and Valea de Bramighere, are an attempt by the Government to increase coal output.

Natural Gas.—The new Government has announced natural gas discoveries at Partos, Dudestu, Dadu, and Balta Alba. The acute shortage of natural gas, however, prompted the Government to restrict its use to industrial users and to begin construction of a new pipeline to import more gas from the U.S.S.R. While the domestic production of natural gas was estimated to be well over 30 billion cubic meters, it is to be supplemented by the doubling of imported Soviet gas to 8 billion cubic meters of gas. The natural gas purchased from the U.S.S.R. was in addition to the 24 billion cubic meters produced at the Cluij gasfield in Transylvania with its field reserves estimated at 283 billion cubic meters of gas.

Petroleum.—At present, only a little more than 10% of Romania's total crude oil production is estimated to be from the Black Sea; however, this area has been viewed as the area in which additional reserves of oil might been found. The production platforms built at the Galati shipyard are designed to drill to a depth of 7,620 meters in up to 91.44 meters of water. These platforms are designed to withstand 11-meter waves and 144-kilometer-per-hour winds. The "Gloria" platform, the first offshore platform in the Romanian territorial portion of the Black Sea, was built in 1981, but actually began production in 1987 at the rate of 4,300 barrels per day from Lebada East Field. An 80-kilometer gas pipeline was constructed from the platform to the Midia-Navodari chemical plant, while the crude was stored on the *Bustenari* storage tender before transshipment to shore. Other platforms in the Black Sea and their construction dates are as follows: Orizont (1982), Atlas and Fortuna (1985), Jupiter and Prometeu (1987), and Saturn (1988). Two wells from the Fortuna platform went on production in 1989, as apparently did the Jupiter platform. The production of crude from this platform was reportedly to increase the country's offshore production by 30%. Two additional platforms, Pluton and Uranus, are anticipated to be completed shortly. In the first quarter of 1990, the Ministry of Oil reported that three platforms were to be relocated and that exploration work indicated a deeper zone, "Lebada Vest." The zone was referred to as a new and substantial zone, but no specifics were disclosed. It was reported that in the first quarter of 1990 about 1.8 million barrels of oil and 47,000 cubic meters of gas were produced from offshore fields.

Reserves

The mineral resources of Romania have been exploited by Government-mandated operations. Many of these operations would not be economical in a market economy, and the subsidies required to continue operations would not be justified. Therefore, the deposits are more like resources, which would need further evaluation. Other deposits have not been available for evaluation due to

the limited access and lack of published information about them.

TABLE 3

ROMANIA: APPARENT RESERVES OF MAJOR MINERALS

(Metric tons unless otherwise specified)

Commodity	Amount[e]
Aluminum	2,550,000
Copper	1,462,500
Lead	585,000
Natural gas	[1]120
Zinc	1,440,000

[e]Estimated.
[1]Billion cubic meters.

INFRASTRUCTURE

Most of Romania's raw materials are transported by railroad system. The country has more than 11,221 kilometers (km) total of standard-gauge tracks. Of this total, 3,328 km is electrified and 3,060 km is double track. The country has only 72,783 km of roads, of which 9,010 km is unpaved. In recent years, the country has improved the river transportation system, building new canals, port facilities, etc., to make more efficient use of its 1,726 km of inland waterways natural transportation system. The 2,808 km of crude and 6,417 km of natural gas pipelines have been expanded slightly, with the offshore lines laid in recent years. These figures do not include the U.S.S.R.'s pipeline across the country. Several Soviet gas and electric lines enter the country, and some continue on to Bulgaria.

OUTLOOK

The political and economic problems and adjustments facing the country are enormous. Segments of the Romanian mineral industry are inefficient and larger than the domestic resources and internal demand can economy justify. The modernization and rationalization of industries will, however, cause stresses and adjustments in the employment of the populous. The pollution of the envoronment is reported to be especially bad around many of the mining and mineral processing centers owing to years of operations with little regard for such matters: improvements to the standards presently in effect in most of the market economy countries of Europe will present major problems.

OTHER SOURCES OF INFORMATION

Agencies

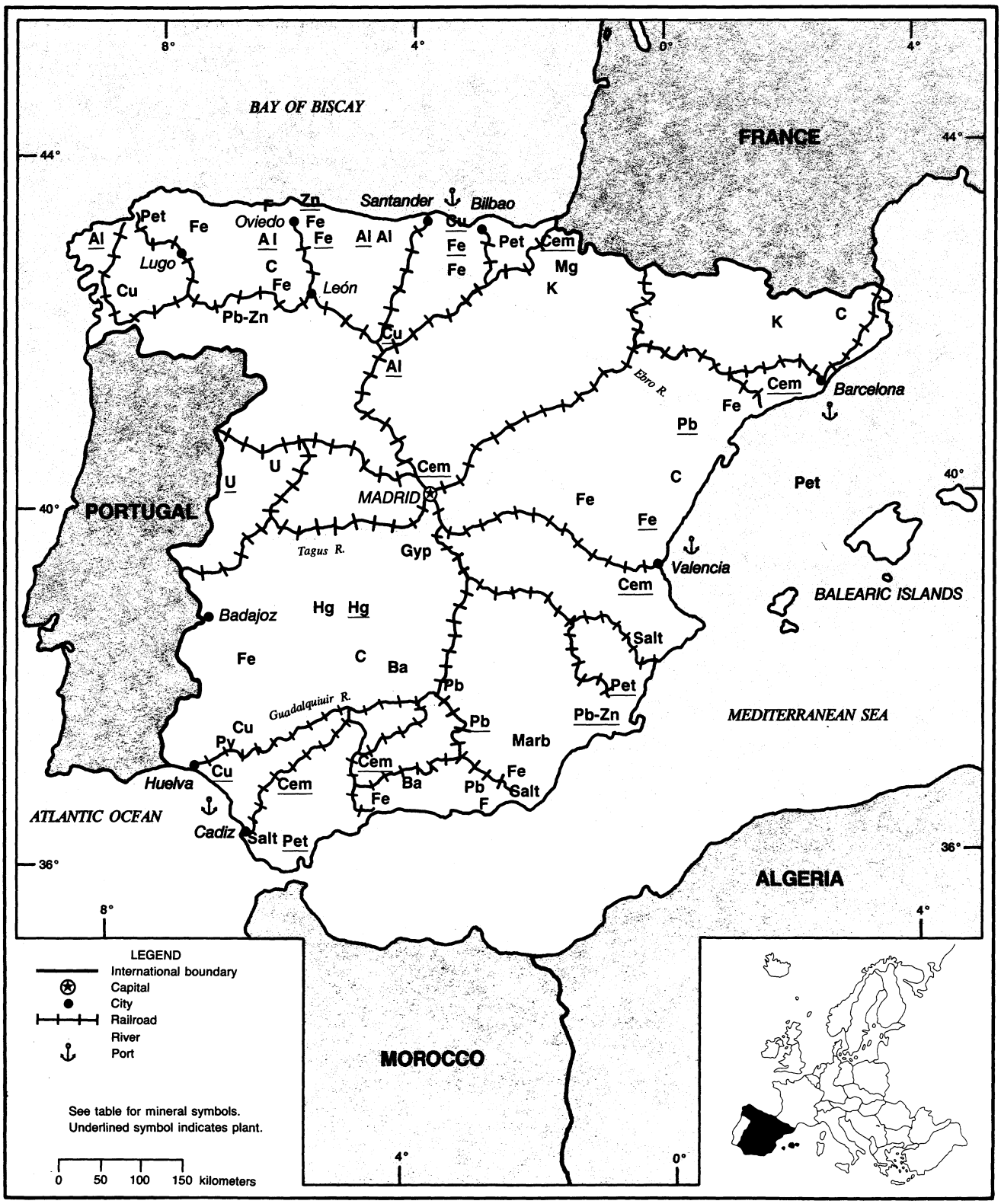
Ministerul Industriei Metalurgice
(Ministry of Metallurgical Industry)
Bucharest, Romania
Ministerul Minelor
(Ministery of Mines)
Bucharest, Romania
Ministerul Geologiei
(Ministry of Geology)
Bucharest, Romania
Ministerul Petrolului
(Ministry of Petroleum)
Bucharest, Romania

Publications

The publications that were received from the Government of Romania have not been received for 9 months, since Oct. 1989.
Romanian Foreign Trade (in English)
Bucharest Revista de Statistica.
Annuarul Statistic al Republicii Socialiste
Romania, annual.

SPAIN

AREA 505,000 km² **POPULATION 39.3 million**



THE MINERAL INDUSTRY OF

SPAIN

By Donald E. Buck, Jr.

Spain remained one of Europe's most important mineral producers of base metals and industrial minerals. The country remained the EC's sole producer of mercury and tantalite and only significant producer of natural sodium sulfate. The country's entry into the EC meant that many industries had to rationalize and adjust to the economic reality of the European market and prepare for the "1992" market. Industries particularly effected by these requirements were the steel, fertilizer, and coal industries. The Spanish economic growth in recent years has been partially due to the availability of plentiful natural resources, lower labor costs than other EC countries, and access to EC markets. Industrial growth has been above the EC average, and the projected economic advantages of Spain's entry into the EC indicate a strong near-term outlook for the country.

GOVERNMENT POLICIES AND PROGRAMS

The Government has fostered economic growth, but has had to rationalize some of the Government-controlled industries. The steel industry, by agreement for Spain's acceptance into the European Coal and Steel Community, had to reduce production capacity. The resulting loss of jobs was projected to exacerbate unemployment, which already has a higher-than-EC-average unemployment rate. Investment-led economic growth has provided employment. The Government initiated consultations and improved relationships with labor and business in an attempt to maintain the competitive advantages and control inflation. The unions and the Government have not reached the level of cooperation desired, as workers feel that increases in wages have not kept up with economic growth or inflation. Government and business, on the other hand, see challenges to the competitive advantages in the Spanish market and the fiscal and monetary stability, if inflation and wages are not managed.

PRODUCTION

In 1989, Spain was the EC's largest producer of mined zinc, second largest producer of mined lead, and third largest producer of mined copper and tin. The mineral industry in Spain operated in numerous regions throughout the country, with the Government having retained a majority position in many of the mining enterprises. Due in part to the growth in the domestic economy, the demand for natural resources increased dramatically. Quarried producer of mined copper and tin. The products used for infrastructure construction mineral increased significantly in the country; the industrial growth in the EC contributed to the increased demand of all mineral products from Spain. The growth in Spanish industrial productivity resulted in Spain having one of the greatest increases in electrical demand of any EC country.

TRADE

Spain produces significant amounts of selected minerals, although it is not self-sufficient in its mineral requirements. In 1988, imports of United States coal were strong at 2.6 million tons per year. The U.S. was the second largest exporter of coal to Spain after the Republic of South Africa (4.4 million tons). Spain was a strong importer of energy and will need to import more as the demand grows.

TABLE 1

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity	1985	1986	1987	1988[p]	1989[e]
METALS					
Aluminum:					
Bauxite	2,427	3,000	1,050	[e]2,000	3,000
Alumina[2]	724,700	748,006	800,654	[e]800,000	880,000
Metal:					
Primary	370,118	354,687	340,972	323,100	320,000
Secondary[e]	38,000	54,000	70,000	80,000	85,000

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Antimony, mine output, Sb content		248	45	—	—	—
Cadmium metal		268	247	297	306	300
Copper:						
Mine output, Cu content		55,486	51,084	16,300	18,100	27,400
Metal:						
Blister:						
Primary		88,000	r100,000	115,700	111,000	120,000
Secondary		r32,500	r35,200	33,000	34,600	32,300
Total		r120,500	r135,200	148,700	145,600	152,300
Refined:						
Primary		101,700	r130,575	100,410	108,756	115,700
Secondary		50,000	24,600	51,000	50,000	50,000
Total		151,700	r155,175	151,410	158,756	165,700
Gold, mine output, Au content	kilograms	5,771	5,200	7,752	8,034	8,200
Iron and steel:						
Iron ore and concentrates (including byproduct concentrate):						
Gross weight	thousand tons	6,463	6,054	4,499	4,212	4,000
Fe content	do.	2,926	2,761	2,109	1,925	1,828
Metal:						
Pig iron	do.	5,477	4,803	4,901	4,691	[3]5,535
Ferroalloys, electric furnace[e]	do.	300	300	[3]146	200	200
Steel:						
Crude	do.	14,235	11,977	[e]11,900	9,754	[3]10,722
Castings and forgings	do.	138	[e]150	[e]140	160	182
Total	do.	14,373	12,127	12,040	9,914	10,904
Semimanufactures	do.	11,050	[e]11,000	[e]11,000	8,843	[3]11,012
Lead:						
Mine output, Pb content		85,636	82,057	81,629	74,672	74,100
Metal:						
Primary		112,800	88,000	71,400	68,800	75,000
Secondary		43,300	42,000	51,300	52,000	50,000
Mercury:						
Mine output, Hg content	kilograms	r873,208	2,757,393	1,085,203	1,715,629	1,500,000
Metal	do.	r1,552,707	1,470,379	1,570,971	1,614,586	1,500,000
Silver, mine output, Ag content	do.	r303,876	289,185	409,048	550,812	550,000
Tantalum minerals (tin byproduct):						
Gross weight	do.	18,300	12,500	[e]10,000	[e]10,000	11,000
Ta content	do.	4,496	3,071	[e]2,500	[e]2,700	2,700
Tin:						
Mine output, Sn content		637	296	77	66	70
Metal, primary		3,500	2,000	1,700	[e]800	800
Titanium dioxide[e]		38,000	35,000	36,000	37,000	37,000
Tungsten, mine output, W content		458	495	101	102	100
Uranium, mine output, U_3O_8 content		308	376	372	323	325
Zinc:						
Mine output, Zn content		234,695	233,307	272,556	281,724	280,000
Metal, primary and secondary		213,300	r202,000	224,000	256,000	257,000

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS						
Barite		67,512	49,678	7,776	6,585	6,600
Bromine[e]		350	280	300	300	300
Cement, hydraulic, other than natural	thousand tons	24,197	24,201	[e]25,000	[e]25,000	25,000
Clays:						
Attapulgite		59,697	67,820	40,818	43,585	45,000
Bentonite		90,239	114,972	103,420	103,753	104,000
Kaolin, marketable:						
Crude		96,533	259,572	17,891	150,840	125,000
Washed		317,186	314,094	433,077	438,160	435,000
Refractory, not further described		449,226	549,457	484,608	506,456	500,000
Other	thousand tons	9,598	9,244	9,949	[e]10,000	10,000
Diatomite and tripoli		96,251	128,050	66,217	81,331	80,000
Feldspar		136,190	135,526	161,631	195,668	190,000
Fluorspar:						
Gross weight:						
Acid-grade		266,774	257,108	147,757	137,140	130,000
Metallurgical-grade		38,835	25,352	3,670	5,435	5,000
Total		305,609	282,460	151,427	142,575	135,000
CaF_2 content:						
Acid-grade		258,561	250,374	144,052	133,727	125,000
Metallurgical-grade		31,140	22,404	3,126	4,598	4,000
Total		289,701	272,778	147,178	138,325	129,000
Gypsum and anhydrite, crude	thousand tons	5,525	5,062	6,684	7,469	7,500
Kyanite, andalusite, related materials		2,800	3,304	3,916	3,360	3,500
Lime, hydrated and quicklime[e]	thousand tons	1,100	1,200	1,200	1,200	1,200
Magnesite:						
Calcined		173,927	177,681	127,375	151,216	150,000
Crude[e]		[3]692,196	700,000	710,000	700,000	700,000
Mica		727	325	370	2,233	2,200
Nitrogen: N content of ammonia	thousand tons	[r]664	512	495	525	608
Pigments, mineral:						
Other		10,293	7,697	7,765	8,394	8,400
Red iron oxide[e]		21,000	20,000	20,000	20,000	20,000
Potash, K_2O equivalent		658,863	794,586	741,240	855,466	850,000
Pumice		849,440	968,116	1,053,914	909,625	925,000
Pyrite, including cuprous, gross weight	thousand tons	2,676	2,614	2,177	2,281	2,200
Salt:						
Rock, including byproduct from potash works	do.	2,160	2,101	2,250	2,455	2,500
Marine and other	do.	1,079	1,006	944	1,425	1,300
Sand and gravel: Silica sand[4]	do.	2,467	2,403	2,434	2,420	2,400
Sepiolite		341,193	455,194	482,784	507,782	500,000
Sodium compounds; n.e.s.:						
Soda ash, manufactured[e]	thousand tons	550	525	550	550	550
Sulfate:						
Natural:						
Glauberite, Na_2SO_4 content		243,745	288,714	266,885	269,518	270,000
Thenardite, Na_2SO_4 content		237,502	162,197	208,370	209,700	210,000
Manufactured[e]		150,000	150,000	160,000	160,000	160,000

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Stone:						
Calcareous:						
Chalk	thousand tons	412	427	345	361	360
Dolomite	do.	2,196	2,192	2,240	2,829	2,800
Limestone	do.	74,173	77,050	85,522	100,222	100,000
Marble	do.	798	955	948	1,369	1,400
Marl	do.	5,043	5,326	5,474	5,106	5,700
Basalt	do.	3,956	3,476	1,352	2,109	2,000
Granite	do.	9,127	10,843	11,433	9,635	10,000
Ofite	do.	1,225	1,050	1,552	1,905	1,900
Phonolite	do.	559	593	[e]600	763	765
Porphyry	do.	795	715	721	805	800
Quartz	do.	252	568	532	977	975
Quartzite	do.	993	744	910	715	715
Sandstone	do.	2,274	2,620	1,549	1,768	1,800
Serpentine	do.	375	417	544	422	425
Other	do.	25,243	26,660	[e]26,000	37,232	37,000
Strontium minerals:						
Gross weight		42,500	34,500	28,867	45,631	45,000
Sr_2O_4 content		39,100	31,740	26,496	41,981	41,000
Sulfur:						
S content of pyrites	thousand tons	1,231	1,192	1,011	1,057	1,050
Byproduct:[e]						
Of metallurgy	do.	115	105	110	110	110
Of petroleum	do.	9	8	8	8	8
Of coal (lignite) gasification	do.	2	2	2	2	2
Total	do.	1,357	[r]1,307	[r]1,131	[r]1,177	1,170
Talc and steatite		88,776	73,914	75,307	[e]75,000	75,000
MINERAL FUELS AND RELATED MATERIALS						
Coal (marketable):						
Anthracite	thousand tons	5,810	5,610	5,361	5,276	5,300
Bituminous	do.	10,281	10,286	13,607	13,609	13,600
Lignite	do.	23,572	22,425	15,627	12,960	13,600
Total	do.	39,663	38,321	34,595	31,845	32,500
Coke, metallurgical[e]	thousand tons	3,000	3,000	3,000	3,000	3,000
Gas, natural (marketed)	million cubic meters	273	384	710	952	1,000
Peat		54,049	63,869	67,401	75,434	75,000
Petroleum:						
Crude	thousand 42-gallon barrels	15,217	13,154	14,207	15,949	15,000
Refinery products:						
Liquefied petroleum gas	do.	13,642	19,116	18,850	20,497	20,000
Naphtha	do.	24,973	25,160	21,224	20,336	20,000
Gasoline, motor	do.	57,019	66,164	68,629	68,655	68,000
Jet fuel	do.	19,312	25,192	24,344	27,600	27,000
Kerosene	do.	22,002	26,862	24,986	29,613	28,000
Distillate fuel oil	do.	85,887	91,825	89,385	95,757	90,000
Residual fuel oil	do.	94,719	107,572	98,801	93,220	95,000
Other	do.	46,267	39,592	38,836	37,709	38,000
Refinery fuel and losses	do.	5,582	14,637	12,957	12,026	12,000
Total	do.	369,403	416,120	398,012	405,413	398,000

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

[1]Table includes data available through Sept. 1990.

[2]Reflects aluminum hydrate.

[3]Reported figure.

[4]Includes sand obtained as a byproduct of feldspar and kaolin production.

TABLE 2

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		(2)	39	—	All to West Germany.
Alkaline-earth metals		—	(2)	—	All to Japan.
Aluminum:					
Ore and concentrate		1,849	2,066	—	Portugal 1,739; Israel 150.
Oxides and hydroxides		159,787	310,232	(2)	Netherlands 134,349; Italy 38,130; Poland 29,549.
Ash and residue containing aluminum		526	193	—	France 143; Belgium-Luxembourg 49.
Metal including alloys:					
Scrap		810	2,818	—	West Germany 1,263; Belgium-Luxembourg 445.
Unwrought		106,479	89,889	108	Netherlands 28,783; Japan 19,295; Italy 14,955.
Semimanufactures		40,954	49,952	1,841	France 15,447; Japan 4,733; United Kingdom 4,498.
Antimony:					
Ore and concentrate		1	(2)	—	All to Italy.
Oxides		25	26	—	Italy 22; United Kingdom 4.
Metal including alloys, all forms		5	2	—	Portugal 1.
Arsenic: Oxides and acids		1	5	—	All to Portugal.
Bismuth:					
Oxides and hydroxides		2	—		
Metal including alloys, all forms	value	—	$8,274	—	Portugal $7,752; Saudi Arabia $521.
Cadmium: Metal including alloys, all forms		230	438	18	Netherlands 420.
Chromium:					
Ore and concentrate		(2)	755	—	France 614; United Kingdom 100; Mexico 38.
Oxides and hydroxides		33	8	—	Italy 2; Algeria 1; France 1.
Metal including alloys, all forms		(2)	1	—	Mainly to Saudi Arabia.
Cobalt:					
Oxides and hydroxides		2	16	—	Kenya 10; Portugal 5; Belgium-Luxembourg 1.
Metal including alloys, all forms	value, thousands	$177	$49	—	West Germany $17; France $12; Venezuela $12.
Columbium and tantalum:					
Ore and concentrate		—	17	—	Netherlands 8; France 6; United Kingdom 3.
Ash and residue containing columbium and/or tantalum		76	969	—	All to Netherlands.
Metal including alloys, all forms:					
Tantalum	value, thousands	$67	$176	$141	France $28; United Kingdom $7.
Copper:					
Ore and concentrate		47,402	24,009	—	Japan 21,025; Finland 2,871.
Matte and speiss including cement copper		3,778	4,486	—	West Germany 4,446; France 40.
Oxides and hydroxides		2	3	—	Mainly to Portugal.
Sulfate		2,045	1,066	—	France 629; Equatorial Guinea 260.
Ash and residue containing copper		2,116	950	—	All to Norway.
Metal including alloys:					
Scrap		967	11,741	—	France 3,970; Belgium-Luxembourg 3,583; United Kingdom 2,161.
Unwrought		44,126	40,701	23	United Kingdom 13,809; Italy 7,685; Netherlands 6,158.
Semimanufactures		36,679	19,892	288	Portugal 6,025; United Kingdom 4,913; Algeria 2,180.
Germanium:					
Oxides		—	9	(2)	Netherlands 4; United Kingdom 2; West Germany 1.
Metal including alloys, all forms		1	—		
Gold:					
Waste and sweepings	value, thousands	$4	$11	$4	Unspecified $7.
Metal including alloys, unwrought and partly wrought	kilograms	1,429	184	1	United Kingdom 126; Venezuela 25; Andorra 24.
Iron and steel:					
Iron ore and concentrate: Excluding roasted pyrite	thousand tons	1,991	2,037	(2)	Netherlands 717; United Kingdom 566; France 463.

See footnotes at end of table.

TABLE 2—Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Pyrite, roasted	thousand tons	24	31	—	France 17; Lebanon 6; Egypt 3.
Metal: Scrap		15,790	56,960	—	Belgium-Luxembourg 29,604; France 18,439; Italy 8,278.
Pig iron, cast iron, related materials		18,870	83,039	260	Belgium-Luxembourg 34,183; West Germany 24,412; Italy 11,578.
Ferroalloys:					
Ferroaluminum		503	—		
Ferrochromium		13,949	13,716	—	United Kingdom 5,802; Japan 2,104; West Germany 1,702.
Ferromanganese		13,103	14,268	759	Italy 3,997; Canada 2,651; West Germany 1,849.
Ferromolybdenum		2,027	6	—	All to Portugal.
Ferronickel		—	(2)	(2)	
Ferrosilicochromium		152	—		
Ferrosilicomanganese		7,132	8,470	1,182	Italy 2,398; West Germany 1,912; Japan 1,320.
Ferrosilicon		4,579	13,700	—	West Germany 8,847; Portugal 2,740; France 2,048.
Silicon metal		2,361	1,666	198	Japan 1,231; West Germany 144.
Unspecified		1,144	1,225	204	Italy 722; France 150.
Steel, primary forms		679,970	578,934	29,519	Belgium-Luxembourg 152,631; Morocco 97,387; Italy 94,456.
Semimanufactures:					
Bars, rods, angles, shapes, sections	do.	2,606	2,018	239	France 303; West Germany 239.
Universals, plates, sheets	do.	1,149	NA		
Hoop and strip	do.	64	NA		
Rails and accessories	do.	14	10	—	Portugal 9; West Germany 1.
Wire	do.	78	53	1	France 16; Libya 15; Portugal 6.
Tubes, pipes, fittings	do.	351	346	35	France 55; U.S.S.R. 47.
Castings and forgings, rough	do.	17	NA		
Lead:					
Ore and concentrate		65,913	69,589	—	Italy 17,060; Morocco 16,726; France 11,790.
Oxides		2,158	1,442	—	Portugal 579; Turkey 475; Morocco 256.
Ash and residue containing lead		2,031	950	—	All to Norway.
Metal including alloys:					
Scrap		3,976	824	—	France 569; Taiwan 196; West Germany 58.
Unwrought		18,250	14,305	—	Turkey 4,500; Portugal 3,033; Netherlands 2,187.
Semimanufactures		395	238	—	West Germany 121; United Kingdom 44; Guatemala 26.
Lithium:					
Ore and concentrate		96	NA		
Oxides and hydroxides		1	1	—	NA.
Metal including alloys, all forms		(2)	—		
Magnesium: Metal including alloys:					
Scrap		—	17	17	
Unwrought		1,175	941	—	Mainly to France.
Semimanufactures		57	79	—	France 75; Tunisia 4.
Manganese:					
Ore and concentrate, metallurgical-grade		—	37	—	NA.
Oxides		1,375	1,143	72	France 540; Czechoslovakia 356.
Metal including alloys, all forms		19	2	—	Italy 1.
Mercury		702	700	158	Netherlands 124; Netherlands 116.
Molybdenum:					
Ore and concentrate		30	—		
Metal including alloys:					
Scrap		—	(2)	—	All to France.
Unwrought	value, thousands	—	$2	—	Mainly to France.

See footnotes at end of table.

TABLE 2—Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Molybdenum—Continued					
Semimanufactures	value, thousands	$63	$15	—	Portugal $7; West Germany $5; Venezuela $1.
Nickel:					
Matte and speiss		3	1	—	Mainly to Portugal.
Oxides and hydroxides		1	1	—	Do.
Ash and residue containing nickel		226	277	—	Netherlands 136; Austria 56; West Germany 56.
Metal including alloys:					
Scrap		64	166	23	United Kingdom 66; France 43; West Germany 27.
Unwrought		11	87	—	West Germany 30; Portugal 27; United Kingdom 17.
Semimanufactures		46	345	(2)	Austria 112; West Germany 86; United Kingdom 48.
Platinum-group metals:					
Waste and sweepings	do.	$922	$1,104	—	France $636; Netherlands $418.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	49	—	Switzerland 20; Andorra 14.
Platinum	do.	30	124	—	United Kingdom 100; France 21; Argentina 2.
Rhodium	do.	NA	3	—	All to France.
Iridium, osmium, ruthenium	do.	NA	1	—	NA.
Unspecified	do.	48	—		
Rare-earth metals including alloys, all forms	value	—	$1,761	—	Portugal $1,410.
Selenium, elemental		3	11	—	Portugal 10; Republic of South Africa 1.
Silicon, high-purity		18	—		
Silver:					
Waste and sweepings[3]	value, thousands	$1,444	$6,173	—	France $4,752; West Germany $167.
Metal including alloys, unwrought and partly wrought	kilograms	181,503	166,246	7	United Kingdom 55,145; West Germany 25,772; Netherlands 20,117.
Tin:					
Ore and concentrate		—	1	—	All to Nigeria.
Oxides		(2)	5	—	Mainly to Portugal.
Ash and residue containing tin		72	58	—	All to United Kingdom.
Metal including alloys:					
Scrap		275	84	—	Do.
Unwrought		6	5	—	All to Nicaragua.
Semimanufactures		51	12	(2)	Italy 6; Netherlands 3; Portugal 1.
Titanium:					
Ore and concentrate		20	41	—	Portugal 33; West Germany 8.
Oxides		1,475	219	—	Portugal 41; Canada 36; Cuba 32.
Metal including alloys:					
Scrap		21	14	—	United Kingdom 13; France 1.
Unwrought		(2)	36	—	Italy 31; Sweden 5.
Semimanufactures		28	17	—	Belgium-Luxembourg 9; West Germany 6; France 1.
Tungsten:					
Ore and concentrate		140	87	—	Netherlands 48; United Kingdom 39.
Metal including alloys:					
Scrap		(2)	(2)	—	All to West Germany.
Unwrought		(2)	1	—	Mainly to France.
Semimanufactures	value, thousands	$70	$55	$6	Austria $21; West Germany $20.
Uranium and thorium:					
Ore and concentrate		744	305	—	U.S.S.R. 220; France 85.
Oxides and other compounds	do.	—	$3,678	—	United Kingdom $3,677; Bolivia $1.
Vanadium:					
Oxides and hydroxides		1	—		

See footnotes at end of table.

TABLE 2—Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Vanadium—Continued					
Ash and residue containing vanadium		190	—		
Zinc:					
Ore and concentrate		79,481	109,613	—	Italy 31,203; Finland 28,588; France 21,239.
Oxides		2,817	4,179	—	U.S.S.R. 2,100; West Germany 528; Italy 463.
Blue powder		10	5	5	
Matte		429	26	—	All to France.
Ash and residue containing zinc		3,023	13,676	—	United Kingdom 3,990; Italy 3,864; France 3,315.
Metal including alloys:					
Unwrought		105,532	146,246	69,673	Netherlands 25,300; U.S.S.R. 22,892.
Semimanufactures		1,219	1,132	47	France 641; Venezuela 161; United Kingdom 140.
Zirconium:					
Ore and concentrate		135	641	—	Italy 280; West Germany 153; United Kingdom 109.
Oxides	value, thousands	$7	$8	—	Argentina $5; Portugal $2.
Metal including alloys:					
Unwrought including scrap		22	2	—	France 1; Netherlands 1.
Semimanufactures		(2)	42	—	Mainly to Egypt.
Other:					
Ores and concentrates		279	43	(2)	West Germany 23; Andorra 13.
Oxides and hydroxides		328	399	139	Republic of South Africa 53; United Kingdom 50.
Ashes and residues		[4]1,579	1,516	—	Belgium-Luxembourg 658; France 400; Japan 280.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		2,301	2,357	2	West Germany 1,182; Portugal 487.
Artificial:					
Corundum		2,626	96	—	Portugal 31; West Germany 24; Morocco 24.
Silicon carbide		4,811	10,021	234	United Kingdom 3,488; West Germany 3,474; France 1,221.
Grinding and polishing wheels and stones		3,790	4,747	566	France 926; West Germany 705.
Asbestos, crude		23	309	—	Libya 258; Portugal 26.
Barite and witherite		22,346	2,355	(2)	Italy 1,430; France 694.
Boron materials:					
Crude natural borates		1,510	893	—	Portugal 677; Tunisia 128.
Elemental		(2)	NA		
Oxides and acids		1	(2)	—	All to Cyprus.
Bromine		43	(2)	—	NA.
Cement	thousand tons	4,697	4,068	1,955	Cote d' Ivoire 410; United Kingdom 356.
Chalk		2,248	26,935	—	Algeria 16,799; Libya 2,000.
Clays, crude:					
Bentonite		36,914	50,183	—	Netherlands 37,571; Portugal 7,078.
Chamotte earth		452	137	—	Italy 58; Andorra 25; Portugal 24.
Fuller's earth		2,702	3,976	—	Italy 2,149; Netherlands 1,156; United Kingdom 342.
Fire clay		—	6,175	—	Netherlands 4,152; Portugal 858; United Kingdom 752.
Kaolin		160,924	165,960	: 2	Italy 57,198; Netherlands 23,908; West Germany 21,261.
Unspecified		41,238	6,637	—	France 4,275; Italy 1,463; East Germany 264.
Cryolite and chiolite		1	—		
Diamond:					
Natural:					
Gem, not set or strung	carats	16,215	1,305	—	Belgium-Luxembourg 1,248; Panama 32.
Industrial stones	do.	4,832	5,960	—	Belgium-Luxembourg 2,664; India 2,500; Netherlands 675.
Dust and powder	kilograms	[5]21	15	1	Ireland 5; Argentina 2; Portugal 2.
Synthetic, industrial	grams	2,000	NA		

See footnotes at end of table.

TABLE 2—Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diatomite and other infusorial earth		7,780	9,065	—	Belgium-Luxembourg 4,925; France 2,334.
Feldspar, fluorspar, related materials:					
Feldspar		3,382	3,945	—	France 1,811; Morocco 451.
Fluorspar		90,970	72,724	25,233	Netherlands 14,066; West Germany 9,958.
Unspecified		328	39	—	Portugal 23; Guatemala 16.
Fertilizer materials:					
Crude, n.e.s.		732	74,931	—	China 46,500; Venezuela 26,250.
Manufactured:					
Ammonia		76	2,828	—	Morocco 2,825; Andorra 2; United Kingdom 1.
Nitrogenous		237,180	325,094	—	West Germany 171,233; France 88,292; United Kingdom 28,643.
Phosphatic		1,466	34	—	All to United Arab Emirates.
Potassic		686,298	676,192	—	Brazil 164,510; France 158,292; Italy 92,105.
Unspecified and mixed		268,803	257,846	—	West Germany 61,234; Italy 57,995; France 40,423.
Graphite, natural		72	296	1	France 246; Switzerland 24.
Gypsum and plaster	thousand tons	2,596	2,915	929	Denmark 294; Sweden 269; United Kingdom 266.
Iodine		5	3	—	Egypt 2.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		11	—		
Mullite		NA	9	—	Mainly to Tunisia.
Lime		16,077	20,162	—	France 14,947; Equatorial Guinea 1,380.
Magnesium compounds:					
Magnesite, crude		216	13,851	—	France 9,500; West Germany 1,568; United Kingdom 1,243.
Oxides and hydroxides		87,058	82,954	2,386	France 36,949; United Kingdom 26,953; Sweden 2,693.
Sulfate		—	6	—	Mainly to Portugal.
Meerschaum, amber, jet		459,905	485,656	—	France 175,630; West Germany 57,653; United Kingdom 55,861.
Mica:					
Crude including splittings and waste		21	537	24	West Germany 297; Netherlands 84; United Kingdom 69.
Worked including agglomerated splittings		110	69	3	West Germany 20; Italy 11; Turkey 9.
Phosphates, crude		200	25	—	All to Venezuela.
Phosphorus, elemental		67	3	—	All to Morocco.
Pigments, mineral:					
Natural, crude		522	7,011	18	France 6,519.
Iron oxides and hydroxides, processed		10,846	14,320	1,033	France 3,327; United Kingdom 1,411.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	2,625	2,509	—	West Germany 2,474; France 13.
Synthetic	do.	5,230	232	53	Switzerland 140; Italy 9.
Pyrite, unroasted		248,457	162,984	—	Belgium-Luxembourg 143,915; Greece 10,464.
Quartz crystal, piezoelectric		—	1	—	Mainly to West Germany.
Salt and brine		435,424	297,257	9,897	Portugal 63,382; Iceland 35,205; Norway 30,959.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		169,246	200,979	—	Belgium-Luxembourg 123,966; Morocco 13,905; Argentina 10,211.
Sulfate, manufactured		146,886	26,765	—	Portugal 16,272; Italy 2,729.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		428,447	464,742	1,166	Italy 355,360; Japan 32,586.
Worked		383,207	455,575	43,741	France 227,965; West Germany 72,456.
Dolomite, chiefly refractory-grade		131,015	123,544	—	United Kingdom 107,858; Finland 5,390; West Germany 4,750.
Gravel and crushed rock		42,451	95,756	3	United Kingdom 34,616; Portugal 18,285; Belgium-Luxembourg 14,924.
Limestone other than dimension		(2)	—		

See footnotes at end of table.

TABLE 2—Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Sand, stone and gravel—Continued				
Dimension stone—Continued				
Quartz and quartzite	434,804	521,051	—	Norway 333,083; Iceland 112,272.
Sand other than metal-bearing	393,496	663,845	—	Andorra 578,536; Portugal 47,433.
Sulfur:				
Elemental:				
Crude including native and byproduct	10,774	29,485	—	Algeria 20,678; Portugal 6,006.
Colloidal, precipitated, sublimed	47	39	—	France 38; Venezuela 1.
Dioxide	2,217	3,409	—	Portugal 3,404; Greece 5.
Sulfuric acid	290,836	476,703	58,847	Belgium-Luxembourg 116,110; Netherlands 66,688.
Talc, steatite, soapstone, pyrophyllite	31,875	17,213	(2)	Belgium-Luxembourg 10,737; West Germany 1,400; Morocco 1,035.
Vermiculite, perlite, chlorite	209	691	—	France 319; Italy 269; Andorra 80.
Other:				
Crude	411,740	893,195	2,500	Belgium-Luxembourg 334,617; Japan 311,335; West Germany 186,811.
Slag and dross, not metal-bearing	125,098	80,107	(2)	Portugal 49,708; France 12,506.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9,564	5,173	(2)	Poland 3,130; Guinea-Bissau 1,000; Zaire 540.
Carbon:				
Carbon black	16,828	26,847	—	France 12,664; West Germany 4,367; Morocco 2,717.
Gas carbon	(2)	1	—	Mainly to Guinea.
Coal:				
Anthracite	21	7,013	—	France 6,974.
Bituminous	74	198	—	Andorra 70; Nigeria 70.
Briquets of anthracite and bituminous coal	—	16	—	Mainly to Morocco.
Lignite including briquets	35	—		
Coke and semicoke	50,300	171,170	117,579	Turkey 11,970; Sweden 11,748.
Gas, natural, gaseous cubic meters	21	—		
Peat including briquets and litter	37	16	—	United Kingdom 8; Andorra 7; France 1.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	2,149	1,393	—	Morocco 335; Italy 447; United Kingdom 166.
Gasoline do.	26,446	30,243	15,069	Netherlands 4,770; France 3,887.
Mineral jelly and wax do.	152	268	16	Algeria 80; West Germany 70; Netherlands 24.
Kerosene and jet fuel do.	12,360	13,422	1,798	Netherlands 4,065; Nigeria 2,287.
Distillate fuel oil do.	7,495	8,974	737	Netherlands 1,683; France 1,447; Tunisia 837.
Lubricants do.	3,466	2,516	28	France 354; Italy 312; West Germany 311.
Residual fuel oil do.	49,876	38,907	6,371	Netherlands 11,128; France 4,248.
Bitumen and other residues do.	4,114	5,903	1,955	Portugal 1,142; Turkey 518.
Bituminous mixtures do.	240	197	70	Portugal 41; Ethiopia 31.
Petroleum coke do.	229	224	—	U.S.S.R. 104; Netherlands 84; West Germany 29.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes precious metals.
[5]May include dust and powder of other precious and semiprecious stones.

TABLE 3

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		94	93	—	West Germany 52; France 39; United Kingdom 2.
Alkaline-earth metals		86	48	—	U.S.S.R. 25; France 13; West Germany 6.
Aluminum:					
Ore and concentrate	thousand tons	1,663	1,390	—	Guinea 1,310; Guyana 38; China 20.
Oxides and hydroxides		27,305	30,884	209	France 16,921; West Germany 8,628; United Kingdom 2,936.
Ash and residue containing aluminum		19,680	28,941	19	Austria 6,089; West Germany 5,332; Netherlands 4,024.
Metal including alloys:					
Scrap		16,103	16,230	825	France 6,699; Portugal 5,183.
Unwrought		13,691	49,873	(2)	Brazil 22,979; Romania 12,369; Netherlands 2,872.
Semimanufactures		50,495	63,514	811	West Germany 14,526; Italy 10,072; France 7,348.
Antimony:					
Ore and concentrate		684	129	—	Thailand 104; China 24; Canada 1.
Oxides		411	596	18	China 288; France 112; U.S.S.R. 72.
Metal including alloys, all forms		235	171	(2)	China 145; France 16; East Germany 10.
Arsenic:					
Oxides and acids		280	3,280	—	France 2,302; United Kingdom 906.
Metal including alloys, all forms		20	12	—	Mainly from China.
Beryllium: Metal including alloys, all forms	value	—	$513	$453	France $60.
Bismuth:					
Oxides and hydroxides		71	—		
Metal including alloys, all forms		82	77	—	Peru 32; United Kingdom 21; Belgium-Luxembourg 11.
Cadmium: Metal including alloys, all forms		87	65	(2)	West Germany 45; Belgium-Luxembourg 20.
Chromium:					
Ore and concentrate		76,902	104,254	2	Republic of South Africa 38,802; Turkey 32,300; Albania 20,548.
Oxides and hydroxides		449	618	17	West Germany 317; Poland 150.
Metal including alloys, all forms		143	80	1	United Kingdom 51; West Germany 20.
Cobalt:					
Oxides and hydroxides		140	179	11	Belgium-Luxembourg 67; Canada 38; United Kingdom 28
Metal including alloys, all forms		208	264	4	Zaire 91; West Germany 57; Belgium-Luxembourg 36.
Columbium and tantalum: Metal including alloys, all forms:					
Columbium (niobium)		18	(2)	—	All from West Germany.
Tantalum	value, thousands	$2,611	$3,403	$3,315	West Germany $48; United Kingdom $19.
Copper:					
Ore and concentrate		346,867	381,180	16,714	Chile 112,989; Canada 82,507; Morocco 39,103.
Matte and speiss including cement copper		226	24	—	All from Portugal.
Oxides and hydroxides		344	441	4	Norway 98; Belgium-Luxembourg 79; Italy 79.
Sulfate		1,808	1,187	—	Portugal 468; France 304; Italy 256.
Ash and residue containing copper		22,640	22,422	8,576	Peru 3,801; West Germany 1,721.
Metal including alloys:					
Scrap		33,002	49,944	6,453	France 17,403; United Kingdom 9,126.
Unwrought		19,595	18,504	20	France 6,831; Chile 4,129; Belgium-Luxembourg 3,183.
Semimanufactures		72,555	101,346	1,269	France 36,699; Italy 16,837; West Germany 13,959.
Gallium: Metal including alloys, all forms	do.	—	$31	$11	West Germany $15; United Kingdom $6.
Germanium: Metal including alloys, all forms	do.	$21	$26	$8	Belgium-Luxembourg $14; Israel $2.
Gold:					
Waste and sweepings	do.	$334	$6,468	—	Lesotho $5,357; Liberia $562; France $468.
Metal including alloys, unwrought and partly wrought	kilograms	6,635	9,435	171	Republic of South Africa 2,683; West Germany 2,040; Switzerland 1,583.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	5,767	5,556	—	Brazil 2,338; Venezuela 794; Liberia 737.
Pyrite, roasted	do.	179	115	—	Belgium-Luxembourg 108; Portugal 6.
Metal:					
Scrap	do.	4,285	4,494	334	United Kingdom 1,884; France 1,041; U.S.S.R. 485.
Pig iron, cast iron, related materials		166,178	177,927	8	Brazil 40,786; Canada 31,177; U.S.S.R. 25,020.
Ferroalloys:					
Ferroaluminum		1	—		
Ferrocolumbium		—	119	—	Brazil 113; United Kingdom 6.
Ferrochromium		80,627	68,768	—	Republic of South Africa 47,228; Finland 5,511; Zimbabwe 3,751.
Ferromanganese		14,129	9,065	—	Republic of South Africa 7,147; West Germany 865.
Ferromolybdenum		197	724	—	United Kingdom 381; France 175; Netherlands 79.
Ferronickel		24,632	24,597	—	New Caledonia 10,964; Dominican Republic 8,095; Yugoslavia 3,947.
Ferrosilicochromium		2,080	2,094	—	Zimbabwe 1,544; Sweden 511.
Ferrosilicomanganese		14,535	9,995	—	Republic of South Africa 8,066; France 914; Netherlands 856.
Ferrosilicon		11,089	5,429	—	France 1,728; West Germany 1,055; Yugoslavia 1,028.
Silicon metal		298	1,353	(2)	China 690; Brazil 344; Hong Kong 278.
Unspecified		2,881	6,083	11	France 2,024; West Germany 1,746; Netherlands 995.
Steel, primary forms	do.	1,093	96	(2)	Netherlands 24; United Kingdom 22; West Germany 14.
Semimanufactures:					
Bars, rods, angles, shapes, sections		232,712	371,285	1,102	West Germany 88,797; France 59,718; Italy 48,887.
Universals, plates, sheets		813,580	NA		
Hoop and strip		147,366	NA		
Rails and accessories		5,212	14,981	1	United Kingdom 5,495; Austria 4,500; Belgium-Luxembourg 1,299.
Wire		31,219	43,391	107	Belgium-Luxembourg 16,896; France 8,045; Italy 5,052.
Tubes, pipes, fittings		109,217	124,137	2,333	France 45,295; West Germany 25,536; Italy 18,534.
Castings and forgings, rough		2,249	NA		
Lead:					
Ore and concentrate		40,866	57,867	—	Canada 16,446; Mexico 14,573; Morocco 13,333.
Oxides		23	94	—	Argentina 60; United Kingdom 26.
Ash and residue containing lead		2,004	579	304	United Kingdom 161; Portugal 93.
Metal including alloys:					
Scrap		698	6,865	5,771	France 567.
Unwrought		13,370	10,150	20	Morocco 4,437; France 3,983; West Germany 1,313.
Semimanufactures		333	354	1	France 117; Portugal 97; West Germany 46.
Lithium:					
Ore and concentrate		803	NA		
Oxides and hydroxides		206	127	5	Netherlands 62; Yugoslavia 25; China 23.
Metal including alloys, all forms		(2)	—		
Magnesium: Metal including alloys:					
Scrap		25	68	—	France 46; West Germany 17; Lebanon 5.
Unwrought		2,773	2,426	1,753	Norway 438.
Semimanufactures		26	43	1	West Germany 23; Belgium-Luxembourg 8; United Kingdom 6.
Manganese:					
Ore and concentrate, metallurgical-grade		202,286	199,519	(2)	Republic of South Africa 53,682; Ghana 47,436; Gabon 38,191.
Oxides		3,009	2,119	2	Japan 1,059; Belgium-Luxembourg 603; Republic of South Africa 359.
Metal including alloys, all forms		614	679	75	China 222; France 199; United Kingdom 102.
Mercury		98	198	—	China 107; Algeria 31; Turkey 17.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Molybdenum:					
Ore and concentrate		4,991	2,720	452	Chile 1,557; Netherlands 334.
Oxides and hydroxides		(2)	(2)	—	All from West Germany.
Metal including alloys:					
Unwrought		3	5	1	Austria 3; West Germany 1.
Semimanufactures		41	51	16	Netherlands 19.
Nickel:					
Ore and concentrate		—	3	—	Mainly from Italy.
Matte and speiss		1,503	503	(2)	Australia 193; U.S.S.R. 130; Canada 107.
Oxides and hydroxides		28	66	—	Canada 31; Cuba 14; Finland 13.
Ash and residue containing nickel		191	67	19	France 48.
Metal including alloys:					
Scrap		45	146	41	West Germany 54; United Kingdom 38.
Unwrought		4,270	7,895	(2)	U.S.S.R. 4,156; Canada 1,393; Norway 561.
Semimanufactures		784	880	63	West Germany 335; United Kingdom 143; Italy 123.
Platinum-group metals:					
Waste and sweepings	value, thousands	$3,577	$6,714	—	United Kingdom $2,511; France $1,658; Costa Rica $683.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	556	38	U.S.S.R. 167; Switzerland 140; West Germany 55.
Platinum	do.	437	353	64	Republic of South Africa 97; United Kingdom 69.
Rhodium	do.	NA	13	—	Republic of South Africa 7; U.S.S.R. 4; West Germany 1.
Iridium, osmium, ruthenium	do.	NA	—		
Unspecified	do.	728	—		
Rare-earth metals including alloys, all forms		14	12	(2)	Austria 9; Brazil 3.
Rhenium: Metal including alloys, all forms		(2)	—		
Selenium, elemental		69	107	6	United Kingdom 69; Canada 22.
Silicon, high-purity		10	1	1	
Silver:					
Ore and concentrate[3]	value, thousands	$40,410	$31,202	$316	Mexico $20,393; Morocco $2,323; Canada $2,293.
Waste and sweepings[3]	do.	$4,008	$1,713	—	Peru $1,587.
Metal including alloys, unwrought and partly wrought	kilograms	224,147	299,863	351	West Germany 160,259; Switzerland 39,334; United Kingdom 29,557.
Tellurium, elemental		7	5	—	China 1; Japan 1; Mexico 1.
Tin:					
Ore and concentrate		1,848	1,273	—	Zaire 506; Netherlands 200; Nigeria 155.
Oxides		310	367	—	United Kingdom 217; Italy 83; West Germany 61.
Ash and residue containing tin		56	—		
Metal including alloys:					
Scrap		2	3	(2)	France 1.
Unwrought		1,838	2,266	(2)	United Kingdom 1,235; Netherlands 833.
Semimanufactures		205	263	(2)	France 111; West Germany 68; United Kingdom 64.
Titanium:					
Ore and concentrate		135,941	142,825	1,124	Australia 98,897; Malaysia 39,784.
Oxides		2,354	3,466	1	United Kingdom 1,036; West Germany 748; China 623.
Metal including alloys:					
Scrap		196	271	111	France 158; United Kingdom 2.
Unwrought		23	48	43	France 3; Canada 1.
Semimanufactures		230	213	93	United Kingdom 20; West Germany 16.
Tungsten:					
Oxides and hydroxides		1	2	—	All from Austria.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Tungsten—Contnued					
Metal including alloys:					
Scrap		20	1	—	Mainly from West Germany.
Unwrought		3	6	(2)	France 4; West Germany 1.
Semimanufactures		14	26	2	United Kingdom 6; Austria 5; Netherlands 5.
Uranium and thorium:					
Ore and concentrate	value	—	$932	—	France $470; Niger $462.
Oxides and other compounds		3	186	94	U.S.S.R. 44; France 39.
Metal including alloys, all forms:					
Uranium	kilograms	33	479	—	All from United Kingdom.
Vanadium:					
Oxides and hydroxides		216	42	(2)	China 40; Netherlands 1; West Germany 1.
Metal including alloys, semimanufactures		—	(2)	—	All from West Germany.
Zinc:					
Ore and concentrate		33,743	33,398	—	Peru 19,877; Canada 13,520.
Oxides		2,244	3,796	1	France 1,450; Portugal 766; China 605.
Blue powder		145	164	—	West Germany 156; Italy 5; France 2.
Matte		3,244	2,881	21	France 1,620; West Germany 736; United Kingdom 287.
Ash and residue containing zinc		7,206	6,928	—	France 3,535; Italy 1,968; Belgium-Luxembourg 820.
Metal including alloys:					
Scrap		1,292	2,356	—	France 1,759; United Kingdom 148.
Unwrought		6,919	6,502	—	France 3,508; Belgium-Luxembourg 2,432.
Semimanufactures		769	1,363	(2)	Belgium-Luxembourg 758; France 229; West Germany 204.
Zirconium:					
Ore and concentrate		35,300	42,646	108	Australia 19,751; Republic of South Africa 18,085; Malaysia 2,039.
Oxides		186	317	24	France 196; Republic of South Africa 50; United Kingdom 47.
Metal including alloys:					
Unwrought		1	22	—	United Kingdom 21; Belgium-Luxembourg 1.
Semimanufactures		1	3	(2)	Mainly from West Germany.
Other:					
Ores and concentrates		1	[4]5	(2)	France 3; Papua New Guinea 1.
Oxides and hydroxides		224	135	5	Belgium-Luxembourg 63; France 36.
Ashes and residues		[4]614	146	107	Malaysia 20; Belgium-Luxembourg 16.
Base metals including alloys, all forms		2	2	(2)	Belgium-Luxembourg 1; West Germany 1.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		24,539	12,782	63	Turkey 8,175; Greece 1,949; Italy 1,877.
Artificial:					
Corundum		7,996	8,667	545	France 3,015; West Germany 2,024; Austria 1,361.
Silicon carbide		3,393	3,642	—	West Germany 1,037; Norway 965; Italy 701.
Dust and powder of precious and semi-precious stones excluding diamond	kilograms	[5]1,191	10	10	
Grinding and polishing wheels and stones		2,427	2,828	24	Italy 1,212; France 414; West Germany 329.
Asbestos, crude		45,666	47,408	64	Canada 26,488; Zimbabwe 12,290; Italy 4,087.
Barite and witherite		7,243	10,657	—	Morocco 10,047; France 256.
Boron materials:					
Crude natural borates		64,839	76,112	—	Turkey 75,901.
Elemental	value, thousands	$9	$14	$7	Japan $5; United Kingdom $1.
Oxides and acids		440	1,608	11	France 1,107; Italy 416.
Bromine		59	107	—	Israel 36; Netherlands 31; France 27.
Cement	thousand tons	504	1,047	(2)	Tunisia 372; Romania 329; Portugal 75.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Chalk		13,153	13,264	9	France 12,958; Portugal 216.
Clays, crude:					
Bentonite		28,692	35,913	1,786	Morocco 25,800; Greece 3,598.
Chamotte earth		6,777	7,715	283	France 4,745; West Germany 2,071.
Fuller's earth		4	62	—	United Kingdom 60; West Germany 2.
Fire clay		—	6,032	13	France 4,368; United Kingdom 1,470.
Kaolin		196,495	232,606	16,694	United Kingdom 174,995; France 27,376.
Unspecified		27,483	197,220	42	Andorra 183,810.
Cryolite and chiolite		92	1,671	—	Denmark 1,670; France 1.
Diamond:					
Natural:					
Gem, not set or strung	carats	48,697	168,297	—	Belgium-Luxembourg 161,341; India 4,196; Netherlands 2,244.
Industrial stones	do.	298,586	143,921	6,805	Zaire 74,954; Ireland 29,437; Belgium-Luxembourg 11,386.
Dust and powder	kilograms	NA	743	225	Ireland 348; West Germany 63.
Synthetic, industrial	do.	1,061	NA		
Diatomite and other infusorial earth		3,221	3,448	1,140	France 2,089.
Feldspar, fluorspar, related materials:					
Feldspar		32,607	42,837	—	France 38,369; Portugal 2,469; Republic of South Africa 1,113.
Fluorspar		1,387	7,628	—	China 3,707; West Germany 3,353; France 568.
Unspecified		6,050	9,062	—	Canada 4,751; Norway 4,217.
Fertilizer materials:					
Crude, n.e.s.		3,610	5,015	128	France 1,482; Netherlands 1,147; West Germany 909.
Manufactured:					
Ammonia		750,953	729,819	9,982	Trindad and Tobago 154,050; Netherlands 151,721; U.S.S.R. 135,014.
Nitrogenous		677,881	826,872	1,956	Italy 170,249; Netherlands 140,900; West Germany 132,551.
Phosphatic		89,087	63,272	100	Israel 21,585; Iraq 13,954.
Potassic		30,767	46,788	10,691	Israel 28,911.
Unspecified and mixed		568,847	578,090	121,861	France 98,502; West Germany 62,961.
Graphite, natural		4,692	4,109	(2)	China 2,295; West Germany 671; Mexico 429.
Gypsum and plaster		61,903	144,943	99	Morocco 143,327.
Iodine		335	318	—	Chile 160; Japan 158.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		5,502	8,470	314	Republic of South Africa 6,911; France 619.
Mullite		NA	349	—	West Germany 256; United Kingdom 93.
Lime		875	611	—	West Germany 368; France 133; Portugal 68.
Magnesium compounds:					
Magnesite, crude		14	41	—	West Germany 27; Austria 8; Italy 5.
Oxides and hydroxides		58,940	63,962	3,207	Greece 13,522; China 9,947; Italy 9,007.
Sulfate		452	1,032	—	France 755; West Germany 134; East Germany 100.
Meerschaum, amber, jet		47	12	3	West Germany 9.
Mica:					
Crude including splittings and waste		1,515	1,550	143	India 446; France 363.
Worked including agglomerated splittings		192	125	47	Belgium-Luxembourg 30; Austria 14.
Nitrates, crude		24,922	20,998	—	Chile 19,374; West Germany 1,452.
Phosphates, crude	thousand tons	2,833	2,871	24	Morocco 2,146; Togo 290; Senegal 179.
Phosphorus, elemental		76	112	17	Republic of South Africa 50; United Kingdom 20; West Germany 19.
Pigments, mineral:					
Natural, crude		429	578	27	United Kingdom 300; West Germany 116; Austria 79.
Iron oxides and hydroxides, processed		6,614	7,083	95	West Germany 5,475; France 652.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Precious and semiprecious stones other than diamond:					
Natural	kilograms	147,866	171,560	4,037	Brazil 110,982; Peru 21,00; India 7,251.
Synthetic	do.	7,181	6,581	1,100	Switzerland 2,839; France 538.
Pyrite, unroasted		278	238	—	Italy 158; France 72.
Quartz crystal, piezoelectric	kilograms	43	1,112	(2)	Brazil 1,082; United Kingdom 19.
Salt and brine		12,558	7,882	(2)	Egypt 5,350; West Germany 1,262; United Kingdom 644.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		13,224	525	—	France 225; Turkey 220; Yugoslavia 69.
Sulfate, manufactured		1,134	163	—	West Germany 103; France 28; Finland 20.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		202,988	256,305	—	Portugal 81,982; Italy 65,980; Finland 34,130.
Worked		26,433	45,678	100	Italy 21,867; Portugal 18,973.
Dolomite, chiefly refractory-grade		19,472	15,761	—	France 8,173; United Kingdom 3,804; Belgium-Luxembourg 3,625.
Gravel and crushed rock		63,615	39,341	—	Morocco 21,994; France 16,821.
Limestone other than dimension		(2)	(2)	—	All to France.
Quartz and quartzite		4,199	7,105	50	Yugoslavia 4,205; Sweden 1,121; France 771.
Sand other than metal-bearing		74,033	88,789	24	Morocco 44,807; France 43,533.
Sulfur:					
Elemental:					
Crude including native and byproduct		42,825	56,636	40	France 37,960; West Germany 13,823; Iraq 2,000.
Colloidal, precipitated, sublimed		87	59	1	West Germany 32; France 26.
Dioxide		271	138	—	Mainly from West Germany.
Sulfuric acid		69,070	69,930	1	Italy 69,256.
Talc, steatite, soapstone, pyrophyllite		19,998	28,341	384	France 17,191; Belgium-Luxembourg 4,463; Norway 2,421.
Vermiculite, perlite, chlorite		16,452	27,207	—	U.S.S.R. 18,183; Turkey 5,550; Republic of South Africa 2,673.
Other:					
Crude		35,062	43,376	2,456	France 9,706; Norway 8,670; Morocco 7,831.
Slag and dross, not metal-bearing		51,047	81,450	9	West Germany 36,630; Sweden 23,547; Portugal 10,000.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		744	572	385	United Kingdom 75.
Carbon:					
Carbon black		r34,051	37,424	699	France 25,753; Netherlands 3,348; Mexico 2,667.
Gas carbon		(r 2)	(2)	—	All from Austria.
Coal:					
Anthracite	thousand tons	35	14	—	Republic of South Africa 10; West Germany 1; Belgium-Luxembourg 1.
Bituminous	do.	8,844	8,748	2,557	Republic of South Africa 4,437; Australia 1,000.
Briquets of anthracite and bituminous coal	do.	8	4	—	All from France.
Lignite including briquets	do.	64	81	—	East Germany 79; France 2.
Coke and semicoke		170,526	189,542	35,000	Japan 54,300; East Germany 29,946.
Gas, natural:					
Gaseous	thousand cubic meters	66	—		
Liquefied	thousand tons	1,969	2,328	—	Algeria 1,581; Libya 731.
Peat including briquets and litter		54,938	67,053	—	West Germany 49,677; Netherlands 3,932.
Petroleum:					
Crude	thousand 42-gallon barrels	359,107	332,730	—	Mexico 73,960; Nigeria 55,787; U.S.S.R. 41,219.
Refinery products:					
Liquefied petroleum gas	do.	10,919	8,857	37	Algeria 3,073; U.S.S.R. 2,843; United Kingdom 1,208.
Gasoline	do.	23,870	27,574	(2)	Kuwait 5,260; Italy 4,394; U.S.S.R. 3,350.
Mineral jelly and wax	do.	69	254	192	France 12; Austria 11.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Kerosene and jet fuel	do.	1,125	1,436	3	Italy 603; Portugal 265; France 194.
Distillate fuel oil	do.	13,480	15,034	940	U.S.S.R. 5,006; Bulgaria 1,605; Italy 1,188.
Lubricants	do.	537	477	34	France 188; Belgium-Luxembourg 64; United Kingdom 40.
Residual fuel oil	do.	11,833	17,566	3,301	U.S.S.R. 6,734; Saudi Arabia 1,472.
Bitumen and other residues	do.	708	929	(2)	France 635; Belgium-Luxembourg 241.
Bituminous mixtures	do.	12	14	(2)	West Germany 4; France 3; Sweden 3.
Petroleum coke	do.	6,779	8,486	8,053	United Kingdom 215.

rRevised. NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes precious metals.
[5]Includes diamonds.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is composed of both state-owned and privately owned corporations. Since joining the EC in 1986, foreign investment has resulted in substantial growth. The Government has resisted the trend of privatization in other countries in Europe. The Ministry of Industry implements the mineral laws, regulates the private sector, and manages, through the Instituto Nacional de Industria (INI), most Government-owned companies.

COMMODITY REVIEW

Metals

Aluminum.—The 1988 decision of Alcan Aluminium Ltd. to divest itself of its 23.9% financial share of Industria Espanola del Aluminio SA (Inespal) was complicated by the difficulty of finding a suitable purchaser. Alcan's withdrawal was significant because the company provided the technical expertise and supplied some raw materials. Potential purchasers indicated the desire to gain control of the company, which INI apparently was not willing to relinquish. If INI were to continue to keep control of the company, then INI was projected to be required to negotiate with Alcan on purchasing that company's interest. A 35% decrease in Inespal's production resulted from a wildcat strike that shut down the 512 potlines at the company's San Ciprian smelting facility. By June, the plant was reopened after sustaining damage and production losses of $103 million.[1]

Inespal's plant at Amorebieta, with an initial hot-rolling capacity of 128,000 tons per year, was progressing toward completion and startup in early 1990. The plant's capacity could be expanded to 200,000 tons per year in the future. Another project Inespal decided to pursue was the specialized alumina plant at the San Ciprian facility of its associate company, Alumina Espanola. The physicochemical treatment of alumina fines at the initial rate of 16,000 tons per year was targeted for the higher value nonmetallurgical applications of alumina. The second phase of construction at this plant would allow the capacity of the latter product to be increased to 30,000 tons per year.

Copper.—The EC approved the proposal by Outokumpu Oy (Finland) to increase its interest in Spain's Iberca del Cobre (Ibercobre) to 51%. Ibercobre was also thought to have completed a deal on the foundry owned by Rio Tinto Minera for a $26 million purchase price and $17 million in modernization and improvements costs.

In another exploration project, the joint-venture partners, Rio Tinto Minera and Orminex SA, announced discovery of a copper-gold soil anomaly in Brana Seita. The copper mineralized dolomitic limestones were in the same geologic formation as the Pena Negra copper mine about 3 kilometers to the west. Ore grades reported at Pena Negra are 2.8 grams per ton gold and 3.5% copper per ton.

Ferroalloys.—The Spanish ferroalloy industry has undergone considerable change in recent years, including the purchase by SE de Carburos Metalicos SA (Carburos) of Ferroaleaciones y Electrometales SA (Fyesa). Carburos has become the largest producer in Spain of ferroalloys and one of the largest in Europe.The company, Spain's leading ferroalloys producer, had purchased 30% of the ferromanganese enterprise Fyesa for approximately $8 million. The purchase was contingent on an arrangement whereby Carburos would sell electricity to Union Fenosa, and, in return, Electra de Viesgo, the Spanish electricity enterprise, would deliver energy to Fyesa.

TABLE 4

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Alumina Espanola S.A	Alumina plant San Ciprian, Lugo	800
Aluminum	Aluminio Espanola S.A	Electrolytic plant at San Ciprian, Lugo	180
Do.	Empresa Nacional del Aluminio (Endasa) S.A.	Electrolytic plant at Aviles	110
Do.	do.	Electrolytic plant at Valladolid	25
Do.	Aluminio de Galicia S.A	Electrolytic plant at La Coruna	78
Do.	do.	Electrolytic plant at Sabinanigo	14
Coal:			
Anthracite	Approximately 95 producers, including—		6,100
	65 producers in Province of Leon, of which the largest are—		(3,400)
	Antracitas Gaiztarro S.A	Mines at Maria and Paulina	(385)
	Minero-Siderurgica de Ponferrada S.A.	NA	(230)
Do.	13 producers in Province of Oviedo, of which the largest are—		(1,900)
	Antracita de Gillon S.A	NA	(500)
	Gonzalez y Diez S.A	Mines: Grupo Minero de Tineo	(130)
Do.	14 producers in Province of Palencia, of which the largest are—		(600)
	Antracita de Gillon S.A	Mines at La Velilla	(135)
	Sdad. Minera San Luis	Mines at Trueno and Cecilia	(61)
Do.	Nacional de Carbon del Sur (Encosur).	Rampa 3 and Pozo San Jose Mines, in Province of Cordoba-Empresa	(200)
Bituminous	88 producers, of which the largest is—	Mines and plants in Provinces of Ciudad Real, Cordoba, Leon, Oviedo, Palencia, and Seville	14,000 including—
	Hunosa S.A	Various mines and plants	(3,300)
Lignite	Empresa Nacional de Electricidad Endesa	Mines: Grupo Minero de Puentes, La Coruna	25,000
Barite	Minas de BAritina S.A.	Mine and plant in Espiel area, Cordoba	50
Cement	Approximately 36 cement companies, of which the largest is—	54 plants, including—	44,000 including—
	Asland S.A	5 (Asland) plants, of which the largest ones are—	(6,600)
		Plant at Puerto de Sagunto, Valencia	(2,000)
		Plant at Villaluenga de la Sagra, Toledo	(2,000)
Copper:			
Metal	Rio Tinto Minera S.A.	Smelter at Huelva	85
		Electrolytic refinery at Huelva	105
Do.	Industrias Reunidas de Cobre	Smelter at Asua-Bilbao	30
Do.	Electrolitico y Metales S.A	Fire and electrolytic refinery at Asua-Bilbao	36
Do.	Electrolisis de Cobre S.A	Smelter at Barcelona	24
		Electrolytic refinery at Palencia	32

See footnote at end of table.

TABLE 4—Contined

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Copper—Continued			
Ore	Rio Tinto Minera S.A. (Union Explosivos Rio Tinto, 75%; Rio Tinto Zinc, 25%)	Mines and plant at Arientero, near Santiago de Compostela, Galicia	12
		Corta Atalay opencast mine, Cerro Colorado opencast mine and plant, and Alfredo underground mine—all in Rio Tinto area	30
Fluorspar	Fluoruros S.A.	Plant at Caravia, near Colunga, Asturias	400 (ore)
Do.	do.	Opencast mines at San Lino and Val Negro, and underground mine at Eduardo, near Caravia—all in Asturias	350 (ore)
Do.	do.	Plant at Collada, Gijon	200 (ore)
Do.	do.	Mines at Veneros Sur and Corona, Gijon	
Iron ore	Compania Andaluza de Minas S.A.	Mine at Marquesado, Granada	4,000
Do.	Altos Hornos de Viscaya S.A.	9 mines in Province of Vizcaya	4,000
Do.	Compania Minera Siderurgica de Ponterrada S.A.	8 mines in Province of Leon	3,000
Do.	Minera del Andevalo S.A	Opencast mine at Coba, Huelva	2,000
Lead:			
Metal	Sociedad Minera y Metalurgica de Penarroya de Espana, S.A.	Smelter at Cartagena, Murcia	60
Do.	do.	Refinery at Cartagena, Murcia	60
Do.	Compania La Cruz, Minas y Fundaciones de Plomo S.A.	Smelter at Lineares, Jaen	40
Do.	do.	Refinery at Lineares, Jaen	40
Do.	Tudor S.A	Secondary smelter at Saragoza	16
	Ferroaleaciones Espanolas, S.A	Secondary smelter at Medina del Campo.	12
	Derivados de Minerales y Metales	Secondary smelter at Barcelona	5
Ore	Sociedad Minera y Metalurgica de Penarroya Espana, S.A.	Opencast mine at Montos de los Azules, near Union, Murcia	25
Do.	Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcollar, Sevilla	21
Do.	Exploracion Minera International Espana S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	16
Magnesite	Magnesitas de Rubian S.A	Plants at Zubiri	100
Do.	do.	Mines and plant near Sarria, south of Lugo	220
Mercury			
kilograms per year	Minas de Almaden y Arrayanes S.A.	Mine and smelter at Almaden	4,100,000
Petroleum:			
Crude barrels per day	Chevron S.A	Oilfield at Casablanca	300
Refined	Empresa Nacional del Petroleo S.A. (Enepetrol)	Refineries at Escombreras	200,000
Do.	do.	Puertollano	140,000
Do.	do.	Tarragona	260,000
Do.	Refineria de Petroleos del Norte S.A. (Petronor)	Refinery at Somorrostro	240,000

See footnote at end of table.

TABLE 4—Contined

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1989

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum—Continued			
Refined—Continued	Compania Espanola de Petroleos S.A.	Refinery at Santa Cruz de Tenerife	160,000
	(Cepsa)	Refinery at Algeciras	160,000
Do.	Petroleos del Mediterraneo S.A.	Refinery at Castellon de la Plana	120,000
	(Petromed)		
Do.	Compania Iberica Refinadora de	Refinery at La Coruna	140,000
	Petroleos S.A. (Petroliber)		
Potash	Potasas de Navarra S.A.	Mines and plant near Pamplona	3,000 (ore)
Do.	Minas de Potasas de Suria S.A.	Mines at Suria	1,000 (ore)
Do.	Union Explosivos Rio Tinto S.A.	Mines at Balsareny/Sallent and Cardona	2,000 (ore)
Pyrite	Compania Espanola de Minas de	Mines and plants at Tharsis and Zarza,	1,300
	Tharsis	near Seville	
Do.	do.	Plant at Huelva	600
Do.	Rio Tinto Minera S.A.	Mines and plant at Rio Tinto, near	900
		Seville	
Sepiolite	Tolsa S.A.	Mine at Vicalvaro, near Toledo	100
Do.	do.	Plant at Vicalvaro, near Toledo	100
Do.	Silicatos-Anglo-Ingleses S.A.	Mine at Villecas near Madrid	200
Do.	do.	Plant at Villecas near Madrid	200
Steel	Empresa Siderurgica S.A. (Ensidesa)	Plants at Aviles, Verina, and Mieres	6,000
		in Oviedo, and Moreda, Gijon	
Do.	Altos Hornos de Viscaya S.A.	Iron and steel works at Sestao, Bilbao	1,500
Uranium			
metric tons			
per year	Government	Mines and plant near Ciudad Real	500
			(U_3O_8)
Zinc:			
Metal	Real Cia. Asturiana de Minas S.A.	Electrolytic zinc plant at San Juan de	200
		Nueva	
Ore	do.	Reocin mines and plants near	500 (ore)
		Torrelavega, Santander	
Do.	Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcollar, Sevilla.	3,500 (ore)
Do.	Exploracion Minera International	Underground mine at Rubiales, Lugo	500 (ore)
	Espana S.A. (EXMINESA)		
Do.	Sociedad Minera y Metalurgica de	Mines and plants at Montos de los	220 (ore)
	Penarroya-Espana S.A.	Azules y Sierra de Lujar, San	
		Agustin	

NA Not available.

Prerreducidos Integrados Del Sureste de Espana (Presur) made a request to the Spanish Ministry of Industry for permission to import a 2,000-megavolt plasma-furnace from the United Kingdom. The new furnace was intended for a 2,000- to 3,000-ton-per-year ferrochromium plant at Fragenal de la Sierra, Badajopz Province. The State controlled Instituto Nacional de Industria (INI), which is the holding concern for the ferroalloy industry, had received and approved the plan.

Ferronor, another Spanish ferroalloys producer, signed an agreement with Carburos, Electra de Viesgo, and workers at Ferronor's Mataporquera plant in northwest Spain to close that facility and place Ferronor into liquidation. The reason for the closure was that Ferronor was unable to pay the $3 million it owed to Electra de Viesgo. Consequently, the electrical company cut off power to the Mataporqueras plant, resulting in the cessation of Ferronor's ferrosilicon operations. As part of the liquidation arrangement, 36 of Ferronor's 80 employees would be transferred to Carburos' ferroalloys plant in Galicia, in northwest Spain.

Gold.—Orminex S.A. was issued a license to prospect for gold at Suspiron in the Provinces of Castille and Leon, northern Spain. Bedrock panel sampling re-

portedly identified gold grades of 4.4 grams per ton, and Orminex has plans to start an exploration program at that site. Also, Orminex S.A. planned to explore a 100-square-kilometer area at Brana Seita, northwest of Leon. Soil geochemical surveys located an area with anomalous values for antimony, arsenic, copper, and gold. The same geological horizon has copper mineralization and is mined at Penas Negra, 3 kilometers to the west.

The Filon Sur and Thorco Resources continued processing gold ore at Europe's first heap-leach gold project in Spain. The project, near the southwestern Spanish port of Huelva, focused on processing tailings to recover gold. The ore was produced from Tharsis Mining's operations, which originally recovered copper, sulfur, and zinc from pyrite deposits.

Iron and Steel.—Spain gained full membership into the European Coal and Steel Community (ECSC) as of January 1, 1989. However, the Spanish steel industry still must adapt to the economic environment and realities of the 1992's single market in Europe. The ECSC Commission stressed the need for Spanish specialty steel maker, Acenor SA, to improve productivity and reduce capacity and work force. If the minimum financial target has not been reached by the end of 1990, the company has agreed to guarantee further personnel reductions. Some of the capacity and production reductions had been demanded by EC members as a condition to admittance in the Community. The EC granted the release of funds to the steel companies to cover the costs of closures.

One of the more significant developments associated with the rationalization brought about by the integration of Spain's steel industry into the ECSC was a restructuring plan by the state- owned steel company, Empresa Nacional Siderurgica SA (Ensidesa).

In 1989, Ensidesa announced plans to expand its galvanized sheet output to meet the demand of the automobile industry. The subsidiary company, Sidmed, was planning to build an electro-galvanizing line at Sagunto and to expand an existing line at the plant to 180,000 tons per year. If all these modernization efforts came to fruition, Spanish output would increase to 500,000 tons per year. At present, domestic demand for galvanized sheet was reported to be 350,000 tons per year.

Consolidation of Spain's steel industry continued during 1989. Shareholders of five specialty steel producers (Forjas Alavesas, SA Echevarria, Aceros de Lodio, Pedro Orbegozo, and Olsa) agreed to merge into the new company, Acenor SA, which would then supposedly be granted state aid of $129 million. The combined output was expected to be 600,000 tons per year of ferroalloy and stainless steels, of which 39% would be exported.

The Golden Shamrock Mines Ltd. (Australia) purchased a 61.46% interest in Compania Andaluza de Minas SA (CAM) and the iron ore operations in Minas del Marquesado at Alquife. In addition to the mine, CAM operates a port facility on the Mediterranean coast constructed in the early 1980's to handle 7 million tons per year, despite the mine only producing 3 million tons per year of iron ore. The iron ore deposit has an estimated reserve base of 39 million tons grading 54% iron.

Manganese.—Minas del Mediterraneo SA was on schedule to re-open operations on a high-grade manganese deposit. The mine, at Sotoviejo in Huelva Province, was projected to produce 100,000 tons of ore per year. The total output was to be marketed by the Swedish company, Fondmetall International. State and local governments were to provide some of the funding for the project expected to begin production in early 1990.

Mercury.—The world's oversupply of mercury during the year hurt the profitability of primary and secondary mercury producers. The drop in both mercury sales and prices aggravated economic problems at Minas de Almaden y Arrayanes S.A. The company had reported an inventory of 4,100,000 kilograms of mercury,[2] against world consumption of only 3,100,000 kilograms in 1989. The company's employment at the end of 1987 was 850 workers, and negotiations between the board of supervisors at Almaden and the unions to reach a plan to rescue the company had been in progress for 5 months by the end of the year. The rescue plan was anticipated to include a reduction in employment to a level of between 600 and 650 employees, with approximately 200 employed in the mines.

Simultaneously, work continued on a new mine of Minas de Almaden y Arrayanes S.A. (MAYASA) at Almaden, in southern Spain. The new facility, expected to begin production in 1990, reportedly contains ore with a relatively high mercury content of 20.5%, an amount sufficient to reduce extraction costs significantly.

Tungsten.—The Spanish banks, Banco Espanol de Credito and Banco de Credito Industrial, have taken a 50% interest in the Grupo Minera La Parilla. With this financing the company plans to develop the tin and wolfram mine owned by the Wolframio de Extremadura and Minera Adelaide at the Mari Carmen-La Parilla Mine in Extremadura. It was estimated that $34 million would be required to revive the La Parilla mine.

Capitalization of the new company was expected to amount to $7 million. The banks indicated that the new company would be eligible for financial assistance from the regional government, Junta de Extremadura.

Zinc.—Asturiana de Zinc S.A., with approximately 4% of the world's zinc production, was evaluating the possibility of increasing the output from the San Juan de Nieva zinc refinery to 300,000 tons per year. The Asturiana smelter is better suited than most European operations to increase output. The proximity of the company's Reocin Mine supplies 45% of the feed concentrates, and long-term contractors with Exminesa's two other mines provide another 40%. Exminesa, owned jointly by Asturiana de Zinc S.A. and Cominco Ltd. (Canada), was planning to close the Rubiales Mine, producing 70,000 tons per year in the next few years. Another mine, La Troya, opened in 1987, produces only 55,000 tons per year. More reserves of zinc have been reported in Santillana de Mar, Vive da Queveda, near Reocin operations.

Canada's Curragh Resources Ltd. purchased a 20% interest in Asturiana de Zinc S.A. for $119.6 million. This acquisition was reportedly thought to provide Curragh Resources Ltd. with smelting capacity for its mines in Canada. Furthermore, the two companies were anticipated to jointly develop the Cirque mine in British Columbia, Canada. For Asturiana de Zinc, S.A.it was thought that an assured supply of concentrates would justify the planned refinery expansion, expected to reach full capacity in 1991.

Industrial Minerals

Ammonia.—The major Spanish nitrogen producer, Feritilizantes Espanoles S.A. (FESA), announced the closure of several plants. Under a rationalization plan, the less-competitive ammonia-producing units were closed; these were primarily plants with annual outputs less than 100,000 tons. As a result, ammonia production was to be concentrated at three large plants: Fesa's, plant at Huelva, with an annual capacity of 246,000 tons, and the two plants at Cartagena and Puertollano (with a combined annual capacity of 380,000 tons per year) owned by Empresa Nacional de Fertilizantes S.A. (Enfersa). The rationalization plan involved improving the competitiveness of the three remaining plants. The annual capacity of the Puertollano plant was to be increased from 217,000 tons per year to 228,000 tons per year, and production of the Huelva plant was to increase to 307,000 tons. Also, energy consumption was made more efficient by converting the plant's feedstocks from naphtha to natural gas.

With the completion of the rationalization plan, ammonia capacity in Spain would be about 700,000 tons per year, well below the high of 900,000 tons per year produced during the preceding decade.

In Spain, a significant effort was made to focus on ammonium nitrate production, which accounts for most of Spain's nitrogen fertilizer capacity. To this end, many ammonium sulfate plants were closed, while investment in ammonium nitrate plants increased. Specifically, Enfersa invested $102 million in a new ammonium nitrate plant at Sagunto, which began operations in mid-1988. Annual capacity at that plant was 122,000 tons.

Cement.—Societe des Ciments Francais SA purchased the controlling interest in the Spanish cement producer Sociedad Financiera y Minera. While Financiera y Minera had only 3% of the domestic market, the company had interests in foreign countries, including Greece and Morocco. Ciments Francais had indicated that they desired a 10% share of the Spanish cement market and acquired interest in two other Spanish cement operations: a 75% stake in Cementos Rezola SA and a 25% interest in Cementos Molinas SA.

Other foreign companies had interest in the Spanish cement market. The French company Lafarge Coppee SA acquired a controlling interest in Spain's largest cement producer, Ashland SA, through the acquisition of the Swiss company, Cementia.

Kaolin.—Kaolin deposits occur in two different geological environments in Spain. The first occurs as hydrothermal alteration of pre-Hercynian granites in the northwestern part of Spain. The other source in eastern Spain was derived from the weathering of crystalline rocks of the Lower Cretaceous age. These two areas in the country produce more than 400,000 tons per year of kaolin and have resulted in Spain becoming one of the larger kaolin producers in Europe.

Potash.—Fesa closed the depleted Cardona Mine; however, another deposit in the area, Salinas Victoria, was being evaluated for development. The potash seam analyzed 24% K_2O as compared with 12% at Cardona. However, irregularities in the seam at the new deposit had raised questions about the economic viability of the proposed new mine.

Mineral Fuels

Coal.—Spain is endowed with coal and lignite resources. In the past, domestic production had provided the coal requirements of the steel and power generation industries. Presently, one-third of Spain's coal needs are imported, and future plans call for increased coal usage in the electric generating industry. Miners at Minero Siderurgica de Ponderrada's La Camoch coal pit at Gijon continued to protest the restructuring of the company, which caused the loss of jobs. Spain's largest coal producer, state-owned Empresa Nacional Hulleras del Norte (Hunosa), has invested $104 million in modernization and general improvements in its mines. The production target set for washed coal from the company's operations, however, was reportedly not met during the year.

The contracts by the state-owned steel company, Ensidesa, for imports of coal from the Powder River Basin, the United States, were reportedly above the previous year's requirements. Carboex, Spain's state-ownedelectric company, has also purchased coal from Powder River Basin suppliers in the United States. Foreign suppliers were attempting to obtain long-term contracts, especially as they see an increased demand for coal in Spain and a determination on the part of the Government to reduce Spain's dependance on South African sources. U.S. exports to Spain contribute approximately 80% of the coking coal needed by the country.

Petroleum.—Spain has very little domestic crude production, and that accounts for a small percentage of the country's requirements. The Royal Dutch/-Shell Group was reported to be shutting down its Amposta Field, Spain's first offshore producer. The field's cumulative production since 1973 was reported to be 55 million barrels. The field produced only 1,075 barrels per day during the last months of production. Casablanca and Ayoluengo, small onshore fields, were the only two producing fields.

Natural Gas.—The energy contribution of domestic natural gas has historically been small, contributing only 3% of the country's energy requirements. The Spanish Government has indicated that gas was expected to contribute 5% of Spain's energy requirements in the early 1990's. There have been significant gas discoveries, and the country has embarked on a drilling program to bring these resources to market. The Gaviota Field in the Cantabrian Sea provides most of the natural gas. The resources were estimated to provide 1.7 billion cubic meters per year. Furthermore, a new planned pipeline will initially deliver 1.3 billion cubic meters of natural gas from Algeria. This volume will increasing to 2.8 billion cubic meters by the mid-1990's.

Uranium.—In October 1989, a fire damaged the Vandellos nuclear powerplant near Barcelona. The repair costs were expected to reach $320 million over 4 years. Although technically feasible, repairs to the reactor might not be as advantageous as importing electrical power from France. A moratorium on continuing construction on nuclear powerplants was imposed, and this has affected several projects that were more than one-half completed. Hidroelectrica Espanola and Sevillana utilities would be the hardest hit, with the termination of work on the Valdecaballeros plant in western Spain.

INFRASTRUCTURE

The Spanish National Railways (RNFE) operates on 13,500 kilometers of 1.668-meter gauge track and 1,820 of

1-meter gauge track. Most of the 150,000 kilometers of highways is paved; however, only a small portion is limited-access divided highways. The infrastructure improvements are one of the Government's priorities. The main ports are Bilboa, Gijon, Barcelona, Tarragona, Cartagena, Cadiz, and Huelva.

OUTLOOK

The mineral base in Spain has not been fully exploited, and this mineral-rich country is projected to continue to contribute mineral resources for the continued development of Spain and the EC. For example, mercury and zinc are important export commodities, and additional exploration potential may lead to additional resources of these commodities. The lower labor costs in Spain and the abundant mineral resources have fueled growth above the EC average growth in GNP. The fears of an overheated economy have resulted in the tightening of the fiscal policy, which would slow the growth. The lower technological metal processing and fabrication plants are going to have to compete in the EC 1992 single market environment. For this reason, there will be further rationalization of companies as well as new investment in Spain.

[1]Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas 116=US$1.00, the average exchange rate in 1989.

[2]Metal Bulletin. Nov. 27, 1989, pp. 13.

OTHER SOURCES OF INFORMATION

Agencies

Instituto Geological y Minero (Mining and Geological Institute)
Rios Rosas 23
Madrid 3, Spain

Ministerio de Industria y Energia (Ministry of Industry and Energy)
Doctor Fleming, 7.28036
Madrid, Spain

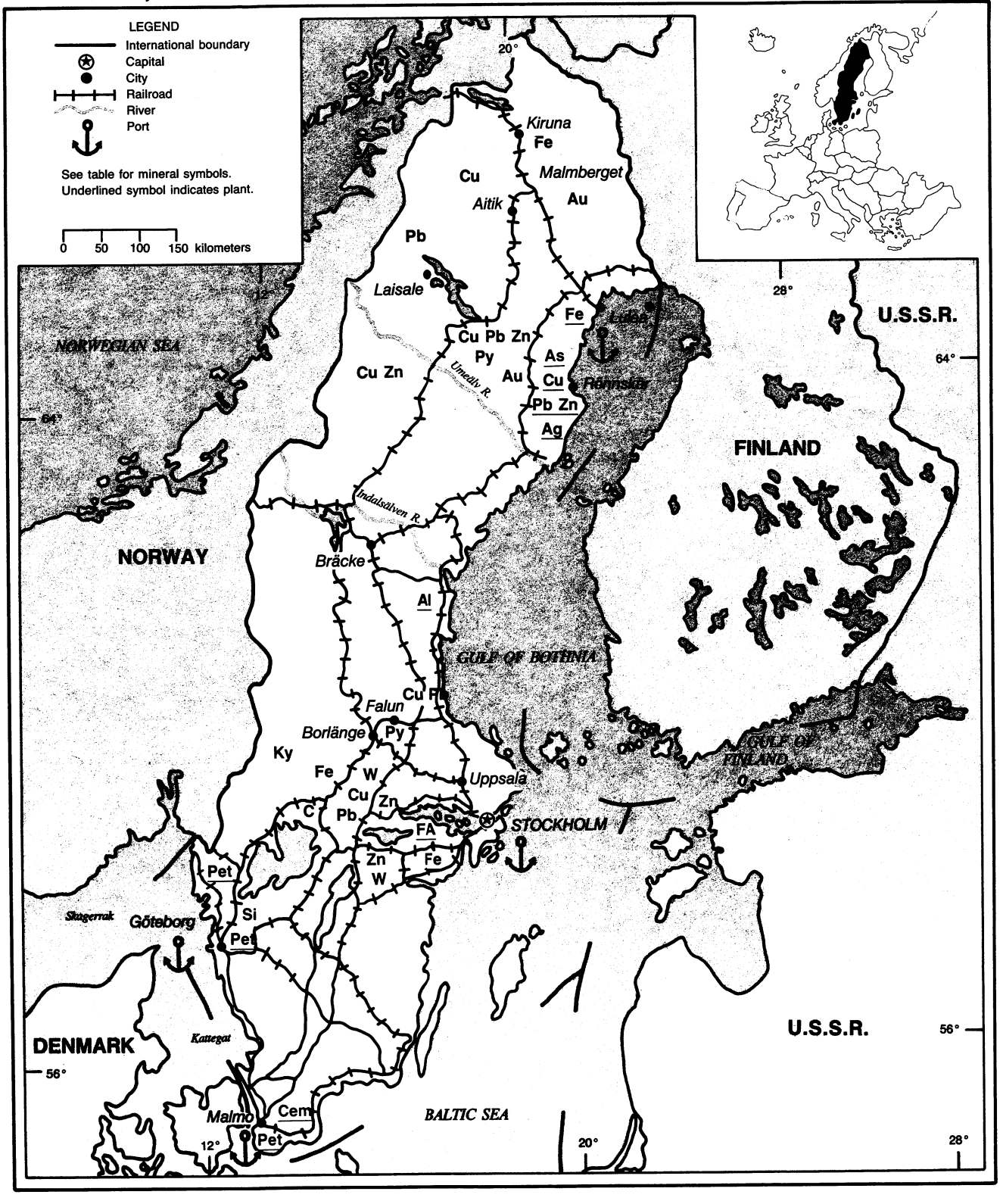
Direccion General de Minas y Industrias de la Construccion
Ministerio de Industria y Energia
Serrano 37
Madrid, Spain

Publications

Estadistica Minera de Espana (Mineral Statistics of Spain)
Industria Minera (Mineral Industry)
La Industria Siderurgica Espanola
Annual reports from companies: Repsol S.A. et. al.

SWEDEN

AREA 449,000 km² **POPULATION 8.5 million**



THE MINERAL INDUSTRY OF

SWEDEN

By Harold R. Newman

The mineral industry of Sweden has a long history and old traditions. The mining of limonitic bog and lake ores began around 300 B.C. The mining of copper ores began in about the 12th century, iron ore in the 14th century, and silver ore in the 16th century. Royal charters were given to regulate the activities of the mining and metallurgical industries as early as the 13th century. However, by modern standards, the production was small.

The mineral deposits of Sweden are found in a number of distinct geographic regions. Iron ore and base metal sulfides are mostly in central Sweden. The iron ore district of Norrbotten in the north also contains some copper deposits. Between Norrbotten and central Sweden is the Skellefte district containing base metal sulfide ores. All of these deposits occur in Precambrian rocks. In southern Sweden, the vein deposits of lead, manganese, silver and also occur in the Precambrian. The youngest metallic ores in Sweden are the Jurassic iron ores in Scania in Southern Sweden.

Industrial minerals occur throughout the country in various geologic environments; however, exploitation of these deposits are mainly in the more densely populated southern part of the country. Because much of Swedish geology is covered by glacial till, it is difficult to determine the industrial minerals beneath, and much detailed mapping is required. Mineral fuels are imported.

Sweden is an advanced, industrialized country with a high standard of living and an extensive social services system. One of the major economic problems the country faced in 1989 was rising prices and costs, which created problems for the sectors of the economy exposed to competition. Resource utilization in the economy was high and production capacity was considered to be fully utilized. The unemployment rate was 1.4%, the lowest since 1970. Despite this, growth was low in general. Gross domestic product (GDP) rose less than 2%, and total industrial production growth was about 3%. As in 1988, wages continued to rise faster than productivity and inflation combined.

GOVERNMENT POLICIES AND PROGRAMS

Sweden's mineral industry is in the form of private enterprise; however, the industry is dominated by state-owned holding companies mainly in iron, steel, and energy. The mineral industry is one of the important basic industries in Sweden, and as such, the State maintains a strong interest. Government incentive programs stimulate exploration, development, and research in mining projects and metallurgical processing techniques.

PRODUCTION

The Swedish production of base metals and precious metals amounted to about 2% of world production. However, in relation to Western Europe, Sweden's share was approximately 25%. The country produced up to three times its domestic requirement of lead and zinc; most of its requirements of gold; 80% of its requirements of copper; and 60% of its requirements of silver. Also, the sulfur content of the sulfide ores were sufficient for the production of sulfuric acid for domestic consumption. Even if Sweden might be considered rich in certain mineral deposits, the range of commodities produced was relatively limited, and many commodities were imported. In particular, Sweden was a major producer of specialty steel but had to import the necessary ferroalloys. Eighteen metal mines were in operation in 1989. At year-end, Boliden's Udden Mine, a lead and zinc producer, closed, and all personnel were transferred to the newly opened Kedtrask Mine.

TRADE

Sweden was strongly dependent on foreign trade. Exports represented roughly 30% of the GDP. Many of Sweden's largest industries export more than one-half of their output. This outward orientation was also reflected in the production capacity maintained abroad through direct investments in both industrialized and developing countries. Imports also played a role in complementing domestic production, stimulating efficiency in the domestic economy and exerting a downward pressure on prices.

Free trade is a fundamental principal in Swedish trade policy. Sweden was a founding member of the European Free Trade Association (EFTA), whose present membership also includes Austria, Finland, Iceland, Norway, and Switzerland. Sweden acceded to the General Agreement on Tariffs and Trade (GATT) in 1950 and has since participated in all negotiating rounds.

The impending formation of the single European Market in 1992 has caused some concern for the Swedish Government because the European Community (EC) is a major consumer of Swedish products, accounting for more than one-half of Swedish exports. As yet the Swedish Government had not decided whether or not to apply for membership in the EC. The main block to EC membership for Sweden is the issue of the country's neutrality in defense and foreign policy. Nevertheless, the Government was taking action to bring Sweden as closely as possible in line with the EC by harmonizing regulations and practices and opening up the economy to competition. Sweden, with other EFTA members, is currently negotiating with the EC to form a European Economic Space (EES) to allow free movement of goods, services, capital, and persons among the member countries.

STRUCTURE OF THE MINERAL INDUSTRY

Sweden's mineral industry consisted mainly of state-owned iron ore and iron and steel companies, one privately owned metal mining and metallurgical company,

TABLE 1

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum metal:						
Primary		83,509	77,667	81,480	98,597	[2]96,982
Secondary		17,545	18,144	8,820	[re]14,101	16,000
Arsenic, trioxide, refined[e]		10,000	10,000	10,000	10,000	10,000
Copper:						
Mine output, Cu content		90,495	87,387	85,016	74,548	[2]69,489
Metal:						
Smelter:						
Primary		74,668	83,358	92,909	93,653	[2]87,125
Secondary		26,017	19,142	12,669	22,247	[2]24,623
Total smelter		100,685	102,500	105,578	115,900	111,748
Refined:						
Primary		[r]58,500	[r]72,800	79,905	68,300	[2]69,977
Secondary[e]		[r]26,000	[r]19,100	[r]12,000	[r]22,000	24,623
Total refined[e]		[r]84,500	[r]91,900	91,905	[r]90,300	94,600
Gold:						
Mine output, Au content	kilograms	4,631	4,514	4,108	3,590	5,120
Metal, primary[3]	do.	4,320	3,640	3,620	3,339	[2]4,403
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	20,454	20,489	19,707	20,440	[2]21,578
Fe content	do.	13,500	13,520	13,006	13,470	[2]13,508
Metal:						
Pig iron and sponge iron	do.	2,523	2,539	2,314	2,527	[2]2,638
Ferroalloys:						
Ferrochromium		135,453	126,144	111,815	143,055	151,697
Ferrochromium-silicon		26,243	17,024	—	—	—
Ferromolybdenum		161	—	—	—	—
Ferrosilicon		28,279	19,969	19,949	20,622	[2]19,303
Total		190,136	163,137	131,764	163,677	171,000
Steel, crude	thousand tons	4,813	4,710	4,595	4,779	[2]4,697
Semimanufactures, rolled	do.	4,254	4,005	[e]4,000	[e]4,100	4,200
Lead:						
Mine output, Pb content		75,894	88,903	90,423	91,579	[2]88,967
Metal:						
Smelter:						
Primary:						
Crude		15,535	6,512	1,439	1,257	[2]1,294
Refined		43,221	49,160	61,229	[e]62,000	58,000
Total		58,756	55,672	62,668	[r e]63,257	59,294
Secondary		25,861	27,783	30,185	[e]32,000	30,000
Total smelter		84,617	83,455	92,853	[re]95,257	89,294
Refined:						
Primary		43,222	49,160	61,229	56,800	35,200

See footnotes at end of table.

TABLE 1—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Lead—Continued						
Metal—Continued						
Refined—Continued						
Secondary		25,861	27,783	30,185	27,900	35,600
Total		69,083	76,943	91,414	84,700	70,800
Molybdenum, oxide, roasted, Mo content		1,486	2,170	2,121	3,371	[2]3,082
Selenium, elemental, refined	kilograms	46,000	24,000	31,000	19,000	20,000
Silicon metal[e]		[2]19,755	[2]19,156	20,000	17,059	10,000
Silver:						
Mine output, Ag content	kilograms	231,483	262,708	254,107	207,804	227,715
Metal, primary[e 3]	do.	[r]162,000	[r]168,000	[r]151,000	[r]149,000	152,000
Tungsten: Mine output, W content		402	357	574	420	80
Zinc: Mine output, Zn content		216,403	219,289	218,570	188,979	[2]173,515
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,124	2,119	2,238	3,953	2,200
Clays: Kaolin		106	60	[e]100	92	100
Feldspar, salable, crude and ground		41,720	35,160	34,226	[e]36,000	40,000
Fluorspar concentrate		3,169	265	220	225	150
Kyanite[e]		2,200	5,000	5,000	6,000	6,000
Lime, mostly quicklime	thousand tons	649	656	590	589	670
Nitrogen: N content of ammonia	do.	18	46	41	—	—
Phosphate rock (byproduct):						
Gross weight	do.	187	192	221	142	71
P_2O_5 content	do.	71	71	82	52	26
Pyrite, gross weight	do.	407	447	429	355	300
Quartz[e]		[2]17,298	17,000	17,000	18,000	18,000
Sodium sulfate, synthetic[e]		100,000	100,000	100,000	100,000	100,000
Stone:						
Dimension, mostly unfinished:						
Granite	thousand tons	148	169	135	89	100
Limestone	do.	15	[e]15	[e]15	[e]20	15
Sandstone	do.	3	[e]3	[e]3	[e]5	5
Slate	do.	21	21	20	28	20
Crushed:						
Dolomite	do.	963	780	606	[e]600	600
Granite	do.	8,060	6,888	7,313	4,978	6,000
Limestone:						
For cement manufacture	do.	765	913	943	[e]950	950
For lime manufacture	do.	1,997	[e]2,000	[e]2,000	[e]2,000	2,000
For other construction and industrial uses	do.	2,068	[e]2,100	[e]2,100	[e]2,000	2,000
Chalk (ground)	do.	40	39	37	[e]38	40
Marl	do.	2,314	[e]2,500	[e]2,500	[e]2,500	2,500
For agricultural uses (ground)	do.	306	[e]300	[e]300	122	150
For other uses (ground)	do.	94	[e]100	[e]100	[e]100	100
Total	do.	7,584	[e]7,952	[e]7,980	[e]7,888	7,890

See footnotes at end of table.

TABLE 1.—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Stone—Continued						
Crushed—Continued						
Quartzite	thousand tons	1,466	[r]1,425	1,317	[e]1,400	1,200
Sandstone	do.	126	52	47	58	50
Other	do.	690	[e]700	[e]700	[e]700	700
Sulfur:						
S content of pyrite	do.	[r]287	[r]310	215	286	233
Byproduct:						
From metallurgy	do.	123	125	[e]130	[e]125	125
From petroleum	do.	23	49	[e]50	[e]45	40
Total	do.	[r]433	[r]484	[r e]395	[r e]456	398
Sulfuric acid	gross weight	960	1,001	985	[e]1,000	900
Talc, soapstone		14,400	2,000	800	16,550	—
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		[2]31,000	30,000	30,000	30,000	30,000
Coke, metallurgical	thousand tons	[r]1,203	[r]1,176	1,096	893	800
Peat, for agricultural use[e]		60,000	60,000	60,000	60,000	60,000
Petroleum:						
Crude	thousand 42-gallon barrels	60	30	24	[e]15	[2]19
Refinery products:						
Liquefied petroleum gas	do.	2,088	2,714	2,448	[e]2,500	[2]1,856
Naphtha	do.	1,096	1,530	1,726	[e]2,640	[2]1,632
Gasoline, motor	do.	25,466	26,868	32,989	[e]37,600	[2]32,122
Jet fuel	do.	4,112	3,544	3,275	[e]6,600	[2]4,130
Kerosene	do.	202	170	311	[e]395	[2]245
Distillate fuel oil	do.	34,480	40,761	41,552	[e]44,230	[2]52,551
Residual fuel oil	do.	27,206	28,025	28,731	[e]25,785	[2]26,855
Other	do.	5,252	5,485	5,872	[e]6,000	[2]4,488
Refinery fuel and losses	do.	8,010	6,630	7,448	[e]7,500	11,300
Total	do.	107,912	115,727	124,352	[e]133,250	135,179

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1, 1990.
[2]Reported figure.
[3]Includes only that recovered from indigenous ores excluding scrap.
[4]Revised to zero.

TABLE 2

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	6	—		
Aluminum:				
Ore and concentrate	20	—		
Oxides and hydroxides	676	356	(2)	Norway 116.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Aluminum—Continued					
Ash and residue containing aluminum		—	1,761	NA	Finland 1,540.
Metal including alloys:					
Scrap		11,259	11,069	—	Finland 5,112; Denmark 1,594; West Germany 1,228.
Unwrought		43,565	59,887	—	West Germany 27,428; United Kingdom 8,482; Norway 6,421.
Semimanufactures		52,289	60,053	1,594	Denmark 13,488; United Kingdom 9,924; Norway 8,064.
Antimony:					
Oxides		—	36	NA	Norway 24.
Metal including alloys, all forms		(2)	—		
Beryllium: Metal including alloys, all forms	value, thousands	$3	—		
Cadmium: Metal including alloys, all forms		(2)	—		
Chromium:					
Ore and concentrate		912	—		
Oxides and hydroxides		346	137	—	Austria 98; West Germany 33.
Cobalt:					
Oxides and hydroxides		(2)	155	—	Mainly to Finland.
Metal including alloys, all forms		76	319	6	United Kingdom 253; West Germany 14.
Columbium and tantalum: Tantalum metal including alloys, all forms	value, thousands	$18	—		
Copper:					
Ore and concentrate		72,584	55,190	—	Finland 32,100; East Germany 20,840.
Oxides and hydroxides		(2)	—		
Sulfate		49	—		
Ash and residue containing copper		4,324	3,377	NA	Belgium-Luxembourg 3,357.
Metal including alloys:					
Scrap		8,059	3,658	—	Poland 837; Finland 782; Denmark 759.
Unwrought		56,674	50,695	2,829	Finland 17,042; United Kingdom 13,503; Belgium-Luxembourg 5,947.
Semimanufactures		83,614	86,914	17,989	United Kingdom 9,150; Finland 9,038.
Gold:					
Waste and sweepings	value, thousands	$25,254	$16,785	$157	West Germany $9,330; Switzerland $3,161; United Kingdom $2,554.
Metal including alloys, unwrought and partly wrought	do.	$112,021	$94,759	NA	Finland $848; West Germany $489; unspecified $93,089.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	16,762	17,722	79	West Germany 6,251; Belgium-Luxembourg 2,988; Finland 1,469.
Pyrite, roasted		203	—		
Metal:					
Scrap		44,426	87,273	69	Italy 40,164; Denmark 14,465; West Germany 9,260.
Pig iron, cast iron, related materials		121,222	131,769	156	Italy 9,382; unspecified 115,401.
Ferroalloys:					
Ferrochromium		78,862	96,031	NA	NA.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Ferroalloys—Continued				
Ferrocolumbium	23	14	NA	Mainly to Finland.
Ferromanganese	488	867	NA	Iraq 150; West Germany 111; United Kingdom 91.
Ferromolybdenum	18	27	NA	Finland 18.
Ferronickel	1	19	—	All to Canada.
Ferrosilicochromium	3,774	—		
Ferrosilicomanganese	233	146	NA	East Germany 143.
Ferrosilicon	12,457	14,931	NA	United Kingdom 1,103; unspecified 12,823.
Ferrovanadium	16	42	—	Netherlands 20; Finland 13; Norway 9.
Ferrotitanium	81	—		
Silicon metal value, thousands	$27,025	$21,028	NA	NA.
Unspecified	112	144	103	Switzerland 4.
Steel, primary forms	594,613	430,390	243,468	West Germany 39,269; Italy 23,551.
Semimanufactures:				
Bars, rods, angles, shapes, sections	763,742	803,127	48,667	West Germany 224,978; United Kingdom 105,680; Denmark 75,523.
Universals, plates, sheets	1,037,180	NA		
Hoop and strip	135,981	NA		
Rails and accessories	36,442	38,225	2,222	Norway 13,114; Italy 6,887; United Kingdom 4,267.
Wire	65,475	65,798	8,151	West Germany 13,304; Finland 7,456.
Tubes, pipes, fittings	222,338	246,979	28,935	West Germany 44,560; United Kingdom 23,269.
Castings and forgings, rough	5,268	NA		
Lead:				
Ore and concentrate	56,820	60,980	2	West Germany 23,393; Belgium-Luxembourg 22,683; United Kingdom 11,759.
Oxides	82	—		
Ash and residue containing lead	—	2,926	NA	NA.
Metal including alloys:				
Scrap	2,217	3,379	—	West Germany 2,183; Denmark 1,186.
Unwrought	66,285	69,532	2,002	West Germany 10,668; Norway 10,141; U.S.S.R. 9,544.
Semimanufactures	683	715	1	United Kingdom 405; Finland 144; Denmark 94.
Magnesium: Metal including alloys:				
Scrap	1,086	1,391	—	West Germany 954; Netherlands 182; United Kingdom 172.
Unwrought	(2)	—		
Semimanufactures	12	4	—	Norway 1.
Manganese:				
Oxides	(2)	—		
Metal including alloys, all forms	119	273	—	Finland 242; Norway 30.
Mercury	7	8	NA	NA.
Molybdenum:				
Ore and concentrate	2,747	1,725	—	West Germany 546; Netherlands 480; Finland 221.
Oxides and hydroxides	(2)	—		

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Molybdenum—Continued					
Metal including alloys:					
Unwrought including scrap		9	19	—	All to West Germany.
Semimanufactures	value, thousands	$278	$278	$56	Japan $50.
Nickel: Metal including alloys:					
Scrap		740	642	—	West Germany 229; United Kingdom 207; Netherlands
Unwrought		78	1,802	737	Japan 204; United Kingdom 171.
Semimanufactures		1,737	1,604	596	West Germany 256; Italy 167.
Platinum-group metals:					
Waste and sweepings	value, thousands	NA	$10,152	$1,222	Norway $3,055; Belgium-Luxembourg $2,390; United Kingdom $2,113.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	NA	$248	NA	Norway $210.
Platinum	do.	NA	$2,078	NA	Belgium-Luxembourg $620; Netherlands $454; Finland $311.
Unspecified	do.	$1,228	—		
Silicon, high-purity		NA	1	—	Mainly to West Germany.
Silver:					
Waste and sweepings[3]	value, thousands	$14,660	$8,636	—	West Germany $5,029; United Kingdom $1,430; Norway $969.
Metal including alloys, unwrought and partly wrought		319	301	NA	Finland 22; Norway 6; unspecified 267.
Tellurium and boron, elemental		[4]402	7	—	West Germany 4; United Kingdom 3.
Tin: Metal including alloys:					
Scrap		(2)	—		
Unwrought		183	157	—	Denmark 56; Finland 48; Norway 42.
Semimanufactures		142	124	(2)	Denmark 59; Norway 41; Finland 21.
Titanium:					
Ore and concentrate		1	—		
Oxides		35	72	—	Belgium-Luxembourg 32; Denmark 22; West Germany 15.
Metal including alloys:					
Unwrought including scrap		295	329	13	United Kingdom 313.
Semimanufactures		108	121	10	Canada 28; Norway 24; Finland 20.
Tungsten:					
Ore and concentrate		265	688	—	West Germany 486; India 101; Argentina 52.
Metal including alloys:					
Unwrought including scrap		80	90	65	United Kingdom 14; West Germany 10.
Semimanufactures		4	6	(2)	Denmark 1.
Uranium and thorium: Oxides and other compounds		21	50	NA	West Germany 48; Belgium-Luxembourg 2.
Vanadium: Oxides and hydroxides		(2)	—		
Zinc:					
Ore and concentrate		461,033	374,896	—	Norway 109,582; Belgium-Luxembourg 94,162; Finland 53,199.
Oxides		708	602	—	West Germany 287; Norway 216.
Blue powder		(2)	—		

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Zinc—Continued					
Matte		NA	37,811	NA	Norway 26,553; Belgium-Luxembourg 5,915; Italy 3,300.
Ash and residue containing zinc		18,140	1,953	NA	Norway 969; West Germany 481.
Metal including alloys:					
Scrap		4,574	3,156	—	Taiwan 872; Norway 460; India 388.
Unwrought		1,257	833	—	West Germany 455; Norway 287.
Semimanufactures		23	157	1	Norway 61; Botswana 60.
Zirconium:					
Ore and concentrate		211	—		
Oxides, including germanium	value, thousands	—	$123	NA	Netherlands $112.
Unwrought including scrap		24	17	1	United Kingdom 15; West Germany 1.
Semimanufactures		77	65	(2)	West Germany 39; Romania 11; Finland 9.
Other:					
Ores and concentrates		—	[5]101	—	West Germany 100; United Kingdom 1.
Oxides and hydroxides		183	242	238	NA.
Ashes and residues		[5]6,909	3,451	174	Norway 476; Austria 255.
Base metals including alloys, all forms		6	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		213	155	(2)	Norway 59; Finland 52; Portugal 36.
Artificial:					
Corundum		40	—		
Silicon carbide		13	—		
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$46	[6]$81	—	Finland $79.
Grinding and polishing wheels and stones		1,828	2,180	3	France 343; United Kingdom 342; West Germany 264.
Asbestos, crude		17	—		
Barite and witherite		1	—		
Boron materials:					
Crude natural borates		1	460	—	Mainly to Finland.
Oxides and acids		10	155	NA	Norway 150.
Cement		536,962	441,502	48,404	Norway 195,036; Bahamas 75,620; Nigeria 62,186.
Chalk		8,784	8,732	—	Finland 4,469; Norway 2,395; Denmark 1,400.
Clays, crude:					
Bentonite		699	922	—	Finland 746; Norway 75; Denmark 72.
Fire clay		2,500	—		
Kaolin		2,807	1,706	—	Finland 1,537; Norway 90.
Unspecified		178	83	—	Norway 31.
Cryolite and chiolite		(2)	—		
Diamond:					
Natural:					
Gem, not set or strung	value, thousands	$2,846	$2,411	—	Belgium-Luxembourg $850; Denmark $720.
Industrial stones	do.	$77	$96	—	West Germany $63; Finland $12; Netherlands $11.
Dust and powder	do.	NA	$343	—	Finland $310.
Synthetic: Industrial	do.	$31,762	[7]$37,004	—	Ireland $36,982.
Diatomite and other infusorial earth		95	125	—	Belgium-Luxembourg 47; Norway 31; Denmark 14.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Feldspar, fluorspar, related materials:				
Feldspar	NA	26,386	—	United Kingdom 14,437; Austria 2,762; Italy 2,669.
Fluorspar	1,458	2,108	—	Finland 1,548.
Unspecified	16,047	—		
Fertilizer materials:				
Crude, n.e.s.	1,356	1,320	—	Norway 601; West Germany 318; Japan 231.
Manufactured:				
Ammonia	1,133	1,256	NA	Norway 1,254.
Nitrogenous[8]	247,612	206,100	—	United Kingdom 42,342; West Germany 40,983; Denmark 38,884.
Phosphatic	69,235	102,386	—	United Kingdom 51,124; Ireland 27,055; West Germany 11,061.
Potassic	10	8,612	—	Norway 8,590.
Unspecified and mixed	204,019	211,424	—	West Germany 49,386; United Kingdom 45,415; Tanzania 32,981.
Graphite, natural	4	68	—	United Kingdom 18; Republic of Korea 13; Finland 11.
Gypsum and plaster	326	279	5	Denmark 94; Finland 63; Norway 54.
Iodine	1	4,218	NA	East Germany 3,264; France 673.
Kyanite and related materials	—	2,559	NA	Italy 1,264; United Kingdom 454; France 377.
Lime	7,688	4,795	(2)	Norway 4,389.
Magnesium compounds:				
Magnesite, crude	NA	185	—	Norway 98; Denmark 31; Australia 24.
Oxides and hydroxides	NA	346	—	Norway 295; Denmark 48.
Unspecified	796	—		
Mica:				
Crude including splittings and waste	38	—		
Worked including agglomerated splittings	1	—		
Phosphates, crude	142,096	72,363	—	Norway 72,353; Finland 10.
Phosphorous, elemental	1	—		
Pigments, mineral: Iron oxides and hydroxides, processed	1,366	5,444	1,170	Republic of Korea 1,536; Japan 1,260.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$8,216	$12,766	$1	Belgium-Luxembourg $8,181; Hong Kong $2,131; Denmark $1,441.
Synthetic do.	$2	—		
Pyrite, unroasted	58,654	—		
Salt and brine	1,681	1,793	(2)	Norway 725; Denmark 430; Finland 343.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	2,159	116	(2)	Poland 77; Norway 35; Mozambique 2.
Sulfate, manufactured	90,403	83,825	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	168,851	277,493	756	United Kingdom 84,328; West Germany 62,106; Italy 43,399.
Worked	14,403	11,864	29	Denmark 7,384; Norway 2,655.
Dolomite, chiefly refractory-grade	35,829	43,133	14	Denmark 14,005; Netherlands 11,911; Norway 9,691.
Gravel and crushed rock thousand tons	1,331	1,284	4	Denmark 689; West Germany 386; United Kingdom 97.
Limestone other than dimension	791,446	890,512	—	Finland 789,996; Denmark 76,385.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Quartz and quartzite		348,431	316,133	—	Norway 308,141; Iceland 4,825.
Sand other than metal-bearing		120,715	101,631	(2)	Norway 47,733; Denmark 22,035.
Sulfur:					
Elemental:					
Crude including native and byproduct		18,969	15,570	—	United Kingdom 10,771; Denmark 4,132.
Colloidal, precipitated, sublimed		82	2,363	NA	Norway 2,350.
Dioxide		35,024	37,261	NA	Finland 21,602; Norway 13,800.
Sulfuric acid		92,683	19,611	NA	Netherlands 10,031; Belgium-Luxembourg 5,056; United Kingdom 4,177.
Talc, steatite, soapstone, pyrophyllite		13,916	14,684	—	Netherlands 10,042; Norway 2,330; Denmark 1,304.
Vermiculite, pertite, chlorite		—	254	—	Norway 231; West Germany 22.
Other:					
Crude		4,882	4,220	—	Norway 2,264; Denmark 1,323.
Slag and dross, not metal-bearing		112,241	108,603	46	United Kingdom 43,017; Denmark 32,175; Finland 13,104.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		7	1,659	—	Denmark 975; Norway 277.
Carbon:					
Carbon black		17,937	21,538	—	Poland 5,776; East Germany 5,322; Norway 4,520.
Gas carbon		—	6,517	—	Netherlands 6,450.
Coal:					
Anthracite		31,945	—		
Bituminous		72,114	35,353	—	Ireland 22,399; United Kingdom 8,470; Denmark 3,276.
Briquets of anthracite and bituminous coal		196	—		
Coke and semicoke		169,423	85,236	—	Finland 53,416; Netherlands 20,223; Norway 11,509.
Gas, natural, gaseous	thousand cubic meters	6	—		
Peat including briquets and litter		44,256	49,493	—	Norway 20,442; Netherlands 14,703; Denmark 11,546.
Petroleum:					
Crude	thousand 42-gallon barrels	1,024	—		
Refinery products:					
Liquefied petroleum gas	do.	[8]619	954	297	France 259; Norway 144.
Gasoline	do.	10,639	8,272	201	Denmark 3,532; Norway 2,879.
Mineral jelly and wax	42-gallon barrels	1,456	756	39	Japan 31.
Kerosene and jet fuel	thousand 42-gallon barrels	1,402	1,190	—	Norway 790; Denmark 385.
Distillate fuel oil	do.	21,141	20,487	963	Denmark 7,647; West Germany 6,051; Norway 3,405.
Lubricants	do.	1,114	1,541	(2)	Norway 365; France 343; Netherlands 297.
Residual fuel oil	do.	17,733	19,245	3,910	United Kingdom 7,522; West Germany 2,417.
Bitumen and other residues	do.	1,835	1,619	—	Norway 732; Denmark 417; Finland 295.
Bituminous mixtures	do.	39	37	2	Belgium-Luxembourg 7; Norway 5; Finland 4.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes selenium and arsenic.
[5]Includes precious metals.
[6]Excludes diamond.
[7]Includes other precious and semiprecious stones.
[8]Data incomplete due to statistical restrictions.

TABLE 3

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	—	29	(2)	Austria 13.
Unspecified	97	—		
Aluminum:				
Ore and concentrate	46,425	51,108	—	Australia 28,115; Greece 9,465; Guyana 4,294.
Oxides and hydroxides	270,898	253,716	19	Jamaica 82,139; Australia 62,240; West Germany 38,188.
Ash and residue containing aluminum	—	9,366	NA	Norway 7,030; West Germany 1,889.
Metal including alloys:				
Scrap	2,526	3,592	(2)	Norway 1,241; Denmark 980; United Kingdom 844.
Unwrought	43,124	58,819	17	Norway 24,580; Canada 12,850; Finland 4,104.
Semimanufactures	89,493	98,108	851	West Germany 29,739; Norway 14,488.
Antimony:				
Oxides	—	652	NA	United Kingdom 311; China 136; France 105.
Metal including alloys, all forms	12	112	—	Mainly from China.
Arsenic: Metal including alloys, all forms	(2)	143	(2)	France 138.
Beryllium: Metal including alloys, all forms	(2)	—		
Bismuth: Metal including alloys, all forms	—	19	—	China 8; United Kingdom 8.
Cadmium: Metal including alloys, all forms	122	177	—	Finland 139; Norway 37.
Chromium:				
Ore and concentrate	314,495	435,595	—	Finland 149,013; Turkey 82,506; U.S.S.R. 45,400.
Oxides and hydroxides	570	450	(2)	West Germany 312; United Kingdom 106.
Metal including alloys, all forms	216	220	(2)	United Kingdom 162; France 52.
Cobalt:				
Oxides and hydroxides	10	12	4	France 1.
Metal including alloys, all forms	335	580	69	Zaire 84; Finland 78; West Germany 74.
Columbium and tantalum:				
Ore and concentrate	45	—		
Metal including alloys, all forms, tantalum	1	1	(2)	Austria 1.
Copper:				
Ore and concentrate	56,037	77,758	—	Peru 27,562; Norway 14,085; Greece 12,000.
Matte and speiss including cement copper	5,219	3,437	—	Mainly from France.
Oxides and hydroxides	786	778	NA	Yugoslavia 567; West Germany 177.
Sulfate	1,019	942	NA	U.S.S.R. 273; Israel 229; Hungary 190.
Ash and residue containing copper	31,559	48,034	18	West Germany 20,009; United Kingdom 8,881; Peru 5,500.
Metal including alloys:				
Scrap	19,951	16,494	5,068	France 3,535; United Kingdom 1,904.
Unwrought	51,519	65,692	308	Chile 11,123; Canada 10,258; Finland 9,982.
Semimanufactures	44,320	43,190	157	West Germany 17,849; United Kingdom 6,478; Finland 5,595.
Germanium: Metal including alloys, all forms value, thousands	—	$1,004	$1	U.S.S.R. $935; West Germany $63.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Gold:				
Waste and sweepings value thousands	$1,226	$808	NA	Finland $455; Denmark $130; Norway $104.
Metal including alloys, unwrought and partly wrought do.	$20,634	$21,415	$360	West Germany $7,537; Switzerland $5,636; United Kingdom $4,401.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	70,079	129,332	—	Norway 68,975; Canada 59,746.
Metal:				
Scrap	789,422	799,280	13,493	West Germany 251,470; United Kingdom 208,002; U.S.S.R. 145,301.
Pig iron, cast iron, related materials	61,172	76,409	584	U.S.S.R. 22,186; Poland 20,394; United Kingdom 7,407.
Ferroalloys:				
Ferrochromium	50,593	44,420	88	Finland 19,067; Turkey 6,962; West Germany 6,143.
Ferrocolumbium	291	266	NA	Brazil 140; West Germany 33; Netherlands 30.
Ferromanganese	25963	31,104	—	Norway 17,904; France 7,595; Belgium-Luxembourg 4,600.
Ferromolybdenum	1,431	2,039	89	China 677; United Kingdom 410; Austria 393.
Ferronickel	14,049	9,283	—	New Caledonia 3,917; Colombia 2,268; Dominican Republic 1,737.
Ferrosilicochromium	2,611	2,455	—	Zimbabwe 1,347; U.S.S.R. 815; West Germany 283.
Ferrosilicomanganese	11,926	17,336	—	Norway 12,660; Belgium-Luxembourg 4,600.
Ferrosilicon	22,515	24,142	10	Norway 18,936; U.S.S.R. 4,230.
Ferrotitanium	1,475	1,876	NA	West Germany 649; U.S.S.R. 456; United Kingdom 363.
Ferrotungsten	372	697	20	China 628.
Ferrovanadium	1,105	1,097	12	West Germany 524; Austria 268; Belgium-Luxembourg 262.
Silicon metal	292	803	(2)	France 447; Hong Kong 200; Norway 148.
Unspecified	1,227	2,426	62	Norway 1,116; West Germany 316; United Kingdom 301.
Steel, primary forms	186,123	122,330	1	Finland 65,114; United Kingdom 19,925; West Germany 15,925.
Semimanufactures:				
Bars, rods, angles, shapes, sections	415,364	495,630	2,199	West Germany 92,041; United Kingdom 71,223; Finland 65,315.
Universals, plates, sheets	850,005	NA		
Hoop and strip	132,307	NA		
Rails and accessories	6,806	7,046	(2)	United Kingdom 1,746; Austria 1,729; France 1,677.
Wire	33,722	34,075	60	Belgium-Luxembourg 9,815; United Kingdom 5,487; Finland 5,280.
Tubes, pipes, fittings	323,676	341,472	284	West Germany 71,657; Finland 63,132; United Kingdom 47,868.
Castings and forgings, rough	8,391	NA		
Lead:				
Ore and concentrate	—	3,312	—	Denmark 2,287; Poland 1,025.
Oxides	4,091	4,553	(2)	West Germany 3,781; East Germany 317.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lead—Continued					
Ash and residue containing lead		—	968	NA	Denmark 500; Finland 390.
Metal including alloys:					
Scrap		18,551	23,244	13	Norway 8,041; Denmark 5,924; United Kingdom 4,412.
Unwrought		3,801	2,885	1	United Kingdom 1,525; West Germany 728; Denmark 280.
Semimanufactures		982	1,039	1	West Germany 710; United Kingdom 157; Netherlands 141.
Lithium: Oxides and hydroxides		—	31	30	NA.
Magnesium: Metal including alloys:					
Scrap		(2)	—		
Unwrought		2,275	2,310	166	Norway 1,736.
Semimanufactures		150	146	20	France 46; West Germany 33.
Manganese:					
Ore and concentrate, metallurgical-grade		11,139	11,710	—	Brazil 11,496; Netherlands 214.
Oxides		344	326	239	Netherlands 58.
Metal including alloys, all forms		2,064	1,593	177	France 1,029; China 237.
Mercury		11	2,539	3	West Germany 2,512; China 11.
Molybdenum:					
Ore and concentrate		7,402	7,870	3,716	Belgium-Luxembourg 1,449.
Oxides and hydroxides		236	234	9	West Germany 128; East Germany 51; Chile 21.
Metal including alloys:					
Unwrought including scrap		227	98	(2)	West Germany 76; China 15.
Semimanufactures		35	185	24	West Germany 109; Austria 22.
Nickel:					
Ore and concentrate		—	2,866	—	Belgium-Luxembourg 2,675; Norway 131; Finland 60.
Matte and speiss		3,515	2,319	—	All from Australia.
Oxides and hydroxides		—	4	3	NA.
Metal including alloys:					
Scrap		6,048	11,665	3,661	West Germany 6,502; United Kingdom 1,000.
Unwrought		10,805	14,148	511	United Kingdom 4,284; Canada 3,140; U.S.S.R. 1,781.
Semimanufactures		1,151	1,470	167	United Kingdom 937; West Germany 128.
Platinum-group metals:					
Waste and sweepings	value, thousands	NA	$368	$24	Switzerland $193; Finland $100.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	NA	$2,634	$1,176	Switzerland $885; West Germany $235.
Platinum	do.	NA	$39,059	$5,863	Switzerland $17,748; West Germany $5,970.
Unspecified	do.	$47,699	—		
Rare-earth metals including alloys, all forms		NA	31	NA	Austria 15; U.S.S.R. 12.
Selenium, elemental		10	22	NA	West Germany 12; United Kingdom 3.
Silicon, high-purity		NA	16	NA	Denmark 7; West Germany 6; Japan 3.
Silver:					
Waste and sweepings[3]	value, thousands	$7,465	$4,948	$1,654	Finland $1,708; United Kingdom $1,175.
Metal including alloys, unwrought and partly wrought		160	174	(2)	West Germany 76; Spain 29; France 20.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Tellurium and boron, elemental	8	7	NA	Mainly from U.S.S.R.
Tin: Metal including alloys:				
Scrap	128	153	23	Denmark 119.
Unwrought	480	549	(2)	United Kingdom 141; Malaysia 130; Brazil 92.
Semimanufactures	139	126	(2)	Netherlands 54; West Germany 43; United Kingdom 22.
Titanium:				
Ore and concentrate	2,405	1,376	—	Australia 1,123; Netherlands 128.
Oxides	3,636	4,725	150	Norway 2,469; Finland 958.
Metal including alloys:				
Unwrought	45	—		
Semimanufactures	493	567	73	Japan 392; West Germany 46.
Tungsten:				
Ore and concentrate	268	756	73	Thailand 288; China 237; Australia 140.
Oxides and hydroxides	42	—		
Metal including alloys:				
Unwrought including scrap	159	200	8	China 70; Singapore 54; United Kingdom 35.
Semimanufactures	13	33	(2)	West Germany 10; Austria 3; Finland 3.
Uranium and thorium: Oxides and other compounds	18	334	42	U.S.S.R. 113; France 63; Netherlands 63.
Vanadium:				
Oxides and hydroxides	(2)	—		
Metal including alloys, all forms	—	8	6	Netherlands 1.
Zinc:				
Oxides	1,911	1,795	—	West Germany 627; United Kingdom 519; Netherlands 311.
Blue powder	334	331	NA	Norway 311.
Matte	NA	848	NA	United Kingdom 479; Norway 215; Finland 101.
Ash and residue containing zinc	17,155	26,163	NA	West Germany 21,168; United Kingdom 3,272.
Metal including alloys:				
Scrap	270	117	—	Norway 64; Denmark 51; Belgium-Luxembourg 1.
Unwrought	39,613	43,280	—	Finland 23,733; Norway 17,876.
Semimanufactures	41	254	(2)	West Germany 166; Belgium-Luxembourg 45.
Zirconium:				
Ore and concentrate	1,139	232	24	Australia 125; Netherlands 41; Finland 30.
Oxides including germanium	—	9	NA	U.S.S.R. 1.
Metal including alloys:				
Unwrought including scrap	163	134	62	France 60; United Kingdom 9.
Semimanufactures	90	130	69	France 58.
Other:				
Ores and concentrates[4]	16,542	5,329	—	Canada 4,270; Peru 1,059.
Oxides and hydroxides	781	64	34	West Germany 17.
Ashes and residues	[4]16,293	2,335	27	United Kingdom 1,352; West Germany 155.
Base metals including alloys, all forms	65	6	1	France 1; United Kingdom 1.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		2,480	3,346	3	Iceland 2,542; West Germany 156.
Artificial:					
Corundum		5,530	6,294	255	West Germany 3,452; Hungary 664.
Silicon carbide		6,209	5,886	1	Norway 4,888; West Germany 460.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$4,482	[5]$75	NA	NA.
Grinding and polishing wheels and stones		2,814	3,010	37	Austria 1,097; West Germany 435; France 354.
Asbestos, crude		937	972	5	Canada 784; Italy 182.
Barite and witherite		6,489	5,440	1	West Germany 4,279; United Kingdom 710.
Boron materials:					
Crude natural borates		13,104	12,093	1,650	Turkey 8,176; Netherlands 2,230.
Oxides and acids		863	696	50	France 293; Turkey 218; United Kingdom 60.
Bromine		12	10	NA	NA.
Cement		183,587	216,480	332	Poland 95,764; East Germany 83,411; Denmark 19,285.
Chalk		20,072	63,320	—	West Germany 31,280; Denmark 25,440.
Clays, crude:					
Bentonite		11,958	7,693	108	Cyprus 5,460; United Kingdom 1,074.
Chamotte and dinas earth		—	1,111	NA	Czechoslovakia 813; West Germany 222.
Fuller's earth		—	7,570	NA	United Kingdom 5,465; West Germany 2,010.
Fire clay		19,015	8,022	1,051	United Kingdom 2,973; Czechoslovakia 2,406; West Germany 1,166.
Kaolin		442,104	441,212	45,934	United Kingdom 361,517; Czechoslovakia 15,216.
Unspecified		17,472	22,638	3	United Kingdom 15,936; West Germany 4,244.
Cryolite and chiolite		91	100	—	Denmark 97.
Diamond:					
Natural:					
Gem, not set or strung	value, thousands	$12,037	$10,228	$132	Belgium-Luxembourg $6,384; Israel $968.
Industrial stones	do.	$568	$970	$210	Netherlands $360; United Kingdom $236.
Dust and powder		NA	2	1	Ireland 1.
Synthetic, industrial	value, thousands	$2,705	NA		
Diatomite and other infusorial earth		2,884	2,810	879	Denmark 1,185; Spain 308.
Feldspar, fluorspar, related materials:					
Feldspar		NA	10,035	—	Norway 7,766.
Fluorspar		10,956	11,670	—	Mexico 8,969; United Kingdom 2,208.
Unspecified		12,431	6,245	—	Norway 6,238.
Fertilizer materials:					
Crude, n.e.s.		22	72	—	U.S.S.R. 35; Finland 18; United Kingdom 18.
Manufactured:					
Ammonia		236,645	222,737	(2)	U.S.S.R. 105,949; Poland 86,618.
Nitrogenous[6]		505,221	678,912	NA	Norway 382,862; West Germany 90,879; East Germany 53,971.
Phosphatic		2,105	1,163	NA	Poland 1,100; Denmark 58.
Potassic		(7)	172,496	802	West Germany 89,318; U.S.S.R. 51,604.
Unspecified and mixed		(7)	286,158	36	West Germany 86,198; Norway 77,161; Netherlands 49,087.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Graphite, natural	789	599	1	West Germany 326; United Kingdom 76.
Gypsum and plaster	418,212	502,072	—	Spain 236,278; East Germany 213,810; Denmark 37,475.
Iodine	—	6	NA	United Kingdom 2; Denmark 1.
Kyanite and related materials:				
Andalusite, kyanite, sillimanite	NA	305	229	NA.
Mullite	NA	89	NA	United Kingdom 81.
Lime	5,772	8,939	—	Poland 5,071; West Germany 954.
Magnesium compounds:				
Magnesite, crude	NA	17,712	—	China 7,760; Spain 2,619; Austria 2,012.
Oxides and hydroxides	NA	21,058	110	Greece 8,362; China 4,744; Norway 3,891.
Sulfate	NA	17,141	NA	West Germany 16,165; Norway 975.
Unspecified	28,138	—		
Mica:				
Crude including splittings and waste	434	398	—	Norway 147; United Kingdom 89; France 84.
Worked including agglomerated splittings	75	85	1	Switzerland 47; Belgium-Luxembourg 9; Austria 8.
Nitrates, crude	3,652	7,489	—	Chile 6,227; West Germany 626.
Phosphates, crude	739,838	693,265	164,133	U.S.S.R. 262,456; Morocco 126,226.
Phosphorus, elemental	34	30	NA	West Germany 29.
Pigments, mineral: Iron oxides and hydroxides, processed	5,015	5,349	2	West Germany 4,967.
Potassium salts, crude	1,998	4,934	—	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$7,088	$7,620	$199	Thailand $2,886; Sri Lanka $2,002; Belgium-Luxembourg $1,068.
Synthetic do.	$360	$236	$53	Belgium-Luxembourg $64; Switzerland $42.
Pyrite, unroasted	65,914	125,843	—	Finland 123,222; Poland 2,437.
Quartz crystal, piezoelectric value, thousands	NA	$18	—	Canada $10; West Germany $8.
Salt and brine thousand tons	1,157	1,342	(2)	Netherlands 368; West Germany 328; Denmark 188.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	102,875	135,415	39,488	East Germany 48,184; West Germany 14,725.
Sulfate, manufactured	10,361	7,305	(2)	U.S.S.R. 4,530; Netherlands 1,319; Austria 909.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,079	6,556	(2)	Finland 2,397; Norway 1,964; Portugal 1,390.
Worked	18,705	20,424	17	Portugal 7,367; Italy 7,213; Finland 1,183.
Dolomite, chiefly refractory-grade	159,205	155,960	—	Belgium-Luxembourg 68,269; United Kingdom 41,093; Norway 40,954.
Gravel and crushed rock	84,046	67,712	1	Norway 21,166; Denmark 14,724; Italy 8,738.
Limestone other than dimension	63,394	63,246	—	Denmark 29,142; United Kingdom 19,197; Norway 13,690.
Quartz and quartzite	63,209	43,872	14	Spain 40,857; Finland 1,740.
Sand other than metal-bearing thousand tons	4,529	863	(2)	Denmark 658; Belgium-Luxembourg 172.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental:					
Crude including native and byproduct		7,885	8,092	—	Poland 6,380; Norway 1,352.
Colloidal, precipitated, sublimed		8,402	7,935	—	Poland 7,891.
Dioxide		12,515	16,912	—	Norway 8,608; Poland 5,713; West Germany 1,948.
Sulfuric acid		3,305	13,908	(2)	Poland 8,196; Norway 5,316.
Talc, steatite, soapstone, pyrophyllite		31,426	32,650	20	Finland 16,515; Norway 6,224; Belgium-Luxembourg 4,831.
Vermiculite, perlite, chlorite		—	667	—	U.S.S.R. 386; Belgium-Luxembourg 155.
Other:					
Crude		19,0274	175,503	292	Norway 172,651; West Germany 791.
Slag and dross, not metal-bearing		34,416	97,208	33	Finland 61,201; West Germany 8,973; Norway 8,093.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		635	2,112	138	West Germany 1,429; Hungary 294.
Carbon black		14,285	13,590	224	Netherlands 7,521; West Germany 3,370; United Kingdom 1,658.
Coal:					
Anthracite		23,895	31,181	—	China 19,085; Poland 3,617; Australia 3,420.
Bituminous	thousand tons	3,942	3,808	669	Australia 1,080; Poland 972.
Briquets of anthracite and bituminous coal		84	33,879	2	Poland 33,807.
Lignite including briquets		4,740	—		
Coke and semicoke		227,997	350,093	30,506	United Kingdom 62,426; Poland 52,565; Belgium-Luxembourg 38,537.
Gas, natural: Gaseous-million cubic meters		308	383	—	Mainly from Denmark.
Peat including briquets and litter		48,736	32,763	—	Finland 22,407; United Kingdom 8,246.
Petroleum:					
Crude	thousand 42-gallon barrels	112,592	104,942	—	Norway 42,818; United Kingdom 16,625; Iran 12,640.
Refinery products:					
Liquefied petroleum gas	do.	6,403	5,453	(2)	Norway 2,101; United Kingdom 1,309; U.S.S.R. 741.
Gasoline	do.	20,001	22,141	(2)	Finland 6,702; Denmark 4,496; Norway 2,663.
Mineral jelly and wax	do.	117	110	1	West Germany 67; United Kingdom 11; East Germany 9.
Kerosene and jet fuel	do.	3,298	3,573	141	Finland 1,059; Spain 696; United Kingdom 631.
Distillate fuel oil	do.	18,058	18,651	(2)	U.S.S.R. 6,706; Finland 3,142; East Germany 2,846.
Lubricants	do.	1,642	1,488	19	Netherlands 424; United Kingdom 399; West Germany 229.
Residual fuel oil	do.	11,616	10,782	—	U.S.S.R. 3,062; United Kingdom 1,755; Norway 1,373.
Bitumen and other residues	value, thousands	$9,643	$9,150	NA	Finland $5,401; Belgium-Luxembourg $1,194; West Germany $932.
Bituminous mixtures	thousand 42-gallon barrels	40	38	1	Finland 8; United Kingdom 8; France 7.
Petroleum coke	do.	316	841	522	United Kingdom 167.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes precious metals.
[5]Excludes diamond.
[6]Totals incomplete owing to statistical restrictions.
[7]Unreported quantities valued, in thousands, at: potassic—$19,735 and unspecified and mixed—$10,201.

two foreign-owned metal mining companies, and various private specialty steel and industrial minerals producers. Prospecting and mining rights are granted under the Mining Act, 1974; the Act Concerning Certain Mineral Deposits, 1974; and the Continental Shelf Act, 1966. Any person may acquire the right to explore for and exploit mineral deposits containing metalliferous ores or graphite, apatite, and magnesium on his or her land or on land belonging to another party. Industrial minerals, except for the three above, are not covered in the Mining Act and, as such, belong to the landowner.

Government agencies involved in the mineral industry are the Swedish Geologic Survey (SGU), which carries out a general bedrock mapping and mineral information function and prepares detailed geologic maps; the State Mining Property Commission (NSG), which is a Government vehicle for exploration financing of potentially economic ore deposits. The Swedish Geologic Co. (SGAB), acts as a consultancy to the minerals industry, both domestic and foreign, and also to NSG and SGU. Another Government authority is the National Board for Technical Research, which is responsible for the financing of research into mineral extraction and exploration techniques.

Sweden's metal-based industries, primary metals and metalworking, were important in terms of employment and output. Nearly 4,000 firms employed almost 425,000 workers and had a market value of $39 billion.[1] Metal mining accounted for about 1.4% of GDP. There were about 10,500 people directly working in mining and quarrying.

COMMODITY REVIEW

Metals

The Trelleborg Group continued with its international activities. The Group, in a partnership deal with Noranda Inc., acquired a 50% interest in Falconbridge Ltd. of Canada. The Group also acquired the Bald Mountain copper zinc deposit in Maine from Chevron Resources Inc. of the United States and was reportedly negotiating to buy a 20% interest in Curragh Mining Ltd.'s lead zinc mines in the Yukon, Canada. This was consistent with the company's strategy to increase its presence outside of Sweden.

Copper.—Outokumpu Oy announced it will restructure the activities of Metallverken AB, its Swedish subsidiary, effective January 1, 1990. The new companies to be formed were: Outokumpu Copper Tubes, Outokumpu Copper Brass Rod, Outokumpu Copper Radiator, Outokumpu Copper Partner, and Outokumpu Rawmet. NSG, Sweden's state mining board, announced it was considering the proposals of two companies, Newmont Mining Co. of the United States and Outokumpu Oy of Finland, to develop the copper and gold deposit at Pahtohavaare in Swedish Lapland. NSG estimated the Pahtohavaare ore deposit's value to be about $235 million with reserves of 4.5 million tons of copper and gold ore.

Ferrochrome.—SwedeChrome AB, a ferrochromium producer, overcame several operational problems that developed in the previous year. In 1989, SwedeChrome was increasing production up to 50,000 tons per year toward a plant capacity of 80,000 tons per year. However, the company announced at yearend that it was closing its facilities in 1990. SwedeChrome stated that the declining price of ferrochromium, the uncertainty of electrical power rates, and the Swedish embargo of South African chromite had placed it in an unfavorable cost position that required the termination of production.

Gold.—Boliden Mineral was developing its Akerberg gold deposit near Skellefteå in northern Sweden during 1989. It was estimated that 1 million tons of ore had been outlined with an average assay of 3 grams of gold per ton. The development program at the Akerberg Mine was estimated to cost $4.7 million, of which $1 million would be furnished by the Government. The mine was being designed to produce 600 kilograms per year of gold from an open pit operation during a 5-year period.

Boliden was also conducting drilling and seismic studies at Petiknas, west of Skellefteå. The company indicated it had outlined about 1 million tons of gold mineralization. The deposit is 200 meters below the surface and, if further development proves the deposit to be economically viable, underground mining methods would be used.

Iron Ore.—Iron ore production increased by 6% in 1989. Most of the production came from Luossauaara Kiärunavaara A.B. (LKAB) Kiruna and Svappavaaŕa Mines in Swedish Lapland. Both mines annual production increased over 1988. Pellet production at Kiruna and Svappavaara set a new record of 6.8 million tons. Production at Malmberget Mine was 2.7 million tons of concentrate and 3.2 million tons of pellets. Environmental control facilities at all locations were being replaced or rebuilt to meet new, more rigorous emission requirements.

Sventskt Stal AB (SSAB) iron ore mines in central Sweden were in the process of ceasing production. Reserves were mostly depleted, and no new exploration or development work was underway. The Grängesberg Gruvor Mine closed at the end of 1989 and the Dannemor Gruvor mine is scheduled to cease production at the end of 1991. This will bring to a close of more 400 years of iron ore mining in the area.

LKAB signed a 5-year contract with Finnish steel producer Rautaruukki OY to supply about 2 million tons of iron ore per year from 1991 to 1995. The price of the ore will be negotiated annually. The company also signed a contract with Arbed SA, a Luxembourg steel producer, to furnish 1 to 2 million tons of Kiruna high-phosphorus ore per year until the end of 1994. Price is to be negotiated annually.

Steel.—After major rationalizations during the past few years, there were 12 producing steel mills in Sweden at yearend. These mills were geared toward specialty and high-quality steels. The largest of the steel companies was majority state-owned SSAB with a production of 2 to 3 million tons per year. The steel industry is important to the Swedish economy. One of the most active sectors of the industry was in powder metallurgy. Sweden was the most powder metal (PM) intensive producer in the world. Swedish producers lead the world with ownership or interests in one-half the world's iron powder production, 40% of the world's hard-metal production, and as much as 70% of the world's full-density PM steel production.

Höganäs AB was the leading producer of PM's. Together with its sister company, Hoeganaes Inc. of the United States, the company has about one-half of the world's market for iron powders. The companies had a combined capacity of about 300,000 to 400,000 tons per year. Precise production figures were not disclosed.

SSAB completed its restructuring plans and is now producing only flat products. The company intends to expand its sheet steel production and has

TABLE 4

SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating company (Ownership)	Location	Capacity (thousand tons per year unless otherwise stated)
Aluminum	Gränges AB (Electrolux AB)	Smelter at Kubikenborg	92
Arsenic, white	Boliden Metall AB (Trelleborg Group)	Smelter at Rönnskär	15
Cement	Cementa AB (Euroc Group)	Plants at Degerhamn, Skövde, and Slite	3,400
Copper:			
Concentrate	Boliden Mineral AB (Trelleborg Group)	Mines at Aitik, Boliden, Kristineberg, Saxberget, and Stekenjokk	60
Do.	Outokumpu Oy	Mine at Viscaria	28
Refined	Boliden Metall AB (Trellevorg Group)	Refinery at Rönnskär	90
Feldspar	Forshammars Mineral AB	Mine and plant at Riddarhyttan	40
Ferroalloy	Vargon Alloys AB	Plant at Vargon	180
Do.	Sandvik AB	Plant at Trollhättan	50
Do.	SwedeChrome AB	Plant at Malmo	80
Gold	Terra Mining AB	Björkdal Mine at Skellefteå	[1]2,100
Do.	Boliden Metall AB (Trelleborg Group)	Refinery at Rönnskär	[1]64,300
Iron ore	Luossavaara Kiirunavaara AB (LKAB), (Government)	Mines at Kiruna, Malmberget, and Svappavaara	21,000
Do.	Sventskt Stal AB, (SSAB) Governmwent	Mines at Dannemora, and Grängesberg	2,000
Iron and steel	do.	Steelworks at Luleå, Oxelösund, and Domnarvet	3,000
Do.	Several smaller steelmakers, mostly privately owned	Plants in various locations	30
Kyanite	Svenska Kyanite AB	Quarry at Hålsköberg.	40
Lead:			
Concentrate	Boliden Metall AB (Trelleborg Group)	Mines at Boliden, Kedtrask, Laisvall, Långdal, Långsele, and Renström	62
Smelter	do.	Smelter at Rönnskär	85
Lime	Euroc Mineral AB (Euroc Group)	Plants at Limham, Köping, and Storugns	270
Do.	SMA Svenska Mineral AB	Plants at Rättvik and Boda	250
Petroleum, refined	Skandinaviska Raffinaderi AB (Texaco Oil AB)	Refinery at Lysekil	[2]210
Do.	BP Raffinaderi AB (British Petroleum Co. Ltd.)	Refinery at Göteborg	[2]100
Do.	Shell Raffinaderi AB (Shell Oil Co.)	do.	[2]82
Do.	AB Nynas Petroleum (Rederi AB Nordsjernan)	Refineries at Göteborg, Malmö, and Nynäshamn	[2]54
Phosphate, apatite concentrate	Luossavaara Kiirunavaara AB (LKAB), (Government)	Plant at Kiruna	200
Do.	Svensk Stal AB (Government)	Plant at Grängesberg	130
Pyrite	Boliden Mineral AB (Trelleborg Group)	Mines at Kedträsk, Långsele, and Udden	400
Do.	Stora Kopparbergs AB (Stora Group)	Mine at Falun	50
Silica sand	Ahlsell Mineral AB	Southern Sweden	600
Silicon	KemaNord AB	Plant at Ljungaverk	24
Silver	Boliden Metall AB (Trelleborg Group)	Refinery at Rönnskär	[1]250,000
Tungsten, ore	AB Statsgruvor (Luossavaara Kiirunavaara AB) (Government)	Scheelite Mine at Yxjöberg	[3]380
Zinc, concentrate	Vieille Montagne Sverige AB (ACEC-Union Miniere Group)	Zinkgruvan Mine, Åmmeberg	80
Do.	Boliden Mineral AB (Trelleborg Group)	Mines at Boliden, Garpenberg, Kristeneburg, Laisvall, Langdalen, Langsele, and Renstrom	130

[1]Kilograms per year.
[2]Thousand 42-gallon barrels per day.
[3]Metric tons per year.

moved production into two iron concentrate-based plants. SSAB and other steel producers benefited from the buoyancy of the construction industry.

Industrial Minerals

Cement.—Cementa AB is the sole producer of cement in Sweden. As a result of increased activity in the building and construction industry, domestic cement sales increased by 15%. Cementa also exported cement to the United Kingdom through its Castle Cement Ltd. interests. Cementa invested in a new terminal in Bristol, United Kingdom, to handle its exports to the United Kingdom. Most of the material exported came from Cementa's plant at Slite, where an existing roller mill is being modernized. On completion, throughput capacity at the roller mill will be increased from 380 tons per hour to 435 tons per hour in continuous operation.

Other Industrial Minerals.—The dimension stone industry also benefited from the buoyant construction sector. Production, mostly granite, had increased during the last 3 years. Finely ground dolomite production also increased, responding to environmental market demands. The material was used for desulfurization of fumes. Lime production increased, responding to demands from the paper and pulp industry. Dulakalk AB added a new plant for the production of lime hydrate to its existing plant at Rättvik, which produced quicklime and ground limestone.

NSG identified a crystalline flake graphite deposit at Kringeltjärn Lake in central Sweden. The deposit is in an extended graphite schist horizon with stratabound graphite mineralization. Reserves were estimated to be 1 million tons of material grading 10% to 12% carbon. NSG was also investigating a kaolin deposit at Hultserod in southern Sweden. Reserves of 2.5 million tons of filler-quality kaolin have been identified. This was not enough material to economically justify development; however, NSG was exploring other adjacent deposits to determine if sufficient reserves were available to make the project economically viable.

Mineral Fuels

Energy is a major problem facing the country. Sweden has no significant indigenous fuels except for some low-grade coal deposits in southern Sweden that are not mined. Acting on a 1980 referendum, Parliament made three decisions. The first decision was to close all 12 nuclear reactors by the year 2010. Some 45% of Sweden's energy was produced by nuclear power. The second decision was to prohibit exploitation of the four major rivers in northern Sweden. This would prevent any further development of hydroelectric power, which makes up most of the rest of the country's energy supply. The third decision was to limit carbon dioxide emissions to the level recorded in 1988. This impacted on the use of coal, natural gas, or oil for energy generation. This created a dilemma for the Government and caused consternation in industry, particularly since the cost of electricity was expected to rise by 50% in 1995.

Sweden had a total capacity of 33,100 megawatts. To replace a significant amount of this capacity with another source of electrical power generation was expected to be quite costly. This cost would presumably be passed on to the consumer. In energy-intensive industries, such as iron and steel and paper and pulp, this higher cost would be difficult to bear.

One solution that the Government was pursuing is the use of natural gas-fired power stations to replace nuclear energy power stations. Negotiations were continuing with Finland, Norway, and the U.S.S.R. for the construction of pipelines and purchase of natural gas. The Government signed a new agreement with Denmark to import 10 billion cubic meters of natural gas over a period of 20 years starting in 1990. The value of the contract was approximately $780 million. Sweden had previous contracts with Denmark, going back to 1980, for imports of up to 600 cubic meters per year of natural gas for 20 years. Denmark was the sole supplier of natural gas to Sweden in 1989.

Prospecting for gas and oil was continuing in the Baltic Sea sector and on the island of Gotland. Gotlandsolja AB, a subsidiary of Grauten Oil AB, reported the discovery of oil near Rute on the northern tip of the island of Gotland. The company estimated that the new oilfield, designated Rute 1, could contain up to 200,000 barrels of high-quality oil worth an estimated $4.6 million. Two more test wells were scheduled to be drilled in an offshore area east of Gotland.

TABLE 5

SWEDEN: RESERVES OF MAJOR MINERALS

Commodity (ore)	Amount[e] (million tons)
Iron ore	3,000
Copper	150
Lead	50
Zinc	20

[e]Estimated.

INFRASTRUCTURE

The country has a well-developed transportation system, especially in the southern part. There are 98,000 kilometers of highway, of which 52,000 km are paved. Swedish State Railways (SJ) operates 12,000 km of railroad, including 10,819 km 1.435-meter standard gauge, 6,955 km electrified, and 1,152 km double track; 182 km 0.891-meter gauge; and 117 km of rail ferry service. There are several major ports, including Gavle, Göteborg, Malmo, Stockholm, and numerous minor ports. There are 2,100 km of inland waterways navigable for small steamers and barges.

OUTLOOK

Sweden is an advanced, industrialized country with a high standard of living and an extensive social services system. As a trading nation, Sweden is dependent on world economic developments and must adjust to them. The country has accomplished this quite adequately in the past and is expected to continue to do so in the future. The formation of the single European Market is an economic concern because the EC is a major consumer of Swedish exports.

Although Sweden has a select portfolio of minerals, especially iron and steel, many minerals have to be imported. Active exploration and development work is being carried out by the SGU, NSG, SGAB, and others to find alternatives and other mineral sources within Sweden.

[1]Where necessary, values have been converted from Swedish kroner (SKr) to U.S. dollars at the rate of SKr6.44 = US$1.00, the average for 1989.

OTHER SOURCES OF INFORMATION

Agencies

National Board for Technical Development
#65103
Stockholm, Sweden

State Mining Property Commission (NSG),
#8103
Stockholm, Sweden

Swedish Geological Company (SGAB),
#8103
Stockholm, Sweden

Swedish Geologic Survey,
#8721
Uppsala, Sweden

Swedish Iron Industry Association,
#8105
Stockholm, Sweden

Swedish Mining Association,
#8105
Stockholm, Sweden

Publications

Jerkontorets Annaler (Scandinavian Journal for Steel and Metal Industries), Stockholm: annual.

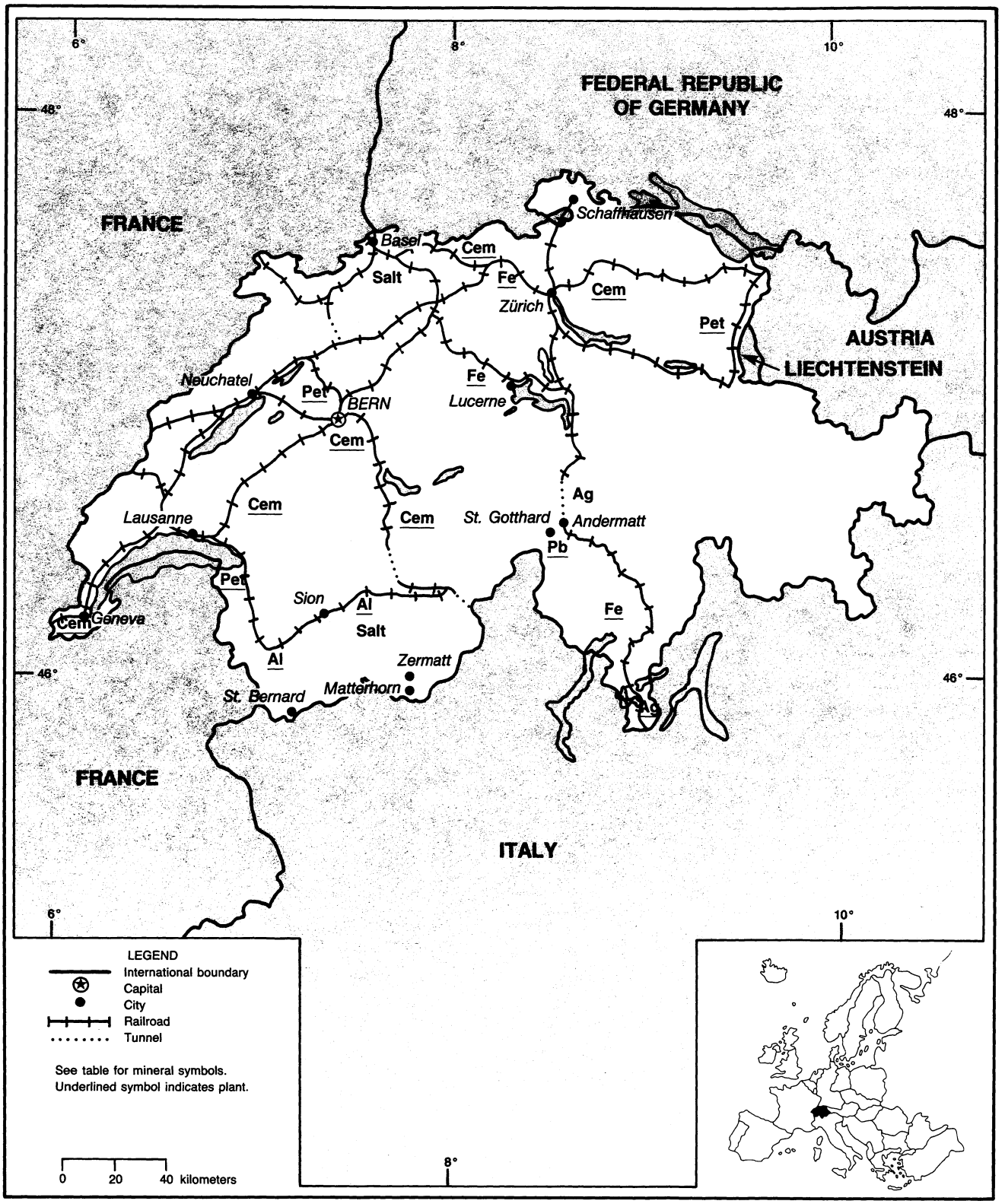
Statistics Sweden, Stockholm:

Bergshantering (Mining and Mineral Industries): annual Industri: monthly.

Digest of Swedish Statistics Report: monthly.

SWITZERLAND

AREA 41,000 km² **POPULATION 7.1 million**



THE MINERAL INDUSTRY OF

SWITZERLAND

By George A. Rabchevsky

Switzerland lies in a rugged mountain region in central Europe. Two-thirds of its borders follow the natural contours of mountain ridges, lakes, and rivers. The country is about one-half the size of Maine or of Scotland. Switzerland is a republic; its official name is Schweizerische Eidgenossenschaft or Swiss Confederation. The Confederation was empowered to legislate on atomic energy matters and on the construction of pipelines for petroleum and gas. The neutral status of Switzerland has made the country a popular site for the headquarters of international organizations. Although a founding member of the European Free Trade Association (EFTA), Switzerland's neutrality has precluded its membership in the European Community (EC).

Landlocked and mountainous with an area of about 41,000 square kilometers, Switzerland is the source of many of Europe's great rivers and glaciers. Owing to its complex geology and spectacular geomorphology, Switzerland has been one of the most favored countries for tourism, and its central location has been a vital factor in making Switzerland one of the world's financial centers. The sophisticated and secretive banking system enabled Switzerland to remain an international financial center through the wave of deregulation in the 1980's. The two aluminum producers were at Valais, a bilingual canton famous for its ski slopes and mountains. Alpine passes have loomed large in Swiss history for more than 2,000 years, and they still have an important role. The St. Bernard Pass, between the Mont Blanc and Grand Combin massifs, has provided a route across the Alps since the time of the Gauls. The town of Zermatt and the peak of Matterhorn, also at Valais, have been magnets for well over a million visitors every year. The west is bounded by the Jura Mountains, a wooded limestone range with upland meadows; the Alps, split by the Rhone and Rhine valleys, cover the southern half of the country. Most of the population, at 7.1 million in 1989, live on the central plateau.

Most of Switzerland's mineral deposits are small and diversified, but mining activity virtually stopped long ago. The general geology of Switzerland has been studied in detail; however, mineral exploration to assess the country's grades of ores and reserves has remained incomplete.

Real gross domestic product (GDP) growth was 2.9% in 1988 versus 2.4% in 1987; it reached at least 3.1% in 1989—the best result since 1985, when growth of 3.7% was recorded. A revival of exports has contributed markedly to growth in 1989. The inflation rate at about 4.5% was caused by higher prices for imported goods and a restrictive monetary policy of the Swiss National Bank to slow inflation. Switzerland has been one of the few countries that often records a federal budget surplus. The latest surpluses were due mainly to extensive cost cutting and increased revenues.

Unemployment, at 0.6%, has been virtually nonexistent. Wages have been high, and Swiss towns have displayed an affluence matched in few other countries. There were more than 3.2 million workers in Switzerland, of which about 1.3 million were employed by industry. Employment levels continued to rise in the last quarter of 1989. The biggest increases were reported by the watchmaking, plastics, and metal industries. In 1988, the country counted an average number of 816,000 gainfully employed aliens, which corresponded to 25% of overall work force.

GOVERNMENT POLICIES AND PROGRAMS

The Swiss Constitution vested control of minerals in the governments of 23 sovereign cantons, three of which were each divided into two half cantons. The Law of Private Property has been the only national regulation that relates to mining. The authority to grant permits and concessions has varied from canton to canton. In all cantons, environmental considerations were important, and strict regulations were imposed to protect the natural beauty of the land. Private companies shared the burden of defense preparedness. The industry was encouraged to keep stockpiles of essential raw materials. Financial relief was granted to companies for expenses incurred in handling stockpiles.

PRODUCTION

Without mineral resources, the Swiss have made the most of their human ones, using a skilled, highly paid work force to develop a diversified industrial base, famous for quality products. The value of the output of the Swiss mineral industry was modest. All metallic commodities, such as aluminum, iron, steel, and secondary lead, were produced from imported raw materials. The extractive mineral industry was limited to the production of construction materials and salt. Except for hydroelectric power and a small natural gas production, all mineral fuels were imported.

TRADE

Neutrality has been the cornerstone of Swiss foreign policy since the 16th century, and, in 1986, voters rejected a proposal to join the United Nations (U.N.). The country has been a member of the so-called Group of 10 and active in a number of U.N. agencies. It has also been a member of EFTA, a signatory of the General Agreement on Tariffs and Trade, and has had a free trade agreement with the EC.

Switzerland's role in the world supply of minerals was insignificant. However, Switzerland's large imports and exports of many minerals reflected active trading. Switzerland's exports accounted for about 35% of the GDP. Approximately 61% of mineral exports by value were precious metals and jewels. Switzerland had trade

TABLE 1

SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum, smelter, primary	tons	72,742	80,259	73,169	71,816	[3]71,328
Iron and steel:						
Pig iron and blast furnace ferroalloys		66	79	70	[e]70	70
Electric-furnace ferroalloys[e]		5	5	5	5	5
Steel, crude		987	1,075	870	825	[3]916
Semimanufactures, rolled products		950	980	[e]1,000	[e]1,100	1,300
Lead, refined, secondary	tons	2,000	[r]2,500	2,500	1,500	1,400
INDUSTRIAL MINERALS						
Cement, hydraulic		4,254	4,393	4,617	4,965	5,461
Gypsum[e]		220	200	230	230	230
Lime		37	35	40	42	40
Nitrogen: N content of ammonia[e]		31	30	39	35	35
Salt		374	389	390	309	[3]243
Sodium compounds, n.e.s.: Carbonate[e]	tons	45	43	23	—	—
Sulfur, from petroleum refining	do.	2,638	3,201	3,533	[e]3,550	3,700
MINERAL FUELS AND RELATED MATERIALS						
Gas:						
Manufactured	million cubic feet	1,154	1,162	[e]1,170	[e]1,200	1,300
Natural	do.	700	600	1,100	1,300	1,400
Petroleum refinery products:[4]						
Liquefied petroleum gas	thousand 42-gallon barrels	1,677	1,546	1,817	1,986	1,880
Gasoline, all kinds	do.	8,650	8,723	8,765	8,695	8,700
Naphtha	do.	38	31	6	9	8
Jet fuel	do.	1,936	2,099	2,286	1,949	2,000
Kerosene	do.	32	31	30	19	15
Distillate fuel oil	do.	13,450	13,521	12,863	11,887	11,000
Residual fuel oil	do.	4,590	4,579	3,917	4,322	3,000
Bitumen	do.	721	892	931	904	925
Other refinery products	do.	2	2	5	5	5
Refinery fuel and losses	do.	1,191	1,291	1,311	1,133	1,100
Total[4]	do.	32,287	32,715	31,931	30,909	28,633

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

[1]Table includes data available through May 1990.

[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) were produced, but output was not reported, and available general information was inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Total of listed products only.

relations with more than 80 countries. Its most important trading partners were the Federal Republic of Germany, France, Great Britain, Italy, and the United States. The Federal Republic of Germany was not only Switzerland's main trading partner but also its chief competitor in third markets. In 1988, the EC accounted for 71% of Swiss imports and 56% of Swiss exports.

Switzerland's robust economic growth in 1988 continued well into 1989. Trade with the United States was nevertheless insignificant for the economy of both countries. Switzerland had a negative balance in minerals trade with the United States in 1988. Imports from the United States reached about $3.2 billion,[1] an increase of 37.5% for the first 10 months of 1989, and U.S. market share has grown to 6.5%. Fuels were the bulk of U.S. exports to Switzerland. Swiss authorities do not collect statistics on investment by foreign firms. However, U.S. direct investment in Switzerland was an estimated $20 billion in 1987. At the end of 1986, 627 American companies were operating in Switzerland. Switzerland was the United States' 16th largest export market in 1989.

TABLE 2

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals	kilograms	1,918	1,423	4	West Germany 455; unspecified 931.
Alkaline-earth metals	do.	1,462	122	NA	NA.
Aluminum:					
Ore and concentrate		—	18	—	West Germany 10; Philippines 7.
Oxides and hydroxides		459	1,313	25	West Germany 791; France 191.
Ash and residue containing aluminum		—	13,370	NA	Portugal 7,981; West Germany 4,198.
Metal including alloys:					
Scrap		—	35,776	—	Italy 14,772; West Germany 14,146; France 3,852.
Unwrought		60,991	32,871	192	West Germany 22,266; Italy 3,757; France 3,432.
Semimanufactures		106,813	122,940	1,811	West Germany 33,216; France 19,267; Netherlands 10,162.
Antimony:					
Ore and concentrate		—	(2)	NA	NA.
Oxides		—	39	(2)	Italy 17; Portugal 14; France 6.
Metal including alloys, all forms		1	(2)	NA	NA.
Arsenic:					
Oxides and acids	kilograms	139	—	NA	NA.
Metal including alloys, all forms	do.	—	2	NA	NA.
Beryllium: Metal including alloys, all forms	do.	2,631	397	45	Unspecified 346.
Bismuth: Metal including alloys, all forms		—	3	3	
Cadmium: Metal including alloys, all forms		—	2	NA	Mainly to West Germany.
Chromium:					
Oxides and hydroxides		51	165	2	West Germany 150.
Metal including alloys, all forms		—	48	14	West Germany 14; India 7.
Cobalt:					
Oxides and hydroxides	kilograms	38	490	1	New Zealand 480.
Metal including alloys, all forms		—	88	26	France 26; West Germany 15.
Columbium and tantalum: Metal including alloys, all forms, tantalum	kilograms	472	1,638	397	West Germany 297; France 177.
Copper:					
Matte and speiss including cement copper		3,715	126	—	West Germany 104; Italy 22.
Oxides and hydroxides		—	1	NA	West Germany 1.
Sulfate		42	41	NA	France 15; West Germany 11; Belgium-Luxembourg 8.
Ash and residue containing copper		—	4,374	NA	West Germany 2,503; Belgium-Luxembourg 995.
Metal including alloys:					
Scrap		17,723	23,721	120	West Germany 12,398; Italy 4,195; Austria 2,217.
Unwrought		5,202	11,038	(2)	West Germany 6,850; Italy 1,770; Netherlands 1,276.
Semimanufactures		25,886	26,987	4,827	West Germany 9,753; France 4,176.
Germanium: Metal including alloys, all forms	kilograms	—	254	NA	Belgium-Luxembourg 175; West Germany 58.
Gold:					
Waste and sweepings	value, thousands	—	$20,581	$9	West Germany $17,900; Italy $1,252.

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Gold—Continued				
Metal including alloys, unwrought and partly wrought kilograms	671,605	839,620	63	United Kingdom 2,956; Belgium-Luxembourg 1,864; unspecified 830,428.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	—	33	—	West Germany 11; France 9; Peru 6.
Pyrite, roasted	31	503	—	All to West Germany.
Metal:				
Scrap	87,360	78,091	—	Italy 48,366; West Germany 21,321.
Pig iron, cast iron, related materials	798	2,260	(2)	West Germany 871; Finland 335; Austria 238.
Ferroalloys:				
Ferroaluminum	4	6	—	West Germany 5.
Ferrochromium	—	75	—	West Germany 24; Taiwan 11; Thailand 8.
Ferromanganese	—	92	1	Portugal 20; Belgium-Luxembourg 15; West Germany 15.
Ferromolybdenum	—	7	—	NA.
Ferrosilicomanganese	—	27	—	West Germany 8; unspecified 19.
Ferrosilicon	84	81	—	West Germany 48; Italy 11; unspecified 19.
Silicon metal	4,437	1,578	84	West Germany 955; Italy 539.
Unspecified	159	71	NA	West Germany 34; Italy 16; Republic of South Africa 6.
Steel, primary forms	26,355	26,915	1	Italy 19,610; France 5,926.
Semimanufactures:				
Bars, rods, angles, shapes, sections	419,474	389,920	549	West Germany 222,381; Italy 59,981; France 44,093.
Universals, plates, sheets	125,153	164,939	68	West Germany 83,943; Austria 27,388; France 21,460.
Hoop and strip	67,303	—		
Rail and accessories	1,122	1,735	(2)	Dominican Republic 825; Italy 369; Austria 182.
Wire	26,502	23,227	2,477	West Germany 11,622; Italy 3,045; France 2,630.
Tubes, pipes, fittings	198,243	219,540	9,029	West Germany 85,862; France 22,040; Italy 21,919.
Castings and forgings, rough	7,959	5,775	95	West Germany 1,879; France 1,817; Italy 1,140.
Lead:				
Oxides	101	125	(2)	U.S.S.R. 122.
Ash and residue containing lead	—	813	—	West Germany 527; Italy 164; India 84.
Metal including alloys:				
Scrap	11,232	14,799	—	Italy 4,893; France 4,064; Yugoslavia 2,706.
Unwrought	2,855	3,484	—	Italy 1,864; West Germany 1,042.
Semimanufactures	16	45	(2)	Netherlands 22; Austria 9; Italy 5.
Lithium: Oxides and hydroxides	—	3	(2)	Bulgaria 2.
Magnesium: Metal including alloys:				
Scrap	—	149	—	West Germany 60; France 49; Italy 30.
Unwrought	201	87	—	West Germany 47; France 20; Austria 15.
Semimanufactures	724	919	—	United Kingdom 490; France 176.
Manganese:				

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Manganese—Continued					
Ore and concentrate, metallurgical-grade		—	23	—	Peru 10; Philippines 9; Australia 2.
Oxides		2	141	—	Italy 69; West Germany 65.
Metal including alloys, all forms		—	12	(2)	NA.
Mercury	kilograms	19,845	2,960	—	United Kingdom 2,000; France 869.
Molybdenum:					
Oxides and hydroxides	do.	—	129	NA	West Germany 64.
Metal including alloys:					
Unwrought		3	3	(2)	Brazil 1; West Germany 1.
Semimanufactures	kilograms	15,861	1,461	29	France 412; West Germany 392; Austria 259.
Nickel:					
Matte and speiss		—	3	—	All to Italy.
Oxides and hydroxides		—	1	NA	NA.
Metal including alloys:					
Scrap		369	440	8	West Germany 398; Netherlands 30.
Unwrought		122	662	18	West Germany 380; Netherlands 259.
Semimanufactures		529	436	(2)	France 118; West Germany 112; Italy 71.
Platinum-group metals:					
Waste and sweepings	value, thousands	—	$8,248	$4	United Kingdom $5,035; West Germany $1,782.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	—	24,558	1,872	West Germany 9,013; Japan 8,765.
Platinum	do.	—	38,533	5,906	Japan 22,778; United Kingdom 2,552.
Rhodium	do.	—	125	NA	Netherlands 58; United Kingdom 42; West Germany 16.
Iridium, osmium, ruthenium	do.	—	119	11	Hong Kong 98; West Germany 7.
Unspecified	do.	37,741	—		
Rare-earth metals including alloys, all forms	do.	2,670	511	NA	West Germany 500.
Selenium, elemental		—	(2)	NA	NA.
Silicon, high-purity		—	3	(2)	NA.
Silver:					
Waste and sweepings[3]	value, thousands	$60,520	$20,384	—	West Germany $12,973; France $5,111; United Kingdom $2,050.
Metal including alloys, unwrought and partly wrought	kilograms	132,584	179,370	831	West Germany 44,977; France 43,086; Italy 22,213.
Tellurium and boron, elemental	do.	—	68	NA	West Germany 48.
Tin: Metal including alloys:					
Scrap		41	39	—	Netherlands 22; West Germany 16.
Unwrought		97	110	—	West Germany 77; Italy 23.
Semimanufactures		14	63	(2)	West Germany 25; Iraq 16; Italy 7.
Titanium:					
Ore and concentrate		—	49	NA	Netherlands 25; unspecified 24.
Oxides		128	348	18	West Germany 103; Italy 73; Austria 72.
Metal including alloys:					
Unwrought including scrap		—	84	(2)	West Germany 61; United Kingdom 17.

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Titanium—Continued					
Metal including alloys—Continued					
Semimanufactures		—	90	1	France 59; Italy 16; West Germany 7.
Tungsten: Metal including alloys:					
Scrap		—	—		
Unwrought		30	77	3	West Germany 57; Italy 10; Austria 5.
Semimanufactures		3	10	(2)	West Germany 5.
Uranium and thorium:					
Oxides and other compounds		5	10	NA	U.S.S.R. 6; West Germany 3.
Vanadium:					
Oxides and hydroxides		—	(2)	NA	NA.
Metal including alloys, all forms	value	—	$1,666	NA	Saudi Arabia $232; unspecified $1,434.
Zinc:					
Oxides		38	72	—	France 35; Italy 20; Hungary 10.
Blue powder		46	13	—	Austria 11.
Matte		—	2,338	NA	Italy 1,917; Belgium-Luxembourg 184.
Ash and residue containing zinc		—	6,537	NA	Belgium-Luxembourg 3,562; West Germany 2,340.
Metal including alloys:					
Scrap		868	1,192	—	Italy 527; West Germany 416; France 176.
Unwrought		1	410	—	West Germany 164; Italy 101; Belgium-Luxembourg 72.
Semimanufactures		59	144	1	West Germany 126.
Zirconium:					
Ore and concentrate		—	19	NA	West Germany 5; unspecified 13.
Metal including alloys, all forms	kilograms	—	1,927	60	France 1,530; West Germany 317.
Other:					
Ores and concentrates		62	480	—	Belgium-Luxembourg 14; unspecified 66.
Oxides and hydroxides		161	21	(2)	France 10; Egypt 5; West Germany 2.
Ashes and residues		36,503	1,419	NA	West Germany 306; Italy 154; unspecified 946.
Base metals including alloys, all forms		328	33	6	West Germany 23.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		14	34	(2)	West Germany 9; France 6.
Artificial:					
Corundum		214	244	4	West Germany 108; France 53; Israel 15.
Silicon carbide		5,001	6,903	189	Italy 1,832; France 1,430; West Germany 1,247.
Dust and powder of precious and semiprecious stones including diamond	kilograms	3,859	4,828	521	Italy 1,906; France 467.
Grinding and polishing wheels and stones		2,001	2,181	75	United Kingdom 531; West Germany 414; Chile 220.
Asbestos, crude		15	8	(2)	Austria 3; West Germany 2; United Kingdom 2.
Barite and witherite		3	26	—	Thailand 6; West Germany 5; Philippines 4.
Boron materials:					
Crude natural borates		(2)	6	—	Brazil 5; Burma 1.
Oxides and acids		12	6	1	West Germany 3; Paraguay 1.

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Bromine		[5]6	10	(2)	Iran 5; Netherlands 3.
Cement		42,043	25,597	(2)	West Germany 17,494; France 8,027.
Chalk		259	93	1	France 25; Austria 24; Republic of South Africa 19.
Clays, crude:					
Bentonite		—	108	—	West Germany 58; United Kingdom 41.
Chamotte or dinas earth		—	70	NA	West Germany 69.
Kaolin		—	452	(2)	West Germany 238; Italy 78; France 47.
Unspecified		44,413	36,086	NA	West Germany 36,007; Austria 47.
Cryolite and chiolite		3	8	—	Brazil 5; Peru 1; Turkey 1.
Diamond; natural:					
Gem, not set or strung	value, thousands	$1,557,460	$1,957,730	$130,592	United Kingdom $937,460; Israel $510,135.
Industrial stones	do.	$43,089	$2,189	$24	West Germany $915; Belgium-Luxembourg $666.
Diatomite and other infusorial earth		60	70	(2)	Yugoslavia 24; West Germany 16; France 13.
Feldspar, fluorspar, related materials:					
Feldspar		—	46	(2)	Taiwan 11; Austria 8; Italy 4.
Fluorspar		—	54	NA	NA.
Unspecified		95	42	NA	NA.
Fertilizer materials:					
Crude, n.e.s.		2,088	2,066	—	Austria 1,815; France 751.
Manufactured:					
Ammonia		698	8	(2)	Venezuela 2; France 1; West Germany 1.
Nitrogenous		761	1,093	3	West Germany 1,020.
Phosphatic		1	5	—	Mainly to Nigeria.
Potassic		4	43	—	West Germany 42.
Unspecified and mixed		3,418	3,314	18	West Germany 2,019; France 526; Ecuador 250.
Graphite, natural		15	16	—	Philippines 3; Thailand 3; Republic of Korea 2.
Gypsum and plaster		18,972	13,827	(2)	France 13,616.
Iodine		—	7	(2)	West Germany 3; Algeria 2; Tunisia 1.
Kyanite and related materials	kilograms	—	2,345	NA	West Germany 300; unspecified 2,045.
Lime		839	967	—	Norway 389; Denmark 322; West Germany 190.
Magnesium compounds:					
Magnesite, crude		4	19	—	Austria 10; West Germany 4.
Oxides and hydroxides		91	57	(2)	West Germany 14; France 13; Japan 12.
Sulfate		—	15	—	All to West Germany.
Meerschaum, amber, jet		7	—		
Mica:					
Crude including splittings and waste		89	143	31	Austria 28; Thailand 19.
Worked including agglomerated splittings		414	463	16	France 56; India 50; Sweden 49.
Phosphates, crude		—	1	—	All to Bulgaria.
Phosphorous, elemental		77	75	(2)	France 74.
Pigments, mineral:					
Natural, crude		18	16	NA	Austria 1; unspecified 15.
Iron oxides and hydroxides, processed		39	51	(2)	Austria 14; West Germany 10; Yugoslavia 10.

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Potassium salts, crude		4	—		
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$246,192	$252,803	$37,043	France $47,303; United Kingdom $30,903.
Synthetic	kilograms	79,757	62,067	4,248	West Germany 12,087; France 8,092; Philippines 7,879.
Pyrite, unroasted		—	29	—	Philippines 16; Austria 13.
Quartz crystal, piezoelectric	kilograms	—	127	2	Italy 78; West Germany 36; France 11.
Salt and brine		43	102	(2)	West Germany 39; Thailand 21; France 19.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		1,445	9	(2)	West Germany 1; Japan 1; Yugoslavia 1.
Sulfate, manufactured		22	18	NA	West Germany 13.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		26,149	26,295	—	Italy 14,922; West Germany 9,972.
Worked		7,724	9,302	5	West Germany 7,444; France 1,020; Austria 469.
Dolomite, chiefly refractory-grade		49	45	—	Ecuador 27; West Germany 11; Burma 5.
Gravel and crushed rock		8,926	16,465	1	West Germany 9,640; France 5,329.
Limestone other than dimension		100	53	—	France 49; West Germany 4.
Quartz and quartzite		38,633	43,879	(2)	Italy 43,173.
Sand other than metal-bearing		21,412	20,543	—	Italy 14,800; France 3,604.
Sulfur:					
Elemental:					
Crude including native and byproduct		16,876	12,389	—	West Germany 4,222; Yugoslavia 3,313; Italy 2,970.
Colloidal, precipitated, sublimed	kilograms	27,688	1,024	—	France 207; West Germany 108; unspecified 709.
Dioxide		14	4,640	NA	West Germany 4,585.
Sulfuric acid		15,947	22,365	1	West Germany 18,930; France 1,146; Austria 1,109.
Talc, steatite, soapstone, pyrophyllite		144	146	(2)	Austria 53; France 28; West Germany 17.
Vermiculite		—	20	NA	West Germany 9; unspecifies 11.
Other:					
Crude		1,886	1,664	—	West Germany 1,053; Italy 432.
Slag and dross, not metal-bearing		41,685	44,721	—	West Germany 30,503; Italy 12,673.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	6	—	France 5.
Carbon:					
Carbon black		193	215	4	Czechoslovakia 82; West Germany 70; Republic of South Africa 25.
Gas carbon		—	122	NA	France 118; West Germany 2.
Coal:					
Anthracite		—	7,648	—	West Germany 6,363; Netherlands 1,188.
Bituminous		12,567	18,641	—	West Germany 8,890; Netherlands 5,960; Italy; 2,022.
Briquets of anthracite and bituminous coal		1	49	—	All to West Germany.
Coke and semicoke		655	487	—	West Germany 432; Italy 55.
Gas, natural: Gaseous	thousand cubic meters	—	9,632	—	Italy 9,517; West Germany 114.

See footnotes at end of table.

TABLE 2—Continued

SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Peat including briquets and litter		1,145	877	—	Austria 684; West Germany 161.
Petroleum:					
Crude	42-gallon barrels	7	73	(2)	France 29; West Germany 22; Guinea 7.
Refinery products:					
Liquefied petroleum gas	do.	351,932	276,615	125	Italy 186,686; France 77,960.
Gasoline	do.	1,190	2,890	(2)	France 1,836; Austria 374.
Mineral jelly and wax	do.	944	1,534	181	West Germany 1,125.
Kerosene and jet fuel	do.	1,232	372	—	U.S.S.R. 139; West Germany 62; Austria 47.
Distillate fuel oil	do.	49,408	145,768	—	Austria 125,731; West Germany 20,030.
Lubricants	do.	102,844	108,773	6,944	West Germany 30,037; Italy 21,434.
Residual fuel oil	do.	753,040	755,690	—	West Germany 745,354.
Bitumen and other residues	do.	16,616	5,007	—	France 3,415; West Germany 1,436.
Bituminous mixtures	do.	18,556	14,906	1,118	France 5,949; West Germany 3,416.
Petroleum coke	do.	996	4,456	429	West Germany 1,359; Italy 1,229; Belgium-Luxembourg 1,215.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]Includes other precious metals.
[4]Includes precious metals.
[5]Includes fluorine and iodine.

TABLE 3

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	429	465	1	West Germany 311; France 113; United Kingdom 40.
Alkaline-earth metals	2	6	NA	France 5.
Aluminum:				
Ore and concentrate	2,625	3,852	—	Australia 2,413; West Germany 1,401.
Oxides and hydroxides	156,382	140,615	50	Australia 56,487; Italy 54,873; West Germany 12,167.
Ash and residue containing aluminum	—	570	—	All from West Germany.
Metal including alloys:				
Scrap	—	4,042	11	West Germany 2,332; Netherlands 672; Norway 544.
Unwrought	[2]90,239	94,826	57	Iceland 32,137; West Germany 29,684; Norway 21,526.
Semimanufactures	65,659	73,852	363	West Germany 33,796; Belgium-Luxembourg 9,491; Austria 8,419.
Antimony:				
Ore and concentrate	—	31	NA	NA.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Antimony—Continued				
Oxides	—	464	10	Belgium-Luxembourg 181; West Germany 123; France 61.
Metal including alloys, all forms	90	65	NA	China 64.
Arsenic:				
Oxides and acids	1	—		
Metal including alloys, all forms	—	6	NA	NA.
Beryllium: Metal including alloys, all forms	17	3	1	West Germany 1.
Bismuth: Metal including alloys, all forms	—	27	—	Peru 11; Belgium-Luxembourg 8; China 5.
Cadmium: Metal including alloys, all forms	—	28	NA	Belgium-Luxembourg 15; Peru 5.
Chromium:				
Ore and concentrate	—	1,211	—	Belgium-Luxembourg 401; West Germany 303; Republic of South Africa 227.
Oxides and hydroxides	637	642	7	West Germany 403; Italy 156.
Metal including alloys, all forms	—	112	1	France 76; Netherlands 11.
Cobalt:				
Oxides and hydroxides	3	2	1	France 1.
Metal including alloys, all forms	—	243	68	West Germany 59; Zambia 40.
Columbium and tantalum:				
Ore and concentrate	—	[3]24	—	All from West Germany.
Metal including alloys, all forms, tantalum	2	2	1	Austria 1.
Copper:				
Ore and concentrate	([4])	—		
Matte and speiss including cement copper	7,594	46	—	West Germany 45.
Oxides and hydroxides	—	156	NA	Norway 132; Belgium-Luxembourg 17.
Sulfate	769	697	NA	Czechoslovakia 295; Italy 209; France 77.
Ash and residue containing copper	—	487	—	All from West Germany.
Metal including alloys:				
Scrap	4,064	4,105	55	West Germany 2,298; Austria 528; France 436.
Unwrought	1,148	7,778	157	West Germany 4,260; Belgium-Luxembourg 2,302; Austria 716.
Semimanufactures	90,667	93,055	520	West Germany 45,136; France 13,202; United Kingdom 12,563.
Germanium: Metal including alloys, all forms kilograms	—	253	NA	Belgium-Luxembourg 81; West Germany 65; Netherlands 23.
Gold:				
Waste and sweepings value, thousands	—	$31,322	$855	Italy $7,030; Sweden $4,930; Panama $3,208.
Metal including alloys, unwrought and partly wrought kilograms	909,709	967,629	381	West Germany 1,652; United Kingdom 674; unspecified 963,682.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	—	230	—	West Germany 131; Denmark 50; United Kingdom 20.
Pyrite, roasted	8,860	12,321	—	Belgium-Luxembourg 7,825; Norway 3,186; Sweden 1,310.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap	136,487	85,586	—	West Germany 55,268; France 24,466.
Pig iron, cast iron, related materials	42,301	50,989	209	West Germany 21,441; Brazil 10,839; France 10,703.
Ferroalloys:				
Ferroaluminum	557	373	—	United Kingdom 347; Belgium-Luxembourg 26.
Ferrochromium	—	701	NA	West Germany 305; U.S.S.R. 167; Sweden 130.
Ferromanganese	—	4,568	—	West Germany 3,835; China 396.
Ferromolybdenum	—	151	17	Austria 50; United Kingdom 31; Netherlands 30.
Ferronickel	—	11	NA	West Germany 7; Republic of South Africa 2; Sweden 2.
Ferrosilicomanganese	—	6,375	NA	Norway 3,246; Republic of South Africa 2,666.
Ferrosilicon	6,814	7,157	23	West Germany 3,579; U.S.S.R. 1,327.
Silicon metal	364	2,143	1	France 1,055; Norway 505; Italy 354.
Unspecified	14,648	1,236	NA	West Germany 360; Italy 304; France 291.
Steel, primary forms	125,689	243,924	34	West Germany 75,457; United Kingdom 63,360; Belgium-Luxembourg 35,602.
Semimanufactures:				
Bars, rods, angles, shapes, sections	729,283	768,005	736	Italy 244,673; West Germany 192,779; France 100,659.
Universals, plates, sheets	729,422	1,051,209	634	West Germany 377,978; France 118,383; Belgium-Luxembourg 110,309.
Hoop and strip	255,037	—		
Rails and accessories	50,803	66,050	—	Austria 36,503; West Germany 21,739; Italy 6,279.
Wire	55,977	83,418	67	Italy 49,142; West Germany 16,252.
Tubes, pipes, fittings	154,429	185,517	134	West Germany 79,991; Italy 26,602; Belgium-Luxembourg 18,198.
Castings and forgings, rough	11,495	16,165	70	West Germany 7,180; France 2,293; Poland 1,413.
Lead:				
Ore and concentrate	—	3	—	All from France.
Oxides	306	420	—	West Germany 404.
Ash and residue containing lead	—	2	NA	NA.
Metal including alloys:				
Scrap	74	50	—	Netherlands 46; Yugoslavia 3.
Unwrought	8,075	9,802	—	Belgium-Luxembourg 1,946; West Germany 1,724; France 1,453.
Semimanufactures	1,800	1,896	2	West Germany 1,704; Belgium-Luxembourg 141.
Lithium: Oxides and hydroxides	—	45	17	West Germany 16; Netherlands 6.
Magnesium: Metal including alloys:				
Scrap	—	43	—	France 15; Norway 15; West Germany 10.
Unwrought	2,679	3,480	328	Norway 1,652; Italy 721; Canada 536.
Semimanufactures	55	22	(4)	West Germany 17; Italy 2; Sweden 2.
Manganese:				
Ore and concentrate, metallurgical grade	—	258	—	France 169; Netherlands 50; West Germany 24.
Oxides	927	1,516	1	Greece 1,230; Belgium-Luxembourg 119.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Manganese—Continued					
Metal including alloys, all forms		—	493	10	Netherlands 185; Belgium-Luxembourg 154; Republic of South Africa 129.
Mercury	kilograms	17,691	16,025	—	West Germany 7,254; Yugoslavia 4,000; France 2,830.
Molybdenum:					
Oxides and hydroxides		—	([4])	—	All from West Germany.
Metal including alloys:					
Unwrought		12	6	1	West Germany 4; United Kingdom 1.
Semimanufactures		11	11	([4])	Austria 5; France 3; West Germany 2.
Nickel:					
Ore and concentrate		—	4	—	Mainly from West Germany.
Matte and speiss		—	4	—	Canada 3.
Oxides and hydroxides		—	1	NA	NA.
Metal including alloys:					
Scrap		29	85	—	West Germany 45; Sweden 36.
Unwrought		1,157	665	1	Norway 151; Netherlands 103; Finland 88.
Semimanufactures		1,118	1,127	111	West Germany 568; United Kingdom 233.
Platinum-group metals:					
Waste and sweepings	value, thousands	—	$16,256	$33	Taiwan $12,549; West Germany $1,601.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	11,379	3,102	United Kingdom 1,754; U.S.S.R. 1,593.
Platinum	do.	NA	12,057	778	Republic of South Africa 3,264; West Germany 2,845; United Kingdom 2,042.
Rhodium	do.	NA	147	13	United Kingdom 54; Republic of South Africa 34; West Germany 16.
Iridium, osmium, ruthenium	do.	NA	152	98	Republic of South Africa 40.
Unspecified	do.	48,225	—		
Rare-earth metals including alloys, all forms		1	60	NA	Saudi Arabia 56; United Kingdom 3.
Selenium, elemental		—	4	—	Australia 2; unspecified 2.
Silicon, high-purity		—	71	18	West Germany 23; Netherlands 17.
Silver:					
Ore and concentrate	value, thousands	—	$5	—	West Germany $4; Italy $1.
Waste and sweepings[5]	do.	$52,179	$11,114	$12	France $3,399; West Germany $1,863; Denmark $1,211.
Metal including alloys, unwrought and partly wrought	kilograms	122,758	73,403	805	West Germany 40,429; United Kingdom 13,491; France 12,207.
Tellurium and boron, elemental		—	([4])	—	All from West Germany.
Tin: Metal including alloys:					
Scrap		25	26	—	West Germany 25.
Unwrought		1,011	995	1	Malaysia 273; Belgium-Luxembourg 186; Indonesia 161.
Semimanufactures		375	313	([4])	West Germany 244; Netherlands 34.
Titanium:					

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Titanium—Continued				
Ore and concentrate	—	504	NA	Australia 405; West Germany 72.
Oxides	2,004	2,058	([4])	West Germany 512; Belgium-Luxembourg 476; Finland 410.
Metal including alloys:				
Unwrought including scrap	—	20	9	West Germany 4; France 3.
Semimanufactures	—	333	75	Japan 109; United Kingdom 82.
Tungsten:				
Ore and concentrate	—	45	—	West Germany 27; Portugal 18.
Metal including alloys:				
Scrap	—	—		
Unwrought	37	51	2	West Germany 27; France 13; Italy 6.
Semimanufactures	24	24	1	West Germany 8; France 7; Austria 5.
Uranium and thorium:				
Ore and concentrate value	—	$262	NA	NA.
Oxides and other compounds	23	14	NA	U.S.S.R. 13; Belgium-Luxembourg 1.
Vanadium:				
Oxides and hydroxides	—	([4])	—	NA.
Metal including alloys, all forms	—	19	NA	Mainly from Saudi Arabia.
Zinc:				
Ore and concentrate	10	14	—	All from West Germany.
Oxides	1,240	872	—	France 336; West Germany 287; United Kingdom 149.
Blue powder	3,731	3,269	—	Belgium-Luxembourg 1,584; West Germany 210.
Ash and residue containing zinc	—	57	NA	West Germany 41; unspecified 16.
Metal including alloys:				
Scrap	123	([4])	([4])	
Unwrought	23,386	20,378	—	Belgium-Luxembourg 5,816; West Germany 5,566; Netherlands 4,545.
Semimanufactures	2,241	3,765	13	West Germany 2,291; Belgium-Luxembourg 646; France 558.
Zirconium:				
Ore and concentrate	—	312	NA	Netherlands 105; West Germany 93; United Kingdom 50.
Metal including alloys:				
Unwrought including scrap	—	14	3	Belgium-Luxembourg 4; West Germany 2; unspecified 5.
Semimanufactures	—	10	6	France 1; unspecified 3.
Other:				
Ores and concentrates	2,858	[6]8	NA	NA.
Oxides and hydroxides	1,819	118	([4])	West Germany 52; Spain 33; Italy 9.
Ashes and residues	1,937	806	—	Austria 533; West Germany 70; unspecified 188.
Base metals including alloys, all forms	1,145	62	4	United Kingdom 28; Belgium-Luxembourg 10; West Germany 9.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	19,115	18,238	128	West Germany 16,568; Iceland 909.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued				
Artificial:				
Corundum	6,108	6,536	84	West Germany 2,883; Austria 1,969; Yugoslavia 862.
Silicon carbide	1,070	1,403	([4])	West Germany 996; Norway 207; Netherlands 123.
Dust and powder of precious and semiprecious stones including diamond kilograms	5,839	9,331	3,236	Ireland 4,747; West Germany 729.
Grinding and polishing wheels and stones	2,739	2,467	22	West Germany 1,164; Italy 458; Austria 224.
Asbestos, crude	5,778	5,893	48	Canada 2,679; U.S.S.R. 1,513; Italy 730.
Barite and witherite	985	3,069	2	West Germany 1,889; China 827.
Boron materials:				
Crude natural borates	228	365	—	Netherlands 240; West Germany 99.
Oxides and acids	412	479	—	France 162; Italy 119; Turkey 103.
Bromine	[7]1,930	2,105	17	Israel 887; France 704; United Kingdom 368.
Cement	443,242	256,705	8	Italy 182,803; West Germany 35,280; France 19,936.
Chalk	42,158	55,470	11	France 38,225; Italy 15,558.
Clays, crude:				
Bentonite	NA	8,566	4	West Germany 6,383; Italy 1,072.
Chamotte or dinas earth	NA	12,733	NA	West Germany 10,577; France 1,157.
Fuller's earth	NA	609	244	United Kingdom 243; West Germany 110.
Fire clay	NA	8,274	NA	France 4,467; West Germany 3,355.
Kaolin	NA	111,219	5,032	United Kingdom 65,799; West Germany 27,049; Brazil 6,295.
Unspecified	175,551	45,189	NA	West Germany 42,080; United Kingdom 1,350.
Cryolite and chiolite	22	40	—	All from Denmark.
Diamond, natural:				
Gem, not set or strung value, thousands	$1,766,908	$2,207,776	$173,950	Belgium-Luxembourg $108,582; Hong Kong $74,554.
Industrial stones do.	$42,927	$9,787	$967	Israel $2,397; Belgium-Luxembourg $2,356.
Diatomite and other infusorial earth	6,308	7,196	350	Denmark 5,323; France 710.
Feldspar, fluorspar, related materials:				
Feldspar	—	16,207	([4])	Italy 6,380; West Germany 4,800; France 4,279.
Fluorspar	—	696	—	France 484; West Germany 92; unspecified 120.
Unspecified	14,994	430	—	Netherlands 304.
Fertilizer materials:				
Crude, n.e.s.	12,963	20,635	20	West Germany 9,153; France 8,069; Italy 3,067.
Manufactured:				
Ammonia	17,596	19,246	—	West Germany 6,854; France 5,944; Austria 4,963.
Nitrogenous	99,866	101,003	542	Austria 30,979; Netherlands 19,784; Italy 7,789.
Phosphatic	67,538	61,037	208	France 36,407; Belgium-Luxembourg 18,773.
Potassic	68,464	62,000	—	France 39,443; West Germany 16,623; East Germany 4,045.
Unspecified and mixed	173,619	174,652	14,546	France 52,853; West Germany 47,939; Belgium-Luxembourg 22,263.
Graphite, natural	187	157	2	West Germany 89; Austria 29.
Gypsum and plaster	181,108	115,203	61	West Germany 83,122; Italy 17,527; France 8,195.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Iodine		—	38	3	Japan 28; West Germany 3.
Kyanite and related materials		—	339	NA	West Germany 254.
Lime		75,196	83,138	—	West Germany 49,336; Italy 33,653.
Magnesium compounds:					
Magnesite, crude		37	1,053	—	West Germany 482; Austria 435.
Oxides and hydroxides		6,565	5,416	22	Austria 2,610; Spain 1,422; Netherlands 564.
Sulfate		—	9,636	—	All from West Germany.
Mica:					
Crude including splittings and waste		726	856	—	West Germany 298; France 286; United Kingdom 71.
Worked including agglomerated splittings		391	461	1	France 198; India 143; Belgium-Luxembourg 68.
Nitrates, crude		32	459	—	West Germany 316; France 132.
Phosphates, crude		5,237	2,193	—	Morocco 1,161; Israel 753.
Phosphorous, elemental		3,866	4,893	122	Italy 1,253; France 1,169; Netherlands 1,071.
Pigments, mineral:					
Natural, crude		274	246	NA	Austria 145; West Germany 34.
Iron oxides and hydroxides, processed		1,873	2,515	16	West Germany 2,413; Japan 53.
Potassium salts, crude		—	2,545	—	All from France.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$326,605	$323,044	$50,792	Hong Kong $41,491; United Kingdom $41,122.
Synthetic	kilograms	48,930	53,395	9,831	France 16,841; West Germany 16,347.
Pyrite, unroasted		146	218	—	West Germany 154; Italy 59.
Quartz crystal, piezoelectric	kilograms	—	609	322	West Germany 162; Japan 104.
Salt and brine		3,283	4,082	1	France 1,985; West Germany 1,762.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		24,619	42,230	—	France 24,420; West Germany 16,111.
Sulfate, manufactured		21,193	15,334	—	West Germany 7,628; Austria 6,370.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		151,652	152,808	5	West Germany 54,938; Austria 38,587; Italy 28,059.
Worked		164,144	185,710	9	Italy 125,560; Portugal 29,380; West Germany 11,723.
Dolomite, chiefly refractory-grade		19,654	22,371	—	Italy 13,684; West Germany 4,112; Belgium-Luxembourg 2,515.
Gravel and crushed rock	thousand tons	6,975	7,760	(4)	France 3,657; West Germany 2,659; Italy 933.
Limestone other than dimension		7,314	10,059	—	France 6,751; West Germany 2,823.
Quartz and quartzite		7,914	6,118	49	West Germany 4,015; France 630; Italy 522.
Sand other than metal-bearing	thousand tons	1,784	2,026	(4)	Italy 680; West Germany 594; France 584.
Sulfur:					
Elemental:					
Crude including native and byproduct		57,173	54,828	—	West Germany 54,810.
Colloidal, precipitated, sublimed		145	78	(4)	France 43; West Germany 34.
Dioxide		42	80	NA	West Germany 38; Italy 29; France 13.
Sulfuric acid		1,568	2,266	2	France 2,084; Italy 155.

See footnotes at end of table.

TABLE 3—Continued

SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Talc, steatite, soapstone, pyrophyllite		15,059	13,733	2	Austria 8,958; Italy 1,883; France 1,258.
Vermiculite, perlite, chlorite		—	8,949	NA	Republic of South Africa 6,954; Hungary 878.
Other:					
Crude		137,231	136,609	1,126	West Germany 66,860; Spain 24,555; France 17,084.
Slag and dross, not metal-bearing		41,675	45,387	2	West Germany 31,157; France 11,046.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,616	18,791	106	Italy 16,313; Trinidad and Tobago 1,716.
Carbon:					
Carbon black		5,757	5,963	210	West Germany 3,785; France 1,538.
Gas carbon		(4)	(4)	—	NA.
Coal:					
Anthracite		—	7,524	—	West Germany 6,606; France 702.
Bituminous		521,212	429,031	—	Republic of South Africa 377,157; West Germany 40,297.
Briquets of anthracite and bituminous coal		8,244	7,764	—	West Germany 5,759; Republic of South Africa 1,420.
Lignite including briquets		20,237	17,180	—	West Germany 16,215; East Germany 878.
Coke and semicoke		60,384	38,011	926	West Germany 22,806; France 11,117.
Gas, natural:					
Gaseous	million cubic meters	1,681	1,892	—	Netherlands 926; West Germany 854.
Liquefied		—	73	—	West Germany 72.
Peat including briquets and litter		66,283	72,306	—	West Germany 62,621; U.S.S.R. 7,236.
Petroleum:					
Crude	thousand 42-gallon barrels	29,326	28,817	—	Libya 11,332; United Kingdom 5,671; Algeria 2,940.
Refinery products:					
Liquefied petroleum gas	do.	325	397	(4)	West Germany 355; France 24.
Gasoline	do.	20,292	21,790	81	West Germany 5,340; Belgium-Luxembourg 4,650; Netherlands 4,270.
Mineral jelly and wax	do.	119	111	1	West Germany 63; France 27.
Kerosene and jet fuel	do.	591	692	(4)	Netherlands 208; Belgium-Luxembourg 190; France 121.
Distillate fuel oil	do.	34,739	35,309	130	West Germany 8,702; Belgium-Luxembourg 6,911; Netherlands 5,339.
Lubricants	do.	618	613	11	West Germany 182; Netherlands 111; France 102.
Residual fuel oil	do.	(4)	764	—	West Germany 545; France 138.
Bitumen and other residues	do.	862	823	—	West Germany 606; Italy 111; France 95.
Bituminous mixtures	do.	96	75	1	West Germany 40; France 17; Italy 10.
Petroleum coke	do.	363	424	115	West Germany 298.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Includes scrap.
[3]May include vanadium.
[4]Less than 1/2 unit.
[5]Includes other precious metals.
[6]May include precious metals.
[7]Includes fluorine and iodine.

Superhards Inc., a company owned by the U.S. consortium Tempo Technology Corp., will build a $31.3 million factory at Etoy, Vaud canton, to produce hard metal pieces for superconductors. The factory was scheduled to be operational in 1991 with about 100 workers.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry was privately owned. The Swiss Government was limited by the Constitution in its ability to impose a particular economic policy. The Government's role as an entrepreneur was confined mainly to public services and defense, and its participation in business was limited. The Government has operated experimental atomic reactors for peaceful uses. Cantonal or communal governments operated electrical generating facilities, water resources, gas utilities, and local transportation facilities. Mining also came under the jurisdiction of cantonal authorities, but the local governments granted concessions to and set up joint ventures with private firms. The cantons usually hold 51% of the shares, as in the salt mine near Bex, in which five of the nine members of the board of directors represented the Canton of Vaud. Foreigners seeking to engage in mining must obtain cantonal approval. Foreigners may hold a majority in petroleum exploration companies, but they are limited to less than 51% in exploration operations. The minerals industry labor force was about 34,000 persons or 1.5% of the total labor force.

COMMODITY REVIEW

Metals

Aluminum.—The first European industrial aluminum plant to use the electrolytic process has remained a model for Europe. Swiss Aluminium Ltd. (Alusuisse) produced aluminum, metal, fabricated products, and chemicals, based on imported alumina and bauxite. Alusuisse operated three plants in Switzerland and two in the Federal Republic of Germany. The company also operated bauxite mines in France, at Gove in Guinea, and in Sierra Leone. The ore was mined for the production of alumina for shipment to its smelters in Switzerland. Alusuisse also owned three plants in the United States: aluminum rolling facilities in Hannibal, Ohio, and Jackson, Tennessee, and an aluminum recycling unit in West Virginia. Alusuisse purchased companies in the Federal Republic of Germany, the United Kingdom, the United States, and France in the first half of 1989. Alusuisse was renamed Alusuisse-Lonza Holding AG on January 1, 1990. The company reported a 47% increase in 1989 net earnings and announced a restructuring of its aluminum and chemical sections into five divisions. The new divisions will be materials and energy, raw materials and metal supply, industrial products, organic chemicals, and packaging.

Aluminum was recycled in Switzerland by the Metallwerke Refonde AG at Niederglatt. Production of recycled aluminum requires only 5% of the energy consumed in the production of primary aluminum. Refonde produced more than 28,000 tons of ingots.

Lead.—All lead in Switzerland was refined from secondary raw materials and scrap. Metallum AG was overhauling its battery scrap plant at Pratteln to reduce

TABLE 4

SWITZERLAND: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year)
Aluminum	Swiss Aluminium Ltd. (Alusuisse)	Smelter at Steg	45.
Do.	do.	Smelters at Chippis and Fierre	25.
	Usine Aluminium Martigny SA	Smelter at Martigny	10.
Cement	17 companies, of which the largest is Vigier Cement Ltd.	18 plants, of which the largest is Reuchenette-Pery	6,000 including (800).
Petroleum, refined	The major refineries are Raffinerie du Sud (Compagnie Francaise des Petroles, 49%; British Petroleum (Schweiz) AG, 49%)	Refinery at Collombey	92,000,[1] including (40,000[1]).
Do.	Raffinerie de Cressier SA (Koninklijke Nederlandsche Petroleum Maatschappij NV, 100%)	Refinery at Cressier	(36,000[1]).
Do.	Raffinerie Rheintal AG (Ente Nazionale Idrocarburi, Italy, 100%)	Refinery at Senwald	(12,000[1]).
Salt	Government of Vaud Canton	Mine at Bex	5.
Do.	Schweizerische Rhein Salined	Saline at Ridburg	220.
Do.	do.	Saline at Rheinfelden	220.
Steel	Ferrowohlen AG	Plant at Wohlen	150.
Do.	Von Moos Stahl AG	Plant at Lucerne	300.
Do.	Von Roll Ltd.	Plant at Gerlafingen	300.
Do.	do.	Plant at Monteforno	250.

[1]42-gallon barrels per day

sulfur dioxide emissions, to increase the level of automation, and to improve working conditions. The plant will have a processing capacity of five tons of batteries per hour. The desulfurized paste will then be treated at the smelter without the problems caused by sulfur dioxide emissions. The startup was planned for March 1991.

Precious Metals.—Mining of gold in Switzerland has been carried out since the Middle Ages. Recently, however, there has been no gold mining in Switzerland. Historic production figures, available only for the Napf region, did not exceed a total of 30 kilograms.[2] Gold was mined around Gondo, Valais Canton, Ticino, and Grisons. Exploration for gold was recently carried out in the Graubunden Canton, near Disentis, by Narex International Exploration Inc. and other companies. Three mineralized horizons were outlined. Gold mineralization is associated with sulfide units. The canton did not have a mining law, and the community prepared a mining code to ensure that any economic deposit may be developed. In the Valais Canton, the Salanfe deposit test produced about 1,500 tons of ore for gold content. An exploration permit was granted for Narex to look for gold in the Ticino Canton, on the Astano-Sessa abandoned gold mine.[3]

Domestic gold scrap was refined, and gold bullion was imported from all over the world. Metaux Precieux SA Metalor was the only company in Switzerland that was involved in the precious metals business on an international level. The company's headquarters were in Neuchatel, at the lakeshore, and the company was owned by the Swiss Bank Corp. Metalor manufactured gold wires, sheets, strips, profiles, and other semifinished products. Bullion gold, fine silver, fine platinum, and fine palladium of "good-delivery" quality, bearing a mark, are renowned throughout the world. The Chemicals Div. carried out research and development in the manufacture of precious metal salts, electroplating solutions, and high-purity precious metals and alloys for the chemical, electroplating, and other industries. At the beginning of 1989, Metalor purchased a refinery, Leach & Garner, Inc., in Attleboro, Maine. The new entity was renamed Metalor USA Refining Corp.

Refiners of precious metals in Switzerland included Valcambi SA, owned by Credit Suisse, and Argor-Heraeus SA, a joint venture between Heraeus Holding GmbH (25%) and Union Bank of Switzerland (75%). Both companies were in Ticino Canton. Cendres & Metaux SA operated from Biel-Bienne since 1924. H. Hilderbrand et Cie SA, in Geneva produced atomized powders of gold, silver, and platinum solder alloys. The company's plan to reopen a gold mine in Ticino was opposed by environmentalists for fear of cyanide pollution. The Swiss Federal Assayers controlled the production of precious metal alloys and dealings in precious metals and products.

De Beers Consolidated Mines of Switzerland announced its intent to restructure. One of the new entities, De Beers Centenary AG, will be based in Lucerne and will handle all of the groups non-South African assets.

Rare Earths.—A new organization, the European Rare Earth Society (ERES), has been set up as a permanent association under provisions of Swiss law. ERES, with headquarters in Lausanne, was formed to encourage the development of scientific and technological activities in the field of f-elements, with special reference to European international and interdisciplinary research projects; exchange of professional, technical, industrial, and economic information by suitable means; promotion of educational activities; organization of international conferences on f-elements, in coordination with similar conferences; and maintenance of close contacts with similar societies and organizations around the world.[5]

Steel.—Aside from scrap, Switzerland imported all of raw materials necessary for pig iron and steel production. About 250,000 tons of ferrous scrap were imported in 1989. Production of crude steel has remained at about the same level for the past 3 years. Von Roll AG, the largest Swiss engineering and steel production company, has purchased several firms in the EC in preparation for EC-92. Steel accounted for about 29% of the group's revenues, 19% of which came from two mills in Switzerland and smaller plants in the Federal Republic of Germany, with 10% coming from New Jersey Steel Corp., Sayreville, New Jersey. The remaining 71% of steel revenues was generated by the newly acquired Von Roll Isola AG. Von Roll Isola also produced insulation materials, winding wire, and electrical cable through subsidiaries in the Federal Republic of Germany, France, Italy, Spain, and Switzerland.

Industrial Minerals

Construction materials, gypsum, and salt were the only commodities mined in Switzerland. About 160,000 tons of recycled glass was collected, which represented about 55% of the share of national glass consumption.

Cement.—Lafarge Coppee, a French company, acquired control of the Swiss firm, Cementia Holding AG, which has operations in the United States, Australia, the Indian Ocean area, and Spain. The $750 million takeover will make Lafarge the world's second largest cement producer.

Lime.—The production of lime has remained about the same for the past 6 years. Kalkfabrik Netstal AG and Cementfabrik Holderbank AG produced virtually all of Switzerland's lime. Kalkfabrik Netstal operated a plant at Netstal, producing burned, ground, and hydrated lime. Cementfabrik, one of the world's largest cement holding companies, also produced lime at its Lausanne, Unterterzen, and Holderbank facilities.

Salt.—Salt production in Switzerland was a monopoly of several cantons. The largest solution-mining operation in the Rhine Valley produced 350,000 tons per year. The second largest produced 50,000 tons per year.

Mineral Fuels

Extensive Alpine precipitation, glacial water storage, and the great range of altitudes made hydroelectric power widely available. The Swiss Government did not own electric utilities, but 85% of electric utilities were under public (cantonal or municipal) control. The electrical industry has become an essential branch of the Swiss economy, with more than 400 large hydroelectric powerplants and numerous low-pressure plants situated on the lower courses of rivers. The highest dams in Europe, Mauvoisin (256 meters) and Grande Dixence (308 meters), are in the Valais Canton on the Rhone River. This area had the highest rate of hydroelectric power consumption in Europe, primarily by the aluminum industry.

Hydroelectric power accounted for close to 60% of Switzerland's primary energy. Domestic gas production came

from the Finsterwald, in Lucerne Canton. The rest was imported from the Netherlands, the Norwegian sectors of the North Sea, and from the U.S.S.R. Some 150 million cubic meters per year of gas was purchased from Gaz de France over a 20-year period, following the completion of a 108-kilometer pipeline in 1989.[4]

Switzerland discouraged the burning of coal as well as the use of other hydrocarbons. All crude oil, and the vast majority of oil-refined products were imported. Panoco AG, a Geneva-based international oil and natural gas company, was attempting to purchase two mothballed oil refineries in Texas in 1989. Switzerland operated two oil refineries, and there were 3,977 operating gas stations, mostly owned by Avia, BP, and Shell.

Shell Ltd. was reportedly planning to invest $14.4 million[5] in its refinery at Cressier to comply with the new Swiss air pollution rules. Shell Switzerland AG already supplies about 25% of Swiss oil needs.

Five nuclear power stations supplied about 40% of the country's energy needs. In 1988, the Government dropped its longstanding plans to build a sixth nuclear plant at Kaiseraugst (near Basel) because of pressure from environmentalists. Two other nuclear plants, which were in the early planning stages, were reportedly unlikely to be constructed in the coming years.

Energy policy at Confederal and cantonal levels was based mainly on the Energy Policy Programme (EPP), which was endorsed in 1985 by the Confederal and cantonal Governments. The EPP defined the roles of the Confederation and the cantons and included a series of measures to improve energy efficiency. Energy security was of great importance to Switzerland and was part of a comprehensive security system. Oil stocks were a combination of commercial and compulsory stocks. The level of stocks was maintained at levels in excess of 90 days consumption. Emergency storage for natural gas was still in the planning stage.

Resources

Numerous small ore deposits, mainly for iron, base metals, nickel-cobalt, molybdenite, gold, and silver, occur in Switzerland, many of which have been mined on a small scale in the past. None of these deposits were economic under 1989 conditions.

INFRASTRUCTURE

Switzerland was a highly developed country with an excellent network of about 72,000 kilometers of paved roads, 5,200 kilometers of operating railroads, and 1,400 kilometers of oil and gas pipelines. Control of the most important passes and the ancient routeways through the Mittelland between the Rhone, Rhine, and Danube waterways has given Switzerland a key position in European transit traffic. The main artery of European trans-Alpine traffic, the St. Gothard route, ran through Swiss territory. Switzerland used the ports of Belgium, the Federal Republic of Germany, France, Italy, and the Netherlands, both for exports and imports.

OUTLOOK

Major changes in the mineral industry of Switzerland were not expected in the near future. The environment was becoming an issue, and environmental protection politics were likely to become a greater force in the future. Switzerland's relationship with the EC will continue to be the country's most urgent international concern, while energy and environmental policies will dominate the domestic scene. It seems unlikely that any new nuclear power stations will be built in Switzerland in the next decade. The burning of coal and hydrocarbons was being discouraged. Work will continue on a partial revision of the labor law, including new rules on working hours and night and Sunday work for women.

[1]Where necessary, values have been converted from Swiss francs (SWF or Sfr) to U.S. dollars at the rate of SWF1.60 = US$1.00.

[2]Economic Geology (Tucson). V. 84, 1989, pp. 1444–1451.

[3]Mining Magazine (London). Oct. 1989, pp. 290–295.

[4]Petroleum Economist (London). Sept. 1987, p. 347.

[5]Ceramic Industry (Solon, Ohio). Mar. 1990, pp. 19–20.

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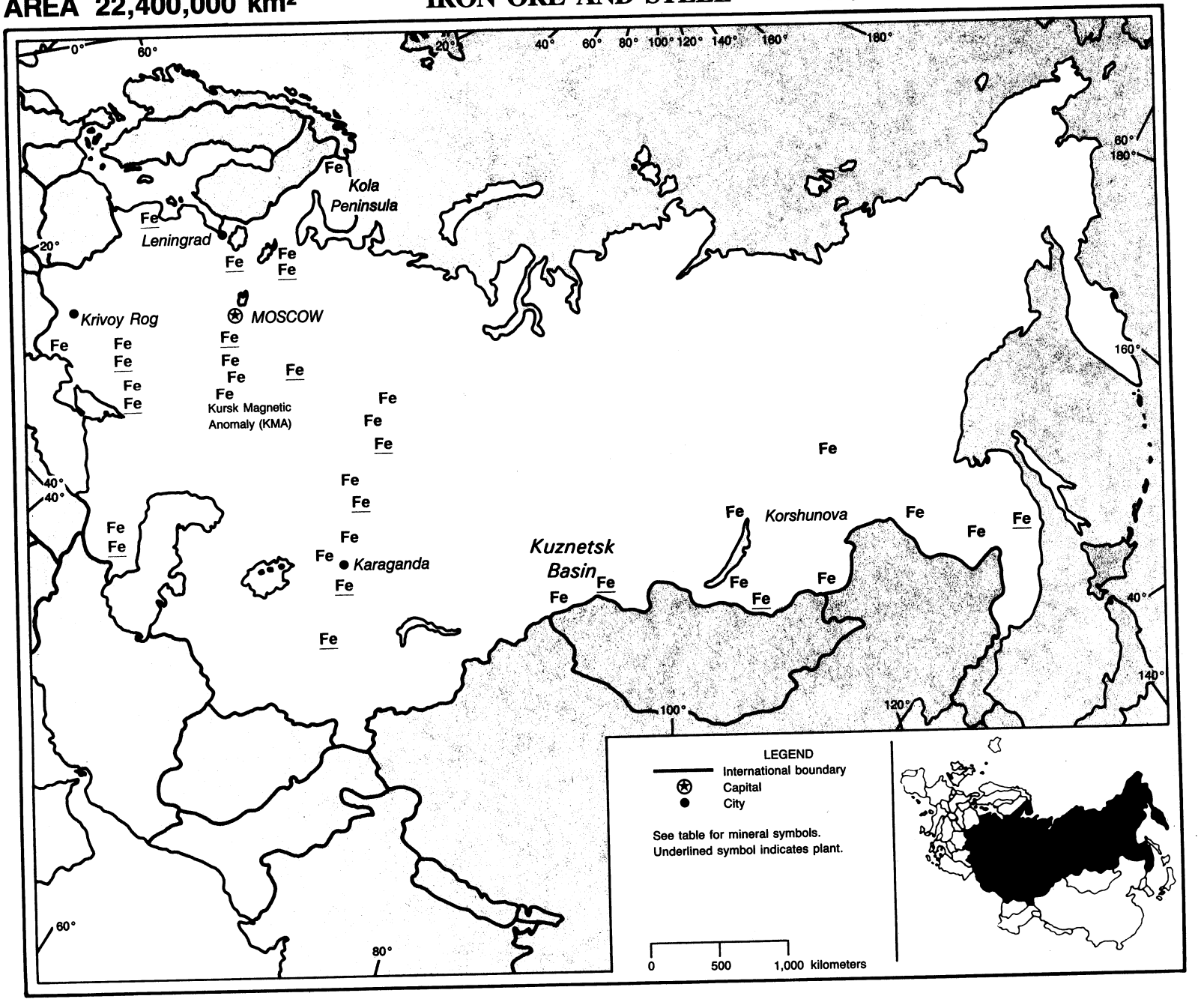
U.S.S.R.

AREA 22,400,000 km² | **IRON ORE AND STEEL** | **POPULATION 280 million**

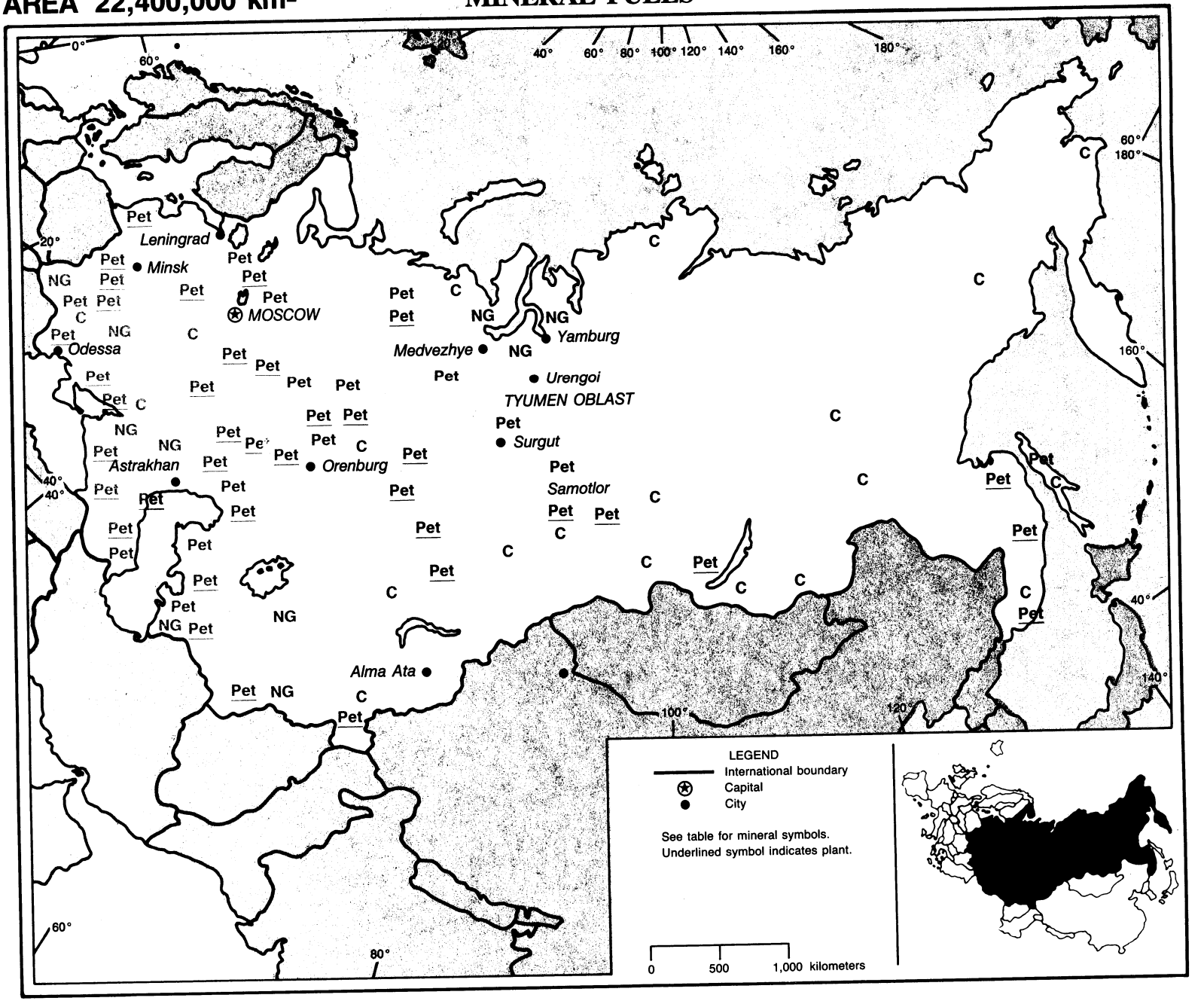


U.S.S.R.

AREA 22,400,000 km² **FERROALLOY METALS** **POPULATION 280 million**

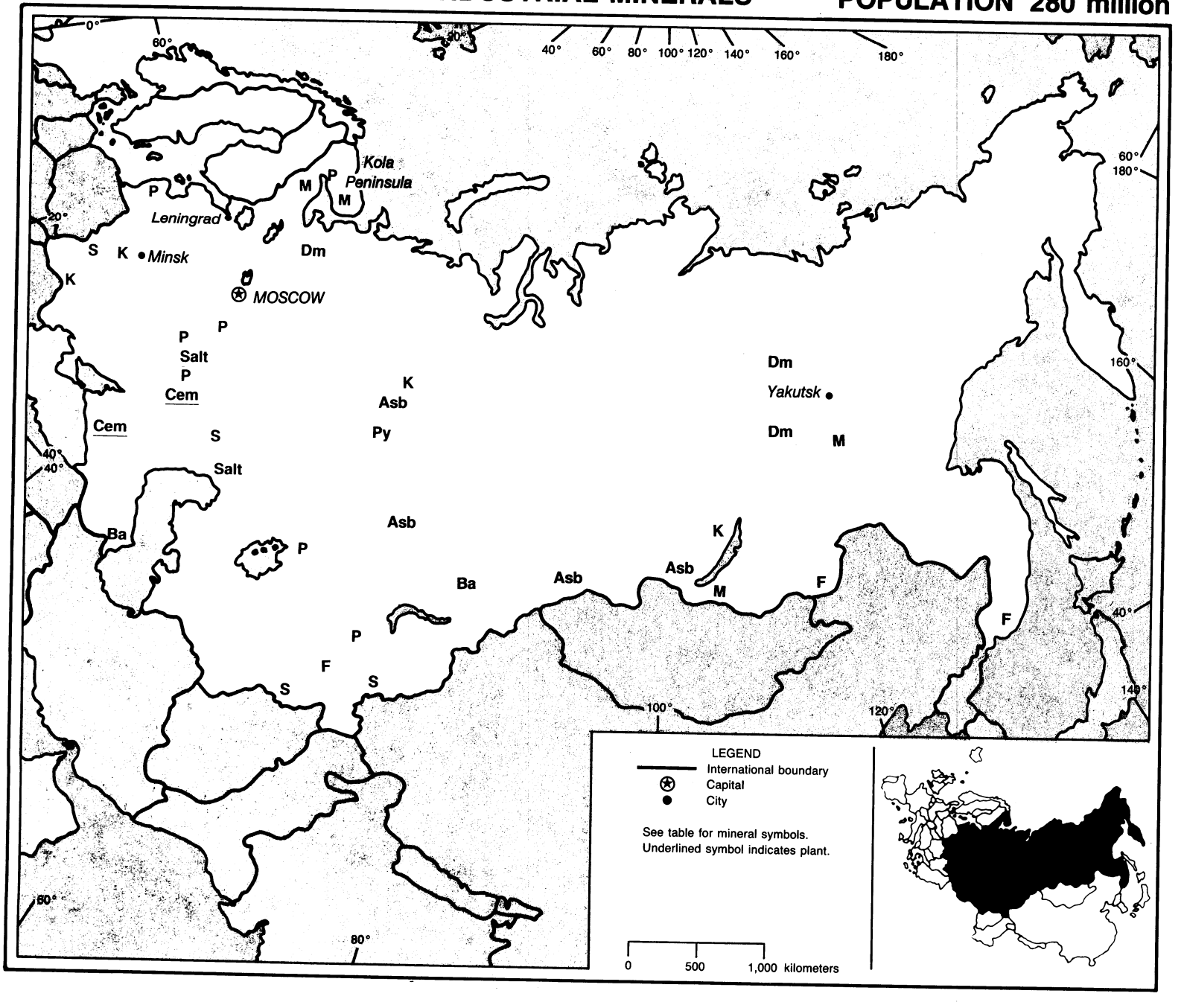
U.S.S.R.

AREA 22,400,000 km² | **MINERAL FUELS** | **POPULATION 280 million**



U.S.S.R.

AREA 22,400,000 km² **INDUSTRIAL MINERALS** **POPULATION 280 million**

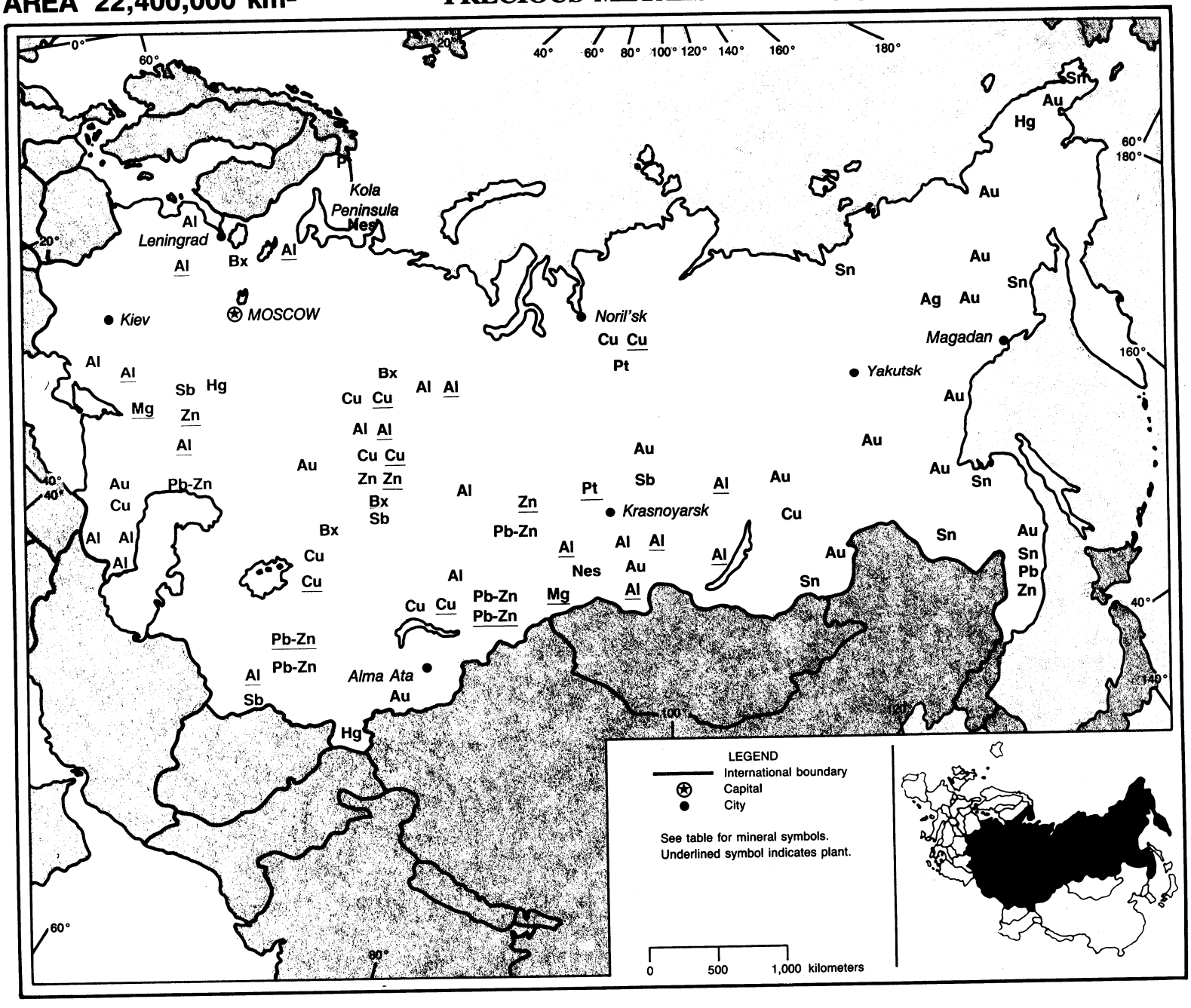


U.S.S.R.

NONFERROUS AND PRECIOUS METALS

AREA 22,400,000 km²

POPULATION 280 million



THE MINERAL INDUSTRY OF THE

U.S.S.R.

By Richard M. Levine

In 1989, a year of historic change in the U.S.S.R. and Eastern Europe, the U.S.S.R. confronted major economic problems in its process of restructuring "perestroyka." Plans for most economic indicators were not met, and labor and ethnic unrest that surfaced with the country's new political freedoms placed an added burden on the economy. The process of transforming the U.S.S.R.'s centrally planned economy into one responsive to market forces and better integrated into the world economy was in its initial stages. During this time, the country faced coping with the economic problems arising from this transition, for which successfully tested theories or models did not exist, and dealing with the political currents that changes would engender.

Despite "glasnost'," the U.S.S.R. still published only a few statistics on its mineral industry, reporting production of only coal, iron ore, natural gas, and steel in its end-of-year statistical summary. In 1989, production of all but natural gas decreased, and natural gas also grew at less than one-half of its average annual growth rate for the past decade. Although production figures were not given for nonferrous metals, reportedly, contract delivery plans for primary aluminum, lead, magnesium, and zinc were not met.

The ferrous metals sector suffered three setbacks in 1989 when scrap collection fell by 10%, iron ore production fell by 3%, and shortages occurred in deliveries of coking coal.[1] The reported fall in iron ore production, although in keeping with the Soviet long-term plan to reduce inputs in steelmaking, was larger than planned. The plan for the production of high-quality steels, including cold-rolled sheet, low-alloy steel, cold-drawn sectional steel, heat-hardened steel, and high-strength drilling pipes, was not fulfilled. The decline in output of mineral fuels lent greater urgency to the need to conserve fuel resources. The U.S.S.R. consumes three times the amount of energy per unit of output as does the United States, and the ratio was even higher in comparison to Western Europe and Japan.[2]

Implementing restructuring, the U.S.S.R. engaged in a major reorganization of mineral production management to increase efficiency. Prior to this reorganization, which has still not changed the basic system of management, all mineral production in the U.S.S.R. was controlled by various ministries, each of which acted as a monopolistic national corporation responsible for the production of a designated category of minerals.

In 1989, the former Ministries of Ferrous and Nonferrous Metallurgy were merged into a new Ministry of Metallurgy. This merger also resulted in the reduction of staff by 53% to 1,200 persons.[3] The former Ministries of the Chemical Industry and Petroleum Refining and Petrochemical Industries were merged and became the new Ministry for Chemicals and the Petroleum Refining Industry.

The former Ministry of the Oil Industry was renamed the Ministry of the Oil and Gas Industry. The former Ministry of the Gas Industry was transformed into a new form of administration termed a Kontsern (concern). This new concern Gazprom (Gas Industry), which is considered to be of ministerial level, is composed of two groups of enterprises. The first is organizations directly engaged in the extraction, processing, transporting, and storing of natural gas. The second group consists of enterprises engaged in research and development, design and construction work, repairs and other services, as well as enterprises engaged in extracting and supplying gas on a local basis. The concern is a new form of organization intended to grant greater economic independence to enterprises of the gas industry and thus improve efficiency.

As part of the program of economic reform calling for granting greater autonomy to enterprises, the Noril'sk mining and metallurgical complex, the Severonikel and Pechenga Nikel complexes and the Olenogorsk engineering works on the Kola Peninsula, and the Krasnoyarsk nonferrous metallurgical works producing platinum-group metals were removed from the control of the Minister of Metallurgy. They were formed into a separate legal entity called Noril'sk Nikel directly under the control of the Council of Ministers. Noril'sk Nikel, rather than the ministerial system, directly controls production of almost all of the country's platinum-group metals, two-thirds of the country's nickel output; as well as a large percentage of the country's output of cobalt, copper, and more than 14 other metals.

These changes are intended to reduce bureaucracy, to consolidate management, to ensure more complete utilization of ore constituents, and improve enterprise efficiency. Also, withdrawing certain mineral production sectors and enterprises from direct ministerial control and allowing them to operate as independent entities with the right to engage in foreign trade is intended to stimulate production of hard-currency-earning exports. In accordance with the goals of "perestroyka," encouraging production for the world market, combined with granting greater economic autonomy, should help introduce market efficiencies and disciplines to these sectors and enterprises.

During the year, a number of attempts were made to derive a more realistic exchange rate for the ruble in limited spheres. These included revising the exchange rate for tourists and holding currency auctions for enterprises desiring to acquire hard currency. However, these actions were quite limited, affecting only tourists engaged in local shopping or Soviet enterprises present at certain auctions. These were not major advances

toward general ruble convertibility, which by Soviet admission was a goal probably a number of years away.

Now that the U.S.S.R. has begun reporting accidents, information on their occurrences provides a better insight into health and safety issues affecting the work force and population. In 1988, reportedly, almost 14,400 people died in on-the-job-accidents.[4] Coal mines in the Ukraine were among the most hazardous workplaces. The most serious accident reported in 1989 involving mineral products was an explosion on a natural gas liquids pipeline in the Urals on June 3 in the vicinity of two passenger trains traveling on the Chelyabinsk-Ufa Line. Both trains were heavily damaged. Hundreds of people reportedly perished.

Another serious accident occurred on the night of November 13, 14, when a powerful explosion occurred that damaged more than 40 kilometers (km) of gas pipeline that supplies the Noril'sk mining and metallurgical complex, the country's chief supplier of nickel, cobalt, and platinum-group metals raw materials. The damage took about 10 days to repair.

Following a series of labor strikes and the formation of independent union movements, the country adopted a new law on labor disputes in October. The formation of rules for striking, an act previously not tolerated, is a significant indicator of changed thinking. A large percentage of the significant strikes that occurred in 1989 were in the minerals sector, particularly coal mining.

GOVERNMENT POLICIES AND PROGRAMS

In 1989, the Ministry of Geology fulfilled its annual plan as well as the plan for the first 4 years of the 1986-90 5-year plan for the growth of reserves for all minerals. However, several organizations under the Ministry of Geology did not fulfill their plan for establishing new reserves. The important areas where the plan was now fulfilled were for establishing new oil and condensate reserves in Tyumen' Oblast', the country's main oil-producing region, for establishing new oil and natural gas reserves in southern Kazakhstan, and for establishing new natural gas reserves in Turkmenistan.

The new Minister declared that he wanted to make fundamental changes in the operation of the Ministry. Although he stated that the Ministry had previously successfully fulfilled its exploration plans, in the future, he stated, the Ministry should orient its exploration toward the actual needs of mining enterprises and planned regional development. He also stated that he intended to reduce expenditures on geological work by employing state-of-the-art equipment and technology. The Minister further discussed the Ministry's work abroad in 30 foreign countries, declaring that the Ministry was not being adequately compensated for its work. In the future, he declared that the Ministry of Geology should work in foreign countries as do Western firms that factor into their costs a calculation of risks and potential rewards. The Ministry of Geology, he declared, should also be paid not only for the work it conducts in foreign countries, but should, by contract, share in the profits from its discoveries. He also stated that he would encourage developing joint enterprises with foreign countries and that, unfortunately, not enough progress had been made in developing this form of cooperation.[5]

In May 1989, the U.S. Geological Survey signed a Memorandum of Understanding (MOU) with the U.S.S.R. Ministry of Geology for cooperation in the geological sciences. Also listed as participating organizations under the MOU were the U.S. National Science Foundation and the U.S.S.R. Academy of Sciences. The MOU addressed cooperation in basic rather than applied research. Areas of common interest between the United States and the U.S.S.R., according to the Director of the U.S. Geological Survey, include deep continental drilling, in which the U.S.S.R. has had an active program for many years, and comparing findings regarding estimates of ore deposits and assessments of the geological situation in Alaska with comparable areas in Siberia and the Soviet Far East.

The Chairman of the State Committee for Science and Technology unveiled a new approach to science and technology under "perestroyka." According to the Chairman, the new direction includes a stronger economic component in the conduct of scientific research. Under the new plan, a much smaller portion of the new science and technology budget will be devoted to direct support of research. A new system of tax benefits, preferential credit, and other means to help enterprises and associations finance science and technology is being developed. The need was stressed of increasing the number of small innovative engineering cooperatives and firms. The State Committee for Science and Technology's programs are to be focused on projects and proposals for improvements in the health sciences, ecological improvement of industry, super conductivity, mapping of the human genome, and improvements in constructing nuclear powerplants. The plan also calls for improving international science and technology cooperation, including establishing joint enterprises and laboratories.

The State Committee for Science and Technology was working with the Supreme Soviet to draft legislation for protection of intellectual property rights, contract laws to enable and encourage independent industrial use of research and development, and patent and trademark law; passage of these laws was envisioned for 1992.

With "glasnost'" (openness), the U.S.S.R. is now coming to terms with the environmental havoc wrought by past policies. According to the Soviet journal Soviet Union, 20% of the U.S.S.R. population is already living in ecological disaster zones and 40% in ecologically unfavorable conditions.[6] A resolution to improve the situation adopted by the Supreme Soviet in November noted that "an alarming, and in some places critical, ecological situation has taken shape in the country." The journal warns, "The pollution of Lake Baikal continues. The tragedy of the Aral Sea and the Chernobyl' disasters are only the first fearsome warnings of a coming ecological apocalypse."[7] Fault for the ecological problems was attributed to "the mistakes of central planning," and "that environmental improvement is not part of the plans."[8] Many of the large economic projects of the past in which nature was viewed as a tool to be engineered or an obstacle to be ignored or overcome are now resulting in complex environmental problems that might take long periods of time and advanced technology and ecological understanding to rectify.

As part of the effort to combat pollution and improve the environment, the Soviet President proposed establishing an Urgent Ecological Aid Center at the United Nations for organizing international cooperation in critical ecological situations; it would incorporate research in environmental problems for use by the

world community.[9] Also, speaking to the Global Forum on the Environment and Development for Survival, the Soviet President urged the formation of a "Green Cross," an international relief agency that would respond to ecological disasters. The Soviet President stated that "his own country had suffered greatly from thoughtless decisions and that the Soviet Union has only begun to recognize its environmental problems."[10]

The main agency created to deal with the U.S.S.R.'s environmental problem is the State Committee for Environmental Protection, known by its acronym Goskompriroda. Its purpose is to develop a unified policy of environmental protection and to implement it. However, Goskompriroda, according to Soviet critics, besides being created "at a minimum of 10 years too late," was not empowered to "effectively block the destruction of nature which is proceeding under the banner of ministries, despite perestroyka', glasnost', and the concern of the public."[11] The country also was faulted for still lacking a national ecological strategy. For example, a minimum of three decades, it was claimed, would be required to deal with pollution problems at some of the major steel production centers.[12]

Efforts at pollution control could also lead to greater cooperation with advanced market economy countries. However, given the fact that perestroyka is only beginning to dismantle the apparatus of the centrally planned economy, a large number of barriers to effective cooperation between Western firms and their U.S.S.R. counterparts still exist that require creative and innovative thinking to overcome. The Soviet Government already was seeking Western technology and equipment in controlling pollution. For example, the U.S.S.R. approached Japan's Mitsubishi Corp. for technology concerning desulfurization and deacidification equipment.

Mining and metallurgy have been significant contributors to the country's ecological problems, according to Izvestiya. In ferrous metallurgy, "Discharges of pollutants into the atmosphere remain high. They determine the condition of the air over a number of cities."[13] A list of 68 Soviet cities termed especially dangerous in terms of air pollution included practically all of the U.S.S.R.'s major steel production centers.[14]

In nonferrous metallurgy, reportedly, "a serious situation with environmental pollution has emerged. Enterprises of this sector are discharging large amounts of polluted or simply untreated effluent."[15] In the nonferrous sector, the greatest polluters of the environment were declared to be the Noril'sk and Severonikel mixed sulfide mining and metallurgical plants above the Arctic Circle, the Almalyk and Balkhash copper plants in Soviet Central Asia, the Ust'-Kamenogorsk lead-zinc plant in Soviet Central Asia, and the Bratsk and Krasnoyarsk aluminum plants in Siberia.[16] Noril'sk was cited as the worst city in the U.S.S.R. in terms of emissions from stationary sources, discharging 2.3 million tons of pollutants per year or 13 tons per inhabitant.[17]

Serious environmental problems, however, connected with the mineral industry are so general that it is difficult to rate places as being better or worse. The Soviet press is now filled with numerous articles about the environmental damage and health problems people are encountering in areas where these industries are. Probably the best organized and most effective protest movement has occurred concerning the operation and siting of nuclear powerplants, although public protests have also affected developments in the aluminum, copper, phosphate, and other branches of the mineral industry.

Pollution problems were particularly severe in certain regions of the country such as Soviet Central Asia where mineral production activity combined with other ecological problems such as the evaporation of the Aral Sea intensify the damage. In other regions such as the arctic tundra with its more fragile ecological balance, mineral industry activity alone was creating major problems. In the arctic tundra, Tass reported that an ecological disaster was likely to occur if the current intensive industrial development of the region continues.[18] The head of the U.S.S.R. Institute for Problems of Development of the North reported that "if one sticks to the old approach—gas and oil at any cost—then the arctic tundra will be in for an ecological catastrophe . . . industrial development had already affected 28 rivers once rich in fish, as well as 6 million hectares of reindeer pasture and birds' nesting places."[19]

In 1989, the U.S.S.R. began publication of a statistical yearbook concerning the environmental situation in the country entitled "Okhrana Okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodonykh resursov v SSSR, statisticheskiy sbornik (Environmental Preservation and the Rational Use of Natural Resources, Statistical Collection).[20] This book, which presents environmental data on a large number of cities and regions in the U.S.S.R. as well as on a number of topics concerning the environment, is evidence of the growing movement in the U.S.S.R. to present more data and to engage the public in more open discussion and activity in matters concerning the environment.

Another issue connected with environmental protection is the issue of resource conservation. The U.S.S.R., on the average, consumes two to three times the mineral inputs per unit of output as do advanced industrial market economy countries. If the U.S.S.R. could increase its efficiency in the use of mineral resources, it would greatly increase the country's and world's mineral supply as well as possibly lessening the need to extract and process minerals. Therefore, both effectively introducing environmental controls and state-of-the-art technology into the Soviet economy could have substantial impact on pollution and the conservation of mineral resources.

TRADE

The foreign trade sector was an area of high interest as the U.S.S.R., under perestroyka, moved to better integrate its economy with the world economy. The country's long-range program called for switching from being primarily an exporter of mineral products, which accounted for more than 80% of Soviet hard- currency earnings, to being an exporter of manufactured goods, which accounted for only about 5% of hard-currency earnings. Despite this program for the next decade, it was envisioned that the country would still be primarily an exporter of mineral commodities.[21] Petroleum and petroleum products were the primary export earning commodity, with other mineral commodities, including aluminum, chrome, diamonds, ferroalloys, gold, natural gas, nickel, and platinum-group metals, accounting for the rest of these earnings. In 1989, a 3% decline in oil production was responsible, in part, for a fall in oil exports, putting a further strain on the Soviet economy.

The U.S.S.R., although the world's most self-sufficient major industrial country in mineral products, was traditionally

TABLE 1

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

COMMODITY		1985	1986	1987	1988	1989
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[3]		1,615	1,638	1,660	1,639	1,697
Alunite ore, 16% to 18% alumina		615	620	625	625	600
Alumina		4,300	4,400	4,400	4,600	4,600
Metal, smelter:						
Primary		2,300	2,400	2,400	r2,400	2,200
Secondary		375	400	400	425	400
Total		2,675	2,800	2,800	r2,825	2,600
Antimony, mine output, recoverable Sb content	tons	9,400	9,500	9,600	9,600	9,600
Arsenic, white (As_2O_3)	do.	8,100	8,100	8,100	8,100	8,100
Beryllium: Beryl, cobbed, 10% to 20% BeO	do.	1,900	2,000	2,000	2,000	2,000
Bismuth, mine output, recoverable Bi content	do.	83	84	85	85	85
Cadmium metal, smelter	do.	3,000	3,000	3,000	2,900	2,900
Chromium:						
Chrome ore, crude[3]		3,864	4,033	4,060	4,131	e4,200
Chrome ore, marketable[3]		3,360	3,640	3,570	3,700	e3,800
Cobalt:						
Mine output, recoverable Co content	tons	2,700	2,800	2,900	3,000	3,000
Metal, smelter	do.	4,800	5,300	5,300	5,400	5,200
Copper:						
Ore:						
Gross weight, 0.5% to 2% Cu		86,000	89,000	91,000	93,000	93,000
Cu content, recoverable		600	620	630	640	640
Metal:						
Blister:						
Primary		750	770	790	800	800
Secondary		145	145	147	150	150
Refined:						
Primary		810	830	840	850	830
Secondary		143	145	147	150	150
Gold, mine output, Au content	thousand kilograms	270	275	275	280	285
Iron and steel:						
Iron ore, 55% to 63% Fe[3]		247,639	249,959	250,874	r249,754	241,348
Iron ore, Fe content[3]		r135,663	r137,252	r138,216	r138,217	134,789
Agglomerated products:						
Sinter		3151,000	3154,466	3154,000	154,000	151,000
Pellets		365,400	366,476	367,500	r68,000	68,700
Metal:						
Pig iron and blast-furnace ferroalloys:						
Pig iron for steelmaking[3]		102,840	105,881	106,026	107,008	106,723
Foundry pig iron[3]		r6,518	r7,313	r7,214	r6,903	6,550
Spiegeleisen[4]		319	320	319	20	20
Ferromanganese[4]		3574	r600	3593	600	600
Ferrophosphorous		326	326	325	25	25
Total[3 5]		109,977	113,840	113,877	114,558	113,928
Electric-furnace ferroalloys[3]		2,900	3,000	3,100	3,200	3,300
Crude steel[3]		154,668	160,550	161,887	163,037	e160,000
Finished steel[3]		108,274	111,996	114,081	115,958	e116,000
Semimanufactures:						
Wire rods[3]		8,836	8,715	8,800	r6,535	6,158
Pipe stock[3]		5,586	6,565	6,878	r6,934	6,817

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

COMMODITY		1985	1986	1987	1988	1989
METALS—Continued						
Iron and steel—Continued						
Metal—Continued						
Semimanufactures—Continued						
Tubes from ingots[3]		1,930	1,963	1,929	1,947	1,889
Selected end products:						
Total pipes and tubes[3]		19,354	19,817	20,346	20,840	20,567
Cold-rolled sheet[3]		10,203	10,516	10,795	11,214	11,346
Lead:						
Mine output, recoverable Pb content		440	440	440	440	440
Metal, smelter:						
Primary		485	485	475	447	465
Secondary		265	270	275	280	280
Magnesium metal, including secondary		87	89	90	91	91
Manganese concentrate:[3]						
Gross weight		9,900	9,300	9,400	r9,100	9,100
Mn content		2,900	2,800	2,800	r2,800	2,740
Mercury metal, including secondary	tons	2,250	2,275	2,300	2,300	2,300
Molybdenum, mine output, Mo content	do.	11,300	11,400	11,500	11,500	11,500
Nickel:						
Mine output, Ni content		r250	r260	r270	r280	280
Metal, smelter		r265	r275	r285	r290	295
Platinum-group metals, mine output, Pt content	metric tons	118	121	124	128	128
Silver metal including secondary	do.	1,490	1,500	1,510	1,520	1,520
Tin:						
Mine output, recoverable Sn content	tons	13,500	14,500	16,000	16,000	16,000
Metal, smelter:						
Primary	do.	16,000	16,000	18,500	18,500	18,000
Secondary	do.	3,700	3,800	4,000	4,000	4,000
Total	do.	19,700	19,800	22,500	22,500	22,000
Titanium:						
Concentrates:						
Ilmenite	do.	445,000	450,000	455,000	460,000	460,000
Rutile	do.	10,000	10,000	10,000	10,000	10,000
Metal	do.	43,000	43,500	44,000	46,000	46,000
Tungsten concentrate, W content	do.	9,200	9,200	9,200	9,200	9,200
Vanadium metal	do.	9,500	9,600	9,600	9,600	9,600
Zinc:						
Mine output, recoverable Zn content		810	810	810	810	810
Metal:						
Primary		900	900	910	848	862
Secondary		100	105	110	115	115
Zirconium metal		85	85	90	90	90
INDUSTRIAL MINERALS						
Asbestos, grades I-VII		2,500	2,400	3,2,552	2,600	2,600
Barite		540	540	540	540	540
Boron minerals and compounds:						
Gross weight		200	200	200	200	200
B_2O_3 content		40	40	40	40	40
Bromine		70	65	65	65	65
Cement, hydraulic[3]		130,722	135,119	137,404	139,499	140,436
Clays: Kaolin including china clay		2,000	2,000	2,000	2,000	2,000
Corundum, natural	tons	8,700	8,700	8,700	8,700	8,700

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

COMMODITY		1985	1986	1987	1988	1989
INDUSTRIAL MINERALS—Continued						
Diamond:						
Gem	thousand carats	r7,400	r7,400	r7,500	r7,500	7,500
Industrial	do.	r7,400	r7,400	r7,500	r7,500	7,500
Total	do.	r14,800	r14,800	r15,000	r15,000	15,000
Diatomite		245	250	255	260	260
Feldspar		330	330	330	330	330
Fluorspar, ore		1,400	3 1,400	1,400	1,400	1,400
Fluorspar, concentrate (55% to 96.4% CaF_2)	tons	410,500	3 410,500	410,500	410,500	410,500
Graphite		82	84	84	84	84
Gypsum[3]		4,223	4,599	4,781	4,902	e4,900
Iodine	tons	2,000	2,000	2,000	2,000	2,000
Lime, dead-burned[3]		29,200	30,122	30,121	r30,577	30,378
Lithium minerals, not further specified		55	55	55	55	55
Magnesite:						
Crude		4,400	4,300	4,300	4,200	4,200
Marketable product		1,975	1,925	1,875	1,825	1,825
Mica		50	50	50	50	50
Nitrogen: N content of ammonia		18,300	19,600	20,000	r20,200	19,500
Perlite		600	600	600	600	600
Phosphate rock:						
Crude ore:						
Apatite, 15% P_2O_5		50,209	51,316	51,840	52,298	e51,000
Sedimentary rock[3]		22,184	23,409	24,915	26,245	e25,000
Total		72,393	74,725	76,755	78,543	76,000
Concentrate:						
Apatite, 37% to 39.6% P_2O_5		r20,600	20,700	r20,900	r21,200	21,100
Sedimentary rock, 19% to 30% P_2O_5		r15,500	r15,500	r16,100	r15,800	15,900
Total		r36,100	r36,200	r37,000	r37,000	37,000
Potash:						
Ore, gross weight[3]		65,501	63,475	68,710	68,410	e62,000
K_2O equivalent[3]		10,367	10,228	10,888	11,301	10,233
Pyrite, gross weight		3 5,543	3 4,769	3 4,893	4,900	4,800
Salt, all types[3]		16,100	15,300	15,400	14,800	e15,000
Sodium compounds, n.e.s.:						
Carbonate[3 6]		4,916	5,032	5,051	4,989	4,809
Sulfate:						
Natural		360	360	360	375	375
Manufactured		r250	260	260	270	270
Sulfur:						
Frasch		900	1,100	1,100	1,100	1,100
Other native		r2,300	r2,400	r2,400	r2,400	2,350
S content of pyrite[3 7]		r2,478	r2,094	r2,170	r2,086	1,914
Byproducts:						
Of metallurgy		r1,000	r1,050	r1,250	r1,375	1,350
Of natural gas[3]		1,974	1,618	2,397	3,288	e2,500
Of petroleum		350	400	450	450	450
Total		r9,002	r8,662	r9,767	r10,699	9,664
Sulfuric acid[3]		26,037	27,847	28,531	29,372	28,276
Talc		520	520	530	530	530
MINERAL FUELS AND RELATED MATERIALS						
Coal:[3]						
Anthracite		r71,346	r71,420	r71,544	72,274	68,043

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

COMMODITY		1985	1986	1987	1988	1989
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal—Continued						
Bituminous		498,989	516,278	523,338	527,212	508,754
Lignite and brown coal		r157,096	r163,412	r164,490	r172,395	163,523
Total[8]		r727,431	r751,110	r759,372	r771,881	740,320
Coke: Coke oven, beehive, breeze, gas coke[3]		81,261	83,135	83,038	81,916	80,424
Fuel briquets:[3]						
From anthracite and bituminous coal		767	781	771	762	751
From lignite and brown coal		4,117	4,090	4,238	5,448	5,628
Total		r4,884	r4,871	r5,009	r6,210	6,379
Gas, natural, marketed:						
As reported[3]	million cubic meters	643,000	686,000	727,000	770,000	796,000
Oil shale[3]		32,076	30,099	30,081	r28,061	28,076
Peat:						
Agricultural use		155,000	160,000	160,000	160,000	160,000
Fuel use[3]		16,000	19,500	11,400	17,500	16,800
Petroleum:						
Crude:						
As reported, gravimetric units[3]		595,291	614,753	624,177	624,323	607,254
Converted, volumetric units	thousand 42-gallon barrels	4,380,000	4,520,000	4,590,000	4,590,000	4,460,000
Refinery products[9]		447,975	461,334	472,053	475,000	470,000

eEstimated. rRevised.

[1]Production estimated unless otherwise specified.

[2]Includes data available through Oct. 1991.

[3]Reported in Soviet sources.

[4]Estimate based on total of spiegeleisen and blast-furnace ferromanganese reported by United Nations sources.

[5]Data may not add to total shown because not all items comprising total are listed.

[6]Excludes potash.

[7]Pyrite series derived from reported Soviet data for pyrite production in gross weight.

[8]Run-of-mine coal.

[9]Not distributed by type and therefore not suitable for conversion to volumetric units. Data apparently include all energy and nonenergy products but exclude losses.

dependent on imports for some products such as bauxite, tin, tungsten, and high-quality steel products. As part of its program to promote the efficient use of resources as well as to conserve hard currency, the plan for 1990 called for a significant reduction in imports of goods for heavy industry with an emphasis on reducing steel imports. An article in Sotsialisticheskaya Industriya, August 9, 1989, argued that it was not that the U.S.S.R. was primarily an exporter of raw material that was evidence of the weakness of its economy because advanced market economy countries such as Canada and the United States were also significant exporters of raw materials. But rather the country's weakness was the inefficiency prevelant within the economy, including the inability to gain full benefit from earnings from the sale of natural resources. The article stated, "It is enough to fly into Nizhnevartovsk to understand. In any country except ours, the discovery of oil causes an economic boom . . . In Alaska the oilmen have pools and tennis courts. In our country they have log huts or simply put slums . . . It turns out that the center has turned the periphery into a raw material colony, and neither the center, nor, obviously, the periphery is better off due to this."[22]

Although meeting world quality standards is primarily an issue in exporting manufactured goods, with certain mineral commodities the Soviets also lagged behind world standards. Soviet mineral producers experienced problems in competing in metal purity, variety of product types, delivery conditions, packaging, etc., which led to a loss of markets. Problems in meeting world market standards were cited with certain types of aluminum, copper, zinc, rolled nonferrous metals, and secondary nonferrous metals.[23] Still, a large number of Soviet mineral products fully conformed to world standards.[24]

In 1989, new laws were promulgated intending to promote increased opportunities for Soviet and foreign firms to engage in trade and economic cooperation. Prior to these new laws, all Soviet foreign trade was conducted by foreign trade organizations (FTO's, now renamed All Union Foreign Economic Association, VVO's) subordinate to the U.S.S.R. Ministry of Foreign Trade (now renamed the Ministry of Foreign Economic Relations). These FTO's formerly were responsible for all of the country's trade with each FTO responsible for trade in a designated category of commodities. However, with the renaming of these organizations and the promulgation of new laws and regulations, this monopolistic control of all foreign trade by the trade ministry and its organizations changed. Enterprises producing goods for export

were now allowed, in principal, to engage in foreign trade, although numerous restrictions still existed depending on the commodity.

In May 1989, a law took effect stating the "right to directly carry out export-import operations shall be exercised by all enterprises, associations, producer cooperatives and other organizations whose products (work, services) are competitive on the foreign market. Enterprises, associations, producer cooperatives and other organizations may carry out export-import operations directly, setting up for the purpose, if and when necessary, self-supporting foreign trade firms, or on a contractual basis through other external economic organizations, being guided in so doing by the best terms of export and import, currency self-recoupment and self-financing and on the conditions the state shall not be liable for their commitments."

Under these new, more entrepeneurial conditions, the old FTO's (now VVO's), including those that engaged in minerals and metal trading, were now having to negotiate contracts with their former clients. To keep their business, the VVO's were having to compete with others in the marketplace, including other VVO's and representatives of the enterprises themselves, regarding who could best represent enterprise interests in foreign trade.

This law also indicated a major change in that the state, under the former monopolistic system, guaranteed payment for all trade dealings. In 1989, a number of Soviet enterprises, newly freed to begin foreign trade operations, had trouble making payments on commitments. As a result, the once almost unquestioned credit worthiness of Soviet trade transactions changed, and foreign creditors and clients were restricting dealings because many Soviet firms were not able to meet payment commitments.

Following the passage of the law allowing enterprises to engage in foreign trade, laws were passed to restrict the export of essential commodities. The U.S.S.R. Council of Ministers introduced a licensing and quota system for goods listed as being of national significance, which included minerals, metals, and chemical products.[25]

Despite this new freedom for enterprises to engage in foreign trade, the state still maintained a great deal of control over the sale of mineral commodities, particularly the major hard-currency-earning commodities. For example, all gold bullion sales were still only permitted through the U.S.S.R. State Bank for Foreign Economic Relations (Vneshekonombank). It is at this point not clear regarding the system through which the U.S.S.R. central Government exercised control over the sale of other major hard-currency-earning commodities or the system that the central Government would use in the future for maintaining this control.

Efforts are now underway to establish joint ventures in the nonferrous metals sectors. To promote trade in nonferrous metals, a foreign economic joint-stock company, Tsvetmeteksport (Nonferrous Metals Export), was formed for exporting Soviet nonferrous metals products made above state orders as well as for importing raw materials and equipment for manufacturing consumer goods. Thirty-six nonferrous metallurgical enterprises and associations, among which are some of the country's largest, are shareholders in the company. Tsvetmeteksport also will render assistance to shareholders in setting up joint ventures, in purchasing and selling licenses and technology, and in carrying out advertising and marketing.[26]

Some of the most dramatic and far-reaching events were the political changes in the U.S.S.R. and Eastern Europe, which also were leading to significant economic changes and realignments in the Council for Mutual Economic Assistance (CMEA)[27] trading bloc. The CMEA countries were dependent on the U.S.S.R. for mineral raw materials, which they bartered for manufactured goods, that were generally not competitive on world markets. Plans were formulated to conduct CMEA trade in hard-currency, which was one of the initial steps in the eventual disbandonment of CMEA. The immediate change to hard currency trade would benefit the U.S.S.R., which could sell its raw materials to either CMEA countries or on the world market for additional hard currency and buy state-of-the-art manufactured goods from the West.

Regarding relations with the European Community (EC), in November, the EC drafted a document with the U.S.S.R. on trade and economic cooperation that envisaged both sides granting each other most-favored-nation (MFN) status in trade; a list of quotas on Soviet exports to EC countries that are to be phased out was finalized. One year after the agreement was to take affect, about one-half of the quotas were to be abolished, and, by 1995, they were to be almost completely phased out. Quotas on coal and steel products were, to remain as they were excluded from this agreement.

The agreement further specified that the U.S.S.R. and the EC would cooperate in statistics, product standards, mining, agriculture, the food industry, environmental protection, energy (including nuclear), science, technology, insurance, banking, transport, tourism, management, and vocational training. Cooperation with the EC was to complement the U.S.S.R.'s economic relations with individual EC countries. The draft agreement was to be sent to the relevant bodies of the EC and U.S.S.R. for ratification, after which it would remain in effect for 10 years. The agreement contained a clause regarding consultation between both parties to ensure that goods were being traded at real market prices.

As part of the efforts to assist economic reform in Eastern Europe, 41 nations from the East and West were laying the groundwork for the creation of a new European Reconstruction and Development Bank for Eastern Europe. The bank was to help finance Eastern Europe's economic transformation. Bank operations were planned to commence in 1991. The U.S.S.R. would provide capital for the bank and would also be eligible to borrow from the bank. The United States, however, as terms for its participation, was taking the position that the U.S.S.R. should not be allowed to borrow an amount beyond its contribution to the bank and that at least 50% of the bank's loans should go to the emerging private sector rather than the state-owned sector. In trade with the United States, in accordance with policies set forth at the Malta summit, the United States was working to improve trading conditions with the U.S.S.R. by considering extending MFN status, negotiating a trade treaty, and dropping objectives to Soviet entry into organizations such as the General Agreement on Tariffs and Trade (GATT), the World Bank, and the International Monetary Fund. As part of its effort to join the world trading system, the U.S.S.R. pursued its interest in acquiring observer status in GATT, and the United States was supporting the U.S.S.R. being granted observer status.

During the year, the United States also eased some trade restrictions on advanced technology products to the U.S.S.R., including personal computers. However, the United States still maintained the need to keep Coordinating Committee on Multilateral Export Controls restrictions on sales to the U.S.S.R. on a range of products, including a number of products approved for sale to some East European countries.

The program of promoting joint ventures, begun in 1986, continued to gain momentum in 1989. At the end of 1989, 1,274 joint ventures had been formed with the largest number being with Finland, 196; the Federal Republic of Germany (FRG), 191; the United States, 143; Austria, 90; Great Britain, 84; and Italy, 83.[28] In the U.S.S.R., managers for joint ventures were being trained at two business schools opened at the U.S.S.R. Academy of the National Economy and the All-Union Foreign Trade Academy. In addition, a number of nonofficial business schools had been formed.[29]

The U.S.S.R., in an effort to promote trade and development, raised the issue of creating a number of free trade zones in the U.S.S.R. termed Joint Enterprise Zones (JEZ) for attracting foreign investment. These JEZ would provide free market conditions combined with economic incentives. In 1989, a decision was reached to set up free economic zones in the city of Vyborg between Leningrad and the Finnish border, termed a scientific and industrial zone, and a free economic zone in Nakhodka in the Soviet Far East, termed a zone for the in-depth processing of raw materials.[30] In addition, the creation of free economic zones was being considered for a number of other areas.

COMMODITY REVIEW

Metals

Aluminum.—Environmental pollution from aluminum plants remained an important issue for the industry. Owing to pollution, the potlines at the Sumgait aluminum plant in Azerbaidzhan were closed down at midyear.[31] Reportedly, only 21% of the plant's emissions was safely discharged. Environmental problems in Armenia were severe as untreated effluents from the Akson aluminum foil plant were being discharged into the municipal water system. The new Akson plant appeared to be replacing the Kanaker aluminum foil plant because it was receiving parts of the plant and equipment from the Kanaker facility.[32]

Environmental pollution was a major concern at the Tadzhik aluminum plant where work was occurring on covering the potlines and on modernizing gas equipment. People's health and the condition of the vegetation near the plant and in neighboring regions were considered so critical that the people in the region were threatening to close supply lines to the plant.[33]

Although work is completed on the construction of the Tadzkik aluminum plant, the plant is still being expanded and modernized. During 1989, the Tadzkik plant planned to commission a new Italian-supplied casting shop. Work on improving automation was occurring. An automated system for continuous feeding of alumina was being tested on potlines No. 1 and 9, and there were plans to install this system on remaining potlines.

International commercial activities in the aluminum sector included the formation of a joint venture between the Reynolds Aluminum Corp. of the United States, the Fata European Group of Italy, and a consortium of six Soviet organizations. The joint venture would build a 47,000-ton-per-year foil and aluminum products plant at Sayanogorsk in East Siberia. The Soviet group would own 70% of the facilities, Reynolds and the Fata Group, 13.5% each, and the Sao Paolo Bank of Italy would hold a 3% interest in the venture. The Reynolds Aluminum Co. planned to purchase an unspecified percentage of the plant's output that would be marketed by its subsidiary Reynolds Europe Ltd.

In November, a letter of intent was signed between the Barcon Co. of Akron, Ohio, and a Soviet consortium called the Russian Aluminum Association to build a rolling mill in the U.S.S.R. The mill's capacity and cost were not provided by yearend; however, it would be a continuous casting operation, using scrap for the production of aluminum alloy coil.

Progress on the much publicized Greek-Soviet alumina project at Aghia Efthymia in Boeotia, Greece, was stalled in 1989 over finances. A downturn in the Greek bauxite and aluminum industry, owing partly to reduced imports of Greek bauxite by Romania and the U.S.S.R., diminished capacity of the Greek Government to meet the original financial provisions of the agreement. However, at yearend, the Government of Greece appeared prepared to continue to fund the project.

The Governments of the U.S.S.R. and Hungary agreed to extend the alumina-aluminum agreement, which was to expire in 1990, through 1995. The agreement calls for the shipment of 530,000 tons of Hungarian alumina to the U.S.S.R. annually in exchange for 250,000 tons of of primary aluminum metal.

The U.S.S.R. was discussing the developement of a 10-million-ton-per-year bauxite mine at Dian Dian in the Boke region of Guinea. This mine, however, would require heavy investment in infrastructure, including roads, a railway extension, a mobile crusher, and a hydroelectric power source.

In conjunction with the discussions to develop this bauxite mine, discussions were conducted between Guinea and the U.S.S.R. concerning building two industrial facilities for alumina and aluminum production in Guinea. The aluminum plant's projected capacity would be about 150,000 tons per year, while that of the alumina plant, between 600,000 and 800,000 tons per year.

Chrome.—In 1989, the U.S.S.R. began publishing statistics for chrome ore production in its national statistical yearbook, "Narodnoye Khozyoystvo SSSR." Chrome ore production increased annually during the 1987-89 period, reaching 3.8 million tons in 1989. Chrome ore exports also increased in 1989, reaching 791,000 tons. Chrome ore exports went to both former Eastern bloc countries as well as Western customers.

The growth in chrome ore production is occurring with the development of the 2-million-ton-per-year-capacity Molodezhnaya underground mine at the Donskoy complex in Kazakhstan. In 1989, a new chromite deposit was discovered in the vicinity of the Donskoy chrome ore mining and beneficiation complex, which currently produces more than 95% of the country's chrome ore. The new deposit, it was claimed, would add substantially to the country's chrome ore reserves. The deposit was suitable for open pit development, which, reportedly, was planned in the near future.

Criticism of pollution from the Ak-

tyubinsk ferroalloys plant in Kazakhstan began appearing in the Soviet press. The Aktyubinsk plant, which utilizes chromite from the Donskoy deposit, reportedly, was discharging polluted water into the Ilek River, which was described as the most "metallic" river in the country. The discharges were destroying the valuable caviar-producing sturgeon that come up the river from the Caspian in springtime to spawn.

Copper.—Issues concerning the environment and pollution were also important to the copper industry in 1989. In September, the U.S.S.R.'s Ministry of Metallurgy and the Armenian S.S.R.'s Council of Ministers announced a decision to close down the Alaverdi copper mining and beneficiation complex.[34] Reportedly, in 1988, the Alaverdi complex released about 161,000 tons of emissions into the atmosphere, including 41,000 tons of sulfurous emmissions. The situation by mid-1989 further deteriorated with sulfur emmissions during certain periods reaching 200 times permited levels.[35] The Alaverdi operation was also a source of arsenic contamination resulting from both atmospheric dispersion into the local environment as well as by surface runoff into the Debet River.

The Karabash copper smelter in the Chelyabinsk region of the Urals came under criticism for yearly exposing 18,000 area residents to 162,000 tons of stack emissions containing sulfur, lead, arsenic, tellurium, and other contaminants. Contamination was reportedly extreme. Operating on reduced quotas, the facility processed and smelted Karabash, Uchaly, Sibay, Gay, and Buribay ores and concentrates to produce daily 67 tons of copper, 130 kilograms of silver, and 1.5 kilograms of gold. In past years, the Karabash facility produced 3 times as much copper and 10 times as much gold.[36]

At the Kyshtym copper refinery in Chelyabinsk Oblast' in the Urals, equipment was installed for producing copper foil essential in the production of microcircuits. The new equipment will enable Kyshtym to produce 18-micron-thick foil compared with 35-micron-thick foil that was being produced. The U.S.S.R. had been dependent on imports for very thin copper foil; further planned expansion would enable Kyshtym to produce this foil for exports.

Foreign commercial arrangements during the year included the start of construction of the Elkat copper wire mill in Moscow, a venture jointly owned by Nokia Cables of Finland and Moskabel of the U.S.S.R. The facility would produce about 100,000 tons per year of copper wire using U.S. manufactured continuous casting equipment. Scheduled to go online in autumn of 1990, Elkat would employ primarily Soviet workers, but also Finnish management personnel and technical staff. Nokia would derive part of the profits from the sale of copper wire abroad.[37] It was reported that the U.S.S.R. currently produces about 320,000 tons per year of rolled copper wire rod.[38]

There are 15 beneficiation plants in the U.S.S.R. as well as the Erdenet coppermolybdenum complex in Mongolia that supply the country with copper concentrates. Practically all of the output from Erdenet was being exported to the U.S.S.R. under a long-term barter agreement. However, in 1989, Mongolia agreed to conduct a feasibility study with Japan's C. Ihoh concerning constructing a 60,000-ton-per-year copper smelter that would utilize about one-half of Erdenet's output.

Gold.—In 1988, the industry's management was reorganized. Both the gold and diamond mining and production sectors were removed from the control of the then Ministry of Nonferrous Metallurgy and formed into the new Main Directorate of Precious Metals and Diamonds. This Directorate—generally referred to by its acronym Glavalmazzoloto (Main Diamond and Gold Directorate)—is not subordinate to any ministry. Rather, it reports directly to the Soviet Council of Ministers.

All Soviet gold sales in nonjewelry forms were still channeled through the Vneshekonombank, which maintains the state monopoly for gold sales. The Vneshekonombank's main gold trading branch is in Zurich, Switzerland. The Vneshekonombank has the right not only to sell, but also to buy gold in response to market conditions. The Vneshekonombank is conducting gold transactions on a daily basis, opening at 7 a.m. to monitor the Hong Kong exchange and working until 11 p.m., when the stock markets in New York close. The quantities that Vneshekonombank usually trade in single transactions are between 2,000 to 3,000 troy ounces, although amounts can sometimes be several tons. On given days, gold sales can total between 20 to 30 tons.[39]

Despite the policy of "glasnost," all former secrecy was maintained regarding information concerning the nations mineral production, trade, and reserves including gold. Nevertheless, the Soviet press was more openly quoting Western sources regarding gold data as well as discussing the release of such data. For example, in an interview printed in the October 24, 1989, edition of Izvestiya, an official with Vneshekonombank stated that Soviet gold sales are easily monitored by Western sources, which place their range at between 200 to 300 tons annually. He stated that Western estimates on Soviet gold production range from 250 to 350 tons.[40] The U.S. Bureau of Mines estimate for Soviet gold production for 1989 is 285 tons, and the estimate for gold sales is 350 tons. A November 30, 1988, article in Izvestiya questioned the reason for keeping statistics on gold secret, stating that doing so was only producing bread for Western analysts.[41]

The official from Vneshekonombank, in the October 24, 1989, Izvestiya interview, stated that he was much in favor of publishing such data on the country's gold production and bullion stocks, saying that it could only improve the country's credit rating. He did, however, believe that there was a commercial advantage to maintaining secrecy about gold sales.[42] He reiterated his position in a March 9, 1990, Pravda article, and, speaking at the Gold Institute Conference in Scottsdale, Arizona, in March 1990, he stated that he believed that such data would be released within 1 year.

Western sources are also quoted in the October 24, 1989, Izvestiya article as estimating Soviet gold bullion stocks at between 3,000 to 3,500 tons. In this article, the official from Vneshekonombank, responded that it was still not possible for Soviet officials to comment on these estimates. However, the article in the November 30, 1988, issue of Izvestiya quotes an unnamed U.S.S.R. Deputy Minister of Finance, as saying: "Our gold bullion stocks are among the very largest in the world and totally sufficient." Also, in the article in Pravda March 9, 1990, the official from Vneshekonombank stated that "as is known, our country is very rich in bullion stocks." Many Western assessments, however, place Soviet gold bullion stocks more in the range of 2,000 to 2,500 tons.

"Perestroika" placed an increased em-

phasis on gold as a standard of value. One of the most difficult problems confronting the U.S.S.R. in its attempt to move toward a more market-oriented economy is transforming the ruble into a convertible currency. Proposals were made inside the U.S.S.R. and by economists outside the U.S.S.R. to use the Soviets' vast gold reserves and production potential to back the ruble with gold, at least initially, to stabilize the ruble and transform it into a convertible currency.

This solution, however, was strongly debated. The Vneshekonombank official, speaking for a number of Soviet economists, argued against backing the ruble with gold. Given the increasing loss of faith in the ruble and the billions of excess rubles that Soviet citizens have accumulated in savings, Gostev stated that any attempt to back the ruble with gold would cause a run on the country's gold stocks, without necessarily improving the economy.[43] One of the Government's chief economic advisors stated that, in reforming the Soviet economy, ruble convertibility was the last stage. He commented: "The opinion is general and prevalent that there is a need for the ruble to be convertible . . . The professional assessment—as held by all the great experts, not just in the Soviet Union, but in the West, too—is that convertibility cannot be introduced by decree . . . In order for this to come about, we must have, within the country, a developed market economy, a price structure akin to the price structure on the world market. We must have a developed infrastructure with the accumulation of domestic securities, and at least what we call internal convertibility."[44]

Internal convertibility refers to the fact that the ruble could be used only to purchase a limited number of consumer goods and services. It could not be used to purchase most producer goods, capital stock, and property, which were either owned by the state or acquired only through state allocation. Thus, broadening the very limited purchasing power of the ruble through creating domestic markets was often discussed as a prerequisite to ruble convertibility.

Still, gold was viewed as possibly playing some important—but still undefined—role in the country's economic transformation. For example, proposals called for a parallel currency to the ruble, backed by gold, as the Soviets did in the 1920's, under the New Economic Policy. At that time, Moscow issued a new currency, in addition to the ruble, called the chervonets, which was backed by gold and traded on world markets.

Regarding the question of creating another parallel currency, similar to the gold-backed chervonets, a chief economic advisor in the U.S.S.R. replied: "The question of a parallel currency is open to discussion. There are many plans and proposals on this score, but there has been no decision on this matter. There are pros and cons. It is not clear which outweighs which or by how much."[45] Other proposals discussed both in the U.S.S.R. and the West called for backing loans from the West with gold-backed bonds to bolster the country's faltering credit rating and using market mechanisms in many of the ways currently used by Western countries, including gold swaps, gold market hedging instruments, gold loans for mining, etc.

Individual Soviet citizens increasingly viewed gold as a storehouse of value, particularly as the economic situation deteriorated. The Soviet press was filled with discussions about inflation and devaluation of the ruble. Although there was no legal market for gold in the U.S.S.R., except for state outlets, which purchased gold items at set prices in rubles, long lines for purchasing gold were present at all jewelry stores. And many of these jewelry stores' shelves were bare because citizen rushed to buy gold in its only legally obtainable form. At the start of 1990, the Soviets doubled the domestic ruble price of gold in jewelry to try to control the rush for gold. The price of gold for making false teeth remained unchanged.

Despite the rise in domestic gold prices, the "gold fever" had not been stemmed. According to an article in Izvestiya, January 12, 1990, shortages of gold items persisted, and the black-market price for gold had risen from 50% above the state set price to up to 100% above the state price. The author refuted the rumor that it was foreign tourists who were lining up at Soviet jewelry stores to buy gold item at bargain rates, and stated that, instead, he saw in these lines "Soviet women in Soviet overcoats and Soviet boots."[46]

The improving of relations between the U.S.S.R. and the United States opened the way for a series of scientific exchanges between Alaska and its Siberian counterpart, the Magadan Oblast'. Representatives from the University of Alaska, Fairbanks School of Mineral Engineering, the Alaska mining industry, and the U.S. Bureau of Mines become the first Americans to visit some areas of Magadan Oblast' since World War II. On that previous trip, Vice President Henry Wallace was shown the gold fields as proof of the Soviets' ability to pay American war loans.

Magadan Oblast' is the Soviets' leading producer of gold, supplying perhaps a quarter of the entire country's new gold production. Gold placer mining has been the traditional mainstay of the Magadan mineral industry. Major hardrock mining is only a recent development in Magadan. In the upper Kolyma placer region of the Oblast', the Americans saw many examples of operational technology at mining sites. They were impressed with the scale of production and innovations that the Soviets had adapted to large-scale mechanized placer mining. Despite heavy-equipment shortages in the U.S.S.R., the country had developed this industry well beyond that found in North America. Soviet gold operations are huge. At least 400 million cubic meters of frozen material—overburden and paygravel—are moved annually in Magadan. To cope with persistent shortages of equipment within the Kolyma mining district, the Soviets constructed a steel mill, foundry, and mine equipment factory to recycle scrap steel and to produce a full line of drilling equipment, sluicing plants, and even major castings for bulldozers.

Iron Ore.—In line with planned reductions of iron ore output, the U.S.S.R. fulfilled its annual 1989 production plan for iron ore by 100.4%, as actual output declined by 3% compared with that of 1988. Planned 1990 production targets for iron ore, however, were not announced. Soviet sources indicated that iron ore production over the past 15- to 20-year period had worsened largely owing to the increased depths of open pits and associated complex mining conditions. About 30% of the open pit mines operated at depths of 300 meters. Decreasing grades of ore and increasing amounts of waste rock were cited as well.[47]

In 1989, output of crude iron ore was reportedly 549.3 million tons, with open pit output exceeding 450 million tons. Seven large open pit mining and beneficiation complexes produced more than 235 million tons. Over 85% of the open pits had production in excess of 10 million tons per year with the largest open pits producing more than 40 million tons

per year. The average depth of open pits was 200 meters, with one-third of the open pits deeper than 300 meters. About 45% of total ore output came from open pits deeper than 250 meters. Ore grades had over the years been continually worsening. More than 90% of ore was beneficiated by a system that involved fine crushing, dry and wet magentic separation, and flotation.

Underground mines accounted for about 75 million tons of crude iron ore output. Plans to the year 2005 did not call for a significant increase in underground iron ore output.

In 1989, iron ore exports, including pellets, totaled 39.8 million tons, and iron ore was exported to 11 countries. Iron ore production dereased in the three main producing republics, the Ukraine, the Russian Soviet Federative Socialist Republic (R.S.F.S.R.), and Kazakhstan.

The Krivoy Rog basin in the Ukraine was still the country's chief iron ore-producing region, accounting for more than 40% of the country's output, but production at Krivoy Rog had been declining during the past decade. However, in the second most important iron ore-producing region, the Kursk Magnetic Anomaly in the R.S.F.S.R., production had been steadily increasing. The Kursk region contains three large open pit operations, Stoylo, Mikhaylovka, and Lebedi, with major expansion of capacity occurring at Stoylo. Despite the increased production at Kursk, production in the R.S.F.S.R. decreased because of decreasing production in other regions, including the Urals.

Iron and Steel.—Results for 1989 gave plan fulfillment at 99%, 99.6%, and 99% for crude steel, rolled steel, and steel pipes, respectively. Pig iron production declined in 1989. Moreover, the production plan was not met for higher quality products such as cold-rolled steel, high-alloy drilling pipes, and cold-drawn sectional steel. Also, reductions in deliveries of iron and steel scrap and coking coal negatively affected the industry. In 1989, scrap deliveries, which in prior years averaged about 50 million tons per year, declined by 10% or approximately 5 million tons.[48] The scrap shortage was attributed in part to enterprises selling scrap abroad for hard currency rather than delivering it to domestic markets. Coking coal shortages were attributed in part to the strikes that occurred in the country's coal mines.

Although the U.S.S.R. remained the world's largest producer of crude steel in terms of gross weight of output, its steel industry lagged significantly behind Western market economy countries in respect to technology and efficiency. Despite a Soviet crude steel output level that was twice that of the United States and almost 60% larger than that of Japan, the actual output of rolled steel in these countries was more comparable. In commenting on the inefficiencies in their steel industry, a Soviet writer noted that the ratio of products to crude steel was significantly lower than in advanced market economy countries such as Japan or the United States.[49]

To modernize its steel industry, the U.S.S.R. planned to decrease its reliance on open-hearth furnaces and, instead, rely more on electric and oxygen converter furnaces, combined with an increased use of continuous casting and minimills that would broaden the product range and raise the efficiency of the industry. In 1989, the country's share of oxygen converter and electric furnace steelmaking rose to 46.5% of total steelmaking from 46% in 1988. The balance was produced by the open-hearth process. However, new capacities for electric furnace smelting, as well as those for producing large-diameter, cold-resistant anticorrosive welded pipes, scheduled for startup in 1989, were not commissioned during the year. Although the use of continuous casting rose by 3% in 1989 over the 1988 level to constitute about 18.2% of steel output, less than one-third of the plan to commission continuous casting facilities was achieved.[50]

In 1989, the steel industry's foreign commercial activities included the formation of a joint-venture consortium called Elmet Engineering to design and install both software and hardware for automating Soviet steel plants. The consortium members include Chermet Automation of the U.S.S.R., controlling 68.5% of the venture, as well as engineering and design subsidiaries of Italian, Swiss, Finnish, and Bulgarian companies. Investors would be paid in steel products produced in the U.S.S.R., which would be marketed by consortium members Coe & Clerici of Italy, Interhortus of Switzerland, and Eke Engineering of Finland.

Austria's Voest-Alpine A.G. reported reaching an agreement with Uralmash of the U.S.S.R. to form an equal-share joint venture to produce continuous casting equipment for the Soviet steel industry. Also, in January 1990, Voest Alpine contracted for the delivery of a 320,000-ton-per-year hot-dip galvanizing line to the Magnitogorsk steelworks. Construction of this facility was scheduled to begin in August 1991, and completion was set for mid-1992. Some of the equipment would be supplied by Uralmash at Sverdlovsk.

Steel trade with the United States in 1989 included the sale of 60,000 tons of cold-rolled steel coils by the USX Corp. to the Soviet foreign trade organization Promsyr'yeimport. Promsyr'yeimport also concluded two contracts with U.S. Steel International Inc. for delivery to the U.S.S.R. of 40 tons of seamless pipe for the petroleum and gas industry and for 80,000 tons of galvanized sheet steel. Other commercial developments involved the sale of technology for plasma conditioning of steel surfaces, developed by the E.O. Paton Electric Welding Institute of Kiev, to Shasta Technology of the United States. Additionally, a joint venture called Intermet was arranged between Metvac Inc. of the United States and the Moscow Steel and Alloys Institute to develop new processes and materials in the field of vacuum technology and powder metallurgy. The Soviet side would supply the facilities for the enterprise in Moscow and a vacuum rolling mill; Metvac Inc. would contribute technology and coating know-how.

The R.S.F.S.R. and the Ukrainian S.S.R. continued to form the hub of iron ore mining and steelmaking in the U.S.S.R., producing 90% or more of the country's iron ore, pig iron, and steel products. While crude steel was produced in all 15 republics, rolled steel was produced in 9 republics (R.S.F.S.R., Ukraine, Byelorussia, Uzbekistan, Kazakhstan, Georgia, Azerbaidzhan, Moldavia, and Latvia), and pig iron was produced in only 4 republics (R.S.F.S.R., Ukraine, Kazakhstan, and Georgia). Table 2 shows the geographic distribution by republic of the production of crude iron ore, pig iron steel, and rolled steel.

During the 1986-90 period, the change from open-hearth to oxygen converter furnace production was planned to occur in a large part at the Magnitogorsk, Krivoy Rog, Novokuznetsk, Zaporozhye, and Lipetsk steel mills. However, all planned changes at these plants were be-

TABLE 2

U.S.S.R.: PRODUCTION OF IRON ORE, PIG IRON, CRUDE STEEL, AND ROLLED STEEL, BY REPUBLIC

(Million tons)

Republic	Iron ore			Pig iron			Crude steel			Finished steel		
	1980	1988	1989	1980	1988	1989	1980	1988	1989	1980	1988	1989
Armenia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Azerbaidzhan	1.1	0.7	0.7	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Byelorussia	—	—	—	—	—	—	(1)	1.1	1.1	(1)	(1)	(1)
Estonia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Georgia	—	—	—	0.8	0.7	0.7	1.3	1.5	1.4	1.2	1.2	1.2
Kazakhstan	25.8	24.3	23.8	4.8	4.9	5.3	6	7	7	4.1	4.9	5.0
Kirgiziya	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Latvia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Lithuania	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Moldavia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Russia	92.4	109	107	55.2	61.5	61.5	84	94	93	59.7	66.4	65.9
Tadzhikistan	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Turkmenistan	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Ukraine	125	116	110	46.5	47.4	46.5	54	56	55	36.0	40.0	39.9
Uzbekistan	—	—	—	—	—	—	(1)	1.0	1.1	(1)	(1)	(1)
U.S.S.R. total	245	250	241	107	115	114	148	163	160	103	116	116

[1]Reported production less than 1 million tons.

Source: Promyshlennost' SSSR, Statisticheskiy sbornik (U.S.S.R. Industry, Statistical Compendium), Moscow, State Committee for Statistics, 1990.

hind schedule. At Magnitigorsk, the country's largest steel mill where all output was from open-hearth furnaces, a million-ton-capacity oxygen converter furnace was installed in late 1989, but did not appear to be operational. Some older open-hearth capacity was shut down in 1989 because of pollution problems at the Azovstal' and Il'yich plants in the Ukraine.

In an effort to expand direct-reduction steelmaking, in 1989 at the Cherepovets plant, an experimental unit was commissioned for direct process steel smelting to produce sponge iron. A similar unit had been commissioned at the Orsk-Khalilovo plant in 1988. The main center for direct-reduction steelmaking was Staryy Oskol near the Kursk Magnetic Anomaly. Staryy Oskol had four electric furnaces in operation, and, in 1989, a fifth electric furnace with a 150-ton-per-melt capacity was being installed with planned commissioning in 1990.

In October, Truboprom, a steel pipe producers' association, was formed under the Ministry of Metallurgy to promote exports of steel pipe, increase productivity, control costs, and transfer production from unprofitable plants to profitable ones. The enterprises within Truboprom produce the entire range of tubes and pipes, including high-quality products for oil and gas pipelines, which the country also imports. Although the U.S.S.R. is the world's largest steel producer, the country was still a large importer of high-quality steel from the West. Steel imports, however, declined in 1989 as the U.S.S.R. tried to save hard currency. In 1989, the U.S.S.R. imported 3.486 million tons of rolled steel in comparison with 4.743 million tons in 1988 and imported 2.731 million tons of steel pipe in comparison with 3.966 million in 1988.

Manganese.—Manganese production, which in 1988 fell to a 10-year low of 9.1 million metric tons of marketable ore, remained at this level in 1989. Manganese exports in 1989 fell by more than 10% to 895,000 tons, the lowest export level since 1964. Manganese exports again went almost entirely to East European countries. Although the U.S.S.R. is the world's largest manganese producer, for almost the entire decade it has suffered from a shortage of high-grade ore owing to depleting reserves at the Chiatura complex in Georgia, the only major source of high-grade ore, and has been importing up to ½ million tons of high-grade manganese concentrate per year. Attempts are now being made to mine low-grade carbonate ore to compensate for depleting reserves of high-grade as well as lower grade oxide ores. However, the Soviets have not satisfactorily mastered the processing technology for upgrading this carbonate ore. The country's future manganese supply will be dependent in part on its success in utilizing these carbonate ores. However, the Soviets could also considerably increase their manganese supply by utilizing more efficient steelmaking practices and more efficient consumption of manganese in steelmaking. The country produced twice the amount of steel as the United States and consumed two to three times more manganese per ton of steel output as did the United States.

Nickel.—In 1989, the Soviet nickel industry was reorganized with the Noril'sk mixed sulfide mining and metallurgical complex in East Siberia, the Pechenga and Monchegorsk mixed sulfide mining and metallurgical complexes and the Olenogorsk Engineering works on the Kola Peninsula, and the Krasnoyarsk platinum-group metals production plant in East Siberia being combined into the new association Noril'sk Nikel. The new association's production which was previously predominately under the control of the Minister of Metallurgy, was re-

moved from its control and is now directly subordinate to the U.S.S.R. Council of Ministers.[51] This new association controls about two-thirds of the country's nickel production, almost all of its platinum-group metals production, a large percentage of its cobalt production, and more than one-third of its copper production as well as a large portion of the country's output or more than 14 precious and rare metals, including columbium, gold, rhenium, and silver.

It appears that the formation of this new association was intended to stimulate greater efficiency and production for the world market by offering these enterprises greater managerial autonomy, fiscal responsibility, and profit-earning capabilities as part of the new association. A similar type of independence was granted to the gold- and diamond-producing sectors; these sectors are also predominately producing output for sale on the world market and are significant earners of hard currency for the country.

The new association Noril'sk Nikel, which, under the previous system, had to channel all production for sale abroad through the state trading company, Raznoimport, began seeking other outlets for marketing its output abroad. However, licenses permitting exports of output from Noril'sk Nikel still appeared to be required. This export permission, of course, was granted for a substantial portion of the association's output, and the new association appeared free to conduct business with foreign as well as domestic firms.

A major news item in the metals industry in 1989 was the explosion of a 40-kilometer section of gas pipeline that supplied both the Noril'sk mining and metallurgical facilities as well as the inhabitants of the city of Noril'sk. Although the temperature at the time of the explosion was minus 33 C, the pipeline was repaired in about 10 days. Unlike the platinum-group metals market, the nickel market did not react strongly to this news from Noril'sk.

In 1989, following the trend of the past several years, the Soviets again appeared to have increased nickel exports with an estimated record-high export of about 95,000 tons. During the year, the U.S.S.R. was negotiating with Finland's Outokumpu Oy concerning a joint venture to develop a nickel-copper mine 80 kilometers from Pechenga on the Kola Peninsula with a projected production of 2 to 3 million tons per year of ore yielding 15,000 tons per year of nickel. The project is to exploit the underground portion of the Tundrovoye deposit where an open pit has been operating for more than 30 years. The ore would be used as feed for Outokumpu's Harjavalta smelter in Finland. A final decision to carry out this joint mining venture, however, had not be reached.

Pollution from the nickel industry on the Kola Peninsula was seriously affecting the Scandinavian countries that were exploring initiatives to modernize the Soviet nickel industry and control pollution.

Platinum-Group Metals.—The U.S.S.R. and the Republic of South Africa produce practically the entire world's supply of platinum-group metals. Any event that could affect platinum-group metals output or demand is quickly perceived to affect the world's platinum-group metals supplies.

Several such events occurred in 1989. For example, the experiments at achieving cold fusion in which particularly palladium but also platinum were used stirred these markets at instances where there were indications of success. Although controversial in the West, the subject of cold fusion was attracting a good deal of research in the U.S.S.R. Also, in November, a gas pipeline explosion that destroyed 40 kilometers of gas pipeline supplying the Noril'sk mining and metallurgical complex in East Siberia, which is the major source of platinum-group metals in the U.S.S.R., affected the platinum-group metals market. This occurred despite the fact that shipments from Noril'sk at that time were never regular owing to weather conditions and the fact that platinum-group metals production from Noril'sk raw material occurs at the Krasnoyarsk plant more than 1,000 kilometers south of Noril'sk. The pipeline was repaired in about 10 days. During the year, indications that the Soviets were curtailing supplies of rhodium to the West caused a rise in rhodium prices. The tight rhodium market during much of the year was attributed to low Soviet supplies.

In December, it was announced that the U.S.S.R. would market the world's first legal tender palladium bullion coin in the United States termed the ballerina coin. It is a 1-ounce 99.9%- pure coin minted in a denomination of 25 rubles. The Soviets initially planned to mint 30,000 of these coins of which 3,000 would be of proof quality. The Soviets also introduced the second in a 10-year series of coins, commemorating Russian history, with the collections set including silver, platinum, and palladium coins.

In a move that created a good deal of speculation concerning Soviet intentions, in March, the U.S.S.R. imported from the United States more than 500,000 ounces of palladium, according to the U.S. Commerce Department. This marked the first time in history that the United States shipped palladium to the U.S.S.R. and the first time in 5 years that the U.S.S.R. bought palladium.

Silver.—Silver was one of a few mineral commodities for which domestic production was not adequate. Efforts to alleviate the shortage of silver, which was heightened by an increase in consumption demand, was occurring through greater efforts at recycling. However, silver recovery from metallurgical wastes was being impeded by technological problems as well as environmental concerns.[52]

Silver production was also being increased through the development of hard-rock gold-silver mining in Magadan Oblast' in the Soviet Far East. Mines under development included the large Dukat gold and silver mine in Magadan Oblast' where there were both underground and surface mining. Dukat and other gold-silver mining projects in Magadan Oblast' were administered by the Severovostokzoloto (North East Gold) mining association.

Industrial Minerals

Asbestos.—The Uralasbest mining and beneficiation complex was the largest producer of asbestos, producing more than 50% of the country's total output. The enterprise planned to increase its output by 8% by 1995 by raising production at the Bazhenovskiy deposit by up to 12% and by developing the Krasnouralsk asbestos deposit. Uralasbest supplies more than 4,000 domestic enterprises with asbestos and asbestos products and exports more than 30% of its production of asbestos products.

Efforts were being made to increase asbestos production at the Kustanayasbest complex in the Dzhetygarinskiy rayon of Kustanay Oblast', Kazakhstan. The complex was developed in three stages with a total planned production of

TABLE 3

U.S.S.R.: OUTPUT AT KUSTANAYASBEST

Indicator		1986	1987	1988	1989	1990 (planned)	1990 (actual)
Mined material	million tons	57.0	58.0	61.0	62.0	70.0	64.0
Ore extraction	do.	7.0	6.8	7.6	7.4	10.5	8.7
Maximum depth of the open pit	meters	190	195	210	210	240	225
Asbestos production	thousand tons	413.5	432.3	455.0	470.0	520	520

Source: Gornyy zhurnal (Mining Journal) Moscow, No. 10, Oct. 1990, p. 27.

745,000 tons per year of asbestos. The first stage was commissioned in 1965, and the second and third stages in 1974. Maximum output at Kustanayasbest was achieved in 1980 when the complex produced 641,300 tons of asbestos from 11 million tons of ore.

Owing to a number of technical difficulties in developing this complex, including problems with the open pit development, the beneficiation plants, and the equipment, production decreased annually from 1980 to 1986. With the resolution of a number of technical difficulties, production at Kustanayasbest increased from 1986 to 1990. Table 3 shows production at Kustanayasbest from 1986 to 1990.

Reserves at Kustanayasbest are sufficient to meet planned production goals. Kustanay ranks second in the U.S.S.R. in asbestos reserves, with 20.8% of the country's economic reserves.

Cement.—Cement output again increased in 1989. Both cement output and consumption in the U.S.S.R. were greater than in the United States owing to differences in types of construction materials used and construction techniques, as well as heavy cement losses in transportation and construction in the U.S.S.R. The U.S.S.R. produced mainly portland cement, which accounted for about 70% of total output.

Only about 19% of cement was produced by the energy efficient dry processing method. Efforts were being made to increase the percentage, in part, by utilizing imported Western equipment. Besides lagging behind Western countries in dry processing, the Soviets were also behind in automation and process control and were using much outdated equipment that needed replacement and modernization. In 1989, there were no joint ventures with the Soviet cement industry.

In 1989, there were 90 major cement plants in the U.S.S.R., with at least two new plants commissioned in 1989. These were the Bryansk plant with a capacity of 650,000 tons per year and the Achinsk plant with a capacity of 400,000 tons per year. In addition, three plants were under construction: the Serebryakovsky plant in the Volgograd region with a capacity of 770,000 tons per year, the Navoy plant with a capacity of 150,000 tons per year, and the Araratskiy plant in Armenia with a capacity of 1.2 million tons per year.

The U.S.S.R. was traditionally an exporter of cement to East European countries and developing countries of Asia and the Mideast.

Diamonds.—According to a Soviet representative interviewed by Jewelery News Asia in Hong Kong in June 1990, the U.S.S.R. produces about 15 million carats of rough diamonds annually, of which about 7.5 million carats are excellent gem quality. The Soviets export about 6 million carats of gem-quality diamonds annually.

While kimberlite deposits in Yakutia now are the principal source of Soviet diamonds, other deposits have been discovered in Kazakhstan near Lake Balkhash and near Arkhangelsk in the European North. Diamonds are reportedly of good quality in both regions.

A deposit composed of five kimberlite pipes locally in the Arkhangelsk region about 1 kilometer northeast of Arkhangelsk in the area of the Zolotitsa River was proclaimed as the "discovery of the century" in the Soviet publication Soviet Union. The Soviet newspaper Izvestiya, September 25, 1990, declared that the diamond deposit in Arkhangelsk is "richer than Yakutia." Up to one-half of the diamonds are of jewel quality." Soviet geologists stated their discoveries near Arkhangelsk are "only the first link in a chain of new deposits in the European part of the U.S.S.R. Reportedly, the Pomor Almaz enterprise was engaged in developing six diamond mines in this region, with first output planned for the late 1990's.

Phosphate.—Explored reserves of phosphate raw material total 2.1 billion tons P_2O_5, and 60% of these reserves is on the Kola Peninsula and in Kazakhstan; in these two locations 90% of the country's phosphate productions occurred.[53] The uneven geographic distribution of phosphate production was hampering the country's agricultural production as phosphate had to be shipped from these two places throughout the country. In areas of Siberia especially, this created a complex and costly transport problem. Therefore, one of the major priorities for the phosphate industry was discovering new high-grade and/or easy-to-beneficiate phosphate deposits dispersed throughout the country.

At some deposits that were slated for development, plans had to be changed. In Estonia, environmental concerns had halted phosphate development; at the large, low-grade Seligdar deposit in Siberia that was planned for development during the 1986-90 periods, the high costs associated with development forced cancellation of these plans. It was recommended that new development occur at a number of smaller explored deposits dispersed throughout the country.

At the apatite production association on the Kola Peninsula, the largest and most high-quality source of phosphate raw material, production for the period 1991-95 was planned to stabilize at its current high level of about 20 million tons per year of apatite concentrate averaging about 39% P_2O_5. In 1988, the apatite association reportedly produced 20.04 million tons of apatite concentrate.[54] About one-fourth of the apatite concentrate pro-

TABLE 4

U.S.S.R.: CEMENT PRODUCTION, BY TYPE

(Thousand tons)

Year	Portland	High early strength	Blast furnace slag	Puzzolan	Decorative	Oil well	Alumina	Sand	Others
1986	92,456	8,453	35,022	3,763	753	2,344	103	200	468
1987	94,103	8,552	35,998	3,409	767	2,361	111	136	519
1988	95,776	10,012	29,049	2,929	780	2,543	101	137	90
1989	97,396	10,929	27,556	2,896	789	2,529	107	144	128

Source: Rock Products, May 1990.

TABLE 5

U.S.S.R.: PRODUCTION OF CEMENT, BY REPUBLIC, 1989

(Thousand metric tons)

Republic	Quantity
Armenia	1,639
Azerbaidzhan	1,058
Byelorussia	2,283
Estonia	1,129
Georgia	1,530
Kazakhstan	8,650
Kirgiziya	1,408
Latvia	776
Lithuania	3,410
Moldavia	2,258
R.S.F.S.R.	84,518
Tadzhikstan	1,110
Turkmenistan	1,057
Ukraine	23,416
Uzbekistan	6,194
U.S.S.R. total	140,436

Source: Narodnoye Khozyaystvo SSSR v 1989 g, Statisticheskiy Sbornik (The National Economy of the U.S.S.R. in 1989, Statistical Compendium) Moscow, Finansy i Statistika, 1990, p. 399.

duction was exported.

In 1989, at the apatite association, mining occurred at three underground mines and two open pits; three beneficiation plants were operating. For the past decade, new development occurred primarily at the open pits that compensated for falling output at the underground mines. To maintain production levels for the next 5 years, it would be necessary to further develop the underground mines. This would require using state-of-the-art domestic and imported equipment. Exploitation of these deeper levels where the ore has a lower P_2O_5 content would be made more economically feasible if better use was made of associated nepheline syenite and its byproducts.[55]

Potash.—The U.S.S.R. claimed to have the world's largest potash reserves, which were primarily in the Western half of the country in the Urals, Byelorussia, and the Ukraine. About 90% of explored reserves had a K_2O ore content of between 10% to 28%. Potash mining occurred at three locations: Verkhnekamsk in the Urals; Starobin in Byelorussia; and Kalush-Golynsky in the Ukraine. The Nepskoye deposit in the Katangskiy rayon of Irkutsk Oblast', East Siberia, was considered one of the most significant potash deposits still to be developed. Annual production averaged over 10 million tons per year K_2O. Potash exports were between 5.3 million and 5.8 million tons K_2O annually.

In Turkmenistan, a second experimental commercial plant for leach mining potassium salts was put into operation at the Karlyuk deposit in March. The leaching technology was based on methods developed in the German Democratic Republic for leaching carnallites.[56] A third plant was planned, and, reportedly, a potassium-base fertilizer works would be built nearby with U.S. assistance.

Sodium Compounds.—In 1989, the U.S.S.R.'s production of caustic soda declined 4% below the output level of 1988 and was 5% below the planned output target for the year. According to Soviet data published for 1989, 73% of the U.S.S.R.'s soda ash output was produced in the R.S.F.S.R.; the balance, or 26.3%, was produced in the Ukrainian S.S.R. During the same period, the country's production of caustic soda was distributed as follows: 73% was produced in the R.S.F.S.R., 14.8% in the Ukrainian S.S.R., and 2% in the Kazakh S.S.R.[57]

In 1989, in Turkmenistan, the production of sodium sulfate declined by 3% compared with that of 1988. Turkmenistan's output of 259,000 tons of sodium sulfate fell short of the annual plan by 13%.[58] The Karabogazsulfat operation in Turkmenistan was the U.S.S.R.'s major producer of sodium sulfate and other commercially useful sodium compounds, including bishofite, Glauber's salt, and epsomite.

Sulfur.—The U.S.S.R. claimed to have the third largest reserves of native sulfur in the world. The large majority of these reserves are in the western part of the country, with more than one-half of the explored reserves in the Carpathian foothills basin in the Ukraine. Here, more than 80% of the country's production of natural sulfur occurs. Production by the Frasch process began in Turkmenistan at the Guardak deposit in 1971 and exceeds 800,000 tons per year. By far, the largest source of sulfur production was from processing sour gas, which was considered to be the major source of additional future sulfur output.

Mineral Fuels

The U.S.S.R.'s energy development plan that was based, in part, on oil production stabilizing and coal production increasing suffered a setback in 1989 with the decrease in both oil and coal production. The fall in oil production presented a more serious long-term problem than did the drop in coal production for which labor unrest played a major part. Furthermore, oil production in the largest production regions possibly peaked, and new oil reserves are not of the same magni-

tude; large coal reserves, however, awaited development.

Oil exports were the mainstay of Soviet hard-currency earnings, and falling oil production appeared to have affected oil exports in 1989, which also fell. Exports of natural gas, although significant in the country's hard-currency earnings, composed only a small percentage of these earnings compared to oil. In 1989, natural gas exports increased by about 15% in comparison with those of 1988. Owing to limited new markets, increased natural gas sales would not be able to compensate for lost hard-currency revenues from falling oil exports. Both oil and gas production were conducted at great expense, and the cost of their development in comparison to the earnings they generated would be looming larger in Soviet planning as the U.S.S.R. attempted to introduce market disciplines into the economy.

The development of mineral fuels in the coming decades would entail major costs. Much of the pipeline network used to transport oil and gas was in need of replacement because of corrosion, and there would be major costs for replacing the majority of compressors for gas pipelines. Costs for developing new oil and gas deposits would be even higher because the new deposits are located in more remote locations with severe climates and lack of infrastructure or in offshore or other regions that require state-of-the-art equipment and technology to develop and process the output. There would also be large costs involved in developing the country's coal resources. It would require large investments to maintain production at older coal deposits where reserves were being depleted and large investments in technology and transport means for exploiting Siberia's huge low-grade lignite reserves.

Opportunities existed for improving economic efficiency in the production and consumption of mineral fuels. The U.S.S.R. consumed a much higher percentage of fuel per unit of output than did advanced industrial market economy countries, and there was much opportunity for conserving resources through introducing fuel conserving technologies.

Many of the problems that the oil and gas sectors faced were the results of past decisions that stressed speed of development and achieving ever-increasing quantities of output over long-term economic considerations. As the U.S.S.R. under "Perestroyka" moved toward greater efficiency in the development and use of its mineral fuel resources, it was making an effort to cooperate with Western firms to increase output at existing deposits, develop new deposits, and produce more value added products from its hydrocarbon output.

Coal.—In 1989, coal production fell 4% below the 1988 level, owing in part to a series of strikes that affected coal mining operations in major coal mining regions. Another reason stated for the fall in output was the lack of demand for low- quality coal.[59] Coal output fell a total of 32 million tons, of which 7 million tons was attributed to the strikes. Coking coal fell by 6% in comparison with the 1988 level, and the U.S.S.R. Ministry of Metallurgy failed to receive 3 million tons of coking coal called for by the plan. In addition, 13 million tons or 42% of additional coal mining capacity and 18.7 million tons or 100% of planned coal beneficiation capacity were not commissioned.[60]

Also, there was a shortfall of almost 2 million tons of coal planned for export. Exports of coal totaled 37.5 million tons in 1989 in comparison with 39.4 million tons in 1988, while exports of coke totaled 2.297 million tons in 1989 in comparison with 2.315 million tons in 1988. Coal imports in 1989 were 10 million tons in comparison with 11.9 million tons in 1988. Coke imports, however, rose from 1.8 million tons in 1988 to 2.1 million tons in 1989.

Regionally, production fell significantly in the Ukraine where the Donets Basin, the largest producing basin in the country and a producer of high-quality coals, including coking coal, is located. Total production was planned to decrease in the Ukraine by 8.3 million tons, but actual deliveries fell by 11.6 million tons in comparison with those of 1988. Production of coking coal in the Ukraine fell by 6.4%. The Donets Basin is one of the oldest coal mining regions, and production is falling owing to depleting reserves and the accompanying worsening of ore grades and increasing depth of mines. The average depth now exceeds 600 meters; about 40% of the mines in the Donbas operate at a depth of from 700 to 1,200 meters; and 22% of the coal is found in seams less than 0.7 meters thick.

Decreases in production and planned mine closings in the Donets Basin have aroused intense discussion concerning the future development of the basin and the fate of the work force.

In Kazakhstan where the Karaganda and Ekibastuz Basins are, coal production fell by 6%. This decrease was attributed to a fall in demand for the subbituminous coal from the Ekibastuz Basin where the ash content at times exceeded 50%. At the Karaganda Basin, which experienced labor unrest, there was a 5.9% decrease in coking coal output.

In the country's largest republic, the Russian Republic containing a number of coal basins, including the country's second largest producer, the Kuznetsk basin, production fell by 9% in comparison with the 1988 level. Strikes were primarily faulted for shortfalls in coal deliveries.

Plans called for a long-term growth in coal output. To achieve the increases envisioned in table 7 would require, by the year 2005, adding 450 to 520 million tons of new coal mining capacity, resulting in a total increase in capacity of 215 million tons accounting for depletion of reserves. A major objective for 1995 was increasing the quantity of open pit production to the point where it was equal to underground production. Open pit production in 1989 accounted for 45% of total coal output.

The entire growth in coal output was planned to come from the eastern regions of the country, mainly in the Kansk-Achinsk, Kuznetsk, and Ekibastuz Basins. In the European part of the country where the Donetsk, Podmoskovye, Pechora, and other basins are, plans call for stabilizing output by renovating existing underground mines. Some new underground mine production was planned to compensate for depleted reserves, and new open pit development was planned in the Dnieper brown coal basin for supplying the Ukraine. Production in the European portion of the country was planned to remain at its current level until the year 2000, at which point production, it was envisaged, would start decreasing.[61]

To accomplish these goals would require large-scale introduction of state-of-the-art technology and equipment in the coal mining sector. Also, to accomplish these goals would entail a major increase in coal beneficiation capacity. Plans called for increasing the amount of coal annually undergoing beneficiation in the next 10 to 15 years from the present level of about 350 million tons to 490 to 505 million tons yielding 270 to 280 millions tons of concentrate. Problems of increas-

TABLE 7

U.S.S.R.: PLANNED PRODUCTION INCREASES IN THE MAJOR COAL PRODUCTION BASINS

(Million tons)

Basin	1985 actual production	1990 planned production	Long-range plan		
			1995	2000	2005
Donets	197.1	194.8	188—193	184—193	178— 193
Kuznetsk	141.4	156.3	165—170	178—188	193— 213
Kansk-Achinsk	40.7	62.3	70— 75	115—130	165— 180
Ekibastuz (including Maykyuben)	80.5	93.2	95—100	120—125	130— 135
Total for U.S.S.R. Ministry of the Coal Industry	718.0	785.3	807—827	887—906	984—1,034

Source: Ugol' (Coal) Moscow, No. 8. Aug. 1989, No. 4

ing beneficiation facilities would be most acute in the Donets Basin owing to the worsening coal quality and the Kuznetsk Basin owing to the need to transport the coal long distances.[62]

Natural Gas.—In 1989, the Ministry of the Gas Industry was abolished and the natural gas producers united in a new type of organization termed the "Gaz Kontsern Gazprom." This new concern, apparently, is created to allow the natural gas processing enterprises and association to operate more independently under the rights specified in the Law on Socialist Enterprises, but still, however, within the framework of the new entity "Gazprom." Although the former Ministry of the Oil Industry was renamed the Ministry of the Oil and Gas Industry, it appeared that enterprises that were primarily producers of natural gas became part of the new "Gazprom" concern.

The Soviet gas industry fulfilled its 1989 production plan by 100.6%, raising the output of natural gas to 796 billion cubic meters or a 3% increase over the 1988 output level. However, the rate of increase of natural gas was only about one-half of that achieved on average in the 1980's. The production plan for 1990 called for output of natural gas to increase between 4.9% and 6.0% compared with that of 1989, which would be within the range of 835 and 850 billion cubic meters.[63] In 1989, the industry exploited about 270 deposits and employed a more than 200,000-kilometer gas pipeline network. Gas industry byproduct production showed substantial gains during the 1978-88 period, with sulfur and helium production each increasing twofold and natural gas liquids increasing by 115%.[64]

Total Soviet exports of natural gas increased from 87.8 billion cubic meters in 1988 to 103 billion cubic meters in 1989. Exports for hard currency increased from 41.1 billion cubic meters in 1988 to 46.7 billion cubic meters in 1989. In East Europe, there was a 87% increase in gas exports to Romania. Romania signed a new 5-year agreement with the U.S.S.R. to import 7.3 billion cubic meters of gas per year, up from 3.1 billion cubic meters in 1988. The U.S.S.R.'s small imports of natural gas decreased to 30.4 million cubic meters in comparison with 1.043 billion cubic meters in 1988.

West Siberia was the country's chief gas-producing area, accounting for about 70% of the total gas output and practically the entire increase in natural gas production in 1989. The European part of the country accounted for about 13% of the total output, while Central Asia and Kazakhstan accounted for about 15% of the total. West Siberia would continue to be the U.S.S.R.'s chief source of gas production. Natural gas production could increase based on Soviet assessments of large deposits of offshore gas discovered in the Barents and Kara Seas in the European North and West Siberia. Preliminary Soviet assessments indicated that the Kara deposit's gas reserves could exceed those in the Barents Sea.[65] However, a number of issues requiring large-scale investment, apart from new field development, faced the industry. These included the replacement of large amounts of pipeline and compressors by the year 2000 and the need to increase the number of gas processing facilities for liquefied petroleum gases contained in rich natural gas. It was projected, however, that, in 1990, only 5% of the ethane and 14% of the propane-butane resources from rich natural gas would be processed.[66] Inefficient domestic gas consumption was still another key issue. Nearly all sectors of Soviet industry consumed more gas than the world average. Industries involved in the heat treatment of metal, the production of prefabricated reinforced concrete, plate glass, and ammonia were examples where gas consumption ranged from 150% to 400% in excess of world consumption levels.[67] The Ministry of the Gas Industry and other Soviet Government agencies introduced measures aimed at conserving up to 8.1 billion cubic meters of gas in 1990 through more efficient gas use.[68]

Two major gas pipeline explosions occurred during the year. In early June, a section of the West-Siberian Urals pipeline, part of a 1,860-kilometer system carrying natural gas liquids from Surgut to Chelyabinsk and Kuybyshev, exploded near a railroad crossing 89 kilometer east of Ufa in Soviet Bashkiria. The incident coincided with the crossing of two trains near the pipeline, which resulted in numerous deaths and injuries. Also, a large explosion occurred on the same line near Tobol'sk in the autumn during a trial run on a seemingly repaired section. No injuries were reported owing to the remoteness of the area of the incident. It was estimated that repair of the damaged system would take ½ year. Another explosion damaged 40 kilometers of the Messoyakha-Norilsk pipeline that supplied Noril'sk industries and municipal services with natural gas. Service was restored in just more than 1 week's time, but operations at the Noril'sk mining and metallurgical complex were affected during this period.

Serious environmental pollution problems affected the gas industry throughout the country. One major concern was the

Astrakhan sour gas processing plant near the Volga River delta. Harmful discharges from this facility affected the health of area residents and destroyed crops in the region, which led regional authorities to contemplate the plant's closure. The plant was closed for a short period during the year and, at other periods, operated significantly below capacity. The Astrakhan gas processing plant is an important source not only of natural gas, but of byproduct sulfur for the Soviet economy, and in 1989, there was a significant decrease in output from Astrakhan. The gasfield and processing plant facilities at Astrakhan were built with the participation of Western firms. Further facility expansion was under consideration with the participation of the Lavalin Co. of Canada, an expert in the field of anticorrosion technology.[69]

Nuclear Power.—Safe operations of nuclear powerplants has remained a primary concern for a significant segment of the Soviet population since the Chernobyl' accident. Numerous successful protests have been held to halt construction of new nuclear powerplants and stop operations at ones considered a risk because of seismic or other hazards. Also, there appears to be much closer monitoring of safety compliance at operating plants.

In a summary report for 1989, it was revealed that there was a total of 118 unscheduled stoppages and 100 unscheduled reductions in capacity at nuclear power plants. Although figures are not available for 1988, the 1989 figures are, reportedly, an improvement over those of the previous year.[70]

As news is updated on the Chernobyl' accident, the human and environmental toll is increasing. As of November 1989, more than 250 people reportedly died either as an immediate result of the accident or in helping contain the damage.[71] Although it is difficult to assess the ultimate environmental impact of the Chernobyl' accident, the Soviets are assessing the current situation. Reportedly, a "radiation plague" covers almost one-fifth of the territory of Byelorussia with mud from Chernobyl' "being spread further and further afield by wind, rain, and the wheels of motor vehicles."[72]

In the area around Chernobyl', one of the more serious problems appears to have been the contamination of the soil, making it unsuitable for farming. Also, thousands of people who lived in the affected area around the plant were still awaiting permanent resettlement.

Also, more information is being released concerning an accident that occurred at a plutonium production facility near Kasli in Chelyabinsk Oblast' in 1957 and was kept secret for more than 30 years. At that time, a container of dehydrated radioactive wastes exploded, sending a cloud of radioactive substances measured at a level of 2 million curries spread over an area 105 kilometers long and 8 to 9 kilometers wide. Some 10,200 people were, reportedly, promptly evacuated from the territory. No deaths reportedly occurred, and no noticeable deviation in the rate of illnesses was reported.[73] By 1978, agricultural activity had been resumed on 80% of the land that was contaminated, and the remaining 20% was converted into a nature ecology reserve to study any possible effects of the contamination. The nature reserve studies fish, wildlife, and many forms of vegetation. It is claimed to be the only nature reserve of its type in the world having been born of this peculiar disaster and is the basis for the emergence of what the Soviets term a new science, "radioecology."[74]

In addition to studying any lingering effects from the accident in 1957, experiments with cesium, plutonium, and strontium are conducted on the reserve on vegetation and animals. A work entitled "Guide to Eliminating the Consequences of Radioactive Accidents" was recently completed by the employees of the reserve, who include biologists, forestry specialists, chemists, zoologists, veterinarians, meteorologists, botanists, and physicists. The opinion was expressed that if the activity of the reserve had not been covered by the secrecy at the time of the Chernobyl' accident, the findings of the reserve could have been more useful in alleviating the consequences from Chernobyl'.[75]

Oil.—In 1989, petroleum production fell by 3% or 13 million tons below the planned target; the shortfall was attributed primarily to unsatisfactory work at the large associations in West Siberia, the major petroleum-producing region in the country. Along with falling oil production, oil exports, which traditionally supplied about 75% of the country's hard-currency earning, fell. In 1989, the U.S.S.R. exported 127 million tons of crude oil in comparison with 144 million tons in 1988, of which exports for hard currency fell from 49.1 million tons of crude oil in 1988 to 27.2 million tons in 1989. Exports of refinery products fell from 61 million tons in 1988 to 57.4 million tons in 1989, of which exports for hard currency fell from 40.5 million tons in 1988 to 34.6 million tons in 1989.

Serious long-term problems with the oil industry were being discussed. Doubts were arising as to whether the U.S.S.R. would be able to stabilize oil production levels or instead be faced by continually falling output. Reasons for the problems in oil production were attributed, in part, to the inadequate technological state of the industry. The following quoted paragraphs from the Soviet daily newspaper Sotsialisticheskaya Industriya (Socialist Industry), May 28, 1989, gave a good summation of the problems the country faced.

"As we know, in our economy the oilmen are the principal providers. Most of the imported grain, . . . meat, medicines, consumer goods and modern equipment are purchased with tons of oil converted into jingling coins. Were the river of oil to suddenly run dry, the country would suffer disaster. But petrodollar abundance is dripping far away from Soviet oil fields. Electronics, microprocessors and automated drilling and extraction procedures remain the property of oilmen of Alaska, California or the Arab Emirates. This is why the productivity of the labor of American drillers, for example, is five times greater than ours.

"However, nature has helped us for a rather long time. Samotlor, Mamontovo .... These are unique deposits. It is there that oil gushers allowed the Soviet Union to surpass the records of Arab sheiks within just a few years and extract over 50 million tons of oil each month. But there came a time when the gushers began to abate, and the era of gifts from nature ended. Reliance upon our own effort—that is, upon modern technology capable of effectively extracting oil from great depths—became necessary. And as always, it was unexpectedly revealed that there was nothing to rely on. The drilling equipment and the oil extraction resources were obsolete even 25 years ago. And even this obsolete, inconvenient and extremely unreliable equipment was in short supply. There were many deposits, and the wells were increasing in number, but the oil extracted from each of them was increasingly less.

"The first alarm bell sounded in the mid-1980's. For 3 years in a row, the oilmen were unable to meet their planned targets. Interruptions in fuel supply begin in the world's largest petroleum power. But then the situation was rectified. Mikhail Sergeyevich Gorbachev traveled to the Tyumen' North in September 1985. He gathered together the exectives of all interested departments in Surgut. 'In general,' reads a report of the Tyumen' Oblast' Party Committee, 'measures to provide assistance, adopted by the party and government after M. S. Gorbachev's visit to Tyumen' Oblast', made it possible to ensure further growth of oil and gas extraction volumes and to sharply intensify cultural, personal and housing construction . . . . Fifty-six new deposits were placed into operation.'

"But here is what a summary from the State Committee for Statistics for the first quarter of the current year says: 'Oil extraction has fallen by 3 percent. What is this? A chance failure? No, from all appearances this is the second alarm bell. The news coming from the Tyumen oil fields is so bad that only a further decline can be predicted. And a much steeper one than 4 years ago. At the end of last year almost 800 (!) wells suffered downtime in excess of the standards. Today there are already almost a thousand of them. And if in the estimation of specialists the shortfall in Western Siberia was 15 million tons of oil last year, this year the shortfall may double, and even triple.'

"And so, repetition of the past. The energy imparted by the nudge in September 1985 was enough to last only 3 years."[76]

The labor unrest that affected major sectors of the Soviet economy, including the rail transport sector, had a negative effect on oil production as did the ethnic unrest in the Republic of Azerbaidzhan that produced a large percentage of the equipment for the oil industry. Also, a major crisis loomed in the spring of 1990 as the oil and gas workers from Tyumen Oblast' in West Siberia threatened to go on strike concerning demands regarding food and housing as well as being able to retain additional hard currency from the sale of their output.

The U.S.S.R. was engaged in a program to develop a number of new oilfields outside the West Siberian complex. Among the most prominent of these is the large Tengiz field in Kazakhstan where Soviet officials placed reserves at more than 25 billion barrels; but development presents serious technological difficulties because of its high hydrogen sulfide content. Western firms were to participate in oil development at Tengiz.

Opportunities were emerging throughout the country for Western oil companies that could provide technology for drilling in difficult conditions and assist in lowering costs. Conditions at the Tengiz Field provide opportunities for Western investors, as do conditions at many other Soviet fields.

The U.S.S.R. also was negotiating joint ventures with Western firms to improve efficiency at opertating oilfields and to produce more value added products from petroleum output.

Oil Shale.—The Estonian S.S.R.'s Estonslanetz production association, which produced more than 80% of the U.S.S.R.'s oil shale, reported several fatalities early in 1989 from an explosion at the Oktyabrskiy open pit shale mine because of unsafe explosives used in the industry. The explosives were recalled and would be replaced by safer and more environmentally sound explosive materials developed by an enterprise in the defense sector being converted to civilian use. A fire that caused concern among Estonia's health officials broke out at a shale tar dump belonging to the Shale Chemical Production Association at Kohtla-Jarve. The fire was contained with some difficulty. Pollution from oil shale-fueled powerplants remained a serious problem. In 1988, the four oil shale-fueled electric powerplants in Narva, Estonia, reportedly generated 380,000 tons of sulfur dioxide and 200,000 tons of ash.

Peat.—Owing to a lack of fuel for household needs and fertilizer raw materials in the eastern U.S.S.R., as well as for environmental considerations, the U.S.S.R. is considering expanding the use of nontraditional raw materials such as peat for fuel and agricultural use. The resource base in Siberia and the Soviet Far East is significant. Reserves in these areas constitute 71% of the total reserves of the country, of which West Siberia, East Siberia, and the Soviet Far East hold 91.4%, 3.4%, and 5.2%, respectively, of this 71%.[77] West Siberia contains 54 peat deposits, which Soviet sources assess at 336 million tons of overall resources and 24 million tons in the category of explored reserves considered economic in accordance with Soviet reserve classification standards. However, not all of these deposits may be suitable for development because of geographic, economic, and technical factors.[78] The greatest portion of these deposits is in the Altai Kray and Novosibirsk Oblast'.[79] Despite large peat reserves, shortages of peat were reported in some regions, and it was recommended to more extensively develop Sapropel reserves, many of which are colocated in peat deposits.

Uranium.—Information on the Soviet uranium industry was, for many decades, one of the most secretive areas of the Soviet mineral industry, and very little descriptive information, let alone data, appeared in Soviet publications on their uranium industry. However, in 1989, with the policy of "glasnost'," descriptive information on this industry began to be published. Following is a synopsis of a description of the Soviet uranium industry that appeared in an article in the Soviet journal Atomnaya Energiya, April 1990.

Extensive geological prospecting began for uranium in 1946. Prior to that, only one deposit, Taboshary, near Tashkent, had been known in the U.S.S.R. It was opened in 1931, and a pilot radium plant operated on its base. Industrial deposits on the territory of the U.S.S.R. are characterized by a diversity of conditions and types. Many deposits, which have no analogs in the world, have been detected.

The most important industrial deposits occur in sandstones. Large deposits there are confined to underwater delta and coastal sea depositories, for example, the Uch-Kuduk deposit in Uzbekistan. Deposits confined to marine clay are unique, for example, deposits near Shevchenko on the Caspian Sea.

Mining is carried out by various methods, that is, by underground and open pit methods or by underground leaching. Deposits with a high content of uranium occurring in hard and stable rocks at a depth of 200 meters and more are developed by the underground mining method. Deposits having large areas with a uniform occurrence at a shallower depth and with not very hard rocks create favorable conditions for open pit mining. Underground leaching makes it possible to develop reserves of lean uranium ores occurring at different depths and under complex mining and geological conditions.

Uranium ores are processed at large

hydrometallurgical plants of the U.S.S.R. Ministry of Atomic Power and Industry with output of pure U_3O_8 and useful accessory components (molybdenum, rhenium, scandium, vanadium, gold, copper, rare-earth elements, and phosphorus, complex, and nitrate fertilizers).

Owing to the large variety of ores and the presence of accessory elements, flow diagrams of plants differ. Ore preparation flow diagrams differ, various leaching methods are used, and final stages of production of byproduct elements differ. However, all flow diagrams are nonfiltering sorptive-extractive, which predetermines their technological qualities and efficiency.

Ion-exchange technology forms the basis for industrial methods of extraction of uranium and byproduct from ores, concentrates, and natural and pit water and for the production of compounds of these high-purity elements. The high purity of produced U_3O_8 makes it possible to give up subsequent affinage and to significantly simplify the technology of fluoride and uranium metal production.

The high level of sorption technology of uranium ores has made it possible to develop similar flow diagrams for the extraction of gold, molybdenum, silver, tungsten, and so forth.

Highly productive technology and powerful mining equipment have made it possible to develop large capacity mines with high labor productivity and low mining costs.

When complex uranium ores are processed, molybdenum, phosphorus, rare-earth elements, rhenium, vanadium, and so forth are extracted along with uranium. This makes it possible to more fully utilize raw materials, to lower costs, and, what is especially important, to improve the ecological conditions of uranium mining.

Plants, where centrifugal technology of uranium enrichment is used, form the basis for the Soviet uranium enrichment industry. The first laboratory models of centrifuges were developed in the U.S.S.R. in 1952, and the first pilot plant equipped with centrifuges was put into operation in 1957. An evaluation of this operation resulted in a decision to proceed with the development of the centrifugal method of uranium enrichment.

The first industrial gas centrifuge unit was put into operation in 1959. The first industrial plant equipped with gas centrifuges in the U.S.S.R. was built and put into operation in three modules in 1962-64.

Modern designs of gas centrifuges differ significantly from the first developments both in productivity and reliability. Presently used centrifuges can operate without stopping for more than 15 years with a failure level not exceeding a few tenths of a percent annually. Domestic industrial gas centrifuges now form the bulk of the country's separating capacities.

A specialized foreign trade organization—the All-Union Tekhsnabeksport Association—which is part of the Ministry of Nuclear Power Generation, is engaged in the export of nuclear materials (enriched uranium and fuel for nuclear electric power stations) and services connected with uranium processing and enrichment, as well as of special nonnuclear materials and sources of ionizing radiation.

The provision of services connected with uranium enrichment forms the export basis of Tekhsnabeksport. Tekhsnabeksport entered the world market in services connected with uranium enrichment in the early 1970's. In order to diversify its commercial activity, in 1988, Tekhsnabeksport began deliveries of enriched uranium produced from Soviet natural uranium to clients along with long-term transactions; there were short-term contracts and, if needed, contracts for one delivery.

Recently the problem of enrichment of regenerated uranium has acquired ever greater importance. Tekhsnabeksport has already begun negotiations on this matter. Necessary research and full-scale industrial tests have been conducted. They have fully confirmed the suitability of centrifugal technology for the enrichment of such regenerated uranium and the production of a product suitable for fuel production.

Until recently, Tekhsnabeksport did not sell natural uranium. Based on market analyses, in the second half of the 1990's, there would be a demand for new uranium production capacities and new suppliers. Tekhsnabeksport could export up to 2,000 to 3,000 tons of natural uranium annually with the possibility of a subsequent increase in the volume of deliveries provided that there is a sufficient market capacity and volume of unmet demand in the world. Under the emerging conditions, Tekhsnabeksport could become a new uranium supplier—a long-term supplier relying on the substantially explored uranium reserves in the U.S.S.R. A number of issues also were discussed concerning the Soviet uranium industry. One of the issues being aired was the tragic history of forced labor used to develop uranium mining. In 1989, Western journalists were permitted to visit a prison camp at an abandoned uranium mine in East Siberia that was being turned into a memorial to the victims.[80]

As the U.S.S.R. begins to switch resources from the defense sector to the civilian sector, it has converted a number of enterprises that mine and process uranium. The Caspian mining and metallurgical complex in Kazakhstan that mines and processes uranium for military purposes operated under a blanket of secrecy for 30 years. Current as well as former activities of this complex were being openly discussed while its production was being converted to civilian purposes. By the year 2000, uranium output at this complex would be greatly reduced as it switched to the production of nonmilitary products. The complex also was a large producer of fertilizers.[81]

Issues of nuclear waste disposal also entered into public debate. With "glasnost'," citizen concern was being aroused when people found out that nuclear waste disposal sites had been located in their vicinity. One such matter receiving considerable publicity was the discovery that in Krasnoyarsk Kray, near the city of Krasnoyarsk and the Yenisey River, a complex was developed in the early 1970's to process wastes from nuclear powerplants. Toxic industrial wastes from the nuclear waste processing facilities were being turned into a liquid solution for burial in what geologists determined was a closed lens in the depths of the earth. Because of the former secrecy, public concern was great concerning the thoroughness of the study of the geological conditions where these wastes were buried and the quality of the construction work at the burial site. Also of great concern was the fact that the wastes were transported to the burial site by a 20-kilometer-long pipeline that crossed the Yenisey River, one of Siberia's main arteries. Alarm was displayed at the potential for a major catastrophe if these wastes were ever released into the Yenisey River.[82]

Citizen concern was also aroused in Latvia concerning the shipment of radioactive wastes through its territory.

Much of the Soviet trade in natural and enriched uranium was conducted through the port at Riga. Soviet authorities countered that no radioactive wastes, but rather only natural and enriched uranium were being transported through Latvia.

Nuclear cargo was transported through the Ports of Riga and Leningrad and then shipped by rail. The design of the containers used to ship the uranium products, reportedly, met all requirements of the International Atomic Energy Agency. It was claimed that, during the past 15 years, there had been no accidents with containers of natural or enriched uranium hexafluoride.[83]

Soviet policy regarding disposal of nuclear wastes called for burial of radioactive wastes with low radioactivity, including isotypes used in technology, science, and medicine as well as the instruments and clothing associated with their use and operation. These wastes are buried at about 35 sites existing on the territory of the U.S.S.R. Practically every major city in the country has a burial site of this type. Operational wastes from nuclear powerplants, reportedly, are buried at the nuclear powerplant. Used fuel is kept either at storage facilities at the nuclear powerplant or in holding pools at a fuel processing installation.[84]

The U.S.S.R. was in the process of closing down reactors producing plutonium for military purposes, including the one at Kasli where the 1957 accident occurred. As of July 1989, three reactors had been closed, and another two were scheduled for closing in 1990. Not only the accident in 1957, but also other environmental problems were associated with the operation of these reactors. Until 1951, waste products from the production unit at the facility near Kasli were dumped into the Techa River, which became entirely contaminated. This contamination was carried as far away as the Arctic Ocean. To decontaminate the Techa River, bypass channels were constructed and the waters diverted into industrial reservoirs that still present a danger to the region. A new nuclear powerplant was under construction in this region that, reportedly, would help regulate the level of these reservoirs, make use of the large stocks of requisite elements found there, and be able to employ the workers from the closed plutonium production plant.[85]

Reserves

The U.S.S.R. uses a reserve classification system that is not comparable to that in the United States, and data on reserves for the majority of minerals has been a state secret.

According to the Soviet classification system approved in 1982, deposits of all solid mineral materials are classified under two cross-imposed systems, one relating to the economic viability of the material in question and the other relating to the reliability of the information on the quantity of material in place.

Under the first system, the Soviets separate deposits into one of two categories, "balansovyye" or "zabalansovyye." The former word literally translated means balance, this term referring to the fact that materials so classified are included in studies relating to mineral reserves in places that are suitable for exploitation. This "balansovyye" material, in effect, is that which currently is regarded as viable for economic development or exploitable. The other category term, "zabalansovyye," translates literally as beyond balance, the term implying that materials so classified are not regarded as suitable for economic exploitation at present.

The second classification system relating to the reliability of information on the quantity of material in place assigns each occurrence to one of seven categories, the traditional A, B, C_1, C_2, and three more, P_1, P_2, and P_3. The first four categories are regarded as reserves by the Soviets, but some materials reported in each of these classes may not correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). The final three categories, "prognoznyye resursy" (prognosticated resources), together with "zabalansovyye" material from categories A, B, C_1, and C_2, correspond very roughly to the Western term "resources."

Mining and construction of mining enterprises and the appropriate capital investment are authorized in the U.S.S.R. on the basis of the economic ("balansovyye") reserves in place in categories A = B = C_1, which must be in prescribed ratios. Reserves in the C_2 category are also taken into account in project planning for mining enterprises to provide a general perspective of the development, but they do not constitute a justification for project planning.

All of these four categories (A, B, C_1, and C_2) are based on the data obtained on an exploration grid of prescribed density (or by its equivalent) and on certain types of chemical and other tests according to regulations. Density of the grid in each of the reserves categories is different for different kinds of ore and for five different types of ore bodies, depending on geolgoical formation.

According to Soviet classification, the reserves and resources of solid mineral raw materials in place are divided into explored ("razvedannyye")—A + B + C_1 categories—and perspective ("perspektivnyye")—C_2—category. The categories P_1, P_2, and P_3 are prognosticated resources ("prognoznyye resursy"). There are appropriate specifications for the four traditional categories.

Category A means that the reserves in place are known in detail. The ore body boundaries are outlined by trenching, exploratory boreholes, or exploratory workings; the depositional environment, the proportion of different commercial grades of the ore, and the hydrogeologic conditions of the exploitations are ascertained; quality and technological properties of the ore are ascertained in detail, assuring the reliability of the projected beneficiation and production operations.

Category B means that the reserves in place are explored. The ore bodies are outlined by exploratory workings or by exploratory boreholes; the depositional environment is known, and types and industrial grades of the ore are ascertained, but without details of their distribution; quality and technological properties of the ore is known sufficiently well to assure the conditions of the exploitation, and the hydrogeologic environment, as a whole, are known in fair detail.

Category C_1 means that the reserves in place are estimated by a sparse grid of exploratory boreholes or exploratory workings. This category also includes reserves adjoining the boundaries of the A and B categories of ore as well as the reserves of the very difficult deposits in which the distribution of the values or of mineral cannot be ascertained even by a dense exploratory grid; quality, types, industrial grades, and technology of beneficiation are ascertained tentatively by means of analyses and laboratory tests and by analogy with known deposits of the same type; general conditions of exploitation and general hydrogeological environment of the deposit are known tentatively.

Category C_2 means that the reserves in place are adjoining the explored reserves of A plus B plus C1, categories and reserves indicated by geologic and geophysical evidence confirmed by boreholes.

Depending on the nature of deposits, various boring and excavation methods are used in the determination of ore reserves for all solid minerals in the U.S.S.R. Deposits are divided into five major groups.

The First Group Deposits are simple in form and have large dimensions and uniform distribution of minerals (such as coal deposits, many deposits of iron ore, and disseminated copper deposits). The high category reserves of such deposits can be determined by boring with a normal density grid of boreholes. Excavation is used only for controlling the data of samples from boreholes and for taking bulk samples.

The Second Group Deposits include large deposits of different and sometimes complicated forms, with uneven distribution of mineral content. A combination of both drilling and exploratory workings is required to determine ore reserves. With a normal grid of boreholes, only B category reserves might be revealed by drilling. With close-spaced drilling and control by exploratory workings, it is possible to establish A category reserves.

The Third Group Deposits include deposits of medium dimensions with irregular distribution of ore minerals, such as vein or dyke deposits. Reserves of A and B categories can be revealed only with the help of openings. Drilling alone can establish reserves only of C1 category.

The Fourth Group Deposits include deposits similar to The Third Group, but with smaller ore bodies of more complicated forms. It is impossible to establish category A reserves under a normal grid of openings. Exploratory openings and underground drilling are needed to determine ore reserves of category B.

The Fifth Group Deposits are small pocket deposits of categories A and B that could not be established by systematic prospecting. Only category C reserves can be established.

Oil and gas reserves are classified according to a similar letter system using the A, B, C_1, and C_2 categories for reserves and the categories C_3, D_1, D_2 for the determination of the prognosticated resources. Categories and the criteria for development are similar to those for land minerals except based on the specific characteristics of oil and gas deposits.

Data on Soviet reserves has been located for only a small number of minerals. Table 8 shows estimated Soviet reserves for a selected number of minerals.

INFRASTRUCTURE

The U.S.S.R., in 1990, had a total of 146,100 kilometers of rail lines, including 51,700 kilometers of electrified lines; 1,609,900 kilometers of highway, of which 413,900 kilometers are dirt roads; 122,500 kilometers of navigable inland waterways, excluding the Caspean Sea; and 81,500 km of crude oil and products pipelines; and 195,000 km of natural gas pipelines. The U.S.S.R. has 4,530 usable airports, with 1,050 with permanent surface runways, 30 with runways more than 3,659 km, 40 with runways 2,440 to 3,659 meters, and 660 with runways 1,220 to 2,439 meters.

The U.S.S.R. has the longest coastline of any country, with more than 15 open sea ports and a large number of inland ports, including Astrakhan, Baku, Nizhniy Novgorod, Kazan, Khabarovsk, Krasnoyarsk, Kuybyshev, Moscow, Rostov, Volgograd, and Kiev. The greater portion of the sea coasts, however, are in sparsly settled or uninhabited regions along the Arctic Ocean. There are only a few good natural ports, and year-round access to the open seas is available only along the temperate coast in the extreme northwest.

The U.S.S.R. faces the problem of depleting older deposits in areas with developed infrastructure while new deposits are located in remote eastern and northern areas with severe climates and lack of infrastructure. Despite the statistics quoted on the U.S.S.R.'s extensive transportation network, the country has no cross-country road system and practically no developed road networks in most of the northern and northeastern portions of the country. Furthermore, practically the entire rail network is concentrated in the western part of the country. There are only two rail lines transversing the eastern part of the country, the trans-Siberian and the Baikal Amur Mainline (BAM), with the BAM only partially operational and lacking connecting lines to areas of potential mineral development. Air transportation plays a vital role in passenger and industrial transport owing to the vast distances and the lack of other transport means.

TABLE 8

U.S.S.R.: ESTIMATED ECONOMIC RESERVES, 1990

(Thousand metric tons unless otherwise specified

Mineral		Reserves
Antimony	metric tons	4,200
Asbestos		125,000
Barite		10,000
Bauxite		300,000
Boron (B_2O_3 content)		54,000
Bromine		1,400
Chromium		129,000
Cobalt		140
Copper		37,000
Diamond, industrial	million carats	80
Diatomite	million cubic meters	139.8
Flourspar		98,600
Gold		6,220
Gypsum		2,000,000
Ilmenite (TiO_2 content)		5,900
Indium	kilograms	187,000
Iodine	do.	400,000
Iron ore	million metric tons	100,000
Lead		9,000
Magnesite		650,000
Manganese[1]		325,000
Mercury	metric tons	10,000
Molybdenum		500
Nickel[1]		7,300
Peat[1]		5,320,000
Phosphate rock		1,300,000
Platinum-group metals	kilograms	5,900,000
Potash (K_2O equivalent)		3,800,000
Rare-earth metals		450
Rhenium	pounds	1,310,000
Rutile (contained TiO_2)		2,500
Silver	metric tons	44,000
Sodium sulfate[1]		2,000,000
Sulfur		250,000
Tin		300
Tungsten		280
Vanadium	thousand pounds	5,800,000
Yttrium	metric tons of yttrium oxide	9,000
Zinc		10,000
Zirconium (ZrO_2 content)		4,000

[1]Data in short tons.

In the eastern and northern parts of the country, the Soviets have relied on a combinaton of road, rail, river, and sea transport for minerals transport and have developed a number of deposits depending primarily on air transport for freight-

TABLE 9

U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Apparent main production centers
Aluminum	Mining areas: Alunite: Alunitdag deposit in Azerbaidzhan; supplies Kirovabad alumina plant, Azerbaidzhan. Bauxite: Tikhvin area in Leningrad Oblast', Turgay area in Kazakhstan, and Ural Mountains. Nepheline syenite: Belogorsk area in East Siberia, and Kola Peninsula. Alumina plants: Achinsk in East Siberia, Bogoslovsk and Kamensk-Ural'sk in Urals; Dneprovsk and Nikolayevsk in Ukraine, Kirovabad in Azerbaidzhan, Pavlodar in Kazakhstan, and Pikalevo and Volkhov in Leningrad Oblast'. Aluminum plants: Bogoslovsk and Kamensk-Ural'sk in Urals; Bratsk, Irkutsk, Sayansk, Krasnoyarsk, and Novokuznetsk in Siberia; Dneprovsk in Ukraine; Kandalaksha, Nadvoitsy, and Volkhov in European North; Regar in Tadzhik S.S.R.; Sumgait in Azerbaidzhan S.S.R. (possibly closed for environmental reasons); and and Volgograd in lower Volga region.
Antimony	Dzhidzhikrutskiy complex in Tadzhik S.S.R., Kadamzhay complex in Kirgiz S.S.R., and Nikitovskiy complex in Ukraine.
Arsenic	Deposit in Tadzhik S.S.R. Byproduct production at Kazakhstan and in Urals.
Asbestos	Uralasbest complex in central Urals (produces about 50% of country's output); Dzhetygara complex in Kazakhstan; Kiyembay complex in Orenburg Oblast'; and Tuvaasbest complex in Ak-Dovurak, Tuva A.S.S.R.
Barite	Iri and Madneuli areas in Georgia, Kazakhstan, and West Siberia.
Beryllium	Deposits in Altay region of West Siberia, Kazakhstan, Kola Peninsula, Transbaykal, Soviet Far East, Urals, and western Ukraine. Beryllium metal production at Ulbinsky metallurgical plant in Ust-Kamenogorsk, Kazakhstan.
Bismuth	Deposits in Kantarkhana and Taryzkan areas (copper-bismuth) in Tadzhik S.S.R. and Chatkal Mountains (bismuth ore concentrates shipped to Chimkent lead plants, Kazakhstan) in Kirgiz S.S.R. Byproduct production from lead-zinc smelting in Kazakhstan, from dust and crude metal at Balkhash copper complex in Kazakhstan, and from Kirovgrad and Mednogorsk copper complexes in Urals.
Cadmium	Production at lead-zinc smelters and at some copper-zinc complexes, a large producer is Leninogorsk complex in Kazakhstan.
Chromium ore	Donskoye complex in Khrom-Tau, Kazakhstan (95% of total production), and Saranov mining mining enterprise in middle Urals.
Coal	Donets Basin in Ukraine, Ekibastuz and Karaganda Basins in Kazakhstan, Kansk-Achinsk Basin in East Siberia, Kuznetsk Basin in West Siberia, Moscow Basin, Pechora Basin, European North, and Yakutsk Basin in Yakutia.
Cobalt	Production (associated mainly with nickel) in Norilsk in East Siberia, Monchegorsk and Pechenga on Kola Peninsula, southern Urals, and Tuva A.S.S.R. in Siberia (cobalt-arsenide ore).
Copper	Mining areas: East Siberia (Noril'sk and others), Kazakhstan, Transcaucasus, Urals, and Uzbekistan. Smelters and/or refineries: Almalyk in Uzbekistan (smelter and refinery); Alaverdi in Armenia (smelter and refinery) (possibly closed for environmental reasons); Balkhash, Dzhezkazgan, and Irtysh in Kazakhstan (smelters and refineries); Karabash (possibly closed for environmental reasons), Kirovgrad, Krasnoural'sk, Mednogorsk, Sredneural'sk (smelters), Kyshtym, and Verkhnaya Pyshma in Urals (refineries); Moscow (secondary smelter and refinery); and Pechenganikel and Severonikel on Kola Peninsula (smelters and refineries).
Diamond	Mirnyy, Aykhal, and Udachnaya areas in Yakut A.S.S.R.
Fluorspar	Abagaytuy, Kalanguy, Solonechnyy, and Usugli areas in Chita Oblast', East Siberia.
Gold	Aldan, Allakh-Yun, and Indigirka regions of Yakut A.S.S.R.; Magadan Oblast' and Khabarovsk Kray in Soviet Far East; Murantau deposit in Uzbekistan; also Armenia; Kazakhstan; Siberia; and Urals.
Iron ore	Dneprovsk complex in Ukraine; Gubkin, Lebedi, Mikhaylovsk, and Stoylensk complexes in Kursk Magnetic Anomaly, European R.S.F.S.R.; Ingulets, Novokrivoy Rog, Severnyy, Tsentral'nyy, and Yuzhniy complexes in Krivoy Rog Basin, Ukraine; Kachar, Kachkanar, Lisakovsk, and Sokolovo-Sarbay complexes in Kazakhstan; Korshunovo complex in Irkutsk Oblast', East Siberia; Kostamush complexd in Karelia; and Olenegorsk complex in European North.
Lead and zinc	Mining areas: Akhtala region in Armenia; Alma-Ata Oblast', Chimkent Oblast', Dzhezkazgan Oblast', East Kazakhstan Oblast', Karaganda Oblast', Semipalatinsk Oblast', and Taldy Kurgan Oblast' in Kazakhstan; Chita Oblast', Khabarovsk Kray, and Primorskiy Kray in Soviet Far East; Degtyarsk, Gay, Karabash, Kirovgrad, and Krasnoural'sk regions in Urals; Krigiz S.S.R.; Kvaisi and Madneuli regions in Georgian S.S.R.; North Ossetian A.S.S.R. in North Caucasus; Tadzhik S.S.R.; Turkmen S.S.R.; Uzbek S.S.R.; and West Siberia. Smelters and/or refineries: Chimkent, Leningorsk and Ust-Kamenogorsk in Kazakhstan (smelters and refineries); Karlyuk in Uzbekistan (refinery, lead only); Konstantinov in Ukraine, (smelter and refinery); Ordzhonikidze in North Caucasus (smelter and refinery); and Tetyukhe in Primorskiy Kray, Soviet Far East (smelter, lead only).
Magnesite	Satka deposit in Chelyabinsk Oblast', Urals (produces majority of output); and Talskoye deposit in Krasnoyarsk Kray, East Siberia (very small producer).
Magnesium	Berezniki and Solikamsk plants in Urals, Dneprovsk plant in Ukraine; Leningrad plant, and Ust-Kamenogorsk plant in Kazakhstan.
Manganese	Chiatura Basin in Georgia, Kazakhstan, and Nikopol Basin in Ukraine.
Mercury	Dzhidzhikrutskiy complex in Tadzhik S.S.R., Khaydarkan complex in Kirgiz S.S.R., and Nikitovskiy complex in Ukraine.

TABLE 9—Continued

U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Apparent main production centers
Mica	Aldan complex in Yakut A.S.S.R.; Karel complex in Chupa and Ambarnyy areas, of Karelia; Kovdor complex in Murmansk Oblast'; and Mam complex in Mamsko-Chuyskiy Rayon in Irkutsk Oblast', East Siberia.
Molybdenum	Agarsk, Dastakert, and Zangezur complexes in Armenia; Almalyk complex in Uzbekistan; Akchatau and Balkhash complexes in Kazakhstan; Chorukhdayransk complex and South Yashransk deposit in Tadzhik S.S.R.; Dzhida complex in Zakamensk area, Buryat A.S.S.R.; Sorsk complex in Krasnoyarsk Kray, East Siberia; Tyrny-Auz complex in Kabardino-Balkar A.S.S.R., North Caucasus; and Zhireken complex in Chita Oblast', East Siberia.
Natural gas	Astrakhan region in lower Volga, Komi A.S.S.R., Orenburg Oblast' in southern Urals, Turkmen S.S.R., Ukraine, Uzbek S.S.R., and West Siberia (principally Tyumen' Oblast' at Urengoi and Yamburg deposits.
Nickel	Mining areas: Noril'sk in East Siberia, Orsk in southern Urals, Pechenga and Monchegorsk on Kola Peninsula, Pobugskoye in Ukraine, and Verkhniy Ufaley in southern Urals. Smelters: Khalilovo, Rezh, and Verkhniy Ufaley in Urals; Monchegorsk and Pechenga on Kola Peninsula; Noril'sk in East Siberia; and Pobugskoye in Ukraine. (Noril'sk Monchegorsk, and Pechenga are part of the new Noril'sk Nikel association)
Oil shale	Estonia and Leningrad regions in Baltic Basin (97% of output) and Kashpirskoye region in Volga Basin.
Petroleum	Bashkir A.S.S.R.; Caspian Sea (offshore); Komi A.S.S.R.; Kuybyshev Oblast', middle Volga; Mangyshlak Peninsula in Kazakhstan; Orenburg Oblast' and Perm Oblast' in Urals; Tatar A.S.S.R.; Turkmen S.S.R.; and West Siberia (principally Tyumen' Oblast').
Phosphate	Karatau phosphorite complex in Kazakhstan, Khibiny apatite complex and Kovdor iron ore complex on Kola Peninsula, Kingisepp complex in Leningrad Oblast', Lopatino and Yegorevsk deposits in Moscow Oblast', Maardu deposit in Estonia, Polpinskoy deposit in Bryansk Oblast', and Verkhenkamsk deposit in Urals.
Platinum-group metals	Noril'sk complex in East Siberia (smelter at Krasnoyarsk) and Pechenga nickel complex and Severonikel complex on Kola Peninsula.
Potash	Berezniki and Solikamsk complexes in Urals, Kalush and Stebnikov enterprises in Ukraine, and Soligorsk complex in Byelorussia. (Urals and Byelorussia each contribute about 50% of output. Small amount from Ukraine.)
Salt	Artemsol' complex in Donets Basin and Lake Baskunchak in Astrakhan Oblast'.
Silver	Byproduct or secondary operations in Armenia, Kazakhstan, Moscow plant (secondary), Noril'sk in East Siberia, Soviet Far East, and Urals. Hard-rock gold-silver mining at Dukat Mine in Magadan Oblast', Soviet Far East.
Soda ash	Berezniki and Sterlitamak plants in Urals; Krym, Lisichansk, Saki, and Slavyansk plants in Ukraine; Mikhaylovskiy plant in Siberia (produces natural soda ash from alkaline brine lakes); and Pikalevo plant in Leningrad Oblast' (produces byproduct) of alumina production from nepheline syenite).
Steel	Enterprises: Chelyabinsk, Magnitogorsk, Nizhniy Tagil, and Orsko-Khalilovo in Urals; Cherepovets in northwest; Karaganda in Kazakhstan; Dneprodzerzhinsk, Kommunarsk, Krivoy Rog, Makeyevka, Zaporozh'ye Zaporozhstal, Zhdanov Azovstal, and Zhdanov Il'ich in Ukraine; Novokuznetsk and Zapsib in West Siberia; and Novolipetsk in European Center. Mini mills at Rybnitsa in Moldavia, Zhlobin in Byelorussia, and Komsomol'ski, Soviet Far East. Direct reduction plant at Oskol in Kursk region.
Sulfur	Deposits: Alekseyevka in Kuybyshev Oblast' in middle Volga, Gaurdak in Turkmen S.S.R., and Rozdol and Yavorov in Ukraine.
Talc	Deposits: Kirgiteysk in Krasnoyarsk Kray, East Siberia; Miass and Shabrovsk in Urals; and Ontosk in Irkutsk Oblast', East Siberia.
Tin	Mining areas (all in Soviet Far East): Khingan complex and Solnechnyy complex in Khabarvosk Kray and Khrustal'nyy complex in Primorskiy Kray; Iul'tin complex in Magadan Oblast'. Smelters: Novosibirsk in West Siberia and Podol'sk and Ryazan in European Center.
Titanium	Mining areas (deposits, all in Ukraine): Irshanskoye, Streminogorskoye, and Zelenogorskoye in Zhitomir Oblast'; Tarasovskoye in Kiyev Oblast'; and Samotkanskoye and Volchanskoye in Dnepropetrovsk Oblast'. Plants (metal): Berezniki in Urals, Moscow and Podol'sk in European Center, Khar'kov and Zaporozh'ye in Ukraine, and Ust'-Kamenogorsk in Kazakhstan. Plants (titanium dioxide): Armyansk in Crimea and Sumy in Ukraine.
Tungsten	Deposits under exploitation: Akchatau, Karaoba, and Verkhnye-Kayraktin in Kazakhstan; Chorukh-Dayron and Yubileynoye in Tadzhik S.S.R.; Ingichka and Lyangar in Uzbekistan; Dzhida in Buryat A.S.S.R.; Iul'tin in Magadan Oblast', Soviet Far East; Kul'gutin in Altay region, Siberia; Lermontov and Vostok in Primorskiy Kray, Soviet Far East; and Tyrny Auz in North Caucasus. Production facilities: Akchatau complex in Kazakhstan; Iul'tin complex in Magadan Oblast', Soviet Far East; Nal'chik plant in Kabardino-Balkar A.S.S.R., North Caucasus (tungsten metal producer); and Primorskiy Kray and Vostok complexes in Soviet Far East.
Vanadium	Raw material suppliers: Kachkanar iron ore complex and other small deposits in Urals. Processing plants: Chusovoy and Nizhniy Tagil in Urals.
Zinc (not primarily associated with lead)	Mining areas: Sibay and Uchlay in Bashkir A.S.S.R., and Urals. Refineries: Almalyk complex in Uzbekistan, Belovo plant in Kuznetsk Basin, Siberia, and Chelyabinsk plant in Urals.

ing supplies and shipping minerals. For mineral fuels, the Soviets have developed extensive pipeline networks that are now in great need of expensive maintenance and repair.

Given the subsidized nature of Soviet economic activity and the Soviet transport system in particular, it is not possible to assess the costs of mineral transport. However, these costs will play a much larger factor as the country switches from a policy of central planning that promoted mineral development at almost any cost to a market economy system where production costs could be a crucial factor.

OUTLOOK

Occupanying one-sixth of the world's land surface, the U.S.S.R. has the largest resource base for mineral development of any country in the world and also is one of the world's largest mineral producer of practically every mineral. Despite this endowment and the size of its mineral industry, the outlook for the Soviet mineral industry under "perestroyka" could be termed good and bad.

It could be termed good in that the U.S.S.R. still possesses significant undeveloped deposits as well as enormous unexplored areas. Furthermore, the U.S.S.R. is an inefficient producer and consumer of mineral resources, requiring twice the inputs of minerals per unit of output as in advanced market economy countries. By employing state-of-the-art technology, the Soviets could greatly increase their mineral supply by eliminating losses and waste from inefficient production and consumption.

Large opportunties exist for investors with capital and tehnology to both assist the Soviets in the development of new deposits and improve efficiency at existing enteprises.

Because the U.S.S.R. does not have a convertible currency, investment in its mineral industry, unlike many other industries, has the attraction that profits can be repatriated by selling the mineral products obtained.

On the bad side, prospects for the Soviet mineral industry are bleak if the Soviet mineral industry were to quickly transfer to operating according to market economy principles without substantial restructuring. Given the current levels of input, technology, and worker productivity, it would be difficult to assess if any significant portion of the Soviet mineral industry could operate on a profitable basis without significant restructuring. Therefore, unless the Soviets are willing to sacrifice their already enormous investments in mineral development, they will have to continue to subsidize the mineral industry until adequate restructuring occurs; this will require infusions of capital, technology, and management practices in keeping with market econcomy disciplines.

The overall economic deterioration of the Soviet economy as well as the disorganization in the political system also pose bleak prospects for the Soviet mineral industry. If the current decline of the Soviet economy continues with no significant investment in the Soviet mineral industry, then the mineral industry along with the rest of the Soviet economy will experience increasing problems in maintaining production. Furthermore, significant foreign investment in the Soviet mineral industry is less likely if the country does not achieve a stable political structure and establish a legal structure capable of enforcing regulations regarding investment.

Thus, the country as well as the mineral industry is on the brink of changes that can present opportunities and difficulties with the combination of the quantity of each still unknown.

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[1]Ekonomika i organizatsiya promyshlennogo proizvodstva (The Economics and Organization of Industrial Production), Novosibirsk, No. 1, Jan. 1990, p. 87.

[2]Page 81 of work cited in footnote 1.

[3]Stal' (Steel) (Moscow). No. 1, Jan. 1990, p. 2.

[4]Wall Street Journal (New York). June 6, 1989.

[5]Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources) (Moscow). No. 8, 1989, pp. 4-6.

[6]Soviet Union (Moscow). No. 3, Mar. 1990, p. 4.

[7]Work cited in footnote 6.

[8]Work cited in footnote 6.

[9]BBC Monitoring. (Reading, England). Summary of World Broadcasts (SWB). May 5, 1989. Tass in Russian for abroad, 1318 G.m.t., May 3, 1987.

[10]San Francisco Chronicle (San Francisco). Jan. 20, 1990.

[11]Sovetskaya kultura (Soviet Culture) (Moscow). Aug. 5, 1989, p. 4.

[12]Work cited in footnote 11.

[13]Izvestiya (Moscow). Nov. 26, 1987, p. 6.

[14]Ekonomika i zhizn' (Economics and Life) (Moscow). No. 4, 1989, P. 18.

[15]Work cited in footnote 13.

[16]Tsvetnye metally (Nonferrous Metals) (Moscow). No. 5, May 1989, p. 5.

[17]Okhrana okruzhayyushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v S.S.S.R. (Conservation of the Environment and the Rational Use of Natural Resources in the U.S.S.R.) (Moscow). State Committee for Statistics (Goskomstat), 1989, p. 22.

[18]Radio Liberty Research, RL 392/88, Sept. 2, 1988, p. 14.

[19]Work cited in footnote 18.

[20]Work cited in footnote 17.

[21]Tsvetnye metally (Nonferrous Metals) (Moscow). No. 11, Nov. 1989, p. 4.

[22]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). Aug. 9, 1982, p. 2.

[23]Pages 4-7 of work cited in footnote 21.

[24]Work cited in footnote 23.

[25]Foreign Trade, Moscow, No. 12, Dec. 1989, p. 9.

[26]Page 48 of work cited in footnote 25.

[27]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 Feb. 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 that have participated as observers are Afghanistan, Angola, Ethiopia, Laos, Mozambique, Nicaragua, and Republic of Yemen.

[28]Pravitel'stvennyi vestnik (Legal Review) (Moscow). No. 5, Jan. 1990, p. 10.

[29]Argumenty i fakty (Arguments and Facts) (Moscow). No. 32, Aug. 12-18, 1989, p. 2.

[30]Work cited in footnote 29.

[31]Bakinskiy rabochiy (Baku Worker) (Baku). June 30, 1989.

[32]Kommunist (Communist) (Yerevan). Jan. 25, 1990, p. 2.

[33]Kommunist Tadzhikistana (Tadzhikistan Communist) (Dushanbe). Apr. 22, 1989, p. 2.

[34]Foreign Broadcast Information Service (FBIS) (Washington, DC). Oct. 34, 1989, p. C/6. Yerevan in Armenian, 2130 G.m.t., Sept. 28, 1989.

[35]Work cited in footnote 34.

[36]Moscow News (Moscow). Nos. 8-9, 1990, p. 17.

[37]BBC Monitoring. (Reading, England). Summary of World Broadcasts (SWB). Dec. 8, 1989, p. A/5. Helsinki in Finnish, 1600 G.m.t., Nov. 28, 1989.

[38]Tsvetnye metally (Nonferrous Metals) (Moscow). No. 1, Jan. 1990, p. 94.

[39]Izvestiya (Moscow). Oct. 24, 1989, p. 8.

[40]———. Nov. 30, 1988, p. 7.

[41]Work cited in footnote 40.

[42]Work cited in footnote 39.

[43]Work cited in footnote 39.

[44]Foreign Broadcast Information Service (FBIS) Washington, DC. Nov. 21, 1989, p. 42. Moscow Television Service in Russian, 1903 G.m.t., Nov. 17, 1989.

[45]Work cited in footnote 44.

[46]Izvestiya (Moscow). Jan. 12, 1990, p. 2.

[47]Gornyy zhurnal (Mining Journal) (Moscow). No. 11, p. 3.

[48]Ekonomika i organizatsiya promyshlennogo proizvodstva (Economics and Organization of Industrial Production), Novosibirsk, No. 1, Jan. 1990, p. 81.

[49]Planovoye khozyaystvo (Planned Economy) (Moscow). No. 10, Oct. 1987, pp. 19-22.

[50]Pravda (Moscow). Jan. 28, 1990, pp. 1-3.

[51]BBC Monitoring. (Reading, England). Summary of World Broadcasts (SWB). Nov. 17, 1989, p. A/6. Moscow, 1600 G.m.t., and Tass in English, 0580 G.m.t., Nov. 13, 1989).

[52]Kompleksnoye ispol'zovaniye mineral'nogo syr'ya (Complex Utilization of Mineral Resources) (Moscow). No. 11, Nov. 1989, p. 58.

[53]Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources) (Moscow). No. 7, July 1989, pp. 3-10.

[54]Gornyy zhurnal (Mining Journal) (Moscow) No. 12,

Dec. 1989, p. 5.

[55]Work cited in footnote 54.

[56]Gornyy zhurnal (Mining Journal) (Moscow). No. 10, Oct. 1989, p. 59.

[57]Narodnoye Khozyaystvo S.S.S.R., 1988 (National Economy of the U.S.S.R., 1988 Statistical Yearbook) (Moscow). p. 342.

[58]Turkmenskaya iskra (Turkmenistan Spark) (Ashkhabad). Feb. 2, 1990, p. 2.

[59]Work cited in footnote 50.

[60]Work cited in footnote 50.

[61]Ugol' (Coal) (Moscow). No. 8, Aug. 1989, pp. 3-7.

[62]Work cited in footnote 61.

[63]Gazovaya promyshlennost' (Gas Industry Journal) (Moscow). No. 7, July 1989, p. 2.

[64]Work cited in footnote 63.

[65]Financial Times (London). Aug. 29, 1989, pp. 1 and 18.

[66]Gazovaya promyshlennost' (Gas Industry Journal) (Moscow). No. 7, July 1989, p. 3.

[67]———. No. 8, Aug. 1989, p. 7.

[68]Work cited in footnote 67.

[69]Gazovaya promyshlennost' (Gas Industry Journal) (Moscow). No. 6, June 1989, p. 62.

[70]Izvestiya (Moscow). Feb. 11, 1990, p. 3.

[71]Moscow News (Moscow). Feb. 11, 1990, p. 3.

[72]BBC Monitoring. (Reading, England). Summary of World Broadcasts (SWB). p. A/11. Moscow, 1900 G.m.t., Feb. 1, 1990.

[73]Pravda (Moscow). July 17, 1989.

[74]Work cited in footnote 73.

[75]Work cited in footnote 73.

[76]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). May 28, 1989, p. 2.

[77]Torfyannaya promyshlennost' (Moscow). No. 6, 1989, p. 10.

[78]Work cited in footnote 77.

[79]Khimizatsiya sel'skogo khozyaystva (Chemical Use in Agriculture) (Moscow). No. 12, Dec. 1989, p. 19.

[80]Washington Post (Washington, DC). Oct. 1, 1989, p. 1.

[81]BBC Monitoring. (Reading, England). Summary of World Broadcasts (SWB). Mar. 17, 1989, p. A/9. Moscow World Service in English, 1200 G.m.t., Mar. 9, 1989.

[82]Sotsialisticheskaya industriya (Socialist Industry) (Moscow) July 23, 1989, p. 4.

[83]Work cited in footnote 82.

[84]Trud (Labor) (Moscow). Mar. 24, 1989, p. 4.

[85]Work cited in footnote 73.

OTHER SOURCES OF INFORMATION

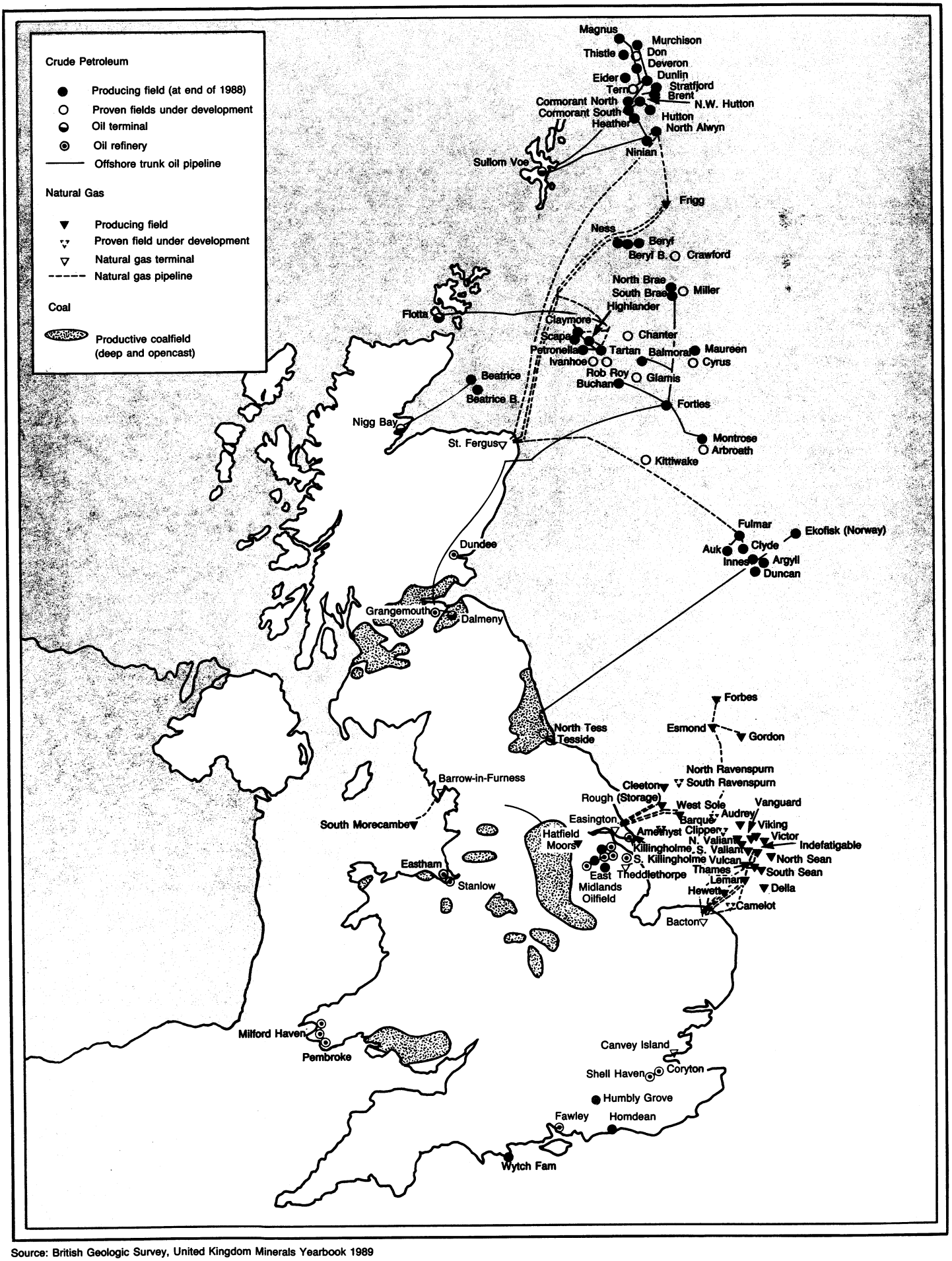
Official Soviet information on production and trade in minerals is limited to some data on ferrous metals, fuels, and nonmetallics; and, even for some of these, data are sparse. The annual Soviet statistical publications on production and trade are as follows:

Narodnoye Khozyaystvo S.S.R. (The National Economy of the U.S.S.R.

Vneshnyaya Torgovlya S.S.R. (Foreign Trade of the U.S.S.R.).

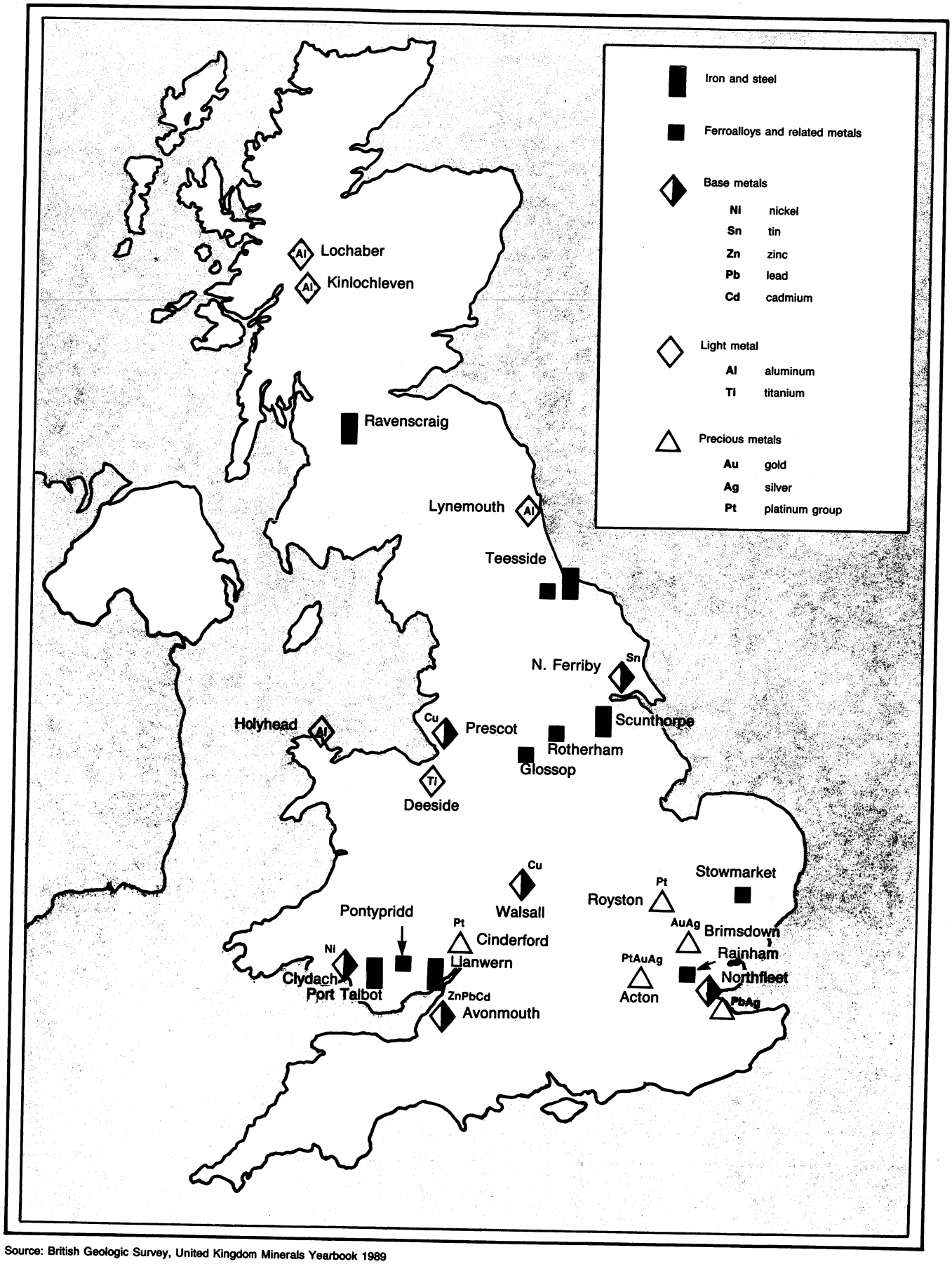
Promyshlennost' SSSS (U.S.S.R. Industry).

Statistics on capacity and output for nonferrous, precious, and rare metals and many nonmetallic minerals are regarded by the Soviets as secret. Soviet trade data on precious metals have not been available for decades; and, in 1976, publication of trade statistics for nonferrous metals ceased. Although the U.S.S.R. possesses large mineral resources, reserve figures are also secret for most minerals.



Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989

Figure 1. United Kingdom: Mineral Fuel Resources

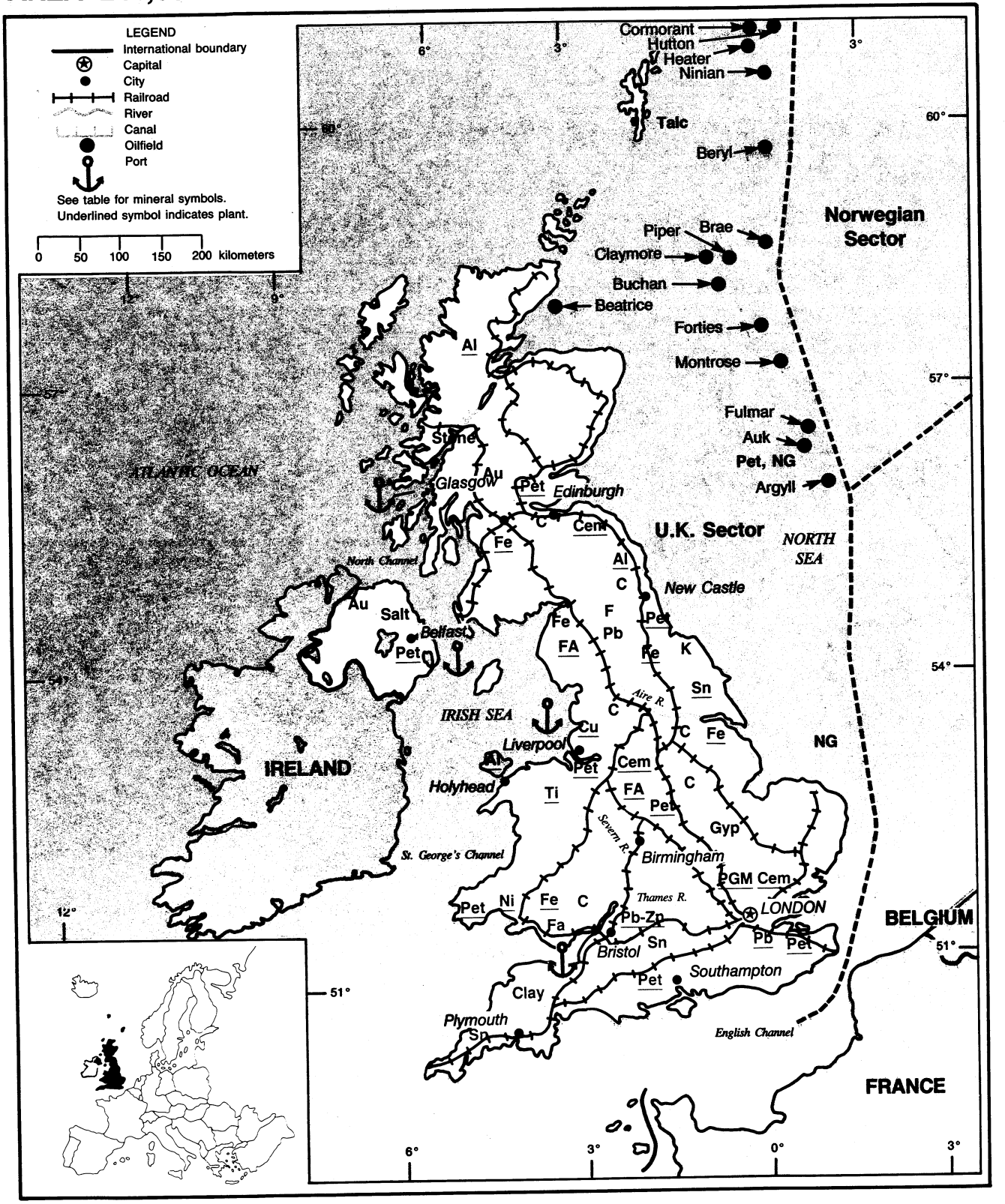


Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989

Figure 2. United Kingdom: Primary Metal Smelters and Refineries 1989

UNITED KINGDOM

AREA 244,000 km² **POPULATION 57.4 million**



THE MINERAL INDUSTRY OF THE

UNITED KINGDOM

By Harold R. Newman

As a result of a rather complex geologic history, the United Kingdom has historically been well endowed with mineral resources. Metallic ore deposits were typically small and of relatively high grade. Mining of nonferrous minerals, particularly copper and tin, has been ongoing since the Bronze Age. Mine production of nonferrous minerals has been declining because deposits are depleted. Although the exploitation of nonferrous minerals has become less significant, the processing of these minerals is the basis of a large and economically important industry. Because most ore bodies have been exhausted, the industry requires imports to satisfy its metallurgical requirements.

The industrial minerals sector has provided a significant base for expanding the extractive industries and, in recent years, provided a shift in balance from the metallic mineral sector. United Kingdom companies have a substantial interest, both domestic and foreign, in the production of industrial minerals such as aggregates, ball clay, china clay (kaolin), and gypsum.

The country has the 10th largest petroleum refining capacity in the world. The offshore United Kingdom sector of the North Sea oilfield, now in its 25th year of activity, continues to be a significant player in the international oil and gas sector. As a result, the country has become a base for international oil companies and a major energy supplier to other countries.

The Government's anti-inflationary, high interest rate policy caused the country's economy to slow significantly in 1989. Real gross domestic product (GDP) growth rate in 1989 was 2.3%. The tough monetary policy has resulted in the United Kingdom having one of the slowest growing economies among the industrialized nations. One encouraging event in the economy was the unemployment rate, which had declined to 5.8% at yearend. This was the lowest unemployment rate in 9 years.

GOVERNMENT POLICIES AND PROGRAMS

The development and working of mineral deposits are subject to laws and regulations dating back to 1948 when the Town and Country Planning Act of 1947 introduced general planning control over the development of land. The current statute is the 1971 Act, as amended, which consolidates all earlier planning legislation and has been amended by various statutes. Mineral development was specifically addressed in the Town and Country Planning (Minerals) Regulations, 1971, and the Town and Country Planning (Minerals) Act, 1981. Minerals are defined in section 209 of the 1971 act to include all minerals and substances in or under land of a kind ordinarily worked for removal by underground or surface workings, except it does not include peat cut for purposes other than sale.

Mineral rights to the mineral fuels such as coal, petroleum, and uranium belong to the state. The British Coal Corp. (BC), a state-owned company, controls almost all the mineral rights to the national coal reserves. However, BC is authorized to license open pit and underground mines to the private sector subject to restrictions on size and the payment of royalty on the amount of coal produced.

Most other mineral rights in Great Britain are privately owned. The exception is gold and silver, the rights to which are vested in the Royal Family and is referred to as Crown Rights. A different situation applies to Northern Ireland where, under the Mineral Development Act (Northern Ireland), 1969, the right to work minerals and the right to license others to do so is vested in the state as opposed to private ownership.

Currently, there is no national registry for mineral rights except for hydrocarbons. This has created problems and is a matter of concern for the mining industry. Locating current owners of mineral rights on some properties can be a costly and time-consuming process.

After the successful privatization of British Steel PLC, formerly British Steel Corp., in late 1988, the Government was proceeding with plans to privatize the Central Electric Generating Board (CEGB), which holds the monopoly for generating electric power in the United Kingdom. CEGB will be replaced by two power-generating companies, National Power and PowerGen. These two companies would compete with each other and any other power-generating company that wishes to produce electricity, with the aim being to bring down overall generating costs.

As a result of the privatization efforts, independent power producers were proceeding with plans to build new plants. Enron Power Corp. of the United States and Imperial Chemical Industries (ICI) of the United Kingdom were conducting a feasibility study on constructing one of the world's largest gas-fired power stations. The station, to be at ICI's petrochemical complex at Wilton on Teeside, would have a capacity of 1,725 megawatts (MW) and was expected to cost more than $1,200 million[1] to construct.

Other electricity related events included the Government's commitment to fund 50%, up to $1.6 million, toward the cost of research to speed up development of cleaner coal-fired electricity generation.

Another company being prepared for privatization is BC. The Coal Industry bill was passed through the House of

Commons and, at yearend, was with the House of Lords for consideration. The bill contains proposals for the write-off of BC's $7.2 million in losses and other debts; the increase of limitations on licenses for private company open pit coal operations from 25,000 tons to 250,000 tons; and the increase of the number of personnel permitted to work in private underground coal mines from 30 to 150 workers per mine.

PRODUCTION

The sluggish economy was reflected in the industrial production index, which rose less than 1% during the previous year. The steel sector operated at or near full capacity throughout 1989. Output of ferromanganese and refined nickel continued to decline. Production of tin concentrate decreased when marginal mines closed. Coal production decreased when reserves were depleted, and nine mines closed during 1989. Production of crude petroleum was down owing to the continuing effects of the Piper Alpha drilling rig disaster in 1988, which has cut production by nearly 10%, and the gas explosion on the Cormorant A drilling platform in 1989.

TRADE

The United Kingdom has shifted from being a net exporter as recently as 1986 to being a net importer in 1987–88. Part of the reason for the weaker export performance during the past 2 years has been troubles, as mentioned above, in the North Sea oilfields. It is expected that these problems will be resolved in 1990 and petroleum will make a positive contribution to earnings in the external account. It is also expected that the economy will slow further in 1990, which should cause the demand for imported consumer goods to decline. The trade balance deficit at yearend was nearly $34 billion, up from 1988's deficit of $26 billion.

United Kingdom trade in minerals and mineral-based products, 1987–88, in value terms, are shown in table 4.

STRUCTURE OF THE MINERAL INDUSTRY

The Department of Trade and Industry (DTI) has the responsibility to ensure a continuing supply of minerals for the country's industry. DTI's overview includes all nonenergy, nonconstruction minerals. These include metallic ores and such industrial minerals as barite, china clay (kaolin), fluorspar, high-grade limestone, potash, salt, and silica sand.

The Department of Energy (DOE) is responsible for mineral fuels that include coal, natural gas, and petroleum. DOE is also responsible for the issuing of licenses for the exploration, appraisal, and production of natural gas and petroleum. The Department of the Environment is responsible for minerals used in the construction industry. These include aggregates, brick and brick clay, cement and its raw material, dimension stone, gypsum for plaster, and sand and gravel. Both state and privately owned corporations produce minerals and mineral-based products. State ownership is mostly in the mineral fuels and nuclear power industry.

In 1988, employment in the mineral industry, including quarrying, was about 155,000 workers.

COMMODITY REVIEW

Metals

Aluminum.—There are four primary aluminum smelters in the United Kingdom. Three of these are owned and operated by British Alcan Aluminium Ltd. The fourth smelter, Anglesey Aluminium Ltd., is 51% owned by RTZ Corp. Ltd. and 49% owned by Kaiser Aluminum and Chemical Corp. These smelters produce about 60% of domestic requirements for aluminum metal. The remaining 40% is imported from various countries, mainly Norway. All of the aluminum smelters depend on imported alumina for feedstock.

The secondary aluminum metal industry in the country treats recycled aluminum and low-grade aluminum scrap such as swarf. One such company is Trent Alloys, which is a member of the Cookson Group. Cookson is said to be the largest buyer of aluminum scrap in the United Kingdom. Trent Alloy's new secondary aluminum operation in North Cave, Humberside, came on-stream in late 1989. The plant produces 10,000 metric tons per year (mt/yr) of aluminum alloys. The alloys are produced to customers' specifications and supplied in 5 kilogram ingots.

Copper.—Anglesey Mining PLC was continuing with the development of its Parys Mountain polymetallic mine in Wales. At yearend, 200 tons of ore had been removed for metallurgical testing from the White Rock zone at the 280-meter level. The company estimated that drilling had indicated reserves of 4.8 million metric tons (MMmt) of ore grading 1.49% copper, 3.03% lead, 6.04% zinc, 57 grams (g) of silver per ton, and 0.4 g of gold per ton. The main domestic source of copper concentrates remained the Wheal Jane tin mine in Cornwall where concentrates of copper, lead, and zinc are recovered as byproducts.[2]

Gold.—Continued interest in gold was reflected in the increased activity in gold exploration and development in the United Kingdom. Northern Ireland, Scotland, and Wales were three areas of concentration by companies. At yearend, it was reported that 14 Mines Royal exploration permits had been issued for Northern Ireland; 1 Mines Royal lease and 22 permits for Scotland; 5 leases and 5 permits for Wales; and 6 permits for England.[3]

Ennex International PLC was continuing exploration and development efforts on two of its projects. The company was advancing with an exploration adit on the gold-silver vein structure at its Cononish deposit in Scotland. Sampling and drilling of the deposit was reported by the company to have outlined a block of ore estimated to contain 900,000 tons of ore with an average grade of 10.3 g of gold per ton and 51.4 g of silver per ton. The exploration and development program is continuing into wider sections of the ore body. Ennex expects to bring Scotland's first gold mine into production by late 1991.[4]

Ennex's other project, the Curreghinalt gold deposit in Northern Ireland, remained stalled at yearend. Use of explosives has been precluded by the Government because of security rea-

TABLE 1

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	1987	1988[p]	1989[e]
METALS					
Aluminum:					
Alumina from imported bauxite	109,700	109,940	109,800	[e]110,000	110,000
Metal:					
Primary	275,373	275,876	294,382	300,166	[2]297,313
Secondary	127,595	116,406	116,744	105,764	[2]109,695
Cadmium: Metal including secondary	370	379	498	399	[2]395
Copper:					
Ore and concentrate, Cu content	592	602	750	732	[2]508
Metal, refined:					
Primary	63,851	62,368	54,023	[e]49,258	48,643
Secondary	61,575	63,206	68,264	[e]74,700	70,390
Total	125,426	125,574	122,287	123,958	119,033
Iron and steel:					
Iron ore:					
Gross weight	274,400	289,000	262,700	224,100	185,000
Fe content	60,400	61,000	58,000	49,302	40,000
Metal:					
Pig iron thousand tons	10,381	9,686	12,017	13,056	[2]12,638
Ferroalloys, blast-furnace: Ferromanganese do.	77	100	92	107	100
Steel, crude do.	15,722	14,725	17,414	18,950	[2]18,740
Rolled products do.	12,818	11,594	18,606	[e]20,909	21,000
Lead:					
Mine output, Pb content	3,994	648	691	1,185	600
Metal:					
Smelter:					
Bullion from imported concentrate	35,994	37,798	35,200	34,901	[2]34,523
Secondary (refined)[3]	179,064	172,537	201,100	[e]201,600	200,000
Total	215,058	210,335	236,300	[e]236,501	234,000
Refined:					
Primary[4]	148,133	156,093	145,823	172,213	156,500
Secondary[3]	179,064	172,537	201,131	201,632	193,500
Total	327,197	328,630	346,954	373,845	350,000
Magnesium metal, secondary including alloys[e]	900	1,000	1,000	1,200	1,000
Nickel metal, refined[5]	17,800	30,900	29,500	[e]27,700	26,100
Silver: Mine ouptut, Ag content kilograms	1,720	1,773	2,031	2,113	1,700
Tin:					
Mine output, Sn content	5,204	4,276	4,003	3,454	4,000
Metal:					
Primary	7,548	9,227	12,135	9,014	8,100
Secondary (refined)	7,265	5,676	4,871	7,757	8,700
Zinc:					
Ore and concentrate, Zn content	5,043	5,605	6,522	5,502	[2]5,771
Metal, smelter	74,278	85,902	81,360	76,028	[2]79,773
INDUSTRIAL MINERALS					
Barite[6]	107,344	86,754	77,000	[e]76,250	80,000
Bromine	29,851	26,000	26,184	[e]26,000	26,000
Cement, hydraulic thousand tons	13,339	[r]13,465	14,311	16,500	15,000

See footnotes at end of table.

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Clays:						
Fire clay	thousand tons	831	940	[e]900	[e]1,060	1,000
Fuller's earth[7 e]	do.	216	202	213	[r]213	210
Kaolin (china clay)	do.	2,870	2,913	3,059	3,278	3,140
Ball clay and pottery clay	do.	587	611	679	[e]716	780
Other including shale	do.	18,909	17,565	18,262	18,899	18,500
Diatomite[e]		200	300	350	320	270
Feldspar (china stone)		5,934	7,304	5,692	6,422	7,000
Fluorspar, all grades[8]		167,390	133,420	120,400	103,800	120,000
Gypsum and anhydrite	thousand tons	3,189	3,416	[e]3,500	[e]3,700	4,000
Lime: Quicklime and hydrated[e]	do.	2,500	2,600	2,800	2,800	2,800
Nitrogen: N content of ammonia	do.	1,767	1,388	1,415	1,105	1,037
Potash, K_2O equivalent		354,496	416,965	431,256	463,268	465,000
Salt:						
Rock	thousand tons	2,030	2,040	1,855	877	900
From brine	do.	1,552	1,510	1,554	1,426	1,500
In brine, sold or used as such	do.	3,563	3,305	3,672	3,827	3,600
Sand and gravel:						
Common sand and gravel	do.	107,727	112,043	117,827	136,404	135,000
Industrial sand	do.	4,178	4,108	3,265	[e]4,300	4,500
Sodium compounds, n.e.s.: Carbonate, synthetic[e]	do.	1,000	1,000	[2]765	1,000	1,000
Stone:						
Crushed:						
Calcite	do.	6	10	[e]10	23	17
Chalk	do.	12,023	12,511	13,444	14,516	15,000
Chert and flint	do.	22	14	[e]15	[e]11	12
Dolomite	do.	14,953	15,851	17,000	[e]19,900	21,000
Igneous rock	do.	31,720	34,038	39,529	[e]51,959	55,000
Limestone	do.	93,517	97,056	110,641	[e]105,816	112,000
Sandstone including ganister	do.	10,870	11,337	13,824	18,901	20,000
Slate including fill	do.	124	242	322	[e]708	700
Total	do.	163,111	171,059	193,341	190,755	223,729
Dimension:						
Igneous[e]	do.	[2]67	100	100	128	100
Limestone	do.	[e]175	127	244	[e]233	200
Sandstone	do.	130	120	142	[e]183	200
Slate[e]	do.	[2]34	35	35	40	50
Strontium minerals		23,000	14,700	22,655	25,553	25,000
Sulfur, byproduct:						
Of metallurgy		53,766	58,319	51,398	[e]55,000	52,000
Of petroleum refining		80,000	105,000	119,000	129,000	130,000
Total		133,766	163,319	170,398	[e]184,000	182,000

See footnotes at end of table.

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Talc, soapstone, pyrophyllite		20,000	12,352	12,529	14,182	15,400
Titania[9]		219,100	229,900	225,600	[e]230,000	225,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	2,142	1,985	2,091	1,827	2,000
Bituminous including slurries,fines,etc.	do.	91,905	106,107	102,344	101,964	98,300
Lignite	do.	5	7	6	[e]18	20
Total	do.	94,052	108,099	104,441	[e]103,809	100,320
Coke:						
Metallurgical	do.	7,838	7,795	[2]7,585	[e]7,610	7,572
Breeze, all types	do.	337	344	273	[e]277	200
Fuel briquets, all grades	do.	1,763	1,599	1,637	[e]1,464	1,500
Gas, natural:						
Marketable[10]	million cubic meters	42,961	45,289	47,623	45,729	44,711
Marketed[11]	do.	39,396	41,454	43,690	41,761	41,228
Natural gas liquids[12]	thousand 42-gallon barrels	59,740	67,442	66,039	58,035	56,000
Petroleum:						
Crude[13]	do.	914,204	905,162	878,099	820,515	651,300
Refinery products:						
Liquefied petroleum gases	do.	17,354	16,484	17,110	[e]19,129	19,200
Naphtha including white spirit	do.	24,506	22,542	18,123	16,728	18,500
Gasoline	do.	189,159	198,560	209,780	224,477	231,500
Jet fuel	do.	42,056	46,504	48,504	53,800	56,800
Kerosene	do.	17,879	16,639	17,592	17,740	18,000
Distillate fuel oil	do.	161,897	167,171	159,828	178,480	173,700
Residual fuel oil	do.	85,887	83,403	85,228	83,217	97,130
Lubricants	do.	8,316	6,363	6,202	6,790	7,350
Bitumen	do.	10,690	11,435	12,459	13,908	14,500
Petroleum coke	do.	2,844	2,827	2,844	[e]2,976	3,100
Petroleum wax	do.	559	456	449	[e]496	425
Unspecified	do.	2,982	2,051	2,100	3,563	3,570
Refinery fuel and losses	do.	46,632	49,321	44,889	47,626	40,700
Total	do.	610,761	623,756	625,107	[e]668,930	684,475

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

[1] Includes data available through Sept. 1, 1990.

[2] Reported figure.

[3] Includes a small quantity of primary lead from domestic concentrate.

[4] Produced entirely from imported bullion and includes the lead content of alloys.

[5] Refined nickel and nickel content of ferronickel.

[6] Includes witherite.

[7] Salable product.

[8] Proportions of grades not available; probably about two-thirds acid grade.

[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 condensates.

[12] Excludes gases and condensates.

[13] Sales.

TABLE 2

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	11	136	NA	NA.
Alkaline-earth metals	9	68	—	Ireland 44; Norway 16; Djibouti 5.
Aluminum:				
Ore and concentrate	1,042	1,290	—	Italy 913; Sweden 113; Netherlands 97.
Oxides and hydroxides	42,366	49,148	4,704	Norway 4,297; Sweden 3,997.
Ash and residue containing aluminum	1,823	1,770	—	Republic of South Africa 1,221; West Germany 135; France 107.
Metal including alloys:				
Scrap	87,372	114,286	3,067	West Germany 39,073; Italy 17,362; Finland 14,672.
Unwrought	133,555	155,050	527	West Germany 70,402; Belgium-Luxembourg 21,268; France 13,524.
Semimanufactures	141,561	151,126	8,801	West Germany 30,663; Ireland 20,257; France 18,580.
Antimony: Metal including alloys, all forms	59	33	1	Norway 20; Austria 3; West Germany 3.
Arsenic:				
Oxides and acids	2,372	NA		
Metal including alloys, all forms	NA	29	—	Ireland 14; Netherlands 8; Zambia 4.
Beryllium:				
Oxides and hydroxides	2	—		
Metal including alloys, all forms	30	1	—	All to France.
Bismuth: Metal including alloys, all forms	40	566	262	West Germany 96; France 78.
Cadmium: Metal including alloys, all forms	62	82	2	Republic of Korea 34; Finland 28; Japan 16.
Chromium:				
Ore and concentrate	217	207	86	Belgium-Luxembourg 60; Norway 51.
Oxides and hydroxides	9,479	—		
Metal including alloys, all forms	3,282	3,469	1,362	Japan 499; Ireland 200.
Cobalt:				
Oxides and hydroxides	780	1,004	85	Belgium-Luxembourg 385; France 94.
Metal including alloys, all forms	928	596	55	Netherlands 147; France 98; Belgium-Luxembourg 53.
Columbium and tantalum: Metals including alloys, all forms:				
Columbium (niobium)	16	NA		
Tantalum	18	38	5	West Germany 23; France 3.
Copper:				
Ore and concentrate	2,990	4,310	29	Sweden 4,095; Belgium-Luxembourg 80; Spain 42.
Matte and speiss including cement copper value, thousands	—	$5	$2	West Germany $3.
Oxides and hydroxides	409	924	20	Netherlands 190; West Germany 176; Singapore 160.
Sulfate	2,487	1,020	35	Ireland 449; Hong Kong 140; Taiwan 60.
Ash and residue containing copper	2,583	2,955	—	Belgium-Luxembourg 1,283; India 894; Sweden 348.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Copper—Continued				
Metal including alloys:				
Scrap	123,013	125,438	127	West Germany 46,799; Belgium-Luxembourg 33,342; Italy 20,950.
Unwrought	34,266	33,385	305	West Germany 9,153; Italy 5,517; France 5,261.
Semimanufactures	95,109	95,403	4,191	Switzerland 12,108; West Germany 11,054; Ireland 9,197.
Germanium: Metal including alloys, all forms	6	5	2	China 1; Japan 1.
Gold:				
Waste and sweepings kilograms	3,747	2,862	NA	NA.
Metal including alloys, unwrought and partly wrought do.	373,633	621,204	NA	NA.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	1,225	2,108	—	Republic of Korea 982; West Germany 506; Angola 224.
Pyrite, roasted	—	118	—	Nigeria 90; Ireland 25; Australia 3.
Metal:				
Scrap thousand tons	3,306	3,609	10	Spain 1,692; Turkey 314; Italy 225.
Pig iron, cast iron, related materials	74,616	72,150	572	Belgium-Luxembourg 19,581; France 10,846; West Germany 10,425.
Ferroalloys:				
Ferrochromium	953	648	—	West Germany 250; France 140; Italy 50.
Ferromanganese	13,990	9,756	3,266	Netherlands 4,010; Belgium-Luxembourg 905.
Ferromolybdenum	4,298	6,661	628	West Germany 1,945; Netherlands 790; Belgium-Luxembourg 758.
Ferronickel	(2)	8	—	Mainly to Italy.
Ferrosilicochromium	14	79	—	West Germany 60; Portugal 19.
Ferrosilicomanganese	419	2,820	—	West Germany 2,127; Ireland 520; Mozambique 59.
Ferrosilicon	2,548	2,387	34	Ireland 549; Hungary 325; West Germany 280.
Silicon metal	1,505	1,144	615	Belgium-Luxembourg 184; West Germany 141.
Unspecified	15,902	18,019	1,472	West Germany 4,131; France 1,719.
Steel, primary forms thousand tons	1,954	1,690	326	West Germany 317; Italy 276.
Semimanufactures:[3]				
Bars, rods, angles, shapes, sections do.	1,941	2,066	316	West Germany 175; Netherlands 139.
Universals, plates, sheets do.	1,645	NA		
Hoop and strip do.	161	NA		
Rails and accessories do.	184	168	3	India 45; Singapore 19; Italy 12.
Wire do.	126	129	23	France 11; Sweden 8.
Tubes, pipes, fittings do.	534	590	27	Netherlands 49; Sweden 48; West Germany 47.
Castings and forgings, rough do.	35	NA		

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Lead:				
Ore and concentrate	1,658	1,290	—	Belgium-Luxembourg 828; France 219; Austria 138.
Oxides	8,387	6,644	1	Ireland 3,010; West Germany 1,136; Cyprus 334.
Ash and residue containing lead	3,628	8,631	—	Belgium-Luxembourg 7,296; France 924; India 209.
Metal including alloys:				
Scrap	21,394	17,195	—	Ireland 5,835; Sweden 4,412; West Germany 1,722.
Unwrought	112,671	110,950	216	West Germany 37,950; France 19,125; Belgium- Luxembourg 9,725.
Semimanufactures	8,280	8,905	402	Belgium-Luxembourg 2,883; West Germany 1,530; Italy 782.
Lithium: Oxides and hydroxides	62	169	2	West Germany 48; France 41; Netherlands 30.
Magnesium: Metal including alloys:				
Scrap	844	61	3	West Germany 18; Norway 13; Italy 11.
Unwrought	790	796	276	France 83; Canada 70.
Semimanufactures	812	581	9	India 363; Netherlands 54; France 29.
Manganese:				
Ore and concentrate: Metallurgical grade	323	419	—	Netherlands 129; Nigeria 72; India 59.
Oxides	939	696	7	Ireland 188; France 157; Mozambique 90.
Metal including alloys, all forms	165	1,813	22	Australia 509; Canada 211; Sweden 156.
Mercury	64	66	1	Republic of South Africa 36; Kenya 11; Netherlands 7.
Molybdenum:				
Ore and concentrate	2,269	2,551	—	Netherlands 1,096; Belgium-Luxembourg 438; Austria 312.
Oxides and hydroxides	1,298	459	18	Austria 238; India 79; Netherlands 41.
Metal including alloys:				
Scrap	17	40	5	West Germany 22; Spain 11.
Unwrought	643	119	19	France 35; Norway 20.
Semimanufactures	103	329	16	Sweden 67; West Germany 59; France 38.
Nickel:				
Ore and concentrate	(2)	228	—	Republic of Korea 110; Belgium-Luxembourg 59.
Matte and speiss	1,285	762	5	Sweden 631; Finland 70; West Germany 24.
Oxides and hydroxides	98	219	—	West Germany 182; Indonesia 17; Belgium-Luxembourg 8.
Ash and residue containing nickel	6,359	7,939	232	Canada 6,277; Finland 492; Belgium-Luxembourg 376.
Metal including alloys:				
Scrap	5,030	4,185	600	Sweden 1,685; West Germany 343.
Unwrought	18,565	18,564	456	Belgium-Luxembourg 4,146; Sweden 3,406; West Germany 3,296.
Semimanufactures	9,707	13,578	213	Japan 3,425; West Germany 2,196; France 2,138.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals:					
Waste and sweepings	value, thousands	$22,875	$8,544	NA	Italy $7,403; Switzerland $1,011; France $69.
Metals including alloys, unwrought and partly wrought	kilograms	48,737	76,078	15,449	Japan 12,145; Italy 10,456.
Rare-earth metals including alloys, all forms		64	28	2	West Germany 22; Spain 3.
Rhenium: Metal including alloys, all forms		1	NA		
Selenium, elemental		225	221	16	Spain 52; Belgium-Luxembourg 41; China 35.
Silicon, high-purity		20	25	—	Japan 11; West Germany 10; Italy 3.
Silver:					
Ore and concentrate	value, thousands	—	$18	—	All to Greece.
Waste and sweepings	do.	$13,307	$18,099	$2,134	West Germany $6,054; France $5,619; Sweden $2,353.
Metal including alloys, unwrought and partly wrought		1,513	1,151	1	West Germany 357; Switzerland 238; Dubai 119.
Tellurium and arsenic, elemental		87	68	12	Netherlands 19; Ireland 14.
Tin:					
Ore and concentrate		3,840	5,424	—	Netherlands 3,040; Malaysia 2,292; East Germany 61.
Oxides		NA	674	NA	NA.
Ash and residue containing tin		829	1,294	—	West Germany 1,214; Singapore 43; Netherlands 19.
Metal including alloys:					
Scrap		529	374	15	West Germany 279; Belgium-Luxembourg 36; Spain 22.
Unwrought		17,581	16,333	580	Netherlands 6,971; U.S.S.R. 4,888; West Germany 1,073.
Semimanufactures		1,299	783	15	West Germany 149; Ireland 104; Italy 98.
Titanium:					
Ore and concentrate		16,187	33	—	All to Finland.
Oxides		27,348	33,327	12,829	West Germany 3,109; Netherlands 2,247.
Metal including alloys:					
Scrap		970	1,432	286	Canada 634; West Germany 177.
Unwrought		152	387	86	West Germany 130; Sweden 50.
Semimanufactures		915	1,270	138	West Germany 333; France 281.
Tungsten:					
Ore and concentrate		597	449	63	West Germany 187; Japan 126; Czechoslovakia 69.
Oxides and hydroxides		25	19	9	Austria 7; Portugal 2.
Ash and residue containing tungsten		42	35	26	West Germany 9.
Metal including alloys:					
Scrap		297	256	34	Sweden 71; Austria 43; Belgium-Luxembourg 36.
Unwrought		83	5	(2)	Italy 1; Taiwan 1.
Semimanufactures		104	205	41	West Germany 29; France 19.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Uranium and thorium:				
Ore and concentrate	NA	23	—	Mainly to Belgium-Luxembourg.
Metal including alloys, all forms:				
Uranium	1	NA		
Thorium	1	NA		
Vanadium:				
Oxides and hydroxides	18	7	—	Syria 3; France 2; Tanzania 2.
Ash and residue containing vanadium	58	—		
Metal including alloys:				
Scrap	99	16	8	France 8.
Unwrought	(2)	—		
Semimanufactures	43	8	1	Ireland 6; Japan 1.
Zinc:				
Ore and concentrate	8,852	9,330	—	Netherlands 8,913; Ireland 150.
Oxides	5,203	4,892	93	Ireland 963; West Germany 696; France 537.
Blue powder	2,060	2,312	NA	NA.
Matte	21	26	—	All to West Germany.
Ash and residue containing zinc	4,647	6,019	—	France 3,202; Sweden 2,055; Belgium-Luxembourg 337.
Metal including alloys:				
Scrap	22,461	25,079	125	West Germany 5,961; Taiwan 5,839; Sweden 4,051.
Unwrought	13,637	13,699	886	France 4,585; Belgium-Luxembourg 2,200; Portugal 1,514.
Semimanufactures	2,783	4,785	200	West Germany 1,019; France 809; Portugal 331.
Zirconium:				
Ore and concentrate	376	345	4	West Germany 105; Italy 88; Ireland 50.
Metal including alloys:				
Scrap	19	34	20	West Germany 6; Malaysia 5.
Unwrought	54	54	1	France 40; Sweden 7.
Semimanufactures	20	6	—	Norway 2; Australia 1; France 1.
Other:				
Ores and concentrates	637	710	NA	NA.
Oxides and hydroxides	1,828	NA		
Ashes and residues	12,497	6,979	793	Belgium-Luxembourg 2,656; France 465.
Base metals including alloys, all forms	9	49	12	Sweden 12; West Germany 10.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	2,966	1,913	178	Ireland 418; Netherlands 221; West Germany 201.
Artificial:				
Corundum	7,706	9,206	316	West Germany 3,691; Australia 1,468; Netherlands 748.
Silicon carbide	751	3,069	7	Belgium-Luxembourg 1,064; Norway 949; West Germany 369.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Abrasives, n.e.s.—Continued					
Dust and powder of precious and semiprecious stones including diamond	kilograms	1,694	2,134	511	West Germany 281; India 238.
Grinding and polishing wheels and stones		3,974	5,272	772	West Germany 704; France 576.
Asbestos, crude		462	289	—	Belgium-Luxembourg 106; Yugoslavia 89; Spain 21.
Barite and witherite		8,214	17,104	—	Angola 5,526; Ireland 4,644; Gabon 1,500.
Boron materials:					
Crude natural borates		1,446	2,739	—	France 2,563; Ireland 63; Sweden 47.
Elemental		35	10	—	Finland 3; Netherlands 3; Spain 3.
Oxides and acids		NA	1,004	25	Netherlands 559; Denmark 126; Ireland 94.
Bromine		2,556	2,147	—	France 911; Belgium-Luxembourg 486; Switzerland 382.
Cement		95,961	97,278	652	Ireland 58,800; France 5,575; Finland 3,855.
Chalk		38,138	21,057	248	West Germany 4,623.; Australia 2,665; Portugal 1,108.
Clays, crude:					
Bentonite		35,606	39,027	108	Sweden 10,353; West Germany 4,331; France 3,344.
Fuller's earth		24,824	31,091	39	West Germany 9,571; Sweden 4,768; Malaysia 4,421.
Kaolin	thousand tons	2,600	2,902	11	Finland 728; West Germany 478; Sweden 346.
Unspecified		r424,688	355,193	16,750	Spain 93,524; Italy 80,641; West Germany 47,217.
Cryolite and chiolite		8	20	—	Saudi Arabia 15; Ireland 4; Greece 1.
Diamond, natural:					
Gem, not set or strung	thousand carats	41,441	51,089	3,097	Belgium-Luxembourg 25,729; India 18,729.
Industrial stones	do.	9,812	15,219	1,944	Ireland 11,245; Israel 571.
Unsorted stones	do.	2,076	1,599	1,222	Belgium-Luxembourg 192; Republic of South Africa 73.
Diatomite and other infusorial earth		484	679	—	Belgium-Luxembourg 188; Bahrain 125; Nigeria 91.
Feldspar, fluorspar, related materials:					
Feldspar		450	823	—	Norway 499; Ireland 117; Sweden 94.
Fluorspar		4,732	8,115	—	Sweden 2,149; Norway 1,284; Netherlands 1,244.
Unspecified		641	677	—	All to Ireland.
Fertilizer materials:					
Crude, n.e.s.		1,202	38,312	137	Ireland 29,622; Netherlands 3,925; Denmark 1,424.
Manufactured:					
Ammonia		31,922	19,792	—	Belgium-Luxembourg 15,974; Sweden 2,705; France 275.
Nitrogenous		130,778	219,437	—	France 58,385; Spain 46,659; Belgium-Luxembourg 33,959.
Phosphatic		332	169	—	Ireland 101; Sweden 36; Belgium-Luxembourg 20.
Potassic		339,374	436,607	283	NA.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued				
Manufactured—Continued				
Unspecified and mixed	344,106	747,925	20,707	France 285,386; Ireland 218,897; Finland 64,145.
Graphite, natural	3,184	3,250	236	West Germany 1,803; France 221.
Gypsum and plaster	12,146	13,554	34	Ireland 4,205; Hong Kong 1,707; Spain 887.
Iodine	145	150	—	West Germany 73; France 42; Netherlands 12.
Kyanite and related materials	4,362	5,619	393	West Germany 3,000; Italy 487; France 470.
Lime	35,950	27,194	—	France 5,915; Cote d'Ivoire 5,810; Nigeria 2,416.
Magnesium compounds:				
Magnesite, crude	50	4,028	24	Poland 2,992; Netherlands 734; France 105.
Oxides and hydroxides	84,685	72,917	NA	NA.
Sulfate	1,371	1,257	—	Nigeria 493; Netherlands 280; Saudi Arabia 100.
Mica:				
Crude including splittings and waste	4,310	4,391	—	West Germany 2,498; Belgium-Lxuembourg 294.
Worked including agglomerated splittings	175	229	3	Republic of South Africa 40; France 29; Iran 23.
Nitrates, crude	167	592	—	Ireland 391; Belgium-Luxembourg 40; Italy 35.
Phosphates, crude	326	356	—	Ireland 145; Denmark 81; West Germany 72.
Phosphorous, elemental	1	—		
Pigments, mineral:				
Natural, crude	1,110	1,166	40	Spain 260; Belgium-Luxembourg 230; Kenya 149.
Iron oxides and hydroxides, processed	NA	8,759	NA	NA.
Potassium salts, crude	3	896	(2)	Denmark 715; United Arab Emirates 181.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$99,592	$67,493	$9,493	Switzerland $37,386; France $4,640.
Synthetic do.	$210	$1,221	$647	Netherlands $135; Republic of South Africa $97.
Pyrite, unroasted	171	70	—	France 46; West Germany 8; Norway 8.
Salt and brine	404,587	293,028	56,047	Sweden 105,498; Nigeria 40,364.
Sodium compounds, n.e.s.: Sulfate, manufactured	[4]45,431	33,622	36	Canada 8,002; Republic of South Africa 6,768; Italy 5,950.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,944	6,844	128	Norway 3,000; Ireland 1,813; Netherlands 746.
Worked	10,322	8,056	2,194	Ireland 1,640; West Germany 596.
Dolomite, chiefly refractory-grade	79,892	9,432	1	Belgium-Luxembourg 4,078; Netherlands 2,238; Norway 2,037.
Gravel and crushed rock	1,658,917	1,809,524	451,568	West Germany 459,508; France 370,330.
Limestone other than dimension	609,540	480,312	—	Denmark 146,858; West Germany 114,821; Belgium-Luxembourg 68,140.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued				
Quartz and quartzite	270	122	6	Ireland 72; Sweden 23; Netherlands 9.
Sand other than metal-bearing	60,449	48,292	55	Ireland 22,892; Sweden 16,073; Norway 2,712.
Sulfur:				
Elemental:				
Crude including native and byproduct	2,857	3,325	—	Saudi Arabia 1,022; Malaysia 600; Republic of South Africa 514.
Colloidal, precipitated, sublimed	169	1,089	—	France 290; Netherlands 164; West Germany 126.
Dioxide	11	198	—	Ireland 174; Spain 10; France 6.
Sulfuric acid	68,884	69,849	1	France 21,010; Ireland 19,204; Belgium-Luxembourg 20,762.
Talc, steatite, soapstone, pyrophyllite	2,354	1,978	5	Ireland 343; Netherlands 266.
Vermiculite, perlite and chlorite	1,206	1,931	1	Sweden 537; Ireland 323; Netherlands 254.
Other:				
Crude	36,132	35,942	40	West Germany 17,689; Ireland 3,581; Belgium-Luxembourg 2,657.
Slag and dross, not metal-bearing	77,561	71,346	979	West Germany 52,259; Sweden 3,612; United Arab Emirates 3,048.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,897	2,601	—	Ireland 698; Canada 500; Netherlands 162.
Carbon:				
Carbon black	12,813	35,017	242	France 7,989; West Germany 5,331; Ireland 4,669.
Gas carbon	34	45	—	Ireland 34; Netherlands 10; Angola 2.
Coal:				
Anthracite thousand tons	201	286	(2)	France 152; Morocco 47; Norway 27.
Bituminous do.	2,141	1,444	1	Denmark 426; Ireland 327; Portugal 170.
Briquets of anthracite and bituminous coal do.	114	79	(2)	Norway 65; Venezuela 8; Sweden 3.
Lignite including briquets	2,989	813	10	Norway 341; Ireland 182; Sweden 92.
Coke and semicoke	352,430	424,448	24,150	Norway 136,267; Sweden 58,059; Brazil 44,061.
Gas, natural:				
Gaseous cubic meters	r61,101	4,908	—	Netherlands 4,243; Australia 558; Ireland 46.
Liquefied thousand cubic meters	NA	54,924	—	Norway 47,994; Netherlands 6,298; Hong Kong 348.
Peat including briquets and litter	21,760	20,792	21	France 8,211; Sweden 8,026; Ireland 878.
Petroleum:				
Crude thousand 42-gallon barrels	612,051	464,434	107,097	Netherlands 81,694; France 80,722.
Refinery products:				
Liquefied petroleum gas do.	29,602	23,264	(2)	Netherlands 6,650; France 6,156; Portugal 2,409.
Gasoline do.	r38,357	45,680	9,463	Netherlands 12,845; West Germany 11,122.
Mineral jelly and wax do.	317	323	6	Netherlands 50; West Germany 49; Nigeria 23.

See footnotes at end of table.

TABLE 2—Continued

UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Kerosene and jet fuel	thousand 42-gallon barrels	r8,513	6,826	82	Ireland 2,555; France 851; West Germany 823.
Distillate fuel oil	do.	r33,965	71,753	11,623	France 19,577; Ireland 9,529.
Lubricants	do.	4,600	4,671	16	Netherlands 700; West Germany 697; Belgium-Luxembourg 647.
Residual fuel oil	do.	30,286	NA		
Bitumen and other residues	do.	274	384	—	Ireland 285; Spain 37; Kenya 33.
Bituminous mixtures	do.	202	125	(2)	Norway 13; Nigeria 11; Sweden 10.
Petroleum coke	do.	r2,662	NA		

r Revised. NA Not available.
[1] Table prepared by staff, International Data Section.
[2] Less than 1/2 unit.
[3] As a result in changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[4] Includes cadmium sulfate.

sons; therefore, the company is unable to use conventional drill and blast mining methods to exploit the underground deposit. Alternate mining methods are being investigated after attempts to use rock cutters in the unweathered sections of the deposit were unsuccessful.

In other gold related activities, Andaman Resources PLC was issued exploration permits covering 530 square meters in the Highlands of Scotland. Exploration emphasis will be mainly on alluvial gold localities. RTZ was continuing exploration on the Kearney structure within the Lack deposit near Tyrone, Northern Ireland. Channel sampling of a 212-meter-long by 5-meter-wide trench gave a reported average assay of 7.6 g of gold per ton of gold, 19.9 g of silver per ton, and 0.9% lead.

Iron and Steel.—Closure of Appleby Slag Reduction Ltd.'s iron ore operation at Scunthorpe at yearend 1988 signaled the end of an era of iron ore mining that was started in 1860. About 300 MMmt of iron ore had been produced from Lower Jurassic formations in the Humberside area. Production is currently limited to Peter Bennie Ltd.'s mine in Oxfordshire. There is a small amount of hematite mined by Egremont Mining Co.'s Florence Mine in Cumbria. Primary steel production is based almost entirely on imported iron ore.

British Steel PLC's (BS) five integrated steelworks were producing close to capacity owing to continued demand. BS continued with its major capital expansion program. Projects in progress or to be initiated include a $75 million continuous casting plant and a $95 million hot-dip galvanizing line at Llanwern, a $16 million second continuous casting plant at Port Talbot, and a $26 million blast furnace coal injection plant at Ravenscraig. Also, a $72 million sinter plant and a $24 million ladle arc furnace at Scunthorpe, and a $20 million ladle arc furnace and a $110 million modernization of the universal beam mill at Teesside was in progress in 1989.

BS announced the purchase of C. Walker and Sons (Holdings) Ltd. for $530 million subject to approval of the Government and the European Commission. The Walker group is the largest steel distribution company in the United Kingdom. Not only will the acquisition increase the market share of finished steel products for BS, it will also significantly increase BS's existing distribution network.

Tin.—The continued low price for tin in the world market has caused tin production to be further reduced. Carnon Consolidated Ltd. announced that the Wheal Jane Mine would be shut down by the end of 1990. Carnon's other mine, South Crofty, would remain in operation. The mill at Wheal Jane would continue operating to treat ore from South Crofty.

Capper Pass Ltd.'s tin smelter at North Ferriby, Humberside, reduced its capacity from 16,000 mt/yr to 12,000 mt/yr in a restructuring effort to reduce operating costs. Capper Pass now is operating with one rotary, one fuming, and one blast furnace. The company's source of tin concentrates is mainly from Bolivia with some additional amounts from China and Peru. Capper Pass also produces small amounts of bismuth, copper, indium, lead, silver, and zinc from secondary materials.

Industrial Minerals

Aggregates.—In 1989, there was a change in the structure of the aggregate industry in the United Kingdom. Hanson PLC purchased the assets of Consolidated Gold Fields PLC, which was the owner of ARC Ltd., one of the major aggregate producers in the United Kingdom. ARC produces more than 40 MMmt of aggregate per year along with

TABLE 3

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	1,540	1,848	268	West Germany 971; France 382.
Alkaline-earth metals	85	133	NA	NA.
Aluminum:				
Ore and concentrate	325,436	371,134	253	Ghana 249,811; Sierra Leone 50,513; Greece 29,487.
Oxides and hydroxides	629,179	639,638	3,158	Ireland 233,646; Jamaica 174,396; Guinea 76,389.
Ash and residue containing aluminum	698	1,053	—	West Germany 965; Ghana 45; France 43.
Metal including alloys:				
Scrap	12,621	18,607	696	Ireland 6,435; France 3,450; West Germany 2,218.
Unwrought	175,823	235,015	27	Norway 107,413; Netherlands 50,257; Iceland 20,262.
Semimanufactures	298,650	323,893	7,190	West Germany 97,440; France 46,821; Belgium-Luxembourg 42,361.
Antimony:				
Oxides	1,416	1,599	30	France 595; China 519; Belgium-Luxembourg 87.
Metal including alloys, all forms	389	410	6	Netherlands 119; China 79; Japan 26.
Arsenic: Oxides and acids	4,059	NA		
Beryllium:				
Oxides and hydroxides	7	11	11	
Metal including alloys, all forms	7	3	3	
Bismuth: Metal including alloys, all forms	550	678	20	Australia 447; West Germany 96; Netherlands 59.
Cadmium: Metal including alloys, all forms	1,099	1,157	13	Netherlands 493; Finland 247; Canada 215.
Cesium and rubidium: Metal including alloys, all forms	(2)	NA		
Chromium:				
Ore and concentrate	124,318	199,043	37	Republic of South Africa 191,399; Greece 3,365; Netherlands 2,774.
Oxides and hydroxides	541	858	17	Italy 460; Mexico 126; West Germany 116.
Metal including alloys, all forms	504	391	79	Japan 101; Sweden 42.
Cobalt:				
Oxides and hydroxides	636	645	3	Canada 456; Finland 109; Belgium-Luxembourg 33.
Metal including alloys, all forms	2,014	2,898	91	Netherlands 1,054; Switzerland 382; Canada 334.
Columbium and tantalum:				
Ore and concentrate	65	1,120	—	Canada 1,100; Netherlands 15; West Germany 5.
Metal including alloys, all forms:				
Columbium (niobium)	20	1,054	—	Canada 1,100; Netherlands 15.
Tantalum	64	66	38	West Germany 21; Austria 3.
Copper:				
Ore and concentrate	68	373	—	Republic of South Africa 293; West Germany 22; Belgium-Luxembourg 21.
Matte and speiss including cement copper	—	428	—	Mainly from Netherlands.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Copper—Continued					
Oxides and hydroxides		2,166	18,269	230	Norway 160; West Germany 147.
Sulfate		10,579	6,636	257	France 2,624; Israel 1,101; Netherlands 1,008.
Ash and residue containing copper		34,071	15,923	1,827	Turkey 5,078; Netherlands 3,166; West Germany 2,770.
Metal including alloys:					
Scrap		14,344	18,832	4,793	France 1,942; Chile 1,164.
Unwrought		313,187	312,468	4,202	Chile 70,939; Canada 45,847; Peru 41,068.
Semimanufactures		119,448	140,142	2,573	West Germany 46,589; France 23,726; Finland 10,457.
Germanium: Metal including alloys, all forms		8	10	1	West Germany 3; Netherlands 3; France 2.
Gold:					
Waste and sweepings	kilograms	205,799	165,158	39,000	Uruguay 47,000; Netherlands 27,000.
Metal including alloys, unwrought and partly wrought	do.	407,781	603,621	NA	NA.
Hafnium: Metal including alloys, all forms		2	3	3	
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	18,028	17,867	—	Canada 5,552; Australia 4,779; Brazil 2,163.
Pyrite, roasted	do.	168	216	—	Sweden 208; Norway 8.
Metal:					
Scrap		72,635	91,809	18,968	Canada 12,786; France 11,913.
Pig iron, cast iron, related materials		125,707	215,500	198	Sweden 71,473; Brazil 28,825; U.S.S.R. 26,901.
Ferroalloys:					
Ferrochromium		109,992	177,378	2,184	Norway 47,657; Sweden 29,190; Netherlands 25,579.
Ferromanganese		36,954	67,937	126	Norway 26,198; Republic of South Africa 13,589; Netherlands 10,490.
Ferromolybdenum		724	600	41	Belgium-Luxembourg 338; Austria 162; Netherlands 54.
Ferronickel		22,307	17,757	—	Greece 7,653; Netherlands 4,730; France 2,525.
Ferrosilicochromium		4	35	—	All from Republic of South Africa.
Ferrosilicomanganese		21,524	32,377	49	Norway 18,570; Republic of South Africa 8,470; Netherlands 1,845.
Ferrosilicon		76,352	75,353	NA	NA.
Silicon metal		40,911	42,988	20	France 17,014; Norway 11,721; Republic of South Africa 5,642.
Unspecified		15,285	18,147	771	Norway 4,925; France 3,210; West Germany 1,888.
Steel, primary forms		200,524	344,972	613	Netherlands 103,106; West Germany 87,547; Finland 45,407.
Semimanufactures:[3]					
Bars, rods, angles, shapes, sections	thousand tons	962	1,232	3	Spain 228; West Germany 150; Ireland 114.
Universals, plates, sheets	do.	1,710	NA		
Hoop and strip	do.	190	NA		

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal—Continued					
Semimanufactures—Continued					
Rails and accessories	thousand tons	29	15	(2)	Belgium-Luxembourg 11; West Germany 2; Ireland 1.
Wire	do.	69	68	(2)	Belgium-Luxembourg 24; France 13; West Germany 9.
Tubes, pipes, fittings	do.	326	523	4	West Germany 89; Netherlands 88; Italy 63.
Castings and forgings, rough	do.	25	NA		
Lead:					
Ore and concentrate		25,382	39,222	3,436	Sweden 8,514; Honduras 8,300; Spain 8,223.
Oxides		1,484	1,537	24	Netherlands 916; West Germany 543.
Ash and residue containing lead		14,504	12,995	10,332	West Germany 1,376; Netherlands 381.
Metal including alloys:					
Scrap		10,456	8,837	245	Belgium-Luxembourg 2,205; Ireland 1,417; Netherlands 1,387.
Unwrought		186,634	215,787	382	Australia 172,299; Canada 24,252; Sweden 4,074.
Semimanufactures		14,051	17,959	31	Ireland 7,978; Belgium-Luxembourg 6,405; Sweden 805.
Lithium:					
Oxides and hydroxides		883	573	283	West Germany 198; China 70.
Metal including alloys, all forms		51	NA		
Magnesium: Metal including alloys:					
Scrap		479	1,448	39	Netherlands 667; West Germany 189; Sweden 180.
Unwrought		4,426	3,898	6	Norway 1,659; Netherlands 1,483; France 360.
Semimanufactures		2,954	2,730	68	Belgium-Luxembourg 900; France 510; Switzerland 396.
Manganese:					
Ore and concentrate, metallurgical grade		120,550	195,457	201	Republic of South Africa 135,675; Brazil 43,600; Australia 7,562.
Oxides		5,199	5,711	158	Ireland 2,812; Norway 1,013; Belgium-Luxembourg 495.
Metal including alloys, all forms		2,484	2,859	112	Republic of South Africa 1,614; Netherlands 381; France 353.
Mercury		436	311	(2)	Netherlands 131; West Germany 74; Spain 67.
Molybdenum:					
Ore and concentrate		15,756	19,881	11,225	Netherlnads 4,907; Chile 1,251.
Oxides and hydroxides		135	256	—	West Germany 71; Netherlands 71; Belgium-Luxembourg 50.
Metal including alloys:					
Scrap		117	91	4	Austria 45; West Germany 19; France 14.
Unwrought		52	75	25	Belgium-Luxembourg 17; France 11.
Semimanufactures		146	175	44	Austria 82; France 22.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Nickel:				
Ore and concentrate	159	72	(2)	West Germany 60; Netherlands 10; Canada 2.
Matte and speiss	39,958	43,892	—	Canada 43,698; Belgium-Luxembourg 104.
Oxides and hydroxides	1,230	2,942	4	Canada 2,512; Australia 198; Netherlands 121.
Ash and residue containing nickel	2,709	796	78	West Germany 328; Netherlands 246; Taiwan 81.
Metal including alloys:				
Scrap	4,503	6,350	1,515	Canada 704; Taiwan 646.
Unwrought	18,157	17,556	370	Netherlands 5,216; Canada 3,144; Australia 1,713.
Semimanufactures	4,922	4,938	2,421	West Germany 1,448; France 371.
Platinum-group metals:				
Waste and sweepings value, thousands	$79,723	$93,819	$29,473	Republic of South Africa $18,444; Belgium-Luxembourg $8,701.
Metals including alloys, unwrought and partly wrought kilograms	26,000	59,195	7,067	Republic of South Africa 22,628; Belgium-Luxembourg 12,214.
Rare-earth metals including alloys, all forms	57	54	NA	NA.
Rhenium: Metal including alloys, all forms	13	NA		
Selenium, elemental	462	622	153	Canada 176; Japan 96.
Silicon, high-purity	27	40	—	West Germany 19; Japan 18; Spain 1.
Silver:				
Ore and concentrate[4] value, thousands	$213,939	$227,215	$20,110	Canada $110,577; Republic of South Africa $80,195.
Waste and sweepings[4] do.	$21,997	$110,216	$33,781	Chile $17,992; Austria $9,279.
Metal including alloys, unwrought and partly wrought kilograms	1,327	1,338	216	France 208; Mexico 146.
Tellurium and arsenic, elemental	152	130	7	Sweden 35; Belgium-Luxembourg 25; China 24.
Tin:				
Ore and concentrate	26,280	20,239	1,089	Bolivia 8,219; Peru 6,548; Canada 3,340.
Oxides	38	353	—	West Germany 323; Italy 30.
Ash and residue containing tin	9,369	11,126	3,656	West Germany 2,974; Belgium-Luxembourg 1,514.
Metal including alloys:				
Scrap	446	517	41	Ireland 164; Netherlands 82.
Unwrought	5,232	4,514	119	Netherlands 1,690; Belgium-Luxembourg 803; Malaysia 499.
Semimanufactures	468	429	3	Malaysia 125; West Germany 89; Netherlands 63.
Titanium:				
Ore and concentrate	416,209	456,902	26	Australia 275,024; Norway 102,490; Sierra Leone 36,343.
Oxides	3,450	3,490	224	West Germany 1,297; China 713; Czechoslovakia 380.
Metal including alloys:				
Scrap	9,435	12,005	4,625	U.S.S.R. 4,287; West Germany 963.
Unwrought	2,024	2,781	212	Japan 1,873; U.S.S.R. 483.
Semimanufactures	1,179	1,901	986	Japan 628; West Germany 106.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Tungsten:				
Ore and concentrate	311	20	(2)	Mainly from Netherlands.
Oxides and hydroxides	2	5	—	All from West Germany.
Ash and residue containing tungsten	142	67	27	Taiwan 21; Austria 19.
Metal including alloys:				
Scrap	229	551	126	Sweden 242; West Germany 119.
Unwrought	114	141	16	Republic of Korea 63; France 21; West Germany 17.
Semimanufactures	81	100	33	West Germany 21; Netherlands 16.
Uranium and thorium: Metals including alloys, all forms:				
Uranium	4	NA		
Thorium	2	NA		
Vanadium:				
Oxides and hydroxides	255	94	—	Republic of South Africa 29; Austria 20; China 19.
Ash and residue containing vanadium	67	21	—	All from Netherlands.
Metal including alloys:				
Scrap	(2)	14	—	China 7; West Germany 3; Netherlands 2.
Unwrought	202	163	37	West Germany 126.
Semimanufactures	37	59	—	West Germany 51; Netherlands 8.
Zinc:				
Ore and concentrate	177,233	187,826	—	Australia 74,911; Peru 51,724; Canada 18,035.
Oxides	6,915	7,521	63	West Germany 2,078; China 1,100; Peru 799.
Blue powder	1,718	1,344	NA	West Germany 1,141.
Matte	137	868	—	West Germany 467; Belgium-Luxembourg 224; Nigeria 55
Ash and residue containing zinc	26,808	14,329	501	Spain 9,793; Austria 1,202; France 1,138.
Metal including alloys:				
Scrap	4,601	6,487	45	France 1,681; West Germany 1,369; Canada 1,069.
Unwrought	121,491	137,623	24	Netherlands 48,576; Finland 22,259; Canada 20,977.
Semimanufactures	3,724	4,053	12	West Germany 2,129; France 589; Netherlands 392.
Zirconium:				
Ore and concentrate	37,308	43,411	403	Australia 26,504; Republic of South Africa 14,309.
Metal including alloys:				
Scrap	81	47	28	Netherlands 10; Sweden 8.
Unwrought	185	37	36	West Germany 1.
Semimanufactures	48	75	39	France 34; Netherlands 1.
Other:				
Ores and concentrates	429	14,993	2,951	Republic of South Africa 5,668; Canada 3,157.
Oxides and hydroxides	883	1,560	2	France 666; West Germany 507; Italy 242.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Other—Continued					
Ashes and residues		r10,382	7,061	2,493	Netherlands 1,023; Belgium-Luxembourg 362.
Base metals including alloys, all forms		141	183	18	West Germany 66; Belgium-Luxembourg 31; Portugal 25.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		169,676	175,622	356	Greece 87,233; Italy 47,391; Iceland 26,785.
Artificial:					
Corundum		18,775	22,547	NA	NA.
Silicon carbide		24,838	27,610	28	Norway 14,179; West Germany 5,438; Spain 2,741.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$14,335	$18,236	NA	NA.
Grinding and polishing wheels and stones		6,601	8,796	212	West Germany 1,828; France 1,608; Netherlands 1,511.
Asbestos, crude		23,865	24,266	379	Canada 17,771; Republic of South Africa 3,619.
Barite and witherite		112,042	157,892	1	Morocco 55,678; Netherlands 48,910; Ireland 41,451.
Boron materials:					
Crude natural borates		72,507	49,525	—	Turkey 49,280; Netherlands 179.
Elemental		34	16	1	France 6; Netherlands 6; West Germany 3.
Oxides and acids		5,609	9,527	168	France 6,812; Belgium-Luxembourg 906; Netherlands 896.
Bromine		8,968	9,726	221	Israel 9,497; West Germany 7.
Cement	thousand tons	978	2,804	(2)	Ireland 493; France 366; Greece 346.
Chalk		18,038	21,864	30	France 14,090; Denmark 6,426; Switzerland 703.
Clays, crude:					
Bentonite		98,133	115,114	25,943	Greece 41,542; Cyprus 29,409.
Chamotte earth		38,437	43,609	4,724	France 27,875; Spain 3,670.
Fire clay		NA	16,664	3,232	France 9,571; Belgium-Luxembourg 2,100.
Fuller's earth		1,284	3,068	976	Senegal 2,041; West Germany 33.
Kaolin		7,658	8,265	1,528	Belgium-Luxembourg 2,942; Netherlands 2,590.
Unspecified		59,582	75,391	10,129	France 23,493; Republic of South Africa 19,969.
Cryolite and chiolite		864	628	—	Denmark 585; India 40; Sweden 2.
Diamond, natural:					
Gem, not set or strung	thousand carats	(5)	40,661	NA	NA.
Industrial stones	do.	(5)	7,655	NA	NA.
Unsorted	do.	(5)	8,860	NA	NA.
Diatomite and other infusorial earth		25,689	42,718	2,517	Denmark 26,125; Senegal 6,115; France 2,805.
Feldspar		53,985	50,756	22	Finland 16,579; Norway 15,100; Sweden 14,675.
Fertilizer materials:					
Crude, n.e.s.		1,029	18,649	54	France 11,275; Italy 5,775.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials—Continued					
Manufactured:					
Nitrogenous	thousand tons	915	967	7	Netherlands 258; Belgium-Luxembourg 161; Ireland 108.
Phosphatic	do.	287	266	—	Netherlands 91; Sweden 54; Tunisia 46.
Potassic	do.	759	594	—	East Germany 179; West Germany 172; Canada 83.
Unspecified and mixed	do.	640	573	2	Netherlands 209; Belgium-Luxembourg 62; Sweden 44.
Fluorspar		4,295	8,144	20	Mexico 4,085; Netherlands 3,945; France 94.
Graphite, natural		19,728	23,437	137	China 10,956; Madagascar 5,570; Sri Lanka 1,880.
Gypsum and plaster		144,106	217,766	679	Spain 128,257; Ireland 43,215; France 17,941.
Iodine		1,633	1,631	141	Japan 1,062; Chile 236.
Kyanite and related materials		48,717	51,058	4,125	France 23,333; Republic of South Africa 20,504.
Lime		6,442	5,711	—	Ireland 4,208; France 918; Sweden 420.
Magnesium compounds:					
Magnesite, crude		7,778	16,323	644	Turkey 5,925; Greece 4,500.
Oxides and hydroxides		121,752	148,655	766	Netherlands 41,109; Spain 25,351; Greece 24,873.
Sulfate		19,494	17,157	—	East Germany 10,298; West Germany 6,681; Cyprus 178.
Mica:					
Crude including splittings and waste		19,942	13,713	84	India 4,536; China 4,181; France 1,937.
Worked including agglomerated splittings		474	471	8	Belgium-Luxembourg 154; France 104; Switzerland 62.
Nitrates, crude		5,060	10,372	—	Belgium-Luxembourg 3,209; Chile 2,656; West Germany 2,427.
Phosphates, crude		758,084	746,823	8	Morocco 504,517; Senegal 163,510; Tunisia 46,980.
Pigments, mineral:					
Natural, crude		5,313	5,609	13	India 2,121; Austria 1,589; Cyprus 679.
Iron oxides and hydroxides, processed		36,291	32,213	397	West Germany 22,416; Italy 1,730; China 1,588.
Potassium salts, crude		25,912	28,038	—	West Germany 19,003; East Germany 8,865.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$86,769	$108,407	$139	Switzerland $3,277; Belgium-Luxembourg $1,646.
Synthetic	do.	$3,003	$3,066	$111	Switzerland $1,214; Austria $525; West Germany $284.
Quartz crystal, piezoelectric	kilograms	152	1,283	4	Japan 877; Brazil 244; Madagascar 88.
Pyrite, unroasted		r631,814	696,229	260	Poland 240,243; France 211,893; West Germany 122,013.
Salt and brine		222,668	162,057	1,123	East Germany 38,075; West Germany 32,746; France 29,877.
Sodium compounds, n.e.s.: Sulfate, manufactured		[6]120,062	93,209	3,797	Belgium-Luxembourg 33,343; Sweden 28,807; Spain 12,287.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	214,672	308,490	56	Norway 154,473; Sweden 90,684; Italy 5,985.
Worked	112,071	141,727	995	Italy 39,330; Spain 37,853; Portugal 33,607.
Dolomite, chiefly refractory-grade	171,329	171,382	96	Spain 114,020; Norway 48,900.
Gravel and crushed rock	785,714	1,077,652	3,587	Ireland 312,012; France 296,659; Belgium-Luxembourg 111,216.
Limestone other than dimension	433	4,555	2	Spain 2,953; Denmark 734.
Quartz and quartzite	4,057	8,171	156	West Germany 1,357; Belgium-Luxembourg 1,064.
Sand other than metal-bearing	87,149	71,218	2,138	Belgium-Luxembourg 31,424; West Germany 13,717; Netherlands 13,250.
Sulfur:				
Elemental:				
Crude including native and byproduct	(7)	—		
Colloidal, precipitated, sublimed	379	910	3	West Germany 780; France 91; Spain 14.
Dioxide	837	423	—	Netherlands 295; Sweden 109; France 19.
Sulfuric acid	277,500	302,106	4	West Germany 110,897; Norway 100,777; France 62,866.
Talc, steatite, soapstone, pyrophyllite	70,675	60,243	—	France 2,468; Australia 705; China 51.
Vermiculite, perlite and chlorite	115,705	136,907	1,158	Republic of South Africa 47,191; Italy 39,700; Greece 27,570.
Other:				
Crude	267,341	310,571	9,790	Norway 190,215; Spain 53,224; France 14,990.
Slag and dross, not metal-bearing	704,392	791,500	5,440	France 312,353; Belgium-Luxembourg 220,185; Republic of South Africa 36,260.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11,390	17,668	2,922	Trinidad and Tobago 6,453; France 3,794.
Carbon:				
Carbon black	39,096	40,726	4,708	France 14,431; West Germany 10,012; Netherlands 6,487.
Gas carbon	2,253	NA		
Coal:				
Anthracite thousand tons	573	804	4	Netherlands 320; West Germany 167; China 150.
Bituminous do.	9,208	10,981	3,431	Australia 2,471; Netherlands 1,698.
Briquets of anthracite and bituminous coal do.	129	159	(2)	West Germany 97; Netherlands 45; France 10.
Lignite including briquets do.	19	11	(2)	West Germany 6; East Germany 2; Ireland 2.
Unspecified do.	—	208	2	Netherlands 169; Ireland 16; Poland 9.
Coke and semicoke	248,399	732,689	211,068	West Germany 234,477; Netherlands 81,623.
Gas, natural:				
Gaseous million cubic meters	r10	9	(2)	Mainly from Norway.
Liquefied do.	NA	57	(2)	Mainly from Algeria.
Peat including briquets and litter	241,861	299,493	22	Ireland 258,431; U.S.S.R. 10,052; Finland 9,509.

See footnotes at end of table.

TABLE 3—Continued

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum:					
Crude	thousand 42-gallon barrels	223,612	240,912	—	Norway 123,637; Turkey 19,422; Iran 15,634.
Refinery products:					
Liquefied petroleum gas	do.	9,343	10,841	(2)	Algeria 3,818; Noway 3,099; Finland 1,585.
Gasoline	do.	r40,289	50,639	1,400	Netherlands 13,490; U.S.S.R. 11,265; Algeria 8,390.
Mineral jelly and wax	do.	184	225	5	Netherlands 147; West Germany 21; France 16.
Kerosene and jet fuel	do.	6,910	4,710	290	Netherlands 2,123; Belgium-Luxembourg 732; Spain 659
Distillate fuel oil	do.	12,716	4,635	3	Netherlands 2,051; U.S.S.R. 1,345; Italy 319.
Lubricants	do.	14,050	8,275	37	Belgium-Luxembourg 2,661; Netherlands 1,558; Norway 1,493.
Residual fuel oil	do.	64,070	71,995	877	U.S.S.R. 15,694; Libya 11,110; Netherlands 7,668.
Bitumen and other residues	do.	799	653	204	France 225; Norway 94.
Bituminous mixtures	do.	38	14	3	Netherlands 4; Venezuela 3.
Petroleum coke	do.	2,987	3,813	1,857	Netherlands 855; Belgium-Luxembourg 730.

r Revised. NA Not available.
[1] Table prepared by staff, International Data Section.
[2] Less than 1/2 unit.
[3] As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[4] May include other precious metals.
[5] Unreported quantities valued, in thousand dollars, at: gem and unsorted—$2,629,894 and industrial—$33,119.
[6] Includes cadmium sulfate.
[7] Revised to zero.

other products, including coated stone and premixed concrete.

Blue Circle Industries PLC, the United Kingdom's largest cement producer, purchased Georgia Marble Corp. of the United States for $148.5 million in late 1989. The company is one of the largest aggregate suppliers in the Atlanta area. Georgia Marble has seven quarries within 80 kilometers of Atlanta and estimated reserves of more than 700 MMmt.

The United Kingdom continued to be the world's second largest producer, after Japan, of marine-dredged aggregate, extracting about 20 MMmt/yr, mainly from the southern North Sea area and the English Channel.

ARC Ltd. commissioned a 5,546-ton trailing suction marine sand and gravel dredge in mid-1989. ARC has also ordered 2 smaller dredges, which will bring its fleet up to 17 dredgers. The company produces about 40% of the country's marine aggregate output. Civil and Marine (Holdings) Ltd. (CAM) is another major producer of marine aggregate. CAM operates a fleet of three suction-hopper dredgers and a self-discharging bulk carrier. The combined capacity of the three dredges is about 4.2 MMmt/yr.

Cement.—Demands of the construction industry continued to exceed the capacity of the cement industry. Imports were required to meet consumption levels. Construction of the English Channel tunnel is expected to keep demand levels high into the future.

To capitalize on this increased demand, companies are boosting production levels. Blue Circle is planning to raise its production level by 300,000 mt/yr to a level of about 9 MMmt/yr. Castle Cement Ltd. is expanding cement kiln capacity at the Padeswood plant from the present level of 500,000 mt/yr to 1.5 MMmt/yr and adding additional crushing equipment at its nearby Cefn Mawr quarry. Castle is also constructing a $15 million cement terminal on the Thames in West Thurrock, Essex. Initially, the terminal will handle 500,000 mt/yr; however, capacity can be doubled if necessary to meet demand.

Clays.—The United Kingdom is the leading world producer and exporter of ball clay. Also, it is the world's largest exporter and second largest producer after the United States of kaolin (china clay). Continuing strong demand has resulted in continuing high production levels. English China Clays PLC (ECC) is the largest producer of china clay and, in 1989, reported that its worldwide sales exceeded 6 MMmt for the first time.

TABLE 4

UNITED KINGDOM: TRADE IN MINERALS AND MINERAL-BASED PRODUCTS[1]

(Million dollars)

Commodity[2]	Imports		Exports		Net balance (im - ex)	
	1987	1988	1987	1988	1987	1988
Crude minerals, ores, scrap	2,416	2,760	1,267	1,483	1,149	1,277
Fuel minerals and products	9,398	9,400	14,318	9,307	-4,920	93
Gold[3]	1,083	7,254	650	1,611	438	5,643
Iron and steel	3,024	3,101	3,498	2,965	-474	136
Manufactured fertilizers	338	203	136	117	202	86
Metal manufactures	3,021	91	2,466	72	555	53
Mineral-based chemicals	6,773	4,784	7,136	4,051	-363	733
Nonferrous metals	3,107	4,006	2,403	2,638	704	1368
Nonmetallic mineral products	4,395	4,750	4,246	4,160	149	590
Total	33,555	36,349	36,120	26,404	-2,560	9,979
All traded goods	150,441	168,010	127,158	127,218		
Mineral-based product as percentage of all traded goods	22%	22%	28%	21%		

[1]Imports are valued c.i.f. and exports are valued f.o.b.
[2]The Combined Nomenclature integrated classification was effective Jan. 1, 1988. The revised codes have made comparison with previous years unfeasible.
[3]Owing to revised codes, comparison between monetary and nonmonetary gold is no longer possible.

Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989.

Talc.—Shetlands Talc Ltd., a joint venture between Anglo European Minerals Ltd. and Dalraida Mineral Ventures Ltd. was planning to exploit a talc-magnesite deposit at Cunningsburgh, Shetland Islands. The main product would be a high-brightness, high-purity talc, and a secondary product would be a 95%-pure magnesite. Estimated reserves were between 3 and 4 MMmt.

Mineral Fuels

Coal.—Since the coal strike of 1984–85, BC has made remarkable progress in improving its competitiveness. The number of operating underground coal mines has been reduced by more than 50% to 78, the work force has been reduced by more than 50% to 75,000, productivity has risen by 90% to 4.7 tons per man per shift, and colliery costs have fallen by one-third. The number of open pit coal operations, where coal is less costly to mine, has been increasing. At yearend, there were 42 pits in England and Wales and 11 in Scotland, where a major new mine was opened at Dalquhandy. In the private sector, there were 170 mines licensed for operation at yearend.

BC signed a 3-year contract to supply coal to the newly formed private electric utilities National Power and PowerGen. For the first 2 years BC will supply an aggregate of 70 MMmt/yr, then, for the third year, will supply 65 MMmt. The price structure is based on Net Calorific Value, which, in real terms, means no price increases for the next 3 years. The electricity industry accounts for about 80% of BC's total sales.

BC was successful in negotiating a $38.5 million loan package from the European Coal and Steel Community to be used as part of $78.5 million that BC requires to improve efficiency at three collieries. Improvements will be made to surface and underground infrastructure, ventilation, and hoisting capacity.

Riccall, Stillingfleet, Whitemoor, and Wistow, the four mines of the Selby Complex, had a combined production of more than 5 MMmt. The fifth mine, North Selby, is scheduled to start production in 1990.

It was reported that the Australian company Meekatharra Minerals Ltd. had signed a joint agreement with BHP-Utah, another Australian-owned company, to develop the lignite deposit near Ballymoney, Northern Ireland. The lignite would be used to supply the electricity generating industry of Northern Ireland and reduce dependency on imported coal.

Natural Gas.—It was reported that British Petroleum Ltd. (BP) and partners negotiated a gas sales agreement with British Gas that would enable BP to implement a $2.4 billion development project. The project, in the southern part of the East Shetland Basin, is the largest United Kingdom North Sea project currently underway. Reserves were estimated to be 2.6 trillion cubic feet with 210 million barrels of condensate. Startup is scheduled for late 1993 with peak production of 470 million cubic feet per day. In 1989, there were 37 producing gasfields in the United Kingdom sector of the North Sea. Two new gasfields, Camelot and Ravenspun, came on-stream in 1989.[5]

The electricity supply industry has been investigating ways to reduce dependence on coal. As a result, PowerGen was negotiating for the exclusive use of gas from Atlantic Richfield's Pickerill Field in the southern North Sea. The gas would be used in the purposed 1,000 megawatt power station at Killingholme, Humberside.

Petroleum.—The 11th Licensing Round awarded 105 offshore petroleum licenses in 1989, and 7 new oilfields came on-stream. These were the Central Brae, Clamas, Crawford, Don, Ivanhoe/Rob Roy, Linnhe, and Tern. New discoveries added an additional 435 million barrels to offshore petroleum reserves.

Occidental Petroleum was able to resume production from the Claymore Field in mid-1989. Production had ceased in mid-1988 after the Piper Alpha disaster. At yearend, the Government gave approval for redevelopment of the Piper Field with stricter design and safety features to be incorporated into the new production facility.

The United Kingdom has an onshore producing oilfield. The Wytch Farm Field in Dorset contains estimated reserves of 400 million barrels. Exploration and drilling by BP confirmed that

TABLE 5

UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Aggregate	ARC Ltd. (Hanson PLC, 100%)	50 quarries in various locations	50,000
Do.	Foster Yoeman Ltd.	Glensanda quarry at Oban	15,000
Aluminum, primary	British Alcan Aluminium Ltd.	Ft. William, Kinlochleven, and Lynemouth	175
Do.	Angelesy Aluminium LTD. (RTZ Corp. Ltd., 51%; Kaiser Aluminum & Chemical Corp., 49%)	Holyhead, Wales	113
Aluminum, secondary	Trent Alloys Ltd. (Cookson Group, 100%)	North Cave, Humberside	10
Ball clay	Watts, Blake, Bearne & Co. PLC	Various operations in north and south Devon	500
Celestite	Bristol Minerals Co. Ltd.	Yate, Avon	30
Cement	Aberthaw & Bristol Channel Portland Cement Co. Ltd.	East Aberthaw, Glamorgan, and Rhoose, Glamorgan	1,000
Do.	Blue Circle Industries PLC	Main plants at Couldon, Dunbar, Hope, Northfleet, Weardale, and Westbury	11,300
Do.	Castle Cement Ltd. (Aker Norcem AS, 50%; Indus AB Euroc, 50%).	Main plants at Ketton, Ribblesdale, Pades, and Pitstone	4,000
China clay (kaolin)	ECC Group	Mines and plants in Devon	3,000
Copper	IMI Refiners Ltd.	Refinery at Walsall, West Midlands	80
Ferroalloys	British Steel PLC	Teesside, Cleveland	80
Do.	Murex Ltd.	Rainham, Essex	25
Do.	London and Scandinavian Metallurgical Co. Ltd.	Rotherham, South Yorkshire	30
Fluorspar	Deepwood Mining Co. Ltd.	Mines in Derbyshire	50
Do.	Laporte Industries	Mill at Stoney Middleton, Mines in Derbyshire	70
Gypsum	British Gypsum Ltd.	Mines in Midlands, Cumbria and Sussex	3,500
Lead, refined	Britania Refined Metals Ltd.	Northfleet, Kent	165
Lead, secondary	H. J. Enthoven and Son Ltd. (Billiton (U.K.) Ltd., 100%)	Darley Dale, Derbershire	60
Lead, smelter	Pasminco Ltd.	Avonmouth, Avon	40
Natural gas	Amoco Ltd., British Petroleum Ltd., Esso (U.K.) Ltd, Phillips Petroleum Co. PLC, Shell (U.K.) Ltd.	North Sea gasfields	[1]1,250
Nickel, refined	INCO Europe Ltd. (INCO Ltd., Canada)	Clydach, Wales	30
Petroleum, crude	Amoco Ltd., British Petroleum Ltd., Chevron Ltd., Esso (U.K.) Ltd., Occidental Petroleum Co. Ltd., Shell (UK) Ltd., Texaco Ltd., Unocal, Inc.	North Sea oilfields	[2]2.1
Petroleum, refined	British Petroleum Ltd., Conoco Ltd., Mobil Oil Co. Ltd., and others	11 refineries in various locations	[2]2.3
Platinum-group metals	Johnson Matthey PLC	Enfield (London) and Royston, Cambridgeshire	20
Do.	INCO Europe Ltd. (INCO Ltd., Canada)	Acton (London)	6
Potash	Cleveland Potash Ltd.	Boulby Mine, Yorkshire	500
Salt, rock	Imperial Chemical Industries PLC	Mines at Winsford, Chesire	3,000
Do.	Irish Salt Mining & Exploration Co.	Carrick Fergus, Northern Ireland	300
Silica sand	Hepworth Minerals and Chemicals Ltd.	Operations in Cambridgeshire, Cheshire, Humberside, and Norfolk	6,000
Steel	British Steel PLC	5 integrated steelworks in Gwent, Lanark, South Humberside, and Cleveland	16,800
Talc	Alex Sandison & Sons Ltd.	Unst, Shetland Islands	15
Do.	Shetland Talc Ltd. (Anglo European Minerals Ltd., 50%; Dalriada Mineral Ventures Ltd., 50%)	Cunningsburg, Shetland Islands	35

See footnotes at end of table.

TABLE 5—Continued

UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Tin, ore	Carnon Consolidated Tin Mines Ltd.	Wheal Jane Mine and South Crofty Mine, Cornwall	3,600
Do.	Geevor PLC	Geevor Mine, Cornwall	1,600
Tin, refined	Capper Pass Ltd. (RTZ Corp. Ltd.)	North Ferriby, North Humberside	14
Titanium, sponge	Deeside Titanium Ltd.	Plant at Deeside, Clyde	5
Zinc, smelter	Pasminco Ltd.	Avonmouth, Avon	90

[1] Billion cubic feet per year.
[2] Million 42-gallon barrels per day.

the field extends offshore under Poole Bay. The extent and amount of additional reserves had not been reported at yearend.

TABLE 6

UNITED KINGDOM: RESERVES OF MAJOR MINERALS

Commodity	Amount[e] (million metric tons unless otherwise specified)
Clays:	
Ball clay	300
Fire clay	15,000
Kaolin (china clay)	2,000
Coal (all)	[1]5
Fluorspar	[2]2,000
Natural gas	[3]1,265
Petroleum, crude	1,790
Potash (K_2O content)	[2]25,000
Tin (Sn content)	[2]90
Tungsten (W content)	[2]20

[e] Estimated.
[1] Billion metric tons.
[2] Thousand metric tons.
[3] Billion cubic meters.

INFRASTRUCTURE

Rail and trucking transportation is well developed and excellent. The state-owned British Railways (BR) operates a 16,629-kilometer 1.435-meter standard-gauge system with 4,205 kilometers (km) of electrified and 12,591 km of double or multiple track. There are additional standard and narrow-gauge lines that are privately owned and operated. Northern Ireland Railways (NIR) operates a 332-km 1.600-meter gauge system with 190 km of double track.

All three major steel-producing areas are on or near tidewater. Petroleum refineries are likewise on the coast. The major cargo ports are Bristol, Liverpool, London, and Southhampton in England; Glasgow in Scotland; Cardiff and Milford Haven in Wales; and Belfast in Northern Ireland.

Transportation, not only in the United Kingdom but also in the whole of Europe, will change significantly with the completion of the Channel Tunnel. The tunnel, being constructed underneath the English Channel, will connect Folkestone, England, and Coquelles, near Calais, France. From these terminals, people will drive their cars and trucks onto trains that will transport them 49 km to each respective side in about one-half hour. Everything going through the tunnel will move by high-speed rail.

The system consists of a north running tunnel and a south running tunnel and a service tunnel with connections between the two main tunnels. The tunnel system, with 38 km of it under water, is the longest undersea tunnel ever built. It is also the largest privately financed construction project in history with an estimated cost of $14 billion. Completion is estimated for the two railway tunnels in June 1993, at which time service between Folkestone and Calais will begin. The Channel Tunnel linking the two countries will be a vital component of the Single Market 1992 when the European Community becomes one marketplace of 320 million people.

OUTLOOK

The United Kingdom is a significant player in the world mining and mineral processing industries. This is more the result of an extensive range of organizations in the country, with various interests in the mineral industry internationally, rather than production from the domestic industry. This is expected to continue.

Exploration is also expected to continue at a high level both onshore and offshore. Onshore exploration activities will be mainly directed toward precious metals. Offshore exploration interest will continue to be focused on North Sea areas, particularly east of the Shetland Islands and in the southern North Sea, which have been the most prolific areas in the past.

[1] Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of (£)1.00 = US$1.62, the average rate during 1989.
[2] Metal Bulletin. No. 7534, Nov. 19, 1989, p 7.
[3] British Geologic Survey. United Kingdom Minerals Yearbook 1989, p 4-1.
[4] ——.
[5] British Geologic Survey. United Kingdom Minerals Yearbook 1989, p 2-2.

OTHER SOURCES OF INFORMATION

Agencies

British Geologic Survey,
Keyworth, Nottingham NG125GG
Central Statistics Office
Great George Street
London, SW1P 3AQ
United Kingdom

Department of Economic Development
(Northern Ireland)
Belfast BT1 3AJ
Northern Ireland

Department of Energy
1 Palace Street
London SW1E 5HE
United Kingdom

Department of Environment
2 Marsham Street
London SW1P 3EB
United Kingdom

Department of Trade and Industry
123 Victoria Street
London SW1E 6RB
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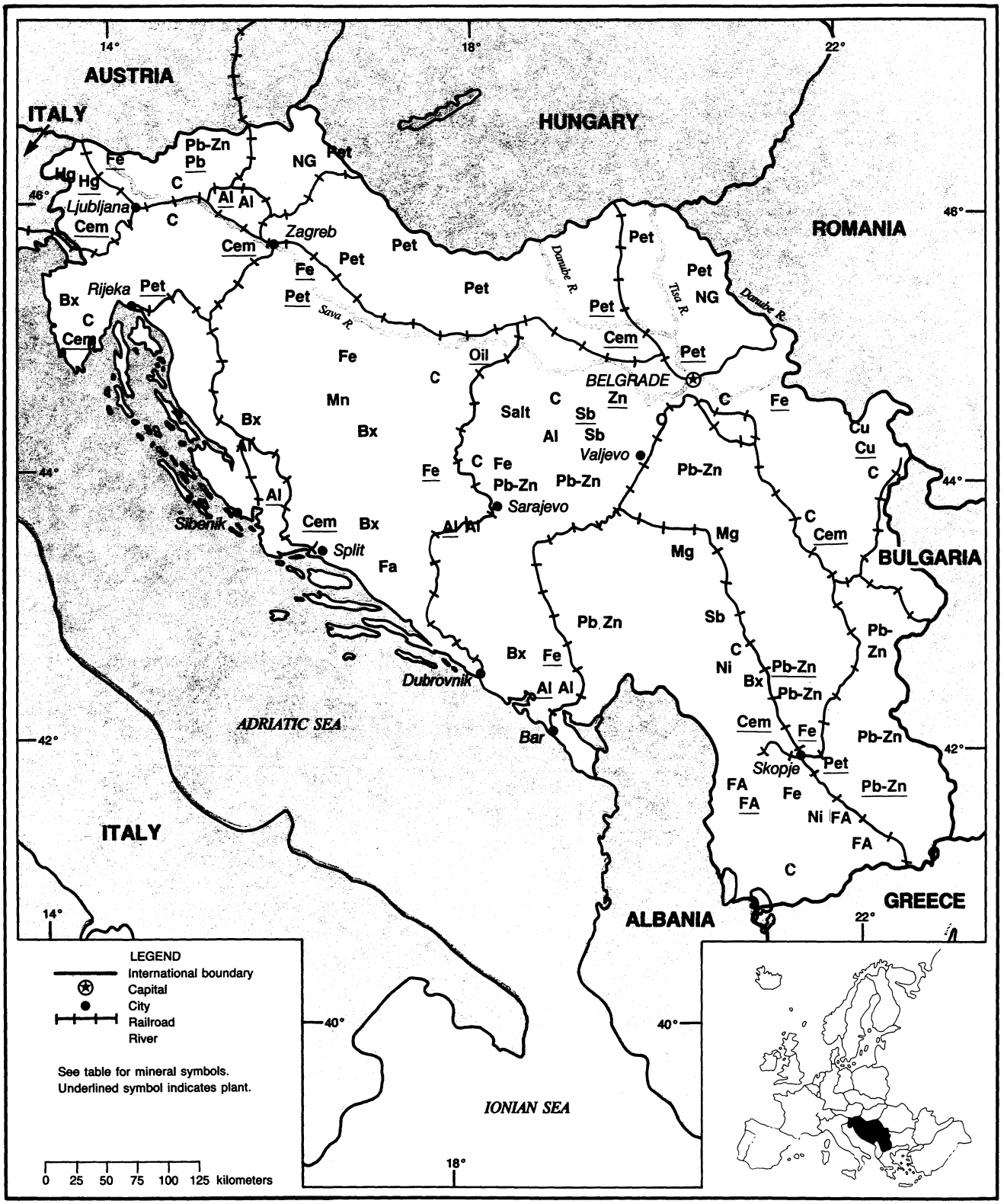
YUGOSLAVIA

AREA 256,000 km² **POPULATION 23.9 million**



THE MINERAL INDUSTRY OF

YUGOSLAVIA

By Walter G. Steblez

In 1989, Yugoslavia remained an important European producer of nonferrous metals, ferroalloys, iron ore, and industrial minerals. Production of mineral fuels supplied the country with lignite and relatively small quantities of petroleum and natural gas. Real national income and industrial production increased slightly compared with those of 1988. However, the rate of inflation exceeded 2,000% by yearend. Prices for industrial goods increased 1,406%. The rapid growth in the country's inflation accompanied the institution of new economic structures such as the Yugoslavian foreign exchange market, designed to promote transition to a market-based economy. During the year, activities in the mineral industry included the opening of a new copper mine at Severni Revir and the discovery of new gold and petroleum deposits.

GOVERNMENT POLICIES AND PROGRAMS

To promote the development of a market economy, the Government continued to decentralize the country's planned economy, including the mineral industry. To break with past centrally planned policies and minimize Government interference in the country's economic affairs, new policies instituted during the year allowed the Government only certain regulatory functions in respect to the country's commercial activity. Also, legal status was granted to private, state-owned, and other mixed forms of enterprise ownership, including joint ventures with foreign economic organizations. Limited convertibility of the country's currency was achieved by linking the Dinar to the Deutschemark of the Federal Republic of Germany at the rate of seven Dinars to one Deutschemark.

PRODUCTION

Mixed results were reported in the country's mining and extraction sectors during the year. In aggregate, compared with indices for 1988, Yugoslavia's coal and nonferrous mining sectors showed modest gains during the year in terms of both physical output and worker productivity. However, iron ore and industrial minerals mining, as well as petroleum and natural gas extraction, registered declines in both production and productivity during the same period.

TRADE

Yugoslavia's mineral trade provided in this report was compiled into 6 tables from the country's latest available trade returns. Tables 2 and 5 are compatible with the historical trade data that had been provided in previous Minerals Yearbook, Vol. III reports for Yugoslavia. For 1989, additional data have been presented in tables 3, 4, 6, and 7 that give Yugoslavia's exports of minerals after processing (table 3); that is, minerals acquired from abroad to be processed (table 7); e.g., toll refined, in Yugoslavia and reshipped to the country of origin. Similarly, Yugoslavia's exports for processing (table 4) are those mineral commodities shipped abroad for further processing or refining that would be returned to Yugoslavia for final disposition (table 6).

STRUCTURE OF THE MINERAL INDUSTRY

Table 8 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1989.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Energoinvest's Mostar aluminum enterprise reported completing preparations to build a new rolling mill in October. The new mill was designed to produce 25,000 tons per year of 405-millimeter-wide strip. Construction and equipment costs for the project were estimated at $20 million, and a tender was issued for the supply of equipment, which invited bids from both domestic and foreign firms. Mostar's plan for 1990 called for exports of $90 million worth of aluminum products. At yearend, the Cimos-Koper Automobile Works at Koper reportedly put into operation a new aluminum foundry costing $35 million at Buzet in Istria. The foundry's output would be used to manufacture engine and transmission components. Also, work continued at Unial-TGA's Boris Kidric alumina refinery and aluminum smelting enterprise to modernize the enterprise's smelters. The new electric cells were to be supplied by Pechiney of France and installed during the year. Plans were announced at the Kombinat Aluminija Titograd to begin construction of a 3.5-ton-per-year gallium production facility in midyear. The new facility would be built with Soviet participation and would use byproduct feedstock from Kombinat Aluminija Titograd's alumina refinery. The output from this unit would be used by the local and international electronics industry.

Foreign commercial agreements during the year involving Yugoslavia's aluminum and bauxite sectors included a sale of bauxite worth $5.5 million by the Niksic bauxite mines to the Oradea alumina refinery of Romania. Mostar concluded an agreement with Raznoimport of the U.S.S.R.

TABLE 1

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Bauxite	thousand tons	3,250	3,459	3,394	3,034	[3]3,252
Alumina	do.	1,138	1,117	1,113	1,051	[3]1,170
Metal ingot:						
Primary		280,000	282,000	244,000	260,120	276,000
Remelted[4]		36,092	37,670	37,084	53,229	55,654
Total		316,092	319,670	281,084	313,349	[3]331,654
Antimony:						
Mine and concentrator output:						
Ore, gross weight		[r]70,825	61,376	48,449	37,903	[3]43,000
Sb content of ore		1,088	859	834	725	774
Concentrate, gross weight		[r]4,952	2,746	1,227	1,105	1,200
Metal (regulus)		1,502	1,842	1,002	1,145	[3]1,081
Bismuth, smelter output		68	21	73	23	[3]40
Cadmium, smelter output		279	259	305	405	476
Chromite:						
Mine and concentrator output:						
Ore, gross weight		10,015	8,780	13,172	11,538	11,000
Concentrate (produced largely from imported ores)		101,937	57,593	59,482	46,063	[3]37,000
Copper:						
Mine and concentrator output:						
Ore, gross weight	thousand tons	26,166	27,864	27,745	30,056	[3]30,078
Cu content of ores		142,479	138,544	130,470	103,523	103,000
Concentrate, gross weight		581,620	537,504	513,971	560,192	[3]578,000
Metal:						
Blister and anodes:						
Primary		137,037	196,358	103,399	106,457	107,000
Remelted[4]		52,160	31,525	62,384	65,519	66,000
Total		189,197	227,883	165,783	171,976	[3]173,000
Refined:						
Primary		101,673	99,152	98,805	105,595	111,035
Remelted[4]		33,769	849	40,062	39,781	40,000
Total		135,442	100,001	138,867	145,376	[3]151,035
Gold refined	kilograms	4,876	4,398	5,348	4,620	4,700
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	5,478	6,618	5,983	5,545	[3]5,080
Fe content	do.	1,685	1,983	1,764	1,844	1,500
Iron concentrate, gross weight	do.	2,482	2,995	3,247	3,332	[3]3,170
Metal:						
Pig iron	do.	3,120	3,063	2,867	2,916	[3]2,899
Ferroalloys:						
Ferrochromium		73,308	68,604	56,276	93,349	90,000
Ferromanganese		35,775	40,051	38,041	45,078	45,000
Ferronickel		9,248	8,647	9,556	15,047	15,000
Ferrosilicon		91,702	99,574	98,843	120,522	115,000
Silicon metal		33,094	31,312	31,915	25,830	20,000
Ferrosilicomanganese		43,374	41,330	42,528	46,804	48,000
Ferrosilicocalcium		149	—	487	772	1,000

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Iron and steel—Continued						
Iron ore—Continued						
Metal—Continued						
Ferroalloys—Continued						
Ferrosilicochromium		7,199	7,513	6,240	3,668	3,000
Other		[r]5,390	6,715	7,584	10,678	10,000
Total		299,239	303,746	291,470	361,748	[3]347,000
Crude steel:						
From oxygen converters	thousand tons	1,801	1,769	1,715	1,913	[3]1,934
From Siemens-Martin furnaces	do.	1,524	1,509	1,301	1,158	[3]1,100
From electric furnaces	do.	1,155	1,241	1,351	1,416	[3]1,466
Total	do.	4,480	4,519	4,367	4,487	[3]4,500
Semimanufactures	do.	5,694	5,411	6,260	6,066	[3]6,164
Lead:						
Mine and concentrator output:						
Ore, gross weight (lead-zinc ore)	do.	4,590	4,558	3,908	3,847	[3]3,885
Pb content of ores		115,115	114,633	106,670	103,286	104,000
Concentrate, gross weight		147,079	101,033	109,119	104,596	105,000
Metal:						
Smelter:						
Primary		116,500	39,650	118,185	121,607	121,000
Secondary[5]		13,436	28,748	28,423	30,430	20,000
Total		129,936	68,398	146,608	152,037	[3]141,000
Refined:						
Primary, for domestic use and export[e 6]		59,954	74,963	76,417	70,888	60,237
Secondary[e]		40,000	38,000	[r]36,000	39,000	37,000
Total		99,954	112,963	112,417	109,888	[3]97,237
Magnesium metal		4,978	4,897	5,932	6,176	[3]6,100
Manganese ore:						
Gross weight		31,800	41,283	41,297	40,100	[3]39,000
Mn content		11,119	14,448	14,452	14,036	13,600
Mercury	kilograms	88,010	75,013	67,016	69,980	51,000
Nickel:[e]						
Mine output:						
Ore, gross weight	thousand tons	270	270	280	280	270
Ni content of ore		3,800	3,800	3,900	3,900	3,800
Concentrate		200,000	200,000	200,000	200,000	200,000
Metal: Ferronickel, Ni content		2,400	2,500	2,500	[r]4,000	3,900
Platinum-group metals:						
Palladium	kilograms	95	85	132	142	140
Platinum	do.	3	33	24	23	20
Selenium metal, refined	do.	43,720	54,400	66,362	60,812	60,000
Silver metal, refined including secondary	thousand kilograms	171	175	165	139	133
Uranium:						
Mine output		[e]50,000	[e]110,000	110,011	107,365	107,000
Concentrate		34	80	83	93	93
U_3O_8 Content[e]		23	56	58	65	65
Zinc:						
Zn content of lead and zinc ore		[r]89,347	99,080	87,352	91,175	90,000

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Zinc—Continued						
Concentrator output, gross weight		149,390	98,587	118,904	117,565	118,000
Smelter, primary		49,665	49,924	51,320	56,316	[3]56,000
Refined, primary and secondary:						
Smelter		15,609	14,978	9,684	11,234	[3]13,000
Electrolytic		67,789	67,063	108,383	116,290	[3]107,000
Total		83,398	82,041	118,067	127,524	[3]120,000
INDUSTRIAL MINERALS						
Asbestos, all kinds		6,611	7,557	10,964	17,030	[3]9,111
Barite concentrate		35,488	18,250	19,270	23,350	20,000
Cement, hydraulic	thousand tons	9,028	9,127	8,963	8,840	[3]8,560
Clays:						
Bentonite		148,752	148,447	154,288	125,069	120,000
Ceramic clay, crude		[r]258,220	307,378	287,887	283,689	[3]313,000
Fire clay:						
Crude		[r]227,076	148,573	174,124	155,718	[3]164,000
Calcined		47,210	42,803	42,092	28,188	33,000
Kaolin		244,534	204,311	218,851	218,673	218,000
Feldspar, crude		[r]49,391	47,909	44,912	35,614	[3]49,000
Gypsum:						
Crude		600,152	594,704	553,372	555,231	[3]544,000
Calcined		[r]82,801	87,803	75,396	81,245	[3]67,000
Lime:						
Quicklime	thousand tons	1,948	1,888	1,790	1,268	1,711
Hydrated	do.	759	748	708	725	700
Total	do.	2,707	2,636	2,498	1,993	[3]2,411
Magnesite:						
Crude		417,407	428,791	402,976	382,606	[3]364,000
Sintered		[r]170,046	161,295	149,000	136,746	140,000
Caustic calcined		14,279	14,420	10,217	11,113	[3]11,682
Mica, all grades		382	674	250	807	700
Nitrogen: N content of ammonia	thousand tons	766	814	937	858	[3]680
Pumice and related volcanic materials: Volcanic tuff		450,610	385,844	423,917	407,988	400,000
Quartz, quartzite, glass sand:						
Quartz and quartzite	thousand tons	301	239	260	226	200
Glass sand	do.	2,334	2,427	2,258	1,798	1,900
Total	do.	2,635	2,666	2,518	2,024	2,100
Salt:						
Marine		67,897	69,482	64,672	58,286	68,000
From brines		193,194	282,493	282,650	200,276	200,000
Rock		149,151	147,652	153,064	126,650	100,000
Total		410,242	499,627	500,386	385,212	[3]368,000
Sand and gravel excluding glass sand	thousand cubic meters	22,136	21,841	19,778	19,710	[3]20,373
Sodium compounds:						
Sodium carbonate		199,629	207,968	201,539	213,891	[3]204,050
Sodium bicarbonate		15,486	20,940	19,844	18,016	18,000
Sodium sulfate		40,584	42,581	37,556	41,479	40,000

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Stone excluding quartz and quartzite:						
Dimension:						
Crude:						
Ornamental	cubic meters	265,522	100,659	97,619	[e]100,000	[3]103,000
Other	do.	546	1,978	1,585	[e]1,500	1,500
Partly worked facing	thousand square meters	2,544	2,847	3,059	3,253	[3]3,377
Cobblestones, curbstones, other	thousand cubic meters	6,153	4,259	4,846	[e]5,000	5,000
Dolomite	thousand tons	1,716	2,306	645	709	700
Limestone	do.	7,314	7,888	7,771	[e]8,000	8,000
Crushed and broken n.e.s.	thousand cubic meters	2,544	2,981	2,861	2,833	2,800
Milled marble and other	do.	4,450	5,129	4,486	[e]5,000	5,000
Sulfur, pyrite and pyrrhotite:						
Pyrite, gross weight	thousand tons	507	758	609	[e]610	600
Pyrrhotite, gross weight	do.	13	4	[r e]5	[e]6	5
Sulfur:						
Sulfur content of pyrite[7]	do.	213	319	256	[e]250	250
Sulfur content of pyrrhotite[7]	do.	5	1	2	[e]2	2
Byproduct:						
Of metallurgy[e]	do.	170	175	175	[e]170	170
Of petroleum[e]	do.	3	3	3	[e]3	3
Total	do.	391	498	436	[e]425	425
Talc:						
Crude		27,500	28,000	30,993	29,204	29,000
Washed		27,104	27,815	28,440	27,566	27,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		29,638	31,972	35,078	34,797	38,000
Coal:						
Bituminous	thousand tons	400	407	379	362	[3]293
Brown	do.	12,465	13,099	12,135	11,877	[3]12,063
Lignite	do.	56,635	56,626	59,359	60,352	[3]62,276
Total	do.	69,500	70,132	71,873	72,590	[3]74,632
Coke:						
Metallurgical	do.	3,123	3,092	2,570	2,827	2,900
Breeze	do.	265	253	220	280	200
Foundry	do.	157	149	170	151	173
Total	do.	3,545	3,494	2,960	3,208	[3]3,273
Gas:						
Manufactured (excluding petroleum refinery gas):						
From coke plants	million cubic feet	41,433	41,317	43,267	[e]42,000	42,000
From lignite gasification plants	do.	2,337	2,688	822	[e]2,000	2,000
Natural, gross production	do.	[r]84,743	86,272	101,974	106,474	[3]101,388
Natural gas plant liquids: Propane and butane	thousand 42-gallon barrels	960	937	1,173	940	1,100
Petroleum:						
Crude:						
As reported	thousand tons	4,149	4,140	3,867	3,681	[3]3,392
Converted	thousand 42-gallon barrels	30,731	30,665	28,685	27,305	[3]24,246
Refinery products:						
Gasoline	do.	31,221	34,603	34,075	35,436	[3]34,450

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Liquefied petroleum gas	thousand 42-gallon barrels	3,039	3,424	4,424	[e]4,000	3,500
Jet fuel	do.	3,119	1,870	2,824	2,602	2,500
Kerosene	do.	262	835	204	[e]200	200
Diesel	do.	25,341	27,766	28,062	30,288	[3]25,416
White spirit	do.	109	50	119	[e]100	100
Paraffin	do.	166	718	227	[e]200	200
Middle distillate fuel oil	do.	1,329	558	1,218	[e]1,200	1,200
Lubricants	do.	4,228	4,494	4,830	4,802	4,500
Residual fuel oil	do.	30,156	37,409	39,423	40,772	40,000
Asphalt and bitumen	do.	4,113	3,412	3,776	3,580	[3]3,806
Petroleum coke	do.	334	503	318	[e]300	300
Other	do.	1,378	1,699	2,153	[e]2,000	2,000
Total	do.	104,795	117,341	121,653	125,480	118,172

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

[1]Table includes data available through May 1991.

[2]In addition to the commodities listed, 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.

TABLE 2

YUGOSLAVIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	584,714	639,528	—	U.S.S.R. 252,924; Czechoslovakia 200,897; Romania 181,924.
Oxides and hydroxides	418,762	224,832	—	U.S.S.R. 74,456; Poland 40,044; Guinea 28,192.
Metal including alloys:				
Scrap	1,702	1,594	—	Italy 614; West Germany 611; Switzerland 186.
Unwrought	157,223	152,961	—	Italy 59,613; France 28,380; East Germany 24,110.
Semimanufactures	104,645	90,150	12,809	Czechoslovakia 17,207; Italy 11,828.
Antimony: Metal including alloys: Regulus	10	—		
Arsenic: Oxides and acids	(2)	—		
Bismuth: Metal including alloys, all forms	35	22	—	All to Belgium-Luxembourg.
Cadmium: Metal including alloys, all forms	81	120	20	Greece 60; Czechoslovakia 29.
Chromium:				
Ore and concentrate	10,589	2,459	—	Czechoslovakia 2,132; Italy 327.
Oxides and hydroxides	67	17	—	Hong Kong 10; Albania 7.
Columbium and tantalum: Tantalum metal including alloys, all forms	(4)	1	—	All to West Germany.

See footnotes at end of table.

TABLE 2—Continued

YUGOSLAVIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Copper:				
Ore and concentrate	24,500	11,722	—	Japan 9,307; West Germany 2,415.
Matte and speiss including cement copper	3,137	4,902	—	Belgium-Luxembourg 4,825; United Kingdom 77.
Sulfate	10,947	7,545	1,960	Turkey 1,157; Canada 1,140.
Metal including alloys:				
Scrap	20,828	4,326	—	Italy 3,166; West Germany 1,057; Switzerland 41.
Unwrought	19,387	26,520	—	Italy 14,804; Turkey 3,241; Greece 2,214.
Semimanufactures	55,022	42,693	4,071	Italy 8,775; West Germany 6,340; United Kingdom 4,216.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	—	5	—	Malta 4; Austria 1.
Pyrite, roasted	67,714	62,528	—	Hungary 49,920; Austria 12,608.
Metal:				
Scrap	366,528	361,815	—	Italy 238,921; West Germany 96,262; Austria 23,803.
Pig iron, cast iron, related materials	43,260	17,101	—	Italy 5,231; Spain 5,125; West Germany 3,132.
Ferroalloys:				
Ferrochromium	36,657	63,365	39,008	Italy 8,081; Austria 8,033.
Ferromanganese	9,542	15,244	7,188	Italy 4,846; Albania 1,604.
Ferronickel	—	12,818	885	Spain 5,395; West Germany 2,748; Italy 2,495.
Ferrosilicomanganese	38,561	33,741	20,470	Austria 6,847; Italy 3,548.
Ferrosilicon	69,697	77,417	1,368	Japan 33,469; Italy 12,871; Turkey 8,401.
Silicon metal	26,879	18,463	2,064	West Germany 4,011; Bulgaria 2,101.
Unspecified	13,195	4,228	—	Iran 1,996; West Germany 1,282; Austria 213.
Steel, primary forms	347,022	119,740	—	Italy 49,052; Canada 20,941; India 15,481.
Semimanufactures:[3]				
Bars, rods, angles, shapes, sections	168,936	851,443	10	Italy 241,066; Egypt 91,480; West Germany 81,224.
Universals, plates, sheets	378,983	NA		
Hoop and strip	70,317	NA		
Rails and accessories	68,435	23,146	—	India 11,136; Turkey 6,893; Austria 3,081.
Wire	38,617	43,542	3	Italy 26,233; Czechoslovakia 7,640; Iraq 4,570.
Tubes, pipes, fittings	172,016	248,386	3,301	Italy 64,729; West Germany 39,479; Austria 22,899.
Castings and forgings, rough	6,724	NA		
Lead:				
Ore and concentrate	727	1,140	—	All to Italy.
Oxides	2	7	—	U.S.S.R. 3; Syria 2; Uganda 1.
Metal including alloys:				
Unwrought	18,284	11,102	—	Czechoslovakia 7,479; Belgium-Luxembourg 2,368; U.S.S.R. 474.
Semimanufactures	455	587	—	Denmark 332; Austria 121; U.S.S.R. 42.
Magnesium: Metal including alloys:				
Scrap	31	15	—	All to West Germany.
Unwrought	4,512	3,970	—	West Germany 2,003; Belgium-Luxembourg 719; Japan 425.
Manganese:				
Ore and concentrate: Metallurgical-grade	1,060	—		
Metal including alloys, all forms	—	5	—	Algeria 4; Uganda 1.
Mercury	17	27	—	United Kingdom 19; Liechtenstein 4; Venezuela 4.
Nickel: Metal including alloys:				
Scrap	81	12	—	West Germany 6; United Kingdom 5; Sweden 1.

See footnotes at end of table.

TABLE 2—Continued

YUGOSLAVIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Nickel: Metal including alloys—Continued				
Semimanufactures	2	—		
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	—	$12	—	All to West Germany.
Selenium, elemental	—	40	—	All to Netherlands.
Silver: Metal including alloys, unwrought and partly wrought kilograms	71,000	79,000	29,000	West Germany 14,000; Czechoslovakia 12,000.
Tin: Metal including alloys:				
Unwrought	39	13	—	Italy 12; Kenya 1.
Semimanufactures	2	1	—	Mainly to U.S.S.R.
Titanium: Oxides	6,578	7,148	—	East Germany 4,610; Italy 2,338; Austria 200.
Tungsten: Metal including alloys, unwrought including waste and scrap	(2)	11	—	All to West Germany.
Uranium and thorium: Metal including alloys, all forms	(2)	—		
Zinc:				
Ore and concentrate	—	1,735	—	Italy 1,063; Belgium-Luxembourg 671.
Oxides	1,750	3,022	—	Hungary 2,199; Italy 321; Romania 200.
Blue powder	3,857	4,979	—	Czechoslovakia 4,005; Australia 475; Italy 251.
Metal including alloys:				
Scrap	767	583	—	All to Italy.
Unwrought	38,885	22,394	1,899	Czechoslovakia 9,283; East Germany 5,718.
Semimanufactures	4,490	2,402	—	West Germany 635; Czechoslovakia 498; France 317.
Other:				
Oxides and hydroxides	2,103	812	47	Sweden 619; West Germany 100.
Ashes and residues	9,599	2,389	—	Italy 1,825; Austria 377; West Germany 188.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	26	72	—	All to U.S.S.R.
Artificial:				
Corundum	18,233	18,201	—	Italy 6,970; West Germany 3,646; Romania 2,388.
Silicon carbide	2,744	2,077	—	West Germany 1,548; Italy 299; Austria 134.
Grinding and polishing wheels and stones	3,830	4,250	117	West Germany 843; Egypt 424; Italy 369.
Asbestos, crude	1,179	203	—	Albania 200; Colombia 3.
Barite and witherite	9,377	10,095	—	All to Hungary.
Boron materials: Crude natural borates	102	—		
Cement	902,512	825,176	627	Italy 615,661; West Germany 51,357; Austria 40,304.
Chalk	603	160	—	Czechoslovakia 98; Hungary 40; West Germany 21.
Clays, crude:				
Bentonite	4,799	2,792	—	Poland 2,204; Iraq 314; U.S.S.R. 99.
Chamotte earth	11	—		
Fire clay	359	460	—	Italy 411; Egypt 46; Bulgaria 2.
Kaolin	36	777	—	Bulgaria 731; Sweden 22; Italy 20.
Unspecified	23	3	—	Austria 1; Iraq 1; West Germany 1.
Cryolite and chiolite	2	10	—	Malta 8; Austria 2.
Diatomite and other infusorial earth	369	712	—	Austria 543; Czechoslovakia 169.
Feldspar	3,026	3,576	—	Greece 3,166; Hungary 375; West Germany 35.

See footnotes at end of table.

TABLE 2—Continued

YUGOSLAVIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials:				
Crude, n.e.s.	21	37	—	All to Austria.
Manufactured:				
Ammonia	56,566	17,054	—	Italy 17,015; West Germany 39.
Nitrogenous	367,794	294,964	34,670	Morocco 68,037; West Germany 47,527; Denmark 37,481.
Phosphatic	65,290	98,746	—	Bulgaria 35,474; U.S.S.R. 34,669; Czechoslovakia 17,742.
Unspecified and mixed	538,748	494,666	—	West Germany 152,934; Nigeria 79,435; Hungary 60,921.
Graphite, natural	—	3	—	All to Tanzania.
Gypsum and plaster	9,125	16,158	—	Hungary 16,012; U.S.S.R. 90; Czechoslovakia 34.
Iodine	4	(2)	—	All to Iraq.
Lime	34,092	34,804	—	Hungary 21,614; Italy 9,666; Austria 3,042.
Magnesium compounds:				
Magnesite, crude	30	—		
Oxides and hydroxides	5,787	7,510	—	Italy 6,622; Poland 506; Albania 131.
Pigments, mineral: Iron oxides and hydroxides, processed	(2)	34	—	Australia 17; Finland 15; Canada 1.
Pyrite, unroasted	65,467	36,928	—	All to West Germany.
Salt and brine	101	83	—	Iraq 51; Hungary 30; Canada 1.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	21,697	30,722	—	West Germany 12,580; Italy 12,349; Greece 2,318.
Sulfate, manufactured	—	2,036	—	Greece 1,036; Bulgaria 1,000.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	51,879	114,355	16	Italy 92,515; Czechoslovakia 13,748; Japan 2,390.
Worked	10,248	12,782	806	Austria 4,776; West Germany 2,297; U.S.S.R. 1,494.
Dolomite, chiefly refractory-grade	(2)	833	—	Austria 770; Italy 63.
Gravel and crushed rock	31,273	37,250	—	West Germany 16,021; Italy 10,098; Czechoslovakia 5,251.
Limestone other than dimension	32	—		
Quartz and quartzite	911	1,234	—	Spain 1,211; Greece 23.
Sand other than metal-bearing	17,298	26,959	—	Austria 10,374; Italy 8,736; Greece 7,438.
Sulfur:				
Elemental:				
Crude including native and byproduct	1,998	30	—	All to Italy.
Colloidal, precipitated, sublimed	(2)	—		
Dioxide	20	31	—	All to Hungary.
Sulfuric acid	22,853	21,600	—	Bulgaria 12,187; Italy 9,366; Zaire 26.
Talc, steatite, soapstone, pyrophyllite	21	18	—	Mainly to Austria.
Other:				
Crude	3,734	6,760	—	Austria 5,769; West Germany 315; France 310.
Slag and dross, not metal-bearing	12,843	11,037	—	Italy 10,201; Austria 766; West Germany 64.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	40,241	—	Italy 30,056; Austria 10,157; Iraq 28.
Carbon black	73	—		
Coal:				
Anthracite	2	2	—	All to Iraq.
Briquets of anthracite and bituminous coal	1	—		
Lignite including briquets	67,223	45,625	—	Hungary 39,194; Austria 4,335; Italy 1,371.

See footnotes at end of table.

TABLE 2—Continued

YUGOSLAVIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Coke and semicoke		397,694	446,575	181,159	Brazil 51,202; Austria 36,104.
Peat including briquets and litter		179	498	—	All to Italy.
Petroleum:					
Crude	thousand 42-gallon barrels	296	—		
Refinery products:					
Liquefied petroleum gas	do.	555	405	—	West Germany 175; Italy 92; Austria 70.
Gasoline	do.	3,214	3,684	(2)	Italy 2,573; Spain 621; Austria 299.
Mineral jelly and wax	do.	57	52	—	Italy 27; West Germany 17; Iran 2.
Kerosene and jet fuel	do.	266	248	32	United Kingdom 44; U.S.S.R. 37; France 36.
Distillate fuel oil	do.	622	283	2	West Germany 203; Austria 44; Italy 12.
Lubricants	do.	1,638	1,663	—	Austria 1,293; West Germany 237; Italy 71.
Residual fuel oil	do.	805	935	—	West Germany 737; Austria 186; Panama 8.
Bitumen and other residues	do.	1,219	627	(2)	Austria 384; Italy 236; Djibouti 6.
Bituminous mixtures	do.	22	14	—	Italy 7; Djibouti 3; U.S.S.R. 3.
Petroleum coke	do.	27	3	—	All to Italy.

NA Not available
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.

TABLE 3

YUGOSLAVIA: EXPORTS AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	—	291,270	—	All to U.S.S.R.
Metal including alloys:				
Unwrought	1,286	—		
Semimanufactures	1,345	6,158	709	U.S.S.R. 3,501; Cuba 699.
Cadmium: Metal including alloys, all forms	17	5	5	
Cobalt: Metal including alloys, all forms, value, thousands	—	$10	$10	
Copper: Metal including alloys:				
Scrap	—	50	—	Switzerland 40; Italy 10.
Unwrought	14,899	25,956	—	Italy 10,171; United Kingdom 8,688; Bulgaria 5,477.
Semimanufactures	1,720	5,278	282	U.S.S.R. 3,967; West Germany 486; Cuba 320.
Iron and steel: Metal:				
Scrap	—	3,542	—	Italy 2,030; Switzerland 1,512.
Ferroalloys:				
Ferrochromium	931	6,441	2,300	West Germany 1,693; Belgium-Luxembourg 1,053.
Unspecified	304	123	—	All to West Germany.
Steel, primary forms	123,836	7,485	—	Bulgaria 7,356; Czechoslovakia 129.

See footnotes at end of table.

TABLE 3—Continued

YUGOSLAVIA: EXPORTS AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel scrap—Continued					
Semimanufactures:					
Bars, rods, angles, shapes, sections		130,299	77,416	—	U.S.S.R. 72,969; Hungary 3,905; Austria 379.
Universals, plates, sheets		229,610	NA		
Hoop and strip		40,450	NA		
Rails and accessories		237	260	—	Bulgaria 250; Austria 10.
Wire		3,512	2,944	—	Italy 1,959; East Germany 783; U.S.S.R. 142.
Tubes, pipes, fittings		42,775	41,267	—	Czechoslovakia 18,553; Hungary 10,884; Bulgaria 4,869.
Lead: Metal including alloys, unwrought		5,540	10,140	—	United Kingdom 6,270; Switzerland 2,154; Austria 1,326.
Magnesium: Metal including alloys, unwrought		16	—		
Manganese: Metal including alloys, all forms	value, thousands	—	$15	$15	
Mercury	kilograms	5,000	—		
Silver: Metal including alloys, unwrought and partly wrought	do.	39,000	28,000	—	Mainly to United Kingdom.
Zinc:					
Oxides		4	—		
Blue powder		2,262	640	—	United Kingdom 546; Czechoslovakia 94.
Metal including alloys:					
Unwrought		14,102	36,426	2,220	United Kingdom 22,646; Switzerland 6,964; Czechoslovakia 4,134.
Semimanufactures		764	3,032	—	West Germany 2,652; Austria 380.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Artificial, corundum		653	903	—	West Germany 855; Austria 48.
Fertilizer materials: Manufactured:					
Nitrogenous		1,971	—		
Unspecified and mixed		28,769	21,608	—	West Germany 12,553; France 9,055.
Stone, sand and gravel: Dimension stone, worked		83	9	—	All to Austria.
Sulfur: Sulfuric acid		—	3,315	—	All to Bulgaria.
MINERAL FUELS AND RELATED MATERIALS					
Coke and semicoke		876	233,824	64,000	France 104,072; U.S.S.R. 50,442; Romania 8,910.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	138	94	—	Panama 90; Italy 4.
Gasoline	do.	1,127	744	—	Panama 386; United Kingdom 358.
Kerosene and jet fuel	do.	102	49	—	United Kingdom 35; West Germany 14.
Distillate fuel oil	do.	1,019	1,512	—	United Kingdom 867; Panama 434; West Germany 211.
Lubricants	do.	6	1	—	Mainly to East Germany.
Residual fuel oil	do.	1,705	1,089	—	Panama 507; United Kingdom 373; West Germany 208.

NA Not available.

[1]Table prepared by H. D. Willis.

TABLE 4

YUGOSLAVIA: EXPORTS FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal destinations, 1988
METALS				
Aluminum:				
Oxides and hydroxides	value, thousands	—	$15	All to West Germany.
Metal including alloys:				
Unwrought		1,248	782	West Germany 756; Italy 26.
Semimanufactures		56	24	All to West Germany.
Copper:				
Matte and speiss including cement copper		1,124	—	
Metal including alloys:				
Scrap		—	365	Italy 196; France 110; West Germany 40.
Unwrought		425	1,080	Bulgaria 1,019; Austria 23; Cameroon 22.
Semimanufactures		1,202	934	Italy 819; Austria 115.
Iron and steel: Metal:				
Scrap		84,566	124,068	West Germany 117,218; Italy 6,654; Hungary 195.
Steel, primary forms		48,460	14,089	Austria 8,507; Italy 2,188; West Germany 1,959.
Semimanufactures:				
Bars, rods, angles, shapes, sections		3	19	All to West Germany.
Universals, plates, sheets		4	NA	
Hoop and strip		26	NA	
Wire		2	1	All to Italy.
Tubes, pipes, fittings		—	15	West Germany 14; Italy 1.
Castings and forgings, rough		4	NA	
Lead:				
Ore and concentrate		—	5,860	All to Bulgaria.
Metal including alloys, unwrought		14	515	Belgium-Luxembourg 505; Austria 10.
Nickel: Scrap		2	2	All to West Germany.
Platinum-group metals:				
Waste and sweepings	kilograms	1,000	62,000	United Kingdom 52,000; West Germany 10,000.
Metals including alloys, unwrought and partly wrought:				
Platinum	value, thousands	$2,398	$756	All to West Germany.
Unspecified	do.	—	$355	West Germany $222; Italy $65; United Kingdom $65.
Silver: Metal including alloys, unwrought and partly wrought	kilograms	1,000	10,000	Italy 8,000; West Germany 2,000.
Tin: Metal including alloys:				
Scrap		—	2	All to West Germany.
Unwrought		2	—	
Tungsten: Metal including alloys, unwrought including waste and scrap		—	26	All to West Germany.
Uranium and thorium: Uranium metal including alloys, all forms		—	111	All to United States.
Zinc:				
Blue powder		23	152	All to Bulgaria.
Metal including alloys:				
Unwrought		97	—	
Semimanufactures		2	—	
Other:				
Oxides and hydroxides		—	12	All to Switzerland.
Ashes and residues		371	179	Austria 178; West Germany 1.
Base metals including alloys, all forms		12	—	
INDUSTRIAL MINERALS				
Clays, crude: Kaolin		—	1	All to France.
Graphite, natural		20	—	

See footnotes at end of table.

TABLE 4—Continued

YUGOSLAVIA: EXPORTS FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principle destinations, 1988
INDUSTRIAL MINERALS—Continued				
Magnesium compounds:				
Magnesite, crude		108	—	
Oxides and hydroxides	value, thousands	—	$3,000	All to Italy.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked		—	26	Do.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite		2,000	—	
Petroleum refinery products:				
Gasoline	42-gallon barrels	65,187	91,443	All to Hungary.
Lubricants	do.	22,953	59,381	Hungary 58,394; Austria 987.

NA Not available.
[1]Table prepared by H. D. Willis. No exports for processing reported to the United States in 1988.

TABLE 5

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	40	6	—	France 4; United Kingdom 2.
Alkaline-earth metals	116	223	—	U.S.S.R. 149; France 69; Austria 3.
Aluminum:				
Ore and concentrate	132,797	364,761	—	Guinea 304,313; Greece 31,033; Australia 13,124.
Oxides and hydroxides	118,165	128,230	5	Italy 94,919; Greece 19,457; Ireland 7,006.
Metal including alloys:				
Scrap	127	—		
Unwrought	32,597	19,657	—	U.S.S.R. 18,997; Netherlands 533; United Kingdom 74.
Semimanufactures	10,933	8,077	25	U.S.S.R. 4,638; West Germany 1,411; Netherlands 597.
Antimony:				
Ore and concentrate	2,907	—		
Metal including alloys, all forms	—	66	—	U.S.S.R. 63; West Germany 2; Austria 1.
Arsenic:				
Oxides and acids	112	167	—	West Germany 142; Belgium-Luxembourg 15; Netherlands 6.
Metal including alloys, all forms	50	39	(2)	U.S.S.R. 20; Sweden 12; West Germany 7.
Beryllium: Metal including alloys, all forms value, thousands	$21	$30	—	West Germany $28; Austria $1; United Kingdom $1.
Bismuth: Metal including alloys, all forms	—	30	—	Belgium-Luxembourg 15; China 10; Switzerland 5.
Chromium:				
Ore and concentrate	225,856	288,006	105	Albania 113,107; Turkey 98,736; U.S.S.R. 74,928.
Oxides and hydroxides	657	632	—	U.S.S.R. 350; West Germany 90; Poland 59.
Metal including alloys, all forms	—	11	(2)	Mainly from West Germany.
Cobalt:				
Oxides and hydroxides	47	50	(2)	United Kingdom 26; West Germany 7; China 5.
Metal including alloys, all forms	—	19	4	Zaire 7; Switzerland 4; Austria 2.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Columbium and tantalum: Tantalum metal including alloys, all forms	1	1	(2)	Mainly from West Germany.
Copper:				
Sulfate	2,940	2,892	—	Mainly from U.S.S.R.
Metal including alloys:				
Scrap	403	11	—	All from Poland.
Unwrought	21,482	20,256	—	Chile 9,518; Zaire 3,938; Philippines 1,641.
Semimanufactures	19,819	12,582	2	Poland 6,722; Zambia 2,448; U.S.S.R. 811.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	1,081,456	1,485,638	—	Peru 416,436; India 402,985; Brazil 344,873.
Metal:				
Scrap	688,997	746,283	87	U.S.S.R. 660,282; Bulgaria 40,718; Poland 34,575.
Pig iron, cast iron, related materials	27,385	41,042	(2)	U.S.S.R. 22,286; Turkey 10,999; Canada 4,479.
Ferroalloys:				
Ferrochromium	232	204	—	West Germany 173; Austria 20; Sweden 11.
Ferromanganese	1,078	1,561	—	West Germany 727; France 334; Austria 121.
Ferromolybdenum	656	—		
Ferronickel value, thousands	—	$3	—	All from Italy.
Ferrosilicochromium	—	677	—	Belgium-Luxembourg 563; Hungary 69; U.S.S.R. 45.
Ferrosilicomanganese	175	58	—	Mainly from Bulgaria.
Ferrosilicon	1,268	959	1	West Germany 527; U.S.S.R. 226; United Kingdom 70.
Silicon metal	50	436	1	Norway 203; West Germany 128; France 100.
Unspecified	1,916	2,753	—	Austria 1,050; U.S.S.R. 666; West Germany 289.
Steel, primary forms	723,677	393,589	2,280	U.S.S.R. 274,274; Czechoslovakia 59,598; Poland 41,851.
Semimanufactures:[3]				
Bars, rods, angles, shapes, sections	162,784	127,528	123	Poland 47,597; Czechoslovakia 19,242; Romania 17,750.
Universals, plates, sheets	463,804	NA		
Hoop and strip	83,003	NA		
Rails and accessories	6,266	4,472	—	Poland 2,110; West Germany 881; U.S.S.R. 852.
Wire	27,269	23,955	1	Czechoslovakia 6,435; Poland 3,868; West Germany 2,701.
Tubes, pipes, fittings	55,707	47,438	135	East Germany 18,081; West Germany 10,729; Italy 4,427.
Castings and forgings, rough	1,930	NA		
Lead:				
Ore and concentrate	—	20,008	—	Greece 12,444; Peru 7,564.
Oxides	4,672	5,954	5	Austria 3,793; East Germany 1,402; Netherlands 365.
Metal including alloys:				
Scrap	1,112	509	—	All from Switzerland.
Unwrought	7,752	8,578	—	Greece 3,769; Spain 2,000; Bulgaria 1,011.
Semimanufactures	16	29	(2)	U.S.S.R. 20; West Germany 7; France 2.
Magnesium: Metal including alloys:				
Scrap	—	(2)	(2)	
Unwrought value, thousands	$5	$7	$7	
Semimanufactures	66	42	(2)	Norway 27; Austria 10; France 2.
Manganese:				
Ore and concentrate: Metallurgical-grade	88,173	130,587	—	Botswana 65,547; Gabon 42,791; U.S.S.R. 15,685.
Oxides	1,481	406	(2)	Belgium-Luxembourg 102; West Germany 93; Greece 82.
Metal including alloys, all forms	—	478	72	Netherlands 166; West Germany 124.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Mercury		23	48	—	Austria 30; West Germany 13; Italy 4.
Molybdenum: Metal including alloys:					
Unwrought	value, thousands	$3	—		
Semimanufactures		20	17	(2)	Austria 13; Hungary 2; Japan 1.
All forms		—	3	(2)	Mainly from Austria.
Nickel:					
Matte and speiss		586	(4)	NA	NA.
Metal including alloys:					
Scrap		3	—		
Unwrought		1,627	1,681	—	U.S.S.R. 1,035; Canada 337; Bolivia 83.
Semimanufactures		760	503	2	United Kingdom 143; U.S.S.R. 138; West Germany 102.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Platinum	value, thousands	$1,777	$1,293	—	United Kingdom $760; West Germany $285; France $248.
Iridium, osmium, ruthenium	do.	$33	—		
Unspecified	do.	—	$1,180	$1	United Kingdom $356; West Germany $343; Austria $336.
Silver:					
Waste and sweepings		(2)	—		
Metal including alloys, unwrought and partly wrought	kilograms	17,000	14,000	NA	Austria 12,000; West Germany 1,000.
Tin:					
Oxides		4	—		
Metal including alloys:					
Unwrought		1,068	1,456	—	Malaysia 1,188; Brazil 98; West Germany 97.
Semimanufactures		32	25	(2)	West Germany 17; Italy 4; Belgium-Luxembourg 3.
Titanium:					
Ore and concentrate		48,463	46,058	—	Australia 45,891; West Germany 160; Italy 7.
Oxides		1,329	1,979	—	Poland 990; West Germany 484; Czechoslovakia 315.
Metal including alloys, all forms	value, thousands	—	$10	$10	
Tungsten: Metal including alloys:					
Unwrought		1	—		
Semimanufactures		16	9	(2)	Hungary 3; Japan 2; Switzerland 1.
All forms		—	29	(2)	Sweden 16; Austria 6; France 4.
Zinc:					
Ore and concentrate		45,145	45,402	—	Peru 18,173; Mexico 6,511; United Kingdom 5,020.
Oxides		1,481	1,453	—	Czechoslovakia 888; West Germany 323; Austria 120.
Metal including alloys:					
Scrap		1	—		
Unwrought		1,425	7,756	—	Bulgaria 3,074; United Kingdom 3,000; Peru 604.
Semimanufactures		1,104	366	(2)	Spain 309; France 30; West Germany 24.
Zirconium:					
Ore and concentrate		—	735	—	Australia 322; Italy 175; Austria 137.
Metal including alloys, all forms		—	5	—	Mainly from Italy.
Other:					
Ores and concentrates		1,352	2,044	—	U.S.S.R. 1,963; West Germany 75; Austria 6.
Oxides and hydroxides		1,669	601	(2)	U.S.S.R. 243; West Germany 105; China 95.
Ashes and residues		1,632	227	—	All from Austria.
Base metals including alloys, all forms		479	13	(2)	Mainly from West Germany.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	461	1,419	—	Italy 965; Turkey 300; U.S.S.R. 64.
Artificial:				
Corundum	1,542	2,445	(2)	U.S.S.R. 1,203; Poland 757; Austria 342.
Silicon carbide	1,571	1,693	1	Poland 1,010; West Germany 536; Italy 80.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$1,917	$1,663	$18	Belgium-Luxembourg $567; Switzerland $468; Ireland $296.
Grinding and polishing wheels and stones	1,442	641	4	Austria 317; Italy 148; West Germany 74.
Asbestos, crude	45,600	38,456	46	U.S.S.R. 29,810; Zimbabwe 4,635; Botswana 2,620.
Barite and witherite	327	2,979	—	China 2,022; Turkey 900; West Germany 46.
Boron materials:				
Crude natural borates	35,425	41,922	7,036	Turkey 34,116; Austria 284.
Oxides and acids	4,656	4,991	(2)	Italy 3,083; Turkey 837; France 547.
Bromine	2	12	—	Israel 7; Netherlands 4; Austria 1.
Cement	32,555	106,671	—	Hungary 90,841; Bulgaria 10,071; Albania 5,075.
Chalk	5,811	7,543	—	Austria 4,655; Switzerland 2,050; France 790.
Clays, crude:				
Bentonite	65	635	—	Bulgaria 500; Czechoslovakia 73; West Germany 56.
Chamotte earth	620	1,244	—	Czechoslovakia 693; France 350; Austria 175.
Fire clay	45,668	42,010	400	Czechoslovakia 32,000; Poland 7,417; Spain 995.
Kaolin	91,789	83,307	3,720	Czechoslovakia 31,665; East Germany 13,292; Greece 10,500.
Unspecified	8,704	7,248	—	Poland 7,221; Austria 13; West Germany 12.
Cryolite and chiolite	800	970	—	Denmark 750; Norway 200; Austria 20.
Diamond:				
Gem, not set or strung value, thousands	$374	$223	—	India $113; Belgium-Luxembourg $108; Japan $2.
Industrial stones do.	$756	$871	—	Belgium-Luxembourg $496; Austria $256; Italy $59.
Diatomite and other infusorial earth	1,150	1,352	157	Italy 613; Austria 379.
Feldspar, fluorspar, related materials:				
Feldspar	1,676	2,373	—	Czechoslovakia 1,664; France 699; West Germany 10.
Fluorspar	8,280	10,349	—	China 8,496; East Germany 789; Czechoslovakia 330.
Unspecified	—	3	—	Netherlands 2; Italy 1.
Fertilizer materials:				
Crude, n.e.s.	200	120	—	All from France.
Manufactured:				
Ammonia	75,136	102,447	—	Hungary 53,043; Bulgaria 41,131; Czechoslovakia 4,183.
Nitrogenous	323,535	315,231	—	Czechoslovakia 157,305; Hungary 63,352; Bulgaria 36,852.
Phosphatic	16,945	33,650	—	Romania 18,437; Tunisia 15,213.
Potassic	540,583	638,017	(2)	U.S.S.R. 383,007; East Germany 251,524. Italy 2,900.
Unspecified and mixed	96,081	102,738	54,972	Romania 29,641; U.S.S.R. 16,505; Austria 1,119.
Graphite, natural	2,415	2,560	43	West Germany 1,216; Czechoslovakia 946; Austria 224.
Gypsum and plaster	58	78	2	West Germany 60; Italy 14.
Iodine	5	12	—	Chile 8; U.S.S.R. 2; West Germany 1.
Lime	148	25	—	Italy 20; West Germany 5.
Magnesium compounds:				
Magnesite, crude	(2)	5	—	Mainly from West Germany.
Oxides and hydroxides	12,897	10,358	3	Greece 6,900; Italy 2,030; France 583.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Mica:				
Crude including splittings and waste	336	101	(2)	West Germany 81; Norway 16; India 4.
Worked including agglomerated splittings	109	89	(2)	Czechoslovakia 39; Austria 24; Belgium-Luxembourg 12.
Nitrates, crude	310	396	—	East Germany 325; Austria 51; Poland 20.
Phosphates, crude	1,373,803	1,741,304	—	Jordan 807,968; Morocco 422,325; Syria 253,149.
Phosphorous, elemental	—	133	(2)	West Germany 81; U.S.S.R. 43; Italy 8.
Pigments, mineral: Iron oxides and hydroxides, processed	1,905	1,443	30	Belgium-Luxembourg 460; Spain 288; West Germany 281.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$131	$16	—	West Germany $15; Spain $1.
Synthetic do.	$224	$295	$16	Ireland $101; Belgium-Luxembourg $51; West Germany $47.
Pyrite, unroasted	451	11,197	—	All from Bulgaria.
Quartz crystal, piezoelectric value, thousands	—	$84	$55	Japan $26; United Kingdom $3.
Salt and brine	329,638	255,485	(2)	Romania 189,491; East Germany 34,455; Tunisia 22,660.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	65,137	86,672	—	Romania 41,509; Bulgaria 24,155; Poland 13,153.
Sulfate, manufactured	—	31,834	—	East Germany 23,879; U.S.S.R. 4,748; Austria 2,641.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,340	5,966	—	Bulgaria 4,568; U.S.S.R. 725; France 406.
Worked	1,191	396	—	Italy 348; Albania 40; Czechoslovakia 3.
Dolomite, chiefly refractory-grade	52	30	—	All from Norway.
Gravel and crushed rock	6,112	15,563	—	Austria 11,713; Hungary 3,509; Italy 161.
Limestone other than dimension	14	—		
Quartz and quartzite	7,783	741	172	West Germany 387; Netherlands 49.
Sand other than metal-bearing	71,384	68,680	9	Hungary 29,914; Czechoslovakia 17,595; West Germany 17,388.
Sulfur:				
Elemental:				
Crude including native and byproduct	131,856	210,343	—	Poland 165,614; U.S.S.R. 19,045; Saudi Arabia 17,461.
Colloidal, precipitated, sublimed	130	175	—	West Germany 86; Hungary 50; Italy 35.
Dioxide	100	70	(2)	West Germany 50; France 20.
Sulfuric acid	9,272	15,276	—	Hungary 15,190; West Germany 59; Switzerland 25.
Talc, steatite, soapstone, pyrophyllite	4,336	5,099	24	Austria 1,746; West Germany 1,319; Italy 1,198.
Other:				
Crude	15,937	21,411	(2)	Hungary 10,382; U.S.S.R. 3,301; Czechoslovakia 1,853.
Slag and dross, not metal-bearing	44,898	53,232	—	Italy 38,520; Canada 11,997; Morocco 2,635.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,460	3,244	364	Czechoslovakia 2,223; Albania 621.
Carbon:				
Carbon black	18,115	16,034	37	Italy 11,505; Mexico 2,031; West Germany 992.
Other	26	18	1	West Germany 8; Austria 5; France 3.
Coal:				
Anthracite thousand tons	3,993	3,857	767	U.S.S.R. 2,552; Australia 261; Poland 153.
Lignite including briquets	160,202	25,153	—	West Germany 13,465; U.S.S.R. 9,244; Czechoslovakia 2,444.
Coke and semicoke	22,469	59,676	17,253	West Germany 17,835; Japan 11,597.
Gas, natural million cubic feet	141,427	127,797	—	All from U.S.S.R.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Peat including briquets and litter		14,938	3,045	—	All from U.S.S.R.
Petroleum:					
Crude	42-gallon barrels	81,082	89,666	27	Iraq 36,705; U.S.S.R. 23,492; Libya 14,623.
Refinery products:					
Liquefied petroleum gas including non-refinery production	do.	NA	747	(2)	U.S.S.R. 504; Bulgaria 170; Hungary 68.
Gasoline	do.	1,310	2,503	—	Italy 493; Romania 381; Greece 351.
Mineral jelly and wax	do.	19	20	(2)	West Germany 9; Netherlands 3; East Germany 2.
Kerosene and jet fuel	do.	564	550	—	Libya 283; Hungary 95; Italy 73.
Distillate fuel oil	do.	62	611	—	Panama 374; U.S.S.R. 81; United Kingdom 75.
Lubricants	do.	587	742	2	Italy 190; Greece 143; Hungary 132.
Residual fuel oil	do.	6,135	3,305	3	U.S.S.R. 2,161; Iraq 315; Panama 284.
Bitumen and other residues	do.	15	2	—	Mainly from Albania.
Bituminous mixtures	do.	(2)	1	(2)	Mainly from United Kingdom.
Petroleum coke	do.	625	691	451	West Germany 135; Switzerland 54; U.S.S.R. 51.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[4]Unreported quantity valued at $27,000.

TABLE 6

YUGOSLAVIA: IMPORTS AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal sources, 1988
Aluminum:				
Oxides and hydroxides	value, thousands	—	$15	All from West Germany.
Metal including alloys, semimanufactures		1,150	741	Do.
Bismuth: Metal including alloys, all forms		—	17	All from Belgium-Luxembourg.
Cobalt: Metal including alloys, all forms		—	2	All from West Germany.
Copper: Metal including alloys:				
Unwrought		1,216	1,323	Italy 1,070; Bulgaria 252.
Semimanufactures		941	920	Bulgaria 660; Italy 260.
Gypsum and plaster		5	—	
Iron and steel: Metal:				
Steel, primary forms		33,526	107,449	U.S.S.R. 103,739; West Germany 3,710.
Semimanufactures: Universals, plates, sheets		4,800	NA	
Lead:				
Oxides		—	34	All from Austria.
Metal including alloys, unwrought		57	193	Bulgaria 159; Italy 34.
Petroleum refinery products: Lubricants	42-gallon barrels	3,304	15,267	Hungary 15,001; Austria 266.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum	value, thousands	$587	$58	Mainly from West Germany.
Unspecified	do.	—	$788	West Germany $763; Austria $23; United Kingdom $2.

See footnotes at end of table.

TABLE 6

YUGOSLAVIA: IMPORTS AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal sources, 1988
Rare-earth metals including alloys, all forms	value, thousands	$13	—	
Silver: Metal including alloys, unwrought and partly wrought	kilograms	2,000	2,000	Bulgaria 1,000; West Germany 1,000.
Tin: Metal including alloys, unwrought		2	2	All from West Germany.
Zinc: Metal including alloys:				
Unwrought		680	147	Bulgaria 77; Italy 70.
Semimanufactures		21	14	All from West Germany.

NA Not available.

[1]Table prepared by H. D. Willis. No imports after processing reported from the United States in 1988.

TABLE 7

YUGOSLAVIA: IMPORTS FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	1,531	1,183	—	U.S.S.R. 1,160; Austria 23.
Semimanufactures	624	7,109	1,295	U.S.S.R. 2,672; Romania 1,559; United Kingdom 612.
Chromium:				
Ore and concentrate	—	2,206	—	All from Turkey.
Metal including alloys, all forms	—	2	—	All from Belgium-Luxembourg.
Copper:				
Ore and concentrate	6,602	9,626	—	All from Bulgaria.
Metal including alloys:				
Scrap	20	10	—	All from Czechoslovakia.
Unwrought	12,218	1,289	83	Chile 992; U.S.S.R. 180; Cuba 34.
Semimanufactures	609	2,915	(2)	U.S.S.R. 1,901; West Germany 570; Poland 300.
Iron and steel:				
Iron ore and concentrate	13,132	19,258	—	All from Bulgaria.
Metal:				
Scrap	15,531	3,173	—	Hungary 2,972; Austria 201.
Ferroalloys:				
Ferrochromium	200	5,863	—	Belgium-Luxembourg 4,491; Austria 1,039; Hungary 181.
Ferrosilicochromium	18	—		
Unspecified	30	40	—	All from West Germany.
Steel, primary forms	472,060	198,649	—	U.S.S.R. 188,845; Bulgaria 9,530; Hungary 205.
Semimanufactures:				
Bars, rods, angles, shapes, sections	39,428	44,415	(2)	U.S.S.R. 34,806; Hungary 3,190; West Germany 2,709.
Universals, plates, sheets	126,163	NA		
Hoop and strip	35,159	NA		
Rails and accessories	—	513	—	All from Bulgaria.
Wire	2,714	180	—	Hungary 104; West Germany 76.
Tubes, pipes, fittings	41,685	33,739	—	Bulgaria 14,227; Czechoslovakia 8,745; Hungary 8,253.
Castings and forgings, rough	160	NA		
Lead:				
Ore and concentrate	12,042	13,690	—	Greece 10,692; United Kingdom 2,998.

See footnotes at end of table.

TABLE 7—Continued

YUGOSLAVIA: IMPORTS FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Lead—Continued					
Metal including alloys:					
Scrap		2,793	763	—	All from Switzerland.
Unwrought		3,069	9,311	—	Switzerland 5,729; United Kingdom 2,950; Austria 596.
Semimanufactures		40	(2)	—	All from West Germany.
Magnesium: Metal including alloys, unwrought		—	16	—	All from France.
Manganese: Ore and concentrate:					
Metallurgical-grade		—	8,000	—	All from Gabon.
Tin: Metal including alloys, unwrought		1	—		
Zinc:					
Ore and concentrate		26,002	15,742	—	United Kingdom 8,001; Peru 4,595; Greece 2,955.
Oxides		5	—		
Blue powder		—	2,137	—	All from United Kingdom.
Metal including alloys:					
Unwrought		1,943	36,387	—	United Kingdom 27,652; Canada 3,471; Morocco 2,933.
Semimanufactures		1,025	3,119	—	West Germany 2,669; Austria 450.
Other: Oxides and hydroxides		1	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Artificial:					
Corundum		881	—		
Silicon carbide		3	—		
Asbestos, crude		3	—		
Barite and witherite		1	—		
Bromine		70	—		
Cement		—	60	—	All from Hungary.
Clays, crude: Kaolin		21	—		
Diamond:					
Gem, not set or strung	value, thousands	$4	—		
Industrial stones	do.	—	$30	—	All from Belgium-Luxembourg.
Diatomite and other infusorial earth		10	20	—	All from Austria.
Fertilizer materials: Manufactured:					
Nitrogenous		1,951	—		
Unspecified and mixed		14,006	9,610	—	Jordan 6,934; Romania 2,676.
Graphite, natural	value, thousands	$7	$23	$23	
Magnesium compounds: Oxides and hydroxides		3	—		
Salt and brine		232	245	—	All from West Germany.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		24	—		
Worked		—	22	—	All from Austria.
Quartz and quartzite		—	8	—	All from Italy.
Talc, steatite, soapstone, pyrophyllite		41	—		
Other: Slag and dross, not metal-bearing		—	60	—	All from Italy.
MINERAL FUELS AND RELATED MATERIALS					
Coal: Bituminous		1,225	264,526	127,027	U.S.S.R. 81,084; Switzerland 56,414.
Coke and semicoke		—	70,166	39,571	U.S.S.R. 30,595.

See footnotes at end of table.

TABLE 7—Continued

YUGOSLAVIA: IMPORTS FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum:					
Crude	thousand 42-gallon barrels	1,275	—		
Refinery products:					
Gasoline	42-gallon barrels	148,376	159,341	—	All from United Kingdom.
Kerosene and jet fuel	do.	1,435	2,162	—	West Germany 2,007; Iraq 155.
Lubricants	do.	539	973	—	All from West Germany.
Residual fuel oil	do.	160,719	—		

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 8

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities[1]	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Kombinat Aluminijuma Titograd	Plant at Titograd, Montenegro	200.
Do.	Energoinvest	Plants at Birac-Zvornik, BiH	600.
Do.	do.	Plant at Mostar, BiH	280.
Do.	Unial, Tvornica Glinice in Aluminija Boris Kidric	Plant at Kidricevo, Slovenia	120.
Aluminum	Boris Kidric, Tvornica Lakih Metala	Smelter at Sibenik, Croatia	75.
Do.	Kombinat Aluminijuma Titograd	Smelter at Titograd, Montenegro	100.
Do.	Energoinvest	Smelter at Mostar, BiH	92.
Do.	Unial, Tvornica Glinice in Aluminija Boris Kidric.	Smelter at Kidricevo, Slovenia	50.
Antimony, metal	Zajaca, Rudarsko Topionicarski Bazen	Smelter at Zajaca, Serbia	4.
Antimony ores and concentrates	do.	Mines and mills near Zajaca, Serbia	80.
Do.	do.	Mines and mill at Rajiceva Gora, Serbia	300.
Bauxite	Energoinvest	Mines in BiH at Vlasenica, Jajce, Bosanska Krupa, Posusje, Listica, Citluk, and other locations; and mines in Croatia at Rovinj and other locations	2,500.[2]
Do.	Rudnici Boksita, Niksić	Mines in Montenegro at Kutsko Brdo, Zagrad, Biocki Stan, Durakov Do., and other locations	650.
Do.	Jadral, Jadranski Aluminijum	Mines in Croatia at Obrovac, Drniš, and other locations	450.
Coal:			
Bituminous	Istarski Ugljenokopi Raša	Mines at Labin and Potpićan, Croatia	300.
Do.	do.	do.	200.
Do.	Ibarski Rudnici Kamenog Uglja	Mines at Jarando and Uśće, near Baljevac na Ibru, Serbia	150.
Do.	do.	do.	100.
Brown	SOUR Titovi Rudnici Uglja, Tuzla, BiH	Mines in BiH	12,000.[2]
Do.	SOZC, Rudarsko Energetski Kombinat E. Kardelj, Trbovlje, Slovenia	Mines: Sasavski Rudnici at Trbovlje, Hrastnik, Ojstro, Senovo, and Kanizarnica	1,300.[2]
Lignite	SOUR Titovi Rodnici Uglja, Tuzla, BiH	Mines in BiH	7,000.[2]
Do.	SOUR Kolubara, Rudarsko Energetsko Industrijski Kombinat, RO Kolubara Povrśinski Kopovi	Opencast mines: Polje B and Polje D Tamnavski Kopovi (also known as Kolubarski Rudnici Lignita), near Vreoci, Serbia	10,000.[2] 14,000.[2]

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities[1]	Capacity (thousand metric tons per year unless otherwise specified)
Coal—Continued			
Lignite—Continued	SOUR Elektroprivreda Kosova, RO Kosovo, Proizvodnja Separacija i Transport Uglja	Opencast mines: Dobro Selo and Belacevac, near Obilić, Serbia	2,000.[2]
Do.	Rudarsko Energetski Kombinat Velenje, RO Rudnik Lignita-Velenje	Mine at Velenje, Slovenia	5,000.[2]
Cement	16 producing enterprises, of which the largest were—Dalmacija Cement	20 plants in operation	13,860.[2]
		Partizan plant at Kaštel Sućurac, Croatia	1,525.[2]
		Prvoborac plant at Solin, Croatia	884.
		"10 Kolovoz" plant at Solin Majdan, Croatia	440.
		Renko Šperac plant at Omiš, Croatia	140.
	Beocinska Fabrika Cementa	Plant at Beocin, Serbia	2,031.[2]
	Fabrika Cementa Novi Popovac	Plant at Popovac, Serbia	1,613.[7]
Chromite, concentrate	Jugohrom, Hemijsko-Elektrometalurški-Kombinat	Concentrator at Radusa, Macedonia	150.
Copper	Rudarsko Topionicki Bazen Bor	Smelter at Bor, Serbia	180.
Do.	do.	Electrolytic refinery at Bor, Serbia	180.
Do.	do.	Mine and mill at Bor, Serbia	5,000 ore.[2]
Do.	do.	Mine and mill at Majdanpek, Serbia	15,000 ore.[2]
Do.	do.	Mine and mill at Veliki Krivelj, Serbia	8,000 ore.[2]
Do.	Bućim, Rabotna Organizacija za Rudarstvo i Metalurgija Baker	Mine and mill at Bućim, near Radoviš, Macedonia	7,000 ore.[2]
Ferroalloys	Jugohrom, Hemijsko-Elektrometalurški-Kombinat	Plant at Jegunovce, Macedonia	80.
Do.	Elektrobosna, Elektrohemijska i Eletrotermijska Industrija	Plant at Jajce	80.
Iron ore	Rudarsko Metalurški Kombinat Zenica	Mines at Vareš, Ljubija, and Radovan, BiH	5,000.[2]
Do.	Skopje Rudnici i Zeljezarnica Skopje	Mines at Tajmište, Demir Hisar, and Damjan, Macedonia	1,000.[2]
Lead-zinc ore	Rudarsko-Metalurško-Hemijski Kombinat za Olovo i Cink Trepca	Mines at Ajvalija, Kopaonik, Badovac; Trepca, Blagodat, Lece; Veliki Majdan, Tisovak; and Kišnica, Rudnik, Veliki, and Majdan, Šuplja Stijena	5,000.[2]
Do.	do.	Mills at Kriva Feja, Lece, Rudnik, Badovac, Leposavic, Zvecan, and Maravce, Šuplja Stijena	3,160.[2]
Do.	Energoinvest	Mine and mill at Srebrenica, BiH	300.
Do.	Rudarsko Metalurško Prepobotuvacki, Kombinat Zletovo-Sasa: Sase, Rudnici za Olovo i Cink	Mine and mill near Kamenica, Macedonia	300.
Do.	Zletovo, Rudnici za Olovo i Cink	Mine and mill near Probistip, Macedonia	700.
Do.	Rudnik Svinca, Topilnica, Mezica	Mine and mill near Mezica, Slovenia	400.
Do.	Hemijska Industrija Zorka:		
Do.	Brskovo, Rudnici Olova i Cinka	Mine at Brskovo, Montenegro	500.
Do.	Veliki Majdan Rudnik Olova i Cinka	Mine at mill near Krupanj, Serbia	250.
Lead metal	Rudarsko Metalurško Hemijski Kombinat za Olovo i Cink Trepca	Smelter at Zvecan, Serbia	180.
Do.	do.	Refinery at Zvecan, Serbia	90.
Do.	Rudnik Svinca in Topilnica, Mezica	Smelter at Mezica, Slovenia	35.
Do.	do.	Refinery at Mezica, Slovenia	30.
Do.	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter at Titov Veles, Macedonia	40.
Do.	do.	Refinery at Titov Veles, Macedonia	40.
Magnesite	Rudnici Magnezita "Šumadija"	Mine and plant at Šumadija, 20 km northwest of Cacak, Serbia	120 conc.
Do.	Rudnik i Industrija Magnezita "Strezovce"	Opencast mine at Beli Kamen, Strezovce, near Titova Metrovica, Serbia	300.
Do.	do.	Sinter plant at Strezovce	40.
Do.	Magnohrom, Rudnik Magnezita "Magnezit"	Mine at Bela Stena, Baljevac na Ibru, Serbia	30.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities[1]	Capacity (thousand metric tons per year unless otherwise specified)
Manganese, ore	Mangan-Energoinvest	Mine and concentrator at Buzim, BiH	100.
Mercury	Rudnik Zivega Srebra, Idrija	Mine and smelter in Idrija, Slovenia	15,000.[2 3]
Natural gas	Industrija Nafte (INA)	Natural gasfields in Croatia: Bogšic Lug, Molve, and others	70,000.[4]
Do.	Naftaplin (Naftagas), RO za Istrazivanje, i Proizvodnju Nafte i Gasa	Natural gasfields in Serbia: Kikinda and others	30,000.[4]
Nickel, ore	Feni-Rudnici i Industrija za Nikel, Celik i Antimon	Mine and opencast mine near Kavadarci, Macedonia[5]	2,300.[2]
Do.	do.	Ferronickel Plant at Kavadarci, Macedonia[6]	16,000.[2 7]
Petroleum:			
Crude	Industrija Nafte (INA)	Oilfields in Croatia and Slovenia: Benicanci, Zutica, Struzec, Ivanic Grad, Lendava, and others	70.[8]
Do	Naftagas, Naftna Industrija	Oilfields in Serbia: Kikinda and others	30.[8]
Refined	Industrija Nafte (INA):		
Do	Rafinerija Nafte Rijeka	Refineries at Urinj and Rijeka, Croatia	160.[8]
Do	Rafinerija Nafte Sisak	Refinery at Sisak, Croatia	150.[8]
Do	Rafinerija Nafte Lendava	Refinery at Lendava, Slovenia	16.[8]
	Naftagas, Naftna Industrija:		
Do	Rafinerija Nafte Pancevo	Refinery at Pancevo, Serbia	110.[8]
Do	Rafinerija Nafte Novi Sad	Refinery at Novi Sad, Serbia	28.[8]
Do	Energoinvest: Rafinerija Nafte Bosanski Brod	Refinery at Bosanski Brod, BiH	100.[8]
Pig iron	Rudarsko Metalurški Kombinat Zenica (RMK Zenica)	4 blast furnaces at Zenica, BiH 2 blast furnaces at Vareš, BiH	2,250.[2] 100.
Do.	do.	Electric reduction furnaces at Iljaš, BiH	100.
Do.	Metalurški Kombinat, Smederevo	Blast furnace at Smederevo, Serbia	720.
	Metalurški Kimbinat "Zeljezara Sisak"	2 blast furnaces at Sisak, Croatia	235.
Do.	Zdruzeno Podjetje Slovenske Zelezarne	2 blast furnaces at Zelezara Jesenice, Slovenia	300.
Do.	Zelezara Štore	Electric reduction furnaces at Štore pri Celju, Slovenia.	290.
Do.	Skopje, Rudnici i Skopje	5 Elkem electric furnaces at Macedonia,	430.
Salt	Hemijski Kombinat "Sodaso," Rudnik Soli i Solni Bunari	Rock salt: Mines at Tušanj, BiH	120,000.[2]
Do.	do.	Production from brine at Tuzla, BiH	2,000,000.[9]
Do.	Solana "Pag," Solana "Ante Festin"	Marine Salt: Pag Island, Croatia	13.
Steel, crude	Rudarsko Metalurški Kombinat Zenica	Plant at Zenica, BiH	2,060.[2]
Do.	Skopje, Rudnici i Zeljezarnica	Plant at Skopje, Macedonia	980.
Do.	Zdruzeno Podjetje Slovenske Zeljezare	Plant at Jesenica, Slovenia	960.
Do.	do.	Plant at Ravne, Slovenia	200.
Do.	do.	Plant at Štore, Slovenia	200.
Do.	Metalurški Kombinat Smederevo	Plant at Smederevo, Serbia	600.
Zinc metal	Rudarsko Metalurško Hemijski Kombinat Olova i Cinka Trepca, Metalurgija Cinka	Electrolytic plant at Titova Metrovica, Serbia	40.
Do.	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter plant and refinery at Titov Veles, Macedonia	65.
Do.	Hemijska Industrija Zorka	Electrolytic plant at Šabac, Serbia	40.

[1]BiH Bosnia i Hercegovina.
[2]Million metric tons per year.
[3]Flasks per year.
[4]Million cubic feet.
[5]Both closed in 1984.
[6]Shut down in 1984.
[7]Nickel in ferronickel.
[8]Thousand barrels per day.
[9]Cubic meters per year.

to supply the U.S.S.R. with 20,000 tons of hydrated alumina, reportedly worth $8.5 million.

Copper.—The country's major copper producer, Rudarsko Topionicki Bazen Bor (Bor), announced the start of construction of a new electrolytic refinery. Upon completion, the refinery would add 35,000 tons of capacity to Bor's annual cathode output. Bor's management also indicated that a second stage of modernization would begin during the year that would include a new primary smelter and sulfuric acid plant. The project would raise Bor's yearly anode output to 190,000 tons. The total cost of the second stage of modernization was estimated at about $28 million. In addition, the new facilities would substantially reduce the emission of particulates and harmful gases. Bor's old smelter would be decommissioned.[1]

The Majdanpek copper mining and smelting enterprise, a subsidiary of Bor, began mining operations in 1989 at the new Severni Revir open pit mine at an initial production rate of 2.5 million tons per year. Further development at this facility would reportedly achieve a yearly output of 5 million tons of copper ore by the year 2000. Development plans at Majdanpek also included the addition of a new company-designed unit for recovering copper, gold, silver, and magnetite from mine tailings.[2] During the year, exploration conducted by the Slobodan Penezic-Krcun enterprise of Sevojno resulted in the discoveries of two copper ore bodies near Prijepolje, in the southern part of the country. The deposits were found to contain more than 3 million tons of ore, grading at 2% copper. The management of the Slobodan Penezic-Krcun enterprise planned to develop a mine at this site.

Ferroalloys.—In 1989, the management of Feni-Rudnici i Industrija Nikel, Celik i Antimon (Feni), owner of Yugoslavia's largest ferronickel plant, and Falconbridge of Canada came close to finalizing negotiations on a joint venture to reopen Feni's ferronickel plant, closed since 1984. Reportedly, Falconbridge's management indicated that it would be willing to assume a portion of Feni's foreign debt as part of the agreement. However, during the negotiations, Falconbridge was acquired by Noranda of Canada and Telborg of Sweden. The new management continued negotiations with Feni, but by yearend, the unresolved issues of Feni's debt and the supply of power to the ferronickel facility remained. It was expected that the ferronickel operation would resume production in 1990 following early resolution of these issues.

Reportedly, Hemijsko-Elektrometalurski Kombinat Jugohrom (Jugohrom) signed a contract during the year with several steel companies in Turkey to deliver 2,000 tons of ferrosilicon to the Turkish plants in 1989. Jugohrom's management indicated that the company's $22 million modernization effort would be completed by the end of 1990. The new facility would increase the company's ferroalloy production capacity mainly for export.

Gold.—Activity in the country's gold sector reportedly included the discovery of a large quartz vein-type gold deposit grading 15 grams of gold per ton of ore. The exploration work was conducted near the old Blagoev Kamen Mine in Kucevo by specialists from Bor and the Belgrade Institute of Geology. The Blagoev Kamen Mine may be reactivated after having been closed for 25 years.

Also during the year, the Sovet Za Istrazuvacki Raboti Vo Rudarstvo enterprise sought joint-venture partners to explore for alluvial and hard-rock deposits in southern Macedonia.

Iron and Steel.—Following 12 months of study and review of proposals, Opste Udruzenje Crne Metalurgije Jugoslavije (the Steel Producer's Association of Yugoslavia) awarded a contract to British Steel Consulting Ltd. to survey Yugoslavia's iron and steel industry and prepare recommendations regarding its restructuring. British Steel Consulting Ltd. indicated that when the contract is finally approved, they would apply a model that was used to restructure the steel industries of the European Community, developed by W.S. Atkins Consultants.

Early in 1989, Smederevo Iron and Steelworks initiated a modernization program with the closure of the No. 1 blast furnace. The construction and installation of a new blast furnace was scheduled for early 1990. The new furnace, with computerized production monitoring, would include an automated system for furnace charge preparation. The furnace would have a production capacity of 750,000 tons of pig iron per year.[3]

Two new 85-ton converters were installed during the year at Smederevo together with a new coking system. Construction of these facilities, however, was behind schedule, reportedly owing to financial problems. At yearend, plans were announced at the Sisak Iron and Steelworks to begin the construction of a new rolling mill in early 1990 to produce 200,000 tons of seamless pipe per year.

Lead and Zinc.—The authorities at the Mezice Mine in Slovenia in midyear indicated that the mine would be closed by 1992 owing to depletion unless new reserves are discovered by that time. Exploration for new reserves in the area, however, was discontinued because of a shortage of funds.[4] On the other hand, in Bosnia, the Vares Mine resumed production after having been closed for more than 2 years. The ore extracted from the 300,000-ton-per-year Vares Mine included barite as well as significant amounts of mercury. Lacking domestic technology needed to extract mercury from the lead concentrates, the concentrates were shipped to Belgium for mercury extraction. Despite this added cost, production at the Vares operation became important owing to disruptions of the country's mine output of lead and zinc stemming from ethnic disturbances in Kosovo during the year.

Protests and strikes by ethnic Albanians in the Serbian Province of Kosovo resulted in disruptions of mine and smelter operations at the Trepca mining, beneficiation, and smelting complex, the country's major producer of lead and zinc. To compensate for shortages caused by the strikes, the Government authorized the use of stocks and imports of lead and zinc concentrates. The Veres mining operation was able to obtain technical assistance for mercury extraction from the NESA company of Belgium, but by yearend a suitable location for this extraction facility was not established. The Trepca lead and zinc mining, beneficiation, and smelting complex in Kosovo would have been the most likely site, but, because of ethnic problems in the area, other sites were under review, including the Veres mine site.[5]

Industrial Minerals

Yugoslavia continued to produce a large number of industrial minerals that included barite, bentonite, gypsum, kaolin, magnesite, and pumice for domestic needs as well as exports. In 1989, the Agropanonija enterprise began mining

operations at its newly discovered deposit of mixed industrial mineral ores at Vrsacki Breg, near the Romanian border. Initial operations were to produce 200,000 tons of processed minerals annually, of which 20% would be feldspar; clays, 15%; and quartz and sand, 65%. Additionally, small quantities of byproduct titanium would be produced also.

Phosphate Rock.—Reportedly, a deposit containing about 260 million tons of phosphate was discovered near Bosilegrad. Exploration work was conducted by the Institute of Mining and Geology of Belgrade. According to specialists in this organization, mine development at the site would require about $180 million.

Sulfur.—A major deposit of native sulfur was discovered by geologists from the Zletovo lead and zinc mine at Pribistip. Preliminary estimates showed the deposits to contain 10 million tons of high-quality ore. Most of Yugoslavia's sulfur requirements have been met by byproduct production from nonferrous metals, pyrite concentrates, and imports.

Mineral Fuels

Coal.—In 1989, the country's coal industry continued to show production gains. The Kolubara Basin, which accounted for 36% of Yugoslavia's total output of coal and lignite, reportedly reached a production record of 26.3 million tons of bituminous coal and lignite during the year. The balance, or 49.2 million tons of coal and lignite, were produced at Kakanj, Kosovo, Kostolac, Kreka-Banovici, Tuzla, and Velenje mines. The industry planned to raise production to 80 million tons in 1990.

In November, more than 90 miners were killed by a methane explosion during a welding operation in an underground shaft at the Aleksinac Rudnici Mine, about 120 kilometers (km) south of Belgrade. Reportedly, 5 years prior to the accident a commission of experts recommended the closure of this operation because of its poor safety record. In 1983, 38 miners were killed at the same facility by a similar accident.

Natural Gas.—In 1989, Ina-Naftaplin put a new gas well into production at the Molve natural gasfield, and a new compressor station was commissioned at Kalinovac. Additionally, the Stari Gradec I and Kalinova II natural gas wells went on-stream with a combined total daily output of 220,000 cubic meters of gas and 180,000 cubic meters of condensate.

Nuclear Power.—In December, an earthquake forced a stoppage at the Krsko nuclear powerplant, near Ljublana. However, no damage to the facility was reported.

In 1989, the Krsko nuclear powerplant, which in previous years had purchased 100% of its fuel from the United States, decided to purchase 70% of its enriched uranium requirements from the United States and 30% from the U.S.S.R.

Petroleum.—During the year, Ina-Naftaplin announced the discovery of petroleum deposits near Banova Jruga and Bizovac in Croatia. The company indicated that further work would be done to determine the size of the deposits and their productivity. Also, Energoinvest of Sarajevo and Amoco of the United States signed a 3-year agreement to conduct joint exploration of the Dinaric Alps. Reportedly, Amoco signed a similar agreement with Ina-Naftaplin to explore the Croation portion of the Alps.

TABLE 9

YUGOSLAVIA: APPARENT RESERVES OF MAJOR MINERALS

Commodity	Quantity (thousand metric tons)
Antimony, in ore	12,000
Bauxite	150,000
Coal (in SCE [1])	10,000,000
Copper, in ore	4,000
Iron, in ore	500,000
Lead and zinc ore	90,000
Lead, in ore	2,500
Manganese ore	6,000
Mercury (cinnabar) ore	4,000
Nickel, in ore	25,000
Phosphate, in P_2O_5	30,800
Sulfur	10,000
Zinc, in ore	2,200

[1]Standard coal equivalent.

Reserves

In view of Yugoslavia's efforts to become more market economy oriented, the country's mineral reserves will have to be reevaluated from a market perspective. Reserves, as defined by market economies, are mineral deposits that can be mined at a profit under existing conditions with existing technology. In centrally planned and other nonmarket economy countries, such as Yugoslavia, political rather than economic considerations were paramount in formulating policies for industrial development. Political directives to discover exploitable resources may have resulted in possible overestimations and other distortions of collected field data. The reserves and/or resources given in table 9 reflect data gathered by previous Yugoslavian Governments operating under nonmarket conditions.

INFRASTRUCTURE

Yugoslavia's inland system of ways and communications consisted of 132,617 km of railroads, highways, and inland waterways. The railroad system consisted of 9,270 km of 1.435-gauge track, of which 930 km was double track and 3,771 km was electrified. The highway and road system consisted of 71,315 km of asphalt, concrete, and stone block-paved roads; 34,299 km of macadam, asphalt-treated, gravel, and crushed stone roads; and 15,133 km of earth roads. Yugoslavia had 2,600 km of navigable waterways. The country's merchant marine fleet consisted of 270 ships with a total weight of 5,809,219 deadweight tons. The fleet included 131 cargo, 16 container, 14 roll-on/roll-off, 9 petroleum, 3 ore/oil, 73 bulker, and 8 combination bulker vessels. The major seaports were Bar, Koper, Ploce, Split, and Rijeka. In addition, Yugoslavia had 1,373 km of pipeline for crude petroleum, 150 km of pipeline for refined products, and 2,900 km of pipeline for natural gas.

OUTLOOK

Given Yugoslavia's long history of mining and the fact that a significant portion of the country has reportedly not been adequately surveyed for mineral deposits, Yugoslavia will probably remain an important European producer of minerals. However, the major issue confronting the restructuring of the country's economy, including its mineral industries, has been a

strong ethnic and/or political division within Yugoslavia's population. A secondary, but no less important issue, has been concern for the environment brought about by years of industry-generated pollution. Both of these issues will continue to confront Yugoslavia in the near term, and their resolution will bear directly on the future structure of mining and processing of the country's minerals and fuels.

[1]Politika. June 6, 1989, p. 13.
[2]———. May 3 and 7, 1989, pp. 5,9.
[3]Privredni Pregled. Sept. 9, 1989, p. 6.
[4]———. July 19, 1991, p. 4.
[5]———. May 5, 1989, p. 4.

OTHER SOURCES OF INFORMATION

Agencies

Industrijska Komora (Chamber of Industry)
Belgrade, Yugoslavia.
Savezni Geoloski Zavod (Federal Geological Institute)
Belgrade, Yugoslavia.

Publications

Indeks (Index), monthly.
Statisticki Godisnjak (Statistical Yearbook).
Nafta (Petroleum), monthly.
Celik (Steel), monthly.

MAP SYMBOLS

Commodity	Symbol
Alunite	Alu
Alumina	Al
Aluminum	AL
Andalusite	And
Antimony	Sb
Arsenic	As
Asbestos	Asb
Asphalt	Asp
Barite	Ba
Bauxite	Bx
Bentonite	Bent
Beryllium	Be
Bismuth	Bi
Bitumen (Natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Carbon Black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Dol
Emerald	Em
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fert
Fluorspar	F
Gallium	Ga
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Ilmenite	Il
Indium	In
Iron and Steel	Fe
Iron Ore	Fe
Kaolin	Kao
Kyanite	Ky
Lapis Lazuli	Laz
Lead	Pb
Lignite	Lig
Lime	Lime
Limestone	Ls
Liquefied Natural Gas	LNG
Liquefied Petroleum Gas	LPG
Lithium	Li
Magnesite	Mag
Magnesium	Mg
Manganese	Mn
Marble and Alabaster	Marb
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural Gas	NG
Natural Gas Liquids	NGL
Nepheline Syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (Ammonia Plants)	N
Oil Sands	OSs
Oil Shale	OSh
Olivine	Ol
Opal	Opal
Peat	Peat
Perlite	Per
Petroleum, Crude	Pet
Petroleum Refinery Products	Pet
Phosphate	P
Pig Iron	Pig
Pigments, Iron	Pigm
Platinum Group Metals	PGM
Potash	K
Precious and Semiprecious Stones	Gem
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or Quartzite	Qtz
Rare Earths	REE
Rhenium	Re
Rutile	Ru
Salt	Salt
Sand and Gravel	Sd/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, Meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	Soap
Soda Ash, Trona	NaAsh
Sodium Sulfate	$NaSO_4$
Stone	Stone
Strontium	Sr
Sulfur	S
Talc	Talc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium	Ti
Titanium Dioxide	TiO_2
Tungsten	W
Uranium	U
Vanadium	V
Vermiculite	Verm
Wollastonite	Wo
Wonderstone	Ws
Yttrium	Y
Zinc	Zn
Zirconium	Zr

MAP LEGEND

Symbol = Mine, including beneficiation plants, well

Circled Symbol = Group of producing mines or wells

Underlined Symbol = Processing plant or oil refinery, including smelters and metal refineries

(Symbol) = Undeveloped resource

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