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MINERAL INDUSTRIES OF

# EUROPE AND CENTRAL EURASIA


U.S.
DEPARTMENT
OF THE
INTERIOR


BUREAU
OF
MINES

1991

UNITED STATES DEPARTMENT OF THE INTERIOR • Bruce Babbitt, Secretary

BUREAU OF MINES

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# Preface

This edition of the Minerals Yearbook records the performance of the worldwide minerals industry during 1991 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains annual reports 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 are 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 annual international 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 Central Eurasia, Mineral Industries of the Middle East, and Minerals in the World Economy. The reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Mineral Perspectives Series quinquennial regional books, which were discontinued in 1990. The U.S. 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.

# Acknowledgments

The U.S. 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*

# Contents



# Table



# Vitae

Mr. Donald E. Buck was formerly a country specialist in the Branch of Europe and Central Eurasia. He joined the U.S. 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. He is currently working at the Department of Energy.

Mr. Michel C. Frippel is Chief, Branch of Europe and Central Eurasia. He has been with the U.S. Bureau of Mines since 1988. His experience includes 7 years as a materials engineer in the U.S. aerospace industry (at Lycoming, The Boeing Airplane Co., and the Grumman Aircraft Engineering Corp.) and more than 13 years in international minerals investment, planning, and marketing at AMAX Inc. Over the course of his career at AMAX, Mr. Frippel represented the company in Europe, Asia, Latin America, and Africa. Mr. Frippel holds a Master's degree in Business Administration from Columbia University and a B.S. degree in Metallurgical Engineering from Polytechnic University. He has also done graduate work in Metallurgy and Materials Science at New York University.

Mr. Charles L. Kimbell is the Bureau Senior Foreign Mineral Specialist. He is on the staff of the Chief of the Division of International Minerals and has more than 33 years of experience in international minerals studies at the U.S. Bureau of Mines. He has been involved with the preparation of the international volume of the Minerals Yearbook since the inception of the volume in 1963. He has been the senior author of Minerals in the World Economy since 1969. Mr. Kimbell has studied geology at both the Colorado School of Mines and American University. He holds a B.S. degree in Geology from American University.

Mr. Richard M. Levine is a country specialist in the Branch of Europe and Central Eurasia. He has more than 20 years of experience as an analyst of Soviet industry and economic affairs. Mr. Levine joined the U.S. Bureau of Mines as a mineral specialist for the U.S.S.R. in 1981. Prior to joining the Bureau, he was Senior Research Specialist at the Library of Congress. Mr. Levine holds a B.A. degree from Ohio State University and an M.A. in Soviet Economics and Area Studies from Georgetown University.

Mr. Harold R. Newman is a country specialist in the Branch of Europe and Central Eurasia. He has more than 25 years of experience, including 3 years as a civil engineer with the State of Texas, 2 years as a mining engineer with HPE Consulting, and 9 years with the U.S. Army Corps of Engineers. Mr. Newman joined the Research Directorate of the U.S. Bureau of Mines in 1981 as a mining engineer working on improved efficiency in materials handling. He joined the Division of International Minerals in 1983 as a Canadian Minerals Industry Specialist. Mr. Newman holds a B.S. degree in Geology and an M.S. in Engineering, both from the University of Texas, El Paso. He is a registered professional engineer in the State of Texas.

Mr. Jozef Plachy is a country specialist in the Branch of Europe and Central Eurasia. He has been with the U.S. Bureau of Mines since 1976 where he has worked as a mineral trade statistician, Soviet mineral industry research assistant, and Eastern European country specialist. Mr. Plachy is a graduate of Vysoke Uceni Technicke-Fakulta Stonjni in Brno, Czechoslovakia, and holds an M.A. in history from Western Connecticut State College.

Dr. George A. Rabchevsky was formerly a country specialist in the Branch of Europe and Central Eurasia. He joined the U.S. Bureau

of Mines in 1978. He has 15 years of experience as a Soviet and European minerals industry analyst and 2 years experience with the Mining Research Directorate. Dr. Rabchevsky's work experience also includes 5 years as a Senior Geologist at Allied Research Associates, Inc.; 4 years at Photo Sciences, Inc., where he headed the Image Analysis and Applications Division; and 5 years as a Vice President in the area of geotechnical and remote sensing consultation at Rainbow Systems, Inc. Dr. Rabchevsky has lectured in geology and remote sensing at the George Washington University and American University. He holds a B.S. degree in Geology from American University and a Ph.D. in Geology from George Washington University. He has also done graduate work at Cornell University. Dr. Rabchevsky is presently a country specialist in the Branch of Latin American and Canada.

Mr. Walter Steblez has been a country specialist for Eastern Europe in the Branch of Europe and Central Eurasia since 1979. His work experience includes 4 years as U.S.S.R. Analyst for the Stanford Research Institute and 5 years as Russian language interpreter with the U.S. Department of State. Mr. Steblez obtained his B.A. degree in history from the University of Cincinnati.

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THE MINERAL INDUSTRIES OF

# EUROPE AND CENTRAL EURASIA

By Michel C. Frippel and Staff, Branch of Europe and Central Eurasia

## INTRODUCTION[1]

This section of the Minerals Yearbook reviews the minerals industries of 27 countries: the 12 nations of the European Community (Belgium, Denmark/Greenland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom); 6 of the 7 nations of the European Free Trade Association (Austria, Finland, Iceland, Norway, Switzerland, and Sweden); Malta; the 8 Eastern European economies in transition (Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and Yugoslavia); 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 the more minerally endowed countries in North and South America, Africa, and Australia. In this regard, Western Europe is the most important determinant of raw materials consumption (and thus, indirectly, raw materials production). Western Europe has significant reserves of industrial minerals but has limited availability of metalliferous raw materials. It, therefore, imports significant quantities of the latter and ranks along with the United States and the U.S.S.R. in the production of refined metals. 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, the United States, the U.S.S.R., and Japan 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 15 EC and EFTA countries, Western Europe has a land area approximately 40% of that of the United States, exceeds the U.S. population by 50% and has a gross domestic product about the same as that of the United States.

Although more limited in the availability of local low cost raw materials, the minerals industries of Western Europe, which see themselves as international entities rather than local enterprises, have, in the past few years, merged together and restructured themselves such that they now represent increasingly powerful multinational corporations. 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 world steel production and is becoming an increasingly cost-effective producer. Germany's Thyssen and Krupp have historically been among the most efficient steel producers and are continuing this legacy. Although 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 Miniere, Germany's Metallgesellschaft, and France's Pechiney are all expanding, heartily acquiring, or merging with smaller firms in related sectors.

Although the official date wherein trade barriers between EC countries will be eliminated will not occur until the end of 1992, most international companies are preparing for the event in advance of this date. This major event will lead more companies within and outside the community to consolidate their positions in their respective industries in what will be the world's largest market.

### Eastern Europe

It was in 1987 that Soviet President Gorbachev first introduced his concepts of "glasnost" (openness) and "perestroika" (rebuilding) to the world. By 1989, the affects of glasnost were particularly being felt in the Eastern European Council for Mutual Economic Assistance (CMEA) nations that, 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 German Democratic Republic into the Federal Republic of Germany in late 1990, and Bulgaria, Czechoslovakia, Hungary, and Poland, 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 increased 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 extensive 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 past half century, produced a great deal of heavy military equipment for the U.S.S.R. 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. Statistics for 1990 corroborate this view in that virtually all mineral production in former CMEA nations decreased between 1989 and 1990. Steel production in the 8 Eastern European nations declined 17% during this period.

## 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 tradeable 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 affects of more liberal trade patterns between the U.S.S.R. and the market economies will have tremendous bearing on international mineral trade flows.

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[1]Michel C. Frippel, Chief, Branch of Europe and Central Eurasia, Division of International Minerals.

## SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

Barclays Bank International, London, England: ABECOR Group Country Reports.
British Broadcasting Corp., Reading, England: Summary of World Broadcasts (SWB).
British Geological Survey, Keyworth, England: World Minerals Statistics, various issues.
British Sulphur Corp. Ltd., London, England:
Nitrogen, bimonthly.
Phosphorus and Potassium, bimonthly.
Sulphur, bimonthly.
Eurostat, Brussels, Belgium: Energy and Industry Monthly.
Fairchild Publications, New York, N.Y.
American Metals Market, daily.
Financial Times, London, England
Institution of Mining and Metallurgy, London, England:
Transactions, monthly.
Bulletin, monthly.
International Lead and Zinc Study Group, London, England:
International Monetary Fund, Washington, DC: International Financial Statistics, monthly and annual yearbook.
The Journal of Commerce, N.Y., N.Y.
Metal Bulletin Journals Ltd., London, England:
Metal Bulletin.
Metal Bulletin Monthly.
McGraw-Hill, Inc., New York: Engineering and Mining Journal, monthly.
Miller Freeman Publications, San Francisco, CA: World Mining, monthly.
Metallgesellschaft AG, Frankfurt-am-Main, Germany:
Metallstatistik 1980-90.
Minemet Holding.
Mining Journal Ltd., London, England:
Mining Magazine, monthly.
Mining Journal, weekly.
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Nuova Samim, Rome, Italy: Metalli Non Ferrosi Statistiche 1990.
Organization For Economic Co-Operation and Development (OECD), Paris, France: OECD Economic Surveys.
Penn Well Publishing Co., Tulsa, OK: International Petroleum Encyclopedia.
Service Etude et Statistique Metaleurop S.A., Fontenay-Sous-Bois, France: Annuaire Statistique 1990.
Sovetskaya Entsiklopediya, Moscow, U.S.S.R.: Gornaya Entsiklopediya, 5 Volumes.
United Nations Statistical Office, New York, N.Y.: 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. 1, Metals and Minerals; V. 3, Area Reports: International.
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, England: World Metal Statistics, monthly.

TABLE 1

## EUROPE AND U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1991[1]

(Thousand metric tons unless otherwise specified)

| | Iron and steel | | | Ferroalloying materials | | | Aluminum | | Copper (metal content) | | Lead (metal content) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Iron ore (metal content) | Pig iron | Crude steel (gross weight) | Chromite (gross weight) | Manganese ore (gross weight) | Nickel, plant production | Bauxite (gross weight) | Primary metal | Mine | Refined | Mine | Refined |
| Market economy countries: | | | | | | | | | | | | |
| European Community (EC) | | | | | | | | | | | | |
| Belgium | — | 9,373 | 11,332 | — | — | — | — | — | — | 287 | — | 100 |
| Denmark/Greenland | — | — | 633 | — | — | — | — | — | — | — | — | — |
| France | 2,316 | 13,645 | 18,437 | — | — | 9 | 183 | 472 | — | 46 | 2 | 260 |
| Germany | 17 | 30,989 | 42,169 | — | — | 1 | — | 768 | — | 523 | 8 | 430 |
| Greece | 600 | 160 | 980 | 45 | 4 | 16 | 2,130 | 150 | — | — | 24 | 5 |
| Ireland | — | — | 293 | — | — | — | — | — | — | — | 35 | 12 |
| Italy | — | 10,862 | 25,007 | — | 7 | — | 9 | 246 | — | 83 | 16 | 172 |
| Luxembourg | — | 2,600 | 3,379 | — | — | — | — | — | — | — | — | — |
| Netherlands | — | 4,734 | 5,174 | — | — | — | — | 266 | — | — | — | 40 |
| Portugal | 4 | 251 | 564 | — | — | — | — | — | 165 | 6 | — | 5 |
| Spain | 1,790 | 5,588 | 12,700 | — | — | — | 3 | 349 | 16 | 165 | 60 | 115 |
| United Kingdom | 11 | 12,094 | 16,511 | — | — | 29 | — | 287 | — | 70 | 1 | 335 |
| Subtotal | 4,738 | 90,296 | 137,179 | 45 | 11 | 55 | 2,325 | 2,538 | 181 | 1,180 | 146 | 1,474 |
| European Free Trade Association (EFTA): | | | | | | | | | | | | |
| Austria | 649 | 3,439 | 4,186 | — | — | — | — | 92 | — | 53 | 1 | 23 |
| Finland | — | 2,331 | 2,456 | 475 | — | 16 | — | — | 12 | 65 | 1 | — |
| Iceland | — | — | — | — | — | | — | 86 | — | — | — | — |
| Norway | 1,436 | 61 | 438 | — | — | 59 | — | 851 | 17 | 38 | 4 | — |
| Sweden | 13,046 | 2,812 | 4,248 | — | — | — | — | 91 | 81 | 97 | 79 | 74 |
| Switzerland | — | 70 | 955 | — | — | — | — | 72 | — | — | — | 5 |
| Subtotal | 15,131 | 8,713 | 12,283 | 475 | — | 75 | — | 1,192 | 110 | 253 | 85 | 102 |
| Total, market economy countries | 19,869 | 99,009 | 149,462 | 520 | 11 | 130 | 2,325 | 3,730 | 291 | 1,433 | 231 | 1,576 |
| Centrally planned economies: | | | | | | | | | | | | |
| Eastern Europe: | | | | | | | | | | | | |
| Albania | 350 | 50 | 35 | 800 | — | 2 | 8 | — | 6 | 8 | — | — |
| Bulgaria | 300 | 800 | 2,000 | — | 60 | — | — | — | 30 | 24 | 44 | 50 |
| Czechoslovakia | 470 | 8,479 | 12,133 | — | — | 3 | — | 60 | 3 | 28 | 3 | 22 |
| Hungary | — | 1,311 | 1,900 | — | 65 | — | 2,037 | 78 | — | 18 | — | — |
| Poland | — | 6,355 | 10,439 | — | — | — | — | 48 | 390 | 378 | 60 | 80 |
| Romania | 220 | 4,500 | 7,000 | — | 15 | — | 200 | 250 | 20 | 22 | 7 | 29 |
| Yugoslavia | 900 | 1,600 | 2,200 | 9 | 51 | 3 | 2,700 | 347 | 138 | 122 | 90 | 88 |
| Subtotal | 2,240 | 23,095 | 35,707 | 809 | 191 | 8 | 4,945 | 783 | 587 | 600 | 204 | 269 |
| U.S.S.R. | 110,000 | 91,000 | 132,666 | 3,800 | 8,500 | 257 | 3,800 | 2,740 | 550 | 870 | 400 | 630 |
| Total, centrally planned economies | 112,240 | 114,095 | 168,373 | 4,609 | 8,691 | 265 | 8,745 | 3,523 | 1,137 | 1,470 | 604 | 899 |
| Total, Europe and U.S.S.R. | 132,109 | 213,104 | 317,835 | 5,129 | 8,702 | 395 | 11,070 | 7,253 | 1,428 | 2,903 | 835 | 2,475 |
| United States | 35,333 | 44,123 | 79,738 | — | — | 7 | W | 4,133 | 1,631 | 1,995 | 477 | 1,229 |
| World total | 526,149 | 508,730 | 733,673 | 13,237 | 22,330 | 876 | 109,172 | 19,967 | 8,820 | 10,484 | 3,318 | 5,642 |
| Europe and U.S.S.R., percent of world total | 25.1 | 41.9 | 43.3 | 38.7 | 39.0 | 45.1 | 10.1 | 36.3 | 16.2 | 27.7 | 25.2 | 43.9 |

See footnotes at end of table.

TABLE 1-Continued

## EUROPE AND U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1991[1]

(Thousand metric tons unless otherwise specified)

| | Zinc (metal content) | | Industrial minerals | | | | | | Mineral fuels | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Coal (million metric tons) | | Marketable natural gas (billion cubic meters) | Petroleum (million 42-gallon 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 | | Crude | Refined |
| Market economy countries: | | | | | | | | | | | | | |
| European Community (EC): | | | | | | | | | | | | | |
| Belgium | — | 298 | 6,900 | 300 | — | — | — | 300 | — | — | — | — | 174 |
| Denmark/Greenland | — | — | 2,000 | — | — | — | 520 | 12 | — | — | — | 52 | 65 |
| France | 27 | 300 | 26,000 | 1,604 | — | 1,129 | 6,500 | 1,199 | 10 | 2 | 3 | 21 | 561 |
| Germany | 54 | 347 | 42,000 | 2,348 | — | 3,868 | 13,785 | 1,990 | 66 | 279 | 20 | 25 | 761 |
| Greece | 30 | — | 13,500 | 210 | — | — | — | 240 | — | 52 | — | 6 | 106 |
| Ireland | 188 | — | 1,600 | 429 | — | — | — | — | — | — | 2 | — | 13 |
| Italy | 38 | 265 | 40,000 | 1,147 | — | 48 | 4,000 | 600 | — | 2 | 18 | 29 | 679 |
| Luxembourg | — | — | 550 | — | — | — | — | — | — | — | — | — | — |
| Netherlands | — | 201 | 3,255 | 3,000 | — | — | 3,400 | 290 | — | — | 73 | 22 | 448 |
| Portugal | — | 5 | 6,000 | 195 | — | — | 650 | 100 | — | — | — | — | 76 |
| Spain | 260 | 273 | 27,576 | 470 | — | 585 | 3,200 | 910 | 18 | 21 | — | — | 418 |
| United Kingdom | 1 | 101 | 12,000 | 866 | — | 495 | 5,200 | 165 | 96 | — | 55 | 666 | 697 |
| Subtotal | 598 | 1,790 | 181,381 | 10,569 | (2) | 6,125 | 37,255 | 5,806 | 190 | 356 | 171 | 821 | 3,998 |
| European Free Trade Association (EFTA): | | | | | | | | | | | | | |
| Austria | 15 | 16 | 5,000 | 400 | — | — | 656 | 39 | — | 2 | 1 | 9 | 68 |
| Finland | 56 | 170 | 1,600 | 20 | 500 | — | — | 636 | — | — | — | — | 73 |
| Iceland | — | — | 114 | 9 | — | — | — | — | — | — | — | — | — |
| Norway | 19 | 125 | 1,147 | 384 | — | — | — | 211 | — | — | 24 | 692 | 98 |
| Sweden | 155 | — | 2,400 | — | — | — | — | 385 | — | — | — | — | 159 |
| Switzerland | — | — | 5,200 | 32 | — | — | 250 | 4 | — | — | — | — | 24 |
| Subtotal | 245 | 311 | 15,461 | 845 | 500 | — | 906 | 1,275 | — | 2 | 25 | 701 | 422 |
| Total, market economy countries | 843 | 2,101 | 196,842 | 11,414 | 500 | 6,125 | 38,161 | 7,081 | 190 | 358 | 196 | 1,522 | 4,420 |
| Centrally planned economies: | | | | | | | | | | | | | |
| Eastern Europe | | | | | | | | | | | | | |
| Albania | — | — | 700 | 80 | — | — | — | — | — | 1 | — | 5 | 3 |
| Bulgaria | 31 | 60 | 4,717 | 1,300 | — | — | 150 | 130 | — | 28 | — | 4 | 20 |
| Czechoslovakia | 7 | 2 | 8,299 | 551 | — | — | 350 | 96 | 19 | 83 | — | 1 | 110 |
| Hungary | — | 1 | 2,700 | 291 | — | — | — | 10 | 2 | 15 | 5 | 13 | 46 |
| Poland | 144 | 125 | 12,031 | 1,669 | — | — | 3,900 | 4,820 | 140 | 69 | 4 | 1 | 75 |
| Romania | 15 | 10 | 13,000 | 1,130 | — | — | 6,500 | 650 | 5 | 33 | 23 | 51 | 110 |
| Yugoslavia | 75 | 87 | 7,500 | 700 | — | — | 390 | 362 | — | 69 | 2 | 21 | 145 |
| Subtotal | 241 | 285 | 48,947 | 5,721 | — | — | 11,290 | 6,068 | 166 | 298 | 34 | 96 | 509 |
| U.S.S.R. | 650 | 800 | 127,000 | 17,100 | 30,000 | 8,400 | 14,000 | 8,100 | 449 | 180 | 810 | 3,785 | 2,535 |
| Total, centrally planned economies | 891 | 1,085 | 175,947 | 22,821 | 30,000 | 8,400 | 25,290 | 14,168 | 615 | 478 | 844 | 3,881 | 3,044 |
| Total, Europe and U.S.S.R. | 1,734 | 3,186 | 372,789 | 34,235 | [2]35,30 | 14,525 | 63,451 | 21,249 | 805 | 836 | 1,040 | 5,403 | 7,464 |
| United States | 547 | 377 | 69,853 | 12,692 | 48,096 | 1,749 | 36,959 | 10,816 | 825 | 78 | 506 | 2,707 | 5,560 |

See footnotes at end of table.

TABLE 1-Continued

## EUROPE AND U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1991[1]

(Thousand metric tons unless otherwise specified)

| | Zinc (metal content) | | Industrial minerals | | | | | | Mineral fuels | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Coal (million metric tons) | | Marketable natural gas (billion cubic meters) | Petroleum (million 42-gallon 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 | | Crude | Refined |
| World total | 7,282 | 7,082 | 1,274,819 | 93,712 | 146,859 | 25,548 | 183,659 | 55,592 | 3,572 | 1,075 | 2,074 | 21,945 | 22,245 |
| Europe and U.S.S.R., percent of world total | 23.8 | 45.0 | 29.2 | 36.5 | 22.9 | 56.9 | 34.5 | 38.2 | 22.5 | 77.8 | 50.1 | 24.6 | 33.6 |

W Withheld to avoid disclosing company proprietary data; value included in "World total."

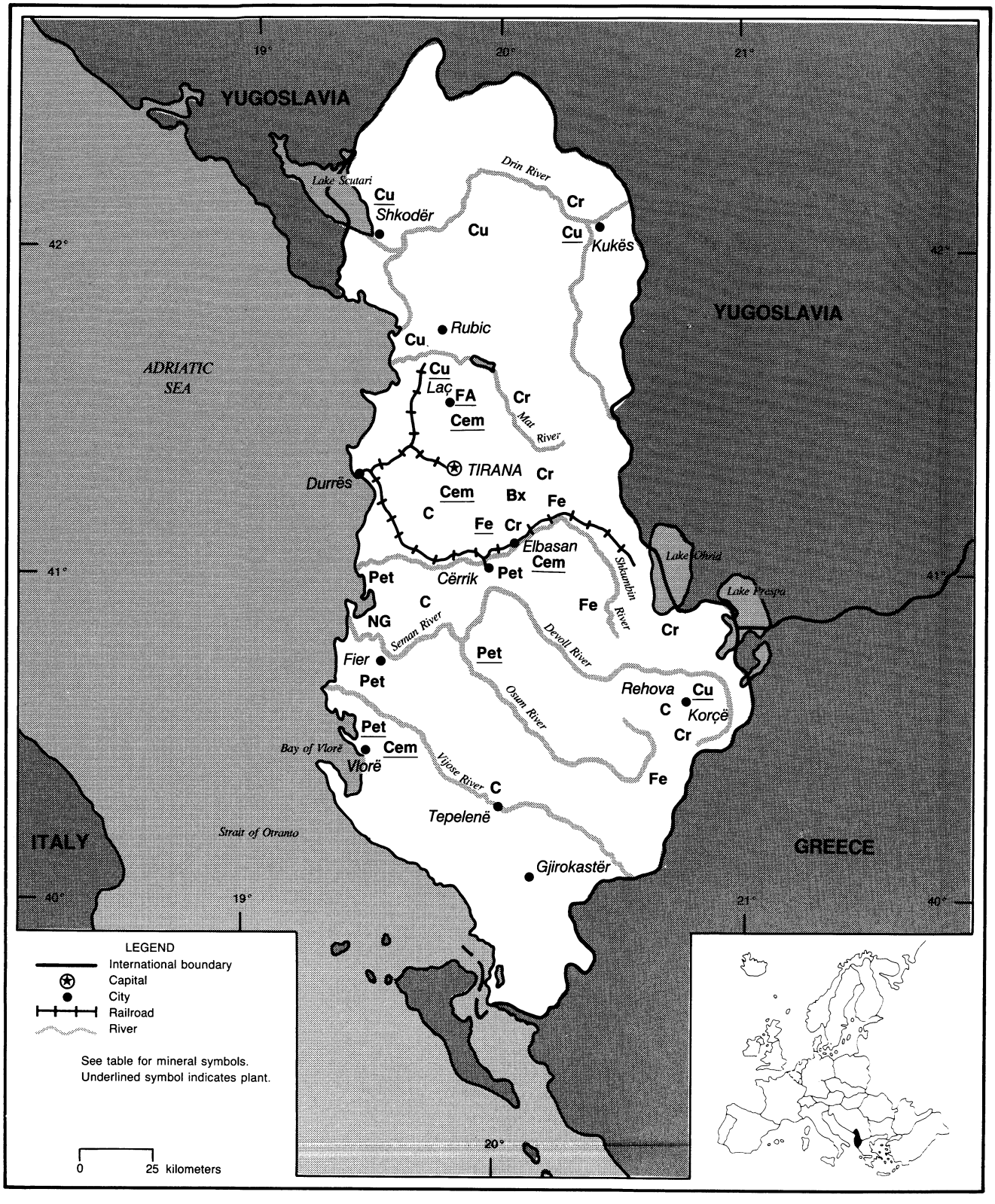
[1]Some of the individual entries in this table may differ from those appearing in individual country production tables elsewhere in this volume owing to the inclusion in this table of data received at a later time.

[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 1991, in thousand metric tons: Belgium—160; France—700; Luxembourg—600; European Community, market economy Europe, and Europe totals—1,460; world total—1,468. Thomas slag averages about 16% $P_2O_5$ content. World phosphate rock production at 162,268,000 tons, averaged slightly more than 31% $P_2O_5$.

[3]Less than 1/2 unit.

# ALBANIA

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



THE MINERAL INDUSTRY OF

# ALBANIA

By Jozef Plachy

In 1991, Albanian industrial production reportedly decreased 60% from 1990 levels.[1] Frequent work stoppages at mining and metallurgical plant sites, which reportedly account for 47% of GNP, played a large part in this decline.

Despite social unrest and labor problems, Albania remained an important mineral producer. It is the world's third largest producer of chromium ore, after the former U.S.S.R. and the Republic of South Africa, and chromite reserves are estimated to be the fourth largest in the world. The 1.2-Mmt/a chromite output constitutes about 10% of total world production. Because the country's two ferrochromium plants can reportedly presently process only up to 200,000 tons of ore per year, the Albanian Government is reportedly planning to upgrade both facilities and build new ore concentrating and ferrochromium plants, beginning in 1994.[2] Albania also accounts for about 16% of Europe's nickel ore production and 2% of its copper ore production.

## GOVERNMENT POLICIES AND PROGRAMS

During the past 45 years, the development of Albania's mineral industry was handicapped by self-imposed isolation, a drive for self-sufficiency, and the goal for full employment. It resulted in a shortage of capital, aging and inadequate machinery, overstaffing, and damage to the environment. To speed up economic reconstruction, the Albanian National Council of Privatization, the Albanian Foreign Investment Agency, and the Albanian Chamber of Commerce were established in 1991. Although all natural resources were still the property of the Albanian Government, foreign partners of joint ventures were reportedly allowed to repatriate their profits. The convertibility of the Albanian "lek" was established by tying the exchange rate to the European Currency Unit (ECU).

## PRODUCTION

The year of 1990 was a year of prolonged drought, which resulted in decreased hydroelectric power production and, in turn, decreased mineral production. This was followed, in 1991, by social unrest. During this 2-year period, estimated oil and gas production declined 45%, chromite production declined 60%, copper production dropped 70%, and production of coal decreased 50%.[3] Only ferrochromium production, in 1991, was substantially higher than in the previous year because of the completion of the Elbasan ferrochromium plant. *(See table 1.)*

## TRADE

In the past few years, Albania's foreign debt has increased so that at the end of 1991 it was $400 million, reportedly exceeding the value of the country's annual exports. Because exports of minerals and metals account for about 40% of all Albania's exports, the Teknoimport Foreign Trade Enterprise, an affiliate of the Ministry of Foreign Economic Relations, was eliminated in October 1991, and its functions transferred to the individual mining enterprises. However, all prior agreements signed in 1991 by the Albanian Government with foreign nations will remain effective. These include barter deals with China (export of chromium ore and concentrate, copper wire, bitumen, etc.), the Republic of Vietnam (export of pyrite concentrate, copper wire, and bitumen), and Egypt (export of ferrochromium for phosphate).

## STRUCTURE OF THE MINERAL INDUSTRY

The privatization of Albanian enterprises affected mainly small- and medium-sized establishments. At the end of 1991, the large enterprises were reorganized, and although still state controlled, given some autonomy in the planning of production, sales, pricing, and purchasing. However, the mineral industry of Albania remained virtually under the direction of the Ministry of Mining and Energy Sources due to the state's ownership of resources and a long tradition of central control. *(See table 2.)*

## COMMODITY REVIEW

### Metals

*Bauxite.*—The present production of bauxite, estimated at 20,000 tons per year, is mainly concentrated in the Tirana and Librazhd districts in central Albania. The ore reportedly contains 40% to 44% $Al_2O_3$, 16% to 17% $Fe_2O_3$, and 13% to 15% $SiO_2$. The major portion of the estimated 12 Mmt of reserves is in the northern part of Albania. The composition of the ore is reportedly 50% to 60% $Al_2O_3$, 9% to 17% $Fe_2O_3$, and 4% to 19% $SiO_2$.

Because there are no processing facilities in Albania, the entire production is exported to Yugoslavia in exchange for aluminum metal.

*Chromium.*—About one-third of Albania's chromite reportedly contains more than 41% $Cr_2O_3$ and more than 90% of it is of metallurgical grade with a 2.5:1 to 3:1 chrome to iron ratio.

In 1991, there were 6 deposits and about 20 mines, all underground. The ore, produced by the sublevel caving method, is reportedly loaded manually or by compressed air loaders, or, more recently, by electrohydraulic load-haul-dump (LHD) equipment, into rail hoppers and transported to the surface, either along horizontal adits or up vertical shafts. The ratio of waste to ore reportedly approaches 1:1, often restricting mine production due to inadequate transport capacity. All ore is hand sorted and, in many cases, screened underground.

The largest chromite mine complex, Bater, is 40 km northeast of Tirana. The complex consists of Martanesh, Bater I and II Mines, and a beneficiation plant. The annual production in 1991 was an estimated 425,000 tons of ore (25% to 40% $Cr_2O_3$) and about 30,000 tons of concentrate of reportedly average grade 50% $Cr_2O_3$ with a Cr/Fe ratio of 3:1.

The low-grade ore is sent to one of four enrichment plants. At Todo Manco, the ore is hand sorted, screened, washed, and then screened again. At the Bater, Bulquize, and Kalimash plants, the ore mixture is crushed, milled, and a concentrate, grading 50% $Cr_2O_3$, is produced using gravity separation methods. The average recovery rate at all plants is reportedly about 65% to 70%.

In 1991, Albania reportedly entered negotiations with the South African mining company Samancor Ltd. to develop chromite deposits in the Kukes region, where the Kalimash, Kam, and Krume Mines are located. It would be the first major joint-venture international company to develop new ore mines, upgrade old ones, and construct an enrichment plant in Albania. The Kukes region, in northeastern Albania, reportedly has about 14 Mmt of reserves.

*Ferrochromium.*—Because of the startup of the new ferrochromium plant, the 1991 estimated production of ferrochromium, with 63% to 66% chromium content, increased by about 45% over that of the previous year.

The newest ferrochromium plant is part of the "Steel of the Party Metallurgical Combine" in Elbasan (Elbasan Combine), 30 km southeast of Tirana. The plant consists of three 9-MV•A closed furnaces, designed in China but built in Albania. The first began operation at the end of 1989, but soon had to be closed down because of electricity shortages. With the completion of the third furnace at the beginning of 1991, the plant became operational. The designed annual capacity is reportedly 100,000 tons of ore, which was to be supplied by mines in the Pogradec region. Because of declining ore grade and lack of beneficiation facilities in Pogradec, however, it had to be augmented with the ore from the Bulqize mines. With the exception of a few hundred tons sent to the Elbasan Combine, all ferrochromium is reportedly exported.

The older of the two ferrochromium plants is in Burrel, 35 km northeast of Tirana. The 42% $Cr_2O_3$ chromium ore is supplied by the Bulqize mines. Ferrochromium production in 1991 was below its capacity of 40,000 mt/a.

*Copper.*—In 1991, Albania had 8 copper mining enterprises, some consisting of up to 4 mines, for a total of 27 mines. Production capacities range from reportedly 50,000 mt/a to 350,000 mt/a. All the mines are shallow underground operations, served by adits and a few vertical shafts. Some of the small mines that work individual lenses are very labor intensive. In the larger mines, electrohydraulic load-haul-dumps are being gradually introduced. The ore grade reportedly ranges from 0.8% Cu to 3% Cu, for an average of about 1.5% copper content. Beneficiation consists of crushing, milling, and flotation, where, reportedly, about 80% to 90% of the metal is recovered. The 16% Cu concentrate is sent to a smelter where it is mixed with coarse ore at a fixed ratio.

The largest copper mine in Albania is in Fushe-Arrez, 80 km north of Tirana. It reportedly has three underground mines and uses a small-scale sublevel caving method. Broken ore is removed by compressed air loader or hand loaded into hoppers and transported to the surface. Estimated ore output in 1991 was 350,000 tons of 1.5% copper content, from which about 25,000 tons of copper concentrate (16.5% Cu) and 50,000 tons of pyrite concentrate (44% to 45% S) was reportedly produced.

One of the most important deposits is the recently discovered Munella deposit, 55 km north of Tirana. The reserves at this site amount to about 7 to 10 Mmt of copper ore with an initial average head grade of 1.3% Cu (expected to increase to 2% at lower levels), 3% to 3.5% Zn, 25% S, and 3.4 g/mt Au. The mine is to reach a depth of 300 m and produce between 300,000 to 500,000 tons of ore per year.

All three smelters and two refineries are older designs, without briquetting facilities. The oldest smelter, built in 1936, is in Rubik, 50 km north of Tirana, followed by Kukes (1964) and Lac. The refineries at Rubik and Lac are reportedly more modern, built in 1966 and 1979, respectively. The Lac smelter and refinery, 30 km north of Tirana, was upgraded in 1987. It reportedly has an annual capacity of 7,000 tons of blister and 8,600 tons of refined copper.

*Nickeliferous Iron Ore.*—The laterite ore deposits of Albania are around Pogradec, Kukes, and Korce. The existing deposits reportedly hold more than 70 Mmt of contained iron, 1 Mmt of contained nickel, and commercial quantities of cobalt. At present, there are two mining enterprises operating nine mines and a metallurgical plant in Elbasan.

About 60% of nickeliferous ore production comes from the Prenjas ore mining enterprise, 55 km southeast of Tirana. The estimated reserves of 150 Mmt reportedly contain an average 45% Fe and nearly 1% Ni. The ore is exploited by four mines (Bushtrica, Prenjas, and Skroska I & II) connected underground. The production is reportedly about 650,000 mt/a, of which 70% is transported by rail to Elbasan, while the rest is exported to Czechoslovakia.

Other nickeliferous ore is supplied by the five mines of the Guri Kuq ore mining enterprise, 65 km southeast of Tirana. Reserves at this location are estimated at 25 Mmt and reportedly contain an average of 44% Fe, less than 1% of Ni, and small amounts of Co. One-half of the annual production of about 500,000 tons is railed to Elbasan, while the rest is exported to Bulgaria and Czechoslovakia.

*Nickel.*—The Elbasan nickel smelter and refinery began production of nickel carbonate in 1980. The existing 6,000-mt/a carbonate capacity was augmented in 1988 by a reportedly 6,000-mt/a capacity metal smelter and refinery. The iron-nickel ore is first crushed and roasted, and then the iron and the nickel are separated by ammonia leaching. The 50% to 55% nickel carbonate is mixed with coke and fed into a 15-ton electric arc furnace. The resulting blister, containing about 92% Ni, 1% Co, and some iron and sulfur, is converted to anodes and then to cathodes (99.99% Ni).

### Industrial Minerals

*Phosphate Rock.*—Production of phosphate declined from 25,000 to 30,000 tons in the past years, to an estimated 9,000 tons in 1991. The entire production of phosphorite, graded 6% to 7% $P_2O_5$, reportedly comes from Gjirokaster, in southern Albania. Most of the production is processed in the Lac fertilizer plant, while the remainder is locally ground and used as fertilizer. In addition to basic fertilizers, the Lac fertilizer plant, built in stages from 1966 through 1989, reportedly produces superphosphate with 15% to 20% $P_2O_5$, concentrated nitric acid, and simple phosphate made into granular form.

*Salt.*—All the production of salt in Albania, which in 1991 declined by an estimated 35%, reportedly comes from underground mines in the Dhrovjan, Saranda district, and Durres districts. The salts are mainly halite (78% to 80%) with the remainder composed of anhydride, gypsum, and magnesium salts. With an addition of recently discovered deposits in the Elbasan area, the reserves reportedly amount to about 80 Mmt.

### Mineral Fuels

*Coal.*—Lignite deposits in Albania are found in three principal regions of the country: in the east at Librazhd, Pogradec, Korce, and Kolonje; in the central part of the country at Elbasan, Tirana, and Durres; and in the south at Berat and Tepelene. The largest lignite resource is the Tirana coal basin with reportedly about 40 Mmt of reserves exploited by the Krrabe, Mezez, Mushgetas, Priske, and Valias Mines. The coal seams are generally very thin, averaging 0.5 m, resulting in very high wall-rock dilution of coal. Because of many different coal types, high ash content, and other impurities, high cost beneficiation processes are required to produce usable coal.

The 1991 lignite production declined by nearly one-half, to an estimated 1.1 Mmt. It was produced from 20 underground mines with capacities reportedly ranging from 40,000 mt/a to 500,000 mt/a. The entire production is used by the home market, mainly for domestic heating.

*Crude Oil.*—The production of crude oil has been declining since 1973, when it reached 3 Mmt. The 1991 production was an estimated 700 tons, about one-third lower than that in 1990. Present production is concentrated in the southern part of the country at the Ballsh, Gorrisht, Kucova, Marineze, Patos, and Shqisht Fields. To reverse a production decline, Albania has to either increase the extraction of existing deposits or find new deposits. Reportedly, only 12% of oil is extracted, whereas modern technology would allow 40% extraction. A rise of 10% in the extraction coefficient would nearly double the present production.

In 1991, an exploration and production-sharing agreement was reportedly signed by Albania's General Directorate of Oil and Gas with Occidental Petroleum Corp. It reportedly permits Occidental Petroleum to start offshore prospecting in a 2,600 $km^{-2}$ area off the north coast and in the Durres Basin. In addition to seismological studies, the agreement envisages sinking of the wells, preparation for production, and production itself. If petroleum is found, foreign personnel, with the exception of management, will be replaced by Albanian workers. Occidental Petroleum will reportedly keep 55% of the production until the initial expenditure is defrayed. Similar but smaller concessions have been granted to Chevron and Hamilton of the United States, Agip of Italy, Deminex of Germany, and OeMV of Austria.

Albania is interested in finding partners for oil processing in its four refineries (Ballsh, Cerrik, Fier, and Stalin) that are operating at 70% of capacity. It is also considering upgrading its main harbor at Vlore, which can handle tankers of up to 30,000 dwt and store 15,000 tons of oil.

### Reserves

According to the system used in Albania, the reserves are measured as a sum of categories A+B+C1. These categories refer to identified reserves that were either measured (A), indicated (B), or, based on A and B, inferred (C1). *(See table 3.)*

## INFRASTRUCTURE

Albania's inland transportation consists mainly of roads and, to a lesser degree, railroads. Waterway transportation is almost exclusively between coastal cities. Albania has about 16,700 km of roads, of which 6,700 km is paved highways and roads and the rest is forest and agricultural roads. One of the many new projects was the 241-km-long four-lane highway connecting the port city of Durres with Greece, via Pogradec and Kapshtica. Also, a new road is planned between Peshkopi in Yugoslavia and Burchiz, 60 km northeast of Tirana, to facilitate easier transportation of nickeliferous ores to the

ferronickel complex at Kavadarci in Macedonia.

The railroad system consists of 509 km of standard-gauge and 34 km of narrow-gauge tracks. All tracks are single, and none are electrified. The short-term plan is to electrify the existing line from Titograd in Yugoslavia to the Albanian cities of Vlore, Durres, and Pogradec.

Most shipping is limited to coastal waters, with a small portion on lakes and rivers. The largest seaport is at Durres. It has a depth of up to 9 m. Two smaller ports are located in Vlore and Sarande.

In the mineral industry, most of the mines use trucks or narrow-gauge railroad to transport ore to the nearest railroad stations or directly to processing centers. Few major mining areas (Elbasan, Prenjas, Guri i Kuq, Librazhd, and Pogradec) are connected by standard-gauge railroad to processing centers.

Albania's hydrocarbon industry has about 145 km of crude oil pipeline, 55 km for refinery products and 64 km of pipeline for natural gas.

## OUTLOOK

Most of the existing mines in Albania were discovered from surface outcrops and from drilling close to the surface. Because there is minimal modern technology and equipment, enterprises reportedly have been unable to map the full extent of known deposits. More extensive exploration at existing mines is likely to result in a large increase in Albania's mineral reserve base. Because much of the country remains unexplored, there is potential for discovering new deposits.

Even without the discovery of new deposits, the production of Albanian mines could be significantly increased by investment in underground mining equipment, redesign and enlargement of the mines' infrastructure, introduction of efficient beneficiation plants, and improvement of underground and surface transportation. Because only a small portion of ore is beneficiated, capital investment is needed for new plants and new technology for existing enrichment plants to increase the recovery rate and metal content of concentrates.

The largest potential exists in chromium ore mining. Low operating cost and proximity to Europe's major ferrochromium producers could make Albanian chromite very competitive. However, the rapid rate of growth resulted in the depletion of deposits close to the surface. Without capital investment for deep underground mining and beneficiation equipment, the production will probably stabilize at about 1 to 1.2 Mmt/a. To increase production and improve the quality of ferrochromium, additional investment in equipment for agglomeration of fines and preheating of ore may be required.

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[1]Hospodarske Noviny, Czechoslovakia, Feb. 19, 1992, p. 13.

[2]Metal Bulletin. Aug. 1, 1992, p. 11.

[3]Speech by Prime Minister Aleksander Meksi to the People's Assembly on Apr. 18, 1992; available upon request from author.

TABLE 1

## ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Bauxite e | | r25,000 | r25,000 | r25,000 | 26,000 | 20,000 |
| Chromium: | | | | | | |
| Chromite, gross weight | thousand tons | 1,075 | 1,109 | r e900 | 910 | 500 |
| Marketable | do. | 420 | 346 | 294 | 295 | 150 |
| Concentrate | do. | 164 | 160 | 173 | 157 | 75 |
| Ferrochromium | do. | e26 | 39 | 39 | 24 | 35 |
| Cobalt: e | | | | | | |
| Mine output, Co content[3] | | 600 | 600 | 600 | 600 | 600 |
| Plant production, Co content[4] | | — | 10 | 10 | 20 | 15 |
| Copper: | | | | | | |
| Ore: | | | | | | |
| Gross weight | thousand tons | 1,166 | 1,187 | 1,136 | 931 | 500 |
| Concentrate | | 55,000 | 55,000 | 62,000 | e49,000 | 25,000 |
| Cu content e | | r12,500 | r13,300 | r14,000 | r11,500 | 6,100 |
| Metal, primary: | | | | | | |
| Smelter | | r13,880 | r14,772 | r15,312 | e12,000 | 6,000 |
| Refined e | | r12,807 | r14,097 | r14,512 | r e11,300 | 5,000 |
| Iron and steel: | | | | | | |
| Iron ore, nickeliferous: | | | | | | |
| Gross weight | thousand tons | 972 | 1,067 | 1,179 | 930 | 800 |
| Fe content e | do. | r430 | r470 | r520 | r410 | 350 |
| Metal: | | | | | | |
| Pig iron | | 140,000 | 172,000 | 179,000 | 96,000 | 50,000 |
| Crude steel e | | 85,000 | 110,000 | 112,000 | 65,000 | 35,000 |
| Rolled steel | | e65,000 | 96,000 | 92,500 | e60,000 | 30,000 |
| Nickel: e | | | | | | |
| Mine output, Ni content | | r9,200 | r10,100 | r11,200 | r8,800 | 7,500 |
| Plant production, carbonate Ni content | | r4,500 | 4,500 | r5,400 | r5,500 | 5,000 |
| Metal, Ni cathode | | — | 300 | 1,800 | 2,500 | 2,200 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | thousand tons | e860 | 746 | 754 | e750 | 700 |
| Clay, kaolin e | | 9,000 | 9,000 | 9,000 | 5,000 | 2,000 |
| Dolomite e | | 350,000 | 350,000 | 400,000 | r397,000 | 350,000 |
| Fertilizer, manufactured: | | | | | | |
| Phosphatic | | e150,000 | 165,000 | 165,000 | e100,000 | 75,000 |
| Urea | | e90,000 | 77,000 | 92,000 | e50,000 | 25,000 |
| Nitrogen: N content of ammonia e | | 95,000 | 100,000 | 110,000 | r100,000 | 80,000 |
| Olivinite e | | 50,000 | 50,000 | 52,000 | 56,000 | 45,000 |
| Phosphate rock (12% to 15% $P_2O_5$) e | | 25,000 | 25,000 | 25,000 | 10,000 | 9,000 |
| Pyrite, unroasted e | | 50,000 | 50,000 | 50,000 | r48,000 | 40,000 |
| Salt e | | 75,000 | 70,000 | 80,000 | r85,000 | 55,000 |
| Sodium compounds, n.e.s.: Soda ash, calcined | | e31,000 | 22,000 | 27,000 | e27,000 | 25,000 |
| Sulfuric acid | | e80,000 | 81,000 | 82,000 | e70,000 | 50,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Asphalt and bitumen, natural e [6] | thousand tons | 950 | 900 | 900 | 900 | 800 |

See footnotes at end of table.

TABLE 1—Continued

## ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Coal: Lignite | thousand tons | 2,134 | 2,184 | 2,193 | 2,071 | 1,100 |
| Gas, natural, gross production[7] | million cubic meters | 263 | 480 | 312 | 243 | 170 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| Weight | thousand tons | 1,181 | 1,167 | 1,129 | 1,069 | 700 |
| Converted | thousand 42-gallon barrels | 7,880 | 7,786 | 7,533 | 7,132 | 4,670 |
| Refinery products[6] | | 9,000 | 9,000 | 9,000 | r5,000 | 3,000 |

eEstimated. rRevised.

[1]Table includes data available through June 1, 1992.

[2]In addition to the commodities listed, a variety of industrial minerals and construction materials (common clay, olivinite, quartz, 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]Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.

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

[5]Reported figure.

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

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

TABLE 2

## ALBANIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Location of main facilities | Capacity |
|---|---|---|
| Cement | Elbasan, 32 km southeast of Tirana; Kruje, 20 km northwest of Tirana; Shkoder, 85 km northwest of Tirana; and Vlore southwest of Tirana | 1,200 |
| Chromite | Bater (including Bater I and II and Martanesh), 40 km northeast of Tirana Bulqize (including Bulqize south, Fush, Newpoints, Ternove, and Todo Maco), 35 km northeast of Tirana | 450 |
| Do. | Kalimash, 60 km north of Tirana | 250 |
| Do. | Kam, 70 km north of Tirana | 100 |
| Do. | Klos, 20 km northeast of Tirana | 50 |
| Do. | Pogradec (including Katjiel, Memelisht, Poljske, Pishkash, and Prenjas), 50 km east of Tirana | 100 |
| Ferrochromium | Burrel, 35 km northeast of Tirana | 40 |
| Do. | Elbasan, 32 km southeast of Tirana | 36 |
| Copper: | | |
| Ore | Flushe-Arrez, 80 km north of Tirana | 350 |
| Do. | Gjegjan, 100 km northeast of Tirana | 150 |
| Do. | Golaj (including Nikoliq and Pus), 120 km northeast of Tirana | 150 |
| Do. | Kurbnesh-Perlat, 55 km northeast of Tirana | 100 |
| Do. | Rehove, 110 km southeast of Tirana | 100 |
| Do. | Reps (including Gurch, Lajo, Spac, and Thurr), 55 km north of Tirana | 350 |
| Do. | Rreshen, 50 km northesat of Tirana | 50 |
| Do. | Shkoder (including Palaj, Karma I and II), 85 km northwest of Tirana | 100 |
| Smelter | Kukes, 110 km northeast of Tirana | 6 |
| Do. | Lac 35 km northwest of Tirana | 7 |
| Do. | Rubik, 50 km north of Tirana | 3.5 |
| Iron ore | Prenjas (Bushtrica, Prenjas, Skorska I and II), 70 km southeast of Tirana | 650 |
| Do. | Guri i Kuq (including Cerveake, Grasishta, Guri i Kuq, Hudenisht & Guri Pergjrfjur), 25 km east of Tirana | 500 |

TABLE 2—Continued

## ALBANIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | | Location of main facilities | Capacity |
|---|---|---|---|
| Steel | | "Steel of the Party" Metallurgical Combine at Elbasan | 150 |
| Nickel, smelter | | Elbasan | 6 |
| Coal lignite | | Maneze, Mezes, and Valias Mines in Tirana Durres area; Krabe Mine, 20 km southeast of Tirana; Alarup and Cervnake Mines, in Pogradec area, 80 km southeast of Tirana; Mborje-Drenove Mine in Korce area, 85 km southwest of Tirana; and Memaliaj Mine in Tepelene area, 110 km south of Tirana | 2,500 |
| Natural gas | million cubic feet | Gasfields in southwest Albania between Ballsh and Fier | 16,000 |
| Petroleum: | | | |
| Crude | 42-gallon barrels per day | Oilfields at Marineze, Ballsh, Shqisht, Patos, Kucova, Gorrisht, and others | 35,000 |
| Refined | do. | Refineries: Ballsh, Cerrik, Fier, and Stalin | 33,000 |

TABLE 3

## ALBANIA: APPARENT RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

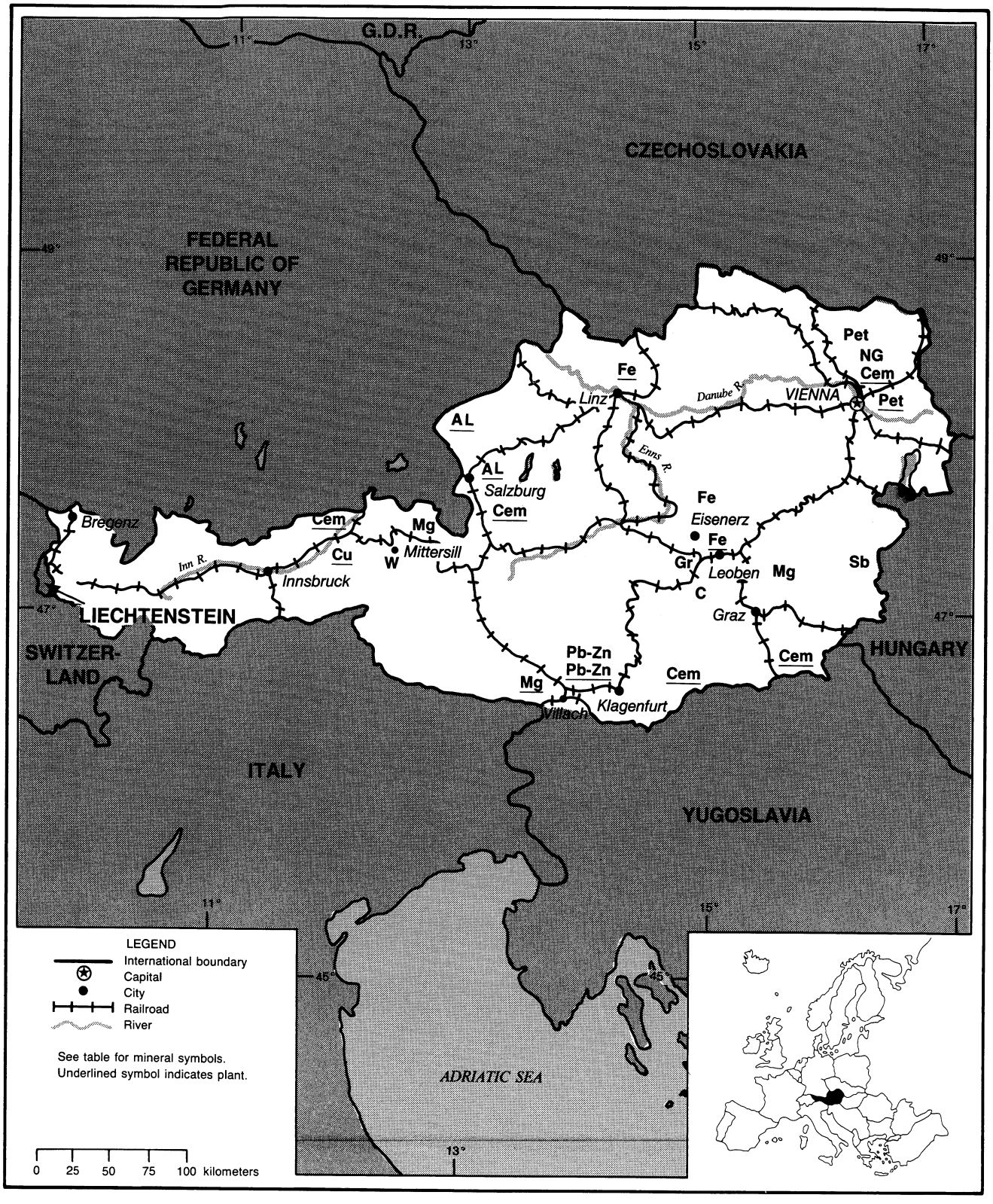
(Thousand metric tons unless otherwise specified)

| Commodity | | Reserves |
|---|---|---|
| Bauxite | | 12,000 |
| Chromite, 20% to 44% $Cr_2O_3$ | | 30,000 |
| Cobalt, recoverable in ore | | 60 |
| Copper, recoverable in ore | | 700 |
| Iron, recoverable in ore | | 70,000 |
| Salt | | 80,000 |
| Coal | | 150,000 |
| Natural gas | billion cubic meters | 20 |

Sources: Gornaya Entsiklopediya, v. 1, Moscow; and Gazovaya Promyshlennost, Moscow, Dec. 1989; Commodities Research Unit Ltd., London; Mining Journal, London, May 8, 1992, and Erzmetall, No. 3, 1992, Germany.

# AUSTRIA

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



THE MINERAL INDUSTRY OF

# AUSTRIA

By Jozef Plachy

The mineral industry of Austria continued to be dominated by iron, lead, tungsten, and zinc in metalliferous ore mining; graphite and magnesite in industrial minerals mining; and lignite. The main processing industries included antimony, copper, germanium, lead, steel, and zinc.

In 1991, Austrian environmental expenditures reportedly equaled 1.9% of the country's gross domestic product (GDP).

## GOVERNMENT POLICIES AND PROGRAMS

With the treaty on the European Economic Area expected to enter into force as of January 1, 1992, and negotiations for accession to the European Community (EC) to begin in 1992, the Austrian Government has begun partial structural reform of the economy. In November 1991, the last foreign exchange controls were reportedly lifted, opening the economy further to foreign competition. Direct support of the mineral industry was reduced, although subsidies to technology and the environment were increased. Changed company taxation encouraged the reduction of administrative costs and the strengthening of the capital base of small- and mid-sized firms.

## PRODUCTION

The sector most affected by restructuring and foreign competition was energy. One of the most important lignite mines is expected to close in 1992, in spite of proven reserves that could last until the year 2003. Austria became a net importer of electric energy in 1991, necessitating investment in new hydroelectric power plants in Slovenia.

In metallic ore processing, the 25,000 mt/a zinc smelter in Arnoldstein will reportedly close by the end of 1992, and the 83,000 mt/a aluminum smelter in Ranshofen will reportedly close in five stages, beginning in 1991. *(Insert Table 1.)*

## TRADE

Austrian economic performance has been increasingly affected by the international slowdown of economic activity and trade. Export growth came to a virtual standstill by the end of the year, and export-oriented companies began a reduction of work force and postponement of investments. Trade with European Free Trade Association (EFTA) countries declined, while trade with EC countries, the main trading block, increased slightly. The only large increase in trade was with former Eastern European countries where total exports reportedly rose by 21% to $2.7 billion and imports increased by 14% to $2.3 billion. The main component of this increased co-operation with the emerging new democracies of Eastern Europe is "compensation trading," practiced by Austria for many years. In exchange for a commodity, the respective plant is compensated not only with money, but also with modern technology, engineering services, and general know-how.

Voest-Alpine Erzberg GmbH, the Government-owned steel company, signed a letter of intent to take a minority shareholding in the Czechoslovakian steel distribution company Ferona. It is to acquire a 30.1% stake by the end of 1991 at a reported cost of $37 million with an option of an additional 14.9% in later stages of privatization. Also, negotiations with the East Slovak Iron and Steelworks in Kosice, Czechoslovakia, about cooperation continued in 1991.

Voest-Alpine, through its subsidiary Krems, acquired a Belgian cold profiling company, Sadef NV. *(Insert Tables 2 and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

In spite of recent changes, the Austrian Government, through the Federal Ministry of Trade, Commerce and Industry, remained in control of most mining and processing enterprises. The Government also funds research and foreign exploration, and regulates all foreign investment ventures. Proprietorship is exercised by the Government through a holding company, Osterreichische Industrieholding Aktiengesellschaft (OIAG). In addition to the mineral industry, it also administers the major part of other nationalized enterprises. *(Insert Table 4.)*

## COMMODITY REVIEW

### Metals

***Aluminum.***—Austria Metall AG has reportedly decided to close its 135,000 mt/a aluminum smelter in Ranshofen, 95 km west of Linz, on the German border. It will be shut down in five stages, with production cut by one-fifth at each step, starting at the end of 1991. The decision to close the smelter reflects the high cost of electric energy and environmental considerations. The only remaining aluminum smelter is in Lend in central Austria. The 15,000 mt/a capacity smelter is owned by Salzburger Aluminum GmbH.

*Antimony.*—The only antimony mine, in Schlaining in eastern Austria, owned by Bleiberger Bergwerks Union AG (BBU), was closed in 1990. The reason for the closing was a depletion of reserves.

*Copper.*—All copper metal production is from imported ore and scrap. Although the imports of ore remained basically unchanged, the imports of copper scrap increased from 21,374 tons in 1990 to 52,763 tons in 1991. Most of the imported scrap and residues were smelted and refined in Brixlegg, 45 km northeast of Innsbruck. In addition to copper products, which include electrolytic cakes, cathodes, wire bars, billets, and slabs, the facility also produces gold, nickel, and silver. The second smelter is located in Amstetten, 110 km west of Vienna. Both smelters are owned and operated by Austria Metall AG.

*Iron and Steel.*—The production of the Erzberg strip mine, Austria's only significant iron ore mine in Eisenerz, central Austria, may depend on continued operation of the nearby Donawitz steel plant owned by Voest-Alpine. Because of environmental considerations, one of the two blast furnaces was reportedly closed in 1991, reducing the annual production to 2 Mmt. The contract for ore delivery to the Donawitz plant expires in 1993, after which it may not be renewed, making the future existence of the Erzberg mine questionable.

The economic changes in Europe had an uneven effect on the Austrian steel industry. Voest-Alpine has reportedly decided to build a new electrogalvanizing line at its works in Linz to satisfy anticipated demand for sheet metal, mainly from the automobile industry. The initial capacity of 100,000 tons is to be operational by the end of 1993. With a final capacity of 250,000 tons, the steelmaker will be coating about 70% of its cold rolled output. Of the approximately 1 Mmt cold-rolling production in 1991, 186,000 tons was galvanized in two hot-dip lines, 210,000 tons in an electrolytic line, and 52,000 tons was color-coated.

*Lead and Zinc.*—The only producer of lead and zinc ores in Austria is BBU in Bleiberg-Kreuth, southern Austria. The ore is locally concentrated and transported to the nearby BBU smelter and refinery plant, at Arnoldstein. Because of declining metal prices, the plant is reportedly being reorganized into a multifunction plant able to reprocess products, such as batteries and steel mill dust. In addition to lead and zinc metal, production includes cadmium metal and germanium dioxide.

## Industrial Minerals

*Cement.*—Increased Austrian consumption of cement was met by increased imports rather then expanded production, in spite of ample supplies of raw material. With three plants, Perlmooser Zementwerke AG (PZ) is the largest Austrian producer, accounting for about 65% of annual domestic production. During recent years, a high-pressure mill was installed at its Vienna plant, and high-pressure grinding rolls were being installed in 1991 at PZ's plants in Vils and Peggau. After completion, it will allow the Schretter & Cie AG plant in Vils to grind cement clinker and granulated blast furnace slag at a rate of 85 mt/h, while Peggauer Zementwerke's mill in Peggau will reportedly grind clinker at a rate of 105 mt/h.

*Graphite.*—In spite of a 12% decline in production in 1991, Austria remained one of the largest graphite producers in Europe. Nearly all the graphite in Austria is amorphous, located in two regions. In the Styrian Alps, central Austria, the graphite occurs in highly folded slates and limestones. The two mines of this region are at Kaiserberg and Trieben, owned by Grafitbergbau Kaisersberg Franz Mayr-Melnhof and Co. KG and Industriegesellschaft und Bergbaugesellschaft Pryssok and Co. KG, respectively. The Lower Austria region is along the left bank of the Danube, 70 km west of Vienna. The Muhldorf Mine of this region is operated by Grafitwerk Kropfmuehl.

*Gypsum.*—1991 gypsum production declined by more than 14%, to 643,000 tons. About 80% of the gypsum and 85% of the anhydride were produced in open pit mines. The eight operational mines are along the northern Alps, between Moosegg in the west and Preinsfeld near Vienna. The industry employs about 300 people, mainly by Ersten Salzburger Gipswerks-Gesellschaft KG, which has a mine at Moosegg-Abtenau.

*Magnesite.*—Production of crude magnesite in 1991, from Austria's six mines, declined by nearly 19%, to 958,000 tons. One of the two largest producers is Veitscher Magnesitwerke AG, which operates the Breitenau and Trieben-Hohentauren Mines and plants, both in the Steiermark region, central Austria. The annual production is about 7,000 tons of MgO. Production includes refractory bricks, caustic magnesia, lubricant additive, and dead-burned magnesia derived predominantly from imported natural magnesite. In recent years, RADEX Austria AG has made a concentrated effort to expand its international market in Hungary and Australia. Most of its domestic production are shaped products (75%), unshaped products (16%), and sintered and caustic magnesia (9%). Nearly three-fourths of the products went to the steel industry in the form of refractory bricks, followed by the cement industry.

*Salt.*—Most of the salt production in Austria in 1991 was by the underground leaching method. Because salt-bearing strata are a mixture of clays and marl, only about 1,000 tons of rock salt was produced at the Altaussee Mine. All of the salt mines are concentrated in the Salzkammergut area of north-central Austria. Salt from brine was produced at, in descending order, at the Altaussee, Hallstatt, Bad Ischl, and Hallein plants.

The number of employees in salt mines was about 270 and in the brine plants about 120.

*Talc.*—The 1991 production of talc increased by 17% over that of 1990. All of the production was supplied by three mines (Lassing, Kleinfeistritz, and Rabenwald), operated by consolidated Naintsch Mineralwerke GmbH, headquartered in Graz, and employed about 250 people. About 70% of annual production is supplied by the Rabenwald opencast mine and nearby mill at Oberfeistritz, southeast Austria. Most production is exported, mainly to EC countries.

### Mineral Fuels

*Coal.*—Austria has limited brown coal and lignite deposits, but no anthracite or bituminous coal, which are imported mainly from Czechoslovakia, Poland, the former U.S.S.R., and the United States. All of the 1991 production of brown coal and lignite was reportedly used exclusively in thermal powerplants. The slightly increased 1991 output was produced by four mines in the Upper Austria and Steiermark regions. The largest producer in 1991 was Graz-Koflacher Eisenbahn- und Bergbau GmbH with about 60% of total output from two open pit mines (Oberdof and Koeflach), followed by Salzach-Kohlenbergbau GmbH (Grunbach) and Wolfsegg-Traunthaler Kohlewerks GmbH (Ampflwang) with about 20% each.

*Natural Gas.*—Natural gas production in 1991 increased slightly over that of 1990, but still supplied less than 20% of Austria's consumption. The former U.S.S.R. will remain the sole natural gas supplier, at least until 1993 when Austria is to start importing Norwegian gas. More than one-half of Austrian production was produced by Osterreichische Mineraloelverwaltungs AG (OMV), while virtually all of the remainder was supplied by the Mobil and Shell subsidiary, Rohol-Aufsuchungs GmbH (RAG). The reserves are estimated at 17.5 billion $m^3$/. The average amount of natural gas stored annually is about 1.5 billion $m^3$/. Austria has two international gas pipelines: the Trans-Austria Gasline (TAG), which connects Italy and Slovenia with the former U.S.S.R., and the West Austria Gasline (WAG), connecting Germany and France to the former U.S.S.R. According to the director of natural gas department of OMV, Austria is involved in negotiations concerning the construction of a liquefied natural gas terminal and pipeline from Croatia to France, with branches to Croatia, Bosnia, Slovenia, Hungary, and Czechoslovakia. At the first stage, the terminal capacity will be 5.5 billion $m^3$/a with the possibility of future expansion to approximately 10 billion $m^3$/a.

*Petroleum.*—The nearly 10% increase in Austrian petroleum production in 1991 over 1990 was mainly supplied by Osterreichische Mineraloelverwaltungs AG (OMV), which supplied about 90% of all domestic production. Petroleum reserves at the beginning of 1991 were estimated at 15 Mmt. The OMV is 70% Government-owned through Osterreichische Industrieholding Aktiengesellschaft (OIAG). Estimated crude oil reserves at the beginning of 1991 were 15 Mmt. Most of the consumption is covered by imports. The share of Soviet oil imports continued to decrease, although imports from Nigeria and Libya increased. To further diversify, during 1991, in addition to considerable foreign involvement, OMV acquired stakes in two North Sea oilfields, concluded an exploration and production agreement with Bulgaria, and expanded its operations in Canada. OMV also agreed to join a venture with a regional oil and gas company, Lenaneftegas Geologija of Yakutsk, U.S.S.R. It involves exploration, possible production, and construction of pipelines to Korea and Japan.

OMV operates Austria's major refinery, at Schwechat, near Vienna. The capacity is 10 Mmt/a; production in 1991 was about 8 Mmt. OMV hopes to build a 70-km pipeline between Schwechat and the Slovnaft refinery in Bratislava, Czechoslovakia. The 2 to 4 Mmt/a capacity pipeline would connect Slovnaft with the Transalpine pipeline, which connects the Trieste oil terminal in Italy with Ingolstadt in Germany.

## INFRASTRUCTURE

Austria is a landlocked country, and, with an exception of Danube River transport, is dependent on railroads and highways. There are 6,028 km of railroad track, of which 5,403 km is 1.435 m gauge. About 90% is Government-owned and more than one-half is electrified. Highways total 95,412 km, of which 34,612 km are the primary network (highways, Federal, and provincial roads), with the rest unpaved communal roads. The only navigable river is the Danube, with ports in Linz and Vienna.

## OUTLOOK

In the coming years, the Austrian mineral industry will be influenced by its likely integration into the EC and increased penetration into the Eastern European market. The strongest pressure for structural reform is exerted by anticipated participation of Austria in the EC. It will mean the removal of many barriers that have sheltered important sectors from international competition. As a result, a number of Austrian mines and processing plants will likely be closed, while at the remaining enterprises the personnel and subsidies will probably be reduced. Because of geographical location and historical ties, Austrian industry is in a favorable position to work closely with the emerging Eastern European markets. Cooperation is expected in the iron and steel industry, and in the processing and distribution of mineral fuels.

### OTHER SOURCES OF INFORMATION

#### Publications

Osterreichisches Montan-Handbuch (Austrian Mining Yearbook).

Bundesministerium fur wirtschaftliche Angelegenheit, Wien, Austria.
Statistisches Handbuch fur die Republik Osterreich 1991 (Austrian Statistical Yearbook).
Osterreichischen Statistischen Zentralamt, Wien, Austria.
Organization for Economic Cooperation and Development Economic Surveys—Austria, Paris, France. 1991-92.

TABLE 1

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum metal: | | | | | | |
| Primary | | 93,414 | 95,494 | [r]92,933 | 89,434 | 80,400 |
| Secondary | | 19,800 | 29,400 | [r]76,051 | 69,693 | 60,000 |
| Total | | 113,214 | 124,894 | [r]168,984 | 159,127 | 140,400 |
| Antimony, mine output, Sb content of concentrate | | 322 | 228 | 350 | 352 | — |
| Cadmium metal | | 26 | 26 | 49 | 44 | 20 |
| Copper: | | | | | | |
| Smelter, secondary | | 29,100 | 34,500 | 39,100 | 41,000 | 44,800 |
| Refined: | | | | | | |
| Primary | | 3,855 | 3,551 | 7,178 | 8,690 | 8,042 |
| Secondary | | 32,924 | 38,378 | 39,089 | 41,013 | [2]44,758 |
| Total | | 36,779 | 41,929 | 46,267 | 49,703 | 52,800 |
| Germanium, Ge content of concentrate | kilograms | 6,700 | 6,000 | 6,000 | 5,000 | 5,000 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate: | | | | | | |
| Gross weight | thousand tons | 3,061 | 2,311 | 2,410 | 2,301 | [2]2,130 |
| Fe content | do. | 954 | 727 | 761 | 653 | 600 |
| Metal: | | | | | | |
| Pig iron | do. | 3,451 | 3,665 | 3,823 | 3,452 | 3,000 |
| Ferroalloys, electric-furnace[e] | do. | 12 | 12 | 12 | 12 | 12 |
| Crude steel | do. | 4,301 | 4,560 | 4,718 | 4,292 | 4,000 |
| Semimanufactures | do. | 3,432 | 3,752 | 3,732 | 3,719 | 3,500 |
| Lead: | | | | | | |
| Mine output, Pb content of concentrate | | 5,246 | 2,281 | 1,571 | 1,494 | 1,100 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary | | 3,400 | 6,753 | [e]6,500 | [e]5,500 | 5,500 |
| Secondary | | 15,700 | 15,651 | 15,800 | [e]15,599 | 15,500 |
| Total | | 19,100 | 22,404 | [e]22,300 | 21,099 | 21,000 |
| Refined: | | | | | | |
| Primary[e] | | 6,800 | 9,000 | 8,800 | 8,400 | 6,400 |
| Secondary | | 16,000 | 16,000 | 15,218 | 15,100 | 16,300 |
| Total | | 22,800 | 25,000 | 24,018 | 23,500 | 22,700 |
| Manganese, Mn content of domestic iron ore | | 57,486 | 40,917 | 46,287 | 42,669 | 40,000 |
| Tungsten, mine output, W content of concentrate | | 1,250 | 1,235 | 1,517 | 1,378 | 1,300 |
| Zinc: | | | | | | |
| Mine output, Zn content of concentrate | | 15,735 | 17,051 | 14,800 | [r]16,700 | 14,800 |
| Metal, refined | | 24,300 | 23,900 | 26,102 | [r]28,300 | 16,300 |
| **INDUSTRIAL MINERALS** | | | | | | |
| Cement, hydraulic | thousand tons | 4,522 | 4,763 | 4,749 | 4,903 | 5,000 |
| Clays: | | | | | | |
| Illite | | 275,921 | 280,369 | 242,767 | [r]191,121 | [2]217,361 |
| Kaolin: | | | | | | |
| Crude | | 444,927 | 485,011 | 492,417 | 473,386 | [2]352,344 |
| Marketable | | 92,186 | 89,491 | 157,258 | 81,265 | 80,000 |
| Other | | 12,961 | 52,102 | 6,855 | 31,039 | 3,458,770 |

See footnotes at end of table.

TABLE 1—Continued

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Feldspar, crude | | 4,692 | 8,222 | 7,251 | 8,788 | [2]10,429 |
| Graphite, crude | | 39,391 | 7,577 | 15,307 | 22,705 | [2]19,750 |
| Gypsum and anhydrite, crude | | 664,452 | 721,745 | 625,433 | 751,645 | [2]654,594 |
| Lime | thousand tons | 1,378 | 1,545 | 1,622 | 1,637 | 1,600 |
| Magnesite: | | | | | | |
| Crude | do. | 947 | 1,122 | 1,205 | 1,179 | [2]961 |
| Sintered or dead-burned | do. | 345 | 360 | 360 | 411 | 400 |
| Caustic calcined | do. | 58 | 67 | 60 | 55 | 50 |
| Nitrogen: N content of ammoniae/ | do. | 450 | 408 | 410 | 410 | 400 |
| Pigments, mineral: Micaceous iron oxide | | 10,807 | 9,938 | 10,924 | 9,936 | [2]10,200 |
| Pumice (trass) | | 6,922 | 7,359 | 8,130 | 8,954 | [2]8,204 |
| Salt: | | | | | | |
| Rock | thousand tons | 1 | 1 | 1 | 1 | [2]1 |
| In brine: | | | | | | |
| Evaporated | do. | 484 | 413 | 396 | 386 | 380 |
| Other[e] | do. | 180 | 256 | 251 | 288 | 280 |
| Total | do. | 664 | 669 | 647 | 674 | 660 |
| Sand and gravel: | | | | | | |
| Quartz sand | do. | 684 | 756 | 819 | 818 | [2]2,090 |
| Other sand and gravel | do. | 9,322 | 14,700 | 16,057 | [r]16,664 | [2]17,001 |
| Total | do. | 10,006 | 15,456 | 16,876 | 17,482 | 19,091 |
| Sodium compounds, n.e.s.:[e] | | | | | | |
| Soda ash, manufactured | thousand tons | 150 | 145 | 150 | 150 | 150 |
| Sulfate, manufactured | do. | 109 | 118 | 120 | 120 | 120 |
| Stone:[3] | | | | | | |
| Dolomite | do. | 1,406 | 1,521 | 1,645 | 1,880 | [2]5,085 |
| Quartz and quartzite | do. | 196 | 167 | 263 | 249 | [2]464 |
| Other, including limestone and marble | do. | 9,540 | 12,324 | 12,700 | 12,800 | [2]10,652 |
| Total | do. | 11,142 | 14,012 | 14,608 | 14,929 | 16,201 |
| Sulfur: | | | | | | |
| Byproduct: | | | | | | |
| Of metallurgy | | 10,448 | 11,331 | 12,064 | 11,974 | 12,000 |
| Of petroleum and natural gas | | 24,946 | 36,217 | 37,070 | 30,390 | 30,000 |
| From gypsum and anhydrite | | 13,091 | — | — | — | — |
| Total | | 48,485 | 47,548 | 49,134 | 42,364 | 42,000 |
| Talc and soapstone | | 129,959 | 132,974 | 133,078 | 133,971 | [2]161,425 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, brown and lignite | thousand tons | 2,786 | 2,129 | 2,066 | 2,448 | [2]2,081 |
| Coke | do. | 1,727 | 1,744 | 1,771 | 1,725 | 1,700 |
| Gas, natural: | | | | | | |
| Gross | million cubic meters | 1,167 | 1,265 | 1,323 | 1,288 | [2]1,329 |
| Marketed | do. | 968 | 1,062 | [e]1,020 | [e]1,081 | 1,100 |
| Oil shale | | 1,090 | 210 | 570 | 475 | [2]290 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 7,410 | 8,196 | 8,075 | 8,072 | [2]8,926 |

See footnotes at end of table.

TABLE 1—Continued

## AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum—Continued: | | | | | | |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 6,476 | 7,010 | [r]6,000 | 5,288 | 5,000 |
| Gasoline | do. | 20,054 | 20,516 | 19,935 | 22,237 | 22,000 |
| Kerosene and jet fuel | do. | 1,546 | 1,772 | 2,226 | 2,398 | 2,500 |
| Distillate fuel oil | do. | 18,917 | 18,288 | 20,920 | 22,504 | 23,000 |
| Lubricants | do. | — | — | — | 416 | 500 |
| Residual fuel oil | do. | 12,411 | 12,027 | 9,912 | 11,353 | 11,000 |
| Bitumen | do. | 1,382 | 1,425 | 1,487 | 1,474 | 1,500 |
| Unspecified | do. | 82 | 71 | 75 | 75 | 75 |
| Refinery fuel and losses | do. | 3,620 | 3,458 | 2,387 | 2,124 | 2,000 |
| Total | do. | 64,488 | 64,567 | 62,942 | 67,869 | 67,575 |

[e]Estimated. [r]Revised

[1]Table includes data available through July 1992.

[2]Reported figure.

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

TABLE 2

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 2 | 2 | — | Mainly to Czechoslovakia. |
| Alkaline-earth metals | — | 5 | NA | NA. |
| Aluminum: | | | | |
| Ore and concentrate | 70 | 8 | — | All to West Germany. |
| Oxides and hydroxides | 1,025 | 1,499 | 78 | Iran 608; Italy 276; West Germany 191. |
| Ash and residue containing aluminum | 58,920 | 21,725 | — | Italy 11,967; West Germany 5,440; Czechoslovakia 1,014. |
| Metal including alloys: | | | | |
| Scrap | 35,508 | 26,881 | — | West Germany 14,543; Italy 8,432; Czechoslovakia 1,398. |
| Unwrought | 42,984 | 52,056 | 3 | Italy 17,241; Japan 6,976; France 6,664. |
| Semimanufactures | 126,439 | 139,882 | 1,365 | West Germany 56,971; Italy 21,701; Switzerland 9,635. |
| Antimony: | | | | |
| Ore and concentrate | 138 | 1 | — | All to West Germany. |
| Oxides | 5 | 20 | NA | Saudi Arabia 15. |
| Metal including alloys, all forms | 7 | 5 | — | Mainly to Yugoslvaia. |
| Cadmium: Metal including alloys, all forms | 120 | 35 | — | Netherlands 15; United Kingdom 15. |
| Chromium: | | | | |
| Ore and concentrate | 94 | 131 | — | Italy 46; West Germany 24; Switzerland 23. |
| Oxides and hydroxides | 27 | 3 | — | Switzerland 1; Turkey 1. |
| Metal including alloys, all forms | 2 | 4 | — | Mainly to West Germany. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Cobalt: | | | | |
| Oxides and hydroxides | — | 3 | — | West Germany 1; Poland 1; Yugoslavia 1. |
| Metal including alloys, all forms | 18 | 8 | 3 | Yugoslavia 2; Hungary 1. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | 31 | 56 | 1 | West Germany 35; United Kingdom 6; Belgium 5. |
| Copper: | | | | |
| Matte and speiss including cement copper | 23 | 13 | — | Mainly to West Germany. |
| Oxides and hydroxides | 3 | 1 | — | All to European Community, country unspecified. |
| Sulfate | 38 | 18 | — | NA. |
| Ash and residue containing copper | 10,746 | 16,676 | — | Italy 8,180; West Germany 4,500; Belgium 2,813. |
| Metal including alloys: | | | | |
| Scrap | 15,716 | 13,639 | — | West Germany 9,589; Italy 1,863; Belgium 738. |
| Unwrought | 33,444 | 44,684 | — | Italy 29,999; West Germany 11,379; Switzerland 2,069. |
| Semimanufactures | 28,403 | 28,820 | 157 | West Germany 11,303; Italy 4,813; France 3,432. |
| Germanium: Oxides and hydroxides kilograms | — | 100 | — | NA. |
| Gold: | | | | |
| Waste and sweepings value, thousands | — | $229 | — | Mainly to West Germany. |
| Metal including alloys, unwrought and partly wrought kilograms | 622 | 313 | — | Italy 175; Switzerland 40; Yugoslavia 38. |
| Iron and steel: | | | | |
| Iron ore and concentrate excluding roasted pyrite | — | 88 | — | All to West Germany. |
| Metal: | | | | |
| Scrap | 95,983 | 342,438 | — | Italy 275,544; West Germany 32,317; Yugoslavia 26,314. |
| Pig iron, cast iron, related materials | 1,488 | 8,801 | (2) | Italy 6,894; France 908; Poland 308. |
| Ferroalloys: | | | | |
| Ferroalloys | 19,707 | 22,049 | 248 | West Germany 4,899; Italy 3,269; India 2,262. |
| Silicon metal | — | 7 | — | Hungary 4; West Germany 2. |
| Steel, primary forms | 16,803 | 13,954 | 19 | West Germany 4,637; Yugoslavia 4,059; Italy 3,294. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 1,404,430 | 1,411,804 | 96,918 | West Germany 492,750; Italy 247,572; U.S.S.R. 101,036. |
| Clad, plated, coated | 280,552 | 346,519 | 427 | West Germany 166,817; Italy 56,668; Sweden 30,182. |
| Of alloy steel | 220,870 | 137,787 | 17,255 | West Germany 71,630; Italy 14,975. |
| Bars, rods, angles, shapes, sections | 393,006 | 475,231 | 2,096 | West Germany 152,746; Italy 140,337; Switzerland 47,002. |
| Rails and accessories | 101,827 | 142,512 | 5,962 | Switzerland 38,848; Yugoslavia 13,153; Denmark 10,370. |
| Wire | 68,966 | 65,816 | 1,667 | West Germany 34,171; Italy 9,520; Switzerland 6,485. |
| Tubes, pipes, fittings | 623,065 | 620,959 | 22,445 | U.S.S.R. 222,823; West Germany 144,454; Italy 43,913. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Lead: | | | | |
| Ore and concentrate | — | 232 | — | All to West Germany. |
| Ash and residue containing lead | 5,715 | 6,236 | — | Yugoslavia 4,730; West Germany 1,233; Netherlands 246. |
| Metal including alloys: | | | | |
| Scrap | 3,554 | 10,727 | — | Yugoslavia 9,821; West Germany 802; Belgium 60. |
| Unwrought | 4,659 | 4,829 | — | Italy 3,500; Yugoslavia 1,094; West Germany 143. |
| Semimanufactures | 33 | 42 | — | Hungary 19; West Germany 9; Italy 6. |
| Lithium: Oxides and hydroxides | — | 1 | — | All to Eastern Europe. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 282 | 222 | — | West Germany 124; Belgium 88. |
| Unwrought | 342 | 92 | — | West Germany 88. |
| Semimanufactures | 1,278 | 800 | NA | West Germany 162; Sweden 8; unspecified 620. |
| Manganese: | | | | |
| Ore and concentrate | — | 22 | — | All to West Germany. |
| Oxides | 61 | 59 | — | Yugoslavia 49; Denmark 9. |
| Metal including alloys, all forms | 1 | — | | |
| Mercury | 1 | 1 | — | Mainly to Denmark. |
| Molybdenum: | | | | |
| Ore and concentrate, roasted | 406 | 191 | — | Italy 111; India 39; West Germany 20. |
| Oxides and hydroxides | 14 | 7 | — | All to European Community, country unspecified. |
| Metal including alloys, all forms | 1,651 | 1,656 | 184 | West Germany 820; France 148; United Kingdom 137. |
| Nickel: | | | | |
| Matte and speiss kilograms | — | 200 | — | All to Yugoslavia. |
| Oxides and hydroxides | — | 28 | — | Mainly to Italy. |
| Metal including alloys: | | | | |
| Scrap | 200 | 184 | — | All to West Germany. |
| Unwrought | 171 | 99 | — | Sweden 95; West Germany 2. |
| Semimanufactures | 608 | 700 | (2) | West Germany 244; Iran 52; Italy 43. |
| Platinum-group metals: | | | | |
| Waste and sweepings value, thousands | $3,319 | $1,595 | — | West Germany $1,625; United Kingdom $155. |
| Metals including alloys, unwrought and partly wrought kilograms | 766 | 1,255 | — | West Germany 479; Yugoslavia 276; United Kingdom 185. |
| Rare-earth metals including alloys, all forms | 358 | 273 | NA | NA. |
| Selenium, elemental | — | 1 | — | Mainly to West Germany. |
| Silicon, high-purity | 438 | 2 | — | All to West Germany. |
| Silver: | | | | |
| Waste and sweepings[3] value, thousands | $5,584 | $7,320 | — | West Germany $5,643; France $1,480; United Kingdom $190. |
| Metal including alloys, unwrought and partly wrought kilograms | 175,888 | 50,403 | — | West Germany 30,425; Switzerland 9,560; Yugoslavia 6,268. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| Metals—Continued | | | | |
| Tin: Metal including alloys: | | | | |
| Scrap | 36 | 3 | — | West Germany 2; Netherlands 1. |
| Unwrought | 25 | 11 | — | West Germany 8; Greece 1. |
| Semimanufactures | 14 | 70 | — | Switzerland 38; Czechoslovakia 22; Hungary 6. |
| Titanium: | | | | |
| Ore and concentrate | 8 | — | | |
| Oxides | 725 | 317 | — | West Germany 122; Italy 47; Yugoslavia 45. |
| Metal including alloys: | | | | |
| Unwrought including scrap | 3,339 | 1,695 | 157 | United Kingdom 689; Italy 664; Switzerland 179. |
| Semimanufactures | 41 | 45 | — | Switzerland 17; West Germany 14; Italy 8. |
| Tungsten: | | | | |
| Ore and concentrate | — | 18 | 18 | |
| Oxides and hydroxides | — | 8 | — | Mainly to Italy. |
| Metal including alloys, all forms | 1,318 | 1,032 | 23 | West Germany 759; Israel 103; United Kingdom 40. |
| Uranium and thorium: Oxides and other compounds value, thousands | $31 | $27 | NA | NA. |
| Vanadium: | | | | |
| Oxides and hydroxides | 370 | 384 | NA | Brazil 119; Czechoslovakia 83; France 54. |
| Ash and residue containing vanadium | 122 | — | | |
| Zinc: | | | | |
| Ore and concentrate | (2) | — | | |
| Oxides | 2,461 | 3,165 | — | Hungary 1,259; West Germany 775; Yugoslavia 698. |
| Blue powder | 156 | 119 | — | Belgium 94. |
| Ash and residue containing zinc | 2,517 | 5,940 | — | West Germany 3,290; Spain 1,067; Belgium 888. |
| Metal including alloys: | | | | |
| Scrap | 2,539 | 2,527 | — | Taiwan 1,096; Belgium 958; West Germany 427. |
| Unwrought | 6,360 | 5,625 | — | Yugoslavia 3,055; Italy 1,621; West Germany 843. |
| Semimanufactures | 187 | 1,914 | 27 | West Germany 1,533; Hungary 125; Denmark 68. |
| Zirconium: | | | | |
| Ore and concentrate | 24 | 24 | — | All to Yugoslavia. |
| Metal including alloys, all forms | 22 | (2) | (2) | Mainly to Republic of South Africa. |
| Other: | | | | |
| Ores and concentrates | — | 67 | — | Bulgaria 44; Hungary 23. |
| Oxides and hydroxides | 52 | — | | |
| Ashes and residues | 1,644 | 686 | 91 | West Germany 334; Switzerland 100; Netherlands 95. |
| Base metals including alloys, all forms | 14 | 3 | NA | West Germany 2. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 128 | 114 | — | Libya 76; Hungary 20; West Germany 11. |
| Artificial: Silicon carbide | 83 | 60 | NA | Albania 29; Yugoslavia 23. |
| Grinding and polishing wheels and stones | 14,781 | 14,834 | 629 | West Germany 3,408; Italy 1,774; Sweden 1,020. |
| Asbestos, crude | 247 | 675 | — | Yugoslavia 540; Hungary 94. |
| Barite and witherite | 3 | 10 | — | All to Yemen. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Boron materials: | | | | |
| Crude natural borates | 57 | 6 | — | Yugoslavia 5; Saudi Arabia 1. |
| Oxides and acids | 3 | 20 | — | Yugoslavia 19. |
| Bromine | (2) | 2 | NA | NA. |
| Cement | 29,390 | 21,877 | — | West Germany 11,679; Italy 4,605; Switzerland 3,602. |
| Chalk | 2,559 | 2,102 | — | Hungary 1,134; Czechoslovakia 677; Yugoslavia 128. |
| Clays, crude: | | | | |
| Bentonite | 1,114 | 782 | — | Switzerland 628; West Germany 76. |
| Chamotte earth | 482 | 318 | — | West Germany 202; Denmark 96. |
| Fuller's earth | 12 | 15 | — | NA. |
| Fire clay | 95 | 183 | — | West Germany 118. |
| Kaolin | 50,040 | 39,967 | 2 | Yugoslavia 14,966; Hungary 12,287; West Germany 7,755. |
| Unspecified | 255 | 151 | — | Philippines 53; Yugoslavia 30. |
| Cryolite and chiolite | 1 | — | | |
| Diamond, natural: | | | | |
| Gem, not set or strung value, thousands | $635 | $352 | — | West Germany $154; Belgium $58; Switzerland $35. |
| Industrial stones do. | $122 | $276 | $2 | Yugoslavia $217; Czechoslovakia $32. |
| Dust and powder kilograms | 18 | 10 | 8 | Italy 7. |
| Diatomite and other infusorial earth | 3,671 | 5,780 | 9 | West Germany 1,428; Yugoslavia 1,202; Hungary 1,201. |
| Fluorspar | 47 | 12 | NA | NA. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 206 | 4,254 | — | Netherlands 2,165; East Germany 1,054; Italy 569. |
| Manufactured: | | | | |
| Ammonia | 1 | 18 | NA | NA. |
| Nitrogenous | 556,445 | 542,626 | 10 | West Germany 347,831; Italy 78,648; Yugoslavia 33,948. |
| Phosphatic | 67,515 | 3 | — | All to Switzerland. |
| Potassic | 3,655 | 35,986 | — | Czechoslovakia 34,266; Italy 1,373. |
| Unspecified and mixed | r279,003 | 283,333 | 244 | West Germany 147,004; Italy 52,789; Czechoslovakia 49,675. |
| Graphite, natural | 8,723 | 8,376 | 40 | Italy 2,561; West Germany 2,517; Poland 1,154. |
| Gypsum and plaster | 151,337 | 159,938 | — | West Germany 156,241; Italy 2,363; Switzerland 875. |
| Iodine | 1 | — | | |
| Kyanite and related materials | 10 | (2) | — | NA. |
| Lime | 7,552 | 6,159 | — | West Germany 4,810; Switzerland 1,174; Italy 122. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 219 | 347 | — | Netherlands 150; West Germany 55; Italy 48. |
| Oxides and hydroxides | 165,686 | 166,603 | 11,206 | Venezuela 34,033; West Germany 29,819; Italy 11,998. |
| Mica: | | | | |
| Crude including splittings and waste | 615 | 671 | 2 | West Germany 372; Italy 158; Switzerland 90. |
| Worked including agglomerated splittings | 4,811 | 5,179 | 27 | Yugoslavia 2,777; West Germany 1,048; Czechoslovakia 888. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Pigments, mineral: | | | | |
| Natural, crude | 7,198 | 7,198 | 108 | United Kingdom 1,772; West Germany 1,534; Netherlands 695. |
| Iron oxides and hydroxides, processed | 4,703 | 4,657 | — | Italy 1,584; West Germany 1,074; Taiwan 864. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural kilograms | 2,316 | 8,377 | 8 | Switzerland 5,343; Thailand 305; West Germany 158. |
| Synthetic do. | 19,486 | 15,331 | 3,214 | Singapore 5,708; West Germany 790; Switzerland 763. |
| Pyrite, unroasted | — | 40 | — | Italy 23; Czechoslovakia 15; Denmark 2. |
| Quartz crystal, piezoelectric kilograms | 10 | 16 | — | All to West Germany. |
| Sodium compounds, n.e.s.: Sulfate, manufactured | 108,549 | 95,216 | — | Italy 28,989; Yugoslavia 10,502; Switzerland 7,201. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 51,907 | 38,966 | — | West Germany 32,299; Switzerland 4,301; Italy 1,506. |
| Worked | 24,362 | 22,739 | 306 | West Germany 15,272; Switzerland 3,863; Italy 968. |
| Dolomite, chiefly refractory-grade | 32,915 | 38,365 | — | West Germany 37,038; Belgium 448; Tanzania 282. |
| Gravel and crushed rock | 743,361 | 697,287 | 1 | West Germany 324,376; Switzerland 179,421; Italy 91,555. |
| Limestone other than dimension | 699 | 776 | — | West Germany 704; Switzerland 72. |
| Quartz and quartzite | 76 | 116 | — | France 61; Finland 22; West Germany 19. |
| Sand other than metal-bearing | 83,905 | 76,833 | 4 | Switzerland 38,376; West Germany 34,741; Italy 2,174. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 56 | 186 | — | West Germany 164; Yugoslavia 20. |
| Colloidal, precipitated, sublimed | 285 | 301 | — | Mainly to Yugoslavia. |
| Dioxide | 23 | 7 | — | All to West Germany. |
| Sulfuric acid | 5,443 | 2,982 | — | Italy 2,720; West Germany 206; Philippines 20. |
| Talc, steatite, soapstone, pyrophyllite | 116,949 | 119,546 | 84 | West Germany 67,386; Italy 16,718; Switzerland 9,004. |
| Vermiculite, perlite, chlorite | 512 | 184 | — | Hungary 100; Italy 58; West Germany 24. |
| Other: | | | | |
| Crude | 32,527 | 35,091 | 29 | West Germany 4,640; Italy 2,678; Switzerland 1,077. |
| Slag and dross, not metal-bearing | 108,033 | 148,357 | — | West Germany 83,638; Yugoslavia 52,436; Norway 5,991. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 36 | 680 | — | West Germany 621; Iraq 56; Bulgaria 3. |
| Carbon black | 54 | 48 | (2) | U.S.S.R. 17; Yugoslavia 17; West Germany 13. |
| Coal: | | | | |
| Anthracite and bituminous | 48 | 31 | — | Yugoslavia 16; West Germany 8; Switzerland 7. |
| Briquets of anthracite and bituminous coal | 25 | 62 | — | West Germany 43; Switzerland 19. |

See footnotes at end of table.

TABLE 2—Continued

## AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Coal—Continued: | | | | |
| Lignite including briquets | 3,289 | 3,496 | — | West Germany 3,446; Switzerland 24. |
| Coke and semicoke | 3,347 | 969 | — | West Germany 936; Switzerland 32. |
| Peat including briquets and litter | 12,764 | 11,981 | — | West Germany 8,113; Italy 3,852; Yugoslavia 15. |
| Petroleum: | | | | |
| Crude 42-gallon barrels | — | (2) | — | All to Switzerland. |
| Refinery products: | | | | |
| Liquefied petroleum gas thousand 42-gallon barrels | 11 | 135 | — | Czechoslovakia 76; Poland 28; Italy 12. |
| Gasoline do. | 1,989 | 2,391 | — | Czechoslovakia 1,419; West Germany 752; Poland 153. |
| Mineral jelly and wax do. | 8 | 6 | — | Greece 2; West Germany 1. |
| Kerosene and jet fuel do. | 59 | 95 | — | West Germany 58; Czechoslovakia 9; Yugoslavia 8. |
| Distillate fuel oil do. | 34 | 57 | — | West Germany 21; Czechoslovakia 9; Yugoslavia 8. |
| Lubricants do. | 349 | 227 | (2) | Czechoslovakia 42; Hungary 38; Poland 32. |
| Residual fuel oil do. | 47 | 35 | — | Czechoslovakia 34. |
| Bitumen and other residues do. | 387 | 15 | — | West Germany 4; Italy 3; Switzerland 2. |
| Bituminous mixtures do. | 166 | 107 | — | Iran 62; Algeria 26; Yugoslavia 11. |
| Petroleum coke do. | (2) | 1 | — | Mainly to Hungary. |

[1]Revised. NA Not available.
[2]Table prepared by staff, International Data Section. Austria reports exports to Belgium and Luxembourg separately; therefore, these two countries are listed separately in this table rather than as "Belgium-Luxembourg."
[3]Less than 1/2 unit.
[4]May include other precious metals.

TABLE 3

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 4 | 4 | — | United Kingdom 3. |
| Alkaline-earth metals | 23 | 24 | — | Ireland 12; Belgium 5. |
| Aluminum: | | | | |
| Ore and concentrate | 54,922 | 34,466 | — | Guinea 16,008; West Germany 6,475; Australia 5,866. |
| Oxides and hydroxides | 232,645 | 231,050 | — | West Germany 126,328; Yugoslavia 35,764; Hungary 32,105. |
| Ash and residue containing aluminum | 86,953 | 30,542 | 133 | Hungary 15,072; U.S.S.R. 5,671; Poland 3,794. |
| Metal including alloys: | | | | |
| Scrap | 47,231 | 41,628 | 21 | West Germany 16,525; Hungary 9,666; Poland 5,449. |
| Unwrought | 130,429 | 150,098 | 19 | West Germany 65,064; Norway 25,374; Hungary 18,749. |
| Semimanufactures | 78,938 | 83,116 | 29 | West Germany 34,867; Switzerland 10,624; Italy 10,094. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Antimony: | | | | |
| Ore and concentrate value, thousands | — | $1,451 | NA | NA. |
| Oxides | 200 | 220 | NA | Belgium 96; United Kingdom 54; West Germany 35. |
| Metal including alloys, all forms | 64 | 49 | — | Sweden 24; China 17. |
| Arsenic: Metal including alloys, all forms | 20 | 22 | — | China 13; Netherlands 7. |
| Beryllium: Metal including alloys, all forms kilograms | 200 | 300 | NA | NA. |
| Bismuth: Metal including alloys, all forms | 2 | 39 | (2) | Netherlands 34; West Germany 3. |
| Cadmium: Metal including alloys, all forms | 1 | 3 | — | Hungary 2. |
| Chromium: | | | | |
| Ore and concentrate | 60,936 | 43,752 | — | Republic of South Africa 34,659; Cuba 3,563; Turkey 2,716. |
| Oxides and hydroxides | 464 | 512 | 1 | West Germany 335; U.S.S.R. 85; Italy 44. |
| Metal including alloys, all forms | 112 | 177 | 11 | United Kingdom 98; China 26; Republic of South Africa 20. |
| Cobalt: | | | | |
| Ore and concentrate | — | 3 | — | All from West Germany. |
| Oxides and hydroxides | 28 | 23 | 3 | West Germany 11; Belgium 5. |
| Metal including alloys, all forms | 388 | 405 | 5 | Belgium 127; Zaire 101; Tanzania 55. |
| Columbium and tantalum: | | | | |
| Ore and concentrate[3] | 57 | 193 | — | All from Republic of South Africa. |
| Metal including alloys, all forms, tantalum | 65 | 42 | 5 | West Germany 27; Belgium 6; Japan 2. |
| Copper: | | | | |
| Ore and concentrate | (2) | 154 | — | All from West Germany. |
| Matte and speiss including cement copper | (2) | 39 | — | Do. |
| Oxides and hydroxides | 51 | 50 | — | Belgium 28; West Germany 21. |
| Sulfate | 710 | 1,235 | — | Yugoslavia 853; Italy 226; U.S.S.R. 124. |
| Ash and residue containing copper | 3,535 | 1,089 | — | West Germany 572; Czechoslovakia 236; Hungary 227. |
| Metal including alloys: | | | | |
| Scrap | 32,226 | 24,662 | 191 | West Germany 16,075; Czechoslovakia 2,287; Hungary 1,605. |
| Unwrought | 7,291 | 10,126 | 73 | West Germany 3,538; U.S.S.R. 1,402; Hungary 1,178. |
| Semimanufactures | 91,676 | 98,273 | 735 | West Germany 56,398; United Kingdom 7,834; Sweden 2,216. |
| Germanium: | | | | |
| Oxides including zirconium oxides | 54 | 28 | — | United Kingdom 20. |
| Metal including alloys, all forms | (2) | 104 | — | Mainly from France. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $38 | $10 | — | Yugoslavia $6; West Germany $4. |
| Metal including alloys, unwrought and partly wrought kilograms | 3,482 | 16,646 | 17 | West Germany 9,999; Switzerland 6,156. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 4,192 | 3,892 | 6 | U.S.S.R. 1,392; Republic of South Africa, 1,315; Canada 410. |
| Pyrite, roasted | do. | 12 | 16 | — | Mainly from Yugoslavia. |
| Metal: | | | | | |
| Scrap | | 88,183 | 54,560 | 190 | West Germany 29,888; Czechoslovakia 14,708; U.S.S.R. 4,514. |
| Pig iron, cast iron, related materials | | 76,999 | 49,513 | — | West Germany 14,522; Canada 13,704; Italy 6,916. |
| Ferroalloys: | | | | | |
| Ferrocolumbium | | 306 | 46 | 32 | Brazil 7; United Kingdom 5. |
| Ferrochromium | | 21,969 | 19,427 | — | Yugoslavia 5,664; U.S.S.R. 5,443; Hungary 4,189. |
| Ferromanganese | | 23,899 | 22,181 | — | West Germany 12,787; Norway 6,851; France 944. |
| Ferromolybdenum | | 274 | 354 | — | United Kingdom 94; Belgium 88; Netherlands 65. |
| Ferronickel | | 1,369 | 1,456 | — | Yugoslavia 998; Greece 366; West Germany 53. |
| Ferrosilicochromium | | 641 | 401 | — | U.S.S.R. 183; West Germany 131. |
| Ferrosilicomanganese | | 5,103 | 5,419 | — | Yugoslavia 1,624; Norway 1,287; West Germany 1,137. |
| Ferrosilicon | | 20,732 | 19,641 | — | Poland 4,509; West Germany 4,444; Yugoslavia 3,274. |
| Ferrotitanium | | 414 | 311 | 10 | West Germany 187; Italy 74; United Kingdom 40. |
| Ferrotungsten | | 888 | 795 | — | China 770; Hong Kong 11; West Germany 8. |
| Ferrovanadium | | 286 | 137 | — | West Germany 84; Belgium 30; Czechoslovakia 20. |
| Silicon metal | | 4,325 | 4,922 | — | Norway 1,106; Brazil 1,037; West Germany 894. |
| Unspecified | | 2,092 | 1,733 | 52 | West Germany 892; U.S.S.R. 273; Italy 116. |
| Steel, primary forms | | 204,438 | 328,693 | — | Netherlands 134,004; West Germany 108,435; Hungary 26,230. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | | 329,215 | 350,326 | 6 | West Germany 170,182; Italy 31,239; Yugoslavia 23,383. |
| Clad, plated, coated | | 137,337 | 147,942 | 19 | West Germany 60,204; Italy 25,231; Belgium 20,720. |
| Of alloy steel | | 76,030 | 74,940 | 19 | West Germany 37,625; Sweden 12,122; Italy 6,504. |
| Bars, rods, angles, shapes, sections | | 502,211 | 563,575 | 136 | Italy 214,838; West Germany 156,900; Switzerland 31,258. |
| Rails and accessories | | 4,721 | 4,634 | 15 | West Germany 3,642; Belgium 510; Switzerland 128. |
| Wire | | 47,603 | 53,543 | 6 | Belgium 18,020; West Germany 16,793; Italy 11,445. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Semimanufacture—Continued: | | | | |
| Tubes, pipes, fittings | 223,063 | 235,563 | 242 | West Germany 107,629; Italy 38,880; Czechoslovakia 14,599. |
| Lead: | | | | |
| Ore and concentrate | 17,946 | 17,836 | — | Poland 10,435; Italy 4,018; Yugoslavia 3,306. |
| Oxides | 1,683 | 1,052 | — | West Germany 925; Netherlands 121. |
| Ash and residue containing lead | 758 | 408 | — | Hungary 335; Netherlands 51. |
| Metal including alloys: | | | | |
| Scrap | 2,637 | 3,453 | — | Poland 2,397; Hungary 443; West Germany 294. |
| Unwrought | 38,902 | 41,770 | — | West Germany 16,482; United Kingdom 8,897; Yugoslavia 7,114. |
| Semimanufactures | 927 | 950 | — | West Germany 627; Hungary 122; Italy 99. |
| Lithium: Oxides and hydroxides | 30 | 16 | NA | West Germany 12. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 30 | 5 | — | All from West Germany. |
| Unwrought | 2,523 | 1,979 | 311 | Norway 821; France 487. |
| Semimanufactures | 96 | 183 | 21 | Turkey 115; Italy 22;. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 528 | 801 | — | Netherlands 576; Brazil 151; West Germany 50. |
| Oxides | 186 | 172 | (2) | Republic of South Africa 120; Japan 18. |
| Metal including alloys, all forms | 428 | 429 | 9 | France 108; West Germany 86; Republic of South Africa 70. |
| Mercury | 4 | 6 | — | Algeria 2; Turkey 2. |
| Molybdenum: | | | | |
| Ore and concentrate: | | | | |
| Roasted | 9,962 | 8,882 | 5,909 | West Germany 1,124; Belgium 763. |
| Unroasted | 7 | 95 | — | China 49; Australia 20; Hong Kong 19. |
| Oxides and hydroxides | 2,486 | 2,419 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 116 | 102 | 9 | West Germany 70. |
| Unwrought | 77 | 118 | 43 | West Germany 71. |
| Semimanufactures | 62 | 87 | 1 | France 58; West Germany 25. |
| Nickel: | | | | |
| Ore and concentrate | 169 | 81 | — | All from West Germany. |
| Matte and speiss | 834 | 843 | — | Netherlands 474; Cuba 142; Canada 85. |
| Oxides and hydroxides | 3 | 790 | NA | Hungary 685; United Kingdom 97. |
| Metal including alloys: | | | | |
| Scrap | 579 | 200 | — | Czechoslkovakia 68; Albania 42; Netherlands 41. |
| Unwrought | 2,370 | 2,709 | 48 | U.S.S.R. 775; Republic of South Africa 435; Albania 376. |
| Semimanufactures | 697 | 898 | 71 | West Germany 498; Sweden 207. |
| Platinum-group metals: | | | | |
| Waste and sweepings value, thousands | $19 | $654 | — | Yugoslavia $627; West Germany $27. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Nickel—Continued: | | | | |
| Metals including alloys, unwrought and partly wrought kilograms | 2,429 | 2,794 | 79 | France 1,158; West Germany 1,013; U.S.S.R. 315. |
| Rare-earth metals including alloys, all forms | 245 | 255 | — | U.S.S.R. 186; China 51; Switzerland 10. |
| Selenium, elemental | 5 | 4 | NA | NA. |
| Silicon, high-purity | 220 | 3 | — | Mainly from West Germany. |
| Silver: | | | | |
| Waste and sweepings[4] value, thousands | $3 | $716 | — | Mainly from France. |
| Metal including alloys, unwrought and partly wrought kilograms | 164,580 | 117,967 | 367 | West Germany 73,655; Belgium 12,994; Switzerland 7,852. |
| Tellurium and boron, elemental | 1 | 1 | NA | Mainly from U.S.S.R. |
| Tin: | | | | |
| Ore and concentrate | 302 | — | | |
| Oxides | 5 | 4 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 47 | 52 | — | Yugoslavia 49; Czechoslovakia 2. |
| Unwrought | 492 | 559 | 10 | Brazil 206; West Germany 173; Netherlands 33. |
| Semimanufactures | 358 | 363 | — | West Germany 288; Netherlands 40; Belgium 29. |
| Titanium: | | | | |
| Ore and concentrate | 537 | 693 | — | Republic of South Africa 240; Australia 228; Netherlands 156. |
| Oxides | 4,594 | 2,959 | 1 | West Germany 1,050; Finland 674; Belgium 531. |
| Metal including alloys: | | | | |
| Unwrought including scrap | 1,921 | 412 | 6 | U.S.S.R. 349; United Kingdom 21; West Germany 16. |
| Semimanufactures | 153 | 229 | 140 | France 28; West Germany 27. |
| Tungsten: | | | | |
| Ore and concentrate | 807 | 691 | — | China 318; Australia 294; Chile 37. |
| Oxides and hydroxides | 191 | 299 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 688 | 836 | 189 | West Germany 445; Japan 52. |
| Unwrought | 196 | 225 | 72 | West Germany 110; Belgium 17. |
| Semimanufactures | 19 | 51 | 3 | West Germany 38; Belgium 5. |
| Uranium and thorium: | | | | |
| Oxides and other compounds value, thousands | $1 | — | | |
| Metal including alloys, all forms | 6 | — | | |
| Vanadium: | | | | |
| Oxides and hydroxides | 1,917 | 972 | 140 | Republic of South Africa 733; China 64. |
| Ash and residue containing vanadium | 22,827 | 18,908 | — | Republic of South Africa 18,856; West Germany 52. |
| Metal including alloys, all forms | 2 | 8 | — | Mainly from West Germany. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Zinc: | | | | |
| Ore and concentrate | 26,184 | 19,376 | — | Italy 9,857; Yugoslavia 6,737; Canada 2,735. |
| Oxides | 1,161 | 1,848 | — | West Germany 1,549; Netherlands 118; France 53. |
| Blue powder | 1,727 | 2,108 | — | Belgium 1,047; Norway 698; West Germany 312. |
| Ash and residue containing zinc including hard zinc | 3,445 | 4,174 | — | West Germany 1,776; Hungary 1,520; Italy 296. |
| Metal including alloys: | | | | |
| Scrap | 1,030 | 808 | — | West Germany 469; Hungary 275. |
| Unwrought | 13,440 | 16,297 | — | Belgium 8,780; West Germany 1,325; Netherlands 1,008. |
| Semimanufactures | 5,723 | 6,017 | (2) | West Germany 4,595; France 447; Yugoslavia 374. |
| Zirconium: | | | | |
| Ore and concentrate | 1,821 | 1,606 | 4 | Republic of South Africa 1,393; Thailand 73; West Germany 60. |
| Metal including alloys: | | | | |
| Unwrought including scrap | (2) | 41 | (2) | Thailand 24; Republic of South Africa 10; West Germany 7. |
| Semimanufactures kilograms | 1,300 | 700 | 300 | NA. |
| Other: | | | | |
| Ores and concentrates | — | 24 | NA | NA. |
| Ashes and residues | 21,911 | 21,009 | 2,690 | East Germany 5,606; West Germany 4,986; Netherlands 3,887. |
| Base metals including alloys, all forms | 8 | 16 | 2 | Belgium 4; West Germany 3. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 541 | 663 | 13 | Italy 238; West Germany 130; Turkey 119. |
| Artificial: | | | | |
| Corundum | 18,860 | 19,120 | 890 | West Germany 5,557; France 3,690; Hungary 3,509. |
| Silicon carbide | 2,632 | 2,998 | NA | West Germany 1,698; Italy 600; Norway 266. |
| Dust and powder of precious and semi-precious stones excluding diamond kilograms | 1 | 155 | NA | West Germany 23. |
| Grinding and polishing wheels and stones | 2,122 | 2,095 | (2) | West Germany 1,038; Italy 361; Netherlands 121. |
| Asbestos, crude | 15,750 | 6,167 | 4 | Canada 3,992; Zimbabwe 1,746; U.S.S.R. 290. |
| Barite and witherite | 2,668 | 2,948 | — | West Germany 2,244; Czechoslovakia 560. |
| Boron materials: | | | | |
| Crude natural borates | 25,051 | 26,325 | 3,337 | Turkey 22,937. |
| Oxides and acids | 812 | 850 | 16 | Italy 277; Netherlands 151; Argentina 106. |
| Bromine including fluorine | 111 | 69 | — | Netherlands 67. |
| Cement | 103,653 | 108,944 | — | Yugoslavia 41,945; Poland 20,072; West Germany 12,478. |
| Chalk | 3,512 | 3,583 | — | France 2,428; West Germany 1,108. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERAL—Continued | | | | |
| Clays, crude: | | | | |
| Bentonite | 15,042 | 12,722 | 16 | West Germany 5,667; Bulgaria 3,653; Czechoslovakia 1,782. |
| Chamotte earth | 30,705 | 27,595 | 328 | Czechoslovakia 15,449; West Germany 7,362; France 3,252. |
| Fuller's earth | 604 | 795 | — | West Germany 462; United Kingdom 320. |
| Fire clay | 23,149 | 19,703 | — | West Germany 16,330; Czechoslovakia 1,386; United Kingdom 1,027. |
| Kaolin | 140,849 | 188,342 | 33,122 | United Kingdom 50,096; Czechoslovakia 42,049. West Germany 41,854. |
| Unspecified | 49,959 | 37,546 | 76 | West Germany 20,674; Czechoslovakia 14,693. |
| Cryolite and chiolite | 185 | 210 | — | Denmark 199; United Kingdom 11. |
| Diamond, natural: | | | | |
| Gem, not set or strung value, thousands | $12,015 | $13,850 | $89 | Belgium $5,693; Israel $4,062; Switzerland $1,354. |
| Industrial stones do. | $813 | $1,134 | $35 | West Germany $486; Belgium $169; Netherlands $110. |
| Dust and powder kilograms | 1,088 | 1,188 | 938 | Ireland 88; Switzerland 77. |
| Diatomite and other infusorial earth | 14,080 | 13,657 | 1,616 | Czechoslovakia 5,070; Denmark 2,535; France 2,290. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 4,386 | 4,944 | — | Sweden 2,851; West Germany 1,629; Italy 292. |
| Fluorspar | 16,778 | 19,756 | — | West Germany 18,812; France 284; Italy 281. |
| Unspecified | 64 | 104 | 25 | Norway 79. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 2,925 | 3,025 | — | West Germany 2,202; Hungary 475; Italy 120. |
| Manufactured: | | | | |
| Ammonia | 35,241 | 36,558 | NA | NA. |
| Nitrogenous | 167,678 | 170,433 | (2) | Czechoslovakia 69,702; Hungary 50,987; Yugoslavia 12,695. |
| Phosphatic | 68,846 | 38,338 | — | Luxembourg 20,352; West Germany 7,920; Yugoslavia 5,056. |
| Potassic | 186,819 | 190,859 | 1 | West Germany 121,543; U.S.S.R. 60,253; Hungary 6,076. |
| Unspecified and mixed | 1,063,853 | 126,818 | 9,548 | Italy 28,563; Yugoslavia 22,990; West Germany 18,762. |
| Graphite, natural | 8,363 | 2,933 | — | China 1,185; North Korea 584; Brazil 460. |
| Gypsum and plaster | 11,907 | 13,220 | 49 | West Germany 11,535; Italy 730; East Germany 638. |
| Iodine | 4 | 3 | NA | West Germany 1. |
| Kyanite and related materials | 3,338 | 2,254 | 185 | Republic of South Africa 1,216; France 603. |
| Lime | 3,114 | 858 | — | West Germany 451; Italy 197; Poland 95. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 594 | 607 | — | West Germany 338; India 200; Hungary 69. |
| Oxides and hydroxides | 142,720 | 134,807 | 97 | Turkey 52,006; Italy 21,891; Ireland 15,611. |
| Sulfate | 14,310 | 19,820 | — | West Germany 14,828; East Germany 4,982. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERAL—Continued | | | | | |
| Mica: | | | | | |
| Crude including splittings and waste | | 401 | 370 | — | Switzerland 144; West Germany 65; United Kingdom 50. |
| Worked including agglomerated splittings | | 301 | 304 | 9 | France 85; Brazil 80; Belgium 48. |
| Nitrates, crude | | 754 | 850 | — | West Germany 726; Poland 80. |
| Phosphates, crude | | 426,004 | 440,217 | 107,726 | Syria 145,255; Egypt 74,198. |
| Phosphorus, elemental | | 3,596 | 2,868 | — | Netherlands 2,737; West Germany 130. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 218 | 274 | — | Spain 121. |
| Iron oxides and hydroxides, processed | | 4,194 | 4,088 | 31 | West Germany 3,078; Italy 498; United Kingdom 108. |
| Potassium salts, crude | | 16,646 | 16,730 | — | All from West Germany. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | kilograms | 26,625 | 31,859 | 2,336 | Italy 8,871; Brazil 8,505; West Germany 6,064. |
| Synthetic | do. | 45,263 | 48,919 | 37,749 | Taiwan 7,250; Switzerland 2,273. |
| Pyrite, unroasted | | 800 | 818 | (2) | Italy 582; West Germany 236. |
| Quartz crystal, piezoelectric | kilograms | 2,593 | 11,121 | 5,851 | Belgium 3,931; Bulgaria 1,256. |
| Salt and brine | | 171 | 216 | (2) | France 122; West Germany 62. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 4,485 | 5,991 | — | Romania 2,400; East Germany 1,488; West Germany 1,392. |
| Sulfate, manufactured | | 3,341 | 1,258 | — | West Germany 1,234. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 46,902 | 44,306 | 16 | Italy 21,625; Republic of South Africa 4,801; France 2,992. |
| Worked | | 116,222 | 114,477 | 22 | Italy 78,591; West Germany 13,536; Yugoslavia 2,992. |
| Dolomite, chiefly refractory-grade | | 5,934 | 5,692 | (2) | West Germany 3,132; Italy 2,566; Yugoslavia 534. |
| Gravel and crushed rock | | 277,135 | 273,152 | 5 | West Germany 153,448; Hungary 64,796; Italy 33,334. |
| Limestone other than dimension | | 1,568 | 33,258 | — | Czechoslovakia 32,291; Yugoslavia 596. |
| Quartz and quartzite | | 9,255 | 8,081 | — | West Germany 6,665; Norway 820; Italy 178. |
| Sand other than metal-bearing | | 315,660 | 280,975 | 46 | West Germany 206,822; Czechoslovakia 42,931; Hungary 20,235. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 84,879 | 59,329 | — | West Germany 17,087; Czechoslovakia 14,886; Poland 13,717. |
| Colloidal, precipitated, sublimed | | 190 | 2,657 | (2) | West Germany 2,487; Hungary 108; Poland 62. |
| Dioxide | | 10,901 | 10,104 | (2) | West Germany 10,088. |
| Sulfuric acid | | 31,184 | 22,446 | 11 | Hungary 13,437; West Germany 4,449; Yugoslavia 2,499. |
| Talc, steatite, soapstone, pyrophyllite | | 12,980 | 9,953 | — | India 7,306; Finland 946; Netherlands 803. |
| Vermiculite, perlite, chlorite | | 37,804 | 43,387 | 78 | Hungary 27,024; Greece 8,865; Republic of South Africa 6,420. |

See footnotes at end of table.

TABLE 3—Continued

## AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERAL—Continued | | | | |
| Other: | | | | |
| Crude | 33,426 | 33,059 | 1,390 | West Germany 13,558; Yugoslavia 4,240; Hungary 2,851. |
| Slag and dross, not metal-bearing | 19,896 | 26,108 | — | West Germany 18,547; Italy 3,544; East Germany 1,360. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 3,236 | 1,775 | 517 | Trinidad and Tobago 1,038. |
| Carbon black | 29,559 | 31,635 | 47 | West Germany 15,388; Italy 10,734; Netherlands 2,090. |
| Coal: | | | | |
| Anthracite and bituminous thousand tons | 3,721 | 3,596 | 456 | Poland 1,767; Czechoslovakia 746; U.S.S.R. 595. |
| Briquets of anthracite and bituminous coal do. | 11 | 12 | — | West Germany 9; France 3. |
| Lignite including briquets do. | 331 | 330 | — | West Germany 185; East Germany 145. |
| Coke and semicoke | 832,557 | 814,780 | — | Czechoslovakia 286,130; West Germany 135,700; Poland 126,901. |
| Gas, natural: Gaseous million cubic meters | 4,013 | 5,220 | — | U.S.S.R. 5,079; West Germany 140. |
| Peat including briquets and litter | 86,268 | 89,876 | — | West Germany 69,589; U.S.S.R. 14,289; Hungary 2,882. |
| Petroleum: | | | | |
| Crude thousand 42-gallon barrels | 44,394 | 50,624 | — | Algeria 11,477; Libya 10,377; Nigeria 7,793. |
| Refinery products: | | | | |
| Liquefied petroleum gas do. | 1,553 | 1,702 | (2) | West Germany 814; U.S.S.R. 378; Czechoslovakia 280. |
| Gasoline do. | 5,215 | 4,747 | (2) | Italy 1,662; West Germany 1,051; Hungary 943. |
| Mineral jelly and wax do. | 130 | 145 | (2) | West Germany 63; Poland 44; Hungary 28. |
| Kerosene and jet fuel do. | 535 | 575 | (2) | Italy 235; Czechoslovakia 118; West Germany 80. |
| Distillate fuel oil do. | 8,146 | 8,410 | (2) | West Germany 2,332; Hungary 2,204; Czechoslovakia 1,058. |
| Lubricants do. | 5,091 | 2,607 | 8 | Yugoslavia 910; Czechoslovakia 481; West Germany 397. |
| Residual fuel oil do. | 4,227 | 4,329 | — | West Germany 2,093; Czechoslovakia 831; Yugoslavia 640. |
| Bitumen and other residues do. | 2,486 | 1,672 | — | West Germany 863; Yugoslavia 426; Hungary 310. |
| Bituminous mixtures do. | 110 | 49 | (2) | West Germany 26; Italy 9; Hungary 7. |
| Petroleum coke do. | 143 | 454 | 87 | West Germany 214; United Kingdom 65. |

[r] Revised. NA Not available.

[1] Table prepared by staff, International Data Section. Austria reports exports to Belgium and Luxembourg separately; therefore, these two countries are listed separately in this table rather than as "Belgium-Luxembourg."

[2] Less than 1/2 unit.

[3] May include vanadium.

[4] May include other precious metals.

TABLE 4

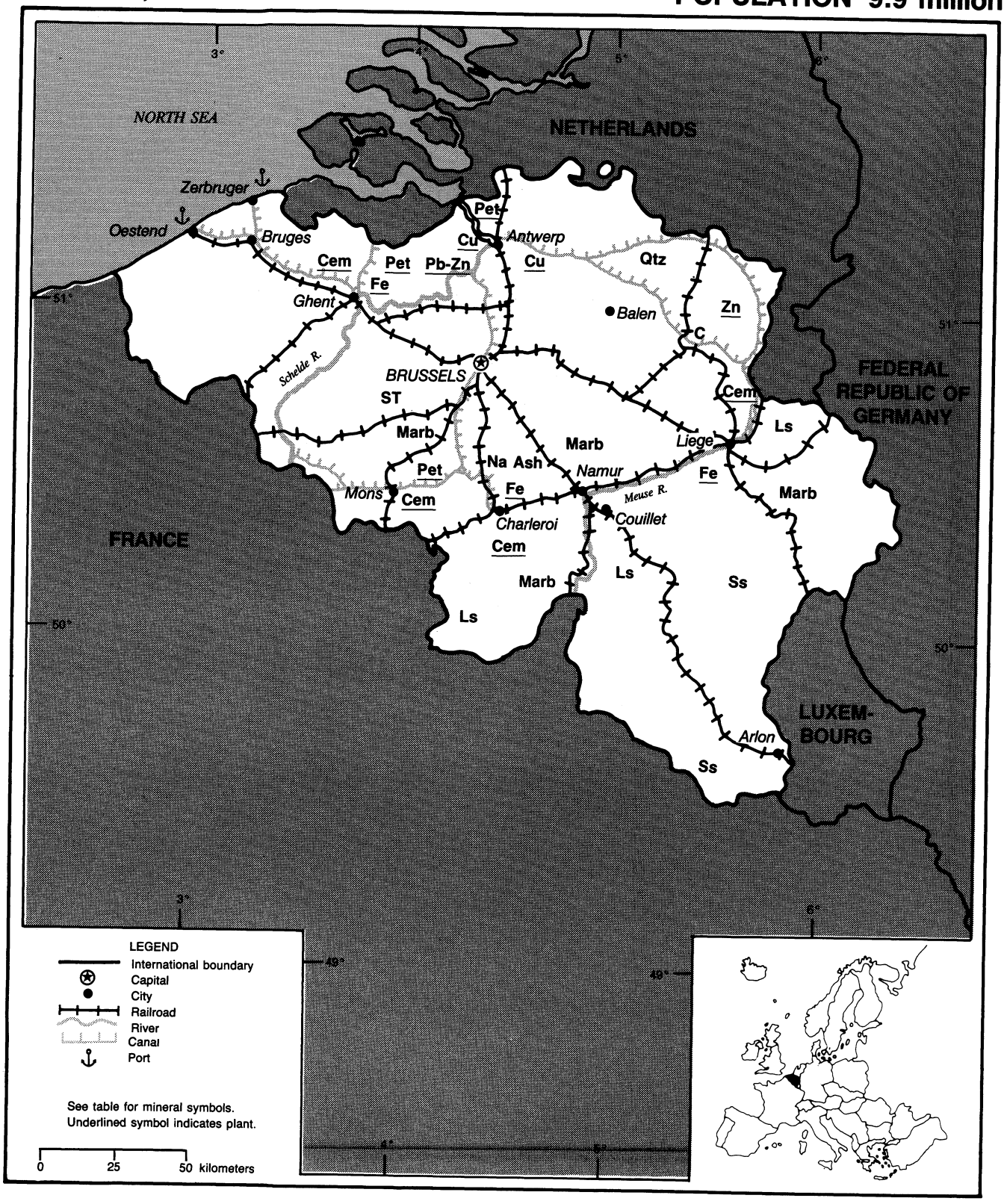
## AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies | Location of main facilities | Annual capacity |
|---|---|---|---|
| Aluminum | Austria Metall AG (AktienGesellschaft) | Smelter at Ranshofen | 135 |
| Do. | Salzburger Aluminium GmbH | Smelter at Lend | 15 |
| Cement | Perlmooser Zementwerke AG | Mannesdorf (Vienna), Rodaun, Kirchbichl, and Retznei | 3,000 |
| Do. | Gebr. Leube Portlandzementwerke | Gartenau | 700 |
| Do. | Zementwerke Eiberg | Eiberg | 600 |
| Do. | Wietersdorfer Zementwerke | Wietersdorf | 600 |
| Coal | Graz-Koflacher Eisenbahn- und Bergbau GmbH (KKB) | Oberdorf, Zangtal, and Karschacht | 1,700 |
| Do. | Salzach-Kohlenbergbau GmbH | Trimmelkam | 640 |
| Do. | Wolfsegg-Traunthaler Kohlenwerks AG | Ampfelwang | 510 |
| Copper | Austria Metall AG | Smelter and refinery at Brixlegg | 45 |
| Do. | do. | Smelter at Amstetten | 40 |
| Graphite | Grafitbergbau Kaisersberg Franz Mayr-Melnhof and Co. KG | Kaiserberg | 15 |
| Do. | Industrie- und Bergbaugesellschaft Pryssok and Co. KG | Trieben | 8 |
| Gypsum | Ersten Salzburger Gipsweerks-Gesellschaft KG | Moosegg-Abtenau | 300 |
| Do. | RIGIPS Austria GmbH | Wienern, Bad Aussee, and Puchberg | 255 |
| Iron and steel | Voest-Alpine Erzberg GmbH | Eisenerz (ore) | 3,500 |
| Do. | do. | Linz and Leoben (steel) | 4,780 |
| Lead-zinc | Bleiberger Bergwerks Union AG | Bleiberg (lead and zinc concentrate) | 33 |
| Do. | do. | Lead smelter and refinery at Arnoldstein | 18 |
| Do. | do. | Zinc smelter at Arnoldstein | 23 |
| Magnesite | Veitscher Magnesitwerke AG | Breitenau and Trieben-Hohentauern | 500 |
| Do. | do. | Plant at Trieben | 250 |
| Do. | RADEX Austria AG | Millstatteralpe | 300 |
| Do. | do. | Plant at Radentheim | 55 |
| Natural gas million cubic meters | Osterreichsche Mineralolverwaltungs AG (Government) | Gasfields in Vienna Basin | 850 |
| Do. do. | Rohoel-Aufsuchungs GmbH | Gasfields in Upper Austria | 680 |

# BELGIUM

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



THE MINERAL INDUSTRY OF

# BELGIUM-LUXEMBOURG

By Harold R. Newman

## BELGIUM

Mineral activities in Belgium date from prehistoric to modern times. These activities ranged from Neolithic flint workings, Gallic iron ore mining, and Middle Ages lead and zinc mining to the current industrial minerals sector.

Metallic mining reportedly reached its apogee between 1850 and 1870, after which mining activity steadily declined until 1978 when the last iron ore operations at Musson and Halanzy in the Belgian sector of the Lorraine basin were closed.

The refining of copper, zinc, and minor metals and the production of steel, all from imported materials, were the largest mineral industries in Belgium. Most base metal raw materials were imported from Africa. The mineral processing industry is a significant contributor to the Belgian economy.

Although the country of Belgium is relatively small in size, there is a large and rather vigorous industrial minerals sector. Belgium is an important producer of four groups of industrial minerals: carbonates, including limestone, dolomite, and whiting; synthetic materials in the form of soda ash and sodium sulfate; silica sand; and construction materials, including a range of different types of marble.

According to OECD data, the Belgian economy performed modestly in 1991, with a real gross domestic product (GDP) growth of 1.5% compared with the 3.7% growth of the previous year. Belgium's unemployment rate of 7.7% was below the EC average unemployment rate of 8.3%.

### Production

Bituminous coal and industrial minerals were the only commodities mined in significant amounts. Belgium, with a per capita steel production exceeding 1.1 mt per inhabitant, was second only to Luxembourg in per capita steel production.

The mineral processing industry, based on imported raw materials, was a significant contributor to the Belgium economy. The country not only produced copper, lead, and zinc metals, it was also a significant producer of cadmium, germanium, selenium, silver, and telurium as byproducts from the copper, lead, and zinc metal smelting and refinery operations. Also, complex industrial wastes were processed by various techniques to recover rare or precious metals.

### Trade

Belgium is a major exporting country and, in general, is one of Europe's most trade-intensive nations. This tends to place the economy in a sensitive position with regard to the vagaries of world demand and prices. Belgium, together with Luxembourg and the Netherlands, forms the Benelux customs union. Benelux, with 25 million inhabitants, has combined exports equal to 70% of Japan's exports, or one-half the total exports of the United States.

Belgium is also a partner in the Belgium-Luxembourg Economic Union (BLEU), which results in a close economic integration between the two countries. In March 1991, the two Governments extended the BLEU for 10 years.

The main mineral-related exports involved copper, lead and zinc and their associated byproducts, and iron and steel. Silica sand and marble, which are high-value industrial minerals, were also exported. *(See tables 1, 2, and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

The structure of the mineral industry in Belgium in 1991 is shown in table 4.

### Commodity Review

*Metals.*—The extraction and recovery of nonferrous metals are carried out in high-technology large-scale plants. Europe's largest electrolytic copper and zinc refineries are in Belgium, as is one of the continent's largest lead refineries.

Acec-Union Miniere (Acec-UM) consists of two operating units, Metallurgia Hoboken-Overpelt SA (MHO) and Vielle-Montagne SA (VM), and one trading and marketing unit, Sogem SA. The parent company of Acec-UM is Societe Generale de Belgique. Acec-UM was considered to be one of the largest zinc metal producers in the world and the leading copper refiner in Europe.

The total capacity of MHO's three operations at Hoboken, Olen, and Overpelt is shown in table 5. *(See table 5.)*

**Cadmium.**—VM reported that it was expected to decrease its production of 4N cadminum by 400 to 600 mt/a when the company closes the Overpelt zinc and cadmium plant in January 1992. The planned closure would reduce VM's European cadmium capacity from the current 1,900 mt/a to between 1,300 and

1,500 mt/a. The company's 1991 production was more than 1,800 tons. VM's cadmium production in Europe would be concentrated at its plant in Belen, Belgium.

**Cobalt.**—MHO was the world's leading producer of special cobalt products: salts, oxides, and metal powders. Since 1986, MHO has been operating a plant at Olen using advanced hydrometallurgical techniques for the recovery of cobalt from complex residues, scrap, and spent catalysts. The plant was reported to have the capacity to produce 900 mt/a of cobalt in the form of metal powders, oxides, and salts.

Another plant, with capacity of 1,000 mt/a cobalt metal, processed complex materials such as residues, slag, machined alloy scrap, and used catalysts with a cobalt content of less than 10% cobalt.

MHO announced it was discontinuing the production of cobalt salts effective the end of 1991 because of supply problems and low profit margins on sales. However, MHO was expected to continue production of metal powders and oxides.

**Copper.**—Acec-UM continued investigating options to diversify its supply of copper. The company had signed a 3-year contract with Mexicana de Cobre of Mexico for 50,000 mt/a of blister copper and also purchased 21% of Mexicana de Cananea SA, owner of Mexico's largest copper mine, in 1990.

However, Acec-UM still experienced a shortfall in deliveries of blister copper and copper anodes from its main supplier located in Zaire. This shortage resulted in a drop of 40,000 mt of crude copper available for refining in 1991. Secure and reliable sources of supply were a major concern of the company.

**Steel.**—Cockerill Sambre SA announced that its 1991 steelmaking activity was slightly below that of 1990. The company's production of 4.4 Mmt of steel accounted for 39% of Belgium's production. In turn, Belgium's total steel production of 11.4 Mmt accounted for about 8.3% of total EC steel production.

Cockerill and Arbed SA of Luxembourg announced that plans to merge their flat products operations had been canceled. Feasibility studies reportedly had shown that the two companies were incompatible on certain essential points. However, both companies stated that the decision would not affect any of their existing agreements.

Fabrique de Fer de Charleroi (Fafer) was spending almost $30 million to convert its 4-high rolling mill into a Steckel mill. The contract was awarded to Tippins Inc. of the United States. The conversion contract included the installation of computer-controlled technology and new electrical, mechanical, and fluid systems. The project, to be operational by mid-1992, was expected to improve product quality and productivity. It would also allow Fafer to roll stainless steel plates up to 3,050 mm wide and 4.77 mm thick.

**Lead-Zinc.**—Compagnie Chimique et Metallurgique Campine initiated construction of a recycling plant for lead batteries. The plant at Beerse would be able to treat up to 50,000 mt/a of lead batteries and was expected to be in operation by midyear 1992.

VM, founded 150 years ago, was one of the world's largest zinc refiners. VM operated zinc plants in Overpelt and Balen in Belgium and in Auby and Asturienne in France and a zinc mine in Sweden. VM's 100% subsidiary, Union Mines, Inc., operated the Union Zinc Inc. mines in the United States, in Gordonsville and Jefferson City, Tennessee.

VM announced it was closing the 100,000-mt/a zinc metal capacity electrolytic plant at Overpelt in early 1992 and was postponing the construction of a new zinc smelter at Balen until 1995. The Overpelt plant closure was part of a major reorganization of its operations by Acec-UM. Closure of the Overpelt plant will remove about 2% of world zinc metal supply.

**Industrial Minerals.**—Belgium has a vigorous industrial minerals sector and is an important producer of several industrial minerals. Significant amounts of aggregates, lime, and limestone are exported to neighboring countries while higher value industrial minerals, such as marble and silica sand, are exported worldwide. The country has a strong international base with some of the largest global corporate producers of industrial minerals, such as the Solvay Group and Lhoist Group, headquartered in Belgium.

**Aggregate.**—Belgium's leading aggregate producer was Gralex SA, whose annual output of almost 7 Mmt accounts for about 20% of domestic production of coarse aggregate and 75% of domestic production of lightweight aggregate. Gralex exports about 20% of its natural aggregate production.

**Cement.**—Belgian cement production capacity was about 8 Mmt/a. SA Cimenteries CBR is Belgium's largest cement producer and controls about 45% of the domestic market. CBR has five plants in various locations throughout the country.

The plants at Antoing and Lixhe produce gray clinker. The Ghent and Mons plants produce gray cement, and the plant at Harmignies produces a white cement. CBR has other subsidiary companies engaged in related activities such as ready-mix concrete and aggregates.

**Fumed Silica.**—Construction was continuing on a fumed silica plant to become operational in 1992. The plant was being built in Puurs for the European Darex Division of Grace Specialty Chemicals Co. Production capacity was to be 5,000 mt/a. Manufacturing reportedly 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 would be targeted at markets in North America and Asia.

**Silica Sand.**—Belgium has long been recognized as a producer of high-quality

quartz sand. Sibelco SA is the primary producer with three operations at Lommel, Maasmechelen, and Mol. The largest reserves are at Lommel.

The Lommel and Mol quartz sands have very similar characteristics that permit the production of a consistent product. The silica content is around 99.5% with the levels of $Fe_2O_3$ and $Al_2O_3$ content maintained within 0.025% and 0.2%, respectively. This product is used mainly in the glass industry; however, a market also exists in the metal-casting industry.

The Maasmechelen quartz sand, with a silica content of 99.8%, is used in glassware and the manufacture of silicon carbide.

**Potassium Sulfate-Sodium Sulfate.**—Belgium had two sodium sulfate producers: Tessenderlo Chemie SA, in Tessenderlo, and Union Chimique-Chemische Bedrijven (UCB), in Ghent. Tessenderlo is a major producer of both potassium sulfate and sodium sulfate while UCB produces only sodium sulfate.

Tessenderlo operated more than 20 Mannheim furnaces with an aggregate production capacity of 1 Mmt/a, of which 800,000 mt/a was potassium sulfate and 200,000 mt/a was sodium sulfate. The combined capacity of UCB's three Mannheim furnaces is 24,000 mt/a of sodium sulfate.

The detergent, glass, and paper industries are the major consumers of the production from the two companies. Most of the output is for the domestic market; however, nominal quantities are exported to France, the Netherlands, and the United Kingdom.

**Stone.**—Belgium is recognized worldwide for the diversity and quality of its dimension stone. The so-called "petit granit," actually a dark blue-gray crinoidal limestone, is one of the most important facing stones the country produces. There were about 60 quarries, mostly small family operations, which produced dimension stone.

The country has been an important producer of marble for more than 2,000 years. All of the marble quarries are in the Wallonia region. Red, black, and gray are the three principal color ranges of the marble from Walloon.

Belgium's specialty is the famous black marble produced at Golzinne from the underground workings of Les Carrieres de Marbre Noir de Golzinne SA. Three grades, starting with grade A, are produced. Grade A is the premier material and is the one most in demand. This marble is totally black with no traces of veining or spotting. The company mines about 500 $m^3$/a from five marble horizons.

Red and gray marble production is mainly in the Philippville area where there are four quarries. Most of the material produced is crude marble, except at one quarry where red marble is dressed and polished. Most of the marble, either black, red, or gray, is exported.

**Zeolite.**—Tessenderlo Chemie and Chimique Prayon Rupel SA announced plans for a joint-venture project to construct a synthetic zeolite plant near Liege. The plant would have a capacity of 60,000 mt/a of detergent-grade zeolite 4A and would cost an estimated $29 million. Completion of construction and commissioning of the plant was scheduled for the first part of 1992.

The plant, using the W.R. Grace process, would transform sodium silicate into zeolite 4A. Prayon and Tessenderlo would produce the sodium silicate, and Tessenderlo would provide the soda ash requirements.

***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 coking and slow-burning coal for the domestic industry. However, Belgium obtains most of its coal requirements from the Republic of South Africa.

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. Although there originally were two mining districts, one in Wallonia and one in Flanders, only two of Flanders' mines were in operation at yearend 1991. 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.

**Natural Gas.**—Distrigaz, 50% owned by the national Government, controlled all aspects of natural gas in Belgium. Almost all of the country's gas requirements were satisfied by imports.

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

**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 throughput of about 306,000 barrels per calendar day of petroleum, or 49% of the country's capacity. Production at the refinery was upgraded and diversified by the construction of new processing plants.

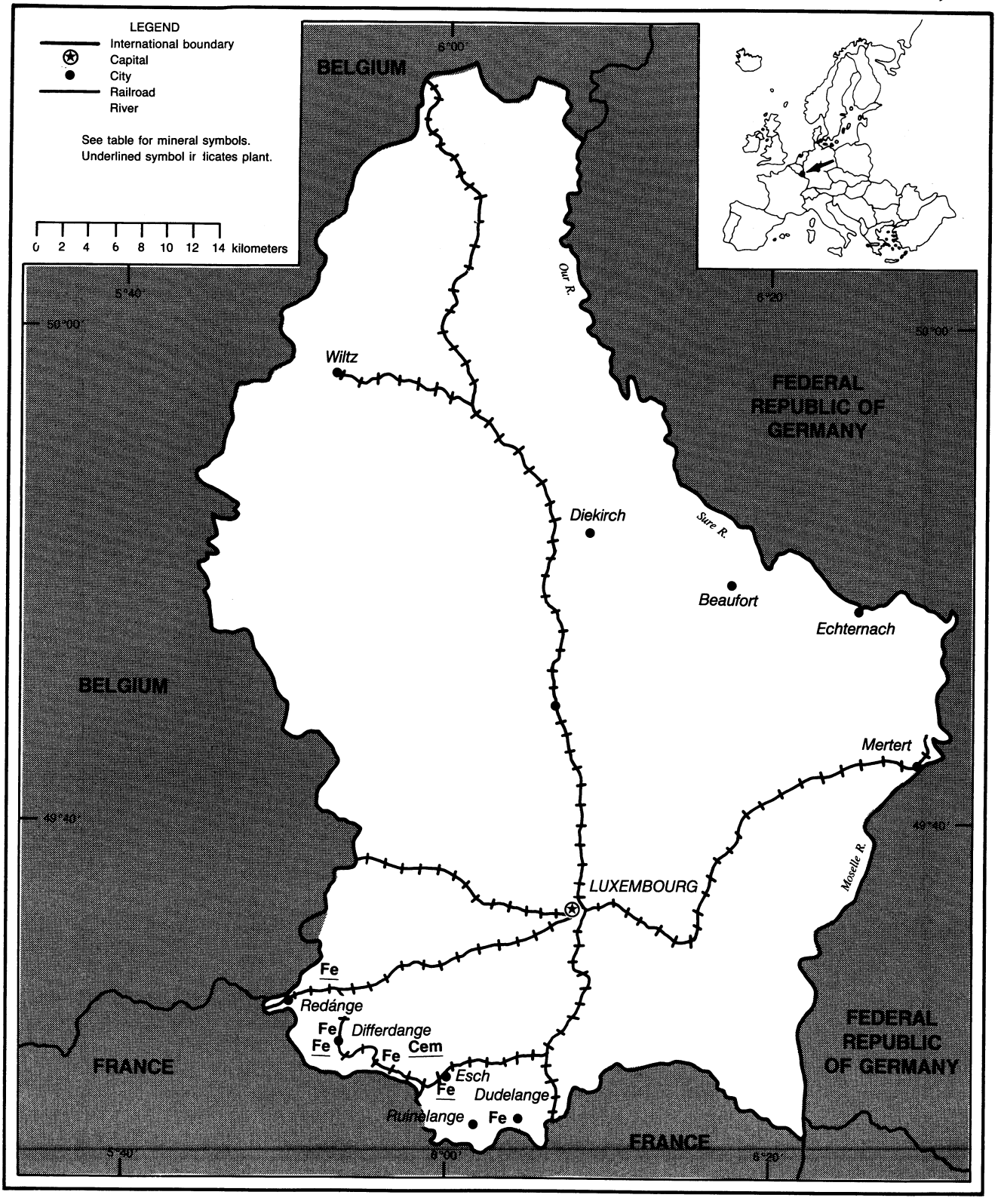
## Infrastructure

The Belgian National Railways operates 3,667 km of 1.435-standard-gauge track. The country has 103,396 km of highways and 2,043 km of inland waterways in regular commercial use. The country's major ports are Antwerp, Brugge, Ghent, Oostende, and Zeebrugge.

With an annual turnover of 95 Mmt Antwerp is a world-class port. It is an important transit center handling general

# LUXEMBOURG

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



cargo and bulk cargo to and from various locations throughout the world.

In addition, Belgium has 1,167 km of refined petroleum products pipeline, 161 km of crude petroleum 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. Belgium will remain a country highly dependent on foreign trade and will maintain its very high export-to-production ratio.

## LUXEMBOURG

Luxembourg's mineral industry is dominated by one steel company, Arbed SA, which has domestic and foreign subsidiaries. Steel is the main export commodity. Mining in Luxembourg is represented by small industrial mineral operations that produce material for domestic consumption. These minerals include dolomite, limestone, sand and gravel, and slate.

According to OECD data, Luxembourg's real GDP growth rate was 3.1% in 1991. The country sustained modest inflation, and its unemployment rate of 1.4% was the lowest of the EC member states.

Luxembourg is a partner in the Belgium-Luxembourg Economic Union (BLEU), which has been in place since 1921. At yearend both countries had agreed to a further 10 years of economic union under the aegis of the BLEU. There is also close economic integration with the Netherlands and with other EC member countries.

The industrial sector, until recently dominated entirely by steel, was becoming increasingly diversified. The financial sector's rapid growth over the past two decades has more than compensated for the relative decline of the steel industry during the above time period. Luxembourg's position as a major financial center was further strengthened by the deregulation of the Luxembourg capital market in July 1990.

The steel and financial sectors continued to contribute about 25% of GDP. Steel's share was a little less than 8%. The country, despite its small size, ranked 30th in world steel production. The country ranked first worldwide with its per capita steel production of 9 mt/a per inhabitant.

Luxembourg's main export commodity is steel with EC countries absorbing approximately three-quarters of Arbed's output. The U.S. markets accounted for an additional 4% in 1991. Arbed specializes in the production of large beams used in construction of skyscrapers. *(See table 6.)*

### Structure of the Mineral Industry

The mineral industry is dominated by one private steel company, Arbed, which had domestic and foreign subsidiaries and part foreign ownership. Production depends on scrap and imported ores. There is no mining in Luxembourg except for some small industrial minerals operations.

Mining and mineral policy is in accordance with the Napoleonic Mining Law of 1810. Regulations are enforced by the Government's Inspection du Travail et des Mines. The Ministry of Economics published annual statistics on the mining and minerals industry. *(See table 7.)*

### Commodity Review

*Metals.*—The iron and steel industry was the single most important industrial sector of the economy. The production and export of steel have traditionally played major roles in Luxembourg's economy. Steel accounted for about 35% of nonservice-related exports, almost 8% of GDP, and 5% of the work force. Arbed specializes in the production of long and round steel products. Steelplate was produced by Arbed Dudelange.

Arbed, faced with the slump in the steel industry, halted production at several of its installations for a brief period in late 1991. The company, whose profits reportedly fell by 47% in the first 6 months of 1991, was expected to undergo further restructuring and rationalization. Government ownership in Arbed amounted to 31% of voting shares.

Arbed and Usinor-Sacilor of France were reportedly setting up a joint-venture company to sell and market steel foundation and piling products. The venture would take over the business of International Sheet Piling, an Arbed subsidiary. The combined hot-rolled sheet piling and pipe production of Arbed's plant at Esch-Belval, Luxembourg, and Usinor-Sacilor's plant at Rombas, France, would be about 300,000 mt/a.

In early 1991, the two companies had set up a joint-venture company, Europrofil, to cover sales and marketing of beams and sections manufactured individually by the two companies.

*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 from small open pits and quarries by independent operators for domestic consumption. Luxembourg imported all its requirements for fertilizers and other industrial minerals.

*Mineral Fuels.*—Luxembourg met virtually all of its energy needs through imports. Its major 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 was imported from other neighboring countries. About 85% of natural gas was imported via Belgium. France supplied the remainder of the country's gas needs.

## Infrastructure

Luxembourg National Railways operates 270 km of 1.435-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-long refined products pipeline. The major river port of this landlocked country is at Mertert on the Moselle River.

## Outlook

For the near future, the level of Luxembourg's steel exports is expected to remain fairly constant. The Government's policy of industrial diversification to prevent the country from becoming overdependent on one sector is expected to continue. Future growth will depend on the Government's success in attracting new industry to the country.

## OTHER SOURCES OF INFORMATION

### Agencies

Administration des Mines, Ministere des Affaires Economiques (administration of Mines, Minister of Economic Affairs) Brussels
Institute National des Industries Extractives (National Institute of Extractive Industries) Liege
Service Geologique de Belgique (Belgian Geological Survey) Brussels
L'Inspection du Travail et des Mines (Office of Labor and Mine Inspection) Luxembourg
Service Geologique (Geological Survey) Luxembourg

### Publications

Annales des Mines de Belgique: Institute National des Industries Extractives et del' Administration des Mines (Mining Chronicle of Belgium), Liege, monthly.
Bulletin de la Banque Nationale de Belgique (Bulletin of the National Bank of Belgium), Brussels, monthly.
Bulletin de Statistique: Institute National de Statistique (Statistical Bulletin), Brussels, monthly.
Statistiques Industrielles: Institute National de Statistique (Industrial Statistics), Brussels, monthly.
Annuaire Statistique du Luxembourg: Service Central de la Statistique et des Etudes Economiques (Statistical and Economic Annual of Luxembourg), Luxembourg.

TABLE 1

## BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum | | 6,300 | 7,464 | 7,355 | 7,905 | [3]7,391 |
| Arsenic, white e | | 3,500 | 3,500 | 3,500 | 3,000 | 2,500 |
| Bismuth, metal e | | 865 | 795 | 800 | 750 | 700 |
| Cadmium, smelter | | 1,308 | 1,836 | 1,746 | 1,956 | [3]1,807 |
| Copper: | | | | | | |
| Blister: e | | | | | | |
| Primary | | 100 | 200 | 200 | 200 | 200 |
| Secondary | | 92,100 | 93,200 | 93,400 | 103,00 | 105,00 |
| Total | | 92,200 | 93,400 | 93,600 | 103,200 | 105,200 |
| Refined, primary and secondary, including alloys | | 475,908 | 504,333 | 564,464 | 542,458 | [3]478,379 |
| Iron and steel: | | | | | | |
| Pig iron | thousand tons | 8,244 | 9,147 | 9,437 | 9,416 | [3]9,354 |
| Ferroalloys: Electric furnace ferromanganese e | | r900 | r950 | r950 | r990 | 980 |
| Steel: | | | | | | |
| Crude | thousand tons | 9,787 | 11,222 | 10,948 | 11,425 | [3]11,338 |
| Semimanufactures | do. | 7,417 | 7,417 | e7,200 | e2,305 | [3]2,032 |
| Lead: | | | | | | |
| Smelter: e | | | | | | |
| Primary[4] | | 59,400 | 64,100 | 70,000 | 73,500 | 65,000 |
| Secondary[5] | | 18,500 | 22,000 | 22,800 | 21,800 | 20,000 |
| Total | | 77,900 | 86,100 | 92,800 | 95,300 | 85,000 |
| Refined: | | | | | | |
| Primary | | 71,100 | 83,200 | e80,000 | e81,000 | 70,000 |
| Secondary | | 36,936 | 43,361 | e46,000 | e42,000 | 30,000 |
| Total | | 108,036 | 126,561 | e126,000 | e123,000 | 100,000 |
| Selenium e | | 230 | 250 | 250 | 250 | 250 |
| Tin: Secondary | | 3,900 | 4,972 | e5,000 | 6,063 | [3]4,426 |
| Zinc: | | | | | | |
| Slab: | | | | | | |
| Primary | | 284,500 | 298,100 | 286,900 | e292,200 | 348,780 |
| Secondary (remelted zinc) | | 24,080 | 25,658 | e25,500 | e26,000 | 36,000 |
| Total | | 308,580 | 323,758 | e312,400 | e318,200 | 384,780 |
| Powder | | 32,556 | 37,708 | e39,000 | e52,630 | [3]52,416 |
| Other, nonferrous: Precious metals, unworked n.e.s.[6] | kilograms | 1,241 | r1,234 | r1,225 | r639 | [3]1,306 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite e | | 40,000 | 35,000 | 40,000 | 35,000 | 35,000 |
| Cement, hydraulic | thousand tons | 5,689 | 6,451 | e6,900 | 6,929 | [3]7,184 |
| Clays: Kaolin e | do. | 45 | [3]40 | 35 | 35 | [3]260 |
| Lime and dead-burned dolomite: Quicklime | do. | 1,764 | 1,892 | e1,900 | 2,014 | [3]2,021 |
| Nitrogen: N content of ammonia | do. | 269 | 365 | e290 | e300 | 300 |
| Phosphates: Thomas slag, gross weight e | do. | 175 | 170 | 165 | 160 | 160 |
| Sodium compounds: | | | | | | |
| Soda ash | | 447,972 | 378,960 | e380,000 | e375,000 | 380,000 |
| Sulfate e | | 260,000 | 255,000 | 255,000 | 250,000 | 260,000 |

See footnotes at end of table.

TABLE 1—Continued

## BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Stone, sand and gravel: | | | | | | |
| Calcareous: | | | | | | |
| Dolomite | thousand tons | 4,072 | 4,684 | e5,000 | e4,300 | 3,4,034 |
| Limestone | do. | 23,616 | 25,872 | e26,000 | 31,845 | 3,33,255 |
| Marble: | | | | | | |
| In blocks | cubic meters | 745 | 576 | e650 | 508 | 3,358 |
| Crushed and other | | 72 | 65 | e65 | e440 | 3,1,340 |
| Petit granite (Belgian bluestone): | | | | | | |
| Quarried | thousand cubic meters | 515 | 959 | e1,350 | e1,010 | 3,864 |
| Sawed | do. | 53 | 64 | e65 | 71 | 3,68 |
| Worked | do. | 12 | 12 | e12 | 11 | 3,12 |
| Crushed and other | do. | 414 | 652 | e700 | e540 | 3,598 |
| Porphyry, all types | thousand tons | 3,464 | 3,395 | e3,400 | 3,996 | 3,3,972 |
| Quartz and quartzite | | 205,196 | 277,000 | e200,000 | 204,308 | 3,402,780 |
| Sandstone: | | | | | | |
| Rough stone including crushed | thousand tons | 1,990 | 2,248 | e2,260 | 2,092 | 3,2,624 |
| Paving | | 9,912 | 13,152 | e13,500 | 56,408 | 3,39,044 |
| Sand and gravel: | | | | | | |
| Construction sand | thousand tons | 7,260 | 8,988 | e9,200 | 9,499 | 3,9,163 |
| Foundry sand | do. | 588 | 595 | e600 | 540 | 3,489 |
| Dredged sand | do. | 928 | 788 | e750 | 678 | 3,2,305 |
| Glass sand | do. | 1,680 | 1,845 | e2,000 | 2,067 | 3,2,065 |
| Other sand | do. | 2,376 | 2,448 | e2,600 | 2,067 | 3,2,685 |
| Gravel, dredged | do. | 5,856 | 5,832 | e4,870 | 4,231 | 3,4,192 |
| Sulfur, byproduct: e | | | | | | |
| Elemental | do. | 155 | 155 | 160 | 160 | 160 |
| Other forms | do. | 145 | 155 | 160 | 150 | 140 |
| Total | do. | 300 | 310 | 320 | 310 | 300 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon black[e] | | 1,800 | 1,900 | 1,800 | 1,700 | 1,700 |
| Coal: Bituminous | thousand tons | 4,356 | 2,487 | 1,916 | r1,037 | 634 |
| Coke, all types | do. | 5,232 | 5,544 | e3,200 | 5,421 | 3,4,481 |
| Gas: | | | | | | |
| Manufactured | thousand cubic meters | r674 | r689 | r510 | r623 | 3,474 |
| Natural[e] | do. | r37 | r40 | r38 | r35 | 30 |
| Petroleum refinery products: | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 12,457 | 13,135 | e6,090 | e5,220 | 5,200 |
| Naphtha | do. | 12,647 | e12,200 | 13,626 | 11,221 | 3,6,673 |
| Gasoline | do. | 41,283 | 41,848 | 45,433 | 44,803 | 3,42,840 |
| Jet fuel and kerosene | do. | 10,332 | 12,584 | e13,330 | 11,757 | 3,10,927 |
| Distillate fuel oil | do. | 67,687 | 68,416 | 72,466 | 72,466 | 3,74,175 |
| Residual fuel oil | do. | 51,771 | 43,746 | 35,265 | 34,332 | 3,10,589 |
| Bitumen, asphaltic | do. | 3,953 | 4,448 | e4,800 | e4,680 | 4,500 |
| Other | do. | 10,297 | 11,985 | e12,000 | e11,000 | 10,000 |

See footnotes at end of table.

TABLE 1—Continued

## BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum refinery products—Continued: | | | | | | |
| Refinery fuel and losses[e] | thousand 42-gallon barrels | 10,516 | 10,660 | [r]10,800 | [r]10,000 | 9,000 |
| Total | do. | 220,943 | 219,022 | [r]213,810 | [r]205,479 | 173,904 |

[e]Estimated. [r]Revised.

[1]Table includes data available through July 31, 1992.

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

3Reported 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 | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 7 | 31 | — | France 28; Zaire 1. |
| Alkaline-earth metals | 116 | 100 | — | Canada 39; United Kingdom 23; West Germany 20. |
| Aluminum: | | | | |
| Ore and concentrate | 1,713 | 1,725 | — | United Arab Emirates 1,088; West Germany 256; France 195. |
| Oxides and hydroxides | 2,143 | 1,079 | — | United Kingdom 425; Denmark 158; Netherlands 6. |
| Ash and residue containing aluminum | 30,338 | 17,103 | 1,460 | West Germany 6,286; Spain 2,740; France 2,210. |
| Metal including alloys: | | | | |
| Scrap | 74,729 | 67,770 | — | France 24,208; West Germany 19,289; Netherlands 17,324. |
| Unwrought | 35,351 | 32,897 | — | West Germany 18,574; France 5,307; Netherlands 2,151. |
| Semimanufactures | 388,498 | 373,084 | 18,442 | France 83,104; West Germany 81,890; Netherlands 56,090. |
| Antimony: | | | | |
| Ore and concentrate | 7 | 265 | — | Hong Kong 99; United Kingdom 95. |
| Ash and residue containing antimony | 210 | 134 | — | All to United Kingdom. |
| Metal including alloys, all forms[2] | 16 | 44 | — | India 40; Bangladesh 2; Honduras 1. |
| Arsenic: Metal including alloys, all forms | 7 | 4 | — | Netherlands 2; West Germany 2. |
| Beryllium: Metal including alloys, all forms | 16 | 39 | — | West Germany 36; France 3. |
| Cadmium: Metal including alloys, all forms | 1,643 | 1,168 | (3) | Japan 382; France 297; West Germany 297. |
| Chromium: | | | | |
| Ore and concentrate | 290 | 12,484 | — | France 5,163; Italy 1,627; West Germany 1,436. |
| Oxides and hydroxides | 327 | 322 | — | West Germany 172; France 89. |
| Metal including alloys, all forms | 82 | 65 | — | West Germany 32; Netherlands 15; France 1. |
| Cobalt: | | | | |
| Ore and concentrate | 2 | 12 | — | All to France. |
| Ash and residue containing cobalt | 31 | 341 | 7 | Netherlands 56. |
| Metal including alloys, all forms[2] | 56 | 22 | 2 | France 8; Austria 5; West Germany 3. |
| Columbium and tantalum: | | | | |
| Ash and residue containing columbium and tantalum | 324 | 836 | — | West Germany 824. |
| Metals including alloys, all forms: | | | | |
| Columbium (niobium)[4] | 23 | 68 | — | France 33; Netherlands 19; West Germany 11. |
| Tantalum | 4 | 2 | — | Indonesia 1; West Germany 1. |
| Copper: | | | | |
| Ore and concentrate | 113 | 95 | — | Spain 59; France 28; Turkey 5. |
| Matte and speiss including cement copper | 110 | 438 | — | Spain 174; Netherlands 146; West Germany 50. |
| Sulfate | 386 | 515 | — | France 161; Netherlands 76; Sao Tome and Principe 72. |
| Ash and residue containing copper | 1,660 | 2,506 | 21 | Spain 491; West Germany 468; France 406. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Copper—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 65,894 | 55,629 | — | Netherlands 19,058; West Germany 18,385; France 3,920. |
| Unwrought | 11,004 | 239,822 | 83 | France 116,432; West Germany 34,771; United Kingdom 29,389. |
| Semimanufactures | 353,050 | 345,292 | 1,091 | West Germany 104,024; France 91,499; Netherlands 38,426. |
| Gallium, indium, thallium: Metals including alloys, all forms | 26 | 22 | 8 | Japan 10; United Kingdom 3. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $7,484 | $5,476 | — | United Kingdom $4,222; Netherlands $1,092. |
| Metal including alloys, unwrought and partly wrought[2] kilograms | 36,066 | 18,829 | 16 | United Kingdom 6,448; Switzerland 5,504; France 1,821. |
| Hafnium: Metal including alloys, all forms value, thousands | $1 | — | | |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 11,373 | 15,791 | — | France 8,526; Netherlands 4,349; Spain 24. |
| Pyrite, roasted | 95,256 | 101,117 | — | France 27,688; Spain 26,212; West Germany 25,984. |
| Metal: | | | | |
| Scrap | 1,051,534 | 869,403 | 752 | France 318,193; Turkey 146,030; Netherlands 143,178. |
| Pig iron, cast iron, related materials | 23,001 | 15,367 | 1 | France 7,627; Netherlands 5,238; West Germany 1,033. |
| Ferroalloys: | | | | |
| Ferrochromium | 4,981 | 2,130 | — | France 990; West Germany 575; Sweden 172. |
| Ferrocolumbium | 38 | 25 | — | West Germany 7; Sweden 2. |
| Ferromanganese | 45,842 | 22,624 | — | France 6,917; West Germany 6,560; Sweden 2,500. |
| Ferronickel | 1 | 3 | — | India 1; West Germany 1; United Kingdom 1. |
| Ferrophosphorus | 67 | 70 | — | France 36; United Kingdom 24; Netherlands 10. |
| Ferrosilicochromium | — | 4 | — | All to Switzerland. |
| Ferrosilicomanganese | 8,939 | 3,609 | — | Sweden 2,700; West Germany 649. |
| Ferrosilicon | 3,792 | 2,439 | — | France 1,185; West Germany 835; Spain 186. |
| Ferrotitanium and ferrosilicotitanium | 745 | 330 | — | France 126; West Germany 102; Sweden 80. |
| Ferrotungsten and ferrosilicotungsten | — | 5 | — | France 2; West Germany 2. |
| Silicon metal | 193 | 616 | 2 | France 312; Spain 199; United Kingdom 9. |
| Unspecified | 305 | 324 | — | France 154; West Germany 93; United Kingdom 11. |
| Steel, primary forms thousand tons | 583 | 835 | 104 | West Germany 361; France 110. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel—Continued: | | | | | |
| Metal—Continued: | | | | | |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | thousand tons | 7,149 | 7,196 | 290 | France 2,405; West Germany 1,617; Italy 896. |
| Clad, plated, coated | do. | 1,934 | 1,979 | 9 | West Germany 529; France 515; Netherlands 212. |
| Of alloy steel | do. | 539 | 593 | 7 | France 212; West Germany 112; Italy 106. |
| Bars, rods, angles, shapes, sections | do. | 2,936 | 3,099 | 204 | West Germany 820; France 678; Netherlands 411. |
| Rails and accessories | do. | 106 | 105 | 18 | France 23; Italy 9. |
| Wire | do. | 467 | 455 | 47 | France 96; West Germany 90; Netherlands 44. |
| Tubes, pipes, fittings | do. | 485 | 485 | 6 | West Germany 91; France 90; Netherlands 69. |
| Lead: | | | | | |
| Ore and concentrate | | 40 | — | | |
| Oxides | | 498 | 155 | — | West Germany 52; France 19; Netherlands 7. |
| Ash and residue containing lead | | 5,975 | 5,117 | — | West Germany 3,037; France 1,941. |
| Metal including alloys: | | | | | |
| Scrap | | 19,341 | 14,077 | — | France 10,640; Netherlands 1,948. |
| Unwrought | | 69,137 | 50,462 | 1 | West Germany 15,941; France 10,908; Netherlands 9,383. |
| Semimanufactures | | 25,820 | 25,841 | 1 | Netherlands 9,292; United Kingdom 5,065; France 4,903. |
| Lithium: Oxides and hydroxides | | — | 41 | — | Netherlands 20; France 18. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 404 | 367 | — | West Germany 105; Italy 103; United Kingdom 43. |
| Unwrought | | 54 | 44 | — | France 25; West Germany 10; United Kingdom 9. |
| Semimanufactures | | 1,404 | 610 | 3 | West Germany 335; Italy 132; United Kingdom 94. |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 4,282 | 335 | — | France 269; West Germany 29; Netherlands 26. |
| Metal including alloys, all forms | | 2,185 | 2,489 | — | West Germany 874; France 581; Norway 577. |
| Mercury | | 5 | 37 | — | Netherlands 32; Austria 4. |
| Molybdenum: | | | | | |
| Ore and concentrate: | | | | | |
| Roasted | | 15,435 | 15,966 | 2,311 | United Kingdom 3,287; West Germany 2,713. |
| Unroasted | | 611 | 1,729 | — | United Kingdom 656; France 470; West Germany 254. |
| Oxides and hydroxides | | 76 | 195 | — | France 86; United Kingdom 42; West Germany 38. |
| Ash and residue containing molybdenum | | 260 | 37 | 18 | United Kingdom 19. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Molybdenum—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 70 | 11 | — | Netherlands 5; Austria 2; France 2. |
| Unwrought | | 74 | 64 | — | United Kingdom 35; France 14. |
| Semimanufactures | | 77 | 121 | — | France 40; Netherlands 28; West Germany 27. |
| Nickel: | | | | | |
| Ore and concentrate | | 1,402 | 50 | — | All to Netherlands. |
| Matte and speiss | | 49 | 4 | — | Do. |
| Oxides and hydroxides | kilograms | 12 | 400 | — | Hong Kong 200; Czechoslovakia 100; Poland 100. |
| Ash and residue containing nickel | | 1,306 | 979 | 19 | Austria 420; Spain 110; West Germany 63. |
| Metal including alloys: | | | | | |
| Scrap | | 1,206 | 2,191 | 108 | Netherlands 1,251; West Germany 649; France 154. |
| Unwrought | | 2,555 | 788 | 83 | Netherlands 194; United Kingdom 103. |
| Semimanufactures | | 285 | 438 | 1 | Netherlands 194; West Germany 140; United Kingdom 22. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $8,789 | $8,166 | — | United Kingdom $6,982. |
| Metals including alloys, unwrought and partly wrought, all forms: | | | | | |
| Palladium | kilograms | 9,970 | 10,832 | 6,788 | United Kingdom 1,781; West Germany 1,079. |
| Platinum | do. | 3,730 | 3,760 | 1,560 | United Kingdom 836; Switzerland 474. |
| Rhodium | do. | 439 | 319 | 86 | Japan 94; United Kingdom 68. |
| Iridium, osmium, ruthenium | do. | 987 | 4 | — | Netherlands 3; West Germany 1. |
| Rare-earth metals including alloys, all forms | | (3) | 64 | — | France 37; Italy 21. |
| Silicon, high-purity | value, thousands | $2 | $3 | $3 | |
| Silver: | | | | | |
| Ore and concentrate[5] | value, thousands | $105 | $96 | — | West Germany $94; Netherlands $2. |
| Waste and sweepings[5] | do. | 3,675 | 2,617 | 296 | United Kingdom $1,022; West Germany $944. |
| Metal including alloys, unwrought and partly wrought | | 1,299 | 1,284 | 194 | United Kingdom 422; West Germany 209; Singapore 207. |
| Tellurium, elemental | | 102 | 85 | 5 | West Germany 37; United Kingdom 16; Finland 13. |
| Tin: | | | | | |
| Ore and concentrate | | 18 | — | | |
| Oxides | kilograms | — | 100 | — | All to France. |
| Ash and residue containing tin | | 1,610 | 1,089 | — | United Kingdom 541; Netherlands 297; West Germany 252. |
| Metal including alloys: | | | | | |
| Scrap | | 53 | 14 | — | West Germany 12; Sweden 1. |
| Unwrought | | 3,992 | 3,639 | — | France 996; West Germany 854; Netherlands 764. |
| Semimanufactures | | 282 | 248 | — | West Germany 94; Austria 37; Netherlands 26. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Titanium: | | | | |
| Ore and concentrate | 168 | 1 | — | Mainly to Zaire. |
| Ash and residue containing titanium | 3,386 | 8,485 | — | France 8,459. |
| Oxides | 42,434 | 27,228 | 3,547 | West Germany 11,116; France 2,378. |
| Metal including alloys: | | | | |
| Scrap | 57 | 41 | — | France 22; West Germany 13. |
| Unwrought | 27 | 42 | — | France 20; Italy 20. |
| Semimanufactures | 207 | 166 | 6 | Canada 35; West Germany 26; France 20. |
| Tungsten: | | | | |
| Ore and concentrate | (3) | 67,609 | — | Mauritania 67,548. |
| Metal including alloys: | | | | |
| Scrap | 73 | 43 | (3) | Netherlands 26; West Germany 16. |
| Unwrought | 33 | 58 | (3) | United Kingdom 41; France 8; Italy 5. |
| Semimanufactures | 52 | 56 | — | Netherlands 32; France 9; West Germany 5. |
| Uranium and thorium: | | | | |
| Ore and concentrate kilograms | — | 400 | — | Italy 300; Côte d'Ivoire 100. |
| Metal including alloys, all forms: | | | | |
| Uranium | 52 | 51 | — | Mainly to France. |
| Thorium | (3) | (3) | — | All to West Germany. |
| Vanadium: | | | | |
| Ore and concentrate | 2 | 5,692 | — | West Germany 4,028. |
| Oxides and hydroxides | 202 | 66 | 17 | Czechoslovakia 36; Netherlands 8. |
| Ash and residue containing vanadium | — | 10 | — | All to Netherlands. |
| Metal including alloys, all forms | 2 | 1 | — | All to France. |
| Zinc: | | | | |
| Ore and concentrate | 84,368 | 50,881 | — | France 50,840. |
| Oxides | 8,014 | 7,388 | — | France 2,925; West Germany 1,841; Italy 1,038. |
| Blue powder | 23,537 | 27,121 | — | West Germany 13,431; France 7,809; Italy 1,287. |
| Ash and residue containing zinc | 38,093 | 51,173 | — | Netherlands 20,354; France 14,538; West Germany 11,078. |
| Metal including alloys: | | | | |
| Scrap | 20,166 | 18,881 | — | France 6,366; Taiwan 5,551; West Germany 3,731. |
| Unwrought | 204,926 | 181,954 | 2,929 | West Germany 68,588; France 22,324; Hong Kong 8,270. |
| Semimanufactures | 32,071 | 8,670 | 154 | West Germany 4,716; France 1,706; Switzerland 481. |
| Zirconium: | | | | |
| Ore and concentrate | 678 | 626 | — | Netherlands 413; Spain 95; France 85. |
| Oxides | 1 | 3 | 2 | France 1. |
| Ash and residue containing zirconium | — | 25 | — | All to Netherlands. |
| Metal including alloys: | | | | |
| Scrap | 1 | — | | |
| Unwrought | (3) | 16 | — | All to France. |
| Semimanufactures | 20 | 15 | (3) | West Germany 6; France 4; Switzerland 4. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Other: | | | | | |
| Ores and concentrates | | 47 | 2,931 | — | France 2,923; Portugal 6; India 2. |
| Oxides and hydroxides | | 2,749 | 2,298 | 74 | France 710; West Germany 587; Italy 379. |
| Ashes and residues | | 66,158 | 20,348 | — | West Germany 2,251; Netherlands 1,576; United Kingdom 305. |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, n.e.s.: | | | | | |
| Natural: Corundum, emery, pumice, etc. | | 992 | 961 | — | Netherlands 541; France 235; United Kingdom 22. |
| Artificial: | | | | | |
| Corundum | | 1,646 | 2,774 | 2 | Netherlands 1,378; West Germany 836; France 400. |
| Silicon carbide | | 10,155 | 10,684 | 2 | Italy 5,151; France 2,661; Spain 1,134. |
| Dust and powder of precious and semiprecious stones excluding diamond | value, thousands | $41 | $13 | — | Netherlands $8; West Germany $5. |
| Grinding and polishing wheels and stones | | 3,793 | 3,829 | 38 | France 2,127; West Germany 499; United Kingdom 271. |
| Asbestos, crude | | 222 | 310 | — | Netherlands 151; United Kingdom 129. |
| Barite and witherite | | 72,044 | 52,166 | — | West Germany 39,928; France 36. |
| Boron materials: | | | | | |
| Crude natural borates | | 28,572 | 26,287 | — | Netherlands 12,653; West Germany 11,683. |
| Oxides and acids | | 193 | 547 | -- | France 215; United Kingdom 123; Netherlands 65. |
| Bromine | | 15 | 53 | — | All to Netherlands. |
| Cement | thousand tons | 2,908 | 2,972 | 8 | Netherlands 1,551; West Germany 581; France 344. |
| Chalk | | 104,523 | 94,191 | — | West Germany 56,681; Saudi Arabia 7,954; Netherlands 12,730. |
| Clays, crude: | | | | | |
| Bentonite | | 553 | 1,498 | — | Netherlands 1,275; United Kingdom 68; West Germany 42. |
| Chamotte and dinas earth | | 1,406 | 3,447 | — | West Germany 2,298; Netherlands 1,118. |
| Fire clay | | 87 | 62 | — | West Germany 23; Sweden 1. |
| Fuller's earth | | 1,220 | 1,758 | — | Netherlands 1,239; United Kingdom 270. |
| Kaolin | | 96,598 | 121,240 | — | Netherlands 56,865; West Germany 45,100; France 80. |
| Unspecified | | 32,279 | 10,127 | — | Netherlands 9,007; France 1,029. |
| Cryolite and chiolite | | 32 | 35 | — | France 32; Zaire 3. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | thousand carats | 77,694 | 65,060 | 1,362 | India 38,357; United Kingdom 13,184; Israel 5,333. |
| Industrial stones | do. | 34,987 | 19,131 | 1,861 | United Kingdom 9,491; Ireland 2,508. |
| Dust and powder | kilograms | 2,901 | 4,023 | 549 | West Germany 1,093; Spain 673. |
| Diatomite and other infusorial earth | | 3,210 | 2,202 | — | Netherlands 1,568; France 133; Uganda 60. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 673 | 113 | — | Italy 59; West Germany 28; Yugoslavia 25. |
| Fluorspar | | 3,715 | 4,131 | — | West Germany 3,978; Yugoslavia 24. |
| Unspecified | | 27 | 144 | — | Norway 69; Netherlands 53. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 75,148 | 98,909 | — | Netherlands 55,345; France 40,107; West Germany 3,020. |
| Manufactured: | | | | | |
| Ammonia | | 60,698 | 74,866 | — | France 51,054; Netherlands 11,154; West Germany 190. |
| Nitrogenous | thousand tons | 2,282 | 2,538 | 108 | France 994; West Germany 238; Netherlands 187. |
| Phosphatic | do. | 774 | 801 | — | France 522; West Germany 207; Netherlands 160. |
| Potassic | do. | 199 | 234 | — | France 160; Netherlands 55; United Kingdom 13. |
| Unspecified and mixed | do. | 2,095 | 2,232 | 9 | France 976; West Germany 269; China 147. |
| Graphite, natural | | 27 | 398 | 1 | France 192; West Germany 82; Netherlands 36. |
| Gypsum and plaster | | 119,228 | 128,027 | — | Netherlands 94,929; West Germany 15,563; France 4,875. |
| Iodine | | (3) | 26 | — | India 17; Spain 5. |
| Kyanite and related materials: | | | | | |
| Mullite | | 250 | 25 | — | All to West Germany. |
| Unspecified | | — | 27 | — | West Germany 26; France 1. |
| Lime | | 736,261 | 805,342 | — | Netherlands 530,372; West Germany 150,519; France 7,411. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 196 | 373 | — | Netherlands 210; West Germany 130. |
| Oxides and hydroxides | | 3,486 | 7,022 | — | Netherlands 3,984; Italy 202; France 195. |
| Sulfate | | 2,217 | 16,196 | — | France 14,084. |
| Mica: | | | | | |
| Crude including splittings and waste | | 521 | 5,165 | — | Norway 2,950; Netherlands 1,330; France 534. |
| Worked including agglomerated splittings[2] | | 63 | 81 | — | West Germany 39; Netherlands 28; France 13. |
| Nitrates, crude | | 28,185 | 34,614 | — | Netherlands 15,734; France 12,639; West Germany 3,464. |
| Phosphates, crude | | 19,342 | 16,438 | — | France 10,265; West Germany 4,127; Gabon 1,307. |
| Phosphorus, elemental | | (3) | 4 | — | Netherlands 2; Switzerland 2. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 1,043 | 87 | — | Philippines 40; Finland 15; Austria 9. |
| Iron oxides and hydroxides, processed | | 18,526 | 15,588 | 91 | West Germany 5,953; France 3,127; Republic of Korea 1,936. |
| Potassium salts, crude | | 945 | 674 | — | Netherlands 374; West Germany 274; France 26. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $36,068 | $34,642 | $8,046 | West Germany $4,453; United Kingdom $3,116. |
| Synthetic | do. | 16,643 | 6,052 | 118 | Spain $2,236; France $1,555; Netherlands $746. |
| Pyrite, unroasted | | 245 | 206 | — | All to Netherlands. |
| Quartz crystal, piezoelectric | | 9 | 22 | — | Republic of Korea 12; Austria 3. |
| Salt and brine | | 80,846 | 81,417 | 103 | France 77,910; Netherlands 97. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | thousand tons | 567 | 377 | (3) | Netherlands 286; United Kingdom 69; West Germany 13. |
| Worked | do. | 61 | 74 | (3) | West Germany 31; Netherlands 21; France 10. |
| Dolomite, chiefly refractory-grade | do. | 1,246 | 1,287 | — | Netherlands 668; West Germany 272; France 256. |
| Gravel and crushed rock | do. | 9,519 | 10,593 | (3) | France 5,903; Netherlands 4,285. |
| Limestone other than dimension | do. | 1,106 | 1,121 | — | Netherlands 862; France 223. |
| Quartz and quartzite | do. | 283 | 214 | (3) | France 203; West Germany 6; Netherlands 4. |
| Sand other than metal-bearing | do. | 4,558 | 3,942 | (3) | Netherlands 1,550; France 1,267; Italy 224. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 27,217 | 29,326 | — | United Kingdom 20,059; France 3,396; Netherlands 1,406. |
| Colloidal, precipitated, sublimed | | 59 | 34 | — | Turkey 21; Greece 5; Italy 2. |
| Sulfuric acid | | 204,385 | 157,304 | — | Netherlands 85,674; France 55,959; West Germany 11,684. |
| Talc, steatite, soapstone, pyrophyllite | | 66,506 | 59,074 | — | United Kingdom 22,122; West Germany 8,483; Netherlands 4,734. |
| Vermiculite[6] | | 373 | 842 | — | Netherlands 279; France 276; Sweden 87. |
| Other: | | | | | |
| Crude | | 469,018 | 389,800 | — | Netherlands 260,697; France 80,693; West Germany 36,528. |
| Slag and dross, not metal-bearing | thousand tons | 2,359 | 2,430 | 35 | France 728; Netherlands 696; West Germany 559. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 6,229 | 18,423 | — | France 11,248; Netherlands 3,876; West Germany 345. |
| Carbon: Carbon black[2] | | 3,231 | 3,678 | 699 | France 925; Italy 332. |
| Coal: | | | | | |
| Anthracite | | 83,189 | 96,709 | — | France 47,431; Netherlands 20,508; Spain 16,518. |
| Bituminous | | 611,107 | 723,999 | — | France 393,771; Netherlands 216,702; West Germany 61,556. |
| Briquets of anthracite and bituminous coal | | 3,803 | 5,353 | — | France 3,735; Switzerland 522. |
| Lignite including briquets | | 22,884 | 17,632 | — | France 9,560; West Germany 5,116. |
| Coke and semicoke | | 895,600 | 726,152 | — | France 277,721; West Germany 276,679; Sweden 66,012. |

See footnotes at end of table.

TABLE 2—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Gas, natural: | | | | | |
| Gaseous | thousand cubic meters | 420 | 52 | — | West Germany 25; Sweden 6. |
| Liquefied | | 825 | 2,279 | — | Netherlands 2,154; France 98; West Germany 26. |
| Peat including briquets and litter | | 91,177 | 89,421 | — | France 76,673. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 68 | 1 | — | Mainly to West Germany. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 4,574 | 3,914 | — | Netherlands 2,021; West Germany 844; France 403. |
| Gasoline | do. | 43,033 | 41,772 | 6,452 | West Germany 9,799; Netherlands 8,635. |
| Mineral jelly and wax | do. | 32,991 | 15,323 | — | France 1,314; Italy 1,031; West Germany 931. |
| Kerosene and jet fuel | do. | 13,936 | 12,954 | — | West Germany 2,097; Switzerland 1,819; United Kingdom 871. |
| Distillate fuel oil | do. | 21,866 | 24,025 | 223 | West Germany 10,848; France 4,743; Switzerland 1,509. |
| Lubricants | do. | 2,543 | 2,602 | 1 | Netherlands 651; West Germany 278; Spain 113. |
| Residual fuel oil | do. | 59,969 | 57,541 | 4,571 | West Germany 6,677; Netherlands 6,402; United Kingdom 6,359. |
| Bitumen and other residues | do. | 3,118 | 3,500 | — | France 1,253; West Germany 729; Netherlands 477. |
| Bituminous mixtures | do. | 1,266 | 112 | — | Netherlands 59; France 33; West Germany 8. |
| Petroleum coke | do. | 501 | 307 | — | France 214; Netherlands 84. |

[1]Table prepared by B. S. Colquitt.
[2]Totals are incomplete due to unreported quantities.
[3]Less than 1/2 unit.
[4]May include rhenium.
[5]May include other precious metals.
[6]Includes perlite and chlorite.

TABLE 3

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 148 | 42 | 14 | Canada 7; France 7. |
| Alkaline-earth metals | 197 | 180 | 1 | France 142; China 16. |
| Aluminum: | | | | |
| Ore and concentrate | 25,077 | 37,310 | — | Netherlands 22,721; West Germany 7,770. |
| Oxides and hydroxides | 41,491 | 58,126 | 3,890 | West Germany 40,247; Netherlands 4,306. |
| Ash and residue containing aluminum | 4,909 | 5,688 | — | U.S.S.R. 1,605; West Germany 1,577; Hungary 1,382. |
| Metal including alloys: | | | | |
| Scrap | 120,806 | 117,184 | 2,413 | France 38,103; West Germany 31,990; Netherlands 28,895. |
| Unwrought | 358,118 | 367,492 | 155 | Netherlands 229,577; West Germany 26,115; Norway 14,952. |
| Semimanufactures | 139,211 | 161,237 | 320 | West Germany 48,990; Netherlands 34,387; France 33,831. |
| Antimony: | | | | |
| Ore and concentrate | 6,048 | 3,863 | — | Bolivia 1,808; China 992; Czechoslovakia 409. |
| Oxides | 665 | 1,299 | 32 | Netherlands 465; France 291; United Kingdom 203. |
| Ash and residue containing antimony | 647 | 107 | NA | Netherlands 54; France 18. |
| Metal including alloys, all forms | 2,395 | 2,952 | — | China 1,759; Netherlands 554; Thailand 309. |
| Arsenic: Metal including alloys, all forms | 107 | 97 | — | Netherlands 89. |
| Beryllium: Metal including alloys, all forms value, thousands | $33 | $47 | $15 | Netherlands $22; West Germany $8. |
| Bismuth: Metal including alloys, all forms[2] | 3 | 45 | — | United Kingdom 32; France 4. |
| Cadmium: Metal including alloys, all forms | 1,990 | 1,925 | 25 | Italy 608; Netherlands 363; France 261. |
| Chromium: | | | | |
| Ore and concentrate | 3,861 | 19,926 | — | Netherlands 11,377; Republic of South Africa 7,814. |
| Oxides and hydroxides | 768 | 863 | — | West Germany 273; United Kingdom 231; Romania 204. |
| Metal including alloys, all forms | 392 | 571 | (3) | West Germany 308; United Kingdom 107; France 78. |
| Cobalt: | | | | |
| Ore and concentrate | 1 | 99 | — | Mainly to Zaire. |
| Oxides and hydroxides | 141 | 191 | — | Finland 107; United Kingdom 79. |
| Ash and residue containing cobalt | 1,312 | 1,177 | 389 | Netherlands 525. |
| Metal including alloys, all forms[2] | 201 | 84 | 5 | West Germany 20. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 24 | 13 | (3) | Singapore 12. |
| Metals including alloys, all forms: | | | | |
| Columbium (niobium)[4] | 5 | 4 | — | West Germany 3. |
| Tantalum | 23 | 14 | 1 | West Germany 8; Austria 5. |
| Copper: | | | | |
| Ore and concentrate | 2,367 | 4,968 | — | Netherlands 4,252. |
| Oxides and hydroxides | 431 | 759 | — | Italy 441; United Kingdom 239. |
| Sulfate | 2,512 | 3,183 | — | Netherlands 1,709; France 452; Italy 227. |
| Ash and residue containing copper | 74,929 | 53,101 | 2,166 | France 18,661; Netherlands 4,594; United Kingdom 2,531. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Copper—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 190,595 | 158,411 | 2,235 | West Germany 36,971; France 30,254; Netherlands 27,968. |
| Unwrought | | 135,978 | 460,951 | 1,348 | Zaire 218,259; Zambia 29,443; U.S.S.R. 29,122. |
| Semimanufactures | | 61,484 | 59,294 | 266 | West Germany 28,422; France 12,557; Italy 5,045. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $3,520 | $2,267 | — | West Germany $794; Netherlands $760; France $700. |
| Metal including alloys, unwrought and partly wrought[2] | kilograms | 22,538 | 26,948 | 2,600 | Switzerland 14,303; Burundi 3,170. |
| Hafnium: Metal including alloys, all forms | value, thousands | — | $20 | $16 | France $4. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 19,787 | 20,278 | — | Brazil 6,446; Sweden 2,938; Mauritania 2,563. |
| Pyrite, roasted | do. | 60 | 71 | — | West Germany 62; Sweden 2. |
| Metal: | | | | | |
| Scrap | do. | 1,975 | 1,885 | 10 | West Germany 896; France 499; Netherlands 410. |
| Pig iron, cast iron, related materials | | 343,418 | 121,801 | 18 | France 25,896; U.S.S.R. 25,001; West Germany 18,727. |
| Ferroalloys: | | | | | |
| Ferrochromium | | 83,155 | 95,093 | — | Netherlands 18,535; Sweden 12,942; West Germany 9,884. |
| Ferrocolumbium | | 586 | 530 | — | Netherlands 250; West Germany 182. |
| Ferromanganese | | 50,963 | 47,496 | 38 | Norway 12,233; France 11,199; United Kingdom 6,628. |
| Ferromolybdenum | | 2,089 | 2,882 | 2 | China 892; Netherlands 529; United Kingdom 451. |
| Ferronickel | | 13,646 | 20,934 | — | Netherlands 6,824; Greece 4,621; Colombia 3,919. |
| Ferrophosphorus | | 6,260 | 518 | — | Netherlands 405; West Germany 64. |
| Ferrosilicochromium | | 2,485 | 2,806 | — | West Germany 1,937; Netherlands 869. |
| Ferrosilicomanganese | | 38,834 | 44,363 | — | Norway 19,505; France 9,673; Netherlands 5,097. |
| Ferrosilicon | | 34,717 | 36,955 | 11 | West Germany 18,521; Netherlands 5,752; Norway 3,581. |
| Ferrotitanium and ferrosilicotitanium | | 838 | 402 | — | United Kingdom 294; Netherlands 71. |
| Ferrotungsten and ferrosilicotungsten | | 7 | 32 | — | Netherlands 22; West Germany 8. |
| Ferrovanadium | | 279 | 487 | 10 | Netherlands 151; Austria 115; West Germany 105. |
| Silicon metal | | 1,275 | 2,020 | — | Norway 746; Netherlands 524; France 336. |
| Unspecified | | 6,425 | 5,322 | 124 | France 3,960; West Germany 602. |
| Steel, primary forms | thousand tons | 488 | 909 | 1 | France 625; Netherlands 153; West Germany 34. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | do. | 1,529 | 1,335 | (3) | Netherlands 422; France 338; West Germany 299. |
| Clad, plated, coated | do. | 335 | 366 | 2 | France 108; Netherlands 74; West Germany 70. |
| Of alloy steel | do. | 117 | 408 | (3) | West Germany 352; France 19; Greece 10. |
| Bars, rods, angles, shapes, sections | do. | 1,117 | 1,193 | 5 | France 290; West Germany 280; United Kingdom 174. |
| Rails and accessories | do. | 4 | 8 | (3) | France 2; West Germany 1; Netherlands 1. |
| Wire | do. | 94 | 94 | 1 | West Germany 29; Netherlands 28; France 11. |
| Tubes, pipes, fittings | do. | 364 | 377 | 2 | Netherlands 118; West Germany 90; France 62. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Lead: | | | | |
| Ore and concentrate | 101,958 | 101,231 | 7,758 | Peru 33,459; Australia 24,200; Greece 20,765. |
| Oxides | 5,814 | 5,592 | 1 | France 4,677; West Germany 593; United Kingdom 60. |
| Ash and residue containing lead | 58,101 | 61,473 | 16,404 | Netherlands 18,511; Yugoslavia 6,663. |
| Metal including alloys: | | | | |
| Scrap | 12,382 | 12,098 | 47 | Netherlands 6,396; Finland 2,168; France 820. |
| Unwrought | 37,461 | 32,179 | 18 | France 17,149; West Germany 6,209; Netherlands 1,531. |
| Semimanufactures | 6,089 | 6,627 | 2 | United Kingdom 2,689; West Germany 1,997; Netherlands 982. |
| Lithium: Oxides and hydroxides | 151 | 143 | — | West Germany 78; Netherlands 37. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 257 | 212 | — | West Germany 122; Netherlands 56. |
| Unwrought | 2,701 | 2,346 | 74 | Yugoslavia 611; Norway 585; Netherlands 470. |
| Semimanufactures | 447 | 357 | 156 | France 95; Italy 41. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 308,496 | 164,337 | — | Brazil 53,790; Gabon 26,734. |
| Oxides | 1,492 | 3,108 | 78 | Mexico 760; Japan 376; Netherlands 277. |
| Metal including alloys, all forms | 4,759 | 3,166 | 897 | Netherlands 1,673; France 208. |
| Mercury | 162 | 74 | (3) | France 26; Spain 13; United Kingdom 9. |
| Molybdenum: | | | | |
| Ore and concentrate: | | | | |
| Roasted | 20,695 | 19,454 | 4,781 | Chile 4,907; Netherlands 4,392. |
| Unroasted | 11,176 | 13,252 | 4,283 | Canada 6,801; Peru 981. |
| Oxides and hydroxides | 129 | 160 | 9 | Netherlands 79; United Kingdom 56. |
| Ash and residue containing molybdenum | 146 | 72 | — | Netherlands 21; Denmark 18; United Kingdom 18. |
| Metal including alloys: | | | | |
| Scrap | 70 | 49 | — | Austria 22; United Kingdom 16; West Germany 8. |
| Unwrought | 74 | 16 | — | United Kingdom 5; France 4; Switzerland 4. |
| Semimanufactures | 185 | 141 | 6 | Netherlands 102; United Kingdom 20; France 8. |
| Nickel: | | | | |
| Ore and concentrate | 2,317 | 1,459 | 1,312 | Netherlands 120; West Germany 27. |
| Matte and speiss | 6,337 | 7,826 | 64 | Netherlands 4,884; Australia 1,544. |
| Oxides and hydroxides | 163 | 166 | 2 | Canada 61; West Germany 43; Netherlands 28. |
| Ash and residue containing nickel | 657 | 478 | 46 | West Germany 292; France 66; Netherlands 66. |
| Metal including alloys: | | | | |
| Scrap | 2,389 | 572 | 16 | U.S.S.R. 210; West Germany 121; Netherlands 77. |
| Unwrought | 9,169 | 8,356 | (3) | U.S.S.R. 2,613; Netherlands 1,280; Australia 769. |
| Semimanufactures | 921 | 774 | 49 | West Germany 311; Netherlands 168; United Kingdom 95. |
| Platinum-group metals: | | | | |
| Waste and sweepings value, thousands | $22,582 | $31,419 | $2,145 | Algeria $8,034; France $6,792; Netherlands $5,598. |
| Metals including alloys, unwrought and partly wrought: | | | | |
| Palladium kilograms | 654 | 1,752 | — | United Kingdom 1,263; West Germany 213. |
| Platinum do. | 1,200 | 3,398 | 647 | United Kingdom 2,129; West Germany 178. |
| Rhodium do. | 28 | 50 | — | West Germany 30; United Kingdom 15. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Platinum-group metals: | | | | |
| Iridium, osmium, ruthenium kilograms | 36 | 15 | — | West Germany 3; United Kingdom 3; Ireland 1. |
| Rare-earth metals including alloys, all forms | 45 | 147 | 22 | U.S.S.R. 76; Netherlands 28. |
| Selenium, elemental | 104 | 30 | — | United Kingdom 9; Norway 8; Netherlands 6. |
| Silicon, high-purity | 15 | 7 | — | West Germany 3; United Kingdom 3. |
| Silver: | | | | |
| Ore and concentrate[5] value, thousands | 8,526 | $1,614 | $211 | Zaire $738; United Kingdom $298. |
| Waste and sweepings[5] do. | $3,094 | $15,360 | $425 | West Germany $5,921; Finland $3,896; United Kingdom $2,075. |
| Metal including alloys, unwrought and partly wrought kilograms | 933,112 | 895,133 | 272,139 | Netherlands 412,694; West Germany 32,779; |
| Tellurium, elemental | 27 | 23 | 5 | West Germany 13; Netherlands 4; Singapore 1. |
| Tin: | | | | |
| Ore and concentrate | 57 | 755 | 29 | West Germany 358; Kenya 136; Hong Kong 102. |
| Oxides | 10 | 19 | — | Italy 8; West Germany 4; Netherlands 3. |
| Ash and residue containing tin | 273 | 891 | — | Netherlands 601; West Germany 182; United Kingdom 47. |
| Metal including alloys: | | | | |
| Scrap | 566 | 652 | — | Netherlands 293; Singapore 214; France 46. |
| Unwrought | 2,266 | 2,331 | 13 | Netherlands 616; Brazil 411; Malaysia 330. |
| Semimanufactures | 256 | 434 | 2 | West Germany 219; Brazil 81; France 58. |
| Titanium: | | | | |
| Ore and concentrate | 115,141 | 105,765 | 4 | Canada 45,962; Sierra Leone 3,491; Netherlands 2,503. |
| Oxides | 8,464 | 8,237 | 1,183 | West Germany 3,781; United Kingdom 1,493. |
| Metal including alloys: | | | | |
| Scrap | 756 | 169 | 38 | West Germany 75; France 24. |
| Unwrought | 124 | 322 | — | Netherlands 91; West Germany 87; France 80. |
| Semimanufactures | 277 | 297 | 76 | United Kingdom 77; West Germany 44. |
| Tungsten: | | | | |
| Ore and concentrate | 1 | 134 | — | Brazil 82; West Germany 52. |
| Oxides and hydroxides | 106 | 25 | — | China 25. |
| Metal including alloys: | | | | |
| Scrap | 58 | 43 | — | Netherlands 26; West Germany 16. |
| Unwrought | 20 | 22 | 4 | West Germany 8; France 6; Austria 3. |
| Semimanufactures | 231 | 126 | (3) | Netherlands 107; Austria 11; West Germany 2. |
| Uranium and thorium: Metals including alloys, all forms: Uranium kilograms | 488 | 206 | — | Netherlands 177. |
| Vanadium: | | | | |
| Ore and concentrate | 3,254 | 45 | — | France 23; Sweden 22. |
| Oxides and hydroxides | 5,929 | 5,657 | 1,289 | China 2,372; Republic of South Africa 1,773. |
| Metal including alloys, all forms | (3) | 8 | — | All from West Germany. |
| Zinc: | | | | |
| Ore and concentrate | 605,123 | 626,045 | 18,626 | Canada 181,104; Mexico 93,612; Peru 67,669. |
| Oxides | 10,533 | 9,305 | 94 | Netherlands 4,391; France 2,754; West Germany 1,325. |
| Blue powder | 1,466 | 1,062 | — | Netherlands 350; West Germany 294; France 160. |
| Ash and residue containing zinc | 94,616 | 81,262 | 7,777 | West Germany 32,327; France 16,207; Netherlands 11,773. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Zinc—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 18,513 | 20,354 | 22 | Netherlands 6,671; France 5,520; West Germany 5,247. |
| Unwrought | 42,005 | 35,156 | 25 | Netherlands 12,751; France 9,096; West Germany 8,686. |
| Semimanufactures | 21,008 | 23,373 | 1,445 | France 17,787; United Kingdom 623. |
| Zirconium: | | | | |
| Ore and concentrate | 2,227 | 1,756 | 22 | Netherlands 1,135; United Kingdom 280; France 240. |
| Oxides | 25 | 62 | 21 | West Germany 21; Netherlands 19. |
| Ash and residue containing zirconium | 43 | 22 | — | All from Canada. |
| Metal including alloys: | | | | |
| Scrap | 92 | 69 | 34 | France 35. |
| Unwrought | 1 | (3) | — | All from West Germany. |
| Semimanufactures | 88 | 120 | 3 | France 115. |
| Other: | | | | |
| Ores and concentrates | 12,906 | 151 | — | Netherlands 125. |
| Oxides and hydroxides | 276 | 159 | 5 | France 67; Netherlands 55. |
| Ashes and residues | 36,354 | 18,799 | 2,448 | United Kingdom 4,378; Netherlands 3,729. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 9,787 | 12,807 | 59 | Turkey 5,166; West Germany 4,979; Netherlands 1,065. |
| Artificial: | | | | |
| Corundum | 7,526 | 7,691 | 13 | West Germany 1,700; Brazil 1,293; Austria 875. |
| Silicon carbide | 8,745 | 9,473 | 3 | West Germany 3,451; China 1,660; Norway 1,510. |
| Dust and powder of precious and semiprecious stones excluding diamond value, thousands | $28 | $22 | — | All from West Germany. |
| Grinding and polishing wheels and stones | 4,335 | 4,766 | 155 | West Germany 1,358; Italy 786; Netherlands 519. |
| Asbestos, crude | 23,998 | 26,514 | 1 | Canada 15,226; Republic of South Africa 5,074; U.S.S.R. 3,744. |
| Barite and witherite | 9,564 | 9,667 | — | West Germany 6,451; France 2,397. |
| Boron materials: | | | | |
| Crude natural borates | 21,837 | 15,481 | — | Turkey 7,856; Netherlands 6,920. |
| Elemental | (3) | 20 | — | All from United Kingdom. |
| Oxides and acids | 3,008 | 3,660 | 247 | France 1,310; Italy 1,145; Chile 379. |
| Bromine | 2,273 | 1,802 | — | United Kingdom 1,344; Israel 351. |
| Cement | 480,571 | 633,960 | 14 | Netherlands 455,095; Greece 69,812; West Germany 44,185. |
| Chalk | 182,015 | 185,207 | 42 | France 157,164; Netherlands 26,118; Spain 1,236. |
| Clays, crude: | | | | |
| Bentonite | 28,121 | 31,876 | 47 | Netherlands 11,641; West Germany 11,354; United Kingdom 2,492. |
| Chamotte and dinas earth | 28,338 | 24,390 | 2,886 | France 10,801; West Germany 7,617. |
| Fire clay | 18,214 | 11,563 | 35 | West Germany 6,494; France 4,277; Netherlands 662. |
| Fuller's earth | 307 | 1,132 | 6,278 | Netherlands 217; West Germany 67. |
| Kaolin | 430,852 | 462,223 | 874 | United Kingdom 228,094; Netherlands 115,575; West Germany 13,862. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays, crude—Continued: | | | | | |
| Unspecified | | 343,151 | 335,711 | 52 | West Germany 188,099; Netherlands 138,247. |
| Cryolite and chiolite | | 50 | 27 | — | Denmark 20. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | thousand carats | 79,022 | 67,200 | 1,348 | United Kingdom 25,594; Zaire 5,711; Liberia 5,283. |
| Industrial stones | do. | 24,381 | 22,429 | 4,612 | India 9,210; Ireland 5,883. |
| Dust and powder | kilograms | 5,244 | 5,495 | 1,122 | Ireland 1,966. |
| Diatomite and other infusorial earth | | 15,929 | 16,011 | 15,489 | Denmark 8,154; France 2,866. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 25,674 | 19,035 | — | France 14,817; West Germany 2,798. |
| Fluorspar | | 17,108 | 20,442 | — | France 8,049; China 6,831; Netherlands 3,083. |
| Unspecified | | 34,755 | 33,727 | — | Norway 26,307; Netherlands 6,678. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 146,037 | 175,141 | 2 | Netherlands 160,883; France 7,870. |
| Manufactured: | | | | | |
| Ammonia[2] | | 7,357 | 25,654 | — | Mainly from Netherlands. |
| Nitrogenous | thousand tons | 983 | 965 | 189 | Netherlands 356; West Germany 126. |
| Phosphatic | do. | 95 | 143 | 6 | Morocco 54; Tunisia 28; Netherlands 19. |
| Potassic | do. | 1,324 | 1,390 | — | West Germany 629; U.S.S.R. 384; Israel 115. |
| Unspecified and mixed | do. | 546 | 665 | 90 | Netherlands 135; Morocco 123. |
| Graphite, natural | | 1,288 | 700 | 10 | West Germany 250; Switzerland 117. |
| Gypsum and plaster | | 676,595 | 702,650 | 313 | France 420,770; West Germany 242,257. |
| Iodine | | 83 | 32 | — | Chile 28. |
| Kyanite and related materials: | | 7,439 | 9,712 | 40,353 | France 2,488; West Germany 1,347. |
| Mullite | | 813 | 5,944 | 4,053 | West Germany 1,347; United Kingdom 238. |
| Unspecified | | 6,626 | 3,768 | 105 | France 2,489; Netherlands 863. |
| Lime | | 140,621 | 157,375 | 17 | France 103,798; West Germany 48,831; Netherlands 3,186. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 2,867 | 1,738 | — | Austria 814; West Germany 395; France 259. |
| Oxides and hydroxides | | 29,939 | 27,834 | 3,449 | Netherlands 5,831; Austria 5,327; Greece 447. |
| Other | | 35,779 | 47,802 | — | West Germany 33,249; East Germany 14,336. |
| Mica: | | | | | |
| Crude including splittings and waste[2] | | 1,689 | 1,589 | 2,902 | United Kingdom 580; France 497. |
| Worked including agglomerated splittings | | 142 | 58 | 11 | Switzerland 21; West Germany 7. |
| Nitrates, crude | | 45,789 | 53,466 | — | Chile 52,907. |
| Phosphates, crude | thousand tons | 2,387 | 2,212 | 382 | Morocco 1,179; Republic of South Africa 445. |
| Phosphorus, elemental | | 201 | 328 | — | France 200. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 1,306 | 626 | — | Austria 393; France 71; Spain 46. |
| Iron oxides and hydroxides, processed | | 29,808 | 28,429 | 578 | West Germany 25,666; United Kingdom 952. |
| Potassium salts, crude | | 29,796 | 32,899 | — | West Germany 24,968; France 3,587. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $32,245 | $40,249 | $1,620 | Sweden $9,625; Thailand $4,815; West Germany $4,291. |
| Synthetic | do. | $12,688 | $13,001 | $138 | Ireland $8,886; Hong Kong $494; Switzerland $373. |
| Pyrite, unroasted | | 147,738 | 85,356 | — | Finland 52,106; Norway 30,647. |
| Quartz crystal, piezoelectric | | 283 | 385 | 65 | United Kingdom 254; France 59. |
| Salt and brine | thousand tons | 1,110 | 960 | (3) | Netherlands 580; West Germany 305; France 9. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash | | 128,387 | 76,635 | 2 | France 34,197; Netherlands 27,854. |
| Sulfate: | | | | | |
| Natural | | 11,109 | 14,497 | 2 | France 5,024; Netherlands 2,724; West Germany 2,278. |
| Manufactured | | 12,096 | 8,546 | 2 | West Germany 4,727; Spain 1,867; France 950. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | thousand tons | 196 | 276 | (3) | France 96; West Germany 24; Brazil 11. |
| Worked | do. | 192 | 193 | 135 | France 39; Italy 37. |
| Dolomite, chiefly refractory-grade | do. | 66 | 118 | — | France 60; West Germany 40; Belgium-Luxembourg 14. |
| Gravel and crushed rock | do. | 5,314 | 4,780 | — | West Germany 1,395; France 901; United Kingdom 92. |
| Limestone other than dimension | do. | 138 | 124 | — | United Kingdom 74; France 46. |
| Quartz and quartzite | do. | 101 | 122 | (3) | West Germany 100; Norway 7; Brazil 1. |
| Sand other than metal-bearing | do. | 14,954 | 15,680 | 4 | Netherlands 11,867; West Germany 11,363. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 434,403 | 447,778 | 160,336 | Netherlands 142,591; West Germany 66,774. |
| Colloidal, precipitated, sublimed | | 848 | 390 | 59 | West Germany 169; France 162. |
| Dioxide | | 1,744 | 2,023 | — | West Germany 970; France 607; Italy 400. |
| Sulfuric acid | | 942,575 | 872,360 | — | West Germany 377,214; France 179,870; Netherlands 126,072. |
| Talc, steatite, soapstone, pyrophyllite | | 83,208 | 91,721 | 374,500 | Netherlands 21,671; France 11,280. |
| Vermiculite[6] | | 51,077 | 57,089 | — | Turkey 28,695; Netherlands 7,191; West Germany 5,328. |
| Other: | | | | | |
| Crude | thousand tons | 1,737 | 2,211 | 9 | France 1,618; Spain 288; West Germany 171. |
| Slag and dross, not metal-bearing | do. | 275 | 809 | — | Netherlands 357; France 276; West Germany 162. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 131,980 | 138,935 | 214 | France 121,582; West Germany 8,428; Trinidad and Tobago 1,513. |
| Carbon: Carbon black | | 52,936 | 48,659 | 907 | Netherlands 18,351; West Germany 15,344; France 10,679. |
| Coal: | | | | | |
| Anthracite | thousand tons | 1,008 | 911 | — | West Germany 462; Netherlands 136; Swaziland 22. |
| Bituminous | do. | 11,405 | 14,182 | 6,007 | Australia 1,163; Netherlands 482. |
| Briquets of anthracite and bituminous coal | do. | 30 | 28 | 1 | West Germany 16; France 10. |
| Lignite including briquets | do. | 309 | 319 | — | West Germany 312. |
| Coke and semicoke | do. | 2,286 | 2,158 | 87 | West Germany 1,237; Netherlands 436. |

See footnotes at end of table.

TABLE 3—Continued

## BELGIUM-LUXEMBOURG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **MINERAL FUELS AND RELATED MATERIALS—Continued** | | | | | |
| **Gas, natural:** | | | | | |
| Gaseous | million cubic meters | 6,357 | 6,834 | — | Netherlands 4,613; West Germany 2,221. |
| Liquefied | thousand tons | 2,857 | 3,263 | — | Algeria 3,257; France 6. |
| Peat including briquets and litter | do. | 287 | 336 | — | Netherlands 266; West Germany 39. |
| **Petroleum:** | | | | | |
| Crude | thousand 42-gallon barrels | 181,902 | 174,271 | 56,963 | Iran 53,169; Norway 34,029. |
| **Refinery products:** | | | | | |
| Liquefied petroleum gas | do. | $2,867 | 2,559 | 19 | Saudi Arabia 797; Algeria 445; Norway 308. |
| Gasoline | do. | 23,600 | 23,544 | 334 | Netherlands 17,649; France 1,600; United Kingdom 1,184. |
| Mineral jelly and wax | do. | 208 | 194 | 4 | West Germany 103; France 36; Netherlands 29. |
| Kerosene and jet fuel | do. | 2,738 | 3,478 | 9 | Netherlands 3,417; United Kingdom 18; West Germany 13. |
| Distillate fuel oil | do. | 33,467 | 38,724 | 26 | Netherlands 32,339; United Kingdom 3,908; Italy 607. |
| Lubricants | do. | 4,104 | 4,079 | 127 | France 1,209; Netherlands 954; United Kingdom 804. |
| Residual fuel oil | do. | 46,109 | 47,363 | 1 | Netherlands 22,331; United Kingdom 11,749; Libya 2,017. |
| Bitumen and other residues | do. | 940 | 878 | (3) | Netherlands 403; West Germany 201; France 183. |
| Bituminous mixtures | do. | 96 | 198 | 3 | Netherlands 141; France 35; West Germany 16. |
| Petroleum coke | do. | 1,789 | 1,890 | 1,070 | Netherlands 404; Kuwait 182. |

NA Not available.
[1]Table prepared by B. S. Colquitt.
[2]Totals are incomplete due to unreported quantities.
[3]Less than 1/2 unit.
[4]May include rhenium.
[5]May include other precious metals.
[6]Includes perlite and chlorite.

TABLE 4

## BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand tons per year, unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Cement | Seven major companies, of which the largest is Cimenteries CBR SA (Societe Generale de Belgique, or SGB) | 13 plants, including ones at Lixhe, Mons/Obourg, Harmignies, Marchienne, and Ghent | 8,000. |
| Do. | Ciments d'Obourg SA | Plants at Obourg and Thieu | 2,640. |
| Do. | Compagnie des Ciment (Ciments Francais SA) | Plant at Airvault, Couvrot and Gargenville | 4,000. |
| 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 | Smelter at Antwerp-Hoboken | 50. |
| Do. | (Acec-Union Miniere SA) | Refinery at Olen | 500. |
| Do. | La Metallo-Chimique SA | Smelter at Beerse | 100. |
| Do. | do. | Refinery at Beerse | 60. |
| 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— | |
| | | Soft-burned | 500. |
| | | Dead-burned | 200. |
| Dolomite | SA Dolomies de Villers-le-Gambon | Quarry at Villers le-Gambon | 300. |
| Lead | Metallurgie Hoboken-Overpelt | Smelter at Antwerp-Hoboken | 100. |
| Do. | (Acec-Union Miniere SA) | Refinery at Antwerp-Hoboken | 130. |
| Petroleum, refined 42-gallon barrels per day | Eight refineries, of which the major ones are— | | 865,000 including— |
| Do. do. | Societe Industrielle Belge des Petroles SA (British Petroleum, U.K.) | Refinery at Antwerp | 330,000. |
| Do. do. | SA Esso NV | do. | 225,000. |
| Do. do. | Texaco Belgium NV | Refinery at Ghent | 185,000. |
| Do. | SA Chevron Oil Belgium NV | Refinery at Felny | 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 Staalnijverheid 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 (Acec-Union Miniere SA) | Smelter and refinery at Balen | 200. |
| Do. | Metallurgie Hoboken-Overpelt SA (Acec-Union Miniere SA) | Refinery at Overpelt | 120. |

TABLE 5
## BELGIUM: CAPACITY OF PRODUCTION, METALLURGIA HOBOKEN-OVERPELT IN 1991

(Thousand tons per year)

| Commodity | Capacity |
|---|---|
| Cobalt, metal powders and oxides | 8,700 |
| Copper, refined | 330,000 |
| Gold | 50 |
| Indium | 25 |
| Lead, refined | 125,000 |
| Palladium | 12 |
| Platinum | 5 |
| Rhodium | 0.5 |
| Nonferrous scrap | 480,000 |
| Selenium | 360 |
| Silver | 2,400 |
| Tellurium | 150 |
| Zinc, refined | 150,000 |

TABLE 6
## LUXEMBOURG: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| Cement, hydraulic | | 509 | 563 | [e]550 | [e]590 | 550 |
| Gypsum and anhydrite, crude[e] | tons | 420 | 450 | 450 | 400 | 400 |
| Iron and steel: Metal: | | | | | | |
| Pig iron (including blast furnace ferroalloys) | | 2,305 | 2,521 | 2,685 | 2,616 | [3]2,463 |
| Steel: | | | | | | |
| Crude | | 3,301 | 3,661 | [e]3,721 | [e]3,560 | [3]3,379 |
| Semimanufactures | | 3,481 | 3,277 | 3,297 | 3,222 | [3]3,787 |
| Phosphates: Thomas slag, gross weight | | 542 | 664 | 672 | [r]603 | 600 |
| Sand and gravel: | | | | | | |
| Other sand except glass sand | | 760 | 780 | [e]780 | [e]760 | 800 |
| Gravel | | 197 | 150 | [e]170 | [e]190 | 180 |
| Stone: Construction: | | | | | | |
| Crushed[e] | thousand cubic meters | [3]345 | 400 | 380 | 345 | 350 |
| Dimension:[e] | | | | | | |
| Rough cut | do. | [3]16 | 17 | 16 | 16 | 16 |
| Facing | square meters | [3]5,599 | 4,000 | 4,500 | 5,600 | 5,000 |
| Finished | cubic meters | 800 | 900 | 900 | 760 | 800 |

[e]Estimated. [r]Revised.

[1]Table includes data available through July 1992.

[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]Reported figure.

TABLE 7

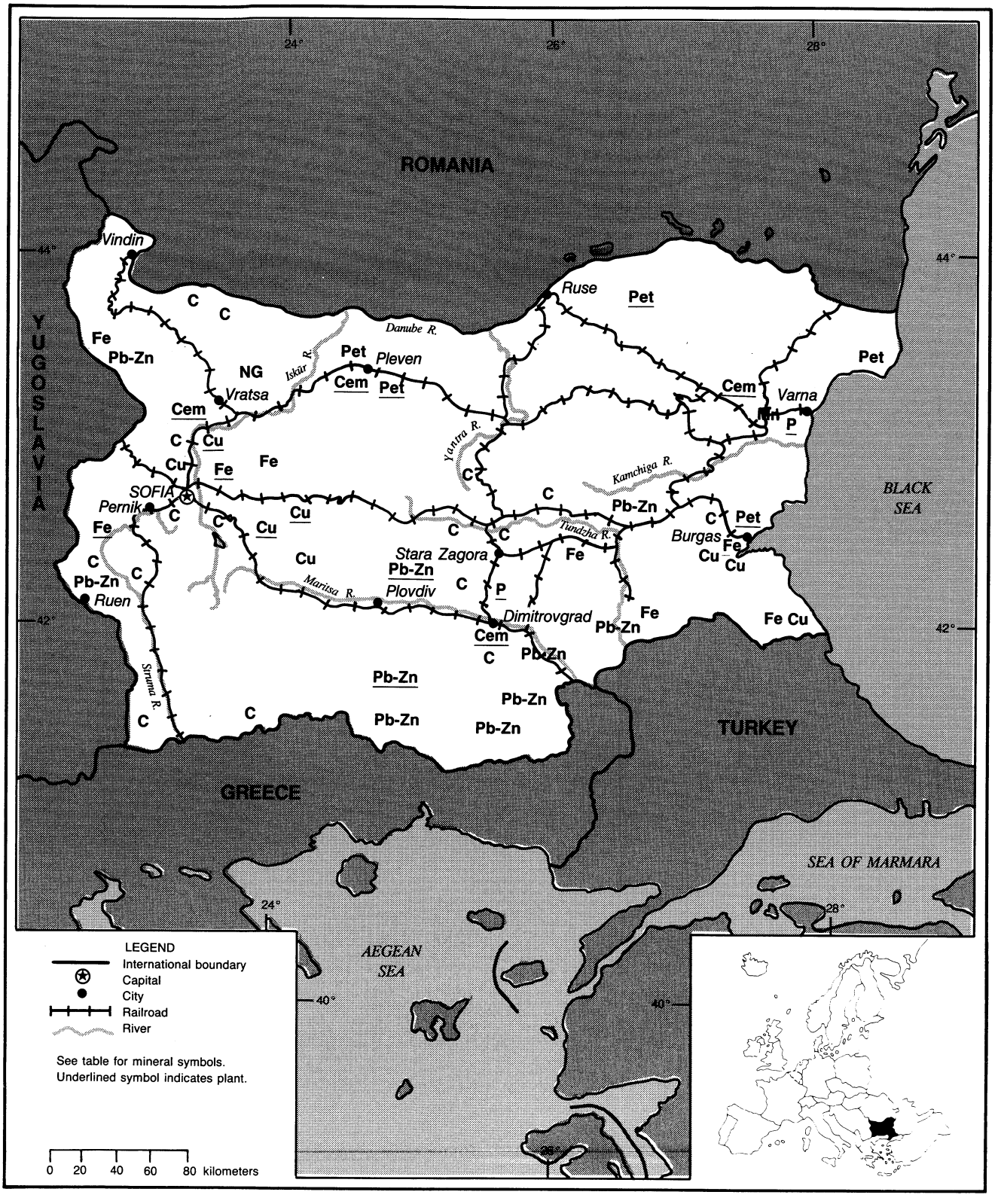
## LUXEMBOURG: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Cement | SA des Ciments Luxembourgeois (ARBED, 31%; SGB, 25%; others, 44%) | Plant at Esch-sur-Alzette | 450 |
| Ferroalloys | Continental Alloys SA (ARBED, 97%; others 3%) | Plant at Dommeldange | 9 |
| Steel | Acieries Reunies de Burbach-Eich-Dudelange (ARBED) (SGB, 25%; Belgium Government, 31%; and others, 44%) | Plants at Dudelange, Esch-Schifflange, Esch-Belval, and Differdange | 4,000 |

# BULGARIA

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



THE MINERAL INDUSTRY OF

# BULGARIA

By Jozef Plachy

In 1991, the Bulgarian mineral industry continued to play a major role in the domestic economy and, with regard to some commodities, in the European marketplace. Bulgaria ranked third in Europe in lead ore production --- after the U.S.S.R. and Yugoslavia. Bulgaria mined about 5% of Europe's copper and zinc. In copper, lead, and zinc metal, it contributed from 2% to 5% of European production. Because of environmental concerns, however, the future production of these metals will be drastically reduced. Following a 1991 Government decision, copper production will reportedly be reduced and lead production will be discontinued by the end of the year.

## GOVERNMENT POLICIES AND PROGRAMS

Economic changes in Bulgaria continued in 1991 with the passage of a bill concerning foreign investment and repatriation of profit. The new ordinance reportedly opens nearly all spheres of economic activity to foreign participation. Some of the few restrictions are in the mineral industry where a lease, lasting up to 70 years, is required for foreign ownership of land, continental shelf, and territorial sea. These changes are aimed at attracting foreign investment that would ease the pressure to close unprofitable mines and nonferrous plants where 1991 capacity utilization was about 40%. Until the anticipated new technologies for increased production and cleaner environment are installed, the Council of Ministers decided to grant approximately $3.5 million in financial aid to eight mining associations, three in the copper sector (Chelopech, Burgas, and Medet-Assarel) and five in the lead-zinc sector (Chiprovtsi, Gorubso, Madzarovo, Ossogovo, and Ustrem). This financial aid will allow a more gradual closing of unprofitable mines, lessening the impact on the approximately 30,000 Bulgarian mine workers.

## PRODUCTION

The estimated production of most minerals in Bulgaria decreased in 1991 due to declining ore grades, strikes, and decreased Soviet imports. It is hoped that the situation will improve somewhat when the conversion to a market economy is completed and foreign investment in the profitable mines is increased. *(See table 1.)*

## TRADE

Rudmetal and Polimet, whose monopoly trading positions were officially eliminated in 1990, continued to play major roles in the mineral trade of Bulgaria. In addition to the traditional imports of some metals, the declining domestic production necessitated gradually increasing imports of ores to keep smelters in operation.

Convertibility of the Bulgarian Leva was introduced in February 1991.

Under a bilateral trade agreement signed on April 22, 1991, the United States granted Bulgaria most-favored-nation status.

## STRUCTURE OF THE MINERAL INDUSTRY

During 1991, the mineral industry of Bulgaria began the process of reorganization. However, by the end of the year, all aspects of the mineral industry were still Government owned. In the copper industry, state-owned Polimet was the largest enterprise, controlling seven mines and enrichment plants, two smelters, one refinery plant, and a number of semimanufactures. The Government owns 21 mines and 2 smelters, either directly, through the state owned Lead and Zinc Co., or indirectly, through Gorubso. All the other mining enterprises remained under government ownership, but not direct control. *(See table 2.)*

## COMMODITY REVIEW

### Metals

*Copper.*—Most of the copper deposits in Bulgaria are in an area about 50 km wide, stretching from Burgas in the east to the Yugoslavian border in the west. More than 90% of copper ore production in 1991 came from three mining complexes--Elatzite, Medet, and Assarel. The reserves at the Elatzite complex are estimated at about 200 Mmt --- reportedly containing about 0.33% copper, 0.0045% molybdenum, and small amounts of gold, silver, and rhenium. Production includes copper concentrate, cement copper, and molybdenum concentrate. At the Medet complex, the crushing and concentrating plant closure in 1989 was reportedly followed by termination of mining operations at the end of 1991 owing to depletion of the deposit. A new mine, Gualdpech, at the nearby Assarel complex, was expected to make up the difference caused by the closure of the Medet Mine. But the hoped for production did not materialize due to prolonged discussion by Government officials, mining representatives, and environmental groups about the effects of arsenic contained in the ore. Production

at the Assarel complex began in 1976. The estimated reserves of 300 Mmt at the complex reportedly contain about 0.5% Cu. The first stage of the beneficiation plant, with a capacity of 5,000 tons, was commissioned in late 1989. The second stage followed in early 1990, and the full capacity of 12.5 to 15 Mmt is targeted for 1994. Production includes copper concentrate (20% to 22% Cu and 34% to 38% S), copper cement (65% to 72% Cu and 46 g/mt As), and pyrite concentrate (46% to 48% S, 41% to 43% Fe, and 6% to 7% $SiO_2$).

*Iron Ore.*—More than 80% of Bulgaria's iron ore production was supplied by the open pit mine at Kremikovtsi, 20 km northeast of Sofia. The reserves are reportedly about 200 Mmt. The ore grade varies from about 25% Fe content in siderite to 40% Fe in hematite ore. The ore contains additional metals, including lead, which is causing severe air pollution problems at the local iron and steel works.

The reserves at the two other iron ore mines--Martinovo and Krumovo--are nearly exhausted and the mines are reportedly scheduled to close in 1992.

*Lead and Zinc.*—The lead and zinc industry is the most important nonferrous sector in Bulgaria. It employs more than 15,000 people in mining and 10,000 in processing and refining. The most important reserves are in the southern part of the country, between Plovdiv and the Greek border. All the mines and beneficiation plants in this area are controlled by Gorubso, a subsidiary of the state-owned Lead and Zinc Co. The 19 mines and 4 beneficiation plants under Gorubso produce about 80% of all lead-zinc ore, more than 80% of lead concentrates, and more than 90% of zinc concentrates. By closing the poorest mines and expanding the exploitation of the richest ones, Gorubso hopes to maintain the present level of production and employment.

The concentrates were processed in two smelters--the Dimitur Blagoev Smelter and Refinery Complex (Blagoev Complex) in Plovdiv and the Georgi Dimitrov Smelter and Refinery Complex (Dimitrov Complex) in Kurdjali. Because of pollution, the Bulgarian Government reportedly decided to close both smelters by the end of 1991. After modernization and reconstruction, the Blagoev Complex will reportedly only produce zinc, while the Dimitrov Complex will reopen as a secondary lead producer. The lead concentrate will probably be exported to Yugoslavia.

During 1991, an Irish company, Navan Resources, reportedly signed an agreement with the Lead and Zinc Co. to (1) reevaluate a large number of small mines, including the recently discovered Erma Reka polymetallic ore deposit; and (2) examine the feasibility of mine development in the Madzarevo district (southeast Bulgaria).

*Manganese.*—One of the largest deposits of manganese ore in Europe is in Bulgaria, near Varna, on the shore of the Black Sea. The estimated 500 Mmt deposit covers an area 25 km wide and 80 km long. The average thickness of ore layers is 9 m, containing 23% to 31% manganese. At present, the deposit is mined only at Obrotchishte, at a rate of 40,000 to 50,000 mt/a. All but 5,000 tons is used by the domestic chemical industry; the rest is exported.

*Steel.*—The largest Bulgarian iron and steel works, and the only pig iron producer in the country, is in Kremikovtsi, 15 km northeast of Sofia. Because domestic production is being curtailed, the imported ore has to be transported by train from the nearest port, 400 km away. In the past, all imported iron ore concentrates were supplied by Krivoj Rog (Ukraine) in payment for partial Bulgarian financing of the enrichment plant at the Krivoj Rog mining complex. Because of the declining domestic production of iron ore and the irregular supply of concentrates from Ukraine, only one-half of the 2-Mmt capacity of the Kremikovtsi Iron and Steel Works was utilized in 1991. The geographical disadvantage of the Kremikovtsi plant was to be alleviated by a new steel plant on the Black Sea, in Burgas. The plan never fully materialized, however, and at the present, the Burgas Steel Works consists of only one light-section mill (700,000-ton capacity) and some auxiliary equipment. The third steel plant, located in Pernik, 25 km southwest of Sofia, is a minimill having a steel production capacity of 1 Mmt/a.

*Uranium.*—At present, there are about five mines producing an estimated 600 tons of contained uranium and employing about 12,000 people. According to NUKEM, Bulgaria has about 15,000 tons of proven reserves and 30,000 tons of inferred reserves of contained uranium. Most of the deposits are not easily accessible. The mineralization in these deposits is unequally distributed and, on average, the ore has a low uranium content (0.015% of $U_3O_8$). Nearly 70% of production is obtained by in situ leaching. Until recently, the entire output was reportedly exported to the former U.S.S.R. in exchange for fuel-grade uranium for the Bulgarian Kozloduy nuclear powerplant. In 1991, the Bulgarian Government reportedly decided to close all uranium mines due to the fact that the contract with the U.S.S.R. lapsed in mid-1991, mining operations were not profitable, and the ground water was in danger of sulfuric acid contamination. However, after prolonged worker unrest at the Simitli uranium mine, 100 km south of Sofia, the Government agreed to a gradual closing of mines and a temporary financial assistance of about $10 million to the Bulgarian uranium industry.

## Mineral Fuels

*Crude Oil.*—In 1991, Bulgarian imports of crude oil declined by 2.2 Mmt, mainly owing to declining exports by the U.S.S.R. caused by deteriorating domestic production. To make up the shortfall, Libya doubled its crude oil deliveries to Bulgaria in 1991 to 160,000 mt/month, accelerating repayment of $300 million owed to Bulgaria. According to the Deputy Premier of Bulgaria, Bulgaria signed a barter

agreement with the U.S.S.R. for delivery of 5 Mmt of crude oil in 1992 in exchange for goods. However, these imports will have to be augmented by imports of 3 to 4 Mmt/a from other sources, presumably Libya.

Under an agreement concluded on May 9, 1991, a consortium of three oil companies--Texaco, Enterprise Oil of the United Kingdom, and OMV of Austria--was reportedly given rights by the Bulgarian Government for oil and gas exploration in three offshore areas and one onshore area.

***Natural Gas.***—The entire Bulgarian production of natural gas is concentrated in an area near Chiren, 50 km north of Sofia. The natural gas is piped to a nearby fertilizer plant in Beli. Because of declining production and increasing consumption, Bulgaria will increasingly depend on imported natural gas, mainly from the U.S.S.R. According to the Minister of Foreign Relations, the U.S.S.R. will pay off its debt for Bulgaria's participation in the building of the Yamburg gas pipeline with free delivery of natural gas until 1996. The agreed amount is reportedly 2.9 billion cubic meters in 1991, increasing to 3.75 billion cubic meters in 1992.

***Nuclear Energy.***—Due to the fact that close to 40% of Bulgaria's electric energy comes from the Kozloduy nuclear power plant, continuous problems with the two oldest reactors contributed to the decline of the country's overall electric energy production. In response to international concerns regarding their safety, two VVER-440-MW reactors were shut down for needed upgrades. The work will reportedly be supervised by experts from the World Association of Nuclear Operators.

Work on the second nuclear powerplant in Belene has reportedly ceased and plans to install a new Czechoslovakian-built reactor have been postponed.

### Reserves

In the past, reserves were defined according to the needs of the Government to achieve self-sufficiency, full employment, and for other noneconomic goals. Mineral reserves in Bulgaria, that is, deposits that can be mined at profit under existing conditions and with existing technology, still have to be classified. In table 3, reserves are in the old category of identified (measured, indicated, and inferred) reserves. *(See table 3.)* A detailed description of the CMEA method of classifying reserves is given in the chapter on Russia.

## INFRASTRUCTURE

A cooperation agreement between Bulgaria and Greece was signed, in February 1991, that covers all fields of transportation, including the possibility of restoring the Thessaloniki-Sofia railway link.

The railroad system in Bulgaria measures 4,049 km of standard-gauge and 245 km of narrow-gauge track. Although the standard-gauge tracks are used for freight and personal transport and are part of the international railway system, the narrow tracks are used mainly by the mineral industry to transport ore or concentrate. Most of the rolling stock and tracks need to be modernized to accommodate higher speed trains and more frequent use. In 1991, about 400 locomotives, more than one-half of the entire fleet, were not used because of a sharp decline in national production.

The highway system consists of 33,535 km of hard-surface roads, including 242 km of highway. There are also 470 km of inland waterways, mainly on the Danube, with ports at Lom, Ruse, and Vidin. Major seaports are at Burgas, Varna, and Varna West.

## OUTLOOK

Most of the Bulgarian mines are either small or of low grade. Problems in the mineral industry are also related to the environment. According to the Director of the Center for Environmental Monitoring, Bulgaria's mineral industry generated more than 2 billion tons of waste during 1975-90. The cost of cleanup is estimated at $2.5 billion, of which $1 billion is needed to cleanup the air and $50 million is needed to repair damage done by using the polluted water of the Danube River to irrigate 500,000 acres of land.

TABLE 1
## BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Bismuth metal | | 56 | 51 | 48 | [e]45 | 40 |
| Cadmium, metal, smelter[e] | | 250 | 300 | 350 | [3]309 | 300 |
| Copper:[e] | | | | | | |
| Ore: | | | | | | |
| Gross weight | thousand tons | 11,500 | 12,500 | [3]12,634 | [3]8,712 | 6,000 |
| Cu content | do. | 44 | 47 | 48 | 30 | 20 |
| Concentrate: | | | | | | |
| Gross weight | do. | 220 | 290 | [3]296 | 200 | 130 |
| Cu content | do. | 35 | 37 | [3]39 | 26 | 18 |
| Metal, primary and secondary: | | | | | | |
| Smelter | | 55,000 | 57,000 | [3]57,000 | [r]25,500 | 25,000 |
| Refined | | 54,000 | 55,500 | [3]55,800 | [3]24,333 | 24,000 |
| Gold metal[e] | kilograms | 2,500 | 2,500 | 2,500 | 2,400 | 2,000 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | thousand tons | 1,850 | 1,826 | 1,613 | 1,079 | 1,000 |
| Fe content | do. | 559 | 528 | 482 | 321 | 300 |
| Iron concentrates | do. | 990 | 629 | [e]600 | [r e]400 | 550 |
| Metal: | | | | | | |
| Pig iron | do. | 1,652 | 1,437 | 1,484 | 1,143 | 800 |
| Ferroalloys, electric furnace, all types[e 4] | do. | 42 | 47 | 45 | 15 | 15 |
| Steel, crude | do. | 3,045 | 2,875 | 2,899 | 2,185 | 1,200 |
| Semimanufactures, rolled | do. | 3,225 | 3,320 | 3,037 | [e]2,500 | 1,300 |
| Lead:[e] | | | | | | |
| Mine output, Pb content | | 69,000 | 69,000 | [3]65,300 | [3]66,570 | 50,000 |
| Concentrate: | | | | | | |
| Gross weight | | 86,000 | 86,000 | [3]81,400 | 81,000 | 62,300 |
| Pb content | | 60,000 | 60,000 | [3]57,000 | 57,000 | 43,600 |
| Metal, refined primary and secondary | | 105,000 | 100,000 | [3]99,000 | [3]65,952 | 50,000 |
| Manganese ore: | | | | | | |
| Gross weight | | 38,000 | [r]34,500 | [r]32,400 | [e]50,000 | 45,000 |
| Mn content | | 10,900 | 9,900 | [r]10,800 | [r e]16,500 | 14,800 |
| Molybdenum, mine output, Mo content[e] | | 200 | 200 | 190 | [r]150 | 120 |
| Silver, mine output, Ag content[e] | | 77 | 85 | [3]95 | 100 | 80 |
| Uranium, oxide, U content[e] | | 1,000 | 1,000 | 1,000 | 1,000 | 600 |
| Zinc:[e] | | | | | | |
| Mine output, Zn content, ore hoisted | | 56,000 | 56,000 | [3]55,600 | [r]56,000 | 50,000 |
| Concentrate: | | | | | | |
| Gross weight | | 79,000 | 79,000 | 79,200 | 79,000 | 70,000 |
| Zn content | | 41,000 | 41,000 | [3]41,000 | [r]35,000 | 31,000 |
| Metal, smelter, primary and secondary | | [3]92,000 | 90,000 | [3]86,800 | [3]75,457 | 60,000 |
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos | | 400 | 300 | [e]300 | [e]300 | 300 |
| Cement, hydraulic | thousand tons | 5,494 | 5,535 | [r]4,968 | [r]4,680 | 4,500 |
| Clays: Kaolin | do. | 281 | 220 | [e]220 | 186 | 180 |

See footnotes at end of table.

TABLE 1—Continued

## BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—CONTINUED | | | | | | |
| Gypsum and anhydrite: | | | | | | |
| Crude | thousand tons. | 306 | 401 | 451 | 494 | 450 |
| Calcined | | 103 | 113 | e130 | 102 | 100 |
| Lime: Quicklime | thousand tons | 1,278 | 1,424 | 1,434 | 1,317 | 1,300 |
| Nitrogen: N content of ammonia | do. | 1,070 | 1,342 | e1,300 | 1,309 | 1,300 |
| Pyrites, gross weight[e] | do. | 185 | 185 | 180 | 180 | 170 |
| Salt, all types | do. | 92 | 103 | 78 | 166 | 150 |
| Sodium carbonate, calcined | do. | 1,070 | e1,100 | e1,100 | 1,046 | 1,000 |
| Sulfur:[e] | | | | | | |
| S content of pyrites | | 80,000 | 70,000 | 70,000 | 70,000 | 60,000 |
| Byproduct, all sources | | 65,000 | 60,000 | 60,000 | 60,000 | 50,000 |
| Total | | 145,000 | 130,000 | 130,000 | 130,000 | 110,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, marketable: | | | | | | |
| Anthracite | thousand tons | 71 | 65 | e100 | 43 | 40 |
| Bituminous | do. | 127 | 131 | e200 | 125 | 100 |
| Brown | do. | 5,220 | 4,762 | e6,000 | 3,705 | 3,000 |
| Lignite | do. | 31,401 | 29,189 | e32,500 | 27,827 | 25,000 |
| Total | do. | 36,819 | 34,147 | e38,800 | 31,700 | 28,140 |
| Coke | do. | 1,314 | 1,457 | 1,350 | 1,376 | 1,000 |
| Gas, natural, marketed[e] | million cubic meters | 130 | 127 | 127 | 120 | 100 |
| Petroleum:[e] | | | | | | |
| Crude: As reported | thousand tons | 1,000 | 1,000 | 1,000 | 900 | 500 |
| Refinery products | thousand 42-gallon barrels | 100,000 | 100,000 | 110,000 | 65,000 | 20,000 |

[e]Estimated. [r]Revised.

[1]Table includes data available through June 1992.

[2]In addition to the commodities listed, barite, chromite, fluorspar, gold, magnesite, palladium, platinum, tellurium, uranium, 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.

[4]1987-89 production includes ferromanganese; since 1990 only ferrosilicone is produced.

TABLE 2

## BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Cement | Reka Devnia | Devnia | 1,825. |
| Do. | Zlatna Panega | Panega | 1,300. |
| Do. | Others | Temelkovo, Dimitrovgrad, Pleven, Beli Izvor | 1,590. |
| Coal: Bituminous | Economic Mining and Power Combine (SMEK) Balkanbass | Balkan coal basin in central Bulgaria, northwest of Silven | 445. |
| Brown | G. Dimitrov | Pernik coal basin, southwest of Sofia | 4,000. |
| Do. | Others | Bobov Dol and Pirin in western Bulgaria | 3,100. |
| Lignite | SMEK East Maritsa | East Maritsa coal basin near Zagora | 25,000. |
| Do. | Others | Marbas, Pernik, Bobov Dol, and Pirnik coal basins | 5,300. |
| Copper, concentrate: (Cu content) | Medet-Asarel | Panagurishte, Pazardzhik district | 25. |
| Do. | Chelopech | Srednogorie, Sofia district | 5. |
| Do. | Bradtze | Malko Turnovo | 2. |
| Do. | Elatzite | Srednogorie, Sofia district | 15. |
| Do. | Rosen | Burgas, near the Black Sea | 1. |
| Do. | Tsar Asen | Srednogorie, Sofia district | 2. |
| Do. | Zidrovo | Burgas, near the Black Sea | .5. |
| Metal, refined | Georgi Damyanov | Srednogorie, Sofia district | 120. |
| Iron ore | Kremikovtsi Iron and Steel Combine | Kremikovtsi | 2,000. |
| Lead-zinc: Concentrate (Pb and Zn content) | Gorubso | Erma Reka, Kurdjali, Laki, and Rudozem all in Madan area near Greek border | 59 Pb.<br>47 Zn. |
| Do. | Madzarovo | Near Plovdiv | 3 Pb.<br>2 Zn. |
| Do. | Ossogovo | Ossogovo mountains, western Bulgaria | 3 Pb.<br>2 Zn. |
| Do. | Ustrem | On Thundza river, eastern Bulgaria | 3.5 Pb.<br>.8 Zn. |
| Metal, Pb refined: | Dimitur Blagoev | Plovdiv | 65. |
| Do. | Georgi Dimitrov | Kurdjali | 60. |
| Zn smelter | Dimitur Blagoev | Plovdiv | 60. |
| Do. | Georgi Dimitrov | Kurdjali | 30. |
| Manganese ore | Obrotchishte | Varna district | 50. |
| Natural gas | Ministry of Power Supply | Chiren field, in the northwest | (1). |
| Petroleum: | | | |
| Crude | do. | do. | (1). |
| Refined barrels per day | Economic Trust for Petroleum Products | Refineries in Burgas, Pleven, and Ruse | 260,000. |
| Steel, crude | Kremikovtsi Iron and Steel Works | Near Sofia | 1,800. |
| Do. | Lenin Metallurgical Complex | Pernik (Dimitrov) | 1,300. |

[1]Insignificant capacity.

TABLE 3

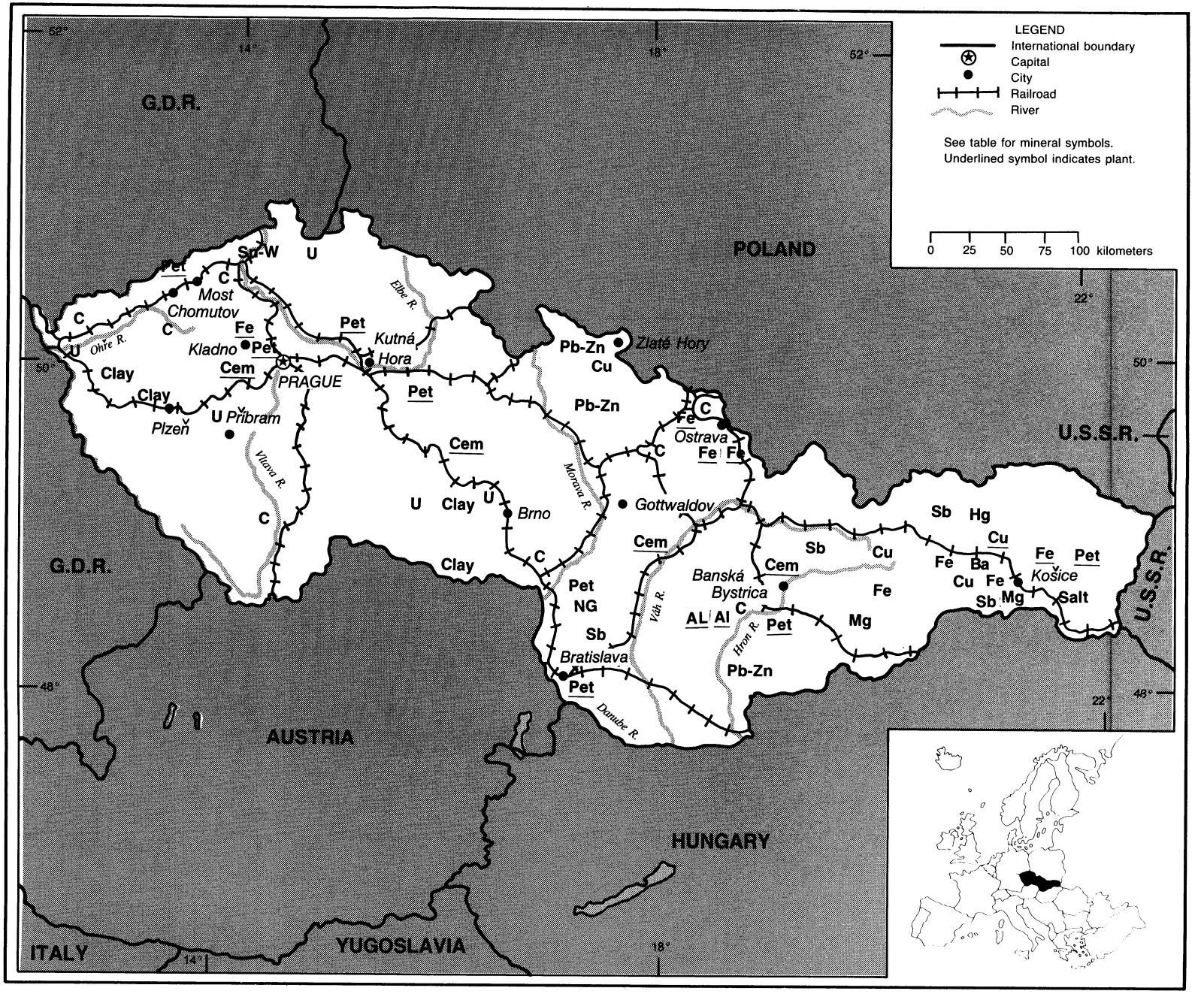
## BULGARIA: APPARENT RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons)

| Commodity | Capacity |
|---|---|
| Bentonite | 58,000 |
| Barite | 30,000 |
| Copper, contained in ore | 4,600 |
| Gypsum | 200,000 |
| Iron, contained in ore | 55,000 |
| Lead, contained in ore | 1,500 |
| Manganese, contained in ore | 35,000 |
| Zinc, contained in ore | 1,400 |

# CZECHOSLOVAKIA

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



THE MINERAL INDUSTRY OF

# CZECHOSLOVAKIA

By Walter G. Steblez

Among the former Eastern European member countries of the Council for Mutual Economic Assistance (CMEA), Czechoslovakia had one of the largest and perhaps the most advanced steel industry. This was largely the legacy of the country's relatively short period of full independence from 1918 to 1938, when Czechoslovakia was considered among the leading technological centers in Europe, especially in respect to engineering and metallurgy. During this period and prior to World War I, when this region was part of the Austro-Hungarian Empire, the Skoda Works in what later was to become the Czech and Slovak Federal Republic was one of Europe's premier machine tool works and munitions manufacturers. In addition, Czechoslovakia has been an important central European producer of industrial minerals, such as basalt, clays, gypsum, limestone, and magnesite, used in both the construction materials and chemical industries within the region.

In 1991, Czechoslovakia's major economic indicators reflected the transition of the country's economy from a centrally planned to a market-based structure. Official Government statistics indicated major declines in both industrial production and GDP (23% and 16%, respectively). However, the extent (if any) to which the country's accounting system has been changed to reflect Czechoslovakia's new economic direction was not clear. Reportedly, the largest declines in industry during 1991 concerned the production of the nonferrous metals mining and processing sector and output in the country's construction industry.

## GOVERNMENT POLICIES AND PROGRAMS

In 1991, the Government of Czechoslovakia directed most of its energy to transforming the country's economy to a market system. The Government's policies included the freeing up of up to 85% of the prices from central administrative control, the implementation of tight monetary policies to control inflation, and instituting partial foreign exchange convertibility within the country. Additionally, the Government reportedly auctioned about 25,000 small businesses and returned approximately 100,000 small businesses to their original owners.

For 1992, the Government planned to extend its denationalization efforts to large-scale state-owned industrial enterprises, including those in the minerals sector. In common with other former members of CMEA, the policies associated with Czechoslovakia's former centrally planned economy stipulated self-sufficiency at all costs, which was aimed at abolishing reliance on the world market or reducing it to a minimum. From 1948 to 1989, the expansion and development of the country's heavy industries was the predominant concern of the Government's economic planners. Decoupled from the world market, Czechoslovakia's heavy industry, including the minerals industry, lost much of the flexibility needed to maintain competitiveness with market economy countries.

Czechoslovakia's industries, compared with those of market economy countries, became relatively inefficient and polluting. Reportedly, serious environmental pollution was caused by the mining sector and the burning of high ash and sulfur brown coal. In the mining sector, severe environmental damage had been caused by untreated tailings and overburden dumps. The use of outdated processing technology and relatively low mineral recovery allowed significant amounts of potentially useful metal and other mineral components to be leached into the environment. In many cases, the application of modern minerals processing technology at the country's tailings and overburden dumps reportedly would create both important additional mineral resources and prevent further environmental degradation. Official data from a study of mining and mineral-related solid wastes from 1980 to 1987 found the average annual output of wastes to have amounted to about 453 Mmt. Of this amount, coal mining waste and overburden amounted to about 404 Mmt/a, or 89% of the total; ashes, slags, and dross from coal consumption amounted to 24 Mmt/a, or 5% of the total; and that of the industrial minerals and construction materials mining and processing sectors amounted to about 21 Mmt/a, also within the range of 5%. Solid waste from metals mining and processing during this period amounted to only 4.4 Mmt/a, or 1% of the total waste.

Reportedly, the most serious medium of pollution in Czechoslovakia has been sulfur dioxide ($SO_2$) emitted with other noxious stack gases during the burning of high ash and sulfur coals, mainly at coal-fired electric powerplants. In respect to total consumption of all energy carriers, measured in terajoules, the use of domestically mined brown coal and lignite represented, on average, about 55% of the energy annually consumed in Czechoslovakia. The emission of $SO_2$

from 1980 to 1987 reportedly amounted to about 3.1 Mmt/a. The distribution of $SO_2$ by sector showed the electric power generating industry to have contributed annually 54% of the total emission of $SO_2$, followed by the chemical and textile industries, 16%, and metallurgy and heavy machine building and metalworking, 8%.

In 1985, the Government of Czechoslovakia addressed many of the country's severe environmental pollution problems in legislation titled, "the Resolution of the Government of Czechoslovakia No. 226/1985." Resolution No. 226/1985 stipulated a sharp reduction in the rate of growth of air pollution through 1990 and its cessation entirely by 1995. An additional goal was to restore air, ground, and water quality to conditions that prevailed in the 1960's.

The chief issue concerning environmental legislation in former CMEA-member countries was the general lack of enforcement of many or all of the provisions prescribed by law. Although the degree of noncompliance varied among the CMEA members, nevertheless, it was reportedly extensive in all cases. Data published in the official statistical abstract for Czechoslovakia for 1992 suggest a consistent decline in all categories of harmful emissions into the atmosphere in 1990 compared with those in 1989. However, this may have resulted as much from an almost universal decline in the country's industrial production during the political and economic transition to democratic and market economy structures as to any focused effort to abate pollution from industrial point sources. The political impact of environmental pollution in Czechoslovakia was demonstrated when environmentally oriented public interest groups prevented the development of the Mokrsko gold deposit because of alleged high environmental risks.

In September 1991, the Governments of the United States and Czechoslovakia signed an agreement that provided Czechoslovakia with a $15 million grant from the United States to be used for cleaning up the environment. Reportedly, this was in addition to an earlier grant of $5 million to Czechoslovakia that was to be earmarked for technical assistance and training in the environmental field.

## PRODUCTION

The overall performance of the country's minerals industry continued to show a downward trend that was evident in 1990. In common with several other former centrally planned economy countries that were members of CMEA, Czechoslovakia's transition to a market economy system involved the gradual creation of a market supply-demand relationship coupled with the use of prices that reflected real costs. Producers no longer were obliged to increase or maintain mineral output levels at all costs and were free to plan closures of economically and, in some cases, environmentally unsustainable operations.

Aggregate indexes of industrial production by sector for 1991 showed a decline in output in all mineral-related sectors compared with those of 1990. The value of output of the mineral fuels industry (extractive and processing) declined by 5.5%. In 1991, the fuel industry's share in the value of total industrial production was 5.7%. The production of the steel industry, whose share of total industrial output was 9.6%, declined by 22% compared with that of 1990. And, as already noted, the steepest decline in output, 43.2%, was in the nonferrous metals sector (extractive and processing), whose share in total value of output of industry was 2.2%. Additionally, the indexes for the chemical, construction materials (extractive and processing), and glass and ceramics (extractive and processing) industries indicated their respective shares of total industrial output at 4.3%, 2.6%, and 1.5%; their respective decline in output value compared with that of 1990 was 31.3%, 32.7%, and 25.9%.

Among the major metals only aluminum showed a marked production increase (by volume) in 1991 compared with that of 1990. However, this increase, following a decline of production from 1989 to 1990, may reflect a determined effort by the regional authorities in the Slovak Republic both to push output toward the smelter's (Zhar nad Hronom) operational capacity and to proceed with plans to raise capacity by 1994. Production in the industrial minerals sector in most cases declined compared with that of 1990. Similarly, with the exception of crude petroleum production, the production of mineral fuels declined in 1991. Although the output of crude petroleum did increase during the year, its output did not reach the level achieved in 1989. *(See table 1.)*

## TRADE

Abridged trade returns published in Czechoslovakia's statistical abstract for 1992 generally showed declining trends in mineral imports for 1991. Import statistics for selected metal ores and metals displayed an increase only in the import of iron ore (12,028,000 tons) compared with that of 1990. This increase reflected a 23% growth in the U.S.S.R.'s delivery of iron ore to Czechoslovakia compared with that of 1990. Imports of crude steel (101,000 tons) declined by 85% compared with those in 1990, and imports of manganese ore (217,000 tons) fell by 77% during this period. The U.S.S.R.'s exports of iron ore to Czechoslovakia constituted 88% of Czechoslovakia's total iron ore imports for 1991. Similarly, Czechoslovakia's imports of manganese ore and crude steel from the U.S.S.R. constituted 46% and 96%, respectively, of the country's total imports of these mineral commodities during the year. In the category of industrial minerals, imports of asbestos (16,974 tons), sulfur (199,000 tons), calcined soda (203,000 tons), and phosphate rock (31,000 tons, $P_2O_5$), respectively, declined by 48%, 50%, 2%, and 66%. More than 90% of the country's sulfur imports was provided by Poland and almost 80% of the asbestos imported by Czechoslovakia was shipped by the U.S.S.R.

Poland also supplied Czechoslovakia with 38% of its import requirements for soda ash. Czechoslovakia's imports of

natural gas (11,673 $Mm^3$) and petroleum (11,383,000 tons) in 1991 declined by 42% and 16%, respectively. The U.S.S.R. remained the dominant provider of these fuels to Czechoslovakia, accounting for 82% of the country's total petroleum imports and 100% of its imported natural gas. Available data for selected mineral exports for 1991 show more mixed results. Exports of bituminous coal (2,484,000 tons), lignite (2,722,000 tons), and coke (1,127,000 tons) rose by 60%, 8%, and 12%, respectively. Exports of rolled steel products (1,784,000 tons) and steel pipe declined, compared with those in 1990, by 40% and 22%, respectively. Among industrial minerals, exports of kaolin (366,000 tons) rose by 2% and plate glass (9,657,000 $m^2$) by 66%. However, the export of magnesite (111,000 tons) declined by almost 80% from the level of the preceding year.

Reportedly, late in the year, Czechoslovakia's largest foreign trade organization involved in mineral trade, Kerametal, received approval from its shareholders—mainly the country's steel and metal companies—to sell about 32% of the company's equity to foreign investors.

## STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1991. *(See table 2.)*

## COMMODITY REVIEW

### Metals

***Aluminum.***—In April, following the country's return to a democratic political structure, Alusuisse-Lonza Holding AG (Alusuisse) of Switzerland, reportedly, became the first Western European nonferrous metals producer to enter a business venture in Czechoslovakia. With the approval of the Ministry of Industry, Alusuisse announced plans to enter into joint venture with Kovohute Decim S.P. of Czechoslovakia. The proposed new company, called Aluminum Decim, would reportedly take over and manage the aluminum processing operation of Kohohute Decim in northern Bohemia. Alusuisse proposed to invest capital in the venture for new equipment and technology to produce high-quality aluminum semimanufactures for sale in both Western and Eastern Europe.

***Copper.***—Reportedly, Czechoslovakia's consumption of copper in recent years ranged from a high watermark of about 97,000 tons in 1986 to slightly more than 76,000 tons in 1990. The decline in the country's consumption of copper and most other nonferrous metals was consistent with industry's general readjustment to newly emerging market-driven economic conditions. With traditional foreign commercial relationships within the context of CMEA no longer valid, Czechoslovakia's nonferrous metals sector was faced with both declining domestic and export markets. Reportedly, from 1990 to 1991, the domestic market for nonferrous metals had fallen by as much as 80% from its previous levels during the country's period of central economic planning.

According to officials of the Ministry of Industry, a plan to restructure the processing and fabricating plants belonging to the nonferrous metals sector, including those for copper, would be formulated in 1992. Excluding 1991, when domestically produced copper declined substantially by 22% from the level reached in 1990, domestic mine production of copper, in most years, generally has accounted for only about 5% of domestic consumption. Copper was mined at small underground operations at the Rudnany Mine in Slovakia and Zlaty Hory in Moravia (Czech Republic). Both facilities produced multimetal concentrates. The concentrates produced at Rudnany have had an average grade of 19.7% copper, 6.8% antimony, and 1.95% mercury, while those produced at Zlaty Hory graded 10.7% copper, 22.3% zinc, and 6.4% lead. Concentrates from both facilities were shipped to the Krompachy smelter and refinery.

In addition to smelting concentrates produced from domestic ore, the Krompachy smelter and refinery also processed about 4,000 mt/a of concentrates from both Cuba and Mongolia and approximately 17,000 mt/a of scrap. The Krompachy smelting and refining complex also had facilities to produce copper billets, powder, and limited quantities of plate and wire. To meet the needs of the country's four major producers of copper semimanufactures (Celahovice, Povrly, Provaske Strojarne, and Velvary), refined copper was imported, ranging from about 40,000 to 49,000 mt/a. The U.S.S.R. has been historically the largest exporter of refined copper to Czechoslovakia, accounting for about 80% of the country's total imports.

Data for 1990, the last year for which the country's trade returns were largely available, indicated a total import of refined copper of 42,700 tons, of which the export component from the U.S.S.R. amounted to 32,300 tons. Additionally, shipments from the Federal Republic of Germany and Poland were reported at 400 tons and 8,000 tons, respectively. However, partial trade data available for 1991 indicated increasing shipments of cathode from Germany to Czechoslovakia: about 6,500 tons during the first 9 months of the year. Consumption of copper would continue to decline mainly in the near term. The need for modern infrastructure and urban construction would give copper a boost through the telecommunications component in these spheres of activity. However, the issue concerning the future of the mining and smelting components of Czechoslovakia's copper industry would depend mainly on the costs that would be involved in modernizing the Krompachy operation from the standpoint of both overall efficiency and optimizing pollution control technology. Reportedly, the entire component of mercury contained in the concentrates is vented with the stack gases during smelting operations, resulting in a serious health threat to the outlying areas.

***Iron and Steel.***—Since 1989, excluding the U.S.S.R., Czechoslovakia has been the largest producer of crude steel and steel products within the former CMEA in terms of gross output and per capita output. Also, with the possible exception of the former German Democratic Republic, Czechoslovakia's technological level both in steelmaking and machine building was reputedly the highest among the former members of CMEA (excluding the U.S.S.R.). The decline in the country's production of steel and steel products in 1990 and 1991 was consistent with Government policies aimed at rationalizing all industrial and other commercial activities to ultimately conform to domestic and foreign market needs. Although output of steel was expected to continue to decline during the transition to a market system, future demand would be driven by modernized machine tool and automotive sectors as well as by structural steels needed to modernize and develop the country's infrastructure along EC standards. In 1991, steel production by process amounted to about 4.4 Mmt by open hearth, 1.3 Mmt by electric furnace, and 6.4 Mmt by oxygen converter. Compared with that of 1990, production by process declined by 25%, 30%, and 11%, respectively. Domestic mining supplied only a small percentage of the steel industry's requirements of iron ore, which in 1991 amounted to about 12% of the total requirement; the rest was imported mainly from the U.S.S.R., Brazil, and India. Soviet iron ore shipments amounted to approximately 87% of total imports for the year.

Traditional barter-based trade agreements for mineral raw materials with the U.S.S.R. and several other former CMEA-member countries continued to be advantageous for Czechoslovakia and other countries owing to a lack of hard currency reserves and other financial resources in the region.

In 1991, an example of the barter-based mineral trade between Czechoslovakia and the U.S.S.R. was an agreement worth $93 million, reportedly signed in August, that entailed exports of 100,000 tons of iron ore in 1991 by the Severniy Mining and Beneficiation Complex in Krivoy Rog in the Ukraine to the East Slovak Iron and Steel Works in exchange for finished steel products. This agreement also included provisions for joint research work on ore processing and other new technologies.

Formal work on restructuring Czechoslovakia's steel industry began in March with an announcement that a study of the country's steel industry would be performed in the second half of 1991 by consultants from the United States and the EC. In August, IFC Kaiser Engineers (Kaiser), reportedly, was awarded a contract, under a $450,000 U.S. Government program to restructure Czechoslovakia's metallurgical industries, to conduct a study of the steel industry and propose recommendations for restructuring it. Most of the $450,000 was to be designated for Kaiser's evaluation of the Poldi United Steel Co. in Kladno, the Trinec Steel Works in Trinec, and the East Slovak Steel Works in Kosice.

Reportedly, a number of steel industry experts in Czechoslovakia considered that the country's steelmaking capacity of about 15 Mmt/a would have to be reduced to about 5 to 8 Mmt/a to be competitive. Similarly, in 1991, W.S. Atkins Consultants of the United Kingdom was awarded a contract worth about $1.4 million to do a study for rationalizing and modernizing the Vitkovice integrated steelworks in Ostrava. Early recommendations in the study urged the Vitkovice steelworks to concentrate future investment in plate and seamless pipe. Vitkovice's management agreed to these recommendations and indicated that based on additional findings by W.S. Atkins, beginning in January 1992, the company would take the form of a holding company with subsidiaries for steel production, engineering, and enterprise or corporate affairs. To implement the proposal that emphasized the production of plate and seamless pipe, Vitkovice's management planned to upgrade the enterprise's seamless pipe and plate mills by 1993.

Efforts to modernize various steel industry facilities during the year included an entire changeover in production process at the Sverma Steelworks at Podbrezova that has produced semimanufactures used in the manufacture of seamless pipes. The Sverma Steelworks planned to replace its open-hearth furnace with an electric arc furnace. Reportedly, a contract valued at about $10.5 million was awarded to Sta Italiana Impianti pa (Italimpianti) to deliver a 60-ton electric arc furnace, a ladle furnace, and associated assemblies. Reportedly, Stelwire, a subsidiary of Canada's Stelco Inc., was awarded a contract, valued at about $700,000, to provide Czechoslovakia's Bohunin Steel and Wire Co. with training in modern management practice, marketing, and related disciplines. Stelwire officials, reportedly, did not discount the possibility of future joint marketing arrangements between the two companies that would include products that are unique to each company.

## Industrial Minerals

Czechoslovakia was richly endowed both in quantity and range of industrial minerals that met the needs of the country's chemical and construction materials sectors as well as its export trade. Industrial minerals should acquire added importance during Czechoslovakia's transition to a market economy system, especially given the unifying forces in Europe generated by the EC's integration policies. EC-set standards, including those prescribed for the construction materials manufacturers, will be increasingly adopted by European countries regardless of their immediate EC membership status because the adoption of these standards would be among the prerequisites for EC membership. Additionally, non-EC countries wishing to conduct foreign commerce with the EC would be required to ensure that their export products meet EC standards and specifications. The need to modernize Czechoslovakia's infrastructure (airports, commercial buildings, highways, railroads, riverine port facilities) and the requirements of both the country's domestic and export

markets should significantly raise the profile of the industrial minerals sector in the economy.

*Cement.*—There were a number of important foreign commercial transactions in the cement industry during the year. At yearend, an agreement reportedly was reached between National Property Fund of the Czech Republic and Italy's Ital Cementi Du. S.p A. (Ital Cement) that would allow Ital Cement to invest in a.s. Cement Hranice. As part of the agreement Ital Cement reportedly would assist in the construction of a new 2,500-ton-per-day clinker shop at a.s. Cement Hranice. The new clinker shop would be fully automated and equipped with the latest dust-abatement technology. Reportedly, both partners in this venture expected the Czech company to be competitive in selected European markets. Details of the financial arrangement between a.s. Cement Hranice and Ital Cementi Du. S.p A. were not disclosed.

Also at yearend, SA des Cimenteries "CBR" (CBR) of Belgium reached an agreement with the Government of Czechoslovakia that would allow it to acquire a 35% share in Cementarny a Vapenky Mokra A.S. (CeVa Mokra), the major cement producer in the southern Moravian and Bohemian regions of the Czech Republic. The agreement called for CBR to acquire a 72% share in CeVa Mokra by the end of 1994 and gives CBR an option to raise its share to 77% between 1994 and 1999. CBR's total investment program in CeVa Mokra would amount to about $65 million over a 10-year period. In 1991, the production capacity at CeVa Mokra amounted to about 2 Mmt/a of cement and 250,000 mt/a of lime. Moreover, the company's mineral resource supply position reportedly was more than adequate to ensure a profitable long-term business association.

In July, Lafarge Coppee S.A. (Coppee) of France concluded a preliminary agreement with the Government of Czechoslovakia to acquire a 40% stake in Cizkovicka cementarna a vapenice (Cizkovice) in the Czech Republic. The output of cement at Cizkovice's 700,000-mt/a operation could be increased to 850,000 tons with a minimum investment. Financial details of the agreement were not disclosed, but, given Coppee's acquisition of the Karsdorf Cement Works, eastern Germany's largest producer of cement, an eventual acquisition of Cizkovice near the German border would give Coppee a strong position in the region. Coppee indicated that it planned to keep the existing management at the Cizkovice works but would also participate in management decisions.

In June, Heidelberger Zement AG, the largest cement producer in Germany, reached a preliminary agreement with the Government of Czechoslovakia to acquire a 40% holding in Pragocement Radotin in Prague and Cementarny a vapenky Beroun in Kraluv Dvor. Each acquisition reportedly would amount to $19 million. Additionally, Cementarny a vapenky Beroun announced plans to sell 49% of its subsidiary, Velkolom Certovy Schody (VCS), which operates quarrying facilities at the largest limestone resources in Eastern Europe, to the Lhoist Group of Belgium. Reportedly, the value of the transaction would amount to approximately $13 million, and a further investment in VCS, valued at $12 million, would be made by Lhoist by 1993. A similar agreement would allow Holderbank of Switzerland to acquire initially a 30% stake in Cementarny a vapenky Prachovice, valued at about $25 million. Additionally, provisions in the agreement allow Holderbank to eventually acquire 57% equity in the company. Reportedly, Heidelberg Zement, Lhoist, and Holderbank planned to focus the commercial activity of their acquisitions in Czechoslovakia toward the German market.

*Magnesite.*—In 1991, Czechoslovakia was ranked as the seventh largest world producer of magnesite. All of the country's exploitable resources of magnesite were in Slovakia between Lucenec and Kosice in the eastern part of the Republic. According to the Slovak Economics Ministry, the production of magnesite would be reduced by 25% before the year 2000, owing to a negative environmental impact from magnesite workings in the area. The Slovak Economics Ministry also announced plans to produce 99%-pure magnesite clinker with no iron residual from the ore and an almost pure magnesium oxide.

## Mineral Fuels

*Coal.*—Domestic coal mining annually has supplied Czechoslovakia with about 55% of its energy needs and has amounted to about 87% of the country's total primary energy production. In 1991, there were seven brown coal- and lignite-producing districts in the country. In the Czech Republic, the brown coal-lignite-producing areas were at Brno, Kladno, Most, Plzen, Sokolov, and Trutnov. In the Slovak Republic, only Prievidza (Handlovan) produced brown coal. Overall recoverable resources of brown coal and lignite in Czechoslovakia amounted to 8,850 Mmt. Reportedly, 90% of the brown coal-lignite was extracted by surface mining and is typically a high ash and sulfur product ranging from 6.6% to 41.1% in ash content (30% average). The coal's sulfur content ranged from 0.7% to 6.0% (1.8% average). Most of the brown coal and lignite has been consumed by the country's electric power generating industry, causing a significant $SO_2$-emission problem, as noted previously.

Bituminous coal was mined entirely underground (longwall method) at the East Bohemia, West Bohemia, Kladno and Ostrava-Karvina Coalfields in the Czech Republic. The Kladno and Ostrava-Karvina Coalfields were the largest producers of bituminous coal, respectively accounting for about 6% and 88% of Czechoslovakia's total bituminous coal output. About 73% of the coal produced at Ostrava-Karvina has been suitable as coking coal. Kladno's entire output consisted of steam coal. The ash content of the country's bituminous coals ranged from 5.2% to 55.4% (18% average); the sulfur content ranged from 0.6% to 1.5% (0.65% average). In 1991, Government sources indicated that although coal's share in the country's

energy balance should gradually decline, by the turn of the century it would still constitute between 45% and 50% of Czechoslovakia's energy requirement.

*Natural Gas.*—The U.S.S.R. continued to supply Czechoslovakia with 100% of its import needs of natural gas. In 1991, the U.S.S.R.'s deliveries of natural gas to Czechoslovakia constituted about 66% of the country's total consumption of natural gas. In August, Czechoslovakia signed an amended agreement with the U.S.S.R. that would extend the cooperation between the two countries on the construction of the U.S.S.R.'s Yamburg natural gas pipeline. The original agreement provided Czechoslovakia with Soviet natural gas in exchange for Czechoslovakia's work on constructing pipeline facilities and supplying large-diameter pipe and equipment.

The new agreement, while calling for the continuation of most of the provisions of the prior agreement, also recognized the U.S.S.R.'s debt of more that 1.5 billion transferable rubles (nonconvertible barter accounting units) to Czechoslovakia for uncompensated past deliveries of goods and services. Reportedly, the U.S.S.R. would repay this debt and its interest with additional deliveries of 16.35 $Mm^3$ of natural gas to Czechoslovakia over the next several years.

*Nuclear Energy.*—Czechoslovakia operated two nuclear electric power stations at Dukovany in the Czech Republic and at Jaslovske Bohunice in the Slovak Republic. Each power station was equipped with four Soviet-built 440-MW VVEhR (pressurize water) reactor blocks. The total installed capacity of both nuclear reactors represented about 15% of the total installed electric power generating capacity of the country. In 1991, the Mochovce nuclear powerplant (1,560 MW) in Slovakia and the Temelin nuclear powerplant (1,780 MW) in the Czech Republic were under construction.

The future of the country's nuclear industry was the subject of intense discussion during the year owing to a fire that resulted in a leakage of radioactive material at the Jasloske Bohunice nuclear power station and the general issue of long-term disposal of spent nuclear materials. Although the radioactive leakage at the Bohunice reactor was contained, there was a reported total of 327 incidents at the country's nuclear power stations during the year. With the exception of the accident at Bohunice, the rest of the incidents, reportedly, were minor and did not present safety problems.

The second issue, relative to radioactive wastes, raised concerns about the environmental impact of handling and storage of spent nuclear fuel. Reportedly, the country's spent fuel would no longer be accepted by the U.S.S.R. for permanent storage. The U.S.S.R. agreed to store this material only on a temporary basis for a fee. Consequently, the Government of Czechoslovakia, reportedly, planned to hold the spent nuclear fuel at the Jaslovske Buhunice nuclear power station until 1994. The Ministry of the Environment planned to begin a study of potential permanent storage sites in 1992. Czechoslovakia supplied its nuclear electric power facilities with fuel produced from uranium ore mined domestically in the Czech Republic at mining districts in Central Bohemia (Pribram), West Bohemia (Dylen), South Moravia (Rozna), and North Bohemia (Hamr). Reportedly, Czechoslovakia's uranium mines have produced about 900 to 1,350 mt/a of contained $U_3O_8$ and had a combined capacity to produce 2,200 mt/a. Although a decline in uranium ore production was expected by 1995, partly owing to depletion at several mining facilities, the country should have sufficient resources to meet an expected demand of 900 mt/a through the 1990's.

*Petroleum.*—A deficit in the production of petroleum in the U.S.S.R., caused by that country's internal economic and political difficulties during the year, resulted in a shortfall of petroleum deliveries to the U.S.S.R.'s former CMEA-partner countries, including Czechoslovakia.

Reportedly, in September, the Adria pipeline, which carried petroleum from Iran and Nigeria from Yugoslavia's port at Omisali to Hungary and Czechoslovakia, was closed because of the widening civil war in Yugoslavia. To compensate for the shortage of imported petroleum in 1991 and to ensure future unimpeded supplies to its consumers, Czechoslovakia's Government considered a number of proposals for new petroleum pipelines to be built in more politically stable areas of Europe. Reportedly, a decision was made to extend the Transalpine petroleum pipeline that runs from Trieste in Italy to Austria and Germany to Czechoslovakia. The annual carrying capacity of the planned extension would be 55 Mmt/a of petroleum.

## Reserves

In view of Czechoslovakia's effort to transform its economy to a market-based system, the country's mineral resources will be subject to reevaluation from a market economy 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 non-market-economy countries, such as Czechoslovakia, political rather than economic consideration was paramount in formulating policies for industrial development. Political directives to discover exploitable mineral resources may have resulted in possible overestimations and other distortions of collected field data.

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 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, $C_1$, and $C_2$, based on the Soviet classification system, where sufficient geological data have been gathered relative to the size of the deposit and its mineral grade.

In category A, the "reserves" are known in detail. The ore boundaries are outlined by trenching, exploratory workings, or exploratory boreholes. The depositional environment, the proportion of different commercial grades of ore, and the hydrogeological conditions of projected exploitations have been ascertained. The quality and technological properties of the ore are ascertained in detail, ensuring the projected reliability of beneficiation and production operations.

In category B, the "reserves" in place are explored. The ore bodies are outlined by exploratory workings or boreholes. The depositional environment is known and the types and industrial grades of ore are ascertained but without details of their distribution. The quality and technological properties of the ore are known sufficiently well to ensure the correct choice of beneficiation system. The general conditions of exploitation and the hydrogeological environment are known in good detail.

In category $C_1$, the "reserves" in place are estimated by a sparse grid of exploratory boreholes or workings. This category also includes "reserves" adjoining the boundaries of A and B categories of ore as well as "reserves" of very difficult deposits in which the distribution of the values of mineral cannot be determined even by a dense exploratory grid. The quality, types and industrial grades, and technology of beneficiation are ascertained tentatively by means of laboratory tests and analyses and by analogy with known deposits of the same type. The general conditions of exploitation and the hydrogeological environment are known tentatively.

The $C_2$ category includes those "reserves" in place that adjoin the explored "reserves" of A plus B plus $C_1$ categories as well as "reserves" indicated by geological and geophysical evidence and confirmed by boreholes. Taking this system into account, Czechoslovakia's mineral resources in categories $A+B+C_1$ are given in table 3. *(See table 3.)*

## INFRASTRUCTURE

Czechoslovakia's inland system of ways and communications consisted of 87,118 km of railroads, highways, and internal waterways. The railroad system consisted of 12,855 km of 1.435-m-gauge track, 102 km of 1.520-m track, and 146 km of 0.750- and 0.760-m narrow-gauge track; 2,861 km was double track and 3,798 km was electrified. The highway and road system was 73,450 km in total length, of which 517 km was classified as superhighways. Czechoslovakia had 475 km of navigable inland waterways with riverine ports at Prague on the Vltava River, Decin on the Elbe River, and Komarno and Bratislava on the Danube. The country's maritime outlets are entirely in neighboring countries: Poland (ports at Gdynia, Gdansk, Szczecin), Croatia (port at Rijeka), Slovenia (port at Koper), and Germany (ports at Hamburg and Rostock). The country's merchant fleet totaled 437,291 dwt and included 13 cargo vessels and 9 bulkers. Pipelines consisted of 1,448 km of pipe for crude petroleum, 1,500 km of pipe for petroleum products, and 8,100 km of pipe for natural gas.

## OUTLOOK

In the near term, the profile of Czechoslovakia's mineral industry will be determined by the country's economic restructuring to a market system, as well as social demands for both Government action on environmental protection and the maintenance of acceptable levels of employment. However, in 1991, it became apparent that much of the debate on these issues could be subordinated to the politics of the country's emerging separatist movements to create independent Czech and Slovak Republics.

## OTHER SOURCES OF INFORMATION

Federalni statisticky urad
Sokolovska 142
18613 Prague 8
Czechoslovakia

Ministerstvo zahranicneho obchodu
Politickych veznu 20
11001 Prague 1
Czechoslovakia

GEOFOND
Kostelni 26
17021 Prague 7
Czechoslovakia

GEOFOND
Bukurestska 4
81104 Bratislava
Czechoslovakia

Ustredni ustav geologicky
Malstranske nam. 19
11821 Prague 1
Czechoslovakia

Slovensky geologicky ustav
Bukurestska 4
81104 Bratislava
Czechoslovakia

TABLE 1
## CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Alumina | | 134,200 | 137,500 | 205,000 | 175,000 | 186,600 |
| Aluminum ingot, primary | | 32,366 | 31,435 | 32,576 | 30,067 | 49,387 |
| Antimony, mine output, Sb content | | e1,000 | 2,921 | 1,187 | 1,272 | e1,100 |
| Cobalt metal[e] | | 50 | 50 | 250 | 259 | 60 |
| Copper: | | | | | | |
| Mine output: | | | | | | |
| Ore, gross weight | | 830,000 | 796,000 | 743,000 | r517,000 | 225,000 |
| Concentrate: | | | | | | |
| Gross weight | | r24,782 | 23,303 | 20,895 | 16,899 | 11,313 |
| Cu content[e] | | 5,200 | r5,100 | 24,900 | 23,308 | 2,600 |
| Metal: | | | | | | |
| Smelter, primary[e] | | 5,300 | 5,000 | 5,500 | 24,300 | 3,500 |
| Refined, primary and secondary | | 27,202 | 27,076 | 26,920 | 24,606 | 25,273 |
| Gallium metal[e] | kilograms | 3,500 | 3,700 | 22,000 | 21,345 | 1,400 |
| Gold metal[e] | do. | 600 | 600 | 550 | 550 | 300 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | thousand tons | 1,798 | 1,773 | 1,780 | 1,831 | 1,738 |
| Fe content | do. | 462 | e440 | 470 | 480 | e460 |
| Metal: | | | | | | |
| Pig iron | do. | 9,788 | 9,706 | 9,911 | 9,667 | 8,479 |
| Ferroalloys, electric furnace | do. | 161 | 162 | 166 | 169 | 162 |
| Crude steel | do. | 15,356 | 15,319 | 15,465 | 14,877 | 12,071 |
| Semimanufactures | do. | 12,950 | 12,999 | 12,929 | 12,555 | 10,442 |
| Lead: | | | | | | |
| Mine output: | | | | | | |
| Concentrate, gross weight | | 5,612 | 5,429 | 5,351 | 5,898 | 6,645 |
| Pb content | | 2,801 | e2,800 | e2,700 | 2,997 | e3,400 |
| Metal, secondary | | 26,008 | 26,045 | 26,008 | 23,665 | 17,835 |
| Manganese ore, gross weight[3] | | 900 | — | — | — | — |
| Mercury | | 164 | 168 | 131 | 126 | 75 |
| Nickel metal, primary[e] | | 3,800 | 3,800 | 23,800 | 22,970 | 2,400 |
| Silver[e] | kilograms | 30,000 | 30,000 | 30,000 | 25,000 | 20,000 |
| Tin: | | | | | | |
| Mine output, Sn content | | r500 | r600 | r500 | r300 | — |
| Metal, primary and secondary | | 545 | 515 | 562 | r613 | 118 |
| Tungsten, mine output, W content[e] | | e45 | e50 | 74 | 83 | 85 |
| Uranium[e] | | 2,300 | 2,300 | 22,300 | 21,900 | 1,900 |
| Zinc: | | | | | | |
| Mine output: | | | | | | |
| Ore, gross weight | | 700,000 | 694,000 | 682,000 | r664,000 | 533,000 |
| Concentrate, gross weight | | 13,662 | 13,870 | 14,137 | 15,423 | 16,611 |
| Zn content | | e7,000 | e7,000 | 7,067 | 7,500 | 7,800 |
| Metal, secondary | | 1,143 | 1,357 | 1,296 | r978 | 811 |

See footnotes at end of table.

TABLE 1—Continued

## CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| **INDUSTRIAL MINERALS** | | | | | | |
| Barite | | e60,000 | 60,794 | 50,800 | 87,000 | e85,000 |
| Cement, hydraulic | thousand tons | 10,369 | 10,974 | 10,888 | 10,215 | 8,299 |
| Clays: | | | | | | |
| Bentonite[e] | | 30,000 | 30,000 | 30,000 | 30,000 | 25,000 |
| Kaolin | | 697,000 | 685,958 | 698,000 | r812,000 | 705,000 |
| Diamond, synthetic[e] | carats | — | 5,000 | 5,000 | 5,000 | 5,000 |
| Fertilizer, manufactured: | | | | | | |
| Nitrogenous, N content | | 596,409 | 596,420 | 603,848 | r513,897 | 356,700 |
| Phosphatic, $P_2O_5$ content | | 277,041 | 313,009 | 295,643 | r256,811 | 168,329 |
| Potassic, $K_2O$ content | | 110,542 | 115,625 | 108,420 | r105,784 | 34,625 |
| Mixed | | 427,095 | 478,001 | 410,631 | r410,000 | 11,040 |
| Fluorite[e] | | 60,000 | 60,000 | 60,000 | 60,000 | 55,000 |
| Fluorspar[e] | | 95,000 | 95,000 | 2e68,910 | 2e46,966 | 45,000 |
| Graphite | | e20,000 | e15,000 | 14,676 | 12,171 | e12,000 |
| Gypsum and anhydrite, crude | | 770,998 | 774,133 | 796,000 | r744,000 | 624,000 |
| Lime, hydrated and quicklime | thousand tons | 3,237 | 3,311 | 3,346 | r3,350 | 3,230 |
| Magnesite, crude | | 671,000 | 630,786 | 642,000 | 561,000 | 328,000 |
| Nitrogen: N content of ammonia | | 775,640 | 771,100 | 603,848 | 513,807 | e400,000 |
| Perlite | | 41,997 | 43,390 | e44,000 | 41,700 | e41,000 |
| Pyrite, gross weight[e] | | 140,000 | 140,000 | 140,000 | 140,000 | 140,000 |
| Salt | | 337,985 | 350,201 | 344,201 | r331,809 | 309,989 |
| Sodium compounds, n.e.s.: | | | | | | |
| Caustic soda | | 332,441 | 337,062 | 337,053 | 334,754 | 334,000 |
| Soda ash | | 102,659 | 112,217 | e110,000 | 104,360 | 104,000 |
| Stone: | | | | | | |
| Limestone and other calcareous stones | thousand tons | 22,927 | 23,244 | r19,494 | r12,146 | 7,442 |
| Quarry stone, not further described | thousand cubic meters | 33,317 | 35,225 | 32,889 | e30,000 | e30,000 |
| Sulfur:[e] | | | | | | |
| Native | | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| From pyrites | | 2e38,000 | 60,000 | 50,000 | 50,000 | 50,000 |
| Byproducts, all sources | | 40,000 | 40,000 | 40,000 | 40,000 | 40,000 |
| Total | | 84,000 | 106,000 | 96,000 | 96,000 | 96,000 |
| Sulfuric acid | | 1,264 | 1,249 | 1,142 | r1,033 | 682 |
| Talc[e] | | 30,000 | 30,000 | 30,000 | 26,000 | 25,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | | |
| Coal: | | | | | | |
| Bituminous | thousand tons | 25,736 | 25,504 | 25,070 | r22,082 | 19,459 |
| Brown and lignite | do. | 101,986 | 99,919 | 94,263 | r85,168 | 82,507 |
| Coke: | | | | | | |
| Metallurgical | do. | 8,351 | 8,349 | 8,130 | r6,173 | 5,539 |
| Unspecified | do. | 2,235 | 2,237 | 2,017 | r3,464 | 3,037 |
| Fuel briquets from brown coal | do. | e1,000 | 1,128 | 1,147 | r1,051 | 892 |
| Gas: | | | | | | |
| Manufactured, all types | million cubic meters | 7,270 | 6,782 | 6,334 | r5,939 | 5,376 |
| Natural, marketed[4] | do. | 696 | 732 | 683 | 457 | 418 |

See footnotes at end of table.

TABLE 1—Continued

## CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | thousand tons | 147 | 142 | 144 | 123 | 140 |
| Converted | thousand 42-gallon barrels | 997 | 963 | 976 | 834 | 949 |
| Refinery products[e] | do. | 126,000 | 126,000 | [r]120,000 | [2]95,462 | 90,000 |

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

[1]Table includes data available through Dec. 15, 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.

TABLE 2

## CZECHOSLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners[1] | Location[2] | Capacity |
|---|---|---|---|
| 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 | SHD administration | Most, Northwest Bohemia | 61,200 |
| Do. | HDB administration | Sokolov, west Bohemia | 17,000 |
| Do. | ULB administration | Prievidza, central Slovakia | 6,800 |
| Lignite | 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 kilograms | SNP Aluminum Works | Ziar nad Hronom, central Slovakia | 4,000 |
| Iron: | | | |
| Ore | Nizna Slana and Rudnan | Central Slovakia | 1,600 |
| Concentrate | do. | do. | 1,300 |
| Lead-zinc, ore | Horni Benesov and Zlate Hory | North Moravia | 400 |
| Do. | Banska Stiavnica | Central Slovakia | 200 |

See footnotes at end of table.

TABLE 2—Continued

## CZECHOSLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners[1] | Location[2] | Capacity |
|---|---|---|---|
| Lead, metal secondary: | | | |
| Refined | Kovohute Pribram | Czech Republic Pribram | 26 |
| Magnesite | SMZ | East Slovakia | 550 |
| Mercury | Dubnik, Malachov, and Rudnany | Central Slovakia | 150 |
| Nickel, smelter | Niklova Huta | Sered, south Slovakia | 5 |
| Natural gas billion cubic meters | Gasfields around Hodonin | South Moravia | 25 |
| Petroleum: | | | |
| Crude | Oilfields around Hodonin | do. | 140 |
| Refinery | Kolin, Kralupy, Pardubice, and Zaluzi | Bohemia | NA |
| Do. | Bratislava, Strazske, and Zvolen | Slovakia | NA |
| Steel, crude | Vychodoslovenske Zeleziarne sp (East Slavak Iron and Steel Works) | Slovakia, Kosice | 4,000 |
| Do. | Nova Hut sp (Ostrava) | Czech Republic, Kunice-Ostrava | 3,800 |
| Do. | Zelezarne Vitkovice | Vitkovice-Ostrava | 1,900 |
| Do. | Trinecke Zelezarny (Trinec Iron and Steel Works) | Trinec | 3,000 |
| Do. | Poldi United Steel Works | Kladno-Prague | 1,700 |
| Do. | Svermove zeleziarne | Slovakia, Podbrezova | 600 |
| Do. | Zelezarny Bila Cerkev | Czech Republic, Hradek-Rokycany | 300 |
| Do. | Zelezarny Veseli | Veseli nad Moravou | 300 |
| Do. | Zelezarny Chomutov sp | Chomutov | 350 |
| Do. | Bohumin Iron and Steel Works | Bohumin | 400 |
| 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.

TABLE 3

## CZECHOSLOVAKIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1991

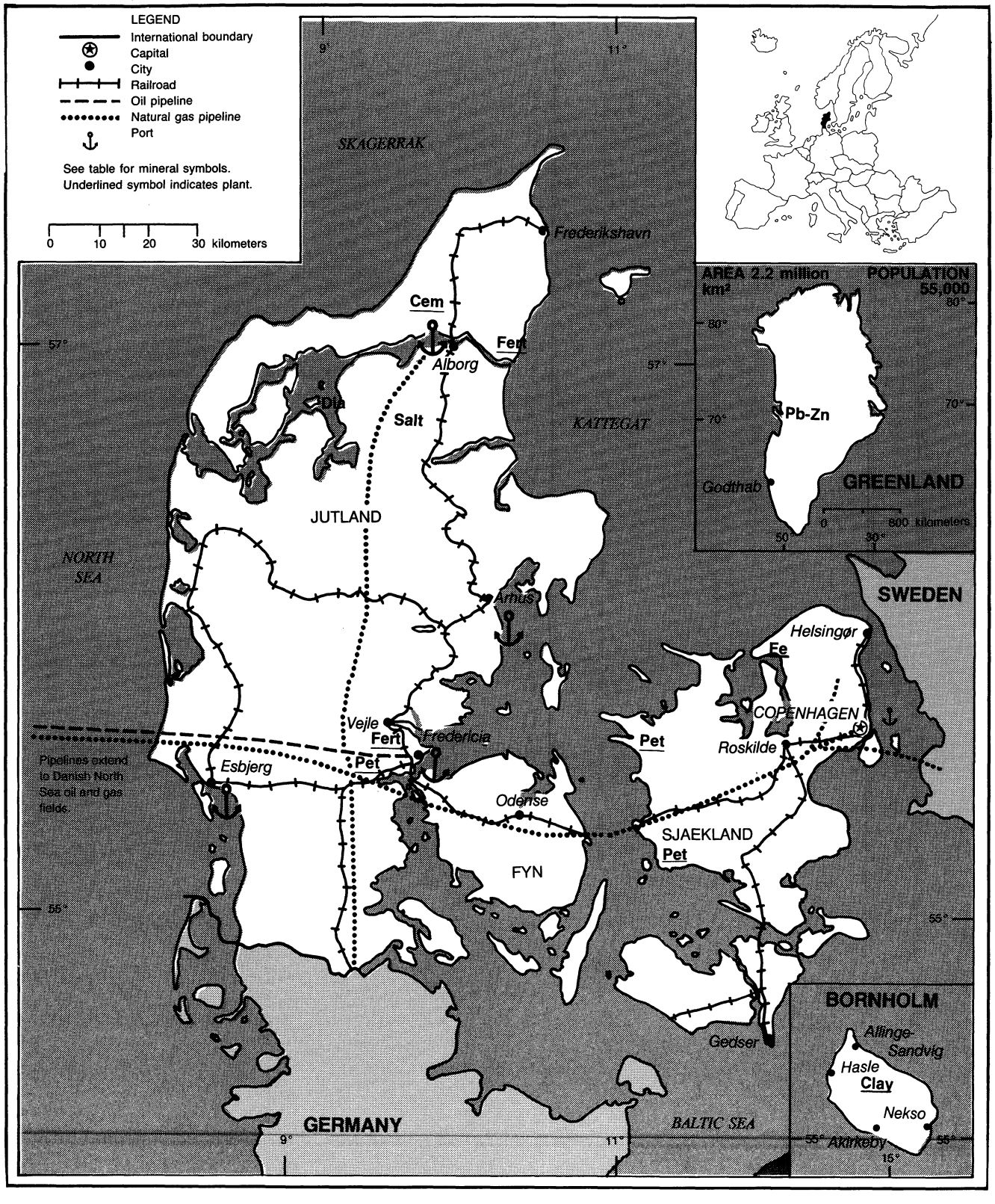
(Thousand metric tons unless otherwise specified)

| Commodity | Resources |
|---|---|
| Clay: | |
| Bentonite | 50,000 |
| Kaolin | 180,000 |
| Refractory | 148,000 |
| Copper, ore 0.6% to 0.9% Cu | 44,846 |
| Coal: | |
| Bituminous | 1,791,000 |
| Brown | 4,179,000 |
| Lignite | 221,000 |
| Diatomite | 8,800 |
| Feldspar | 20,800 |
| Fluorspar | 1,800 |
| Graphite | 2,000 |
| Gypsum | 117,000 |
| Iron ore | 91,869 |
| Limestone | 3,104,000 |
| Magnesite | 168,000 |
| Rock salt | 263,000 |
| Sand: | |
| Glass | 97,000 |
| Foundry | 221,000 |
| Talc | 400 |

Source: Gornaya Entsiklopediya, Moscow: "Sovetskaya Entsiklopediya, 1991.

# DENMARK

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



THE MINERAL INDUSTRY OF

# DENMARK AND GREENLAND

By Charles L. Kimbell

## DENMARK

Denmark's small but economically viable mineral industry continued to make a modest but nontheless very useful contribution to the nation's economy in 1991, registering significant upturns in output in most of its major components. The most significant of these gains were those in the crude oil and natural gas sector, which supplied substantially increased amounts of both crude oil and natural gas to both domestic and export markets, thereby not only reducing Denmark's dependence on foreign energy sources, but also providing increased foreign exchange earnings.

Although Denmark is commonly known more as an agricultural producer than as an industrial center, the country has a number of mineral industry activities beyond its relatively new oil and gas sector that contribute modestly to both the national economy's well-being and to global mineral supplies. Notable are the country's cement industry, with overseas involvement and a significant export market, and the diatomaceous earth industry, with its substantial production of the diatomaceous clay commonly termed moler. Of growing importance in recent years has been production of sand, gravel, and crushed stone, not only to meet domestic requirements but also to supply a very substantial export market, chiefly in Germany, but including lesser amounts to other Scandanavian countries and the United Kingdom.

Denmark, through 1991, had no metallic ore deposits that had been shown to be economically viable, although the 1991 discovery of heavy minerals in Quaternary terraces in the central area of the Jutland peninsula offered some hope for commercial development. The only metal industry in Denmark is Danish Steel Works Ltd.

The gross domestic product (GDP) stood at $91.1 billion[1] (purchasing power equivalent), with a real growth rate of about 2%. The minerals industry's contribution to this GDP was rather modest, but is incompletely assessed. The quarrying sector and the industrial minerals sector contribute about 1% each to the national economy, while the metals sector contributes only about 0.3%. The electricity, gas, and water sectors as a group contribute more than 2% to the economy. Inseparable from other industry results are the contributions of the crude oil and gas extraction sector, the oil refining sector, and the fertilizer chemicals-producing sector, each of some considerable importance in the mineral industry, as well as in the nation's overall industrial picture.

Unemployment in Denmark stood at 10.6% in 1991, a level substantially higher than in neighboring Germany, Norway, and Sweden, and indeed higher than in all European Community (EC) countries except Ireland, Italy, and Spain. The nature of Denmark's mineral industry is such that it can offer but little to improve the unemployment rate, for it is largely capital intensive. At a maximum, less than 3% of the country's labor force is engaged in minerals extraction and processing.

### Government Policies and Programs

The Danish Raw Materials Act of 1978 permits ownership and exploitation of raw materials, such as sand and gravel, clays, chalk, and shallow natural gas, whereas deep hydrocarbons are regulated by the Underground Act of 1981. Marine sand and gravel heretofore have been under the jurisdiction of the Forest and Nature Agency, but in January 1, 1991, responsibilitiess for these commodities were transferred to the Danish Geological Survey. A tax of about $0.76 per cubic meter of any mineral moved has been established, but it is exempted if the product is exported. Mining and petroleum production are regulated by the Danish Ministry of Energy under the Danish Underground Act of 1981. Originally, the Dansk Undergrounds Consortium had a 50-year concession on the exploration and exploitation of hydrocarbons on Denmark's continental shelf, excluding the shelf around Greenland and the Faroe Islands. However, this concession was rewritten, allowing foreign companies to participate in activities in the Danish North Sea.

The Danish Geological Survey conducts and publishes reports on geology and mineral research in the country. The Danish Ministry of Energy represents the Government in foreign dealings in oil and gas explorations. The Ministry of Environment sets limits to control all pollution sources, such as carbon dioxide, nitrogen oxides, phosphates, sulfur dioxide, and particulates.

### Production

Denmark's mineral industry generally enjoyed a good year in 1991, at least as its performance can be assessed from the levels of output. Production of most commodities, both crude and processed, increased with respect to 1990 levels. The 14% increase in crude oil output in 1990 reflected continuing efforts to achieve the greatest possible independence from foreign energy sources. Crude oil output had been increased 7% in 1990 and 17% in 1989.

Output of marketable natural gas—that part of gross production directed toward energy users rather than being flared or reinjected to oilfield and gasfield reservoirs—also increased sharply in 1991, logging a 26% increase over that of 1990. This increase came following a meager 2.1% gain in 1990, but a 17% growth in 1989, and reflected improvement in utilization of the gross amount of gas produced.

Refined oil production in 1991 was only marginally above the 1990 level and was more than 4% below the historic to date high set in 1989. However, it is notable that the ratio of crude oil output to refinery production has been steadily narrowing—in 1991, crude output was equal to about 88% of the year's refinery throughput. Although not all of Denmark's crude oil output is refined at home, it is nonetheless significant that its level is approaching that of refinery capacity and that it is also moving toward total refined oil demand levels.

Denmark's production of crude steel rose by almost 4% in 1991, but the output of steel semimanufactures fell by about the same percentage. Crude mineral production was limited to cement, clays, chalk and limestone, diatomite and related materials, granite, sand, and gravel.

Diatomite production was reportedly being phased out, but efforts were being made to find new sources of pure diatomite. Although diatomite production seemingly was declining as a result of depletion of reserves of the "pure" mineral, output and export shipments of moler, a diatomite and clay mixture, evidently were increasing.

Gains in production of sand and gravel evidently were the result of expansion of both onshore quarries and offshore sand-pump dredge-type operations; of the latter, 40 or more were in operation, some in Danish inshore waters, others in the North Sea. *(See table 1.)*

## Trade

Denmark continued to rely heavily on imports to meet its needs for metals and a number of industrial minerals for which it has no resources. On the other hand, exports of both fuel and nonfuel minerals and mineral products provide a part of the needed foreign exchange essential to preserving some sense of balance in trade. Growth in exports of both crude and refined oil exceeded growth in imports of these two commodities, and when coupled with the substantial increase in natural gas exports, Denmark's mineral fuels industry on its own has made an appreciable contribution to improving the foreign trade balance.

Through 1991, Germany remained Denmark's largest single trading partner in terms of the value of trade, both with regard to Denmark's exports and imports. Sweden ranked second and the United Kingdom third in terms of the total value of both exports and imports. The United States ranked eighth after Norway, France, Italy, and the Netherlands among destinations for Danish exports, and ranked sixth after France and the Netherlands, but ahead of seventh-ranked Norway and eighth-ranked Italy among sources of Danish imports. Table 2 provides data on the export and reexport trade of Denmark proper for 1989 and 1990, while table 3 gives corresponding import data. Tables 4 and 5 provide similar data for the Faroe Islands, the self-governing overseas administrative division of Denmark situated about 330 km north of Scotland and 440 km southeast of Iceland, between the Norwegian Sea and the North Atlantic Ocean. These islands thus far have proven unimportant from the viewpoint of mineral commodity supply, but they do have a modest but measurable requirement for mineral materials—mostly fuels and fabricated metals. *(See tables 2, 3, 4, and 5.)*

## Structure of the Mineral Industry

All Danish companies involved in the minerals industry are privately held, but are regulated by Government ministries: those in the nonfuel sector by the Ministry of Industry and those in the fuels sector by the Ministry of Energy.

The major producing and processing companies in Denmark are listed in table 6. *(See table 6.)*

## Commodity Review

*Metals.*—Denmark has not previously been known to have any commercial metallic mineral deposits. But in 1991, Norstral Minerals AG and the Danish Geological Survey discovered heavy minerals in the Quaternary terraces of central Jutland. Boreholes showed a well-sorted sand containing more than 3% heavy minerals. Norstral has an agreement with Denmark for exploration activities in Denmark for 5 years.

Det Danske Stalvalsevaerk A/S (Danish Steel Works Ltd.), Denmark's only producer of crude steel, increased output of this product in 1991 to 633,000 tons, a level that is about 97% of the facility's rated capacity. In contrast, output of steel semimanufactures was down to only 518,000 tons. Even if the firm operated at capacity, however, and if all output was retained in Denmark, it would be able to provide only slightly more than one-fourth of the country's total 1991 requirement, which aggregated close to 2.5 Mmt. Iron and steel imports totaling more than 1.85 Mmt were reported in 1991, and exports that year aggregated almost 660,000 tons.

In 1991, the company, with its electric arc furnaces and other facilities in Fredricksvaerk, about 60 km northwest of Copenhagen, recorded a profit of $10.53 million. The company's exports represented about 72% of total sales. It employed about 1,300 persons, and its raw material feed was exclusively scrap, some derived in Denmark, but with additional supplies being imported. Rather surprisingly, Denmark has been a net steel scrap exporter.

*Industrial Minerals.*—**Asbestos.**—Even though Denmark has laws prohibiting the manufacture of products containing asbestos, the country still imports some

crude asbestos from Canada, as well as some manufactured products containing asbestos.

**Cement.**—Aalborg Portland Cement Fabrik A/S is the only cement producer in Denmark, with a capacity of about 2.8 Mmt/a. Its plant at Rordal, near Aalborg, produces semidry, grey, white, and portland cement. Aalborg is reputed to be the world's largest producer and exporter of white cement. About 35% of total cement production was exported, primarily to other European countries. To meet Danish requirements, then, necessitated the import of cement, chiefly from Poland and East Germany in 1990, and chiefly from Poland alone in 1991.

Aalborg Portland, reportedly, was Denmark's largest single industrial consumer of coal, but it supposedly accounted for only about 5% of total coal consumption.

**Clays.**—In 1991, there were about 90 pits in Denmark from which clay was mined. This material is used primarily by the cement, brickmaking, and tile industries. Kaolin was mined for ceramic use. About 60% of kaolin used domestically was imported. Hasle Klinker- og Chamottestensfabrik A/S produces tiles manufactured from lime-deficient clays from the island of Bornholm. Hasle Refractories produces fireproof material based on kaolin and other clays from Bornholm. The clay pits are located south of the River Bagaa, south of Hasle.

Other Danish clay producers include A/S Fibo and Dansk Leca A/S, with pits at Olst, just south of Randers in eastern Jutland.

**Cryolite.**—Denmark continued to export processed cryolite in 1991, although mine production and export of the crude mineral from Greenland ended several years ago. Recorded exports of the beneficiated product from Denmark have been as follows, in metric tons: 1987—13,959; 1988—21,301; 1989—12,863; 1990—10,384; and 1991—2,537. The low level of the 1991 shipment suggests that the supply of material in Denmark may have finally been depleted.

**Diatomite, Moler and Vermiculite.**—Although production of diatomite has been very sharply reduced, apparently as a result of the depletion of reserves of this relatively pure form of the crude mineral, there has been no evidence of any reduction in output of the diatomaceous clay material called moler, a material of which Denmark is the only commercial source. Moler, a natural mixture of diatomite and up to 20% to 25% of plastic clay, occurs on the islands of Mors and Fur, in the northwest of the country, adjacent to the Jutland peninsula. Skamol-Skarrehage Molervaek A/S (Skamol) is Denmark's largest moler producer; Dansk Moler Industri A/S (Damolin) is the country's only other producer. The Danish Geological Survey and the county of Viborg have started an exploration program for moler on the Salling peninsula, south of Fur and Mors islands.

Skamol extracts moler from three quarries on the island of Fur and then trucks the material to the Skarremol plant for moler brick manufacture. About 33,000 $m^3$/a of brick is produced, and about 95% of the output is exported worldwide. Skamol also extracts moler from two quarries on the island of Mors, for the production of moler granules at its Skarrehage plant in the north of the island. The plant also produces calcium silicate blocks and boards, and pressed vermiculite boards. Vermiculite was imported from Brazil and the Republic of South Africa.

Damolin extracts moler from three quarries on the island of Fur and trucks the material to its plant on the east coast at Faerker Hede. About 80,000 mt/a of moler is quarried, which is allocated equally for production of powder and granular products.

**Limestone, Carbonate, and Chalk.**—A/S Faxe Kalkbrud is the country's leading producer of calcium carbonate, chalk, lime, and limestone. Faxe Kalkbrud quarries more than 1 Mmt/a of calcium carbonate, and about 100,000 mt/a at Frederikssund from oyster shell beds. Reserves of the oyster shell deposit were estimated to be sufficient for about 30 years. Chalk is quarried in the Stevns region and treated in a plant at Sigerslev. Reserves of chalk were estimated to be about 100 Mmt. Limestone is quarried in the Fakse region using the largest heavy motorized equipment in the world. Three separate plants produced agricultural limestone, industrial limestone, and lime. In eastern Jutland, Faxe Kalkbrud operated three limestone and lime storage and production facilities at Aaabenrae, Grenaa (industrial limestone), and Vejle (lime). The company is active in Sweden and elsewhere overseas. A subsidiary, Faxe Kalkbrud, Inc., operates a limestone quarry in Idaho, the United States.

All told, about 20 chalk and limestone quarries were in operation in Denmark in 1991.

**Salt.**—Dansk Salt I/S produces pure dried vacuum salt in northeast Jutland from the Hvornum salt dome, near Mariager. Sales total 500,000 to 600,000 mt/a, of which about 50% is destined for chemical manufacture, 20% for road salt, 15% for other industrial use, and 10% as edible salt. Brine is extracted from four wells at Hvornum and pumped 26 km to the processing plant at Mariager. About one-half of the company's production each year is exported, primarily to neighboring Scandinavian countries.

**Sand and Gravel.**—Most of Denmark is covered by glacial tills and fluvial and lacustrine sediments, and this geological setting has provided the basis for the country's substantial sand and gravel industry operations. There are about 800 sand and gravel pits onshore and about 40 sand-pump dredgers operating offshore. Near-surface sand deposits constitute about 70% of Denmark's land area.

Ahlsell Mineral AB of Sweden is a major silica sand producer from its operation at Ronne on the island of Bornholm. Sand is quarried from deposits on land and from offshore dredging and is processed at the 250,000-mt/a-capacity plant to produce grades for

foundry, metallurgical, sandblasting, and construction applications.

Dansand Silkeborg AS and other companies produce about 80,000 mt/a of silica sand for a variety of applications from operations in central Jutland. The quarry is about 20 km south of Silkeborg, and the silica sand is processed at two plants. The company is a wholly owned subsidiary of Konbeck Holding A/S and has been operating since 1941.

**Sulfur.**—Almost 60% of Denmark's sulfur output comes from two petroleum refineries, Shell Rafinaderiet at Fredericia and Gulf Oil Co. at Stignaes. The remainder originated from coal processing and gas plants and from the chemical plant of Cheminova AS, located in Lemvig. Domestic output regularly falls far short of demand, and imports of 50,000 to 70,000 mt/a are essential to provide for both domestic and export market commitments for both sulfur and sulfuric acid.

***Mineral Fuels.***—In 1991, oil and gas from Denmark's North Sea oilfields provided a greater share of the country's total energy needs than they did in 1990 (the last year for which complete energy balance data were available). In 1990, Danish crude oil production was equivalent to almost 75% of total liguid fuel consumption, and natural gas output was 92% above domestic demand. However, solid fuels, entirely imported, still represented almost 37% of the country's total energy requirement, and the very small primary electricity supply was substantially augmented by electric power imports.

Primary electric power from hydroelectric plants was only slightly more than 0.1% of total electricity generated in Denmark in 1990; an additional 2.35% of total electricity produced came from wind-powered generators. The country had no nuclear powerplants.

**Coal and Coke.**—Denmark obtains all of its commercial solid fuel needs, both coals and coke, through importation. In 1991, the United States supplied more than 4.7 Mmt of coal, which represented 47% of the total import. Other significant suppliers included the U.S.S.R. (nearly 1.5 Mmt) and Poland (more than 0.7 Mmt). Australia and Colombia were also among the important suppliers, but statistics on imports from these countries were garbled in all available sources. In 1991, the United States became Denmark's leading supplier of petroleum coke, which is used there primarily as fuel for the cement industry.

**Natural Gas.**—Denmark's natural gas and oil operator in Denmark is Maersk Olie og Gas A/S. The country's entire natural gas supply originates in its North Sea gasfields, about 300 km west of the Jutland peninsula. Increases in output have been made possible through construction of pipelines and gas storage facilities, and by 1991, the supply was sufficently large that 30% of the total could be exported, chiefly to Sweden. Contracts were signed between Danish interests and both Swedish and German entities for delivery of Danish gas through the year 2003.

**Petroleum.**—Although Denmark's crude oil output in 1991 reached a level equal to 88% of its refinery throughput in that year, the country continued to import substantial amounts of both crude oil and refinery products to meet domestic market needs for liquid energy materials. In 1991, crude oil imports were 18% larger than crude oil exports, but exports increased almost 49% compared with their 1990 level, while at the same time crude oil imports increased only 17%.

Trade in refinery products was smaller quantitatively than that in crude oil, but not sufficiently smaller to make the value of aggregated product exports and imports less than the value of crude oil exports and imports. On a quantitative basis, refined oil exports in 1991 increased nearly 14.6% from those of 1990, while refinery product imports grew by only 1.7%. This narrowed the gap between product imports and product exports, but the imports still were 24.4% greater than the exports, leaving a substantial trade deficit in this commodity group.

Denmark's major oilfields, listed in order of their cumulative output through yearend 1990, were: Gorm (93.1 Mbbl), Dan (67.2 Mbbl), Skjold (65.6 million barrels), Tyra (30.9 million barrels), and Rolf (13.6 million barrels). They produce from Upper Cretaceous and Devonian chalk deposits, from about 100 producing wells that range between 1,520 m and 2,130 m in depth. The Anne Oilfield, discovered in 1966 and left undeveloped for a number of years, was renamed Kraka, and production at the rate of about 4,000 bbl/d started in March 1991. Kraka has reserves of only 12.6 Mbbl.

## Infrastructure

Denmark is geomorphologically a flat country, with a 66,500-km network of roads (97% paved), nearly 2,700 km of railroads (more than 27% double-tracked), and almost 420 km of canals and other navigable inland waterways. The main ports are Alborg, Arhus, Copenhagen, Esbjerg, and Fredericia. A pipeline nearly 300 km long carries crude oil from the Danish North Sea oilfields to the refinery near Fredericia. Natural gas pipelines total nearly 800 km, including one line from the offshore fields to the Jutland peninsula and thence across the major islands of Fyn and Sjaelland to Copenhagen and beyond across Oresund to Malmo, Sweden, and another from the German border up the Jutland peninsula to a point south of Viborg. A major gas storage reservoir has been built in the Lille Thorup salt dome in Jutland, and another underground storage reservoir is being built in Sjalland in Lower Jurassic sandstone. Further, a 578-km refined product line assists in the distribution of refinery products.

## Outlook

Denmark's petroleum and natural gas industry will remain the dominant sector of the nation's mineral industry for the immediate future and should continue to grow, gradually increasing its share of the nation's total energy supply as well as yielding increased foreign exchange

earnings. At least for the short term, the country's sand, gravel, and crushed stone output should be maintained at present levels or expanded, despite some limitations of onshore material availability through the simple, although somewhat more costly, expedient of offshore dredging. Traditional industrial mineral operations such as the moler industry, clay operations, and the cement industry seem soundly founded and not at risk from reserve depletion or environmental considerations. Denmark's small steel industry presumably will continue to meet the needs of its somewhat specialized clientele, and the bulk of steel requirements will be filled through importation. The economic potential of the discovery of heavy-mineral sands remains to be demonstrated, although it certainly offers a new prospect. All operating mineral producers and processors will be facing increasingly stringent environmental regulations.

## GREENLAND

All mineral exploitation operations in Greenland have been shut down since late July 1990, when Greenex A/S's Black Angel lead-zinc-silver mine closed. Although Greenland is the world's largest island, about 85% of its area is covered by ice, and the area that is realistically accessible for economic development is quite small. There were no oil exploration activities reported in 1991.

Among potential mine sites in Greenland are the Skaergaard gold and platinum deposit with grades of up to 5.8 g/mt gold, 3.7 g/mt palladium, and 1.7 g/mt platinum; the Malmbjerg molybdenum deposit with 150 Mmt of mineralization grading 0.23% $MoS_2$ and 0.02% $WO_3$; low-grade cryolite resources in the Ivigtut deposit of South Greenland; and zirconium-yttrium-rare-earth mineralization in the Ilimaussaq intrusion in southern Greenland. The last of these was prospected by drilling in 1991, but based on initial reports and present conditions, no further development is anticipated. Another potential mine site was the massive stratiform zinc sulfide deposit in the Karrat formation due north of the abandoned Black Angel Mine. This locality was to be sampled in 1992 by RTZ Mining and Exploration.

The Geological Survey of Greenland (GGU) has released an open file report on "Gold Mineralization in Precambrian Supracrustal Rocks on Southern Nuussuaq, Central West Greenland: 1991 Results." The report is based on 8 days of fieldwork and comprises a preliminary description of geology and mineralization and a complete set of chemical analyses. GGU is a research institute affiliated to the Mineral Resources Administration for Greenland within the Danish Ministry of Energy. GGU's investigations are carried out within the framework of the policies decided jointly by the Greenland Home Rule Authority and the Danish State.

Administration of mineral resources in Greenland is the reponsibility of the Danish Ministry of Energy. In 1991, Greenland's Cabinet (Landsstyre) and the Danish Government passed a new Mineral Resources Act 335 to make tax laws and mining concessions terms competitive with those of other countries. As part of the Mineral Resources Act, a new set of procedures was adopted for the granting of nonexclusive prospecting licenses and exclusive exploration licences for hard minerals.

The historic record of Greenland's mineral production is provided in table 7, and the latest available trade statistics for Greenland appear in table 8 (exports) and table 9 (imports). *(See tables 7, 8, and 9.)*

Because of the depletion of Greenland's traditional mineral operations of the recent past, the only hope for a future for the mineral industry rests on demonstration of economic viability of the prospects listed previously and/or on the discovery of entirely new deposits. There seems no doubt that the concerned governmental agencies would like to see the establishment of some type of industry to help the overall economy, but considering the lack of infrastructure, the rugged terrain, and the harsh nature of the island's climate, a deposit would presumably have to be mineralogically quite rich to justify development.

[1]Where necessary, values have been converted from Danish krone (DKr) to U.S. dollars at the rate of DKr 6.56=US$1.00 in 1991.

### OTHER SOURCES OF INFORMATION

**Agencies**

Danmarks Geologiske Undersogelse (The Geological Survey of Denmark)
Kobenhavn NV
Gronlands Geologiske Undersogelse (The Geological Survey of Greenland)
Kobenhavn NV
Ministry of Economic Affairs
Kobenhavn NV
Ministry of Environment
Kobenhavn NV
Ministry of Energy
Kobenhavn NV

**Publications**

Varestatistik for Industri (Industrial Statistics), Office of Danish Statistics, Kobenhavn NV; published quarterly and annually.
Statistisk Arborg (Statistical Yearbook), Kobenhavn NV.
Kvartalstatistik over Undenrigshandelen (Quarterly Bulletin of Trade), Kobenhavn NV.

TABLE 1

## DENMARK: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| Cement, hydraulic | thousand tons | 1,887 | 1,681 | r2,004 | 1,656 | 2,016 |
| Clays:[e] | | | | | | |
| Kaolin | | 9,304 | 39,324 | e15,900 | 17,423 | 17,000 |
| Other | | e6,000 | 230 | e250 | — | — |
| Cryolite[3] | | 17,200 | e18,000 | e18,000 | — | |
| Diatomaceous materials: | | | | | | |
| Diatomite[e] | | 6,000 | 6,000 | 6,000 | r1,000 | 500 |
| Moler[e] | | r72,000 | r75,000 | r78,000 | r82,000 | 84,000 |
| Gas, natural: | | | | | | |
| Gross production | million cubic meters | r4,920 | 5,066 | 5,324 | e5,380 | 5,760 |
| Marketable production | do. | 2,482 | 2,491 | 2,913 | 2,974 | 3,737 |
| Iron and steel: | | | | | | |
| Steel, crude | thousand tons | 606 | 650 | 625 | 610 | 633 |
| Semimanufactures | do. | 538 | 580 | 619 | 539 | 518 |
| Lime, hydrated and quicklime[4] | do. | 119 | 114 | 131 | 134 | 135 |
| Peat[4] | do. | 50 | 50 | 50 | 110 | 100 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 35,167 | 36,222 | 42,304 | 45,387 | 51,929 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 1,879 | 1,751 | 1,624 | r1,659 | 1,700 |
| Gasoline | do. | r10,472 | r11,042 | 11,951 | r11,203 | 11,300 |
| Naphtha | do. | r1,572 | 2,057 | r2,414 | r2,134 | 2,200 |
| Jet fuel | do. | r1,704 | r1,848 | 1,992 | r1,992 | 2,000 |
| Kerosene | do. | r333 | r357 | r411 | r589 | 600 |
| Distillate fuel oil | do. | r23,574 | 24,215 | r25,357 | r24,543 | 24,800 |
| Bitumen and other products | do. | 1,683 | 1,359 | 1,162 | e1,200 | 1,200 |
| Residual fuel oil | do. | r15,052 | 15,684 | r16,217 | r14,785 | 14,800 |
| Asphalt | do. | 279 | 345 | 291 | 164 | 200 |
| Total | do. | r56,548 | r58,658 | r61,419 | r58,269 | 58,800 |
| Salt | thousand tons | 590 | 549 | 604 | 522 | 537 |
| Sand, industrial[4] | thousand cubic meters | e1,600 | 2,024 | e2,050 | 2,685 | 2,700 |
| Sand and gravel | do. | 30,309 | 28,356 | 28,976 | e29,000 | 31,000 |
| Soda ash[4] | thousand tons | 120 | 134 | e140 | 92 | 100 |
| Stone: | | | | | | |
| Crushed: | | | | | | |
| Flint | thousand cubic meters | e60 | 7,456 | e7,500 | 6,158 | 5,500 |
| Limestone: | | | | | | |
| Agricultural | thousand tons | e2,000 | 1,795 | e1,800 | 1,482 | 1,450 |
| Industrial | do. | e150 | 172 | e180 | 205 | 225 |
| Chalk | do. | e250 | 1,664 | e1,700 | 1,814 | 2,000 |
| Other | thousand cubic meters | e1,400 | 2,134 | e2,200 | 2,543 | 2,600 |
| Dimension (mostly granite) | do. | e200 | 65 | e65 | 226 | 300 |
| Sulfur, byproduct[4] | | e13,000 | 13,571 | e14,000 | 12,118 | 12,200 |

[e]Estimated. [r]Revised.

[1]Table includes data available through Nov. 1992.

[2]Reported figure.

[3]Processed material from crude product mined in Greenland, output estimates are based on export sales.

[4]Sales.

TABLE 2

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Alkali metals | | 2 | 1 | — | Mainly to United Kingdom. |
| Aluminum: | | | | | |
| Ore and concentrate | | — | 31 | — | Finland 20; West Germany 11. |
| Oxides and hydroxides | | 172 | 174 | 60 | United Kingdom 38; West Germany 16. |
| Ash and residue containing aluminum | | 170 | — | | |
| Metal including alloys: | | | | | |
| Scrap | | 27,754 | 28,989 | — | West Germany 14,123; Finland 3,577; Belgium-Luxembourg 2,556. |
| Unwrought | | 6,932 | 9,464 | (2) | West Germany 6,482; Austria 1,991; Sweden 347. |
| Semimanufactures | | 27,655 | 24,160 | 60 | West Germany 9,567; Sweden 3,581; United Kingdom 2,754. |
| Antimony: Metal including alloys, all forms | kilograms | 100 | — | | |
| Beryllium: Metal including alloys, all forms | do. | 300 | — | | |
| Bismuth: Metal including alloys, all forms | value, thousands | $14 | $8 | — | Hong Kong $3; Norway $3; Sweden $2. |
| Cadmium: Metal including alloys, all forms | | (2) | — | | |
| Chromium: | | | | | |
| Ore and concentrate | | 2 | — | | |
| Oxides and hydroxides | | 32 | 2 | — | Mainly to Sweden. |
| Metal including alloys, all forms | | 29 | 159 | — | Sweden 143; West Germany 15. |
| Cobalt: | | | | | |
| Oxides and hydroxides | | — | (2) | — | Mainly to West Germany. |
| Metal including alloys, all forms | | 1 | 9 | — | All to Saudi Arabia. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | | (2) | — | | |
| Copper: | | | | | |
| Matte and speiss including cement copper | | 24 | — | | |
| Oxides and hydroxides | | 16 | 21 | — | Norway 20; Cyprus 1. |
| Sulfate | | 191 | 2 | — | All to Sweden. |
| Ash and residue containing copper | | 2,334 | 1,290 | — | West Germany 721; Sweden 415; Netherlands 91. |
| Metal including alloys: | | | | | |
| Scrap | | 23,815 | 22,079 | — | West Germany 18,087; Belgium-Luxembourg 1,129; France 775. |
| Unwrought | | 2,019 | 272 | — | Sweden 201; Netherlands 25; United Kingdom 19. |
| Semimanufactures | | 7,992 | 8,305 | NA | West Germany 3,509; Italy 1,084; Belgium-Luxembourg 688. |
| Gallium | | — | (2) | — | All to Netherlands. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $4,543 | $36,096 | — | West Germany $34,883; United Kingdom $800; Switzerland $264. |
| Metal including alloys, unwrought and partly wrought | kilograms | 962 | 1,941 | — | Norway 824; West Germany 603; Finland 213. |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | | 1,678 | 4,265 | — | West Germany 1,735; United Kingdom 1,530; Netherlands 1,000. |
| Pyrite, roasted | | 1,969 | — | | |
| Metal: | | | | | |
| Scrap | | 279,277 | 310,496 | 2 | West Germany 145,923; Netherlands 61,906; Sweden 41,939. |
| Pig iron, cast iron, related materials | | 131 | 236 | — | West Germany 69; United Kingdom 40; Italy 23. |
| Ferroalloys: | | | | | |
| Ferrochromium | | 23 | 27 | — | West Germany 25; Netherlands 2. |
| Ferromanganese | | — | 1 | — | All to Iceland. |
| Ferrosilicon | | — | 1 | — | All to Sweden. |
| Ferrosilicomanganese | | — | 1 | — | All to West Germany. |
| Silicon metal | kilograms | 11,000 | 2,000 | NA | Japan 400; West Germany 200. |
| Unspecified | | (2) | 5 | — | All to Sweden. |
| Steel, primary forms | | 1,021 | 6,089 | (2) | West Germany 4,885; Sweden 488; United Kingdom 110. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | | 384,755 | 336,936 | 10,404 | West Germany 105,241; Sweden 79,460; Norway 38,909. |
| Clad, plated, coated | | 42,511 | 24,627 | — | Sweden 13,482; Finland 3,442; Norway 2,229. |
| Of alloy steel | | 2,468 | 2,721 | 1 | Sweden 1,513; United Kingdom 310; Norway 259. |
| Bars, rods, angles, shapes, sections | | 116,976 | 137,083 | 16 | West Germany 49,363; Sweden 28,905; United Kingdom 21,581. |
| Rails and accessories | | 3,487 | 4,151 | — | Italy 3,445; West Germany 623; Faroe Islands 37. |
| Wire | | 3,363 | 1,671 | 3 | West Germany 913; Belgium-Luxembourg 394; Sweden 164. |
| Tubes, pipes, fittings | | 15,770 | 92,199 | 76 | Sweden 33,290; West Germany 19,833; United Kingdom 14,300. |
| Lead: | | | | | |
| Oxides | | 7 | 20 | — | West Germany 12; Finland 3; Kenya 3. |
| Ash and residue containing lead | | 212 | 1,493 | — | West Germany 1,424; Sweden 68. |
| Metal including alloys: | | | | | |
| Scrap | | 13,998 | 14,392 | — | West Germany 8,868; Sweden 4,486; United Kingdom 472. |
| Unwrought | | 909 | 1,142 | — | West Germany 857; Sweden 174; Iceland 37. |
| Semimanufactures | | 78 | 194 | — | Canada 67; Sweden 49; West Germany 24. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 125 | 39 | — | West Germany 28; Norway 11. |
| Unwrought | | 15 | — | | |
| Semimanufactures | | 22 | 6 | — | Mainly to Sweden. |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Manganese: | | | | | |
| Ore and concentrate: Metallurgical-grade | | (2) | — | | |
| Oxides | | 2 | 2 | — | All to Belgium-Luxembourg. |
| Metal including alloys, all forms | | 73 | 127 | NA | Sweden 57; West Germany 42; Greenland 24. |
| Mercury | | 2 | 6 | — | United Kingdom 3; Netherlands 2. |
| Molybdenum: Metal including alloys, semimanufactures | kilograms | NA | 100 | NA | NA. |
| Nickel: | | | | | |
| Ore and concentrate | | 441 | 51 | — | All to West Germany. |
| Ash and residue containing nickel | | 101 | 31 | — | Finland 19 Netherlands 12. |
| Metal including alloys: | | | | | |
| Scrap | | 271 | 110 | — | West Germany 69; Netherlands 23; United Kingdom 18. |
| Unwrought | | 25 | — | | |
| Semimanufactures | | 1 | 7 | — | Austria 5; Sweden 1. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $3,715 | $3,419 | — | United Kingdom $2,041; Netherlands $725; West Germany $652. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 7,303 | 106,000 | — | All to United Kingdom. |
| Platinum | do. | 73,030 | 556,467 | — | Sweden 343,067; United Kingdom 187,000; Switzerland 13,983. |
| Rhodium | grams | 4,655 | 6,551 | — | Sweden 6,423. |
| Iridium, osmium, ruthenium | do. | — | 5,413 | — | All to Sweden. |
| Rare-earth metals including alloys, all forms | | (2) | 10 | (2) | Mainly to West Germany. |
| Selenium, elemental | | 10 | 3 | — | West Germany 1; Japan 1; Sweden 1. |
| Silver: | | | | | |
| Waste and sweepings[3] | value, thousands | $9,308 | $8,970 | $73 | Switzerland $3,062; West Germany $2,832; United Kingdom $2,793. |
| Metal including alloys, unwrought and partly wrought | kilograms | 38,226 | 5,984 | — | France 5,477; Norway 316; Finland 90. |
| Tin: | | | | | |
| Ash and residue containing tin | | 84 | 43 | — | All to United Kingdom. |
| Metal including alloys: | | | | | |
| Scrap | | 528 | 663 | — | Netherlands 422; Sweden 203; West Germany 38. |
| Unwrought | | 12 | 13 | — | Yugoslavia 4; Italy 3; Philippines 3. |
| Semimanufactures | | 93 | 189 | (2) | Netherlands 112; Finland 72; Sweden 4. |
| Titanium: | | | | | |
| Oxides | | 659 | 118 | — | Sweden 39; Norway 35; Kenya 20. |
| Metal including alloys: | | | | | |
| Scrap | | 10 | 24 | — | West Germany 21; United Kingdom 2. |
| Unwrought | | (2) | (2) | — | Mainly to West Germany |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Titanium—Continued: | | | | | |
| Metal including alloys—Continued: | | | | | |
| Semimanufactures | | 24 | 18 | 5 | Republic of Korea 5; Philippines 4. |
| Tungsten: Metal including alloys: | | | | | |
| Scrap | | 1 | — | | |
| Unwrought | | 2 | 3 | — | West Germany 2. |
| Semimanufactures | | (2) | 2 | — | All to Norway. |
| Vanadium: Oxides | | — | 4 | — | All to Bangladesh. |
| Zinc: | | | | | |
| Oxides | | 36 | 169 | — | West Germany 133; Netherlands 27; Iceland 5. |
| Blue powder | | 193 | 214 | NA | India 87; Taiwan 31; Singapore 24. |
| Ash and residue containing zinc | | 2,770 | 2,721 | NA | Norway 2,580; Sweden 38. |
| Metal including alloys: | | | | | |
| Scrap | | 4,983 | 4,843 | — | Taiwan 1,613; West Germany 1,203; Norway 775. |
| Unwrought | | 67 | 680 | — | West Germany 366; Netherlands 148; Norway 102. |
| Semimanufactures | | 76 | 94 | — | India 87; Netherlands 34; Singapore 24. |
| Zirconium: | | | | | |
| Ore and concentrate | | 50 | 70 | — | All to Sweden. |
| Metal including alloys, semimanufactures | kilograms | 200 | (2) | — | All to West Germany. |
| Other: | | | | | |
| Ores and concentrates | | 84 | — | | |
| Oxides and hydroxides | | — | (2) | — | All to Sweden. |
| Ashes and residues | | 52 | 32 | — | West Germany 27; Sweden 5. |
| Base metals including alloys, all forms | | — | (2) | NA | NA. |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, n.e.s.: | | | | | |
| Natural: Corundum, emery, pumice, etc. | | 51 | 67 | — | Sweden 44; West Germany 19; Iceland 2. |
| Artificial: | | | | | |
| Corundum | | 4 | 3 | — | Faroe Islands 1; West Germany 1; Netherlands 1. |
| Silicon carbide | | — | 40 | — | All to United Kingdom. |
| Dust and powder of precious and semiprecious stones excluding diamond | grams | — | 20 | — | All to Norway. |
| Grinding and polishing wheels and stones | | 779 | 1,602 | 7 | Ethiopia 631; Yemen 203; Egypt 180. |
| Asbestos, crude | | 15 | — | | |
| Barite and witherite | | 55 | 18 | — | All to Norway. |
| Boron materials: | | | | | |
| Crude natural borates | | — | 9 | — | All to West Germany. |
| Elemental | kilograms | — | (2) | — | All to Sweden. |
| Oxides and acids | | 116 | 125 | — | Finland 53; Sweden 53; Norway 18. |
| Cement | | 706,988 | 389,927 | 9 | United Kingdom 14,575; Faroe Islands 11,169; unspecified 352,315. |
| Chalk | | 211,486 | 268,598 | — | Finland 211,162; Sweden 42,624; United Kingdom 7,784. |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays, crude: | | | | | |
| Bentonite | | 88 | 237 | — | Norway 103; Finland 54; Italy 36. |
| Chamotte earth | | 1 | 11 | — | NA. |
| Fuller's earth | | — | 26 | — | NA. |
| Kaolin | | 551 | 531 | — | Sweden 168; West Germany 91; Finland 86. |
| Unspecified | | 14,829 | 15,497 | — | Netherlands 11,051; West Germany 2,880; Sweden 919. |
| Cryolite and chiolite | | 12,863 | 10,384 | NA | NA. |
| Diamond: | | | | | |
| Gem, not set or strung | carats | 285 | 1,979 | 2 | West Germany 1,168; Belgium-Luxembourg 523; Norway 33. |
| Industrial stones | do. | 1 | 11 | — | Sweden 7; Belgium-Luxembourg 4. |
| Dust and powder | grams | NA | 260 | — | All to West Germany. |
| Diatomite and other infusorial earth | | 81,815 | 84,587 | — | West Germany 21,453; United Kingdom 20,879; Netherlands 15,160. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | — | 25 | — | All to West Germany. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 248 | 1,670 | — | West Germany 862; East Germany 319; Norway 205. |
| Manufactured: | | | | | |
| Ammonia | | 15,252 | 359 | — | United Kingdom 253; Sweden 68; Faroe Islands 11. |
| Nitrogenous | | 26,643 | 11,648 | — | West Germany 7,866; Netherlands 3,015; Faroe Islands 375. |
| Phosphatic | | 95,174 | 67,845 | NA | NA. |
| Potassic | | 48 | 25 | — | Congo 12; Iraq 6; Japan 3. |
| Unspecified and mixed | | 504,834 | 377,733 | NA | NA. |
| Graphite, natural | | 29 | 3 | — | Iceland 2; Kuwait 1. |
| Gypsum and plaster | | 1,349 | 3,544 | — | Sweden 3,308; Greenland 52; Iceland 50. |
| Iodine | | 3 | (2) | — | All to Nepal. |
| Kyanite and related materials | | 15 | — | | |
| Lime | | 10,146 | 7,512 | — | Norway 6,550; Greenland 462; Sweden 235. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | (2) | 3 | — | Finland 2; Norway 1. |
| Oxides and hydroxides | | 32 | 424 | NA | Sweden 213; Austria 186; Finland 18. |
| Sulfate | | — | 32 | — | All to Sweden |
| Mica: | | | | | |
| Crude including splittings and waste | | — | 13 | — | Sweden 12; Norway 1. |
| Worked including agglomerated splittings | | 3 | 16 | — | Finland 14; Sweden 2. |
| Phosphates, crude | | 1,900 | 1,267 | 138 | United Kingdom 872; Japan 146. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 38 | 85 | — | Norway 71; Finland 7; Indonesia 4. |
| Iron oxides and hydroxides, processed | | 168 | 122 | — | Canada 60; Iceland 16; Sweden 14. |
| Potassium salts, crude | | (2) | — | | |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | kilograms | 238 | 813 | 2 | NA. |
| Synthetic | grams | 2,876 | 210 | — | All to Sweden. |
| Pyrite, unroasted | | 77 | 38 | — | Sweden 24; Norway 13; Faroe Islands 1. |
| Salt and brine | | 312,468 | 305,012 | 1 | Sweden 198,465; Norway 84,595; Finland 11,533. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 148 | 118 | — | Togo 114; Greenland 1; Malaysia 1. |
| Sulfate, manufactured | | — | 95 | — | Belgium-Luxembourg 46; Sweden 44; Netherlands 5. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 67,193 | 28,309 | — | West Germany 27,807; Sweden 151; United Kingdom 142. |
| Worked | | 12,344 | 14,651 | — | West Germany 10,020; Sweden 3,197; Norway 403. |
| Dolomite, chiefly refractory-grade | | 66 | 110 | — | Sweden 109; Senegal 1. |
| Gravel and crushed rock | | 563,965 | 760,306 | — | West Germany 691,842; East Germany 45,871; United Kingdom 10,942 |
| Limestone other than dimension | | 129,981 | 119,846 | 62 | West Germany 56,954; Sweden 28,977; Norway 28,010. |
| Quartz and quartzite | | 393 | 119 | — | West Germany 50; Norway 31; Sweden 31. |
| Sand other than metal-bearing | | 259,918 | 240,851 | — | Sweden 143,717; West Germany 68,748; Finland 11,804. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 8,852 | 3,379 | — | West Germany 2,524; France 840; Iceland 15. |
| Colloidal, precipitated, sublimed | | 34 | 67 | — | All to United Kingdom. |
| Sulfuric acid | | 104,339 | 68,334 | — | Belgium-Luxembourg 30,588; Netherlands 15,550; West Germany 11,875. |
| Talc, steatite, soapstone, pyrophyllite | | 62 | 29 | — | West Germany 11; Cyprus 7; Kenya 5. |
| Vermiculite[4] | | 52 | 18 | — | Mainly to Sweden. |
| Other: | | | | | |
| Crude | | 1,340 | 215 | — | Sweden 56; Saudi Arabia 40; Ireland 37. |
| Slag and dross, not metal-bearing | | 226,734 | 121,374 | — | Norway 76,280; West Germany 39,518; Sweden 4,243. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 152 | 1,672 | — | West Germany 1,351; Greenland 268; Sweden 38. |
| Carbon: Carbon black | | 14 | 21 | — | Netherlands 12; Indonesia 2; Spain 2. |
| Coal: | | | | | |
| Anthracite | | 11,407 | 143 | 117 | West Germany 26. |
| Bituminous | | 32,990 | 41,220 | — | Sweden 17,676; Norway 14,079; West Germany 9,411. |
| Briquets of anthracite and bituminous coal | | 99 | 183 | — | Greenland 139; Saudi Arabia 44. |
| Lignite including briquets | | 402 | 1,748 | — | Ireland 1,298; Netherlands 450. |
| Coke and semicoke | | 411 | 510 | — | Sweden 502; Finland 8. |
| Gas, natural: Gaseous | million cubic meters | 900 | — | | |
| Peat including briquets and litter | | 4,590 | 10,879 | — | Netherlands 3,724; Sweden 2,184; Spain 2,081. |

See footnotes at end of table.

TABLE 2—Continued

## DENMARK: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 18,247 | 20,866 | — | Sweden 14,228; Norway 2,702; Netherlands 1,990. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 522 | 737 | 27 | Sweden 184; Netherlands 163; Switzerland 160. |
| Gasoline | do. | 25,548 | 23,114 | 759 | Sweden 9,025; West Germany 4,083; Italy 3,954. |
| Mineral jelly and wax | do. | 6 | 5 | — | Sweden 4; Iceland 1. |
| Bitumen and other residues | do. | 5 | 7 | | West Germany 6. |
| Bituminous mixtures | do. | 16 | 13 | — | Greenland 4; Sweden 3; West Germany 3. |

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Includes perlite and chlorite.

TABLE 3

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS** | | | | | |
| Alkali and alkaline-earth metals: | | | | | |
| Alkali metals | | 11 | 11 | 1 | West Germany 7; Netherlands 3. |
| Alkaline-earth metals | | 41 | 60 | (2) | France 22; West Germany 12; Finland 24. |
| Aluminum: | | | | | |
| Ore and concentrate | | 1,685 | 2,667 | — | West Germany 1,279; Sweden 591; China 546. |
| Oxides and hydroxides | | 5,846 | 5,329 | 953 | United Kingdom 2,224; West Germany 1,943. |
| Ash and residue containing aluminum | | 30 | 2 | — | All from West Germany. |
| Metal including alloys: | | | | | |
| Scrap | | 4,524 | 6,074 | — | Sweden 2,269; West Germany 2,240; Norway 861. |
| Unwrought | | 29,204 | 29,789 | 22 | Norway 11,805; Netherlands 6,839; West Germany 5,111. |
| Semimanufactures | | 57,438 | 75,549 | 59 | West Germany 17,269; Sweden 15,018; Norway 12,221. |
| Antimony: | | | | | |
| Oxides | | 104 | 83 | — | United Kingdom 71; Belgium-Luxembourg 12. |
| Metal including alloys, all forms | value, thousands | $3 | $22 | — | All from Sweden. |
| Beryllium: Metal including alloys all forms | | (2) | (2) | (2) | NA. |
| Bismuth: Metal including alloys, all forms | value, thousands | $87 | $57 | — | United Kingdom $45; Netherlands $7; West Germany $4. |
| Cadmium: Metal including alloys, all forms | do. | $37 | $13 | — | Spain $5; West Germany $4; Belgium-Luxembourg $3. |
| Chromium: | | | | | |
| Ore and concentrate | | 6,481 | 14,770 | (2) | Norway 13,964; West Germany 728; Finland 54. |
| Oxides and hydroxides | | 238 | 312 | 1 | West Germany 256; Italy 45; Poland 8. |
| Metal including alloys, all forms | | 23 | 16 | — | West Germany 5; Italy 5; Poland 3. |
| Cobalt: | | | | | |
| Oxides and hydroxides | | 9 | 2 | — | Netherlands 1; United Kingdom 1. |
| Metal including alloys, all forms | | 20 | 24 | (2) | France 11; United Kingdom 9; West Germany 2. |
| Columbium and tantalum: Metal including alloys, all forms: | | | | | |
| Columbium (niobium) | kilograms | NA | 400 | NA | NA. |
| Tantalum | do. | 26 | 2 | — | Mainly from Sweden. |
| Copper: | | | | | |
| Ore and concentrate | | 215 | 156 | — | All from West Germany. |
| Matte and speiss including cement copper | | 11 | 7 | — | All from Finland. |
| Oxides and hydroxides | | 1,075 | 1,182 | 127 | West Germany 812; Norway 138. |
| Sulfate | | 1,785 | 1,777 | — | Netherlands 934; France 346; West Germany 136. |
| Ash and residue containing copper | | 422 | 190 | — | All from Finland. |
| Metal including alloys: | | | | | |
| Scrap | | 16,482 | 19,774 | — | Sweden 10,573; West Germany 3,915; Norway 1,796. |
| Unwrought | | 2,308 | 2,844 | 7 | United Kingdom 1,125; West Germany 1,022; Sweden 605. |
| Semimanufactures | | 38,462 | 36,268 | 12 | West Germany 15,240; Sweden 10,871; France 2,659. |
| Gallium: Metal including alloys, all forms | kilograms[3] | 100 | 100 | — | All from Italy. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Germanium: | | | | |
| Metal including alloys, all forms | 1 | (2) | — | All from Canada. |
| Oxides | — | 5 | — | All from France. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $635 | $1,563 | — | Finland $848; Sweden $405; Norway $242. |
| Metal including alloys, unwrought and partly wrought kilograms | 975 | 1,218 | — | Switzerland 525; West Germany 408; Norway 218. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 6,338 | 2,733 | — | Sweden 2,659; West Germany 62; Netherlands 11. |
| Pyrite, roasted | 26,996 | 26,438 | — | All from Norway |
| Metal: | | | | |
| Scrap | 105,482 | 74,290 | (2) | West Germany 40,551; Sweden 19,274; Norway 5,142. |
| Pig iron, cast iron, related materials | 124,039 | 112,350 | 9 | U.S.S.R. 67,734; Poland 16,785; Brazil 9,718. |
| Ferroalloys: | | | | |
| Ferrocolumbium | 22 | 50 | — | West Germany 39; United Kingdom 11. |
| Ferrochromium | 145 | 103 | — | West Germany 100; Sweden 3. |
| Ferromanganese | 2,360 | 2,523 | — | Norway 2,437; West Germany 61; Belgium-Luxembourg 22. |
| Ferromolybdenum | 3 | 7 | — | All from West Germany. |
| Ferronickel | — | (2) | | |
| Ferrosilicochromium | — | 10 | — | All from West Germany. |
| Ferrosilicomanganese | 4,842 | 2,807 | — | All from Norway. |
| Ferrosilicon | 4,475 | 3,629 | — | Norway 3,158; West Germany 313; France 107. |
| Ferrotitanium[4] | 4 | 10 | — | West Germany 7; Netherlands 2; United Kingdom 1. |
| Ferrovanadium | 25 | 14 | — | Belgium-Luxembourg 8; Netherlands 3; Switzerland 2. |
| Silicon metal | 700 | 1,024 | — | Norway 603; Netherlands 275; West Germany 112. |
| Unspecified | 1,228 | 1,155 | — | Norway 626; West Germany 349; United Kingdom 126. |
| Steel, primary forms | 96,127 | 40,525 | 3 | West Germany 19,724; Belgium-Luxembourg 9,244; Netherlands 6,990. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 617,355 | 659,495 | 19 | Sweden 151,919; West Germany 130,211; Finland 124,082. |
| Clad, plated, coated | 309,434 | 276,951 | (2) | West Germany 58,749; France 44,490; United Kingdom 39,197. |
| Of alloy steel | 52,388 | 58,342 | 3 | West Germany 18,886; Sweden 18,004; Finland 8,559. |
| Bars, rods, angles, shapes, sections | 362,151 | 376,612 | 73 | West Germany 96,547; United Kingdom 61,808; Sweden 57,911. |
| Rails and accessories | 11,016 | 11,784 | 1 | Austria 10,084; West Germany 986; Netherlands 261. |
| Wire | 45,084 | 44,934 | — | West Germany 20,207; Belgium-Luxembourg 8,563 |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel—Continued: | | | | | |
| Metal—Continued: | | | | | |
| Semimanufactures—Continued: | | | | | |
| Tubes, pipes, fittings | | 230,337 | 240,581 | 623 | West Germany 84,124; United Kingdom 31,977; Switzerland 17,929. |
| Lead: | | | | | |
| Ores and concentrate | | 5 | — | | |
| Oxides | | 218 | 212 | — | West Germany 132; East Germany 74; Netherlands 3. |
| Metal including alloys: | | | | | |
| Scrap | | 678 | 814 | — | Norway 307; Sweden 228; West Germany 169. |
| Unwrought | | 5,363 | 5,842 | — | Sweden 2,239; West Germany 1,993; East Germany 841. |
| Semimanufactures | | 4,444 | 4,967 | (2) | West Germany 4,447; Sweden 257; Norway 155. |
| Magnesium: | | | | | |
| Metal including alloys: | | | | | |
| Unwrought | | 88 | 88 | — | Norway 60; Netherlands 24; France 4. |
| Semimanufactures | | 77 | 103 | 62 | Switzerland 11; Norway 7. |
| Manganese: | | | | | |
| Ore and concentrate: Metallurgical-grade | | 477 | 174 | — | Netherlands 164; West Germany 10. |
| Oxides | | 882 | 1,076 | — | Belgium-Luxembourg 432; Netherlands 275; Greece 240. |
| Metal including alloys: | | | | | |
| Scrap | | 1 | — | | |
| Unwrought | | 828 | 1,150 | — | Norway 750; Sweden 400. |
| Semimanufactures | | 4 | 522 | — | West Germany 520; Sweden 2. |
| Mercury | | 6 | 4 | — | Finland 1; Sweden 1; Turkey 1. |
| Molybdenum: | | | | | |
| Oxides and hydroxides | | 45 | 45 | — | Mainly from Netherlands. |
| Metal including alloys: | | | | | |
| Scrap | | — | (2) | NA | NA. |
| Unwrought | | 7 | 5 | — | All from West Germany. |
| Semimanufactures | | (2) | 1 | — | NA. |
| Nickel: | | | | | |
| Ore and concentrate | | — | 846 | — | All from Netherlands. |
| Matte and speiss | | 699 | 760 | — | West Germany 734; United Kingdom 25; Sweden 1. |
| Oxides and hydroxides | | 3 | 9 | — | Sweden 6; Netherlands 2; West Germany 1. |
| Ash and residue | | 26 | — | | |
| Metal including alloys: | | | | | |
| Scrap | | 19 | 38 | — | Sweden 36; Norway 2. |
| Unwrought | | 115 | 131 | — | Finland 68; United Kingdom 22; West Germany 20. |
| Semimanufactures | | 279 | 302 | 5 | United Kingdom 184; West Germany 64; Sweden 7. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $353 | $1,144 | — | Sweden $1,093; Netherlands $37; United Kingdom $6. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 243 | 291 | 10 | Netherlands 124; Switzerland 71; United Kingdom 46. |
| Platinum | do. | 355 | 284 | 7 | Switzerland 124: Netherlands 55; West Germany 45. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Platinum-group metals—Continued: | | | | | |
| Metals including alloys, unwrought and partly wrought—Continued: | | | | | |
| Rhodium | kilograms | 9 | 6 | — | Mainly from Netherlands. |
| Iridium, osmium, ruthenium | do. | 4 | 109 | — | United Kingdom 101; Netherlands 8. |
| Unspecified | do. | — | 341 | NA | NA. |
| Rare-earth metals including alloys, all forms | kilograms | 8 | 10 | — | All from West Germany. |
| Selenium, elemental | | 71 | 36 | — | United Kingdom 30; Italy 3; Norway 3. |
| Silver: | | | | | |
| Waste and sweepings[5] | value, thousands | $1,766 | $1,483 | — | Norway $552; Finland $498; Sweden $354. |
| Metal including alloys, unwrought and partly wrought | kilograms | 79,125 | 107,360 | 8 | Switzerland 29,509; West Germany 27,057; Italy 15,961. |
| Tin: | | | | | |
| Oxides | | 6 | 3 | — | West Germany 2; United Kingdom 1. |
| Metal including alloys: | | | | | |
| Scrap | | 108 | 15 | — | All from Sweden. |
| Unwrought | | 144 | 121 | 2 | Sweden 34; West Germany 32; Brazil 22. |
| Semimanufactures | | 632 | 448 | — | United Kingdom 189; West Germany 116; Sweden 81. |
| Titanium: | | | | | |
| Oxides | | 3,947 | 3,636 | (2) | Norway 1,818; Finland 972; West Germany 269. |
| Ore and concentrate | | — | 131 | — | Finland 98; Netherlands 28; Norway 6. |
| Metal including alloys: | | | | | |
| Scrap | | 23 | 9 | — | Mainly from Norway. |
| Unwrought | kilograms | 1,300 | 100 | — | All from United Kingdom. |
| Semimanufactures | | 124 | 206 | 6 | Sweden 21; West Germany 3; unspecified 172. |
| Tungsten: | | | | | |
| Ore and concentrates | | — | 25 | — | Mainly from West Germany. |
| Metal including alloys: | | | | | |
| Scrap | kilograms | 600 | 1,800 | 800 | West Germany 1000. |
| Unwrought | do. | 3,500 | 980 | 10 | Norway 600; Netherlands 240; West Germany 6. |
| Semimanufactures | do. | 21,800 | 7,200 | NA | West Germany 400. |
| Uranium and thorium: | | | | | |
| Ore and concentrate: Uranium | | — | (2) | — | All from West Germany. |
| Oxides and other compounds | kilograms | 92 | 201 | NA | NA. |
| Metal including alloys, all forms: | | | | | |
| Uranium | do. | 177 | 88 | NA | West Germany 13. |
| Vanadium: | | | | | |
| Oxides and hydroxides | | — | 4 | — | All from Netherlands. |
| Metal including alloys: | | | | | |
| Unwrought | | 4 | 6 | — | All from West Germany. |
| Semimanufactures | | (2) | (2) | NA | NA. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Zinc: | | | | |
| Oxides | 3,367 | 2,919 | 347 | West Germany 1,683; France 500. |
| Blue powder | 1,185 | 1,741 | — | Norway 747; West Germany 441; United Kingdom 333. |
| Matte | — | (2) | NA | NA. |
| Ash and residue containing zinc | 565 | 676 | — | All from West Germany. |
| Metal including alloys: | | | | |
| Scrap | 88 | 244 | — | Sweden 155; Poland 33; West Germany 33. |
| Unwrought | 13,127 | 15,878 | — | Finland 7,559; Norway 5,779; United Kingdom 1,369. |
| Semimanufactures | 4,974 | 3,914 | — | France 2,174; West Germany 1,084; Netherlands 357. |
| Zirconium: | | | | |
| Ore and concentrate | 30 | 113 | — | United Kingdom 64; West Germany 25; Australia 24. |
| Oxides | 4 | 2 | — | West Germany 1; Netherlands 1. |
| Metal including alloys: | | | | |
| Unwrought | 1 | (2) | — | All from West Germany. |
| Semimanufactures | 7 | 22 | — | All from Sweden. |
| Other: | | | | |
| Ores and concentrates | 18 | 95 | — | All from Canada. |
| Oxides and hydroxides | 1,482 | 1,482 | 142 | West Germany 840; Norway 139. |
| Ashes and residues | 1,887 | 1,804 | 2 | West Germany 1,459; Finland 190; Sweden 136. |
| Base metals including alloys, all forms | (2) | (2) | — | NA. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 8,999 | 8,346 | — | Iceland 7,468; Netherlands 264; Greece 224. |
| Artificial: | | | | |
| Corundum | 463 | 325 | — | West Germany 324; United Kingdom 1. |
| Silicon carbide | 596 | 596 | — | Norway 397; Germany 197; Sweden 2. |
| Dust and powder of precious and semiprecious stones excluding diamond kilograms | 53 | 280 | — | All from West Germany. |
| Grinding and polishing wheels and stones | 1,003 | 1,151 | 18 | West Germany 414; Sweden 116; Austria 264. |
| Asbestos, crude | 1,109 | 800 | — | All from Canada. |
| Barite and witherite | 7,934 | 16,917 | — | Netherlands 11,781; Norway 3,382; United Kingdom 961. |
| Boron materials: | | | | |
| Crude natural borates | 1,414 | 1,108 | 1,080 | West Germany 26; Belgium-Luxembourg 2. |
| Elemental | 9 | 7 | — | United Kingdom 3; Italy 2; Netherlands 2. |
| Oxides and acids | 598 | 614 | 242 | France 184; Italy 80. |
| Bromine | 96 | 24 | — | Netherlands 23; Sweden 1. |
| Cement | 209,116 | 196,984 | 1 | Poland 98,493; East Germany 74,009; West Germany 14,642. |
| Chalk | 17,639 | 21,332 | — | West Germany 17,462; France 1,599; Austria 1,001. |
| Clays, crude: | | | | |
| Bentonite | 10,300 | 12,301 | 11 | West Germany 9,474; United Kingdom 1,015; Netherlands 820. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays, crude—Continued: | | | | | |
| Chamotte earth | | 1,670 | 4,791 | — | France 3,370; West Germany 1,132; Austria 121. |
| Fire clay | | 599 | 500 | — | West Germany 452; Malaysia 25; United Kingdom 22. |
| Fuller's earth | | 600 | 738 | 159 | United Kingdom 329; West Germany 154. |
| Kaolin | | 27,826 | 24,899 | 1,755 | United Kingdom 16,976; West Germany 2,311. |
| Unspecified | | 7,067 | 6,039 | 289 | West Germany 5,482; United Kingdom 200. |
| Cryolite and chiolite | | 2 | — | | |
| Diamond: | | | | | |
| Gem, not set or strung | carats | 5,895 | 4,888 | — | Belgium-Luxembourg 3,273; United Kingdom 881; Netherlands 342. |
| Unsorted stones | do. | 617 | 729 | — | Belgium-Luxembourg 717; United Kingdom 12. |
| Industrial stones | do. | 13,419 | 18,616 | 14,500 | United Kingdom 3,817; Belgium-Luxembourg 179. |
| Dust and powder | grams | 187,830 | 125,125 | 71,130 | Switzerland 19,234; West Germany 17,644. |
| Diatomite and other infusorial earth | | 5,528 | 4,470 | 2,274 | Iceland 1,445; West Germany 170; Spain 127. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 4,945 | 4,994 | — | Norway 4,486; Sweden 379; West Germany 129. |
| Fluorspar | | 445 | 453 | — | France 447; Netherlands 6. |
| Unspecified | | 1,008 | 911 | — | Norway 800; West Germany 110. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 725 | 123 | — | West Germany 65; Netherlands 33; United Kingdom 17. |
| Manufactured: | | | | | |
| Ammonia | | 378,351 | 345,317 | — | Netherlands 187,474; United Kingdom 68,109; U.S.S.R. 40,233. |
| Nitrogenous | | 274,235 | 453,871 | — | Sweden 96,473; Netherlands 57,192; East Germany 55,194. |
| Phosphatic | | 4,671 | 7,463 | — | Netherlands 5,092; Morocco 1,248; Poland 997. |
| Potassic | | 239,907 | 294,138 | — | West Germany 9,358; Sweden 507; unspecified 265,971. |
| Unspecified and mixed | | 566,066 | 507,243 | — | Norway 353,821; Poland 40,138; Belgium-Luxembourg 38,613. |
| Graphite, natural | | 1,436 | 1,748 | 45 | West Germany 1,604; Sweden 68; Switzerland 27. |
| Gypsum and plaster | | 342,730 | 321,486 | 1 | Spain 238,663; West Germany 63,631; France 11,970. |
| Iodine | | 27 | 7 | — | West Germany 6; Belgium-Luxembourg 1. |
| Kyanite and related materials: | | | | | |
| Kyanite | | 727 | 1,145 | — | West Germany 1,028; Sweden 117. |
| Mullite | | 2,010 | 998 | 493 | Netherlands 500; West Germany 5. |
| Lime | | 27,556 | 51,170 | — | Sweden 26,468; Belgium-Luxembourg 17,671; West Germany 6,561. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 2,259 | 5,730 | — | Austria 2,183; Spain 2,105; China 701. |
| Oxides and hydroxides | | 22,349 | 9,746 | 43 | China 5,199; Austria 2,365; Netherlands 638. |
| Sulfate | | 46,366 | 42,021 | — | East Germany 29,698; West Germany 12,266; Belgium-Luxembourg 54. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Mica: | | | | | |
| Crude including splittings and waste | | 197 | 228 | — | Norway 72; Canada 70; United Kingdom 56. |
| Worked including agglomerated splittings | | 49 | 10 | — | Belgium-Luxembourg 4; France 4; Switzerland 1. |
| Nitrates crude | | 1,676 | 161 | — | West Germany 143; East Germany 15; Austria 3. |
| Phosphates, crude | | 219,183 | 172,962 | — | Morocco 99,681; U.S.S.R. 27,039; Finland 26,236. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 115 | 229 | 1 | Cyprus 145; West Germany 45; France 28. |
| Iron oxides and hydroxides, processed | | 3,815 | 3,824 | 21 | West Germany 2,536; United Kingdom 356; Italy 177. |
| Potassium salts, crude | | — | 26 | — | All from West Germany. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | kilograms | 1,486 | 30,209 | 227 | Brazil 10,418; Taiwan 354; West Germany 254. |
| Synthetic | do. | 32 | 24 | NA | Ireland 16; Switzerland 3. |
| Pyrite, unroasted | | — | 42 | — | West Germany 35; United Kingdom 7. |
| Quartz crystal, piezoelectric | kilograms | 29 | 6 | NA | NA. |
| Salt and brine | | 132,122 | 127,150 | 20 | West Germany 60,880; U.S.S.R. 31,555; East Germany 12,808. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 57,391 | 54,569 | — | West Germany 24,820; Netherlands 15,673; East Germany 10,392. |
| Sulfate, manufactured | | 27,305 | 27,465 | — | Sweden 11,695; West Germany 7,282; Austria 2,646. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 368,696 | 355,188 | 42 | Norway 194,384; Sweden 150,576; West Germany 7,844. |
| Worked | | 57,361 | 55,349 | — | Portugal 27,671; Italy 8,486; Sweden 7,290. |
| Dolomite, chiefly refractory-grade | | 43,794 | 66,052 | — | Norway 40,734; Belgium-Luxembourg 13,078; |
| Gravel and crushed rock | thousand tons | 1,414 | 1,453 | (2) | Norway 675; Sweden 644; United Kingdom 110. |
| Limestone other than dimension | | 284,505 | 312,541 | — | United Kingdom 205,205; Sweden 87,081; Norway 12,922. |
| Quartz and quartzite | | 1,029 | 1,056 | — | Sweden 534; West Germany 323; Norway 175. |
| Sand other than metal-bearing | | 97,290 | 107,860 | 770 | Sweden 48,391; Belgium-Luxembourg 35,825; Norway 10,741. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 72,551 | 52,867 | 216 | West Germany 52,326; Poland 302. |
| Colloidal, precipitated, sublimed | | 43 | 41 | — | West Germany 37; United Kingdom 4. |
| Dioxide | | 1,367 | 1,340 | — | West Germany 823; Sweden 517. |
| Sulfuric acid | | 8,683 | 8,140 | — | West Germany 4,485; Poland 1,964; Netherlands 884. |
| Talc, steatite, soapstone, pyrophyllite | | 12,426 | 10,279 | 651 | Finland 4,424; Norway 3,098; Sweden 921. |
| Vermiculite[6] | | 3,038 | 3,362 | NA | NA. |

See footnotes at end of table.

TABLE 3—Continued

## DENMARK: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Other: | | | | | |
| Crude | | 5,740 | 5,066 | 672 | West Germany 1,669; Netherlands 1,388. |
| Slag and dross, not metal-bearing | | 152,129 | 114,235 | — | West Germany 45,429; Norway 37,921; Sweden 30,637. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 1,180 | 12,657 | 110 | Finland 5,535; West Germany 4,332. |
| Carbon: | | | | | |
| Carbon black | | 4,688 | 4,844 | 120 | Sweden 2,600; West Germany 835; Netherlands 697. |
| Gas carbon | | 1,246 | 593 | — | France 509; West Germany 59; Netherlands 25. |
| Coal: | | | | | |
| Anthracite | thousand tons | 232 | 134 | (2) | Poland 131; West Germany 2. |
| Bituminous | do. | 10,507 | 9,811 | 3,224 | Colombia 2,077; U.S.S.R. 1,142. |
| Briquets of anthracite and bituminous coal | | 28 | (2) | NA | NA. |
| Lignite including briquets | | 5,902 | 8,103 | — | East Germany 3,490; West Germany 3,125; Poland 1,249. |
| Coke and semicoke | | 42,267 | 43,084 | 3,647 | United Kingdom 24,124; Belgium-Luxembourg 6,117. |
| Gas, natural: | | | | | |
| Gaseous | million cubic meters | (2) | — | — | |
| Liquefied | | 15 | 21 | — | West Germany 19; Norway 2. |
| Peat including briquets and litter | | 32,985 | 32,974 | NA | Sweden 13,397; West Germany 11,589; U.S.S.R. 4,678. |
| Petroleum: | | | | | |
| Crude | 42-gallon barrels | 30,944,488 | 30,178,840 | — | Norway 11,269,286; Kuwait 9,744,741; United Kingdom 5,737,307. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 295,185 | 197,768 | 81 | Norway 79,727; Sweden 68,892; West Germany 42,885. |
| Gasoline | do. | 35,736,295 | 32,382,110 | 366,750 | Sweden 11,347,390; U.S.S.R. 5,621,909; Kuwait 4,367,598. |
| Mineral jelly and wax | do. | 97,226 | 105,308 | 724 | West Germany 70,248; United Kingdom 9,775; Hungary 9,121. |
| Bitumen and other residues | do. | 1,335,563 | 1,226,738 | — | West Germany 506,234; Sweden 491,223; Netherlands 170,019. |
| Bituminous mixtures | do. | 14,009 | 12,562 | 24 | West Germany 8,217; Sweden 2,266; Netherlands 988. |
| Petroleum coke | do. | 945,643 | 878,212 | NA | West Germany 1,111; United Kingdom 149; unspecified 876,959. |

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 unit.
[3]Includes indium and thallium.
[4]May include ferrosilicotitanium.
[5]May include other precious metals.
[6]Includes perlite and chlorite.

TABLE 4

## FAROE ISLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Principal destinations, 1990 |
|---|---|---|---|
| Salt and brine | 6,550 | 1,125 | Iceland 760; United Kingdom 365. |

[1]Table prepared by Theodore T. Spittal. The Faroe Islands did not report any exports of mineral commodities to the United States during 1990.

TABLE 5

## FAROE ISLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Aluminum: Metal including alloys, all forms | 353 | 186 | (2) | Denmark 94; France 33; West Germany 32. |
| Copper: Metal including alloys, all forms | 116 | 76 | — | West Germany 38; Sweden 21; Denmark 8. |
| Iron and steel: Metal: | | | | |
| Scrap | 559 | 50 | — | Denmark 38; Belgium-Luxemborg 10; Netherlands 2. |
| Steel, primary forms | 4 | 11 | — | All from Denmark. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel | | | | |
| Not clad, plated, coated | 775 | 1,014 | — | Norway 649; Denmark 307; Belgium-Luxembourg 34. |
| Clad, plated, coated | 299 | 274 | — | Denmark 169; United Kingdom 101; West Germany 3. |
| Of alloy steel | 61 | 33 | — | Denmark 29 Sweden 3; West Germany 1 |
| Bars, rods, angles, shapes, sections | 1,406 | 1,003 | — | Norway, 433; Denmark 407; Sweden 151. |
| Rails and accessories | 42 | 138 | — | Norway 100; Denmark 37. |
| Wire | 82 | 15 | — | Denmark 12; Sweden 2. |
| Tubes, pipes, fittings | 793 | 573 | — | Denmark 472; Norway 28; United Kingdom 23. |
| Lead: Metal including alloys: | | | | |
| Scrap | 38 | 58 | — | Denmark 55; West Germany 3. |
| Unwrought | 12 | 6 | — | All from West Germany. |
| Semimanufactures | 26 | 20 | — | West Germany 16; Denmark 4. |
| Manganese: | | | | |
| Oxides | 1 | — | | |
| Metal including alloys all forms | (2) | — | | |
| Tin: Metal including alloys all forms | 1 | — | | |
| Titanium: Oxides | 10 | 10 | — | All from Norway. |
| Zinc: Metal including alloys all forms | 34 | 36 | — | Norway 29; Denmark 3; West Germany 3. |
| Other: Ashes and residues | (2) | — | | |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Artificial: Corundum | 1 | 1 | — | All from West Germany. |
| Dust and powder of precious and semiprecious stones excluding diamond value, thousands | — | $1 | — | All from Netherlands. |
| Grinding and polishing wheels and stones | 2 | 2 | — | Denmark 1. |
| Barite and witherite | — | 1 | — | All from West Germany. |
| Cement | 26,623 | 15,862 | — | Denmark 11,284; Netherlands 4,577. |
| Chalk | 3 | 2 | — | NA. |
| Clays, crude: | | | | |
| Bentonite | 3 | 5 | — | Spain 3; Denmark 2. |
| Kaolin | 3 | — | | |
| Unspecified | 8 | 8 | 1 | Denmark 7. |
| Cryolite and chiolite | — | 2 | — | All from Norway. |
| Diatomite and other infusorial earth | 28 | 16 | 7 | Denmark 9. |

See footnotes at end of table.

TABLE 5—Continued

## FAROE ISLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 20 | 8 | — | All from Iceland. |
| Manufactured: | | | | | |
| Ammonia | | 17 | 12 | — | Denmark 9; Norway 3. |
| Nitrogenous | | 379 | 443 | — | Denmark 375; Norway 68. |
| Phosphatic | | 15 | 8 | — | All from Denmark. |
| Potassic | | 4 | — | | |
| Unspecified and mixed | | 1,121 | 1,152 | — | Denmark 1,138; Norway 13. |
| Gypsum and plaster | | 32 | (2) | — | All from Denmark. |
| Lime | | 3 | 23 | — | Do. |
| Pigments, mineral: Iron oxides and hydroxides, processed | | 2 | 3 | — | West Germany 2; Denmark 1. |
| Precious and semiprecious stones other than diamond: Natural | value, thousands | — | $1 | — | All from West Germany. |
| Pyrite, unroasted | | 1 | 1 | — | All from Denmark. |
| Salt and brine | | 28,365 | 15,994 | 1 | Spain 13,882; East Germany 1,357; Iceland 320. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 22 | 8 | — | Norway 5; Spain 3. |
| Worked | | 415 | 215 | — | Denmark 200; Norway 6; Italy 4. |
| Gravel and crushed rock | | 81 | 22 | — | All from Denmark. |
| Limestone other than dimension | | 163 | 162 | — | Denmark 137; West Germany 25. |
| Sand other than metal-bearing | | 4,403 | 5,082 | — | All from Denmark. |
| Talc, steatite, soapstone, pyrophyllite | | 6 | 8 | — | All from Norway. |
| Other: | | | | | |
| Crude | | 41 | 5 | — | Denmark 4; Finland 1. |
| Slag and dross, not metal-bearing | | 26 | 43 | — | All from Denmark. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 7,588 | 7,537 | — | West Germany 4,999; France 2,536. |
| Coal: Bituminous | | (2) | 50 | — | All from United Kingdom. |
| Peat, including briquets and litter | | 62 | 101 | — | All from Denmark. |
| Petroleum: | | | | | |
| Crude | 42- gallon barrels | — | (2) | — | All from Norway. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 12 | 1,369 | — | All from Denmark. |
| Gasoline | do. | 1,623,288 | 1,718,488 | 17 | Norway 1,421,642; Denmark 290,394; West Germany 5,202. |
| Mineral jelly and wax | do. | 24 | 8 | — | All from West Germany. |
| Bitumen and other residues | do. | 182 | (2) | — | All from United Kingdom. |
| Bituminous mixtures | do. | 733 | 812 | — | Denmark 606; Netherlands 152; Belgium-Luxembourg 42. |

NA Not available.

[1]Table prepared by Theodore T. Spittal.

[2]Less than 1/2 unit.

TABLE 6
## DENMARK: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Cement | Aalborg Portland Cement Fabrik A/S | Plant at Rordal | 2,800 |
| Chalk | A/S Faxe Kalkbrud | Quarries at Stevns and Sigerslev | 250 |
| Diatomite (moler) | Skamol-Skarrehage Molervaerk A/S | Quarries on Mors and Fur (Fyr) Islands | 85 |
| Do. | Dansk Moler Industri A/S | Quarries on Fur Island | 50 |
| Iron and steel | Danish Steel Works Ltd. (Det Danske Stalvalsevaerk A/S) | Plant at Federiksvaerk | 650 |
| Kaolin | Aalborg Portland A/S | Mine and plant on Bornholm Island | 25 |
| Lime | A/S Faxe Kalkbrud (Aalborg Portland Holding A/S) | Plant at Stubberup, near Fakse, on Zealand Island | 190 |
| Natural gas million cubic meters | Maersk Olie og Gas A/S | Roar and Tyra gasfields, Danish North Sea | 6,000 |
| Petroleum: | | | |
| Crude barrels per day | Dansk Undergrounds Consortium (Royal Dutch Shell, 46%; A. P. Moller, 39%; Texaco A/S, 15%) | Dan, Gorm, Rolf, Skjold and Tyra oilfields, Danish North Sea | 143,000 |
| Refined do. | A/S Dansk Shell | Fredericia | 55,000 |
| Do. do. | Kuwait Petroleum Refining A/S | Gulfhavn | 56,500 |
| Do. do. | Statoil A/S | Kalundborg | 65,000 |
| Salt | Dansk Salt I/S | Mine (brine) at Hvornum, processing plant at Mariager | 600 |

TABLE 7
## GREENLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| Cryolite, crude ore[2] | | 38,185 | — | — | — | — |
| Lead: Concentrate, Pb content | | 20,500 | 23,120 | 24,120 | 16,000 | — |
| Silver: In lead concentrate, Ag content | kilograms | 13,001 | 13,001 | 14,712 | 9,176 | — |
| Zinc: Concentrate, Zn content | | 69,200 | 77,520 | 71,500 | 47,850 | — |

eEstimated.
[1]Table includes data available through Nov. 1992.
[2]Shipments.

TABLE 8

## GREENLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Principal destinations, 1990 |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: Metal including alloys, scrap | | 13 | 10 | All to Denmark. |
| Copper: Metal including alloys, all forms | | 29 | 33 | Do. |
| Iron and steel: Metal: | | | | |
| Scrap | | 160 | 97 | Do. |
| Semimanufactures: Tubes, pipes, fittings | | 1 | 2 | Do. |
| Lead: | | | | |
| Ore and concentrate | | 35,564 | 27,573 | Belgium-Luxembourg 22,860; West Germany 4,713. |
| Metal including alloys, scrap | | — | 38 | All to Denmark. |
| Zinc: Ore and concentrate | | 130,494 | 95,544 | Belgium-Luxembourg 64,433; West Germany 31,111. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: Grinding and polishing wheels and stone | value, thousands | $1 | — | |
| Stone, sand, and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | | — | 16 | All to Denmark. |
| Worked | value, thousands | $7 | — | |
| Gravel and crushed rock | | 61 | — | |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | 42-gallon barrels | 1,575 | 904 | All to bunkers. |
| Kerosene and jet fuel | do. | 44,310 | 47,152 | Do. |
| Distillate fuel oil | do. | 21,594 | 15,024 | Canada 264; bunkers 14,760. |

[1]Table prepared by Theodore T. Spittal. Greenland did not report any exports of mineral commodities to the United States during 1990.

TABLE 9

## GREENLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: Metal including alloys, all forms | 96 | 42 | (2) | Denmark 21; West Germany 18; Sweden 2. |
| Copper: Metal including alloys, all forms | 72 | 60 | — | Denmark 54; West Germany 4; Finland 1. |
| Iron and Steel: Metal: | | | | |
| Scrap | 2 | — | | |
| Pig iron, cast iron, related materials | 4 | — | | |
| Steel, primary forms | 81 | 59 | — | Mainly from Denmark. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 327 | 251 | — | Denmark 249; West Germany 2. |
| Clad, plated, coated | 91 | 21 | — | West Germany 13; Denmark 6; Norway 2. |
| Of alloy steel | 56 | 40 | — | Denmark 38; West Germany 1; Sweden 1. |
| Bars, rods, angles, shapes. sections | 1,579 | 2,043 | — | Denmark 1,625; West Germany 26; Norway 10. |
| Rails and accessories | 14 | 15 | — | All from Denmark. |
| Wire | 7 | 5 | — | Denmark 3; West Germany 1. |
| Tubes, pipes, fittings | 954 | 733 | — | Denmark 677; West Germany 29; Norway 26. |
| Lead: Metal including alloys: | | | | |
| Unwrought | 23 | 23 | — | All from Denmark. |
| Semimanufactures | 6 | 20 | — | Do. |
| Manganese: Metal including alloys all forms | 24 | 25 | — | Do. |
| Platinum-group metals: Waste and sweepings value, thousands | $2 | — | | |
| Selenium, elemental | (2) | — | | |
| Silver: Metal including alloys, unwrought and partly wrought value, thousands | $5 | $7 | — | France $3; Denmark $2; Netherlands $2. |
| Tin: Metal including alloys all forms | (2) | — | | |
| Tungsten: Metal including alloys all forms | (2) | — | | |
| Zinc: | | | | |
| Blue powder | — | 1 | — | All from Denmark. |
| Metal including alloys, semimanufactures | 16 | 14 | — | Do. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: Grinding and polishing wheels and stones | 1 | 2 | — | Denmark 1; West Germany 1. |
| Bromine[3] | (2) | — | | |
| Cement | 5,347 | 4,615 | — | Denmark 3,812; Canada 799. |
| Chalk | 2 | — | | |
| Clays, crude: | | | | |
| Bentonite | 1 | — | | |
| Kaolin | 8 | — | | |
| Unspecified | 2 | 2 | 1 | Denmark 1. |
| Diamond: Gem, not set or strung value, thousands | $1 | $1 | — | All from Denmark. |
| Diatomite and other infusorial earth | — | 30 | — | Do. |

See footnotes at end of table.

TABLE 9—Continued

## GREENLAND: IMPORTS OF MINERAL COMMODITIES[1]

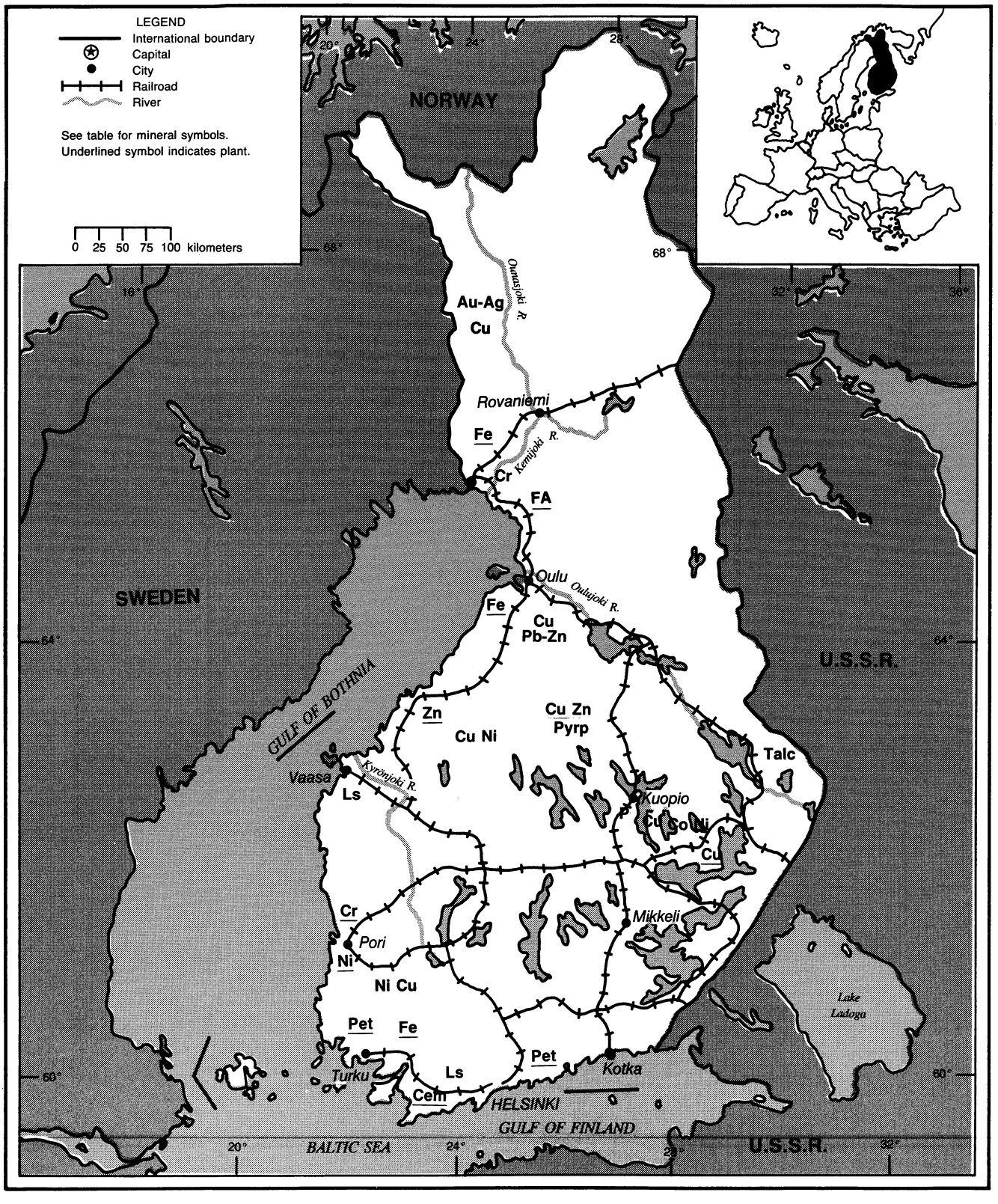
(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Fertilizer materials: | | | | | |
| Crude n.e.s. | | (2) | — | | |
| Manufactured: | | | | | |
| Ammonia | | 15 | 8 | — | Norway 4; Denmark 2; France 2. |
| Nitrogenous | | 501 | 24 | — | Norway 19; Denmark 5. |
| Phosphatic | | 2 | 14 | — | All from Denmark. |
| Unspecified and mixed | | 440 | 406 | — | Mainly from Denmark. |
| Gypsum and plaster | | 19 | 45 | — | Do. |
| Lime | | 2,143 | 450 | — | All from Denmark. |
| Pigments, mineral: Iron oxides and hydroxides, processed | | 1 | — | | |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $3 | $5 | $4 | Denmark $1. |
| Synthetic | do. | $1 | — | | |
| Salt and brine | | 4,968 | 5,037 | — | Denmark 2,610; West Germany 2,404; Iceland 23. |
| Sodium compounds, n.e.s.: Soda ash, manufactured | | 2 | 1 | — | All from Denmark. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: Worked | | 1 | 2 | — | All from Denmark. |
| Gravel and crushed rock | | 130 | 4,924 | — | Norway 4,900; Denmark 24. |
| Limestone other than dimension | | 27 | 21 | — | All from Denmark. |
| Quartz and quartzite | | 34 | — | | |
| Sand other than metal-bearing | | 284 | 127 | — | Denmark 124; Switzerland 3. |
| Sulfur: Sulfuric acid | | 12 | 8 | — | Denmark 7. |
| Other: Crude | | 76 | 36 | — | All from Denmark. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 48 | 268 | — | Mainly from Denmark. |
| Carbon: Carbon black | | 2 | (2) | — | All from Netherlands. |
| Coal: | | | | | |
| Bituminous | | 3 | 2 | — | All from Norway. |
| Briquets of anthracite and bituminous coal | | 97 | 139 | — | All from Poland. |
| Peat including briquets and litter | | 3 | 4 | — | All from Denmark. |
| Petroleum refinery products: | | | | | |
| Liquefied petroleum gas | 42-gallon barrels | 4,188 | 3,306 | — | Do. |
| Gasoline | do. | 1,392,785 | 1,497,122 | 68 | Norway 874,497; Denmark 621,945; Sweden 451. |
| Mineral jelly and wax | do. | (2) | (2) | — | All from Denmark. |
| Bitumen and other residues | do. | 3,030 | 91 | — | Do. |
| Bituminous mixtures | do. | 4,884 | 4,375 | — | Denmark 4,369; Sweden 6. |

[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 unit.
[3]May include flourine and iodine.

# FINLAND

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



THE MINERAL INDUSTRY OF

# FINLAND

By Donald E. Buck, Jr.

Historically, the Finnish mineral industry has been noted for its domestic metalliferous mines. These mines have been important domestic sources of chrome, copper, nickel, and zinc. However, the metalliferous resources and deposits have been progressively exhausted by extensive mining activity over the past 400 years. Most of the mines that are now operating were started less than 25 years ago. With the reduction of available raw materials, Finland has become more dependent on imported metallic ores. Furthermore, emphasis has shifted to exploration of industrial minerals, which would benefit the paper industry and decrease the need to import products for that industry.

The Finnish mining industry was adversely impacted by the weakening economic condition worldwide. In 1991, the domestic economy was again significantly impacted by the recession in Western Europe and by the troubles in the U.S.S.R. The mineral industries contributed to high unemployment (14%) with some reduction in employees. The GNP, which had been flat in 1990, decreased 6.2% in 1991, and stock values on the Helsinki Stock Exchange reportedly lost substantial market capitalization.

## GOVERNMENT POLICIES AND PROGRAMS

The Government has a long history of involvement with the mineral industry. State-owned companies, Kemira Oy, Outokumpu Oy, and Rautaruukki Oy, dominate the domestic 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.

The Government has implemented a policy to reduce sulfur dioxide emissions for metal-producing facilities. The Kemira Oy $TiO_2$ plant at Pori, which produces fertilizers, chemicals, and pigments, is slated for activated carbon removal of sulfur dioxide from the calcining of titanium dioxide. It was projected that this technique would remove 80% of the sulfur dioxide, which then would be used in the company's sulfuric acid plant. During the summer of 1991, the Outokumpu nickel smelter at Harjavalta was shut down for modifications. Sulfur dioxide emissions were reduced 40% and nickel in wastewater fell by more than 50% as reported by Outokumpu. Another proposed project was the cleanup of the Soviet nickel smelter on the Kola Peninsula by Outokumpu with Finnish and other Scandinavian Government backing.

## PRODUCTION

The metal industry output was reported to be down 13% and exports down 15%. The significant factor in these decreases were reportedly the changes that occurred in Eastern Europe. The number of metallic mines operating in Finland will apparently decrease by three as Saattopora, Vamala, and Enonkoski were reported to be closing down by Outokumpu within the next few years. *(See table 1.)*

## TRADE

Finland is an active member of the European Free Trade Association (EFTA). The Government also was engaged in negotiations with the European Community (EC) to create the European Economic Space (EES), which would allow Finland and some other European countries that 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.

Recessions in other Organization for Economic Cooperation and Development (OECD) countries was one reason for the lack of economic growth in Finland. Another was the internal difficulties within the U.S.S.R., which resulted in a sharp decline in trade, especially Finnish exports to the U.S.S.R. Domestic consequences in Finland of this trade drop (down 9%) were decreasing private consumption and investment. Also, the termination of the bilateral Finnish-Soviet clearing trade system reduced the traditional importance of Finland between Eastern and Western economies. Owing to this change, Finland reportedly lost some of its special trade position with the U.S.S.R. In 1990, Soviet trade only represented 13% of total Finnish trade, and this was projected to decrease to 7% in 1991. The metals and engineering industries reportedly accounted for 43% of Finnish exports. However, this was expected to decrease owing to a 50% drop in metal industry exports and deliveries to the U.S.S.R. in the near future.

A 2% increase in export values and a 2% decline in imports resulted in Finland's trade deficit decreasing by

nearly $1 billion to $444 million in 1990. Finland's trade with EFTA registered a small surplus. The deficit with West Germany decreased significantly while trade with the rest of the EC remained even.

Finnish metal industries have expanded downstream to higher value added products. The higher cost of mining in Finland has meant that Finnish companies have had to adopt high technologies and improve efficiencies.

Finland imported significant quantities of copper concentrate, iron ore, zinc concentrate, and nickel matte and concentrate. Major commodity imports from the United States included kaolin, coal, aluminum scrap, and copper ores.

## STRUCTURE OF THE MINERAL INDUSTRY

The major segment of Finland's mineral industry is Government controlled. The state-owned company, Outokumpu Oy, is the largest mining and metallurgical company in the country. Because of the decreasing availability of raw materials domestically, Outokumpu has increased its investments abroad. The Group includes about 200 companies; the majority are registered outside Finland. The company operates in more than 25 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 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. The main products are clays, dolomite, feldspar, and limestone. Other companies are involved in the dimension stone industry.

Overall, there were about 65,000 persons employed in the mining and metal processing industry in Finland. Of these, about 825 are employed in mining and quarrying, down from 860 in 1989. Approximately 42% of the workers are in open pit operations, while the rest are in underground mines. *(See table 2.)*

## COMMODITY REVIEW

### Metals

***Chromium.***—Outokumpu's Kemi Mine is Scandinavia's only chromite mine. The 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 Mmt. 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, which is the current mining method. The average content of the ore was reported to be 26% $Cr_2O_3$ with a reported chromium-iron 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.

The recent investment of $23 million in the pelletizing plant at the Tornio facility, 40 km from the Kemi Mine, has increased the pellet production capacity to 200,000 mt/a. Of the 170,000-ton output, 35% to 40% is used in the adjacent stainless steel plant, while most of the rest is shipped to Western European countries.

***Cobalt.***—In 1991, Outokumpu, the French company Vasset, and Mooney Chemicals of the United States, formed the OM Group into one of the world's largest refiners of cobalt. At yearend, Outokumpu had reportedly agreed to transfer 51% of its ownership to a consortium of other Finnish companies. Also by yearend, Outokumpu Chemicals had completed its expansion of the Kokola plant.

***Copper.***—The domestic production of copper ore has been decreasing. In 1989, the Keretti Mine closed, and, within the next 3 years, Outokumpu reportedly projects that the Vihanti mine will be closed. Mined copper concentrates are smelted at the Harjavalta plant and refined at the Pori plant. In recent years the mine output of copper ores has not been sufficient to meet the needs of the smelter or refinery. As a result of the limited domestic availability of copper concentrates, Outokumpu is expanding its foreign operations to ensure its metallurgical requirements are met. An agreement, signed in 1988 with owners of the La Escondida copper project in Chile, has resulted in the long-term supply of raw materials for the Harjavalta smelter operations. The first shipment of 20,000 tons of copper concentrates was projected to arrive in the spring of 1992. This represents approximately one-fifth of the smelter's requirements.

The Lance development project in Chile was completed at yearend and production was to begin at the first of 1992. Outokumpu increased its interest in the mine from 15% to 40%. The operation was projected to produce 20,000 mt/a of cathode copper for the estimated 10-year life of the mine.

Another project (exploration) purchased by Outokumpu for $25 million in 1990 was the Zalvidar copper deposit in Chile. Zalvidar is a polymetallic deposit 5 km from the large Escondida copper deposit. The deposit was reported to contain an estimated 2 Mmt of copper, twice as large as originally estimated. If this is proven, the deposit would contain twice as much copper as the Finnish Outokumpu Mine. This mine was in operation between 1913 and 1987 and was Outokumpu's largest copper mine.

The revised ore estimates have resulted in delays in finishing feasibility studies and the start of development work. The decision to open the mine could be made in the first half of 1993.

*Iron and Steel.*—Production of ferrochrome increased 20% to 190,000 tons. Production of rolled stainless steel increased 7% to 197,000 tons; a new record, while production of stainless tubes and fittings decreased during the year by approximately 8%.

The investment in the Tornio plant has facilitated the production of about 250,000 tons of cold-rolled and 100,000 tons of hot strip production. The third phase of the modernization involved the addition of the third annealing and pickling line in the cold-rolling mill. The $100 million investment allowed the utilization of the Sendzimir rolling mills to capacity and substantial increase in the hot-strip capacity. Environmental protection improvements totaling $20 million reduced by 85% the dust emissions from the stainless melting shop off-gas cleaning system. The slitting and cutting processes for cold-rolled material were to be transferred to Terenuzen, Netherlands, to strengthen the competitiveness of Outokumpu Polaris Oy in central Europe. Delivery times and improved customer service were objectives for the $44 million investment. Also, the deepening of the Tornio harbor and shipping lane was to be completed by the end of summer 1992. This project was to facilitate the ship transfer of cold-rolled product from Tornio to the Netherlands for processing.

Oy JA-RO Ab, the third company in the steel division, planned to build a $13 million tube mill at Terneuzen adjacent to the new Outokumpu Polaris processing line. The new mill's capacity was planned to be 5,000 tons and completed in 1993. Oy JA-RO Ab planned to invest $5 million in the Veteli mill, expanding the tube fittings production capability.

Overall, the turnover for Rautaruukki Oy was 5% more in 1991 than that in 1990. Capacity utilization at the Steel Division remained high, but this was reportedly not the case for the other industrial divisions.

The Steel Division reportedly produced 2.478 Mmt of steel, representing a 3% increase over that of 1990. Coated sheet and coils increased by 22%, while the production of reinforcing steel decreased 14%.

*Nickel.*—Outokumpu reported an investment of $18 million in the Harjavalta nickel smelter for a major overhaul and expansion project. Coupled with the ongoing environmental program at the plant, the company reported that sulfur dioxide emissions had been reduced 40%, metal content in wastewater reduced 50%, and dust emissions cut by 30%. However, the domestic raw material sources for the smelter were being depleted and the company was forced to invest overseas.

Outokumpu has invested in several Australian projects to secure resources for the Harjavalta nickel smelter. An interest in the Forrestania deposit was originally purchased in 1989. In 1990, the outstanding 50% was purchased, making Outokumpu the sole owner of the nickel deposit.

Development of another Australian project, the Mount Keith nickel deposit, was delayed during the year. The Australia Consolidated Minerals Ltd. shares in the Mount Keith deposit were purchased by the Australian company, Western Mining Corp. Holdings Ltd. Western Mining and Outokumpu were reportedly negotiating a co-operation agreement to exploit the deposit on a 50-50 basis.

Outokumpu Engineering has reportedly made a proposal to renovate the Pechenganikel nickel smelter on the Kola Peninsula in the U.S.S.R. The $600 million project would reportedly reduce emissions of sulfur dioxide and, thereby, reduce the acid rain problems and environmental damage originating from that facility.

*Zinc.*—Outokumpu Zinc Oy operates the Kokkola zinc plant in Finland and the Tara zinc mine in Ireland. The Kokkala zinc plant reportedly operated smoothly during the year, as did the cost-effective Tara Mine. This Outokumpu subsidiary returned satisfactory results to Outokumpu, even though the price of zinc dropped 22%. The sale of the Kokkola powerplant to Imatran Voima Oy resulted in a reported $60 million influx of badly needed capital for the company.

## Industrial Minerals

*Cement/Lime.*—Partek Cement Oy was part of Partek Basic Materials before the September 1991 reorganization, which formed several separate companies. The company's sales of cement in 1991 were approximately 1 Mmt, down slightly from the previous year. Cement sales accounted for 35% of the total sales for Partek Minerals.

*Talc.*—In January 1991, Finnminerals purchased Partek's talc operations and became the country's sole talc producer. The acquisition of the Kaavi plant at Luikonlahti added approximately 60,000-mt/a talc output, which is used in the paper industry. Associated with the Kaavi plant purchase are several ore bodies and the Polvijarvi Mine, which produces 450,000-mt/a crude talc output from surface operations. Two other operations produce talc, and the company total is approximately 360,000 mt/a. Of this amount, 120,000 tons of talc is from the Vuonos operations in northern Karelia and the largest amount is from the Sotkamo mine and plant, which outputs 180,000 mt/a. The largest percentage (80%) of the talc produced is for the paper industry, with the remaining output used in the paint, plastic, and fertilizer industries.

## Mineral Fuels

Finland has one of the world's highest per capita energy consumption levels owing to its harsh climate and industrial structure. The country was receiving most of its energy needs from the U.S.S.R. In the 1980's, Soviet sales of petroleum crude and refined products was

approximately 90% of the Finnish purchases; however, this figure has dropped significantly. Finnish imports of Soviet crude petroleum were expected to be only 40% of total Finnish requirements, with crude purchases from Norway and the United Kingdom recording most of the difference.

### Reserves

The country has exploited many of its domestic metalliferous resources. Therefore, Finnish companies have been investing heavily in overseas operations and are exporting technology that has been used to make domestic operations competitive and efficient. *(See table 3.)*

## INFRASTRUCTURE

Finland has 5,924 total km of railways of which the Finnish State Railways operates a total of 5,863 km of 1.524-m-gauge track. There are about 103,000 km of roads, of which 35,000 km are paved. Including the Saimaa Canal, there are 6,675 km of inland waterways, of which 3,700 km are 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 need to be maintained. As in most West European nations, dwindling domestic reserves have forced the Finnish mining industry to look abroad and to develop new, more efficient production methods to remain competitive.

[1]Where necessary, values have been converted from finnmarks (Fimr) to U.S. dollars at the rate of FIM3.831=US$1.00, the average value for 1991.

## 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.

TABLE 1

## FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum metal, secondary | | 25,700 | 29,900 | 27,989 | r23,900 | 22,100 |
| Cadmium metal, refined | | 687 | 703 | 612 | 569 | 593 |
| Chromite: | | | | | | |
| Gross weight: | | | | | | |
| Lump ore[e] | thousand tons | 338 | 450 | 353 | 347 | 320 |
| Concentrate | do. | 192 | 235 | 140 | 137 | e133 |
| Foundry sand[e] | do. | 13 | 15 | 5 | 5 | 5 |
| Total | do. | 543 | 700 | 498 | 489 | 458 |
| $Cr_2O_3$ content: | | | | | | |
| Lump ore[e] | do. | 91 | 95 | 92 | 90 | 90 |
| Concentrate | do. | e77 | 85 | 65 | 64 | e60 |
| Foundry sand[e] | do. | 6 | 10 | 5 | 5 | 5 |
| Total | do. | e174 | 190 | 162 | 159 | e155 |
| Cobalt: | | | | | | |
| Mine output, Co content | | 190 | — | — | — | — |
| Metal, refined, and salts | | r1,234 | 1,132 | 1,295 | e1,300 | 1,503 |
| Copper: | | | | | | |
| Mine output, Cu content | | 20,398 | 20,200 | 14,459 | e12,600 | 11,700 |
| Metal: | | | | | | |
| Smelter | | 77,400 | 79,000 | 79,470 | e90,200 | 90,100 |
| Refined | | 59,500 | 53,900 | 55,689 | 65,103 | 64,500 |
| Gold metal | kilograms | e1,800 | 2,035 | 2,510 | 2,813 | 2,200 |
| Iron and steel: | | | | | | |
| Iron ore, marketable, all types:[2] | | | | | | |
| Gross weight | thousand tons | r648 | 556 | — | — | — |
| Fe content | do. | 588 | r360 | — | — | — |
| Metal: | | | | | | |
| Pig iron | do. | 2,063 | 2,174 | 2,284 | 2,283 | 2,331 |
| Ferroalloys, ferrochromium | do. | 143 | 156 | 169 | r152 | 190 |
| Steel, crude | do. | 2,669 | 2,798 | 2,921 | 2,861 | 2,890 |
| Semimanufactures, rolled | do. | 2,025 | 2,300 | 2,452 | 2,486 | e2,500 |
| Lead: Mine output, Pb content | | 2,400 | 1,900 | 2,567 | e1,700 | e1,400 |
| Mercury | | 144 | r130 | 159 | 141 | 74 |
| Nickel: | | | | | | |
| Mine output, Ni content | | 10,557 | e11,699 | 10,480 | 11,524 | 9,900 |
| Metal, electrolytic | | 15,392 | 15,721 | 13,355 | 16,882 | 14,100 |
| Platinum-group metals:[e] | | | | | | |
| Palladium | kilograms | [3]89 | [3]106 | 100 | 100 | 100 |
| Platinum | do. | 120 | [3]54 | 60 | 60 | 60 |
| Selenium metal | do. | 23,638 | 25,073 | 27,969 | 31,160 | 35,000 |
| Silver metal | do. | 44,198 | 31,411 | 31,127 | 28,508 | 30,000 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 55,100 | 63,900 | 58,430 | e51,700 | 55,500 |
| Metal | | 151,467 | 156,076 | 162,508 | 174,923 | 170,400 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite | | 11,000 | 10,993 | 1,614 | — | — |
| Cement, hydraulic | thousand tons | 1,426 | 1,504 | 1,596 | 1,666 | 1,324 |

See footnotes at end of table.

TABLE 1—Continued

## FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Feldspar | | 51,632 | 56,200 | 54,581 | 52,630 | 53,000 |
| Lime | thousand tons | 271 | 260 | 224 | e225 | e225 |
| Nitrogen: N content of ammonia | | r50,300 | 42,630 | 41,600 | e23,600 | e18,000 |
| Phosphate rock, apatite concentrate: | | | | | | |
| Gross weight | thousand tons | 553 | 584 | 580 | 546 | 472 |
| $P_2O_5$ content | do. | 195 | 215 | 214 | 201 | e170 |
| Pyrite, gross weight | do. | 621 | 615 | 730 | e700 | 724 |
| Sodium sulfate[e] | do. | 35 | 35 | 33 | 33 | 33 |
| Stone, crushed: | | | | | | |
| Limestone and dolomite: | | | | | | |
| For cement manufacture | do. | 2,054 | 2,150 | 2,107 | 2,397 | e2,100 |
| For agriculture | do. | 1,203 | 1,072 | 1,188 | 1,269 | e1,000 |
| For lime manufacture | do. | 328 | 418 | 464 | 439 | e400 |
| Fine powders | do. | 397 | 455 | 579 | 648 | e560 |
| Metallurgical | do. | e12 | 123 | 25 | 1 | e4 |
| Total | do. | 3,994 | 4,218 | 4,363 | 4,754 | 4,064 |
| Quartz silica sand | do. | 233 | 272 | 274 | 276 | 201 |
| Sulfur: | | | | | | |
| S content of pyrite | do. | r317 | r313 | r306 | r357 | 369 |
| Byproduct: | | | | | | |
| Of metallurgy | do. | e230 | 240 | r180 | r237 | 227 |
| Of petroleum | do. | r52 | 47 | 41 | e42 | e40 |
| Total | do. | r599 | r600 | r527 | r636 | 636 |
| Sulfuric acid | do. | 1,160 | 1,095 | 1,392 | e1,325 | e1,300 |
| Talc | do. | 324 | 379 | 398 | 385 | 361 |
| Wollastonite | | r15,041 | r19,165 | r21,634 | 29,844 | 28,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Peat: | | | | | | |
| For fuel use | thousand tons | r2,409 | r4,851 | r5,940 | r e5,800 | e5,600 |
| For agriculture and other uses | do. | r191 | r325 | r451 | r e450 | e450 |
| Petroleum refinery products | thousand 42-gallon barrels | 73,400 | 72,000 | 74,000 | e72,500 | e73,000 |

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

[1]Table includes data available through Jan. 1993.

[2]Includes approximately 30% of unused roasted pyrite (purple ore) from the Kokkola Works.

[3]Reported figure.

TABLE 2

## FINLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Ammonia | Kemira Oy | Plant at Oulu | 150 |
| Cement | Oy Partek AB | Lappeenranta, Kolari, and Pargas | 1,400 |
| Do. | Oy Lohja AB | Virkkala | 1,000 |
| Chromite | Outokumpu Oy | Mine at Kemi | 420 |
| Cobalt, metal | do. | Smelter at Kokkola | 1 |

TABLE 2—Continued

## FINLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|---|
| Copper, concentrate | | Outokumpu Oy | 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 | kilograms | do. | Mines at Saattopra and Orivesi | 1,200 |
| Do. | do. | do. | Smelter at Pori | 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 | kilograms | Outokumpu Oy | Smelter at Kokkola | 76,000 |
| Nickel, concentrate | | do. | Mines at Hitura, Enonkoski, Telkkala, Vammala | 150 |
| Nickel, metal | | do. | Smelter at Harjavalta | 15 |
| Petroleum, refined | | Neste Oy | Refineries at Porvoo and Naantali | 9,000 |
| Phosphate, apatite | | Kemira Oy | Mine at Siilinjarva | 600 |
| Selenium | kilograms | Outokumpu Oy | Smelter at Pori | 20,000 |
| Silver | do. | do. | do. | 47,000 |
| Steel | | Rautaruukki Oy | 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 Polvijarvi, plant at Vuonos | 150 |
| Titanium dioxide | | Kemira Oy | Plant at Pori | 80 |
| Do. | | Oy Partek AB | Mine at Polvijarvi, plant at Luikonlahti | 100 |
| Wollastonite | | do. | Mine and plant at Lappeenranta | 40 |
| Zinc, concentrate | | Outokumpu Oy | Mines at Vihanti and Pyhasalmi | 150 |
| Zinc, metal | | do. | Smelter at Kokkola | 160 |

TABLE 3

## FINLAND: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

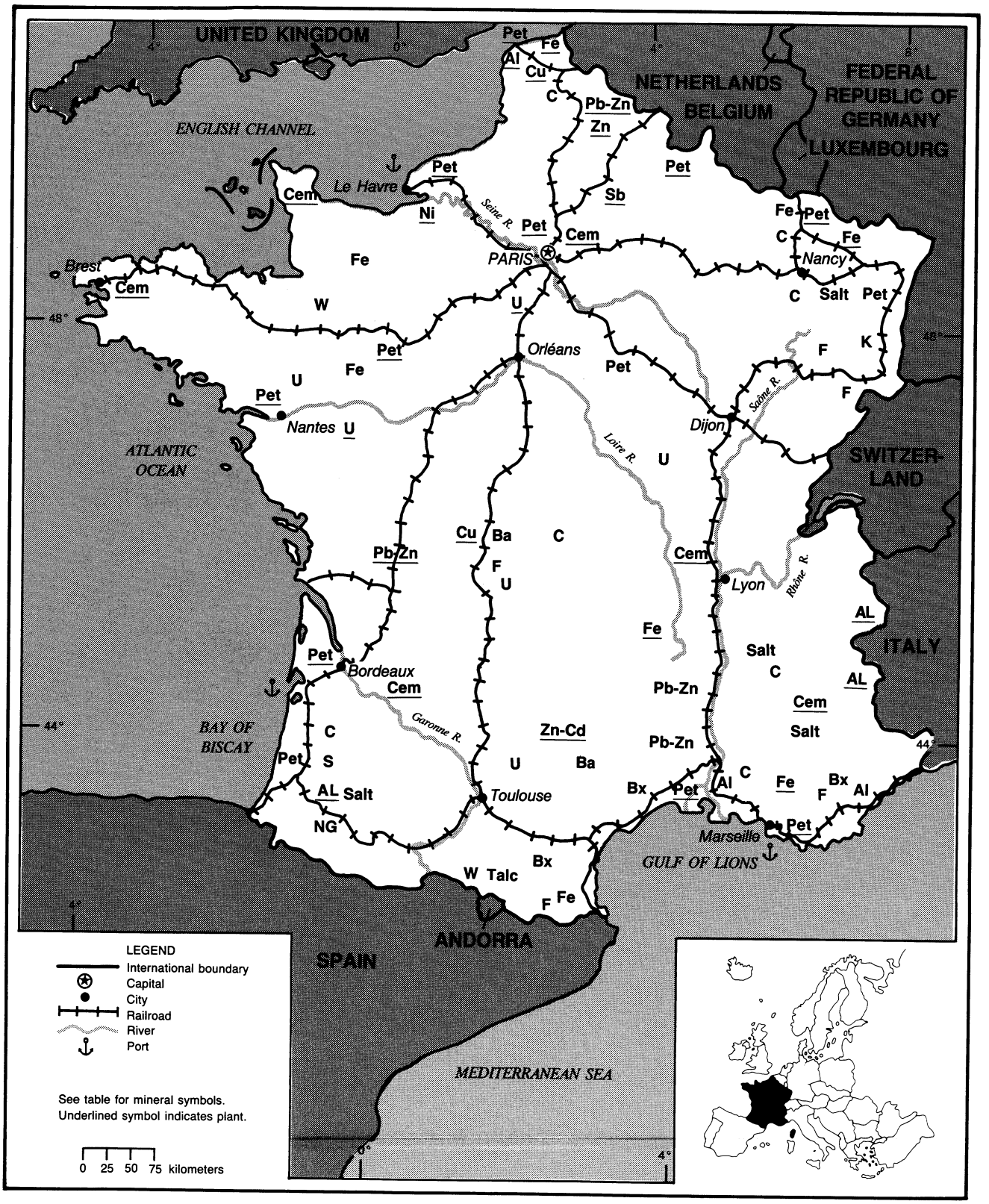
(Million metric tons unless otherwise specified)

| Commodity | Reserves |
|---|---|
| Apatite | 400 |
| Chromium | 38 |
| Cobalt, tons | 18,000 |
| Gold, kilograms | 2,500 |
| Nickel, tons | 40,000 |
| Peat | e350 |
| Phosphate rock | 110 |

eEstimated.

# FRANCE

**AREA 547,030 km²** **POPULATION 57.3 million**



THE MINERAL INDUSTRY OF

# FRANCE

By Harold R. Newman

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. Changing economic conditions such as rising energy costs, increasing supplies of raw materials from other countries, lower prices due to increased competition, and depletion of reserves have necessitated the rationalization of many traditionally strong mineral industries such as bauxite, coal, iron ore, and steel.

Industries have had to adjust to a change in the state's economic policies. In the past, the heavy involvement of the state, both economic and political, was one of the main elements of French mineral policy. Reduction of Government subsidies supporting uneconomic mineral operations and the depletion of mineral reserves have had a significant impact on a number of extractive operations in the French mineral industry.

The real GDP increased by 1.2% and industrial output by 0.6% over those of 1990. Real GDP growth has matched the average for OECD countries for the past 5 years. At yearend, the unemployment rate was 9.4% of the working population.

## GOVERNMENT POLICIES AND PROGRAMS

The French Government was continuing with policies to reduce the budget deficit that were not only affecting the mineral industry, but other industries as well. At the same time, other economic policies were driven by the desire to reduce unemployment and improve French competitiveness, particularly as 1992 and the advent of the single European market approaches. Efforts have been made to promote the private sector and to reduce the dependence of state-owned companies on subsidies, although significant industrial capacity remains in the public domain. Some exchange controls have been eliminated, and the value added tax (VAT) rate has been reduced to bring this tax in line with the EC norm. The top VAT rate of 33% has been reduced to 22%, with a further cut to the standard EC rate of 18.6% effective January 1993. Many state-controlled industries have made significant strides in preparing themselves for EC 1992.

## PRODUCTION

Mineral and metal industries generally maintained their production and other activities at about the same rate or decreased somewhat from those of the previous year. Gold production decreased owing to the closure of a mine. Lead, silver, and zinc production were about the same level. Several industries, such as bauxite, coal, iron ore, and uranium, have steadily undergone changes over the past few years.

The coal and iron ore industries were affected by cheaper foreign sources and the depletion of domestic resources. The continued decline in coal production was accentuated by the closure of mines in the Bassin du Nord and the Pas-de-Calais. As a result, the Government was reducing the subsidies to these industries and closing high-cost or inefficient operations. Similarly, bauxite reserves were being depleted, which resulted in the closure of mining operations. Bauxite production had ceased altogether by the first part of 1991. Other domestic companies were facing increased foreign competition.

The uranium industry reduced its operations by closing a number of mines and processing plants owing to low market prices and depletion of certain deposits.

Another factor in the drop of uranium demand was the reduced cost 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 nuclear plants were considered for construction, some older plants were being closed, and the export market decreased. *(See table 1.)*

## TRADE

The Government's efforts to refocus the country's trading patterns toward OECD countries were continuing. The percentage of France's trade with its EC partners increased while the trade deficit with the EC decreased. There were also strong commercial relations between France and the United States. France was the United States' eighth largest trading partner with two-way trade totaling more than $26 billion in 1990.[1]

Table 2 shows the impact of selected classes of mineral commodities on France's balance of payments position in relation to the EC and the world. *(See tables 2, 3, and 4.)*

## STRUCTURE OF THE MINERAL INDUSTRY

Government and private companies produce minerals and 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 restructured some of these industries, notably steel and coal.

Adjustments to the forthcoming 1992 Common Market resulted in numerous mergers, closures of operations, and cooperative ventures as companies sought ways to obtain competitive advantages. Some industries that have benefited greatly from Government assistance in the past 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 (SNEA); Usinor-Sacilor S.A.; Imetal S.A.; Pechiney; Charbonnages de France (CdF); Compagnie Generale des Matieres Nucleaires (Cogema); and Bureau de Recherches Geologiques et Minieres (BRGM) and its subsidiary, Compagnie Francaise des Mines S.A. *(See table 5.)*

## COMMODITY REVIEW

### Metals

***Alumina and Bauxite.***—French bauxite production continued to decline and ceased altogether at the beginning of 1991. In comparison, the bauxite output in 1980 was more than 1.9 Mmt. The depletion of ores and competition from cheaper foreign sources of raw and partially refined bauxite forced the reduction of production. Mines that were closed had been operated by Pechiney at Var and Hérault Provinces and the mine owned by SA des Bauxites et Alumines de Provence at Blanquette, Var Province. The SA des Bauxites et Alumines operation had produced approximately 2,000 mt/a.

The closures of alumina refineries followed the pattern of the bauxite operations. The Gardenne plant, which was opened by Charles Bayer in 1893, remained the only operating alumina refinery in France. Bauxite feedstock was purchased on the open market, as well as from Aluminium Pechiney's Les Baux operations.

***Aluminum.***—Pechiney closed the Nogueres and Riouperoux primary smelters at yearend 1991. The 38,000-mt/a Nogueres smelter, built in the early 1960's, was one of Pechiney's older plants and would have required substantial funds to modernize and implement environmental safeguards. The same situation existed with the 14,000-mt/a Riouperoux smelter.

Pechiney planned on replacing the lost capacity with the 215,000-mt/a smelter under construction at Graves-sur-loon Plage near Dunkirk. The new smelter was expected to become operational in 1992 at an estimated cost of $850 million. When the smelter does become operational, almost one-half of Pechiney's 10-Mmt/a primary aluminum capacity will be in France. At a reported average cost of 57 cents/lb., France was considered the lowest cost aluminum-producing country in Europe. The main reasons were lower energy costs and advanced technology.

Pechiney continued with plans to build two specialized foundries for aluminum beverage can recycling. One would be built at Nogueres at the site of the existing primary aluminum smelter. The foundry was scheduled to be operational in 1992, with a capacity to process 20,000 mt/a of cans. Cost of the project was estimated to be $710,000.

The second foundry was to be built at Nuef Brisach near Strasbourg. The foundry was also scheduled to be operational in 1992 with the same capacity as Nogueres. The cost of the second foundry was estimated at $1.1 million.

***Antimony.***—The Gagneraud Mine at Brouzils, Vendee Province, started production in early 1991. BRGM, owner of the project, was continuing with a testing program to determine whether to go into full production of 200 mt/month. of contained antimony. The ore, with a grade of about 7% antimony, was thought to be comparable in quality with Bolivian ore. Most of the production was expected to be shipped to Compagnie Lucette, a BRGM subsidiary that produces antimony trioxide.

Other domestic sources of the metal were 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 was importing most of its 4,500 mt/a of antimony metal requirements from Bolivia and China.

***Gold.***—Gold mining in France was mostly concentrated in two operations, Mines et Produits Chimiques de Saligne's (MPCS) operations near Carcassonne and Societe des Mines du Bourneix's operations in the Saint-Yrieix district south of Limoges.

MPCS was declared insolvent in October 1991. After operating at a loss for the remainder of the year, Coframines, a subsidiary of BRGM and the main stockholder, reportedly was not willing to invest more capital in the operation and was proceeding with liquidation efforts. MPCS had reported total liabilities of $44 million and a net debt of more than $6 million.

Gold mineralization at Bourneix's mines is associated with galena, arsenopyrite, and pyrite within broad quartzitic lenses covering an area 15 to 20 km in length.

Of the operating mines, the underground operations at Bourneix and Laurieras produce the greatest tonnage of gold ore and the highest gold content. Three smaller surface mines, Les Renartieres, Cros-Gallet Sud, and Les Fouilloux, truck their ores to the Bourneix concentrator for processing. The original 60,000-mt/a concentrator batch processes the ores depending on the source and gold content of the ore.

Bourneix constructed a 35-mt/h concentrator that was expected to raise the annual contained gold output to 1,600 kg. There were plans, pending environmental approval, for leaching and smelter facilities.

*Iron Ore.*—The famous iron ore basin of northern France stretches from Lorraine, France, northward into Belgium. However, for many years the high phosphorus and relatively low iron content of the ores has limited their desirability. The iron content of the ore varies from 30% to 32%. Consequently, production in Lorraine has been declining for several years. Iron ore production has decreased more than 50% in the past 10 years.

France's domestic producers were having a difficult time competing against foreign iron ore sources, which have higher grade ores and lower production costs. In the past, increased use of highly mechanized equipment and the use of Government subsidies have kept many mines in operation. In recent years, the uneconomic mines were closed, and others are to be closed as deposits are depleted.

Lormines announced a further rationalization that would reduce its work force and set production at 5 Mmt for 1991 from the company's four open pit mines.

Production from the other two French iron ore-producing basins, Normandy and Anjou, were following a similar trend in dropping to small fractions of previous production levels.

*Iron and Steel.*—As a result of a consolidation of the French steel industry and of purchases of additional production facilities outside of France, Usinor-Sacilor S.A., the state steel group, ranked second in world steel production behind Nippon Steel of Japan. Usinor-Sacilor was continuing to strengthen the company's market position both in Europe and in the United States. The company was producing about 75% of its steel in France, 20% in the Federal Republic of Germany, and 5% in the United States.

In Europe, Usinor-Sacilor and Arbed SA of Luxembourg entered into a 50-50 joint venture and formed a new company, Europrofil, to market certain products that both companies produce and to share the export trading company, Le Materiel de Voie. The products produced include beams, joists, and special sections, including mineshaft supports.

The two companies were reported to also be discussing the possibility of co-operation in the production of wire rod. An agreement between the companies was seen as a method of rationalization of production in the wire rod market utilizing the combined resources of two of the largest producers in Europe. A new company, TrefilEurope, would oversee the merging of wire rod production of Usinor-Sacilor's subsidiaries, Trefilunion and Saarstahl, and Arbed's Bissen works.

The EC approved an investment of $463 million by Credit Lyonnais SA of France into Usinor-Sacilor. The investment was expected to be in the form of capital and stock purchases and would give the 51% Government-controlled bank a 20% stake in Usinor-Sacilor.

Usinor-Sacilor acquired a 20% interest in Belgium's Cockerill Sambre Group subsidiary, Trefileries de Fontaine l'Eveque of Belgium; 51% of Alessio Tubi, an Italian small-diameter tubemaker; and 5.4% of Spanish stainless steelmaker Acerinox.

Compagnie Francaise des Ferrailles (CFF), the largest independent scrap metal processor in Europe, continued with investments in shredders and joint ventures. CFF has investments in 22 shredder operations, including 1 each in Spain and Belgium and 2 in the United States. Construction of four new sites was proceeding in 1991; three are in France and one is in Spain. CFF supplies about 4 Mmt of ferrous scrap annually, which is about 40% of the total French market.

*Ferroalloys.*—Societe Europeenne d'Alliages pour la Siderurgie (SEAS), a subsidiary of Usinor=Sacilor, brought its new 110,000-mt/a high-carbon ferromanganese and silicomanganese plant on-stream in late 1991 for an estimated cost of $65 million. The plant, on a 23-hectare site in Dunkirk, is employing modern submerged-arc-furnace technology and utilizing relatively low-cost power from the nearby Graveslines nuclear power station. Most of the smelter's output was expected to be used internally in Usinor-Sacilor's steelmaking operations.

A long-term contract with Brazilian manganese producer Compania Vale Rio Doce (CVRD) was signed to supply approximately two-thirds of the plant's manganese ore requirements. SEAS received the first shipment of 30,000 tons of manganese ore fines in mid-1991 at the deepwater port adjacent to the smelter.

*Lithium.*—The use of lithium in alloying with aluminum has been undergoing extensive research 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 physical problems of separating the metal from the silica minerals, lithium metal recovery has been difficult. Also, a concentration of approximately 7 kg of $LiO_2$ per ton of rock makes economic exploitation of the deposit difficult. The ores that are exploited are processed at the Pombliere Saint Marcel refinery facility operated by Metaux Speciaux, which produces lithium and other chemical compounds.

*Polymetallics.*—BRGM was proceeding with exploration and development of the Chessy polymetallic deposit. Aztec Mining Ltd., the Australian subsidiary of AMAX Inc. of the United States, has a 24% interest in the project.

Exploration drilling has defined estimated geological reserves of 5.4 Mmt of ore. Minable reserves were estimated to be 4.1 Mmt of ore at average grades of 2.5% copper, 7.8% zinc, and 21% barite. The company expects to produce about 30,000 mt/a of 28% to 30% metal content copper concentrate, 40,000 mt/a of 55% to 60% metal content zinc concentrate with a byproduct production of 100,000 mt/a of 52% sulfur content pyrite, and 60,000 mt/a of chemical-grade barite.

Permits to allow construction of the plant and underground mine work to

commence were expected to be obtained by mid-1992. A production rate of 300,000 mt/a was planned by BRGM. Production was scheduled to begin in early 1993 with an estimated mine life of 14 years.

Metaleurop S.A. operated two lead-zinc mines, one at Les Malines and the other at Noailhac-Saint Salvy. The company increased production at Les Malines to offset the lower metal content of the ore and increased efficiency to reduce operating expenses.

At the Saint Salvy Mine, Metaleurop had production difficulties related to irregular mineralization in the Rouquis East zone. This resulted in a decrease in tonnage mined, lower metal content of the ore processed, and an increase in mining costs. Efforts were underway to cut costs and increase metal content of ore processed. Metaleurop, in collaboration with BRGM, was continuing exploration of the western extension of the main vein of the Saint Salvy deposit.

***Uranium.***—Cogema, the state-owned uranium mining company, was the major producer of uranium in France. In recent years, the pace of exploration has decreased and projected future ore requirements have leveled off. In fact, many projects worldwide have been halted or canceled.

The Division Miniere Vendee (DMV) is a division of Cogema and is based in the Loire-Atlantique region of western France. There were four mines and a 450,000-mt/a processing plant, which produced about 650 tons metal content of uranium per year. Two of the mines, Ecarpiere and Piriac, were closed in mid-1990 with the remaining two mines, Le Chardon and La Commanderie, scheduled to close at yearend 1991. The processing plant at Ecarpiere would also be shut down. Cogema cited the low grade of ore mined by DMV as the reason for the closure of the division. Cogema has two other mining divisions in France—La Crouzille, near Limoges, and Herault, in southwest France—that were continuing operations.

France has 56 nuclear reactors that produce 55,778 MW of electricity. Six more reactors were under construction and, when completed, would furnish an additional 8,305 MW of electricity. Nuclear power reactors provide almost 75% of electricity generated in France. About 12% of production was exported to neighboring countries.

***Zinc.***—Two companies operated primary zinc plants in France. The company, Societe des Mines et Fonderies de Zinc de la Vieille-Montagne (VM), of Belgium, operated a zinc refinery at Auby-les-Douai with an annual capacity of 210,000 mt/a 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., operated a 110,000-mt/a primary smelter and a 15,000-mt/a secondary smelter at Noyelles-Godualt.

## Industrial Minerals

***Andalusite.***—Denain-Anzin Mineraux Refractaire Ceramique (DAMREC), a subsidiary of the Imetal Group, was the only producer of andalusite in Europe. DAMREC's mining operation is at Glomel, Brittany, and was producing about 75,000 mt/a. This placed France second only to the Republic of South Africa in terms of world output of andalusite. The company produced three grades of andalusite, which were distinguished by different alumina and iron oxide content. These products were sold to the refractory and ceramic industries.

***Barite.***—The main primary barite-producing area in France is at Chaillac in central France near Limoges. Barytine de Chaillac, a subsidiary of Solvay Barium Strontium GmbH of Germany, is the major producer with an open pit mine and plant at Chaillac. Barytine produces about 90,000 mt/a of flotation-grade barite averaging 98% barium sulfate, which is suitable for chemicals production. Most of the output is exported to Solvay for further processing.

Byproduct barite is produced by Ste. Industrielle du Centre from its underground fluorspar mining operations at Chaillac. The company produces about 3,000 mt/a, mainly for the domestic market.

***Calcium Carbonate.***—Blancs Mineraux de Paris's (BMP) new calcium carbonate plant at Saint-Croix-de-Mareui became fully operational in 1991. The plant, which cost about $8 million, has an annual production capacity of 70,000 tons of calcium carbonate slurry. This production consists of wet-process ultrafine ground calcium carbonate for the paper industry.

Pfizer Inc. of the United States announced it would construct the company's first European precipitated calcium carbonate (PCC) plant at Saillat-sur-Vienne. The plant will be set up at French paper manufacturer Aussedat Rey's paper mill. The PCC slurry would be piped directly to the paper mill. PCC imparts high-brightness and high opacity to paper. Conversion from the acid process of papermaking to the alkaline process has increased the use of both PCC and natural ground calcium carbonate in carbonate filters. This has reduced kaolin's market share of the paper market.

***Cement.***—Lafarge Coppee SA and Societe Des Ciments Francais are the two largest cement producers in France, respectively. During the past several years, these two companies have been acquiring a number of companies within France as well as internationally. Each company has gained control of approximately one-third of the domestic market, leaving fewer than eight other companies with the final one-third.

The economic slowdown, particularly in construction, was more noticeable in the cement sector where French production dropped an estimated 5% as compared with that of 1990.

***Feldspar.***—French feldspar production was from five companies. Ets. Baux, at Saint Paul de Fenouillet, operated three

open pit mines and a plant with a production capacity of 180,000 mt/a. Most of the material produced was sold to the glass industry, with the remainder going to the ceramic industry.

Other producers were Ste. des Feldspaths du Midi and Ste. des Feldspaths du Morvan. These companies, formerly a part of the Pechiney group, were bought by the Harwanne Group of Switzerland in 1991. They produce feldspar for the ceramics industry and have annual capacities of 80,000 mt/a and 50,000 mt/a, respectively. Harwanne, which already controlled Societe Miniere des Kaolin du Morbihan, is now the largest producer of feldspar in France.

Societe d'Exploitation de Sables et Mineraux S.A. (Samin) has an open pit mine at Roche en Regnier with a production capacity of 70,000 mt/a. Samin produced phonolite, which is a fine-grained equivalent of nepheline syenite. This can be substituted for feldspar in most glassmaking and ceramic applications.

***Fluorspar.***—Societe Generale de Recherches et d'Exploitations Minieres (Sogerem), a Pechiney subsidiary, controlled more than 60% of fluorspar production. The fluorspar vein deposits are found in Hercynian massifs, Massif Central, the Vosges, the axial zone of the Pyrenees, and the outer Alps.

Sogerem's mining operations supply Comifluor S.A., another Pechiney subsidiary, which operates a plant at Olette. This plant produces acid-grade fluorspar (97% $CaF_2$) and electrical-grade fluorspar. Total production of both grades is approximately 45,000 mt/a. The Escardo Mine, owned by Denain-Anzin Mineraux, also ships approximately 90,000 mt/a from its surface operation to the Olette plant.

***Gypsum.***—France was one of Europe's largest producers of gypsum. Two-thirds of the production was 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. SA de Materiel de Construction is the largest company, producing almost one-half of the total 5.8 Mmt produced annually. The largest operation was the 1.3-Mmt/a underground mine at Taverny.

***Kaolin.***—Kaolin deposits derived from the granite massifs in Brittany are the most actively mined in France. The largest mine, operated by Societe Kaoliniere Armoricaine, was at Quessoy. The mine has a capacity of 120,000 mt/a. Another deposit in this northern area of Brittany is Plemet. In the southern part of the peninsula, at Ploemeur, are the two operations of Societe des Kaolin d'Arvor and Societe Nouvelle d'Exploitation de Morbinan. Reportedly, these operations each have a capacity to produce 75,000 mt/a. The 50,000-mt/a-capacity 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 Mmt of crude clay per year.

***Mica.***—The country's three largest producers of mica have operations in Brittany. The mica produced was a byproduct of kaolin operations. The largest producer, Micarec SA, partially owned by Societe Nouvelle d'Exploitation des Kaolins du Morbihan, operated 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) was the principal producer of potash with two mines, Marie-Louise and Amelie, near Mulhouse, Alsace. MDPA is the world's fifth largest supplier of potash salts. The main products are about 10 Mmt/a of 15.52% potash ore, which is concentrated to 62% potassium oxide material, bromine and industrial products, and rock salt for snow clearing. About 90% of the potash production is used by agriculture for fertilizer, and 10% is purified and treated for use in other industries.

The Alsace deposits in the Upper Rhine Valley are in the Mulhouse area where a graben of Late Eocene geologic age was filled with two influxes of seawater. The latter surge of seawater in Early Oligocene time resulted in the deposition of two potash-rich beds. The strata were subsequently folded in Pliocene time into three different basins, the Wittelsheim and Munchausen in France and the Buggingen in Germany.

Based on estimated reserves, the French deposit will last into the next century. However, future development will be constrained to the east, west, and south by the boundaries of the tilted potash beds and to the north by the depth of the deposit.

***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 a significant European producer of salt. The country produces rock, solar, and vacuum salt as well as brine. Mining of rock salt is from two areas, Varangeville and Nancy, in northeastern France. One company, Cie. Industrielle et Miniere, operates an 850,000-mt/a facility at Nancy and a 500,000-mt/a facility at Hautrives. Rock salt's share of crystallized salt production is about 7%.

Solar salt production is concentrated along the Mediterranean coast and on the Island of Corsica. This production accounts for 59% of the 4.7-Mmt/a crystallized salt capacity. Vacuum salt is produced at seven locations representing a capacity of 1.45 Mmt/a. This method of production accounts for the remaining crystallized salt capacity. The largest operation is the 600,000-mt/a facility operated by Cie. des Salins du Midi et

des Salins de l'Est (CSME) at Varangeville in northeastern France.

*Talc.*—Talcs de Luzenac S.A. is not only significant to the domestic market, it is also Europe's largest corporate talc producer. The company acquired several talc mining interests worldwide in 1990. Borax Francais S.A., a subsidiary of RTZ Corp., subsequently purchased 92% of Talcs de Luzenac S.A. As a result of this, in 1991, RTZ Corp. became one of the major talc producers in the world.

Talcs de Luzenac's open pit mine near Aix-les-Themes, where the company has been mining since 1905, is the largest operation. Production was about 300,000 mt/a of ore from which more than 40 different grades of talc are derived. In terms of estimated reserves, the deposit, considered one of the largest in the world, could probably support the current output for another 100 years.

### Mineral Fuels

*Coal.*—All underground coal mines were closed in the Midi-Pyrenees region in southern France and in the Nord Pas-de-Calais basin. In the northeast producing regions, Charbonnages de France (CdF) was proceeding with further rationalizations, which resulted in reduced production. The Lorraine basin produced 8.4 Mmt of coal, including lignite, and the Centre-Midi basin 1.9 Mmt of coal, including lignite. CdF planned to stabilize production at 10 to 12 Mmt/a of coal and 2 to 2.5 Mmt/a of lignite.

CdF and Electricite de France (EdF) were continuing with plans to add a number of coal-fired generating plants to the electrical utility grid, which was 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-MW plant was planned, which could be upscaled to 600 MW in the future.

*Nuclear Power.*—EdF signed agreements with Soviet agencies for cooperation in various nuclear fields. Areas of possible cooperation were operational safety; accident recovery; design, construction, and decommissioning of nuclear facilities; and enrichment of reprocessed uranium.

*Petroleum and Natural Gas.*—Elf Aquitaine, the 53.9% state-owned oil company, was continuing negotiations with the U.S.S.R. to begin a 5-year petroleum exploration program starting in the early 1990's. The company would explore 10,000 $km^2$ of territory in the west of Kazakhstan and in Russia. Elf was also planning to eventually develop refinery distribution and petrochemical operations.

In 1991, onshore petroleum production was mainly from the Paris Basin, which produced an estimated 13.1 Mbbl, and the Aquitaine Basin, which produced an estimated 7.3 Mbbl. Because production has started to decline in these areas, the Government was planning to initiate a program to encourage exploration for new deposits in other areas thought to have good potential. The Jura Basin was one area under consideration.

There were six companies that operated refineries in France; SNEA, Total CFP, Royal Dutch/Shell Group, British Petroleum Co. PLC, and Mobil Corp. The structure of the industry is geared to gasoline production. Refining is mainly focused on high-octane unleaded gas because a majority of the vehicles in France can use this without engine modifications.

There are no refining units capable of processing heavy fuels nor is there available hydrocracked feedstocks for the production of gas oil. This leaves the process stream short on middle distillates and naphtha. France is a net petroleum products importer.

## INFRASTRUCTURE

France has a very modern and well-developed infrastructure. The French National Railways (SNCF) operates 34,568 km of 1.435-m standard gauge, of which 11,674 km was electrified. The system incorporates the use of superfast trains on selected tracks. 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-long waterway heavily used. The major seaports are as follows: Bordeaux, Boulogne, Brest, Cherbourg, Dunkerque, Fos-Sur-Mer, Le Havre, Marseille, Nantes, Rouen, Sete, and Toulon. One of the most significant infrastructure developments in recent times has been the Channel Tunnel Project. Transportation, not only in France 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 Coquelles, near Calais, France, and Folkestone, England. 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.

Completion of the project was scheduled for June 1993, at which time service between Coquelles and Folkestone would commence. The Channel Tunnel connecting the two countries will be a vital component of Single Market 1992 when the EC becomes one marketplace of 320 million people.

## 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 in their respective industries. Others have had to make additional adjustments under rationalization schemes proposed by the EC or the French Government. The depletion of natural resources and/or the cessation of subsidies for uneconomic operations will have impacts on 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.

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[1]Where necessary, values have been converted from French francs (f) to U.S. dollars ($) at the rate of f5.62=US$1.00, the average rate of exchange in 1991.

## OTHER SOURCES OF INFORMATION

### Agencies

Ministere de la Recherche et de l'Industrie
(Ministry of Research and Industry)
68 rue de Bellechasse
75353 Paris, cedex 07
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).

Company Annual Reports:
Bureau de Recherches Geologiques et Minieres, Charbonnages de France, Imetal, Entreprise Miniere et Chimique, SocieteNationale Elf Aquitane, Total, Usinor-Sacilor.

Matieres Premieres Minerals.

TABLE 1

## FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite, gross weight | thousand tons | 1,272 | 878 | 550 | 490 | 400 |
| Alumina: | | | | | | |
| Crude | do. | 866 | 720 | 624 | 606 | 500 |
| Calcined | do. | 712 | 551 | 479 | 467 | 400 |
| Metal: | | | | | | |
| Primary | do. | 323 | 327 | r334 | 325 | 3286 |
| Secondary | do. | 196 | 211 | r225 | r208 | 3217 |
| Antimony metal including regulus | | 7,100 | 6,093 | 6,910 | r6,520 | 3,000 |
| Arsenic, white[e] | | 10,000 | 10,000 | 10,000 | r 36,480 | — |
| Bismuth metal | | 95 | 90 | 100 | 70 | 50 |
| Cadmium metal | | 400 | 355 | 170 | r187 | 3271 |
| Cobalt metal including powder | | r136 | r176 | r165 | r150 | 150 |
| Copper: | | | | | | |
| Mine output, Cu content | | 300 | 246 | 300 | 480 | 400 |
| Metal: | | | | | | |
| Blister, secondary | | 7,000 | 8,500 | e10,000 | e9,000 | 9,000 |
| Refined: | | | | | | |
| Primary | | 11,323 | 7,239 | r16,363 | r18,034 | 19,600 |
| Secondary[e] | | 28,000 | 36,000 | r26,800 | r26,000 | 24,000 |
| Total | | 39,323 | 43,239 | r43,163 | r44,034 | 43,600 |
| Gold, mine output, Au content | kilograms | 2,225 | 2,525 | r3,303 | 4,236 | 4,500 |
| Iron and steel: | | | | | | |
| Iron ore and concentrates: | | | | | | |
| Gross weight | thousand tons | 10,852 | 9,983 | 9,368 | 8,729 | 37,472 |
| Fe content | do. | 3,255 | 2,994 | 2,810 | 2,793 | 2,316 |
| Metal: | | | | | | |
| Pig iron | do. | r13,449 | r14,786 | r15,071 | r14,415 | 313,646 |
| Ferroalloys: | | | | | | |
| Blast furnace: Spiegeleisen and ferromanganese | do. | e296 | r324 | 325 | 324 | 320 |
| Electric furnace: | | | | | | |
| Ferrochrome | do. | 1 | r10 | r e20 | 25 | 20 |
| Ferromanganese | do. | 23 | 27 | e27 | 36 | 30 |
| Ferrosilicon | do. | 154 | 131 | e130 | 117 | 115 |
| Silicon metal | do. | 70 | 70 | r e72 | 64 | 70 |
| Other | do. | 59 | 59 | e79 | e50 | 50 |
| Total | do. | e603 | r e621 | r e653 | e616 | 605 |
| Steel ingots and castings | do. | r17,692 | r19,122 | 19,335 | r19,015 | 318,434 |
| Semimanufactures | do. | r16,252 | r17,465 | 17,691 | r16,774 | 316,671 |
| Lead: | | | | | | |
| Mine output, Pb content | | 2,213 | 1,966 | r1,122 | r1,187 | 31,725 |
| Smelter: | | | | | | |
| Primary | | 138,795 | 146,500 | r149,300 | r136,800 | 140,000 |
| Secondary[e] | | 12,000 | 15,000 | 20,000 | 20,000 | 30,000 |

See footnotes at end of table.

TABLE 1—Continued

## FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Lead—Continued: | | | | | | |
| Smelter—Continued: | | | | | | |
| Total | | 150,795 | e161,500 | r e169,300 | r156,800 | 170,000 |
| Refined: | | | | | | |
| Primary: Soft lead | | 138,795 | 146,511 | 149,300 | 162,260 | 3154,500 |
| Secondary: | | | | | | |
| Soft lead | | 32,700 | 37,400 | 52,100 | 47,612 | 57,500 |
| Pb content of antimonial lead | | 74,370 | 71,791 | r76,910 | 60,598 | 71,500 |
| Total | | 245,865 | 255,702 | r278,310 | 270,470 | 283,500 |
| Magnesium metal including secondary | | 13,600 | 13,800 | 14,600 | e14,000 | 14,000 |
| Nickel metal | | 6,680 | r10,400 | 8,632 | r9,800 | 38,607 |
| Silver: | | | | | | |
| Mine output, Ag content: | | | | | | |
| Lead and zinc concentrates | kilograms | 21,150 | 24,074 | 20,600 | e22,100 | 22,000 |
| Mixed copper, gold, silver concentrates | do. | 4,665 | 6,220 | e5,000 | e5,000 | 5,000 |
| Total | do. | 25,815 | 30,294 | 25,600 | e27,100 | 27,000 |
| Metal, Ag content of final smelter products | do. | 24,200 | 24,882 | e25,000 | e22,200 | 20,000 |
| Tin, smelter output of solder and other alloys, secondary | | 2,532 | 2,635 | 2,670 | e2,560 | 2,400 |
| Uranium: | | | | | | |
| Mine output, U content | | 3,321 | 3,385 | 3,219 | r2,820 | 2,300 |
| Chemical concentrate, $U_3O_8$ equivalent | | 3,740 | 3,669 | 3,763 | r3,323 | 2,530 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 31,339 | r31,139 | r26,706 | r23,851 | 327,109 |
| Metal including secondary: | | | | | | |
| Slab | | 249,340 | r274,100 | r265,800 | 263,136 | 3299,600 |
| Dust[e] | | 9,000 | 9,000 | 9,000 | 8,600 | 9,000 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite | | 104,050 | r104,400 | r111,800 | r92,500 | 95,000 |
| Bromine, elemental[e] | | 20,000 | 20,000 | 18,000 | 3,100 | 3,000 |
| Cement, hydraulic | thousand tons | 23,560 | 25,300 | 26,835 | 26,388 | 326,507 |
| Clays: | | | | | | |
| Bentonite[e 4] | | 10,000 | 5,000 | 5,000 | 1,000 | 1,000 |
| Kaolin and kaolinitic clay (marketable) | thousand tons | r309 | r338 | r346 | e370 | 360 |
| Refractory clay, unspecified[e] | do. | 500 | 50 | 315 | 16 | 15 |
| Diamonds: Synthetic, industrial[e] | thousand carats | — | 4,000 | 4,000 | 5,000 | 4,000 |
| Diatomite[e] | thousand tons | 250 | 250 | 250 | 250 | 250 |
| Feldspar, crude | do. | 274 | 322 | e360 | e420 | 400 |
| Fluorspar: | | | | | | |
| Crude | do. | 374 | 313 | 449 | 515 | 400 |
| Marketable: | | | | | | |
| Acid and ceramic-grade | do. | 134 | 133 | 158 | e145 | 150 |
| Metallurgical-grade | do. | e50 | r52 | r62 | e113 | 50 |
| Total | do. | 184 | r185 | r220 | 258 | 200 |
| Gypsum and anhydrite, crude | do. | 5,409 | 5,628 | 5,684 | 5,796 | 5,800 |
| Kyanite, andalusite, related materials[e] | do. | 350 | 50 | 50 | 75 | 60 |

See footnotes at end of table.

TABLE 1—Continued

## FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Lime: Quicklime, hydrated lime, dead-burned dolomite | thousand tons | [e]3,000 | 3,089 | 3,084 | [e]3,000 | 3,000 |
| Mica[e] | | 11,000 | 11,000 | 8,000 | 7,000 | 6,000 |
| Nitrogen: N content of ammonia | thousand tons | [e]2,100 | 1,832 | [r]1,476 | [r]1,586 | 1,604 |
| Pigments, mineral, natural: Iron oxides[e] | | 15,000 | 15,000 | 15,000 | 15,000 | 14,000 |
| Phosphates: Thomas slag | thousand tons | 768 | [r]775 | [r]701 | [r]488 | [3]538 |
| Potash: | | | | | | |
| Gross weight (run-of-mine) | do. | 10,716 | 10,392 | 8,791 | 9,468 | 9,500 |
| $K_2O$ equivalent (run-of-mine) | do. | 1,500 | [r]1,502 | [e]1,400 | [e]1,400 | 1,400 |
| $K_2O$ equivalent (marketable) | do. | 1,485 | [r]1,385 | 1,195 | [r]1,292 | 1,200 |
| Pozzolan and lapilli[e] | do. | [3]420 | 400 | 400 | 336 | 400 |
| Salt: | | | | | | |
| Rock salt | do. | 1,476 | [r]199 | 91 | 79 | 100 |
| Brine salt (refined) | do. | 1,070 | [r]1,133 | [r]1,138 | [r]1,155 | 1,000 |
| Marine salt | do. | 1,627 | [r]1,437 | [r]1,914 | [r]1,320 | 1,400 |
| Salt in solution | do. | 3,663 | 3,973 | [r]4,305 | [r]4,220 | 4,500 |
| Total | do. | 7,836 | [r]6,742 | [r]7,448 | [r]6,774 | 7,000 |
| Sodium compounds:[e] | | | | | | |
| Soda ash | do. | 780 | 780 | 780 | 1,180 | 1,000 |
| Sodium sulfate | do. | 120 | 120 | 120 | 120 | 120 |
| Stone, sand and gravel: | | | | | | |
| Limestone, agricultural and industrial[e] | do. | 6,000 | 7,000 | 7,000 | 7,000 | 6,000 |
| Slate, roof[e] | do. | [3]60 | 60 | 60 | 40 | 50 |
| Sand and gravel: | | | | | | |
| Industrial sands, total | do. | [3]7,472 | 7,500 | 75,000 | 3,500 | 4,000 |
| Other sand and gravel, alluvial | do. | 193,000 | 208,000 | [e]210,000 | [e]208,500 | [3]219,240 |
| Sulfur, byproduct: | | | | | | |
| Of natural gas | do. | 883 | 725 | 647 | [r]666 | 794 |
| Of petroleum | do. | 188 | 225 | 239 | [r]233 | 225 |
| Of unspecified sources[e] | do. | 150 | 150 | 150 | 150 | 180 |
| Total | do. | 1,221 | 1,100 | [e]1,036 | [r]1,049 | 1,199 |
| Talc: | | | | | | |
| Crude | | 269,000 | [r]320,000 | [r]329,960 | [r]328,100 | 310,000 |
| Powder[e] | | 260,000 | 270,000 | 270,000 | [r]287,000 | 280,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Asphaltic material[e] | | [r]37,300 | [r]44,200 | [r]43,000 | [r]44,500 | 45,000 |
| Carbon black[e] | | 180,000 | 180,000 | 180,000 | 252,000 | 250,000 |
| Coal, including briquets: | | | | | | |
| Anthracite and bituminous coal | thousand tons | 13,694 | 12,139 | 11,471 | 10,488 | [3]10,128 |
| Lignite | do. | 2,061 | [r]1,653 | 2,168 | 2,256 | [3]2,200 |
| Total | do. | 15,755 | [r]13,792 | 13,639 | 12,744 | [3]12,328 |
| Briquets | do. | 1,071 | 804 | [e]825 | [e]540 | 500 |
| Coke, metallurgical | do. | 7,470 | [r]5,288 | 5,340 | 5,208 | [3]5,053 |
| Gas, natural: | | | | | | |
| Gross | million cubic meters | 5,890 | 4,644 | 4,406 | [r]4,334 | [3]4,097 |
| Marketed | do. | 4,106 | 3,207 | 3,073 | [r]3,031 | [3]2,845 |
| Natural gas liquids | thousand 42-gallon barrels | 4,171 | 3,882 | 3,983 | [e]4,000 | 3,600 |

See footnotes at end of table.

TABLE 1—Continued

## FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Peat[e] | thousand tons | 200 | 200 | 200 | 200 | 200 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 23,610 | 24,776 | 23,639 | 22,036 | [3]21,240 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 28,835 | 24,000 | [r]30,102 | 32,492 | 30,000 |
| Gasoline, all kinds | do. | 141,620 | 127,140 | 129,515 | 145,029 | 145,000 |
| Jet fuel | do. | 32,850 | 30,600 | [e]30,000 | 39,976 | 40,000 |
| Kerosene | do. | 365 | 400 | 372 | 462 | 500 |
| Distillate fuel oil | do. | 193,450 | 200,150 | 208,768 | 210,372 | 210,000 |
| Heavy fuel oil | do. | 86,140 | 77,000 | 76,732 | 76,510 | 75,000 |
| Other products | do. | 46,355 | 45,000 | 40,041 | 42,000 | 40,000 |
| Refinery fuel and losses | do. | 27,740 | 28,000 | 26,537 | 20,286 | 20,000 |
| Total | do. | 557,355 | 532,290 | [r e]542,067 | 567,127 | 560,500 |

[e]Estimated. [r]Revised.

[1]Table includes data available through May 31, 1992.

[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: 1990 BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars)

| Mineral commodity | Exports to EC | Imports from EC | Net gain or (loss) | Exports to the world | Imports from the world | Net gain or (loss) |
|---|---|---|---|---|---|---|
| Crude industrial minerals: | | | | | | |
| Feldspar | $8,749 | $2,556 | $6,193 | $9,824 | $6,262 | $3,562 |
| Magnesite | 36 | 580 | (544) | 54 | 755 | (701) |
| Slate | 1,546 | 424 | 1,122 | 1,746 | 439 | 1,307 |
| Other | 446,023 | 392,003 | 54,020 | 618,626 | 852,670 | (234,044) |
| Total | 456,354 | 395,563 | 60,791 | 630,250 | 860,126 | (229,876) |
| Metalliferous ores: | | | | | | |
| Copper | 630 | 108 | 522 | 666 | 567 | 99 |
| Lead | 26 | 9,066 | (9,040) | 40 | 80,797 | (80,757) |
| Tin | — | — | — | — | 363 | (363) |
| Zinc | 12,468 | 43,224 | (30,756) | 12,490 | 259,613 | (247,123) |
| Other (including waste and scrap) | 1,186,586 | 584,294 | 602,292 | 1,288,451 | 1,646,507 | (358,056) |
| Total | 1,199,710 | 636,692 | 563,018 | 1,301,647 | 1,987,847 | (686,200) |
| Nonmetallic mineral manufactures | 292,231 | 519,255 | (227,024) | 631,343 | 912,423 | (281,080) |
| Metals: | | | | | | |
| Iron and steel | 6,007,030 | 6,598,561 | (591,531) | 8,978,798 | 7,828,799 | 1,149,999 |
| Mercury | 245 | 487 | (242) | 328 | 902 | (574) |
| Other nonferrous metals | 2,905,864 | 3,541,131 | (635,267) | 3,926,983 | 6,099,523 | (2,172,540) |
| Total | 8,913,139 | 10,140,179 | (1,227,040) | 12,906,109 | 13,929,224 | (1,023,115) |
| Mineral fuels | 3,057,594 | 5,194,693 | (2,137,099) | 4,913,779 | 22,331,972 | (17,418,193) |

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 3

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 36 | 15 | (2) | Belgium-Luxembourg 6; United Kingdom 5. |
| Aluminum: | | | | |
| Ore and concentrate | 28,916 | 13,142 | — | Italy 6,328; Morocco 4,500; Switzerland 1,566. |
| Oxides and hydroxides | 243,336 | 227,878 | 4,705 | Italy 107,527; West Germany 29,000; Spain 20,327. |
| Ash and residue containing aluminum | 16,350 | 17,237 | — | Italy 10,312; West Germany 3,498; Spain 3,176. |
| Metal including alloys: | | | | |
| Scrap | 155,886 | 150,055 | 159 | Italy 57,262; West Germany 27,153; Netherlands 17,807. |
| Unwrought | 121,634 | 135,834 | 221 | Italy 49,151; West Germany 35,226; Belgium-Luxembourg 11,758. |
| Semimanufactures | 363,204 | 399,857 | 26,838 | West Germany 109,473; United Kingdom 74,498; Italy 34,132. |
| Antimony: | | | | |
| Ore and concentrate | 73 | 27 | — | Belgium-Luxembourg 24; Nicaragua 2. |
| Oxides | 5,479 | 5,080 | 475 | West Germany 1,206; Italy 926; United Kingdom 488. |
| Ash and residue containing antimony | 774 | 18 | — | All to Belgium-Luxembourg. |
| Metal including alloys, all forms | 69 | 72 | — | Belgium-Luxembourg 34; Tunisia 20; Portugal 10. |
| Arsenic: Metal including alloys, all forms | 1,058 | 784 | — | Italy 110; Canada 94; Brazil 80. |
| Beryllium: Metal including alloys, all forms | 196 | 96 | — | West Germany 26; Italy 5; United Kingdom 5. |
| Bismuth: Metal including alloys, all forms | 88 | 78 | — | West Germany 66; Netherlands 8. |
| Cadmium: Metal including alloys, all forms | 679 | 377 | 24 | Belgium-Luxembourg 281; West Germany 43; Japan 18. |
| Chromium: | | | | |
| Ore and concentrate | 9,676 | 2,395 | — | Italy 1,652; Spain 480; Netherlands 98. |
| Oxides and hydroxides | 106 | 330 | — | West Germany 217; Netherlands 51; Spain 38. |
| Metal including alloys, all forms | 2,354 | 3,899 | 1,265 | West Germany 1,893; United Kingdom 261. |
| Cobalt: | | | | |
| Ore and concentrate | (2) | 2 | — | All to Senegal. |
| Oxides and hydroxides | 55 | 32 | 8 | Switzerland 16; United Kingdom 7. |
| Ash and residue containing cobalt | 14 | 274 | — | Finland 218; Belgium-Luxembourg 56. |
| Metal including alloys, all forms | 966 | 617 | 65 | Belgium-Luxembourg 167; United Kingdom 93; Italy 75. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | 27 | 26 | 22 | West Germany 2; Greece 1; Netherlands 1. |
| Copper: | | | | |
| Ore and concentrate | 996 | 1,060 | — | West Germany 957; Belgium-Luxembourg 103. |
| Matte and speiss including cement copper | 215 | 77 | — | Italy 25; West Germany 21; Morocco 19. |
| Oxides and hydroxides | 20 | 23 | — | Mauritania 10; Tunisia 6; Gabon 3. |
| Sulfate | 381 | 300 | 44 | West Germany 71; Italy 48; Netherlands 47. |
| Ash and residue containing copper | 12,430 | 16,183 | — | Belgium-Luxembourg 10,894; Switzerland 1,802; Spain 1,238. |
| Metal including alloys: | | | | |
| Scrap | 188,955 | 161,172 | 245 | West Germany 53,003; Italy 52,368; Belgium-Luxembourg 29,260. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Copper—Continued: | | | | | |
| Metal including alloys—Continued: | | | | | |
| Unwrought | | 28,658 | 27,616 | 1 | Spain 14,132; Belgium-Luxembourg 5,934; Italy 3,237. |
| Semimanufactures | | 336,433 | 344,640 | 4,362 | West Germany 86,167; Italy 78,813; Spain 49,142. |
| Germanium: Metal including alloys, all forms | | 19 | 21 | 20 | West Germany 1. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $6,846 | $11,210 | — | Switzerland $7,370; Canada $1,476; Portugal $1,100. |
| Metal including alloys, unwrought and partly wrought | kilograms | 40,779 | 40,919 | 30 | United Kingdom 27,048; Spain 4,219; Switzerland 4,150. |
| Hafnium: Metal including alloys, all forms | | 10 | 9 | 7 | United Kingdom 2. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 3,563 | 3,280 | — | Mainly to Belgium-Luxembourg. |
| Pyrite, roasted | | 317 | — | | |
| Metal: | | | | | |
| Scrap | thousand tons | 4,260 | 3,675 | (2) | Italy 1,466; Spain 1,134; Belgium-Luxembourg 528. |
| Pig iron, cast iron, related materials | | r882,206 | 552,914 | 137,262 | Italy 137,919; West Germany 71,993; Belgium-Luxembourg 37. |
| Ferroalloys: | | | | | |
| Ferrochromium | | 12,895 | 21,657 | 1,174 | West Germany 8,434; United Kingdom 7,066; Italy 1,628. |
| Ferromanganese | | 21,586 | 25,657 | 8,469 | Italy 4,061; West Germany 3,817. |
| Ferromolybdenum | | 2,433 | 3,272 | — | Netherlands 1,826; Italy 874; West Germany 346. |
| Ferronickel | | 4,325 | 3,240 | 1 | Italy 1,466; Spain 1,028; West Germany 635. |
| Ferroniobium | | 46 | 61 | — | Brazil 28; Belgium-Luxembourg 17; Republic of Korea 16. |
| Ferrosilicochromium | | 4 | 136 | 98 | Mexico 38. |
| Ferrosilicomagnesium | | 10,240 | 52,316 | 1,473 | Italy 10,808; Belgium-Luxembourg 10,467; West Germany 10,023. |
| Ferrosilicomanganese | | 45,002 | 51,138 | 295 | Italy 10,808; Belgium-Luxembourg 10,469; West Germany 10,023. |
| Ferrosilicon | | 40,739 | 29,007 | 519 | West Germany 11,051; Italy 7,061; Japan 5,171. |
| Unspecified | | r29,706 | 31,105 | 2,821 | Belgium-Luxembourg 4,181; West Germany 3,975; Spain 3,309. |
| Semimanufactures: | | | | | |
| Steel, primary forms | thousand tons | 887 | 1,072 | 128 | Belgium-Luxembourg 628; West Germany 108; Norway 75. |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | do. | 4,475 | 4,271 | 569 | Italy 1,101; West Germany 581; Spain 380. |
| Clad, plated, coated | do. | 1,569 | 1,594 | 87 | West Germany 356; Italy 184; United Kingdom 169. |
| Of alloy steel | do. | 528 | 534 | 35 | West Germany 105; Italy 97; Spain 60. |
| Bars, rods, angles, shapes, sections | do. | 2,662 | 2,596 | 177 | West Germany 814; Italy 301; Belgium-Luxembourg 299. |
| Rails and accessories | do. | 126 | 124 | 1 | Italy 29; Netherlands 7; Mexico 15. |
| Wire | do. | 193 | 171 | 29 | West Germany 45; Libya 17; Belgium-Luxembourg 11. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Semimanufactures—Continued: | | | | |
| Tubes, pipes, fittings thousand tons | 1,372 | 1,357 | 76 | Netherlands 232; Spain 160; West Germany 159. |
| Lead: | | | | |
| Ore and concentrate | 10 | 34 | — | Belgium-Luxembourg 25; Yugoslavia 3; United Arab Emirates 1. |
| Oxides | 21,531 | 16,134 | 23 | Japan 4,501; Belgium-Luxembourg 4,487; West Germany 1,889. |
| Ash and residue containing lead | 2,613 | 2,443 | — | Belgium-Luxembourg 1,396; West Germany 514; Netherlands 485. |
| Metal including alloys: | | | | |
| Scrap | 12,692 | 9,389 | 5 | Spain 2,258; West Germany 2,056; Ireland 1,832. |
| Unwrought | 73,575 | 62,399 | — | Belgium-Luxembourg 17,690; West Germany 17,474; Italy 10,268. |
| Semimanufactures | 1,779 | 2,833 | (2) | Belgium-Luxembourg 782; West Germany 715; Netherlands 564. |
| Lithium: Oxides and hydroxides | 3 | 1 | — | Mainly to Dominican Republic. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 299 | 242 | 16 | Netherlands 119; Belgium-Luxembourg 38; Italy 23. |
| Unwrought | 385 | — | | |
| Semimanufactures | 1,892 | 120 | 1 | West Germany 110; Italy 4; United Kingdom 2. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 94,956 | 52,873 | — | Italy 30,947; Norway 19,696; Switzerland 1,345. |
| Oxides | 1,901 | 3,588 | — | Italy 2,877; West Germany 133; Belgium-Luxembourg 129. |
| Metal including alloys, all forms | 6,823 | 4,825 | 52 | West Germany 1,119; Italy 993; Spain 935. |
| Mercury | 105 | 38 | (2) | Netherlands 21; Belgium-Luxembourg 10; Greece 3. |
| Molybdenum: | | | | |
| Ore and concentrate | 1,273 | 693 | — | Netherlands 481; Belgium-Luxembourg 117; Austria 70. |
| Ash and residue containing molybdenum | 400 | 509 | — | United Kingdom 436; Italy 42; Spain 20. |
| Metal including alloys: | | | | |
| Scrap | 96 | 73 | 2 | West Germany 36; Austria 22; United Kingdom 8. |
| Unwrought | r120 | 115 | — | Austria 62; India 20; West Germany 14. |
| Semimanufactures | r79 | 83 | (2) | West Germany 19; United Kingdom 13; Italy 12. |
| Nickel: | | | | |
| Ore and concentrate | 289 | 23 | — | Netherlands 22. |
| Matte and speiss | 72 | 367 | — | Belgium-Luxembourg 253; West Germany 97; Republic of Korea 6. |
| Oxides and hydroxides | 15 | 9 | — | West Germany 6; Netherlands 2; Belgium-Luxembourg 1. |
| Ash and residue containing nickel | 2,275 | 1,361 | — | Finland 350; Austria 340; Netherlands 254. |
| Metal including alloys: | | | | |
| Scrap | 3,863 | 4,118 | 455 | West Germany 1,563; Netherlands 799; United Kingdom 592. |
| Unwrought | 6,263 | 8,036 | 1,760 | West Germany 2,461; Italy 1,258; Japan 720. |
| Semimanufactures | 4,589 | 6,722 | 812 | West Germany 4,045; United Kingdom 716; Canada 170. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $11,690 | $25,761 | — | United Kingdom $9,306; Belgium-Luxembourg $7,704; Italy $4,749. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 4,722 | 6,118 | 5 | West Germany 2,991; Austria 1,243; United Kingdom 770. |
| Platinum | do. | 7,164 | 7,014 | 387 | Netherlands 2,503; Switzerland 1,949; United Kingdom 1,391. |
| Rhodium | do. | 315 | 672 | 129 | Netherlands 277; United Kingdom 220; Switzerland 23. |
| Iridium, osmium, ruthenium | do. | 32 | (2) | (2) | |
| Rare-earth metals including alloys, all forms | | 1 | 16 | — | West Germany 10; Netherlands 5; Zaire 1. |
| Selenium, elemental | | 26 | 6 | — | Belgium-Luxembourg 2; Spain 2; China 1. |
| Silicon, high-purity | | 45 | 35 | 3 | Japan 23; West Germany 8. |
| Silver: | | | | | |
| Ore and concentrate | | 5 | 14 | — | All to Belgium-Luxembourg. |
| Waste and sweepings[3] | value, thousands | $10,674 | $18,289 | $125 | United Kingdom $7,980; Spain $7,118; Switzerland $5,035. |
| Metal including alloys, unwrought and partly wrought | | 601 | 1,015 | 1 | Spain 576; United Kingdom 99; West Germany 42. |
| Tellurium, elemental | | 37 | 34 | — | United Kingdom 21; Guadeloupe 5; Martinique 5. |
| Tin: | | | | | |
| Ore and concentrate | | 3 | — | | |
| Oxides | | 23 | 6 | — | West Germany 3; Canada 2; Netherlands 1. |
| Ash and residue containing tin | | 68 | 102 | — | West Germany 94; Belgium-Luxembourg 7. |
| Metal including alloys: | | | | | |
| Scrap | | 442 | 258 | — | West Germany 188; Belgium-Luxembourg 41; Switzerland 14. |
| Unwrought | | 171 | 159 | — | United Kingdom 45; Belgium-Luxembourg 35; Spain 25. |
| Semimanufactures | | 239 | 404 | 4 | Spain 305; Tunisia 15; Netherlands 14. |
| Titanium: | | | | | |
| Ore and concentrate | | 4,735 | 38 | — | Italy 30; Malaysia 5; Mali 1. |
| Oxides | | 24,911 | 17,676 | 4,577 | West Germany 4,424; Morocco 1,079; Italy 885. |
| Metal including alloys: | | | | | |
| Scrap | | 1,254 | 1,090 | 285 | United Kingdom 429; Italy 130; Spain 96. |
| Unwrought | | 230 | 187 | 160 | United Kingdom 22; New Caledonia 2. |
| Semimanufactures | | 1,631 | 1,448 | 104 | United Kingdom 535; West Germany 239; Spain 236. |
| Tungsten: | | | | | |
| Ore and concentrate | | (2) | 7 | — | West Germany 6; United Kingdom 1. |
| Oxides and hydroxides | | 62 | 49 | — | Spain 31; Portugal 10; West Germany 3. |
| Metal including alloys: | | | | | |
| Scrap | | 148 | 20 | — | West Germany 13; Belgium-Luxembourg 5; United Kingdom 2. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Tungsten—Continued: | | | | |
| Metal including—Continued: | | | | |
| Unwrought | r149 | 126 | — | Switzerland 30; United Kingdom 30; West Germany 28. |
| Semimanufactures | r147 | 130 | 2 | Netherlands 62; United Kingdom 18; West Germany 17. |
| Uranium and thorium: | | | | |
| Oxides and other compounds | 1,515 | 1,745 | 201 | U.S.S.R. 477; Belgium-Luxembourg 388; United Kingdom 258. |
| Metal including alloys, all forms: | | | | |
| Uranium | 3,167 | 3,491 | 256 | West Germany 1,434; Netherlands 1,072; Japan 426. |
| Thorium | (2) | — | | |
| Vanadium: | | | | |
| Ore and concentrate | (2) | 24 | — | All to Belgium-Luxembourg. |
| Oxides and hydroxides | 84 | 35 | — | Switzerland 27; United Kingdom 8. |
| Ash and residue containing vanadium | 134 | 132 | 15 | West Germany 116. |
| Metal including alloys: | | | | |
| Unwrought including waste and scrap | 1 | 3 | 3 | |
| Semimanufactures | (2) | 1 | — | Mainly to Republic of South Africa. |
| Zinc: | | | | |
| Ore and concentrate | 26,823 | 24,635 | — | Italy 17,088; Belgium-Luxembourg 5,612; West Germany 1,130. |
| Oxides | 23,134 | 24,441 | 62 | West Germany 5,284; Italy 3,495; Spain 3,296. |
| Blue powder | 2,066 | 1,734 | 3 | Switzerland 629; United Kingdom 336; Belgium-Luxembourg 284. |
| Ash and residue containing zinc | 33,937 | 28,274 | 27 | Belgium-Luxembourg 16,415; Spain 6,937; West Germany 3,916. |
| Metal including alloys: | | | | |
| Scrap | 28,844 | 19,411 | 107 | Belgium-Luxembourg 5,371; Italy 3,692; West Germany 2,169. |
| Unwrought | 85,772 | 83,236 | 2,303 | West Germany 21,895; Belgium-Luxembourg 21,316; Italy 13,748. |
| Semimanufactures | 42,263 | 41,084 | 59 | Belgium-Luxembourg 18,247; West Germany 14,033; Italy 1,348. |
| Zirconium: | | | | |
| Ore and concentrate | 3,288 | 857 | (2) | Italy 414; Spain 245; Belgium-Luxembourg 139. |
| Ash and residue containing zirconium | — | 3 | — | All to United Kingdom. |
| Metal including alloys, all forms | 193 | 10,456 | 539 | West Germany 3,637; Italy 1,228; United Kingdom 550. |
| Other: | | | | |
| Ores and concentrates | 173 | 1,057 | — | Belgium-Luxembourg 1,031; Portugal 24. |
| Oxides and hydroxides | 5,653 | 3,648 | 1 | West Germany 3,385; Belgium-Luxembourg 70; Guadeloupe 69. |
| Ashes and residues | 40,303 | 25,306 | 13 | Belgium-Luxembourg 14,122; West Germany 6,056; Italy 3,939. |
| Base metals including alloys, all forms | 70 | 79 | 5 | United Kingdom 55; Japan 18. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 3,331 | 2,519 | 13 | Spain 851; Portugal 362; Brazil 216. |
| Artificial: Corundum | 23,917 | 23,591 | 872 | West Germany 4,302; Austria 3,819; Spain 3,368. |
| Grinding and polishing wheels and stones | 10,048 | 11,379 | 294 | Netherlands 3,001; Italy 2,326; United Kingdom 1,526. |
| Dust and powder of precious and semi-precious stones excluding diamond kilograms | (e) | 269 | — | Switzerland 268. |
| Asbestos, crude | — | 101 | — | Belgium-Luxembourg 70; United Kingdom 10; West Germany 7. |
| Barite and witherite | 89,037 | 78,032 | — | West Germany 73,039; Belgium-Luxembourg 2,394; Italy 1,024. |
| Boron materials: Crude natural borates | 5,777 | 4,563 | — | Spain 4,307; Belgium-Luxembourg 101; Italy 77. |
| Cement thousand tons | 2,114 | 2,124 | 383 | United Kingdom 468; West Germany 373; Italy 137. |
| Chalk | 605,103 | 629,570 | 1,285 | West Germany 220,355; Belgium-Luxembourg 116,873; Switzerland 60,970. |
| Clays, crude: | | | | |
| Bentonite | 19,315 | 23,045 | — | Spain 7,129; West Germany 6,877; Portugal 4,621. |
| Chamotte earth or dinas earth | 141,729 | 135,547 | 1 | Italy 40,330; United Kingdom 30,668; West Germany 19,009. |
| Fuller's earth | 4,113 | 5,425 | 2 | Italy 3,864; Switzerland 3,064; West Germany 108. |
| Fire clay | 139,957 | 123,853 | 104 | Italy 70,909; West Germany 28,699; Spain 5,523. |
| Kaolin | 267,080 | 267,939 | 184 | Italy 88,409; West Germany 62,944; Belgium-Luxembourg 39,077. |
| Unspecified | 89,212 | 93,918 | — | Italy 59,822; West Germany 18,717; Spain 4,324. |
| Cryolite and chiolite | 258 | 215 | — | Switzerland 109; Hungary 82; Spain 8. |
| Diamond, natural: | | | | |
| Gem, not set or strung carats | r56,280 | 42,557 | 3,865 | Belgium-Luxembourg 17,173; Switzerland 7,373; Hong Kong 5,790. |
| Industrial do. | 142,485 | 53,345 | 29,408 | Belgium-Luxembourg 17,162; West Germany 5,500; Switzerland 1,075. |
| Dust and powder kilograms | 239 | 465 | 5 | Italy 256; Switzerland 82; West Germany 26. |
| Diatomite and other infusorial earth | 36,767 | 41,661 | 4 | West Germany 15,705; Italy 6,738; Belgium-Luxembourg 2,735. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 119,843 | 123,367 | — | Spain 73,106; West Germany 24,506; Netherlands 16,039. |
| Fluorspar | 57,842 | 40,204 | 145 | Italy 18,998; West Germany 10,201; Belgium-Luxembourg 5,593. |
| Unspecified | 393 | 50 | — | Morocco 30; Belgium-Luxembourg 10; Netherlands 10. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 53,834 | 54,418 | 72 | West Germany 21,193; Switzerland 8,614; United Kingdom 8,526. |
| Manufactured: | | | | |
| Ammonia | 42,505 | 25,281 | — | Spain 9,381; Switzerland 4,968; West Germany 4,476. |
| Nitrogenous | 603,650 | 670,104 | 25,483 | Spain 144,436; West Germany 126,843. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Fertilizer materials—Continued: | | | | | |
| Manufactured—Continued: | | | | | |
| Phosphatic | | 278,103 | 258,936 | — | West Germany 185,032; Switzerland 38,639; Italy 14,237. |
| Potassic | | 356,234 | 325,753 | — | Belgium-Luxembourg 160,013; Switzerland 41,013; Netherlands 36,995. |
| Unspecified and mixed | | 645,489 | 707,697 | — | Spain 146,357; Ireland 112,927; West Germany 96,124. |
| Graphite, natural | | 726 | 562 | 19 | West Germany 131; Italy 126; United Kingdom 103. |
| Gypsum and plaster | thousand tons | 1,005 | 1,015 | 40 | West Germany 433; Belgium-Luxembourg 416; Netherlands 89. |
| Iodine | | 30 | 38 | — | Spain 23; French Polynesia 6; Morocco 6. |
| Kyanite and related materials | | 49,764 | 47,655 | — | United Kingdom 27,115; West Germany 9,157; Belgium-Luxembourg 2,963. |
| Lime | | 410,844 | 447,006 | 6 | West Germany 292,541; Belgium-Luxembourg 104,765; Spain 18,213. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 573 | 81 | 10 | Italy 25; West Germany 24; Belgium-Luxembourg 15. |
| Oxides and hydroxides | | 19,580 | 19,520 | — | West Germany 8,698; Italy 2,058; Belgium-Luxembourg 1,762. |
| Sulfate | | 720 | 942 | — | Spain 452; Saint Pierre and Miquelon 183; Italy 102. |
| Mica: | | | | | |
| Crude including splittings and waste | | 8,405 | 8,371 | 28 | West Germany 4,068; United Kingdom 1,383; Belgium-Luxembourg 809. |
| Worked including agglomerated splittings | | 1,214 | 2,128 | 9 | Italy 1,118; Switzerland 320; Hong-Kong 193. |
| Nitrates, crude | | 25 | 1 | — | All to Mali. |
| Phosphates, crude | | 12,863 | 2,660 | — | Belgium-Luxembourg 1,146; United Kingdom 855; Netherlands 257. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 1,137 | 1,956 | 20 | West Germany 292; Portugal 237; Spain 223. |
| Iron oxides and hydroxides, processed | | 13,068 | 17,083 | 14 | Italy 6,656; West Germany 6,585; Spain 1,111. |
| Potassium salts, crude | | 2 | — | | |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $59,610 | $77,244 | $6,001 | Switzerland $55,847; United Kingdom $6,551; West Germany $1,667. |
| Synthetic | do. | $18,345 | $17,773 | $841 | Switzerland $12,659; West Germany $1,042; Italy $477. |
| Pyrite, unroasted | | 23 | 123 | — | Italy 109; Belgium-Luxembourg 9; Côte D'Ivoire 9. |
| Salt and brine | | 529,287 | 936,061 | 432 | Italy 276,032; Spain 138,838; West Germany 95,414. |
| Sodium compounds, n.e.s.: | | | | | |
| Sulfate, manufactured | | 2,885 | 3,662 | (2) | West Germany 2,669; Belgium-Luxembourg 353; Italy 341. |
| Sulfate, natural | | 37,954 | 26,840 | — | Italy 10,155; Spain 4,815; Belgium-Luxembourg 4,268. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | | |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | thousand tons | 196 | 212 | 2 | Belgium-Luxembourg 105; Switzerland 38; West Germany 28. |
| Worked | do. | 95 | 105 | 14 | Belgium-Luxembourg 35; West Germany 21; Switzerland 11. |
| Dolomite, chiefly refractory-grade | do. | 69 | 101 | — | Belgium-Luxembourg 60; Netherlands 11; Spain 7. |
| Gravel and crushed rock | do. | 11,522 | 11,427 | 6 | West Germany 4,171; Switzerland 3,797; Netherlands 1,522. |
| Limestone other than dimension | do. | 296 | 314 | — | Norway 157; West Germany 103; Belgium-Luxembourg 42. |
| Quartz and quartzite | do. | 3 | 11 | — | Italy 8; West Germany 1; Spain 1. |
| Sand other than metal-bearing | do. | 4,897 | 4,884 | 2 | West Germany 2,213; Switzerland 1,071; Italy 792. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 442,523 | 509,127 | 213 | United Kingdom 166,092; Tunisia 92,523; Senegal 54,586. |
| Colloidal, precipitated, sublimed | | 356 | 431 | 2 | Spain 99; Nigeria 82; West Germany 76. |
| Dioxide | | 1,197 | 852 | — | Belgium-Luxembourg 607; West Germany 77; United Kingdom 69. |
| Sulfuric acid | | 287,347 | 271,923 | — | Belgium-Luxembourg 177,721; United Kingdom 54,405; Netherlands 21,706. |
| Talc, steatite, soapstone, pyrophyllite | | 146,352 | 147,109 | 473 | West Germany 40,478; Netherlands 26,065; Spain 23,568. |
| Vermiculite[4] | | 700 | 1,168 | — | Belgium-Luxembourg 260; Spain 239; Portugal 175. |
| Other: | | | | | |
| Crude | thousand tons | 1,371 | 1,761 | (2) | Belgium-Luxembourg 1,636; West Germany 59; Switzerland 58. |
| Slag and dross, not metal-bearing | do. | 325 | 1,373 | (2) | West Germany 455; Israel 305; Belgium-Luxembourg 289. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Asphalt and bitumen, natural | | 5,063 | 5,842 | 3 | Spain 3,828; Italy 432; West Germany 427. |
| Carbon black | | 122,069 | 109,899 | 17 | Spain 30,849; West Germany 26,695; United Kingdom 17,190. |
| Coal: | | | | | |
| Anthracite | | 62,562 | 36,794 | — | Italy 9,259; Belgium-Luxembourg 15,304; West Germany 8,946. |
| Bituminous | | 745,379 | 606,512 | 42 | West Germany 356,393; Norway 116,656; Italy 44,742. |
| Briquets of anthracite and bituminous coal | | 13,361 | 27,051 | — | Belgium-Luxembourg 11,368; Italy 5,728; Ireland 3,395. |
| Lignite including briquets | | 1,022 | 667 | — | Spain 627; Belgium-Luxembourg 27; West Germany 14. |
| Coke and semicoke | | 489,585 | 397,706 | — | West Germany 88,249; Norway 71,263; Italy 47,903. |
| Gas, natural: | | | | | |
| Gaseous | thousand cubic meters | 557,963 | 95,899 | — | Belgium-Luxembourg 81,695; Switzerland 22,330. |
| Liquefied | | 6 | 467 | — | Italy 294; Spain 133; Portugal 19. |

See footnotes at end of table.

TABLE 3—Continued

## FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Gas, natural—Continued: | | | | | |
| Peat including briquets and litter | | 3,383 | 3,536 | — | Spain 1,032; Italy 829; West Germany 636. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 138 | 149 | — | Spain 145; West Germany 4. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 8,048 | 9,393 | 318 | Italy 3,474; United Kingdom 1,078; West Germany 964. |
| Gasoline, motor | do. | 28,243 | 34,587 | 8,897 | Netherlands 6,124; West Germany 4,913. |
| Mineral jelly and wax | do. | 778 | 794 | (2) | West Germany 474; Netherlands 137; Belgium-Luxembourg 59. |
| Kerosene and jet fuel | do. | 7,315 | 6,634 | 860 | Switzerland 3,162; West Germany 752; Belgium-Luxembourg 442. |
| Distillate fuel oil | thousand 42-gallon barrels | 11,728 | 15,890 | 543 | Switzerland 7,191; West Germany 3,171; Spain 1,507. |
| Lubricants | do. | 6,806 | 6,914 | 38 | Belgium-Luxembourg 1,174; West Germany 1,025; United Kingdom 628. |
| Residual fuel oil | do. | r16,851 | 23,955 | — | United Kingdom 6,820; Italy 5,705; Spain 2,191. |
| Bitumen and other residues | do. | 1,549 | 2,196 | (2) | United Kingdom 661; Spain 339; Norway 258. |
| Bituminous mixtures | do. | 200 | 184 | 1 | Algeria 43; Belgium-Luxembourg 37; West Germany 25. |
| Petroleum coke | do. | 7 | 40 | 2 | West Germany 19; Norway 9; United Kingdom 6. |

rRevised.
[1]Table prepared by Bradley S. Colquitt.
[2]Less than 1/2 unit.
[3]May contain other precious metals.
[4]Includes perlite and chlorite.

TABLE 4

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Alkali and alkaline-earth metals: | | | | | |
| Alkali metals | | 1,115 | 4,048 | 2 | Libya 2,500; United Kingdom 871; Belgium-Luxembourg 449. |
| Alkaline-earth metals | | 500 | 2,626 | 2 | Morocco 2,150; U.S.S.R. 186; West Germany 104. |
| Aluminum: | | | | | |
| Ore and concentrate | thousand tons | 1,349 | 1,388 | — | Guinea 1,070; Greece 129; China 82. |
| Oxides and hydroxides | | 410,179 | 446,591 | 767 | Greece 213,501; Suriname 78,801; Yugoslavia 52,501. |
| Ash and residue containing aluminum | | 10,552 | 11,470 | — | West Germany 6,659; Belgium-Luxembourg 2,571; Cameroon 871. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Aluminum—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 122,986 | 137,532 | 9,184 | West Germany 46,945; Netherlands 26,869; Belgium-Luxembourg 24,045. |
| Unwrought | 484,249 | 541,099 | 16,871 | Norway 114,007; Netherlands 93,644; West Germany 59,327. |
| Semimanufactures | 379,111 | 376,022 | 5,083 | West Germany 103,949; Belgium-Luxembourg 77,569; Italy 31,925. |
| Antimony: | | | | |
| Ore and concentrate | 12,806 | 9,620 | — | China 5,095; Bolivia 2,451; Guatemala 648. |
| Oxides | 772 | 1,080 | 18 | Belgium-Luxembourg 453; China 236; Netherlands 132. |
| Ash and residue containing antimony | 1,741 | 422 | — | Spain 325; Peru 67; West Germany 18. |
| Metal including alloys, all forms | 2,729 | 2,977 | — | China 1,951; U.S.S.R. 597; Thailand 141. |
| Arsenic: Metal including alloys, all forms | 250 | 260 | 10 | Finland 166; China 50; Netherlands 29. |
| Beryllium: | | | | |
| Oxides and hydroxides | 11 | — | | |
| Metal including alloys, all forms | 2 | 3 | 1 | Belgium-Luxembourg 2. |
| Bismuth: Metal including alloys, all forms | 273 | 199 | — | United Kingdom 79; Belgium-Luxembourg 63; Peru 46. |
| Cadmium: Metal including alloys, all forms | 1,746 | 1,731 | 101 | Hungary 455; Belgium-Luxembourg 363; United Kingdom 259. |
| Chromium: | | | | |
| Ore and concentrate | 81,288 | 88,181 | — | Albania 36,992; Turkey 19,811; Republic of South Africa 18,523. |
| Oxides and hydroxides | 8,571 | 8,131 | — | United Kingdom 4,060; West Germany 2,587; Italy 1,141. |
| Metal including alloys, all forms | 504 | 1,047 | 4 | U.S.S.R. 653; Netherlands 173; Japan 76. |
| Cobalt: | | | | |
| Ore and concentrate | — | $1 | — | All from West Germany. |
| Oxides and hydroxides | 357 | 290 | 3 | Finland 97; United Kingdom 89; Belgium-Luxembourg 70. |
| Ash and residue containing cobalt | 43 | 529 | — | Hungary 242; West Germany 64; Italy 63. |
| Metal including alloys, all forms | 1,518 | 1,632 | 155 | Zaire 368; Zambia 299; United Kingdom 257. |
| Columbium and tantalum: | | | | |
| Ash and residue containing columbium and tantalum | (2) | 26 | — | All from Belgium-Luxembourg. |
| Metal including alloys, all forms: | | | | |
| Columbium[3] | 49 | 43 | — | Belgium-Luxembourg 37; West Germany 6. |
| Tantalum | 30 | 33 | 24 | United Kingdom 3; Austria 2; West Germany 2. |
| Copper: | | | | |
| Ore and concentrate | 137 | 50 | — | West Germany 23; United Kingdom 23; Zaire 2. |
| Matte and speiss including cement copper | 91 | 322 | 297 | Morocco 20; West Germany 2; United Kingdom 2. |
| Oxides and hydroxides | 1,058 | 801 | 24 | Belgium-Luxembourg 266; Italy 207; West Germany 147. |
| Sulfate | 5,176 | 4,982 | 30 | Italy 1,796; Netherlands 1,494; Spain 310. |
| Ash and residue containing copper | 3,922 | 2,843 | — | West Germany 854; Japan 627; Switzerland 306. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Copper—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 67,093 | 58,382 | 177 | West Germany 13,482; United Kingdom 11,678; Belgium-Luxembourg 7,418. |
| Unwrought | 438,812 | 460,109 | 3,269 | Chile 154,449; Belgium-Luxembourg 122,484; Zambia 68,856. |
| Semimanufactures | 273,360 | 278,089 | 1,985 | Belgium-Luxembourg 92,841; West Germany 74,127; Italy 61,120. |
| Gallium, indium, thallium: Metal including alloys, all forms | 23 | 16 | 6 | Netherlands 3; Japan 2; U.S.S.R. 2. |
| Germanium: | | | | |
| Oxides | 7 | 1 | — | All from Italy. |
| Metal including alloys, all forms | 11 | 6 | — | Belgium-Luxembourg 5. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $1,957 | $7,002 | $3 | Chile $3,463; United Kingdom $1,217; West Germany $660. |
| Metal including alloys, unwrought and partly wrought kilograms | 122,983 | 266,300 | 154,100 | Switzerland 61,900; Spain 16,800; West Germany 15,700. |
| Hafnium: Metal including alloys, all forms | (2) | — | | |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite thousand tons | 19,907 | 18,801 | — | Brazil 6,052; Australia 4,042; Mauritania 2,493. |
| Pyrite, roasted | 100,876 | 103,193 | — | Spain 49,679; Belgium-Luxembourg 25,527; Italy 25,451. |
| Metal: | | | | |
| Scrap | 866,003 | 999,082 | 20,858 | West Germany 475,622; Belgium-Luxembourg 325,131; Netherlands 93,110. |
| Pig iron, cast iron, related materials | 319,837 | 363,849 | 27 | West Germany 242,993; Canada 37,159; United Kingdom 36,369. |
| Ferroalloys: | | | | |
| Ferrochromium | 180,031 | 210,926 | 26 | Republic of South Africa 133,687; Finland 19,027; Sweden 17,268. |
| Ferromanganese | 86,508 | 83,504 | 7 | Norway 22,711; West Germany 16,239; Belgium- Luxembourg 10,213. |
| Ferromolybdenum | 2,086 | 2,704 | — | Belgium-Luxembourg 1,188; Netherlands 654; United Kingdom 466. |
| Ferronickel | 47,359 | 46,933 | 121 | New Caledonia 27,384; Greece 8,134; Dominican Republic 3,748. |
| Ferroniobium | 1,094 | 1,025 | — | Netherlands 507; United Kingdom 285; West Germany 230. |
| Ferrophosphorous | 3,372 | 3,245 | 38 | West Germany 2,238; Netherlands 380; Belgium-Luxembourg 144. |
| Ferrosilicochromium | 107 | 205 | — | Zimbabwe 151; Italy 55. |
| Ferrosilicomanganese | 45,141 | 43,708 | 3 | Norway 28,081; Italy 10,576; Mexico 1,538. |
| Ferrosilicon | 59,029 | 70,179 | 236 | Norway 29,406; West Germany 11,219; Italy 4,137. |
| Ferrotitanium and ferrosilicotitanium | 2,582 | 3,554 | 17 | United Kingdom 2,686; Italy 413; Belgium-Luxembourg 182. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel—Continued: | | | | | |
| Metal—Continued: | | | | | |
| Ferroalloys—Continued: | | | | | |
| Ferrotungsten and ferrosilicotungsten | | 601 | 336 | — | China 244; Netherlands 39; Austria 38. |
| Ferrovanadium | | 851 | 725 | — | Austria 262; West Germany 209; Belgium-Luxembourg 187. |
| Silicon metal | | 13,341 | 13,243 | — | Norway 5,096; Brazil 4,075; Netherlands 1,737. |
| Unspecified | | 11,685 | 11,364 | 1,456 | West Germany 2,331; Italy 2,253; Norway 1,866. |
| Steel, primary forms | | 551,953 | 469,240 | 52 | West Germany 229,067; Belgium-Luxembourg 107,861; United Kingdom 49,987. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel | | | | | |
| Not clad, plated, coated | thousand tons | 4,130 | 4,333 | (2) | Belgium-Luxembourg 2,435; West Germany 773; Italy 389. |
| Clad, plated, coated | do. | 875 | 1,037 | 3 | Belgium-Luxembourg 476; West Germany 212; United Kingdom 86. |
| Of alloy steel | do. | 447 | 482 | 8 | Belgium-Luxembourg 204; West Germany 142; Italy 32. |
| Bars, rods, ang[redacted] sections | do. | 2,803 | 2,977 | 1 | Italy 740; West Germany 693; Belgium-Luxembourg 667. |
| [redacted] | do. | 43 | 53 | (2) | Belgium-Luxembourg 23; U.S.S.R. 19; West Germany 7. |
| [redacted] | do. | 311 | 355 | (2) | Belgium-Luxembourg 98; West Germany 93; Italy 84. |
| Tubes, pipes, fit[redacted] | do. | 783 | 904 | 2 | Italy 299; West Germany 242; Belgium-Luxembourg 80. |
| Lead: | | | | | |
| Ore and concentrate | | 186,920 | 175,294 | 139 | Spain 20,847; Poland 15,689; Bolivia 12,632. |
| Oxides | | 4,355 | 3,781 | 6 | West Germany 3,347; United Kingdom 292; Belgium-Luxembourg 22. |
| Ash and residue containing lead | | 5,206 | 14,274 | 575 | Belgium-Luxembourg 3,796; Italy 3,731; West Germany 2,736. |
| Metal including alloys: | | | | | |
| Scrap | | 31,541 | 40,018 | — | Netherlands 15,799; Belgium-Luxembourg 10,718; West Germany 2,525. |
| Unwrought | | 47,690 | 54,457 | 40 | United Kingdom 16,904; West Germany 15,420; Belgium-Luxembourg 11,122. |
| Semimanufactures | | 8,250 | 7,412 | 9 | Belgium-Luxembourg 4,827; West Germany 1,810; United Kingdom 321. |
| Lithium: Oxides and hydroxides | | 378 | 371 | 1 | West Germany 145; Belgium-Luxembourg 72; Netherlands 57. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 176 | 95 | — | Norway 42; Belgium-Luxembourg 29; West Germany 14. |
| Unwrought | | 5,122 | 4,783 | 1,441 | Norway 3,089; Yugoslavia 84; Italy 46. |
| Semimanufactures | | 804 | 741 | 21 | West Germany 247; Italy 157; Switzerland 143. |

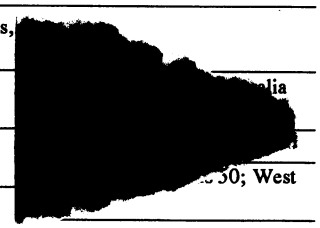
See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 850,594 | 754,716 | — | Gabon 616,293; Republic of South Africa 48,643; Australia 30,116. |
| Oxides | | 8,854 | 11,088 | 46 | Netherlands 3,475; Greece 3,386; Belgium-Luxembourg 2,504. |
| Metal including alloys, all forms | | 3,376 | 3,298 | 241 | Netherlands 800; Republic of South Africa 639; Belgium-Luxembourg 545. |
| Mercury | | 129 | 107 | (2) | Netherlands 29; China 21; Finland 20. |
| Molybdenum: | | | | | |
| Ore and concentrate | | 9,406 | 9,994 | 6,652 | Belgium-Luxembourg 1,710; Chile 475; Netherlands 474. |
| Oxides and hydroxides | | 152 | 126 | — | Belgium-Luxembourg 68; Netherlands 52; United Kingdom 5. |
| Ash and residue containing molybdenum | | 331 | 426 | 6 | West Germany 134; Italy 90; Spain 80. |
| Metal including alloys: | | | | | |
| Scrap | | 59 | 82 | — | West Germany 37; Austria 34; Belgium-Luxembourg 6. |
| Unwrought | | 237 | 281 | 59 | Austria 61; Netherlands 50; Canada 46. |
| Semimanufactures | | 113 | 148 | 64 | Austria 70; United Kingdom 4; West Germany 3. |
| Nickel: | | | | | |
| Ore and concentrate | | 84 | 9 | — | |
| Matte and speiss | | 14,083 | 13,406 | | |
| Oxides and hydroxides | | 204 | 286 | | |
| Ash and residue containing nickel | | 802 | 159 | — | |
| Metal including alloys: | | | | | |
| Scrap | | 1,167 | 2,042 | 209 | United Kingdom 673; Republic of South Africa 383; West Germany 344. |
| Unwrought | | 26,996 | 31,877 | 535 | U.S.S.R. 12,570; Canada 3,941; Republic of South Africa 3,708. |
| Semimanufactures | | 6,058 | 6,952 | 2,234 | United Kingdom 2,272; West Germany 1,769; Italy 137. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $36,620 | $25,578 | $6,600 | Netherlands $20,900; West Germany $6,800; Spain $300. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 5,567 | 6,257 | 604 | United Kingdom 1,581; West Germany 1,469; Republic of South Africa 753. |
| Platinum | do. | 6,746 | 9,361 | 1,088 | United Kingdom 3,266; Republic of South Africa 2,659; Netherlands 585. |
| Rhodium | do. | 544 | 824 | 19 | West Germany 265; United Kingdom 179; Republic of South Africa 156. |
| Iridium, osmium, ruthenium | do. | 52 | 68 | 2 | United Kingdom 49; West Germany 17. |
| Rare-earth metals including alloys, all forms | | 291 | 302 | 3 | Belgium-Luxembourg 86; West Germany 58; Austria 54. |



See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Selenium, elemental | | 68 | 61 | 2 | Canada 19; United Kingdom 18; West Germany 8. |
| Silicon, high-purity | | 321 | 376 | 7 | West Germany 147; Netherlands 142; Belgium-Luxembourg 50. |
| Silver: | | | | | |
| Ore and concentrate | kilograms | 13,000 | 20,700 | — | Morocco 21,100; West Germany 400; Japan 200. |
| Waste and sweepings[4] | value, thousands | $31,811 | $66,403 | $7,386 | Spain $41,894; Switzerland $8,672; Netherlands $3,760. |
| Metal including alloys, unwrought and partly wrought | kilograms | 734,708 | 926,443 | 119,497 | United Kingdom 258,525; Belgium-Luxembourg 157,907; Morocco 149,141. |
| Tellurium, elemental | | 20 | 50 | 1 | West Germany 25; Norway 20; United Kingdom 3. |
| Tin: | | | | | |
| Ore and concentrate | | — | 900 | — | All from Bolivia. |
| Oxides | | 77 | 109 | 3 | Italy 42; West Germany 39; United Kingdom 25. |
| Ash and residue containing tin | | (2) | 8 | 7 | Japan 7. |
| Metal including alloys: | | | | | |
| Scrap | | 2 | 12 | 2 | United Kingdom 6; West Germany 4. |
| Unwrought | | 8,750 | 8,780 | (2) | Brazil 2,681; Indonesia 1,532; Malaysia 1,450. |
| Semimanufactures | | 420 | 535 | 1 | Netherlands 197; West Germany 146; Switzerland 122. |
| Titanium: | | | | | |
| Ore and concentrate | | 201,028 | 198,343 | — | Canada 131,801; Australia 29,670; Malaysia 21,356. |
| Oxides | | 6,736 | 7,860 | 436 | Belgium-Luxembourg 2,410; West Germany 2,131; United Kingdom 1,036. |
| Ash and residue containing titanium | | $23 | — | | |
| Metal including alloys: | | | | | |
| Scrap | | 452 | 257 | 48 | West Germany 85; United Kingdom 80; Spain 38. |
| Unwrought | | 2,437 | 1,551 | 133 | Japan 1,152; United Kingdom 80; U.S.S.R. 73. |
| Semimanufactures | | 3,128 | 3,478 | 1,735 | Japan 792; United Kingdom 587; West Germany 98. |
| Tungsten: | | | | | |
| Ore and concentrate | | 4 | 8 | — | All from Italy. |
| Oxides and hydroxides | | (2) | 9 | — | Spain 8; Austria 1. |
| Ash and residue containing tungsten | | — | 1 | — | All from Spain. |
| Metal including alloys: | | | | | |
| Scrap | | 62 | 17 | — | West Germany 9; Italy 3; United Kingdom 3. |
| Unwrought | | r103 | 138 | 26 | West Germany 55; Malaysia 25; Brazil 10. |
| Semimanufactures | | r50 | 107 | 27 | Austria 23; Sweden 23; West Germany 13. |
| Uranium and thorium: | | | | | |
| Ore and concentrate (monazite) | | 15,793 | 16,240 | 615 | Australia 12,240; India 1,200; Zaire 260. |
| Oxides and other compounds | | 137 | 252 | 39 | U.S.S.R. 106; China 43; West Germany 62. |
| Metal including alloys, all forms: | | | | | |
| Uranium | | 13,677 | 12,828 | 1 | Niger 3,623; Republic of South Africa 2,483; Canada 1,937. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Uranium and thorium—Continued: | | | | |
| Metal including alloys, all forms—Continued: | | | | |
| Thorium | (2) | 9 | — | All to United Kingdom. |
| Vanadium: | | | | |
| Ore and concentrate | (2) | 3 | — | All from Austria. |
| Oxides and hydroxides | 252 | 282 | 6 | Netherlands 137; China 81; Austria 53. |
| Ash and residue containing vanadium | 220 | 217 | — | All for West Germany. |
| Metal including alloys: | | | | |
| Unwrought | 89 | 74 | 22 | West Germany 52. |
| Semimanufactures | 1 | 11 | — | Austria 10. |
| Zinc: | | | | |
| Ore and concentrate | 533,365 | 596,063 | 6,272 | Canada 156,073; Sweden 73,198; Bolivia 65,414. |
| Oxides | 12,990 | 12,371 | — | West Germany 4,185; Belgium-Luxembourg 2,698; Netherlands 2,112. |
| Blue powder | 7,083 | 8,852 | — | Belgium-Luxembourg 7,707; West Germany 615; Norway 485. |
| Ash and residue containing zinc | 50,131 | 57,377 | 4,215 | Belgium-Luxembourg 16,431; West Germany 16,329; Italy 5,702. |
| Metal including alloys: | | | | |
| Scrap | 11,418 | 9,753 | 8 | Belgium-Luxembourg 4,623; Netherlands 2,571; United Kingdom 831. |
| Unwrought | 109,026 | 110,473 | — | West Germany 33,914; Netherlands 29,277; Belgium-Luxembourg 22,374. |
| Semimanufactures | 10,354 | 11,885 | 77 | West Germany 6,082; Belgium-Luxembourg 1,779; Italy 1,372. |
| Zirconium: | | | | |
| Ore and concentrate | 52,164 | 49,714 | 610 | Australia 45,088; Republic of South Africa 2,987; Italy 419. |
| Oxides | 239 | 264 | 6 | West Germany 118; United Kingdom 92; Spain 23. |
| Metal including alloys: | | | | |
| Scrap | 72 | 144 | 29 | Italy 63; Japan 28; West Germany 22. |
| Unwrought | 20 | 71 | 20 | Italy 20; United Kingdom 19; Belgium-Luxembourg 11. |
| Semimanufactures | 101 | 81 | 73 | West Germany 3; United Kingdom 2; Belgium-Luxembourg 1. |
| Other: | | | | |
| Ores and concentrates: | | | | |
| Of base metals | 728 | 9,620 | — | China 5,095; Bolivia 2,451; Guatemala 648. |
| Of precious metals | 22,716 | 235 | — | Turkey 162; Republic of South Africa 49; Italy 24. |
| Ashes and residues | 27,678 | 25,794 | 78 | Spain 12,790; Belgium-Luxembourg 12,146; Italy 308. |
| Base metals including alloys, all forms | 88 | 68 | 12 | Belgium-Luxembourg 38; West Germany 10. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 26,275 | 25,488 | 510 | Turkey 18,837; Netherlands 2,072; Italy 1,680. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Abrasives, n.e.s.—Continued: | | | | |
| Artificial: | | | | |
| Corundum | 18,592 | 16,615 | 2,082 | West Germany 5,971; Austria 3,001; Italy 2,515. |
| Silicon carbide | 26,032 | 26,637 | 101 | West Germany 8,184; Norway 5,215; Italy 3,526. |
| Dust and powder of precious and semi-precious stones excluding diamond kilograms | 1,563 | 6 | — | Belgium-Luxembourg 5; Switzerland 1. |
| Grinding and polishing wheels and stones | 23,421 | 15,741 | 430 | Italy 4,017; Belgium-Luxembourg 2,428; West Germany 2,350. |
| Asbestos, crude | 66,556 | 63,672 | 23 | Canada 39,154; U.S.S.R. 10,368; Republic of South Africa 8,752. |
| Barite and witherite | 45,441 | 42,058 | — | China 14,560; West Germany 11,789; Belgium-Luxembourg 6,848. |
| Boron materials: | | | | |
| Crude natural borates | 105,905 | 44,034 | 466 | Turkey 40,713; Belgium-Luxembourg 1,576; United Kingdom 1,003. |
| Elemental | 29 | 16 | 13 | West Germany 3. |
| Oxides and acids | 2,040 | 2,903 | 365 | Italy 1,496; Chile 275; U.S.S.R. 271. |
| Bromine | 8,314 | 7,514 | — | Israel 6,498; East Germany 371; Netherlands 292. |
| Cement | 634,106 | 681,282 | 76 | Belgium-Luxembourg 381,999; Greece 96,106; West Germany 92,794. |
| Chalk | 40,386 | 22,136 | 4 | West Germany 15,839; Belgium-Luxembourg 4,888; Spain 330. |
| Clays, crude: | | | | |
| Bentonite | 125,749 | 127,279 | 632 | Italy 71,776; Greece 39,000; West Germany 8,253. |
| Chamotte earth | 29,114 | 30,124 | 990 | West Germany 25,448; Czechoslovakia 3,068; Netherlands 437. |
| Fire clay | 3,291 | 6,814 | 26 | West Germany 6,430; Italy 136; Belgium-Luxembourg 107. |
| Fuller's earth | 2,618 | 5,967 | 237 | Spain 4,832; United Kingdom 589; Belgium-Luxembourg 156. |
| Kaolin | 378,275 | 405,005 | 74,039 | United Kingdom 232,478; West Germany 22,635; Czechoslovakia 20,697. |
| Unspecified | 315,570 | 385,117 | 2,668 | West Germany 237,287; Senegal 105,786; United Kingdom 17,463. |
| Cryolite and chiolite | 797 | 831 | — | Denmark 801; Italy 24; West Germany 2. |
| Diamond, natural: | | | | |
| Gem, not set or strung carats | r340,847 | 357,292 | 8,205 | Belgium-Luxembourg 162,408; India 59,066; Israel 49,270. |
| Industrial stones do. | 557,147 | 219,797 | 63,870 | United Kingdom 63,554; Belgium-Luxembourg 58,534; Zaire 16,759. |
| Dust and powder kilograms | 1,790 | 1,516 | 756 | Switzerland 389; Belgium-Luxembourg 147; Ireland 53. |
| Diatomite and other infusorial earth | 14,130 | 20,160 | 11,044 | West Germany 3,605; Spain 2,604; Denmark 1,996. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 32,008 | 32,340 | — | West Germany 22,378; Portugal 4,304; Spain 2,845. |
| Fluorspar | | 21,852 | 18,441 | — | China 8,057; West Germany 7,143; Morocco 3,150. |
| Leucite, nepheline, nepheline syenite | | 33,180 | 34,595 | 132 | Norway 24,208; Canada 5,086; Netherlands 4,713. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 100,802 | 112,272 | — | Netherlands 47,177; Belgium-Luxembourg 38,624; Italy 14,904. |
| Manufactured: | | | | | |
| Ammonia | thousand tons | 618 | 566 | 8 | Trinidad and Tobago 131; West Germany 108; Netherlands 101. |
| Nitrogenous | do. | 4,112 | 4,252 | 612 | Netherlands 1,204; Belgium-Luxembourg 804; Poland 287. |
| Phosphatic | do. | 848 | 1,100 | 25 | Belgium-Luxembourg 497; Morocco 190; Tunisia 147. |
| Potassic | do. | 1,428 | 1,246 | 7 | United Kingdom 248; U.S.S.R. 204; Canada 188. |
| Unspecified and mixed | do. | 2,200 | 2,220 | 69 | Belgium-Luxembourg 841; Netherlands 419; Morocco 369. |
| Graphite, natural | | 6,424 | 5,203 | 5 | China 1,684; West Germany 978; Belgium-Luxembourg 859. |
| Gypsum and plaster | | 185,551 | 147,935 | 741 | West Germany 81,264; Netherlands 28,617; Switzerland 14,917. |
| Iodine | | 931 | 881 | 2 | Japan 549; Chile 239; United Kingdom 56. |
| Kyanite and related materials: | | | | | |
| Mullite | | 2,005 | 2,675 | 603 | West Germany 1,588; United Kingdom 463; Italy 21. |
| Unspecified | | 5,100 | 5,402 | 2,003 | Republic of South Africa 1,230; Netherlands 982; West Germany 739. |
| Lime | | 147,214 | 175,182 | 1 | West Germany 86,504; Belgium-Luxembourg 63,838; Spain 14,175. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 987 | 1,368 | — | Italy 913; Austria 198; Netherlands 46. |
| Oxides and hydroxides | | 217,808 | 206,667 | 1,169 | Greece 43,816; Spain 43,408; North Korea 35,156. |
| Sulfate | | 187,025 | 209,215 | — | West Germany 162,131; Belgium-Luxembourg 24,644; East Germany 22,397. |
| Mica: | | | | | |
| Crude including splittings and waste | | 5,855 | 4,654 | 86 | India 1,070; Brazil 760; Netherlands 509. |
| Worked including agglomerated splittings | | 399 | 300 | 1 | Belgium-Luxembourg 131; Switzerland 100; Italy 18. |
| Nitrates, crude | | 10,654 | 18,326 | — | Chile 12,874; West Germany 3,147; Poland 1,416. |
| Phosphates, crude | | 3,578,361 | 3,270,873 | 669,956 | Israel 867,956; Morocco 386,996; Syria 364,227. |
| Phosphorus, elemental | | 962 | 663 | 1 | U.S.S.R. 400; Switzerland 143; Italy 73. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Pigments, mineral: | | | | |
| Natural, crude | 1,068 | 8,591 | — | Switzerland 6,000; West Germany 802; Spain 636. |
| Iron oxides and hydroxides, processed | 50,341 | 40,141 | 411 | West Germany 29,207; Belgium-Luxembourg 3,050; Italy 2,303. |
| Potassium salts, crude | 74,040 | 85,922 | — | Israel 40,074; U.S.S.R. 38,931; United Kingdom 4,317. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural value, thousands | $113,204 | $153,643 | $8,798 | Switzerland $79,230; Thailand $26,299; West Germany $6,293. |
| Synthetic do. | $9,342 | $10,408 | $2,031 | Mauritius $2,737; Switzerland $1,921; Ireland $1,067. |
| Pyrite, unroasted | 1,188 | 2,865 | 17 | West Germany 2,157; Italy 663; United Kingdom 27. |
| Salt and brine | 169,210 | 182,412 | 42 | Netherlands 45,380; Belgium-Luxembourg 41,006; West Germany 39,289. |
| Sodium compounds, n.e.s.: | | | | |
| Soda ash, manufactured | 69,110 | 136,613 | 11,560 | West Germany 56,144; Spain 23,660; Belgium-Luxembourg 18,699. |
| Sulfate: | | | | |
| Manufactured | 43,384 | 49,628 | 25 | Belgium-Luxembourg 22,607; Spain 21,878; Austria 2,644. |
| Natural | 45,838 | 42,241 | — | Belgium-Luxembourg 25,579; Spain 10,262; West Germany 1,920. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 335,273 | 294,037 | 368 | West Germany 49,376; Italy 37,813; Norway 23,932. |
| Worked | 438,161 | 472,334 | 45 | Spain 225,810; Italy 140,959; Portugal 46,636. |
| Dolomite, chiefly refractory-grade | 315,935 | 281,731 | (2) | Belgium-Luxembourg 254,571; Italy 17,670; West Germany 5,689. |
| Gravel and crushed rock | 6,090,265 | 7,416,522 | 97 | Belgium-Luxembourg 6,235,572; United Kingdom 534,363; West Germany 450,233. |
| Limestone other than dimension | 202,948 | 186,479 | — | Belgium-Luxembourg 185,850; West Germany 423; Italy 119. |
| Quartz and quartzite | 257,260 | 334,374 | 448 | Belgium-Luxembourg 310,656; Spain 13,689; Italy 5,906. |
| Sand other than metal-bearing | 2,178,462 | 2,133,913 | 368 | Belgium-Luxembourg 1,432,321; United Kingdom 459,564; West Germany 126,367. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 636,923 | 661,815 | 28,287 | Poland 273,929; Canada 158,487; West Germany 107,234. |
| Colloidal, precipitated, sublimed | 604 | 353 | (2) | Spain 144; West Germany 142; Netherlands 63. |
| Dioxide | 197 | 1,140 | — | Belgium-Luxembourg 747; Italy 300; West Germany 93. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | | |
| Sulfur—Continued: | | | | | |
| Sulfuric acid | | 166,638 | 166,078 | (2) | Belgium-Luxembourg 57,329; Spain 54,665; West Germany 30,220. |
| Talc, steatite, soapstone, pyrophyllite | | 25,979 | 25,368 | 695 | Belgium-Luxembourg 8,461; China 5,895; Italy 3,557. |
| Vermiculite[5] | | 98,429 | 96,852 | 383 | Turkey 22,025; Greece 21,386; Italy 19,795. |
| Other: | | | | | |
| Crude | thousand tons | 4,127 | 2,877 | 1 | Switzerland 2,393; Spain 189; Norway 127. |
| Slag and dross, not metal-bearing | do. | r2,631 | 2,766 | 3 | West Germany 1,669; Belgium-Luxembourg 804; Netherlands 148. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Asphalt and bitumen, natural | | 3,720 | 17,940 | 2,485 | Belgium-Luxembourg 14,544; West Germany 593; Venezuela 178. |
| Carbon black | | 112,619 | 108,543 | 1,482 | West Germany 37,122; Netherlands 34,061; Spain 11,158. |
| Coal: | | | | | |
| Anthracite | thousand tons | 1,808 | 1,980 | 15 | Republic of South Africa 703; West Germany 510; China 395. |
| Bituminous | do. | 14,067 | 17,132 | 6,739 | Australia 3,451; Colombia 1,885; China 1,345. |
| Briquets of anthracite and bituminous coal | do. | 98 | 107 | (2) | West Germany 106. |
| Lignite including briquets | do. | 136 | 138 | (2) | West Germany 133; East Germany 5. |
| Coke and semicoke | do. | 1,487 | 1,043 | (2) | West Germany 419; Belgium-Luxembourg 274; Netherlands 183. |
| Gas, natural: | | | | | |
| Gaseous | million cubic meters | 17,287 | 19,117 | — | U.S.S.R. 9,755; Norway 5,237; Netherlands 4,125. |
| Liquefied | thousand tons | 6,562 | 6,966 | — | Mainly from Algeria. |
| Peat including briquets and litter | | 550,410 | 554,974 | 59 | Netherlands 130,848; West Germany 228,117. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 492,275 | 491,344 | — | Saudi Arabia 108,133; Iran 63,956; Norway 40,082. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 20,736 | 20,768 | 302 | Saudi Arabia 6,331; Algeria 4,693; United Kingdom 4,606. |
| Gasoline | do. | 70,875 | 65,658 | 1,931 | Netherlands 11,246; Italy 10,287; Saudi Arabia 5,599. |
| Mineral jelly and wax | do. | 695 | 951 | 121 | West Germany 223; Netherlands 159; United Kingdom 150. |
| Kerosene and jet fuel | do. | 4,227 | 7,825 | — | United Kingdom 2,130; Italy 1,117; Spain 1,061. |
| Distillate fuel oil | do. | 67,348 | 71,869 | 1,054 | Italy 11,738; United Kingdom 10,988; U.S.S.R. 10,352. |
| Lubricants | do. | 1,713 | 1,915 | 24 | Sweden 486; Syria 385; Belgium-Luxembourg 269. |
| Residual fuel oil | do. | 44,116 | 34,232 | (2) | U.S.S.R. 10,306; Belgium-Luxembourg 4,963; Syria 3,278. |

See footnotes at end of table.

TABLE 4—Continued

## FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products—Continued: | | | | | |
| Bitumen and other residues | thousand 42-gallon barrels | 2,675 | 2,828 | (2) | Belgium-Luxembourg 1,281; Republic of South Africa 878; West Germany 471. |
| Bituminous mixtures | do. | 65 | 62 | 1 | Belgium-Luxembourg 33; West Germany 15; Netherlands 5. |
| Petroleum coke | do. | 8,773 | 7,815 | 6,639 | West Germany 737; United Kingdom 321; Netherlands 35. |

'Revised.
[1]Table prepared by Bradley S. Colquitt.
[2]Less than 1/2 unit.
[3]May contain rhenium.
[4]May include other precious metals.
[5]Includes perlite and chlorite.

TABLE 5

## FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | 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. |
| Do. | | do. | Noguéres, Pyrénées Atlantiques Province | 115. |
| Do. | | do. | Lannemezan, Hautes-Pyrénées Province | 63. |
| Do. | | do. | Auzat, Ariége Province | 44. |
| Antimony, metal | | Societe 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. |
| Do. | | Societe Industrielle du Centre | Mine at Rossignol, Chaillac, Indre Province | 100. |
| Bauxite | | Aluminium Pechiney (Government) | Mines in Hérault and Var Provinces | 900. |
| Do. | | Societe Anonyme des Bauxites et Alumines de Provence (S.A.B.A.P.) | Mine at Combecave, Var Province | 400. |
| Cadmium | metric tons | Compagnie Royale Asturienne des Mines | Plant at D'Auby-les-Douai, Nord Province | 300. |
| Cement | | Eight companies, of which the largest are: Ciments La Farge France | 80 plants, including:<br>15 plants<br>Largest at St. Pierre-la-Cour | 23,233. including: (7,815). (1,160). |
| Do. | | Societe des Ciments Française | 13 plants | 6,190. |
| Coal | | Charbonnages de France: | | 15,000. including: |
| Do. | | Basin de Paris | Mines and washeries | 4,500. |
| Do. | | Bassin Nord-Pas-de-Calais | Mines and washeries in northern France | (1,500). |
| Do. | | Bassin de Lorraine | Mines and washeries in eastern France | (10,000). |
| Cobalt, metal | metric tons | Societe Metallurgique Le Nickel (SLN) | Plant at Sandouville, near Le Havre (treats New Caledonian nickel-cobalt ores) | 600. |
| Copper, metal | | Compagnie General d'Electrolyse du Palais | Electrolytic plant: Palais-sur-Vienne, Haute Vienne Province | 45. |

See footnotes at end of table.

TABLE 5—Continued

## FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Copper, metal—Continued: | | | |
| Do. | Societe Française d' Affinage du Cuivre (Afficuivre) | Smelter at Poissy, Yvelines Province | 11. |
| Do. | Affinerie Sud-Ouest | Fire refinery at Toulouse | 2. |
| Feldspar | Denain-Anzin Mineraux S.A. | Mine and plant at St. Chély d'Apcher, south of Clermont- Ferrand | 55. |
| Ferroalloys | Societe du Ferromanganese de Paris, Outreau | Plant at Boulogne-sur-Mer | 420. |
| Do. | Pechiney Electrometallurgie (Pechiney, Government) | 12 plants at Bellegarde 27 furnaces | 387. |
| Do. | Chromeurope SA | Plant at Dunkerque | 25. |
| Fluorspar | Societe d'Enterprises, Carrieres et Mines, de l'Esterel (SECME) | Fonsante Mine near Adrets d'Esterel, Var Province | 150. |
| Do. | Denain-Anzin Minefaux | Mine and plant at Escaro, Pyrénéés-Orientales Province | 120. |
| Do. | Societe Generale de Recherches et d'Exploitation Miniere (SOGEREM) | Opencast mine at Montroc, Tar Province | 100. |
| Do. | Comifluor S.A. | Plant at Bastide-á-Olette, Pyrénéés-Orientales Province | 80 concentrate. |
| Do. | Compagnie Miniere Dong Trieu | Mine at Lussac-les-Eglises | NA. |
| Do. | Compagnie Francaise des Minerais d'Uranium (CFMU) | Mine at Autun in Saone-et-Loire | 50. |
| Gold, ore kilograms | Societe des Mines du Bourneix (Government) | Mines in the district of Saint Yrieix la Perche, Limoges | 1,700 concentrate. |
| Iron and steel: | | | |
| Iron ore | Bassin de Lorraine Acieres Reunies de Burbach-Eich-Dudelange, (ARBED) and Usinor-Sacilor | Mines in eastern France | 10,000. |
| Do. | Bassin l de l'Ouest: Societe Metallurgique de Normandie (SMN) | Mines in Normandy | 500. |
| Steel | Usinor-Sacilor (Government, 72%) | Dunkerque | 7,500. |
| Do. | do. | Fos-sur-Mer | 4,200. |
| Do. | do. | Seramange | 3,000. |
| Do. | Unimetal, Unsinor-Sacilor (100%) | Gadrange, Neuves Maisons, Thonville, Montereau, Garvenville, Trith-St.-Leper | 8,432. |
| Do. | Asocmetal, Unsinor-Sacilor (100%) | Dunkerque, Fos-Sur-Mer, Hagondange, St. Etienne | 1,355. |
| Lead, metal | Societe Miniere et Metallurgique de Penarroya | Imperial Smelter, Noyelles Godault | 150. |
| Lead-zinc, ores | do. | Mines and plants at Les Mailines, near Granges Gard Province | 50 (Pb). |
| Do. | do. | Sain-Salvy, Tarn Province | 100 (Zn). |
| Magnesium metal | Societe Francaise d'Electro-Metallurgie, Pechiney (100%) | Plant at Marignac, Haute Garonne | 14. |
| Natural gas million cubic feet | Elf Aquitaine | Gasfield and plant at Lacq | 700,000. |
| Nickel | Societe Metallurgique 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 barrels per day | Compagnie Francaise de Raffinage (Total) | Refineries at Gonfreville, Seine-Maritime Province, and La Mede, Bouches-du-Rhone Province | 446,000. |
| Do. do. | Shell-Francaise | Refineries at Petite Couronne, in Seine-Maritime Province | 285,300. |

See footnotes at end of table.

TABLE 5—Continued

## FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Petroleum—Continued: | | | |
| Refined—Continued: | | | |
| Do. barrels per day | Shell Francaise | Berre, Bouches-du-Rhone Province | 270,000. |
| Do. do. | Elf-France | Refineries at Feyzin, Rhone Province | 119,000. |
| Do. do. | do. | Donges, Loire-Atlantique Province | 199,000. |
| Do. do. | do. | Grandpuits, Seine-et-Marne Province | 96,000. |
| Do. do. | Societe Francaise British Petroleum (S.F.B.P.) | Refineries at Lavera, Bouches-du Rhone Province | 175,000. |
| Do. do. | Esso S.A.F. | Refineries at Fos-sur-Mer, Bouches-du Rhone Province | 237,000. |
| Do. do. | Mobil Oil Francaise | Refineries at Gravenchon | 62,000. |
| Do. do. | Cie. Rhenane de Raffinage (CRR) | Refinery at Reichstett, Bas-Rhin | 80,000. |
| Potash | Mines de Potasse d'Alsace S.A. (MDPA) | Mines at Amelie, Marie-Louise, and Theodore in Alsace | 1,750 ($K_2O$). |
| 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 | Societe Nationale Elf Aquitaine (SNEA) | Byproduct from natural gas desulfurization at Lacq, Aquitaine | 3,000. |
| Talc | Talcs de Luzenac | Trumouns, near Ariege | 400. |
| Uranium metric tons | Cogema, Compagnie Generale des Matieres Nucleaires (Government) | Mines at Limousin | 1,013 ($U_3O_8$). |
| Do. do. | do. | Vendee | 500 ($U_3O_8$). |
| Do. do. | do. | Herault | 377 ($U_3O_8$). |
| Zinc metal | Compagnie Royale Asturienne des Mines (Belgium) | Electrolytic plant at Auby-les-Douai, Nord | 115. |
| Do. | Societe des Mines et Fonderies de Zinc de la Vieille Montagne (SGB, Belgium) | Electrolytic plant at Viviez, Aveyron | 110. |

NA Not available.

TABLE 6

## FRANCE: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Million metric tons unless otherwise specified)

| Commodity | Reserves* |
|---|---|
| Barite | 2 |
| Bauxite | 5 |
| Bromine million kilograms | 1.6 |
| Coal | 284 |
| Copper/zinc ore | 27 |
| Fluorspar | 10 |
| Iron ore | 935 |
| Potash | 20 |
| Sulfur | 10 |

*Estimated.

# GERMANY

**AREA 356,900 km²** **POPULATION 79.5 million**

THE MINERAL INDUSTRY OF

# GERMANY

By William Zajac

The year 1991 was the first full year of the unification of the territories of the former German Democratic Republic (GDR) and the former Federal Republic of Germany (FRG). Fiscal and economic unification took place on July 1, 1990, and unification of territory took place on October 3, 1990. As a result of the unification of these two very different countries and economies, a comparison between the activities and structures of the country that existed in 1991 with its former parts of past years is completely invalid. The shock of the revaluation of the former East German mark to parity with the West German mark caused economic problems to an extent that had not been foreseen. The accompanying rise in wages, prices, etc., caused most of the former state-run industries instantly to become even more inefficient and less cost effective than they had been previously, causing many to be closed in late 1990 or early 1991. In the Western states, the increased taxes intended for the rebuilding of the Eastern states coupled with the worldwide economic slowdown resulted in decreased actual production in many commodity areas. Despite the economic and other problems that Germany faced during 1991, the country had, according to Statistisches Bundesamt (Federal Statistics Office), a GDP of 2,947.5 billion Deutsche Mark (DM) (US$1,776.7 billion)[1] and a GNP of 2,976.5 billion DM (US$1,794.2 billion).

In 1991, Germany was the leading producer in Western Europe of alumina, refined copper, refined lead, lignite (the world's leading producer), pig iron, potash, salt, steel, and refined zinc and ranked second in the production of primary aluminum metal, cadmium, cement, nitrogen in ammonia, elemental sulfur, and hard (anthracite and bituminous) coal in Western Europe.

## GOVERNMENT POLICIES AND PROGRAMS

The Bundesberggesetz (Federal Mining Law) that went into effect in 1982 provides uniform regulations concerning most natural raw materials of the Republic and replaced the individual mining laws of the separate states. The law regulates the exploration and exploitation of natural resources and includes health, safety, and environmental regulations. It was amended in 1990 with new procedures to ensure planned management of the mining conducted and to provide for environmental impact investigations. A significant development resulting from the unification was the responsibility given by the Federal German Government to the agency Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) (Federal Institute for Geosciences and Natural Resources) to restructure the agency responsible for geological survey of and mining in the former German Democratic Republic, the Ministry of Geology. This Ministry had, for many decades, operated in strictest secrecy, and all contact with outside organizations and agencies was forbidden owing to the importance of mineral resources to national security.

On July 1, 1990, the date of monetary union, the Ministry of Geology was transformed into three private companies with responsibilities for petroleum and natural gas, for geophysics, and for geological research and exploration. All geological agencies of the former East German Government were formally abolished on October 3, 1990, and their work with regard to geosciences and securing comprehensive and widely scattered data was to be completed by the end of 1990. With the help of the BGR, new geological survey offices were set up in the five new Federal states during 1991.

The Treuhandanstalt (Trust Agency), the Federal trustee agency responsible for the handling of the privatization of the holdings of the former GDR into internationally competitive and viable organizations, continued the process of selling holdings or deciding to close unprofitable enterprises. At the end of 1991, less than one-half of the mining, energy, and ferrous and nonferrous metals concerns of the formerly centrally controlled and "owned-by-the-people" concerns had been dealt with, thereby contributing to the almost 20 billion DM (US$12 billion) loss by the agency for that year by supporting and continuing to operate the remaining installations at a loss in an effort to minimize the shocks of unemployment and loss of wages in the Eastern states. At the end of 1991, Treuhandanstalt had privatized 5,200 of the 10,000 state-owned industrial enterprises it took over at unification. Of these, 100 companies, or parts of companies, were in the mining industry, mostly producing building materials.

## PRODUCTION

Germany remained one of the world's leading producers, processors, and consumers of mineral commodities in the world. Although mining of metals continued to decline, the processing of imported raw materials and the production of ferrous and nonferrous metals products continued to contribute to the strong economic position of the country as did the continued leading position in the production of the industrial mineral products such as cement,

limestone, potash, salt, and sulfur, all raw materials for domestic consumption and transformation as well as for export. Continued strong production of construction materials (cement, gypsum, sand and gravel, stone, etc.) reflected the rebuilding of the new states in the East, part of the policy of unification that is intended to bring the quality of plants, homes, facilities, etc., up to the standards enjoyed by the western part of the country, as well as continuing the trend in the western part of the country of increasing new building construction, both residential and nonresidential.

The production of raw materials, such as lignite and potash, in the eastern part of Germany generally declined as a result of the closing of uneconomic ventures and the more stringent environmental laws now in force since unification. Eastern production of lignite, for example, dropped by about one-third between 1990 and 1991 while it increased in the western part of the country to the highest level in 5 years. Production of potash in the eastern part of the country fell to less than one-half the average production for the past several years as a result of the inefficient mining methods and the horrendous pollution caused by these methods, although it remained fairly steady in the western part of the country.

## TRADE

Except for very small amounts of domestic production of iron and lead-zinc ores, Germany has become entirely dependent on imports for metallic raw materials to supply its smelting and processing industry. For the unified country, the pattern of suppliers of these raw materials has not changed significantly from the supply combination of the two former countries, even though the Eastern states relied heavily on supply from the former Eastern European states. The collapse of the centrally planned economies of Eastern Europe and the resultant collapse of the trade and barter agreements and industrial policies associated therewith virtually shut off the supply lines—as well as the market—for the eastern part of the country from its former allies and shifted the supply balance for the entire country to the patterns of the Western states, namely a reliance on the market economies of the world. Bauxite, copper ore, and iron ore are typical of metallic raw material imports. Imports of bauxite in 1991 by Germany were principally from Australia (46.8%), Sierra Leone (22.6%), Guinea (22.4%), and China (6.1%); imports of copper ore in 1991 were principally from Poland (32%), Chile (21.7%), Papua New Guinea (21.1%), and Indonesia (8.9%); and imports of iron ore were principally from Brazil (46.3%), Canada (18.6%), Sweden (13.2%), and Australia (13.1%). In comparison, in 1989, the major suppliers of iron ore to the former German Democratic Republic were the U.S.S.R. (more than one-half), India, Brazil, and Sweden. The United States is not a significant supplier of raw materials to Germany except for natural phosphates, supplying about 40% of the total imported.

Export patterns during 1991 mirrored those of imports. The collapse of the system of supply lines for the Eastern states from their former centrally planned economy allies also disrupted the market for the products produced in that part of the country. That development, combined with the disdain of the citizens of the Eastern states for their own products, led to a combination of circumstances that resulted in virtually no market for the products produced there. Production by the Western states, therefore, supplied not only areas outside the new borders, but also the new states with materials needed for modernization and new construction as well as materials to satisfy the desires of the citizens of the Eastern states to help them move up to the standard of living of their western counterparts. The United States was not a major market for German mineral products, but rather a principal market for finished consumer goods.

In 1991, crude materials, excluding fuels, accounted, by value, for 4.4% of total imports by Germany and mineral fuels accounted for 8.3%. The EC accounted, by value, for 52.6% of Germany's imports in 1991 while the United States accounted for 6.8%, and Japan accounted for 6.2%. Exports of crude materials in 1991, excluding fuels, accounted, by value, for 1.9% of Germany's exports, manufactured goods (nonfinished products) accounted for 17.0%, and manufactured goods (finished products) accounted for 66.0%. The EC accounted, by value, for 55.1% of Germany's total exports, the United States for 6.4%, and Austria for 6.0%.

Exports and reexports and imports for 1989 and 1990 of selected mineral commodities, with principal destinations and sources for 1990, are presented in tables 3 and 4. These tables do not include trade between the former GDR and the preunification FRG but do include the exports and reexports and imports of the area of the former GDR beginning with monetary and economic union, for the second half of 1990.

## STRUCTURE OF THE MINERAL INDUSTRY

Mining as well as metal and mineral processing activities are controlled by privately owned companies except, at present, the enterprises still under the control of the Treuhandanstalt. These latter enterprises are under the control of this federally run organization until they can be either sold to private owners or can be closed or restructured without causing more disruption to the economy of the Eastern states, and by association, to that of the country as a whole. Care is being taken by the agencies responsible for the integration of the former centrally planned economy of the eastern part of the country to the market-oriented economy of the unified nation to try to not disrupt the social and industrial structures of either part any more than absolutely necessary.

## COMMODITY REVIEW

### Metals

*Aluminum.*—Germany remained the second largest primary aluminum-producing country in Western Europe

despite a drop in production resulting from a smelter being shut down in the Western states. The aluminum smelters of the ex-VEB Mansfeld Kombinat Wilhelm Pieck at Lauta and at Bitterfeld (part of the chemical complex) were both closed during late 1990, thereby leaving an aluminum smelting industry only in the Western states. Net consumption of aluminum, including both primary and secondary, reached 2.1 Mmt, continuing the trend of increased use evident for the past several years. Secondary aluminum, both domestic and imported, accounted for about 35% of aluminum consumption during 1991.

*Steel.*—Germany remained Western Europe's largest steel producer and the world's fifth largest steel producer during 1991. Germany, unlike other European countries, is not dominated by one large steel-producing company, but rather has a number of large firms. In fact, there are 5 German companies included in the top 12 European steel producers: Thyssen Stahl AG, Krupp Stahl AG, Stahlwerke Peine-Saltzgitter AG, Hoesch Werke AG, and Klöckner-Werke AG. No other European country has more than 1 steel producer in the listing of the top 12 European steel producers. Also, unlike other European steel-producing countries, Germany does not suffer from the overcapacity that affects other countries. According to German steel industry officials, in 1990, for example, steel capacity utilization was 70% in Germany compared with 55% in France and 25% in Italy. With respect to steel in Germany's Eastern states, most of the mills are expected to be shut down, with the ones that are economically viable being privatized. Of the steel mills in the Eastern states, the ones most likely to survive the restructuring are the ones at Brandenburg and Henningsdorf. These two mills were not dependent on trade with the former trading partners, but rather serve the local market and are expected to benefit from the booming construction industry. Industry sources reportedly do not expect the steel industry in the Eastern states to regain the level of production of the times prior to unification, but expect production eventually to level off at about 3 to 5 Mmt/a.

### Industrial Minerals

Prior to unification, potash mining activities in the GDR were combined in the VEB Kombinat Kali Sondershausen, which was dissolved and restructured into Mitteldeutsche Kali AG Sondershausen (MDK). MDK, in turn, is being restructured to reflect the new economic and political climate. Six of its 10 mines are slated to be closed, and the equivalent of about DM180 million is slated to be invested in the redevelopment of the remaining four mines. More than DM60 million is to be spent in the next few years dealing with environmental problems resulting from the potash mining, including using some mine openings for underground deposits of industrial wastes.

### Mineral Fuels

The lignite industry in the former GDR was also drastically changed as a result of unification. The prior two organizations responsible for lignite production, Braunkohlenkombinat Bitterfeld and Braunkohlenkombinat Senftenberg, were reorganized and have been renamed Lausitzer Braunkohle Aktiengesellschaft (LAUBAG) and Vereinigten Mitteldeutschen Braunkohlenwerke Aktiengesellschaft (MIBRAG). The 39 surface mines and 35 briquetting plants belonging to these two organizations are in the process of being restructured and reorganized to meet the recent developments in the country. Vereinigte Energiewerke AG (VEAG), the holding company for the high-tension electricity grid and major power stations of the Eastern states, plans to shut down, within the next 10 years, all but eight of the lignite-fired power stations under its control. Some of the new, replacement power stations would be fired by hard (bituminous) coal, possibly imported, because the Eastern states were excluded from German restrictions on imported hard coals by provisions of the unification treaty.

## INFRASTRUCTURE

Germany has a total of 590,909 km of highways and roads, ranging from the high-speed Autobahn system to undeveloped gravel and packed dirt country roads. With unification, many of the links between the eastern and western parts of the country, such as bridges and the roads in the former border areas, are in the process of being rebuilt and are coming back into use. The railroad system consists of 45,468 km, about 90% of which is Government owned. Inland waterways and canals comprise 7,541 km and have 31 major ports, with the Kiel Canal an important connection between the Baltic and North Seas. Major maritime ports, with total traffic in thousand tons, include Hamburg (53,857), Rostock (20,775), Bremerhaven (15,077), Bremen (14,825), and Wilhelmshaven (14,499), which together accounted for about 70% of total merchandise traffic in 1989. Crude petroleum pipelines totaled 2,436 km and moved more than 500 Mbbl during the year.

## OUTLOOK

The integration of the Eastern states into the market economy of Germany, together with the traditional market forces of supply and demand, will continue to be a major factor in dealing with the mining and minerals industries of the country. The continued worldwide economic slowdown, coupled with the economic shocks of the disintegration of the Eastern European centrally planned economies, make the future, both near-term and long-term, very difficult to analyze. The aluminum industry in Germany, as elsewhere, is being affected by the large amounts of this metal being shipped out of the U.S.S.R. to earn badly needed hard currency, depressing the price and thereby the competitiveness of all market-controlled aluminum plants.

Despite the high efficiency of the German steel industry, the outlook here is

also uncertain. Increased competition from other producers, including the newly restructured steel industries in Eastern Europe, is growing, thus adding to other burdens for the German steel industry, such as the requirement to buy German coking coal (at higher-than-world market prices) and ever increasing employee costs.

Lignite production is expected to remain fairly steady in the western part of the country while the Eastern states are expected to be forced to handle drastic cutbacks in production. It is estimated that by the year 2000 production in the Eastern states will amount to no more than about 100 Mmt/a but nevertheless will remain a major energy source for that part of the country.

Very much of the outlook of the mining and processing industries of Germany depends on the success of the work of the Treuhandanstalt in restructuring, privatizing, and closing the industrial complexes of the Eastern states. In addition to the challenges involved in this restructuring, a major obstacle to a valid analysis of these industries is the lack of statistical information from the Eastern states that correspond to that of the Western states. The statistical reporting from the Eastern states is still poor and sketchy, and bringing these statistics into line with Western reporting practices is a major challenge. Until this is accomplished, comparisons to past years or other countries can be misleading.

[1]Conversions made at DM1.659=US$1.00.

## OTHER SOURCES OF INFORMATION

### Agencies

Statistisches Bundesamt
(Federal Statistics Office)
Wiesbaden, Germany

Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
Hannover and Berlin, Germany

Bundesministerium für Forschung und Technologie (Federal Ministry for Research and Technology)
Bonn, Germany

Bundesministerium für Wirtschaft, Abteiling III, Energiepolitik, Mineralische Rohstoffe (Federal Ministry for Economics, Section III, Energy Policy and Mineral Raw Materials)
Bonn-Duisdorf, Germany

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Wirtschaft und Statistik (Economics and Statistics), Wiesbaden, Statistisches Bundesamt.

TABLE 1

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Alumina, $Al_2O_3$ equivalent: | | | | | | |
| Calcined: | | | | | | |
| Eastern states | | 50,880 | 64,000 | r69,000 | r27,000 | — |
| Western states | | 1,017,370 | 939,085 | 964,017 | 921,567 | 863,222 |
| Hydrate: Western states | | 1,312,828 | 1,162,786 | 1,173,993 | 1,172,808 | 1,148,310 |
| Metal: | | | | | | |
| Primary: | | | | | | |
| Unalloyed: | | | | | | |
| Eastern states | | 67,866 | 61,243 | 53,930 | 19,731 | — |
| Western states | | 792,628 | 752,927 | 733,703 | 714,946 | 705,033 |
| Total | | XX | XX | XX | XX | 705,033 |
| Alloyed: Western states | | 369,478 | 551,646 | 533,652 | 481,318 | 395,624 |
| Secondary: | | | | | | |
| Eastern states | | 54,458 | 54,583 | 53,802 | 51,580 | — |
| Western states | | 470,154 | 516,750 | 546,420 | 554,793 | 506,673 |
| Total | | XX | XX | XX | XX | 506,673 |
| Arsenic, white: $Ar_2O_3$ content: Western states[e] | | 360 | 360 | 360 | 360 | 300 |
| Cadmium metal, refinery: | | | | | | |
| Eastern states | | r28 | r30 | r26 | r17 | XX |
| Western states, including secondary | | r1,125 | r1,156 | 1,208 | 973 | XX |
| Total | | XX | XX | XX | XX | 1,060 |
| Cobalt metal including alloys: Western states | | 475 | 656 | 733 | [2]1,303 | [2]975 |
| Copper: | | | | | | |
| Mine output, Cu content: | | | | | | |
| Eastern states | | r11,112 | r9,019 | r7,906 | r3,564 | — |
| Western states (recoverable) | | r1,378 | r671 | r122 | r3 | — |
| Total | | XX | XX | XX | XX | — |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary: | | | | | | |
| Eastern states[e] | | r23,300 | r22,700 | r20,100 | r14,000 | — |
| Western states | | r168,900 | r162,500 | r176,900 | r183,600 | 171,900 |
| Secondary: Western states | | r38,800 | r59,000 | r79,000 | r70,000 | e70,000 |
| Total smelter | | XX | XX | XX | XX | e241,900 |
| Refined: Primary including secondary: | | | | | | |
| Eastern states | | r95,000 | r95,100 | r93,600 | r56,700 | NA |
| Western states | | 399,900 | 426,400 | 475,100 | 476,200 | NA |
| Total refined | | XX | XX | XX | XX | 521,500 |
| Gold, mine output, Au content: | | | | | | |
| Eastern states | kilograms | 1,952 | e2,000 | 2,047 | 1,751 | — |
| Western states[e] | do. | 26 | 16 | 16 | 18 | 10 |
| Total | | XX | XX | XX | XX | 10 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Iron and steel: | | | | | | |
| Ore and concentrate: Western states: | | | | | | |
| Gross weight | | 247,273 | 70,186 | r101,555 | r83,473 | 120,300 |
| Fe content | | 68,000 | r9,800 | 14,200 | r11,686 | 16,800 |
| Metal: | | | | | | |
| Pig iron: | | | | | | |
| Eastern states | | 2,755,000 | 2,786,000 | r2,732,000 | r2,163,000 | 1,111,000 |
| Western states | | r28,116,000 | r31,890,000 | r32,112,000 | r29,585,000 | 29,497,000 |
| Total | | XX | XX | XX | XX | 30,608,000 |
| Ferroalloys: | | | | | | |
| Eastern states | | 127,000 | 131,000 | 130,000 | 125,000 | 54,000 |
| Western states (includes speigeleisen, unspecified crude iron, and blast furnace ferromanganese with 2% or more carbon) | | 368,000 | 481,000 | 536,000 | r704,000 | e587,000 |
| Steel, crude: | | | | | | |
| Eastern states | | 8,243,000 | 8,131,000 | 7,829,000 | r5,546,000 | 3,027,000 |
| Western states | | 36,248,000 | 41,023,000 | 41,073,000 | 38,435,000 | 39,142,000 |
| Total | | XX | XX | XX | XX | 42,169,000 |
| Semimanufactures: | | | | | | |
| Eastern states | | 5,887,000 | 5,708,000 | e5,600,000 | e4,000,000 | 3,442,000 |
| Western states | | 27,437,000 | 30,385,000 | r31,702,000 | r29,729,000 | 29,299,000 |
| Total | | XX | XX | XX | XX | 32,741,000 |
| Lead: | | | | | | |
| Mine output, Pb content, recoverable: | | | | | | |
| Western states | | 18,844 | r14,352 | r7,420 | r7,146 | 6,900 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Eastern states[e] | | 18,000 | 20,000 | 20,000 | 15,000 | 10,000 |
| Western states | | 167,600 | 176,600 | 170,200 | 162,100 | 160,800 |
| Total | | XX | XX | XX | XX | 170,800 |
| Refined: | | | | | | |
| Primary: Western states | | 167,600 | 176,600 | r170,200 | r162,100 | 160,800 |
| Secondary: Western states | | 172,800 | 168,500 | r179,700 | r186,700 | 201,700 |
| Undifferentiated: Eastern states | | r62,100 | r39,600 | r40,100 | 45,500 | XX |
| Total | | XX | XX | XX | XX | 362,500 |
| Nickel: | | | | | | |
| Mine output, Ni content: Eastern states | | r1,689 | r1,367 | r1,476 | r872 | — |
| Metal, refined: Eastern states | | r2,696 | r2,379 | r2,271 | r1,657 | 850 |
| Platinum-group metals: | | | | | | |
| Mine output, metal content: Eastern states | kilograms | 2,702 | e2,600 | 2,592 | 2,023 | e1,100 |
| Metal, refined: Western states[e] | do. | 62,000 | 68,000 | 68,000 | 65,000 | 65,000 |
| Selenium metal: Eastern states[e] | | 25 | 25 | 25 | 15 | — |
| Silver: | | | | | | |
| Mine output, Ag content: | | | | | | |
| Eastern states | kilograms | 41,057 | 62,000 | 53,000 | 35,000 | — |
| Western states | do. | 30,900 | r14,672 | r6,173 | r5,633 | 4,477 |
| Total | do. | XX | XX | XX | XX | 4,477 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Silver—Continued: | | | | | | |
| Metal, refined: | | | | | | |
| Eastern states | kilograms | 242,000 | e200,000 | 172,000 | 175,000 | e100,000 |
| Western states[e] | do. | 684,000 | 622,000 | 600,000 | 600,000 | 600,000 |
| Total | do. | XX | XX | XX | XX | e700,000 |
| Tin: | | | | | | |
| Mine output, Sn content: Eastern states | | r2,391 | r2,474 | r2,413 | r1,806 | 118 |
| Metal: Primary including secondary: | | | | | | |
| Eastern states | | r3,214 | r3,322 | r3,470 | r2,862 | XX |
| Western states | | r200 | r100 | 300 | r400 | XX |
| Total | | XX | XX | XX | XX | 700 |
| Uranium concentrate, $U_3O_8$ content: | | | | | | |
| Eastern states | | e5,000 | e5,000 | 4,481 | 3,505 | — |
| Western states | | 62 | 45 | 57 | 11 | 10 |
| Total | | XX | XX | XX | XX | 10 |
| Zinc: | | | | | | |
| Mine output, Zn content: Western states: | | | | | | |
| Analytic content | | 98,900 | 75,625 | 63,900 | r58,200 | 54,000 |
| Recoverable content | | 80,542 | 61,619 | r53,754 | r49,141 | 45,600 |
| Metal: | | | | | | |
| Eastern states | | r21,100 | r20,000 | 18,500 | r12,700 | XX |
| Western states (including secondary) | | r380,100 | r356,300 | r353,500 | 337,600 | XX |
| Total | | XX | XX | XX | XX | 345,700 |
| INDUSTRIAL MINERALS | | | | | | |
| Abrasives: | | | | | | |
| Natural: Pumice: Western states | | 580,000 | 265,000 | 330,000 | 318,000 | 366,000 |
| Artificial corundum: Western states[3] | | 84,576 | 88,253 | 91,806 | 87,374 | 68,542 |
| Barite, marketable: | | | | | | |
| Eastern states (contained $BaSO_4$) | | r87,400 | r92,100 | r89,400 | r25,000 | 16,472 |
| Western states | | 173,356 | 165,317 | 144,106 | 147,776 | 147,219 |
| Total | | XX | XX | XX | XX | 163,691 |
| Boron materials: Processed borax, $Na_2B_4O_7\ 10H_2O$ content: Eastern states[e] | | 4,000 | 4,000 | 4,000 | 4,000 | 3,000 |
| Bromine: Western states | | e2,500 | r2,000 | r2,000 | r1,500 | e1,500 |
| Cement: | | | | | | |
| Clinker: Western states (intended for market) | | 872,000 | 948,000 | 1,300,000 | 1,310,000 | 1,052,000 |
| Hydraulic: | | | | | | |
| Eastern states | | r12,432,000 | r12,516,000 | r12,264,000 | r7,228,000 | 2,476,000 |
| Western states | | r25,270,000 | 26,215,000 | 28,499,000 | 30,456,000 | 31,920,000 |
| Total | | XX | XX | XX | XX | 34,396,000 |
| Chalk, crude including ground: | | | | | | |
| Eastern states | | r344,000 | r365,000 | r370,000 | r e300,000 | e200,000 |
| Western states | | 324,000 | 370,000 | 421,000 | 412,000 | e400,000 |
| Total | | XX | XX | XX | XX | e600,000 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays: | | | | | |
| Bentonite: Western states[2] | 167,000 | 197,000 | 200,000 | 223,000 | 224,000 |
| Bleaching and Fuller's earth: Western states[2] | 677,000 | 670,000 | 636,000 | 653,000 | 708,000 |
| Ceramic clay: | | | | | |
| Eastern states | 268,100 | 264,100 | 345,000 | e300,000 | e200,000 |
| Western states | 2,137,000 | 2,543,000 | 2,707,000 | 3,037,000 | e2,798,000 |
| Total | XX | XX | XX | XX | e2,998,000 |
| Fire clay: | | | | | |
| Eastern states | 758,000 | 787,000 | 766,000 | e400,000 | 71,000 |
| Western states | r1,058,000 | r993,000 | r1,058,000 | r1,110,000 | 1,013,000 |
| Total | XX | XX | XX | XX | 1,084,000 |
| Kaolin, marketable: | | | | | |
| Eastern states | r e310,000 | r e300,000 | r e308,000 | r e200,000 | 41,000 |
| Western states | 587,900 | 672,520 | 738,000 | 684,000 | 557,000 |
| Total | XX | XX | XX | XX | 598,000 |
| Unspecified and other: | | | | | |
| Eastern states | 601,300 | 670,000 | 621,000 | e400,000 | 190,000 |
| Western states | 488,000 | 505,000 | 569,000 | 533,000 | 571,000 |
| Total | XX | XX | XX | XX | 761,000 |
| Diatomite: | | | | | |
| Eastern states | 12,000 | 11,000 | 11,000 | e5,000 | — |
| Western states | 47,206 | 47,184 | 46,800 | 49,800 | 44,309 |
| Total | XX | XX | XX | XX | 44,309 |
| Feldspar: | | | | | |
| Eastern states: | | | | | |
| Feldspar sand | 68,000 | 66,000 | 74,000 | e70,000 | e65,000 |
| Feldspar stone | 12,000 | 12,000 | 10,000 | e10,000 | e10,000 |
| Western states: Marketable including byproduct | 310,447 | 308,776 | r332,638 | r337,572 | 328,788 |
| Fluorspar: | | | | | |
| Eastern states | r290,500 | r280,100 | r244,900 | r120,000 | e80,000 |
| Western states: | | | | | |
| Acid-grade | 76,681 | 69,940 | 67,050 | e75,600 | e65,000 |
| Metallurgical-grade | 8,520 | 7,770 | 7,450 | e9,400 | e7,000 |
| Total | XX | XX | XX | XX | e152,000 |
| Graphite: Western states: | | | | | |
| Crude | 17,255 | 15,769 | r e15,800 | r e15,800 | 15,807 |
| Marketable[4] | 9,891 | 9,666 | r10,584 | r10,437 | 10,400 |
| Gypsum and anhydrite, marketable: | | | | | |
| Eastern states | r2,608,000 | r2,748,000 | r2,678,000 | r e2,300,000 | e1,750,000 |
| Western states | r2,218,000 | r2,317,000 | r2,201,000 | r2,172,000 | 2,461,000 |
| Total | XX | XX | XX | XX | e4,211,000 |
| Lime, quicklime, dead-burned dolomite: | | | | | |
| Eastern states | r3,085,000 | r3,329,000 | r3,407,000 | e3,000,000 | 599,000 |
| Western states | 6,111,000 | 6,801,000 | 7,033,000 | 6,893,000 | 6,933,000 |
| Total | XX | XX | XX | XX | 7,532,000 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | |
| Magnesium salts (byproduct of potash mining): | | | | | |
| Eastern states | e825,000 | e835,000 | e775,000 | e585,000 | 348,000 |
| Western states | 1,060,000 | 1,099,000 | 1,101,000 | 1,122,000 | 1,194,000 |
| Nitrogen: N content of ammonia: | | | | | |
| Eastern states | 1,176,000 | 1,156,000 | r1,200,000 | r e700,000 | 573,084 |
| Western states | 1,930,926 | 1,824,416 | 1,732,117 | 1,671,444 | 1,550,247 |
| Total | XX | XX | XX | XX | 2,123,331 |
| Phosphate materials: | | | | | |
| Phosphatic fertilizers, $P_2O_5$ content: | | | | | |
| Eastern states | 291,000 | r299,000 | r287,000 | r54,000 | e50,000 |
| Western states | 361,000 | 339,000 | 253,000 | 240,000 | e240,000 |
| Thomas slag: Western states: | | | | | |
| Gross weight | 229,000 | 104,000 | 122,000 | 128,000 | 127,000 |
| $P_2O_5$ content | r34,000 | r15,000 | r18,000 | r19,000 | 19,000 |
| Pigments, mineral, natural: Western states | r11,283 | 8,143 | 7,596 | r6,218 | 7,043 |
| Potash: | | | | | |
| Crude, gross weight: | | | | | |
| Eastern states | 34,925,000 | 35,251,000 | 32,783,247 | e24,700,000 | 14,730,700 |
| Western states | 25,795,000 | 27,030,000 | 26,002,000 | 26,105,200 | 26,591,000 |
| Total | XX | XX | XX | XX | 41,321,700 |
| Crude, $K_2O$ content: | | | | | |
| Eastern states | 4,222,000 | 4,203,000 | 3,852,484 | e2,900,000 | 1,887,400 |
| Western states | 2,773,000 | 2,869,000 | 2,752,000 | 2,723,000 | 2,786,000 |
| Total | XX | XX | XX | XX | 4,673,400 |
| Marketable, $K_2O$ content: | | | | | |
| Eastern states | 3,510,000 | 3,510,000 | r3,199,000 | r2,653,000 | 1,634,400 |
| Western states | 2,199,000 | 2,290,000 | 2,182,000 | r2,216,000 | 2,221,000 |
| Total | XX | XX | XX | XX | 3,855,400 |
| Pyrite, marketable concentrate, gross weight: | | | | | |
| Eastern states | e185,000 | e240,000 | 230,000 | e135,000 | e100,000 |
| Western states | 412,270 | 313,148 | 342,051 | r301,778 | 219,200 |
| Salt, marketable: | | | | | |
| Marine: | | | | | |
| Eastern states | r1,964,000 | r2,032,000 | r2,079,000 | r e2,000,000 | e1,500,000 |
| Western states | r913,000 | r946,000 | r941,000 | r785,000 | 778,000 |
| Rock and other: | | | | | |
| Eastern states | r3,028,000 | r3,253,000 | r3,143,634 | e2,450,000 | e2,000,000 |
| Western states | r12,651,544 | r11,630,475 | r10,997,147 | r10,808,186 | 11,747,212 |
| Total | XX | XX | XX | XX | e16,025,212 |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured: | | | | | |
| Eastern states | 893,000 | 914,000 | r e800,000 | r e700,000 | e575,000 |
| Western states | 1,447,633 | 1,404,268 | 1,443,129 | 1,435,766 | 1,373,496 |
| Total | XX | XX | XX | XX | e1,948,496 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | |
| Sodium compounds, n.e.s.—Continued: | | | | | |
| Sulfate, manufactured: | | | | | |
| Eastern states | 179,000 | 180,000 | e175,000 | e170,000 | e150,000 |
| Western states | 163,974 | 175,067 | 172,178 | 167,120 | 138,943 |
| Total | XX | XX | XX | XX | e288,943 |
| Stone, sand and gravel: | | | | | |
| Stone: | | | | | |
| Dimension, crude and partly worked: | | | | | |
| Western states[3] | 145,946 | 161,379 | 170,761 | 188,776 | 176,691 |
| Dolomite: | | | | | |
| Eastern states | 710,000 | 596,000 | 612,000 | e450,000 | e300,000 |
| Western states | 969,000 | 1,031,000 | 848,000 | 934,000 | 1,033,000 |
| Limestone, industrial: | | | | | |
| Eastern states | 25,754,000 | 24,840,000 | 24,423,000 | e15,000,000 | 6,409,000 |
| Western states | 41,059,000 | 44,402,000 | 48,075,000 | 48,716,000 | 51,697,000 |
| Quartz and quartzite: | | | | | |
| Eastern states | 38,000 | 41,300 | 46,000 | e15,000 | — |
| Western states | 290,000 | 297,000 | 300,000 | 283,000 | 26,000 |
| Slate: | | | | | |
| Eastern states | 103,100 | 98,000 | 98,000 | e75,000 | e50,000 |
| Western states | 22,077 | 26,825 | 20,588 | 11,638 | 14,623 |
| Sand and gravel: | | | | | |
| Building sand and gravel: | | | | | |
| Eastern states | r97,811,200 | r109,732,500 | r97,034,000 | r e50,000,000 | 25,687,000 |
| Western states | r137,366,000 | r146,622,000 | r158,587,000 | r159,443,000 | 163,397,000 |
| Gravel including terrazzo splits: | | | | | |
| Eastern states | 23,628,200 | 24,399,200 | 24,496,000 | e22,000,000 | 20,133,000 |
| Western states | 127,476,000 | 132,351,000 | 129,778,000 | 128,176,000 | 131,804,000 |
| Sand: | | | | | |
| Foundry: | | | | | |
| Eastern states | 1,959,000 | 2,302,000 | 2,156,000 | e1,100,000 | e500,000 |
| Western states | e3,250,000 | e3,500,000 | 3,406,000 | 2,915,000 | 2,846,000 |
| Industrial (glass): | | | | | |
| Eastern states | 1,146,000 | 1,190,000 | 1,196,000 | e750,000 | 594,000 |
| Western states | 6,128,000 | 5,793,000 | 6,018,000 | 6,129,000 | 6,707,000 |
| Sulfur: | | | | | |
| Pyrites, S content: | | | | | |
| Eastern states | 27,000 | 35,000 | 34,000 | 20,000 | 15,000 |
| Western states[e] | 180,000 | 140,000 | 150,000 | 130,000 | 95,000 |
| Byproduct: | | | | | |
| Eastern states | e315,000 | e315,000 | e300,000 | e260,000 | 83,968 |
| Western states | r1,248,063 | r1,193,335 | r1,186,665 | r1,140,335 | 1,102,628 |
| Of which from natural gas | 1,029,148 | 952,283 | r946,854 | r858,056 | 905,300 |
| Total | XX | XX | XX | XX | 1,186,596 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Sulfur—Continued: | | | | | | |
| Sulfuric acid: | | | | | | |
| Eastern states | | 867,000 | 799,000 | r832,000 | r e200,000 | 110,679 |
| Western states | | 3,331,267 | 3,317,927 | 3,297,671 | 3,230,614 | 2,961,842 |
| Total | | XX | XX | XX | XX | 3,072,521 |
| Talc and steatite: Western states | | 20,013 | 19,525 | r20,520 | r21,378 | e21,500 |
| Other: Eastern states | | 5,460,000 | 5,338,300 | 6,110,000 | e4,000,000 | e2,500,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon black: Western states[3] | | 361,982 | 379,999 | 401,853 | 394,365 | 379,561 |
| Coal: | | | | | | |
| Anthracite and bituminous, marketable: | | | | | | |
| Western states | | 76,300,250 | 73,303,643 | 71,428,367 | 70,158,527 | 66,438,000 |
| Lignite: | | | | | | |
| Eastern states | | 308,976,000 | 310,314,000 | r300,789,912 | r249,000,000 | 167,727,000 |
| Western states | | r108,863,100 | r108,630,705 | r109,912,974 | r107,599,595 | 111,676,000 |
| Total | | XX | XX | XX | XX | 279,403,000 |
| Coke: | | | | | | |
| Of anthracite and bituminous coal: | | | | | | |
| Eastern states | | 1,256,000 | 1,251,000 | 1,223,000 | 1,100,000 | 82,000 |
| Western states | | 19,674,000 | 18,274,000 | 18,384,000 | 17,580,000 | 15,790,000 |
| Total | | XX | XX | XX | XX | 15,872,000 |
| Of lignite: | | | | | | |
| Eastern states | | r5,229,000 | r5,448,000 | r5,216,000 | r e4,100,000 | 665,000 |
| Western states | | 140,000 | 138,000 | 135,100 | 174,000 | 197,000 |
| Total | | XX | XX | XX | XX | 862,000 |
| Fuel briquets: | | | | | | |
| Of anthracite and bituminous coal: Western states | | 1,001,000 | 825,000 | 723,000 | 756,000 | 860,000 |
| Of lignite: | | | | | | |
| Eastern states | | 49,514,000 | 49,727,000 | 47,236,276 | e47,000,000 | 18,188,000 |
| Western states | | 3,188,000 | 2,526,000 | r2,158,000 | 2,397,000 | 2,861,000 |
| Total | | XX | XX | XX | XX | 21,049,000 |
| Gas: | | | | | | |
| Manufactured: | | | | | | |
| Eastern states | million cubic meters | 8,104 | 7,485 | e7,450 | e7,000 | e1,000 |
| Western states: | | | | | | |
| Blast furnace | do. | 4,365 | 5,007 | 5,231 | r e4,730 | e4,720 |
| Coke oven | do. | 4,723 | 4,392 | 4,455 | r e4,250 | e3,800 |
| Natural: | | | | | | |
| Gross: | | | | | | |
| Eastern states | do. | 13,075 | 11,936 | 10,262 | 8,900 | XX |
| Western states | do. | r17,685 | r16,511 | r16,388 | r16,016 | XX |
| Total | do. | XX | XX | XX | XX | 21,366 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Gas—Continued: | | | | | | |
| Natural—Continued: | | | | | | |
| Marketed: | | | | | | |
| Eastern states | million cubic meters | r e9,900 | r e9,000 | r e7,750 | 6,713 | XX |
| Western states | do. | 15,948 | 14,832 | 14,716 | 14,711 | XX |
| Total | do. | XX | XX | XX | XX | 19,998 |
| Peat: Western states:[3] | | | | | | |
| Agricultural use | | r2,418,000 | r2,668,000 | r2,836,000 | r2,983,000 | 2,876,000 |
| Fuel use | | 240,370 | 231,509 | 232,275 | r237,787 | e225,000 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| Eastern states | thousand 42-gallon barrels | r310 | r305 | r355 | r295 | 737 |
| Western states | do. | 27,447 | 28,437 | 27,231 | 26,046 | 24,450 |
| Total | do. | XX | XX | XX | XX | 25,187 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas: | | | | | | |
| Eastern states | do. | 3,016 | 3,341 | 3,271 | 3,016 | 2,648 |
| Western states (sales) | do. | 29,032 | 33,848 | 31,046 | 28,894 | 29,782 |
| Total | do. | XX | XX | XX | XX | 32,430 |
| Gasoline including aviation: | | | | | | |
| Eastern states | do. | r39,780 | r40,494 | r41,616 | r39,950 | 22,863 |
| Western states | do. | 160,072 | 167,613 | 173,505 | 172,806 | 176,190 |
| Total | do. | XX | XX | XX | XX | 199,053 |
| Naphtha: | | | | | | |
| Eastern states (sales) | do. | NA | NA | NA | NA | 6,659 |
| Western states | do. | 56,329 | 63,742 | 62,887 | 63,998 | 55,948 |
| Total | do. | XX | XX | XX | XX | 62,607 |
| Mineral jelly and wax: | | | | | | |
| Eastern states (sales) | do. | e800 | e800 | e750 | e700 | 626 |
| Western states (sales) | do. | 3,280 | 3,618 | 3,820 | 3,829 | 2,436 |
| Total | do. | XX | XX | XX | XX | 3,062 |
| Kerosene and jet fuel: | | | | | | |
| Eastern states (kerosene only 1987-90) | do. | 101 | 93 | 93 | e85 | 1,625 |
| Western states (sales) | do. | 15,295 | 14,600 | 15,783 | 18,785 | 16,603 |
| Total | do. | XX | XX | XX | XX | 18,228 |
| Distillate fuel oil: | | | | | | |
| Eastern states | do. | 47,505 | 46,916 | 47,856 | e46,250 | 41,226 |
| Western states | do. | r240,055 | r256,099 | r240,549 | r252,629 | 267,178 |
| Total | do. | XX | XX | XX | XX | 308,404 |
| Lubricants: | | | | | | |
| Eastern states | do. | r3,367 | r3,542 | r3,507 | r3,430 | 568 |
| Western states | do. | r3,892 | r4,210 | r4,343 | r4,673 | 4,292 |
| Total | do. | XX | XX | XX | XX | 4,860 |

See footnotes at end of table.

TABLE 1—Continued

## GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum—Continued: | | | | | | |
| Refinery products—Continued: | | | | | | |
| Nonlubricating oils: | | | | | | |
| Eastern states | thousand 42-gallon barrels | e200 | e200 | e200 | e150 | 106 |
| Western states | do. | 5,540 | 5,739 | 5,805 | 7,842 | 7,137 |
| Total | do. | XX | XX | XX | XX | 7,243 |
| Residual fuel oil: | | | | | | |
| Eastern states | do. | r35,265 | r30,336 | r27,672 | r e19,980 | 12,979 |
| Western states | do. | r70,039 | r66,997 | r56,068 | r58,048 | 62,922 |
| Total | do. | XX | XX | XX | XX | 75,900 |
| Bitumen and other residues: | | | | | | |
| Eastern states | do. | 4,254 | 4,509 | 4,606 | e4,400 | e2,250 |
| Western states | do. | 16,259 | 16,257 | 16,930 | r17,232 | 19,797 |
| Total | do. | XX | XX | XX | XX | e22,047 |
| Bituminous mixtures: | | | | | | |
| Eastern states | do. | e330 | e330 | e330 | e300 | 296 |
| Western states | do. | 773 | 840 | 872 | 918 | 1,121 |
| Total | do. | XX | XX | XX | XX | 1,417 |
| Petroleum coke: Western states | do. | 6,739 | 7,581 | 7,961 | 8,245 | 8,661 |
| Unspecified: Western states[3] | do. | 17,648 | 18,313 | 15,159 | 19,075 | 20,196 |
| Total: | | | | | | |
| Eastern states | do. | r e134,618 | r e130,561 | r e129,901 | r e118,261 | 91,846 |
| Western states | do. | r624,953 | r659,457 | r634,728 | r656,974 | 672,263 |
| Total | do. | XX | XX | XX | XX | 764,109 |

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Table contains data available through Oct. 31, 1992. Data for the Eastern states of Germany have been revised to reflect information that has become available since the unification of the Germanys; however, all the categories of materials might not be entirely compatible with the definitions used for the Western states. Further refinement of the data will be made in the future as definitions of categories become available.

[2]Intended for sale.

[3]Production in Eastern states has historically been confidential; no basis exists for reliable estimation.

[4]Includes production from imported raw materials.

TABLE 2

## GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Alumina | VAW Aluminium AG | Plant at Schwandorf | 430. |
| Do. | Aluminium Oxid Stade GmbH | Plant at Stade | 700. |
| Do. | Martinswerke GmbH | Plant at Bergheim | 350. |
| Aluminum | VAW Aluminium AG | Smelters: Innwerke at Töging, Elbewerk at Stade, Rheinwerke at Neuss, Lippenwerke at Lünen (secondary) | 367. |
| Do. | Leichtmetall-Gesellschaft mbH | Smelter at Essen-Borbeck | 136. |
| Do. | Hamburger Aluminium-Werke GmbH | Smelter at Hamburg | 120. |
| Cement | 35 companies, the major ones are: | 65 plants including: | 35,000. |
| Do. | Heidelberger Zement AG | Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kiefersfelden, et al. | (9,000). |
| Do. | Dyckerhoff AG | Plants at Amoneburg, Gollheim, Neuwied, Neubeckum, et al. | (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: | | | |
| Anthracite and bituminous | Four companies, of which the major ones are— | About 27 mines, including— | 75,000 including— |
| Do. | Ruhrkohle AG | 17 mines in Ruhr region | (54,000). |
| Do. | Saarbergwerke AG | 5 mines in Saar Basin | (11,000). |
| Do. | Preussag-Anthrazit GmbH | Mine at Ibbenburen | (2,500). |
| Do. | Eschweiler Bergwerks | Mine in Aachen Basin | (2,500). |
| Copper | Norddeutsche Affinerie AG | Smelter and refinery, both at Hamburg | 200.<br>290. |
| Do. | Huttenwerke Kayser AG | Smelter and refinery, both at Lünen | 105.<br>115. |
| Lead: | | | |
| Mine | Sachtleben Bergbau GmbH | Meggen Mine at Lennestadt | 3. |
| Do. | Preussag AG Metall | Mine at Bad Grund | 5. |
| Metal | Metaleurop Weser Blei GmbH | Smelter and refinery at Nordenham | 90.<br>120. |
| Do. | Berzelius Metallhutten GmbH | QSL smelter at Duisburg | 75. |
| Do. | do. | Refinery at Binsfeldhammer | 120. |
| Do. | Norddeutsche Affinerie AG | Refinery at Hamburg | 50. |
| Lignite | Rheinische Braunkohlenwerke AG (Rheinbraun) | Surface mines in Rhein Basin: Garzweiler, Fortuna/Bergheim, Zukunft/Inden, and Hambach | 150,000. |
| Do. | Brauschweigische Kohlen-Bergwerke AG | Surface mines in Helmsted Basin: Alversdorf, Helmstedt, Schoningen, Offledben, and Buschhaus | 4,500. |
| Do. | LAUBAG (Lausitzer Braunkohle AG) | Surface mines in Lausitz Basin: Cottbus, Glückauf, Oberlausitz, Senftenburg, and Welzow | 180,000. |
| Do. | MIBRAG (Vereinigte Mitteldeutsche Braunkohlenwerke AG) | Surface mines in Bitterfeld Basin: Borna, Deuben, Geiseltal, and Regis | 100,000. |
| Natural gas million cubic meters | Brigitta Erdgas and Erdöl GmbH, and Elwerath Erdgas und Erdöl GmbH | Plants at Clenze and Grossenkneten | 9,500. |
| Do. do. | Mobil Erdgas-Erdöl GmbH | Plants at Scholen | 4,000. |
| Do. do. | Other companies | Plants at Duste, Rutenbrock, and others | 2,000. |

TABLE 2—Continued

## GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|---|
| Petroleum: | | | | |
| Crude | 42-gallon barrels per day | The largest companies are— | 6 areas with about 85 oilfields | 80,000 including— |
| Do. | do. | Elwerath Erdgas und Erdöl GmbH | West of Ems River | (30,000). |
| Do. | do. | Wintershall AG | Weser-Ems Rivers | (21,000). |
| Do. | do. | Deutsche Texaco AG | Elbe-Weser Rivers | (20,000). |
| Refined | do. | About 25 companies, of which the largest are— | About 30 refineries | 2,175,000 including— |
| Do. | do. | Deutsche Shell AG | Refineries at Godorf, Hamburg, and Grasbrook | (295,000). |
| Do. | do. | Esso AG | Refineries at Karlsruhe and Ingolstadt | (245,000). |
| Do. | do. | Ruhr Oel GmbH | Refinery at Gelsenkirchen | (210,000). |
| Do. | do. | OMW AG | Refinery at Karlsruhe | 150. |
| Potash | | Kali und Salz AG | Mines at Bergmannssegen-Hugo, Niedersachsen-Riedel, Salzdetfurth, Sigmundshall, Hattorf, Neuhof-Ellers, and Wintershall | 2,300 ($K_2O$). |
| Do. | | MDK (Mitteldeutsche Kali AG Sondershausen) | 10 mines mostly in the state of Thuringen | 3,500. |
| Salt (rock) | | Kali und Salz AG | Mines at Bad Friedrichshall-Kochendorf, Braunschweig-Luneburg, Heilbronn, Riedel, Stetten, and Wesel (Borth) | 15,000. |
| Steel | | Major companies include— | About 25 plants | 45,000 including— |
| Do. | | Thyssen Stahl AG | Plants at Krefeld, Duisburg, Hattungen, Krefeld, Oberhausen, and Written | (13,000). |
| Do. | | Stahlwerke Peine-Salzgitter AG | Plants at Peine and Salzgitter | (4,500). |
| Do. | | Krupp Stahl AG | Plants at Bochum and Rheinhausen | (4,500). |
| Do. | | Hoesch AG | Plants at Dortmund | (4,500). |
| Do. | | Klockner-Werke AG | Plants at Bremen and Osnabruck | (4,200). |
| Zinc | | Ruhr-Zink GmbH | Refinery at Datteln | 200. |
| Do. | | Berzellius Metallhutten GmbH | Imperial smelter and fire refinery at Duisburg | 100. |
| Do. | | Metaleurop Weser Zink GmbH | Refinery at Nordenham | 130. |

TABLE 3

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: | | | | |
| Ore and concentrate | 60,982 | 86,019 | — | Sweden 32,525; Belgium-Luxembourg 15,153; France 9,157. |
| Oxides and hydroxides | 522,075 | 531,314 | 30,702 | Austria 115,880; Italy 89,144; Belgium-Luxembourg 36,606. |
| Ash and residue containing aluminum | 25,656 | 25,393 | — | France 5,832; Spain 5,712; Netherlands 5,027. |
| Metal including alloys: | | | | |
| Scrap | 164,157 | 198,959 | 8 | Netherlands 53,085; Italy 49,518; France 39,768. |
| Unwrought | 324,968 | 295,309 | 311 | Austria 64,361; France 58,080; Italy 42,728. |
| Semimanufactures | 658,837 | 639,768 | 29,634 | United Kingdom 104,758; France 101,404; Italy 59,260. |
| Antimony: | | | | |
| Ore and concentrate | 605 | 78 | — | Austria 76; Iran 2. |
| Oxides and hydroxides | 689 | 675 | 91 | Switzerland 194; Netherlands 42. |
| Metal including alloys, all forms | 288 | 76 | 2 | Belgium-Luxembourg 19; France 18; Italy 15. |
| Arsenic: | | | | |
| Oxides and acids | 345 | 344 | — | United Kingdom 287; Belgium-Luxembourg 17. |
| Metal including alloys, all forms | 2 | 2 | 2 | |
| Beryllium: Metal including alloys, all forms kilograms | 902 | 584 | — | Greece 348; Netherlands 179. |
| Bismuth: Metal including alloys, all forms | 168 | 75 | (2) | United Kingdom 57; Austria 3; Netherlands 2. |
| Cadmium: Metal including alloys, semimanufactures | 5 | 5 | (2) | Iran 1; Israel 1; Portugal 1. |
| Chromium: | | | | |
| Ore and concentrate | 16,237 | 13,466 | 11 | Austria 3,225; France 2,917; Netherlands 1,459. |
| Metal including alloys, all forms | 363 | 1,183 | 36 | France 622; Belgium-Luxembourg 258; United Kingdom 89. |
| Cobalt: | | | | |
| Oxides and hydroxides | 50 | 63 | 1 | Spain 24; Italy 13; Austria 10. |
| Ash and residue containing cobalt | 536 | 804 | — | Belgium-Luxembourg 416; United Kingdom 151; Canada 103. |
| Metal including alloys, all forms | 1,075 | 1,364 | 181 | France 115; Austria 34; unspecified 1,077. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 157 | 364 | 243 | China 105; Belgium-Luxembourg 14. |
| Ash and residue containing columbium and/or tantalum | 974 | 576 | 576 | |
| Metal including alloys, all forms: | | | | |
| Columbium including rhenium | 8 | 13 | 1 | Switzerland 4; France 3. |
| Tantalum | 130 | 93 | 19 | United Kingdom 19; Austria 15. |
| Copper: | | | | |
| Ore and concentrate | 149 | 130 | — | Italy 120; Netherlands 10. |
| Matte and speiss including cement copper | 1,644 | 1,568 | — | Belgium-Luxembourg 1,511; Netherlands 54. |
| Oxides and hydroxides | 1,684 | 2,426 | — | Denmark 768; Netherlands 291; United Kingdom 274. |
| Sulfate | 2,895 | 2,764 | 16 | Netherlands 2,156; Belgium-Luxembourg 146. |
| Ash and residue containing copper | 13,915 | 24,365 | — | Sweden 10,829; Belgium-Luxembourg 4,168; Austria 3,558. |

See footnotes at end of table.

TABLE 3—Continued

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Copper—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 143,471 | 156,553 | 191 | Italy 47,230; Belgium-Luxembourg 34,584; Netherlands 28,605. |
| Unwrought | 58,728 | 67,072 | 133 | Netherlands 15,585; Belgium-Luxembourg 11,277; France 9,310. |
| Semimanufactures | 565,006 | 551,720 | 27,358 | Italy 78,017; France 74,172; Austria 56,058. |
| Gallium, indium, thallium: Metals including alloys, all forms | 17 | 15 | 2 | Japan 6; France 5. |
| Germanium: | | | | |
| Oxides | 5 | 5 | 1 | Japan 3; Netherlands 1. |
| Metal including alloys, unwrought and scrap | 3 | 4 | 4 | |
| Gold: | | | | |
| Waste and sweepings | 89 | 108 | 19 | Belgium-Luxembourg 52; Canada 20. |
| Metal including alloys, unwrought and partly wrought | 47 | 45 | — | Italy 7; Switzerland 7; Portugal 6. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 6,853 | 4,469 | — | Austria 2,523; France 799; Belgium-Luxembourg 462. |
| Pyrite, roasted | 29,290 | 18,883 | — | Belgium-Luxembourg 12,178; Switzerland 3,316; France 3,237. |
| Ash and residue containing iron | 3,811,457 | 3,602,355 | — | Netherlands 1,983,588; France 1,380,852. |
| Metal: | | | | |
| Scrap | 4,876,884 | 5,072,703 | 290 | Italy 2,111,288; Netherlands 1,030,558; Belgium-Luxembourg 764,994. |
| Pig iron, cast iron, related materials | 407,074 | 597,651 | 689 | France 443,071; Italy 50,781; Netherlands 25,823. |
| Ferroalloys: | | | | |
| Ferrochromium | 49,250 | 51,889 | 10,605 | France 6,288; Sweden 4,774; unspecified 15,996. |
| Ferrocolumbium | 913 | 591 | 18 | France 163; Belgium-Luxembourg 134; Italy 115. |
| Ferromanganese | 95,147 | 78,449 | 20,556 | France 15,972; Austria 10,372. |
| Ferromolybdenum | 261 | 396 | — | Belgium-Luxembourg 134; France 57; China 34. |
| Ferronickel | 306 | 1,114 | — | Sweden 733; Belgium-Luxembourg 174; France 59. |
| Ferrophosphorus | 6,342 | 6,589 | — | France 2,335; United Kingdom 2,140; Italy 584. |
| Ferrosilicochromium | 4,230 | 4,336 | — | Belgium-Luxembourg 2,060; Sweden 1,073; Italy 891. |
| Ferrosilicomanganese | 7,156 | 7,775 | — | France 2,604; Belgium-Luxembourg 2,477; Netherlands 1,149. |
| Ferrosilicon | 70,417 | 64,644 | 588 | Belgium-Luxembourg 18,518; France 13,395; Italy 4,075. |
| Ferrotitanium | 1,311 | 1,011 | — | Sweden 681; Italy 96; France 81. |
| Ferrotungsten | 28 | 28 | 1 | France 8; Belgium-Luxembourg 6; Japan 3. |
| Ferrovanadium | 2,672 | 2,497 | 24 | Sweden 589; United Kingdom 310; Italy 294. |
| Silicon metal | 5,910 | 5,740 | 416 | Italy 1,513; Japan 770; Austria 751. |
| Steel, primary forms | 23,277 | 14,605 | 1 | Italy 6,536; Switzerland 2,902; Indonesia 1,500. |
| Semimanufactures, all forms | 16,554,591 | 15,408,869 | 1,277,504 | France 2,130,745; Netherlands 1,630,928; Italy 1,435,682. |

See footnotes at end of table.

TABLE 3—Continued

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Lead: | | | | | |
| Oxides | | 25,170 | 20,069 | 7 | Netherlands 4,479; Sweden 3,269; France 2,370. |
| Ash and residue containing lead | | 2,868 | 4,396 | — | France 2,723; Belgium-Luxembourg 718; United Kingdom 712. |
| Metal including alloys: | | | | | |
| Scrap | | 11,019 | 14,813 | — | Netherlands 11,242; Poland 1,691; Belgium-Luxembourg 517. |
| Unwrought | | 77,279 | 68,563 | 117 | France 17,081; Austria 15,059; Italy 10,256. |
| Semimanufactures | | 20,220 | 17,379 | 195 | Denmark 4,462; France 2,370; Belgium-Luxembourg 2,121. |
| Lithium: | | | | | |
| Carbonate | | 1,819 | 1,685 | — | France 556; United Kingdom 346; Italy 232. |
| Oxides and hydroxides | | 745 | 724 | — | Netherlands 161; United Kingdom 152; France 129. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 3,558 | 1,818 | 85 | United Kingdom 418; Netherlands 364; Italy 319. |
| Unwrought | | 954 | 644 | — | Sweden 271; Italy 161; Austria 64. |
| Semimanufactures | | 252 | 348 | 3 | France 212; Switzerland 25; Netherlands 23. |
| Manganese: | | | | | |
| Ore and concentrate | | 5,978 | 11,066 | — | France 2,601; Netherlands 2,274; Turkey 1,468. |
| Oxides | | 1,250 | 1,567 | 65 | Republic of Korea 578; France 211; United Kingdom 171. |
| Metal including alloys, all forms | | 1,011 | 1,502 | — | Netherlands 821; Bahrain 185; Norway 121. |
| Mercury | | 122 | 76 | 7 | Yugoslavia 8; Switzerland 7. |
| Molybdenum: | | | | | |
| Ore and concentrate, roasted | | 2,057 | 2,499 | 67 | Austria 1,091; Netherlands 593; Belgium-Luxembourg 452. |
| Oxides and hydroxides | | 394 | 493 | 18 | Austria 217; Sweden 171; Denmark 21. |
| Ash and residue containing molybdenum | | 504 | 145 | — | France 131; Austria 7; Belgium-Luxembourg 7. |
| Metal including alloys: | | | | | |
| Scrap | | 889 | 801 | 89 | Austria 147; Japan 144; Sweden 88. |
| Semimanufactures | | 34 | 34 | (2) | Brazil 13; Austria 9; Hungary 4. |
| Nickel: | | | | | |
| Ore and concentrate | | 48 | 12 | — | Denmark 9; Italy 1; Netherlands 1. |
| Matte and speiss | | (2) | 143 | — | Netherlands 140. |
| Oxides and hydroxides | | 68 | 107 | 1 | Belgium-Luxembourg 25; Singapore 22; Spain 16. |
| Ash and residue containing nickel | | 10,052 | 3,010 | — | Austria 832; Canada 663; Netherlands 616. |
| Metal including alloys: | | | | | |
| Scrap | | 8,041 | 9,765 | 1,124 | Sweden 5,355; Belgium-Luxembourg 1,399. |
| Unwrought | | 7,747 | 8,135 | 172 | France 4,510; Netherlands 1,595; Austria 431. |
| Semimanufactures | | 11,564 | 11,485 | 2,600 | France 1,869; United Kingdom 1,566. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | kilograms | 42,588 | 36,682 | — | Belgium-Luxembourg 30,448; United Kingdom 5,740. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | do. | 9,292 | 10,727 | 1,442 | Japan 2,052; Switzerland 1,249. |
| Platinum | do. | 24,798 | 24,642 | 3,625 | Netherlands 7,849; Brazil 1,921. |

See footnotes at end of table.

TABLE 3—Continued

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Platinum-group metals—Continued: | | | | | |
| Metals including alloys, unwrought and partly wrought—Continued: | | | | | |
| Rhodium | kilograms | 384 | 1,015 | 392 | United Kingdom 185; Japan 97; Brazil 53. |
| Iridium, osmium, ruthenium | do. | 684 | 307 | 52 | Japan 87; United Kingdom 58; U.S.S.R. 30. |
| Rare-earth metals: | | | | | |
| Oxides and other compounds | | 210 | 249 | NA | NA. |
| Metals including alloys, all forms | | 12 | 6 | — | France 2; Belgium-Luxembourg 1; Finland 1. |
| Silver: | | | | | |
| Waste and sweepings | | 1,495 | 978 | 37 | United Kingdom 370; Belgium-Luxembourg 358; Netherlands 92. |
| Metal including alloys, unwrought and partly wrought | | 1,638 | 1,576 | — | Spain 202; United Arab Emirates 180; Italy 117. |
| Tin: | | | | | |
| Ash and residue containing tin | | 2,852 | 3,210 | — | United Kingdom 2,980; Ecuador 90. |
| Metal including alloys: | | | | | |
| Scrap | | 369 | 316 | — | Netherlands 209; Switzerland 53; Belgium-Luxembourg 34. |
| Unwrought | | 1,840 | 2,383 | 12 | United Kingdom 554; Sweden 319; Yugoslavia 246. |
| Semimanufactures | | 1,731 | 1,677 | 10 | Austria 339; Italy 227; Switzerland 176. |
| Titanium: | | | | | |
| Ore and concentrate | | 4,847 | 3,116 | — | Hungary 1,451; France 743; Austria 330. |
| Oxides | | 37,200 | 33,074 | 12,002 | Taiwan 4,357; Netherlands 1,695. |
| Metal including alloys: | | | | | |
| Scrap | | 2,691 | 1,142 | 38 | United Kingdom 788; France 91; Belgium-Luxembourg 88. |
| Unwrought | | 144 | 71 | — | Belgium-Luxembourg 45; Netherlands 20. |
| Semimanufactures | | 907 | 1,017 | 108 | Italy 135; France 126. |
| Tungsten: | | | | | |
| Ore and concentrate | | 35 | 26 | — | India 10; Japan 10; Netherlands 6. |
| Oxides and hydroxides | | 3,108 | 1,728 | NA | Bulgaria 70; Austria 61; unspecified 1,555. |
| Ash and residue containing tungsten | | 53 | 198 | — | Austria 197. |
| Metal including alloys: | | | | | |
| Scrap | | 805 | 1,240 | — | Austria 630; Sweden 424; United Kingdom 134. |
| Unwrought | | 422 | 456 | 42 | Netherlands 22; Belgium-Luxembourg 16; unspecified 389. |
| Semimanufactures | | 218 | 199 | 8 | Austria 55; Netherlands 17; France 17. |
| Uranium and thorium: | | | | | |
| Ore and concentrate | | 7,387 | 2,141 | — | All to Czechoslovakia. |
| Oxides and other compounds | | 1,450 | 1,070 | 321 | France 646; United Kingdom 102. |
| Vanadium: | | | | | |
| Oxides and hydroxides | | 155 | 220 | NA | NA. |
| Ash and residue containing vanadium | | 871 | 171 | — | Republic of South Africa 126; Spain 24; Japan 21. |
| Metal including alloys, unwrought | | 408 | 401 | 27 | United Kingdom 260; Japan 58; France 51. |
| Zinc: | | | | | |
| Ore and concentrate | | 73,104 | 31,476 | — | Netherlands 18,488; Belgium-Luxembourg 10,926; France 1,253. |

See footnotes at end of table.

TABLE 3—Continued

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Zinc—Continued: | | | | | |
| Oxides | | 22,152 | 19,451 | 288 | France 3,435; Netherlands 2,144; Austria 1,732. |
| Blue powder | | 9,299 | 7,834 | 47 | Netherlands 1,213; Austria 1,008; Switzerland 901. |
| Ash and residue containing zinc | | 114,387 | 147,108 | 145 | Sweden 36,786; Belgium-Luxembourg 34,467; Poland 23,466. |
| Metal including alloys: | | | | | |
| Scrap | | 29,165 | 26,419 | 78 | Taiwan 14,090; Belgium-Luxembourg 6,400; Netherlands 2,094. |
| Unwrought | | 99,588 | 94,252 | 1,521 | France 34,856; United Kingdom 12,724; Italy 10,639. |
| Semimanufactures | | 21,697 | 24,639 | NA | NA. |
| Zirconium: | | | | | |
| Ore and concentrate | | 5,139 | 2,821 | — | Austria 534; Republic of South Africa 477; Hungary 466. |
| Oxides | | 312 | 272 | 2 | France 110; Italy 68; Belgium-Luxembourg 21. |
| Ash and residue containing zirconium | | 1 | 11 | — | All to Netherlands. |
| Metal including alloys: | | | | | |
| Scrap | | 37 | 46 | — | United Kingdom 24; France 22. |
| Unwrought | | 11 | 33 | — | France 20; Sweden 5; United Kingdom 2. |
| Semimanufactures | | 11 | 18 | 7 | Brazil 5; Belgium-Luxembourg 2. |
| INDUSTRIAL MINERALS | | | | | |
| Asbestos, crude | | 292 | 608 | — | Yugoslavia 293; Spain 104; Austria 59. |
| Barite and witherite | | 34,505 | 36,000 | — | France 12,924; Belgium-Luxembourg 6,494; Netherlands 3,725. |
| Boron materials: | | | | | |
| Crude natural borates | | 1,096 | 121 | — | Yugoslavia 100; Austria 10; Czechoslovakia 5. |
| Oxides and acids | | 47,805 | 53,338 | NA | NA. |
| Cryolite and chiolite | | 88 | 154 | 19 | Italy 114; Pakistan 7. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | carats | 183,107 | 129,391 | 10,402 | Belgium-Luxembourg 29,984; Hong Kong 25,142; Thailand 14,226. |
| Industrial stones | do. | 296,042 | 337,547 | 143,353 | Belgium-Luxembourg 57,217; Greece 29,640. |
| Fluorspar | | 27,207 | 41,232 | — | Austria 19,482; France 8,014; Netherlands 5,016. |
| Graphite, natural | | 12,143 | 8,646 | — | Italy 2,054; France 907; Spain 680. |
| Kyanite and related materials | | 10,929 | 12,919 | — | Italy 2,153; Spain 2,086; France 2,069. |
| Magnesite, crude including oxides | | 72,012 | 68,107 | 376 | France 45,110; Italy 7,269. |
| Phosphates, crude | | 5,089 | 5,039 | — | Switzerland 4,363; Austria 407; Netherlands 160. |
| Vermiculite, perlite, similar materials | | 10,983 | 11,110 | — | Belgium-Luxembourg 5,170; Netherlands 4,116; Switzerland 929. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Coal: Anthracite and bituminous | | 6,093,175 | 5,398,130 | — | France 1,630,988; Belgium-Luxembourg 1,411,651; Italy 887,271. |
| Coke and semicoke | | 4,530,441 | 2,312,650 | 16,599 | Belgium-Luxembourg 1,251,056; France 418,005; Finland 138,398. |

See footnotes at end of table.

TABLE 3—Continued

## FEDERAL REPUBLIC OF GERMANY: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Gas, natural, gaseous | million cubic meters | 1,561 | 1,807 | — | Norway 1,132; Switzerland 470; Denmark 205. |
| Petroleum, crude | 42-gallon barrels | 438 | 95 | -- | All to Netherlands. |

NA Not available.
[1]Table prepared by W. Zajac. Data exclude exports to the German Democratic Republic but include exports from the former German Democratic Republic for July-Dec. 1990.
[2]Less than 1/2 unit.

TABLE 4

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: | | | | |
| Ore and concentrate | 2,879,675 | 3,076,544 | 139 | Australia 1,154,469; Guinea 775,850; Sierra Leone 744,233. |
| Oxides and hydroxides | 1,056,085 | 993,141 | 2,425 | Australia 273,957; Italy 176,288; Spain 160,078. |
| Ash and residue containing aluminum | 67,514 | 44,438 | 18 | Netherlands 15,338; Belgium-Luxembourg 7,319; Switzerland 4,988. |
| Metal including alloys: | | | | |
| Scrap | 271,197 | 229,001 | 5,874 | Netherlands 60,135; France 29,528; United Kingdom 26,726. |
| Unwrought | 925,436 | 875,639 | 12,913 | Norway 243,633; Ghana 88,823; United Kingdom 74,285. |
| Semimanufactures | 518,744 | 579,561 | 3,843 | France 112,412; Belgium-Luxembourg 76,020; Netherlands 71,351. |
| Antimony: | | | | |
| Ore and concentrate | 36 | 5 | — | China 4; Austria 1. |
| Oxides and hydroxides | 5,411 | 5,517 | 44 | China 1,573; France 1,306; United Kingdom 1,114. |
| Metal including alloys, all forms | 1,386 | 3,145 | (2) | Belgium-Luxembourg 1,187; China 1,183; U.S.S.R. 446. |
| Arsenic: | | | | |
| Oxides and acids | 1,370 | 1,678 | — | France 1,444; Belgium-Luxembourg 206. |
| Metal including alloys, all forms | 11 | 29 | — | China 23; Sweden 3; Hong Kong 2. |
| Beryllium: | | | | |
| Oxides and hydroxides | 1 | (2) | (2) | |
| Metal including alloys, all forms kilograms | 829 | 1,535 | 1,217 | France 230; Switzerland 32. |
| Bismuth: Metal including alloys: | | | | |
| Unwrought including scrap | 492 | 546 | 1 | Belgium-Luxembourg 316; Peru 135; Mexico 29. |
| Semimanufactures | 110 | 89 | — | United Kingdom 64; Belgium-Luxembourg 15; Taiwan 9. |
| Cadmium: Metal including alloys, all forms | 568 | 530 | 25 | Belgium-Luxembourg 286; Zaire 89; Netherlands 44. |
| Chromium: | | | | |
| Ore and concentrate | 343,779 | 245,513 | — | Republic of South Africa 138,267; Turkey 54,092; Philippines 21,629. |
| Oxides and hydroxides | 3,529 | 4,314 | 84 | China 1,334; Poland 840; United Kingdom 781. |
| Metal including alloys, all forms | 2,146 | 3,235 | 5 | U.S.S.R. 1,179; France 423; United Kingdom 326. |
| Cobalt: | | | | |
| Ore and concentrate | 2 | 3 | — | All from Norway. |
| Oxides and hydroxides | 387 | 496 | 13 | Belgium-Luxembourg 235; Finland 149; United Kingdom 56. |
| Ash and residue containing cobalt | 423 | 369 | 257 | Japan 110. |
| Metal including alloys, all forms | 2,690 | 2,765 | 59 | Zaire 1,296; Zambia 299; Norway 190. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 1,295 | 1,302 | 1 | Zaire 830; Canada 158; Brazil 75. |
| Ash and residue containing columbium and/or tantalum | 9,545 | 4,243 | 402 | Malaysia 1,516; Thailand 1,211. |
| Metal including alloys, all forms: | | | | |
| Columbium including rhenium | 31 | 49 | 30 | Belgium-Luxembourg 9; Switzerland 4; Brazil 3. |
| Tantalum | 218 | 196 | 1120 | Austria 35; Belgium-Luxembourg 14. |

See footnotes at end of table.

TABLE 4—Continued

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Copper: | | | | |
| Ore and concentrate | 621,619 | 487,451 | (2) | Portugal 188,021; Papua New Guinea 110,982; Chile 67,033. |
| Matte and speiss including cement copper | 8,543 | 17,568 | — | Australia 6,118; Spain 3,400; France 3,056. |
| Oxides and hydroxides | 1,731 | 1,611 | 129 | Belgium-Luxembourg 727; Italy 332. |
| Sulfate | 10,010 | 10,655 | 101 | Poland 2,440; France 1,964; Czechoslovakia 1,916. |
| Ash and residue containing copper | 31,727 | 48,987 | 14,521 | Italy 16,257; Netherlands 2,998. |
| Metal including alloys: | | | | |
| Scrap | 364,619 | 310,643 | 27,087 | Netherlands 52,716; France 49,176; United Kingdom 40,403. |
| Unwrought | 555,701 | 625,438 | 17,867 | Chile 159,567; Poland 107,378; U.S.S.R. 66,013. |
| Semimanufactures | 306,841 | 343,171 | 1,665 | Belgium-Luxembourg 106,829; France 79,802; Italy 31,880. |
| Gallium, indium, thallium: Metals | | | | |
| Metals including alloys, all forms | 18 | 10 | (2) | France 5; United Kingdom 3; Netherlands 1. |
| Germanium: | | | | |
| Oxides | 7 | 15 | — | Italy 6; U.S.S.R. 6; Austria 2. |
| Metal including alloys, all forms | 2 | 6 | 1 | Netherlands 4; Belgium-Luxembourg 1. |
| Gold: | | | | |
| Waste and sweepings | 287 | 361 | 49 | Netherlands 67; Sweden 56; Czechoslovakia 46. |
| Metal including alloys, unwrought and partly wrought | 123 | 118 | 9 | Canada 18; Republic of South Africa 16; U.S.S.R. 16. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 47,170,629 | 43,729,850 | 33 | Brazil 19,676,675; Canada 6,011,406; Sweden 5,698,071. |
| Pyrite, roasted | 112,264 | 160,483 | — | Norway 70,343; Sweden 36,759; Belgium-Luxembourg 29,714. |
| Metal: | | | | |
| Scrap | 1,299,147 | 1,100,710 | 4,042 | Netherlands 366,986; France 258,433; Denmark 153,434. |
| Pig iron, cast iron, related materials | 282,151 | 286,921 | 459 | Brazil 86,728; Canada 84,034; U.S.S.R. 63,502. |
| Ferroalloys: | | | | |
| Ferrochromium | 390,773 | 322,329 | 151 | Republic of South Africa 170,686; Zimbabwe 48,849; U.S.S.R. 30,015. |
| Ferrocolumbium | 2,579 | 2,158 | — | Brazil 1,919; United Kingdom 221. |
| Ferromanganese | 98,964 | 126,001 | 608 | Norway 45,198; France 27,996; Republic of South Africa 20,055. |
| Ferromolybdenum | 7,747 | 7,881 | 259 | Belgium-Luxembourg 2,764; United Kingdom 2,446; Austria 714. |
| Ferronickel | 96,373 | 89,529 | 707 | Greece 37,515; New Caledonia 12,441; Indonesia 10,366. |
| Ferrophosphorus | 14,376 | 11,673 | 3,953 | U.S.S.R. 4,614; Netherlands 1,404; China 1,100. |
| Ferrosilicochromium | 19,147 | 12,002 | (2) | Zimbabwe 6,942; Poland 1,333. |
| Ferrosilicomagnesium | 4,414 | 4,121 | 1,310 | Yugoslavia 1,360; Norway 649. |
| Ferrosilicomanganese | 117,149 | 101,868 | — | Norway 46,878; Republic of South Africa 11,605; France 11,044. |
| Ferrosilicon | 199,251 | 206,239 | 886 | Norway 85,346; U.S.S.R. 30,171; Poland 15,176. |
| Ferrotitanium | 5,390 | 5,120 | 55 | United Kingdom 3,206; Italy 539. |

See footnotes at end of table.

TABLE 4—Continued

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Iron and steel—Continued: | | | | |
| Metals—Continued: | | | | |
| Ferroalloys—Continued: | | | | |
| Ferrotungsten | 1,388 | 1,455 | — | China 1,250; Hong Kong 86. |
| Ferrovanadium | 2,692 | 2,702 | 10 | Belgium-Luxembourg 1,293; Austria 856; United Kingdom 224. |
| Silicon metal | 85,348 | 83,577 | 306 | Norway 27,643; Brazil 17,302; France 11,137. |
| Steel, primary forms | 50,276 | 37,967 | 205 | Belgium-Luxembourg 16,710; United Kingdom 12,730; Canada 5,947. |
| Semimanufactures, all forms | 12,819,375 | 13,764,698 | 593 | Belgium-Luxembourg 3,477,765; France 1,925,769; Italy 1,495,933. |
| Lead: | | | | |
| Ore and concentrate | 222,361 | 205,979 | 1,115 | Canada 57,350; Ireland 32,525; Sweden 31,665. |
| Oxides | 7,055 | 5,228 | 18 | France 1,788; United Kingdom 744; undetermined 2,559. |
| Ash and residue containing lead | 37,074 | 38,017 | 4,767 | Australia 13,897; Belgium-Luxembourg 6,764; Czechoslovakia 5,173. |
| Metal including alloys: | | | | |
| Scrap | 29,934 | 27,641 | 446 | Denmark 10,353; United Kingdom 3,672; Switzerland 3,119. |
| Unwrought | 137,339 | 141,181 | 90 | United Kingdom 51,836; Belgium-Luxembourg 18,881; France 17,009. |
| Semimanufactures | 5,461 | 6,323 | 41 | Belgium-Luxembourg 3,765; United Kingdom 1,699; France 271. |
| Lithium: | | | | |
| Carbonate | 5,972 | 5,490 | 3,897 | Chile 844; U.S.S.R. 342; China 296. |
| Oxides and hydroxides | 966 | 779 | 283 | China 399; U.S.S.R. 59. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 9,023 | 7,702 | 1,442 | Turkey 1,446; France 1,028. |
| Unwrought | 24,160 | 25,385 | 6,311 | Norway 10,107; France 2,670. |
| Semimanufactures | 389 | 564 | 367 | France 73; Canada 56. |
| Manganese: | | | | |
| Ore and concentrate | 546,351 | 368,591 | — | Republic of South Africa 211,975; Australia 73,615; Gabon 55,490. |
| Oxides | 6,966 | 8,547 | 234 | Japan 2,448; Belgium-Luxembourg 1,579; Ireland 1,360. |
| Metal including alloys, all forms | 9,113 | 9,581 | 905 | China 4,412; Republic of South Africa 2,398; France 1,116. |
| Mercury | 264 | 189 | 1 | Algeria 45; Netherlands 36; Spain 33. |
| Molybdenum: | | | | |
| Ore and concentrate | 16,450 | 15,929 | 5,526 | Belgium-Luxembourg 3,707; Netherlands 2,121. |
| Oxides and hydroxides | 448 | 361 | 62 | Chile 136; Netherlands 102. |
| Ash and residue containing molybdenum | 226 | 228 | — | Netherlands 60; Italy 49; Hungary 45. |
| Metal including alloys: | | | | |
| Scrap | 767 | 652 | — | Austria 566; Netherlands 38; China 20. |
| Unwrought | 164 | 151 | 72 | United Kingdom 30; Netherlands 16. |
| Semimanufactures | 443 | 481 | 122 | Austria 314; France 11. |

See footnotes at end of table.

TABLE 4—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Nickel: | | | | | |
| Ore and concentrate | | 202 | 28 | — | Australia 25; Republic of South Africa 2. |
| Matte and speiss | | 11,935 | 11,196 | (2) | Australia 10,363; Canada 474. |
| Oxides and hydroxides | | 271 | 378 | 19 | Canada 172; Finland 92; Netherlands 39. |
| Ash and residue containing nickel | | 1,708 | 3,103 | — | Netherlands 2,562; United Kingdom 303. |
| Metal including alloys: | | | | | |
| Scrap | | 12,508 | 8,045 | 1,060 | France 2,741; Netherlands 683. |
| Unwrought | | 57,370 | 56,416 | 217 | U.S.S.R. 23,988; Norway 8,441; United Kingdom 4,574. |
| Semimanufactures | | 8,923 | 8,604 | 1,009 | France 4,466; United Kingdom 1,773. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | kilograms | 103,755 | 105,543 | 51,834 | Czechoslovakia 13,612; Netherlands 11,410. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | do. | 21,889 | 26,212 | 2,614 | United Kingdom 7,576; Switzerland 4,847; U.S.S.R. 3,030. |
| Platinum | do. | 24,767 | 21,880 | 900 | Republic of South Africa 8,633; United Kingdom 5,956; Switzerland 1,431. |
| Rhodium | do. | 830 | 1,389 | 2 | United Kingdom 393; Republic of South Africa 388; U.S.S.R. 263. |
| Iridium, osmium, ruthenium | do. | 2,501 | 1,323 | 67 | Republic of South Africa 752; United Kingdom 418. |
| Rare-earth metals: | | | | | |
| Oxides and other compounds | | 1,503 | 1,871 | 1,043 | Austria 313; India 192. |
| Metals including alloys, all forms | | 117 | 162 | 33 | Brazil 47; Austria 44; China 13. |
| Silver: | | | | | |
| Ore and concentrate | | (2) | 938 | — | All from Peru. |
| Waste and sweepings | | 3,315 | 2,855 | 988 | United Kingdom 457; Switzerland 207. |
| Metal including alloys, unwrought and partly wrought | | 2,075 | 1,634 | 25 | United Kingdom 679; Belgium-Luxembourg 190; Switzerland 181. |
| Tin: | | | | | |
| Ore and concentrate | | 695 | 115 | — | Brazil 59; Burundi 27; Canada 22. |
| Oxides | | | 44 | 1 | United Kingdom 29; Netherlands 7. |
| Ash and residue containing tin | | 7,599 | 4,423 | 172 | Malaysia 2,056; United Kingdom 456; Belgium-Luxembourg 412. |
| Metal including alloys: | | | | | |
| Scrap | | 421 | 485 | 1 | Ireland 130; Netherlands 129; Switzerland 60. |
| Unwrought | | 20,593 | 21,124 | 45 | Brazil 7,845; Singapore 2,189; Malaysia 1,932. |
| Semimanufactures | | 192 | 255 | 3 | Italy 101; Belgium-Luxembourg 86; Switzerland 21. |
| Titanium: | | | | | |
| Ore and concentrate | | 475,972 | 517,142 | 22,481 | Norway 228,727; Canada 187,554; Egypt 24,289. |
| Oxides | | 29,942 | 26,667 | 897 | Belgium-Luxembourg 8,857; France 4,580; Australia 4,395. |
| Ash and residue containing titanium | | 255,792 | 262,990 | — | Canada 188,021; Republic of South Africa 62,389; Namibia 7,455. |
| Metal including alloys: | | | | | |
| Scrap | | 1,850 | 478 | 57 | France 102; U.S.S.R. 83; Israel 42. |
| Unwrought | | 3,263 | 3,585 | 295 | Japan 1,094. |
| Semimanufactures | | 1,503 | 1,923 | 772 | Japan 360; United Kingdom 317. |

See footnotes at end of table.

TABLE 4—Continued

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

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Tungsten: | | | | | |
| Ore and concentrate | | 4,819 | 1,394 | — | China 467; Portugal 202; Vietnam 160. |
| Oxides and hydroxides | | 893 | 940 | — | China 870; Netherlands 58. |
| Ash and residue containing tungsten | | 293 | 18 | 2 | Japan 5; France 4; United Kingdom 3. |
| Metal including alloys: | | | | | |
| Scrap | | 844 | 716 | 38 | United Kingdom 180; Netherlands 177; Austria 85. |
| Unwrought | | 830 | 757 | 23 | Austria 574; United Kingdom 46; France 29. |
| Semimanufactures | | 139 | 136 | 16 | Austria 57; Belgium-Luxembourg 32. |
| Uranium and thorium: Oxides and other compounds | | 788 | 1,155 | — | France 614; Canada 228; Republic of South Africa 225. |
| Vanadium: | | | | | |
| Oxides and hydroxides | | 1,454 | 597 | NA | Republic of South Africa 376; China 69; unspecified 145. |
| Ash and residue containing vanadium | | 32,559 | 25,923 | NA | Italy 315; Netherlands 261; unspecified 25,102. |
| Metal including alloys, unwrought | | 24 | 19 | 19 | |
| Zinc: | | | | | |
| Ore and concentrate | | 595,494 | 592,604 | 5,930 | Canada 262,475; Australia 101,295; Peru 66,141. |
| Oxides | | 21,747 | 20,635 | 97 | Netherlands 5,100; France 4,971; Poland 2,142. |
| Blue powder | | 15,515 | 15,076 | 17 | Belgium-Luxembourg 13,134; Norway 1,405. |
| Ash and residue containing zinc | | 50,478 | 56,481 | 360 | Belgium-Luxembourg 9,178; Italy 6,572; Poland 5,197. |
| Metal including alloys: | | | | | |
| Scrap | | 30,539 | 25,349 | 43 | Netherlands 7,035; United Kingdom 3,459; Belgium-Luxembourg 3,222. |
| Unwrought | | 202,060 | 241,980 | 297 | Belgium-Luxembourg 68,051; Netherlands 51,178; Spain 35,291. |
| Semimanufactures | | 29,890 | 34,363 | 1,912 | France 18,205; Netherlands 4,521; Yugoslavia 4,451. |
| Zirconium: | | | | | |
| Ore and concentrate | | 63,510 | 50,225 | 5,026 | Australia 27,786; Republic of South Africa 16,785. |
| Oxides and hydroxides | | 1,208 | 1,341 | 54 | France 906; United Kingdom 359. |
| Metal including alloys: | | | | | |
| Unwrought including scrap | | 30 | 92 | 8 | Netherlands 74; France 4. |
| Semimanufactures | | 375 | 376 | 188 | France 137; Sweden 50. |
| **INDUSTRIAL MINERALS** | | | | | |
| Asbestos, crude | | 37,161 | 15,692 | 54 | Canada 10,939; Poland 1,520; Zimbabwe 1,346. |
| Barite and witherite | | 218,342 | 221,261 | (2) | France 75,624; China 46,932; Belgium-Luxembourg 41,926. |
| Boron materials: | | | | | |
| Crude natural borates | | 48,280 | 75,668 | — | Turkey 74,423. |
| Oxides and acids | | 77,830 | 81,899 | 1,006 | Belgium-Luxembourg 35,100; Switzerland 12,403; France 8,821. |
| Cryolite and chiolite | | 1,455 | 1,525 | — | All from Denmark. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | carats | 661,420 | 596,106 | 4,146 | Belgium-Luxembourg 252,858; India 139,239; Israel 69,858. |
| Industrial stones | do. | 1,255,480 | 1,067,101 | 64,094 | Republic of South Africa 310,126; Belgium-Luxembourg 304,447; United Kingdom 154,039. |

See footnotes at end of table.

TABLE 4—Continued

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

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | |
| Fluorspar | 247,380 | 215,271 | — | China 84,540; Republic of South Africa 71,750; Kenya 14,104. |
| Graphite, natural | 43,061 | 35,828 | 65 | China 14,895; Austria 2,482; Madagascar 2,178. |
| Magnesite, crude including oxides | 504,982 | 526,921 | 1,464 | China 132,529; Netherlands 69,154; Greece 61,941. |
| Phosphates, crude | 1,208,982 | 902,914 | 352,492 | Israel 202,009; Republic of South Africa 136,405. |
| Vermiculite, perlite, similar materials | 118,084 | 118,141 | 315 | Greece 73,715; Hungary 18,237; Republic of South Africa 13,087. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal: Anthracite and bituminous | 6,409,120 | 10,857,038 | 715,741 | Republic of South Africa 4,511,783; Poland 2,698,935; Australia 1,151,386. |
| Coke and semicoke | 908,042 | 852,922 | 27,500 | Belgium-Luxembourg 307,683; Czechoslovakia 148,051; Netherlands 131,192. |
| Gas, natural million cubic meters | 44,766 | 51,259 | — | U.S.S.R. 21,861; Netherlands 18,802; Norway 10,596. |
| Petroleum, crude thousand 42-gallon barrels | 484,186 | 535,592 | — | United Kingdom 111,053; Libya 87,516; Norway 49,153. |

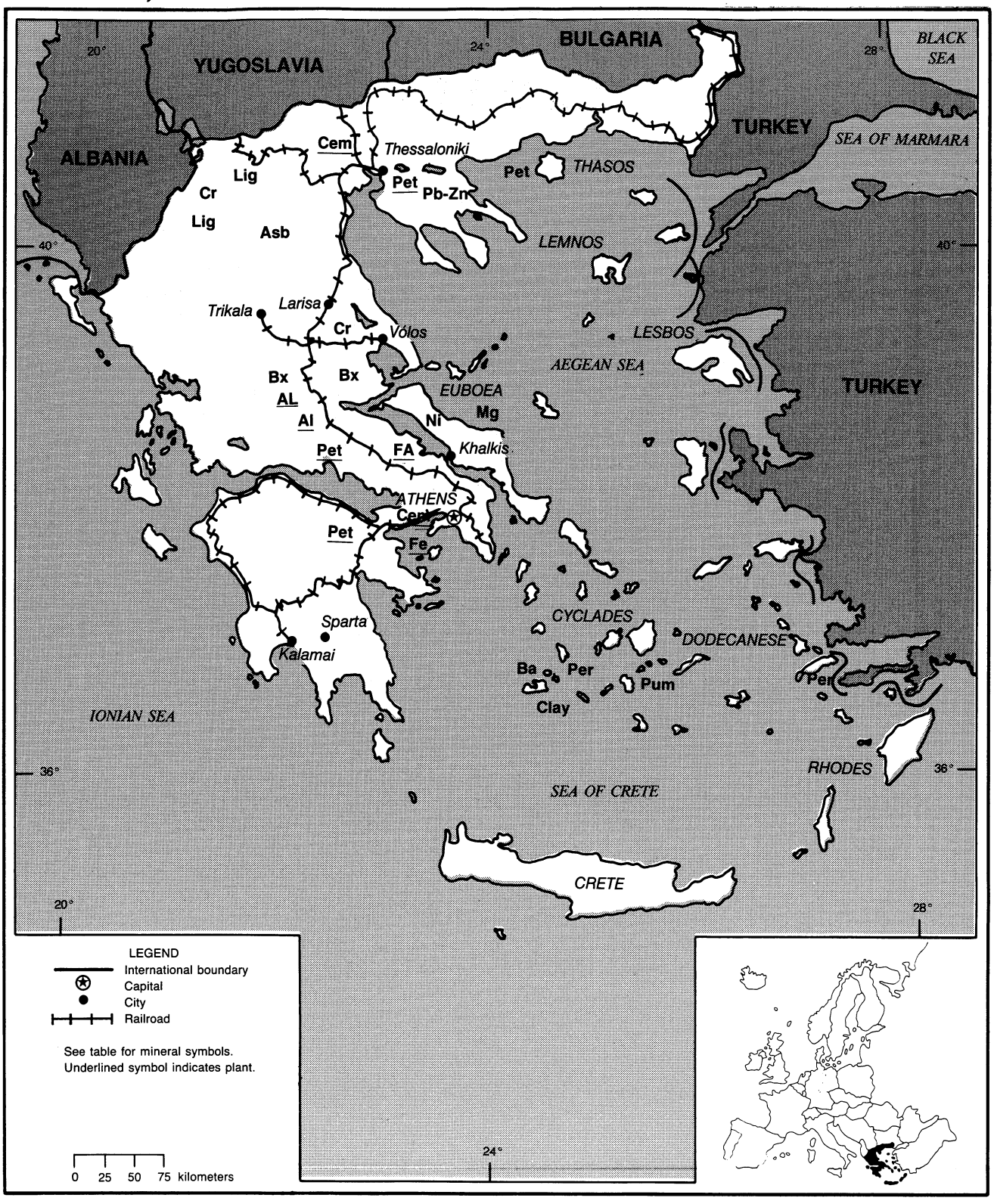
NA Not available.

[1]Table prepared by W. Zajac. Data exclude imports from the German Democratic Republic but include imports into the German Democratic Republic for July-Dec. 1990.

[2]Less than 1/2 unit.

# GREECE

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



THE MINERAL INDUSTRY OF

# GREECE

By William Zajac

During 1991, Greece continued to be a leading world producer of bentonite, emery, lignite, magnesite, and perlite and a significant European producer of alumina, bauxite, cement, ferronickel, and pumice. Despite continuing problems with the country's economic situation, both public and private, the GDP, according to figures provided by the Greek Government to the Organization for Economic Cooperation and Development (OECD), grew by 1.8% during 1991 based on 1985 prices, mainly as a result of a sharp upturn in agricultural production. At the same time, inflation dropped to about 18% by the end of the year from 23% in 1990 and public-sector borrowing requirements dropped to 16% of the GDP from 18.5% the previous year.

## GOVERNMENT POLICIES AND PROGRAMS

As the second year of the implementation of the Government's economic stabilization program, 1991 was a year of transition, with the main problems being the reduction of deficits and borrowing requirements of the public sector. Investment recovery is expected to be a result of major infrastructure projects begun, such as the construction of a natural gas pipeline, the modernization of road and rail networks, and the new airport at Spata. The Maastricht accords on the Economic, Monetary, and Political Union (EMU) of the European Communities (EC) were a positive development for the Greek economy. Under the terms for entry into the EMU, an individual country's economy must meet the EC's average, which is a very strong incentive for the Greek economy to improve. The transfer of EC structural funds to Greece would also be a great boost to its economy.

Despite the Government program of denationalization, only 19 companies were sold during 1991, mostly small industrial firms not directly involved in the minerals industry. Data on selling prices, the timetable of payments, and actual cash receipts were not available, but considering the old capital equipment and the fact that payment for some will be spread over a number of years, receipts from the sales in 1991 were insignificant. Some of the problems encountered by this denationalization program have been legal, the result of claims made by the owners prior to nationalization. Other problems were the result of deficiencies in the administration of the program, lack of coordination between agencies responsible for the privatization, overestimation of the value of the firms, popular belief that a low price corresponded to a selloff to foreigners (although only 4 of the 19 sold in 1991 were to foreigners), the statist attitude of many in decisionmaking positions, and the fear that the restructuring of the privatized firms would lead to job cuts.

## PRODUCTION

Production of mineral products in Greece during 1991 generally remained at about the level of the previous year or declined somewhat. In addition to the generally unfavorable worldwide economic conditions and the local economic policy, the turmoil in the political and economic arenas in eastern and central Europe had an adverse effect on the mineral industries of Greece. These areas have traditionally been one of the principal markets for some important commodities produced in Greece, such as bauxite. The decline in the mineral producing and processing industries in this area caused a reduction in the need for the materials produced in Greece, thereby cutting Greek exports and as a consequence, production. The small increases in the production in the domestic industries in Greece have not been enough to compensate for the loss of export markets. For example, the production of alumina increased by 6%, the production of primary aluminum increased by 2%, and the production of aluminum semimanufactures increased by about 10% between 1990 and 1991, but these increases did not create enough demand to be able to stop the drop in bauxite production.

Among metals, Greece produces aluminum, ferrochromium, ferronickel, steel, and a small amount of secondary tin. Other metals consumed in Greece must, by necessity, be imported, as must the final forms of the aforementioned metals in forms that cannot be produced in Greece itself. (*See table 1.*)

## TRADE

During 1990, Greece exported goods with a total value of about $8,021 million.[1] Of this total, inedible crude materials, excluding fuels, accounted for about $457 million, or 5.7% of the total; iron and steel accounted for $415 million, or 5.2% of the total; and aluminum metal accounted for $279 million, or 3.5% of the total. Of these three categories, aluminum metal was the only one that increased in value compared to that of the previous year, by 5.4%, from a value of

$265 million in 1989. The value of inedible crude materials, excluding fuels, dropped by 12.7% from $523 million and iron and steel dropped by 9.4% from $458 million. It is interesting to note that the exports of bauxite by Greece declined by 67% between 1987 and 1990, from 1,224,290 tons to 401,648 tons.

The EC continued to be the principal market for Greek exports, accounting for almost 65% of the value total; the United States accounted for about 6% of the total value of merchandise exported. The value of total merchandise imports by Greece in 1990 amounted to $19,701 million, an increase of 22% from the total value of $16,103 million imported during the previous year. With respect to mineral-related imports, inedible crude materials, excluding fuels, accounted for $1,530 million, or 7.8% of total goods imported; crude petroleum accounted for $997 million, or 5.1% of the total value of goods imported; and petroleum products accounted for $456 million, or 2.3% of the total.

In comparison to that of 1989, the value of inedible crude materials, excluding fuels, imported during 1990 increased by 13.4% from $841 million. Imports of crude petroleum increased by 27.6%, from $782 million, and imports of petroleum products increased in value by 126.2%, from $202 million in 1989. With respect to sources of imported merchandise, the EC accounted for about 64% of the value of the total while the United States accounted for about 4% of the total and the Organization of Petroleum Exporting Countries accounted for about 6% of the total.

## STRUCTURE OF THE MINERAL INDUSTRY

The Greek mining industry, until recently a dynamic factor in the economic development of the country, has, in the past few years, been experiencing serious problems, both financial and operational. Many companies, especially those under control of the state, face serious financial problems such as large debt and high operating costs. Some important companies, such as Hellenic Ferroalloys, are in liquidation, and the assets have been put up for sale with the hope of reorganizing, restructuring, and possibly restarting operations. Other companies, such as Hellenic Alloyed Steel, have declared bankruptcy. It is extremely uncertain how many of such companies can ever start operations again, not only because of the huge debts owed, but also because of old, outdated facilities and growing environmental concerns. Principal facilities are shown in table 2. (*See table 2.*)

## COMMODITY REVIEW

### Metals

*Aluminum.*—The aluminum industry was one of the few parts of the mineral industry that was relatively healthy in Greece during 1991. Although bauxite production decreased during 1991, principally as a result of the loss of export markets, alumina and aluminum metal production both increased, despite the company's financial problems. According to Aluminium de Grece, the company pays one of the highest prices for electric power among aluminum producers worldwide, and, as a result, company profits drop even when production increases.

The Hellenic Industrial Development Bank (ETBA) remains committed to the construction of an alumina plant in Thisvi, Boeotia, in collaboration with the U.S.S.R. The foundation stone of the plant was laid in 1987, procedures for the acquisition of the land have been completed, and work has started on preparation of the site on which the plant is to be built. Contracts for the supply of equipment and the extraction and storage of bauxite have been signed. When the plant is completed, the permanent work force is expected to be about 650 persons. During 1991, the feasibility study for the project was brought up to date in order to be financed partly by the European Investment Bank. ETBA is looking for a third partner in the project for one-third interest for financing and/or absorbing part of the future production of the plant.

*Chromium.*—According to press reports, the ferrochromium plant run by Hellenic Ferroalloys was closed in June 1991 after an agreement with the Public Power Corp. (PPC) to restore power collapsed. Hellenic Ferroalloys owes PPC $70 million, and the agreement was to have frozen the debt and restore power. However, talks on resolving the situation broke down when PPC accused Hellenic Ferroalloys of submitting inaccurate financial data. The 45,000-mt/a plant has been undergoing maintenance prior to its anticipated reopening when the power/debt problem will have been resolved.

*Nickel.*—Despite the discovery of new deposits, increased production, high productivity, good sales, new investments, and a new dressing plant, General Mining & Metallurgical Co. S.A. (LARCO), the only ferronickel producer in Greece, did not have a good year in 1991. The depressed international price for nickel, combined with the high cost of electric power and large obligations to the Industrial Reconstruction Organization (IRO), caused the company to post a loss at the end of the year. LARCO, however, was one of the few heavy users of electricity to reach an agreement with PPC despite owing a large amount of money for electric power.

### Industrial Minerals

*Asbestos.*—Another company facing an uncertain future is the Northern Greece Asbestos Mines (MAVE), which had debts of $185 million, of which $22 million were owed to PPC, at the end of the year. The company's activities were suspended early in the year for nonpayment of power costs in conjunction with labor disputes. By the end of the year, no decision had been made on the fate of the company. At one point the Government was to lease the company to foreign investors, hoping to privatize and stabilize the company using Government

collateral and a reduction in the work force. The Government then decided to liquidate the company, but that decision was being reviewed at the end of the year with the possibility of some sort of agreement between the Government and the labor force that could restart operations.

*Cement.*—As part of the privatization program, the 69.8% majority stake in the company held by the IRO in one of the largest and most profitable cement companies in Greece, Heracles General Cement Co., was put up for sale. The first stage of initial bidding was completed in December, and it is hoped that the finalization of the sale could be completed early in 1992. The Government was eager to start collecting revenue from its privatization program. Reportedly, British, French, Italian, Spanish, and Swiss organizations were in the bidding for the shares. Heracles has about a 44% share of the Greek cement market, and one of its two plants, the one at Volos, has a 4.5-mt/a capacity, said to be the largest in Europe. The company also has its own shipping fleet and berthing facilities, enabling it to export worldwide, as well as 28 subsidiaries and affiliated companies with activities including ready-mix concrete, mining, quarrying, and transport.

### Mineral Fuels

A combination of funding coming from the EC, the Greek Government, and private investors is expected for the construction of a pipeline to deliver natural gas from the U.S.S.R. via the border with Bulgaria to Athens as well as storage facilities at Revythousa in Attica for liquefied natural gas from Algeria. The project also would have local distribution centers along the length of the pipeline. The reaction to these two projects has been very favorable as a result of the positive repercussions expected for the environment owing to the replacement of petroleum as an energy source. The cost of the entire project is expected to be about $1.5 billion, and the first natural gas power units are hoped to be in operation by late 1994.

### Reserves

Greece has sufficient reserves of bauxite, chromite, lead, nickel, and zinc and a wide range of industrial minerals, especially magnesite and perlite, to supply the domestic industry and export commitments well into the 21st century.

Exploration carried out by LARCO at Aghios Ioannis, Euboea, and northern Greece resulted in identifying a new 2 to 3 Mmt of nickel ore and in changing the classification of 2 Mmt from possible to definite. Exploration was expected to continue in 1992.

The reserves of selected minerals in Greece are shown in table 3. (*See table 3.*)

## INFRASTRUCTURE

The railroad system in Greece, all Government owned, totaled 2,479 km, of which 1,565 km was 1.435-m standard-gauge track (of which 36 km was electrified), 892 km of 1.000-m-gauge track, 100 km of double track, and 22 km of 0.750-m narrow-gauge track. The highway and road system totaled 38,938 km, of which 16,090 km was paved, 13,676 km was crushed stone and gravel, 5,632 km was improved earth, and 3,540 km was unimproved earth. The inland waterway system was 80 km, consisting of three coastal canals and three unconnected rivers. The pipeline system consisted of 26 km for crude petroleum and 547 km for refined products.

Greece's major ports were Piraeus and Thessaloniki and the merchant marine fleet consisted of 958 ships over 1,807 tons dead weight and totaling 39,011,361 dead weight tons. The merchant fleet consisted of 2 passenger/cargo, 152 cargo, 21 container, 17 roll-on/roll-off cargo, 23 refrigerated cargo, and 1 vehicle carrier ships. The tanker fleet consisted of 185 petroleum/oil/lubricant, 15 chemical, 10 liquefied gas, 25 combination ore/oil, and 5 specialized ships. The merchant fleet also had 707 bulk carriers and 19 combination bulk carriers. In addition to the ships under Greek registry, ethnic Greeks also owned a large number of ships under registry of Cyprus, Lebanon, Liberia, and Panama.

## OUTLOOK

The policies of the Government that took office in May 1990 have not yet shown any substantial improvement in the situation in the minerals industries in Greece. The program of privatization has not yet reaped any benefits for the industry or the Government, and the income inflow from the sale of state-owned enterprises has not begun. Many companies have been operating at a loss for many years, either as direct beneficiaries of Government subsidies or as Government-owned enterprises, and the reorganizing and restructuring of the companies to enable them to survive in a competitive market had only started, so little could be determined about the policy. As a member of the EC, Greece is obligated to conform to the policies of the EC with regard to subsidies as well as with regard to the national economy. To become a fully integrated member of the economic market, Greece must stabilize its economy, lower inflation, and lower its foreign debt and borrowing requirements to levels that meet the standards of the other members. Failure to meet these standards will prevent Greece from fully benefiting from its membership in the EC. As a result of its geographic location, Greece was affected more negatively economically from the Gulf War in early 1991 than the other members of the EC because of closed airlane connections and interrupted general trade patterns.

It remains to be seen how successful the reorganization of the Greek industry will be under the new policies. If successful, the Greek mining industry has a very good chance to return to the dynamic, progressive state that it had been in the past.

[1]Where necessary, values have been converted from Greek drachmas (DR) to U.S. dollars at the rate of DR 157.6=US$1.00.

## OTHER SOURCES OF INFORMATION

### Agencies

The Institute of Geology and Mineral Exploration (IGME)
70 Messoghion Street
608 Athens, Greece
Project Studies and Mining Development Corp. S.A. (GEMEE)
15 Valaoritou Street
106 71 Athens, Greece
Hellenic Industrial and Mining Investment Co. (HIMIC)
3 Korai Street
105 64 Athens, Greece
Hellenic Industrial Development Bank S.A. (ETBA)
18 El Venizelou Street
196 72 Athens, Greece
National Investment Bank for Industrial Development
14 Amalias Avenue
192 36 Athens, Greece
Public Power Corp.
30 Halkopcondyli
104 32 Athens, Greece
Public Petroleum Corp.
119 Kifissias Maroussi
151 24 Attica, Greece
Bauxite Parnasse Mining Co.
21a Amerikis Street
106 72 Athens, Greece
Aluminium de Grece SAIC
1-3 Sekeri
106 71 Athens, Greece

### Publication

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

TABLE 1

## GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| METALS | | | | | |
| Aluminum: | | | | | |
| Bauxite | r2,455,988 | r2,460,782 | r2,550,015 | r2,495,940 | 2,133,521 |
| Alumina, $Al_2O_3$ equivalent | 518,000 | r514,650 | 521,000 | r587,000 | 624,600 |
| Metal: | | | | | |
| Primary | 126,751 | r148,253 | 144,833 | r149,674 | 152,368 |
| Secondary | e7,000 | e7,000 | e7,000 | r2,882 | e3,000 |
| Chromite: | | | | | |
| Run-of-mine | 211,599 | 180,836 | 187,322 | r177,400 | e75,000 |
| Marketable products: | | | | | |
| Direct-shipping ore | e16,000 | e14,000 | e15,000 | e13,000 | e5,500 |
| Concentrate | 63,825 | 49,535 | 47,324 | r22,400 | e9,500 |
| Iron and steel: | | | | | |
| Iron ore and concentrate, nickeliferous:[3] | | | | | |
| Gross weight | 1,083,000 | 1,572,954 | 2,013,021 | r2,112,725 | 2,023,678 |
| Fe content | 423,000 | 640,000 | 820,000 | r860,600 | 814,600 |
| Metal: | | | | | |
| Pig iron | r— | r— | r— | r— | — |
| Ferroalloys: | | | | | |
| Ferrochromium | r43,287 | r44,147 | r43,579 | r30,300 | e15,000 |
| Ferronickel | r35,400 | r50,500 | r41,200 | r e60,500 | 64,020 |
| Steel, crude | 907,000 | 959,000 | r957,000 | 999,000 | 995,000 |
| Lead: | | | | | |
| Mine output, Pb content by analysis | 20,600 | r25,900 | r24,500 | r26,200 | 31,700 |
| Metal: | | | | | |
| Smelter, primary | 700 | 15,100 | r5,600 | r— | — |
| Refined: | | | | | |
| Primary | 700 | 13,100 | 5,600 | r— | — |
| Secondary | 2,000 | 2,000 | 1,400 | r— | — |
| Total | 2,700 | 15,100 | 7,000 | r— | — |
| Manganese: | | | | | |
| Ore, crude: | | | | | |
| Gross weight | 19,010 | 17,830 | 18,925 | e18,500 | 13,540 |
| Mn content | 6,277 | 5,900 | e6,000 | e6,000 | e4,480 |
| Concentrate: | | | | | |
| Gross weight | 4,024 | 3,725 | 3,034 | r5,400 | 3,840 |
| Mn content | 1,932 | 1,825 | 1,487 | r e2,500 | 1,882 |
| Nickel: | | | | | |
| Ore: Ni content of nickeliferous iron ore | r9,200 | r15,400 | r18,900 | 18,500 | 24,284 |
| Metal: Ni content of ferronickel | 9,202 | 13,131 | 16,097 | r15,727 | 16,005 |
| Silver: Mine output, Ag content | 52 | 61 | r61 | r63 | e70 |
| Tin: Metal, secondary | r200 | r200 | r800 | r700 | 200 |
| Zinc: Mine output, Zn content by analysis | 20,700 | 21,200 | r24,600 | r26,700 | 30,000 |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, natural: Emery | e7,500 | e7,500 | e7,000 | e7,000 | 7,855 |
| Asbestos: | | | | | |
| Ore | 3,384,000 | 4,000,000 | 4,500,000 | r4,320,000 | e400,000 |
| Processed | 60,134 | 71,114 | r73,300 | r65,993 | e5,500 |

See footnotes at end of table.

TABLE 1—Continued

## GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | |
| Barite: | | | | | |
| Ore, crude | 4,799 | 1,316 | 1,247 | r1,617 | 1,309 |
| Concentrate | 1,881 | 1,407 | 1,218 | e1,250 | 763 |
| Cement, hydraulic | 13,168,000 | 13,053,000 | 12,535,000 | r13,561,000 | 13,580,000 |
| Clays: | | | | | |
| Bentonite: | | | | | |
| Crude | r681,101 | 730,525 | 1,096,177 | r592,684 | 600,286 |
| Processed | 360,831 | 502,537 | 529,802 | e500,000 | 474,796 |
| Kaolin: | | | | | |
| Crude | 144,634 | 127,395 | 67,234 | r169,986 | 189,235 |
| Processed | 5,720 | 4,163 | 6,946 | r e17,500 | e20,000 |
| Feldspar | 8,260 | 37,531 | 28,903 | 17,608 | e17,500 |
| Fluorspar, grade unspecified | r112 | r604 | r450 | r e150 | e150 |
| Gypsum and anhydrite | r665,144 | r599,011 | r540,637 | r450,149 | e450,000 |
| Magnesite: | | | | | |
| Crude | 842,000 | 847,911 | 904,000 | r696,900 | 590,188 |
| Dead-burned | 222,807 | 237,995 | 214,945 | r150,300 | 118,602 |
| Caustic-calcined | 119,096 | 124,140 | 111,826 | r119,200 | 130,801 |
| Nitrogen: N content of ammonia | e254,000 | e263,000 | e242,000 | e257,000 | e255,000 |
| Perlite: | | | | | |
| Crude | 360,831 | 361,849 | 390,849 | r e360,000 | 369,495 |
| Screened | 208,352 | 211,404 | 217,305 | r e240,000 | 286,404 |
| Pozzolan (Santorin earth) | 814,000 | 358,000 | 786,000 | e785,000 | 536,320 |
| Pumice | 779,885 | 752,525 | 640,152 | e600,000 | 445,143 |
| Pyrites, gross weight | 148,972 | 130,129 | 97,051 | r e70,000 | e60,000 |
| Salt, all types | r141,548 | r181,324 | r148,265 | r e150,000 | e150,000 |
| Silica sand | e38,000 | e38,000 | 61,144 | e60,000 | e60,000 |
| Sodium compounds: | | | | | |
| Carbonate | e1,000 | e1,000 | e900 | e900 | e900 |
| Sulfate | e7,000 | e7,000 | e6,000 | e6,000 | e6,000 |
| Stone: Marble cubic meters | r e595,000 | r e655,000 | 365,146 | e300,000 | e225,000 |
| Sulfur: | | | | | |
| S content of pyrites | r67,037 | r58,558 | r57,150 | r41,247 | 35,332 |
| Byproduct: | | | | | |
| Natural gas | e135,000 | e135,000 | e135,000 | e135,000 | e125,000 |
| Petroleum | e5,000 | e5,000 | e5,000 | e5,000 | e6,000 |
| Total | r e207,037 | r e198,558 | r e197,150 | r e181,247 | e166,332 |
| Talc and steatite | r9,507 | 1,587 | r10,518 | r1,114 | 790 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Coal: | | | | | |
| Lignite | 43,100,000 | 48,091,733 | r49,772,000 | r49,909,300 | 50,537,241 |
| Lignite briquets | r121,000 | r130,000 | r155,000 | r160,000 | e162,000 |
| Coke: | | | | | |
| Coke oven | r— | r— | r— | r— | — |
| Gashouse | e18,000 | e19,000 | e16,000 | e16,000 | e16,000 |

See footnotes at end of table

TABLE 1—Continued

## GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Gas: | | | | | | |
| Manufactured, gasworks | million cubic meters | r e18 | r e19 | r e18 | r e18 | e18 |
| Natural | do. | r152 | r181 | r185 | r191 | e180 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | thousand metric tons | r1,238 | r1,142 | r927 | r825 | 843 |
| Converted | thousand 42-gallon barrels | r8,907 | r8,215 | r6,666 | r5,935 | 6,065 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 3,515 | 3,990 | 4,396 | 4,478 | 5,951 |
| Gasoline | do. | r20,596 | r25,636 | r26,648 | 28,551 | 26,588 |
| Mineral jelly and wax | do. | 24 | 16 | 39 | 24 | e20 |
| Naphtha | do. | 6,401 | 5,976 | 5,177 | 4,675 | 1,921 |
| Jet fuel | do. | r15,968 | r14,840 | r14,768 | r14,400 | e11,600 |
| Kerosine | do. | r202 | r163 | r101 | r171 | e150 |
| Lubricants | do. | r1,281 | r1,267 | 1,148 | r1,323 | 1,106 |
| Distillate fuel oil | do. | r28,408 | r25,506 | 27,848 | r27,117 | 24,409 |
| Residual fuel oil | do. | r41,978 | r36,963 | r37,243 | r37,269 | 34,419 |
| Bitumen | do. | 800 | 1,291 | 1,703 | 1,479 | 2,048 |
| Petroleum coke | do. | 385 | 644 | 754 | 748 | 700 |
| Other | do. | r469 | r490 | r616 | r644 | 506 |
| Refinery fuel and losses | do. | r e2,680 | r e3,240 | r e3,460 | r e3,660 | e3,000 |
| Total | do. | r e122,704 | r e120,020 | r e123,900 | r e124,538 | e112,418 |

eEstimated. rRevised.

[1]Table includes data available through Oct. 31, 1992.

[2]In addition to the commodities listed, crude construction materials are produced, but no basis exists for estimation.

[3]This ore is mined for its nickel content and there is no indication that the iron content is recovered other than in ferronickel.

TABLE 2

## GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Alumina | Aluminium de Grèce S.A. (60% owned by Pechiney of France) | Distomon, in Boeotia area | 600 |
| Aluminum | do. | do. | 160 |
| Asbestos | Asbestos Mines of Northern Greece S.A. (MAVE) (Hellenic Industrial Development Bank-Government, 95%; International Finance Corporation, 5%) | Mines at Zidani, near Kozani<br>Plants at Zidani, near ozani | 110<br>100 |
| Barite | Silver and Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group) | Milos Island | 10 |
| Bauxite | Bauxites Parnasse Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group) | Mines in Parnassos-Ghion area and Pasha, Euboea Island | 2,000 |
| Do. | Eleusis Bauxites Mines, S.A. (ELBAU-MIN) (National Bank of Greece) | Plant in Drama and Eleusis; mines near Drama, Itea, Kimi and Mandra | 700 |
| Do. | Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A.; (Aluminium de Grèce S.A.) Delphi Bauxites S.A. | Opencast mines at Delphi-Distomon area | 500 |

TABLE 2—Continued

## GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Bauxite—Continued | Am. E. Barlos-Bauxite Hellas Mining S.A. | Mines at Distomon (Elixon), Beotia | 300 |
| | | Processing plant at Distomon, Beotia | 250 |
| Bentonite: | | | |
| Crude | Mediterranean Bentonite Co. S.A. (Industria Chimica Mineraria S.p.A., Italy) | Surface mines on Milos Island | 20 |
| Do. | Mykobar Mining Co. S.A. (MI Drilling Fluids) | Mines at Adamas, Milos Island | 180 |
| | | Plants at Adamas, Milos Island | 150 |
| Do. | Silver and Baryte Ores Mining Co. | Mines at Adamas, Milos Island | 500 |
| Processed | do. | Plant at Voudia Bay, Milos Island | 400 |
| Cement | Halkis Cement Co. S.A. | Micro-Vathi plant, west-central Euboea | 3,000 |
| Do. | Halyps Cement S.A. (acquired in 1990 by Ciments Français, France) | Paralia Aspropyrgos plant, Athens | 800 |
| Do. | Heracles General Cement Co. S.A. [Industrial Reconstruction Organization (IRO), 69.8%] | Plant at Milaki | 1,900 |
| | | Plant at Volos | 4,600 |
| Do. | Titan Cement Co. S.A. | Elefsis plant, Athens region | 400 |
| | | Kamari plant, Boeotia | 2,600 |
| | | Patras plant, northern Peloponnesus | 1,900 |
| | | Salonica plant, Salonica | 1,650 |
| Chromite | Financial Mining-Industrial and Shipping Corp. (FIMISCO) (IRO) | Tsingeli mines and plant near Volos | 25 |
| Do. | Hellenic Ferroalloy S.A. (HFA) (Government) (operations suspended in November 1991) | Skoumtsa mines in Vourinos | 350 |
| | | Skoumtsa concentrator in Vourinos | 110 |
| Ferroalloys: | | | |
| Ferrochrome | HFA (Government) (operations suspended in November 1991) | Tsingeli near Volos | 45 |
| Ferronickel, Ni content | General Mining & Metallurgical Co. SA (LARCO) (IRO) | Larymna Metallurgical Plant | 25 |
| Lead: Mine: Pb in concentrate | Hellenic Chemical Products and Fertilizer S.A. (Bodossakis Group) | Kassandra mines (Olympias; Stratoni), northeast Chalkidiki | 31 |
| Lignite | Public Power Corp. (DEH) (Government) | Aliveri Mine, Euboea Island | 420 |
| | | Megalopolis Mine, central Peloponnesus | 7,000 |
| | | Ptolemais Mine, Near Kozani | 28,000 |
| Magnesite, concentrate | Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (Government owned, IRO) | Mines at Gerorema, Kakavos, and Paraskevorema at Mantoudhi, northern Euboea Island | 350 |
| Do. | Grecian Magnesite S.A. | Mines at Yerakini and Kastri in Chalkidiki | 400 |
| Do. | Magnomin-General Mining Co. S.A. (A subsidiary of Radex Eraclit Industrie Beteiligungs GmbH, Austria) | Mines at Vavdos, Chalkidiki | 68 |
| | | Processing plant at Vavdos | 60 |
| Manganese (battery grade $MnO_2$ concentrate) | Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. [National Bank of Greece (OAE)] | Nevrokopi, Drama | 4 |
| Natural gas (million cubic meters per day) | Public Petroleum Corp. (DEP) (Government) | Prinos offshore gasfield and oilfield, east of Thasos Island | 125 |
| Nickel, ore | General Mining & Metallurgical Co. S.A. (LARCO) (IRO) | Agios Ioannis mines near Larymna | 500 |
| | | Mines at Euboea | 2,500 |
| Perlite | Silver and Baryte Ores Mining Co. S.A. | Kos and Milos Islands | 250 |
| | | Plant at Pireaus | 300 |
| Do. | Otavi Minen Hellas S.A. (Otavi Minen AG, Germany) | Milos Island | 120 |
| Do. | Peletico Hellas S.A. (Peletico Ltd. of Cyprus) | do. | 20 |
| Do. | N. Bouras & Company | Kos Island | 75 |

TABLE 2—Continued

## GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Petroleum, refined (42-gallon barrels per day) | Hellenic Aspropyrgos Refinery S.A. | Aspropyrgos | 95,000 |
| Do. | Motor Oil (Hellas) Corinth Refineries S.A. | Aghii Theodori, Corinth | 140,000 |
| Do. | Petrola Hellas S.A. | Eleusis | 100,000 |
| Do. | Thessaloniki Refining Co. A.E. | Thessaloniki | 76,000 |
| Pozzolan (Santorin Earth) | Lava Mining & Quarrying Co. Ltd. (Heracles General Cement Co. S.A.) | Quarries on Ghyali Island | 800 |
| 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) | Steelworks at Volos (Operates two 35-ton electric-arc furnaces) | 1,500<br>300<br>200 |
| Do. | Halyvourgiki, Inc. | Steelworks at Eleusis (three 100-ton electric arc furnaces) | 1,200 |
| Do. | Helleniki Halivourgia S.A. | Steelworks at Aspropyrgos (operates two 55-ton electric furnaces) | 400 |
| Do. | Metallurgiki Halyps S.A. (closed in 1988) | Steelworks at Almyros, near Volos (operates two 50-ton electric-arc furnaces) | 300 |
| Do. | Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.) | Steelworks at Nea Maguisia, near Thessaloniki (operates two 50-ton and two 30-ton electric-arc furnaces) | 350 |
| Zinc: Mine: Zn in concentrate | Hellenic Chemical Products and Fertilizer Co. (Bodossakis Group) | Kassandra mines (Olympias; Stratoni), northeast Chalkidiki | 25 |

TABLE 3

## GREECE: RESERVES[1] OF SELECTED MINERAL COMMODITIES FOR 1991

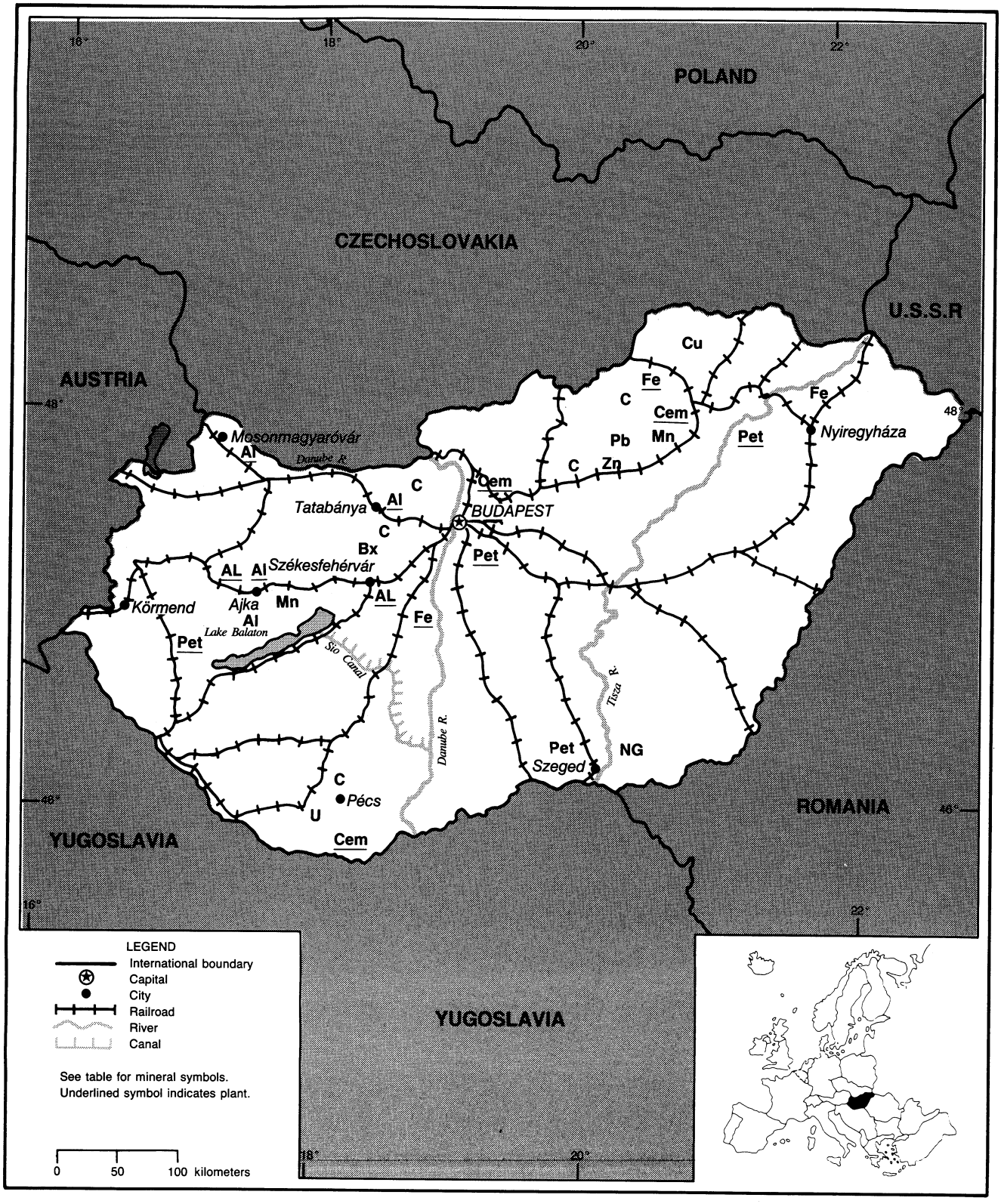
(Million metric tons)

| Commodity | Reserves |
|---|---|
| Asbestos | 4 |
| Barite | 4 |
| Bauxite | 750 |
| Chromite | 16 |
| Iron | 70 |
| Lead, content of ore | .7 |
| Lignite | 3,570 |
| Magnesite | 50 |
| Manganese, content of ore | 2 |
| Nickel, content of ore | 3 |
| Perlite | 200 |
| Pyrite | 6 |
| Zinc, content of ore | 1.3 |

[1]Measured and inferred reserves.

# HUNGARY

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



THE MINERAL INDUSTRY OF

# HUNGARY

By Walter G. Steblez

In 1991, Hungary continued to report declines of production in all the major sectors of its mineral industry: metals, industrial minerals, and mineral fuels. The major factors behind the declining production trend in the country's minerals industry were the transition from Hungary's centrally planned economy to a market-based system and the dissolution of intra-CMEA trade, in which Hungary played an integral part. State-owned heavy industries, which included the minerals sector, continued to receive fewer subsidies from the Government and therefore had to rely more on market demand than on production targets imposed by central planning authorities in past years. A similar economic transition status among Hungary's former CMEA trading partners forced a major reorientation of the country's foreign trade toward the world market. This resulted in a realignment of Hungary's industrial profile more toward the country's real economic needs and therefore more realistic mineral production levels. In 1991, Hungary's GNP declined by about 7% compared with that of 1990, and the value of gross industrial output fell sharply by 19% during this period.

By European standards, Hungary remained a major producer of bauxite, alumina, and aluminum products, although the future of this industry had become uncertain in light of the emerging market forces within the country.

Major events in the country's mineral industry during the year included the restructuring of the aluminum and coal industries and the privatization of the uranium mining industry.

## GOVERNMENT POLICIES AND PROGRAMS

The Government of Hungary continued to promote programs designed to create market economy conditions in the country. In March, the Government began the implementation of a 4-year economic reform package. The broad features of this program included the reduction of expenditures in the central budget from 51% of the GDP in 1991 to 46% by 1993 and the further reduction of state subsidies to 7% of the GDP in 1991 from 9% in 1990, and down to 4% of the GDP in 1993. To accelerate currency convertibility, the forint, which had been an unconvertible currency, was devalued by 13% in January, relative to a basket of West European currencies and the U.S. dollar. In 1991 the forint was described as internally convertible, which was based on the fact that Hungarian enterprises could hold hard currency accounts and convert part of their forint profits to buy hard currency imports. Another element in the reform package was a provision to abolish import and export licensing requirements. Average import duties were to be cut from 50% to 7% during this period. Since its establishment in 1990, through the end of 1991, privatization of state-owned companies by the State Property Agency (AVU) involved 500 relatively small enterprises. Large-scale enterprises, including those in the country's mineral industry, remained state-owned during the year. In February 1991 a new holding agency was established to buy failing and/or very unprofitable enterprises from AVU for restructuring and resale.

## PRODUCTION

Hungary continued to show a downward production trend in 1991 in the metals, industrial minerals, and mineral fuels sectors of the minerals industry. In contrast to the country's previous centrally planned socialist economic system, Hungary's transition to a market economy no longer obligated the Government to produce mineral raw materials at "all costs," maintain full employment, and invest the majority of the available capital in heavy industries. Moreover, as in other branches of the economy, the structural and production profiles of the constituent branches of Hungary's minerals industry should increasingly continue to conform to the demands of the market. In 1991, the aggregate value of output of the country's mining and extracting sectors fell by about 12% compared with that of 1990. Coal mining and natural gas extraction, respectively, declined by about 18% and 8%. Similarly, the output of both the iron and steel and aluminum sectors fell by about 17%. The decline of production in the building materials and petroleum refining sectors was less substantial, amounting to 5% and 4%, respectively. *(See table 1.)*

## TRADE

In 1991, the policy of reorienting Hungary's foreign commerce from traditional CMEA areas toward market economy countries continued from the previous year. Total exports to former centrally planned European countries fell by 12.3% during this period, while those to the EC and the EFTA rose by 56% and 52%, respectively. During this period, the value of Hungary's total imports amounted to 856 billion forints,[1]

which represented an increase of 53.9%, of which imports from former Eastern European planned economy countries rose by 26.4%, while those from EC and EFTA countries rose by 68.3% and 91.5%, respectively.

Available data for the first 6 months of 1991 indicated that imports of mineral raw materials declined by 56.9% compared with the same period in 1990, while exports of the same category of goods fell by 12.8%.

## STRUCTURE OF THE MINERAL INDUSTRY

The information provided in 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. *(See table 2.)*

## COMMODITY REVIEW

### Metals

***Aluminum and Bauxite.***—In February, the Government of Hungary formally decided to reorganize HUNGALU, known officially in Hungary as the Hungarian (Magyar) Aluminum Trust (MAT). The plan involved the transfer of all shares of the 14 constituent enterprises of HUNGALU to the AVU to prepare for eventual privatization. The Government of Hungary would be the majority stockholder in HUNGALU's privatized enterprises, but the reorganization plan would permit foreign investment of up to 49% in the new enterprises. HUNGALU's management expected the predominant share of foreign investment to be made in enterprises involved in the production of aluminum semimanufactures, which had been the most profitable branch of the industry. In July, the plan was put into operation, symbolized by the official change in the Trust's title from MAT to HUNGALU. Reportedly, at yearend, the Ajka smelter was closed, largely owing to high electric power costs. HUNGALU's two remaining smelters at Tatabánya and Inota reportedly would be closed later in 1992 and 1993, although they may continue to operate their secondary aluminum smelters, which are significantly less energy intensive than those for smelting primary metal. Moreover, HUNGALU would continue to produce alumina largely for export in exchange for primary metal needed by the company's fabricating operations. The decline in output of both bauxite and primary metal in 1991 was consonant with HUNGALU's observance of high energy costs and supply and market demand.

***Copper.***—In 1991, Hungary moved closer toward resolving the status of its Recsk copper ore deposit and mine infrastructure (exploratory underground mine and surface pilot plant), which had been placed on a care-and-maintenance basis since the early 1980's. The deep-lying Recsk ore body in the Matra mountains contained between 172 and 175 Mmt of copper ore, grading 1.12% copper, and about 20 Mmt of polymetallic ore, grading 4.22% lead and 0.92% zinc along with smaller quantities of gold, molybdenum, and silver. Geological investigations conducted by the Government, reportedly, determined the area of mineralization to be about 10 $km^2$. Porphyritic copper was found to occur over a 2-$km^2$ area with a peripheral mineralization of pyrite and chalcopyrite. Also, the surrounding area was found to contain polymetallic mineralization. With the collapse of CMEA-based commodity barter trade, Hungary's traditional copper trade with former CMEA member countries, reportedly, declined by about 84% in 1991 compared with that of 1990. On a per capita basis, Hungary's consumption of copper during this period fell from 4.5 kg to 2.2 kg. Most of Hungary's requirements for copper in 1991 were met by imports from Poland as opposed to the U.S.S.R. in previous years. Imports of copper from market economy countries, reportedly, fell from about 22% of the country's total copper imports in 1990 to 4.9% of the total in 1991.

In view of Hungary's shift of foreign trade away from barter and toward a full hard currency-based trading system, the development of the Recsk deposit began to acquire greater economic importance. In midyear, the AVU allowed the Recsk mining company to form a joint public limited company (PLC). The Government of Hungary, reportedly, would own 50% equity in this venture, while a U.S.-Austrian joint venture, Development Coordinators International (DCI), would also hold 50% of the equity. However, DCI, reportedly, was to have the predominant executive powers at the mine. DCI would contribute $10 million toward the purchase of its share of equity, and, additionally, $160 million would be allocated for mine development. DCI also reportedly concluded an agreement with RTZ Consultants of the United Kingdom for the latter to prepare technical and operational plans for the mine. When operational, the Recsk mine reportedly would produce 2.5 Mmt/a of copper ore and 500,000 mt/a of zinc-bearing ore. Annual metal output from this operation was expected to amount to about 40,000 tons of copper and 10,000 tons of zinc.

***Iron and Steel.***—PLC Ozder Stahlwerke AG (Ostag), formed in late 1990 as a joint venture between Metallgesellschaft AG (30%) and Korf AG (30%), both of Germany, and Hungary's integrated steelworks Ozki Kohazati Uzemok (OKU), reportedly had problems in early 1991. OKU, serving in the capacity of a government holding company with a 40% share in Ostag, was faced with dynamic management decisions by the Korf-Metallgesellschaft consortium to raise efficiency by installing a 90-ton cokeless energy-optimizing furnace in place of the existing open-hearth furnaces and by reducing the work force at the company.

Additionally, major debts accumulated in 1990 under the previous management of the Ozd steelworks, as well as losses accrued during the first quarter of 1991, reportedly prompted OKU's German partners to demand the assumption of a proportional share of the company's debt burden by the Government of Hungary. Ostag's management also reportedly expressed an interest in acquiring

additional assets at the steelworks that were not included under the provisions of the initial joint-venture agreement. These included separate service units at the plants in charge of haulage, maintenance, and supplying fuel and power to the company's facilities. A light section mill was also included in the acquisition list. Reportedly, the offer for these assets was less than 10% of their book value. In midyear, reportedly faced with the inability to operate Ostag effectively and Ostag's mounting losses, the German consortium of Metallgesellschaft AG and Korf AG withdrew from the Ostag partnership. Reportedly, the German consortium's assets in Ostag, valued at about $26 million, were to be transferred to the Hungarian Development Institute, a Government agency, in exchange for other unspecified assets of equal value.

The decline in the U.S.S.R.'s demand for Hungary's output of steel pipe and semimanufactures, reportedly, led to the shutdown of Csepel Muvek Femmu's (Csepel Metal Works) two of three open-hearth furnaces. The company's three open-hearth and two electric steel furnaces had supplied much of the feed to the company's seamless tube mill. During the year, Csepel actively began to seek foreign joint-venture investment in its pipemaking operation.

*Manganese.*—The Urkut manganese mine in the Bakony Mountains continued to produce some carbonated and oxidized ores. The significant decline in manganese ore output in 1991 presumably reflected the sharp decline in barter-base trade with former CMEA members. In past years, most of Hungary's manganese was designated for export to these countries because Hungary lacked the necessary facilities and electric power to domestically produce electric furnace ferromanganese. Reportedly, some of the ore is used for the production of blast furnace ferromanganese. The decline in the country's total ferroalloy production parallels the decline in the country's steel output.

## Industrial Minerals

In contrast to Hungary's other heavy industries, including metal mining and processing, which showed a declining production trend and a need for extensive rationalization, industrial minerals were seen as having a brighter future. This was mainly because of the forecast growth in the construction, pharmaceutical, and chemical sectors of the country's economy. Hungary's desire to eventually join the EC would necessitate the adoption of EC standards, including those relative to infrastructure. The decline of the country's output of most industrial minerals in 1991 reflected a transitional economy in which the construction industry's old centrally planned priorities were being replaced gradually by market demand.

## Mineral Fuels

*Coal.*—Despite the increase in the use of oil and gas-fired electric power stations, coal and lignite power stations in 1991 reportedly had an aggregate installed capacity of about 1,819 MW, or approximately 26% of the country's installed electric power generating capacity. Despite both the uneconomic and environmentally polluting aspects of its use, the mine output of subbituminous coal and lignite decreased only slightly because only about 50% of Hungary's energy needs were met by domestic production. Additionally, a significant decrease in coal production and ensuing layoffs would cause socially "unacceptable" levels of unemployment. However, closure and rationalization of the most unprofitable operations continued. Reportedly, late in the year, the Mecsek Coal Mine Company went into receivership because of debts that accumulated to 6 billion forints. A court-appointed commission would reportedly assess the company's assets to begin debt payment to about 60 of the coal mine's creditors. Until then all loss-making operations at Mecsek would be curtailed. It was expected that layoffs would occur in all employment categories except those at the work face and would affect foreign workers first.

*Natural Gas and Petroleum.*—In 1991, Hungary's National Oil and Gas Trust was abolished and replaced by the Hungarian Society of Oil and Gas Industries, which would control all aspects of the industry's operation and also would give greater independence to the constituent enterprises in the industry. More than 80% of the country's import needs of petroleum have been met historically by barter-based shipments from the U.S.S.R. Similarly, all of Hungary's import needs of natural gas had been met by shipments from the U.S.S.R.

The closure of the Adria pipeline, because of the civil war in Yugoslavia, forced Hungary to obtain additional supplies of petroleum from Iran, partly on a barter basis. Financial assistance to Hungary for the purchase of additional supplies of petroleum reportedly was provided by the International Monetary Fund.

*Nuclear Energy.*—The Paks nuclear power station, which accounts for about 25% of the country's electric power output, signed an agreement with Mecseki Ercbanyaszati Vallalat (MEV), Hungary's uranium mining enterprise at Pecs, to purchase 414,000 kg of yellow cake. Although the purchase price of $60/kg was higher than the world spot market rate for uranium concentrate, this transaction assured the solvency of MEV during its restructuring period as well as the longer term viability of a domestic source of supply.

## Reserves

Taking into consideration Hungary's transition to a market economy system, the country's mineral resources would have to be reevaluated from the perspective of market economics. Reserves, as defined by most 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 previous policies for centrally planned industrial development often had more to do with political rather 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 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 mineral in question for exploitation and the other relating to the reliability of the information on the quantity of mineral in place. The first system determined whether 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 mineral in situ.

The second classification designated deposits into "reserve" (resource) categories A, B, $C_1$, and $C_2$ where sufficient geological data have been gathered relative to the size of the deposit and its mineral grade. In category A the "reserves" are known in detail. The ore boundaries are outlined by trenching, exploratory, workings, or exploratory boreholes. The depositional environment, the proportion of different commercial grades of ore, and the hydrogeological conditions of the exploitations have been ascertained and the quality and technological properties of the ore have been ascertained in detail, assuring the reliability of projected beneficiation and production operations.

In category B, the "reserves" in place are explored. The ore bodies are outlined by exploratory workings or boreholes. The depositional environment is known and the types and industrial grades of ore are ascertained but without details of their distribution. The quality and technological properties of the ore are known sufficiently well to ensure the correct choice of the system for its beneficiation. The general conditions of exploitation and the hydrogeological environment are known in good detail.

In category $C_1$, the "reserves" in place are estimated by a sparse grid of exploratory boreholes or workings. This category also includes "reserves" adjoining the boundaries of A and B categories of ore as well as "reserves" of very difficult deposits in which the distribution of the values of mineral cannot be determined even by a dense exploratory grid. The quality, types, and industrial grades and technology of beneficiation are ascertained tentatively by means of laboratory tests and analyses and by analogy with known deposits of the same type. The general conditions of exploitation and the hydrogeological environment are known tentatively.

The $C_2$ category includes those "reserves" in place that adjoin the explored "reserves" of A plus B plus $C_1$ categories as well as "reserves" indicated by geological and geophysical evidence and confirmed by boreholes. Taking this system into account, Hungary's major mineral resources in categories $A+B+C_1$ are provided in table 3. *(See table 3.)*

## INFRASTRUCTURE

Railways carried a substantial amount of Hungary's mineral freight. The railroad network consisted of 7,779 km of track, of which 7,513 km was 1.435-meter standard gauge track. According to the most recent data, in 1990, of the total volume of mineral freight carried in Hungary, railroads carried 44.8% of the fuels, 18.8% of ores and other mining products, 26% of the construction materials, and 74% of the total amount of iron and steel and nonferrous metal products.

Hungary also had maritime port access on the Baltic Sea in Poland at Gdansk and Gdynia, as well as at Rostock in the German Democratic Republic. Major ports on the Danube were located at Budapest and Dunaujvaros. In 1990, marine transport carried 0.7% of the fuels, 2.8% of the ores and mining-related products, 0.7% of the construction industry's products, and 6.4% of the iron and steel and nonferrous metals.

Hungary's highways had a total length of 130,000 km, of which 28,701 km was part of the national highway system. In 1990, the country's highway system carried 14.2% of the fuels, 78.4% of the ores and mining-related products, 73.1% of the construction industry's products, and 19.6% of the iron and steel and nonferrous metals.

The country's pipeline network consisted 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. In 1990, Hungary's pipelines carried 40.3% of the total fuel transport.

The total net installed electric generating capacity as of 1990 amounted to 6,956,000 kW, of which 4,750,000 kW was rated by thermal electric generating plants, 1,760,000 kW by nuclear powerplants, and 46,000 kW by hydroelectric power facilities.

## OUTLOOK

Given the Hungarian Government's objective to bring the country into conformity with standards that are current within EFTA and the EC, greater investment can be envisaged for the reconstruction and modernization of the country's infrastructure: transportation networks, commercial buildings, and private and publicly owned dwellings, etc. To accommodate most of these objectives, the country's industrial minerals and construction materials sectors would increase in importance as the demand for cement, quarry products, and other industrial minerals increases. To respond to growing domestic market demands for structural steels, as well as the Government's plans to increase both energy efficiency and minimize environmental degradation, the country's steel industry may adopt the more energy-efficient minimill approach rather than reliance on integrated steel mills.

[1]Hungary, Abecor Country report, Barclays, May 1992.

## OTHER SOURCES OF INFORMATION

**Agency**
Iparugyi Miniszterium (Ministry of Industry) Budapest, Hungary

**Publications**
Magyar Aluminium (Hunagarian Aluminum), Budapest; monthly.

Statistikai Evkonyv (Statistical Yearbook), Budapest.

Statistikai Havi Kozlemenyek (Monthly Statistical Bulletin), Budapest.

TABLE 1

## HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite, gross weight | thousand tons | 3,101 | 2,593 | 2,644 | 2,559 | 2,037 |
| Alumina, gross weight, calcined basis | do. | 858 | 873 | 882 | 826 | 546 |
| Metal: | | | | | | |
| Primary | | 73,500 | 74,692 | 75,195 | 75,162 | 52,095 |
| Secondary | | r26,800 | r27,000 | r31,000 | r e30,000 | e32,000 |
| Total | | r100,300 | r101,692 | r106,195 | r e105,162 | e84,095 |
| Copper, metal: | | | | | | |
| Smelter, secondary[e] | | 100 | 100 | 100 | 100 | 100 |
| Refined including secondary | | r23,251 | r15,261 | r13,137 | r12,817 | e12,000 |
| Gallium, metal[e] | kilograms | 34,103 | 4,100 | 4,100 | 4,100 | 3,600 |
| Gold, mine output, Au content[e] | do. | 600 | 600 | 600 | 600 | 500 |
| Iron and steel: Metal: | | | | | | |
| Pig iron: | | | | | | |
| For steel industry | thousand tons | 2,051 | 2,054 | 1,927 | 1,682 | e1,286 |
| For foundry use | do. | 56 | 39 | 27 | 15 | e25 |
| Total | do. | 2,107 | 2,093 | 1,954 | 1,697 | e1,311 |
| Ferroalloys:[e 4] | | | | | | |
| Ferrosilicon | | 10,000 | 10,000 | 9,000 | 9,000 | 7,000 |
| Silicon metal | | 2,000 | 2,000 | 2,000 | 2,000 | 1,000 |
| Other | | 2,000 | 1,000 | 1,000 | 1,000 | 500 |
| Total | | 14,000 | 13,000 | 12,000 | 12,000 | 8,500 |
| Steel: | | | | | | |
| Crude | thousand tons | 3,621 | 3,583 | 3,356 | 2,963 | 1,931 |
| Semimanufactures, rolled only | do. | 2,831 | 2,793 | 2,539 | 2,176 | 1,534 |
| Lead: Metal, refined, secondary[e] | | 100 | — | — | — | — |
| Manganese ore: | | | | | | |
| Run of mine: | | | | | | |
| Gross weight | | 125,634 | 110,908 | 108,327 | 118,200 | 54,783 |
| Mn content[e] | | 24,000 | 24,000 | 20,000 | 22,000 | 10,000 |
| Concentrate: | | | | | | |
| Gross weight | | 78,000 | 80,983 | 84,000 | 60,000 | e40,000 |
| Mn content[e] | | 25,000 | 325,915 | 27,000 | 18,000 | 12,000 |
| Vanadium, metal[e] | | 300 | 300 | 300 | 300 | 200 |
| Zinc: Metal, smelter, secondary | | e600 | 1,565 | 1,374 | e1,300 | e1,200 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | thousand tons | 4,153 | 3,873 | 3,857 | 3,933 | 2,529 |
| Clays: | | | | | | |
| Bentonite: | | | | | | |
| Raw | | 98,331 | 66,014 | 59,973 | 36,600 | 18,097 |
| Processed | | 52,828 | 53,250 | 47,175 | 28,600 | 14,127 |
| Kaolin: | | | | | | |
| Raw | | 33,289 | 29,572 | 24,824 | 18,000 | 9,400 |
| Processed | | 5,179 | 5,329 | 3,788 | 3,100 | 4,815 |
| Gypsum and anhydrite[e] | | 104,400 | 117,845 | 113,000 | 112,000 | 110,000 |
| Lime, calcined | thousand tons | 831 | 851 | 878 | 831 | 559 |

See footnotes at end of table.

TABLE 1—Continued

## HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Nitrogen: N content of ammonia | thousand tons | 786 | 692 | 673 | 445 | e300 |
| Perlite | | 112,410 | 120,562 | 108,678 | 93,000 | 87,750 |
| Refractory materials, n.e.s.: | | | | | | |
| Chamotte products | thousand tons | 116 | 109 | 101 | 77 | e70 |
| Chrome magnesite products | do. | 53 | 33 | 32 | 29 | e20 |
| Sand and gravel: | | | | | | |
| Gravel | thousand cubic meters | 8,269 | 7,769 | 7,720 | 5,557 | e5,000 |
| Sand: | | | | | | |
| Common[e] | do. | 400 | 400 | 400 | 400 | 200 |
| Foundry | thousand tons | 631 | 648 | 649 | 543 | 181 |
| Glass | do. | 769 | 690 | 791 | 705 | 182 |
| Sodium compounds: | | | | | | |
| Hydroxide (caustic soda) | | 201,167 | 201,784 | 204,044 | 193,063 | 165,943 |
| Sulfate[e] | | 9,000 | 9,000 | 9,000 | 8,000 | 6,000 |
| Stone: | | | | | | |
| Dimension, all types | thousand tons | 5,537 | 5,217 | 4,677 | 4,025 | e4,000 |
| Dolomite | do. | 1,086 | 1,005 | 917 | 778 | e700 |
| Limestone | do. | 7,282 | 7,091 | 7,259 | 6,572 | e5,000 |
| Quartzite | do. | 30 | 42 | 24 | 31 | e20 |
| Sulfur: | | | | | | |
| From pyrite[e] | | 1,000 | 1,000 | 1,000 | 1,000 | 900 |
| Byproduct, elemental, all sources[e] | | 10,000 | 10,000 | 10,000 | 9,000 | 8,000 |
| Total[e] | | 11,000 | 11,000 | 11,000 | 10,000 | 8,900 |
| Sulfuric acid | | 573,323 | 512,374 | 482,421 | 244,051 | 129,430 |
| Talc[e] | | 15,000 | 13,000 | 12,000 | 10,000 | 10,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Asphalt, natural | | 572,117 | 552,334 | e550,000 | e500,000 | e400,000 |
| Carbon black[e] | | 5,000 | 5,000 | 5,000 | 5,000 | 4,000 |
| Coal: | | | | | | |
| Bituminous | thousand tons | 2,360 | 2,255 | 2,127 | 1,736 | 1,695 |
| Brown | do. | 13,261 | 12,986 | 12,020 | 10,373 | 9,953 |
| Lignite | do. | 7,223 | 5,634 | 5,883 | 5,469 | 5,327 |
| Total | do. | 22,844 | 20,875 | 20,030 | 17,578 | 16,975 |
| Coke: | | | | | | |
| Coke oven: | | | | | | |
| Metallurgical | do. | 669 | 547 | 602 | 564 | 611 |
| Other[e] | do. | 150 | 150 | 150 | 150 | 150 |
| Total[e] | do. | 819 | 697 | 752 | 714 | 761 |
| Gashouse[e] | do. | 160 | 302 | 210 | 200 | 200 |
| Total coke | do. | 979 | 999 | 962 | 914 | 961 |
| Fuel briquets | do. | 2,134 | 2,302 | 1,983 | 1,761 | 1,924 |
| Gas: | | | | | | |
| Manufactured | million cubic meters | 151 | 52 | — | — | — |
| Natural, marketed | do. | 7,126 | 6,272 | 6,176 | 4,932 | 5,041 |

See footnotes at end of table.

TABLE 1—CONTINUED

## HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| MINERALS FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Natural gas liquids:[e] | | | | | | |
| Natural gasoline | thousand 42-gallon barrels | [3]5,540 | 5,500 | 5,500 | 5,000 | 5,000 |
| Liquefied petroleum gas | do. | [3]2,444 | 2,400 | 2,400 | 2,300 | 2,000 |
| Peat, agricultural use[e] | thousand tons | 70 | 70 | 70 | 65 | 65 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | do. | 1,876 | 1,947 | 1,966 | 1,974 | 1,893 |
| Converted | thousand 42-gallon barrels | 12,977 | 13,025 | 13,152 | 13,206 | 12,664 |
| Refinery products:[5] | | | | | | |
| Liquefied petroleum gas | do. | [r]3,793 | [r]4,002 | [r]3,909 | [r]3,840 | [e]3,500 |
| Gasoline, including naphtha | do. | 11,059 | 11,306 | 11,033 | [r]12,343 | [e]11,000 |
| Kerosene and other light distillates | do. | 2,581 | 2,449 | 2,542 | [r]2,373 | [e]2,000 |
| Distillate fuel oil | do. | 24,200 | 24,200 | 22,902 | [r]20,411 | [e]18,000 |
| Lubricants | do. | 1,463 | 1,323 | 1,302 | [r]1,156 | [e]1,000 |
| Residual fuel oil | do. | 9,597 | 11,642 | 12,075 | [r]10,263 | [e]8,000 |
| Paraffin and petrolatum | do. | 236 | 236 | 236 | [r]207 | [e]200 |
| Asphalt and bitumen | do. | 3,466 | 3,345 | 3,115 | [r]2,866 | [e]2,000 |
| Total[e] | do. | [r]56,395 | [r]58,503 | [r]57,114 | [r]53,459 | 45,700 |

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

[1]Table includes data available through Dec. 1992.

[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]Reported figure.

[4]Hungary is believed to produce some blast furnace ferromanganese.

[5]Excludes refinery fuel and losses.

TABLE 2

## HUNGARY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand tons per year unless otherwise specified)

| Commodity | Major operating companies (all state-owned) | Location of main facilities | Annual capacity |
|---|---|---|---|
| Alumina | Magyar Aluminiumipari Tröszt (MAT) (Hungarian Aluminum Corp.) | 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 | 75 |
| Aluminum, primary | do. | Ajka plant about 120 kilometers 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 | Magyar Aluminiumipari Tröszt (MAT) (Hungarian aluminum Corp.): Bakony Mining Enterprise and Nyirád Darvastó and Halimba Mining Complexes | Bakony District, extending roughly 100 kilometers northeast along Lake Balaton | 1,900 |
| Do. | Fejér County Mining Enterprise | 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) | 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 |

TABLE 2—Continued

## HUNGARY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand tons per year unless otherwise specified)

| Commodity | | Major operating companies (all state-owned) | Location of main facilities | Annual capacity |
|---|---|---|---|---|
| Manganese ore | | Magyar Szénbányászati Tröszt (MSZT) (Hungarian Coal Mining Trust) | Urkut manganese ore mines, 120 kilometers southwest of Budapest | 160 |
| Natural gas | million cubic feet per year | National Petroleum and Gas Industrial Trust | Szeged and Algyö gasfields, southern Hungary | 151,960 |
| Do. | do. | do. | Hajduszoboszó gasfield, 180 kilometers east of Budapest | 49,440 |
| Do. | do. | do. | Smaller gasfields: Szánk, Kardoskut, Békés, Berefurdö, and others | 38,740 |
| Petroleum: | | | | |
| Crude | million barrels per year | do. | Szeged-Algyö field, near Romanian-Yugoslav border; 50% of total capacity | 7 |
| Refined | do. | National Petroleum and Gas Industrial Trust: | | 54.8 |
| | | Danube Petroleum Refining Co. | Százhalombatta | |
| Do. | do. | Tisza Petroleum Refining Co. | Leninaváros | 21.9 |
| Do. | do. | Zala Petroleum Refining Co. | Zalaegerszeg | 3.7 |
| Steel | | Dunaujváros (Danube Steel Works) | 60 kilometers south of Budapest | 1,400 |
| Do. | | Ozd Metallurgical Works | 120 kilometers northeast of Budapest | 1,100 |
| Do. | | Lenin Metallurgical Works | Diosgyör, 145 kilometers northeast of Budapest | 1,300 |

TABLE 3

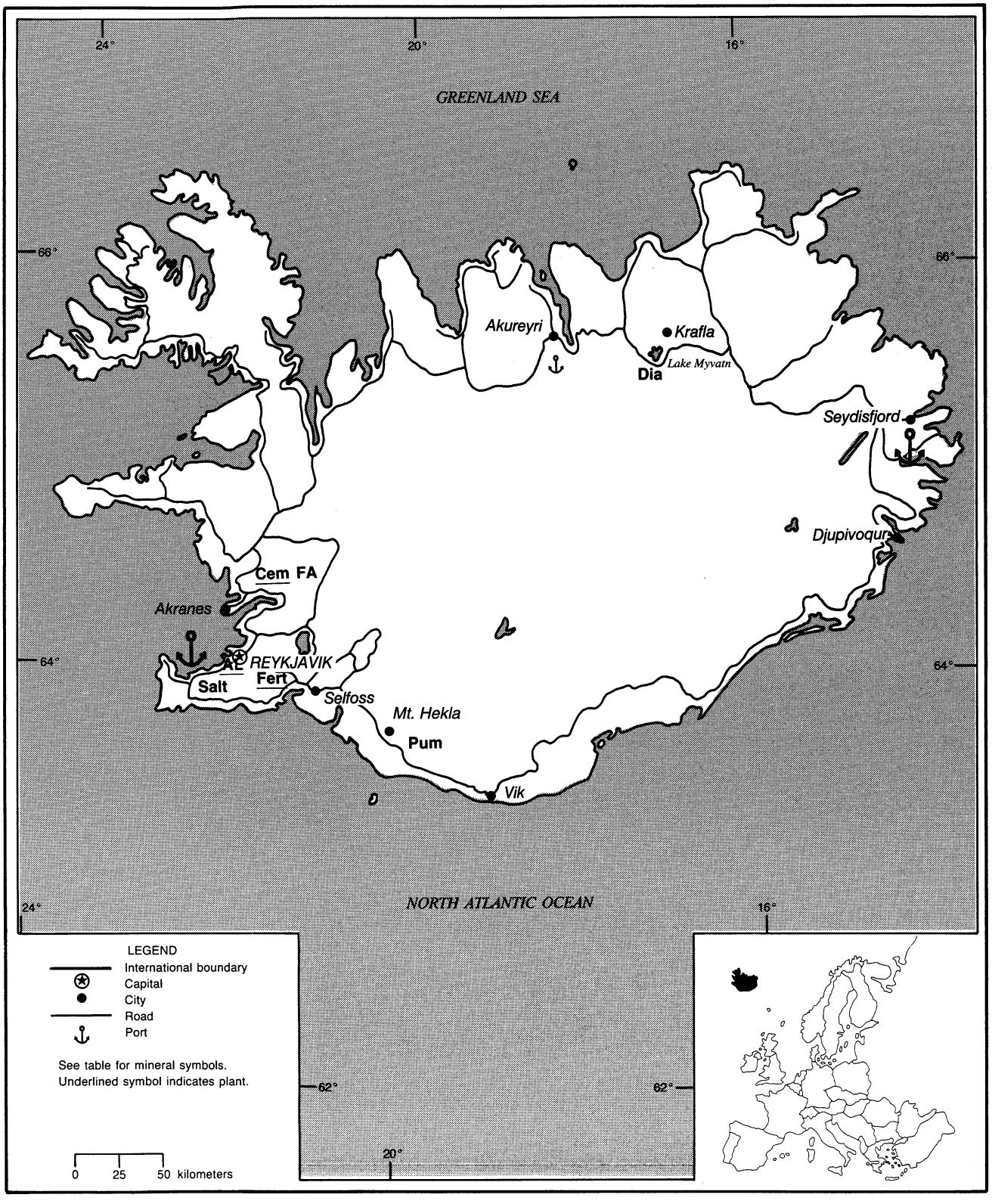
## HUNGARY: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Resources |
|---|---|
| Bauxite | 124.0 |
| Copper content of ore | 1.9 |
| Manganese ore | 18.2 |
| Lead, content of ore | .8 |
| Zinc, content of ore | .2 |
| Coal, bituminous | 86.3 |
| Coal, brown and lignite | 3,193.3 |
| Natural gas million cubic meters | 126.7 |
| Petroleum | 158.0 |
| Bentonite | 15.9 |
| Kaolin | 15.7 |
| Perlite | 18.1 |

# ICELAND

**AREA 103,000 km²** **POPULATION 252,000**



THE MINERAL INDUSTRY OF

# ICELAND

By Donald E. Buck, Jr.

Iceland is a mid-Atlantic volcanic island and lacks a significant mineral resource base. Minerals and metals were processed with the abundant hydroelectric and geothermal energy resources of the country. Although the domestic consumption of minerals was small, the country was almost totally dependent on imported materials. In recent years, the Government has continued with development of the hydroelectric energy potential to attract more mineral processing companies.

## GOVERNMENT POLICIES AND PROGRAMS

Both private and Government-owned enterprises exist in the minerals and mineral processing industry. The Ministry of Public Works controls prospecting and mining rights under the amended Mining Law of 1906. The Museum of Natural History and the Iceland Geologic Survey collect mineral information. Also, the national and municipal governments 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 to the United Kingdom or Europe. Three partly or wholly foreign-owned power-intensive projects, Icelandic Aluminium Co. (ISLA), Icelandic Alloys Ltd., and Kisilidjar Corp., contracted for one-half the energy production of the National Power Co. The National Power Co. has an installed hydroelectric power-generating capacity of 4,200 gigawatt hours.[1] IEMU solicited foreign companies in the mineral industry to develop major industrial projects. Iceland's competitive advantages are its lower energy costs and economic position in the European Economic Space.

## PRODUCTION

Aluminum production increased 2.3% in 1991 while ferrosilicon production decreased almost 20%. Cement production decreased 7% and diatomite production decreased over 11%. It was reported that Islenska Stalfelagid's steel plant at Hafuar was placed in receivership in November 1991 after being in operation for just over 1 year. The plant was still producing billet under the terms of its administration; however, the plant was producing below the rate projected by Icelandic Steel for its initial production phase. *(See Table 1.)*

## TRADE

The value of 1991 exports was projected to be $1,548 million,[2] a decrease of 1% over that of 1990. For 1991, exported industrial goods totaled $277 million, of which $149 million was primary aluminum, $26 million was ferrosilicon, and $7.3 million was diatomite. These products represented 15.6% of the total value of commodity groups exported (f.o.b.). Iceland's most important overall export markets were the United Kingdom (25%), Germany (13%), and the United States (10%). The value of imports (c.i.f.) and exports (f.o.b.) with European Free Trade Association countries accounted for 12.5% of Iceland's total trade. The United States had a 12.1% share of Iceland's total trade.

## 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 raw materials. The aluminum industry employs about 700 persons, and the ferroalloy industry employs about 200 persons. Labor is unionized. The unions have historically had a powerful political influence. The Government also owns and operates a cement plant and a salt plant. *(See Table 2.)*

## COMMODITY REVIEW

### Metals

Iceland's main mineral commodities produced were aluminum metal and ferrosilicon. Production of aluminum at ISAL increased, despite a drop in the world market price for aluminum. Although its quality and quantity continue to improve at its plant, ISAL's main disadvantage is related to the distance from its markets. However, the lower cost of energy in Iceland is a definite advantage, especially when energy costs are rising in Europe and the United States.

The Icelandic Government and the Atlantal group [Alumax Inc., (United States), Hoogovens BV, (The Netherlands) and Granges AB, (Sweden)] postponed the construction of the proposed new $1 billion aluminum smelter near Reykjavik.[3]

### Reserves

Iceland has a small mineral reserve base and uses imported materials to produce most of its goods. Aluminum and ferrosilicon are produced from imported raw materials, and the cement plant uses dredged seashells, 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 km long; however, paved roads total only 200 km. 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 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. 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. It is projected that the new aluminum plant project could contribute as much as 5% to the gross national product and create as many as 2,000 jobs while under construction.

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[1]Economic Statistics, Central Bank of Iceland, v. 12, No. 4, Nov. 1991, p. 5.
[2]Where necessary, values have been converted from Icelandic krónas (IKr) to U.S. dollars at the rate of I Kr59.42=US$1.00, the average exchange rate in 1991.
Page 16 of work cited in footnote 1.
[3]News from Iceland. Dec. 1991, p. 1.

## OTHER SOURCES OF INFORMATION

### Agencies

Central Bank of Iceland
Kalkofrisvegur 1
150 Reykjavik, Iceland
Icelandic Geodetic Survey
Laugavegur 178
105 Reykjavik, Iceland
Ministry of Industry
Arnarhvall
150 Reykjavik, Iceland

### Publications

Company annual reports:
Icelandic Alloys Ltd., Grundar tangi, 301 Arkanes.
Icelandic Aluminium Co. (ISAL), P.O. Box 244, 222, Hafnarfjördur.
OECD, Economic Surveys--Iceland, 1989-90.

TABLE 1
## ICELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| Aluminum metal, primary[2] | | 83,485 | 82,034 | 88,477 | r86,773 | 88,768 |
| Cement, hydraulic[3] | thousand tons | r130 | r132 | r118 | r114 | 106 |
| Diatomite | | r23,365 | 25,142 | 24,900 | r26,107 | 23,106 |
| Iron and steel: Ferrosilicon | | 60,184 | 70,051 | 72,007 | 62,791 | 50,299 |
| Nitrogen: N content of ammonia | | 9,039 | 8,812 | 9,482 | r8,292 | 8,917 |
| Pumice and related volcanic material: | | | | | | |
| Pumice | | 58,792 | 65,444 | 56,845 | r28,237 | 33,354 |
| Scoria | | 271 | 351 | 367 | r657 | 389 |
| Salt[e] | | 1,830 | e2,000 | 2,500 | r2,500 | 3,000 |
| Sand: | | | | | | |
| Basaltic | cubic meters | 5,400 | 2,300 | 2,100 | r50 | 50 |
| Calcareous, shell | thousand cubic meters | 115 | 135 | 119 | r111 | 106 |
| Sand and gravel | do. | 4,816 | 4,517 | 4,421 | r4,008 | 3,661 |
| Silica dust[4] | | 12,131 | e14,234 | 12,240 | 11,222 | 10,654 |
| Stone, crushed: | | | | | | |
| Basaltic | thousand tons | 114 | 91 | 91 | r105 | 116 |
| Rhyolite | | 22,700 | 28,300 | 25,811 | r24,424 | 22,984 |

[e]Estimated. [r]Revised.
[1]Table includes data available through Feb. 26, 1992.
[2]Ingot and rolling billet production.
[3]Sales.
[4]Byproduct of ferrosilicon.

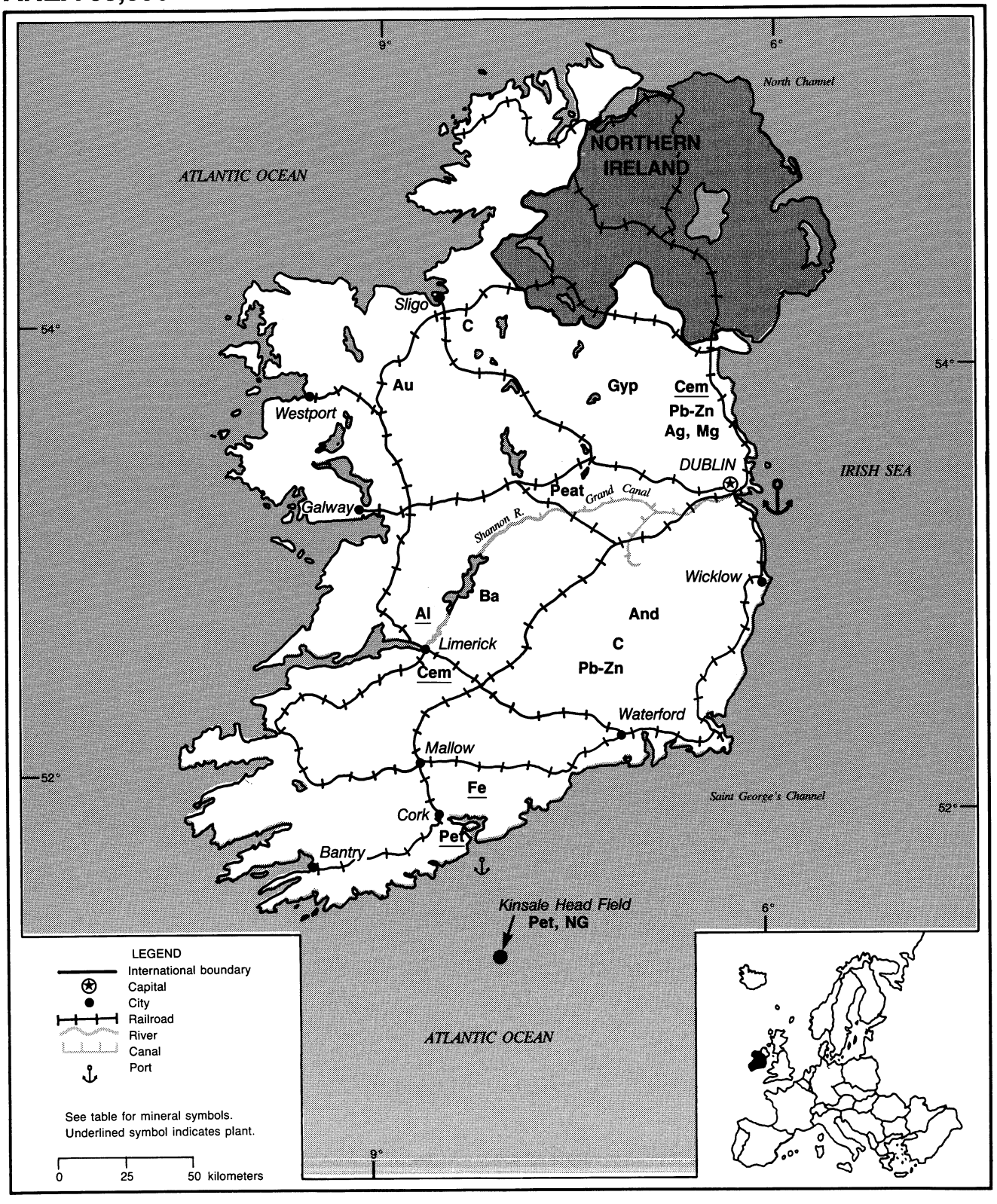
TABLE 2
## ICELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year)

| Commodity | Major operating companies and major equity owners | Location of main facility | Capacity |
|---|---|---|---|
| Aluminum | Icelandic Aluminium Co. (ISAL) | Plant at Straumsvik | 88 |
| Cement | Sementsverksmidja Rikisins | Plant at Akranes | 130 |
| Diatomite | Kisilidjar Corp. | Mine at Lake Myvatn | 27 |
| Ferrosilicon | Icelandic Alloys Ltd. | Plant at Grundartangi | 55 |
| Pumice | Pumice Products Ltd. | Mines at Mount Hecla | 200 |
| Salt | Reykjanes Geo-Chemicals | Plant at Svartsengi | 6 |
| Steel | Islenska Stalfelagid | Plant at Hafuar | 22 |

# IRELAND

**AREA 68,890 km²** **POPULATION 3.6 million**



THE MINERAL INDUSTRY OF

# IRELAND

By Harold R. Newman

Ireland continued as one of Europe's major producers of zinc and a significant producer of alumina, barite, lead, and peat in 1991. The country produced about 18% of the total zinc mine production and 10% of total lead production in the EC. Although the range of minerals exploited has been limited, exploration activity continued to increase, with the main emphasis on gold, lead, and zinc. The country's mineral processing industry was relatively small, as was the demand and consumption of mineral resources.

The downturn in international economic activity led to a corresponding slowdown in Ireland's economic activity. Inflation, at 3%, continued at a low level, and the balance of payments continued into surplus. The real GNP growth was estimated to have been 2.25%. Even with the slowdown in 1991 the Irish economy has shown a very creditable performance in the past few years, with sustained rates of growth and substantial trade surpluses.

## GOVERNMENT POLICIES AND PROGRAMS

As a member of the EC, Ireland is a full participant in the program to complete the single European market by the end of 1992.

The Government was expected to continue to receive EC funding support to assist in constructing and upgrading infrastructure projects, including roads, ports, telecommunications, and indigenous energy development. The EC Directive on Environmental Impact Assessment requires that projects in the extractive industry, including mining of minerals and ores, be subjected to an Environmental Impact Assessment (EIA) of their impact to the environment before development is granted. The Government responded to this by finalizing comprehensive environmental regulations in relation to mining development. Criteria to address the EIA will be incorporated into mining licenses before issuance. Also, prospectors are required to complete an environmental audit. The public and other interests will have an opportunity to comment on the environmental audit before planning permission is given. The Department of Energy will assess the adequacy of any environmental statements submitted.

The EIA is not confined to mineral operations. Some other operations that would be affected are cement plants, iron and steel works and foundries with a batch capacity of 5 mt/d or more, integrated chemical works, glass works where capacity exceeds 5,000 mt/a, and artificial mineral fiber factories.

The Industrial Development Authority (IDA) is an agency that was established and fully financed by the Government. IDA's mandate is to create wealth and provide employment by attracting domestic and foreign investment.

The Geologic Survey of Ireland and IDA were engaged in a project to investigate the feasibility of the dimension stone industry in Ireland. Also, IDA and Castlemore Minerals Ltd. were investigating the possibility of the production and marketing of calcium carbonate fines.

## PRODUCTION

Ireland's base metals 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 throughout the country. Several industrial minerals projects were awaiting the granting of planning permission and mining leases before moving into production. Natural gas production continued from an area off the southern coast of Ireland near Cork. Reserves were not disclosed, and production from the fields was being carefully managed to extend the life of the area. *(See table 1.)*

## TRADE

Ireland's trade sector continued to perform well in 1991 although export growth slowed somewhat as a result of the slower growth in export markets. The trade surplus grew from $2.9 billion[1] in 1990 to $3.3 billion in 1991. This represented 8.75% of the GNP.

Ireland continued its participation in efforts to create a single European market by the end of 1992. 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 affect Ireland's interests are fiscal harmonization and proposals for economic and monetary union. Ireland has been a full participant in the European Monetary System since its inception in March 1979. This has provided a framework for improving the economy by stabilizing the Irish pound, containing wage increases, reducing inflation, and encouraging exports. *(See tables 2 and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

Ireland has traditionally been a rural-based economy, and farm products contributed about 30% of the total export value in 1991. However, Government economic strategy during the past several years has concentrated on building up indigenous industries, 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 provides technical assistance to the exploration and mining industry.

Ireland is fortunate with respect to mineral resources and has a proven geological potential for a variety of minerals. In 1991, the country was a world-ranked producer of barite, lead, and zinc. Interest in gold exploration was continuing. This interest has been the impetus for the revitalization of the exploration sector within the past few years. Employment in mining and quarrying, including turf, was about 8,000. *(See table 4.)*

## COMMODITY REVIEW

### Metals

*Alumina.*—Aughinish Alumina Ltd. (AAL) was continuing with its $12 million expansion plan to improve efficiency and increase the capacity of its plant from the initial 800,000 mt/a of alumina to 1 Mmt/a by 1992. The refinery is currently producing 900,000 mt/a of alumina. The refinery was designed so that production could be doubled or trebled if the world market for alumina improves sufficiently.

The major market for AAL's alumina is primary aluminum smelters. British Alcan Aluminium PLC takes 65% of the refinery's output for its smelter in the United Kingdom. The remaining 35% is taken by Billiton Aluminium Ireland Ltd. for its smelter in Norway.

*Gold.*—Most exploration activity continued to be focused on four districts in the Caledonides that are known to contain significant gold mineralization. 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 and southern Mayo in the paratectonic Caledonides and Connemara in the orthotectonic Caledonides.

Two discoveries, made in 1989, in County Mayo by the Burmin PLC/Tara Exploration PLC and the Andaman Resources PLC/Glencar Explorations PLC joint ventures were under development. Burmin applied for planning permission for its underground mine at Lecanvey. The project consisted of two main quartz vein structures cutting through Silurian feldspathic quartzites. Additional gold-bearing veins were reported to have been intersected. The deposit was reported to contain an estimated 498,000 tons of ore grading 1.5 grams of gold per ton of ore. Production was planned to start in 1992.

Andaman reported favorable results from the 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. At yearend, the company reported that drilling had delineated about 500,000 tons of ore grading 6 grams of gold per ton.

Navan Resources PLC of Ireland and MIM Holdings of Australia were continuing their joint-venture exploration programs in the Central Irish Midlands and in the Scottish Highlands, United Kingdom. MIM and Navan have been exploring for base metals in the Central Irish Midlands since mid-1989.

*Lead and Zinc.*—A major upswing in activity in the lead and zinc sector was expected in Ireland. The country's output of zinc could double by the second half of the 1990's if the development of two new mines continues as planned. There were also several other potential projects under investigation at yearend.

Tara Mines Ltd. was continuing with its major plant renewal. Technical upgrading of mining and processing operations was under way to raise production levels and ensure maximum efficiency and profitability. The Tara Mine, at Navan, is one of the largest lead-zinc producers in Europe, and when the upgrading project is completed in 1992 the mine will have a capacity of 200,000 mt/a of zinc and 38,000 mt/a of lead in concentrates.

Conroy Petroleum and Natural Resources PLC was proceeding with plans to develop its deposit in County Kilkenny. The company submitted a planning application for the development of the Galmoy Mine to the Kilkenny County Council in early 1991.

The application is based on the construction of an underground mine accessed from the surface by a 13% decline midway between the CW and G ore bodies. These ore bodies were reported to contain an estimated 6 Mmt of ore grading 11.3% zinc and 1.1% lead at a depth of 70 m. The estimated cost of bringing the Galmoy Mine into production in 1993 was $80 million. The mine, with an estimated life of 10 years, would be designed to produce 2,000 mt/a of lead and 60,000 mt/a of zinc in concentrates.

Outokumpu Oy, the Finnish state mining concern, has agreed to furnish technical, financial, and marketing support for the mine development. Outokumpu has a 20% shareholding position in Conroy and is also owner of Tara Mines Ltd.

The joint-venture project of Ivernia West PLC and Chevron Mining PLC was continuing. Ivernia reported that drilling results on the Lisheen ore body in County Tipperary had revealed estimated reserves of 9 Mmt of ore grading 12.8% zinc, 2.2% lead, and 34 grams of silver per ton of ore. The company stated drilling would probably continue until the end of

1992. Lisheen shares the 50-km long Rathdowney geologic trend with the Galmoy project, 8 km away in County Kilkinney.

*Steel.*—Irish Steel Ltd. operated a scrap-based minimill near Cork and is the only steel producer in Ireland. The company announced its 1991 results, which showed a 7% decrease in sales over those of the previous year. This was a reflection of the cyclic downturn in the steel industry worldwide. Export sales accounted for 88% of total sales.

Privatization of Irish Steel was still under consideration. The company was in negotiations with its work force over a rationalization and investment program.

### Industrial Minerals

There was continued success in the industrial minerals sector, with one andulusite and two gypsum deposits awaiting development. A talc deposit in County Mayo and dolomite and slate deposits in County Tipperary were being evaluated.

Navan Resources PLC was continuing with exploration and a prefeasibility study of an andalusite deposit at Tomduff, County Carlow. Detailed investigations reportedly revealed a mineralized zone consisting of interlayered andalusite schists and quartz-biotite schists with a 9% to 25% andalusite content.

Navan believes the deposit could be developed to produce 50,000 mt/a of concentrate with up to 98% andalusite content. The size range of the concentrate would be 2.8 mm to 10 mm. Another potential economic mineral at the deposit is stavrolite, which is used in sandblasting.

Ireland produced significant quantities of synthetic diamonds. Output was not quantitatively reported, and information was not available to make reliable estimates of production.

The two companies that manufacture industrial diamonds and super abrasives are De Beers Industrial Diamonds Division (Ireland), a subsidiary of De Beers Consolidated Mines (Pty) Ltd. of the Republic of South Africa, and GE Superabrasives Ireland, a subsidiary of General Electric Co. of the United States.

A range of abrasives are produced from synthetic diamond, cubic boron nitride, and polycrystalline diamond (PCD). Trade names for the PCD products are Syndie for wire-drawing blanks, Syndrill for rock-cutting blanks, and Syndite for cutting tools and wear-resistant parts. All sales are to the export market.

Gypsum Industries PLC began open pit mining of the Knocknacran deposit in County Monaghan. There were estimated reserves for an expected mine life of 20 years operating at a mine capacity of 300,000 mt/a. The project reportedly represented an investment of about $20 million and was expected to compensate for the closure of Gypsum Industries' two other mines, where reserves had been exhausted.

Ivernia West PLC submitted a planning application to the Government Planning Authority to develop its Westport talc-magnesite deposit in County Mayo. The application is in the appeal process after initial rejection by the Mayo County Council. If the appeal is successful, Ivernia would proceed with development. The open pit operation would have an initial production capacity of 40,000 mt/a.

### Mineral Fuels

Coal production was mainly semibituminous high-ash coal from the Connaught Field, which was used for electricity generation. Marathon Petroleum (Ireland) Ltd. continued with the development of the Ballycotton natural gas field off Ireland's coast in the Celtic Sea. The plan calls for a single subsea well connected with the company's Kinsale Head Platform Bravo 14 km to the south.

The company agreed to sell production from the gasfield to the Irish Gas Board (IGB). Kinsale Head, which has a production rate of 6.2 $Mm^3/d$, is Ireland's only source of natural gas. IGB is the largest single primary energy supplier to the industrial sector. *(See table 5.)*

## 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 600 km from a deepwater port.

## OUTLOOK

Ireland has a proven geologic potential for a variety of minerals. The mineral industry is expected to utilize the opportunities created by the boom in gold and lead-zinc exploration and renewed interest from multinational companies to continue mineral developments.

The Geological Survey of Ireland has 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$1.61, the average for 1991.

## OTHER SOURCES OF INFORMATION

### Agencies

Central Statistics Office
Ardee Road
Rathmines
Dublin 6, Ireland

Central Bank of Ireland
Dame Street
Dublin 2, Ireland

Geologic Survey of Ireland
Beggars Bush
Haddington Road
Dublin 4, Ireland

### Publications

Central Statistics Office, Dublin:
Statistics Bulletin.

Central Bank of Ireland, Dublin:
Quarterly Bulletin.

TABLE 1

## IRELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990e | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Alumina | thousand tons | 784 | 843 | 841 | 885 | 981 |
| Iron and steel: Steel, crude | do. | 220 | 271 | 324 | 2326 | 307 |
| Lead: | | | | | | |
| Mine output, Pb content | | 33,800 | 32,500 | e32,100 | 235,300 | 35,000 |
| Metal, refined, secondary | | 9,600 | e11,700 | e12,000 | 15,000 | 11,600 |
| Silver, mine output, Ag content | | 7,185 | 5,590 | e7,247 | 8,000 | 10,500 |
| Zinc, mine output, Zn content | | 177,000 | 173,200 | e168,800 | 2166,500 | 187,500 |
| INDUSTRIAL MINERALS[3] | | | | | | |
| Barite | thousand tons | 70 | 83 | 82 | 2101 | 80 |
| Cement, hydraulic | do. | 1,448 | 1,685 | e1,600 | 1,625 | 1,600 |
| Gypsum | do. | 284 | 326 | 300 | 2394 | 429 |
| Lime | | 77,000 | 96,800 | e111,300 | 112,000 | 110,000 |
| Magnesia[e 4] | thousand tons | 70 | — | — | — | — |
| Nitrogen: N content of ammonia | do. | 399 | 415 | 386 | 395 | 429 |
| Sand and gravel[5] | do. | 5,564 | 6,163 | e7,400 | 7,500 | 7,000 |
| Stone and other quarry products: | | | | | | |
| Limestone[5] | do. | 6,970 | 9,680 | 8,874 | 9,000 | 8,500 |
| Other[5 6] | do. | 1,953 | 1,615 | 1,967 | 2,000 | 2,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, anthracite and bituminous | do. | 45 | 42 | 43 | r45 | 6 |
| Gas, natural: Marketed | million cubic feet | 1,668 | 2,017 | e1,980 | 2,040 | 2,000 |
| Peat: | | | | | | |
| For horticultural use | thousand tons | 81 | e85 | 293 | 229 | 249 |
| For fuel use: | | | | | | |
| Sod peat[7] | do. | 410 | 1,147 | 1,053 | 1,570 | 1,500 |
| Milled peat[8] | do. | 6,765 | 3,230 | 6,714 | 4,950 | 4,500 |
| Total | do. | 7,175 | 4,377 | 7,767 | 6,749 | 6,249 |
| Peat briquets | do. | 505 | 378 | 355 | 400 | 400 |
| Petroleum refinery products:[9] | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 255 | 210 | r244 | 2294 | 250 |
| Naphtha | do. | 387 | 245 | r408 | 2497 | 400 |
| Gasoline, motor | do. | 2,528 | 1,850 | r2,831 | 23,022 | 3,000 |
| Distillate fuel oil | do. | 3,945 | 3,160 | r4,118 | 24,602 | 4,500 |
| Residual fuel oil | do. | 3,556 | 3,075 | r3,257 | 24,049 | 4,000 |
| Refinery fuel and losses | do. | 390 | 400 | e400 | 425 | 400 |
| Total | do. | 11,061 | 8,940 | r e11,258 | 12,889 | 12,550 |

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through Jan. 31, 1992.

[2]Reported figure.

[3]Ireland also produces significant quantities of synthetic diamond and is the major overseas supplier of this material to the United States. However, output is not quantitatively reported, and available general information is inadequate to make reliable estimates of output levels.

[4]Based on exports.

[5]Excludes output by local authorities and road contractors.

[6]Includes clays for cement production, fire clay, granite, marble, rock sand, silica rock, and slate.

[7]Includes production by farmers and by Bord Na Mona.

[8]Includes milled peat used for briquet production.

[9]From imported crude oil.

TABLE 2

## IRELAND: EXPORTS AND REEXPORTS OF COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals | 2 | — | | |
| Aluminum: | | | | |
| Ore and concentrate | — | 7 | — | All to United Kingdom. |
| Oxides and hydroxides | 915,349 | 915,888 | 26,316 | United Kingdom 267,363; West Germany 145,690; Italy 84,988. |
| Metal including alloys: | | | | |
| Scrap | 11,028 | 12,210 | — | United Kingdom 7,924; France 1,274; Japan 854. |
| Unwrought | 2,574 | 1,970 | — | United Kingdom 1,967; Norway 2. |
| Semimanufactures | 2,981 | 4,228 | 11 | United Kingdom 2,147; West Germany 1,058; Belgium-Luxembourg 389. |
| Chromium: | | | | |
| Oxides and hydroxides | 2 | 49 | — | West Germany 41; United Kingdom 8. |
| Metal including alloys, all forms | 8 | (2) | — | All to United Kingdom. |
| Cobalt: | | | | |
| Oxides and hydroxides | 39 | 237 | — | Finland 205; Denmark 20; Belgium-Luxembourg 12. |
| Metal including alloys, all forms | 203 | 49 | 48 | West Germany 1. |
| Columbium and tantalum: Metal including alloys, all forms | 58 | 2 | — | All to Netherlands. |
| Copper: | | | | |
| Ore and concentrate | 5,424 | — | | |
| Matte and speiss including cement copper | 60 | 177 | — | West Germany 139; United Kingdom 20; Netherlands 19. |
| Sulfate | 146 | 108 | — | All to United Kingdom. |
| Metal including alloys: | | | | |
| Scrap | 10,061 | 9,273 | — | Belgium-Luxembourg 2,367; Netherlands 2,299; West Germany 2,159. |
| Unwrought | 74 | 78 | 8 | United Kingdom 64; West Germany 6. |
| Semimanufactures | 1,090 | 1,214 | 7 | United Kingdom 663; West Germany 93; France 86. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $1,979 | $2,409 | — | All to United Kingdom. |
| Metal including alloys, unwrought and partly wrought do. | $261 | $93 | — | United Kingdom $53; Sweden $37. |
| Iron and steel: Metal: | | | | |
| Scrap | 33,827 | 26,054 | — | United Kingdom 23,420; Spain 2,390; Netherlands 119. |
| Pig iron, cast iron, related materials | 42 | 119 | — | United Kingdom 108; Switzerland 4; West Germany 3. |
| Ferroalloys: | | | | |
| Ferrochromium | 25 | — | | |
| Ferrosilicomanganese | 18 | — | | |
| Ferrosilicon | — | 2 | — | All to United Kingdom. |
| Silicon metal | 3 | 85 | — | Do. |
| Unspecified | — | 24 | — | Do. |
| Steel, primary forms | 468 | 285 | 27 | United Kingdom 170; Belgium-Luxembourg 41; Denmark 38. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 5,110 | 3,557 | — | United Kingdom 3,411; West Germany 88; Ethiopia 43. |
| Clad, plated, coated | 3,292 | 3,463 | 10 | United Kingdom 3,443; Spain 4. |

See footnotes at end of table.

TABLE 2—Continued

## IRELAND: EXPORTS AND REEXPORTS OF COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel:Metal—Continued: | | | | |
| Semimanufactures—Continued: | | | | |
| Flat-rolled products—Continued: | | | | |
| Of alloy steel | 914 | 880 | (2) | United Kingdom 844; Sweden 20; Belgium-Luxembourg 13. |
| Bars, rods, angles, shapes, sections | 295,432 | 297,261 | 5 | United Kingdom 94,446; West Germany 50,236; Netherlands 39,254. |
| Rails and accessories | 1,268 | 93 | — | United Kingdom 82; U.S.S.R. 11. |
| Wire | 1,954 | 1,662 | 7 | United Kingdom 825; France 666; Italy 45. |
| Tubes, pipes, fittings | 6,750 | 5,967 | (2) | United Kingdom 5,638; West Germany 123; Netherlands 48. |
| Lead: | | | | |
| Ore and concentrate | 58,501 | 59,881 | — | West Germany 32,525; France 11,694; Spain 7,983. |
| Oxides | 119 | 92 | — | United Kingdom 82; West Germany 10. |
| Ash and residue containing lead | — | 22 | — | All to United Kingdom. |
| Metal including alloys: | | | | |
| Scrap | 4,596 | 4,775 | — | United Kingdom 3,203; Belgium-Luxembourg 836; France 606. |
| Unwrought | 103 | 74 | — | All to United Kingdom. |
| Semimanufactures | 11,388 | 15,419 | — | United Kingdom 15,303; Netherlands 48; Hong Kong 38. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 21 | 5 | — | All to United Kingdom. |
| Unwrought | 63 | — | | |
| Manganese: | | | | |
| Ore and concentrate | — | 4 | — | All to France. |
| Oxides | 262 | 180 | — | West Germany 100; United Kingdom 80. |
| Metal including alloys, all forms | — | 53 | — | Denmark 46; Switzerland 5; United Kingdom 2. |
| Mercury | (2) | (2) | — | Mainly to Netherlands. |
| Molybdenum: Metal including alloys, unwrought | (2) | (2) | — | All to Australia. |
| Nickel: Metal including alloys: | | | | |
| Scrap | 315 | 410 | 18 | United Kingdom 270; West Germany 116. |
| Unwrought | 90 | 99 | 17 | United Kingdom 79; Switzerland 3. |
| Semimanufactures | 498 | 546 | 17 | United Kingdom 298; France 79; Switzerland 78. |
| Platinum-group metals: | | | | |
| Metals including alloys, unwrought and partly wrought kilograms | 374 | 91 | 1 | United Kingdom 89; France 1. |
| Silver: | | | | |
| Waste and sweepings[3] value, thousands | $897 | $969 | — | United Kingdom $578; West Germany $357; Netherlands $32. |
| Metal including alloys, unwrought and partly wrought[3] do. | $279 | $38 | $27 | United Kingdom $11. |
| Tantalum: Metal including alloys, unwrought | 57 | (2) | — | All to Netherlands. |
| Tin: | | | | |
| Ore and concentrate | 2,000 | — | | |
| Ash and residue containing tin | 445 | 104 | — | West Germany 94; Belgium-Luxembourg 7. |

See footnotes at end of table.

TABLE 2—Continued

## IRELAND: EXPORTS AND REEXPORTS OF COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Tin—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 1,782 | 1,858 | — | United Kingdom 1,658; West Germany 200. |
| Unwrought | 183 | — | | |
| Semimanufactures | 110 | 165 | — | United Kingdom 162; West Germany 3. |
| Titanium: | | | | |
| Oxides | 35 | — | | |
| Metal including alloys: | | | | |
| Scrap | 15 | 19 | — | All to Belgium-Luxembourg. |
| Semimanufactures | — | 3 | 1 | United Kingdom 2. |
| Tungsten: Metal including alloys, all forms | 32 | (2) | NA | NA. |
| Vanadium: | | | | |
| Oxides and hydroxides | — | 11 | — | United Kingdom 6; Netherlands 5. |
| Ash and residue containing vanadium | 9 | — | | |
| Zinc: | | | | |
| Ore and concentrate | 341,516 | 319,139 | — | Belgium-Luxembourg 117,663; Italy 60,041; West Germany 43,112. |
| Oxides | 66 | — | | |
| Ash and residue containing zinc | 185 | 146 | — | West Germany 103; France 43. |
| Metal including alloys: | | | | |
| Scrap | 315 | 455 | — | United Kingdom 325; Belgium-Luxembourg 88; West Germany 42. |
| Unwrought | 126 | 1 | — | All to Japan. |
| Semimanufactures | 237 | 58 | — | United Kingdom 55; France 1; Netherlands 1. |
| Zirconium: Metal including alloys, all forms | (2) | — | | |
| Other: | | | | |
| Oxides and hydroxides | 61 | 53 | 1 | West Germany 40; United Kingdom 7; Netherlands 5. |
| Ashes and residues | 639 | 627 | — | United Kingdom 384; West Germany 103; Netherlands 79. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 17 | 48 | — | All to United Kingdom. |
| Artificial: | | | | |
| Corundum | — | 4 | — | United Kingdom 3; France 1. |
| Silicon carbide | 4 | 1 | — | All to Norway. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | — | $4 | — | All to United Kingdom. |
| Grinding and polishing wheels and stones | 117 | 68 | 40 | United Kingdom 10; Switzerland 6. |
| Asbestos, crude | 54 | 10 | — | All to United Kingdom. |
| Barite and witherite | 74,767 | 100,772 | — | Norway 48,960; United Kingdom 47,070; Sweden 3,300. |
| Boron materials: | | | | |
| Elemental | — | 1 | — | All to United Kingdom. |
| Oxides and acids | — | 5 | — | Do. |
| Cement | 517,740 | 346,708 | — | United Kingdom 342,877; Portugal 3,170; Spain 56. |
| Chalk | (2) | — | | |

See footnotes at end of table.

TABLE 2—Continued

## IRELAND: EXPORTS AND REEXPORTS OF COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays, crude: | | | | | |
| Bentonite | | 428 | 316 | NA | United Kingdom 20; unspecified 296. |
| Dinas earth | | — | 3 | — | All to United Kingdom. |
| Fire clay | | 5 | 3 | — | Do. |
| Kaolin | | 58 | 20 | — | Do. |
| Unspecified | | — | 6 | — | United Kingdom 4; Italy 2. |
| Diamond: | | | | | |
| Gem, not set or strung | carats | 1,112 | 15 | — | Netherlands 13; Belgium-Luxembourg 1; United Kingdom 1. |
| Industrial stones | do. | 663,582 | 99,771 | 93,066 | France 3,601; United Kingdom 2,467. |
| Diatomite and other infusorial earth | | 36 | — | | |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 366 | 276 | — | United Kingdom 268; West Germany 8. |
| Manufactured: | | | | | |
| Ammonia | | 128,872 | 116,362 | — | Mainly to United Kingdom. |
| Nitrogenous | | 420,767 | 380,506 | — | United Kingdom 180,625; France 67,038; West Germany 63,965. |
| Phosphatic | | 194 | 441 | — | All to United Kingdom. |
| Potassic | | 558 | 1,769 | — | Netherlands 1,643; United Kingdom 69. |
| Unspecified and mixed | | 25,519 | 13,493 | — | All to United Kingdom. |
| Gypsum and plaster | | 69,132 | 81,547 | — | Do. |
| Iodine | | 13 | 29 | 18 | Denmark 6; Cyprus 2. |
| Lime | | 3,047 | 2,478 | — | All to United Kingdom. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 464 | 638 | 4 | India 500; United Kingdom 84; West Germany 21. |
| Oxides and hydroxides | | 6,243 | 6,059 | 2 | Belgium-Luxembourg 3,144; United Kingdom 2,740; Austria 120. |
| Mica: | | | | | |
| Worked including agglomerated splittings | | (2) | (2) | — | All to United Kingdom |
| Crude including splittings and waste | | 18 | 7 | — | United Kingdom 4; unspecified 3. |
| Nitrates, crude | | 1,369 | 96 | — | All to United Kingdom. |
| Phosphates, crude | | — | 31 | — | Do. |
| Phosphorus, elemental | | 3 | 9 | — | Do. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 25 | — | | |
| Iron oxides and hydroxides, processed | | 5 | 21 | — | Do. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $143 | $22 | — | Netherlands $14; United Kingdom $8. |
| Synthetic | do. | $423 | $9,094 | $1,043 | Spain $2,657; West Germany $785. |
| Quartz crystal, piezoelectric | do. | — | $3 | — | Mainly to Sweden. |
| Salt and brine | | 1,595 | 1,554 | — | United Kingdom 1,295; Sweden 214; Norway 20. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 123 | 185 | — | All to United Kingdom. |
| Sulfate, manufactured | kilograms | 20 | 27 | — | Do. |

See footnotes at end of table.

TABLE 2—Continued

## IRELAND: EXPORTS AND REEXPORTS OF COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 938 | 28,163 | 1 | United Kingdom 27,468; West Germany 630; Netherlands 38. |
| Worked | | 7,348 | 8,793 | 23 | United Kingdom 4,197; France 1,059; Netherlands 594. |
| Gravel and crushed rock | | 450,071 | 678,396 | — | United Kingdom 528,329; West Germany 146,227; Netherlands 3,780. |
| Limestone other than dimension | | 4,124 | 4,719 | — | United Kingdom 3,383; Netherlands 1,248; Belgium-Luxembourg 44. |
| Quartz and quartzite | | 550 | 434 | — | France 270; United Kingdom 148; Netherlands 16. |
| Sand other than metal-bearing: | | | | | |
| Silica | | 1,087 | 1,151 | — | All to United Kingdom. |
| Other | | 214 | 681 | — | Do. |
| Sulfur: | | | | | |
| Elemental: Crude including native and byproduct | | 3 | 44 | — | All to West Germany. |
| Sulfuric acid | | 178 | 122 | — | United Kingdom 120; West Germany 2. |
| Talc, steatite, soapstone, pyrophyllite | | — | 1 | 1 | |
| Other: | | | | | |
| Crude | | 25 | 122 | — | All to United Kingdom. |
| Slag and dross, not metal-bearing | | — | 885 | — | United Kingdom 792; Spain 74. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 736 | 2,188 | — | All to United Kingdom. |
| Carbon black | | 13 | 156 | — | Mainly to United Kingdom. |
| Coal: | | | | | |
| Anthracite | | 3,380 | 6,883 | — | United Kingdom 5,903; France 980. |
| Bituminous | | 19,785 | 20,880 | — | All to United Kingdom. |
| Briquets of anthracite and bituminous coal | | 1,869 | 911 | — | United Kingdom 882; France 29. |
| Lignite including briquets | | 112 | — | | |
| Peat including briquets and litter | | 321,073 | 299,616 | 165 | United Kingdom 203,507; France 52,265; Netherlands 10,409. |
| Petroleum refinery products: | | | | | |
| Liquefied petroleum gas | 42-gallon barrels | 40,252 | 85,944 | 58 | United Kingdom 85,724; West Germany 162. |
| Gasoline | do. | 470,994 | 706,248 | — | Netherlands 375,046; United Kingdom 322,380; France 323. |
| Mineral jelly and wax | do. | 937 | 803 | — | China 315; West Germany 157; Australia 110. |
| Kerosene and jet fuel | do. | 2,131 | 147 | — | West Germany 132; U.S.S.R. 15. |
| Distillate fuel oil | do. | 86,208 | 30,929 | — | United Kingdom 29,027; Norway 1,306; Netherlands 231. |
| Lubricants | do. | 8,792 | 15,456 | — | United Kingdom 15,407; Italy 49. |
| Residual fuel oil | do. | 2,834,363 | 4,095,087 | 419,766 | United Kingdom 2,248,856; France 516,383. |
| Bitumen and other residues | do. | — | 594 | — | All to Belgium-Luxembourg. |
| Bituminous mixtures | do. | 1,763 | 10,563 | — | All to United Kingdom. |
| Petroleum coke | do. | 429 | — | | |

NA Not available.

[1]Table prepared by Theodore T. Spittal.

[2]Less than 1/2 unit.

[3]May include other precious metals.

TABLE 3

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 11 | 3 | (2) | United Kingdom 2. |
| Alkaline-earth metals | 112 | 21 | 21 | |
| Aluminum: | | | | |
| Ore and concentrate | 1,606,158 | 1,746,337 | — | Guinea 1,742,305; Netherlands 1,637; Japan 1,195. |
| Oxides and hydroxides | 5,141 | 3,852 | 603 | United Kingdom 2,108; Netherlands 480. |
| Ash and residue containing aluminum | — | 45 | — | All from United Kingdom. |
| Metal including alloys: | | | | |
| Scrap | 988 | 970 | 171 | United Kingdom 505; West Germany 131. |
| Unwrought | 3,711 | 7,705 | — | United Kingdom 4,537; West Germany 1,718; Yugoslavia 654. |
| Semimanufactures | 35,052 | 39,011 | 482 | United Kingdom 23,617; West Germany 4,541; Belgium-Luxembourg 1,938. |
| Antimony: | | | | |
| Oxides | 62 | 56 | — | United Kingdom 53; West Germany 3. |
| Metal including alloys, all forms | 1 | 2 | — | All from United Kingdom. |
| Arsenic: Metals including alloys, all forms | 11 | 6 | — | Do. |
| Beryllium: Metal including alloys, all forms | (2) | (2) | — | All from Portugal. |
| Bismuth: Metal including alloys, all forms | 8 | 13 | — | All from United Kingdom. |
| Cadmium: Metal including alloys, all forms | 1 | — | | |
| Chromium: | | | | |
| Ore and concentrate | 22 | 47 | — | Netherlands 25; Belgium-Luxembourg 25. |
| Oxides and hydroxides | 124 | 313 | (2) | United Kingdom 200; Israel 98; West Germany 12. |
| Metal including alloys, all forms | 154 | 118 | 1 | United Kingdom 115; West Germany 2. |
| Cobalt: | | | | |
| Ore and concentrate | — | 10 | — | All from United Kingdom. |
| Oxides and hydroxides | 7 | 4 | — | Finland 3; France 1. |
| Metal including alloys, all forms | 78 | 93 | 89 | Switzerland 4. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | 3 | 3 | 3 | |
| Copper: | | | | |
| Matte and speiss including cement copper | 25 | 5 | | West Germany 4; United Kingdom 1. |
| Oxides and hydroxides | 23 | — | | |
| Sulfate | 2,087 | 1,478 | — | Poland 700; United Kingdom 197; France 160. |
| Metal including alloys: | | | | |
| Scrap | 437 | 527 | — | United Kingdom 386; Austria 73; Denmark 41. |
| Unwrought | 194 | 329 | 2 | United Kingdom 303; Italy 16; West Germany 8. |
| Semimanufactures | 28,419 | 30,574 | 243 | United Kingdom 13,129; Belgium-Luxembourg 5,600; France 3,182. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $59 | $31 | — | All from United Kingdom. |
| Metal including alloys, unwrought and partly wrought do. | $1,624 | $7,042 | $9 | United Kingdom $6,177; Japan $752; Singapore $80. |
| Hafnium: Metal including alloys, all forms | 12 | — | | |

See footnotes at end of table.

TABLE 3—Continued

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 37 | 41 | — | United Kingdom 22; Netherlands 19. |
| Pyrite, roasted | 2,500 | — | | |
| Metal: | | | | |
| Scrap | 220,254 | 217,004 | — | United Kingdom 185,901; France 22,635; Poland 8,005. |
| Pig iron, cast iron, related materials | 1,846 | 1,914 | — | United Kingdom 1,832; West Germany 39; France 20. |
| Ferroalloys: | | | | |
| Ferrochromium | 46 | 24 | — | West Germany 22; United Kingdom 2. |
| Ferromanganese | 22 | 21 | — | West Germany 20; United Kingdom 1. |
| Ferrosilicomanganese | 3,830 | 3,517 | — | France 1,589; Norway 1,200; Belgium-Luxembourg 708. |
| Ferrosilicon | 834 | 739 | — | United Kingdom 394; Norway 259; Belgium-Luxembourg 65. |
| Silicon metal | 172 | 165 | — | France 102; United Kingdom 63. |
| Unspecified | 52 | 211 | — | France 205; United Kingdom 6. |
| Steel, primary forms | 1,868 | 2,813 | (2) | United Kingdom 2,282; Netherlands 89; West Germany 87. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 107,326 | 101,844 | 187 | United Kingdom 69,709; France 7,576; West Germany 6,815. |
| Clad, plated, coated | 79,897 | 77,441 | 36 | United Kingdom 56,537; Belgium-Luxembourg 5,203; France 4,937. |
| Of alloy steel | 11,685 | 12,084 | 5 | United Kingdom 5,417; Belgium-Luxembourg 1,941; Sweden 1,139. |
| Bars, rods, angles, shapes, sections | 199,188 | 197,662 | 69 | United Kingdom 123,746; Spain 33,413; Turkey 8,622. |
| Rails and accessories | 411 | 5,897 | — | United Kingdom 5,658; West Germany 143; Italy 58. |
| Wire | 24,640 | 21,189 | 51 | United Kingdom 7,124; Belgium-Luxembourg 3,250; West Germany 1,575. |
| Tubes, pipes, fittings | 69,848 | 67,222 | 187 | United Kingdom 39,115; Netherlands 6,435; Turkey 4,775. |
| Lead: | | | | |
| Oxides | 3,767 | 2,013 | — | United Kingdom 1,669; Netherlands 344. |
| Ash and residue containing lead | — | 21 | — | All from Netherlands. |
| Metal including alloys: | | | | |
| Scrap | 13,106 | 11,371 | 382 | United Kingdom 8,314; France 1,997. |
| Unwrought | 1,940 | 4,553 | — | United Kingdom 3,379; Sweden 601; Netherlands 277. |
| Semimanufactures | 2,131 | 4,326 | 1 | Sweden 2,946; United Kingdom 675; Belgium-Luxembourg 482. |
| Lithium: Metal including alloys, all forms | — | 2 | — | All from United Kingdom. |
| Magnesium: Metal including alloys: | | | | |
| Unwrought | 87 | 98 | 97 | France 1. |
| Semimanufactures | 324 | 445 | 20 | United Kingdom 245; Canada 169. |

See footnotes at end of table.

TABLE 3—Continued

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| Manganese: | | | | |
| Ore and concentrate: Metallurgical-grade | 36,977 | 22,729 | — | Ghana 22,247; Brazil 300; Netherlands 182. |
| Oxides | 257 | 277 | 3 | United Kingdom 143; Belgium-Luxembourg 124. |
| Metal including alloys, all forms | 41 | 8 | — | United Kingdom 5; Belgium-Luxembourg 3. |
| Mercury | 14 | 49 | 4 | United Kingdom 25; Netherlands 18. |
| Molybdenum: | | | | |
| Oxides and hydroxides | — | 2 | — | All from United Kingdom. |
| Metal including alloys, all forms | 2 | 1 | 1 | |
| Nickel: | | | | |
| Ore and concentrate | — | (2) | — | All from Netherlands. |
| Matte and speiss | (2) | 2 | — | All from United Kingdom. |
| Oxides and hydroxides | 3 | 3 | 3 | |
| Metal including alloys: | | | | |
| Scrap | 41 | 15 | | All from United Kingdom. |
| Unwrought | 615 | 653 | 17 | United Kingdom 542; U.S.S.R. 90. |
| Semimanufactures | 896 | 954 | 630 | West Germany 173; United Kingdom 125. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands | $1,134 | $2,117 | $670 | United Kingdom $1,367; West Germany $50. |
| Rare-earth metals including alloys, all forms | 5 | — | | |
| Silicon, high-purity | 59 | 38 | — | All from United Kingdom. |
| Silver: | | | | |
| Waste and sweepings[3] value, thousands | 64 | $130 | — | Do. |
| Metal including alloys, unwrought and partly wrought do. | $5,079 | $5,020 | $3,129 | United Kingdom $1,822; Italy $53. |
| Tin: | | | | |
| Oxides | 3 | 1 | — | All from Netherlands. |
| Metal including alloys: | | | | |
| Scrap | 14 | 24 | — | All from United Kingdom. |
| Unwrought | 59 | 153 | 1 | United Kingdom 149; West Germany 3. |
| Semimanufactures | 95 | 218 | (2) | United Kingdom 173; Netherlands 16; Norway 13. |
| Titanium: | | | | |
| Oxides | 1,419 | 1,315 | — | France 460; West Germany 411; United Kingdom 221. |
| Metal including alloys, semimanufactures | 81 | 39 | 33 | United Kingdom 6. |
| Tungsten: Metal including alloys: | | | | |
| Unwrought | 4 | 5 | 3 | West Germany 2. |
| Semimanufactures | 1 | 2 | 1 | NA. |
| Uranium and thorium: | | | | |
| Oxides and other compounds value, thousands | $22 | $15 | $15 | |
| Metals including alloys, all forms do. | $53 | $23 | $15 | United Kingdom $7. |
| Vanadium: Oxides and hydroxides | 24 | — | | |
| Zinc: | | | | |
| Ore and concentrate | 42 | — | | |
| Oxides | 1,040 | 1,300 | 154 | United Kingdom 860; West Germany 184. |

See footnotes at end of table.

TABLE 3—Continued

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| Zinc:—Continued | | | | |
| Blue powder | 16 | 31 | — | All from United Kingdom. |
| Ash and residue containing zinc | 100 | — | | |
| Metal including alloys: | | | | |
| Scrap | 347 | 254 | | All from United Kingdom. |
| Unwrought | 2,830 | 1,769 | | United Kingdom 669; Netherlands 642; Belgium-Luxembourg 247. |
| Semimanufactures | 316 | 488 | 1 | United Kingdom 478; Netherlands 6. |
| Zirconium: | | | | |
| Ore and concentrate | 151 | 100 | 44 | Republic of South Africa 36; Netherlands 20. |
| Oxides and hydroxides | — | 30 | — | All from Netherlands. |
| Metal including alloys, semimanufactures | 2 | 5 | 3 | United Kingdom 1. |
| Other: | | | | |
| Oxides and hydroxides | 514 | 399 | 20 | United Kingdom 224; Netherlands 15. |
| Ashes and residues | — | 3 | — | All from United Kingdom. |
| Base metals including alloys, all forms | 12 | — | | |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 510 | 465 | 6 | Turkey 225; United Kingdom 195; West Germany 23. |
| Artificial: | | | | |
| Corundum | 225 | 248 | 23 | United Kingdom 214; West Germany 10. |
| Silicon carbide | 18 | 20 | — | All from Norway. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | $7,933 | $8,154 | $7,405 | West Germany $299; France $153. |
| Grinding and polishing wheels and stones | 4,125 | 6,207 | 17 | United Kingdom 5,625; Italy 235; West Germany 231. |
| Asbestos, crude | 4,529 | 5,533 | — | Canada 5,433; United Kingdom 100. |
| Barite and witherite | 2,379 | 2,668 | (2) | United Kingdom 2,630; Hong Kong 20; West Germany 18. |
| Boron materials: | | | | |
| Crude natural borates | 1 | 781 | — | Belgium-Luxembourg 777; United Kingdom 4. |
| Oxides and acids | 147 | 155 | (2) | France 89; United Kingdom 43; West Germany 23. |
| Bromine | 183 | — | | |
| Cement | 247,309 | 281,084 | (2) | United Kingdom 185,119; Spain 37,362; West Germany 21,172. |
| Chalk | 857 | 1,010 | — | United Kingdom 745; France 173; Belgium-Luxembourg 87. |
| Clays, crude: | | | | |
| Bentonite | 1,164 | 1,136 | 1 | United Kingdom 1,135. |
| Chamotte earth | 36 | 1,780 | 497 | Spain 1,200; United Kingdom 83. |
| Fire clay | 195 | 90 | 24 | United Kingdom 66. |
| Fuller's earth | 127 | 153 | 19 | United Kingdom 134. |
| Kaolin | 7,302 | 4,117 | 21 | United Kingdom 4,049; Belgium-Luxembourg 27. |
| Unspecified | 3,996 | 5,817 | — | United Kingdom 5,779; Brazil 19; Canada 18. |
| Cryolite and chiolite | 2 | 43 | — | 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 | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Diamond: | | | | |
| Gem, not set or strung carats | 3,989 | 10,301 | — | United Kingdom 9,850; Belgium-Luxembourg 349; France 100. |
| Industrial stones do. | 11,193 | 107,548 | 87,110 | United Kingdom 19,783; Netherlands 350. |
| Diatomite and other infusorial earth | 269 | 214 | 188 | United Kingdom 20; France 4. |
| Feldspar | 3,683 | 3,428 | — | Norway 2,490; West Germany 657; United Kingdom 281. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 1,982 | 3,123 | — | United Kingdom 3,122; Republic of South Africa 1. |
| Manufactured: | | | | |
| Ammonia | 17,318 | 10,374 | — | West Germany 10,321; United Kingdom 53. |
| Nitrogenous | 307,094 | 378,823 | 1 | Netherlands 141,853; Belgium-Luxembourg 105,118; West Germany 61,012. |
| Phosphatic | 115,081 | 66,698 | — | Morocco 26,919; Netherlands 7,078; West Germany 4,750. |
| Potassic | 259,828 | 233,076 | — | West Germany 144,949; East Germany 21,828; France 15,736. |
| Unspecified and mixed | 725,462 | 786,222 | 36,655 | United Kingdom 303,731; Netherlands 146,216; France 93,458. |
| Fluorspar | 65 | — | | |
| Graphite, natural | 17 | 9 | 1 | United Kingdom 8. |
| Gypsum and plaster | 6,186 | 9,460 | — | United Kingdom 5,779; Spain 2,994; West Germany 502. |
| Iodine | 780 | 72 | 4 | Japan 47; United Kingdom 20. |
| Kyanite and related materials: | | | | |
| Mullite | — | 629 | — | Netherlands 503; United Kingdom 126. |
| Unspecified | 246 | 697 | — | Netherlands 559; West Germany 77; Belgium-Luxembourg 40. |
| Lime | 3,936 | 4,568 | — | United Kingdom 4,477; West Germany 91. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 25,310 | 30,643 | — | United Kingdom 16,584; China 11,276; Netherlands 2,021. |
| Oxides and hydroxides | 12,050 | 15,197 | — | United Kingdom 4,689; Czechoslovakia 3,241; Spain 2,222. |
| Sulfate | 562 | 707 | — | West Germany 689; Belgium-Luxembourg 18. |
| Mica: | | | | |
| Crude including splittings and waste | 686 | 507 | 20 | United Kingdom 466; Norway 20. |
| Worked including agglomerated splittings | 23 | 29 | 1 | Italy 20; United Kingdom 4. |
| Nitrates, crude | 219 | 387 | — | United Kingdom 347; Chile 20; West Germany 18. |
| Phosphates, crude | 6,128 | 4,507 | — | Morocco 3,700; West Germany 586; United Kingdom 133. |
| Phosphorus, elemental | 10 | 23 | — | All from United Kingdom. |
| Pigments, mineral: | | | | |
| Natural, crude | 24 | 12 | — | Do. |
| Iron oxides and hydroxides, processed | 2,456 | 2,089 | 57 | West Germany 1,703; United Kingdom 265. |

See footnotes at end of table.

TABLE 3—Continued

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural value, thousands | $753 | $668 | $13 | United Kingdom $378; Netherlands $189; Belgium-Luxembourg $39. |
| Synthetic do. | — | $9 | — | Mainly from West Germany. |
| Salt and brine | 107,767 | 121,259 | 13 | United Kingdom 55,777; West Germany 26,749; Netherlands 13,308. |
| Sodium compounds, n.e.s.: | | | | |
| Soda ash, manufactured | 25,752 | 18,336 | 1 | United Kingdom 7,482; Poland 5,851; Netherlands 4,982. |
| Sulfate, including cadmium, manufactured | 1,233 | 902 | — | West Germany 573; United Kingdom 227; Netherlands 82. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 6,773 | 7,712 | 31 | Republic of South Africa 1,646; United Kingdom 1,413; Switzerland 969. |
| Worked | 9,606 | 11,015 | 2 | Italy 4,147; United Kingdom 3,771; Portugal 1,263. |
| Dolomite, chiefly refractory-grade | 2,225 | 2,262 | — | United Kingdom 1,614; Netherlands 479; Norway 103. |
| Gravel and crushed rock | 302,386 | 343,788 | 1 | United Kingdom 343,093; Switzerland 61; France 59. |
| Limestone other than dimension | 16,278 | 22,077 | 2 | United Kingdom 22,075. |
| Quartz and quartzite | 224 | 363 | 13 | Portugal 256; Belgium-Luxembourg 23. |
| Sand other than metal-bearing | 209,655 | 226,692 | 18 | United Kingdom 186,843; Belgium-Luxembourg 35,673; Netherlands 2,521. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 274 | 381 | 32 | West Germany 216; United Kingdom 124. |
| Colloidal, precipitated, sublimed | 15 | 31 | — | All from United Kingdom. |
| Sulfuric acid | 86,031 | 81,620 | 11 | Norway 47,613; United Kingdom 23,684; Spain 4,574. |
| Talc, steatite, soapstone, pyrophyllite | 1,646 | 1,118 | 20 | Italy 431; United Kingdom 393; Belgium-Luxembourg 172. |
| Vermiculite | 4,122 | 1,936 | — | Republic of South Africa 1,877; United Kingdom 58. |
| Other: | | | | |
| Crude | 5,437 | 7,368 | 4 | United Kingdom 4,252; West Germany 1,701; Australia 612. |
| Slag and dross, not metal-bearing | 17,998 | 8,712 | 595 | Sweden 4,187; Belgium-Luxembourg 3,627. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 36,026 | 9,236 | — | United Kingdom 9,021; Trinidad and Tobago 212; Italy 3. |
| Carbon: | | | | |
| Carbon black | 4,393 | 4,778 | 1 | United Kingdom 4,450; Netherlands 177; West Germany 144. |
| Gas carbon | 24 | 3,149 | — | United Kingdom 1,905; West Germany 1,228; Switzerland 12. |

See footnotes at end of table.

TABLE 3—Continued

## IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| Coal: | | | | | |
| Anthracite | | 109,099 | 139,914 | — | Republic of South Africa 47,912; Netherlands 30,165; United Kingdom 21,199. |
| Bituminous | | 3,221,436 | 2,994,684 | 1,365,918 | Poland 452,467; United Kingdom 300,317; unspecified 670,029. |
| Briquets of anthracite and bituminous coal | | 12,081 | 14,141 | 44 | West Germany 5,715; Netherlands 3,791; United Kingdom 3,424. |
| Lignite including briquets | | 10,227 | 26,006 | — | West Germany 21,126; Netherlands 3,720; United Kingdom 1,153. |
| Other coal not agglomerated | | 77,359 | 233,815 | 148,090 | United Kingdom 58,068; Netherlands 12,904. |
| Coke and semicoke | | 10,594 | 25,559 | — | Belgium-Luxembourg 13,668; Netherlands 4,099; East Germany 3,968. |
| Gas, natural: Gaseous | million cubic meters | 6,640 | — | | |
| Peat including briquets and litter | | 1,412 | 1,206 | — | United Kingdom 1,110; Netherlands 78; Finland 18. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 10,663 | 14,809 | — | United Kingdom 12,870; Norway 1,939. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 1,224 | 1,306 | — | United Kingdom 1,262; Norway 31; Netherlands 11. |
| Gasoline | do. | 4,669 | 4,685 | — | United Kingdom 4,326; Norway 359. |
| Mineral jelly and wax | do. | 31 | 34 | 2 | United Kingdom 20; West Germany 8; Netherlands 2. |
| Kerosene and jet fuel | do. | 1,314 | 1,783 | — | U.S.S.R. 934; United Kingdom 751; Norway 98. |
| Distillate fuel oil | do. | 8,132 | 8,777 | — | United Kingdom 7,710; U.S.S.R. 626; Norway 440. |
| Lubricants | do. | 297 | 400 | 4 | United Kingdom 344; France 26; Poland 14. |
| Residual fuel oil | do. | 3,923 | 7,506 | — | United Kingdom 4,023; France 1,592; Greece 332. |
| Bitumen and other residues | do. | 660 | 825 | — | United Kingdom 355; Belgium-Luxembourg 240; France 121. |
| Bituminous mixtures | do. | 21 | 18 | (2) | United Kingdom 17; Canada 1. |
| Petroleum coke | do. | 299 | 471 | 301 | Netherlands 109; Belgium-Luxembourg 47. |

[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 unit.
[3]May include other precious metals.

TABLE 4

## IRELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per day unless otherwise specified)

| Commodity | Major operating companies major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| 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 | 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 million cubic feet | Marathon Oil Co. | Kinsale Head Field, Celtic Sea | 75,000 |
| Peat | Bord Na Mona (Government Peat Board) | Production mainly in flat midlands | 4,200 |
| Petroleum, refined barrels per day | Irish Refining Co. (Government) | Refining at Whitegate, near Cork | 56,000 |
| Steel | Irish Steel Ltd. (Government) | Plant at Haulbowline, near Cork | 350 |

TABLE 5

## IRELAND: RESERVES OF MAJOR MINERAL COMMODITIES IN 1991

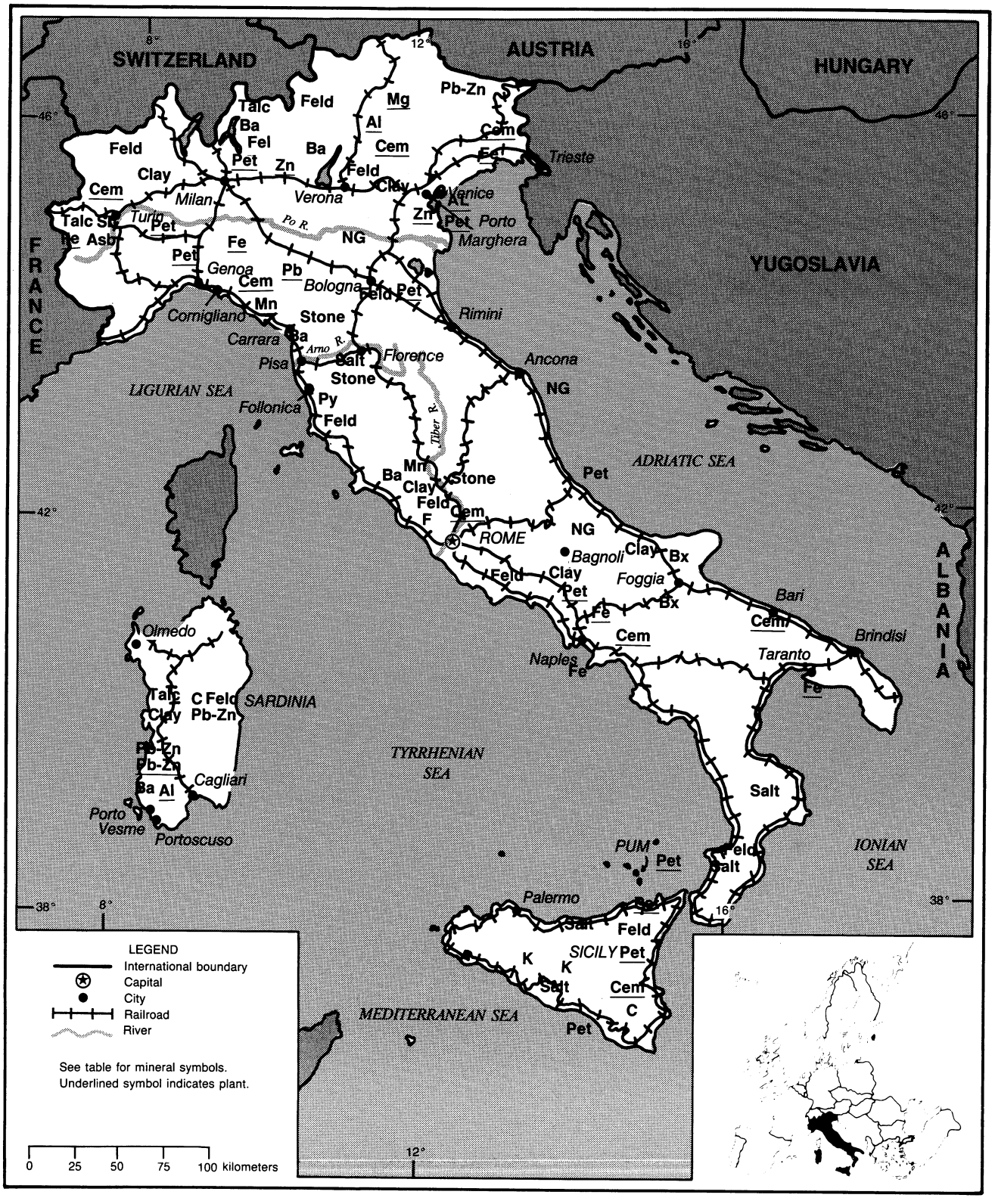
(Million metric tons unless otherwise specified)

| Commodity (in situ resources) | | Reserves[e] |
|---|---|---|
| Barite | | 1.5 |
| Coal | | 70 |
| Lead | | 2 |
| Natural gas | trillion cubic feet | 1.5 |
| Zinc | | 5 |

[e]Estimated.

# ITALY

**AREA 301,300 km²** **POPULATION 57.9 million**



THE MINERAL INDUSTRY OF

# ITALY

By Harold R. Newman

Italy has been a significant processor of imported raw materials as well as a significant consumer and exporter of mineral and metal semimanufactured and finished products. The country was Western Europe's second largest cement producer after Germany and also produced almost one-half of the world's pumice. Moreover, Italy was an important producer of dimension stone, feldspar, and marble. The country's mine output of barite, bentonite, fluorspar, potash, and the manufacturing of steel products were also of world significance.

The GDP increased by 1.4% and industrial production decreased by 2.2% over that of 1990. GDP growth was above the average for the OECD countries for the first time in the past 5 years. The budget deficit, which exceeded 10% of GDP in 1991, is a problem the Government continues to deal with as it moves forward with the European Economic and Monetary Union. At yearend, the unemployment rate was 10.9% of the working population.

## GOVERNMENT POLICIES AND PROGRAMS

The basic mining legislation of Italy is Royal Decree No. 1443 of July 29, 1927, as amended by law No. 1360 of November 7, 1941. This law vests ownership of subsoil minerals to the state. With certain limitations, quarried minerals are the property of the private landowner. Foreigners are permitted to explore, own, and operate mines but must incorporate under Italian laws. Petroleum activities are governed by law No. 6 of January 1957, as amended by title II of law No. 613 of July 21, 1967. Ownership of petroleum and gas is also vested in the state. Concessionaires are required to turn over 9% of all extracted hydrocarbons to the state or pay an equivalent sum.

Law No. 752, which regulates 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. The concessionaires will have to reimburse the state for its contributions, starting after the property has been in production for 3 years. Mining of strategic minerals will be kept operational at the Government's expense. No stockpiling programs are under way in Italy except normal industrial stocks and stocks of crude oil for 90 days of consumption.

Under Italy's mining policy, copper, gold, lead, manganese, molybdenum, nickel, tungsten, zinc, and zirconium were identified as minerals considered essential for the Italian economy and were to be given priority in the funding of Italian companies for exploration abroad.

There has been increasing sensitivity to environmental problems and resistance to the construction of new coal-fired and nuclear electricity generating plants. Strict enforcement of regulations was expected to induce private and public industries to install more pollution-control devices.

## PRODUCTION

The aggregated growth in the extractive industries was minimal. Among the metallic ores, lead, magnesium, manganese, and zinc were mined in 1991. Industrial mineral production remained the most important sector, although reportedly the value of total production in this sector declined slightly in 1991 compared with that of 1990. Domestic production of natural gas, petroleum, and lignite continued to decrease. Italy's most notable contribution to global mineral commodity supplies continued to be its production of processed materials based on imported raw materials.

In 1991, the country ranked seventh globally in steel production and was second after Germany among EC producers. Also, Italy ranked seventh globally in cement output and first in crude oil refining capacity among EC producers. *(See table 1.)*

Italy has become increasingly dependent upon its trade with other EC countries. It has been estimated that Italy's share of total exports going to EC partners has increased from 48% in 1981 to 60% in 1990.

## STRUCTURE OF THE MINERAL INDUSTRY

Both private and public companies own facilities for the production and processing of minerals, metals, fuels, and products. However, some state-owned enterprises are often retained for economic and employment reasons. The Government bank allocates credit to state-owned corporations to avoid the social impact of closure of uneconomic ventures. The primary minerals administrative agency is the Direzione Generale delle Miniere, which also collects mineral statistics. *(See table 2.)*

## COMMODITY REVIEW

### Metals

*Alumina and Aluminum.*—Alumina in Italy was produced only by Eurallumina S.p.A., at Portoscuso in Sardinia. The company was owned jointly by Alumix S.p.A. (52.1%) and by Australian interests. Production of alumina has risen

constantly over the past 5 years. Almost all alumina in Italy was produced from imported bauxite, which was obtained from Australia and Guinea. Bauxite was no longer mined in any significant amount in Italy.

Alumix S.p.A., part of the state holding company Eute Fiere Italiane Atacchine, was the only primary aluminum producer in Italy. The company operated five smelters: one at Portoscuso in Sardinia, one at Bolzano, one at Porto Marghera, and two at Fusina, all near Venice.

More than 80% of the production was used domestically. Italy imported almost 50% of its total aluminum requirements. Details on output and/or capacity were not readily available for Italy's several secondary aluminum producers.

*Copper.*—Italian refined copper production has been rising for the past 3 years. Nuova Samim S.p.A. was the largest producer of refined copper, lead, and zinc metal in Italy, employing almost 3,350 workers. Samim produced about 55% of Italian copper metal. Virtually all of the country's output was derived from scrap, ashes, slags, and other residues. Samim also produced antimony metal, bismuth, gold, and silver. All sources of Nuova Samim's scrap, from copper and aluminum cables to batteries, were handled by two subsidiaries, Nonfermet S.p.A. and Eurobatex S.p.A., which selected and sorted the material before passing it on to the refining plants. Secondary copper was produced by Samim at Paderno Dugnano, near Milan, using alloy scrap and low-grade copper scrap as raw materials. Plant capacity for secondary copper was 50,000 mt/a. Copper scrap from European sources was refined by Samim at Porto Marghera copper-zinc plant, near Venice. Copper cathode capacity at the plant was reportedly increased to 60,000 mt/a in 1991. In an attempt to reduce its cost of scrap material, a new furnace using Boliden technology will produce 25,000 mt/a of blister copper from lower grade dusts, which will then be fed into the existing Maerz anode furnace.

*Lead and Zinc.*—Italy imported most of its supplies of lead and zinc concentrates, with Canada being the largest single source. Within Italy, most of lead and zinc concentrate production came from Nuova Samim's mines in Sardinia. Samim's lead and zinc smelters were also in Sardinia, and the zinc electrolytic plant was near Venice. The Porto Vesme smelter in Sardinia produced primary lead and zinc metal and cadmium, while the San Gavino complex, near Porto Vesme, produced refined lead and byproducts such as bismuth, gold, and silver. Secondary lead, including soft lead and alloys, was produced by Samim at the Paderno Dugnano and Marcianise plants, whose capacities were 50,000 mt/a and 35,000 mt/a, respectively.

In 1991, Nuova Samim operated the country's largest zinc smelter in Crotone. This smelter was acquired from Pertusola Sud S.p.A. in 1990. This acquisition expanded Nuova Samim's control over the country's lead and zinc industry. Samim operated four zinc plants, with a total capacity of 349,000 mt/a. The company also produced cadmium and germanium.

*Steel.*—Italy was the second largest producer of crude steel in the EC, after Germany. About 44% of steel in Italy was produced by basic oxygen furnaces, and 56% was produced by electric arc furnaces. In Italy about one-half of the steel was produced by private companies, with the rest by Government-owned enterprises. All iron ore, almost 17 Mmt, was imported in 1991, of which 37% came from Australia and 35% from Brazil. The country's steel industry imports about 3.5 Mmt/a of scrap, mostly from France and Germany.

Ilva S.p.A. was the country's largest steel company. All the profitable activities and assets of the Finsider companies— Italsider, Nuova Deltasider, and Terni Acciai Speciali—were transferred to Ilva. This marks the end of Ilva's current restructuring plan, drawn up in 1988 by the Italian Government and the EC Commission. With a crude steel output of almost 12 Mmt/a, Ilva was the eighth largest steel producer in the world and the fourth in the EC. Flat products were the company's main strength, with Taranto one of the largest flat-rolling centers in the world. Ilva employed more than 49,000 workers in 1991. About 20% of the company's steel was exported. Table 3 lists Ilva's major operating plants. Ilva continued to be a major importer of metallurgical coal, primarily from the United States. *(See table 3.)*

Ilva closed its steel plant at Bagnoli, shutting down the blast furnaces and converters. Part of the plant was expected to be used later to roll steel produced at the company's Taranto plant. The land would also be used to install tinplate and other products plants.

## Industrial Minerals

*Asbestos.*—Amiantifera di Balangero S.p.A. was the only company in Italy that produced asbestos. The San Vittore Mine was the only significant asbestos producer in Western Europe. The surface mine is in the village of Balangero near Lonzo, about 50 km north of Turin. Reserves were estimated to be large, and the grade of asbestos averages more than 6% fiber. Tailings were stored in a valley about 4 km from the mill. Due to reduced demand, production started to decline in the late 1970's. It went from 165,000 tons in 1977 to about 35,000 tons in 1990. At yearend 1990, the mine had ceased production and remained closed through 1991. The future of the mine was reportedly uncertain because of environmental problems.

*Barite.*—Most barite in Italy came from the island of Sardinia. There were four operating companies in Italy producing barite: Bariosarda S.p.A., owned by the Sardinian regional Government's holding company Ente Mineraria Sarda, with mines at Barega (Iglesias Province), Mont 'Ega (Narcao Province), and Monte Tamara Province in Sardinia; Edem S.p.A., Government owned, with mines at Val di Castello in

Tuscany; 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. Most of the mines produced a 91% to 92% $BaSO_4$ granulated barite that was used by the well-drilling industry. The Mont 'Ega Mine produced a relatively high-grade 97% barite material that was used by the chemical industry.

*Cement.*—Italy was a major EC producer of cement, second only to Germany in the EC and ranked seventh in the world. Italcementi S.p.A. was the largest of Italy's 50 cement producers, with about 40% of the Italian market.

*Clays and Refractory Materials.*—Unimin S.p.A. was the largest supplier of raw materials for the abrasive and refractory markets in Italy. Unimin's production facilities were in the city of Massa, in the Carrara area. Unimin imported bauxite from Brazil and China, kyanite from Brazil, flint clay and kaolin from China, and andalusite from South Africa to augment its domestic raw material production.

Most of Italy's bentonite mining took place on the island of Sardinia, with processing plants on the mainland. More than one-half of the country's bentonite production came from Industria Chemica Carlo Laviosa S.p.A. The company's main mining activity was in the Pedra de Fogu and Puntenuova areas of Sardinia. Production from these areas fed the processing plants at Oristano in Sardinia and at Livorno, south of Pisa. White bentonite, montmorillonite clay, was quarried at S'Aliderru in northwestern Sardinia. Caffaro S.p.A. was Italy's only producer of acid-activated montmorillonite, operating in Sardinia. The clay was shipped to the company's plant at Porto Marghera in Venice. Several small bentonite producers operated on the mainland, at Foggia in the district of Puglia and at Pietracuta di S. Leo in the Pesaro district.

Acdal S.p.A., a subsidiary of Industria Generale Ceramiche S.p.A., produced about 150,000 mt/a of clay from its Cave del Mastro operation at Lozzolo, near Gattinara, in the Province of Vercelli. About 80% of the clay was used in tile manufacture. Industria Chemica Carlo Laviosa S.p.A. produced clay at Cagliari in Sardinia. The company operated several quarries in the Province of Nuoro, with production amounting to about 130,000 mt/a.

*Feldspar.*—Italy was the world's leading producer of feldspar and feldspathic minerals. These materials were important constituents of ceramic tile. Italy accounted for 30% of world tile output and more than 50% of the tile produced in the EC. In Italy there were more than 350 small companies producing tiles, employing about 30,000 workers. Clay was imported from Germany and some was also imported from France and the United Kingdom.

The largest producer of albite was Maffei S.p.A., which operated a surface mine at Pinzola in the Trentin district. Miniera di Fragne S.p.A. also produced albite from its surface mine at Mud di Mezzo and processed the material at its processing plant at Aladna Valsesia in Vercelli.

*Fluorspar.*—Production of fluorspar in Italy has been declining since 1984. The main fluorspar-producing area was near Gerrai, about 40 km from Cagliari, Sardinia. Six mines were in operation in 1991: two in Sardinia, operated by Mineraria Silius 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. Production capacity of Mineraria Silius was about 110,000 mt/a of fluorspar, 30,000 mt/a of barite, and 15,000 mt/a of lead concentrate.

*Marble.*—Marble and travertine production from the world-famous quarries at Massa and Carrara have increased slightly in the past 2 years.

Italian marble occurred in many localities, from the Alps to Sicily, and was quarried at hundreds of operations. The most important white marble-producing area was in the Apuan Alps in Tuscany, particularly near the town of Carrara. The Lazio region, Lombardy, the Po Valley, Puglia, Sicily, and Venice were important colored marble-producing areas. About one-half of production was in block form, and 45% of total production was exported. Annual output of the Carrara district is about 700,000 tons, or almost 35% of the country's total white marble production. Other major areas included the Valle di Susa, near Turin in the northwestern Italian Alps; the valley of the Po River in Lombardy; the Verona-Vicenza area of Venice; and the vicinity of Benevento, northeast of Naples in southern Italy. Reserves are considered to be unlimited.

*Perlite.*—Since the closing of the perlite mines on the island of Ponza off the coast of Naples, most of the perlite produced in Italy comes from Sardinia. Perlite was produced by Perlite S.p.A. at Monti Arci from a volcanic zone of that name in west-central Sardinia. Perlite's processing facilities were at Torre Grande near the port of Oristano.

*Potash.*—The production of potash dropped from 1.73 Mmt in 1989 to 429,000 tons in 1991. The decline was the result of a severe drought that has restricted availability of process water to the plants. One plant was closed. At yearend three underground mines were operating in Sicily at Pasquasia, Racalmuto, and Realmonte.

*Pumice and Pozzolan.*—Italy was the world's leading producer of pumice and pozzolan. The Mediterranean island of Lipari, 40 km off the northern coast of Sicily, was the focus of the Italian pumice industry. Two companies in Italy quarried pumice for world markets—Italpomice S.p.A. and Pumex S.p.A. Pumex, with about 650,000 mt/a capacity, was Italy's largest pumice producer. The company quarried the Mount Pelato deposit on Lipari. Most pumice was exported to the United

Kingdom. W.R. Luscombe Ltd., formerly an equity partner, became a wholly owned subsidiary of Pumex. Italpomice produced pumice at Acqualcalda on the island of Lipari, with an annual output of about 70,000 tons.

*Pyrite.*—Pyrite was mined almost exclusively by Solmine S.p.A. at Campiano and Niccioleta underground mines in Tuscany. Societa Edem S.p.A. produced small amounts of pyrite in its Val de Castello Mine.

*Salt.*—Italy's three major producers of salt were 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, based in Sicily, was a major producer of rock salt, 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.

*Sulfur.*—Italy, once the world's leading producer of mined sulfur, was a modest producer of sulfur in 1991, obtaining one-half or more of its output as a byproduct of petroleum refinery operations. Other sources were iron and cupreous pyrite deposits in the Maremma district of Tuscany. Elemental sulfur was obtained from pyrite from two mines operated by Solmine S.p.A. in southern Tuscany. Sulfuric acid was produced at the Torviscosa plant near Porto Marghera.

*Talc.*—Talco e Grafite Val Chisone S.p.A. operated two underground mines at Pinerolo. The talc, mined from metamorphic rocks, has been of very high quality. Talco also owned 10% interest in the Orani surface talc mine, with the other 90% belonging to the Sardinian Mining Board. Talco Sarda S.p.A. operated a mine at Orani in Sardinia. Talco e Grafite Val Chisone S.p.A. also operated an underground mine at Fontane, and Industria Mineraria Italiana S.p.A. (IMI) worked mines at Largone and Predaccia in Val Malenco, northern Italy. About 35% of IMI's production was reportedly exported to France, Germany, and the Netherlands.

### Mineral Fuels

The country relied heavily on imported energy, satisfying 80% of total demand with purchases from abroad. Energy was the largest deficit item in the trade account. Ente Nazionale per L'Energia Elecrtrica (ENEL), the state electricity corporation, imported about 15% of its electricity from France and Switzerland.

*Coal.*—Domestic production of lignite in Italy was based on two surface mines in Umbria and Tuscany, operated by ENEL for use in domestic electricity production. The only operational subbituminous underground coal mine in Italy was in Sardinia, owned by Carbosulcis S.p.A. Italy was heavily dependent on imported coal, mostly from the United States and South Africa, to meet its coal requirements.

*Geothermal Energy.*—Most Italian geothermal energy is produced in the Larderello, Monte Amiata, and Travale areas in Tuscany.

*Natural Gas and Petroleum.*—There were more than 100 natural gas fields in operation, of which 70% were located offshore. Natural gas supplied almost 25% of Italy's total energy needs. About 35% was produced domestically. More than 25% was imported from Algeria through a 1,070-km-long gasline from Algeria to Mazzara del Vallo in Sicily. The former U.S.S.R. continued to supply 25% of the country's natural gas through a pipeline across Austria and Czechoslovakia.

About 20% of Italy's very small domestic petroleum production came from Sicily. With an annual consumption of almost 95 Mmt of petroleum, Italy was the EC's second largest petroleum consumer after Germany.

Unione Petrolifera represented the country's private oil companies. The Saras refinery was the largest in Italy and reportedly was the most competitive in the Mediterranean area.

Italy was almost totally dependent on imported petroleum. With no large coal or gas industries, petroleum accounted for 75% of the country's energy needs.

### Reserves

Statistics on Italian reserves have not been published. Italy was considered to have sufficient reserves of asbestos, feldspar, marble, potash, pumice, salt, talc, and travertine, while deposits of coal, oil, and natural gas were insufficient to meet domestic needs. There were also smaller reserves of bauxite, magnesium, manganese, pyrite, silver, and a number of other minerals. *(See table 4.)*

## INFRASTRUCTURE

A total of 20,085 km of railroad track was operational in 1991. Highways totaled 294,410 km. Superhighways totaled 5,900 km, and 7,010 km of Italy's roads were unpaved, mostly in the southern half of the country. There were 1,203 km of crude oil pipelines in service, 2,143 km of refined product pipelines, and 13,740 km of gas pipelines.

## OUTLOOK

Public and private spending on environmental controls will continue to grow, particularly in the areas of water treatment and transportation equipment and services, urban and industrial waste disposal, soil contamination, and emissions. Mining of metallic ores will decline slightly. The metals processing industry, based primarily on imported stocks, will continue to play an important role in Italy's economy. Italy is expected to remain a large producer of secondary aluminum and the second largest producer, after Germany, of crude steel in the EC. The industrial minerals

quarrying industry and preparation plants will remain significant in Italy, especially the production of barite, cement, clays, fluorspar, marble, and talc. Italy will continue to be the world's leading producer of feldspar, feldspathic minerals, and pumice. Domestic output of natural gas, crude petroleum, and petroleum refinery products are expected to grow, while Italy will continue to depend on imported coal, gas, and petroleum.

## OTHER SOURCES OF INFORMATION

### Agencies

Ministero dell' Industria, del Commercio e dell' Artiginato
(Ministry of Industry, Commerce and Small Business)
Rome, Italy
Includes:
- Direzione Generale delle Miniere (General Directorate of Mines)
- Corpo delle Miniere (Bureau of Mine Inspection)

### Publications

Annuario di Statistiche Industriali (Yearbook of Industrial Statistics).
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); annually.
Statistica Mensile del Commercio con l'Estero (Monthly Foreign Trade Statistics).
Statistica Annuale del Commercio con l'Estero (Annual Foreign Trade Statistics).
L'Industria Mineraria (Minerals Industry); monthly.

TABLE 1

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum: | | | | | | |
| Alumina | | 699,635 | 708,158 | 722,226 | 752,000 | [2]804,596 |
| Bauxite | | 16,557 | 17,125 | [r]11,761 | [r]338 | — |
| Metal: | | | | | | |
| Primary | | 232,600 | 226,300 | 219,500 | 231,900 | [2]205,636 |
| Secondary | | 335,000 | 378,000 | 390,000 | 349,600 | [2]343,000 |
| Antimony: | | | | | | |
| Mine output, Sb content | | 86 | 24 | — | — | — |
| Oxides, gross weight[3] | | 879 | 731 | [r]856 | [r]940 | [2]861 |
| Bismuth metal | | 43 | 32 | 46 | [r]34 | [2]45 |
| Cadmium metal, smelter | | 320 | [r]686 | [r]776 | [r]691 | [2]658 |
| Copper: Metal, refined, all kinds | | 65,000 | 75,400 | 83,300 | [r]83,000 | 82,500 |
| Iron and steel: Metal: | | | | | | |
| Pig iron | thousand tons | 11,335 | 11,349 | 11,761 | 11,883 | [2]10,856 |
| Ferroalloys: | | | | | | |
| Blast furnace: | | | | | | |
| Ferromanganese | | 19,469 | 27,169 | 26,738 | [r]30,842 | [2]10,814 |
| Spiegeleisen | | 491 | 251 | — | — | — |
| Silicon pig iron[e] | | 1,000 | 1,000 | 1,000 | 1,000 | 600 |
| Electric furnace: | | | | | | |
| Ferrochromium | | 59,045 | 77,123 | 81,331 | [r]53,103 | [2]47,082 |
| Ferromanganese | | 17,067 | 12,280 | 14,220 | [r]10,995 | [2]14,145 |
| Ferrosilicon | | 47,075 | 51,131 | 65,171 | [r]39,761 | [2]12,648 |
| Silicomanganese[e] | | [2]75,192 | [r]69,000 | [r]47,000 | [r]56,000 | 55,000 |
| Silicon metal[e] | | 19,000 | 18,000 | 19,000 | 18,000 | 18,000 |
| Other[e] | | 14,500 | 14,500 | 15,000 | 14,500 | 14,500 |
| Total[e] | | 252,839 | [r]270,454 | [r]269,460 | [r]224,201 | 172,789 |
| Steel, crude | thousand tons | 22,819 | 23,760 | [r]25,213 | 25,439 | [2]25,046 |
| Semimanufactures | do. | 19,800 | 20,700 | 22,000 | [r]23,105 | [2]23,817 |
| Lead: | | | | | | |
| Mine output, Pb content | | 11,994 | 16,503 | 17,544 | [r]16,042 | [2]14,200 |
| Metal, refined: | | | | | | |
| Primary | | 62,285 | 72,204 | 74,205 | [r]68,700 | [2]111,100 |
| Secondary | | 111,400 | 111,600 | 112,000 | [r]102,200 | [2]96,500 |
| Total | | 173,685 | 183,804 | 186,205 | [r]170,900 | [2]207,600 |
| Magnesium: | | | | | | |
| Mine output, Mg content | | 8,805 | 6,878 | 7,096 | [r]7,921 | [2]3,912 |
| Metal, primary | | 7,626 | [r]5,589 | [r]5,768 | [r]5,937 | [2]5,115 |
| Manganese, mine output: | | | | | | |
| Gross weight | | 3,802 | 9,701 | 5,899 | [r]6,654 | [2]8,340 |
| Mn content | | 1,141 | 2,538 | 1,475 | [r]1,996 | [2]2,350 |
| Silver metal | kilograms | 82,031 | 91,563 | 97,036 | [r]103,400 | [2]176,475 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 33,099 | 37,150 | 43,258 | [r]43,043 | [2]36,349 |
| Metal, primary | | 247,000 | 242,117 | 259,481 | [r]264,395 | [2]263,775 |

See footnotes at end of table.

TABLE 1—Continued

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos | | 118,352 | 94,549 | r44,348 | r3,862 | 3,000 |
| Barite | | 81,643 | r77,273 | r60,331 | r44,345 | 288,486 |
| Bromine e | | 450 | 450 | 400 | 400 | 400 |
| Cement, hydraulic | thousand tons | 37,257 | 37,884 | 39,385 | r40,544 | 40,000 |
| Clays, crude: | | | | | | |
| Bentonite | do. | 313 | 301 | r234 | r228 | 2385 |
| Refractory excluding kaolinitic earth | do. | 375 | 454 | 559 | r641 | 2471 |
| Fuller's earth | do. | 39 | 39 | 44 | r46 | 40 |
| Kaolin | do. | 57 | 71 | r64 | r67 | 249 |
| Kaolinitic earth | do. | 22 | 19 | r19 | r16 | 216 |
| Diatomite e | | 27,000 | 28,000 | 25,000 | 25,000 | 26,000 |
| Feldspar | | 1,188,700 | 1,367,776 | 1,350,733 | r1,605,431 | 21,304,203 |
| Fluorspar: | | | | | | |
| Acid-grade | | 77,800 | 81,700 | 66,600 | r81,822 | 260,650 |
| Metallurgical-grade | | 56,600 | 58,157 | 59,679 | r40,661 | 237,868 |
| Total | | 134,400 | 139,857 | 126,279 | 122,483 | 298,518 |
| Gypsum e | thousand tons | 21,215 | 1,300 | r1,231 | r1,262 | 1,200 |
| Lime, hydrated, hydraulic and quicklime e | do. | 23,894 | 3,900 | 3,900 | 3,850 | 3,800 |
| Nitrogen: N content of ammonia | do. | 1,435 | 1,561 | 1,446 | 1,197 | 1,200 |
| Perlite e | | 70,000 | 70,000 | 71,000 | 71,000 | 70,000 |
| Pigments, mineral: Iron oxides, natural e | | 850 | 850 | 850 | 850 | 800 |
| Potash, crude salts: | | | | | | |
| Gross weight | thousand tons | 1,403 | 1,577 | 1,730 | 2661 | 2429 |
| $K_2O$ equivalent | do. | 178 | 197 | 208 | r138 | 263 |
| Marketable product, $K_2O$ equivalent | do. | 134 | 148 | 156 | r69 | 231 |
| Pumice and related materials: e | | | | | | |
| Pumice and pumiceous lapilli | do. | 725 | 730 | 700 | 725 | 700 |
| Pozzolan | do. | 5,000 | 5,000 | 4,500 | 4,500 | 4,500 |
| Pyrite, all types, gross weight | do. | 690 | 774 | 836 | 806 | 2553 |
| Salt: | | | | | | |
| Marine, crude 4 | do. | 571 | 680 | e685 | e680 | 650 |
| Rock and brine | do. | 3,694 | 3,609 | 3,501 | r3,752 | 3,500 |
| Sand and gravel: e | | | | | | |
| Volcanic sand | do. | 100 | 100 | 100 | 100 | 100 |
| Silica sand | do. | 4,300 | 4,300 | 4,500 | 4,300 | 4,200 |
| Other sand and gravel | do. | 122,000 | 123,000 | 124,000 | 124,000 | 125,000 |
| Sodium compounds: e | | | | | | |
| Soda ash | do. | 612 | 612 | 615 | 610 | 600 |
| Sodium sulfate | do. | 80 | 127 | 130 | 125 | 125 |
| Stone: | | | | | | |
| Dimension: e 5 | | | | | | |
| Calcareous: | | | | | | |
| Alabaster | thousand tons | 20 | 20 | 25 | 20 | 20 |
| Marble in blocks: | | | | | | |
| White | do. | 1,600 | 1,600 | 1,650 | r1,700 | 1,600 |
| Colored | do. | 1,800 | 1,800 | 1,900 | r1,950 | 1,900 |

See footnotes at end of table.

TABLE 1—Continued

## ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Stone—Continued: | | | | | | |
| Dimension e [5]—Continued: | | | | | | |
| Marble in blocks—Continued: | | | | | | |
| Travertine | thousand tons | 1,100 | 1,100 | 1,150 | 1,150 | 1,100 |
| Other: | | | | | | |
| Granite | do. | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 |
| Sandstone | do. | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 |
| Slate | do. | 120 | 120 | 120 | 120 | 120 |
| Crushed and broken:e | | | | | | |
| Dolomite | do. | 850 | 850 | 900 | 900 | 800 |
| Limestone | do. | 110,000 | 110,000 | 120,000 | 120,000 | 120,000 |
| Marl for cement | do. | 11,000 | 11,000 | 10,500 | 10,500 | [2]13,123 |
| Serpentine | do. | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Quartz and quartzite | do. | 250 | 250 | 250 | 250 | 250 |
| Strontium minerals: Celestite | | 177 | — | — | — | — |
| Sulfur: Recovered as elemental and in compounds: | | | | | | |
| S content of pyrite | thousand tons | 314 | 310 | 325 | 290 | 200 |
| Byproduct, oil refining and other sources e | do. | 250 | 310 | 315 | [2]297 | 280 |
| Total | do. | 564 | 620 | 640 | 587 | 480 |
| Talc and related materials | | 150,718 | 158,722 | r145,888 | r151,566 | [2]161,200 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Asphalt and bituminous rock, natural | | 71,429 | 56,907 | e60,000 | e60,000 | 65,000 |
| Carbon black e | | 156,000 | 155,000 | 155,000 | 155,000 | 150,000 |
| Coal: | | | | | | |
| Lignite | thousand tons | 1,642 | 1,600 | r1,485 | 1,482 | [2]1,554 |
| Subbituminous (Sulcis coal) | | 15,356 | 48,408 | r69,420 | r56,300 | [2]172,400 |
| Coke, metallurgical | thousand tons | 5,893 | 5,884 | e5,900 | e5,800 | 5,600 |
| Gas, natural | million cubic meters | 16,324 | 16,634 | 16,978 | 17,296 | [2]17,398 |
| Natural gas liquids e | thousand 42-gallon barrels | 400 | 400 | 400 | 400 | 400 |
| Petroleum: | | | | | | |
| Crude | do. | 26,625 | 32,784 | 31,197 | 31,619 | [2]29,344 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 28,314 | 30,712 | 24,638 | r26,251 | [2]24,580 |
| Gasoline, all kinds | do. | 137,989 | 139,102 | 135,498 | r153,149 | [2]151,513 |
| Naphtha | do. | 18,921 | 15,806 | 16,168 | r15,355 | 15,000 |
| Jet fuel | do. | 11,056 | 14,128 | 16,624 | e17,000 | 16,000 |
| Kerosene | do. | 28,760 | 30,349 | 31,007 | e31,500 | 30,000 |
| Distillate fuel oil | do. | 190,946 | 188,685 | 191,140 | r216,318 | [2]221,569 |
| Residual fuel oil | do. | 156,090 | 156,783 | 154,898 | r154,512 | [2]148,278 |
| Other | do. | 46,263 | 49,287 | 61,292 | r33,649 | [2]32,165 |
| Refinery fuel and losses | do. | 37,443 | 45,367 | 40,089 | e41,500 | 40,000 |
| Total | do. | 655,782 | 670,219 | 671,354 | re689,234 | 679,105 |

eEstimated. rRevised.

[1]Table includes data available through Nov. 1992.

[2]Reported figure.

[3]Antimony content is 83% of gross weight.

[4]Does not include production from Sardinia and Sicily estimated at 200,000 mt/a.

[5]Output of limestone and serpentine for dimension stone is included with "Stone: Crushed and broken." In addition to the commodities listed, a variety of other dimension stone was produced and previously listed, but available general information was inadequate for continued reliable estimation of output levels.

TABLE 2

## ITALY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Alumina | Eurallumina S.p.A. (Alumix S.p.A. 52.1%; Comalco 26.9%, Clarendon 21% both Australian companies) | Plants at Portoscuso, in Sardinia; at Porto Marghera, near Venice | 720. |
| Aluminum | Alumix S.p.A. (EFIM) | Smelters at Portoscuso, in Sardinia; at Bolzano, Porto Marghera, and two at Fusina, all near Venice | 255. |
| 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 5 companies, of which the largest are | | 1,500 including— |
| Do. | Maffei S.p.A. | Surface mines at Pinzola, Sondalo, and Campiglia Marittima; underground mine at Vipiteno | 200. |
| Do. | Miniera di Fragne S.p.A. | Surface mine at Aladna Valsesia | 60. |
| Do. | Sabbie Silicee Fossanova S.p.A. (Sasifo) | Surface mine at Fossanova | 30. |
| Lead-zinc | Nuova Samim S.p.A. (ENI) | Mines at Masua, Monteponi (Montevecchio, San Giovanni, San Benedetto) in Sardinia; at Raibl, in Veneto region | 60. |
| Do. | Others | | 10. |
| Lead metal | Nuova Samim S.p.A. (ENI) | Refinery at San Gavino, in Sardinia | 80. |
| Do. | do. | Kivcet smelter and Imperial smelter at Porto Vesme, in Sardinia | 114. |
| Zinc metal | do. | Plants at Crotone and Porto Vesme, in Sardinia; and Porto Marghera, near Venice | 349. |
| Lignite | Ente Nazionale per L'Energia Elettrica (ENEL) | Surface mines at Pietrafitta, in Umbria, and San Barbara, in Tuscany | 1,500. |

TABLE 2—Continued

## ITALY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Magnesium metal | Societa Italiana Magnesio S.p.A. (INDEL) | Dosseni Mine | 65. |
| Do. | do. | 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. | Quarries in the Carrara area | 100. |
| Petroleum: | | | 90. |
| Crude thousand 42-gallon barrels per day | Enté Nazionale/Idrocarburi (ENI) | Oilfields: Offshore Sicily and in the Adriatic sea; onshore in Po River Valley | |
| Refined | do. | About 30 refineries | 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 | Underground 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 Lavoraizone Minerali e Derivati S.p.A. (Samim 51%; Agip S.p.A. 49%) | Underground mines at Campiano and Niccioleta | 900. |
| Salt rock | Italkali Societa Italiana S.p.A. (Sta Italiana Sali Alcalini S.p.A. - Italkali) | Underground mines at Petralia, Racalmuto, and Realmonte, in Sicily | 4,000. |
| Do. | Solvay S.p.A. | Underground mines at Buriano, Pontteginori, and Querceto in Tuscany | 2,000. |
| Steel crude | Ilva S.p.A. (Government) | 34 steel plants, of which— | 13,000. |
| Do. | do. | Plant at Taranto | 8,000. |
| 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. |

TABLE 3
## ITALY: ILVA S.P.A.'S MAJOR OPERATING PLANTS

| Products | Location of plants |
|---|---|
| Flat | Bagnoli, Cornigliano, Novi Ligure, Racconigi, Taranto, Turin. |
| Long | Condove, Piombino. |
| Special steel long | Aosta. |
| Special steel flat | Terni, Turin. |
| Pipes and tubes | Costa Volpino, Dalmine, Piombino, Racconigi, Sabbio, Taranto, Torre Annunziata. |
| Other activities | Various locations. |

TABLE 4
## ITALY: RESERVES[1] OF MAJOR MINERAL COMMODITIES FOR 1991

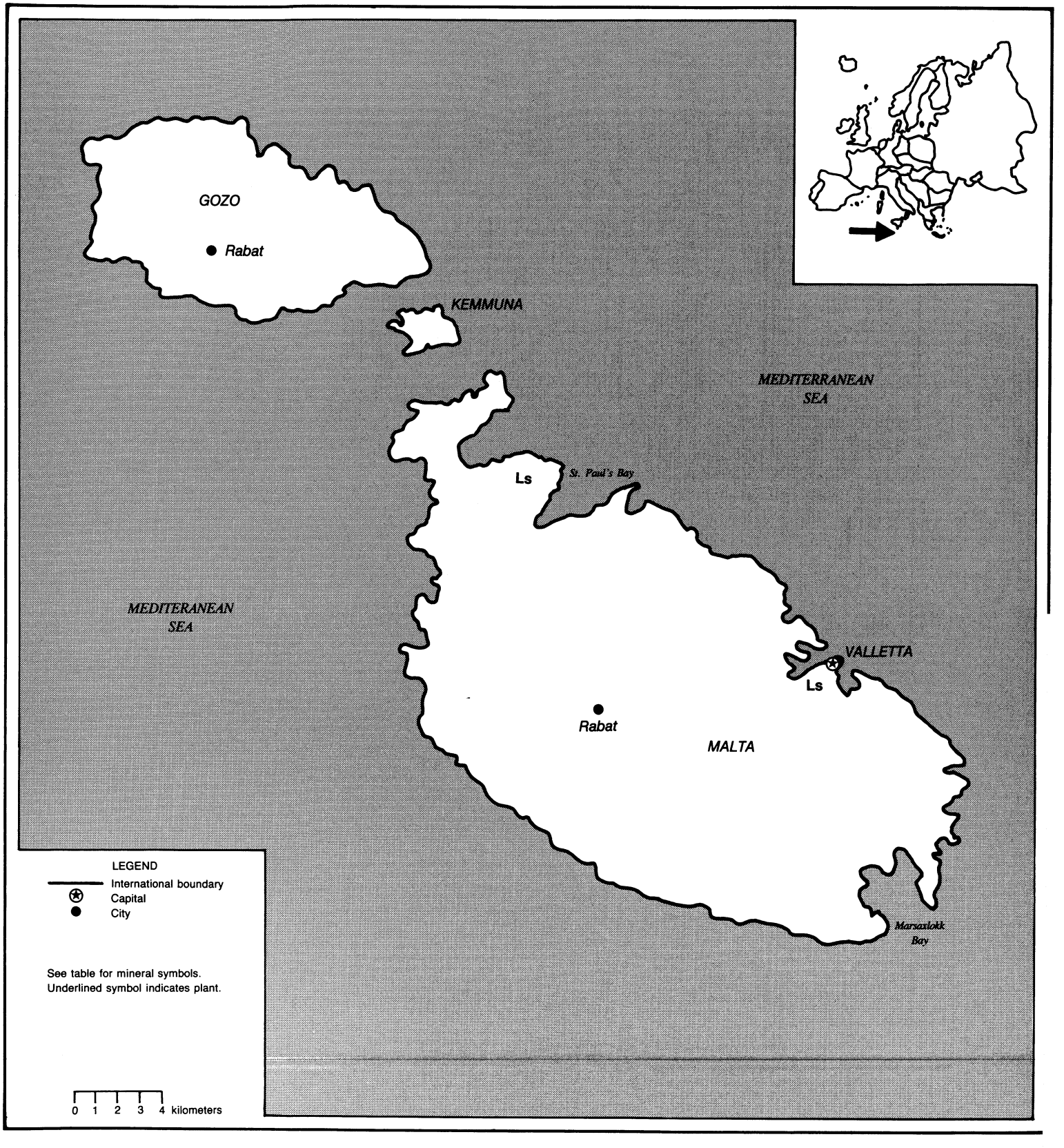
(Metric tons)

| Commodity | Reserves |
|---|---|
| Asbestos | 35,000 |
| Barite | 2,000 |
| Cement | 44,000 |
| Fluorspar | 6,000 |
| Ilmenite | 9,000 |
| Marble | 2,000,000 |
| Potash | 20,000 |
| Rutile | 20,000 |
| Salt | 1,000,000 |
| Sulfur | 10,000 |
| Talc | 45,000 |
| Travertine | 450,000 |

[1]Measured and inferred reserves.

# MALTA

**AREA 320 km²** **POPULATION 357,000**



THE MINERAL INDUSTRY OF

# MALTA

By Jozef Plachy

The importance of Malta's mineral industry mainly involves trade and storage of crude oil and refinery products. The only minerals of local importance produced in Malta were limestone, used in domestic construction and the manufacture of lime, and marine salt, obtained during the desalination of sea water.

In the oil industry, the completion of the first stage of a major oil depot at Marsaxlokk Bay in 1991 enhanced Malta's position in the transshipment of crude oil and refinery products. The modified "Terminal One" of the storage and blending facilities in the Marsaxlokk Freeport Terminal, a Maltese-German joint venture, was inaugurated on July 25, 1991. After completion in 1992, the port will be able to accommodate three vessels of up to 100,000 dwt.

Encouraging results from a seismic survey by the Japan National Oil Corp. in 1989 in the 15,250-km$^2$ area south of Malta known as Area 4, led to further exploration of other offshore areas. In January 1991, the Texaco oil company reportedly began a detailed seismic survey of Area 3, west of Malta, while American Oil Co. (Amoco) and British Petroleum Co. (BP) are reportedly exploring offshore areas to the north and east of the island.

The remaining mineral industry of Malta consists of small-scale mining of limestone, used mainly for construction and the manufacture of lime. Globigerina limestone, known locally as "franka" stone, is mined and used by local construction companies as the main building material. The Coralline limestone is blasted, crushed, screened, and used for the manufacture of lime or as aggregate for concrete.

According to a trade agreement signed with Libya on February 5, 1991, nearly three-fourths of all Malta's imports of petroleum products will reportedly be supplied by Libya.

In 1991, the European Parliament approved the extension of association status of Malta to give its economy more time to reorganize on a market basis after the years of centrally planned socialist economy.

TABLE 1
MALTA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| Lime | cubic meters | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| Limestone | thousand cubic meters | 600 | 600 | 600 | 600 | 600 |
| Salt | metric tons | 100 | 100 | 100 | 100 | 100 |

[1]Table includes data available through May 1992.

TABLE 2

## MALTA: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: Metal including alloys: | | | | |
| Scrap | $3,462 | $1,803 | — | Italy $1,771; Switzerland $32. |
| Unwrought | $706 | — | | |
| Semimanufactures | $11,178 | $10,532 | 2 | Italy $10,436; Libya $87; bunkers $6. |
| Antimony: Metal including alloys, all forms | — | $21 | — | All to Republic of Korea. |
| Copper: Metal including alloys: | | | | |
| Scrap | $827 | $772 | — | United Kingdom $255; Italy $250; West Germany $242. |
| Semimanufactures | $27 | $36 | — | Italy $21; Singapore $13; Libya $2. |
| Gold: Metal including alloys, unwrought and partly wrought grams | — | 848 | — | Italy 656; Canada 161. |
| Iron and steel: Metal: | | | | |
| Scrap | $1,511 | $1,679 | — | Italy $1,271; United Kingdom $345; Denmark $60. |
| Pig iron and related material | $399 | — | | |
| Ferroalloys: Silicon metal | — | $8 | — | All to Libya. |
| Semimanufactures: | | | | |
| Bars, rods, angles, shapes, sections | $12 | $2 | — | Mainly to Libya. |
| Flat-rolled products: | | | | |
| Not clad, plated, coated | NA | $1 | — | Do. |
| Of alloy steel | NA | $46 | — | United Kingdom $43; West Germany $3. |
| Wire | $39 | $56 | — | Ireland $39; United Kingdom $14. |
| Tubes, pipes, fittings | — | $204 | — | Italy $92; United Kingdom $63; Libya $45. |
| Lead: Metal including alloys, scrap | $98 | $438 | — | Italy $379; Greece $34; Turkey $26. |
| Magnesium: Metal including alloys, unwrought | — | $7 | — | All to United Kingdom. |
| Nickel: Metal including alloys: | | | | |
| Scrap | $34 | $27 | — | United Kingdom $23; West Germany $4. |
| Semimanufactures | — | $19 | — | West Germany $12; Ireland $6. |
| Silver: Metal including alloys, unwrought and partly wrought | $10 | — | | |
| Tin: Metal including alloys: | | | | |
| Scrap | $10 | $6 | — | All to United Kingdom. |
| Semimanufactures | — | $23 | — | Mainly to United Kingdom. |
| Uranium and thorium: Oxides and other compounds | — | $2 | — | All to United Kingdom. |
| Zinc: | | | | |
| Oxides | — | (2) | — | All to Italy. |
| Metal including alloys, scrap | $43 | $65 | — | Italy $35; United Kingdom $18; Netherlands $11. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: Grinding and polishing wheels and stones | $1,504 | $944 | — | West Germany $447; Yugoslavia $132; Iraq $99. |
| Diamond: Natural, gem, not set or strung | $2,529 | $4,091 | — | All to Belgium-Luxembourg. |
| Stone, sand, and gravel: Dimension stone: | | | | |
| Crude and partly worked | — | (2) | — | All to Italy. |
| Worked | $115 | $121 | 13 | United Kingdom $49; France $49. |
| Sulfur: Sulfuric acid | — | $1 | — | All to Libya. |

See footnotes at end of table.

TABLE 2—Continued

## MALTA: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Petroleum refinery products: | | | | | |
| Mineral jelly and wax | | $1 | $4 | — | All to Libya. |
| Lubricants | 42-gallon barrels | (3) | 4,987 | — | Libya 25; West Germany 4; bunkers 4,957. |
| Residual fuel oil | | — | $352 | — | All to Italy. |
| Bituminous mixtures | | — | $98 | — | All to Libya. |

NA Not available.
[1]Table prepared by Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $763.

TABLE 3

## MALTA: IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Aluminum: | | | | | |
| Oxides and hydroxides | | $49 | $47 | $20 | Ireland $20; United Kingdom $7. |
| Metal including alloys: | | | | | |
| Scrap | | — | $17 | — | All from Denmark. |
| Unwrought | | $12,946 | $8,116 | — | Italy $6,973; Bahrain $906; Argentina $226. |
| Semimanufactures | | $10,613 | $11,214 | $102 | Italy $8,909; United Kingdom $940; West Germany $380. |
| Antimony: Metal including alloys, all forms | | — | $2 | — | All from West Germany. |
| Beryllium: Metal including alloys, all forms | | — | $3 | — | All from Italy. |
| Cadium: Metal including alloys, all forms | | — | (2) | — | All from United Kingdom. |
| Chromium: | | | | | |
| Oxides and hydroxides | | $9 | $3 | — | Mainly from United Kingdom. |
| Metal including alloys, all forms | | — | (2) | — | All from West Germany. |
| Cobalt: Metal including alloys, all forms | | — | $4 | — | Do. |
| Copper: | | | | | |
| Oxides and hydroxides | | — | $76 | $74 | West Germany $1. |
| Sulfates | | — | $1 | — | Mainly from West Germany. |
| Metal including alloys: | | | | | |
| Unwrought | | $2 | $477 | (2) | United Kingdom $146; Italy $120; Turkey $94. |
| Semimanufactures | | $3,399 | $3,493 | $8 | United Kingdom $1,546; West Germany $619; Turkey $384. |
| Gold: Metal including alloys, unwrought and partly wrought | kilograms | — | [3]2,059 | (2) | United Kingdom 1,571; Singapore 154; Switzerland 153. |
| Iron and steel: | | | | | |
| Ore and concentrate: | | | | | |
| Excluding roasted pyrite | | $1 | $1 | — | All from Yugoslavia. |
| Pyrite, roasted | | $1 | $2 | — | Do. |

See footnotes at end of table.

TABLE 3—Continued

## MALTA: IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Metal: | | | | |
| Scrap | $3 | $60 | — | Italy $32; United Kingdom $28. |
| Pig iron, cast iron, related materials | $525 | $450 | — | Greece $318; Belgium-Luxembourg $47; United Kingdom $34. |
| Ferroalloys: Silicon metal | — | $2 | — | Mainly from France. |
| Steel, primary forms | $2,195 | $2,734 | (2) | United Kingdom $1,436; Greece $637; Turkey $371. |
| Semimanufactures: | | | | |
| Flat-rolled products: Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | NA | $3,043 | — | United Kingdom $1,131; Belgium-Luxembourg $758; Italy $673. |
| Clad, plated, coated | NA | $2,454 | — | Belgium-Luxembourg $1,130; West Germany $612; Hungary $159. |
| Bars, rods, angles, shapes, sections | $8,722 | $11,049 | (2) | United Kingdom $6,137; Italy $2,977; France $781. |
| Rails and accessories | $262 | $50 | — | Italy $43; United Kingdom $5; West Germany $2. |
| Wire | $2,463 | $1,797 | $5 | United Kingdom $527; Italy $387; Czechoslovakia $358. |
| Tubes, pipes, fittings | $7,906 | $7,421 | $10 | United Kingdom $2,577; Italy $2,403; France $554. |
| Lead: | | | | |
| Oxides | $59 | $4 | — | United Kingdom $3; West Germany $1. |
| Metal including alloys: | | | | |
| Unwrought | $96 | $208 | — | United Kingdom $95; Belgium-Luxembourg $92; Italy $20. |
| Semimanufactures | $95 | $18 | — | United Kingdom $11; Italy $6; Belgium-Luxembourg $41. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | — | $3 | — | Mainly from Italy. |
| Unwrought | $12 | — | | |
| Semimanufactures | $6 | $7 | — | West Germany $5; Italy $2. |
| Molybdenum: Metal including alloys, unwrought | — | $1 | — | All from United Kingdom. |
| Nickel: Metal including alloys: | | | | |
| Unwrought | — | $1 | — | Mainly from West Germany. |
| Semimanufactures | $415 | $386 | — | West Germany $303; United Kingdom; Italy $26. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought: | | | | |
| Palladium | — | $7 | — | Mainly from West Germany. |
| Platinum grams | — | 3,700 | — | Do. |
| Unspecified | $33 | — | | |
| Rare-earth metals including alloys, all forms | — | $3 | — | All from Netherlands. |
| Selenium, elemental | r$2 | $9 | — | All from Italy. |
| Silicon, high-purity | — | $2 | — | Mainly from Czechoslovakia. |
| Siver: Metal including alloys, unwrought and partly wrought kilograms | (3) | 2,059 | — | West Germany 1,197; United Kingdom 165; Italy 4. |
| Tin: Metal including alloys: | | | | |
| Scrap | — | $4 | — | All from West Germany. |
| Unwrought | — | $10 | — | Belgium-Luxembourg $8; United Kingdom $1. |
| Semimanufactures | $1,386 | $1,044 | — | Italy $635; United Kingdom $328; France $80. |

See footnotes at end of table

TABLE 3—Continued

## MALTA: IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Titanium: | | | | |
| Ore and concentrate | — | $45 | — | All from Italy. |
| Oxides | $1,131 | $893 | $332 | United Kingdom $303; West Germany $188; Italy $45. |
| Metal including alloys, unwrought | — | $2 | $2 | |
| Tungsten: Metal including alloys, semimanufactures | — | $1 | — | All from United Kingdom. |
| Uranium and thorium: Oxides and other compounds | $2 | — | | |
| Zinc: | | | | |
| Oxides | $69 | $76 | — | Netherlands $55; Denmark $13; West Germany $3. |
| Blue powder | $5 | $12 | $1 | Denmark $6; Netherlands $5. |
| Metal including alloys: | | | | |
| Scrap | — | $17 | — | All from France. |
| Unwrought | $281 | $219 | — | United Kingdom $105; Belgium-Luxembourg $81; France $15. |
| Semimanufactures | $183 | $100 | (2) | Belgium-Luxembourg $45; United Kingdom $32; Netherlands $5. |
| Other: | | | | |
| Ores and concentrates | $1 | (2) | — | All from Italy. |
| Oxides | — | $25 | — | France $18; United Kingdom $4; Italy $2. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | $68 | $212 | $4 | Turkey $92; United Kingdom $30; West Germany $25. |
| Artificial: | | | | |
| Corundum | $54 | $82 | — | Yugoslavia $80; United Kingdom $2. |
| Silicon carbide | [6]$46 | $88 | — | Yugoslavia $84; Norway $3. |
| Grinding and polishing wheels and stones | $862 | $911 | $4 | Italy $355; West Germany $186; Yugoslavia $107. |
| Asbestos, crude | $1,291 | (2) | — | All from United Kingdom. |
| Barite and witherite | $27 | $18 | — | United Kingdom $9; West Germany $4; Finland $4. |
| Boron materials: Oxides and acids | $2 | $5 | — | United Kingdom $4; Italy $1. |
| Cement metric tons | 206,615 | 225,740 | — | U.S.S.R. 196,830; Turkey 22,150; Italy 2,751. |
| Chalk | — | $78 | — | United Kingdom $45; Spain $10; Italy $6. |
| Clays, crude: | | | | |
| Bentonite | NA | $69 | — | United Kingdom $36; Italy $12; Denmark $9. |
| Chamotte earth and dinas earth | NA | $6 | — | All from West Germany. |
| Fire clay | NA | $12 | — | Italy $7; United Kingdom $5. |
| Kaolin | NA | $37 | — | United Kingdom $19; Italy $17; Netherlands $1. |
| Unspecified | $163 | $121 | — | United Kingdom $101; Italy $20; West Germany $1. |
| Cryolite and chiolite | $10 | $17 | — | Mainly from Yugoslavia. |
| Diatomite and other infusorial earth | $30 | $29 | — | Italy $16; United Kingdom $8; Netherlands $2. |
| Diamond, natural: | | | | |
| Gem, not set or strung | $4,331 | $5,252 | — | Ghana $2,071; Belgium-Luxembourg $1,474; Angola $815. |
| Industrial stones | [7]$1 | $55 | — | All from United Kingdom. |

See footnotes at end of table.

TABLE 3—Continued

## MALTA: IMPORTS OF SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Diamond, natural—Continued: | | | | | |
| Dust and powder | | [7]5 | $2 | — | Mainly from Ghana. |
| Feldspar and related material: | | | | | |
| Feldspar | | — | $1 | — | All from United Kingdom. |
| Leucite, nepheline, and nepheline syenite | | — | (2) | — | Mainly from Netherlands. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | metric tons | 5 | 112 | — | Italy 105. |
| Manufactured: | | | | | |
| Ammonia | | $18 | $43 | — | France $26; United Kingdom $7; Netherlands $8. |
| Nitrogenous | | $290 | $455 | — | West Germany $270; Spain $23; France $22. |
| Potassic | metric tons | 16 | 7 | — | Italy 4; United Kingdom 3. |
| Unspecified and mixed | do. | 230 | 838 | — | West Germany 510; Belgium-Luxembourg 205; Italy 58. |
| Graphite, natural | | $4 | $2 | $2 | |
| Gypsum and plaster | | $87 | $97 | $8 | Spain $59; United Kingdom $13; West Germany $10. |
| Iodine | | — | (2) | — | All from United Kingdom. |
| Lime | | — | $62 | — | United Kingdom $43; Italy $10; West Germany $6. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | $7 | $7 | — | Mainly from Italy. |
| Oxides and hydroxides | | — | $17 | — | Mainly from Japan. |
| Mica: | | | | | |
| Crude including splittings and waste | | $18 | $7 | $1 | United Kingdom $5; Netherlands $1. |
| Worked including agglomerated splittings | | $1 | $2 | — | Mainly from Sweden. |
| Phosphates, crude | | — | (2) | — | All from Belgium-Luxembourg. |
| Pigments, mineral: | | | | | |
| Natural, crude | | $8 | $3 | — | United Kingdom $2; Netherlands $1. |
| Iron oxides and hydroxides, processed | | $26 | $34 | — | Denmark $11; Netherlands $11; United Kingdom $8. |
| Potassium salts, crude | | — | (2) | — | All from United Kingdom. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | | $10 | $13 | — | Switzerland $4; West Germany $3; United Kingdom $3. |
| Synthetic | | $7 | $6 | — | Austria $3; Switzerland $1; Japan $1. |
| Pyrites, unroasted | | — | $4 | — | All from Italy. |
| Salt and brine | metric tons | (8) | 1,871,449 | 80 | United Kingdom 1,268,210; Tunisia 480,000; West Germany 110,033. |
| Stone, sand, and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | $3,017 | $3,787 | — | Italy $3,780; United Kingdom $4; Malaysia $3. |
| Worked | | $132 | $188 | — | Italy $170; Taiwan $5; India $5. |
| Dolomite, chiefly refractory-grade | | — | $7 | — | Sweden $6; Norway $1. |
| Gravel and crushed rock | | $804 | $895 | — | Italy $878; United Kingdom $7; Sweden $6. |
| Sand other than metal-bearing | | $124 | $115 | (2) | Netherlands $54; Italy $28; United Kingdom $22. |
| Quartz and quartzite | | $6 | $15 | — | Italy $12; United Kingdom $3. |

See footnotes at end of table.

TABLE 3—Continued

## MALTA: IMPORTS OF SELECTED MINERAL COMMODITIES[1]

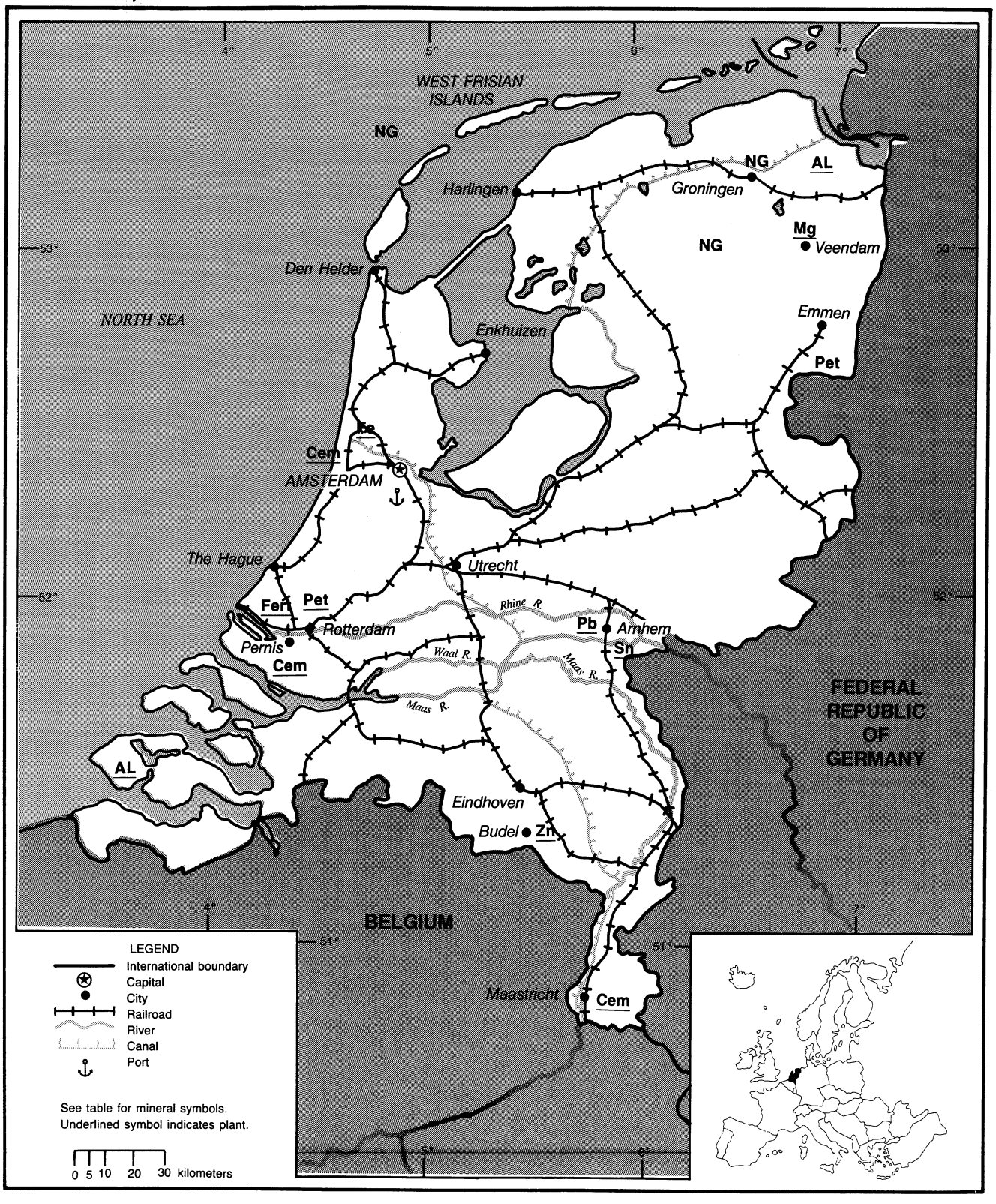
(Thousand U.S. dollars unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Sodium compounds, n.e.s.: | | | | |
| Sulfate, manufactured | — | $148 | — | West Germany $58; Spain $47; Austria $21. |
| Soda ash, manufactured | $5 | $129 | — | West Germany $103; Italy $22; United Kingdom $4. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | $47 | $40 | — | All from Italy. |
| Colloidal, precipitated, sublimed | $65 | $34 | — | Italy $20; West Germany $14; United Kingdom $1. |
| Dioxide | $4 | $1 | — | All from Italy. |
| Sulfuric acid | $437 | $230 | — | Italy $136; United Kingdom $41; Netherlands $30. |
| Talc, steatite, soapstone, pyrophyllite | $59 | $86 | — | West Germany $34; Italy $20; United Kingdom $18. |
| Other: Crude | $11 | $18 | (2) | France $11; Italy $4; United Kingdom $2. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | — | $257 | — | Italy $117; Canada $81; West Germany $54. |
| Coal: Briquets of anthracite and bituminous coal | $14,171 | $25 | — | All from Austria. |
| Coke and semicoke | $13 | (2) | — | All from West Germany. |
| Peat including briquets and litter | — | $158 | — | United Kingdom $49; Netherlands $44; West Germany $35. |
| Petroleum refinery products: | | | | |
| Mineral jelly and wax | $500 | $427 | $1 | Hungary $235; United Kingdom $108; West Germany $68. |
| Bitumen and other residues | $4,527 | $21 | — | United Kingdom $17; West Germany $1; Denmark $1. |
| Bituminous mixtures | $76 | $126 | $3 | France $69; United Kingdom $42; Italy $9. |

NA Not available.
[1]Table prepared by Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]Unreported quantity of gold leaf valued at $21,615 not included.
[4]May include silicon or tellurium.
[5]Unreported quantity valued at $234,000.
[6]May include other carbides, except calcium.
[7]May include dust of other gems.
[8]Unreported quantity valued at $228,000.

# NETHERLANDS

**AREA 34,000 km²** **POPULATION 14.8 million**



THE MINERAL INDUSTRY OF

# THE NETHERLANDS

By Charles L. Kimbell and George A. Rabchevsky

The Netherlands continued to be the leading producer of natural gas in northern Europe. Natural gas was the Netherlands most significant mineral resource. Cement materials, magnesium oxide salt, and sand and gravel were the only nonfuel mineral commodities produced in the Netherlands from indigenous deposits. The mining and quarrying industries (including gas producers) accounted for about 4% of the gross national product (GNP). The metal processing industries, using imported raw materials and both imported and domestic scrap, produced aluminum, cadmium, iron, lead, steel, tin, and zinc, and production of these metals was important to the GNP.

Overall economic growth in the Netherlands slowed in 1991; the GNP increased by only 2.25%, compared with 3.4% in 1990. Mining, quarrying, and natural gas contributed about 5% to the national income. The unemployment rate in the Netherlands is estimated at 5.7%.

## GOVERNMENT POLICIES AND PROGRAMS

Environmental policies distinguish the Netherlands as one of the strictest environmentally concerned countries in Europe. The country spends about 1.5% of its GNP on environmental measures, 78% of which comes from the Government. In 1991, Government and industry spent about $6.8 billion[1] on environmental measures. The ambitious environmental plan of the Dutch Ministry of Environmental Affairs covers the period from 1990 to 1994. The country's National Environmental Policy Plan (NEPP) is aimed at reducing all levels of pollution.

The Netherlands is situated on the Rhine, Meuse, and Scheldt Rivers, which bring in pollution from Belgium, France, Germany, and Switzerland. This not only threatens drinking water supplies, but also creates problems with dredging sludge from rivers and ports. This sludge is heavily polluted with heavy metals and other substances. Air pollution does not stop at national borders. It has been claimed that about 60% of the acid deposition in the Netherlands comes from abroad. The NEPP calls for stringent limits on $CO_2$ emissions, which were to be achieved through energy conservation, reduction in the use of coal, and increased reliance on public transportation. Recycling of materials is also encouraged.

Ground water, soil, ponds, and canals in the Netherlands are heavily polluted with nitrogen, phosphorus, and potassium, which are largely derived from agricultural activities. Environmentalists indicated that excessive use of nitrogenous fertilizers and the excess supply of manure in agriculture were still main problem areas.

Mineral extraction operations in the Netherlands are regulated under the Napoleonic Code of April 21, 1810, as supplemented by the Mining Code of 1903 and the Mineral Exploration Law of May 3, 1967. The Continental Shelf Mining Law of 1965 covers licensing regulations and safety standards in that area. The Minister of Economic Affairs supervises mining laws.

## PRODUCTION

The production of primary aluminum, zinc, and natural gas increased slightly in 1991. The production of crude steel declined for the second year; the 1991 drop was 4.5%, and that for 1990 was 4.7%. The output of industrial minerals and petroleum decreased slightly from that of the previous year. *(See table 1.)*

## TRADE

The Netherlands continued in its role as the world's foremost trade center, with the world's largest port, Rotterdam, and a host of lesser ports, including Amsterdam, Delfzijl, Ijmuiden, and Scheveningen, among others. Trade has long been a critical element in the country's economy; trade and financial services together contribute more than one-half of the country's GDP. The Netherlands' overall foreign trade balance in 1991 was positive, with exports at $133.6 billion exceeding imports of $125.9 billion by almost 6.1%. Mineral commodities, both crude and processed, and both fuel and nonfuel, represented almost 18% of imports and a little over 17% of exports. The trade balance in mineral commodities was also positive, with 1991 exports valued at $23.3 billion and imports at only $22.5 billion, this positive balance resulting primarily from energy exports exceeding imports basically because of the country's substantial exports of natural gas. Other notable mineral exporting industries included the producers of fertilizers, other mineral-based chemicals, and nonferrous metals. The country had a negative trade balance in 1991 in iron and steel, with the value of exports equaling only 86% of that of imports. The same was true for manufactures derived from nonmetallic minerals, for which the export value was equal to only 70% of that of imports.

The Netherlands imports more than 350 million barrels of oil annually, mostly from a variety of countries in the Near East. Dutch firms have extensive business connections in Eastern Europe

and the Commonwealth of Independent States.

With regard to the United States, almost 7.7% of all Dutch imports on a value basis originated in the United States. Of this total, mineral commodities accounted for only 8.9%, with a value of almost $866 million. Only 3.4% of total Dutch exports were directed to the United States, and of this total 11.4% were minerals and mineral products, with a value of about $524 million. From the viewpoint of the United States, total goods received from the Netherlands were valued at nearly $5.1 billion, including $660 million worth of minerals and mineral products, whereas total U.S. shipments (exports and reexports) to the Netherlands were valued at $13.5 billion, of which almost $1.6 billion were minerals and mineral products. *(See tables 2 and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

Most Netherlands' companies are privately held. The Directorate of Mines of the Ministry of Economic Affairs regulates mining and petroleum operations. The Geological Survey compiles data on the mineral resource industry and advises the Minister on the status of mineral reserves. The Central Bureau of Statistics collects information on mineral production. *(See table 4.)*

At least 1.5%, or 90,000 workers, of the total employment of 6,065,000 workers was in the mineral industry, including metals, industrial minerals, and mineral fuels; 0.2%, or 12,130 workers, was employed by the mining and quarrying industries. Table 5 is the estimate for employment in the mineral industry in the Netherlands for 1991.

## COMMODITY REVIEW

### Metals

Koninklijke Nederlandsche Hoogovens en Staalfabrieken NV (Hoogovens Groep BV) is the leading metals company in the Netherlands and it produces both aluminum and steel. The building industry is one of the Hoogovens Group's most important markets, accounting for more than 20% of the Group's sales. Aluminum and steel scrap are also recycled by the company.

The Billiton Group is the principal Dutch nonfuel minerals mining company, although most of its mining activities are conducted outside the country.

*Aluminum.*—There are two primary aluminum smelters in the Netherlands, one in Delfzijl and the other in Vlissingen. The Delfzijl plant is operated by Aluminium Delfzijl BV, an affiliate of Hoogovens Aluminium BV, and owned by the Hoogovens Group. The Vlissingen plant is operated by Pechiney-Nederland NV, which is 85%-owned by the French company Pechiney. The aluminum section of the Hoogovens Group accounted for 35% of the Group's income. In October, the company temporarily closed 10% of its capacity at the Delfzijl smelter owing to a fall in prices. Furthermore, the expansion plan was halted at the smelter because of the firm's inability to reach agreement of the cost of gas supply after 1998. After Norway, the Netherlands was the second largest exporter of aluminum in Western Europe.

There are three major companies in the Netherlands producing secondary aluminum; Aluminium Hardenberg NV is the largest. Both production and consumption of secondary aluminum continued to grow in 1991.

Hoogovens Group remained a leader in both the integrated aluminum and steel industries. It was the fourth largest producer of aluminum semimanufactures in Western Europe.

*Iron and Steel.*—Hoogovens IJmuiden BV (HI), owned by Hoogovens Group, operated the only integrated iron and steel plant in the Netherlands. More than 95% of its steel was produced by the oxygen process and the rest by the electric arc process. Ninety-four percent of steel was processed by the continuous cast method. The steel sector makes up 50% of the Hoogovens Group's total income. The 1991 production of steel in the Netherlands declined by almost 4.5%, primarily because of a decline in orders and the closure for several months of the No. 7 blast furnace for repairs.

Most raw materials for iron and steel production were imported. Raw material was received at the deepwater berth at IJmuiden. Receipts in 1990 consisted of the following: iron ore, 7.7 Mmt; coal, 3.7 Mmt (70% from the United States); and olivine sand (from Norway), 250,000 tons. All of Hoogovens' iron ore supply is imported, of which 29% in 1990 was from Brazil.

*Lead and Zinc.*—Two secondary lead producers are operating in the Netherlands. Hollandsee Metallurgische Industrie Billiton BV operated an electrolytic lead smelter at Arnhem, handling 95% of the country's scraped lead batteries. Billiton Witmetaal BV is the other secondary lead producer in the Netherlands.

Budelco BV is the only company in the Netherlands producing zinc. The electrolytic smelter in Budel-Dorplein has a capacity of 210,000 mt/a of zinc. Budelco's waste product (jarosite) is stored in three ponds. A fourth pond has been licensed and will be built provided that a jarosite treatment plant becomes operational by 1995.

### Industrial Minerals

*Cement.*—There are three cement companies in the Netherlands that operate 15 plants. The cement production capacity is 5.02 Mmt/a. About 40% of total output consists of portland cement and the rest is other varieties of hydraulic cement. The Eerste Nederlandse Cement Industrie NV is the largest cement producer, with 10 plants. Most of the raw materials were imported primarily from Belgium and West Germany.

*Emery.*—The German firm Possehl Erzkontor GmbH acquired 100% of the shares of Van Mannekuvs & Co. BV of Rotterdam, whose assets included a plant

of Oudenbosch that produced emery. Modernization and expansion of the plant gave it a capacity of 8,000 mt/a of emery.

*Fertilizer Materials.*—Amfert BV, part of the Rotem-Amfert fertilizer group, is situated on the North Sea Canal, between the Mercuriushaven and Coenhaven. Amfert functions primarily as a fertilizer manufacturing plant and distribution center. Imports of raw materials and fertilizers totaled about 800,000 tons, and Amfert's fertilizer production amounted to 750,000 tons. Outgoing material is loaded into small barges of about 300 tons bound for internal markets and exports to France and Germany, or into barges between 300 to 5,000 tons for Ireland, Scandinavia, and the United Kingdom.

*Magnesium Compounds.*—Magnesia is produced in a plant at Veendam from salt brines extracted 7 km away by the deep solution method. Noordelijke Zoutwinning BV produces the salt solution and Magnesia International BV produces about 105,000 mt/a refractory-grade MgO from the brine. The MgO output in the Netherlands is about 70% of Billiton's worldwide production.

Possehl Erzkontor GmbH, a German-owned company in Lubeck, acquired 100% of the shares of Van Mannekus & Co. BV, of Rotterdam, a producer of milled caustic magnesite from its plant in Schiedam. This facility was modernized and expanded to a capacity of 50,000 mt/a of milled caustic magnesite.

*Salt.*—Akzo Zout Chemie BV is the only company producing salt in the Netherlands, with plants at Delfzijl and at Hengelo. Akzo also operated plants in Denmark and the Federal Republic of Germany. About 65% of its production was exported. The company also produced chemicals, fibers, polymers, coatings, and health care products. In 1991, the sale of salt and basic chemicals amounted to $1.3 billion, a slight increase from the previous year.

### Mineral Fuels

In the Netherlands, natural gas accounted for 45% of primary energy requirements in 1990. Coal generated about 35% of the country's electricity. Two nuclear powerplants together supplied about 3% of the country's total electricity. All coal requirements were imported, primarily from the United States, Australia, Colombia, and the Republic of South Africa. In 1991, more than 6 Mmt of coal was imported from the United States.

The country produced about 14% of its crude oil requirements. The Netherlands operated seven refineries, based chiefly on imported oil, primarily from Norway, the United Kingdom, and the Middle East. Shell's refinery in Pernis is the largest in Europe. Development of an oil and gas field discovered beneath the refinery is being considered.

*Natural Gas.*—Natural gas is the Netherlands' dominant energy source. Natural gas is obtained from the Groningen Field, Western Europe's largest onshore gasfield. The reserves of natural gas were estimated at 3 trillion $m^3$. About 35 billion $m^3$ of gas is exported annually to neighboring countries, of which more than 58% was shipped to Germany in 1991, and the rest to Italy, France, and Belgium (listed by order of importance as recipients).

## INFRASTRUCTURE

The Dutch transportation infrastructure is one of the best in Europe. The Ports of Amsterdam and Rotterdam are the Netherlands' most important handling centers for mineral industry materials. Rotterdam is on the delta of three of Europe's most important trading rivers, the Rhine, the Mass, and the Scheldt. Europe's dense networks of roads and railways are also linked to Rotterdam, providing almost unlimited access to markets. Raw materials and processed minerals were handled at Rotterdam, the world's largest port (crude oil, 88.5 Mmt; and 27 Mmt divided almost equally between iron ore and coal). Ore and scrap material cargoes handled at the port vary from 42 to 46 Mmt/a, depending on demand. The only centralized trading of stainless steel scrap in Europe is at Rotterdam, which is the major transit point for international cargoes. Europe's largest refinery, Royal Dutch/Shell's Europort Pernis plant, and its largest coal and ore transshipment operation are also in Rotterdam.

Amsterdam Port is an important gateway to the Rhine River via the Amsterdam-Rhine Canal. Amsterdam is on the northern flank of the Rhine delta. Eggerding & Co. is one of the companies known for the handling, processing, and distribution of mineral commodities at Amsterdam. Eggerding handles about 200,000 mt/a of minerals, about 50% of which is mineral sands, followed by lithium ores, refractory minerals, feldspars, aluminas, and others. Imports are not only to meet requirements in the Netherlands, but also those in neighboring countries.

The steel producer, Hoogovens IJmuiden BV, is situated on the coast at the mouth of the River Scheldt, with its own docking and shipping facilities.

The transportation system for materials within the Netherlands and extending to its borders with neighboring countries includes 6,340 km of navigable waterways, 108,360 km of highways, 3,037 km of railways, 418 km of crude oil pipelines, 965 km or refined oil pipelines, and 10,230 km of natural gas pipelines.

## OUTLOOK

The gross domestic product of the Netherlands is predicted to increase in 1992, but the rate of growth will continue to decline. Export and import trade levels are expected to be near those of 1991. Production levels of metals are expected to remain about the same, except for decreases in lead and steel, and the elimination of tin production. Output of the construction nonmetals was expected to decline as a result of recession conditions that prevailed in 1992. Natural gas production is expected to be steady, while crude oil output is

expected to continue to decrease. A slight increase in the export of natural gas to neighboring countries is expected. Employment in the mineral industry most likely will continue to decrease slightly. The country will continue to rely on imports to meet needs for most basic mineral materials.

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[1]Where necessary, values have been converted from Netherlands guilder (f.) to U.S. dollars at the rate of f.1.85=US$1.00, the average for 1991.

## OTHER SOURCES OF INFORMATION

### Agencies

Rijks Geologische Dienst
(Geological Survey of the Netherlands)
Spaarne 17
Postbus 157
2000 AD Haarlem, the Netherlands

Ministerie van Economische Zaken
Inspecteur-Generaal der Mijnen
(Ministry of Economic Affairs, Inspector General of Mines)
Bezuidenhoutseweg 30, 2594 AV
The Hague, the Netherlands

### Publications

Statistical Yearbook of the Netherlands; published by Centraal Bureau voor de Statistiek, Voorburg/Heerlen.

Maandstatistiek van de Industrie (Monthly Industry Statistics); published by Centraal Bureau voor de Statistiek, Voorburg/Heerlen.

Maandschrift: Centraal Bureau voor de Statistiek (Monthly of the Central Bureau of Statistics), Voorburg/Heerlen.

De Nederlandse Energiehuishouding (Energy Economy of the Netherlands); published monthly by Centraal Bureau voor de Statistiek, Voorburg/Heerlen.

TABLE 1

## NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum metal: | | | | | | |
| Primary | | 275,939 | 278,198 | 279,243 | 257,884 | [3]263,900 |
| Secondary | | 101,403 | 115,866 | 130,158 | 134,221 | [3]114,300 |
| Cadmium metal | | 517 | 563 | 505 | [r]590 | [3]549 |
| Iron and steel: | | | | | | |
| Ore sinter (produced from imported ore) | thousand tons | 3,682 | 3,935 | 4,042 | 4,061 | 3,970 |
| Metal: | | | | | | |
| Pig iron | do. | 4,575 | 4,994 | 5,163 | 4,960 | [3]4,734 |
| Steel, crude | do. | 5,082 | 5,518 | 5,681 | 5,412 | [3]5,170 |
| Semimanufactures | do. | 4,709 | 5,034 | 5,116 | 5,055 | [3]4,865 |
| Lead metal, refined, secondary | | 40,300 | 39,500 | 41,500 | 44,100 | [3]33,700 |
| Tin metal, refined: | | | | | | |
| Primary | | 3,834 | 3,478 | 4,529 | 5,900 | [3]5,000 |
| Secondary[e] | | 180 | 180 | 190 | 200 | 220 |
| Zinc (slab), primary | | 207,111 | 211,019 | 202,962 | [r]208,537 | [3]201,300 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | thousand tons | 2,929 | 3,418 | 3,541 | 3,729 | 3,255 |
| Nitrogen: N content of ammonia | do. | 2,287 | 2,699 | 2,906 | 3,194 | 3,000 |
| Salt, all types | do. | 3,979 | 3,693 | 3,756 | 3,653 | 3,400 |
| Sand, industrial | do. | 22,274 | 25,999 | 25,647 | 25,137 | 25,000 |
| Sodium compounds, n.e.s.:[e] | | | | | | |
| Carbonate | do. | 380 | 400 | 400 | 400 | 390 |
| Sulfate, synthetic | do. | 15 | 15 | 15 | 15 | 15 |
| Sulfate, natural | do. | 22 | 22 | 22 | 22 | 22 |
| Sulfur: | | | | | | |
| Elemental byproduct:[e] | | | | | | |
| Of metallurgy | do. | — | 125 | 125 | 120 | 115 |
| Of petroleum and other forms | do. | 211 | 215 | 260 | [3]285 | 290 |
| Total | do. | 211 | 340 | 385 | 405 | 405 |
| Sulfuric acid, 100% $H_2SO_4$ | do. | 1,043 | 1,144 | 1,150 | [e]1,150 | 1,200 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon black | | 105,500 | 107,500 | 114,000 | 112,100 | 110,500 |
| Coke, metallurgcial | thousand tons | 2,736 | 2,908 | 2,898 | 2,900 | 2,900 |
| Gas: | | | | | | |
| Manufactured[4] | million cubic meters | 9,216 | 9,445 | 10,016 | 10,272 | 10,015 |
| Natural, gross | do. | [r]74,253 | 65,610 | 71,715 | 72,238 | 73,000 |
| Natural gas liquids | thousand 42-gallon barrels | 4,278 | 3,707 | [e]3,800 | [r]3,850 | 3,900 |
| Peat[e] | thousand tons | 400 | 300 | 300 | 300 | 250 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | [r]29,247 | [r]26,643 | [r]23,113 | [r]24,080 | 22,000 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 27,457 | 26,576 | 30,357 | 31,412 | 31,500 |
| Gasoline, motor | do. | 62,254 | 68,757 | 70,890 | [r]72,930 | 73,000 |
| Naphtha | do. | 75,944 | 90,773 | 88,710 | 82,808 | 82,500 |
| Jet fuel | do. | 31,120 | 38,408 | 42,848 | 40,048 | 40,000 |

See footnotes at end of table.

TABLE 1—Continued

## NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum—Continued: | | | | | | |
| Refinery products—Continued: | | | | | | |
| Kerosene | thousand 42-gallon barrels | 3,891 | 4,720 | 4,123 | 3,386 | 3,500 |
| Distillate fuel oil | do. | 133,549 | 137,488 | 129,521 | 116,689 | 117,00 |
| Residual fuel oil | do. | 92,154 | 95,464 | 93,720 | 88,877 | 89,000 |
| Lubricants | do. | 5,000 | 5,712 | 6,223 | 6,223 | 6,200 |
| Bitumen | do. | 4,545 | 4,721 | 4,938 | 4,951 | 5,000 |
| Total[5] | do. | 435,914 | 472,619 | 471,330 | [r]447,324 | 447,700 |

[e]Estimated. [r]Revised.

[1]Table includes data available through Apr. 1992.

[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]Reported figure.

[4]Coke oven and blast furnace gas only.

[5]Total of listed products only; other products not included; fuel and losses included in listed products.

TABLE 2

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Aluminum: | | | | |
| Ore and concentrate | 22,351 | 25,048 | 65 | Belgium-Luxembourg 11,710; United Kingdom 3,026; West Germany 2,290. |
| Oxides and hydroxides | 103,424 | 101,247 | 4 | West Germany 52,693; United Kingdom 15,525; France 5,873. |
| Ash and residue containing aluminum | 26,414 | 12,307 | — | West Germany 7,949; Spain 2,357; Finland 1,601. |
| Metal including alloys: | | | | |
| Scrap | 149,824 | 132,672 | 140 | West Germany 57,245; Belgium-Luxembourg 28,530; France 25,924. |
| Unwrought | 348,834 | 362,464 | 4 | Belgium-Luxembourg 147,267; France 105,762; West Germany 66,668. |
| Semimanufactures | 152,166 | 170,173 | 257 | West Germany 72,955; Belgium-Luxembourg 34,627; France 19,575. |
| Antimony: | | | | |
| Oxides | 527 | 495 | 73 | West Germany 316; France 58; India 27. |
| Metal including alloys, all forms | 9 | 15 | — | Spain 10; West Germany 5. |
| Arsenic: Metal including alloys, all forms | 119 | 27 | — | Spain 19; West Germany 4. |
| Bismuth: Metal including alloys, all forms | 18 | 46 | — | Austria 34; Italy 5; West Germany 3. |
| Cadmium: Metal including alloys, all forms | 717 | 500 | 35 | United Kingdom 182; Belgium-Luxembourg 103; France 90. |
| Chromium: | | | | |
| Ore and concentrate | 39,777 | 37,703 | — | West Germany 15,502; France 7,143; Italy 4,124. |
| Oxides and hydroxides | 279 | 361 | — | West Germany 244; Belgium-Luxembourg 33; France 26. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Chromium—Continued: | | | | |
| Metal including alloys, all forms | 65 | 50 | — | West Germany 38; Brazil 5; Thailand 2. |
| Cobalt: | | | | |
| Oxides and hydroxides | 24 | 45 | (e) | West Germany 28; Yugoslavia 5; France 4. |
| Ash and residue containing cobalt | 755 | 153 | — | West Germany 72; United Kingdom 31. |
| Metal including alloys, all forms | 91 | 93 | 2 | United Kingdom 32; Spain 22; Taiwan 18. |
| Columbium and tantalum: Metal including alloys, all forms, tantalum | 20 | 1 | — | Mainly to Tanzania. |
| Copper: | | | | |
| Ore and concentrate | 71 | 94 | — | Belgium-Luxembourg 70; France 24. |
| Matte and speiss including cement copper | 250 | 126 | 18 | Belgium-Luxembourg 48; France 26; Iran 22. |
| Oxides and hydroxides | 241 | 138 | — | West Germany 83; Belgium-Luxembourg 33. |
| Sulfate | 7,406 | 6,718 | 192 | West Germany 1,681; Belgium-Luxembourg 1,601; France 1,468. |
| Ash and residue containing copper | 8,121 | 8,081 | — | Belgium-Luxembourg 4,022; West Germany 2,732; Spain 526. |
| Metal including alloys: | | | | |
| Scrap | 105,708 | 83,437 | 46 | West Germany 42,209; Belgium-Luxembourg 25,798; Italy 5,602. |
| Unwrought | 10,663 | 8,972 | 86 | West Germany 7,548; United Kingdom 454; Italy 227. |
| Semimanufactures | 60,299 | 66,439 | 15,145 | West Germany 14,939; United Kingdom 8,371; Belgium-Luxembourg 5,343. |
| Gallium, indium and thallium : Metal including alloys, all forms | 7 | 8 | — | France 5 |
| Germanium: Metal including alloys, all forms value, thousands | $136 | $14 | — | All to Turkey. |
| Gold: | | | | |
| Waste and sweepings do. | $15,557 | $12,474 | $5 | West Germany $10,740; Belgium-Luxembourg $733; United Kingdom $477. |
| Metal including alloys, unwrought and partly wrought kilograms | 4,693 | 1,643 | 4 | Switzerland 697; West Germany 308; Belgium-Luxembourg 255. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 127,191 | 82,283 | 91 | Belgium-Luxembourg 37,230; France 19,894; West Germany 12,437. |
| Pyrite, roasted | 705 | 559 | — | West Germany 465; Australia 37. |
| Metal: | | | | |
| Scrap thousand tons | 2,815 | 2,621 | 3 | Turkey 537; Belgium-Luxembourg 411; West Germany 369. |
| Pig iron, cast iron, related materials | 2,927 | 1,419 | 18 | United Kingdom 256; France 206; West Germany 118. |
| Ferroalloys: | | | | |
| Ferrochromium | 4,750 | 3,355 | — | Belgium-Luxembourg 3,092; France 26; West Germany 17. |
| Ferromanganese | 3,117 | 132 | — | West Germany 45; Thailand 38; Belgium-Luxembourg 26. |
| Ferromolybdenum | 475 | 464 | — | West Germany 103; Yugoslavia 97; Italy 57. |

See footnotes at end of table

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel—Continued: | | | | | |
| Metal—Continued: | | | | | |
| Ferroalloys—Continued: | | | | | |
| Ferrosilicomanganese | | 52 | 19 | — | All to West Germany. |
| Ferrosilicon | | 959 | 325 | — | West Germany 150; Belgium-Luxembourg 139; United Kingdom 22. |
| Ferrotitanium and ferrosilicotitanium | | 1,571 | 208 | — | West Germany 96; Italy 83. |
| Ferrovanadium | | 46 | — | | |
| Silicon metal | | 1,934 | 4,859 | — | West Germany 4,758. |
| Unspecified | | 721 | 203 | — | Belgium-Luxembourg 82; France 52; West Germany 42. |
| Steel, primary forms | thousand tons | 1,119 | 1,152 | 54 | West Germany 155; United Kingdom 155; Belgium-Luxembourg 151. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | do. | 2,642 | 2,532 | 359 | West Germany 663; Belgium-Luxembourg 522; Italy 199. |
| Clad, plated, coated | | 621,398 | 689,351 | 10,235 | United Kingdom 166,615; West Germany 97,116; Belgium-Luxembourg 80,451. |
| Of alloy steel | | 22,278 | 23,646 | 3 | West Germany 11,101; Belgium-Luxembourg 7,752; United Kingdom 902. |
| Bars, rods, angles, shapes, sections | | 684,925 | 664,485 | 3,198 | West Germany 325,627; Belgium-Luxembourg 174,438; United Kingdom 54,673. |
| Rails and accessories | | 21,446 | 27,073 | (2) | Italy 16,908; Iran 4,900; West Germany 2,929 |
| Wire | | 68,830 | 13,770 | 90 | France 3,514; Switzerland 1,672; Belgium-Luxembourg 1,608. |
| Tubes, pipes, fittings | | 553,064 | 541,737 | 7,167 | West Germany 135,311; Belgium-Luxembourg 123,870; France 60,553. |
| Lead: | | | | | |
| Oxides | | 6,610 | 6,923 | — | West Germany 2,547; Ireland 1,491; Czechoslovakia 1,095. |
| Ash and residue containing lead | | 1,909 | 3,589 | — | Belgium-Luxembourg 2,111. |
| Metal including alloys: | | | | | |
| Scrap | | 21,649 | 26,534 | — | France 17,101; Belgium-Luxembourg 6,325; West Germany 1,517. |
| Unwrought | | 20,232 | 17,678 | — | West Germany 12,366; Belgium-Luxembourg 2,106; Portugal 1,900. |
| Semimanufactures | | 3,424 | 5,902 | 2 | United Kingdom 2,642; Belgium-Luxembourg 961; Norway 468. |
| Lithium: Oxides and hydroxides | | 40 | 18 | — | Belgium-Luxembourg 10; France 7. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 1,196 | 878 | 212 | West Germany 211; United Kingdom 182; Turkey 109. |
| Unwrought | | 6,206 | 6,596 | 25 | West Germany 4,174; Turkey 1,128; United Kingdom 546. |
| Semimanufactures | | 70 | 498 | 41 | West Germany 233; Romania 90; Sweden 41. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Manganese: | | | | | |
| Ore and concentrate | | 56,447 | 45,429 | — | Republic of South Africa 8,212; West Germany 7,992; U.S.S.R. 3,728. |
| Oxides | | 224 | 647 | — | France 445; West Germany 82; Italy 50. |
| Metal including alloys, all forms | | 1,780 | 1,983 | 6 | France 818; Belgium-Luxembourg 228; West Germany 196. |
| Mercury | | 74 | 154 | — | West Germany 31; France 20; Romania 15. |
| Molybdenum: | | | | | |
| Ore and concentrate: | | | | | |
| Roasted | | 14,087 | 14,403 | — | West Germany 2,125; Japan 2,021; United Kingdom 1,955. |
| Unroasted | | 3,316 | 1,581 | — | United Kingdom 1,245; West Germany 288. |
| Oxides and hydroxides | | 1,193 | 1,451 | — | Austria 799; West Germany 255; East Germany 145. |
| Ash and residue containing molybdenum | | 372 | 356 | — | West Germany 44; Japan 41; Belgium-Luxembourg 21. |
| Metal including alloys: | | | | | |
| Scrap | | 53 | — | | |
| Unwrought | | 87 | 37 | — | West Germany 32. |
| Semimanufactures | | 215 | 163 | 1 | Belgium-Luxembourg 102; France 19; West Germany 11. |
| Nickel: | | | | | |
| Ash and residue containing nickel | | 4,605 | 4,347 | — | Austria 2,393; Finland 357; Japan 340. |
| Metal including alloys: | | | | | |
| Scrap[3] | | 6,367 | 5,500 | — | Finland 4,597; West Germany 369; United Kingdom 173. |
| Unwrought | | 1,558 | 365 | 22 | United Kingdom 149; West Germany 56; India 21. |
| Semimanufactures | | 237 | 270 | 1 | Austria 85; Belgium-Luxembourg 56; France 29. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $25,230 | $30,571 | — | Italy $10,247; West Germany $7,831; Belgium-Luxembourg $5,596. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 266 | 173 | — | Denmark 109; France 35. |
| Platinum | do. | 1,872 | 2,093 | 4 | West Germany 1,464; Italy 183; Belgium-Luxembourg 160. |
| Rhodium | do. | 48 | 20 | — | France 19. |
| Iridium, osmium, ruthenium | do. | — | 13 | — | Denmark 9; Sweden 4. |
| Selenium, elemental | | 10 | 4 | — | Belgium-Luxembourg 3; Brazil 1. |
| Silicon, high-purity | | 28 | 25 | — | Mainly to West Germany. |
| Silver: | | | | | |
| Waste and sweepings[4] | value, thousands | $11,671 | $16,584 | $3,612 | West Germany $6,117; France $4,794. |
| Metal including alloys, unwrought and partly wrought | kilograms | 101,100 | 105,970 | 318 | West Germany 62,021; France 12,064; United Kingdom 8,447. |
| Tin: | | | | | |
| Oxides | | 11 | 9 | — | West Germany 5; Belgium-Luxembourg 3. |
| Ash and residue containing tin | | 757 | 877 | — | Belgium-Luxembourg 601; West Germany 226. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Tin—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 611 | 367 | — | Belgium-Luxembourg 293; West Germany 59. |
| Unwrought | | 2,475 | 2,553 | (2) | West Germany 1,390; France 334; Belgium-Luxembourg 156. |
| Semimanufactures | | 801 | 955 | 6 | West Germany 366; France 214; United Kingdom 95. |
| Titanium: | | | | | |
| Ore and concentrate | | 48,808 | 30,326 | — | United Kingdom 3,479; U.S.S.R 3,295; Romania 3,245. |
| Oxides | | 2,303 | 1,614 | — | Belgium-Luxembourg 832; West Germany 385; Greece 78. |
| Metal including alloys: | | | | | |
| Scrap | | 161 | 88 | — | United Kingdom 54; West Germany 29. |
| Unwrought | | 37 | 1 | — | Mainly to West Germany. |
| Semimanufactures | | 91 | 87 | (2) | United Kingdom 20; West Germany 14; Belgium-Luxembourg 13. |
| Tungsten: | | | | | |
| Ore and concentrate | | 74 | 214 | 107 | West Germany 81; France 26. |
| Metal including alloys: | | | | | |
| Scrap | | 591 | 503 | 355 | West Germany 125. |
| Unwrought | | 10 | 91 | 59 | West Germany 24; France 3. |
| Semimanufactures | | 503 | 210 | 7 | Belgium-Luxembourg 107; West Germany 50; United Kingdom 13. |
| Uranium and thorium: | | | | | |
| Oxides and other compounds | kilograms | 24,000 | 111,211 | 1,519 | West Germany 92,734; Switzerland 13,000; United Kingdom 2,934. |
| Metal including alloys, all forms, uranium | do. | 678 | 2,344 | — | Sweden 1,500. |
| Vanadium: | | | | | |
| Ash and residue containing vanadium | | — | 45 | — | West Germany 130; India 14. |
| Zinc: | | | | | |
| Ore and concentrate | | 165 | 48 | — | West Germany 47; Australia 1. |
| Blue powder | | 795 | 602 | — | Belgium-Luxembourg 349. |
| Ash and residue containing zinc | | 22,943 | 17,756 | — | Belgium-Luxembourg 6,074; West Germany 2,028; India 2,075. |
| Metal including alloys: | | | | | |
| Scrap | | 29,290 | 23,621 | — | West Germany 7,599; Belgium-Luxembourg 6,657; Taiwan 6,592. |
| Unwrought | | 167,177 | 162,419 | 999 | West Germany 47,121; United Kingdom 35,865; France 27,671. |
| Semimanufactures | | 5,245 | 7,815 | — | West Germany 4,618; France 1,253; United Kingdom 435. |
| Zirconium: | | | | | |
| Ore and concentrate | | 15,552 | 24,263 | — | West Germany 8,373; Republic of South Africa 2,233; Poland 1,541. |
| Oxides | | 63 | 84 | — | Italy 50; Belgium-Luxembourg 17; West Germany 13. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Zirconium—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 16 | 2 | 2 | |
| Unwrought | | 25 | 36 | — | West Germany 26; Belgium-Luxembourg 8; Spain 1. |
| Semimanufactures | | 27 | 6 | (2) | West Germany 3; France 1. |
| Other: | | | | | |
| Ores and concentrates | | 365 | 220 | — | West Germany 32; India 18; Japan 13. |
| Oxides and hydroxides | | 33 | 45 | — | West Germany 23; East Germany 8; France 5. |
| Ashes and residues | | 1,811 | 3,922 | 69 | West Germany 1,921; Belgium-Luxembourg 1,574. |
| **INDUSTRIAL MINERALS** | | | | | |
| Abrasives, n.e.s.: | | | | | |
| Natural: Corundum, emery, pumice, etc. | | 7,533 | 9,125 | 17 | Thailand 1,831; France 1,808; Belgium-Luxembourg 1,677. |
| Artificial: | | | | | |
| Corundum | | 698 | 1,053 | — | West Germany 436; Republic of South Africa 260; United Kingdom 200. |
| Silicon carbide | | — | 6 | — | West Germany 4; Belgium-Luxembourg 2. |
| Grinding and polishing wheels and stones | | 8,468 | 8,854 | 3 | West Germany 2,708; United Kingdom 1,696; France 1,015 |
| Asbestos, crude | | 31 | 162 | — | Belgium-Luxembourg 53; Canada 32; Italy 21. |
| Barite and witherite | | 75,756 | 73,133 | 178 | United Kingdom 30,628; West Germany 21,407; Denmark 12,721. |
| Boron materials: | | | | | |
| Crude natural borates | | 48,085 | 28,149 | — | Belgium-Luxembourg 3,888; Czechoslovakia 980; West Germany 387. |
| Oxides and acids | | 1,766 | 1,921 | — | NA. |
| Bromine | | 691 | 586 | — | France 298; West Germany 92; Spain 50. |
| Cement | | 544,324 | 693,275 | 190 | Belgium-Luxembourg 456,040; West Germany 151,711; United Kingdom 35,028. |
| Chalk | | 24,843 | 28,242 | — | Belgium-Luxembourg 26,121. |
| Clays, crude: | | | | | |
| Bentonite | | 35,010 | 40,936 | 4 | West Germany 14,822; Belgium-Luxembourg 11,972; United Kingdom 6,595. |
| Chamotte earth | | 1,262 | 2,209 | — | Belgium-Luxembourg 833; West Germany 693. |
| Fire clay | | 592 | 515 | — | Belgium-Luxembourg 190; West Germany 155. |
| Fuller's earth | | 502 | 670 | — | West Germany 569; Belgium-Luxembourg 72. |
| Kaolin | | 124,063 | 153,738 | 8 | Belgium-Luxembourg 99,038; West Germany 28,449; France 8,860. |
| Unspecified | | 204,264 | 266,943 | 4 | West Germany 125,671; Belgium-Luxembourg 138,426. |
| Cryolite and chiolite | | 1 | 26 | — | All to Republic of South Africa. |
| Diamond: | | | | | |
| Gem, not set or strung | carats | 228,091 | 271,753 | 48,156 | Israel 63,110; Switzerland 60,506. |
| Industrial stones | do. | 783,373 | 526,887 | 6,391 | Belgium-Luxembourg 211,833; Switzerland 107,127; West Germany 42,855. |
| Dust and powder | kilograms | 1 | 49 | — | West Germany 28; Switzerland 4; Belgium-Luxembourg 1. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Diatomite and other infusorial earth | | 860 | 866 | 20 | Belgium-Luxembourg 349; West Germany 199. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 1,608 | 1,840 | — | Belgium-Luxembourg 1,405; West Germany 177. |
| Fluorspar | | 964 | 1,704 | — | Hungary 534; Belgium-Luxembourg 462; West Germany 221. |
| Unspecified | | 20,482 | 28,124 | — | West Germany 9,114; Italy 8,826; Belgium-Luxembourg 5,159. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 211,269 | 254,946 | — | Belgium-Luxembourg 160,730; France 48,978; West Germany 41,177. |
| Manufactured: | | | | | |
| Ammonia | thousand tons | 996 | 1,166 | (2) | Belgium-Luxembourg 333; United Kingdom 322; Denmark 167. |
| Nitrogenous | do. | 4,511 | 4,818 | 241 | West Germany 1,212; France 1,043; Belgium-Luxembourg 426. |
| Phosphatic | do. | 209 | 266 | — | United Kingdom 92; France 77; West Germany 48. |
| Potassic | do. | 132 | 127 | (2) | West Germany 91; France 21; Belgium-Luxembourg 8. |
| Unspecified and mixed | do. | 1,453 | 1,576 | (2) | France 423; West Germany 321; Belgium-Luxembourg 151. |
| Graphite, natural | | 1,890 | 1,880 | 7 | West Germany 1,308; Spain 422; Turkey 142. |
| Gypsum and plaster | | 88,266 | 72,695 | 8 | Belgium-Luxembourg 38,934; France 24,880; West Germany 6,189. |
| Iodine | | 168 | 214 | — | Italy 75; U.S.S.R. 38; United Kingdom 22. |
| Kyanite and related materials | | 1,011 | 1,384 | — | France 977. |
| Lime | | 6,523 | 9,142 | — | Belgium-Luxembourg 4,428; West Germany 1,818; Camaroon 512. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 3,881 | 5,457 | 33 | West Germany 3,494; Ireland 1,000. |
| Oxides and hydroxides | | 44,756 | 47,970 | 136 | West Germany 22,125; Belgium-Luxembourg 5,832; France 4,152. |
| Other | | 105 | 561 | — | France 250; Belgium-Luxembourg 190; Denmark 42. |
| Mica: | | | | | |
| Crude including splittings and waste | | 1,283 | 1,985 | — | France 664; West Germany 268; Egypt 160. |
| Worked including agglomerated splittings | | 78 | 12 | — | Belgium-Luxembourg 5; Saudi Arabia 4; Aruba 1. |
| Nitrates, crude | | 566 | 295 | — | West Germany 156; Belgium-Luxembourg 139. |
| Phosphates, crude | | 194,541 | 211,330 | — | West Germany 199,827; Belgium-Luxembourg 9,328. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 211 | 478 | 5 | West Germany 375; Saudi Arabia 36; Yugoslavia 20. |
| Iron oxides and hydroxides, processed | | 7,933 | 7,812 | 477 | West Germany 2,191; France 1,092; Belgium-Luxembourg 444. |
| Potassium salts, crude | | 859 | 274 | — | Belgium-Luxembourg 251; West Germany 23. |
| Precious and semiprecious stones other than diamond: Natural | kilograms | 205,561 | 24,412 | 2 | Denmark 11,000; France 1,000; West Germany 1,000. |
| Pyrite, unroasted | | 116 | 65 | — | Denmark 23; West Germany 14. |
| Salt and brine | thousand tons | 2,815 | 2,662 | — | Belgium-Luxembourg 730; United Kingdom 18. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 182,250 | 192,700 | — | West Germany 76,464; Belgium-Luxembourg 42,330; Denmark 12,647. |
| Sulfate, natural | | 19,867 | 22,096 | — | West Germany 8,710; Belgium-Luxembourg 3,379; United Kingdom 1,402. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worke | thousand tons | 22 | 25 | (2) | West Germany 11; Belgium-Luxembourg 6; United Kingdom 4. |
| Worked | do. | 64 | 63 | (2) | West Germany 35; Belgium-Luxembourg 21; Austria 2. |
| Dolomite, chiefly refractory-grade | do. | 27 | 26 | — | Belgium-Luxembourg 14; West Germany 8; France 1. |
| Gravel and crushed rock | do. | 2,540 | 1,273 | 1 | Belgium-Luxembourg 877; United Kingdom 197; West Germany 177. |
| Limestone other than dimension | do. | 2 | 6 | — | West Germany 4; Belgium-Luxembourg 2. |
| Quartz and quartzite | do. | 16 | 16 | (2) | Belgium-Luxembourg 9; United Kingdom 2; Japan 1. |
| Sand other than metal-bearing | do. | 11,268 | 11,845 | (2) | Belgium-Luxembourg 11,076; West Germany 638; France 119. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 144,210 | 148,042 | 9,825 | Belgium-Luxembourg 107,011; United Kingdom 15,526. |
| Colloidal, precipitated, sublimed | | 23 | 72 | — | France 66; West Germany 5. |
| Dioxide | | 1,291 | 873 | 11 | United Kingdom 420; West Germany 317; Belgium-Luxembourg 48. |
| Sulfuric acid | | 201,292 | 206,653 | 2 | Belgium-Luxembourg 111,595; West Germany 89,029; Sudan 1,035. |
| Talc, steatite, soapstone, pyrophyllite | | 18,491 | 19,449 | 162 | Belgium-Luxembourg 6,688; West Germany 5,503; Italy 2,169. |
| Vermiculite, perlite, chlorite | | 4,229 | 6,170 | — | West Germany 4,971; United Kingdom 722. |
| Other: | | | | | |
| Crude | | 307,111 | 280,429 | 15 | Belgium-Luxembourg 98,574; West Germany 78,364 France 50,096. |
| Slag and dross, not metal-bearing | | 838,225 | 882,934 | 1,129 | Belgium-Luxembourg 353,963; France 148,623; West Germany 145,166. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 88 | 393 | — | Belgium-Luxembourg 291; West Germany 85; France 18. |
| Carbon black | | 116,521 | 109,891 | 4 | France 33,797; West Germany 27,343; Belgium-Luxembourg 18,953. |
| Coal: | | | | | |
| Anthracite | thousand tons | 231 | 341 | — | Belgium-Luxembourg 92; United Kingdom 86; Morroco 57. |
| Bituminous | do. | 929 | 1,933 | — | West Germany 1,266; Belgium-Luxembourg 330; France 189. |
| Briquets of anthracite and bituminous coal | | 1,337 | 512 | — | France 433. |
| Lignite including briquets | | 10,163 | 3,194 | — | West Germany 3,006; France 189. |

See footnotes at end of table.

TABLE 2—Continued

## NETHERLANDS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Coke and semicoke | | 771,851 | 844,277 | — | Belgium-Luxembourg 382,857; France 209,876; West Germany 104,238. |
| Gas, natural: | | | | | |
| Gaseous | million cubic meters | 33,037 | 34,171 | — | West Germany 18,272; Italy 7,119; Belgium-Luxembourg 4,455. |
| Peat including briquets and litter | | 489,838 | 551,804 | — | Belgium-Luxembourg 261,059; France 119,408; West Germany 87,627. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 7,177 | 8,971 | — | United Kingdom 8,311; Belgium-Luxembourg 659. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 5,486 | 5,313 | 1 | West Germany 2,520; Belgium-Luxembourg 1,037; Italy 616. |
| Gasoline: | | | | | |
| Aviation | do. | 57,688 | 59,608 | 3,210 | West Germany 32,017; Belgium-Luxembourg 10,467; United Kingdom 5,687. |
| Motor | do. | 89,828 | 33,444 | 3,087 | West Germany 20,733; Belgium-Luxembourg 3,266; United Kingdom 2,111. |
| Mineral jelly and wax | do. | 668 | 600 | 6 | United Kingdom 241; France 146; West Germany 84. |
| Kerosene and jet fuel | do. | 34,267 | 29,902 | 113 | West Germany 19,555; Belgium-Luxembourg 3,143; United Kingdom 2,072. |
| Distillate fuel oil | do. | 114,601 | 106,148 | 182 | West Germany 54,423; Belgium-Luxembourg 30,765; United Kingdom 3,832. |
| Lubricants | do. | 5,177 | 4,957 | 41 | Belgium-Luxembourg 843; United Kingdom 621; Sweden 414. |
| Residual fuel oil | do. | 86,633 | 83,736 | 7,354 | Belgium-Luxembourg 13,252; United Kingdom 7,859; West Germany 4,266. |
| Bitumen and other residues | do. | 2,111 | 1,936 | — | West Germany 754; Belgium-Luxembourg 404; Norway 273. |
| Bituminous mixtures | do. | 432 | 547 | (2) | West Germany 361; Belgium-Luxembourg 146; France 6. |

NA Not available.
[1]Table prepared by B.S. Colquitt.
[2]Less than 1/2 unit.
[3]Total incomplete owing to unreported quantities.
[4]May include other precious metals.

TABLE 3

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 1,683 | 1,871 | 303 | France 1,250; West Germany 298. |
| Alkaline-earth metals | 127 | 172 | 3 | West Germany 71; France 68; Canada 23. |
| Aluminum: | | | | |
| Ore and concentrate | 142,971 | 142,916 | 5,396 | Greece 92,302; China 28,821; West Germany 10,600. |
| Oxides and hydroxides | 571,572 | 502,766 | 8,080 | Suriname 321,220; Jamaica 88,871; West Germany 34,434. |
| Ash and residue containing aluminum | 12,815 | 11,068 | — | West Germany 5,036; Belgium-Luxembourg 2,657; United Kingdom 1,728. |
| Metal including alloys: | | | | |
| Scrap | 138,241 | 126,757 | 3,768 | West Germany 50,781; Belgium-Luxembourg 20,327; France 18,023. |
| Unwrought | 177,318 | 190,224 | 586 | Norway 60,204; West Germany 28,222; U.S.S.R. 24,426. |
| Semimanufactures | 169,675 | 191,856 | 514 | West Germany 43,568; Belgium-Luxembourg 55,754; United Kingdom 13,227. |
| Antimony: | | | | |
| Oxides | 1,807 | 1,531 | 23 | Belgium-Luxembourg 488; France 400; Taiwan 159. |
| Metal including alloys, all forms | 82 | 51 | — | China 25; United Kingdom 13; Hong Kong 11. |
| Arsenic: Metal including alloys, all forms | 152 | 30 | 1 | China 28. |
| Beryllium: Metal including alloys, all forms value, thousands | $266 | $571 | $205 | West Germany $364. |
| Bismuth: Metal including alloys, all forms | 25 | 41 | (2) | Belgium-Luxembourg 32; Mexico 5. |
| Cadmium: Metal including alloys, all forms | 65 | 32 | — | West Germany 27; France 5. |
| Chromium: | | | | |
| Ore and concentrate | 42,777 | 54,066 | — | Republic of South Africa 40,329; Finland 7,996; Namibia 2,891. |
| Oxides and hydroxides | 2,124 | 2,128 | 776 | West Germany 553; United Kingdom 522. |
| Metal including alloys, all forms | 137 | 261 | 1 | China 84; France 76; West Germany 20. |
| Cobalt: | | | | |
| Oxides and hydroxides | 285 | 329 | (2) | Belgium-Luxembourg 246; Finland 56; United Kingdom 13. |
| Metal including alloys, all forms | 50 | 127 | 3 | West Germany 36; Spain 34; U.S.S.R. 10. |
| Ash and residue containing cobalt | 71 | 82 | — | Belgium-Luxembourg 49; West Germany 2; United Kingdom 2. |
| Columbium and tantalum: | | | | |
| Metal including alloys, all forms, tantalum value, thousands | $392 | $367 | $23 | West Germany $191; Austria $140. |
| Copper: | | | | |
| Ore and concentrate | 401 | 476 | — | Australia 380. |
| Oxides and hydroxides | 949 | 752 | 99 | West Germany 310; Italy 119; Poland 100. |
| Sulfate | 10,113 | 9,866 | 37 | Poland 4,675; West Germany 2,375; Italy 730. |
| Ash and residue containing copper | 2,751 | 2,050 | — | West Germany 1,404; Cuba 459. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Copper—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 71,478 | 78,218 | 1,126 | West Germany 32,298; Belgium-Luxembourg 19,002; France 5,253. |
| Unwrought | | 22,674 | 25,660 | 1,629 | U.S.S.R. 8,442; West Germany 7,103; Canada 2,101. |
| Semimanufactures | | 107,415 | 112,726 | 593 | West Germany 52,328; Belgium-Luxembourg 38,919; France 11,095. |
| Gallium, indium and thallium: | | | | | |
| Metal including alloys, all forms | value, thousands | $1,886 | $416 | $9 | United Kingdom $154; West Germany $135; Belgium-Luxembourg $23. |
| Germanium: | | | | | |
| Oxides | do. | $600 | $686 | $77 | West Germany $499; Belgium-Luxembourg $109. |
| Metal including alloys, all forms | do. | $136 | $195 | — | Belgium-Luxembourg $157; West Germany $26. |
| Gold: | | | | | |
| Waste and sweepings | do. | $356 | $1,850 | — | Belgium-Luxembourg $1,088; West Germany $336; United Kingdom $231. |
| Metal including alloys, unwrought and partly wrought | kilograms | 3,858 | 5,770 | 1,042 | United Kingdom 1,965; West Germany 1,601. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 8,151 | 8,303 | 62 | Brazil 2,443; Norway 1,460; Australia 1,395. |
| Pyrite, roasted | | 13,541 | 10,894 | — | All from Belgium-Luxembourg. |
| Metal: | | | | | |
| Scrap | thousand tons | 933 | 1,171 | 1 | West Germany 871; Belgium-Luxembourg 129; United Kingdom 41. |
| Pig iron, cast iron, related materials | | 78,278 | 73,082 | 372 | West Germany 24,074; France 12,478; U.S.S.R. 10,816. |
| Ferroalloys: | | | | | |
| Ferrocolumbium | | 94 | 104 | — | Brazil 78; United Kingdom 21. |
| Ferrochromium | | 7,442 | 8,084 | 5 | Albania 4,432; India 2,016; West Germany 916. |
| Ferromanganese | | 17,969 | 17,450 | 132 | Norway 6,770; France 6,213; West Germany 2,186. |
| Ferromolybdenum | | 431 | 544 | — | United Kingdom 455; Belgium-Luxembourg 68. |
| Ferronickel | | 36 | 100 | — | Dominican Republic 39; Austria 38; Yugoslavia 20. |
| Ferrophosphorous | | 281 | 254 | — | All from West Germany. |
| Ferrosilicochromium | | 947 | 72 | — | Do. |
| Ferrosilicomanganese | | 6,360 | 7,050 | — | Republic of South Africa 2,961; Norway 1,829; West Germany 1,192. |
| Ferrosilicon | | 9,411 | 8,085 | (2) | West Germany 2,511; Norway 2,277; Sweden 971. |
| Ferrotitanium and ferrosilicotitanium | | 1,787 | 288 | — | United Kingdom 153; West Germany 68; U.S.S.R. 68. |
| Ferrovanadium | | 67 | 62 | — | West Germany 37; Austria 20. |
| Silicon metal | | 5,317 | 8,812 | — | Norway 4,986; China 2,304; Brazil 780. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Metal—Continued: | | | | |
| Ferroalloys—Continued: | | | | |
| Unspecified | 2,006 | 1,368 | — | West Germany 458; France 451; Italy 168. |
| Steel, primary forms | 79,324 | 77,461 | 20 | West Germany 69,173; Belgium-Luxembourg 3,577; United Kingdom 2,006. |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 1,559,077 | 1,424,746 | 40 | West Germany 572,778; Belgium-Luxembourg 478,531; United Kingdom 82,827. |
| Clad, plated, coated | 629,827 | 597,193 | 1,017 | West Germany 254,239; Belgium-Luxembourg 26,282; United Kingdom 47,576. |
| Of alloy steel | 129,049 | 133,671 | 407 | West Germany 49,678; Belgium-Luxembourg 26,282; Sweden 15,437. |
| Bars, rods, angles, shapes, sections | 1,642,090 | 1,741,716 | 977 | West Germany 640,796; Belgium-Luxembourg 474,133; United Kingdom 192,984. |
| Rails and accessories | 34,047 | 42,445 | — | West Germany 22,895; Belgium-Luxembourg 8,506; France 5,771. |
| Wire | 124,328 | 129,797 | 1,420 | West Germany 60,006; Belgium-Luxembourg 44,218; France 8,848. |
| Tubes, pipes, fittings | 709,615 | 1,068,844 | 4,794 | West Germany 480,878; France 231,057; Italy 100,402. |
| Lead: | | | | |
| Oxides | 5,030 | 4,702 | — | West Germany 4,100; France 563. |
| Ash and residue containing lead | 1,709 | 2,293 | 19 | France 1,107; West Germany 107. |
| Metal including alloys: | | | | |
| Scrap | 19,554 | 20,185 | 102 | West Germany 13,404; Belgium-Luxembourg 1,975; Cuba 1,923. |
| Unwrought | 35,358 | 39,077 | 244 | Belgium-Luxembourg 10,582; United Kingdom 9,476; France 8,989. |
| Semimanufactures | 11,043 | 11,172 | 4 | Belgium-Luxembourg 9,362; West Germany 791; France 595. |
| Lithium: Oxides and hydroxides | 165 | 181 | 48 | Hong Kong 34; West Germany 17. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 1,251 | 749 | 150 | France 125; Egypt 119; West Germany 97. |
| Unwrought | 7,086 | 7,831 | 6,047 | Norway 1,462; France 133. |
| Semimanufactures | 561 | 491 | 105 | West Germany 294; United Kingdom 43. |
| Manganese: | | | | |
| Ore and concentrate | 55,956 | 71,157 | — | Congo 34,630; Australia 22,120; Republic of South Africa 7,211. |
| Oxides | 679 | 1,033 | 457 | Belgium-Luxembourg 150; Japan 150. |
| Metal including alloys, all forms | 2,362 | 2,263 | 1 | China 1,171; Hong Kong 341; West Germany 309. |
| Mercury | 110 | 106 | (2) | Switzerland 30; Sweden 28; Spain 14. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Molybdenum: | | | | | |
| Ore and concentrate: | | | | | |
| Roasted | | 2,678 | 1,013 | 449 | Peru 331; United Kingdom 135; West Germany 87. |
| Unroasted | | 22,899 | 21,192 | 17,825 | Mexico 1,711; Belgium-Luxembourg 513; Peru 378. |
| Oxides and hydroxides | | 18 | 18 | 5 | Belgium-Luxembourg 11; West Germany 2. |
| Ash and residue containing molybdenum | | 99 | 72 | — | United Kingdom 49; West Germany 23. |
| Metal including alloys: | | | | | |
| Scrap | | 56 | 36 | (2) | China 20; Belgium-Luxembourg 5; Hungary 5. |
| Unwrought | | 136 | 72 | — | All from West Germany. |
| Semimanufactures | | 68 | 59 | 4 | Belgium-Luxembourg 28; Austria 14; West Germany 5. |
| Nickel: | | | | | |
| Oxides and hydroxides | | 211 | 200 | — | Belgium-Luxembourg 25. |
| Ash and residue containing nickel | | 2,144 | 2,304 | 184 | West Germany 856; France 211. |
| Metal including alloys: | | | | | |
| Scrap[3] | | 2,962 | 2,797 | 86 | West Germany 774; Canada 566; Belgium-Luxembourg 541. |
| Unwrought | | 3,680 | 1,387 | 2 | United Kingdom 641; Belgium-Luxembourg 212; West Germany 157. |
| Semimanufactures | | 1,158 | 1,198 | 79 | United Kingdom 437; West Germany 333; France 133. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $1,737 | $3,684 | $272 | Belgium-Luxembourg $2,337; Denmark $726. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 2,801 | 2,151 | 994 | U.S.S.R. 637; United Kingdom 196; Switzerland 165. |
| Platinum | do. | 1,094 | 917 | 57 | Switzerland 235; United Kingdom 225; West Germany 225. |
| Rhodium | do. | 38 | 60 | — | France 20; United Kingdom 18; Republic of South Africa 8. |
| Iridium, osmium, ruthenium | do. | 219 | 27 | — | Republic of South Africa 12; West Germany 8; United Kingdom 5. |
| Rare-earth metals including alloys, all forms | | 4 | 12 | — | West Germany 11. |
| Selenium, elemental | | 8 | 13 | — | Canada 8; West Germany 3; United Kingdom 2. |
| Silicon, high-purity | | 115 | 12 | — | West Germany 11; Italy 1. |
| Silver: | | | | | |
| Ore and concentrate[4] | value, thousands | $601 | $3,294 | $23 | Mali $2,888; Liberia $72. |
| Waste and sweepings[4] | do. | $574 | $538 | $40 | West Germany $387. |
| Metal including alloys, unwrought and partly wrought | kilograms | 121,373 | 157,741 | 6,475 | West Germany 49,425; Spain 36,762; United Kingdom 31,111. |
| Tellurium, elemental | | 1 | 7 | — | Mainly from Belgium-Luxembourg. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Tin: | | | | |
| Ore and concentrate | 9,280 | 10,586 | — | United Kingdom 5,994; Peru 1,803; Portugal 1,142. |
| Oxides | 181 | 98 | 4 | United Kingdom 71; West Germany 13. |
| Ash and residue containing tin | 593 | 1,304 | 12 | France 485; Belgium-Luxembourg 296; West Germany 141. |
| Metal including alloys: | | | | |
| Scrap | 488 | 393 | 1 | West Germany 23; Portugal 98; Italy 23. |
| Unwrought | 3,819 | 3,055 | 5 | United Kingdom 1,133; Belgium-Luxembourg 743; Brazil 530. |
| Semimanufactures | 131 | 147 | 1 | West Germany 78; France 37; Belgium-Luxembourg 24. |
| Titanium: | | | | |
| Ore and concentrate | 37,001 | 59,999 | 5,106 | Australia 28,295; Republic of South Africa 12,674; Sierra Leone 7,511. |
| Oxides | 10,051 | 10,036 | 703 | Australia 4,334; United Kingdom 1,112; West Germany 1,095. |
| Ash and residue containing titanium | 50,197 | 48 | — | All from West Germany. |
| Metal including alloys: | | | | |
| Scrap | 141 | 210 | 72 | United Kingdom 69; West Germany 19. |
| Unwrought | 218 | 230 | — | U.S.S.R. 101; Austria 90; United Kingdom 21. |
| Semimanufactures | 412 | 347 | 38 | West Germany 99; Japan 83; France 82. |
| Tungsten: | | | | |
| Ore and concentrate | 310 | 453 | — | Portugal 431. |
| Metal including alloys: | | | | |
| Scrap | 37 | 27 | — | Belgium-Luxembourg 22; West Germany 5. |
| Unwrought | 678 | 666 | 562 | West Germany 94; Israel 9. |
| Semimanufactures | 36 | 78 | (2) | Belgium-Luxembourg 32; West Germany 26; Austria 5. |
| Uranium and thorium: | | | | |
| Oxides and other compounds | 59 | 80 | — | All from Canada. |
| Metal including alloys, all forms, uranium | 2,530 | 1,692 | — | France 754; United Kingdom 704; Canada 233. |
| Vanadium: | | | | |
| Oxides and hydroxides | 13 | 10 | — | Belgium-Luxembourg 7; West Germany 2. |
| Ash and residue containing vanadium | 117 | 129 | — | Cuba 104; West Germany 14. |
| Zinc: | | | | |
| Ore and concentrate | 419,139 | 465,923 | 46,740 | Canada 155,781; Australia 72,852; Ireland 64,351. |
| Oxides | 6,704 | 6,489 | 8 | China 2,546; West Germany 2,309; Belgium-Luxembourg 589. |
| Blue powder | 2,957 | 2,750 | (2) | West Germany 1,126; Norway 1,099; Belgium-Luxembourg 417. |
| Ash and residue containing zinc | 24,594 | 26,319 | 19 | Belgium-Luxembourg 20,320; West Germany 4,903; Hungary 671. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Zinc—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 8,144 | 5,055 | — | West Germany 1,885; Belgium-Luxembourg 1,079; France 938. |
| Unwrought | 37,380 | 26,187 | (2) | Belgium-Luxembourg 7,152; Finland 6,698; West Germany 5,724. |
| Semimanufactures | 5,137 | 6,724 | (2) | West Germany 3,138; France 990; Belgium-Luxembourg 735. |
| Zirconium: | | | | |
| Ore and concentrate | 45,304 | 52,737 | 2,022 | Australia 32,033; Republic of South Africa 17,329; Malaysia 885. |
| Oxides | 34 | 72 | 5 | United Kingdom 28; France 21; West Germany 13. |
| Metal including alloys: | | | | |
| Scrap | 16 | 22 | 21 | NA. |
| Unwrought | 25 | 5 | (2) | France 4. |
| Semimanufactures | 27 | — | | |
| Other: | | | | |
| Oxides and hydroxides | 241 | 248 | 8 | Belgium-Luxembourg 129; West Germany 59; France 19. |
| Ashes and residues | 2,274 | 4,736 | — | Belgium-Luxembourg 1,654; West Germany 1,475; United Kingdom 1,217. |
| Base metals including alloys, all forms | 23 | 15 | (2) | West Germany 14. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 287,834 | 240,764 | 23 | West Germany 228,310; Turkey 10,624; Belgium-Luxembourg 845. |
| Artificial: | | | | |
| Corundum | 9,604 | 11,332 | 875 | West Germany 4,403; United Kingdom 1,663; France 1,253. |
| Silicon carbide | 2,506 | 4,601 | 18 | West Germany 2,276; Brazil 1,295; Belgium-Luxembourg 770. |
| Grinding and polishing wheels and stones | 5,842 | 5,419 | 94 | France 1,926; West Germany 1,550; Italy 491. |
| Asbestos, crude | 9,148 | 6,252 | 42 | Canada 4,462; Republic of South Africa 616; Austria 519. |
| Barite and witherite | 150,665 | 94,774 | — | China 89,814; West Germany 3,755. |
| Boron materials: | | | | |
| Crude natural borates | 61,870 | 28,430 | 12,771 | Belgium-Luxembourg 13,074; Turkey 2,584. |
| Oxides and acids | 4,934 | 5,956 | 1,747 | Italy 1,769; France 1,250; Chile 678. |
| Bromine | 8,125 | 10,640 | — | Israel 10,023; United Kingdom 487. |
| Cement thousand tons | 3,548 | 3,720 | 1 | West Germany 1,739; Belgium-Luxembourg 1,655; Greece 61. |
| Chalk | 113,284 | 102,369 | — | France 52,932; West Germany 35,166; Belgium-Luxembourg 12,719. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Clays, crude: | | | | | |
| Bentonite | | 99,267 | 108,305 | 10,170 | Greece 74,240; West Germany 6,950; India 6,727. |
| Chamotte earth | | 26,582 | 24,165 | 8,211 | West Germany 11,325; France 2,278; Spain 1,480. |
| Fuller's earth | | 8,283 | 5,428 | 107 | United Kingdom 1,672; Spain 1,029; Belgium-Luxembourg 944. |
| Fire clay | | 54,147 | 58,325 | 19 | West Germany 53,380; France 4,606. |
| Kaolin | | 451,417 | 478,972 | 95,370 | United Kingdom 118,759; Spain 66,230; Belgium-Luxembourg 59,417. |
| Unspecified | | 535,196 | 552,582 | 9,072 | West Germany 516,154; United Kingdom 7,748; Denmark 7,685. |
| Cryolite and chiolite | | 38 | 62 | — | Denmark 51; Switzerland 10. |
| Diamond: | | | | | |
| Gem, not set or strung | carats | 389,867 | 489,746 | 45,625 | Panama 219,124; Switzerland 82,641; United Kingdom 72,447. |
| Industrial stones | do. | 773,027 | 380,351 | 4,590 | United Kingdom 169,361; Belgium-Luxembourg 120,448; Ireland 28,397. |
| Dust and powder | kilograms | 270 | 218 | (2) | Belgium-Luxembourg 201; Switzerland 16. |
| Diatomite and other infusorial earth | | 22,435 | 25,398 | 4,131 | Denmark 15,161; West Germany 2,704. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 9,157 | 12,739 | — | Norway 6,603; West Germany 3,630; Italy 1,019. |
| Fluorspar | | 26,045 | 30,520 | 16 | Spain 17,844; West Germany 5,036; East Germany 2,475. |
| Unspecified | | 53,425 | 59,724 | — | Canada 46,889; Norway 12,558. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 211,296 | 236,436 | — | West Germany 174,771; Belgium-Luxembourg 56,646; Italy 1,889. |
| Manufactured: | | | | | |
| Ammonia | | 25,239 | 20,579 | 4,885 | Belgium-Luxembourg 11,242; West Germany 2,708. |
| Nitrogenous | | 480,947 | 470,283 | — | Belgium-Luxembourg 189,861; West Germany 90,212; Spain 44,759. |
| Phosphatic | | 122,379 | 182,429 | 5 | Israel 148,987; Belgium-Luxembourg 16,161; West Germany 8,715. |
| Potassic | | 648,712 | 612,734 | — | Israel 242,888; West Germany 143,172; U.S.S.R. 78,298. |
| Unspecified and mixed | | 259,958 | 291,860 | 536 | Belgium-Luxembourg 114,611; Israel 80,436; United Kingdom 21,764. |
| Graphite, natural | | 3,392 | 4,467 | 11 | China 3,418; West Germany 741; United Kingdom 27. |
| Gypsum and plaster | | 578,532 | 508,775 | 102 | West Germany 280,690; France 97,668; Belgium-Luxembourg 91,227. |
| Iodine | | 809 | 502 | — | Belgium-Luxembourg 11; West Germany 10; unspecified 481. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Kyanite and related materials: | | | | | |
| Mullite | | 965 | 655 | — | West Germany 540; United Kingdom 116. |
| Unspecified | | 7,520 | 5,623 | 512 | Republic of South Africa 2,611; France 1,550. |
| Lime | | 870,509 | 831,492 | 230 | Belgium-Luxembourg 515,487; West Germany 315,215. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 4,061 | 2,743 | — | Greece 946; Italy 589; Austria 489. |
| Oxides and hydroxides | | 89,672 | 107,093 | 617 | China 75,296; Greece 13,836; Belgium-Luxembourg 7,057. |
| Other | | 31,355 | 31,322 | — | West Germany 29,209; Belgium-Luxembourg 1,356. |
| Mica: | | | | | |
| Crude including splittings and waste | | 2,614 | 3,341 | 104 | India 1,384; Belgium-Luxembourg 741; West Germany 424. |
| Worked including agglomerated splittings | | 36 | 69 | (2) | Belgium-Luxembourg 39; West Germany 18; Switzerland 7. |
| Nitrates, crude | | 20,751 | 19,300 | — | Belgium-Luxembourg 15,726; Chile 3,574. |
| Phosphates, crude | thousand tons | 2,367 | 2,236 | 879 | Morocco 696; Israel 350. |
| Phosphorous, elemental | | 367 | 33 | — | Mainly from West Germany. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 730 | 623 | 160 | Austria 436; Cyprus 58. |
| Iron oxides and hydroxides, processed | | 13,230 | 12,267 | 160 | West Germany 9,991; United Kingdom 773; Belgium-Luxembourg 444. |
| Potassium salts, crude | | 768 | 682 | — | West Germany 649; Belgium-Luxembourg 33. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | kilograms | 35,229 | 68,876 | 140 | Brazil 25,000; West Germany 11,772; Hong Kong 605. |
| Synthetic | do. | 11,252 | 18,813 | 17,770 | Japan 441; Spain 326. |
| Pyrite, unroasted | | 491 | 1,203 | — | West Germany 894; Italy 159; Belgium-Luxembourg 149. |
| Salt and brine | | 220,405 | 264,166 | 18 | Belgium-Luxembourg 115,927; West Germany 54,309; East Germany 28,736. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 60,763 | 60,288 | 1 | West Germany 58,484; Poland 1,355. |
| Sulfate: | | | | | |
| Natural | | 38,366 | 42,133 | 2 | West Germany 15,014; Belgium-Luxembourg 13,521; Spain 8,499. |
| Manufactured | | 480 | 75 | — | West Germany 39; Spain 30. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | thousand tons | 886 | 956 | (2) | West Germany 607; Belgium-Luxembourg 279; Republic of South Africa 12. |
| Worked | do. | 91 | 107 | (2) | Italy 48; Belgium-Luxembourg 22; Germany 10. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | | |
| Stone, sand and gravel—Continued: | | | | | |
| Dolomite, chiefly refractory-grade | thousand tons | 727 | 845 | — | Belgium-Luxembourg 667; West Germany 82; United Kingdom 29. |
| Gravel and crushed rock | do. | 19,078 | 20,772 | (2) | West Germany 13,652; Belgium-Luxembourg 4,290; United Kingdom 1,485. |
| Limestone other than dimension | do. | 774 | 892 | — | Belgium-Luxembourg 850; West Germany 32; France 8. |
| Quartz and quartzite | do. | 44 | 56 | (2) | West Germany 35; Norway 12; Belgium-Luxembourg 4. |
| Sand other than metal-bearing | do. | 8,936 | 8,884 | 2 | West Germany 7,081; Belgium-Luxembourg 1,550; Norway 225. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 199,528 | 188,336 | — | West Germany 174,459; Poland 9,502; Belgium-Luxembourg 3,715. |
| Colloidal, precipitated, sublimed | | 377 | 278 | — | West Germany 145; United Kingdom 119. |
| Dioxide | | 2,570 | 3,538 | — | West Germany 3,300; Belgium-Luxembourg 238. |
| Sulfuric acid | | 777,062 | 644,390 | (2) | West Germany 296,873; Norway 100,596; Finland 82,701. |
| Talc, steatite, soapstone, pyrophyllite | | 81,808 | 73,985 | 653 | France 23,570; Finland 14,733; Sweden 8,125. |
| Vermiculite, perlite, chlorite | | 15,755 | 20,359 | 1 | Greece 15,311; Republic of South Africa 3,085. |
| Other: | | | | | |
| Crude | thousand tons | 949 | 665 | 8 | West Germany 364; Belgium-Luxembourg 220. |
| Slag and dross, not metal-bearing | do. | 2,117 | 2,176 | 141 | West Germany 1,327; Belgium-Luxembourg 755. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Asphalt and bitumen, natural | | 679 | 1,031 | 884 | Belgium-Luxembourg 53; West Germany 38; United Kingdom 32. |
| Carbon: Carbon black | | 20,934 | 21,937 | 3,233 | West Germany 13,722; France 1,934; Belgium-Luxembourg 1,493. |
| Coal: | | | | | |
| Anthracite | thousand tons | 346 | 308 | (2) | Republic of South Africa 226; West Germany 32; China 27. |
| Bituminous | do. | 13,549 | 17,196 | 6,201 | Australia 5,490; Columbia 1,640; Republic of South Africa 1,192. |
| Briquets of anthracite and bituminous coal | | 5,643 | 933 | — | West Germany 826. |
| Lignite including briquets | thousand tons | 69 | 77 | (2) | West Germany 74. |
| Coke and semicoke | do. | 355 | 350 | (2) | Poland 131; West Germany 91; Belgium-Luxembourg 47. |
| Gas, natural: Gaseous | million cubic meters | 2,599 | 2,694 | — | All from West Germany. |
| Peat including briquets and litter | thousand tons | 1,329 | 1,386 | — | West Germany 1,272; Finland 42; U.S.S.R. 29. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 379,831 | 366,636 | — | Saudi Arabia 57,198; Iran 53,705; Iraq 44,503. |

See footnotes at end of table.

TABLE 3—Continued

## NETHERLANDS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Source, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products: | | | | | |
| Liquefied petroleum gas | thousands 42-gallon barrels | 14,556 | 22,966 | 42 | Algeria 7,935; Saudi Arabia 5,195; Norway 2,968. |
| Gasoline: | | | | | |
| Aviation | do. | 5,959 | 5,457 | 593 | Belgium-Luxembourg 2,845; Kuwait 738; Spain 624. |
| Motor | do. | 25,496 | 27,120 | 736 | Belgium-Luxembourg 5,365; Kuwait 4,398; United Kingdom 5,029. |
| Mineral jelly and wax | do. | 382 | 320 | 7 | France 122; West Germany 119; Hungary 22. |
| Kerosene and jet fuel | do. | 2,292 | 2,263 | 59 | Belgium-Luxembourg 844; Spain 363; United Kingdom 306. |
| Distillate fuel oil | do. | 39,401 | 33,274 | 474 | U.S.S.R. 17,260; Kuwait 9,799; Belgium-Luxembourg 839. |
| Lubricants | do. | 2,024 | 2,351 | 118 | France 527; Belgium-Luxembourg 518; Italy 442. |
| Residual fuel oil | do. | 32,321 | 24,871 | 231 | U.S.S.R. 13,781; Belgium-Luxembourg 4,245; West Germany 925. |
| Bitumen and other residues | do. | 789 | 818 | 594 | Belgium-Luxembourg 423; West Germany 363; United Kingdom 361. |
| Bituminous mixtures | do. | 157 | 123 | (2) | Belgium-Luxembourg 80; West Germany 36; United Kingdom 3. |
| Petroleum coke | do. | 2,777 | 2,313 | 731 | West Germany 664; Norway 431; United Kingdom 192. |

NA Not available.
[1]Table prepared by B.S. Colquitt.
[2]Less than 1/2 unit.
[3]Total incomplete owing to unreported quantities.
[4]May include other precious metals.

TABLE 4

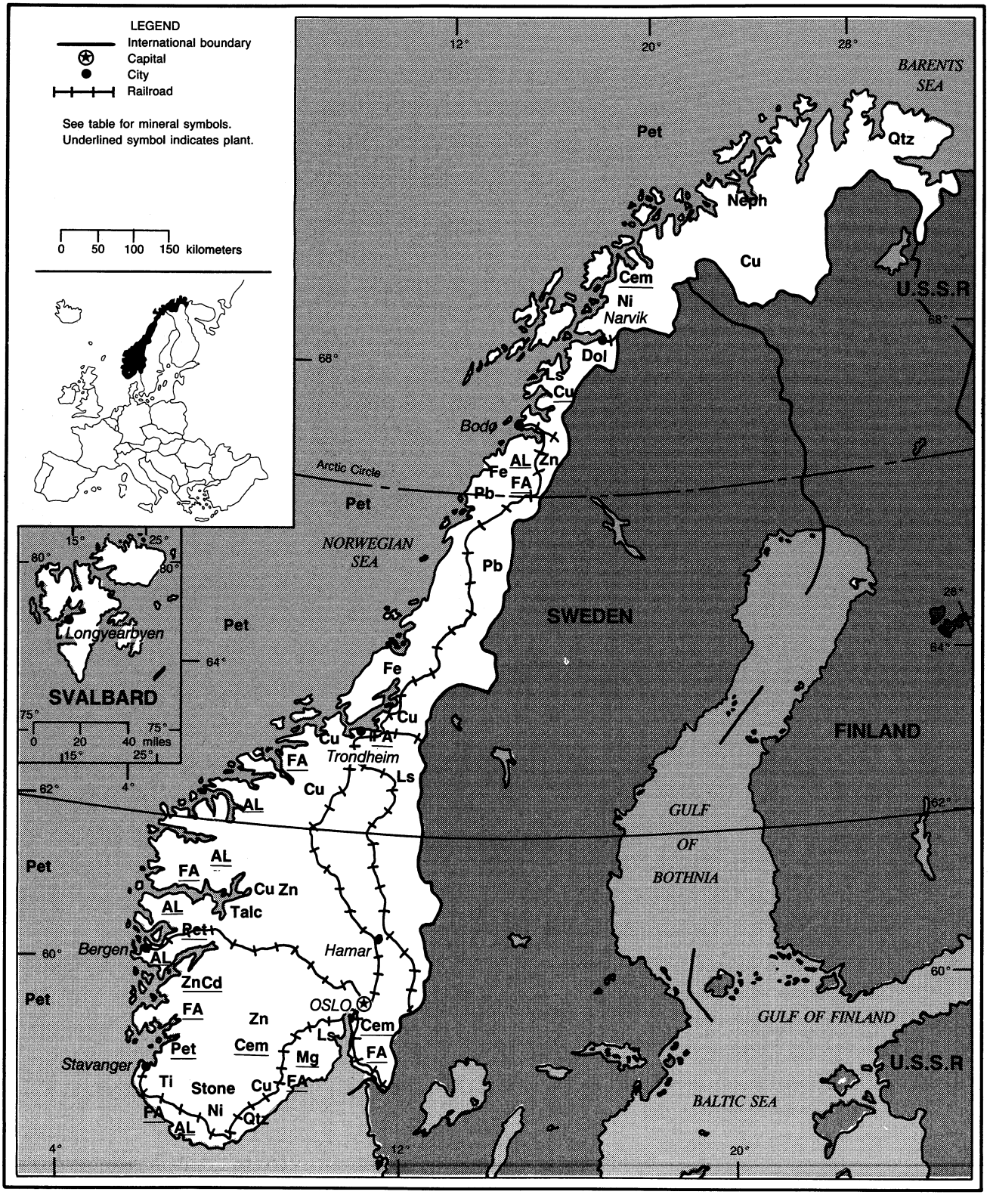
## NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies | Location of main facility | Annual capacity |
|---|---|---|---|---|
| Aluminum | | Aluminium Delfzijl BV | Smelter at Delfzijl | 105 |
| Do. | | Pechiney-Nederland NV | Smelter at Vlissingen | 185 |
| Cadmium | | Kempensche Zink Maatschappij NV | Plant at Budel-Dorplein | 650 |
| Cement | | Eerste Nederlandse Cement Industrie NV | 10 plants | 2,700 |
| Do. | | Cement Fabriek-IJmuiden BV | 3 plants at IJmuiden | 1,400 |
| Do. | | Cement Fabriek-Rozenburg BV | 2 plants at Rozenburg | 920 |
| Lead | | Hollandsee Metallurgische Industrie Billiton BV | Electrolytic plant at Arhem | 37 |
| Do. | | Billiton Witmetaal BV | Electrolytic plant | 6 |
| Magnesia | | Noordelijke Zoutwinning BV, and Magnesia International BV | Plants at Veendam | 91 |
| Natural gas | billion cubic meters | Nederlandse Aardolie Maatschappij BV | Groningen, Leeuwarden, Assen, and other onshore gasfields, and several offshore wells in the North Sea | 75 |
| Petroleum: | | | | |
| Crude | barrels per day | Various operating companies | About 50 oil-producing wells, including | 64,000 |
| Do. | do. | do. | North Sea Fields: Helm, Helder, Hoorn, Kotter, Logger, Rijn, and others | (60,000) |
| Do. | do. | do. | Onshore Fields: Berkel, Ijsselmonde, Rotterdam, Schoonebeek, Wassenaar, Ysselm, and others | (20,000) |
| Refineries | do. | 7 companies, of which the major ones are | | 1,231,000 |
| Do. | do. | Netherlands Refining Co. Total Raffinaderij NV | Refinery at Europoort and Pernis | (446,000) |
| Do. | do. | Shell Nederland Raffinaderij BV | Refinery at Pernis | (374,000) |
| Do. | do. | Chevron Petroleum Maatschappij (Nederland) BV | Refinery at Vissingen | (150,000) |
| Do. | do. | Esso Nederland BV | Refinery at Rotterdam | (175,000) |
| Salt | | Akzo Zout Chemie BV | 4 plants, including— | 4,850 |
| Do. | | do. | Hengelo | (2,000) |
| Do. | | do. | Delfzijl | (2,000) |
| Do. | | do. | Mariager | (500) |
| Do. | | do. | Stadte (Germany) | (350) |
| Sodium: carbonate | | do. | Plant at Delfzijl | 450 |
| Sulfate, natural | | do. | Plant at Delfzijl; salt brines at Arnhem | 25 |
| Steel | | Hoogovens IJmuiden BV | Plant at IJmuiden | 6,000 |
| Tin | | Budelco BV | Smelter and refinery at Arnhem | 7 |
| Zinc | | do. | Electrolytic plant at Budel-Dorplein | 220 |

# NORWAY

**AREA 324,000 km²** **POPULATION 4.2 million**



THE MINERAL INDUSTRY OF

# NORWAY

By Jozef Plachy

The Norwegian resource base is dominated by energy and energy-based production, namely crude oil, natural gas, and hydropower. In 1991, petroleum production accounted for 14.4% of the GDP and 44% of Norway's exports (88% of oil and gas is exported). In the past decade, manufacturing was dominated by the large-scale, export-oriented production of energy intensive metals, mainly ferroalloys and aluminum, which make use of the country's abundant sources of hydroelectric energy. Metallurgy's share of GDP in 1991 was 14%.

## GOVERNMENT POLICIES AND PROGRAMS

Norway is a member of the European Free Trade Association.

The country says it welcomes foreign investment as a matter of policy, but foreign ownership continues to be restricted in areas of mining and hydropower.

## PRODUCTION

Production of metals in Norway was negatively affected by slow economic growth in the Western markets and large increases in the supply of metals from former CMEA countries, mainly the former U.S.S.R. The production cutbacks forced the major metal producers to reduce cost, utilize economies of scale, and secure the greatest possible capacity utilization. *(See table 1.)*

## TRADE

Apart from energy, Norway is a relatively small economy highly reliant on foreign trade. The 1991 trade accounted for 57% of GDP. Taken as a group, the EC remained the principal trading partner, accounting for 66% of Norway's exports and 49% of its imports. With 44% of the total, petroleum continued to dominate Norwegian exports, followed by chemicals and various raw materials (25%), and metals and metal products (11%). The bulk (55%) of Norwegian imports consisted of machinery and equipment, followed by industrial raw materials (39%).

In spite of its declining position, from fourth in 1990 to sixth in 1991, the United States remains one of Norway's principal trading partners. Total exports to the United States in 1991 amounted to $1,626 million, $204 million lower than in 1990. It consisted mainly of crude oil, refinery products, metals, and chemicals. Imports from the United States consisted mainly of machinery, data processing, and equipment for petroleum production and refining, totaling $1,489 million in 1991.

At the end of 1991, the value of total foreign investment in Norway stood at $11 billion, of which 46% was by the United States, 15% by Sweden, and 8% by France. Most of the U.S. investment was concentrated in the petroleum and mining sector (64%), followed by financial and business services (14%).

## STRUCTURE OF THE MINERAL INDUSTRY

Until recently, the Norwegian Government has historically exerted significant control on major industries. Due to the stagnation of the domestic economy and anticipated membership in the European Community (EC), the Government has embarked on a course of privatization. One notable exemption is in the field of mineral fuels, where the Government, through the wholly state-owned company Den norske stats oljeselskap A/S (Statoil), has at least a 50% interest in every production enterprise. *(See table 2.)*

## COMMODITY REVIEW

### Metals

*Aluminum.*—Hydro Aluminum A/S, part of the Light Metals Division of Norsk Hydro A/S, increased aluminum production in 1991 to 646,000 tons, some 8,000 tons more than in 1990. During the past few years Hydro Aluminum has focused on expanding and developing its extrusion activities through increased downstream integration. For the future, Hydro Aluminium is reportedly continuing with plans for a gas-fired power station to supply power for a planned 44% to 50% capacity expansion of the Ardal and Sunndalsora smelters.

With a total annual production of about 200,000 tons, Elkem Aluminum ANS is the second largest aluminum producer in Norway. The subsidiary of Elkem A/S operates the Lista smelter (90,000 mt/a) in Farsund and a 115,000-mt/a-capacity aluminum smelter in Mosjoen. Both smelters, jointly owned by Alcoa and Elkem A/S, are reportedly to be modernized at a cost of $400 million. This will increase the combined capacity by 165,000 tons to a total of 370,000 mt/a. An integral part of the expansion would be a powerplant at the landing site of a new pipeline from the future Haltenbank oilfield and gasfield.

*Ferroalloys.*—Norwegian ferroalloy plants are on navigable fjords allowing easy access by oceangoing vessels. Also, inexpensive electric power is abundantly available.

Elkem A/S, Norway's major ferroalloy producer, saw a decrease in its 1991 ferrosilicon production from 350,000 tons in 1990 to 310,000 tons and the production of manganese alloys dropped from 450,000 tons in 1990 to 380,000 tons in 1991. The production cutback, which was in response to world market conditions, was achieved by temporarily closing one furnace at Salten, and one at Thamshavn, coupled with a significant reduction of output at Bjolvefossen. The combined result was an idle capacity of 125,000 tons and a loss of $32 million. In Norway, Elkem A/S owns three ferrosilicon plants (60,000 mt/a, Bjolvefossen at Alvik; 85,000 mt/a, Salten at Straumen; and 45,000 mt/a, Thamshavn at Orkanger) and two ferromanganese plants (200,000 mt/a, PEA in Porsgrunn and a plant in Sauda). The latest ferroalloy addition, the Elkem Rana A/S ferrochromium plant acquired in 1990, is in Mo i Rana, on the site of Norsk Ferrokrom's former steel plant. The second of two electric furnaces was inaugurated in August 1991, bringing the capacity of Elkem Rana to 140,000 mt/a. The production in 1991 was 90,000 tons of high-carbon ferrochromium. These three ferroalloys (ferromanganese, ferrosilicon, and ferrochromium) account for 90% of Elkem A/S's ferroalloy production.

Fesil is the sales subsidiary belonging to four ferrosilicon producers: Ila og Lilleby Smelterverk in Finnsnes, A/S Hafslung Metal in Sarpsborg, Finnfjord Smelterverk, and the newest addition, Rana Metall in Mo i Rana. Total capacity for the group is 275,000 mt/a, but production in 1991, due to a 20% reduction in the closing months of the year, was only about 200,000 tons. Up to 80% of the group's output is sold directly to end users, mainly in Europe. Ila og Lilleby produces about 25,000 mt/a of high-purity ferrosilicon, supplying about 40% of the world market for this grade. The production capacity of A/S Hafslung Metal's two furnaces (42 MV.A and 60 MV.A) is 65,000 mt/a, though output in 1991 was only about 42,000 tons of ferrosilicon. Most raw materials such as quartz, iron ore pellets, and coal are from Norway, while coke is imported. During 1991, the two furnaces at Rana Metall were running at about 85% of capacity, which is 75,000 mt/a.

Tinfos Jernverk A/S is the smallest ferroalloy producer of the three. The Oye Smelterverk near Kvinesdal buys manganese on the open market, usually from Brazil. The 1991 output was about 100,000 tons of silicomanganese, 20,000 tons of high-carbon ferromanganese, and 13,000 tons of low-carbon silicomanganese. Tinfos has two 30-MW submerged arc furnaces, one of which was closed for 2 months for relining. Tinfos has plans to install a third furnace, but no final decision on the starting date has been made.

*Iron Ore.*—After 4 years of decline in iron ore production in Norway, the 1991 output of 2.2 Mmt of ore was slightly higher than that in 1990.

Rana Gruber A/S, the largest iron ore producer, is owned by Norsk Jernverk Holding A/S. The mine, in the Dunderland Valley, about 30 km north of the port city Mo i Rana, yields about 5 Mmt of ore and waste, from which 1.9 to 2 Mmt/a of iron ore of 33% to 34% Fe and 800,000 mt/a of concentrate are produced. Most of the concentrate was sold to German and French steelworks.

Norway's other iron ore producer, A/S Sydvaranger, operates the Bjornevatn Mine in Kirkens. All 1991 production of 1.4 Mmt was exported to Germany and the United Kingdom. The upgraded beneficiation plant in Kirkens is now also able to produce about 100,000 mt/a of high quality concentrate.

*Magnesium.*—The combined capacity of two production plants for primary magnesium, at Porsgrunn in Norway and Becancour in Canada, makes Norsk Hydro A/S one of the world's leading producers of this metal. The 1991 production of 44,322 tons was 8% lower than that in 1990, forcing temporary closure of one production line at the Porsgrunn plant at the end of 1991. Coupled with modernization costs, the Magnesium Div. exhibited a substantial operating loss in 1991.

*Nickel.*—Although only about 10% of feed comes from the former U.S.S.R., irregular shipments reportedly forced a production cutback in September 1991. As a result, Falconbridge Nickel Mines Ltd. of Canada was forced to reduce nickel production by 10% to 15% at its 58,000-mt/a Norwegian nickel refinery, the Nikkelverk A/S at Kristiansand.

*Silicon.*—In 1991, Elkem has decided to undergo major restructuring, including a $3 million investment in the Elkem Fiskaa silicon plant in Kristiansand to upgrade quality and production. It will take over all the production from the 30,000-mt/a Meraker plant in Koppera which, after completion of work at Fiskaa, will be closed permanently.

*Steel.*—The major producer of crude steel in Norway, the Norsk Jernverk A/S, a subsidiary of the Norsk Jern Holding Group (NHJ), underwent major corporate changes in 1991. A Nordic steel group, Fundiainteressenter AB (FIAB), was established with participation of Norsk Jernverk A/S and its subsidiaries from Norway, Fundia AB from Sweden, and Dalsbruk Oy AB from Finland.

In 1991, Norsk Jernverk A/S produced 449,000 tons of steel, compared with 383,000 tons in 1990.

*Zinc.*—The 1991 production of primary zinc metal at Norway's only smelter was slightly lower than that in 1990, in spite of plans to increase it to 130,000 mt/a through better capacity utilization. The capacity of the Eitrheim smelter in Odda, western Norway, owned by Norzik A/S, is 137,000 mt/a. Norzik A/S is jointly owned by Boliden Mineral AB, a subsidiary of Trelleborg AB, and Rio Minerals Development Ltd. of the United Kingdom. At Norzik's Larvik Pigmentfabrikk a total of 14,367 tons of secondary zinc was processed, resulting in a total 1991 production of 12,003 tons of zinc pigment.

## Industrial Minerals

*Cement.*—Cement production continued to decline to 1.1 Mmt in 1991. Norway's only producer, Norcem A/S, operates two plants: Dalen Cement Works, in Brevik (1,345,000 mt/a capacity) and one in Kjopsvik (210,000 mt/a capacity). During 1991, Norcem added a new cement grinding facility at its Dalen plant and is converting its Kjopsvik plant from wet- to dry-process technology. Both cement works are close to the port city of Brevik, allowing continuous loading and unloading of bulk or bagged material.

*Graphite.*—In 1991, the Norwegian natural graphite producer Skaland Grafitverk was purchased by Elkem A/S from German Grafitverk Kropfmuhl. The underground mine near Tromso and the processing plant at Skaland were closed in December for renovation at the cost of $1.5 million. When fully operational, in the second half of 1992, production should reach 6,000 mt/a of both flake and powder graphite.

*Talc.*—Norwegian Talc, owned by Ernstrom Mineral AB since 1990, has two operations in Norway. The largest, Altermark in northern Norway, supplies raw materials to an 80,000-mt/a plant at Knarrevik, near Bergen. Talc at this plant is processed mainly for paints and plastics. The other operation is at Framfjord, where about 10,000 mt/a of coarse grate talc is produced. About 70% of Norwegian Talc's products are exported to the European markets.

## Mineral Fuels

Anticipated recoverable reserves of hydrocarbons at the Norwegian Continental Shelf are estimated at about 8.8 billion tons of oil equivalent (t.o.e.) of which 5.4 billion t.o.e. has been proven. About 64% of this is gas, while petroleum, natural gas liquids, and condensate account for the remaining 36%. Exploration of hydrocarbons is regulated by the Norwegian Petroleum Directorate, under the direction of the Ministry of Petroleum and Energy. Exploration and production is carried out under direct control of Government-owned Statoil, which takes at least a 50% interest in any license it grants.

During 1991, a total of 47 exploration wells were spudded, of which 34 were wildcat and 13 were delineation (appraisal) wells, mostly in the North Sea. Norwegian oil companies operated 29 wells, distributed between Statoil with 8 wells, Norsk Hydro with 14, and Saga Petroleum with 7 wells. Four new fields, Heidrun, Loke (formerly Sleipner Theta), Tordis, and Lille-Frigg, were reportedly approved for development. By the end of 1991, a total of 24 fields were on-stream at the Norwegian Continental Shelf.

*Natural Gas.*—According to Thorleif Enger, senior vice president of Norsk Hydro A/S, the production of natural gas should double between the years 2000 and 2005, and Norway's market share in Europe should climb from 10% to 19% in 1992. The added production will come in large part from two worldscale offshore gas developments--Troll (80 km northeast of Bergen) and Sleipner. The export contract, signed in 1986 between Norway and a consortium of European buyers, stipulates delivery of 30.51 billion $m^3$ of natural gas starting by 1996. At first, the gas will be delivered through the existing Statpipe/Norpipe to Emden in Germany and later through Zeepipe, linking the Sleiper (1993) and Troll (1996) fields to the European distribution system at Zeebrugge in Belgium. A further increase of natural gas delivery to Europe will require the construction of a third pipeline, already approved by the Norwegian Government in 1991.

*Petroleum.*—Norwegian oil production passed 2 Mbbl/d for the first time at the beginning of September 1991. Production is due to peak at about 2.3 to 2.4 Mbbl/d in the mid-1990's. By the end of 1991, Norway became the largest oil producer in Europe and the world's largest oil exporter outside OPEC.

The 1991 production was boosted by the addition of two satellite fields to the Oseberg Field, elevating its output to 450,000 bbl/d. Increasing production at the Gullfaks Field, which should stabilize at about 400,000 bbl/d in 1992, and higher production than expected from Hod Field has also contributed to the rise in Norway's crude oil production in 1991.

In August 1991, two of the four largest crude oil production complexes in the North Sea (24 platforms in the Ekofisk area and Statfjord B and C platforms) were shut down for maintenance, temporally reducing Norwegian production to only 1.43 Mbbl/d.

## Reserves

Estimated resources for the entire Norwegian continental shelf for 1992 remained essentially the same as those in 1991. Only the proven reserves increased by 0.1 billion t.o.e. About 60% of oil reserves were in the Statfjord, Gullfaks, Oseberg, Snorre, and Ekofisk Fields.

Reserves for other minerals, after years of mining, have been considerably depleted. One notable exception are the reserves of olivine, which are substantial. *(See table 3.)*

# INFRASTRUCTURE

Norway's land transportation system is better developed in the southern part of the country than in the less populated north. More than one-half of 79,540-km total length of highway is gravel, crushed stone, or earth. The railroad system, with 4,223 km of standard-gauge track operated by the Norwegian State Railways, is almost completely electrified. Major ports for the 867 ships of Norway's merchant marine are Bergen, Fredrikstad, Kristiansand, Oslo, Stavanger, and Trondheim in the southern portion of the country and Narvik in the northern part of the country.

The transportation system for gas and oil consists of a system of pipelines connecting Norway, England, and Germany with different gasfields and

oilfields in the North Sea. The Norpipe system connects the Ekofisk Field with the continental gas market at Emden in Germany and oil market in the United Kingdom at Teesside. The Statpipe system connects Statfjord, Gullfaks, and Veslefrikk with Karsto on Norway's western shore where the gas is fractioned. The resulting dry gas is transported by Statpipe to Norpipe and ultimately to Emden. The Frigg Transport system is made up of two gas pipelines from the Frigg and Odin Fields to St. Ferguson in Scotland. The future Zeepipe gas pipeline will connect the Troll and Sleipner East Fields with Zeebrugge in Belgium.

## OUTLOOK

Norway's mainstay offshore energy sector will probably continue to expand in the near future because of the recent successful exploration and development of new fields.

Norsk Hydro A/S is reportedly planning to expand production at its Ardal and Sunndalsora smelters. Because the aluminum industry is the largest user of pure magnesium, the magnesium consumption is expected to increase. Already in 1991, foundation has been laid for improved productivity and reduced cost at the Porsgrunn magnesium plant by a long-term cost-efficiency program that will continue in 1992.

In hydrocarbon production, the Norwegian Government has come under pressure from offshore operators to change its licensing procedure and reduce corporate tax from 50.8% to 28%. In Norway, companies are required to bid individually, but the production group is made up of different companies, with one designated as the operator. Because the grouping is done by the authorities, it often brings together companies with different tax positions and outlook, often making the co-operation difficult. The 10% $CO_2$ tax, imposed in 1991, is to rise to 30% in 1992. This reduction in profitability could slow foreign investment in offshore production. In spite of uncertainties, apart from opportunities in trade, Norwegian offshore petroleum and gas development will continue to provide most of the opportunities to foreign investors.

## OTHER SOURCES OF INFORMATION

**Agencies**

Norges geologiske undersokelse
P.O. Box 3006 Lade 7002
Trondheim, Norway

The Royal Ministry of Petroleum and Energy Norway
P.O. Box 8148 Dep. 0033
Oslo 1, Norway

**Publications**

Economic Bulletin.
Statistisk Arbok 1991
Norsk Hydro, Annual Report 1991.
Elkem A/S, Annual Report 1991.
Annual Report and Accounts for the Norsk Jern Holding Group 1991.
Norzik Annual Report, 1991.

TABLE 1

## NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum: | | | | | | |
| Primary | | 853,213 | 864,190 | 863,354 | 845,068 | 832,558 |
| Secondary | | e7,200 | e7,200 | 67,305 | 49,036 | 63,066 |
| Cadmium, smelter | | 147 | 169 | 207 | 286 | 227 |
| Cobalt | | 1,576 | 1,951 | 1,946 | 1,830 | 1,983 |
| Copper: | | | | | | |
| Mine output, Cu content | | 21,984 | 15,877 | 16,497 | 19,745 | 17,393 |
| Metal, primary and secondary: | | | | | | |
| Smelter | | 29,701 | 31,729 | 34,980 | 36,458 | 38,445 |
| Refined | | 29,386 | 31,729 | 34,980 | 36,458 | 38,445 |
| Gallium[e] | kilograms | r5,000 | r5,000 | r5,000 | r4,000 | — |
| Gold | do. | 937 | 677 | 703 | 802 | e800 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate: | | | | | | |
| Gross weight | thousand tons | 3,140 | 2,644 | 2,358 | 2,081 | 2,209 |
| Fe content | do. | 2,040 | 1,718 | 1,532 | 1,352 | 1,435 |
| Metal: | | | | | | |
| Pig iron | do. | 365 | 367 | 240 | — | — |
| Ferroalloys: | | | | | | |
| Ferrochromium | | — | — | — | 30,000 | 90,000 |
| Ferromanganese | | 191,992 | 361,345 | 220,591 | 213,266 | 173,212 |
| Ferrosilicomanganese | | 237,277 | 232,501 | 270,305 | 223,310 | 226,737 |
| Ferrosilicon (75% basis) | | 336,168 | 380,976 | 398,744 | 397,520 | 377,455 |
| Silicon metal | | r81,460 | r88,854 | r100,194 | r76,601 | e65,000 |
| Other[e] | | 2r21,540 | 14,000 | 14,000 | 14,000 | 14,000 |
| Total | | r868,437 | r1,077,676 | r1,003,834 | r954,697 | 946,404 |
| Steel, crude | thousand tons | 837 | 869 | 678 | 376 | 438 |
| Semimanufactures, rolled[e] | do. | 700 | 700 | 2556 | 350 | 300 |
| Lead, mine output, Pb content | | 3,100 | 2,801 | 3,188 | 3,017 | 3,517 |
| Magnesium, primary | | 56,907 | 50,317 | 49,827 | 48,222 | 44,322 |
| Nickel: | | | | | | |
| Mine output, Ni content | | 496 | e500 | 780 | 3,100 | 2,200 |
| Metal, primary | | 44,565 | 52,547 | 54,886 | 57,812 | 58,730 |
| Platinum-group metals[e 3] | kilograms | 1,555 | 1,555 | 1,555 | 1,500 | 1,500 |
| Titanium: | | | | | | |
| Ilmenite concentrate | thousand tons | 852 | 898 | 930 | 814 | e800 |
| $TiO_2$ content | do. | 378 | 398 | 412 | 361 | e350 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 22,164 | 17,783 | 15,023 | 17,546 | 18,886 |
| Metal, primary | | 116,468 | 121,156 | 120,404 | 125,052 | 124,916 |
| **INDUSTRIAL MINERALS** | | | | | | |
| Cement, hydraulic | thousand tons | 1,639 | 1,428 | 1,375 | 1,261 | 1,147 |
| Feldspar[e] | | 90,000 | 90,000 | 90,000 | 90,000 | 90,000 |
| Graphite | | — | — | 1,800 | e5,000 | 6,930 |
| Lime, hydrated, and quicklime[e] | thousand tons | 100 | 100 | 100 | 100 | 100 |
| Mica, flake[e] | | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |

See footnotes at end of table.

TABLE 1—Continued

## NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[p] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Nepheline syenite | thousand tons | 242 | 262 | 262 | e250 | e250 |
| Nitrogen: N content of ammonia | do. | 347 | 424 | 467 | 431 | 384 |
| Olivine sand[e] | do. | [2]1,912 | 2,000 | 2,000 | 2,000 | 2,000 |
| Pyrite | do. | 358 | 304 | 244 | r303 | 306 |
| Stone, crushed:[e] | | | | | | |
| Dolomite | do. | 550 | 550 | 550 | 525 | 500 |
| Limestone | do. | 4,000 | 4,000 | 4,200 | 4,000 | 4,000 |
| Quartz and quartzite | do. | 800 | 800 | 800 | 800 | 800 |
| Sulfur: | | | | | | |
| Pyrite, S content | do. | 179 | 152 | 122 | e125 | e125 |
| Byproduct of:[e] | | | | | | |
| Metallurgy | do. | 85 | 80 | 75 | 75 | 75 |
| Petroleum | do. | 10 | 10 | 13 | 15 | 15 |
| Total | do. | 274 | 242 | 210 | 215 | 215 |
| Talc, soapstone, steatite[e] | do. | 100 | 100 | 100 | 100 | 80 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, all grades | thousand tons | 448 | 275 | 413 | 358 | 389 |
| Coke, all grades | do. | 284 | 161 | e50 | — | — |
| Gas, natural: | | | | | | |
| Gross | million cubic meters | 34,437 | 31,520 | 31,964 | 27,817 | 28,315 |
| Marketed[4] | do. | 28,800 | 28,400 | 28,700 | 25,400 | e25,000 |
| Peat:[e] | | | | | | |
| For agricultural use | thousand tons | 30 | 30 | 30 | 30 | 30 |
| For fuel use | do. | 1 | 1 | 1 | 1 | 1 |
| Petroleum: | | | | | | |
| Crude[5] | thousand 42-gallon barrels | 344,000 | 397,947 | 560,252 | 609,381 | 679,184 |
| Natural gas liquids | do. | 22,470 | 27,230 | 22,707 | 33,060 | 17,204 |
| Refinery products: | | | | | | |
| Naphtha | do. | 4,419 | 3,363 | 4,504 | e4,200 | e4,200 |
| Gasoline | do. | 12,248 | 11,968 | 14,917 | 27,134 | e27,000 |
| Kerosene | do. | 6,402 | 5,786 | 6,682 | 8,327 | e8,300 |
| Distillate fuel oil | do. | 33,756 | 32,764 | 34,072 | 44,502 | e45,000 |
| Residual fuel oil | do. | 6,973 | 8,032 | 11,102 | 9,444 | e9,500 |
| Other | do. | 4,050 | e4,200 | e4,300 | 4,093 | e4,000 |
| Refinery fuel and losses[e] | do. | [2]3,795 | 4,000 | 4,000 | 4,000 | 4,000 |
| Total[e] | do. | [2]71,643 | 70,113 | 79,577 | 101,700 | e102,000 |

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

[1]Table includes data available through Oct. 1992.

[2]Reported figure.

[3]Data represent exports.

[4]Reported as total methane sales.

[5]Excluding natural gas liquids.

TABLE 2

## NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Aluminum | Hydro Aluminum A/S (Norsk Hydro A/S, 70%) | Smelters at Ardal, Hoyanger, Karmoy, and Sunndalsora | 640 |
| Do. | Elkem Aluminium Mosjoen (Elkem A/S, 55%) | Smelter at Mosjoen | 115 |
| Do. | Elkem Aluminium Lista (Elkem A/S, 55%) | Smelter at Farsund | 90 |
| Do. | Sor-Norge Aluminium A/S (Alusuisse, 67%) | Smelter at Husnes | 72 |
| Cadmium | Det Norske Zinkkompani A/S (Boliden, AB) | Smelter at Odda | 150 |
| Cement | Norcem A/S | Plants at Brevik and Kjopsvik | 1,555 |
| Coal | Store Norske Spitsbergen Kulkompani A/S | Mines at Longyearbyen and Svea | 500 |
| Cobalt | Nikkelverk A/S (Falconbridge Nickel Mines Ltd.) | Smelter at Kirstiansand | 2 |
| Copper: | | | |
| Ore, Cu content | Grong Gruber A/S (Nursulfid A/S) | Mine at Royrvik | 7 |
| Do. | Folldal Verk A/S (Nursulfid A/S) | Mine at Hjerkinn | 6 |
| Do. | Skorovas Gruber | Mine at Namsskogan | 3 |
| Do. | A/S Bidjovagge Gruber (Outokumpu Oy) | Mine at Bidjovage | 3 |
| Metal | Nikkelverk A/S (Falconbridge Nickel Mines Ltd.) | Smelter at Kristiansand | 30 |
| Do. | Sulitjelma Gruber A/S (Elkem A/S, 96%) | Smelter at Sulitjelma | 9 |
| Ferroalloys | Elkem Rana A/S (Elkem A/S) | Ferrochromium plant at Mo i Rana | 140 |
| Do. | Elkem Sauda (Elkem A/S) | Ferromanganese plant at Sauda | 250 |
| Do. | Elkem PEA (Elkem A/S) | Ferromanganese plant at Porsgrunn | 200 |
| Do. | Elkem Salten (Elkem A/S) | Ferrosilicon plant at Straumen | 85 |
| Do. | Elkem Bjolvefossen (Elkem A/S) | Ferrosilicon plant at Alvik | 60 |
| Do. | Elkem Thamshavn (Elkem A/S) | Ferrosilicon plant at Orkanger | 45 |
| Do. | Finnfjord Smelterverk, Rana Metal (Fesil) | Ferrosilicon plant at Mo i Rana | 75 |
| Do. | A/S Hafslung Metal (Fesil) | Ferrosilicon plant at Sarpsborg | 65 |
| Do. | Ila og Lilleby Smelterverk (Fesil) | Ferrosilicon plant at Finnsnes | 60 |
| Do. | Oye Smelterverk (Tinfos Jernverk A/S) | Silico-manganese plant at Kvinesdal | 135 |
| Graphite | A/S Skaland Grafitverk | Mine on Senja Island | 40 |
| Iron ore | Rana Gruber A/S (Norsk Jernverk Holding A/S) | Mine at Mo i Rana | 2,000 |
| Do. | A/S Sydvaranger (Government, 87.45%) | Bjornevatn mine at Kirkens | 1,500 |
| Lead ore, Pb content | A/S Bleikvassli Gruber (A/S Sydvaranger) | Mine at Bleikvassli | 4 |
| Do. | Bergverkselskapet Nord-Norge A/S (A/S Sydvaranger) | Mine at Mo i Rana | 1 |
| Lime | Hylla Kalkverk (Nikolai Bruch A/S) | Verdal/Trondheim | 100 |
| Do. | A/S Norsk Jernverk | Plant at Mo i Rana | 48 |
| Do. | Ardal og Sunndal Verk A/S | More og Romsdal mine at Surnadal | 20 |
| Do. | Breivik Kalkverk A/S | Alesund Mine at Larsnes | 20 |
| Do. | Mjoendalen Kalkfabrik | Plant at Asen/Drammen | 7 |
| Magnesium | Norsk Hydro A/S | Plant at Porsgrunn | 50 |
| Natural gas billion cubic feet per year | Phillips Petroleum C. Norway | Ekofisk area (Albukjell, Edda, Ekofisk, Eldfisk, Hod, Valhall, and Tor Fields) | 350 |
| Do. | Amoco Norway Oil Company | Valhall and Hod Fields | 100 |
| Do. | Den norske stats oljeselskap A/S | Gullfaks, Statfjord, Tommeliten, and Veslefrikk Fields | 250 |
| Do. | Elf Aquitaine Norge A/S | Frigg and Heimdal Fields | 300 |
| Do. | Esso Norge A/S | Odin Field | 100 |
| Do. | Norsk Hydro A/S | Oseberg and Troll Fields | 100 |
| Nickel: | | | |
| Ore, Ni content | Titanco A/S | Titania Mine at Hauge i Dalane | 1 |
| Metal | Nikkelverk A/S (Falconbridge Nickel Mines) | Smelter at Kristiansand | 50 |

TABLE 2—Continued

## NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Olivine | A/S Olivin | Mine at Aaheim | 750 |
| Do. | Nor-Mineral A/S | Bryggja Mine and plants at Moere and Romsdal | 300 |
| Do. | K/S Norddal Olivin A/S & Co. | Norddal Mine at Tafjord and Lefdal Mine at Aaheim | 150 |
| Petroleum barrels per day | Phillips Petroleum C. Norway | Ekofisk area (Albukjell, Edda, Ekofisk, Eldfisk, Hod, Valhall, and Tor Fields | 208,000 |
| Do. | Den norske stats oljeselskap A/S | Gullfaks, Statfjord, Tommeliten, Veslefrikk Fields | 430,000 |
| Do. | BP Petroleum Development of Norway A/S | Gyda nad Ula Fields | 165,000 |
| Do. | Conoco Ltd. of United Kingdom | Murchinson Field | 9,000 |
| Do. | Norsk Hydro A/S | Oseberg and Troll Fields | 320,000 |
| Pyrite | Folldal Verk A/S (Nursulfid A/S) | Mine at Hjerkinn | 350 |
| Steel | Norsk Jernverk A/S | Plant in Mo i Rana | 500 |
| Talc | A/S Norwegian Talc (Ernstrom Mineral AB) | Mine/plant at Altermark/Knarrevik and mine/plant at Framfjord | 90 |
| Do. | Kvam Talc A/S | Mine/plant at Kvam | 6 |
| Titanium | Titania A/S | Mine at Tellnes | 850 |
| Do. | K/S Ilmenittsmelverk A/S | Titanium dioxide plant at Tyssedal | 200 |
| Zinc: | | | |
| Ore, Zn content | Folldal Verk A/S (Nursulfid A/S) | Mine at Hjerkinn | 6 |
| Do. | Skorovas Gruber | Mine at Namsskogan | 6 |
| Do. | Grong Gruber A/S (Nursulfid A/S) | Mine at Royrvik | 6 |
| Do. | A/S Bleikvassli Gruber (A/S Sydvaranger) | Mine at Bleikvassli | 5 |
| Do. | Orkla Industrier A/S | Mine at Meldal | 5 |
| Do. | Bergverkselskapet Nord-Norge A/S (Sydvaranger A/S) | Mine at Fauske | 5 |
| Metal | Norzik A/S (Boliden Mineral AB, 50%) | Eitrheim smelter at Odda | 137 |

TABLE 3

## NORWAY: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

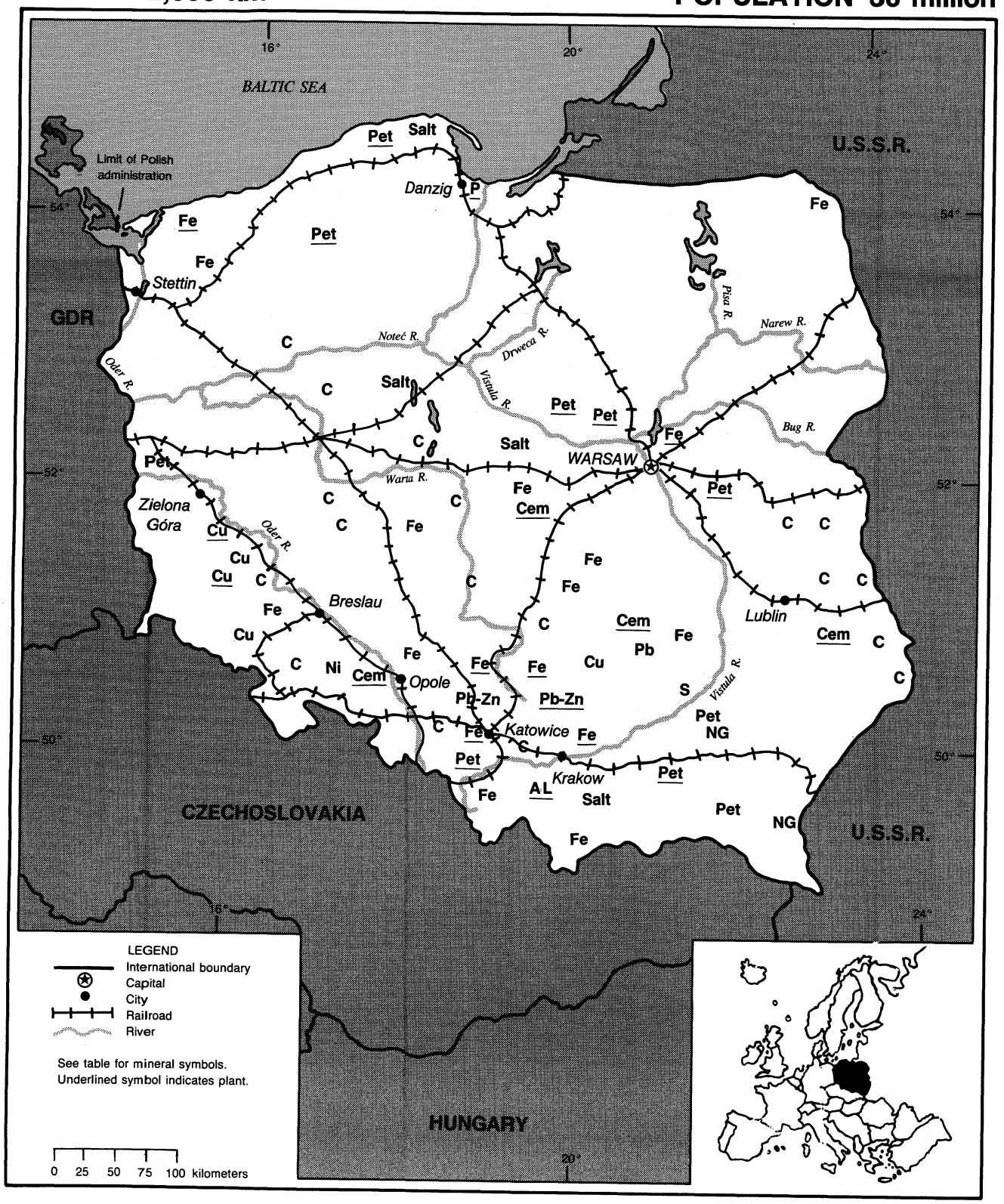
(Million metric tons unless otherwise specified)

| Commodity | | Reserves[e] |
|---|---|---|
| Copper-zinc ore | | 27 |
| Iron ore | | 935 |
| Natural gas | billion cubic meters | 6,500 |
| Nepheline syenite | | 300 |
| Olivine | | 2,000 |
| Petroleum | billion barrels | 24 |

[e]Estimated.

# POLAND

**AREA 312,000 km²** **POPULATION 38 million**



THE MINERAL INDUSTRY OF

# POLAND

By Walter G. Steblez

In 1991, efforts to transform Poland's economy to a market-based system continued in accordance with recommendations made by world financial institutions. As in 1990, the changes in the structure of the country's economy—the dissolution of state price controls and subsidies and the gradual privatization of the economy—resulted in a further decline of production of most mineral commodities during the year. However, these reforms gradually were installing a market discipline that would raise the efficiency of their intermediate and final use. In 1991, the country's GNP declined by about 10% and industrial production by 14%, compared with those of 1990. As in 1990, Poland's sales of minerals including fuels declined significantly in 1991 to former traditional CMEA trading partners.

Despite the structural changes that have occurred within the country's economy, Poland remained a significant producer of major nonfuel minerals and fuels by both world and European standards. In 1991, excluding the U.S.S.R., Poland was the largest producer of copper in Europe and was ranked seventh and ninth in the world in terms of mine output and refined metal production, respectively. Similarly, the country was the 3d largest European mine producer of zinc and ranked as the 11th largest world mine zinc producer. Poland was also the 7th largest mine producer of silver in the world and the largest producer in Europe, excluding the U.S.S.R. Among Europe's producers of industrial minerals, Poland ranked 3d in the production of lime and nitrogen (in ammonia), second in salt, and was the largest European producer of sulfur, and ranking 5th in world output. Poland was also the largest European producer of bituminous coal and the 7th largest hard coal producer in the world.

## GOVERNMENT POLICIES AND PROGRAMS

Issues and policies of the greatest consequence to Poland's mineral industries involved the environment. Environmental pollution in Poland was, reportedly, extensive. The Government reported Poland to be the only country in Europe in which sulfur dioxide ($SO_2$) was estimated to increase into the 1990's and the next century.[1] The chief cause of this increase was the country's continuing and growing reliance on coal, which comprised about 80% of Poland's primary energy supply. During the period from 1967 to 1987, the proportion of Poland's river water suitable for municipal (Class I) use fell from 31% to 5%; the proportion of Poland's surface water considered too polluted for any use rose from 29% to 42% during this time. The discharge of saline mine water was a principal if not the chief source of degradation of the country's surface waters. Further Government studies projected an increase in the daily discharges of mine water to be between 11,000 and 13,000 tons by the year 2000. Other major polluters of the country's surface waters were the metals processings, fuel-energy, and chemical industries.

During this period, about 150 Mmt/a of solid and hazardous waste had been dumped annually in Poland. Approximately 46% of the total amount was generated by the country's coal, copper, lead and zinc, lignite, and sulfur mining operations; 7% was generated by the ferrous and nonferrous metals sectors; and 19% was generated by the coal-fired electric power industry. Concentrations of heavy metals such as arsenic, cadmium, and lead and zinc were significant in Poland's southwestern industrial areas. Severe localized soil contamination was found in the Legnica-Glogow copper mining and processing region. Reportedly, the highest concentrations of cadmium and lead ever recorded in the world were found in the Upper Silesian towns of Olkusz and Slawkow (lead and zinc mining). Also, significant quantities of residues containing both chlorine and fluorine were found in the vicinity of the Skawina alumina works in the Krakow area.

Following the country's fundamental change in government and economic policy in 1989, the Government of Poland introduced a series of environmental policy initiatives that were to parallel the country's orientation to a market economy structure and also to conform with EC environmental regulatory standards. A three-phase program to implement these objectives was developed. Phase 1 would address immediate, near-term threats to human health and the natural environment. Phase 2 would direct domestic compliance with existing environmental standards during the 1998 to 2000 period, while, at the same time, the country's environmental regulatory policies would be brought in accord with those of the EC. Phase 3 would focus on long-term environmentally sustainable economic development to the year 2020.

Priority action proposed by the Ministry of Environmental Protection, Natural Resources and Forestry to improve air quality included:

- desulfurization of 50 Mmt tons of hard coal during 1991 - 1993 to reduce $SO_2$ emissions by 10%;
- desulfurization of flue gases of coal- and lignite-fired electric powerplants at

Belchatow, Jaworzno, Lazisko, Polaniec, and Rybnik;
- greater application of coal gasification technology at new electric powerplants.

Measures to improve water quality and industrial waste management included:
- desalinization of coal mine wastewater at the Budryk, Czeczot, Debiensko, Piast, and Ziemowit Mines in Silesia to reduce the salt load of coal mine discharges by 20% by removing 2 Mmt/a of salt;
- development of manufacturing capacity to produce equipment for wastewater aeration, sludge dewatering, and automatic process control;
- the reuse of fly ash and slag in coal combustion and pyrite tailings from the desulfurization of coal;
- recovery and recycling of metal waste at steel mills in Krakow and Katowice and the copper and lead and zinc refineries at Legnica, Olkusz, and Miasteczko Slaskie.

Additional Government policies with direct bearing on the country's mineral resources stipulated the abandonment of mining operations when a substitute for a given raw material would become available. The Government of Poland would also encourage the reduction of raw material inputs in manufacturing. Plans included the creation of a new comprehensive geological exploration and mining law to efficiently manage nonrenewable mineral resources, particularly by closely observing real economic factors in the determination of the country's mineral reserves. Ecological parameters also would be added to the process of geological exploration work and to the documentation and economic evaluation of mineral deposits.

In midyear, the Government of Poland reestablished the country's stock exchange, which ceased to function during World War II and was not reopened by the country's postwar Marxist Government.

## PRODUCTION

The trend of declining output in Poland's mineral industry, evident in 1989 and 1990, continued in 1991. The few notable exceptions in the metals sector included increases in the quantity of copper ore hoisted in 1991 compared with that of 1990 and the output of both total smelter and refined copper. There also was a corresponding production increase of silver, which largely was a byproduct of the copper industry. In the fuels sector, the production of lignite and brown coal increased marginally in 1991 compared with 1990. The overall declining trend in the mineral industry of Poland reflected the country's continuing structural shift away from a command economy profile to that of a market-driven economy. Producers no longer were obliged to increase or maintain mineral output levels at all costs and were free to plan closures of economically unsustainable operations. *(See table 1.)*

## TRADE

In 1991, Poland's foreign commercial activity continued to grow with EC countries and diminish with former fellow members of the CMEA. The value of Poland's total exports to the EC rose by 14.6%, while imports from the EC grew by 62.8% compared with those of 1990. On the other hand, the value of Poland's total exports and imports with former CMEA countries declined by 41.5% and 39.1%, respectively. Trade in metals, both exports and imports, with the EC grew substantially during the year, with Poland obtaining a trade surplus in this sector. Imports of fuel and energy from the EC during this period rose by more than 25%, while it declined sharply with former CMEA countries. To meet its energy needs while at the same time decreasing hard-currency expenditures for imported natural gas and petroleum, Poland substantially reduced imports of natural gas, petroleum, and refinery products and reduced exports of bituminous coal, coke, and lignite, which increased the apparent consumption of domestically produced fuels. *(See tables 2 and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 4 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1991. *(See table 4.)*

## COMMODITY REVIEW

### Metals

*Aluminum.*—In midyear, the management of Poland's Huta Aluminium Konin (Konin Aluminum Works) announced plans to both privatize the company and expand facilities at the aluminum works. Konin was among 400 state-owned companies considered to have potential for privatization by the Polish Government's Agency for Ownership Transformation. Facility expansion would involve raising Konin's smelter capacity from a reported 48,000 mt/a to 70,000 mt/a. The company's electrolysis shop also would be modernized as well as the 50,000-mt/a rolling mill to produce strip and sheet thinner than the current minimum of 0.5 mm. Reportedly, the cost of expanding and upgrading Konin's facilities would range between $150 and $200 million.

*Copper.*—Kombinat Gorniczo-Hutniczy Miedzi (KGHM), Poland's state-owned vertically integrated copper mining, smelting, and refining monopoly, sought ways to rationalize and privatize its operations during the year. To assist in this effort KGHM retained A.T. Kearney Inc., management consultants of Chicago, Illinois, to help evaluate the company's assets in respect to their suitability for further development or sale. Late in the year, Poland's Agency for Ownership Transformation converted KGHM to a treasury-owned corporation as the first step toward privatization. Eventual sale and privatization would involve an initial distribution of stock among workers and management, as well as offerings for general investors.

Reportedly, in 1991, potential investors in KGHM were, among others, ASARCO Incorporated of the United States, Metallgesellschaft AG of the Federal Republic of Germany, and Outokumpu Oy of Finland. However, Poland's complex and largely untested privatization procedure and the country's powerful private and public environmental interests had placed actual investments in abeyance until these issues are resolved. Reportedly, KGHM earmarked about 75% of the company's total investment for 1991 for pollution abatement technology to reduce $SO_2$ emissions and to recycle industrial wastewater supplied from the Odra (Oder) River. KGHM officials indicated that the cleanup of tailings dumps and dust collected from industrial filters would be done in subsequent years. Reportedly, the Glogow I smelter was rated relatively emission free during the year, particularly with respect to $CO_2$. The more modern Glogow II smelter with hermetically sealed waste entrainment systems reportedly did not need new pollution abatement technology. In May, there was a general strike for higher wages by Poland's copper miners that lasted 6 days. Reportedly, the miners dropped demands for a 100% pay increase until after KGHM's privatization.

*Gold.*—Reportedly, KGHM concluded an agreement with Boliden Contech, a subsidiary of Trelibors AB of Sweden, for the delivery of a precious metals processing plant. Installation of the plant was to be completed in 1993. The plant would produce about 300 kg/a of gold and about 1,000 mt/a of silver as a byproduct of KGHM's copper mining and processing operations.

*Iron and Steel.*—The declining trend of Poland's steel production continued into 1991. As in other sectors of industry, central economic planning no longer dictated rigid production targets to the steel industry as the country moved to a market-based system. The means to privatize and rationalize the country's steel industry was the principal issue in the country's iron and steel sector during the year. Poland's law preventing foreign ownership of land was among the chief obstacles to foreign investment. Other issues that inhibited investment were the large-scale and technologically dated integrated steel mills and strong labor unions with virtual veto power over management decisions. Following initial preparation for privatization through the Agency for Ownership Transformation, large integrated steel mills (Nowa Huta Sendzimir, Huta Katowice, and Huta Warszawa) could rationalize their operations either by creating a holding company to gradually privatize various subordinate units and affiliates, or by direct transfer of ownership to the Ministry of Industry, which could attract investment by issuing corporate stock for domestic as well as outside investors. A mainly Canadian consortium, composed of Hatch Associates, Steltech (a subsidiary of Stelco Steel Inc.), and Ernst and Young, reportedly, negotiated a contract with the Government of Poland to conduct an economic study of Poland's steel industry. To help determine their perspectives of operating in a market economy, each of the country's iron and steel-producing and processing facilities would be studied for their relative efficiency and environmental impact. Reportedly, two-thirds of the $1.5 million study would be financed by the Government of Canada and the balance by the International Bank for Reconstruction and Development (World Bank).

In September, Lucchini Siderurgica S.p.A. (Lucchini) of Italy signed a letter of intent with the Government of Poland to acquire a 51% stock share in Huta Warszawa in Warsaw. Reportedly, Lucchini agreed to invest $200 million for a modernization program at Huta Warszawa that was to change the operation's production profile by replacing the steelwork's two 70-ton open-hearth furnaces with two electric arc furnaces. The modernization program reportedly was scheduled for completion in late 1993. Huta Warszawa's steelmaking capacity in 1991 was about 460,000 mt/a at two 70-ton open-hearth furnaces and five 50-ton electric arc furnaces. Other facilities included rolling mills to produce semimanufactures and a wire-drawing plant.

At yearend, the Seco/Warwick Corp. of the United States (Meadvill, Pennsylvania) reportedly formed a joint venture with Trans-Vac, a producer of vacuum and general heat treatment furnaces in Swiebodzin. The new company, Seco/Warwick Ltd., would manufacture Seco/Warwick heat-treating and melting furnaces at Trans-Vac facilities for markets in both Europe and Asia.

*Lead and Zinc.*—Lead and zinc ore was mined in the southeastern part of the country at three underground mines. The Boleslaw mining concentrating and zinc refining complex at Bukowino produced ore grading about 0.6% lead and 3.4% zinc. The Olkuz-Pomorzany Mine, near Olkusz, part of the Boleslaw operation, produced ore grading about 1.2% lead and 3.5% zinc, and the Trzebinia Mine and concentrator, at Trzebinia, near Chrzanow, produced ore grading 3.7% lead and 2% zinc.

Reportedly, preliminary discussions were held in 1991 between the Government of Poland and Metallgesellschaft AG of the Federal Republic of Germany concerning the possible acquisition of Polish zinc smelters at the Miasteczko Slaskie Lead and Zinc Works and the Boleslaw Mining and Smelting Enterprise. Metallgesellschaft reportedly indicated interest in the possibility of upgrading and expanding the capacity of Miasteczko Slaskie's 90,000-mt/a zinc refinery or possibly building a new 200,000-mt/a refinery on-site. Metallgesellschaft also reportedly expressed an interest in either supplying new technology to upgrade the zinc smelter at Boleslaw through its subsidiary Lurgi GmbH or possibly acquiring a major stock share in the operation.

## Industrial Minerals

*Cement.*—The decline of Poland's production of cement from slightly more

than 17 Mmt in 1989 to 12.6 Mmt in 1990 and about 12 Mmt in 1991 corresponded to the decline in the country's construction activity during this period. In both 1990 and 1991, market demand began to assume a more dominant position in Poland's economy. Large-scale, state-subsidized construction projects in heavy industry were all but abolished as was central economic planning. In August, Chelm, Poland's chief cement producer, reportedly concluded a barter contract with the U.S.S.R. that stipulated delivery of 250,000 tons of cement to the U.S.S.R. through March 1992 in exchange for a like tonnage of Soviet bituminous coal.

*Silica.*—Early in the year, HSO Sandomierz, Poland's chief producer of sheet glass, reportedly signed a letter of intent with Pilkington PLC of the United Kingdom to form a joint venture to build Poland's first float glass plant at Sandomierz. The 125,000-mt/a plant would reportedly cost $140 million, of which 40% would be supplied by Pilkington PLC, 30% by HSO Sandomierz, and the balance by unspecified Polish and international investors. The new facility was to become operational in 1993 and would export about 18,000 mt/a of the product to Western Europe. In past years, Poland reportedly depended on imports of about 25,000 mt/a of float glass from Czechoslovakia.

*Sulfur.*—Poland remained among the largest producers of sulfur in the world. With an output of slightly more than 4 Mmt of sulfur in 1991, the country's production represented more than 7% of total world sulfur production. Approximately 87% of Poland's total sulfur production was generated at the Jeziorko and Grzybow borehole mines in the Tarnobrzeg region using a modified Frasch process. Approximately 13% was produced at the Machow open pit mine. As in other branches of the mineral industry, sulfur mining has been a serious source of both air and water pollution. In the Tarnobrzeg region, the sulfur industry reportedly contributed just under 90 $Mm^3/a$ of industrial sewage, or 70% of the total amount of industrial sewage generated in the region. Cleanup costs after years of neglect reportedly would be substantial.

## Mineral Fuels

*Coal.*—In terms of output, consumption, and export trade, coal remained the country's chief mined product. Poland's resources of bituminous and anthracite coal were in Upper and Lower Silesia and in the Lublin district. Mining operations in the Upper Silesian coal basin, the largest and most productive of the three areas, were performed within an area of about 4,500 $km^2$. Mining was conducted at increasingly greater depths, in some cases exceeding 1,000 m. At the more recently developed Lublin Basin, exploration has been systematically performed since 1974. Indicated resources were delineated within a 754-$km^2$ area. Inferred resources were bounded within an area of 9,100 $km^2$. Total demonstrated resources at Lublin were reported to be 7.7 Bmt of bituminous coal.

Mining at Lublin also has been conducted at increasingly greater depths, ranging from 800 m to 1,000 m. At the Lower Silesian Basin, the total area worked by four mines amounted to 108 $km^2$. Demonstrated resources in the area amounted to about 500 Mmt of coal, and workings ranged in depth from 800 m to 1,100 m. The total demonstrated resources at the three basins amounted to about 65.2 Bmt of hard coal. Poland's commercial-grade coal resources were distributed as follows: Upper Silesia—11.9 Bmt, Lublin—0.3 Bmt, and Lower Silesia—0.2 Bmt.

In 1991, coal accounted for about 75% of the country's energy supply. Domestic sales of coal also had become more profitable to the country's coal producers, owing to the partial removal of price controls on coal, a more than 60% increase in domestic rail freight rates for moving coal to export port facilities, and a substantial increase (20%) in export tariffs.

*Natural Gas and Petroleum.*—In 1991, Poland invited competitive bids on petroleum and natural gas concessions. Applications were to be submitted by January 15, 1992. The offerings by the Ministry of Environmental Protection, Natural Resources and Forestry included 10 blocks in the country's northern lowlands, east of Gdansk, which reportedly have potential petroleum and gas resources mainly in Cambrian, Ordovician, and Silurian source rocks. The second group of offerings consisted of 22 blocks in the central lowlands, between Warsaw and Poznan with good petroleum and natural gas potential in Permian Zechstein and Rotliengendes source rocks. The licensing process would be administered by the ministry's Bureau of Geological Concessions. Licensing terms called for giving Polish markets priority to purchase production from these fields with prices based on a basket of imported fuel oil prices. Petroleum prices would be based on current market prices.

## 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 in market economy countries, 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 economic directives to discover exploitable resources may have resulted in possible overestimates 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 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 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, $C_1$, and $C_2$, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade.

In category A the "reserves" are known in detail. The ore boundaries are outlined by trenching, exploratory workings, or exploratory boreholes. The depositional environment, the proportion of different commercial grades of ore, and the hydrogeological conditions of the exploitations have been ascertained and the quality and technological properties of the ore ascertained in detail, ensuring the reliability of projected beneficiation and production operations.

In category B the "reserves" in place are explored. The ore bodies are outlined by exploratory workings or boreholes. The depositional environment is known, and the types and industrial grades of ore are ascertained but without details of their distribution. The quality and technological properties of the ore are known sufficiently well to ensure the correct choice of the system for its beneficiation. The general conditions of exploitation and the hydrogeological environment are known in good detail.

In category $C_1$ the "reserves" in place are estimated by a sparse grid of exploratory boreholes or workings. This category also includes "reserves" adjoining the boundaries of A and B categories of ore as well as "reserves" of very difficult deposits in which the distribution of the values of minerals cannot be determined even by a dense exploratory grid. The quality, types and industrial grades, and technology of beneficiation are ascertained tentatively by means of laboratory tests and analyses and by analogy with known deposits of the same type. The general conditions of exploitation and the hydrogeological environment are known tentatively.

The $C_2$ category includes those "reserves" in place that adjoin the explored "reserves" of A plus B plus $C_1$ categories as well as "reserves" indicated by geological and geophysical evidence and confirmed by boreholes. Taking this system into account, Poland's mineral resources in categories $A+B+C_1$ are given in table 5. *(See table 5.)*

## INFRASTRUCTURE

Poland's inland transportation system consisted of 331,129 km of railroads, highways, and waterways. The railroad system consisted of 24,287 km of 1.435-m standard-gauge, 397 km of 1.524-m broad-gauge, and 2,357 km of narrow-gauge track. Of the total railroad system, 8,987 km was double-tracked and 11,016 km electrified track. 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. By yearend, the country's merchant fleet consisted of 222 ships totaling 4,019,531 dwt. Maritime ports (Gdansk, Gdynia, Szczecin, and Swinoujscie) handled 44.2 Mmt of cargo in 1990. In 1990, 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.

## OUTLOOK

To ensure maximum interim employment during the country's economic transition to a market economy, near-term Government policies probably will continue to direct subsidies to some state-owned heavy industries such as coal mining and steel production. Crude steel production should continue to decline in 1992 owing to continued rationalization (including environmental factors) of the industry and the decline in domestic demand. The steel industry's production profile in the longer term should tend toward the output of higher value specialty steels. Poland's coal, copper, lead, sulfur, and zinc industries, because of their developed infrastructures and operations and relatively well-assured mineral resources, should continue their mining and processing activities (with improved pollution controls) for at least another 10 to 15 years.

[1]Ministry of Environmental Protection, Natural Resources and Forestry, National Environmental Policy—Appendix B (Warsaw: 1990), pp. 3-21; and U.S. Environmental Protection Agency, Environmental Conditions in Poland and Hungary, Report to Congress (Washington, DC, 1992), pp. 27-79.

## OTHER SOURCES OF INFORMATION

**Agencies**

Ministry of Industry
Warsaw, Poland
Ministry of the Environment, Forestry, and Natural Resources
Warsaw, Poland
Kombinat Gorniczo Hutniczy Miedzi
Lubin, Poland

**Publications**

Przeglad Gorniczy (Mining Review), Warsaw, annually.
Przeglad Geologiczny (Geology Review), Warsaw, annually.
Rocznik Statystyczny Przemyslu (Statistical Handbook for Industry) Glowny Urzad Statystyczny (Main Statistical Directorate), Warsaw, annually.
Rocznik Statystyczny (Statistical Abstract) Glowny Urzad Statystyczny (Main Statistical Directorate), Warsaw, annually.

TABLE 1

## POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum metal, primary | | 47,500 | 47,700 | 47,800 | 45,974 | [3]45,800 |
| Cadmium metal, primary | | [e]620 | 642 | 485 | 373 | 350 |
| Copper: | | | | | | |
| Mine output, Cu content, recoverable[e] | | 438,000 | 437,000 | 384,000 | 370,000 | 390,000 |
| Metal: | | | | | | |
| Smelter, including secondary | | 367,300 | 469,560 | 460,519 | 346,000 | 380,000 |
| Refined, including secondary | | 390,200 | 400,560 | 390,268 | 352,000 | [3]378,000 |
| Gold:[e] | | | | | | |
| Mine output, Au content, recoverable | thousand kilograms | 35 | 30 | 30 | 30 | 30 |
| Metal, smelter[4] | kilograms | 180 | 177 | 175 | 175 | 175 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate, gross weight | | 6,300 | 6,300 | 7,400 | [r]2,400 | [3]— |
| Metal: | | | | | | |
| Pig iron | thousand tons | 10,476 | 10,264 | 9,488 | [r]8,658 | [3]6,355 |
| Ferroalloys:[e] | | | | | | |
| Blast furnace | do. | 85 | 80 | 75 | 75 | 70 |
| Electric furnace | do. | 180 | 175 | 175 | 140 | 140 |
| Steel: | | | | | | |
| Crude | do. | 17,145 | 16,873 | 15,094 | 13,625 | [3]10,439 |
| Semimanufactures: | | | | | | |
| Rolled excluding pipe | do. | 12,410 | 12,424 | 11,272 | [r]9,836 | [3]8,059 |
| Pipe | do. | 1,038 | 1,053 | 971 | 567 | [3]517 |
| Lead: | | | | | | |
| Mine output, Pb content, recoverable | | [e]48,800 | 64,000 | 66,000 | 61,344 | 49,000 |
| Metal, smelter | | 89,800 | 90,700 | 78,200 | 64,812 | [3]50,800 |
| Silver, mine output, Ag content, recoverable | thousand kilograms | 831 | 1,063 | 1,003 | 832 | [3]899 |
| Zinc: | | | | | | |
| Mine output, Zn content[e] | | 184,000 | 184,000 | 179,000 | 178,000 | 175,000 |
| Metal, refined, including secondary | | 177,000 | 174,000 | [r]163,727 | [r]132,100 | [3]125,000 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite | | 73,100 | 63,100 | 57,900 | 25,316 | 25,000 |
| Cement, hydraulic | thousand tons | 16,090 | 16,984 | 17,125 | 12,600 | [3]12,030 |
| Clays and clay products: | | | | | | |
| Crude: | | | | | | |
| Bentonite | do. | 75 | [r]83 | [r]80 | [e]70 | 70 |
| Fire clay | do. | 1,104 | 1,032 | 856 | 523 | 500 |
| Kaolin[e] | do. | 49 | 59 | 50 | [3]48 | 45 |
| Products[e] | do. | 600 | 600 | 550 | 300 | 300 |
| Feldspar[e] | | 55,000 | 50,000 | 50,000 | 45,000 | 40,000 |
| Gypsum and anhydrite, crude[5] | thousand tons | 1,127 | 1,097 | 1,133 | 755 | 700 |
| Lime, hydrated and quicklime | do. | 4,265 | 4,430 | 4,421 | 3,194 | [3]2,469 |
| Magnesite, crude | | 22,300 | 23,900 | 24,100 | 23,000 | 23,000 |
| Nitrogen: N content of ammonia | thousand tons | 2,177 | 2,338 | 2,360 | 2,006 | 2,000 |

See footnotes at end of table.

TABLE 1—Continued

## POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Salt: | | | | | | |
| Rock | thousand tons | 1,234 | 1,247 | 995 | 556 | 500 |
| Other | do. | 4,941 | 4,932 | 3,675 | 3,499 | 3,340 |
| Total | do. | 6,175 | 6,179 | 4,670 | 4,055 | [3]3,840 |
| Sodium compounds, n.e.s.: | | | | | | |
| Carbonate (soda ash) | do. | 930 | 956 | 1,005 | [r]968 | 950 |
| Caustic soda (96% NaOH) | do. | 440 | 463 | 452 | 404 | [3]324 |
| Stone: Dolomite | do. | 3,390 | 3,422 | 4,000 | 4,989 | 4,500 |
| Sulfur: | | | | | | |
| Native: | | | | | | |
| Frasch | do. | 4,410 | 4,411 | 4,276 | 4,027 | 3,282 |
| Other than Frasch | do. | 550 | 589 | 588 | 637 | 600 |
| Total | do. | 4,960 | 5,000 | 4,864 | 4,664 | [3]3,882 |
| Byproduct:[e] | | | | | | |
| From metallurgy | do. | 170 | 150 | 150 | 140 | 140 |
| From petroleum | do. | 25 | 30 | 20 | 20 | 20 |
| Total | do. | 195 | 180 | 170 | 160 | 160 |
| From gypsum[e] | do. | 22 | 20 | 20 | 10 | 10 |
| Total sulfur[e] | do. | 5,177 | 5,200 | 5,054 | 4,834 | 4,052 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal: | | | | | | |
| Bituminous | thousand tons | 193,011 | 193,015 | 177,628 | [r]147,624 | [3]140,269 |
| Lignite and brown | do. | 73,196 | 73,489 | 71,816 | 67,584 | [3]69,350 |
| Total | do. | 266,207 | 266,504 | 249,444 | [r]215,208 | [3]209,619 |
| Coke: | | | | | | |
| Coke oven | do. | 17,066 | 17,071 | 16,584 | 13,713 | [3]11,428 |
| Gashouse[e] | do. | [3]363 | 350 | 350 | 350 | 300 |
| Total[e] | do. | [3]17,429 | 17,421 | 16,934 | 14,063 | 11,728 |
| Fuel briquets, all grades | do. | 1,379 | 1,460 | 632 | 199 | 190 |
| Gas: | | | | | | |
| Manufactured: | | | | | | |
| Town gas | million cubic meters | 176 | 133 | 109 | 122 | 120 |
| Coke oven gas | do. | 6,468 | 6,593 | 6,456 | 5,475 | 5,000 |
| Natural, marketed | do. | 5,781 | 5,713 | 5,368 | 3,866 | 4,134 |
| Natural gas liquids:[e] | | | | | | |
| Natural gas | thousand 42-gallon barrels | [3]50 | 50 | 50 | 30 | 30 |
| Propane and butane | do. | 40 | 40 | 30 | 30 | 30 |
| Peat: Fuel and agricultural[e] | thousand tons | 60 | 60 | 50 | 50 | 50 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | thousand tons | 149 | 163 | 159 | 163 | [3]158 |
| Converted | thousand 42-gallon barrels | 1,105 | 1,209 | 1,180 | 1,209 | [3]1,172 |

See footnotes at end of table.

TABLE 1—Continued

## POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petroleum—Continued: | | | | | | |
| Refinery products[6] | thousand 42-gallon barrels | 89,982 | 94,397 | 95,844 | 80,874 | 75,000 |

[e]Estimated. [r]Revised.

[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.

TABLE 2

## POLAND: EXPORT OF SELECTED MINERAL COMMODITIES FOR 1990 AND 1991

(Thousand metric tons unless otherwise indicated)

| Commodity | | 1990 | 1991 |
|---|---|---|---|
| METALS | | | |
| Aluminum: Unwrought metal | | 16.3 | 14.5 |
| Copper: Unwrought metal and semimanufactures | | 198.9 | 245.3 |
| Iron and steel: | | | |
| Scrap: | | | |
| Iron | | 32.3 | 14.2 |
| Steel | | 392.3 | 159.1 |
| Ferroalloys | | 28.1 | 18.3 |
| Semimanufactures | | 515.5 | 1,236.0 |
| Lead: Unwrought metal | | 6.0 | 9.9 |
| Silver | tons | 678.0 | 931.0 |
| Zinc: | | | |
| Unwrought metal, alloys and semimanufactures | | 33.6 | 27.9 |
| Unwrought only | | 31.3 | 25.9 |
| INDUSTRIAL MINERALS | | | |
| Cement | | 903.1 | 1,178.4 |
| Fertilizer materials: | | | |
| Manufactured: Nitrogenous | | 511.9 | 385.2 |
| Phosphate | | 41.6 | 26.9 |
| Lime | | 75.9 | 93.1 |
| Sodium compounds: | | | |
| Calcined soda | | 516.7 | 461.6 |
| Caustic soda | | 117.9 | 80.7 |
| Sulfur | | 3,815.2 | 2,812.1 |
| MINERAL FUELS | | | |
| Coal: | | | |
| Anthracite | | 40.0 | 156.0 |
| Bituminous | | 28,026.0 | 19,139.0 |
| Lignite | | 28,348.7 | 1,196.0 |
| Coke and semicoke | | 3,661.0 | 2,022.0 |
| Refined petroleum products | | 1,655.4 | 1,662.6 |

Sources: Selected mineral export data compiled from Handel Zagraniczny, Warsaw, 1992, and Maly Rocznik Statystyczny, Warsaw, 1991.

TABLE 3

## POLAND: IMPORT OF SELECTED MINERAL COMMODITIES FOR 1990 AND 1991

(Thousand metric tons unless otherwise indicated)

| Commodity | | 1990 | 1991 |
|---|---|---|---|
| METALS | | | |
| Aluminum: Oxides hydroxides: Alumina, calcined | | 130.0 | 112.5 |
| Metal: Unwrought metal and semimanufactures | | 58.1 | 32.8 |
| Antimony, metal | tons | 838 | 14.6 |
| Chromite | | 147.4 | 6.8 |
| Cobalt: Metal; ingot and powder | tons | 77 | 22.0 |
| Gold and platinum-group metals | kilograms | 9 | 56.0 |
| Iron steel: | | | |
| Ore and concentrate | | 12,066.3 | 8,580.6 |
| Metal: | | | |
| Scrap | | 8.4 | .8 |
| Pig iron | | 1,283.5 | 102.2 |
| Ferroalloys | | 44.6 | 26.6 |
| Rolled steel | | 728.5 | 32.6 |
| Lead, metal | | 2.5 | 7.8 |
| Magnesium, metal | tons | 300 | 200.0 |
| Manganese: | | | |
| Ore and concentrate | | 103.2 | 151.8 |
| Metal | tons | 384 | 156.0 |
| Mercury, metal | tons | 33 | 2.0 |
| Molybdenum, ore and concentrate | tons | 617 | 21.0 |
| Nickel, metal | | 3.6 | .6 |
| Silicon, metal | | 1.7 | 767 |
| Tin, metal | tons | 890 | 29.8 |
| Titanium: | | | |
| Ore and concentrate: Ilmenite | | 54.7 | 42.5 |
| Rutile | | 1.9 | 1.5 |
| INDUSTRIAL MINERALS | | | |
| Asbestos | tons | 65.6 | 700 |
| Boron, ore and concentrate | | 3.1 | 3.0 |
| Cement | | 35.1 | 1.7 |
| Fertilizer materials: | | | |
| Manufactured: Potassic | | 592.1 | 84.3 |
| Kaolin | | 102.8 | 59.8 |
| Magnesite, calcined | | 178.1 | 64.9 |
| Phosphates, crude | | 506.4 | 214.6 |
| MINERAL FUELS | | | |
| Coal: | | | |
| Anthracite | | 20.0 | 8.0 |
| Bituminous | | 540.0 | NA |
| Natural gas | million cubic meters | 8,410.0 | 7,317.0 |
| Petroleum: | | | |
| Crude | | 13,008.0 | 11,576.2 |
| Refined: For consumption | | 2,365.2 | 797.1 |
| For reexport | | 3.1 | 3.6 |

NA Not available.

Sources: Selected mineral import data compiled from Handel Zagraniczny, Warsaw, 1992, and Maly Rocznik Statystyczny, Warsaw, 1991.

TABLE 4

## POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies (all state-owned) | Location of main facilities | Annual capacity |
|---|---|---|---|
| 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 | 200,000. |
| Lignite | State Coal Agency | 4 open pit mines at Turow, Belchatow, Konon, and Adamow | 75,000. |
| Copper: | | | |
| Concentrate (gross weight) | Kombinat Gorniczo-Hutniczy Miedzi (KGHM) | Mines and concentrators at Konrad, Lublin, Polkowice, Rudna, and Sieroszowice | 1,900. |
| Metal, refined | do. | Refineries 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 Boleslaw, Olkusz-Pomorzany, and Trzebionka) | 125 Pb.<br>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] |
| Petroleum: | | | |
| Crude | do. | 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 Metalurgizne 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.

TABLE 5

## POLAND: APPARENT RESOURCES OF MAJOR MINERALS

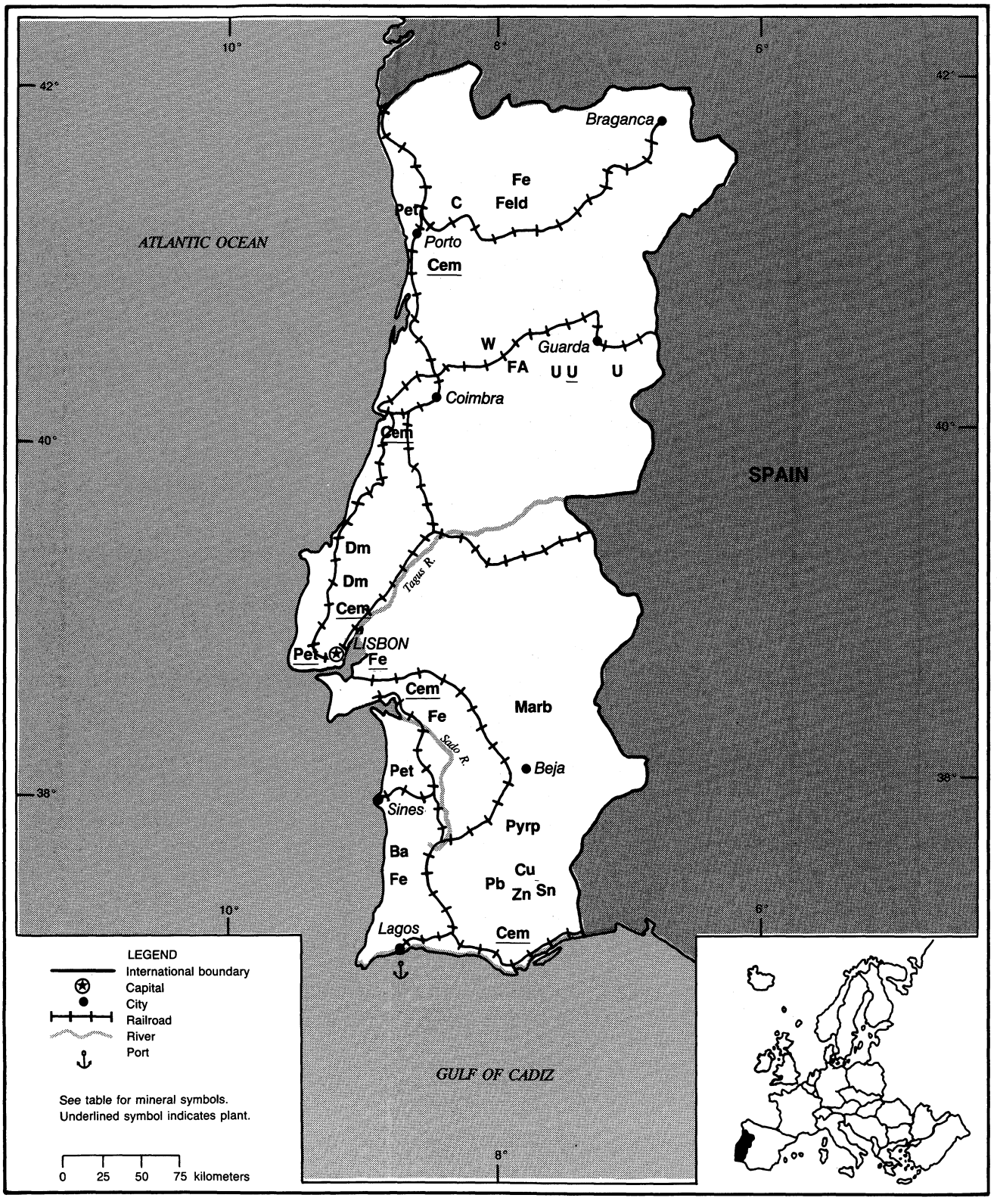
(Thousand metric tons unless otherwise specified)

| Commodity | | Resources |
|---|---|---|
| Barite | | 5,061 |
| Clay, refractory | | 69,000 |
| Coal: | | |
| Bituminous | | 65,510,000 |
| Lignite | | 12,864,000 |
| Copper, contained in ore | | 34,000 |
| Dolomite | | 603,000 |
| Gas, natural | million cubic meters | 126,391 |
| Gypsum and anhydrite | | 303,000 |
| Iron, contained in ore | | 600,000 |
| Lead, contained in ore | | 5,900 |
| Limestone and marls | | 16,951 |
| Nickel, contained in ore | | 117 |
| Petroleum, crude | | 5,000 |
| Quartz sand | | 723,000 |
| Rock salt | | 83,085,000 |
| Silver, contained in Cu/Pb-Zn ores | | 196 |
| Sulfur | | 885,000 |
| Zinc, contained in ore | | 13,000 |

Source: Bilans Zasobow Kopalin i Wod Podziemnych w Polsce, Warsaw, 1990. (Official Polish data, valid for Dec. 1989). Maty Rocznik Statystyczny (Concise Statistical Yearbook of Poland), Warsaw, 1991.

# 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 area is geologically very complex, which increases its potential in regard to mineral resources. 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 and development of the region.

The mineral resource industry of Portugal is modest by world standards; however, growth rates during the past few years have made it a dynamic industrial sector in the country. The industry has undergone important changes with the discovery and development of the rich copper and tin deposit at Neves-Corvo. When the mine reached full production in 1991, there was a major increase in European copper and tin production. The country is also a significant tungsten producer.

Portugal posted a real GDP growth of 3.1% in 1991, with investment continuing to expand as a result of fiscal incentives and foreign interest in the country. Portugal has managed to provide an economic environment more conducive to foreign investment since its accession into the EC in 1986. Foreign investors were availing themselves of Portugal's continuing labor-cost advantage and favorable tax treatment.[1] Foreign direct investment in mining in 1991 was about $14 million.[2]

The annual inflation rate was about 12%. The unemployment rate was below 4%, one of the lowest in the OECD. Portugal has been one of the fastest growing economies in the EC over the past 5 years and was expected to continue growing at a rate above the average for the EC. This growth was due, in no small part, to a massive modernization program backed by EC structural funds. These funds were designed to overcome Portugal's longstanding problems in transportation, communications, technology, and health care.

## GOVERNMENT POLICIES AND PROGRAMS

The Government continued with legislation that would privatize many public companies. Petroleos de Portugal, S.A. (Petrogal), the state oil group, was being considered for privatization along with Siderúrgia Nacional, E.P. (SN), the state steel company. The planned privatization of Cimentos de Portugal, E.P. (CIMPOR) and Cia. Geral de Cal e Cimento, S.A. (SECIL), the country's two cement producers, continued to be delayed until sometime in the future. The privatization issue is part of a broader program to reduce the role of the state and restructure the Portuguese economy from one that is state-controlled to one that is market-driven. On the revenue side, income from the privatization would help pay off some of the Government debt.

Portugal was continuing to address its nationalized industries in other ways. It was spending an estimated $1.5 billion to restructure and streamline SN to meet the EC's steel industry quotas and regulations. This was part of a program placed at the disposal of industries for the modernization of plants and development of infrastructure to increase competitiveness and was financed by a joint program of the EC and the Portuguese Government.

## 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, E.P. produced iron and steel, Beralt Tin and Wolfram Ltd. remained a significant tungsten producer, and Cimentos de Portugal, S.A. was an important producer of cement. With the exception of copper, dimension stone, ferroalloys, tin, and tungsten, which were of international importance, production of other minerals and related materials had only domestic significance. There was potential for increased production of granite, marble, and slate. *(See table 1.)*

## TRADE

In 1990, the latest year for which complete data were available, Portugal's major markets continued to be France, the Federal Republic of Germany, and the United Kingdom, while its major suppliers were the Federal Republic of Germany, Spain, and France, respectively. Portuguese trade with Spain continued to increase because of mutual tariff and nontariff liberalization. The total Portuguese market demand for construction and mining equipment in 1990 was estimated to be $1.5 billion.

Table 2 shows the impact of selected classes of mineral commodities on Portugal's balance of payments position in relation to the EC and the world. *(See table 2.)*

## STRUCTURE OF THE MINERAL INDUSTRY

By world standards, the mineral industry of Portugal is modest; however, the country was a significant producer of copper and tin from Somincor's Neves-Corvo Mine. The mine is considered to be one of the richest copper deposits in the world and was the largest copper mine of any type in Western Europe.

Most of the large mineral resource companies are owned or controlled by the Government, although there are some privately owned operations. The Government was engaged in efforts to privatize some state-owned industries, which included 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 General Directorate for Geology and Mines is the central department of the Ministry of Industry and Energy and regulates the mineral industry and collects statistics. About 35,000 people are employed by the mineral industry, including mining and processing.

## COMMODITY REVIEW

### Metals

*Copper.*—The Neves-Corvo Mine, which started operations in 1989, was operating at about 95% capacity at the end of 1991. 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 mine is designed to produce 1.3 Mmt of raw ore per year, which was expected to yield 500,000 mt/a of concentrate averaging 26% copper content. The estimated life of the mine, based on proven reserves, was 20 years. Total investment in the project was estimated to be $400 million.

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.

Outokumpu Oy, a Finnish company, announced its cancellation of a feasibility study for building a copper smelter and refinery in Portugal. The joint venture, known as the Metalurgia do Cobre (Metcob) project, was 60% owned by Outokumpu, with the remaining interest held by a consortium of Portuguese companies, including the state-owned Investimentos e Participacoes do Estado (IPE).

Preliminary plans had called for the construction of a 200,000-mt/a-capacity anode smelter and a 100,000-mt/a-capacity refinery. Outokumpu stated that uncertainty regarding the ability to obtain necessary financing was the reason for canceling the project. At the same time, the company announced its decision to discontinue active involvement in studies of other international copper smelter projects.

Pirites Alentejanas S.A.R.L.'s metals concentrate plant at Aljustrel came on-stream in late 1991. The company stated it was planning to process up to 1.2 Mmt/a of copper, zinc, and lead-silver ore from its Moinho ore body. The Moinho ore body contains estimated minable reserves of 22.4 Mmt grading 0.9% copper, 1.2% lead, 3.3% zinc, and 36 g of silver per ton of ore. Estimated cost of the plant was $114 million. Output would be exported mainly to European markets.

*Iron and Steel.*—The Portuguese iron and steel operation was nationalized in 1975 and continues to function as a public entity incorporated as SN. SN is seeking to ensure its viability beyond the transition period of 1992, as mentioned in Portugal's Act of Accession to the EC.

SN had almost completed its restructuring and modernization program at yearend. Extensive modernization has taken place at both the Seixal and Maia plants at an estimated cost of about $278 million. The program was intended to improve product quality, reduce production costs, increase energy efficiency, and implement a 40% rationalization of personnel.

In other actions, the Government changed SN into a public limited company as a major step toward privatization. If SN is privatized, the Government was expected to retain a minority share of 25% to 30% to maintain an effective role in the company's affairs.

*Tin.*—Somincor's tin concentrator was inaugurated in May 1990. The facility includes three stages of crushing, then grinding, tabling, and flotation and filtration. The project also included related infrastructure, utilities, a loadout facility, and a 5-km-long tailings pipeline. The plant was considered to be unique in that it was designed to process two types of ore. One ore type is a shale, and the other ore type is a sulfide. The process will produce three grades of tin concentrate ranging from 25% to 55% metal content. Plant capacity is 5,000 mt/a of tin in concentrate, which should make Portugal one of the world's top 10 tin producers. Somincor stated it would initially produce two grades of concentrate: one with a grade of 50% to 55% tin and the other with a lower grade of 30% to 35% tin. Although plant capacity was 5,000 mt/a, recovery levels would fluctuate from year to year because of the complex nature of the ore body. In 1990, mining was restricted to the Upper Corvo and Graca deposits.

*Tungsten.*—In late 1990, Minorco S.A. of Luxembourg finalized its purchase of 91% of Beralt Tin and Wolfram S.A. The remaining 9% interest was retained by the Portuguese Government. Beralt was the only producer of tungsten in 1991 and was proceeding with development work at its Panasqueira Mine at Barroca Grande. The work is to improve efficiency and increase the life of the mine. Most of the work was directed toward accessing lower levels where

proven reserves were estimated to be sufficient for a 40-year mine life.

Beralt was in the second year of a 5-year plan to increase production from the current 1,900 mt/a to 3,000 mt/a of high-grade concentrate averaging 75.5% tungsten. The mine has three levels; level 1 is mined out. All current production is from level 2. In 1993, Beralt was planning to mine 80% of production from level 2 and 20% of production from level 3, which is currently under development. Starting in 1994, all mine production was planned to be from level 3. Most of the concentrate is sold to General Electric Co. of Europe for lighting equipment.

### Industrial Minerals

Demand for cement continued as the building and construction industry maintained its levels of activity. This situation was expected to continue given the substantial volume of work expected in coming years to develop Portugal's infrastructure. The Portuguese Government was continuing to examine measures to privatize the country's cement industry.

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 68% of stone production. The main area for marble mining continued to be the district of Evora.

### Mineral Fuels

Coal accounts for about 4% of total energy consumption. Most coal is imported although there are some domestic reserves. Empresa Carbonifera do Douro S.A., a state-owned company, operates the Germunde Mine at Castelo de Paiva. The mine produces 200,000 mt/a of anthracite coal. However, the Government was planning on closing the mine at the end of 1994 because of high production costs and difficult mining conditions.

There is a growing demand for imported coal because the electricity sector is switching away from oil. There are no gas reserves and no nuclear powerplants in Portugal. Hydropower accounts for about 45% of electricity generation. The Government was seeking to diversify its energy sources and increase electrical power capacity to meet consumption growth. To that end, the Government was considering major energy projects. One was the construction of a liquefied natural gas pipeline, originating in Setubal, 50 km south of Lisbon, and going north 300 km to Oporto. A gas-fired electric generating plant would be linked to the pipeline.

The total project cost was estimated to be about $750 million. A four-unit, 1,200-MW coal-fired station is to be built at Pego. The first unit, generating 300 MW, was scheduled to be on-line in 1992 and the total project completed by mid-1994.

The Administracao do Porto de Sines (APS) has initiated a program to build a terminal at the Port of Sines principally for steam coal imports by Electricidade de Portugal (EDP) for the electricity sector. The two major cement producers, CIMPOR and SECIL, also use coal as a major fuel source. The main source of the 3 Mmt of coal imported in 1991 was the Republic of South Africa. *(See table 3.)*

## INFRASTRUCTURE

The transportation network includes 3,613 km of railroad, most of which is operated by the state-owned Portuguese Railroad Co. (CPR). Most of the trackage is single-track, 1.665-m gauge, of which about 15% is electrified. CPR was planning to match the European gauge width (1.433 m) to a number of key routes through the country. It was expected this would be done by adding a track to the existing lines. Portugal has about 74,000 km of usable highways, of which 84% is paved. Goods are also moved by waterborne coastal shipping. Major seaports are Lisbon, Porto, Ponta Delgada, and Sines.

## OUTLOOK

The present structure of the mineral industry could change in the near future as there is significant mining exploration in progress by several foreign companies. The Iberian Pyrite Belt, which extends from the southwest coast of Portugal near Setubal to the Guadalquivir River near Seville, Spain, is a prime target area for this exploration.

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.

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[1]Organization for Economic Cooperation and Development. OECD Economic Survey, Portugal, 1991/1992, p. 13.

[2]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc141.22=US$1.00, the average exchange rate for 1991.

### OTHER SOURCES OF INFORMATION

**Agencies**

Ministry of Industry and Energy
Rua da Horta Seca, 15
1200 Lisbon

General Directorate of Geology and Mines
Rua Antonio Enes, 7
1000 Lisbon

Geological Survey of Portugal
Rua Academia das Ciencias, 19 - 2
1200 Lisbon

**Publications**

Bulletins listed are published by the Ministry of Industry and Energy, Lisbon:
Bulletin of Industrial Statistics, monthly.
Bulletin of Statistics, monthly.
Bulletins listed are published by the General Directorate of Geology and Mines, Lisbon:
Bulletin of Mines, quarterly.
Bulletin of the Geologic Survey of Portugal, quarterly.

TABLE 1

## PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990e | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Arsenic, white | | 218 | 214 | 199 | 200 | 200 |
| Beryl concentrate, gross weight | | 4 | 4 | e4 | 4 | 4 |
| Copper: | | | | | | |
| Concentrate: | | | | | | |
| Gross weight | | 800 | 42,483 | 411,836 | 2651,750 | 2654,129 |
| Cu content | | 100 | 3,739 | 103,718 | 262,938 | 2164,768 |
| Metal:e | | | | | | |
| Smelter: | | | | | | |
| Primary | | 2,000 | 2,500 | 68 | 1,000 | 1,000 |
| Secondary | | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Total | | 4,000 | 4,500 | 2,688 | 3,000 | 3,000 |
| Refined, primary | | 5,300 | 6,000 | 6,000 | 6,000 | 6,000 |
| Gold, mine output, Au content | kilograms | 248 | 267 | e295 | r350 | 360 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate: | | | | | | |
| Gross weight: | | | | | | |
| Hematite and magnetite | | 9,142 | 3,450 | — | — | — |
| Manganiferous | | 18,316 | 23,300 | 13,178 | 212,480 | 11,600 |
| Total | | 27,458 | e26,750 | 13,178 | 212,480 | 11,600 |
| Fe content: | | | | | | |
| Hematite and magnetite | | e4,000 | 8,296 | e1,106 | — | — |
| Manganiferous | | e5,000 | 1,957 | 4,689 | 4,443 | 24,376 |
| Total | | 9,000 | 10,253 | e5,795 | 4,443 | 24,376 |
| Metal: | | | | | | |
| Pig iron | thousand tons | 435 | 445 | e377 | 2339 | 2340 |
| Ferroalloys:e | | | | | | |
| Ferromanganese | | 17,000 | 10,000 | 213,170 | 12,480 | 12,000 |
| Silicomanganese | | 8,000 | 5,000 | — | — | — |
| Ferrosilicon | | 2,000 | — | — | — | — |
| Silicon metal | | 3,000 | 2,500 | — | — | — |
| Total | | 30,000 | 17,500 | 13,170 | 12,480 | 12,000 |
| Crude steel | thousand tons | 530 | 802 | 762 | r 2699 | 2528 |
| Lead: Refined, secondarye | | 6,500 | 6,500 | 7,000 | r6,000 | r6,800 |
| Manganese: Mn content of iron ore | | 2,059 | 1,782 | e1,800 | 1,200 | 1,200 |
| Silver, mine output, Ag content | kilograms | 755 | 877 | r19,300 | r 242,200 | 42,600 |
| Tin: | | | | | | |
| Mine output, Sn content | | 64 | 81 | 63 | 4,680 | 10,360 |
| Metal, primary and secondary | | 22 | 58 | e62 | 1,404 | 3,100 |
| Titanium, concentrates: | | | | | | |
| Gross weight | | 141 | 59 | e111 | 45 | 40 |
| Content of $TiO_2$ | | 70 | 30 | e55 | 22 | 20 |
| Tungsten, mine output, W content | | 1,205 | 1,382 | 1,376 | 1,400 | 1,400 |
| Uranium concentrate: U content | | 142 | 189 | 124 | 130 | 125 |
| Zinc: Smelter, primary | | 5,800 | r5,500 | 5,000 | r5,500 | 5,500 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite | | 660 | 1,740 | 1,729 | 1,220 | 1,400 |

See footnotes at end of table.

TABLE 1—Continued

## PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990e | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Cement, hydraulic | thousand tons | e5,800 | 5,900 | e6,000 | 6,000 | 6,000 |
| Clays: | | | | | | |
| Kaolin[3] | | 66,736 | 71,200 | 58,297 | [2]73,849 | 74,000 |
| Refractory[e] | | 240,000 | [2]50,253 | 50,000 | 50,000 | 50,000 |
| Diatomite | | 2,880 | 2,070 | e2,990 | 2,190 | 2,200 |
| Feldspar | | 40,729 | 51,093 | 65,854 | [2]43,954 | 45,000 |
| Gypsum and anhydrite | | — | 338,029 | e300,000 | 300,000 | 300,000 |
| Lime, hydrated and quicklime[e] | | 200,000 | 200,000 | 200,000 | 200,000 | 200,000 |
| Lithium minerals: Lepidolite | | — | 212 | 274 | [2]159 | 140 |
| Nitrogen: N content of ammonia | | 153,900 | 190,500 | e151,000 | 198,200 | 186,000 |
| Pyrite and pyrrhotite (including cuprous), gross weight | | 279,061 | 244,175 | 199,018 | [2]144,190 | [2]138,760 |
| Salt: | | | | | | |
| Rock | | 513,203 | 535,942 | e583,670 | 523,300 | 524,800 |
| Marine[e] | | [2]123,000 | [2]138,784 | 150,000 | 125,000 | 125,000 |
| Total[e] | | [2]636,203 | [2]674,726 | 733,670 | 648,300 | 649,800 |
| Sand[e] | | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Sodium compounds, n.e.s.:[e] | | | | | | |
| Soda ash | | 160,000 | 155,000 | 155,000 | 150,000 | 150,000 |
| Sulfate | | 55,000 | 52,000 | 55,000 | 50,000 | 50,000 |
| Stone:[e] | | | | | | |
| Basalt | thousand tons | 65 | [2]87 | [2]86 | 85 | 80 |
| Calcareous: | | | | | | |
| Dolomite | do. | 100 | [2]105 | 100 | 100 | 100 |
| Limestone, marl, calcite | do. | 10,000 | [2]15,418 | 15,000 | 14,000 | 15,000 |
| Marble | do. | 570 | [2]672 | 700 | 650 | 700 |
| Diorite | do. | 1,600 | 1,600 | 1,500 | 1,500 | 1,500 |
| Gabbro | do. | 50 | 50 | 50 | 50 | 50 |
| Granite | do. | [2]6,393 | [2]7,071 | [2]6,752 | 6,800 | 6,800 |
| Graywacke | do. | 1 | [2]28 | 18 | 20 | 18 |
| Ophite | do. | 50 | [2]64 | 58 | 60 | 60 |
| Quartz | do. | 130 | [2]11 | 10 | 10 | 10 |
| Quartzite | do. | 600 | [2]568 | 600 | 575 | 600 |
| Schist | do. | 50 | [2]105 | 100 | 100 | 100 |
| Slate | do. | 100 | [2]27 | 32 | 30 | 30 |
| Syenite | do. | 75 | [2]23 | 25 | 25 | 25 |
| Sulfur: | | | | | | |
| Content of pyrites | | 122,787 | 111,344 | 90,752 | 95,000 | 96,000 |
| Byproduct, all sources[e] | | 5,000 | 3,000 | 3,000 | 3,000 | 4,000 |
| Total[e] | | 127,787 | 114,344 | 93,752 | 98,000 | 100,000 |
| Talc | | 7,702 | 7,187 | 8,063 | [2]7,926 | 8,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal, anthracite | thousand tons | 254 | 241 | e258 | 276 | 237 |
| Coke, metallurgical[e] | do. | 160 | 160 | 160 | 160 | 160 |
| Gas, manufactured[e] | million cubic meters | 136 | 136 | 136 | 136 | 136 |
| Petroleum refinery products:[e] | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 3,500 | 3,600 | r [2]4,338 | r [2]4,628 | 4,500 |

See footnotes at end of table.

TABLE 1—Continued

## PORTUGAL: PRODUCTION OF MINERAL COMMODITIES1—CONTINUED

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990e | 1991e |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Petrolium refinery products:e—Continued | thousand 42-gallon barrels | | | | | |
| Gasoline | do. | 8,500 | 8,900 | r 214,646 | r 214,646 | 10,000 |
| Jet fuel | do. | 4,900 | 4,700 | r 25,791 | r 25,158 | 5,000 |
| Kerosene | do. | 220 | 230 | 225 | 230 | 225 |
| Distillate fuel oil | do. | 16,800 | 17,500 | r 221,365 | r 221,440 | 22,000 |
| Residual fuel oil | do. | 15,600 | 16,200 | r 222,637 | r 222,810 | 21,000 |
| All other products | do. | 8,800 | 9,300 | 9,000 | 8,800 | 9,000 |
| Refinery fuel and losses | do. | 3,900 | 4,100 | 4,000 | 3,600 | 3,800 |
| Total | do. | 62,220 | 64,530 | r82,002 | r81,312 | 75,525 |

eEstimated. rRevised.
1Table includes data available through July 1, 1992.
2Reported figure.
3Includes washed and unwashed kaolin.

TABLE 2

## PORTUGAL: 1990 BALANCE OF PAYMENTS, SELECTED MINERAL COMMMODITIES[1]

(Thousand dollars)

| Mineral commodity | Exports to European Community | Imports from European Community | Net gain or (loss) | Exports to the world | Imports from the world | Net gain or (loss) |
|---|---|---|---|---|---|---|
| CRUDE INDUSTRIAL MINERALS | | | | | | |
| Feldspar | 259 | 1,838 | (1,579) | 461 | 2,170 | (1,709) |
| Magnesite | — | 470 | (470) | — | 472 | (472) |
| Slate | 773 | 42 | 731 | 835 | 42 | 793 |
| Other | 45,952 | 50,854 | (4,902) | 64,927 | 78,825 | (13,898) |
| Total | 46,984 | 53,204 | (6,220) | 66,223 | 81,509 | (15,286) |
| METALLIFEROUS ORES | | | | | | |
| Copper | 134,840 | 33 | 134,807 | 299,807 | 33 | 299,774 |
| Lead | 3,336 | — | 3,336 | 3,336 | — | 3,336 |
| Tin | 3,230 | 354 | 2,876 | 3,328 | 586 | 2,742 |
| Other (including waste and scrap) | 42,880 | 20,846 | 22,034 | 49,037 | 38,394 | 10,643 |
| Total | 184,286 | 21,233 | 163,053 | 355,508 | 39,013 | 316,495 |
| Nonmetallic mineral manufactures | 142,671 | 33,780 | 108,891 | 255,595 | 85,478 | 170,117 |
| METALS | | | | | | |
| Iron and steel | 93,822 | 677,922 | (584,100) | 128,334 | 792,046 | (663,712) |
| Mercury | — | 73 | (73) | — | 134 | (134) |
| Other nonferrous metals | 55,067 | 305,048 | (249,981) | 62,890 | 443,615 | (380,725) |
| Total | 148,889 | 983,043 | (834,154) | 191,224 | 1,235,795 | (1,044,571) |
| Mineral fuels | 322,406 | 532,093 | (209,687) | 568,005 | 2,743,801 | (2,175,796) |

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 3

## PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Cement | Cimentos de Portugal S.A. (Cimpor) (Government, 100%) | 10 plants, various locations | 6,000 |
| Coal | Empressa Carbonifera de Duro S.A.S.L. (Government, 100%) | Germunde Mine at Castello de Paiva | 250 |
| Copper | Sociedade Minera de Neves-Corvo S.A.R.L. (Somicor) (Government, 51%; RTZ Corp. 49%) | Neves-Corvo Mine near Castro Verde | 500 |
| 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, barrels per day | Petroleos de Portugal (Petrogal) (Government, 100%) | Refineries at Lisbon, Porto, and Sines | 300,000 |
| Pyrite | Piritas Alenejanas S.A.R.L. (Government, 82%; Boliden AB, 10%; others, 8%) | 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. (Minorco S.A., 91%; Government 9%) | Mine and plant at Panasqueira | 1,600 |
| Uranium, metric tons per year | Empresa Nacional de Uranio (ENU) (Government, 100%) | Mines and plant at Guarda | 170 |
| Zinc, refined | Quimigel E.P. (Government, 100%) | Electrolytic plant at Barreiro | 11 |

TABLE 4
## PORTUGAL: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

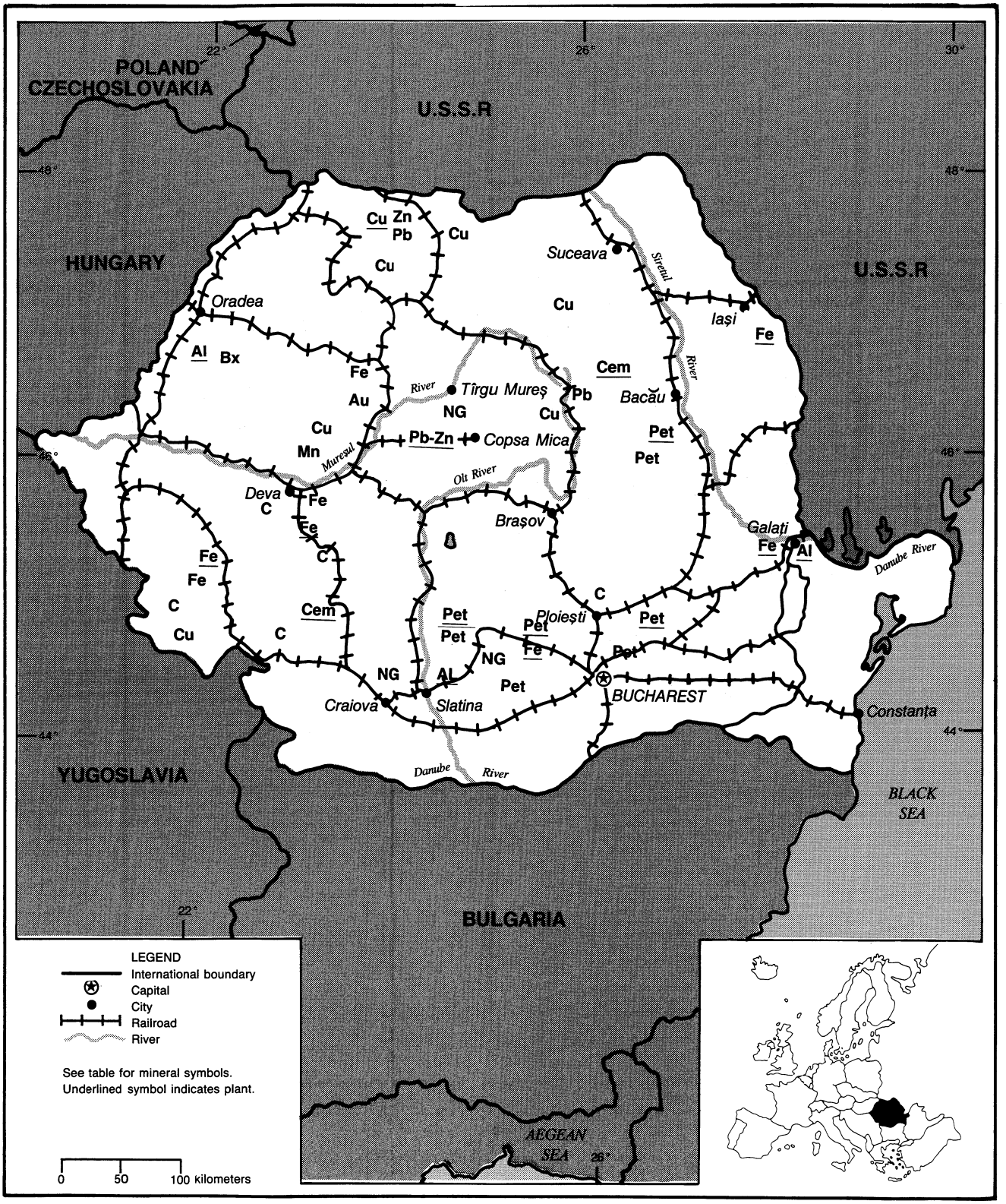
(Million metric tons)

| Commodity (ore) | Reserves* |
|---|---|
| Copper | 32.5 |
| Lead | 5.0 |
| Tin | 3.0 |
| Zinc | 3.5 |

*Estimated.

# ROMANIA

**AREA 238,000 km²** **POPULATION 23.4 million**



THE MINERAL INDUSTRY OF

# ROMANIA

By Walter G. Steblez

In 1991, political and social instability in Romania continued from the preceding year. As in 1990, the country's unstable political situation and social unrest, including strikes in the country's mineral industry sectors, brought some industries to a virtual halt for extended periods of time and affected the country's entire economy. The country's GDP declined by 21%, from about 10.9 trillion lei in 1990 to 8.6 trillion lei in 1991.[1] The value of industrial output declined by about 13%, from 5.3 trillion lei in 1990 to 4.6 trillion lei in 1991.[2] Reportedly, the gross value of output in Romania's coal mining, constructions material, and metals mining and processing sectors declined by about 16%, 24% and 25%, respectively, in 1991, compared with that of 1990.[3] Similarly, the value of output in the natural gas and petroleum extracting industry declined by 15%, while that in the petroleum refining industry declined by 36%, compared with the output levels achieved in 1990.

Romania's mineral industry continued to produce modest amounts of bauxite, copper, iron, lead-zinc, and manganese. The output of petroleum was substantial by European standards but showed a continuing decline because of both depletion and a lack of technology needed for increasing the recovery of petroleum.

## GOVERNMENT POLICIES AND PROGRAMS

Throughout 1990 and 1991, the policies of the Government of Romania to orient the country's economy to a market economic system were carried out at a slower rate than in most other former centrally planned economy countries of Eastern Europe. The Government's economic reform policies, however, did not always appear coordinate with each other. Reportedly, during the period from 1990 to 1991, certain regulations stipulated that the Government would continue to set prices for raw materials, including those for minerals and fuels, during and subsequent to the economy's transition to a market system. However, other legislation during this period promoted a two-tiered system of privatization of the economy. The first stage was to involve the auctioning off of small-to medium-sized state-owned enterprises to Romanian citizens only. The second stage would entail total and/or partial sale of larger heavy industries, including those in the minerals sectors, to both Romanian and foreign organizations and individuals.[4] Whether or not central government price controls would be in effect in this program apparently had not been addressed.

In 1991, a senior official of Romania's Ministry of Industry announced that restructuring and modernization was to be the chief goal for the country's minerals industry. According to the Government's proposal, the program to modernize the country's iron and steel industry would be implemented over a 5-to 6-year period.

From 1981 to 1989 the Communist-led Government of Romania carried out an accelerated export program to pay off the country's convertible currency-based foreign debt, while at the same time reducing imports to a minimum. This policy left the country with little available capital to maintain a transfer of western technology to its industries. Periodic difficulties in acquiring spare or replacement parts for capital equipment supplied from abroad, mainly during the 1970's, was another consequence of this policy. To maintain current or reduced capacities in the steel industry and significantly improve efficiency, the Government's planned restructuring and modernization effort would include the following:

- the establishment of a Romanian Iron and Steel Institute to develop future strategies for the country's metals-producing industries;
- the modernization of continuous casting equipment in current use with new process control and automation systems, and the increased application of continuous casting in the steel industry to a level in excess of 80% of Romania's total steel output;
- the modernization of rolling facilities, especially finishing, coating, and heat treating installations;
- restructuring of steelmaking entirely on the basis of oxygen converters and electric arc furnaces; and
- the modernization of environmental protection programs in the minerals industry with technically advanced pollution abatement systems.

Parallel modernization and rationalization programs were planned for the country's mining and beneficiation activities in the mineral fuels and nonferrous metals industries. To raise the output of bituminous coal in the Jiu Valley coalfields by 400,000 mt/a, continuous longwall mining would replace the shortwall and room-and-pillar mining methods that have been in use.

Lignite mining in the Oltenia region would be upgraded through the addition of new open pit mines, bucket wheel excavators, and high-capacity conveyors and dumpers. Also, technical assitance would be sought from abroad to develop and exploit geothermal energy resources in the Banat and Crisana areas.

In respect to the nonferrous metals mining and processing sectors, the Government planned to raise mining efficiency and the rate of recovery of

copper (50% in 1991) at the Moldova Noua and Rosia Poieni mining operations by acquiring new excavators, loaders, dumpers, and high-capacity conveyors. New ball mills, flotation cells, and automatic control and environmental monitoring equipment would be installed at the beneficiation plants. Similar measures would be taken for the copper, and lead and zinc mining and processing operations at Baia Mare, where the metal recovery rate in 1991 reportedly ranged from 50% to 70%. Additionally, the aluminum smelter at Slatina would be refitted with new electrolysis units and equipped with wet scrubbers. Waste gases at Slatina have been a serious concern to the country's health officials, especially fluorine emissions.

Reportedly, in other related fields, contracts would be tendered to foreign firms to modernize Romania's production of diamond drilling equipment and to improve the technical level of geological exploration for minerals in Arges, Banat, Cluj, Harghita, Hunedoara, Maramures, and Suceava.

During the year, Canadian and Romanian officials reportedly held talks in Bucharest concerning possible Canadian assistance in modernizing various sectors of Romania's minerals industry.

## PRODUCTION

In 1991, the country's overall trend of mineral production continued to decline in nearly every category of mineral production chiefly because of ongoing political and social instability in the country throughout the year. Factors such as shortages of foreign exchange required for imports of raw materials (largely natural gas and petroleum), the slow pace of transition to a market economy system, as well as the loss of the Council for Mutual Economic Assistance (CMEA)-based mineral commodity trade continued to adversely affect Romania's heavy industries. In 1991, Romania's entire mineral industry continued to be owned and operated by the state. *(See table 1.)*

## TRADE

Detailed statistics for Romania's foreign trade for 1991 were unavailable. However, Romanian sources reported exports on a dollar accounting basis to have increased slightly (1.5%) in 1991 compared with those in 1990, while exports on a ruble accounting (clearing) basis fell by almost 32%. This was largely the result of the collapse of the CMEA's barter-based markets, including those for minerals trade.

This data, however, mainly reflected the rapid dissolution of soft currency accounting procedures in the former CMEA areas, as well as the overall orientation by Romania and other former Eastern European centrally planned economy countries toward the developed Western European market.[5]

Romania reported the exports of fuels and nonmetallic mineral raw materials in 1991 to have amounted to almost $620 million, constituting 17.5% of total exports on a dollar accounting basis. At the same time, imports of fuels and nonmetallic mineral raw material products were valued at $2.5 billion, or about 49% of total imports. Similarly, exports of base metals (ingot and semimanufactures) in 1991 amounted to about $610 million, or more than 17% of the total value of Romania's exports, while imports of this category amounted to about $220 million, or more than 4% of total imports.

In 1991, Romania's leading mineral exports to the United States included aluminum, nonalloy flat-rolled steel products, and refined petroleum products. Within the field of Romania's exports to the U.S. market, the sharpest decline was that of petroleum refinery products, which fell from $122 million in 1990 to $523,000 in 1991. This was consonant with both the reduced output of Romania's domestic crude petroleum as well as significantly reduced imports of crude petroleum in 1991 that were needed as feedstock for the country's relatively large petroleum refining sector. Most of Romania's exports to the U.S. market showed declines compared with those of 1991. The chief exception was that of aluminum, whose exports declined from $39 million in 1987 to $7,000 in 1989 and rose to only $70,000 in 1991. Coal, metallic salts, and unroasted iron pyrites comprised the major share of U.S. exports to Romania. In 1991, a substantial share of Romania's mineral imports from the United States also declined in value, compared with those in 1990. However, Romania's import of sulfur and unroasted iron pyrites from the United States appeared to have been the first such shipment in recent years and was valued at $2.4 million.

## 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 chief branches of the country's mineral industry. *(See table 2.)*

## COMMODITY REVIEW

In 1991, the profile of Romania's mining, processing, and fabricating industries reflected the economic priorities dictated by the previous regime. In concert with the rest of the former member countries of the CMEA, Romania's policy for industrial development was structured on the U.S.S.R.'s model of industrial development. Centrally planned economic policy, relative to raw materials, stipulated self-sufficiency at all costs, and where possible, total independence of the world market in respect to imports. The profit motive was eliminated, and an economywide system of subsidies was established. Heavy industries such as mining, metallurgy (steel and nonferrous), and machine building were given priority allocations of capital for both development and modernization. Romania's post-1989 minerals industry, however, was under the twin clouds of unacceptable rates of environmental pollution and questionable economic viability.

## Metals

*Aluminum and Bauxite.*—In 1991, Romania continued both open pit and underground bauxite mining operations at Dobresti-Oradea. Domestic bauxite was blended with small quantities of bauxite imported from Yugoslavia to be used as a feedstock at the Oradea alumina refinery. Imported feedstock was used exclusively at the Tucea refinery. Bauxite traditionally imported from Greece for the Tulcea refinery, in recent years, reportedly was replaced largely by bauxite imported from Australia and Guinea.

The Tulcea refinery exclusively produced metallurgical-grade alumina, whereas the Oradea refinery produced a small quantity of hydrated alumina in addition to metallurgical-grade alumina. Romania's only primary aluminum smelter was at Slatina in the southeastern part of the country. Despite high energy costs and substantial losses incurred from the production of primary metal, reportedly, in 1991, Romanian officials indicated that the country would continue to produce primary aluminum. Reportedly, Romania's aluminum industry would utilize 60% of its primary smelting capacity to produce about 160,000 mt/a of primary aluminum. Owing to a shortage of convertible currency required for importing aluminum as well as the need to maintain socially acceptable levels of employment, Romania's industry officials endorsed the continuation of domestic primary aluminum production to supply the country's needs. Reportedly, efforts to modernize the aluminum industry to increase efficiency and reduce high levels of pollution would continue.

*Copper.*—Copper was mined largely in two districts: the northern-northeastern part of the country that included mines at Baia Sprie, Cavnic, and Lesul Ursului, and in the western-southwestern part of the country, with major mines at Moldova Noua, Rosia Poieni, and Rosia Montana. Generally, the grade of ore has been low, with major producing mines (Moldova Noua and Rosia Poieni) hoisting ore grading about 0.35% Cu or less. Concentrates from these areas were smelted and refined at Baia Mare and Zlatna.

The significant decline in mine production of copper in 1990 and 1991, compared with that of 1989, reflected both rapid depletion of the country's economic ore reserves and greater worker mobility in the work force in the mining districts. Reportedly, from the early 1980's to 1989, work force mobility in mining was severely restricted by the Government to ensure adequate supplies of domestically produced raw materials at all costs.

*Iron and Steel.*—Despite showing increases in 1988 and 1989, the output of iron ore from the country's two operating mines at Hunedoara and Cluj Napoca, generally, has been declining since 1970. Moreover, domestically produced ore and concentrate did not significantly contribute to the feedstock requirements of the country's steel industry. Slightly more than 2 Mmt of low-grade ore (26% Fe) annually was washed and concentrated to produce about 400,000 tons of concentrate, grading 50% Fe. More than 95% of the iron and steel industry's iron ore requirements were met through imports. The U.S.S.R. traditionally has been Romania's chief supplier of iron ore, accounting for more than 50% of total imports of iron ore. In 1991, lacking the convertible currency needed to obtain iron ore for its 15-Mmt/a steel industry, Romania's output of crude steel reached just over 7 Mmt, or about 50% of the country's output in 1989. Reportedly, plans were discussed during the year to create a single holding company that would handle privatization and modernization of the steel industry. Also, Romanian steel industry officials consulted with representatives of France's Usinor-Sacilor about France's experience in restructuring its steel industry.

*Gold.*—Romania's reported gold production of 2 mt/a was primarily a byproduct of the country's copper and lead and zinc mining and refining operations. Small amounts of alluvial placer gold were also produced. In 1991, Romania requested the immediate return of its gold bullion reserves from the U.S.S.R. During World War I, Romania sent its gold bullion reserves, valued at $38 billion at current prices, to Russia for safekeeping. Following the Russian Revolution in 1917, the Soviet Government reportedly refused to return the gold to Romania on ideological grounds.

*Lead and Zinc.*—Low-grade ore was produced at underground mines in the Baia Mare, Borsa, Certej, and Rodna districts, grading from 0.4% Pb and 0.6% Zn to 1.0% Pb and 1.2% Zn. Moreover, Romania's lead and zinc ores also contained copper (0.35%), as well as associated antimony, bismuth, cadmium, gold, and silver. Owing to the complex mineralogy of the lead and zinc ores, concentrates produced from these ores were of uneven quality. Lead and zinc recovery in concentrate reportedly ranged between 50% to 75% PbS and ZnS.

The decline in production during 1990 and 1991, to a large extent, reflected a relaxation of the Government's mandate to produce minerals at all costs as well as the breakdown of intra-CMEA barter-based trade that to a significant extent supplied member countries with mineral fuels and raw materials.

## Industrial Minerals

Romania's extensive output of industrial minerals apparently was sufficient to meet most domestic needs. Barite, bentonite, diatomite, feldspar, graphite, gypsum, kaolin, and limestone, among others, were mined at about 60 deposits throughout the country. Industrial minerals should play an increasingly more important role in the country's economy. The need to modernize the country's economy and infrastructure will increase demand for asbestos, cement, clays, dimension stone, and other industrial minerals.

### Mineral Fuels

*Coal.*—In 1991, labor unrest continued in the Jiu Valley coalfields, which had a negative impact on coal production during the year. At yearend, the 200,000-member Mining Trade Union Confederation of Romania announced the start of a major strike in the coalfields, calling for higher wages and better working conditions. Reportedly, clashes with the authorites resulted in the death of 3 miners and 200 injured strikers. In the 1980's, reportedly, the most repressive measures taken by the Government against the country's work force were directed against the coal miners.

*Nuclear Energy.*—Romania's nuclear power program began in 1979 following an agreement with Candu, Canada's nuclear power design and construction company. Construction of the Cernavoda nuclear power station was reduced significantly in the mid-1980's owing to a lack of available funds. In 1991, reportedly only 50% of the powerplant was completed. In September, Canada reportedly approved a $277 million loan to Romania that would be used for the completion of the first stage of the reactor. Reportedly, the loan also was to help finance project management training, engineering support, and other services. The first 685-MW Candu reactor unit was scheduled to begin operation in 1995. When the four additional 685-MW reactor blocks are completed, the Cernavoda power station would account for about one-third of the country's generated electric power.

*Petroleum.*—With declining domestic production and limited financial resources, Romania was hard pressed to keep its large-scale petroleum refining industry supplied throughout the year with adequate stocks of crude petroleum. Late in the year, Romanian and Iranian officials reportedly held talks concerning a barter-based commercial transaction to supply Romania with 500,000 tons of diesel fuel and 1.5 Mmt of crude petroleum. Romanian officials reportedly also expressed interest in participating in the construction of a 12 $Mm^3/a$ natural gas pipeline that would extend from Iran through Turkey to Europe.

### Reserves

In view of Romania's efforts to orient its economy to a market-based system, the country's mineral resources will have to be reevaluated from a market economy 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 non-market economy countries, such as Romania, political rather than economic consideration was paramount in formulating policies for industrial development. Political directives to discover exploitable mineral resources may have resulted in possible overestimations and other distortions of collected field data. 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 need. The second classification related to the reliability of the data gathered on the quantity on the mineral in situ.

The second classification scheme designated deposits into "reserve" categories A, B, $C_1$, and $C_2$, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. In category A the "reserves" are known in detail. The ore bounderies are outlined by trenching, exploratory, workings, or exploratory boreholes. The depositional environment, the proportion of different commercial grades of ore, and the hydrogeological conditions of the exploitations have been ascertained and the quality and technological properties of the ore ascertained in detail, ensuring the projected reliability of projected beneficiation and production operations.

In category B, the "reserves" in place are explored. The ore bodies are outlined by exploratory workings or boreholes. The depositional environment is known, and the types and industrial grades of ore are ascertained but without details of their distribution. The quality and technological properties of the ore are known sufficiently well to ensure the correct choice of the system for its beneficiation. The general conditions of exploitation and the hydrogeological environment are known in good detail.

In category $C_1$, the "reserves" in place are estimated by a sparse grid of exploratory boreholes or workings. This category also includes "reserves" adjoining the bounderies of A and B categories of ore as well as "reserves" of very difficult deposits in which the distribution of the values of minerals cannot be determined even by a dense exploratory grid.

The quality, types and industrial grades of mineral, and technology of beneficiation are ascertained tentatively by means of laboratory tests and analyses and by analogy with known deposits of the same type. The general conditions of exploitation and the hydrogeological environment are known tentatively.

The $C_2$ category includes those "reserves" in place that adjoin the explored "reserves" of A plus B plus $C_1$ categories as well as "reserves" indicated by geological and geophysical evidence and confirmed by boreholes. Taking this system into account, Romania's mineral resources in categories $A+B+C_1$ are given in table 3.

## INFRASTRUCTURE

Romania's inland transportation system consisted of 85,798 km of railroads, highways, and inland waterways. The railroad system consisted of 10,860 km of 1.435-m-gauge track and 45 km of broad-gauge track; 3,411 km of track was electrified and 3,060 km was double track. The highway and road system consisted of

35,970 km of paved roads, 27,729 km of roads surfaced with gravel and crushed stone, and 9,100 km of unsurfaced roads. The country's inland waterways (Danube) consisted of 1,724 km with riverine ports at Giurgiu, Drobeta-Turnu Severin and Orsova. Sea ports on the Black Sea coast were Constanta, Galati, Braila, and Mangalia. Romania's merchant fleet consisted of 262 ships with a total weight of 5,207,580 dwt. Additionally, crude petroleum was carried in 2,800 km of pipeline, refined petroleum products in 1,429 km of pipeline, and natural gas in 6,400 km of pipeline.

## OUTLOOK

Low ore grades; severe environmental damage caused by the country's metals mining, processing, and smelting industries; and large-scale investments needed to modernize them have posed long-term problems for this sector of the country's mineral industry. However, the rationalization of the country's existing economic structure would include the modernization of its infrastructure, giving added value and importance to the country's industrial minerals sector.

[1]Where necessary, values have been converted from Romanian lei (L) to U.S. dollars at the rate of L76.39=US$1.00.
[2]Tribuna Economica, Bucharest. Mar. 6, 1992, p. 7.
[3]Revista Romana De Statistica, Bucharest. No. 2, 1992, p. 2.
[4]The Romanian Economic Reform Program, International Monetary Fund (Washington, DC, Nov. 1992) and GATT Report-L/6838, Apr.12, 1991, p. 3.
[5]Revista Romana De Statistica, Bucharest. No. 11, 1992, pp. 17-19.

OTHER SOURCES OF INFORMATION

### Agencies

Ministerul Industriei Metalurgice (Ministry of Metallurgy)
Bucharest, Romania
Ministerul Minelor (Ministry of Mines)
Bucharest, Romania
Ministerul Geologiei (Ministry of Geology)
Bucharest, Romania
Ministerul Petrolului (Ministry of Petroleum)
Bucharest, Romania

### Publications

Annuarul Statistic al Romaniei (Statistical Abstract of Romania).
Revista de Statistica (Statistical Review, monthly).

TABLE 1
## ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite, gross weight | | 480,000 | 500,000 | 313,000 | 204,000 | [3]200,400 |
| Alumina, calcined, gross weight | | 584,000 | 620,000 | 611,000 | 440,000 | [3]413,000 |
| Ingot including alloys: | | | | | | |
| Primary | | 260,000 | 265,600 | 269,100 | [r]168,000 | [3]158,200 |
| Secondary[e] | | 15,000 | [r]13,400 | [r]12,900 | 10,000 | 9,300 |
| Total | | 275,000 | [r]279,000 | [r]282,000 | [r]178,000 | [3]167,500 |
| Bismuth, mine output, Bi content[e] | | 75 | 65 | 65 | 40 | 50 |
| Cadmium metal, smelter[e] | | [r]90 | [r]75 | [r]65 | [r]40 | 10 |
| Copper:[e] | | | | | | |
| Mine output, Cu content | | 38,000 | 40,000 | [3]42,912 | [3]24,700 | 27,000 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary | | 38,000 | 40,000 | 42,900 | [3]28,325 | 28,000 |
| Secondary | | 1,000 | 1,000 | 1,500 | 1,000 | 1,000 |
| Total | | 39,000 | 41,000 | 44,400 | 29,325 | 29,000 |
| Refined: | | | | | | |
| Primary | | 39,500 | 40,000 | 42,900 | 24,700 | 24,500 |
| Secondary | | 3,000 | 3,000 | 5,100 | 3,000 | 3,000 |
| Total | | 42,500 | 43,000 | 48,000 | 27,700 | 27,500 |
| Gold, mine output, Au content[e] | kilograms | 1,870 | 1,870 | 2,020 | 2,000 | 2,000 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | thousand tons | 2,281 | [e]2,400 | 2,482 | [r]2,002 | 2,000 |
| Content (26% Fe) | do. | 595 | [e]624 | 645 | [e]580 | 500 |
| Metal: | | | | | | |
| Pig iron | do. | 8,673 | [r]8,941 | [r]9,052 | [r]6,355 | 4,500 |
| Ferroalloys:[e] | | | | | | |
| Ferrochromium | | 42,000 | 42,000 | 42,000 | [r]30,000 | 30,000 |
| Ferrosilicon | | 50,000 | 50,000 | 50,000 | [r]40,000 | 40,000 |
| Ferromanganese | | 81,000 | 80,000 | 80,000 | [r]60,000 | 60,000 |
| Silicomanganese | | 39,000 | 40,500 | 40,000 | [r]30,000 | 30,000 |
| Silicon metal | | 4,500 | 4,500 | 4,400 | [r]4,000 | 4,000 |
| Steel: | | | | | | |
| Crude | thousand tons | 13,885 | [r]14,314 | [r]14,411 | [r]9,761 | [3]7,092 |
| Semimanufactures: | | | | | | |
| Castings and forgings, finished[e] | do. | 1,400 | 1,300 | 1,300 | 1,000 | 1,000 |
| Pipes and tubes | do. | 1,394 | [r]1,569 | 1,360 | [r]1,041 | 800 |
| Rolled products | do. | 9,675 | [r]10,355 | 10,263 | [r]6,787 | 5,000 |
| Lead: | | | | | | |
| Mine output, Pb content[e] | | [r]27,100 | [r]20,500 | [r]17,400 | [r]24,700 | 16,200 |
| Smelter, primary | | [r]28,240 | [r]27,205 | [r]24,908 | [r]12,549 | [3]10,400 |
| Refined: | | | | | | |
| Primary[e] | | 37,700 | [r]33,000 | [r]30,000 | [r]13,000 | 11,000 |
| Secondary[e] | | [3]5,486 | 6,000 | [r]6,000 | [r]5,000 | 6,000 |
| Total[e] | | [3]43,186 | [r]39,000 | [r]36,000 | [r]18,000 | 17,000 |

See footnotes at end of table.

TABLE 1—Continued

## ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Manganese:[4] | | | | | | |
| Ore, gross weight[e] | thousand tons | 250 | 235 | 219 | 200 | 200 |
| Concentrate: | | | | | | |
| Gross weight | do. | 68 | 60 | 48 | 40 | 40 |
| Mn content[e] | do. | 19 | 17 | 12 | 10 | 10 |
| Silver, mine output, Ag content[e] | | 20 | 23 | 26 | r20 | 17 |
| Zinc: | | | | | | |
| Mine output, Zn content[e] | | 40,000 | 42,000 | 3 54,467 | 15,000 | 25,900 |
| Metal, smelter, primary and secondary | | r45,960 | r39,631 | r29,849 | r11,464 | 3 8,700 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite[e] | | 25,000 | 25,000 | 3 25,250 | 15,000 | 20,000 |
| Cement, hydraulic | thousand tons | 13,583 | r14,447 | r13,265 | r10,838 | 3 7,300 |
| Clays:[e] | | | | | | |
| Bentonite | | 180,000 | 180,000 | 180,000 | 150,000 | 150,000 |
| Kaolin | | 400,000 | 400,000 | 400,000 | 250,000 | 250,000 |
| Diamonds, synthetic industrial[e] | thousand carats | — | 5,000 | 5,000 | 3,000 | 3,000 |
| Diatomite[e] | | 55,650 | 55,000 | 3 49,975 | 39,000 | 40,000 |
| Feldspar[e] | | 65,000 | 65,000 | 3 59,960 | 45,000 | 50,000 |
| Fluorspar[e] | | 18,000 | 18,000 | 18,000 | 12,000 | 12,000 |
| Graphite[e] | | 12,000 | 12,000 | 3 10,000 | 6,000 | 6,000 |
| Gypsum[e] | | 1,600 | 1,600 | 1,400 | 800 | 800 |
| Lime | thousand tons | 3,936 | r4,046 | r3,983 | r3,028 | 3,000 |
| Nitrogen: N content of ammonia | do. | r2,776 | r2,795 | r2,736 | r1,786 | 1,800 |
| Pyrites, gross weight[e] | do. | 850 | 930 | 3 897 | 400 | 400 |
| Salt: | | | | | | |
| Rock salt[e] | do. | 2,000 | 2,000 | r2,000 | 2,000 | 2,000 |
| Other | do. | 3,395 | r3,153 | r3,038 | r2,262 | 2,500 |
| Total | do. | 5,395 | r5,153 | r5,038 | r4,262 | 4,500 |
| Sand[e] | do. | 2,500 | 2,450 | 2,400 | 2,000 | 4,000 |
| Sodium compounds, n.e.s.: | | | | | | |
| Caustic soda | do. | 817 | 821 | r763 | r552 | 500 |
| Sodium carbonate, manufactured, 100% $Na_2CO_3$ basis | do. | 894 | 918 | r889 | r632 | 600 |
| Sulfur: | | | | | | |
| S content of pyrites[e] | do. | 340 | 370 | 3 359 | 150 | 150 |
| Byproduct, all sources[e] | do. | 350 | 380 | 3 375 | 200 | 200 |
| Total[e] | do. | 690 | 750 | 3 734 | 350 | 350 |
| Sulfuric acid | do. | 1,693 | 1,825 | r1,687 | r1,111 | 1,100 |
| Talc[e] | | 55,000 | 50,000 | 3 45,638 | 35,000 | 35,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon black | | 88,790 | r102,000 | r77,000 | r58,000 | 60,000 |
| Coal: | | | | | | |
| Run-of-mine: | | | | | | |
| Anthracite and bituminous | thousand tons | 11,693 | r11,568 | r11,583 | r5,950 | 5,500 |

See footnotes at end of table.

TABLE 1—Continued

## ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | | |
| Coal—Continued: | | | | | | |
| Run-of-mine—Continued: | | | | | | |
| Brown | thousand tons | 897 | r910 | r899 | r677 | 500 |
| Lignite | do. | 43,109 | r50,439 | r53,980 | r34,220 | 34,000 |
| Total | do. | 55,699 | r62,917 | r66,462 | r40,847 | 40,000 |
| Washed (produced from above): | | | | | | |
| Anthracite and bituminous: | | | | | | |
| For coke and semicoke production | do. | 3,474 | r3,410 | r3,218 | r1,351 | 1,500 |
| For other uses | do. | 5,625 | r5,732 | r5,082 | r3,096 | 3,000 |
| Brown | do. | 846 | r861 | r843 | r640 | 500 |
| Lignite | do. | 41,579 | r48,751 | r52,200 | r33,097 | 32,400 |
| Total | do. | 51,524 | r58,754 | r61,343 | r38,184 | 3,37,400 |
| Coke: | | | | | | |
| Metallurgical | do. | 5,326 | 5,228 | r5,322 | r3,700 | 3,100 |
| Other | do. | 500 | r523 | r548 | r278 | 300 |
| Total | do. | 5,826 | r5,751 | r5,870 | r3,978 | 3,400 |
| Fuel briquets (from brown coal)[e] | do. | 750 | 750 | 750 | 500 | 450 |
| Gas, natural: | | | | | | |
| Gross: | | | | | | |
| Associated | million cubic meters | 12,117 | r11,609 | r10,729 | r9,182 | 9,000 |
| Nonassociated | do. | 25,301 | r25,195 | r22,222 | r19,154 | 15,400 |
| Total | do. | 37,418 | r36,804 | r32,951 | r28,336 | 3,24,400 |
| Marketed[e] | do. | 29,900 | 29,400 | 29,500 | 21,000 | 23,000 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | thousand tons | 9,504 | r9,389 | r9,173 | r7,928 | 3,6,800 |
| Converted | thousand 42-gallon barrels | 71,850 | r70,474 | r69,852 | r59,508 | 3,51,041 |
| Refinery products | do. | r201,193 | r201,330 | r195,939 | r154,055 | 110,000 |

[e]Estimated. [r]Revised.

[1]Includes data available through Jan. 1993.

[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.

TABLE 2

## STRUCTURE OF THE MINERAL INDUSTRY OF ROMANIA FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies (all stateowned) | Location of main facilities | Annual capacity |
|---|---|---|---|
| Alumina | Ministry of Metallurgical Industry | Plant at Orades, 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 | 3,000 |
| Do. | do. | Cimpulung plant, about 60 kilometers north of Pitesti | 2,000 |
| 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 | 10,400 |
| Lignite | Ministry of Mines, Oltenia Mining Complex, including Rovinari Mining Enterprise | Jiu Valley, Oltenia County, north of Craiova | 20,300 |
| 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 the 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 the 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 | 1,320 |
| 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 the 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 million cubic feet per year | Ministry of Petroleum and Gas | Tirgu Mures Field at Tirgu Mures, north-central Romania | 996,000 |
| Do. do. | do. | Ploesti Field, 50 kilometers of Bucharest | 249,000 |

TABLE 2—Continued

## STRUCTURE OF THE MINERAL INDUSTRY OF ROMANIA FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies (all state owned) | Location of main facilities | Annual capacity |
|---|---|---|---|
| Petroleum crude barrels per day | Ministry of Petroleum Gas | 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, between the west bank of the Olt River and Tirgu Jiu | 250,000 |
| Petroleum products do. | do. | Refineries at Brazi, Pitesti, Suplacu, Bacau, Borzesti, Brosov, Cimpina, Darmanesti, G. Gheorghiu Dej-Onesti, Ploesti, Telajen, and Navodari | 533,000 |
| Steel | Ministry of the Metallurgical Industry: Galati Steel Complex | Danube River, north of Braila, near the U.S.S.R. border | 10,000 |
| Do. | Hunedoara Steel Complex | West-central Romania, near Calan | 4,000 |
| Do. | Resita Steel Plant | Near the Bulgarian border close to the Danube | 1,200 |
| Do. | Calarasi Steel Plant | Southwestern Romania, about 20 kilometers southwest of Caransebes | 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 |

TABLE 3

## ROMANIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1991

(Metric tons unless otherwise specified)

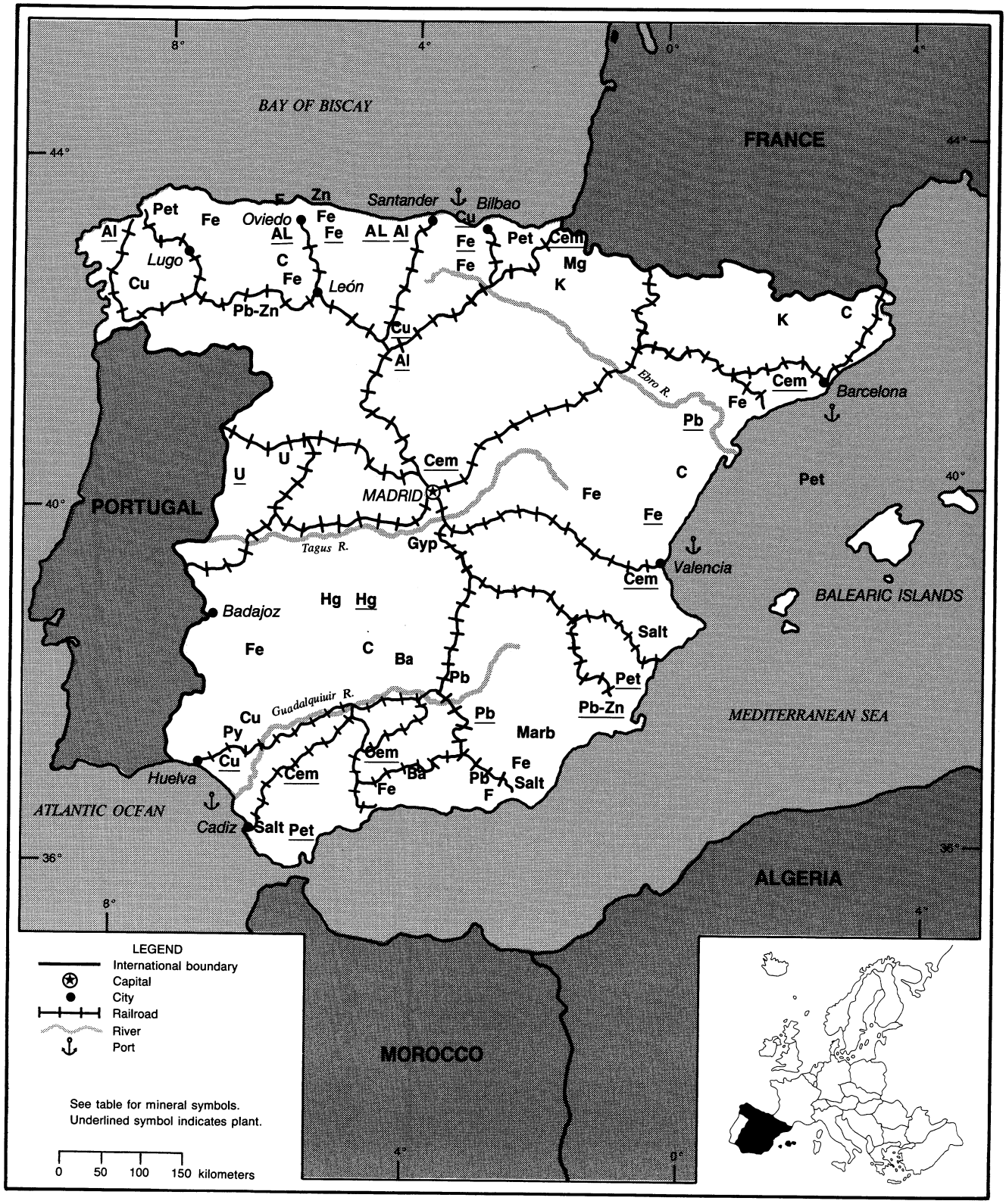
| Commodity | | Resources[e] |
|---|---|---|
| Bauxite | | 2,550,000 |
| Coal:[1] | | |
| Anthracite | | 50,000,000 |
| Bituminous | | 792,000,000 |
| Lignite | | 2,752,000,000 |
| Copper | | 1,462,500 |
| Iron ore | | 15,300,000 |
| Lead | | 585,000 |
| Natural gas | billion cubic meters | 485 |
| Petroleum | | 145,200,000 |
| Zinc | | 1,440,000 |

[e]Estimated.

[1]Sources: Tribuna Economica, No. 10, Mar. 1992.

# SPAIN

**AREA 504,750 km²** **POPULATION 39.3 million**



THE MINERAL INDUSTRY OF

# SPAIN

By Harold R. Newman

Spain, whose land area includes a major portion of the Iberian Peninsula, is one of the most mineralized areas of Western Europe. The area is geologically very complex, and this increases its potential for mineral resources. The Iberian Pyrite Belt is located within the southwestern part of the Iberian Peninsula, covers an area 230 km long and an average of 30 km in width, and trends in an east-west direction from the Portuguese coast near Setubal to the Guadalquivir River near Seville, Spain. This area is considered the most significant mining district within the EC and is an important source of nonferrous and precious metals. The main polymetallic deposits from west to east are Aljustrel and Neves-Corvo in Portugal and Tharsis, Scotiel, Rio Tinto, and Aznalcollar in Spain.

The Iberian Peninsula has a diverse mining history that dates to Phoenician times. Since then, there have been exploitations to extract a wide range of minerals. However, it was not until the middle of the 19th century that intense mining activities were initiated owing primarily to the influx of English and French foreign capital.

In 1991, Spain continued as one of Europe's important mineral producers of base metals and industrial minerals. The country was the EC's sole producer of mercury and tantalite and the only significant producer of natural sodium sulfate. The country's entry into the EC meant that many industries had to adjust to economic realities and prepare to compete in the 1992 European Common Market. Sectors particularly affected by this were the steel, fertilizer, and coal industries. Spain's economic growth in recent years has been largely due to the availability of plentiful natural resources, lower labor costs than most other EC countries, and access to EC markets. Threfore, despite a slowdown in activity in several industrial sectors, Spain had a real GDP increase of about 2.4% in 1991.

## GOVERNMENT POLICIES AND PROGRAMS

The Government has fostered economic growth, but has had to rationalize some of the Government-controlled industries. The coal and steel industries had to reduce production capacity in accordance with Spain's acceptance into the European Coal and Steel Community (ECSC). The resulting loss of jobs increased the rate of unemployment, which was already higher than the EC average unemployment rate. Unemployment at yearend was estimated to be more than 2 million or around 15% of the working population.

Investment-led economic growth has provided some relief to the unemployment problem. Over the past 5 years, Spain has enjoyed the highest investment-led output growth in the Organization for Economic Co-Operation and Development (OECD) countries. The Government continued consultations to improve relationships with labor and business in an attempt to maintain a competitive advantage and to control inflation. The Government sees challenges to competitive advantage if inflation and wages are not managed and market-oriented reforms are not continued.

Because of the very high oil dependency ratio, energy supply was a high priority of the Government. The 1990 to 1995 National Energy Plan (PEN) seeks to reduce this ratio by shifting to natural gas and using renewable sources of energy more intensively. Five new powerplants that are scheduled to be built would be coal-fired and are expected to use imported coal.

## PRODUCTION

The mineral industry operated in numerous regions throughout the country. The estimated value of Spanish mineral production in 1990, the latest year that full data were available, was about $4,325 million.[1] Fifty percent of this value was attributed to the mineral fuels sector; 11% to the metals sector; and 39% to the industrial minerals sector. Within the EC, Spain was the largest producer of mined lead and zinc, a major producer of pyrites, the only producer of mercury, and had the highest level of self-sufficiency with respect to mineral raw materials.

Demand for quarried products used for infrastructure construction increased. The industrial growth in the EC contributed to the increased demand for these mineral products from Spain. Quarried natural stone accounted for 16% of the value of Spanish mining. With the exception of coal it was the most important mining sector in dollar value in the country. *(See table 1.)*

## TRADE

Liberalization of foreign trade flows has proceeded quickly since Spain's entry into the EC. Almost 40% of the difference between Spanish tariffs and EC Common Market external tariffs had been removed with complete elimination planned by 1992. Table 2 shows the impact of selected classes of mineral commodities on Spain's balance of payments position in relation to the EC and the world. *(See table 2.)*

Table 3 shows the reserves of selected minerals. Spain was a large importer of

mineral fuels, and it was expected that this situation would continue as the demand for energy increased. Currently, about 15% of consumption was satisfied by imported coal. Spain received about 80% of its gas supplies from Algeria and Libya, with the remaining from domestic production. *(See table 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is composed of both state-owned and private-owned entities. Minerals belong to the state under an arrangement known as the "Regalian Principal." The Mining Law of July 19, 1944, as amended, and the Hydrocarbon Law of December 26, 1950, as amended, govern the mineral industry. The Ministry of Industry and Energy implements the mineral laws, regulates the private sector, and manages most of the state-owned companies through the Instituto Nacional de Industria (INI), a state holding company. INI and Instituto Geologico y Minero (IGM) are the principal Government mineral resource agencies. Since joining the EC in 1986, foreign investment has resulted in substantial growth in the mineral industry. *(See table 4.)*

## COMMODITY REVIEW

### Metals

***Aluminum.***—Alumina and primary aluminum were produced almost entirely by the Industria Espanola del Aluminio S.A. (Inespal) Group. INI is Inespal's major shareholder. Alumina Espanola S.A., a subsidiary located near San Ciprian, produced alumina,primary aluminum in standard and special alloys,and ingots and sheet ingots. In 1991, Inespal's share of the Spanish market for primary aluminum was about 94% and about 39% for downstream products.

It was a difficult year for Inespal because of increased electricity cost, increases in Spanish interest rates, and weak world aluminum prices. To overcome some of these problems, Inespal initiated a program of specialization within the plants of the group. Also, theoretical alumina capacity at the Alumina Espanola plant was increased from 800,000 mt/a to 1 Mmt/a. These efforts have had a positive effect on controlling costs; however, it was reported by Inespal that production costs at yearend were still higher than the selling price of aluminum.

Aluminum Company of Canada Ltd. (Alcan) sold its 23.9% financial share of Inespal to INI. However, Alcan was still involved in the Iberian market and has established a subsidiary, Alcan Iberica, to market its products in Spain and Portugal from Alcan plants in Germany, Switzerland, and the United Kingdom.

American National Can (ANC), a subsidiary of Pechiney of France, was constructing an aluminum beverage can plant near Barcelona. The plant, scheduled to come on-stream in 1992, is ANC's second in Spain. The plants were expected to produce about 1.2 billion cans annually. ANC was planning to take advantage of the growing market in southern Europe for beverage cans.

In 1991, Spanish aluminum consumption was 9.2 kg per person compared with a 16.5 kg per person average for the EC. Approximately 34% of the country's production was exported.

***Copper.***—Rio Tinto Minera S.A. operated a smelter and refinery at Huelva with a capacity of 120,000 mt/a of copper cathodes, 150 mt/a of refined silver, and 5 mt/a of gold. The copper smelter was the second largest in Europe, and the complex was the only one in Spain that both transformed copper ore into raw copper and then refined the copper in an electrolysis plant.

Electrolisis de Metales S.A. (ELMET) closed its secondary refining plant at the end of 1990. ELMET was constructing a new plant to treat secondary materials to produce black copper. The black copper material to be produced is a binding of 80% copper with varying amounts of lead, tin, and nickel. The technology is based on "Caldo" ovens with oxygen injection, which Metallo Chimique of Belgium developed. Metallo Chimique is the parent company of ELMET.

***Gold.***—Navan Resources PLC of Ireland and Tolsa S.A. of Spain formed a joint venture for a gold exploration project. Navan,with 80% interest, would participate as operator in the exploration of a 150-km$^2$ area in the Almeria Province of southern Spain. Previous exploration by Billiton Minerals S.A. on the La Mezquita concession at Palai-Islica had delineated a deposit of 750,000 tons of ore with a grade of almost 2.2 grams of gold per ton.

Filon Sur and Thorco Resources continued processing gold ore at Europe's first heap-leach gold project in Spain. The project, located near the southwestern Spanish port of Huelva, focused on processing tailings to recover gold. The ore was produced from Minas de Tharsis' mining operations that originally recovered copper, zinc, and sulfur from pyrite deposits.

Anglo American Charter Espana and Villabona-Hullas del Coto SA formed a joint-venture company, Durandel S.A., for the exploration and possible development of a gold-silver deposit at Carles-Salas in the Asturias region.

It was reported that the EC Directorate-General for Science and Research had given the first grant ever to a mining consortium exploring for gold in Spain. Partners in the consortium, known as Empisa, included Europa Minerals Group of Spain, who owns the mineral rights to the lands at Pepon in Badajoz in the Iberian Peninsula; the Portuguese Dereccao Geral de Geologia e Minas; Instituto Technologico Geominera de Espana; the University of South Hampton, United Kingdom; the British Geologic Survey; and the National Engineering Research Council, United Kingdom.

***Iron Ore.***—Compania Andaluza de Minas S.A. (CAM) is the largest iron ore producer in Spain. In addition to an open pit mine that produced about 3.3 Mmt/a from the Alquife deposit on the north side of the Sierra Nevada approximately 80 km from Granada, CAM operated a

90,000-dwt capacity shiploader at the port of Almeira.

CAM was in the process of negotiations with various organizations to reduce its costs. This involved energy costs, rail to port costs, and labor costs through some reduction in the work force. CAM was also considering reducing production. On the whole these measures were expected to enable the company to continue mining the Alquife deposit for another 5 years.

CAM also started a drilling program at its new Calahora deposit about 3 km from the current mine site. If sufficient reserves are defined, CAM was expected to start exploiting the deposit in the late 1990's.

***Iron and Steel.***—Spain gained full membership into the ECSC as of January 1, 1989. The Spanish steel industry was continuing in its efforts to adapt to the economic environment and realities of the 1992 Common Market in Europe. The industry was completely integrated into the EC except for some minor issues such as residual tariffs that are to remain in effect until the end of 1992. However, the industry remained under heavy pressure because of an excess of supply in the Spanish market.

The Spanish Government set up a new state-owned holding company, Corporacion de la Siderurgia Integral (CSI), for Spain's two largest integrated steel producers, Ensidesa and Altos Hornos de Vizcaya (AVH). CSI has been charged with developing the future strategy of the two companies to reduce production costs and improve productivity. Several options were expected to be explored, including closure of one or more of the companies' nine blast furnaces, adoption of thin slab casting, and expansion of both Ensidesa's raw steel output and AVH's higher value products like coated sheet. Also, a unified export organization was expected to be set up.

Ensidesa completed modernization of the four high reversing heavy plate mill at its Gijon works. The $30 million project included measures to improve product quality and yield and reduce operating costs. The mill, with a capacity of 700,000 mt/a of thick plate, was Spain's only heavy plate producer.

***Mercury.***—Spain was second only to the former U.S.S.R. in mercury production. Work was continued on Minas de Almaden y Arrayanes S.A.'s (MAYASA) Las Cuvas Mine at Almaden, in southern Spain. The new mine, expected to begin production in 1992, contained estimated reserves of 140,000 tons of ore at a grade of 5% mercury.

The world's oversupply of mercury during the year hurt the profitability of mercury producers. The drop in both mercury sales and prices continued to aggravate MAYASA's economic problems at its mines. MAYASA was reported to have stopped production and was selling from stockpiled material.

***Zinc.***—Asturiana de Zinc S.A. is the largest refined zinc producer in the EC and accounts for approximately 4% of the world's zinc production. Asturiana was continuing with its expansion project. By yearend 1991, the company had a new roasting unit on-stream with a capacity of 850 mt/a. This, along with the two existing roasting units, was considered sufficient to cover the planned zinc metal production of 320,000 mt/a. Also, a new electrolytic section with a capacity of 100,000 mt/a was under construction.

The Asturiana smelter is better suited than most European operations to increase output. The company's nearby Reocin mine supplies 45% of the feed concentrates. Another 40% is supplied by Exminesa with whom Asturiana has a long-term contract.

Curragh Resources Ltd., of Canada, purchased a 20% interest in Asturiana de Zinc S.A. in 1990. Reportedly, this acquisition would have provided Curragh Resources Ltd. with smelting capacity for its mines in Canada. However, in 1991, Curragh put its 20% interest up for sale reportedly following disagreements with Espanol de Credito, the major shareholder, over the value of the holdings.

Penarroya Espana S.A.'s 40,000 mt/a zinc refinery and Espanola del Zinc's 30,000-mt/a smelter and refinery complex at Cartagena were temporarily closed for 1 month at the beginning of 1991 by the Murcia regional government. The Government stated the closure was due to the companies' nonconformance to environmental legislation, which resulted in sulfur and heavy metal emissions over Cartagena in southern Spain. Nonferrous producers in Spain have come under renewed pressure to reduce pollution emissions.

Trellebourg AB of Sweden, the parent company of Boliden International Mining, announced that it was investing about $96 million at the Aznalcollar Mine near Seville. Andaluza de Piritas (Aprisa), a subsidiary of Boliden, has been operating the mine since 1987. It was originally estimated that reserves would be exhausted by mid-1992; however, discovery of an additional 5.5 Mmt of reserves at deeper levels could extend the estimated life of the open pit operation until mid-1995. The mine was producing 135,000 to 140,000 mt/a of zinc concentrates, 40,000 mt/a of lead concentrates, and 25,000 mt/a of copper concentrates. The mine also produces a large amount of pyrite.

## Industrial Minerals

***Ammonia.***—The major Spanish nitrogen producer, Feritilizantes Espanoles S.A. (Fesa), continued with the closure of several plants. Under the company's rationalization plan, the less competitive ammonia-producing units were closed. Primarily, these were plants with annual outputs under 100,000 tons. As a result, ammonia production was to be concentrated at three large plants: Fesa's plant at Huelva with a capacity of 246,000 mt/a of ammonia and Empresa Nacional de Fertilizantes SA (Enfersa) plants at Cartagena and Puertollano. Enfersa's two plants had a combined capacity of 380,000 mt/a of ammonia.

The annual capacity of the Puertollano plant was to be increased from 217,000 mt/a to 228,000 mt/a, and production of the Huelva plant was to be increased to 307,000 mt/a. Also, energy consumption was made more efficient by converting

the plants' feedstocks from naphtha to natural gas.

With the completion of the rationalization plan, ammonia capacity in Spain would be about 700,000 mt/a, well below the high of 900,000 mt/a produced during the decade of the 1980's.

*Cement.*—Major construction projects such as the Seville Expo '92, the Barcelona Olympics, and associated infrastructure projects have contributed to growth in the cement industry in all sectors except exports. Because domestic production was unable to keep up with demand there was an increase in imports.

During 1984 to 1990, cement consumption almost doubled going from 16 Mmt/a to 29 Mmt/a. Total national cement production was equivalent to about 80% of the effective milling capacity of 36 Mmt/a.

*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 produced more than 400,000 mt/a of kaolin and have resulted in Spain becoming one of the more important kaolin producers in Europe. Most operations are small, and all are mined by open pit methods.

*Other Industrial Minerals.*—Rio Tinto Minera was exploring a rare—earths deposit in Galicia. The Monte Galineiro deposit reportedly contained neodymium and yttrium used for superconducting materials. The deposit was also reported to contain cesium, niobium, thorium, and zirconium.

## Mineral Fuels

*Coal.*—Spain is endowed with reserves of anthracite and bituminous coal and lignite and is the third largest anthracite/bituminous coal producer in the EC. In the past, domestic production had provided the coal requirements of the power generation industries. About 97% of the coal produced is consumed domestically in thermoelectric plants. In 1990, about one-third of Spain's coal needs was imported, and future plans called for increased coal usage in the electric generating industry. More coal was expected to be imported because Spanish coal, particularly lignite, had a high sulfur content. Imported coal, mainly from the Republic of South Africa, was around 15% of consumption and was expected to reach 30% by the end of this century. Compliance with environmental legislation would require significant investments by most companies for them to utilize domestic lignite in their operations.

The Spanish Government presented its coal mines redevelopment plan to the European Commission for Energy. The plan was expected to cost approximately $940 million over the next 4 years. Greater mechanization of the mines would be provided, along with mine closures. Twenty mines were closed in 1991. It was expected that another 20 mines would be closed in the near future under the Government's plan. The total loss of jobs was estimated at 12,000. In conjunction with this, the Government created a state company, Empresa Nacional de Innovation, which was set up to alleviate unemployment in mining areas by channeling investments to create jobs.

*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's National Energy Plan (PEN) has indicated that natural gas was expected to furnish 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 and the Marisma onshore field provided most of Spain's natural gas. It was estimated these resources could provide around 2 billion $m^3$a.

A new planned pipeline will initially deliver 1.3 billion $m^3$ of natural gas from Algeria. This volume would reportedly increase to 2.8 billion cubic $m^3$ by the mid-1990's. The 2,000-km long by 1.2-m diameter pipeline, expected to be completed in the late 1990's, would cross the Strait of Gibraltar and enter Spain at a point still to be determined.

*Petroleum.*—Spain had very little domestic crude production, which accounted for a small percentage of the country's requirements. Casablanca, an offshore field, and Ayoluengo, an onshore field, were the only two producing fields. There has been little effort to discover new reserves since Amoco and Chevron withdrew from Spanish exploration in 1989.

Chevron also withdrew from production operations in 1991 and sold both its exploration and operations assets to Cimaz S.A., a Spanish investment company. Chevron owned 18.92% of the Casablanca offshore oilfield, 25% of the Ayoluengo onshore oilfield, and 25% of the Marisma onshore gasfield. The price was not disclosed.

*Uranium.*—Empressa Nacional del Uranio (Enusa) was proceeding with the construction of a uranium concentrate plant to increase capacity at Saelices el Chico in the province of Salamanca. The capacity of the plant would be increased from the 254 mt/a of $U_3O_8$ existing at yearend 1990 to 950 mt/a and was expected to be in operation in 3 years. The project, estimated to cost $40 million, was being subsidized by the EC through the Salamanca Regional Development Organization.

The Spanish Government continued with the moratorium on construction of nuclear powerplants. Reportedly, the reasons for extending the moratorium were cost, diversification of energy supply, and environmental protection. The moratorium has affected several projects that were more than half completed. Hidroelectrica Espanola and Sevillana Utilities were the plants most

impacted by the termination of work on the Valdecaballeros powerplant in western Spain.

## INFRASTRUCTURE

The Spanish National Railways (RNFE) operates on 13,500 km of 1.668-m-gauge track and 1,820 of 1-m-gauge track. This is different from the 1.435-m-gauge track used throughout most of Europe. Most of the 150,000 km of highways are paved; however, only a small portion is limited access divided highways. Infrastructure improvements were one of the Government's priorities. The main ports are Bilbao, Gijon, Barcelona, Tarragona, Cartagena, Cadiz, and Huelva.

## OUTLOOK

The mineral resource base in Spain has not been fully exploited, and this mineral resource-rich country is expected to continue to contribute these resources for the continued development of Spain and the EC. For example, mercury and zinc are important export commodities, and continued exploration may lead to additional reserves of these commodities.

The lower labor costs in Spain and the abundant natural resources have fueled growth above the EC average, growth rate. The fears of an overheated economy have resulted in the tightening of the country's fiscal policy by the Government. Industrial growth has been above the EC average, and the projected economic advantages of Spain's entry into the EC would appear to indicate a strong near-term outlook for the country. By joining the EC, Spain gained virtually unrestricted access to a market that was 15 times larger in terms of purchasing power than its own.

[1]Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas 103.9 = US$1.00, the average exchange rate in 1991.

## OTHER SOURCES OF INFORMATION

### Agencies

Instituto Geological y Minero
Rios Rosas 23
Madrid 3, Spain
Ministerio de Industria y Energia
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

Published by the Ministerio de Industria y Energia, Madrid:
Estadistica Minera de Espana, annual.
Industria Minera, monthly.
La Industria Siderurgica Espanola, annual.
Panorama Minero, annual.
Annual reports from various mineral resource companies:
Altos Hornos de Vizcaya; Asturiana de Zinc; Ensidesa Group; Grupo Instituto Nacional de Industria (INI); Inespal Group; Rio Tinto Minero; Repsol Petroleos; et al.

TABLE 1
## SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum: | | | | | | |
| Bauxite | | 1,050 | r2,500 | r970 | r1,000 | 1,000 |
| Alumina[2] | | 800,654 | 880,500 | r949,125 | r1,001,605 | 1,003,000 |
| Metal: | | | | | | |
| Primary | | 340,972 | 323,100 | 352,435 | r353,302 | 355,000 |
| Secondary | | r e40,000 | r e40,000 | r44,410 | r63,318 | 64,000 |
| Antimony, mine output, Sb content | | 20 | 20 | — | — | — |
| Cadmium metal | | 297 | 306 | 361 | e300 | 300 |
| Copper: | | | | | | |
| Mine output, Cu content | | r16,213 | r14,165 | r28,519 | r10,877 | 10,000 |
| Metal: | | | | | | |
| Blister: | | | | | | |
| Primary | | 115,700 | 111,000 | e120,000 | e110,000 | 111,100 |
| Secondary | | 33,000 | 34,600 | e32,300 | r40,300 | 38,000 |
| Total | | 148,700 | 145,600 | e152,300 | r e150,300 | 149,100 |
| Refined: | | | | | | |
| Primary | | 100,410 | 108,756 | e115,700 | e116,000 | 129,500 |
| Secondary | | 51,000 | 50,000 | e50,000 | e50,000 | 60,000 |
| Total | | 151,410 | 158,756 | e165,700 | e166,000 | 189,500 |
| Gold, mine output, Au content | kilograms | r7,539 | r7,882 | r8,566 | r8,705 | 8,600 |
| Iron and steel: | | | | | | |
| Iron ore and concentrates (including byproduct concentrate): | | | | | | |
| Gross weight | thousand tons | 4,499 | 4,212 | r4,563 | e3,030 | 3,920 |
| Fe content | do. | 2,109 | 1,925 | r2,128 | r1,438 | r1,840 |
| Metal: | | | | | | |
| Pig iron | do. | 4,901 | 4,691 | 5,535 | 5,542 | 3,5,404 |
| Ferroalloys, electric furnace | do. | 146 | r153 | r161 | r157 | 160 |
| Steel: | | | | | | |
| Crude | do. | 11,691 | 11,886 | 12,765 | 12,718 | 3,13,039 |
| Castings and forgings | do. | e140 | 160 | 182 | r169 | 170 |
| Total | do. | 11,831 | 12,046 | 12,947 | r12,887 | 3,13,209 |
| Semimanufactures | do. | e11,000 | 8,843 | 11,012 | r11,341 | 3,11,146 |
| Lead: | | | | | | |
| Mine output, Pb content | | r81,629 | 74,672 | r62,783 | r58,482 | 50,000 |
| Metal: | | | | | | |
| Primary | | 71,400 | 68,800 | 62,032 | r66,600 | 72,000 |
| Secondary | | 51,300 | 52,000 | r52,500 | r57,400 | 59,000 |
| Mercury: | | | | | | |
| Mine output, Hg content | kilograms | 1,085,203 | r1,967,037 | r1,224,053 | — | — |
| Metal | do. | 1,570,971 | 1,614,586 | r967,100 | r961,515 | 900,000 |
| Silver, mine output, Ag content | do. | r522,208 | r573,511 | r668,298 | e500,000 | 400,000 |
| Tantalum minerals (tin byproduct): | | | | | | |
| Gross weight | do. | 9,980 | 10,890 | r e10,000 | e10,000 | 10,000 |
| Ta content | do. | 2,720 | 2,725 | r e2,600 | r e2,600 | 2,000 |

See footnotes at end of table.

TABLE 1—Continued

## SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Tin: | | | | | | |
| Mine output, Sn content | | 77 | 66 | r56 | r27 | 25 |
| Metal, primary | | 1,671 | 806 | 800 | e600 | 600 |
| Titanium dioxide[e] | | 36,000 | 37,000 | 37,000 | r30,000 | 30,000 |
| Tungsten, mine output, W content | | r80 | r81 | 58 | 49 | 50 |
| Uranium, mine output, $U_3O_8$ content | | 372 | 323 | r273 | r269 | 260 |
| Zinc: | | | | | | |
| Mine output, Zn content | | 272,556 | 281,724 | 266,724 | r257,500 | 261,000 |
| Metal, primary and secondary | | 224,000 | r245,400 | 246,400 | r252,700 | 273,400 |
| INDUSTRIAL MINERALS | | | | | | |
| Barite | | 7,776 | 6,585 | r6,745 | r11,285 | 9,000 |
| Bromine[e] | | 300 | 300 | 300 | 300 | 300 |
| Cement, hydraulic, other than natural | thousand tons | e25,000 | e25,000 | r27,374 | r28,092 | 327,581 |
| Clays: | | | | | | |
| Attapulgite | | 40,818 | 43,585 | r23,990 | r e30,000 | 30,000 |
| Bentonite | | 103,420 | 103,753 | r143,389 | r151,226 | 150,000 |
| Kaolin, marketable: | | | | | | |
| Crude | | 17,891 | 150,840 | r40,530 | e125,000 | 125,000 |
| Washed | | 433,077 | 438,160 | r395,805 | r423,357 | 425,000 |
| Refractory, not further described | | 484,608 | 506,456 | e500,000 | e500,000 | 500,000 |
| Other[e] | thousand tons | 39,949 | 10,000 | 10,000 | 10,000 | 10,000 |
| Diatomite and tripoli | | 66,217 | 81,331 | r83,943 | r92,043 | 90,000 |
| Feldspar | | 161,631 | 195,668 | r198,274 | r214,152 | 200,000 |
| Fluorspar: | | | | | | |
| Gross weight: | | | | | | |
| Acid-grade | | r123,895 | r121,640 | r162,741 | r144,010 | 145,000 |
| Metallurgical-grade | | 3,670 | 5,435 | r9,584 | r9,681 | 9,500 |
| Total | | r127,565 | r127,075 | r172,325 | r153,691 | 154,500 |
| Ca $F_2$ content: | | | | | | |
| Acid-grade | | r120,837 | r118,599 | r158,400 | r144,010 | 150,000 |
| Metallurgical-grade | | 3,126 | 4,598 | r7,452 | r7,394 | 7,000 |
| Total | | r123,963 | r123,197 | r165,852 | r151,404 | 157,000 |
| Gypsum and anhydrite, crude | thousand tons | 6,684 | 7,469 | e5,500 | e5,000 | 5,000 |
| Kyanite, andalusite, related materials | | 3,916 | 3,360 | e3,500 | e3,600 | 3,600 |
| Lime, hydrated and quicklime[e] | thousand tons | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| Magnesite: | | | | | | |
| Calcined | | r106,499 | 151,216 | r165,881 | r158,828 | 160,000 |
| Crude | | r396,002 | r467,816 | r430,778 | r444,350 | 445,000 |
| Mica | | 370 | 2,233 | r951 | r913 | 1,000 |
| Nitrogen: N content of ammonia | thousand tons | 495 | 477 | 552 | 485 | 460 |
| Pigments, mineral: | | | | | | |
| Other | | 7,765 | 8,394 | e8,400 | r8,993 | 8,600 |
| Red iron oxide[e] | | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Potash, $K_2O$ equivalent | | 741,240 | r766,089 | r741,454 | r780,875 | 760,000 |
| Pumice | | 1,053,914 | 909,625 | r828,408 | e900,000 | 800,000 |
| Pyrite, including cuprous, gross weight | thousand tons | 2,177 | r1,521 | r941 | r1,638 | 1,600 |

See footnotes at end of table.

TABLE 1—Continued

## SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Salt: | | | | | | |
| Rock, including byproduct from potash works | thousand tons | 2,250 | 2,455 | [r]2,496 | [r]2,519 | 2,500 |
| Marine and other | do. | 944 | 1,425 | [r]594 | [r]858 | 800 |
| Sand and gravel: Silica sand[4] | do. | 2,434 | 2,420 | [e]2,400 | [r e]2,200 | 2,200 |
| Sepiolite | | 482,784 | 507,782 | [r]494,647 | [r]515,340 | 500,000 |
| Sodium compounds, n.e.s.: | | | | | | |
| Soda ash, manufactured | thousand tons | [e]550 | [e]550 | [r]483 | [r]527 | 500 |
| Sulfate: | | | | | | |
| Natural: | | | | | | |
| Glauberite, $Na_2SO_4$ content | | 266,885 | 269,518 | [r]298,500 | [r]475,752 | 450,000 |
| Thenardite, $Na_2SO_4$ content | | 208,370 | 209,700 | [r]240,105 | [r]240,688 | 250,000 |
| Manufactured[e] | | 160,000 | 160,000 | 160,000 | 150,000 | 150,000 |
| Stone: | | | | | | |
| Calcareous: | | | | | | |
| Chalk | thousand tons | 345 | 361 | [r]429 | [r e]400 | 400 |
| Dolomite | do. | 2,240 | 2,829 | [r]4,371 | [r e]4,000 | 4,000 |
| Limestone | do. | 85,522 | 100,222 | [r]112,439 | [r e]115,000 | 115,000 |
| Marble | do. | 948 | 1,369 | [r]1,336 | [r e]1,400 | 1,400 |
| Marl | do. | 5,474 | 5,106 | [r]5,105 | [e]6,000 | 600 |
| Basalt | do. | 1,352 | 2,109 | [r]2,356 | [r e]2,500 | 2,500 |
| Granite | do. | 11,433 | 9,635 | [r]7,609 | [r e]10,000 | 10,000 |
| Ofite | do. | 1,552 | 1,905 | [r]2,184 | [r e]2,000 | 2,000 |
| Phonolite | do. | [e]600 | 763 | [r]678 | [e]750 | 750 |
| Porphyry | do. | 721 | 805 | [r]678 | [r e]700 | 700 |
| Quartz | do. | 532 | 977 | [r]923 | [e]900 | 900 |
| Quartzite | do. | 910 | 715 | [r]881 | [e]700 | 700 |
| Sandstone | do. | 1,549 | 1,768 | [r]1,967 | [e]1,800 | 1,800 |
| Serpentine | do. | 544 | 422 | [r]420 | [e]400 | 400 |
| Other | do. | [e]26,000 | 37,232 | [r]43,853 | [r e]28,000 | 30,000 |
| Strontium minerals: | | | | | | |
| Gross weight | | 28,867 | 45,631 | [r]35,134 | [r e]35,000 | 30,000 |
| $Sr_2O_4$ content | | 26,496 | 41,981 | [r]32,323 | [e]31,000 | 28,000 |
| Sulfur: | | | | | | |
| S content of pyrites | thousand tons | 1,011 | 1,057 | 894 | 748 | 800 |
| Byproduct:[e] | | | | | | |
| Of metallurgy | do. | 110 | 110 | 110 | 100 | 100 |
| Of petroleum | do. | 8 | 8 | 8 | 8 | 8 |
| Of coal (lignite) gasification | do. | 2 | 2 | 2 | 2 | 2 |
| Total | do. | 1,131 | 1,177 | 1,014 | 858 | 910 |
| Talc and steatite | | 75,307 | [r]68,979 | [r]71,660 | [r e]70,000 | 70,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal (marketable): | | | | | | |
| Anthracite | thousand tons | 5,361 | 5,276 | 5,519 | [r]5,758 | 5,800 |
| Bituminous | do. | 13,607 | 13,609 | 13,605 | [r]13,724 | 14,000 |
| Lignite | do. | 15,627 | 12,960 | 17,275 | [r]16,374 | 16,000 |
| Total | do. | 34,595 | 31,845 | 36,399 | [r]35,856 | 35,800 |

See footnotes at end of table.

TABLE 1—Continued

## SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Coke, metallurgical[e] | thousand tons | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Gas, natural (marketed) | million cubic meters | 710 | 952 | 1,150 | 1,553 | 1,500 |
| Peat | | 67,401 | 75,434 | e75,000 | e77,000 | 75,000 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 14,207 | 15,949 | r7,564 | r7,593 | 37,615 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 18,850 | 20,497 | r21,541 | r20,056 | 20,000 |
| Naphtha | do. | 21,224 | 20,336 | r13,294 | r15,062 | 15,000 |
| Gasoline, motor | do. | 68,629 | 68,655 | r78,464 | r80,376 | 80,000 |
| Jet fuel | do. | 24,344 | 27,600 | e27,000 | e30,000 | 30,000 |
| Kerosene | do. | 24,986 | 29,613 | e28,000 | e29,000 | 29,000 |
| Distillate fuel oil | do. | 89,385 | 95,757 | r100,151 | r109,408 | 110,000 |
| Residual fuel oil | do. | 98,801 | 93,220 | r89,417 | r92,907 | 92,000 |
| Other | do. | 38,836 | 37,709 | r30,093 | r30,128 | 30,000 |
| Refinery fuel and losses | do. | 12,957 | 12,026 | e12,000 | e12,000 | 12,000 |
| Total | do. | 398,012 | 405,413 | r e399,960 | r e418,937 | 418,000 |

[e]Estimated. [r]Revised.

[1]Table includes data available through July 1992.

[2]Reflects aluminum hydrate.

[3]Reported figure.

[4]Includes sand obtained as a byproduct of feldspar and kaolin production.

TABLE 2

## SPAIN: 1990 BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand dollars)

| Mineral commodity | Exports to EC | Imports from EC | Net gain or (loss) | Exports to the world | Imports from the world | Net gain or (loss) |
|---|---|---|---|---|---|---|
| Crude industrial minerals: | | | | | | |
| Feldspar | 825 | 5,103 | (4,278) | 936 | 7,947 | (7,011) |
| Magnesite | 2,251 | 68 | 2,183 | 3,206 | 506 | 2,700 |
| Slate | 271 | 128 | 143 | 429 | 128 | 301 |
| Other | 180,737 | 191,940 | (11,203) | 258,736 | 440,459 | (181,723) |
| Total | 184,084 | 197,239 | (13,155) | 263,307 | 449,040 | (185,733) |
| Metalliferous ores: | | | | | | |
| Copper | 7,853 | 43,835 | (35,982) | 28,519 | 180,548 | (152,029) |
| Lead | 14,864 | 4,424 | 10,440 | 16,694 | 16,664 | 30 |
| Tin | — | 147 | (147) | — | 7,648 | (7,648) |
| Zinc | 32,294 | 1,162 | 31,132 | 52,810 | 63,604 | (10,794) |
| Other (including waste and scrap) | 138,432 | 657,251 | (518,819) | 173,932 | 1,200,321 | (1,026,389) |
| Total | 193,443 | 706,819 | (513,376) | 271,955 | 1,468,785 | (1,196,830) |
| Nonmetallic mineral manufactures | 267,294 | 125,063 | 142,231 | 476,062 | 285,796 | 190,266 |
| Metals: | | | | | | |
| Iron and steel | 1,641,662 | 2,021,337 | (379,675) | 2,742,451 | 2,587,322 | 155,129 |
| Mercury | 2,152 | 292 | 1,860 | 2,707 | 537 | 2,170 |
| Other nonferrous metals | 669,616 | 965,686 | (296,070) | 879,751 | 1,285,540 | (405,789) |
| Total | 2,313,430 | 2,987,315 | (673,885) | 3,624,909 | 3,873,399 | (248,490) |
| Mineral fuels | 1,140,856 | 1,082,732 | 58,124 | 2,882,171 | 10,330,798 | (7,448,627) |

[1]Table prepared by Harold Willis, Section of International Data.

Source: United Nations data base.

TABLE 3
## SPAIN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

| Commodity (in situ resources) | Reserves[e] (thousand tons) |
|---|---|
| Barite | 1,170 |
| Coal, anthracite and bituminous | 500,000 |
| Copper | 2,600 |
| Fluorspar | 25,000 |
| Iron ore[1] | 6,000 |
| Lead | 2,800 |
| Mercury | 76,000 |
| Potash | 28,000 |
| Pyrite | 150,000 |
| Sulfur | 30,000 |
| Uranium[2] | 46 |
| Zinc | 7,200 |

[e]Estimated.
[1]Thousand tons of Fe.
[2]Uranium concentrate, $U_3O_8$.

TABLE 4

## SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Alumina | Alumina Espanola S.A. | Alumina plant at 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— | | |
| | 65 producers in Province of Leon, of which the largest are— | | 6,100 including— |
| | | | 3,400. |
| Do. | 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 | |
| | Gonzalez y Diez S.A. | Mines: Grupo Minero de Tineo | (500). |
| | | | (130). |
| Do. | 14 producers in Province of Palencia, of which the largest are— | | (600). |
| | Antracita de Gillon S.A. | Mines at La Valilla | (135). |
| | Sdad. Minera San Luis | Mines at Trueno and Cecilia | (61). |
| | 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 | 14,000 including— |
| | Hunosa S.A. | Real, Cordoba, Leon, Oviedo, Palencia, Seville | |
| | | 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. (Kali-Chemie of West Germany, 100%) | 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. (Union Explosives Rio Tinto, 75%; Rio Tinto Zinc, 25%) | Smelter at Huelva | 85. |
| Do. | do. | 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. |
| Ore | Electrolists de Cobre S.A. | Electrolytic refinery at Palencia | 32. |
| | 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. |
| Do. | do. | Corta Atalay opencast mine, Cerro Colorado opencast mine and plant, and Alfredo underground mine—all in Rio Tinto area | 30. |

See footnotes at end of table.

TABLE 4—Continued

## SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Fluorspar | Fluorspar S.A. (Bethlehem Steel Corp., 49%) | 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 | 60. |
| Iron ore | Compania Andaluza de Minas S.A. (Mokta, 62%) | Mine at Alquife, Granada | 4,000. |
| Do. | Altos Hornos de Vizcaya S.A. (U.S. Steel, 25%) | 9 mines in Province of Vizcaya | 4,000. |
| Do. | Compania Minera Siderurgica de Ponferrada 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. (Penarroya, France, 98%) | 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. |
| Do. | Ferroaleaciones Espanolas, S.A. | Secondary smelter at Medina del Campo | 12. |
| Do. | Derivados de Minerales y Metales | Secondary smelter at Barcelona | 5. |
| Ore | Sociedad Minera y Metalurgica de Penarroya Espana, S.A. (Penarroya, France, 90%) | 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. (ESMINESA) | 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 | Minas de Almaden y Arrayanes S.A. (Government, 100%) | Mine and smelter at Almaden | 70,000 flask's. |
| Petroleum: | | | |
| Crude | Chevron S.A. | Oilfield at Casablanca | [1]300. |
| Refined | Repsol Petroleo S.A. (Repsol) | Refineries at Escombreras | [1]200,000. |
| | do. | Puertollano | [1]140,000. |
| Do. | do. | Tarragona | [1]260,000. |
| Do. | Refineria de Petroleos del Norte S.A. | Refinery at Somorrostro (Petronor) | [1]240,000. |
| Do. | Compania Espanola de Petroleos S.A. (Cepsa) | Refinery at Santa Cruz de Tenerife | [1]160,000. |
| Do. | do. | Refinery at Algeciras | [1]160,000. |
| Do. | Petroleos del Mediterraneo S.A. (Petromed) | Refinery at Castellon de la Plana | [1]120,000. |
| Do. | Compania Iberica Refinadora de Petroleos S.A. (Petroliber) | Refinery at La Coruna | [1]140,000. |

See footnotes at end of table.

TABLE 4—Continued

## SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

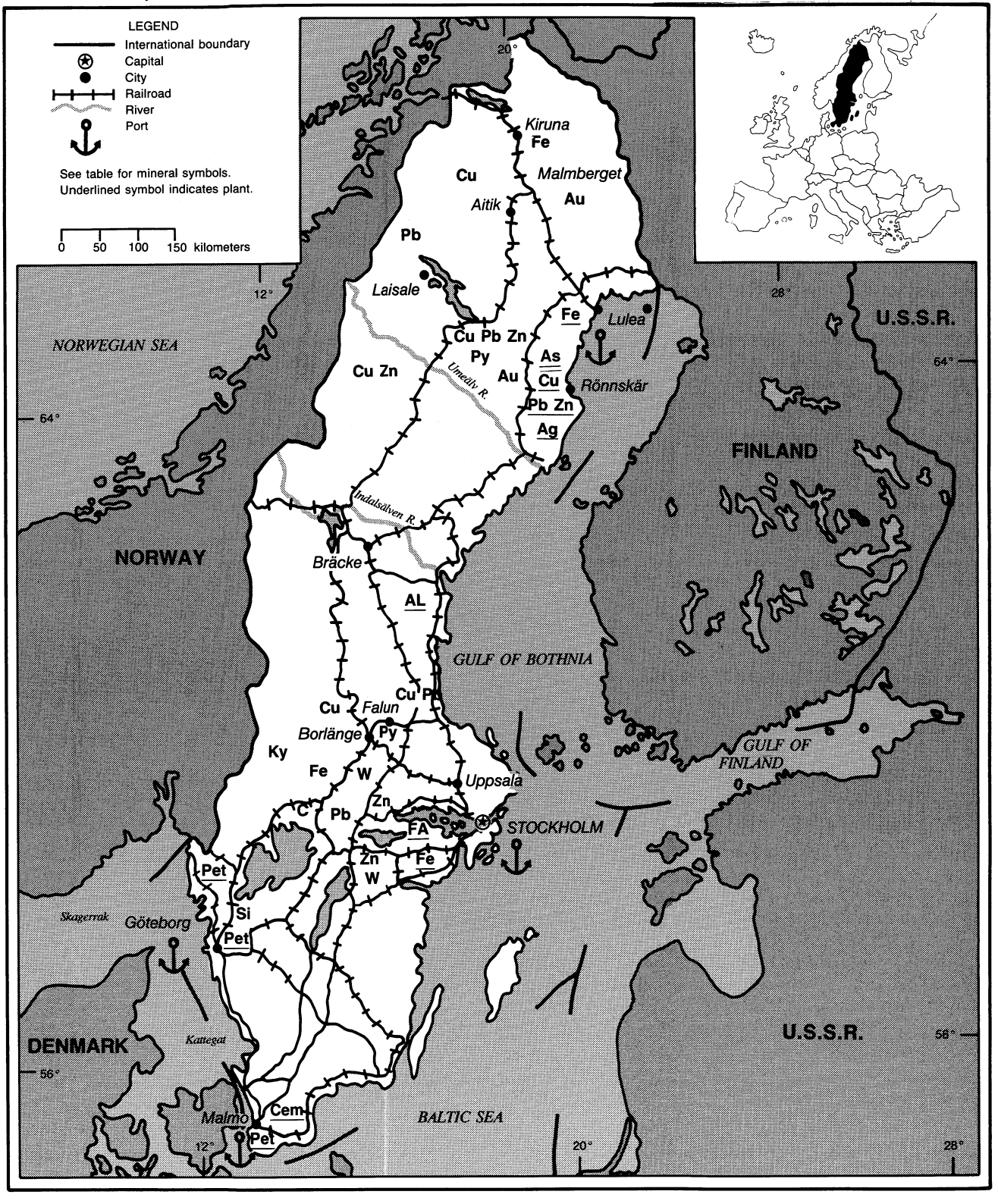
(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| 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 Tharsis | Mines and plants at Tharsis and Zarza, near Siville | 1,300. |
| Do. | do. | Plant at Huelva | 600. |
| Do. | Rio Tinto Minera S.A. (Union Explosivos Rio Tinto, 75%; Rio Tinto Zinc, 25%) | Mines and plant at Rio Tinto, near Siville | 900. |
| 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 in Oviedo, and Moreda, Gijon | 6,000. |
| Do. | Altos Hornos de Viscaya S.A. (U.S. Steel, about 20%) | Iron and steel works at Sestao, Bilbao | 1,500. |
| Uranium | Government | Mines and plant near Cludad Real | 500 ($U_3O_8$). |
| Zinc: | | | |
| Metal | Real Cia. Asturiana de Minas S.A. | Electrolytic zinc plant at San Juan de Nueva | 200. |
| Ore | do. | Reocin mines and plants near Torrelavega, Santander | 500 (ore). |
| Do. | Andaluza de Piritas S.A. (APIRSA) | Open pit mine at Aznalcollar, Sevilla | 3,500 (ore). |
| Do. | Exploracion Minera International Espana S.A. (EXMINESA) | Underground mine at Rubiales, Lugo | 500 (ore). |
| Do. | Sociedad Minera y Metalurgica de Penarroya-Espana S.A. | Mines and plants at Montos de los Azules y Sierra de Lujar, San Agustin | 220 (ore). |

NA Not available.
[1]Barrels per day.

# SWEDEN

**AREA 449,000 km²** **POPULATION 8.5 million**



THE MINERAL INDUSTRY OF

# SWEDEN

By Jozef Plachy

The Swedish economy is a unique blend of capitalism and socialism, combining an internationally oriented free market production system with socialist redistribution policies. The mining and processing industry, employing approximately 10,000 people, was an important sector in this production system. Iron ore was one of Sweden's important natural resources. Total metal mining accounted for 1.7% of Sweden's industrial production and 0.4% of the country's GDP. Another important natural resource was forestry products. Steelmaking, particularly alloy and stainless, have historically been an important part of Sweden's minerals sector. Recently, in spite of a lack of fossil fuels, Sweden's petrochemical and petroleum refining industry has shown significant growth.

## GOVERNMENT POLICIES AND PROGRAMS

In July 1991, the Government formally applied to join the EC, thereby accepting the implemention of the far-ranging structural changes that full membership requires. As part of these changes, Sweden began to dismantle foreign exchange controls, deregulate its financial markets, and relax its legislation controlling foreign takeovers and joint ventures. Current legislation reportedly limits foreign investors' holdings to 20% of voting rights and a 40% share of capital without securing Government approval. According to the Swedish Ministry of Industry and Commerce, the Government is planning to privatize 35 state-owned companies with a total of 300,000 employees and annual sales of over $38 billion. Privatization candidates reportedly include steel industry (Svenskt Stal AB), mining (Luossavaara-Kiirunavaara AB), and energy concerns (Vattanfall). However, ownership of mineral rights and mines are reportedly likely to remain restricted from foreign ownership.

## PRODUCTION

In 1991, Sweden reportedly mined over 65% of Western European iron ore, It also reportedly mined 28% of Western European copper, 34% of Western European lead, and 18% of Western European zinc. The country's relative importance in the production of refined metals, however, was far less significant. Sweden produced less than 7% of Western Europe's refined copper, less than 5% of Western Europe's refined lead, and no refined zinc. Sweden was an important producer of specialty steels.

## TRADE

Foreign trade is an essential part of the Swedish economy. Combined imports and exports of goods and services reportedly account for almost two-thirds of its GDP. In mineral production, because of its relatively small population, Sweden must look to foreign markets to acheive optimal production runs. To achieve high efficiency in the processing of certain minerals, indigenous production is supplemented by foreign raw materials, usually imported duty free.

In 1991, the export of manufactured products, including steel, accounted for about 85% of total exports. Of Sweden's total mineral commodity exports, more than one-half went to the EC and about 20% to its European Free Trade Association (EFTA) partners.

In 1991, the United States received 8.1% of Swedish exports and accounted for 8.5% of Sweden's total imports. *(See tables 2 and 3.)*

## STRUCTURE OF THE MINERAL INDUSTRY

In 1991, most mineral industry enterprises were either wholly state-owned or controlled by the state through majority shareholding.

Government agencies involved in the mineral industry are the Swedish Geological Survey (mapping and information dissemination), the State Mining Property Commission (exploration financing), the Swedish Geologic Company (consultant to the mineral industry), and the National Board for Technical Research (research financing).

Some of the major state-owned enterprises include Luossavaara-Kiirunavaara AB (LKAB) and the Trelleborg Group's Boliden Mineral AB. LKAB is one of the world's largest iron ore producers and Boliden is the largest nonferrous ore producer and processor in Sweden. *(See table 4.)*

## COMMODITY REVIEW

### Metals

The Trelleborg Group, of which Boliden and Svedala Industri AB are two of four business sectors, is Sweden's fastest growing industrial group with more than 300 subsidiaries in 30 different countries. To counter declining profits due to a slowdown of the building industry and weak metal prices, the Trelleborg Group made investments in foreign countries. During the past few years, the Trelleborg Group, through its subsidiary Boliden International Mining, acquired a Spanish mining company Aspirisa (Aznalcollar Mine); 50% of the

Canadian company, Falconbridge; 10% of Portuguese Pirets Alentejanas (Aljustrel Mine); and signed an agreement with Burkina Faso to develop the Perkoa zinc deposit. The latest acquisition, the Sukhaybart gold mine in Saudi Arabia, opened in April 1991.

*Aluminum.*—Because of a $4.6 million loss suffered at the end of 1991, the Swedish primary aluminum producer Granges decided to reduce production at its Sundsvall smelter by 20%, or 20,000 tons. The reason for the cut was the declining price for aluminum metal (33% in 2 years), in part caused by the continuous flow of Russian primary aluminum to Western Europe.

*Copper.*—The 10% increase in mined copper production was partially due to increased production at the Aitik and Viscaria Mines. After a recent closure for modernization and expansion, the production of the Aitik Mine, 100 km north of the Arctic Circle, increased to about 16.5 Mmt of sulfide ores annually along with 14.3 Mmt of waste rock. About 190,000 tons of concentrate, with a metal content of about 50,000 tons copper, is produced annually. Boliden geologists are exploring for another ore body near the existing mine. The estimated proven reserves at this location will ensure production for about 40 years. The relatively low average copper content (0.38%) is offset by 0.22 g/mt of gold and 4 g/mt of silver. The main pit of the Aitik Mine, reportedly the largest in Europe, is 2,500 m long, 915 m wide, and 230 m deep. A 15-m bench height is used. The ore from the Aitik mine is locally concentrated and sent to the Ronnskar smelter and refinery, accounting for more than one-half of its feed. Copper production at Ronnskar increased from 96,500 tons in 1990 to 100,000 tons in 1991. The average recovery of copper is about 90%, with a 50% recovery of gold and a 70% recovery of silver.

At its Kristinerberg copper mine, Boliden has installed an underground haulage system of 500,000-mt/a capacity from a lower working level up to a crusher station.

At the beginning of 1989, the Viscaria copper mine in northern Sweden, owned by LKAB, was falling below the profitability level and was planning to cease operation. With the 1991 introduction of new technology and the discovery of additional reserves, the production will reportedly continue at least until 1993. At present, it produces 1 to 1.3 Mmt of ore annually with 2.8% copper content.

Other nonferrous ores are also processed at Boliden's Ronnskar smelter/refinery complex in Skelleftehamn. In addition to copper, the Skelleftehamn smelter also produces lead ores and precious metals. The capacity of the smelter exceeds domestic mine production and, therefore, both concentrates and scrap metal need to be imported.

*Ferroalloys.*—Wargons Alloys is the only remaining producer of ferroalloys in Sweden. It is on the southern tip of Vanern Lake, close to the coastal city of Goteborg, in southern Sweden. The 1991 production of 115,000 tons of ferroalloys was slightly lower than that in 1990. High-carbon ferrochromium and charge ferrochromium accounted for about 80% of ferroalloy production; the remaining 20% was ferrosilicon. After recent upgrading, the plant capacity was expanded to 150,000 mt/a, and the average chromium content in the ferrochromium was increased from 56% to 62%.

*Iron Ore.*—Sweden's production of iron ore in 1991 was about 3% lower than that in 1990. Approximately 80% of the total was exported to Western European countries, with a small but increasing share (9.4% in 1991) going to the Middle East. Pellet production and exports in 1991 were 9.8 Mmt and 6.4 Mmt, respectively. With the completion of a new pelletizing plant in Kiruna, the Swedish pelletizing capacity should increase from 9.8 Mmt/a in 1991 to an estimated 13 Mmt/a by 1995.

LKAB is the world's eighth largest producer of iron ore. With a 1991 production of 18.6 Mmt (2.6% lower than that in 1990), it accounts for 96% of total Swedish iron ore output. All of LKAB production originated in two mining complexes: Kiruna and Malmberget, both in northern Sweden. With a production of just less than 13 Mmt/a, 0.3 Mmt less than that in 1990, the Kiruna mining complex (Kiirunavaara, Luossavaara, and Leveaniemi Mines near Svappavaara) is the largest producer of iron ore products. The principal ore type is apatite-bearing magnetite averaging 60% iron and 0.05% to 5% phosphorus. The crude ore was processed and delivered in the form of pellets (6.8 Mmt), fines (5.4 Mmt), and lump ore (0.8 Mmt). In October 1991, the Board of Directors decided to build a new main level at the Kiirunavaara Mine at a depth of 1,045 m. It should be operational by 1997 and was expected to extend production by 25 years. A prerequisite for this $300 million investment to be profitable is that LKAB is given full control over the rail transport between the mines and port of Narvik in Norway. The 1991 production at Malmberget Mine was the same as that in 1990, but because of lower iron content, the quantity of finished products was slightly less. Out of 8.7 Mmt of crude ore, a total of 3 Mmt of pellets and 2.6 Mmt of fines was produced in 1991.

LKAB is one of the state-owned companies that the Swedish Government reportedly intends to privatize during the next 2 to 3 years.

*Lead.*—The 7.3% decline of ore production in 1991 was partially caused by the temporary closure of the Laisvall lead-zinc mine, in northern Sweden. The closure was due to low metal prices and adverse currency fluctuations. Although approximately 50% of the feed at Boliden's Ronnskar lead smelter is from the Laisvall Mine, the smelter was not closed during this period. In the past, the Laisvall Mine supplied about 75,000 of the 103,000 mt/a of locally originated lead concentrates that Ronnskar refines. Because the Laisvall reserves, according

to a Boliden spokesman, was expected to last for only 5 to 6 years, the future of the Ronnskar lead smelter would reportedly be reconsidered.

*Molybdenum.*—The Swedish firm Metals & Powders Trollhattan, owners of 2,270 mt/a molybdenum roasting operation and metallothermic ferroalloy plant in Trollhattan, was purchased in 1991 by CLIMAX Molybdenum.

*Steel.*—While production of pig iron increased slightly in 1991, the production of crude steel declined by about 5%, to 4.2 Mmt. The decrease was reportedly caused by the largest fall in steel consumption in Sweden since 1977, a decline of about 15% over that of 1990. For the largest Swedish steel company, the 3.1-Mmt/a capacity Svenskt Stal AB (SSAB), the decline in 1991 was even greater. The lack of demand from the building industry accounted for a 30% drop in business volume for its construction steel subsidiary Plannja, and a weak demand from the auto industry caused a 20% fall in deliveries from its flat products service center division, the Dickinson Group. Because large numbers of shares are already in the private sector (52% of equity and 40% of voting rights) and because it is a reportedly low-cost producer, SSAB was expected to be among the first companies to be privatized.

For Sandvik AB, one of the largest wire producers in Europe, the profit in 1991 reportedly declined by 42% from that of 1990. A net loss was reportedly prevented by successful concentration on stainless and other high-alloy steel products. Sandvik AB, through its subsidiary, Tubular Products, in Scranton, Pennsylvania, will reportedly invest in a U.S. extrusion facility to produce redraw hollows for the company's seamless redraw plants. The proposed plant could be used to bypass a 20.46% dumping duty placed on all Swedish imports of redraw hollows.

The 1991 turnover at Avesta Ab, the largest Swedish stainless steel producer (245,000 mt/a), dropped by 10%, reportedly resulting in a loss of $39 million and 465 jobs. Avesta's purchase of a Florida mill from Armco will soften the impact of a 34.5% U.S. duty on welded stainless pipe imports. Because 82% of its production is exported, Avesta is aiming to make several small foreign acquisitions to increase its distribution network.

As a part of restructuring, the major Swedish rebar producer, Fundia AB, closed its electric melting shop and rebar mill in Halmstad and upgraded its Smedjebacken works.

*Zinc.*—The 1991 mined ore production of 161,700 tons of contained zinc was slightly lower than that in 1990. About 40% came from the Zinkgruvan Mine, near Askersund in central Sweden, where production remained about 720,000 mt/a of ore grading about 10% zinc and 2% lead. The mine is operated by Vieille Montagne Sverige AB, a division of the Belgian ACEC-Union Miniere group. It consists of three sections: the main ore body, which accounts for the bulk of the output; the Knallagruvan section to the west, and the recently discovered Burkland section. The main ore body dips at 70° to 75° over 4 km. The thickness of the seam varies from 0.5 to 10 m. About 20% of all reserves is in veins of 0.5 to 3.5 m wide with an average width of only 1.3 m. At the present time, most of the output originates between levels of 650 m and 800 m. The concentrate is trucked to Lake Vanern for shipping through the inland waterways to the North Sea.

## Industrial Minerals

*Cement.*—During 1991, Cementa, Sweden's sole producer of cement, has reportedly upgraded one of the lines at its Slite plant. The old precalcination system was replaced by an RSP precalciner and a new roller crusher was installed in the existing clinker cooler system. These improvements increased the Slite plant capacity from 4,700 mt/d to 5,200 mt/d.

*Fertilizers.*—Hydro-Supra, the Swedish subsidiary of Norsk Hydro, has announced that the production of phosphate fertilizers at its Landskrona plant will gradually cease production, starting in 1992. Only the production of calcium ammonium nitrate will remain.

*Graphite.*—At the end of 1991, the Swedish Government published the details of the Kringeltjarn graphite deposit, situated 90 km northwest of the Baltic port of Gavle, near Edsbyn, in central Sweden. Following trenching and drilling of 35 holes, the reserves in the central part of the deposit were reportedly estimated to be 1 Mmt grading 10% to 12% carbon. It will reportedly be possible to extract 40% of the carbon content as medium-flake grade containing 87% carbon, while about 50% of the carbon content could reportedly be extracted as a fine crystalline product with a purity approaching 98% carbon. Ore-dressing tests reportedly showed carbon recovery of about 90%.

## Mineral Fuels

*Electric Energy.*—Of the total electric energy, 50% was reportedly hydroelectric and 45% nuclear. Three-fourths of the country's electric power is generated in the north and conveyed to the populous south by high-voltage transmission lines. In 1991, Sweden reportedly decided that by the year 2010 the 12 nuclear reactors will be shut down, with 2 of the reactors closing as early as 1995. They are reportedly to be replaced by natural gas operated plants.

The new sulfur dioxide and carbon dioxide taxes added in 1991 to the existing 25% value added tax on energy use of industrial and domestic consumers would reportedly hurt the competitiveness of the Swedish minerals sector. The energy tax reportedly adds 9% to the cost of mining and quarrying. In the Swedish steelmaking sector, where approximately one-half of carbon steel and all specialty steel is reportedly made in electric furnaces, the energy tax reportedly adds $22 per ton of crude and $57 per ton of special steel.

*Natural Gas.*—The possibility of constructing a pipeline that would supply Norwegian natural gas from the Haltenbanken Gasfield in the Norwegian Sea across central Sweden to the Baltic city of Gavle and from there under the Baltic Sea to Finland was reportedly being studied. If built, this pipeline would give Sweden ready access to natural gas supplies. A major problem in justifying the construction of such a pipeline is that the volume of gas that would be consumed by Sweden and Finland could be too low to justify the necessary investment in infrastructure.

### Reserves

The State Mining Property Commission is an independent authority responsible for all state-financed prospecting and maintaining data on reserves. The estimated reserves of major minerals are shown in table 5. (See table 5)

## INFRASTRUCTURE

Sweden has a well-developed transportation system, especially in the southern part of the country. It includes 97,400 km of highways, of which 51,900 km is paved and 20,650 km is gravel. Out of 12,000 km of railroads, operated by the Swedish State Railway (SJ), 10,800 km is standard gauge, of which about 70% is electrified. The inland waterways add up to 2,050 km, navigable by small steamers and barges. Because of its location, the merchant marine is Sweden's most important mode of transportation. It consists of 182 ships, of which 74 are cargo (including roll-on/roll-off), 70 are tankers (petroleum, oil, lubricants, chemical, liquefied gas, specialized, and combination oil/gas), 12 are bulk, and 3 are container ships. The major ports are in Gavle, Goteborg, Halmstad, Helsingborg, Kalmar, Malmo, and Stockholm.

## OUTLOOK

In 1991, Sweden formally submitted an application for membership in the EC, anticipating full affiliation by January 1, 1995. In May 1991, the Swedish krona was tied to the European Community Unit (ECU). The 1991 interim creation of a European Economic Area, between EC and EFTA countries, will speed up the structural adjustments that EC membership would demand.

The anticipated membership will likely influence policy options for future years. In addition to privatizing 35 state-owned companies, state monopolies, such as power-generation authority Vattenfall, may reportedly also be privatized. The initial sale of assets will reportedly be aimed at domestic investors. Proceeds will reportedly be used to reduce Sweden's foreign debt and/or will be invested in infrastructure upgrading.

Current projects involving the State Mining Property Commission (NSG), include gold exploration in northern Sweden, principally in the Skellefte sulfide ore district and in the Juktan area, lead and zinc exploration in the Bergslagen area of central Sweden, and nickel prospecting in Vasterbotten County. In addition, a number of localities are being investigated for their chromium-platinum potential. The Sumassjon vanadium deposit (12 Mmt of 0.23% vanadium content) is being studied by NSG for open pit mining and on-site processing.

TABLE 1
## SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum metal: | | | | | | |
| Primary | | 81,480 | 98,597 | 96,982 | 96,300 | [2]96,912 |
| Secondary | | 8,820 | 14,101 | [e]16,000 | 25,500 | [2]28,500 |
| Arsenic, trioxide, refined[e] | | 10,000 | 10,000 | 10,000 | [r]7,000 | 2,500 |
| Copper: | | | | | | |
| Mine output, Cu content | | 85,016 | 74,548 | 69,489 | 74,283 | [2]81,650 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary | | 92,909 | 93,653 | 87,125 | 84,203 | [2]67,113 |
| Secondary | | 12,669 | 22,247 | 24,623 | 23,797 | [2]40,887 |
| Total | | 105,578 | 115,900 | 111,748 | 108,000 | [2]108,000 |
| Refined: | | | | | | |
| Primary | | 79,905 | 68,300 | 69,977 | 66,278 | [2]67,587 |
| Secondary[e] | | 12,000 | 22,000 | [2]24,623 | 31,000 | [2]29,000 |
| Total | | [e]91,905 | [e]90,300 | 94,600 | 97,278 | [2]96,587 |
| Gold: | | | | | | |
| Mine output, Au content | kilograms | 4,108 | 3,590 | 5,120 | 6,326 | [2]6,247 |
| Metal, primary[3] | do. | 3,620 | 3,339 | 4,403 | [e]4,300 | 4,200 |
| Iron and steel: | | | | | | |
| Iron ore and concentrate: | | | | | | |
| Gross weight | thousand tons | 19,707 | 20,440 | 21,763 | 19,877 | [2]19,328 |
| Fe content | do. | 12,809 | 13,392 | 14,124 | 12,901 | 12,000 |
| Metal: | | | | | | |
| Pig iron and sponge iron | do. | 2,314 | 2,527 | 2,638 | 2,736 | [2]2,812 |
| Ferroalloys: | | | | | | |
| Ferrochromium | | 111,815 | 143,055 | 151,697 | [r]94,400 | 92,000 |
| Ferrosilicon | | 19,949 | 20,622 | 19,303 | [r]23,600 | 23,000 |
| Total | | 131,764 | 163,677 | 171,000 | [r]118,000 | [2]115,000 |
| Steel, crude | thousand tons | 4,595 | 4,779 | 4,692 | 4,454 | [2]4,248 |
| Semimanufactures, rolled[e] | do. | 4,000 | 4,100 | 4,200 | 4,000 | 4,000 |
| Lead: | | | | | | |
| Mine output, Pb content | | 95,141 | 91,579 | 88,967 | 98,259 | [2]91,127 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary: | | | | | | |
| Crude | | 1,439 | 1,257 | 1,294 | [e]1,200 | 1,000 |
| Refined[e] | | [2]61,229 | 62,000 | 58,000 | 55,800 | 55,000 |
| Total[e] | | [2]62,668 | 63,257 | 59,294 | 57,000 | 56,000 |
| Secondary[e] | | [2]30,185 | 32,000 | 30,000 | 27,500 | 26,000 |
| Total smelter[e] | | [2]92,853 | 95,257 | 89,294 | [r]84,500 | 82,000 |
| Refined: | | | | | | |
| Primary | | 61,229 | 57,764 | 48,694 | 47,466 | [2]49,168 |
| Secondary | | 30,185 | 26,936 | 22,706 | 22,134 | [2]38,835 |
| Total | | 91,414 | 84,700 | 71,400 | 69,600 | [2]88,003 |
| Molybdenum, oxide, roasted, Mo content | | 2,121 | 3,371 | 3,082 | [e]3,000 | 3,000 |
| Selenium, elemental, refined | kilograms | 31,000 | 19,000 | [e]20,000 | [2]27,000 | 25,000 |

See footnotes at end of table.

TABLE 1—Continued

## SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Silicon metal[e] | | 20,000 | [2]17,059 | 10,000 | 10,000 | 10,000 |
| Silver: | | | | | | |
| Mine output, Ag content | kilograms | 254,107 | 207,804 | 227,715 | 242,685 | [2]239,321 |
| Metal, primary[e 3] | do. | 151,000 | 149,000 | 152,000 | [2]288,000 | [2]253,000 |
| Tungsten: Mine output, W content | | 574 | 420 | [e]80 | — | — |
| Zinc: Mine output, Zn content | | 229,353 | 200,393 | 173,515 | 164,128 | [2]161,170 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | thousand tons | 2,253 | [r e]2,300 | [r e]2,300 | [r e]2,300 | 2,400 |
| Clays: Kaolin[e] | | 100 | [2]92 | 100 | [r]300 | 300 |
| Feldspar, saleable, crude and ground | | 34,226 | [r]38,180 | [r]38,437 | 40,000 | [2]35,000 |
| Fluorspar concentrate | | 220 | 225 | 150 | [r]— | — |
| Kyanite[e] | | 5,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Lime, mostly quicklime | thousand tons | 590 | 589 | 670 | [r]650 | 650 |
| Nitrogen: N content of ammonia | do. | 41 | — | — | — | — |
| Phosphate rock (byproduct): | | | | | | |
| Gross weight | do. | 221 | 142 | 71 | [r]— | — |
| $P_2O_5$ content | do. | 82 | 52 | 26 | [r]— | — |
| Pyrite, gross weight | do. | 429 | 355 | 301 | 252 | [2]89 |
| Quartz[e] | | 17,000 | [2]15,206 | 18,000 | 18,000 | 18,000 |
| Sodium sulfate, synthetic[e] | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| Stone: | | | | | | |
| Dimension, mostly unfinished:[e] | | | | | | |
| Granite | thousand tons | [2]135 | [2]89 | [r e]150 | [r 2]210 | [2]240 |
| Limestone | do. | 15 | 20 | 15 | [r 2]20 | [2]20 |
| Sandstone | do. | 3 | 3 | 5 | 5 | 5 |
| Slate | do. | [2]20 | [2]28 | 20 | 20 | [2]20 |
| Crushed: | | | | | | |
| Dolomite[e] | do. | [2]606 | 600 | 600 | [r 2]797 | [2]726 |
| Granite | do. | 7,313 | 4,978 | [e]6,000 | [e]6,000 | 6,000 |
| Limestone:[e] | | | | | | |
| For cement manufacture | do. | [2]943 | [2]1,064 | 950 | [r]900 | 900 |
| For lime manufacture | do. | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| For other construction and industrial uses | do. | 2,100 | [2]1,878 | 2,000 | [r]1,800 | 1,800 |
| Chalk (ground) | do. | [2]37 | 38 | 40 | [r 2]24 | [2]30 |
| Marl | do. | 2,500 | 2,500 | 2,500 | [r]2,200 | 2,000 |
| For agricultural uses (ground) | do. | 300 | [2]122 | 150 | 150 | 150 |
| For other uses (ground) | do. | 100 | 100 | 100 | [r]133 | 108 |
| Total | do. | 7,980 | 7,702 | 7,740 | [r 2]7,207 | [2]6,988 |
| Quartzite | do. | 1,317 | 1,220 | [r e]1,000 | [r]854 | [2]936 |
| Sandstone | do. | 47 | 58 | [e]50 | [e]50 | 50 |
| Other[e] | do. | 700 | 700 | 700 | 700 | 700 |
| Sulfur: | | | | | | |
| S content of pyrite | do. | 215 | 286 | 233 | [r e]200 | 50 |

See footnotes at end of table.

TABLE 1—Continued

## SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Sulfur: | | | | | | |
| Byproduct:e | | | | | | |
| From metallurgy | thousand tons | 130 | 125 | 125 | 125 | 125 |
| From petroleum | do. | 50 | 45 | 40 | 40 | 40 |
| Totale | do. | 395 | 456 | 398 | r365 | r215 |
| Sulfuric acid | gross weight | 985 | 962 | e900 | e900 | 900 |
| Talc, soapstone | | 800 | 16,550 | r16,000 | r20,000 | 2,3 20,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon blacke | | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Coal, anthracite and bituminous | thousand tons | — | — | — | 11 | 10 |
| Coke, metallurgical | do. | 1,096 | 893 | r473 | r318 | 305 |
| Peat:e | | | | | | |
| Agricultural use | do. | r225 | r227 | r227 | r250 | 2,3 263 |
| Fuel | do. | 1,000 | 1,000 | 2,3 1,450 | 1,400 | 1,400 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 24 | e15 | 19 | r19 | 2,3 19 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 2,448 | e2,500 | 1,856 | r2,552 | 2,3 2,946 |
| Naphtha | do. | 1,726 | e2,640 | 1,632 | r503 | 2,3 226 |
| Gasoline, motor | do. | 32,989 | e37,600 | 32,122 | r31,801 | 2,3 31,330 |
| Jet fuel | do. | 3,275 | e6,600 | 4,130 | r4,202 | 2,3 2,390 |
| Kerosene | do. | 311 | e395 | 245 | r113 | 2,3 38 |
| Distillate fuel oil | do. | 41,552 | e44,230 | 52,551 | r46,526 | 2,3 80,742 |
| Residual fuel oil | do. | 28,731 | e25,785 | 26,855 | r24,895 | 2,3 27,254 |
| Other | do. | 5,872 | e6,000 | 4,488 | e4,500 | 4,000 |
| Refinery fuel and lossese | do. | 2,3 7,448 | 7,500 | 11,300 | 11,300 | 10,000 |
| Totale | do. | 2,3 124,352 | 133,250 | 135,179 | r126,392 | 158,926 |

eEstimated. rRevised.

[1]Table includes data available through Sept. 1, 1992.

[2]Reported figure.

[3]Includes only that recovered from indigenous ores excluding scrap.

TABLE 2

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | r19 | 2 | NA | NA. |
| Alkaline-earth metals | r11 | (2) | NA | NA. |
| Aluminum: | | | | |
| Ore and concentrate | 1 | 3,956 | — | Norway 3,753; Finland 159; United Kingdom 44. |
| Oxides and hydroxides | r210 | 452 | NA | Denmark 40; Belgium-Luxembourg 16; West Germany 16. |
| Ash and residue containing aluminum | 2,660 | 2,248 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | r13,691 | 20,882 | — | Finland 5,250; West Germany 4,957; Norway 2,730. |
| Unwrought | r58,814 | 64,140 | (2) | West Germany 31,450; United Kingdom 8,685; Netherlands 6,538. |
| Semimanufactures | r60,546 | 55,666 | 2,600 | Denmark 14,619; United Kingdom 11,155; Norway 7,992. |
| Antimony: | | | | |
| Ore and concentrate | 76 | 30 | — | All to Denmark. |
| Oxides | 45 | 22 | NA | NA. |
| Metal including alloys, all forms | 6 | 7 | — | Finland 4; Denmark 2. |
| Beryllium: Metal including alloys, all forms value, thousands | (2) | $2 | $1 | France $1. |
| Bismuth: Metal including alloys, all forms do. | $3 | $2 | — | All to Denmark. |
| Cadmium: Metal including alloys, all forms do. | $2 | (2) | NA | NA. |
| Chromium: | | | | |
| Ore and concentrate | 652 | 19,060 | — | Japan 7,686; West Germany 5,850; Spain 5,501. |
| Oxides and hydroxides | 19 | 67 | — | Hungary 30; Finland 19; Norway 11. |
| Metal including alloys, all forms | 3 | 3 | — | Denmark 1; Finland 1; Norway 1. |
| Cobalt: | | | | |
| Oxides and hydroxides | 141 | 181 | — | Finland 172; Ireland 9. |
| Metal including alloys, all forms | 217 | 142 | 8 | Belgium-Luxembourg 36; Netherlands 35; United Kingdom 20. |
| Columbium and tantalum: Tantalum metal including alloys, all forms value thousands | $116 | $5 | — | Czechoslovakia $3; Denmark $1; Norway $1. |
| Copper: | | | | |
| Ore and concentrate | 75,144 | 92,751 | — | Finland 60,015; West Germany 23,784; Greece 6,386. |
| Matte and speiss including cement copper | 1 | 21 | — | All to Spain. |
| Oxides and hydroxides | 21 | 1 | NA | NA. |
| Sulfate | 54 | 35 | NA | NA. |
| Ash and residue containing copper | 1,986 | 1,894 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 6,347 | 3,019 | 32 | Denmark 1,522; West Germany 524; Poland 280. |
| Unwrought | r40,746 | 44,505 | — | United Kingdom 12,690; Netherlands 11,987; Finland 9,224. |
| Semimanufactures | r94,814 | 3100,448 | 3,625 | Finland 10,659; West Germany 10,234; Denmark 10,164. |
| Germanium: Metal including alloys, all forms value, thousands | $211 | $160 | $107 | West Germany $53. |
| Gold: | | | | |
| Waste and sweepings do. | $13,291 | $11,282 | NA | NA. |
| Metal including alloys, unwrought and partly wrought do. | $83,669 | $96,401 | NA | NA. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 17,473 | 16,398 | 54 | West Germany 5,723; Belgium-Luxembourg 2,967; Finland 1,817. |
| Pyrite, roasted | | 11,231 | — | | |
| Metal: | | | | | |
| Scrap | | r141,806 | 122,257 | — | Italy 55,452; Spain 24,969; Denmark 23,408. |
| Pig iron, cast iron, related materials | | r134,818 | 130,270 | NA | NA. |
| Ferroalloys: | | | | | |
| Ferrochromium | | r99,347 | 93,305 | NA | NA. |
| Ferrocolumbium | | 22 | 59 | NA | NA. |
| Ferromanganese | | 762 | 792 | NA | NA. |
| Ferromolybdenum | | 229 | 90 | NA | NA. |
| Ferronickel | value, thousands | r$9 | $33 | NA | NA. |
| Ferrophosphorus | | 111 | 151 | NA | NA. |
| Ferrosilicochromium | | — | (2) | NA | NA. |
| Ferrosilicomanganese | | 86 | 91 | NA | NA. |
| Ferrosilicon | | r13,681 | 13,301 | NA | NA. |
| Ferrotitanium and ferrosilicotitanium | | 53 | 17 | NA | NA. |
| Ferrotungsten and ferrosilicotungsten | | (2) | — | NA | NA. |
| Ferrovanadium | | 66 | 55 | NA | NA. |
| Silicon metal | | r12,229 | (4) | NA | NA. |
| Unspecified | | r29 | 12 | NA | NA. |
| Steel, primary forms | | 330,943 | 239,482 | 70,531 | West Germany 44,783; Italy 44,729. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | | 822,461 | 914,137 | 92,988 | West Germany 190,531; Denmark 143,789; Italy 96,323. |
| Clad, plated, coated | | 240,873 | 256,626 | 12,199 | United Kingdom 43,294; Denmark 39,610; Norway 35,877. |
| Of alloy steel | | 408,128 | 391,741 | 35,242 | West Germany 98,719; Italy 35,186. |
| Bars, rods, angles, shapes, sections | | 691,128 | 654,780 | 25,774 | West Germany 162,360; United Kingdom 98,968; Denmark 62,589. |
| Rails and accessories | | 28,187 | 27,276 | 202 | Italy 6,465; United Kingdom 5,865; Norway 4,363. |
| Wire | | 65,151 | 60,882 | 6,609 | West Germany 13,337; Finland 7,468. |
| Tubes, pipes, fittings | | 245,375 | 212,676 | 18,139 | West Germany 44,015; France 22,879. |
| Lead: | | | | | |
| Ore and concentrate | | r71,419 | 80,334 | — | West Germany 35,513; Belgium-Luxembourg 23,580; India 7,700. |
| Oxides | | r34 | 19 | — | West Germany 13; Finland 3; Norway 3. |
| Ash and residue containing lead | | r3,675 | 4,925 | NA | NA. |
| Metal including alloys: | | | | | |
| Scrap | | 875 | 253 | — | West Germany 174; Denmark 48; Belgium-Luxembourg 32. |
| Unwrought | | 49,120 | 51,678 | — | Italy 9,178; West Germany 8,668; Netherlands 7,035. |
| Semimanufactures | | r820 | 661 | — | United Kingdom 279; Finland 168; Denmark 123. |
| Lithium: Oxides and hydroxides | | 37 | 3 | NA | NA. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | r1,323 | 701 | — | West Germany 454; United Kingdom 107; Norway 77. |
| Unwrought | | (2) | (2) | NA | NA. |
| Semimanufactures | | 4 | 3 | — | Denmark 1; Finland 1; Norway 1. |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 26 | 14 | — | All to France. |
| Oxides | | 62 | 3 | — | All to Norway. |
| Metal including alloys, all forms | | 150 | 60 | — | West Germany 14; India 8; Switzerland 7. |
| Mercury | | 59 | 45 | NA | NA. |
| Molybdenum: | | | | | |
| Ore and concentrate, roasted | | 2,647 | 2,952 | 175 | Belgium-Luxembourg 866; Netherlands 815; West Germany 311. |
| Oxides and hydroxides | | 102 | 146 | NA | NA. |
| Metal including alloys: | | | | | |
| Unwrought including waste and scrap | | 1 | 2 | — | All to the United Kingdom. |
| Semimanufactures | | 2 | 1 | (2) | NA. |
| Nickel: | | | | | |
| Matte and speiss | | (2) | 12 | — | All to Belgium-Luxembourg. |
| Metal including alloys: | | | | | |
| Scrap | | 769 | 542 | (2) | Netherlands 225; West Germany 159; United Kingdom 140. |
| Unwrought | | 133 | 95 | — | Norway 85; Netherlands 6; Denmark 2. |
| Semimanufactures | | 1,540 | 1,785 | 395 | Republic of Korea 353; West Germany 230. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $11,834 | $13,265 | $7,092 | Norway $2,221; Denmark $1,208. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | do. | r$303 | $312 | NA | NA. |
| Platinum | do. | $3,958 | $4,724 | NA | NA. |
| Rhodium | do. | r$15 | $17 | NA | NA. |
| Iridium, osmium, ruthenium | do. | — | $3 | NA | NA. |
| Rare-earth metals including alloys, all forms | | 1 | 54 | NA | NA. |
| Silicon, high-purity | | r(2) | — | NA | NA. |
| Silver: | | | | | |
| Ore and concentrate[5] | value, thousands | r$15,527 | $15,980 | — | West Germany $9,312; United Kingdom $6,377; Switzerland $183. |
| Waste and sweepings[5] | do. | $5,949 | $7,130 | $141 | United Kingdom $3,220; West Germany $1,637; Norway $1,481. |
| Metal including alloys, unwrought and partly wrought | | 317 | 297 | NA | NA. |
| Tellurium and boron, elemental | | 5 | 3 | NA | NA. |
| Tin: | | | | | |
| Ore and concentrate | | (2) | — | | |
| Metal including alloys: | | | | | |
| Unwrought | | r172 | 134 | — | Norway 51; Denmark 40; Finland 37. |
| Semimanufactures | | 96 | 155 | — | Denmark 90; Norway 34; Finland 20. |
| Scrap | | — | (2) | NA | NA. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Titanium: | | | | |
| Ore and concentrate | 58 | 80 | — | United Kingdom 50; West Germany 26; Netherlands 2. |
| Oxides | 86 | 765 | — | U.S.S.R. 308; West Germany 216; Hungary 116. |
| Metal including alloys: | | | | |
| Unwrought including waste and scrap | r279 | 286 | 22 | United Kingdom 252; West Germany 12. |
| Semimanufactures | 257 | 482 | 250 | Norway 89; Poland 51. |
| Tungsten: | | | | |
| Ore and concentrate | 598 | 110 | — | West Germany 101; United Kingdom 9. |
| Metal including alloys: | | | | |
| Unwrought including scrap | 7 | 9 | — | Mainly from Germany. |
| Semimanufactures | r3 | 3 | (2) | West Germany 1. |
| Uranium and thorium: | | | | |
| Oxides and other compounds | 83 | 24 | NA | NA. |
| Metal including alloys, all forms, uranium value, thousands | $37 | $5 | — | All to West Germany. |
| Vanadium: Metal including alloys, all forms do. | — | $1 | — | All to Finland. |
| Zinc: | | | | |
| Ore and concentrate | 327,410 | 313,180 | — | Norway 79,791; Finland 67,201; Belgium-Luxembourg 61,716. |
| Oxides | 697 | 647 | — | West Germany 482; Portugal 46; Denmark 37. |
| Blue powder value, thousands | $1 | $1 | — | All to Norway. |
| Ash and residue containing zinc | r35,051 | 41,019 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 4,628 | 5,350 | — | West Germany 699; India 434; Norway 342. |
| Unwrought | r201 | 855 | — | United Kingdom 250; Netherlands 148; Norway 133. |
| Semimanufactures | 127 | 165 | 1 | Norway 107; Finland 27; West Germany 15. |
| Zirconium: | | | | |
| Ore and concentrate | 1 | 2 | — | All to Norway. |
| Oxides[6] | 10 | (2) | NA | NA. |
| Metal including alloys: | | | | |
| Unwrought including waste and scrap | 29 | 33 | 17 | United Kingdom 15; France 1. |
| Semimanufactures | 60 | 76 | 1 | West Germany 55; Romania 12; Japan 5. |
| Other: | | | | |
| Ores and concentrates | r— | 95 | — | All to the Netherlands. |
| Oxides and hydroxides | 1 | 41 | NA | NA. |
| Ashes and residues | r5,213 | 1,118 | NA | NA. |
| Base metals including alloys value, thousands | $23 | $20 | — | Spain $10; Norway $4; Denmark $3; United Kingdom $3. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 46 | 43 | — | Portugal 27; Denmark 10. |
| Artificial: | | | | |
| Corundum | 79 | 53 | NA | NA. |
| Silicon carbide | r75 | 97 | NA | NA. |
| Grinding and polishing wheels and stones | r2,133 | 2,208 | 8 | France 377; United Kingdom 359; U.S.S.R. 337. |
| Barite and witherite | (2) | 2 | — | NA. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Boron materials: | | | | | |
| Crude natural borates | | 13 | 1,134 | | Finland 1,085; Austria 25. |
| Oxides and acids | | r27 | 44 | NA | NA. |
| Bromine including fluorine | value, thousands | $4 | (2) | NA | NA. |
| Cement | | r198,071 | 261,594 | — | West Germany 102,014; United Kingdom 99,264; Nicaragua 25,952. |
| Chalk | | r4,998 | 5,366 | — | Finland 3,232; Norway 1,291; Denmark 688. |
| Clays, crude: | | | | | |
| Bentonite | | 567 | 466 | — | Finland 405; West Germany 43; Norway 5. |
| Chamotte earth | | 14 | 35 | NA | NA. |
| Fuller's earth | | 52 | 76 | NA | NA. |
| Fire clay | | 44 | 42 | NA | NA. |
| Kaolin | | 639 | 1,935 | — | France 1,293; Finland 291; West Germany 129. |
| Unspecified | | 95 | 76 | NA | NA. |
| Cryolite and chiolite | | 10 | 2 | — | All to Denmark. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | value, thousands | $1,824 | $12,542 | — | Belgium-Luxembourg $12,159; Israel $81; Netherlands $70. |
| Industrial stones | do. | $71 | $154 | $1 | Iran $120; Netherlands $16; Argentina $12. |
| Dust and powder | do. | $382 | $104 | — | Ireland $57; Finland $41; China $2. |
| Diatomite and other infusorial earth | | 112 | 188 | — | Norway 55; Belgium-Luxembourg 54; Denmark 51. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 20,070 | 24,202 | — | United Kingdom 16,787; Austria 2,898; Italy 2,493. |
| Fluorspar | | 1,600 | 1,514 | — | Finland 1,237; Norway 244; Denmark 33. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 666 | 568 | — | Norway 221; Japan 167; West Germany 166. |
| Manufactured: | | | | | |
| Ammonia | | 1,643 | 1,063 | NA | NA. |
| Nitrogenous[7] | | r163,220 | 211,751 | NA | NA. |
| Phosphatic | | 81,748 | 87,612 | NA | NA. |
| Potassic | | 33,594 | 55,430 | NA | NA. |
| Unspecified and mixed | | r272,176 | 260,089 | NA | NA. |
| Graphite, natural | | 32 | 70 | — | Republic of Korea 22; Austria 21; Japan 14. |
| Gypsum and plaster | | 636 | 814 | — | Finland 576; Denmark 105; Norway 104. |
| Iodine | value, thousands | $1 | $3 | NA | NA. |
| Kyanite and related materials: Andalusite, kyanite, sillimanite | | r3,280 | 3,623 | NA | NA. |
| Lime | | 27,913 | 42,743 | — | Denmark 21,061; Finland 14,097; Norway 5,933. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 518 | 116 | — | Norway 77; Netherlands 22; Italy 14. |
| Oxides and hydroxides | | 532 | 176 | — | Denmark 156; Finland 15; Norway 4. |
| Mica: | | | | | |
| Crude including splittings and waste | | 15 | 15 | — | Norway 11; Malaysia 3. |
| Worked including agglomerated splittings | | 1 | 18 | — | Australia 7; Norway 6; Japan 4. |
| Nitrates, crude | | 328 | 405 | — | Norway 397; Denmark 8. |
| Phosphates, crude | | 80,328 | 12,354 | — | Mainly from Norway. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Phosphorus, elemental | value, thousands | r (2) | $1 | NA | NA. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 9 | 4 | NA | NA. |
| Iron oxides and hydroxides, processed | | r6,039 | 5,193 | 1,414 | West Germany 1,408; Singapore 846. |
| Potassium salts, crude | | (2) | 1 | NA | NA. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | r$6,773 | $10,430 | $95 | Belgium-Luxembourg $9,365; Switzerland $543; West Germany $258. |
| Synthetic | do. | r$34,428 | 35,829 | — | Mainly from Ireland. |
| Pyrite, unroasted | | 76 | 93 | — | Norway 25; Colombia 21; Venezuela 20. |
| Quartz crystal, piezoelectric | value thousands | r$2 | — | | |
| Salt and brine | | r1,878 | 1,985 | 1 | Norway 876; Finland 503; Denmark 410. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 7,739 | 40 | NA | NA. |
| Sulfate, manufactured | | 6,122 | 3,252 | NA | NA. |
| Sulfate, natural | | r51,406 | 53,041 | NA | NA. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | r304,556 | 402,109 | 1,934 | Denmark 196,429; West Germany 69,566; United Kingdom 46,592. |
| Worked | | 9,392 | 8,577 | 3 | Denmark 4,485; Norway 3,314; West Germany 335. |
| Dolomite, chiefly refractory-grade | | r49,646 | 42,980 | — | Netherlands 12,873; Norway 9,270; Finland 8,074. |
| Gravel and crushed rock | | 1,076,529 | 1,303,249 | — | Denmark 640,677; West Germany 455,824; East Germany 81,754. |
| Limestone other than dimension | | 1,019,765 | 967,420 | — | Denmark 93,714; Finland 85,466; West Germany 18,515. |
| Quartz and quartzite | | 384,374 | 368,574 | — | Norway 325,533; United Kingdom 18,000; Iceland 12,641. |
| Sand other than metal-bearing | | 113,844 | 95,441 | 6 | Norway 45,279; Denmark 43,522; Finland 3,094. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 36,528 | 38,299 | — | France 35,155; Norway 2,339; Finland 803. |
| Colloidal, precipitated, sublimed | | 3,077 | 841 | NA | NA. |
| Dioxide | | 43,891 | 40,497 | NA | NA. |
| Sulfuric acid | | 11,362 | 41,008 | NA | NA. |
| Talc, steatite, soapstone, pyrophyllite | | r17,205 | 12,160 | — | Netherlands 8,502; United Kingdom 1,651; Norway 1,333. |
| Vermiculite[8] | | 261 | 274 | — | All to Norway. |
| Other: | | | | | |
| Crude | | 2,054 | 2,363 | | |
| Slag and dross, not metal-bearing | | 212,138 | 170,267 | — | United Kingdom 42,126; Japan 33,964; Denmark 29,429. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 215 | 17 | — | Poland 11; Finland 3; Norway 1. |
| Carbon black | | 24,161 | 15,812 | — | Poland 3,519; West Germany 3,173; Finland 3,160. |
| Coal: | | | | | |
| Anthracite | | 4 | (2) | NA | NA. |
| Bituminous | | r7,327 | 2,290 | — | Denmark 1,212; Norway 989; Finland 87. |

See footnotes at end of table.

TABLE 2—Continued

## SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Coal—Continued: | | | | | |
| Briquets of anthracite and bituminous coal | | — | 30 | — | All to Tanzania. |
| Lignite including briquets | | (2) | (2) | NA | NA. |
| Coke and semicoke | | 51,552 | 40,506 | — | Finland 18,710; United Kingdom 12,509; Spain 5,539. |
| Peat including briquets and litter | | r53,403 | 55,947 | 1 | Netherlands 19,754; Norway 19,376; Denmark 13,309. |
| Petroleum: | | | | | |
| Crude | 42-gallon barrels | 405,479 | — | | |
| Refinery products: | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | r1,029 | 1,209 | 104 | Norway 177; France 84; Denmark 70. |
| Gasoline: | | | | | |
| Aviation | 42-gallon barrels | 200,900 | 472 | — | All to United Kingdom. |
| Motor | thousand 42-gallon barrels | 8,996 | 9,548 | — | Norway 3,487; Denmark 2,769; Netherlands 987. |
| Mineral jelly and wax | 42-gallon barrels | 1,346 | 6,115 | 16 | Norway 4,321; West Germany 268; |
| Kerosene and jet fuel | do. | r655,790 | 743,884 | — | Denmark 265,531; Norway 247,706; United Kingdom 224,254. |
| Distillate fuel oil | thousand 42-gallon barrels | 25,048 | 23,429 | — | West Germany 8,140; Denmark 6,734; Norway 3,720. |
| Lubricants | do. | 1,874 | 2,291 | (2) | Norway 542; United Kingdom 434; Netherlands 348. |
| Residual fuel oil | do. | 23,412 | 21,364 | 1,483 | United Kingdom 8,129; Italy 5,403; West Germany 2,018. |
| Bitumen and other residues | do. | 1,694 | 1,733 | — | Norway 752; Denmark 502; Finland 357. |
| Bituminous mixtures | 42-gallon barrels | 32,130 | 30,524 | 376 | Belgium-Luxembourg 5,593; Denmark 3,794; Finland 3,460. |
| Petroleum coke | do. | 688 | 1,265 | — | Denmark 665; Finland 600. |

rRevised. NA Not available.

[1]Table prepared by Douglas Rhoten, International Data Section.

[2]Less than 1/2 unit.

[3]Destinations incomplete due to unreported detailed quantities.

[4]Unreported quantity valued at $11,814,000.

[5]May include other precious metals.

[6]Includes germanium oxide.

[7]Totals exclude unreported quantities valued at $4,362,000 in 1989 and $5,640,000 in 1990.

[8]Includes perlite and chlorite.

TABLE 3

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | r57 | 33 | (2) | Austria 9; Hungary 20; United Kingdom 3. |
| Alkaline-earth metals | r4 | 20 | (2) | Austria 11; Brazil 4; U.S.S.R. 3. |
| Aluminum: | | | | |
| Ore and concentrate | 56,593 | 48,822 | 2,800 | Australia 18,055; West Germany 14,238; Greece 5,000. |
| Oxides and hydroxides | r253,507 | 219,426 | 61,382 | Jamaica 63,725; Spain 37,616. |
| Ash and residue containing aluminium | 14,478 | 11,608 | NA | Norway 6,649; West Germany 4,518; Italy 411. |
| Metal including alloys: | | | | |
| Scrap | r5,223 | 6,779 | 311 | Norway 1,740; Denmark 950; West Germany 788. |
| Unwrought | 56,141 | 46,667 | 161 | Norway 21,709; Bahrain 6,566; Finland 4,868. |
| Semimanufactures | r99,632 | 100,972 | 1,489 | West Germany 27,766; Norway 16,727; France 13,815. |
| Antimony: | | | | |
| Oxides | 561 | 563 | NA | France 224; United Kingdom 220; Belgium-Luxembourg 88. |
| Metal including alloys, all forms | 65 | 59 | 16 | China 43. |
| Arsenic: Metals including alloys, all forms | r5 | 29 | NA | China 20. |
| Beryllium: Metal including alloys, all forms value, thousands | $22 | $21 | $8 | United Kingdom $7; France $5. |
| Bismuth: Metal including alloys, all forms | 15 | 15 | — | United Kingdom 10; China 2; Ireland 2. |
| Cadmium: Metal including alloys, all forms | 181 | 252 | — | Finland 166; Norway 47; Republic of Korea 20. |
| Chromium: | | | | |
| Ore and concentrate | r397,178 | 191,722 | NA | NA. |
| Oxides and hydroxides | 447 | 440 | 5 | West Germany 238; United Kingdom 88; China 35. |
| Metal including alloys, all forms | 271 | 315 | (2) | United Kingdom 163; France 61; U.S.S.R. 49. |
| Cobalt: | | | | |
| Oxides and hydroxides | 5 | 5 | (2) | West Germany 4; France 1. |
| Metal including alloys, all forms | 599 | 785 | 149 | Finland 131; Zambia 109; Zaire 99. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | 1 | 1 | (2) | Mainly from Austria. |
| Copper: | | | | |
| Ore and concentrate | r60,666 | 51,084 | 7,603 | Chile 26,373; Greece 12,390. |
| Matte and speiss including cement copper | 1,957 | 26 | — | All from Finland. |
| Oxides and hydroxides | 723 | 726 | NA | Yugoslavia 582; West Germany 130. |
| Sulfate | r1,113 | 1,149 | NA | U.S.S.R. 648; Israel 260; Czechoslovakia 66. |
| Ash and residue containing copper | r26,564 | 57,549 | 6,572 | West Germany 43,260; United Kingdom 5,424; France 1,187. |
| Metal including alloys: | | | | |
| Scrap | r9,148 | 15,074 | 3,129 | United Kingdom 2,349; Netherlands 2,277; France 2,049. |
| Unwrought | r73,459 | 67,445 | — | Finland 13,434; Chile 10,870; Canada 8,791. |
| Semimanufactures | r41,965 | 43,002 | 179 | West Germany 15,924; France 7,079; United Kingdom 6,035. |
| Germanium: Metal including alloys, all forms value, thousands | r$32 | $63 | — | West Germany $54; Belgium-Luxembourg $9. |
| Gold: | | | | |
| Waste and sweepings do. | $553 | $542 | $2 | Finland $303; Denmark $129; Norway $58. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Gold—Continued: | | | | | |
| Metal including alloys, unwrought and partly wrought | value, thousands | $22,071 | $27,543 | $788 | West Germany $11,261; Switzerland $5,934; Norway $3,520. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | r255 | 268 | — | Canada 151; Norway 98; Spain 15. |
| Pyrite, roasted | | — | 25 | — | All from West Germany. |
| Metal: | | | | | |
| Scrap | | 625,494 | 246,897 | 5,653 | West Germany 96,206; United Kingdom 52,142; Denmark 41,917. |
| Pig iron, cast iron, related materials | | r63,920 | 54,068 | 487 | Poland 18,052; U.S.S.R. 11,869; Canada 6,590. |
| Ferroalloys: | | | | | |
| Ferrochromium | | r41,554 | 46,068 | 32 | Finland 20,647; Norway 10,008; West Germany 4,868. |
| Ferrocolumbium | | 371 | 368 | — | Brazil 164; West Germany 111; United Kingdom 70. |
| Ferromanganese | | 27,035 | 24,953 | 60 | Norway 14,689; France 6,405; Belgium-Luxembourg 3,579. |
| Ferromolybdenum | | r3,478 | 3,292 | 35 | China 951; Netherlands 579; Austria 576. |
| Ferronickel | | 12,179 | 12,863 | 36 | Greece 4,005; French Polynesia 3,576; Columbia 2,784. |
| Ferrophosphorus | | 407 | 291 | NA | West Germany 144. |
| Ferrosilicochromium | | 2,453 | 1,379 | 8 | Zimbabwe 1,061; U.S.S.R. 303. |
| Ferrosilicomanganese | | 14,755 | 11,478 | NA | Norway 7,876; Belgium-Luxembourg 3,210; France 300. |
| Ferrosilicon | | r23,284 | 22,838 | (2) | Norway 18,646; U.S.S.R. 3,781; West Germany 206. |
| Ferrotitanium and ferrosilicotitanium | | 1,391 | 1,634 | — | West Germany 638; U.S.S.R. 342; United Kingdom 317. |
| Ferrotungsten and ferrosilicotungsten | | 860 | 705 | NA | China 686; Switzerland 11. |
| Ferrovanadium | | 1,151 | 1,040 | 40 | Austria 387; West Germany 363; Netherlands 102. |
| Silicon metal | | 1,093 | 1,332 | NA | Norway 456; France 346; Brazil 197. |
| Unspecified | | 2,391 | 2,653 | 119 | France 1,131; West Germany 372; U.S.S.R. 361. |
| Steel, primary forms | | r119,821 | 87,187 | 3 | Finland 42,435; United Kingdom 15,644. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | | 551,178 | 535,408 | 88 | West Germany 156,417; Belgium-Luxembourg 101,341; Denmark 53,498. |
| Clad, plated, coated | | 399,705 | 398,094 | 142 | West Germany 98,743; France 72,684; Belgium-Luxembourg 44,125. |
| Of alloy steel | | 91,565 | 127,944 | 102 | West Germany 67,199; Finland 32,730; Japan 8,874. |
| Bars, rods, angles, shapes, sections | | 583,283 | 562,885 | 1,979 | West Germany 102,847; United Kingdom 86,936; Finland 32,730. |
| Rails and accessories | | 14,374 | 18,455 | 9 | Austria 10,923; France 1,666; West Germany 1,250. |
| Wire | | 32,378 | 34,350 | 41 | Belgium-Luxembourg 8,701; United Kingdom 7,696; Finland 5,285. |
| Tubes, pipes, fittings | | 328,060 | 330,125 | 582 | West Germany 73,125; Finland 54,540; United Kingdom 43,575. |
| Lead: | | | | | |
| Ore and concentrate | | r1 | — | | |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Lead—Continued: | | | | |
| Oxides | 3,931 | 4,347 | 3 | West Germany 3,308; United Kingdom 708; East Germany 172. |
| Ash and residue containing lead | r395 | 349 | NA | Finland 197. |
| Metal including alloys: | | | | |
| Scrap | r17,359 | 20,007 | — | Norway 9,472; Denmark 4,599; United Kingdom 3,077. |
| Unwrought | r2,381 | 3,755 | 1 | United Kingdom 2,603; West Germany 343; Norway 254. |
| Semimanufactures | 972 | 706 | 1 | West Germany 576; Netherlands 124. |
| Lithium: Oxides and hydroxides | r96 | 83 | 48 | West Germany 22. |
| Magnesium: Metal including alloys: | | | | |
| Unwrought | r2,534 | 2,036 | 176 | Norway 1,417; West Germany 310. |
| Semimanufactures | r126 | 107 | 55 | Switzerland 12; Austria 9. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 13,398 | 217 | — | Netherlands 173; Norway 30; Finland 15. |
| Oxides | r538 | 559 | 312 | United Kingdom 154; Netherlands 44. |
| Metal including alloys, all forms | r2,040 | 1,254 | 228 | China 462; France 434. |
| Mercury | 13 | 14 | 1 | West Germany 8; Netherlands 2; Spain 2. |
| Molybdenum: | | | | |
| Ore and concentrate: | | | | |
| Roasted | r3,535 | 4,261 | 468 | Netherlands 1,855; Belgium-Luxembourg 854; Chile 553. |
| Unroasted | 4,042 | 3,861 | 829 | Canada 1,922; Iran 501. |
| Oxides and hydroxides | 243 | 201 | 20 | West Germany 138; Netherlands 20. |
| Metal including alloys: | | | | |
| Unwrought including scrap | 321 | 217 | 28 | West Germany 106; United Kingdom 43. |
| Semimanufactures | 51 | 49 | 22 | Austria 21; United Kingdom 2. |
| Nickel: | | | | |
| Ore and concentrate | 2,212 | 1,055 | — | All from Norway. |
| Matte and speiss | r1,872 | 2,330 | 44 | Australia 2,286. |
| Oxides and hydroxides | 53 | 13 | NA | Mainly from West Germany. |
| Metal including alloys: | | | | |
| Scrap | 11,029 | 8,492 | 3,674 | West Germany 3,611; United Kingdom 1,071. |
| Unwrought | 13,783 | 12,533 | 249 | United Kingdom 3,349; Canada 2,261; U.S.S.R. 1,817. |
| Semimanufactures | r2,180 | 1,846 | 285 | United Kingdom 820; France 350. |
| Platinum-group metals: | | | | |
| Waste and sweepings value, thousands | $339 | $97 | — | Finland $58; Switzerland $30; United Kingdom $7. |
| Metals including alloys, unwrought and partly wrought: | | | | |
| Palladium do. | r$6,288 | $5,656 | $868 | Switzerland $2,189; United Kingdom $1,411; Ireland $936. |
| Platinum do. | r$30,454 | $20,010 | $2,147 | Switzerland $9,329; West Germany $3,607; United Kingdom $1,797. |
| Rhodium do. | r$8 | $140 | NA | Netherlands $124. |
| Iridium, osmium, ruthenium do. | r$139 | $201 | NA | Netherlands $146. |
| Rare-earth metals including alloys, all forms | 13 | 19 | NA | Austria 11; China 1. |
| Selenium, elemental | 26 | 8 | NA | United Kingdom 3. |
| Silicon, high-purity | 18 | 14 | — | Japan 7; Denmark 5. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Silver: | | | | | |
| Ore and concentrate[3] | value, thousands | r$27,457 | $35,454 | — | Saudi Arabia $30,463; Peru $4,988. |
| Waste and sweepings[3] | do. | $9,395 | $8,405 | $3,092 | France $3,466; Finland $1,801. |
| Metal including alloys, unwrought and partly wrought | | r192 | 248 | 1 | France 89; West Germany 68; Norway 27. |
| Tellurium and boron, elemental | | 6 | 2 | NA | West Germany 1; U.S.S.R. 1. |
| Tin: Metal including alloys: | | | | | |
| Scrap | | r125 | 180 | NA | Denmark 153; Finland 25. |
| Unwrought | | r543 | 814 | 9 | West Germany 327; Thailand 145; Brazil 119. |
| Semimanufactures | | r138 | 175 | 5 | Netherlands 75; West Germany 61; United Kingdom 26. |
| Titanium: | | | | | |
| Ore and concentrate | | 1,809 | 1,203 | 250 | Australia 885; Netherlands 58. |
| Oxides | | 4,300 | 4,452 | 2 | Norway 2,071; Finland 1,489; West Germany 397. |
| Metal including alloys: | | | | | |
| Unwrought including waste and scrap | | 5 | 1 | (2) | NA. |
| Semimanufactures | | r1,002 | 1,129 | 127 | Japan 763; West Germany 96. |
| Tungsten: | | | | | |
| Ore and concentrate | | 659 | 314 | — | Thailand 186; China 128. |
| Metal including alloys: | | | | | |
| Unwrought including waste and scrap | | r248 | 235 | 31 | China 86; West Germany 83. |
| Semimanufactures | | r13 | 12 | 2 | Japan 3; West Germany 2. |
| Uranium and thorium: | | | | | |
| Oxides and other compounds | | r409 | 342 | 36 | United Kingdom 91; U.S.S.R. 65; Netherlands 58. |
| Metal including alloys, all forms, uranium | | 24 | 4 | — | All from Netherlands. |
| Vanadium: | | | | | |
| Oxides and hydroxides | | r1 | 1 | NA | NA. |
| Metal including alloys, all forms | | 41 | 55 | 25 | West Germany 30. |
| Zinc: | | | | | |
| Ore and concentrate | | 6 | 3 | — | All from West Germany. |
| Oxides | | r1,432 | 1,146 | — | West Germany 481; Netherlands 243; United Kingdom 205. |
| Blue powder | | 307 | 311 | (2) | Norway 287; West Germany 9; United Kingdom 8. |
| Ash and residue containing zinc | | r16,601 | 5,674 | NA | West Germany 4,188; United Kingdom 977; Norway 390. |
| Metal including alloys: | | | | | |
| Scrap | | 107 | 92 | — | Norway 47; Poland 26. |
| Unwrought | | r43,206 | 43,209 | — | Norway 20,268; Finland 17,340; Spain 2,825. |
| Semimanufactures | | r312 | 329 | (2) | West Germany 198; Belgium-Luxembourg 87; United Kingdom 4. |
| Zirconium: | | | | | |
| Ore and concentrate | | 32 | 117 | — | United Kingdom 50; West Germany 31; Austria 18. |
| Oxides[4] | | (2) | 7 | 6 | NA. |
| Metal including alloys: | | | | | |
| Unwrought including waste and scrap | | r146 | 143 | 19 | France 90; United Kingdom 19. |
| Semimanufactures | | r123 | 157 | 81 | France 73; Netherlands 3. |
| Other: | | | | | |
| Ores and concentrates | | (2) | 5 | NA | NA. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Other—Continued: | | | | | |
| Oxides and hydroxides | | 40 | 89 | NA | China 45; West Germany 20; United Kingdom 8. |
| Ashes and residues | | r5,795 | 3,835 | 104 | United Kingdom 2,546; Finland 385; West Germany 137. |
| Base metals including alloys, all forms | | 5 | 2 | NA | NA. |
| **INDUSTRIAL MINERALS** | | | | | |
| Abrasives, n.e.s.: | | | | | |
| Natural: Corundum, emery, pumice, etc. | | r1,576 | 2,707 | 1 | Iceland 2,386; Greece 131; West Germany 63. |
| Artificial: | | | | | |
| Corundum | | r6,507 | 6,805 | 161 | West Germany 3,274; United Kingdom 1,449; Hungary 698. |
| Silicon carbide | | r5,839 | 5,330 | NA | Norway 4,553; Czechoslovakia 481; West Germany 194. |
| Dust and powder of precious and semiprecious stones excluding diamond | value, thousands | $325 | $156 | $33 | United Kingdom $101. |
| Grinding and polishing wheels and stones | | r3,141 | 3,233 | 37 | Austria 1,022; West Germany 600; United Kingdom 354. |
| Asbestos, crude | | 967 | 595 | — | All from Canada. |
| Barite and witherite | | r5,016 | 3,809 | NA | West Germany 3,060; China 471; United Kingdom 229. |
| Boron materials: | | | | | |
| Crude natural borates | | 12,110 | 9,559 | 1,000 | Turkey 7,695; Netherlands 710. |
| Oxides and acids | | 821 | 528 | 239 | France 139; Argentina 76. |
| Bromine including fluorine | | 11 | 10 | (2) | NA. |
| Cement | | r312,259 | 240,668 | 449 | Poland 84,614; Norway 36,464; East Germany 34,683. |
| Chalk | | r128,058 | 123,576 | 2 | West Germany 80,325; Denmark 41,741; Belgium-Luxembourg 1,002. |
| Clays, crude: | | | | | |
| Bentonite | | 9,961 | 11,788 | 318 | Cyprus 4,721; United Kingdom 2,982; West Germany 2,823. |
| Chamotte earth | | 1,687 | 3,864 | NA | Czechoslovakia 1,843; West Germany 677; China 556. |
| Fuller's earth | | 6,595 | 6,435 | NA | West Germany 4,095; United Kingdom 2,036; Netherlands 263. |
| Fire clay | | 7,944 | 5,652 | 1,021 | Czechoslovakia 2,942; United Kingdom 668. |
| Kaolin | | r352,788 | 374,746 | 70,661 | United Kingdom 283,610; Czechoslovakia 13,335. |
| Unspecified | | r22,195 | 9,979 | NA | United Kingdom 4,823; West Germany 2,907; Denmark 707. |
| Cryolite and chiolite | | r167 | 143 | — | Denmark 137; Norway 5. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | value, thousands | r$9,768 | $8,977 | $34 | Belgium-Luxembourg $5,181; Israel $1,132; Switzerland $1,008. |
| Industrial stones | do. | $819 | $1,950 | $956 | Ireland $322; United Kingdom 305. |
| Dust and powder | do. | $6,380 | $6,980 | $1,450 | Ireland $4,039; United Kingdom $500. |
| Diatomite and other infusorial earth | | 2,656 | 2,186 | 500 | Denmark 1,061; Spain 196. |
| Feldspar, fluorspar, related materials: | | | | | |
| Feldspar | | 8,410 | 5,907 | NA | Norway 5,578; West Germany 156. |
| Fluorspar | | 13,915 | 11,407 | — | Mexico 8,011; United Kingdom 1,075; West Germany 1,069. |
| Leucite, nepheline, nepheline syenite | | 5,900 | 6,218 | NA | Norway 6,217. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 144 | 339 | — | West Germany 118; Denmark 114; Austria 57. |
| Manufactured: | | | | |
| Ammonia | 223,081 | 258,664 | (2) | U.S.S.R. 112,681; Poland 63,956; West Germany 60,367. |
| Nitrogenous[5] | r504,629 | 596,623 | 1,288 | Norway 480,701; Poland 23,014; unspecified 91,620. |
| Phosphatic | 6,331 | 8,516 | NA | Netherlands 4,554; Poland 3,912. |
| Potassic | r165,530 | 214,181 | 961 | West Germany 127,147; East Germany 56,582; U.S.S.R. 18,430. |
| Unspecified and mixed | r269,167 | 255,769 | 54 | Belgium-Luxembourg 99,008; Norway 54,104; Netherlands 50,464. |
| Graphite, natural | 456 | 627 | 1 | West Germany 321; United Kingdom 136; China 101. |
| Gypsum and plaster | r531,469 | 511,968 | 39 | Spain 314,975; East Germany 138,611; Denmark 25,277. |
| Iodine | 10 | 3 | NA | NA. |
| Kyanite and related materials: | | | | |
| Andalusite, kyanite, sillimanite | 2,222 | 864 | NA | France 675. |
| Mullite | 45 | 101 | NA | United Kingdom 85. |
| Lime | 14,720 | 47,514 | — | Belgium-Luxembourg 16,345; Norway 12,437; United Kingdom 5,420. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 23,191 | 12,864 | 1 | China 4,549; Austria 2,507; Spain 1,580. |
| Oxides and hydroxides | 21,605 | 16,663 | 93 | Greece 10,200; China 3,184; Norway 1,106. |
| Sulfate | 9,778 | 6,845 | NA | West Germany 6,790. |
| Mica: | | | | |
| Crude including splittings and waste | 510 | 574 | — | France 203; United Kingdom 182; Finland 100. |
| Worked including agglomerated splittings | 95 | 80 | 1 | Switzerland 33; Austria 14; United Kingdom 12. |
| Nitrates, crude | 4,633 | 5,036 | — | Chile 1,835; Belgium-Luxembourg 1,779; West Germany 991. |
| Phosphates, crude | 714,696 | 649,904 | 187,275 | Morocco 247,932; U.S.S.R. 196,174. |
| Phosphorus, elemental | 24 | 43 | NA | Mainly from West Germany. |
| Pigments, mineral: | | | | |
| Natural, crude | 88 | 195 | NA | West Germany 112. |
| Iron oxides and hydroxides, processed | 5,520 | 5,654 | 2 | West Germany 5,195; Spain 167; United Kingdom 134. |
| Potassium salts, crude | 6,309 | 5,720 | — | All from West Germany. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural value, thousands | $9,195 | $12,424 | $186 | Sri Lanka $7,802; Belgium-Luxembourg $1,110; Switzerland $603. |
| Synthetic do. | $218 | $149 | $8 | Switzerland $43; Italy $35; France $27. |
| Pyrite, unroasted | 188,101 | 225,107 | — | Finland 224,884; West Germany 152; United Kingdom 42. |
| Quartz crystal, piezoelectric value, thousands | $20 | $10 | $3 | West Germany $7. |
| Salt and brine | 1,100,235 | 931,183 | 147 | Netherlands 254,006; West Germany 214,527; Denmark 181,183. |
| Sodium compounds, n.e.s.: | | | | |
| Soda ash, manufactured | 124,898 | 101,499 | 21,711 | East Germany 25,875; West Germany 17,420. |
| Sulfate, manufactured | 3,986 | 1,804 | NA | Norway 1,448; Belgium-Luxembourg 280. |
| Sulfate, natural | 7,017 | 3,136 | 2 | East Germany 1,058; Netherlands 888; United Kingdom 530. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 5,789 | 9,668 | 4 | Norway 4,361; Finland 2,323; Italy 488. |
| Worked | 31,885 | 38,057 | 13 | Portugal 17,049; Italy 7,204; Poland 3,963. |
| Dolomite, chiefly refractory-grade | 172,100 | 140,694 | — | Belgium-Luxembourg 52,421; United Kingdom 51,587; Norway 31,696. |
| Gravel and crushed rock | 103,737 | 173,434 | — | Norway 118,143; Finland 26,158; Denmark 12,985. |
| Limestone other than dimension | 81,918 | 67,284 | — | Denmark 27,437; Norway 20,147; United Kingdom 9,757. |
| Quartz and quartzite | 38,315 | 22,066 | 12 | Spain 19,568; Finland 1,812; West Germany 177. |
| Sand other than metal-bearing | 346,026 | 341,473 | 139 | Denmark 166,590; Belgium-Luxembourg 132,475; United Kingdom 17,745. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 5,574 | 5,416 | — | Poland 3,571; West Germany 1,565; Belgium-Luxembourg 144. |
| Colloidal, precipitated, sublimed | 11,315 | 10,803 | — | Poland 6,034; Netherlands 2,904; West Germany 1,850. |
| Dioxide | 15,657 | 12,269 | — | Poland 11,140; West Germany 1,033; Norway 95. |
| Sulfuric acid | 12,418 | 131,779 | (2) | Norway 38,992; Finland 33,309; Poland 26,702. |
| Talc, steatite, soapstone, pyrophyllite | r33,923 | 25,276 | 80 | Finland 16,332; Norway 3,443; Belgium-Luxembourg 3,202. |
| Vermiculite[6] | r903 | 1,864 | 19 | Norway 725; Belgium-Luxembourg 518; U.S.S.R. 445. |
| Other: | | | | |
| Crude | 198,827 | 192,762 | 530 | Norway 185,721; West Germany 1,417; Australia 815. |
| Slag and dross, not metal-bearing | 111,971 | 115,889 | 12 | Finland 70,574; Norway 15,388; West Germany 11,667. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 1,430 | 1,213 | 87 | West Germany 872; Trinidad and Tobago 130. |
| Carbon black | 14,439 | 11,956 | 209 | Netherlands 7,051; West Germnay 3,116; France 830. |
| Coal: | | | | |
| Anthracite | r23,750 | 50,705 | (2) | United Kingdom 16,914; U.S.S.R. 11,540; China 8,446. |
| Bituminous thousand tons | r3,672 | 3,491 | 881 | Poland 725; Australia 636. |
| Briquets of anthracite and bituminous coal | 1,769 | 1,542 | — | Belgium-Luxembourg 1,514. |
| Lignite including briquets | 6,542 | 275 | — | West Germany 252; Poland 23. |
| Coke and semicoke | r472,959 | 318,320 | 29,788 | United Kingdom 69,650; Belgium-Luxembourg 60,288; Netherlands 52,322. |
| Gas, natural: Gaseous million cubic meters | r332 | 418 | — | All from Denmark. |
| Peat including briquets and litter | 27,766 | 27,732 | — | United Kingdom 16,537; Finland 8,198; Denmark 2,842. |
| Petroleum: | | | | |
| Crude thousand 42-gallon barrels | 115,092 | 125,042 | — | Norway 56,511; U.S.S.R. 18,920; Denmark 13,887. |
| Refinery products: | | | | |
| Liquefied petroleum gas do. | 6,547 | 8,292 | (2) | Norway 2,828; Saudi Arabia 2,587; United Kingdom 1,733. |
| Gasoline do. | 20,486 | 19,693 | (2) | Finland 5,037; Norway 4,475; Denmark 4,259. |
| Mineral jelly and wax do. | 101 | 103 | 1 | West Germany 70; United Kingdom 11; Hungary 6. |
| Kerosene and jet fuel do. | 4,724 | 7,033 | (2) | United Kingdom 2,018; Belgium-Luxembourg 767; Norway 746. |
| Distillate fuel oil do. | 14,190 | 12,285 | (2) | Denmark 3,410; Finland 2,721; Norway 2,448. |

See footnotes at end of table.

TABLE 3—Continued

## SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products—Continued: | | | | | |
| Lubricants | thousand 42-gallon barrels | 1,809 | 1,562 | 26 | Netherlands 495; United Kingdom 266; Belgium-Luxembourg 250. |
| Residual fuel oil | do. | 7,026 | 7,197 | (2) | U.S.S.R. 2,456; Norway 672; Libya 628. |
| Bitumen and other residues | value, thousands | $15,168 | $12,776 | $55 | Finland $8,280; United Kingdom $859; Hungary $350. |
| Bituminous mixtures | thousand 42-gallon barrels | 32 | 39 | 1 | Denmark 11; West Germany 7; United Kingdom 6. |
| Petroleum coke | do. | 385 | 260 | 98 | United Kingdom 124; Belgium-Luxembourg 19. |

r Revised. NA Not available.

[1] Table prepared by Douglas Rhoten, International Data Section.

[2] Less than 1/2 unit.

[3] May include other precious metals.

[4] Includes germanium oxide.

[5] Totals exclude unreported quantities valued at $12,218,000 in 1989 and $15,918,000 in 1990.

[6] Includes perlite and chlorite.

TABLE 4

## SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Capacity |
|---|---|---|---|
| Aluminum | Granges AB (AB Electrolux) | Sundsvall smelter at Kubikenborg | 100 |
| Arsenic, white | Boliden Mineral AB (Trelleborg AB) | Smelter at Ronnskar | 15 |
| Cement | Cementa AB (Industry AB Euroc) | Plants at Degerhamn, Skovde, and Slite | 3,400 |
| Copper, concentrate | Boliden Mineral AB (Trelleborg AB) | Mines at Aitik, Kristinerberg, and other | 220 |
| Do. | Luossavaara-Kiirunavaara AB | Mine at Viscaria/Pahtohavare | 130 |
| Copper, refined | Boliden Mineral AB (Trelleborg AB) | Refinery at Ronnskar | 100 |
| Feldspar | Forshammars Mineral AB (Ernstrom Mineral AB) | Mine and plant at Riddarhyttan | 40 |
| Ferroalloys | Vargon Alloys AB | Plant at Vargon | 120 |
| Gold | Terra Mining AB (Norsk Hydro A/S) | Bjorkdal Mine at Skelleftea | 2.1 |
| Do. | Boliden Metall AB (Trelleborg AB) | Mines at Enasen and Akerberg | 4 |
| Do. | Do. | Refinery at Ronnskar | 9 |
| Iron ore | Luossavaara-Kiirunavaara AB | Mines at Kiruna, Malmberget, and Svappavaara | 20,000 |
| Iron and steel | Svenskt Stal AB (Government 67%) | Steelworks at Lule, Oxelosund, and Domnarvet | 3,000 |
| Kyanite | Svenska Kyanite AB (Svenska Mineral AB) | Quarry at Halskoberg | 40 |
| Lead, concentrate | Boliden Metall AB (Trelleborg AB) | Mines at Garpenberg, Kristineberg, Laisvall, Langdal, Renstrom, and other | 130 |
| Lead, smelter | Do. | Smelter at Ronnskar | 85 |
| Lime | Euroc Mineral AB | Plants at Limham, Koping, and Storugns | 270 |
| Do. | Svenska Mineral AB | Plants at Rattvik and Boda | 250 |
| Petroleum, refined barrels per day | Skandinaviska Raffinaderi AB | Refinery at Lysekil | 210,000 |
| Do. do. | BP Raffinaderi AB | Refinery at Goteborg | 100,000 |
| Do. do. | Shell Raffinaderi AB | Do. | 82,000 |
| Do. do. | AB Nynas Petroleum | Refineries at Goteborg, Malmo, and Nynashamn | 54,000 |
| Phosphate, apatite concentrate | Luossavaara-Kiirunavaara AB | Plant at Kiruna | 200 |
| Do. | Svenskt Stal AB (Government 67%) | Plant at Grangesberg | 130 |
| Pyrite | Boliden Mineral AB (Trelleborg AB) | Mines at Kedtrask, Langsele, and Udden | 200 |
| Do. | Stora Kopparbergs AB | Mine at Falun | 50 |
| Silica sand | Ahlsell Mineral AB | Southern Sweden | 600 |
| Silicon | KemaNord AB (Nobel Industries) | Plant at Ljungaverk | 24 |
| Silver | Boliden Metall AB (Trelleborg AB) | Refinery at Ronnskar | 250 |
| Zinc, concentrate | Boliden Mineral AB (Trelleborg AB) | Mines at Garpenberg, Kankberg, Kedtrask, Laisvall, Langdal, Renstrom, and other | 300 |
| Do. | Vieille Montagne Sverige AB | Zinkgruvan Mine at Ammeberg | 80 |

TABLE 5

## SWEDEN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

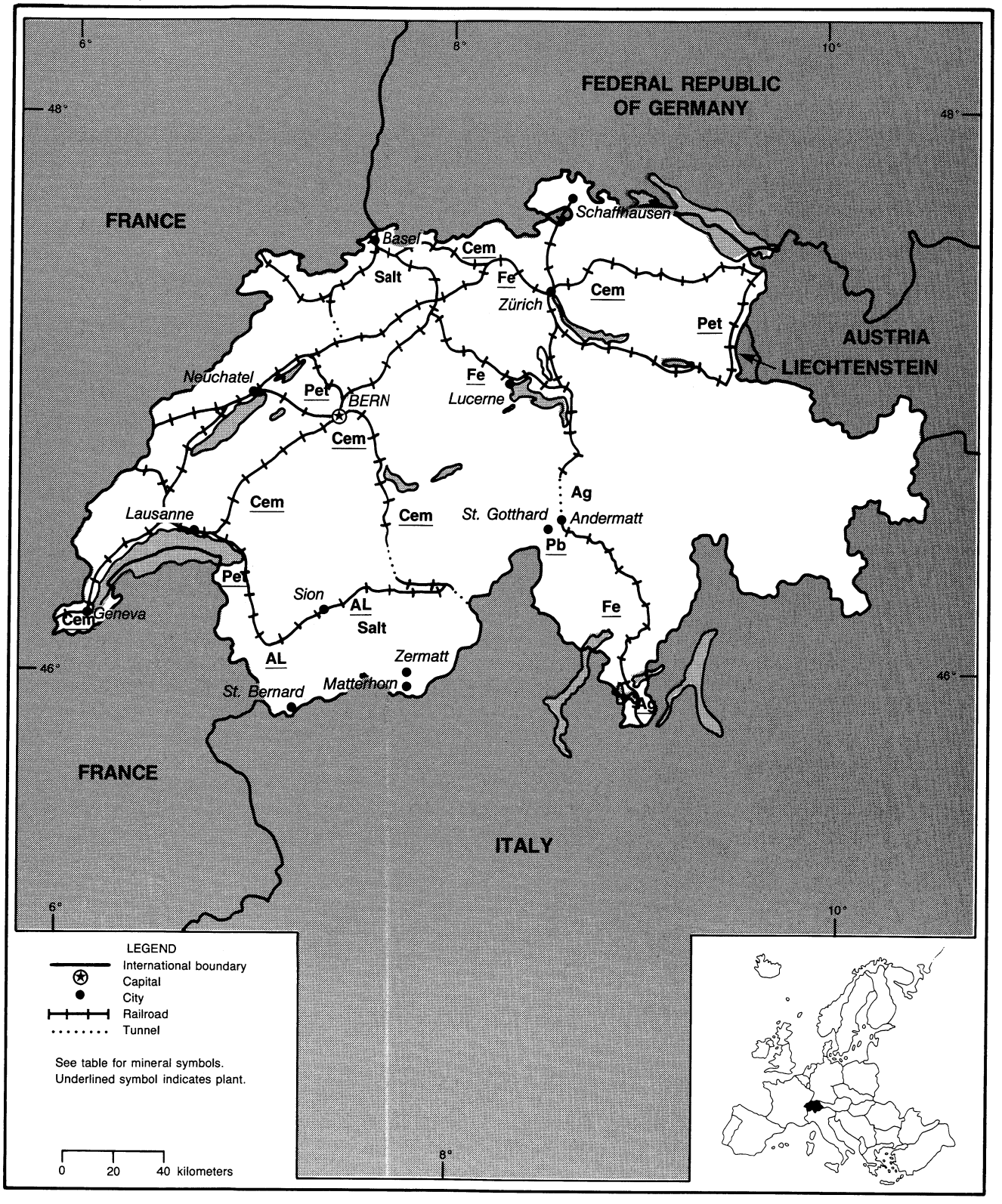
(Million metric tons unless otherwise specified)

| Commodity | Reserves[e] |
|---|---|
| Copper ore | 150 |
| Iron ore | 3,000 |
| Lead ore | 50 |
| Zinc | 20 |

[e]Estimated.

# SWITZERLAND

**AREA 41,000 km²** **POPULATION 7.1 million**



THE MINERAL INDUSTRY OF

# SWITZERLAND

By Donald E. Buck, Jr.

Switzerland has attempted to utilize the limited mineral resources available in this mountainous country. The small, diversified deposits were exploited in the past, and most metalliferous mining activity ceased long ago. Although the general geology of Switzerland has been studied in detail, the mineral exploration to assess the remaining potential of the country's mineral grades of ores and reserves has remained incomplete. Presently, exploration in the country is limited to petroleum and gold. Mining of industrial minerals, gypsum, and sand and gravel are from surface pits.

## GOVERNMENT POLICIES AND PROGRAMS

The Swiss Government, a long time supporter of "Green Issues," has adopted a new energy policy, "Energy 2000." This is a policy to maintain the present growth rate for electricity. To accomplish this, the plan stresses energy conservation, since the hydroelectric resources are fully exploited. Furthermore, the public voted for a 10-year moratorium on new nuclear power plant construction. Nuclear power is the second most important component of domestic power production. However, concerns of nuclear power increased after the Chernobyl accident in the U.S.S.R. Therefore the country's options were either to build more $CO_2$ emitting plants or import more power to meet future requirements. The concern about the greenhouse effect and local pollution swayed the public to vote for a policy of importing more electricity. Under the "Energy 2000" policy, one guideline still to be decided on is the limits on energy use. The specific legislation, when defined between 1995 and 1999, could affect the energy consuming metal producing plants in the country.

Another issue up for Government and public review, is whether to join the Economic Community (EC) or remain in the European Free Trade Association (EFTA). EC acceptance could require substantial changes, particularly to the structure of the banking industry and the transportation industry. The metal and mineral industries would not reportedly be required to make significant changes to conform to EC standards and regulations.

## PRODUCTION

The value of the output of the Swiss mineral industry was modest. All metallic commodities, such as aluminum, steel, and secondary lead, were produced from recycled and/or imported raw materials. The mining industry was limited to construction materials and salt. Except for a small natural gas field, from which production is rapidly declining, mineral fuels were imported. *(See Table 1.)*

## TRADE

Switzerland's famous jewelry industry is dependent on importation of gold, as the country does not have a domestic source. Most metals, minerals, and fuels needed for the domestic industries have to be imported. Switzerland's most important trading partners were the Federal Republic of Germany, France, Great Britain, Italy, and the United States.

## STRUCTURE OF THE INDUSTRY

The mineral industry is either privately owned or owned by cantons or communal governments. The Swiss national Government is limited by the Constitution in its ability to impose a particular economic policy. Cantonal authorities operate the electrical generating facilities, water resources, gas utilities, and local transportation facilities. Mining also comes under the jurisdiction of cantonal authorities.

## COMMODITY REVIEW

### Metals

*Aluminum.*—Alusuisse-Lonza Holding AG, formerly Swiss Aluminium Ltd. (Alusuisse), produced primary aluminum metal, fabricated products, and chemicals from imported alumina and bauxite. The company operates three plants, two smelters, and one rolling mill in Switzerland. Bauxite comes from company operated mines at Var in France, at Gove in Australia, and in Sierra Leone. Alusuisse also owns three plants in the United States: aluminum rolling facilities in Hannibal, Ohio, and Jackson, Tennessee, and an aluminum recycling plant in West Virginia.

Metallwerke Refonde AG, at Niederglatt, which recycled scrap aluminum, was reportedly to be closed in the spring of 1992. The move was reportedly the result of rationalization, of low aluminum prices, and of the shortage of scrap in Switzerland.

*Lead.*—All lead refined in Switzerland is from scrap. Metallum AG was overhauling its battery scrap plant at Pratteln to reduce sulfur dioxide emissions, to increase the level of automation, and to improve working conditions. This modernized smelter will process used batteries at a rate of five

tons per hour, with a planned start-up date of March 1991.

*Precious Metals.*—Mineral exploration in the Anterior Rhine region is traced to the Middle Ages. Historically, gold mining was mainly focused on placer deposits, with a few lode gold operations. Between 1986 and 1988, International Micham (VSE), under a joint venture with Narex International Exploration, reportedly prospected in a 119 square kilometer permit area around Disentis for gold. The company reportedly has spent $1.3 million on a 41-kilometer long zone of discontinuous gold mineralization, consisting of gold-bearing sulfides. A two-hole diamond drilling program reportedly resulted in the identification of gold mineralization of approximately 0.95 g/mt over a 75-m zone and 0.60 g/mt over 92-m.

With limited mining activity in many parts of Switzerland, and the changes in the technology and character of mining, many Cantons have no established laws or guidelines. For example, the Graubunden Canton did not have an appropriate mining law to cover a gold mining license requested by several Canadian companies. The Canadian companies, International Micham and Narex International Exploration, reportedly because of the delays and problems of being granted approval to develop the gold deposit, reportedly elected to terminate their joint-venture agreement and split their interests in the Disentis area exploration permit. One foreseen problem was the reported requirement that a plebiscite was required before any exploitation activities could commence. Although exploitation approval is reportedly difficult, exploration permission was supposedly less problematic. Micham reportedly sought and was reportedly granted an exploration permit for gold at the Val Plattas in the Medel area.

Other refiners of precious metals in Switzerland included Cendres & Metaux SA; Valcambi SA, owned by Credit Suisse; and Argor-Heraeus SA. H. Hilderbrand et Cie. SA, in Geneva, produced atomized powders of gold, silver, and platinum solder alloys.

*Steel.*—All raw materials necessary for steel production, aside from some domestic scrap, must be imported. About 250,000 tons of ferrous scrap was imported in 1989, which is the last year for which data were available. Production of crude steel has averaged, for the past 5 years, 900,000 mt/a. In 1991, the steel production of 925,000 tons was only slightly above the average production level, but below 1990's 970,000 mt/a.

Von Roll AG, the largest Swiss engineering and steel production company, has two plants operating in the country. The plant at Monteforno reportedly has a capacity of 380,000 mt/a. It includes an 85-ton electric arc furnace, a continuous castor, and rolling mill. The plant produces blooms, billets, reinforcing bars, and round bars. The headquarters plant at Gerlafingen has a capacity of 300,000 mt/a, using a 60- to 70-ton, 50-MVA electric arc furnace. The carbon steel products are processed into flats, channels, angles, etc. Also, at this facility are a reinforcing mesh plant and a forging plant.

The Von Moos Stahl AG plant at Lucerne also has a reported capacity of 300,000 mt/a. The products include galvanized wire, alloy steel (excluding stainless), annealed wire, and other types of bars and flats. The Wohlen plant, which reportedly has a capacity of 150,000 mt/a, produces bar and other rolled products. The Wohlen plant, owned by Ferrowohlen AG, reportedly was under consideration for closure. Permits that would have allowed the plant to install new equipment were reportedly not initially granted due to the environmental concerns raised by the local populous. However, the Wohlen City Council reportedly approved the installation of the second-hand hot-rolling mill, new reheat furnace, slab caster, and a taller chimney. The mechanical parts for the rolling mill and the reheat furnace had reportedly been purchased from Hoogovens, of the Netherlands. Prior to the installation of the continuous slab casting equipment, the company was reportedly planning to import slabs for the rolling mill.

## Industrial Minerals

Construction materials and gypsum were the only commodities mined in Switzerland. The country has a few processing plants of industrial minerals, but depends heavily on neighboring EC countries for many commodities.

*Cement.*—Cementia Holding AG, owned by the French company Lafarge Coppee, was the major producer of cement in Switzerland. Most plants in the country were being modernized to meet new $NO_x$ limits, which were forecasted to be imposed on the industry. Domestic cement consumption was projected to decrease for the second year.

*Salt.*—Salt production in Switzerland was a monopoly of several cantons. The largest solution mining operation in the Rhine Valley produced 350,000 mt/a. The second largest produced 50,000 mt/a.

## Mineral Fuels

Extensive Alpine precipitation, glacial water storage, and the great range of altitudes made hydroelectric power widely available. The Swiss Federal 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 Western Europe, Mauvoisin (256 m) and Grande Dixence (308 m), are in the Valais Canton on the Rhone River. This area has a large hydroelectric power consumption, primarily by the aluminum industry.

Hydroelectric power accounted for close to 60% of Switzerland's electric power generation. Domestic nuclear and imported power each contributed about 23

billion kWH, while thermal plants contributed 1.1 billion KWH. Five nuclear power stations supplied 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.

The only domestic natural gas production came from the Finsterwald Field, in Lucerne Canton. The rest was imported from the Netherlands, the Norwegian sectors of the North Sea, and from the U.S.S.R. Switzerland has 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.

### Resources

Numerous small ore deposits were mined in the past in Switzerland; mainly for iron, nickel-cobalt, gold, and silver. These small-scale operations have not been economical for some time.

## INFRASTRUCTURE

Switzerland is a highly developed country with an excellent network of 72,000 km of paved roads, 5,200 km of operating railroads, and 1,400 km of oil and gas pipelines. Several of Europe's most important waterways originate in Switzerland as runoff from the mountain glaciers. The Rhone, Rhine, and Danube rivers have given Switzerland a key position in intra-European traffic. Furthermore, these rivers provide the links to some of the most important ports in the world, through which goods are transshipped to Switzerland.

## OUTLOOK

Major changes in the mineral industry of Switzerland were not expected in the near future. The environment was becoming an important issue and environmental protection politics were likely to become a greater force affecting the mineral industry in the future. Switzerland's relationship with the EC will continue to be an interntional concern for the country, while energy and environmental policies will remain important issues. It seems unlikely that any new nuclear power stations will be built in Switzerland in the next decade due to the citizens' prevalent concerns about nuclear power and construction lead time. 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.

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[1]Where necessary, values have been converted from Swiss francs (SWF or Sfr) to U.S. dollars at the rate of SWF1.30=US$1.00. OECD Economic Surveys, Switzerland, 1991, p. 11.

### OTHER SOURCES OF INFORMATION

**Agencies**

Bundesamt fur Industrie, Gewerbe, und Arbeit
Federal Office for Industry, Business, and Labor
Bern, Switzerland

**Publications**

Annuaire Statistique de la Suisse (Swiss Statistical Annual).

Jahresbericht, Verein, Schweizerischer Zement, Kalk und Gips Fabrikanten (Annual Report of Cement, Lime, and Gypsum Manufacturers' Association).

Union Petroliere, Rapport Annuel (Annual report of the Union Petroleum Co.).

Union Suisse du Commerce et de L'industrie, (Annual report) 1990.

TABLE 1

## SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum, smelter, primary | tons | 73,169 | 71,816 | 71,328 | 71,602 | 71,000 |
| Iron and steel: | | | | | | |
| Pig iron and blast furnace ferroalloys e | | [3]70 | 70 | 70 | 70 | 70 |
| Electric-furnace ferroalloys e | | 5 | 5 | 5 | 5 | 5 |
| Steel, crude | | 870 | r825 | 916 | 970 | 925 |
| Semimanufactures, rolled products e | | 1,000 | r1,100 | 1,300 | 1,100 | 1,000 |
| Lead, refined, secondary | tons | 2,500 | 1,500 | e1,400 | 1,500 | 1,400 |
| INDUSTRIAL MINERALS | | | | | | |
| Cement, hydraulic | | 4,617 | 4,965 | 5,461 | 5,206 | 5,000 |
| Gypsum e | | 230 | 230 | 230 | 230 | 200 |
| Lime | | 32 | 32 | 30 | 26 | 25 |
| Nitrogen: N content of ammonia e | | 39 | 32 | 32 | 32 | 32 |
| Salt | | 390 | 309 | 243 | 254 | 250 |
| Sodium compounds, n.e.s.: Carbonate e | tons | 23 | — | — | — | — |
| Sulfur, from petroleum refining e | do. | [3]3,533 | 3,550 | 3,700 | 3,700 | 3,700 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Gas: | | | | | | |
| Manufactured | million cubic meters | 15 | 14 | 11 | 10 | 10 |
| Natural | do. | 9 | 8 | 5 | 5 | 5 |
| Petroleum refinery products: | | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 1,817 | 1,986 | 1,518 | 1,612 | 1,550 |
| Gasoline, all kinds | do. | 8,765 | 8,695 | 6,180 | r6,450 | 6,400 |
| Naphtha | do. | r6 | r9 | ([4]) | r80 | 75 |
| Jet fuel | do. | 2,286 | 1,949 | 2,018 | r1,832 | 2,100 |
| Kerosene | do. | 30 | 19 | 15 | r15 | 17 |
| Distillate fuel oil | do. | 12,863 | 11,887 | 9,134 | r8,478 | 8,700 |
| Residual fuel oil | do. | 3,917 | 4,322 | 2,827 | r3,545 | 3,300 |
| Bitumen | do. | 931 | 904 | 926 | r872 | 915 |
| Other refinery products | do. | 1 | 1 | 1 | 1 | 1 |
| Refinery fuel and losses | do. | 1,311 | 1,133 | 882 | 882 | 880 |
| Total[5] | do. | r31,927 | r30,905 | r23,501 | r23,767 | 23,938 |

eEstimated. rRevised.

[1]Table includes data available through Apr. 1992.

[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]Revised to zero.

[5]Total of listed products only.

TABLE 2

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS** | | | | | |
| Alkali and alkaline-earth metals: | | | | | |
| Alkali metals | kilograms | 1,883 | 2,148 | (2) | Iran 1,005; West Germany 140; France 24. |
| Alkaline-earth metals | do. | 564 | 358 | (2) | West Germany 309. |
| Aluminum: | | | | | |
| Ore and concentrate | | 1 | 41 | — | France 26; West Germany 10; Peru 5. |
| Oxides and hydroxides | | 830 | 1,432 | 21 | Netherlands 772; France 325; West Germany 177. |
| Ash and residue containing aluminum | | 7,384 | 12,562 | — | West Germany 5,328; Norway 2,934; Portugal 2,324. |
| Metal including alloys: | | | | | |
| Scrap | | 39,143 | 36,846 | (2) | West Germany 20,435; Italy 12,700; France 2,694. |
| Unwrought | | 32,476 | 30,618 | — | West Germany 19,567; Austria 4,246; Italy 3,046. |
| Semimanufactures | | 121,110 | 126,646 | 1,319 | West Germany 38,368; France 21,497; Netherlands 10,334. |
| Antimony: | | | | | |
| Ore and concentrate | | 144 | — | — | |
| Oxides | kilograms | 1 | 7 | NA | West Germany 4; unspecified 3. |
| Metal including alloys, all forms | do. | 56 | 590 | — | NA. |
| Arsenic: Metal including alloys, all forms | do. | 825 | 1 | — | West Germany 1. |
| Beryllium: Metal including alloys, all forms | do. | 57 | 409 | (2) | NA. |
| Bismuth: Metal including alloys, all forms | do. | 819 | 76 | — | Netherlands 4; West Germany 2; unspecified 70. |
| Cadmium: Metal including alloys, all forms | | 8 | 1 | — | NA. |
| Chromium: | | | | | |
| Ore and concentrate | | 30 | 20 | — | All to Italy. |
| Oxides and hydroxides | | 216 | 142 | — | West Germany 110; France 17; Italy 5. |
| Metal including alloys, all forms | | 44 | 39 | 10 | Yugoslavia 10; West Germany 6. |
| Cobalt: | | | | | |
| Oxides and hydroxides | kilograms | 763 | 12,035 | (2) | France 10,772; West Germany 1,098. |
| Metal including alloys, all forms | | 11 | 119 | 44 | France 28; West Germany 22. |
| Columbium and tantalum: Metal including alloys, all forms | kilograms | 688 | 587 | 10 | West Germany 234; France 125; Singapore 31. |
| Copper: | | | | | |
| Matte and speiss including cement copper | | — | (2) | — | All to Canada. |
| Oxides and hydroxides | | 70 | 11 | — | Mainly to Belgium-Luxembourg. |
| Sulfate | | 13 | 10 | — | West Germany 4; France 2; Italy 2. |
| Ash and residue containing copper | | 3,712 | 4,582 | NA | West Germany 2,610; Belgium-Luxembourg 693; Spain 363. |
| Metal including alloys: | | | | | |
| Scrap | | 27,701 | 18,721 | 104 | West Germany 9,404; Italy 4,977; Austria 2,086. |
| Unwrought | | 7,338 | 8,657 | — | West Germany 6,116; Italy 1,502; France 670. |

See footnotes at end of table

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued: | | | | |
| Copper—Continued: | | | | |
| Metal including alloys—Continued: | | | | |
| Semimanufactures | 27,970 | 26,626 | 3,554 | West Germany 10,800; France 4,007. |
| Germanium: Metal including alloys, all forms kilograms | 49 | 3 | NA | NA. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $8,414 | $31,193 | $21,803 | West Germany $5,158; Italy $2,234. |
| Metal including alloys, unwrought and partly wrought | 12,057 | 7,421 | 115 | United Kingdom 3,407; France 2,237; Hong Kong 531. |
| Iron and steel: | | | | |
| Iron ore and concentrate: Excluding roasted pyrite | 56 | 9 | NA | West Germany 4; Republic of Korea 1. |
| Metal: | | | | |
| Scrap | 66,863 | 66,060 | — | Italy 37,703; West Germany 15,866; France 2,579. |
| Pig iron, cast iron, related materials | 1,758 | 1,059 | (2) | West Germany 688; Spain 148; Austria 49. |
| Ferroalloys: | | | | |
| Ferroaluminum | 20 | 1 | NA | NA. |
| Ferrochromium | 86 | 44 | — | Yugoslavia 22; Taiwan 6; unspecified 13. |
| Ferromanganese | 76 | 62 | — | Burma 17; Portugal 14; unspecified 17. |
| Ferromolybdenum | 12 | 11 | — | Yugoslavia 5; Mexico 2; unspecified 3. |
| Ferrosilicomanganese | 413 | 5 | — | Spain 4; Egypt 1. |
| Ferrosilicon | 39 | 84 | — | West Germany 42; Yugoslavia 20; unspecified 16. |
| Silicon metal | 10 | (2) | — | Mainly to Italy. |
| Unspecified | 27 | 45 | — | Mexico 13; Austria 8; Republic of South Africa 4. |
| Steel, primary forms | 7,049 | 16,233 | 2 | Italy 8,854; France 7,056; West Germany 175. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 167,245 | 181,362 | 586 | West Germany 97,858; Austria 30,734; France 22,497. |
| Clad, plated, coated | 13,081 | 11,700 | — | France 3,851; West Germany 3,733; Austria 2,473. |
| Of alloy steel | 7,030 | 6,099 | 72 | West Germany 3,345; Italy 877; Austria 569. |
| Bars, rods, angles, shapes, sections | 445,419 | 460,070 | 461 | West Germany 273,977; Italy 79,524; France 40,478. |
| Rails and accessories | 1,857 | 1,948 | 9 | Italy 630; Austria 531; West Germany 261. |
| Wire | 20,230 | 21,942 | 342 | West Germany 11,041; France 3,672; Italy 3,408. |
| Tubes, pipes, fittings | 221,222 | 209,995 | — | West Germany 95,968; Italy 20,278; Netherlands 19,818. |
| Lead: | | | | |
| Oxides | 82 | 23 | — | Austria 21; France 1. |

See footnotes at end of table.

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Lead—Continued: | | | | | |
| Ash and residue containing lead | | 794 | 979 | — | West Germany 656; Yugoslavia 148; Netherlands 93. |
| Metal including alloys: | | | | | |
| Scrap | | 14,526 | 13,402 | — | Italy 5,447; Yugoslavia 3,047; West Germany 2,973. |
| Unwrought | | 2,111 | 1,585 | — | Italy 1,431; West Germany 109; Austria 33. |
| Semimanufactures | | 77 | 20 | — | Austria 8; Italy 6; West Germany 1. |
| Lithium: Oxides and hydroxides | kilograms | 640 | 1,711 | 20 | United Kingdom 1,557; West Germany 43. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 231 | 90 | — | France 46; Netherlands 13; Norway 12. |
| Unwrought | | 49 | 11 | — | Italy 8; West Germany 1; United Kingdom 1. |
| Semimanufactures | | 1,061 | 760 | 4 | United Kingdom 312; France 160; West Germany 70. |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 34 | 18 | — | France 6; Philippines 5; Egypt 3. |
| Oxides | | 162 | 9 | NA | Japan 5; West Germnay 3; Iran 1. |
| Metal including alloys, all forms | | 35 | 22 | — | Austria 5; Bulgaria 5; West Germany 5. |
| Mercury | kilograms | 3,832 | 32,575 | 9 | Netherlands 29,634; Iran 301. |
| Molybdenum: | | | | | |
| Oxides and hydroxides | do. | 173 | 1,470 | 1,371 | West Germany 64. |
| Metal including alloys: | | | | | |
| Unwrought | do. | 3,155 | 4,091 | (2) | United Kingdom 2,088; West Germany 468; U.S.S.R. 260. |
| Semimanufactures | do. | 871 | 887 | 87 | West Germany 295; France 126. |
| Nickel: | | | | | |
| Matte and speiss | do. | — | 1,021 | — | Mainly to Italy. |
| Oxides and hydroxides | do. | 666 | 110 | NA | NA. |
| Metal including alloys: | | | | | |
| Scrap | | 302 | 276 | 5 | West Germany 270; France 1. |
| Unwrought | | 194 | 63 | — | West Germany 53; Austria 3; Turkey 3. |
| Semimanufactures | | 629 | 520 | 2 | France 220; West Germany 88; Italy 56. |
| Platinum-group metals: | | | | | |
| Ore and concentrate | | 1,746 | -- | | |
| Waste and sweepings | value, thousands | $3,328 | $7,462 | $278 | United Kingdom $2,293; Belgium-Luxembourg $2,182; West Germany $1,969. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 18,602 | 18,556 | 1,292 | West Germany 5,319; Japan 4,943; United Kingdom 2,537. |
| Platinum | do. | 23,456 | 25,968 | 2,122 | Japan 16,926; United Kingdom 1,733. |
| Rhodium | do. | 150 | 70 | (2) | West Germany 43; Netherlands 22; France 3. |
| Iridium, osmium, ruthenium | do. | 30 | 42 | 7 | Yugoslavia 23; Iraq 6. |
| Rare-earth metals including alloys, all forms | do. | 838 | 311 | (2) | West Germany 309. |

See footnotes at end of table.

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Selenium, elemental | kilograms | 70 | 44 | NA | NA. |
| Silicon, high-purity | do. | 98 | 695 | — | East Germany 299; Japan 190; unspecified 186. |
| Silver: | | | | | |
| Waste and sweepings[3] | value, thousands | $21,430 | $20,478 | (2) | France $8,794; West Germany $8,376; Italy $1,758. |
| Metal including alloys, unwrought and partly wrought | | 879 | 1,767 | 1 | France 61; Denmark 28; unspecified 1,584. |
| Tellurium and boron, elemental | kilograms | 20 | 20 | NA | West Germany 2; unspecified 18. |
| Tin: | | | | | |
| Ore and concentrate | | — | (2) | — | All to France. |
| Metal including alloys: | | | | | |
| Scrap | | 84 | 86 | — | West Germany 40; Netherlands 28; Belgium-Luxembourg 18. |
| Unwrought | | 129 | 110 | — | Italy 61; West Germany 42; Austria 3. |
| Semimanufactures | | 81 | 162 | (2) | France 125; West Germany 22; Italy 7. |
| Titanium: | | | | | |
| Ore and concentrate | | 89 | 43 | — | Israel 19; Portugal 10; Iran 8. |
| Oxides | | 868 | 148 | (2) | West Germany 52; Netherlands 35; Italy 31. |
| Metal including alloys: | | | | | |
| Unwrought including scrap | | 55 | 53 | (2) | West Germany 37; United Kingdom 15. |
| Semimanufactures | | 180 | 203 | 1 | France 140; West Germany 77; United Kingdom 18. |
| Tungsten: Metal including alloys: | | | | | |
| Unwrought | | 86 | 91 | (2) | West Germany 55; Austria 19; Belgium-Luxembourg 12. |
| Semimanufactures | kilograms | 7,539 | 2,817 | 362 | West Germany 847; France 391. |
| Uranium and thorium: Oxides and other compounds | value, thousands | NA | $50 | $1 | France $42; West Germany $3. |
| Vanadium: | | | | | |
| Oxides and hydroxides | kilograms | 309 | 68 | — | NA. |
| Metal including alloys, all forms | do. | 37 | 39 | — | NA. |
| Zinc: | | | | | |
| Oxides | | 23 | 41 | — | West Germany 26; Iraq 4; Yugoslavia 4. |
| Blue powder | | 25 | 106 | — | Netherlands 34; West Germany 17; unspecified 55. |
| Ash and residue containing zinc | | 8,142 | 5,759 | NA | Belgium-Luxembourg 1,983; West Germany 1,886; Italy 1,420. |
| Metal including alloys: | | | | | |
| Scrap | | 1,208 | 1,238 | — | West Germany 511; Italy 396; France 211. |
| Unwrought | | 387 | 917 | — | West Germany 590; Netherlands 195; Italy 100. |
| Semimanufactures | | 20 | 158 | — | West Germany 143; Italy 2; unspecified 7. |
| Zirconium: | | | | | |
| Ore and concentrate | | 64 | 13 | — | West Germany 10; Spain 3. |
| Metal including alloys, all forms | kilograms | 104 | 10,576 | 1 | West Germany 10,392; unspecified 183. |
| Other: | | | | | |
| Ores and concentrates | | 2 | (2) | — | NA. |

See footnotes at end of table

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued: | | | | |
| Other—Continued: | | | | |
| Oxides and hydroxides | 19 | 33 | — | Belgium-Luxembourg 11; West Germany 6; France 2. |
| Ashes and residues | 2,735 | 3,313 | 129 | Spain 2,576; Italy 151. |
| Base metals including alloys, all forms kilograms | 10,722 | (2) | — | All to France. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 17 | 61 | — | Italy 30; West Germany 15; France 7. |
| Artificial: | | | | |
| Corundum | 199 | 211 | 7 | West Germany 99; Austria 30; France 22. |
| Silicon carbide | 5,854 | 4,406 | NA | NA. |
| Dust and powder of precious and semi-precious stones excluding diamond kilograms | 5,353 | 6,046 | 557 | Italy 2,572; France 529. |
| Grinding and polishing wheels and stones | 10,168 | 3,130 | 168 | West Germany 1,336; United Kingdom 1,229. |
| Asbestos, crude | 3 | 4 | NA | Hungary 2; France 1; West Germany 1. |
| Barite and witherite | 13 | 7 | — | Thailand 5; West Germany 1; Yugoslavia 1. |
| Boron materials: | | | | |
| Crude natural borates | (2) | 1 | — | Mainly to Burma. |
| Oxides and acids | 5 | 8 | 1 | West Germany 2; Austria 1. |
| Bromine | 3 | 39 | (2) | West Germany 36; Ireland 2. |
| Cement | 21,248 | 23,588 | (2) | West Germany 23,472; France 32; Philippines 15. |
| Chalk | 129 | 176 | — | France 102; West Germany 26; Austria 15. |
| Clays, crude: | | | | |
| Bentonite | 259 | 50 | — | West Germany 22; Austria 10; Spain 5. |
| Chamotte or dinas earth | 100 | 79 | — | West Germany 78; France 1. |
| Kaolin | 305 | 237 | (2) | Austria 90; West Germany 62; United Kingdom 27. |
| Unspecified | 62,462 | 60,024 | — | West Germany 59,980; France 8; Italy 3. |
| Cryolite and chiolite | 21 | 2 | — | Turkey 1. |
| Diamond, natural: | | | | |
| Gem, not set or strung value, thousands | $2,198,350 | $2,407,688 | $195,948 | United Kingdom $1,041,279; Israel $654,197; Belgium-Luxembourg $133,009. |
| Industrial stones do. | $2,269 | $3,082 | $98 | West Germany $1,427; Belgium-Luxembourg $765; Netherlands $327. |
| Dust and powder kilograms | 5,123 | 5,823 | 557 | Italy 2,444; France 529. |
| Diatomite and other infusorial earth | 23 | 76 | (2) | United Kingdom 43; China 11; West Germany 2. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 28 | 36 | (2) | West Germany 10; Portugal 9; Spain 5. |
| Unspecified | 33 | 20 | NA | NA. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 4,710 | 5,212 | — | Italy 2,513; Austria 1,753; France 809. |
| Manufactured: | | | | |
| Ammonia | 8 | 30 | (2) | France 20; Iran 3; West Germany 1. |

See footnotes at end of table.

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Fertilizer materials—Continued: | | | | | |
| Manufactured—Continued: | | | | | |
| Nitrogenous | | 915 | 1,357 | 6 | West Germany 1,303; France 40. |
| Phosphatic | | 1 | — | | |
| Potassic | | 427 | 15 | — | United Kingdom 11; West Germany 3; Republic of Korea 1. |
| Unspecified and mixed | | 3,541 | 5,835 | 25 | West Germany 3,458; France 1,359; Ecuador 255. |
| Fluorspar | | 69 | 55 | — | Portugal 28; Philippines 16; United Kingdom 7. |
| Graphite, natural | | 20 | 11 | — | Iran 4; Philippines 2; West Germany 1. |
| Gypsum and plaster | | 15,283 | 13,265 | — | France 13,073; Austria 86; West Germany 72. |
| Iodine | | 8 | 7 | (2) | Algeria 6. |
| Kyanite and related materials | kilograms | — | 2 | NA | NA. |
| Lime | | 1,093 | 957 | 54 | Denmark 537; West Germany 116; Italy 43. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 8 | 27 | — | West Germany 18; France 3; Ecuador 2. |
| Oxides and hydroxides | | 116 | 72 | — | West Germany 47; Portugal 9; France 4. |
| Mica: | | | | | |
| Crude including splittings and waste | | 133 | 131 | 27 | Austria 21; Venezuela 13. |
| Worked including agglomerated splittings | | 517 | 615 | 15 | West Germany 113; France 101; United Kingdom 70. |
| Phosphates, crude | kilograms | — | 523 | — | NA. |
| Phosphorus, elemental | do. | 105 | 137,861 | 12 | France 137,650; West Germany 68. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 58 | 19 | NA | West Germany 3; Austria 1; unspecified 15. |
| Iron oxides and hydroxides, processed | | 34 | 32 | (2) | Austria 11; France 4; unspecified 9. |
| Potassium salts, crude | | — | 1 | — | All to Norway. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $361,387 | $546,537 | $119,706 | Hong Kong $89,265; France $80,068. |
| Synthetic | do. | $34,508 | $38,716 | $5,182 | West Germany $6,046; Thailand $4,010; Spain $3,546. |
| Pyrites, unroasted | | 27 | 34 | — | Mainly to Philippines. |
| Quartz crystal, piezoelectric | kilograms | 502 | 578 | — | West Germany 419; Iraq 59; Netherlands 27. |
| Salt and brine | | 309 | 526 | 2 | France 387; West Germany 103; Spain 7. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 6 | 24 | (2) | West Germany 13; Philippines 4; Peru 2. |
| Sulfate, manufactured | | 31 | 11 | NA | West Germany 3; Italy 2. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 29,494 | 34,318 | — | Italy 23,515; West Germany 9,555; Austria 791. |
| Worked | | 7,978 | 6,822 | 176 | West Germany 5,383; Italy 433; France 319. |
| Dolomite, chiefly refractory-grade | | 38 | 128 | 10 | France 79; Ecuador 19; West Germany 12. |

See footnotes at end of table.

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Stone, sand and gravel—Continued: | | | | | |
| Dimension stone—Continued: | | | | | |
| Gravel and crushed rock | | 75,963 | 18,217 | 1 | France 11,014; West Germany 5,475; Netherlands 717. |
| Limestone other than dimension | | 2 | — | — | |
| Quartz and quartzite | | 41,899 | 41,150 | 1 | Italy 40,397; West Germany 481; Austria 73. |
| Sand other than metal-bearing | | 28,348 | 18,636 | — | Italy 14,397; France 1,988; Austria 1,197. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 14,331 | 15,791 | — | West Germany 11,020; France 2,806; Yugoslavia 218. |
| Colloidal, precipitated, sublimed | | 6 | 7 | (2) | Algeria 6. |
| Dioxide | | 4,088 | 3,617 | — | West Germany 3,511; Austria 106. |
| Sulfuric acid | | 22,009 | 22,264 | (2) | West Germany 20,239; France 1,010; Austria 690. |
| Talc, steatite, soapstone, pyrophyllite | | 147 | 179 | — | Austria 108; West Germany 35; Ecuador 6. |
| Vermiculite, perlite, chlorite | | 1 | 5 | — | NA. |
| Other: | | | | | |
| Crude | | 9,804 | 12,664 | (2) | France 9,790; West Germany 2,239; Italy 598. |
| Slag and dross, not metal-bearing | | 38,913 | 37,496 | — | West Germany 36,027; Italy 1,428. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Asphalt and bitumen, natural | | 6 | 9 | — | West Germany 6; France 3. |
| Carbon black | | 221 | 269 | (2) | Czechoslavakia 128; West Germany 104; Republic of South Africa 22. |
| Coal: | | | | | |
| Anthracite | | (2) | 351 | — | Netherlands 280; West Germany 71. |
| Bituminous | | 18,426 | 3,923 | — | West Germany 1,605; Yugoslavia 1,493; Netherlands 821. |
| Briquets of anthracite and bituminous coal | | — | 12 | — | Mainly to West Germany. |
| Coke and semicoke | | 1,194 | 8,678 | — | West Germany 6,674; Yugoslavia 2,001; Belgium-Luxembourg 2. |
| Gas, natural: Gaseous-thousand cubic meters | | 2,968 | 2,853 | — | Italy 2,830; Austria 92. |
| Peat including briquets and litter | | 758 | 649 | — | West Germany 395; Italy 71; Netherlands 5. |
| Petroleum: | | | | | |
| Crude | 42-gallon barrels | 95 | 153 | — | France 131; East Germany 7; West Germany 7. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 229,552 | 198,197 | 882 | Italy 88,311; West Germany 65,610; France 64,879. |
| Gasoline | do. | 961 | 60,359 | (2) | West Germany 58,379; United Kingdom 1,285; Austria 238. |
| Mineral jelly and wax | do. | 1,094 | 9,216 | 378 | West Germany 8,602; Italy 550; Canada 63. |
| Kerosene and jet fuel | do. | 302 | — | | |

See footnotes at end of table.

TABLE 2—Continued

## SWITZERLAND: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products—Continued: | | | | | |
| Distillate fuel oil | 42-gallon barrels | 143,814 | 189,275 | — | Austria 189,260; Bulgaria 7. |
| Lubricants | do. | 43,680 | 28,070 | 133 | Italy 12,313; West Germany 8,494; Austria 1,190. |
| Residual fuel oil | do. | 41,572 | 748,950 | — | West Germany 660,605; Austria 76,217; France 12,135. |
| Bitumen and other residues | do. | 12,878 | 5,884 | — | France 5,606; West Germany 242; Netherlands 30. |
| Bituminous mixtures | do. | 18,489 | 11,969 | 842 | West Germany 3,448; France 1,945; Iran 1,164. |
| Petroleum coke | do. | 2,668 | 3,729 | 297 | West Germany 2,398; Italy 490. |

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 a unit.
[3]May include other precious metals.

TABLE 3

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Alkali and alkaline-earth metals: | | | | | |
| Alkali metals | | 449 | 619 | (2) | West Germany 345; France 242; United Kingdom 22. |
| Alkaline-earth metals | kilograms | 1,330 | 2,177 | NA | NA. |
| Aluminum: | | | | | |
| Ore and concentrate | | 1,747 | 691 | — | All to West Germany. |
| Oxides and hydroxides | | 146,529 | 150,483 | 113 | Australia 124,219; West Germany 17,221; Spain 5,449. |
| Ash and residue containing aluminum | | 1,367 | 766 | — | West Germany 446; Austria 320. |
| Metal including alloys: | | | | | |
| Scrap | | 5,734 | 4,110 | 68 | West Germany 2,449; Norway 701; Netherlands 311. |
| Unwrought | | 117,601 | 104,595 | 141 | West Germany 30,006; Iceland 29,984; Norway 21,998. |
| Semimanufactures | | 82,224 | 91,720 | 329 | West Germany 42,898; France 10,477; Austria 9,238. |
| Antimony: | | | | | |
| Oxides | | 316 | 390 | NA | West Germany 179; China 120; United Kingdom 44. |
| Metal including alloys, all forms | | 31 | 79 | (2) | China 65; Republic of Korea 10; France 2. |
| Arsenic: Metal including alloys, all forms | | (2) | 8 | NA | Chile 5. |
| Beryllium: Metal including alloys, all forms | kilograms | 4,838 | 599 | 519 | West Germany 56; unspecified 24. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Bismuth: Metal including alloys, all forms | | 12 | 15 | (2) | Belgium-Luxembourg 5; Netherlands 3; China 2. |
| Cadmium: Metal including alloys, all forms | | 12 | 11 | (2) | Hungary 5; Canada 3; West Germany 1. |
| Chromium: | | | | | |
| Ore and concentrate | | 2,404 | 2,682 | — | Republic of South Africa 1,335; Belgium-Luxembourg 482; West Germany 460. |
| Oxides and hydroxides | | 602 | 560 | 6 | West Germany 394; Italy 146; Poland 10. |
| Metal including alloys, all forms | | 115 | 184 | 3 | France 86; West Germany 73; United Kingdom 19. |
| Cobalt: | | | | | |
| Oxides and hydroxides | kilograms | 4 | 18 | (2) | France 15; China 1. |
| Ore and concentrate | | — | 24 | — | All from Italy. |
| Metal including alloys, all forms | | 240 | 256 | 101 | West Germany 70; Belgium-Luxembourg 26. |
| Columbium and tantalum: | | | | | |
| Ore and concentrate[3] | kilograms | 500 | — | — | |
| Metal including alloys, all forms, tantalum | | 2 | 2 | (2) | Austria 1. |
| Copper: | | | | | |
| Ore and concentrate | kilograms | — | 33 | — | All from United Kingdom. |
| Oxides and hydroxides | | 35 | 60 | NA | Norway 44; Belgium-Luxembourg 11; West Germany 1. |
| Sulfate | | 824 | 773 | NA | Italy 266; Czechoslovakia 225; West Germany 56. |
| Ash and residue containing copper | | 81 | 366 | — | West Germany 326; Spain 21; Netherlands 19. |
| Metal including alloys: | | | | | |
| Scrap | | 5,289 | 8,188 | 687 | West Germany 4,483; France 820. |
| Unwrought | | 8,944 | 8,844 | 201 | West Germany 2,953; Belgium-Luxembourg 2,685; Austria 1,931. |
| Semimanufactures | | 104,178 | 102,380 | 478 | West Germany 48,544; France 15,271; Italy 9,259. |
| Germanium: Metal including alloys, all forms | kilograms | 372 | 116 | (2) | Belgium-Luxembourg 44; West Germany 28. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $58,126 | $66,809 | $169 | West Germany $21,896; Saudi Arabia $14,040; Netherlands $13,680. |
| Metal including alloys, unwrought and partly wrought | | 3,416 | 3,484 | 392 | West Germany 1,549; Italy 363. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | | 321 | 232 | — | West Germany 174; Belgium-Luxembourg 35; United Kingdom 22. |
| Pyrite, roasted | | 10,569 | 13,898 | — | Belgium-Luxembourg 5,904; Norway 4,233; West Germany 2,036. |
| Metal: | | | | | |
| Scrap | | 152,116 | 135,923 | 13 | West Germany 94,852; France 39,569; Austria 1,244. |
| Pig iron, cast iron, related materials | | 55,474 | 55,807 | 13 | West Germany 22,595; Republic of South Africa 11,357; France 8,209. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Ferroalloys: | | | | |
| Ferroaluminum | 573 | 806 | NA | United Kingdom 792; unspecified 14. |
| Ferrochromium | 1,015 | 1,308 | — | West Germany 606; Belgium-Luxembourg 282; Republic of South Africa 150. |
| Ferromanganese | 4,646 | 5,372 | — | West Germany 2,806; France 1,111; Republic of South Africa 785. |
| Ferromolybdenum | 160 | 225 | 30 | Austria 113; Chile 26. |
| Ferronickel | 3 | 26 | — | West Germany 13; Republic of South Africa 13. |
| Ferrosilicomanganese | 7,664 | 7,318 | — | Norway 3,754; Republic of South Africa 2,538; Brazil 765. |
| Ferrosilicon | 6,691 | 6,071 | 11 | U.S.S.R. 1,906; West Germany 1,641; Norway 985. |
| Silicon metal | 3,758 | 4,395 | — | Brazil 1,669; France 844; Italy 616. |
| Unspecified | 1,095 | 1,134 | 3 | Norway 265; France 196. |
| Steel, primary forms | 121,257 | 124,341 | 57 | West Germany 56,938; United Kingdom 28,248; Netherlands 22,038. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 870,380 | 798,474 | 230 | West Germany 288,770; Belgium-Luxembourg 97,938; United Kingdom 87,428. |
| Clad, plated, coated | 239,581 | 205,458 | 168 | West Germany 65,239; France 31,982; United Kingdom 25,939. |
| Of alloy steel | 132,850 | 137,066 | 223 | West Germany 50,453; France 21,793; Japan 15,333. |
| Bars, rods, angles, shapes, sections | 799,629 | 763,855 | 2,276 | Italy 226,208; West Germany 196,074; France 101,381. |
| Rails and accessories | 59,796 | 58,132 | — | Austria 34,423; West Germany 16,709; Italy 5,810. |
| Wire | 94,016 | 106,341 | 30 | Italy 65,383; West Germany 19,218; Belgium-Luxembourg 7,120. |
| Tubes, pipes, fittings | 185,542 | 176,801 | 153 | West Germany 78,214; Italy 27,599; France 15,477. |
| Lead: | | | | |
| Ore and concentrate | 3 | — | — | |
| Oxides | 289 | 464 | — | West Germany 362; United Kingdom 90; Netherlands 10. |
| Ash and residue containing lead | 20 | — | — | |
| Metal including alloys: | | | | |
| Scrap | 118 | 96 | — | West Germany 49; Netherlands 47. |
| Unwrought | 7,175 | 7,893 | 1,001 | Belgium-Luxembourg 2,160; Canada 1,243; Australia 1,198. |
| Semimanufactures | 1,974 | 1,888 | 3 | West Germany 1,633; Belgium-Luxembourg 233; Italy 4. |
| Lithium: Oxides and hydroxides | 54 | 47 | 17 | West Germany 26; United Kingdom 4. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 24 | 25 | — | Italy 9; Norway 9; France 3. |
| Unwrought | | 2,561 | 2,688 | 349 | Norway 1,387; Italy 523. |
| Semimanufactures | | 40 | 77 | 22 | France 18; U.S.S.R. 15. |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 181 | 167 | — | France 106; Netherlands 48; Belgium-Luxembourg 10. |
| Oxides | | 2,129 | 1,482 | 2 | Japan 1,206; Greece 120; Ireland 64. |
| Metal including alloys, all forms | | 684 | 629 | 8 | Republic of South Africa 310; Netherlands 139; Belgium-Luxembourg 123. |
| Mercury | | 18 | 16 | 4 | West Germany 9; Yugoslavia 2. |
| Molybdenum: | | | | | |
| Oxides and hydroxides | kilograms | 400 | 1,900 | — | All from West Germany. |
| Metal including alloys: | | | | | |
| Unwrought | do. | 8,265 | 8,608 | 836 | West Germany 7,170; United Kingdom 460. |
| Semimanufactures | do. | 9,809 | 8,393 | 334 | Austria 5,617; West Germany 1,655. |
| Nickel: | | | | | |
| Matte and speiss | do. | 233 | 2 | — | All from United Kingdom. |
| Oxides and hydroxides | do. | 1,211 | 1,712 | — | Mainly from Italy. |
| Metal including alloys: | | | | | |
| Scrap | | 51 | 64 | — | Italy 35; Spain 21; West Germany 6. |
| Unwrought | | 1,087 | 1,408 | 45 | Norway 320; U.S.S.R. 236; Republic of South Africa 178. |
| Semimanufactures | | 1,086 | 1,274 | 184 | West Germany 610; United Kingdom 178. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $10,494 | $5,351 | $4 | West Germany $1,707; Taiwan $859; United Kingdom $740. |
| Metals including alloys unwrought and partly wrought: | | | | | |
| Palladium | kilograms | 16,317 | 17,489 | 6,516 | U.S.S.R. 4,612; Netherlands 2,142. |
| Platinum | do. | 16,964 | 23,814 | 1,907 | Republic of South Africa 5,720; United Kingdom 4,327; U.S.S.R. 3,385. |
| Rhodium | do. | 298 | 100 | 10 | Republic of South Africa 48; West Germany 22; United Kingdom 15. |
| Iridium, osmium, ruthenium | do. | 164 | 236 | — | United Kingdom 161; Republic of South Africa 55; West Germany 18. |
| Rare-earth metals including alloys, all forms | do. | 3,237 | 5,725 | 6 | Japan 4,102; West Germany 398; unspecified 1,200. |
| Selenium, elemental | do. | 1,076 | 5,682 | NA | United Kingdom 5,000; unspecified 682. |
| Silicon, high-purity | do. | 1,120 | 26,045 | NA | France 25,000; West Germany 569; East Germany 300. |
| Silver: | | | | | |
| Ore and concentrate[4] | value, thousands | $5 | $1,534 | — | All from Ghana. |
| Waste and sweepings[4] | do. | $10,270 | $17,315 | $2,504 | France $3,929; Zimbabwe $2,059. |
| Metal including alloys, unwrought and partly wrought | kilograms | 1,879,370 | 2,045,272 | 134 | West Germany 52,063; Italy 17,012; unspecified 1,951,637. |
| Tellurium and boron, elemental | | 1 | 1 | NA | Mainly from West Germany. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Tin: Metal including alloys: | | | | | |
| Scrap | | 24 | 35 | — | West Germany 19; France 15. |
| Unwrought | | 984 | 1,219 | (2) | Indonesia 220; West Germany 206; Brazil 200. |
| Semimanufactures | | 268 | 234 | (2) | West Germany 164; Netherlands 21; Belgium-Luxembourg 17. |
| Titanium: | | | | | |
| Ore and concentrate | | 335 | 194 | — | Australia 125; West Germany 64; Netherlands 5. |
| Oxides | | 2,396 | 1,490 | 130 | Finland 398; West Germany 389; France 178. |
| Metal including alloys, all forms | | 345 | 573 | 293 | Japan 105; West Germany 93. |
| Tungsten: | | | | | |
| Ore and concentrate | | 40 | 20 | 20 | |
| Metal including alloys, all forms | | 71 | 84 | 7 | West Germany 37; France 24. |
| Uranium and thorium: | | | | | |
| Ore and concentrate | kilograms | — | 5 | — | All from West Germany. |
| Oxides and other compounds | do. | 54 | 152 | 54 | France 72; unspecified 26. |
| Metal including alloys, all forms | do. | 4 | 34 | NA | NA. |
| Vanadium: | | | | | |
| Oxides and hydroxides | do. | 200 | 1,327 | 1,315 | NA. |
| Metal including alloys, all forms | | 14 | 58 | — | Republic of South Africa 45; Netherlands 10; Austria 3. |
| Zinc: | | | | | |
| Ore and concentrate | | 18 | 21 | — | All from West Germany. |
| Oxides | | 897 | 731 | — | France 359; West Germany 155; United Kingdom 142. |
| Blue Powder | | 3,159 | 2,871 | — | Belgium-Luxembourg 1,464; West Germany 873; Norway 305. |
| Ash and residue containing zinc | | 318 | 29 | — | Italy 24; West Germany 5. |
| Metal including alloys: | | | | | |
| Scrap | | 80 | 36 | — | Mainly from West Germany. |
| Unwrought | | 20,029 | 26,122 | — | France 7,397; Netherlands 5,228; West Germany 3,266. |
| Semimanufactures | | 4,734 | 5,418 | (2) | West Germany 3,327; France 1,195; Belgium-Luxembourg 599. |
| Zirconium: | | | | | |
| Ore and concentrate | | 303 | 205 | — | West Germany 101; United Kingdom 41; Netherlands 35. |
| Metal including alloys, all forms | | 41 | 41 | 5 | Italy 26; West Germany 4. |
| Other: | | | | | |
| Ores and concentrates | | (2) | — | | |
| Oxides and hydroxides | | 119 | 96 | 1 | France 28; West Germany 25; Spain 22. |
| Ashes and residues | | 349 | 665 | (2) | West Germany 276; Austria 231; Yugoslavia 81. |
| Base metals including alloys, all forms | kilograms | 13,062 | 1,045 | 145 | West Germany 436; United Kingdom 246. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 22,866 | 15,686 | 144 | West Germany 13,789; Iceland 1,043; Turkey 323. |
| Artificial: | | | | |
| Corundum | 7,205 | 7,142 | 161 | West Germany 3,088; Austria 1,967; Yugoslavia 888. |
| Silicon carbide | 2,731 | 1,243 | (2) | West Germany 740; Netherlands 268; Norway 227. |
| Dust and powder of precious and semi-precious stones excluding diamond kilograms | 8,368 | 10,742 | 1,787 | Ireland 6,225; West Germany 1,103. |
| Grinding and polishing wheels and stones | 2,662 | 2,707 | 17 | West Germany 1,387; Italy 480; Austria 309. |
| Asbestos, crude | 2,877 | 1,341 | 4 | Canada 919; U.S.S.R. 257; Hungary 154. |
| Barite and witherite | 4,228 | 1,547 | — | West Germany 979; Netherlands 200; France 183. |
| Boron materials: | | | | |
| Crude natural borates | 296 | 391 | — | Netherlands 220; Turkey 96; Belgium-Luxembourg 72. |
| Oxides and acids | 313 | 350 | 2 | Chile 116; France 101; West Germany 42. |
| Bromine and fluorine | 2,284 | 2,086 | 157 | Israel 1,176; Austria 537; France 179. |
| Cement | 331,522 | 272,531 | 14 | Italy 214,712; West Germany 24,420; France 18,480. |
| Chalk | 48,860 | 36,998 | — | Italy 18,832; France 14,889; West Germany 2,910. |
| Clays, crude: | | | | |
| Bentonite | 12,288 | 10,668 | 29 | West Germany 7,637; Austria 1,197; Italy 557. |
| Chamotte or dinas earth | 11,616 | 8,555 | NA | West Germany 5,992; Czechoslovakia 1,218; Italy 824. |
| Fuller's earth | 1,329 | 1,624 | 380 | United Kingdom 1,065; West Germany 121. |
| Fire clay | 9,866 | 11,700 | NA | West Germany 6,219; France 5,031; Spain 388. |
| Kaolin | 111,432 | 102,766 | 1,969 | United Kingdom 58,176; West Germany 22,043; Brazil 13,700. |
| Unspecified | 82,217 | 54,005 | NA | West Germany 52,548; France 618; Italy 240. |
| Cryolite and chiolite | 51 | 74 | — | Denmark 59; West Germany 15. |
| Diamond, natural: | | | | |
| Gem, not set or strung value, thousands | $2,406,770 | $2,576,016 | $232,818 | Bermuda $648,917; United Kingdom $600,258; Republic of South Africa $446,412. |
| Industrial stones do. | $7,838 | $7,267 | $1,247 | Belgium-Luxembourg $3,112; West Germany $1,766. |
| Dust and powder kilograms | 3,863 | 7,733 | 1,787 | Ireland 4,781; West Germany 219. |
| Diatomite and other infusorial earth | 7,733 | 6,877 | 315 | Denmark 5,099; France 690. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 16,459 | 14,266 | 1 | Italy 6,528; France 3,386; West Germany 3,147. |
| Fluorspar | 859 | 999 | — | France 687; Italy 264; West Germany 28. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Feldspar, fluorspar, related materials—Continued: | | | | |
| Unspecified | 608 | 568 | — | Netherlands 364; Italy 104; unspecified 100. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 23,251 | 20,810 | 21 | West Germany 8,728; France 7,862; Italy 3,409. |
| Manufactured: | | | | |
| Ammonia | 15,455 | 14,235 | — | West Germany 5,137; France 4,970; Austria 3,434. |
| Nitrogenous | 107,445 | 124,330 | 49 | Austria 24,999; West Germany 18,230; Netherlands 36,416. |
| Phosphatic | 59,574 | 51,035 | — | France 22,621; Belgium-Luxembourg 19,642; Netherlands 5,797. |
| Potassic | 64,028 | 62,002 | — | France 41,182; West Germany 16,974; East Germany 2,980. |
| Unspecified and mixed | 183,397 | 171,394 | 7,083 | West Germany 49,107; France 45,544; Belgium-Luxembourg 27,302. |
| Graphite, natural | 150 | 210 | 1 | West Germany 131; France 23; Austria 20. |
| Gypsum and plaster | 121,958 | 128,658 | 66 | West Germany 82,960; Italy 25,361; France 12,654. |
| Iodine | 61 | 100 | 5 | Japan 43; Belgium-Luxembourg 20; Chile 18. |
| Kyanite and related materials: | | | | |
| Mullite | 603 | 665 | 96 | West Germany 499; unspecified 50. |
| Unspecified | 50 | 109 | NA | France 78. |
| Lime | 99,614 | 104,126 | NA | West Germany 67,089; Italy 34,997; Austria 956. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 438 | 368 | — | West Germany 124; Italy 100; Greece 49. |
| Oxides and hydroxides | 6,037 | 5,967 | 6 | Austria 2,705; Spain 1,511; West Germany 627. |
| Sulfate | 10,464 | 11,368 | NA | Mainly to West Germany. |
| Mica: | | | | |
| Crude including splittings and waste | 925 | 567 | (2) | West Germany 273; France 102; United Kingdom 73. |
| Worked including agglomerated splittings | 490 | 611 | 1 | France 302; India 124; Belgium-Luxembourg 95. |
| Nitrates, crude | 596 | 506 | — | France 190; Chile 130; West Germany 99. |
| Phosphates, crude | 3,312 | 2,039 | (2) | Morocco 1,015; Israel 503; Belgium-Luxembourg 380. |
| Phosphorus, elemental | 5,936 | 5,812 | 86 | Italy 1,783; Netherlands 1,755; France 981. |
| Pigments, mineral: | | | | |
| Natural, crude | 275 | 243 | NA | Austria 103; France 65; West Germany 64. |
| Iron oxides and hydroxides, processed | 2,588 | 2,282 | 27 | West Germany 2,048; Japan 94; Netherlands 64. |
| Potassium salts, crude | — | 29 | — | All to West Germany. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural value, thousands | $436,561 | $490,578 | $105,560 | Thailand $69,807; Hong Kong $46,264. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | | |
| Pigments, mineral—Continued: | | | | | |
| Synthetic | kilograms | 66,283 | 81,600 | 10,500 | West Germany 25,613; France 24,569. |
| Pyrite, unroasted | | 202 | 212 | (2) | Italy 183; West Germany 14; Spain 14. |
| Quartz crystal, piezoelectric | kilograms | 387 | 68 | 6 | West Germany 53; unspecified 9. |
| Salt and brine | | 3,027 | 3,162 | 10 | France 2,060; West Germany 754; Israel 129. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash, manufactured | | 41,152 | 42,154 | — | France 34,315; West Germany 6,669; East Germany 1,045. |
| Sulfate, manufactured | | 19,078 | 16,347 | — | West Germany 8,951; Austria 6,039; Belgium-Luxembourg 458. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 217,609 | 204,209 | 16 | West Germany 82,035; Austria 65,244; Italy 29,384. |
| Worked | | 206,543 | 205,232 | 30 | Italy 131,309; Portugal 39,292; West Germany 13,334. |
| Dolomite, chiefly refractory-grade | | 20,902 | 19,611 | — | Italy 13,380; West Germany 1,993; Belgium-Luxembourg 1,860. |
| Gravel and crushed rock | thousand tons | 9,859 | 9,953 | (2) | France 4,257; West Germany 4,041; Italy 1,211. |
| Limestone other than dimension | | 11,536 | 9,442 | (2) | France 6,303; West Germany 2,217; Italy 852. |
| Quartz and quartzite | | 5,987 | 10,152 | 18 | West Germany 6,999; France 1,543; Italy 722. |
| Sand other than metal-bearing | thousand tons | 2,236 | 2,358 | (2) | Italy 741; France 734; West Germany 712. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 59,932 | 56,163 | — | West Germany 56,143; France 10; Belgium-Luxembourg 7. |
| Colloidal, precipitated, sublimed | | 43 | 52 | — | West Germany 30; France 22. |
| Dioxide | | 65 | 61 | — | West Germany 29; Italy 17; France 14. |
| Sulfuric acid | | 3,160 | 3,457 | — | West Germany 1,898; France 1,377; Italy 146. |
| Talc, steatite, soapstone, pyrophyllite | | 15.072 | 15,260 | — | Austria 8,775; Italy 2,977; France 1,257. |
| Vermiculite, perlite, chlorite | | 9,664 | 11,392 | (2) | Republic of South Africa 9,233; Greece 1,089; West Germany 381. |
| Other: | | | | | |
| Crude | | 131,344 | 80,612 | 1,202 | West Germany 27,413; France 20,950; Spain 19,286. |
| Slag and dross, not metal-bearing | | 48,730 | 45,498 | — | West Germany 30,625; France 11,794; Austria 1,532. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Asphalt and bitumen, natural | | 12,679 | 1,404 | 126 | Trinidad and Tobago 495; France 404; West Germany 334. |
| Carbon black | | 6,124 | 7,029 | 199 | West Germany 4,651; France 1,800. |

See footnotes at end of table.

TABLE 3—Continued

## SWITZERLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **MINERAL FUELS AND RELATED MATERIALS—Continued** | | | | | |
| Coal: | | | | | |
| Anthracite | | 10,783 | 7,299 | — | West Germany 6,027; Republic of South Africa 678; France 590. |
| Bituminous | | 322,575 | 477,355 | — | Republic of South Africa 421,066; West Germany 50,091; France 5,184. |
| Briquets of anthracite and bituminous coal | | 6,628 | 3,137 | — | West Germany 1,911; Republic of South Africa 551; Belgium-Luxembourg 496. |
| Lignite including briquets | | 9,405 | 8,356 | — | West Germany 8,131; East Germany 162. |
| Coke and semicoke | | 38,632 | 27,153 | 919 | West Germany 17,279; France 7,240; Italy 1,627. |
| Gas, natural: | | | | | |
| Gaseous | thousand cubic meters | 1,164,878 | 1,213,494 | — | West Germany 488,210; Netherlands 441,916; France 127,701. |
| Liquefied | thousand cubic meters | 24 | 22 | — | Mainly to West Germany. |
| Peat including briquets and litter | | 79,222 | 88,993 | — | West Germany 78,625; U.S.S.R. 5,048; Netherlands 3,633. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 22,456 | 22,900 | — | Libya 8,593; Norway 6,839; United Kingdom 2,819. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 516 | 497 | (2) | West Germany 428; France 58; Belgium-Luxembourg 5. |
| Gasoline | do. | 24,517 | 35,387 | (2) | West Germany 10,854; Belgium-Luxembourg 8,061; Netherlands 6,100. |
| Mineral jelly and wax | | 103 | 103 | 1 | West Germany 67; France 22; Austria 3. |
| Kerosene and jet fuel | thousand 42-gallon barrels | 113 | 88 | (2) | Hungary 67; Netherlands 18; France 2. |
| Distillate fuel oil | do. | 35,730 | 40,337 | 9 | West Germany 10,541; France 7,308; Netherlands 6,721. |
| Lubricants | do. | 578 | 589 | 8 | West Germany 150; Netherlands 108; France 74. |
| Residual fuel oil | do. | 595 | 466 | — | West Germany 420; France 40. |
| Bitumen and other residues | do. | 960 | 993 | (2) | West Germany 612; Italy 244; France 119. |
| Bituminous mixtures | do. | 81 | 76 | 1 | West Germany 42; France 19; Trinidad and Tobago 5. |
| Petroleum coke | do. | 564 | 447 | 27 | West Germany 398; Indonesia 20. |

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

TABLE 4

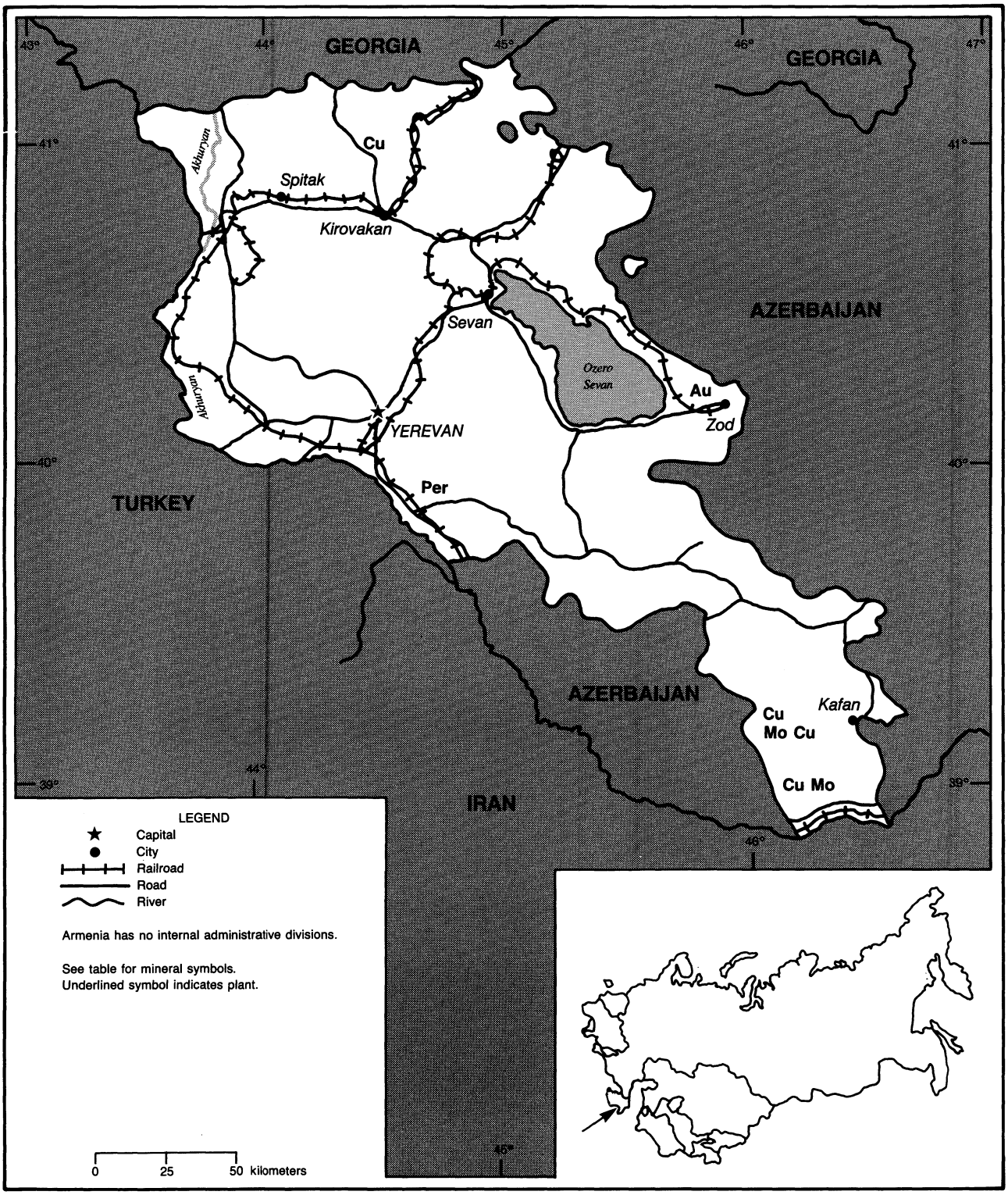
## SWITZERLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Aluminum | Alusuisse-Lonza | Smelter at Steg | 45. |
| Do. | Holding AG | | |
| Do. | do. | Smelters at Chippis and Sierre | 25. |
| Do. | Usine Aluminium Martigny SA | Smelter at Martigny | 10. |
| Cement | 17 companies, of which the largest are—Cementia Holding | 18 plants, of which the largest is— | 6,000 including— |
| Do. | Vigier Cement Ltd. | Reuchenette-Pery | (800) |
| Petroleum, refined 42-gallon barrels per day | The major refineries are— | | 92,000, including— |
| Do. do. | Raffinerie du Sud | Refinery at Collombey | (40,000). |
| Do. do. | Raffinerie de Cressier SA | Refinery at Cressier | (36,000). |
| Do. do. | Raffinerie Rheintal AG | Refinery at Senwald | (12,000). |
| Salt | Government of Vaud Canton | Mine at Bex | 5. |
| Do. | Schweizerische Rhein Salined | Salines at Ridburg | 220. |
| Do. | do. | Salines 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 | 380. |

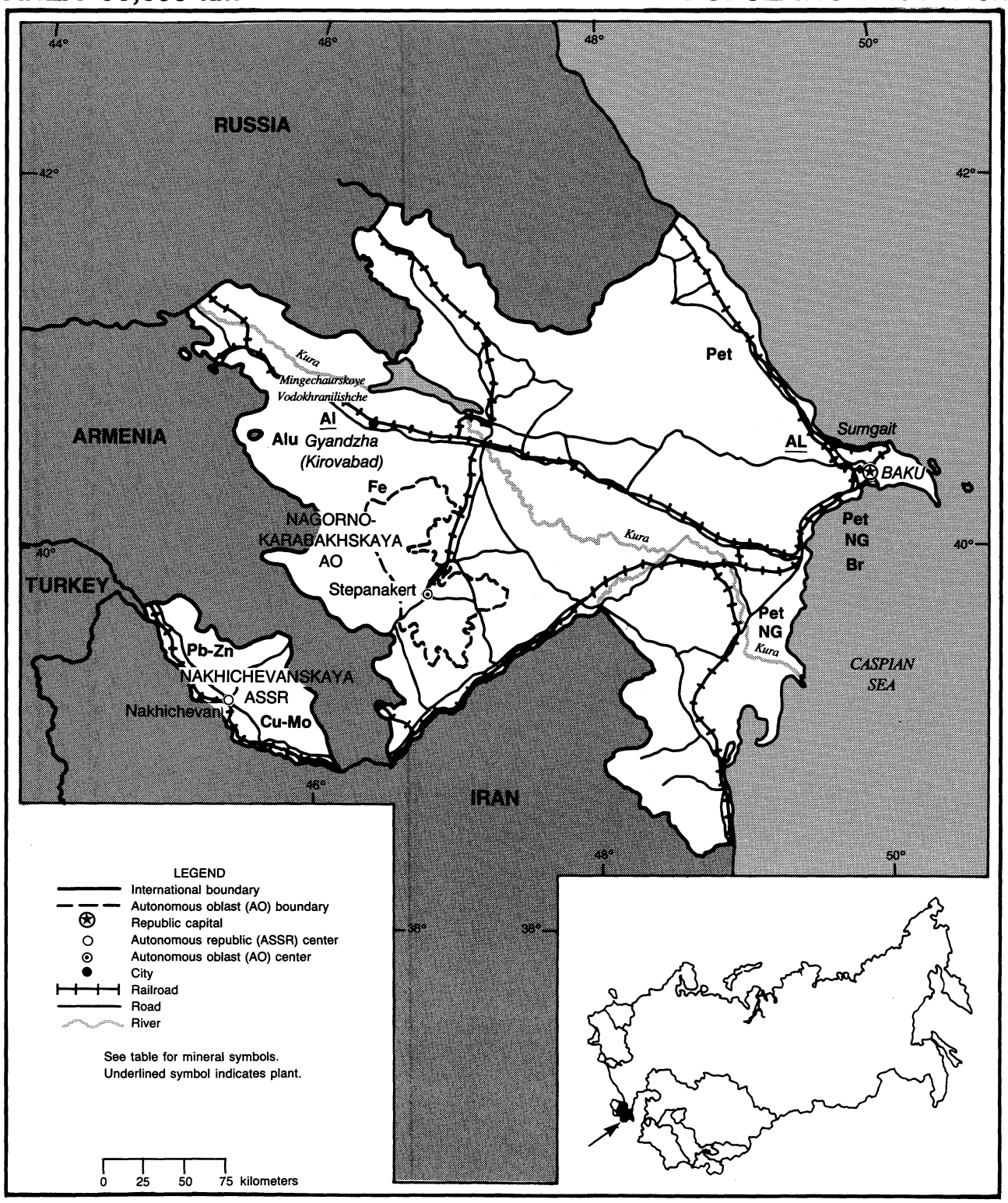
# ARMENIA

**AREA 29,800 km²** **POPULATION 3.4 million**



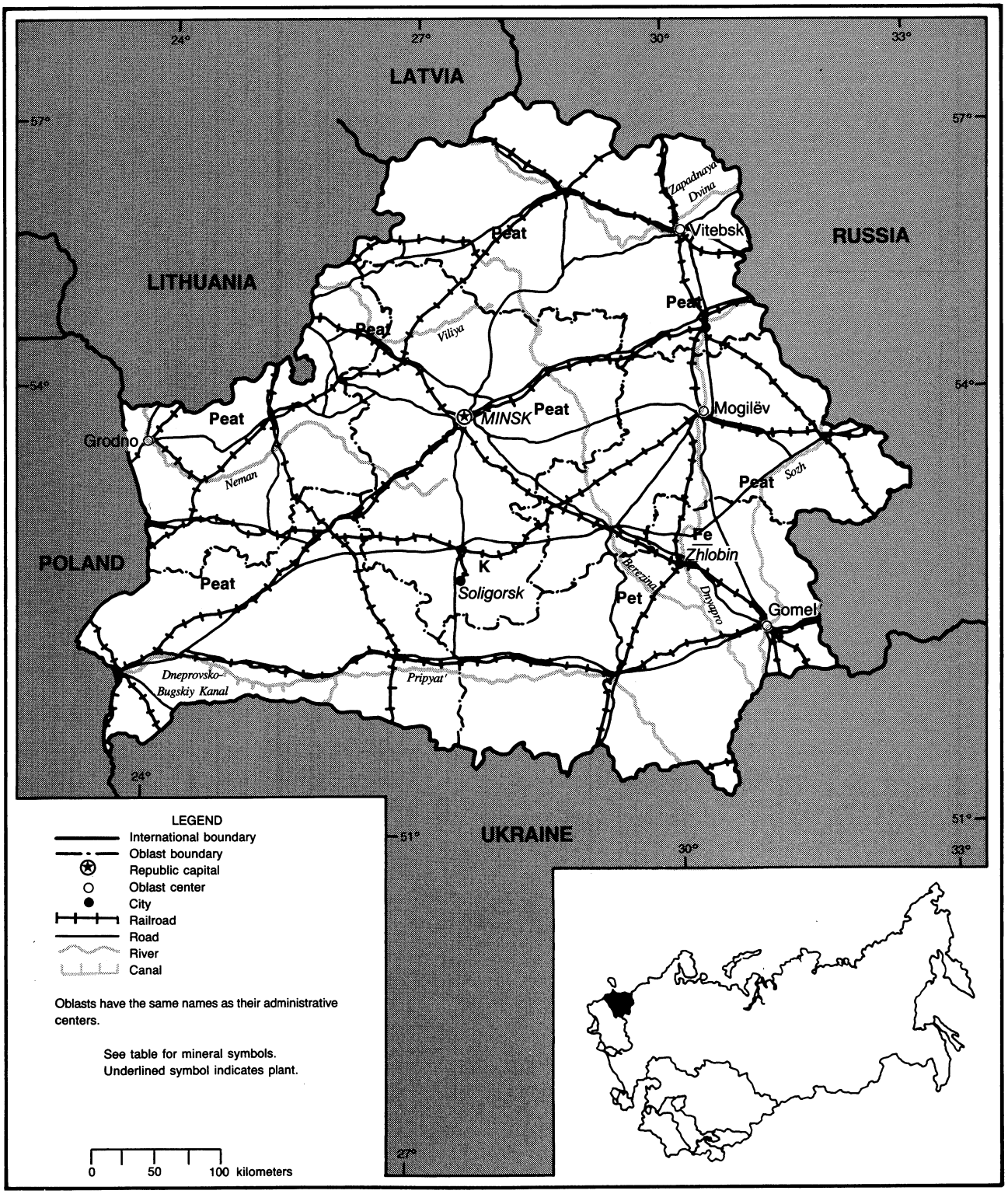
# AZERBAIJAN

**AREA 86,600 km²** **POPULATION 7.5 million**



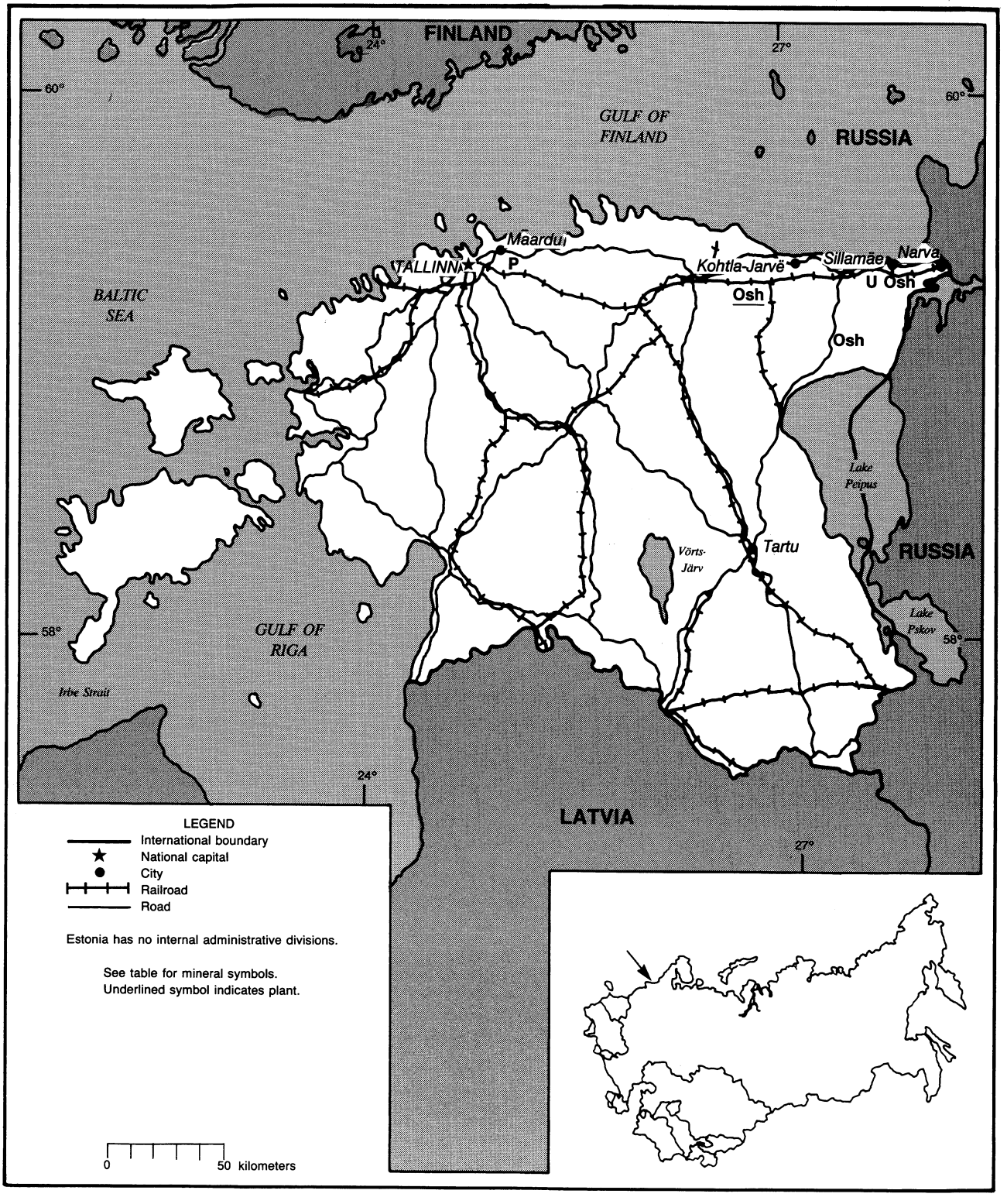
# BELARUS

**AREA 207,600 km²** **POPULATION 10.4 million**



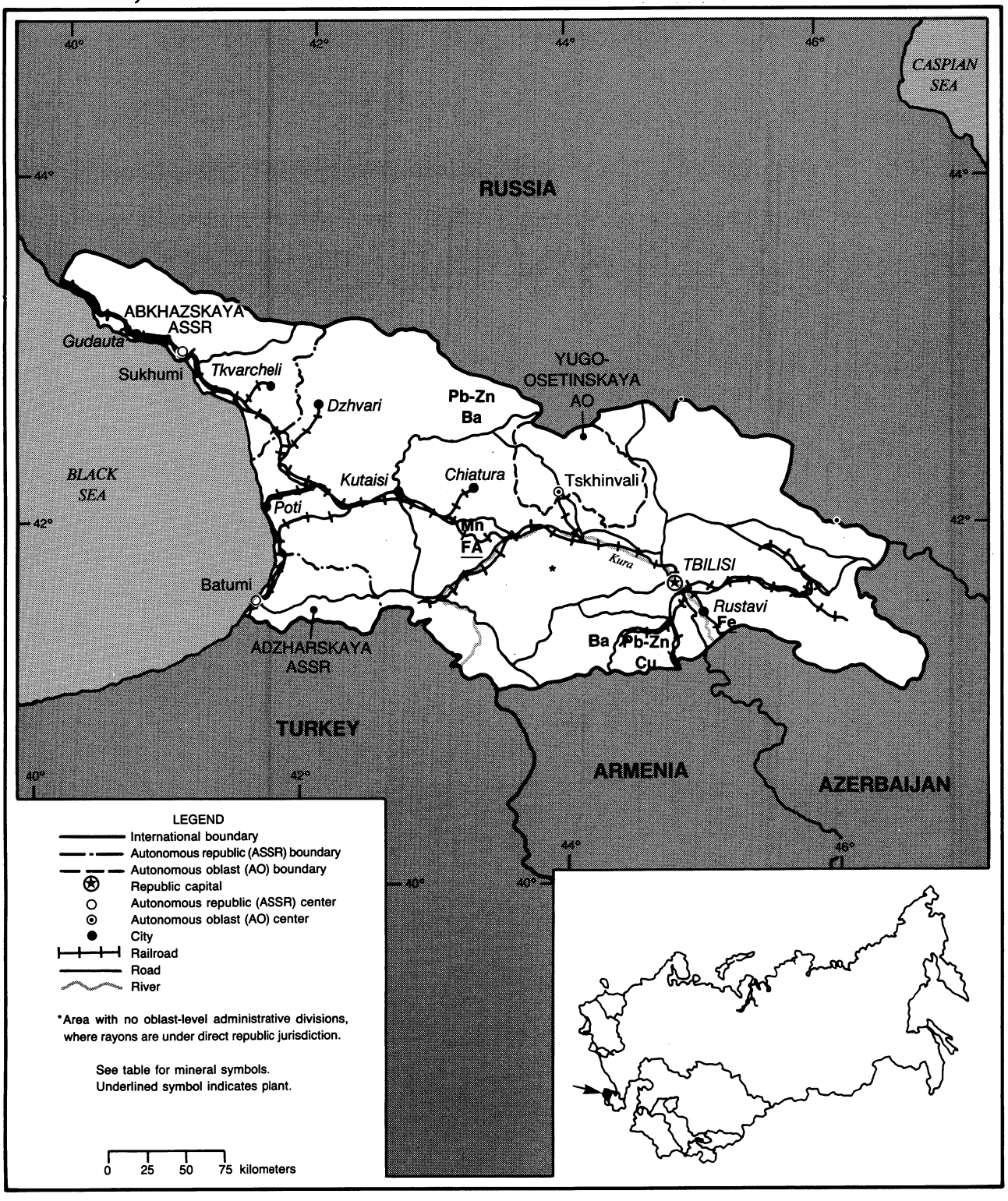
# ESTONIA

**AREA 45,100 km²** **POPULATION 1.6 million**



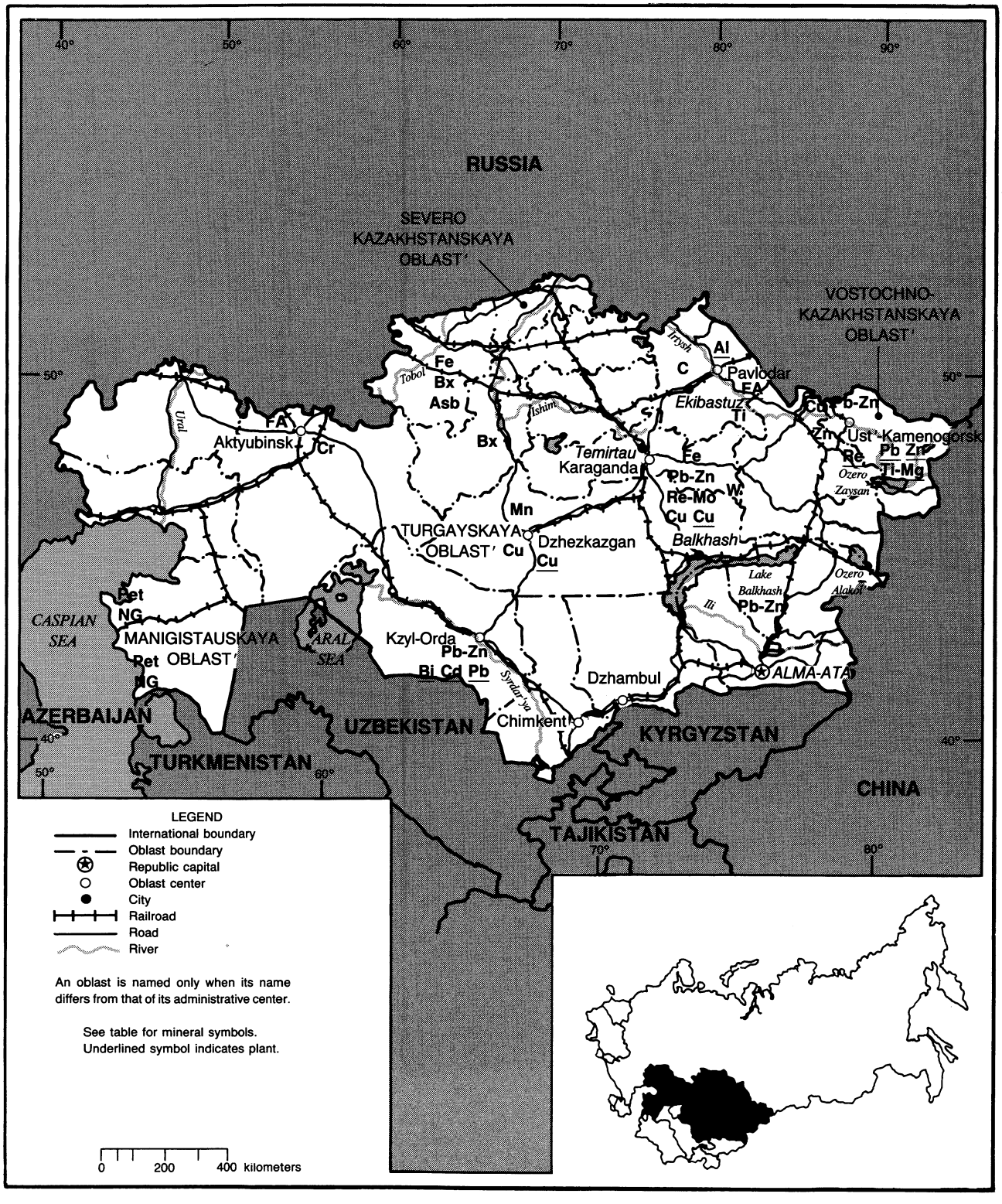
# GEORGIA

**AREA 69,700 km²** **POPULATION 5.6 million**



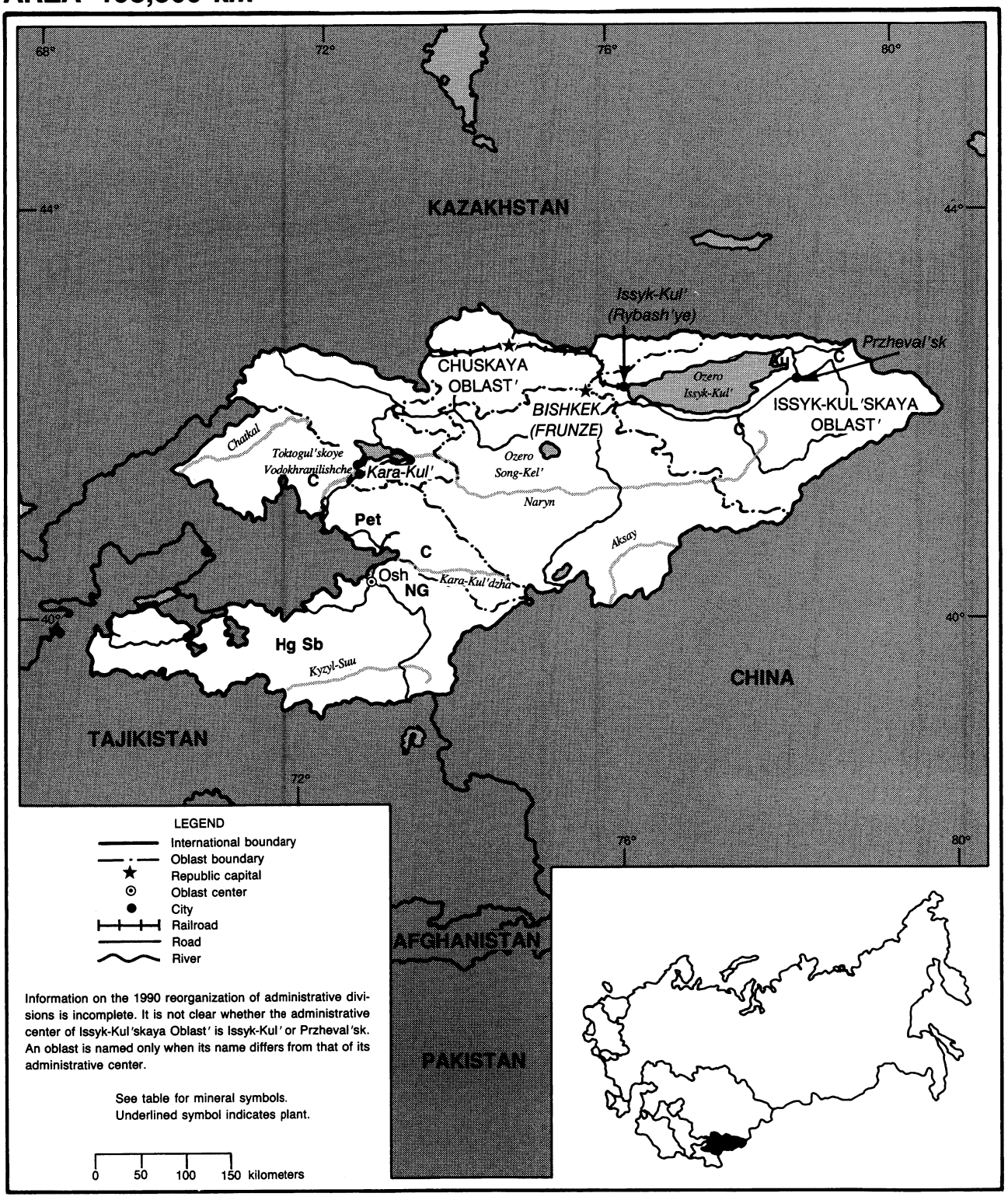
# KAZAKHSTAN

**AREA 2,717,300 km²** **POPULATION 17.1 million**



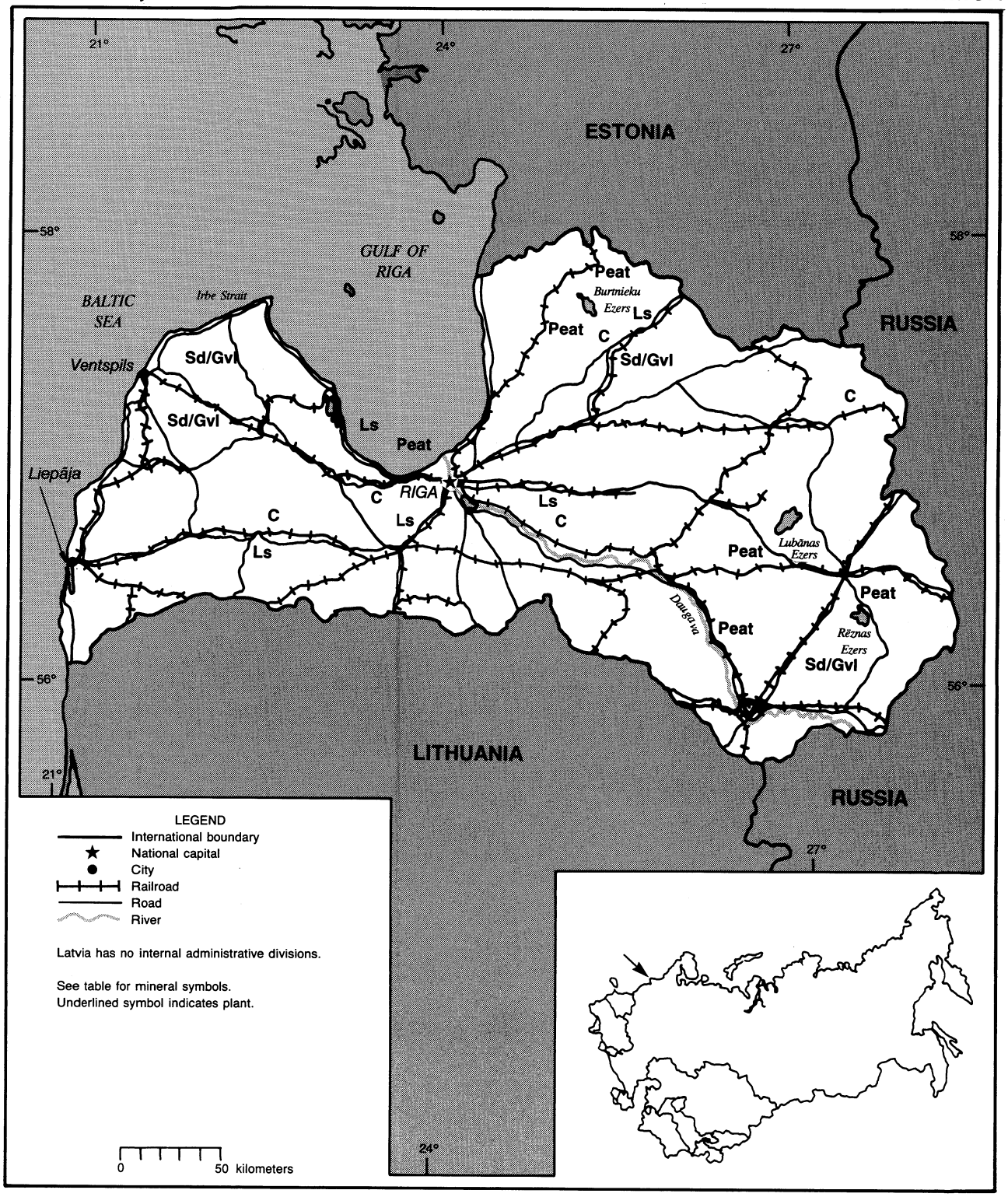
# KYRGYZSTAN

**AREA 198,500 km²** **POPULATION 4.6 million**



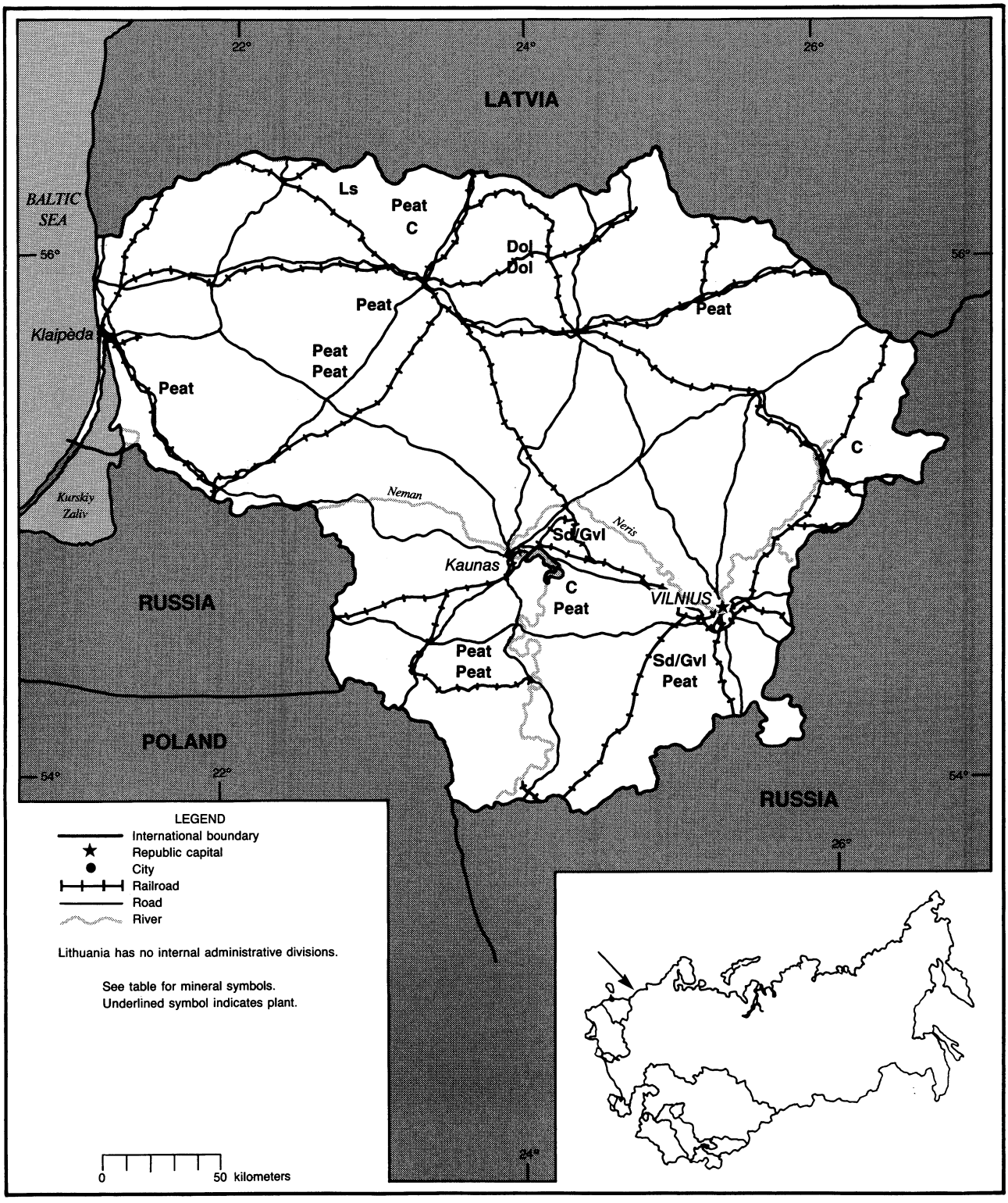
# LATVIA

**AREA 64,100 km²** **POPULATION 2.7 million**



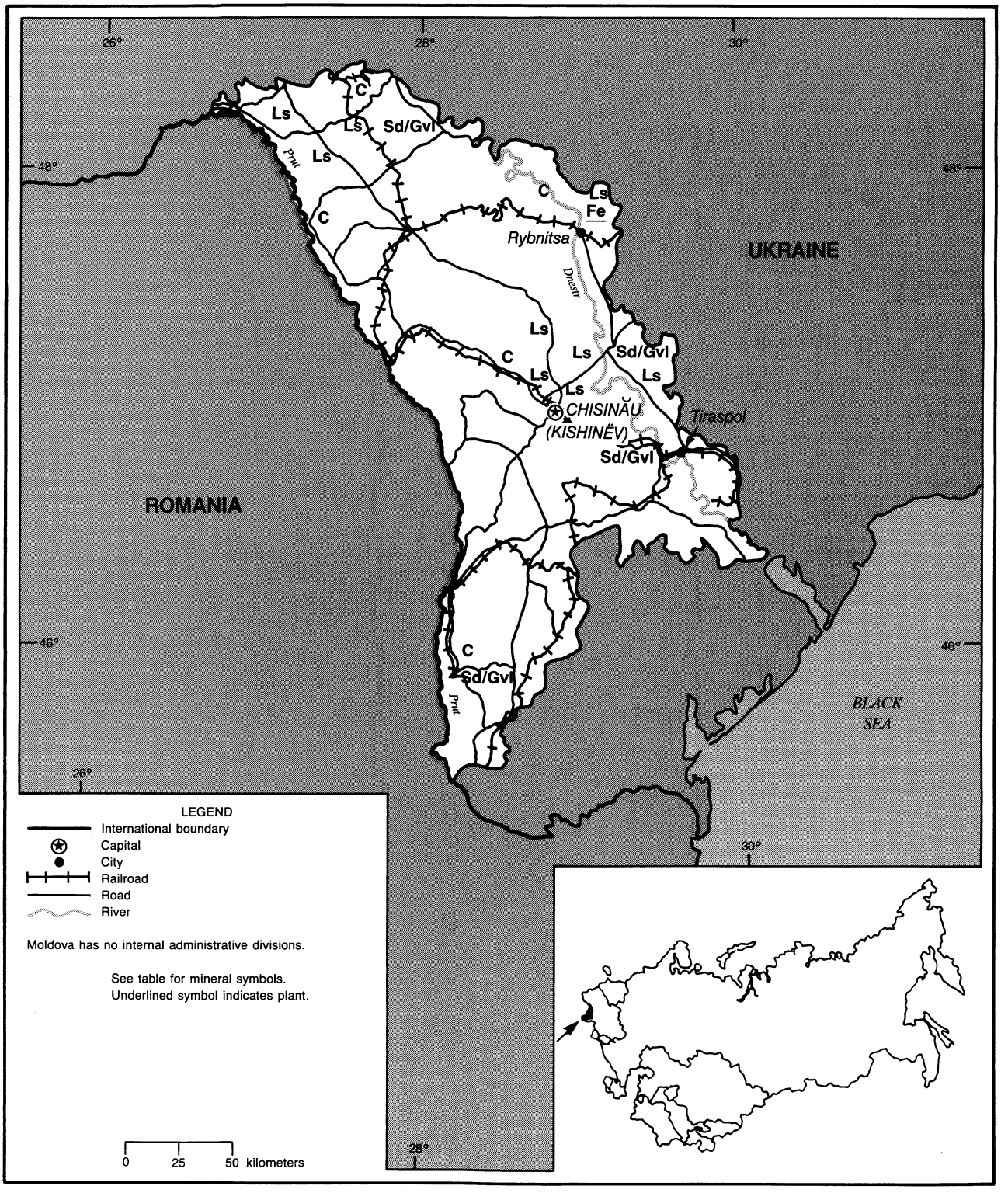
# LITHUANIA

**AREA 65,200 km²** **POPULATION 3.8 million**



# MOLDOVA

**AREA 33,700 km²** **POPULATION 4.5 million**



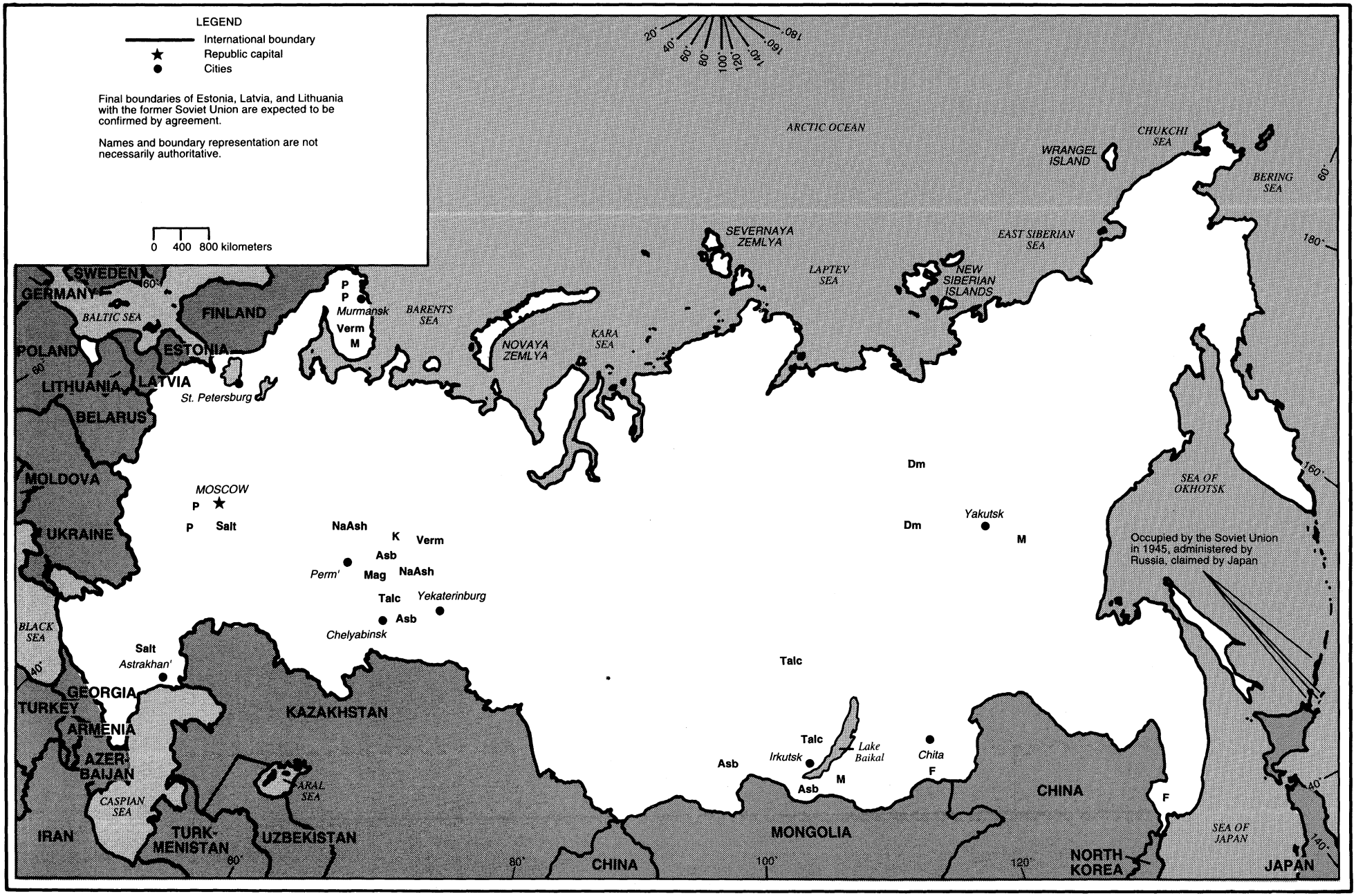
# ADMINISTRATIVE DIVISIONS OF RUSSIA

**AREA 17,075,200 km²** **POPULATION 149.5 million**

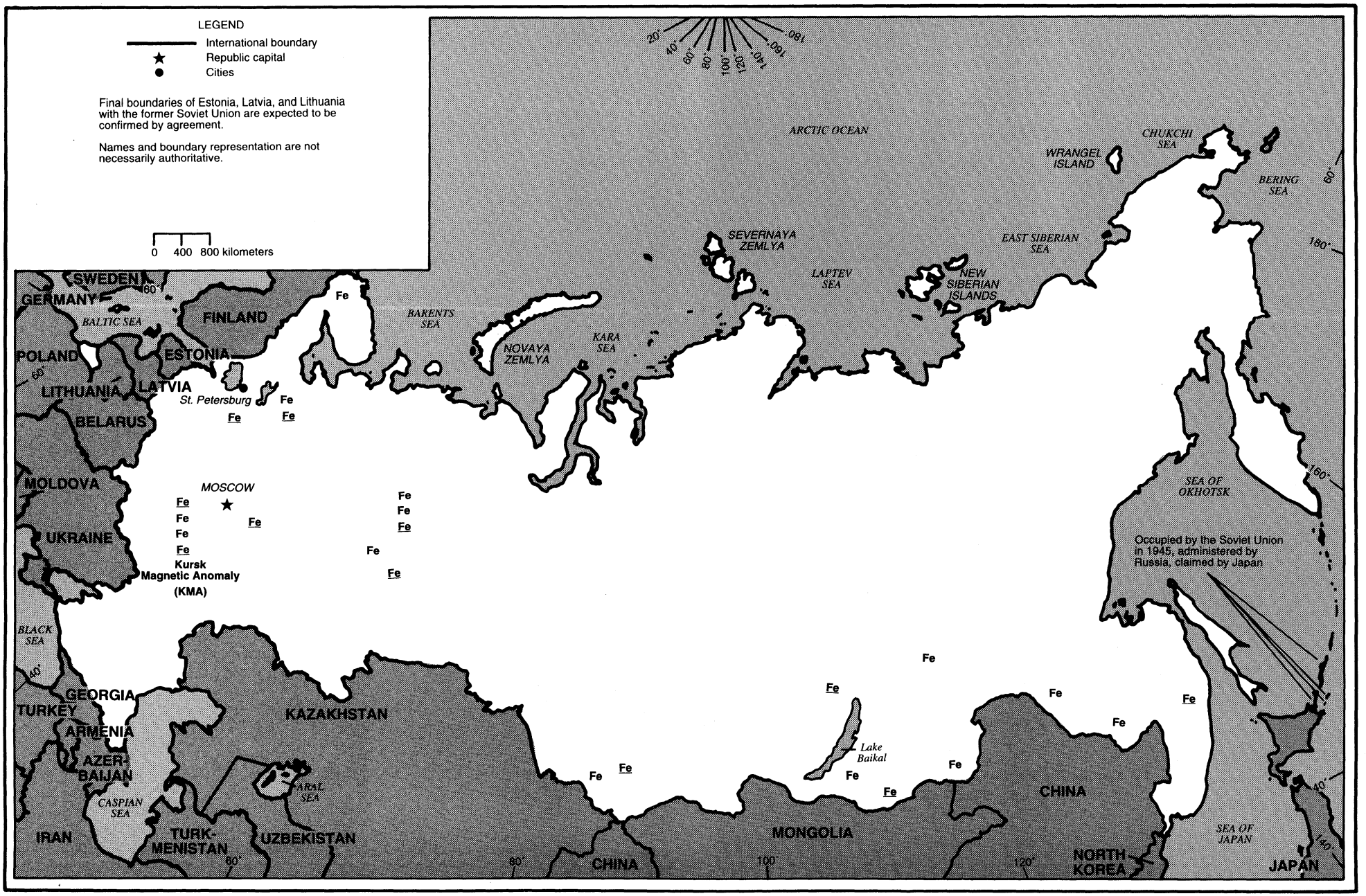

Names and boundary representation are not necessarily authoritative.

# RUSSIA — FERROALLOY METALS

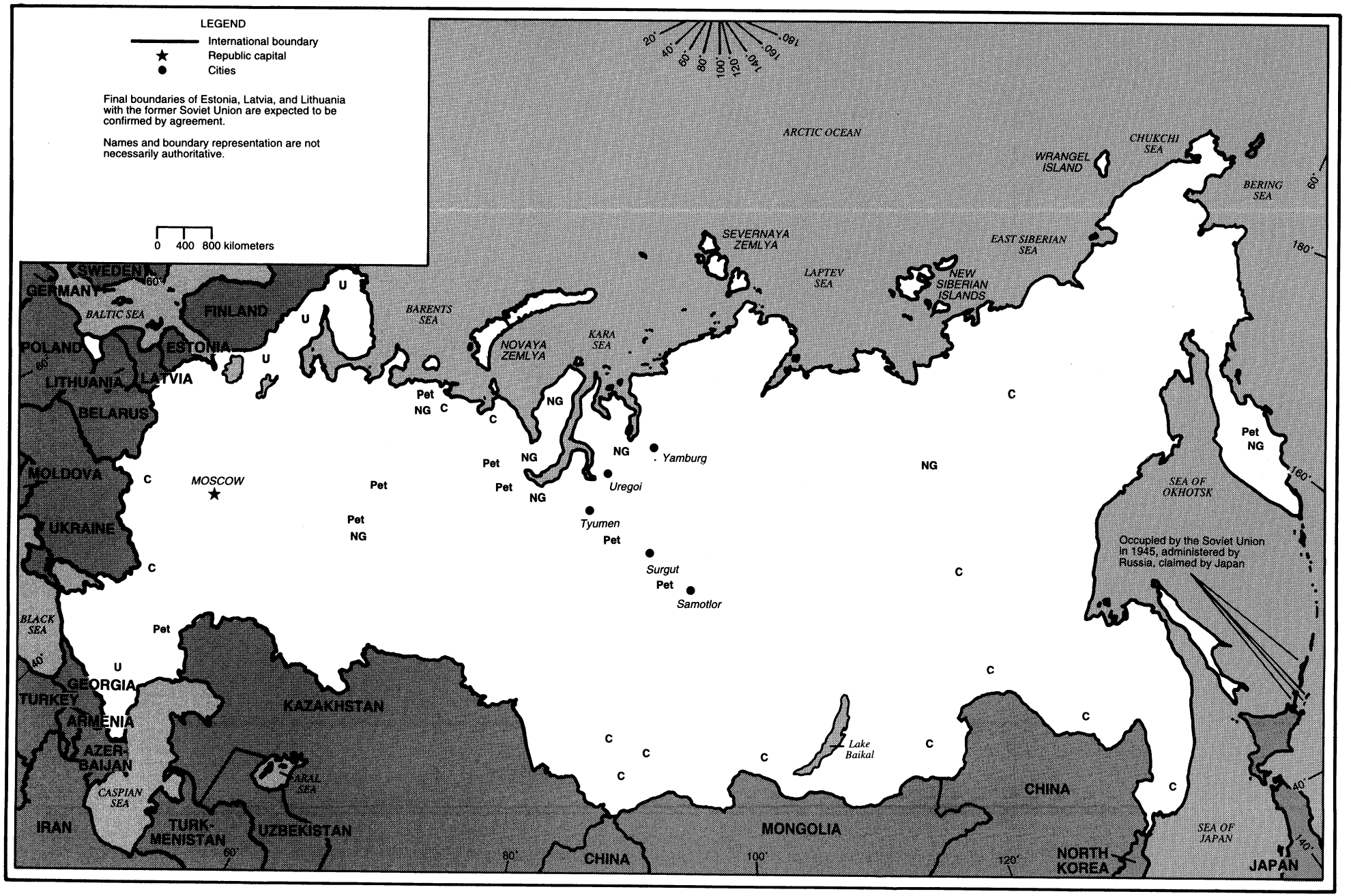
# RUSSIA — INDUSTRIAL MINERALS



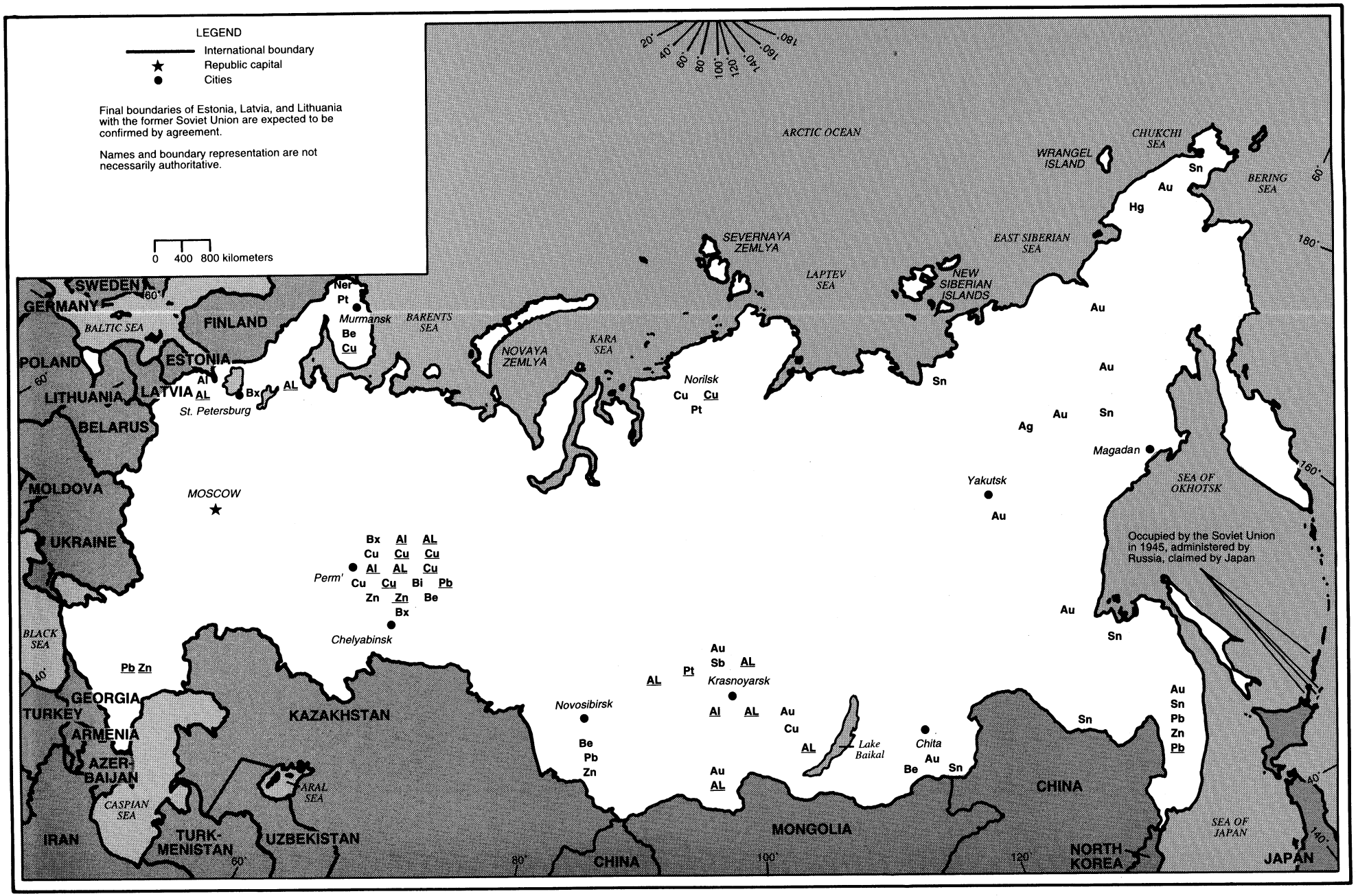
# RUSSIA — IRON ORE AND STEEL



# RUSSIA — MINERAL FUELS

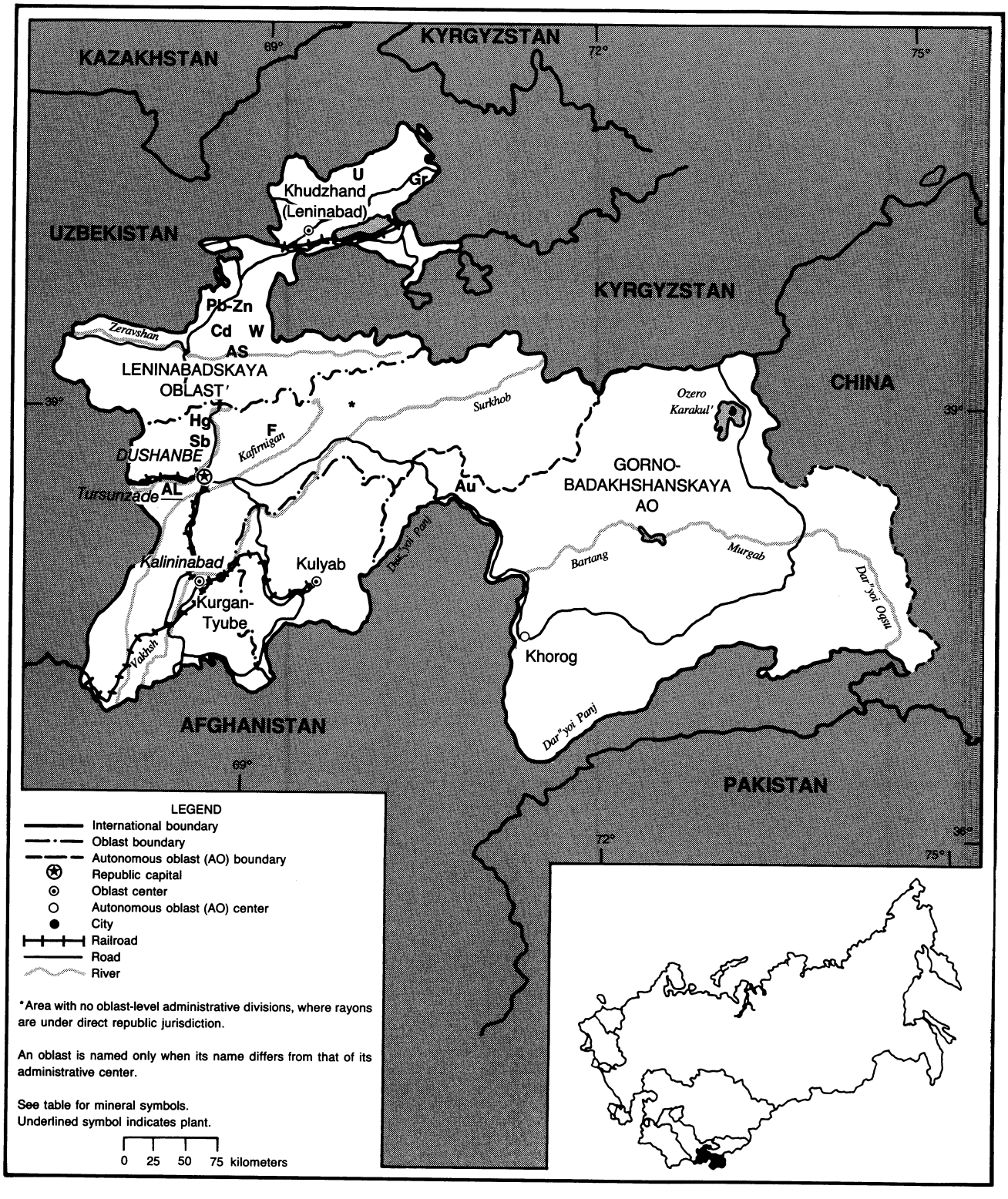


# RUSSIA — NONFERROUS AND PRECIOUS METALS



# TAJIKISTAN

**AREA 143,100 km²** **POPULATION 5.7 million**




LEGEND

- International boundary
- Oblast boundary
- Autonomous oblast (AO) boundary
- Republic capital
- Oblast center
- Autonomous oblast (AO) center
- City
- Railroad
- Road
- River

*Area with no oblast-level administrative divisions, where rayons are under direct republic jurisdiction.

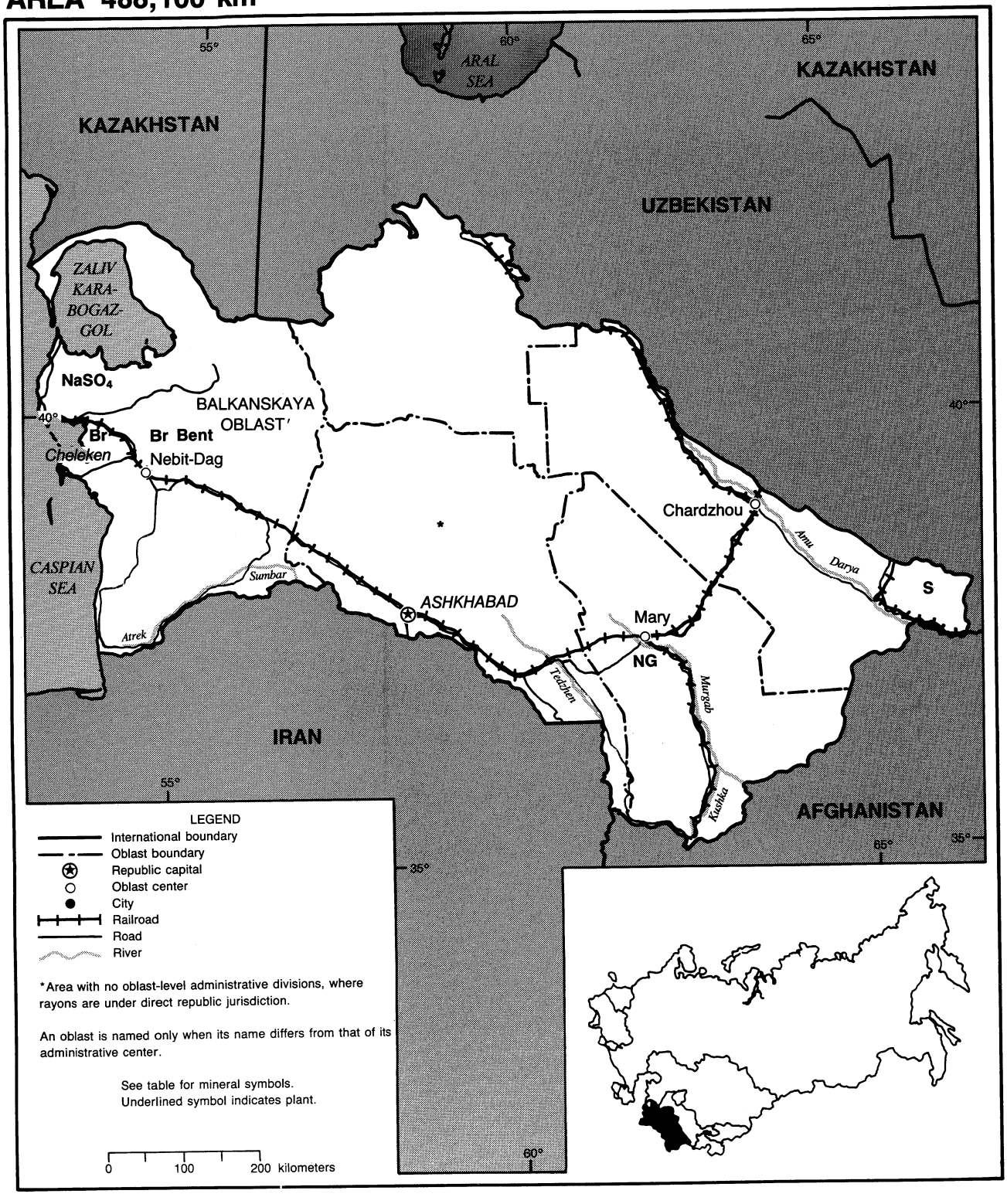
An oblast is named only when its name differs from that of its administrative center.

See table for mineral symbols.
Underlined symbol indicates plant.

0 25 50 75 kilometers

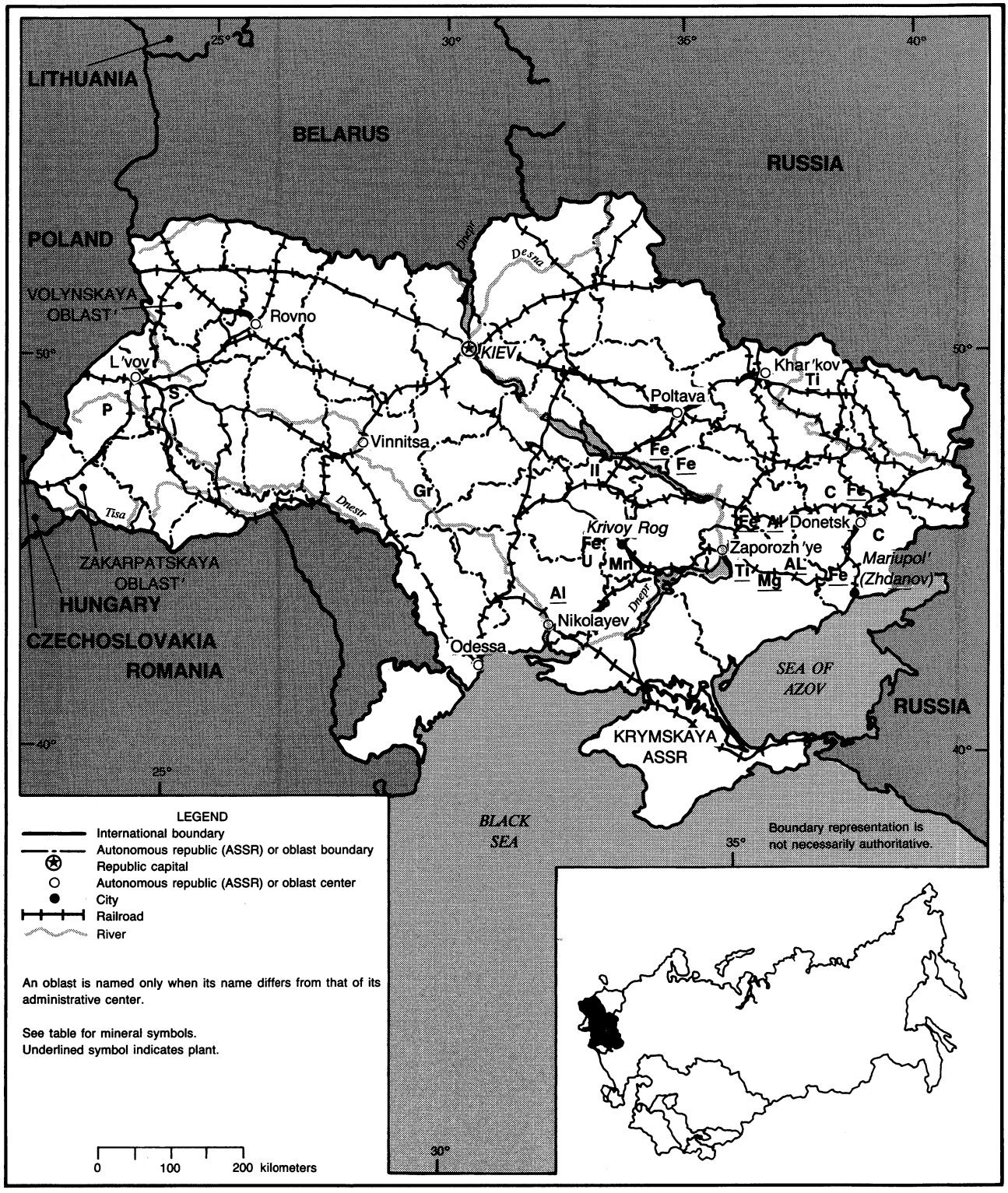
# TURKMENISTAN

**AREA 488,100 km²** **POPULATION 3.8 million**



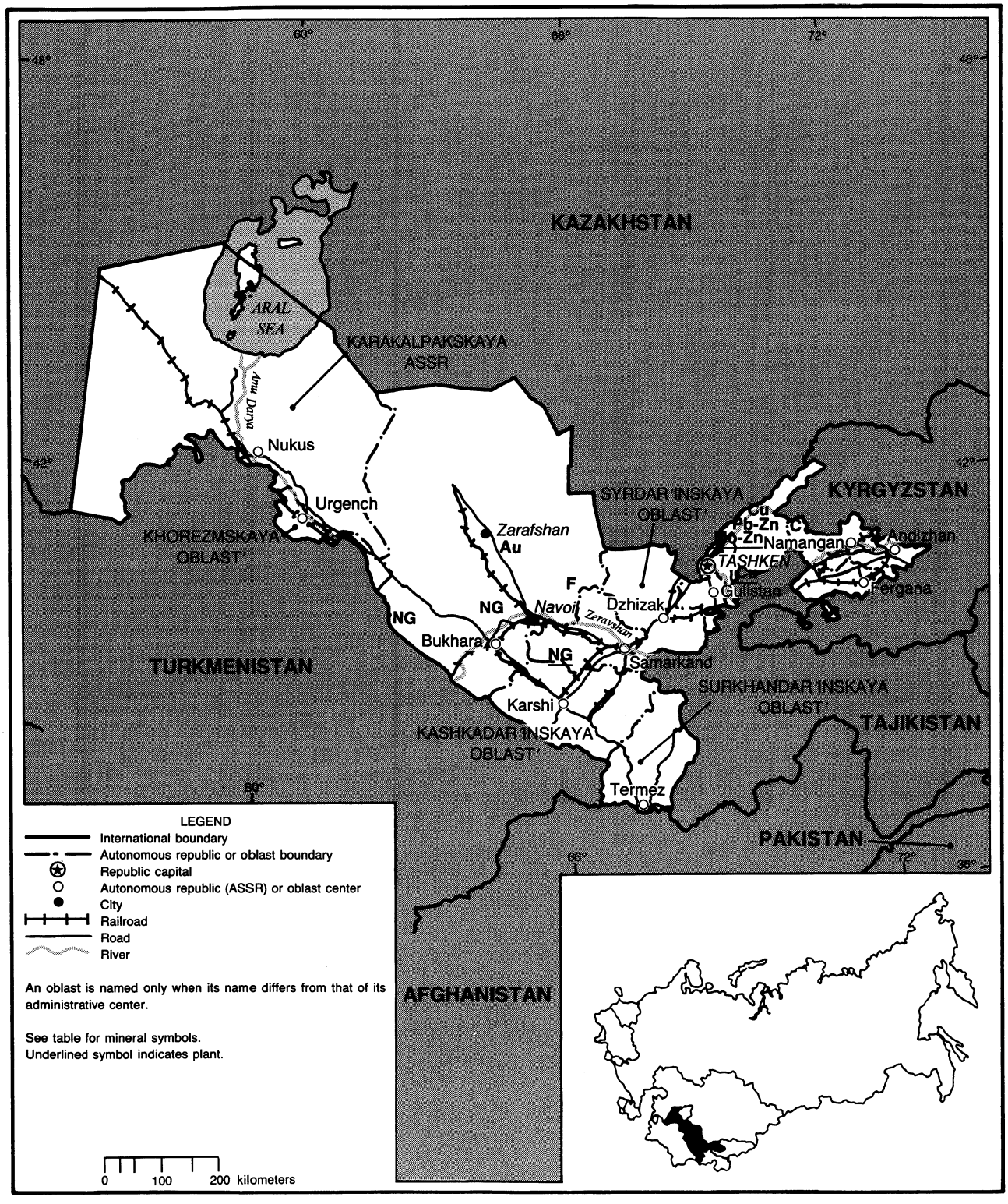
# UKRAINE

**AREA 603,700 km²** **POPULATION 51.9 million**



# UZBEKISTAN

**AREA 447,400 km²** **POPULATION 21.6 million**



THE MINERAL INDUSTRY OF

# U.S.S.R.

By Richard M. Levine

Nineteen hundred ninety-one was a cataclysmic year for the Soviet state and economy and ended with the dissolution of the U.S.S.R. into 15 separate countries formed from the 15 republics. Eleven of these new countries formed the Commonwealth of Independent States (C.I.S.) to facilitate economic, military, and political cooperation. These are, with their new names and spellings given in parentheses, as follows: Armenia, Azerbaidzhan (Azerbaijan), Byelorussia (Belarus), Kazakhstan, Kirgiziya (Kyrgyzstan), Moldavia (Moldova), Russia, Tadzhikistan (Tajikistan), Turkmenistan, the Ukraine (Ukraine), and Uzbekistan. Georgia and the three Baltic States, Latvia, Lithuania, and Estonia, did not become members of the C.I.S.

Throughout this report the term U.S.S.R. will be used to refer to all 15 republics despite the fact that all of the republics either declared their independence or were recognized as independent following the coup attempt in August 1991; also, the spellings for the former republics will be used. The new states, except for the Baltic States, which immediately disengaged from the U.S.S.R. after the coup attempt, commenced a process of dismantlement of the structures of the U.S.S.R. that culminated in December 8, 1991, in the formation of the C.I.S., which became effective December 21, 1991. The remaining U.S.S.R. structures disbanded as the President of the U.S.S.R. resigned on December 25, and the U.S.S.R. was officially dissolved on December 31, 1991.

The Soviet mineral sector witnessed two phenomena during the year:

1. Large exports of both minerals produced and stockpiled for hard currency at the same time that production was decreasing in all mineral-producing sectors.
2. A reorientation of domestic mineral-consuming industries with metal producing, fabricating, and manufacturing industries getting less metals and fuels for their needs while greater quantities of raw materials were being sold to the West.

Some of this was planned with the reduction in defense production but much was unplanned and a result of economic conditions in which those in control of mineral products sought to dispose of them in ways that would be most profitable rather than adhering to previous plans or contracts. To sell minerals or to allocate them, it was necessary to exert control over those minerals, and a great struggle was taking place about forms of ownership and control of minerals within the 15 republics. Questions of actual ownership were far from being resolved, although the long-term direction was toward some form of privatization with the short and intermediate term calling for some combination of Government and private ownership.

## GOVERNMENT POLICIES AND PROGRAMS

The country, as well as the mineral industries after the coup attempt in August, entered a new era of transformation. The coup attempt left not only the country but also the management of the mineral industry without its former structure and a period of rapid change and dissolution of Government structures ensued. Prior to the coup attempt, the central ministries had been gradually losing control of enterprises to new forms of organizations as well as to claims of control by individual republics. After the coup attempt, central ministries were almost entirely discredited by the actions of many ministers during the coup. A number of ministers from the mineral sector were cited as coup collaborators.

The U.S.S.R. Cabinet of Ministers was disbanded following the coup attempt, and control of the economy passed, at least nominally, to the new Committee for the Operational Management of the U.S.S.R. Economy. This committee primarily was composed of officials holding positions within the various republics. Decisions by this new state committee appeared to be unenforceable if the republics chose to veto or ignore them.

Following the coup attempt, all ministers from the former national ministries were declared temporarily replaced by their deputies with the exception of any ministers appointed to the new Committee for the Operational Management of the U.S.S.R. Economy. Then, according to a Tass announcement of November 1, 1991, as of November 15, 1991, about 80 central administrative bodies ceased their legal existence. This decision was made by the State Council of the heads of government, a body comprised of the representatives of the republics.

Only a few central ministries remained—Defense, Transportation, and Atomic Power and Industry. The latter was responsible for uranium mining and nuclear fuel production. The few remaining central ministries survived with severely reduced functions. But all national functions ceased with the dissolution of the U.S.S.R. at yearend, and remaining coordinating functions among the new states were vested in C.I.S. bodies or supranational organizations.

During the year, and particularly following the coup attempt, many of the research institutions subordinate to the various central ministries were being disbanded. The numerous research institutes, including those that once conducted mineral exploration and development throughout the U.S.S.R., faced difficulty as they now either had to acquire republic sponsorship or in some way become self-sustaining.

The decree that abolished centralized ministries was directly affecting management of all aspects of the Soviet mineral industry. Formerly, the ministries functioned as monopolistic national corporations, directly controling all enterprises engaged in designated areas of economic activity. The U.S.S.R. Ministry of Geology that once employed about 800,000 workers was dismantled. In place of the Ministry of Geology, geological organizations within the republics were formed.

The U.S.S.R. Ministry of Metallurgy, which controlled practically all of the country's metals mining and processing, was re-formed in Russia into ferrous and nonferrous entities subordinate to the Russian Republic. In the other republics, various organizations were formed that were responsible for the functions of the former Ministry of Metallurgy.

Following the coup attempt, the republics, without the formalities of a new union economic treaty, took matters into their own hands. For example, the president of Kazakhstan declared national ownership of its mineral industry, including precious-metals production. He also claimed for his republic the right to export minerals. Uzbekistan, which was a major gold producer, claimed similar control of its mineral production, with Armenia and other republics following suite.

This trend continued with the dissolution of the U.S.S.R. Ministry of the Oil and Gas Industry, with control in the Russian Republic passing to the Russian Republic Oil and Gas Corp., and the dissolution of the National Gold and Diamond Mining and Processing Association, Glavalmazzoloto, into republic-controlled organizations that would mine and market gold independently.

Some of the most serious issues regarding mineral production involved environmental concerns. In the newspaper Rossiyskaya Gazeta, December 20, 1991, the state of the environment was termed by the Russian Minister of Ecology and Natural Resources as "catastrophic." He stated, "As a result of the barbaric pollution of the atmosphere, the water sources and the soil, the economic loss reaches 75 billion rubles annually. We have it in our blood that each ruined hectare of forest, each ton of oil spilled on the ground, is not the last. By carelessly utilizing our natural resources, we are living at the expense of future generations." The article quoting the Minister then faulted Soviet mineral development policy that strove continually to increase mineral production without any investment in equipment to reduce pollution from mineral production.

According to an article in the Soviet Mining Journal, (Gornyy Zhurnal) published in January 1991, the Soviet mineral industry annually extracted 20 billion tons of ore and overburden, of which less than 15% was turned into end products. Thus the mineral industry was considered one of the country's largest polluters, creating the largest amount of solid waste. The mineral industry was also the country's largest polluter of the atmosphere, discharging annually more than 20 Mmt of gaseous pollutants. In addition, the mineral production sector annually was responsible for discharging more than 2 billion $m^3$ of polluted water. According to this same article, despite the very significant effect that mineral production had on environmental quality, the majority of money spent on the environment was used to clean up the effects of the pollution after mineral development rather than to prevent this pollution.

## PRODUCTION

There was no yearend statistical reporting for the former U.S.S.R. for 1991 as all data were reported either for the C.I.S or for certain individual republics. In 1991, reported C.I.S. GNP fell by 17%. Reported C.I.S. statistics give evidence of this decline in the mineral-producing sectors as oil and coal output fell by 10% and finished steel output fell by 14%. In the nonferrous sector, primary aluminum production decreased by 8%, magnesium by 9%, titanium by 10%, nickel by 12%, refined copper and lead each by 13%, and zinc by 14%. Overall, there was a decline in the performance of all mineral-producing sectors as supplies of necessary inputs were affected by the disorganization within the economy.

There was no systematic release of Soviet mineral industry data in 1991. It is possible that a primary factor inhibiting the systematic release of data was the absence of any system for releasing the information. Agencies that formerly controlled the data were being dismantled. The republics claiming control of their resources declared an inability to produce countrywide data that might clarify their situation relative to resource management. The laws of secrecy, although still on the books in many cases, appeared to be a relic of the past as many Government agencies and enterprises more openly provided heretofore secret data. Also, as the republics sought membership in international organizations such as the International Monetary Fund and attempted to attract foreign investors, it became apparent that the U.S.S.R. would have to disclose previously secret mineral industry data in accordance with the practices of market economy countries.

## TRADE

Concurrent with the breakup of central control, new organizations for conducting mineral trade emerged. For example, Soyuznefteksport, the major Soviet foreign trade organization that previously held a monopoly on the export of oil and refinery products, was transformed into the Russian Republic oil company "Nafta Moskva." The new oil trading company stated that it would fulfill existing international agreements, then forge new contracts with both state and private

enterprises for the export of oil and refinery products. Nafta Moskva declared its willingness to cooperate with other sovereign states and republics besides the Russian Republic. Similar shifts in the control and organization of mineral trade were occurring with other minerals.

In years just prior to 1991, the Soviets appeared to be diverting a much larger percentage of their metals production for export to hard currency markets. In 1991, the trend accelerated, particularly following the coup attempt, as controls continued to ease and the need for hard currency continued to increase. In addition to the traditional group of metals that the Soviets had historically exported—chromium, gold, nickel, and platinum-group metals—the Soviets began entering western markets with increased quantities of aluminum, cobalt, copper, magnesium, titanium, and vanadium. Some of these exports apparently came from stockpiles.

Commodity exchanges, which were being created, in 1991 continued to increase in number and expand. These exchanges, created to replace central planning, traded in a wide variety of minerals, including oil. The "exchanges," lacking the regulations that govern free-market country exchanges, were more like auctions.

## COMMODITY REVIEW

### Metals

*Aluminum.*—At the International Conference on the Aluminum Industry of Russia held on September 15 to 18, 1992, in St. Petersburg, previously secret data was provided on the aluminum industry of the former U.S.S.R. These data have provided the first apparently official capacity, output, and trade data for the Soviet aluminum industry; previously, only estimated data were available outside the Soviet Union. Primary aluminum production peaked in 1990 at more than 3.5 Mmt. There was a reported 8% decrease in aluminum production from this level in 1991. Reported aluminum production capacity in 1991 was 3.654 Mmt. Tables 2 and 3 give the distribution of aluminum and alumina production capacity, respectively, by plant and republic.

According to the trade data presented at the St. Petersburg Conference, in 1991, the Soviet aluminum industry was dependent on imported bauxite and alumina for 53% of its aluminum raw material needs. This included bauxite imports of 4.29 Mmt comprising 46% of total bauxite consumption and alumina imports of 1.804 Mmt comprising 53% of alumina consumption. A large percentage of the imported bauxite was supplied by Guinea and was a higher grade and better quality than domestic bauxite, allowing the Soviets to produce a greater percentage of alumina from imported than domestic bauxite. Along with bauxite, the Soviets used domestically mined nepheline and alunite, which accounted for less than 10% of aluminum production.

In 1991, U.S.S.R. aluminum exports were in excess of those of previous years. The U.S.S.R. reported exporting 843,000 tons of aluminum in 1991 in comparison with exports of about 724,000 tons in 1990. However, the U.S.S.R. had been radically shifting its export pattern as it drastically cut exports to Eastern European countries and increased exports to market economy countries. In 1986, the U.S.S.R. reported exporting 141,000 tons of aluminum to Western markets, in 1987, 154,000 tons; in 1988, 234,000 tons; in 1989, 290,000 tons; in 1990, 364,000 tons; and in 1991, 713,00 tons. This sharp increase in Soviet exports to market economy countries resulted in depressed prices and uncertainty regarding the future role of the U.S.S.R. and its successor states in supplying aluminum to world markets. *(See tables 2, 3, and 4.)*

*Chromium.*—More than 95% of U.S.S.R. chromite production was mined at the Donskoy mining and beneficiation complex headquartered in Khromtau, Kazakhstan, with mining in the surrounding region. The Donskoy complex's holdings extend almost north-south for 82 km along the fault zone of Ural orientation with an average width of 25 km. Mining has been concentrated in the southern part of the Donskoy region, where the richest pods of chromite have been found. At the present time, more than 300 Mmt of chrome ore reserves has been drilled and proven. If one adds to this figure extension of present pods to the south for several km, an addition of 200 Mmt appears possible. Since 1972, a total of more than 3 Mmt of chromite has been mined annually at Donskoy. Up until 1980, all chromite production was from open pit mines. However, the reserves of high-grade chromite located at shallow depth are being depleted, and underground mining is now being developed.

In 1982, the first stage of an underground mine, the Molodyezhnaya, with a final design capacity of 2 Mmt/a of chrome ore, was put into operation. Development was proceeding on the Tsentral'naya underground mine, with a projected capacity of 5 Mmt/a of chrome ore. A third underground mine, the Glubokoe, was being planned.

The largest operation at Donskoy is the 40 Years Commemoration of the Kazakh SSR open pit where a 1,270-m by 1,100-m by 220-m working face is mined in 16-m by 20-m benches. It produces about 1.7 Mmt/a run-of-mine ore graded at 47% to 49% $Cr_2O_3$ with production planned to increase to 2.0 Mmt/a.

At Donskoy, there are two ore dressing plants, with outputs of approximately 1.3 Mmt/a and 0.7 Mmt/a. The 0.7-Mmt/a plant was being renovated to increase production to about 2.0 Mmt; its target completion date was 1992.

The Donskoy complex was a large chromite exporter, with exports between 500,000 mt/a to 1 Mmt/a of ore. About 15% of the exported chromite was transported by the Siberian railway system to the eastern port of Nakhodka. Another portion of the remaining ore was transported by the following route to foreign markets. Donskoy chromite was transported from the mine site by rail to the port of Gutyev, on the northern part of the Caspian Sea. From there it was transported by boat to the Astrakhan port on the Caspian Sea. From Astrakhan, the

ore was transported by river barges and boats to Volgograd. From here, the part of the ore destined for Western Europe went north to Kazan or Perm, where it was transported by railway to Europe. The ore destined for Japan or southern Europe traveled by barge to the Black Sea, and from the Black Sea by ship through the Bosphorus to the Mediterranean sea. Other ports and mixed modes of transport were also used for shipping chromite. Now, the former integrated transportation system will no longer be under the jurisdiction of one central government and it is now uncertain if this transportation system can remain efficient.

***Cobalt.***—In 1991, the U.S.S.R. became a net exporter of cobalt. The U.S.S.R. was traditionally a net importer of cobalt, importing in the late 1980's large amounts of its domestic consumption needs from Cuba. In this period, cobalt imports from Cuba averaged about 1,500 mt/a. However, in 1991, U.S.S.R. imports of Cuban cobalt declined to about one-fourth this amount. Also, Soviet imports from Africa appear to have declined from about 1,000 mt/a in the mid-1980's to a negligible quantity in 1991. In 1991, the U.S.S.R. became a significant cobalt exporter with sales of more than 1,500 tons. It appears that the U.S.S.R. was able to achieve this turnabout by reducing cobalt consumption in defense sector production, reducing cobalt exports to former Eastern European client states and also selling stockpiled material.

***Copper.***—Copper in the U.S.S.R. was mined and concentrated in the republics of Armenia, Georgia, Kazakhstan, Russia, and Uzbekistan and smelted and refined in Kazakhstan, Russia, and Uzbekistan. Table 5 shows the location of the major copper mines and concentration plants, smelters, and refineries, by republic.

In 1991, there was a 13% decrease in refined copper production. Consideration was being given to closing several copper mines in the Urals in the Russian Republic because they would not be economically viable if the country switched to a market economy system. These mines included the Sibai Mine at the Bashkir complex, the Gai Mine of the Gai complex, the Uchali Mine at the Uchali complex, the Buribai Mine at the Buribai enterprise, and the Karabash Mine. Consideration was also being given to shutting down some smelting capacity. Despite falling production in 1991, U.S.S.R. copper exports to market economy countries increased significantly and more than doubled in quantity between 1988 and 1991. *(See table 5.)*

***Ferroalloys.***—Increased Soviet ferroalloys exports to market economy countries in 1991 were considered a factor in the fall in worldwide ferroalloys prices, but the actual effect of Soviet exports was difficult to ascertain. A significant amount of these exports comprised ferroalloys that previously had been shipped in barter trade to Eastern European countries. In 1991, only 15% of Soviet ferroalloys exports went to Eastern European countries in comparison with 47% in 1991.

Major ferroalloys production in the U.S.S.R. occurred in Georgia, Kazakhstan, Russia, and the Ukraine. A number of ferroalloy plants were built near large deposits of alloying material such as manganese and chrome. Ferroalloy output fell in the major producing republics with production in 1991 falling in Russia by 15%, in the Ukraine by 10%, in Kazakhstan by 9%, and in Georgia by 34% in comparison with that of 1990. Except for Russia, with reported ferroalloys production of 1.7 Mmt in 1991, production figures for the other republics were not available.

In 1991, ferroalloys production decreased in the Russian Republic as manganese shipments from Georgia and the Ukraine were disrupted. Large decreases in ferroalloys production occurred in Georgia where the Zestafoni plant lacked needed raw materials and energy to maintain production. Production of ferroalloys also fell in Kazakhstan and the Ukraine. *(See Table 6.)*

***Gold.***—Soviet gold was again a topic of interest in 1991, as a leading Soviet economist revealed that Soviet bullion stocks totaled only 240 tons. Western estimates were in the range of 2,000 tons. The news about Soviet bullion stocks affected assessments of the country's ability to finance economic reform as well as the amount of gold assets that the central Government could divide among the republics seeking independence.

The U.S.S.R., in a shift away from decades of secrecy, began revealing gold production data. Soviet officials claimed that gold production peaked in 1990 at more than 300 tons. The Soviet newspaper, Moscow News, published the U.S.S.R gold production, exports, and bullion stock data shown in table 7. *(See table 7.)*

Russia produced about 60% of total Soviet production, Uzbekistan about 25%, Kazakhstan about 5%, and Tadzhikistan, Kirgiziya, Armenia, and Georgia lesser amounts. All of the gold refineries were located in Russia except for one in Uzbekistan.

Gold trade data, which had been a state secret, began to be reported. It was reported that in 1990 the U.S.S.R. exported 473.5 tons of gold, including 250 tons in sales and the remainder in swaps that were not redeemed. Although a 1991 figure apparently has not been reported, gold sales for 1991 are estimated to have exceeded 400 tons.

The struggle for control of resources, including gold resources, that was occurring between the central Government and republics resulted at the end of 1991 in the dissolution of the national gold mining association, Glavalmazzoloto, and the founding in its place of republic-based organizations. Also, following the coup attempt, the republics stopped shipping their gold output to the central Government and began forming their own gold reserves from their production. Monopoly control in the production and sale of gold that the U.S.S.R. central Government had, now

appeared to be transferred to the republic Governments, which maintained this monopoly control over gold production and sales.

*Iron and Steel.*—In 1991, there was a decrease in the production of crude steel and steel products. The general economic decline, lack of investment funds, and labor and transport disruptions made it difficult for the steel industry to procure needed inputs. In comparison with that of 1990, output of crude steel and finished raw steel products fell by about 14%, and output of steel pipes fell by 13%. In 1991, in comparison with that of 1990, steel production fell in the two major steel-producing republics, Russia and the Ukraine; in Russia, steel output decreased 14% from 90 Mmt to 77 Mmt and in the Ukraine, 15% from 53 Mmt to 45 Mmt.

The steel industry experienced acute shortages of coking coal and scrap. In 1991, reported coke production decreased by 17% in comparison with that of 1990. Also interrepublic deliveries of alloying material such as manganese, produced primarily in the Ukraine and Georgia, and chrome, produced almost entirely in Kazakhstan, were cut back. Also, many plants dependent on iron ore shipments or crude steel shipments from other areas experienced shortages of these products.

The shortage of coking coal in the country resulted in a 19% reduction in the production of pig iron. Pig iron was produced in the Republics of Russia, the Ukraine, Kazakhstan, and Georgia in large integrated steel mills.

Given the situation of trying to sustain production levels, almost no effort was directed toward modernizing production. There was a great need to further modernization programs, including increasing the percentage of continuous casting, changing from open-hearth to oxygen converter and electric steel making methods, and producing more high-quality and special steels. It appeared that several republics, including the main steel producers Russia and the Ukraine, were considering decreasing steel production and would not concentrate on producing steel in excess of their republics' demand for shipment to other republics.

*Iron Ore.*—U.S.S.R. iron ore production fell by more than 15% in 1991. The Russian Republic reported producing 90.9 Mmt of iron ore in 1991, which was 18% below Russia's reported 1990 iron ore production level.

Iron ore was produced in only four republics; Russia, the Ukraine, Kazakhstan, and Azerbaidzhan. The largest iron ore producer had been the Ukraine until 1990, when Russia surpassed it. The Ukraine and Russia supplied between 40% to 45% of the country's iron ore, with Kazakhstan producing about 10%, with the remainder coming from Azerbaidzhan.

The U.S.S.R.'s two major iron ore-producing regions were the Krivoy Rog basin in the Ukraine and the Kursk Magnetic Anomoly (KMA) in Russia. In the U.S.S.R. there were 18 mining and beneficiation complexes and 5 mining enterprises engaged in iron ore production. All of the iron ore mining in the Ukraine occurred in the Krivoy Rog basin. In Russia, more than 40% of the iron production was from the KMA, about 20% from the Kola Peninsula and Karelia combined, and about 20% each from the Urals and Siberia.

Soviet iron ore reserves reported as of January 1989 were 92.1 billion tons of reserves in categories $A+B+C_1$ termed proved reserves. Reporting as of January 1987 indicated that there were 58.1 billion tons of reserves in category $C_2$. These $C_2$ reserves under the Soviet systems of reserve classification were considered in project planning, but were not sufficiently confirmed to justify project planning. (See the reserve section of this report for definitions of Soviet reserve categories.) Of total reserves in categories A through $C_2$, 65% of these reserves are in the Russian Republic, 20% in the Ukraine, 14% in Kazakhstan, and the remaining 1% in the other republics. In the Ukraine, all of the reserves are in the Krivoy Rog basin, while in Russia, 37% of the reserves are in the KMA, 10% in the Urals, 7% in East Siberia, 5% in the Trans-Baikal region, and 3% on the Kola Peninsula. However, about two-thirds of the reserves in Siberia and the Russian Far East were in the $C_2$ category.

*Molybdenum.*—Molybdenum mining occurred in the republics of Armenia, Kazakhstan, Russia, Tadzhikistan, and Uzbekistan, and molybdenum metallurgical processing occurred in the republics of Georgia, Kazakhstan, Kirgiziya, the Ukraine, and Uzbekistan. All molybdenum, with the exception of the Sorsk mining complex in Russia, was mined with copper or tungsten.

In 1991, the U.S.S.R. received more than 1,000 tons of molybdenum contained in concentrate from the Erdenet complex in Mongolia as part of a long-term contract. Erdenet was developed by the U.S.S.R. Although Mongolia was increasingly seeking trade and commercial ties with countries outside the former Soviet trading bloc, it appeared that the molybdenum concentrate delivery contract with the U.S.S.R. remained in force. *(See table 8.)*

*Nickel.*—The U.S.S.R., which was the world's largest nickel producer, was also one of the world's largest nickel exporters. In 1991, exports again exceeded 100,000 tons of electrolytic nickel. Almost all of the country's nickel was mined in the Russian Republic; the remaining small amount was mined in the Ukraine.

Although production statistics are still not available, it is now possible, based on a great deal of information that has been made available from Western visitors and Soviet sources, to draw a fairly accurate description of the country's nickel industry. The dominant nickel producer is the Noril'sk association, Norils'k Nickel, which mines mixed sulfide ores. It is composed of mining, smelting, and electolytic refining operations near Norils'k in East Siberia and on the Kola Peninsula. Norils'k is also composed of the Olenogorsk Engineering plant on the Kola Peninsula and the Krasnoyarsk platinum-group metals (PGM) refinery in East Siberia. According to statements by

a Norils'k representative, the Norils'k Association produced 85% of the U.S.S.R.'s nickel, 40% of its copper, 70% of its cobalt, and 95% of its PGM output. The remaining nickel was produced from laterite ores by enterprises of the South Urals (Yuzhuralnikel) association that engaged in mining, smelting, and refining. In the Ukraine north of Odessa, there are some small open pit mines and a smelter producing ferronickel.

News from the U.S.S.R. in 1991 regarding instability in nickel production and exports received significant attention in the Western trade press. Issues concerned a strike by miners at Norils'k in the spring, and the possibility that nickel shipments to the West through Latvian ports would be disrupted because of civil unrest. Despite these concerns, Soviet nickel exports to the West reached record levels.

Soviet marketing of nickel to the West underwent a change following the coup as the Norils'k Association signed an accord with Sweden's Axel Johnson Resources giving Axel Johnson exclusive rights to market Norils'k nickel in Western Europe. The agreement was for 5 years. Nevertheless, doubt was expressed by some Western traders and nickel consumers concerning the viability of this exclusive arrangement.

A major change that occurred in 1991 in Soviet nickel trade involved the sharp reduction in nickel imports from Cuba. U.S.S.R. imports of Cuban nickel, which had averaged during the past 10 years between 15,000 and 20,000 tons of contained nickel in nickel-cobalt concentrate, dropped to less than 5,000 tons in 1991 as the U.S.S.R. reassessed its trade relations with Cuba and other former Council for Mutual Economic Assistance (CMEA) members.

*Tin.*—Practically all of the country's tin was mined in the Russian Republic in East Siberia and the far east region. A small amount of tin associated with tungsten was mined in the republic of Kazakhstan. All tin metal production occurred in the Russian Republic at the Novosibirsk and Podol'sk smelters. However, the Republic of Kazakhstan produced the majority of the country's tin plate. In 1991, a fire occurred at the tinplate shop at the Karaganda metallurgical complex in Kazakhstan, the country's largest tinplate producer, causing great damage and seriously impairing the country's ability to produce tinplate. As a result of the fire, the U.S.S.R. needed to import tin plate in 1991.

## Industrial Minerals

Although the U.S.S.R. was one of the world's largest producers of industrial minerals and had some of the world's largest reserves, production and reserve figures must be qualified. Even when these figures were reported by the U.S.S.R., it is not clear that the production figures were for products that would be equally marketable in a competitive market economy. The reserve figures are based on the Soviet system of reserve classification that is not directly equivalent with the U.S. Geological Survey and U.S. Bureau of Mines classification of economic reserves in market economy countries.

Although never maintained with the strict secrecy as data on nonferrous and precious metals, Soviet reserve, production, and trade data for the majority of nonmetallic minerals appeared only rarely, if at all. Such data also usually were buried in articles rather than appearing in any statistical format or compendium. However, in 1989, the U.S.S.R. began publishing considerably more data on industrial minerals.

The production figures given in this report in the following industrial mineral commodities profiles for the late 1980's, when some of the first and last reported numbers appeared, are not indicative of the situation in 1991. Disruptions in supplies of inputs, labor unrest, and the breakdown of central control over production and distribution of output to both domestic and foreign consumers created large disruptions in the production of all commodities produced in the U.S.S.R., including industrial minerals. One may only regard these 1980's figures as a base line for assessing future production potential.

*Asbestos.*—The Soviet asbestos industry had been for many years the largest in the world. More than one-half of the production came from the Uralasbest complex in Russia in the central Urals, and more than one-fourth of the output came from the Dzhetygara deposit in Kustanay Oblast, Kazakhstan. Other important producers included the Tuvaasbest complex in the Tuva Republic in East Siberia in Russia and the Kiyembay complex in Orenburg Oblast' in the southern Urals in Russia.

U.S.S.R. asbestos production reached a peak level of about 2.5 Mmt/a of all grades of asbestos in the 1980's. To produce this amount, the U.S.S.R. mined about 250 Mmt/a of ore and overburden, of which 50 Mmt was processed at beneficiation plants and 200 Mmt was sent to dumps. The average capacity of a Soviet asbestos beneficiation plant was 350,000 mt/a. The largest open pits exceeded 200 m in depth and produced more than 60 Mmt/a of ore.

*Barite.*—Most barite production was associated with the mining of barite contained in polymetallic ore deposits in Kazakhstan and deposits of barite ore in Georgia. Preparations were under way to develop the Khoylinskoye deposit in the Ural mountains in Russia above the Arctic Circle. The deposit was estimated to have 2 Mmt of reserves of barium sulfate. Additional reserves, it was expected, could be discovered at greater depths. The ore, reportedly, was of high quality and suitable for drilling muds and other uses with practically no beneficiation. Based on these reserves, it was considered feasible to construct a barite plant with a capacity of 100,000 to 110,000 mt/a of barite concentrate.

*Clays.*—Reported annual production of kaolin ore peaked in the late 1980's at about 12.5 Mmt. Kaolin concentrate production was centered in the Ukraine, where 90% of the U.S.S.R.'s output was produced.

The U.S.S.R. Ministry of Geology claimed that the volume of extraction and production of high-quality enriched kaolin could be increased by expanding output at the Prosyanovskoye and Glukhovetskoye enterprises in the Ukraine and by attracting foreign capital and technology to develop large deposits such as the Veliko-Gadominetskoye and Belyayevskoye deposits in the Ukraine.

In the other parts of the country, the Soyuznoye kaolin deposit in the Uralo-Mugodzharskiy region in Kazakhstan had reported explored reserves of 80 Mmt. Developing this deposit, it was stated, would be of great significance for supplying high-quality kaolin ceramic products to industry in the eastern part of the U.S.S.R.

The highest quality refractory clay deposits are in the Donets Basin in the Ukraine with 90% of the former U.S.S.R.'s reserves. Output from the Novo-Rayskoye, Chasov-Yarskoye, and Veselovskoye deposits in the Ukraine was used in the ceramics industry.

The U.S.S.R. reported producing 2.9 Mmt/a of lump bentonite in the 1980's. Three of the largest enterprises were the Cherkasskoye in the Ukraine with 54.5 Mmt of reserves, the Biklyanskoye in the Tatar Republic of Russian with 16.6 Mmt of reserves, and the Tarn Varksoye in the Chuvash Republic in Russia with 3.2 Mmt of reserves. These three enterprises produced 1.1 Mmt of lump bentonite. Development was under way at the Verkhne-Nivilotskoye bentonite deposit in the Volga region of Russia with reserves of 4 Mmt.

There were four factories for processing bentonite into powder in the European part of the former U.S.S.R., the Dashukovskiy plant and the Konstantinovskiy plant in the Ukraine, the Ii'skiy plant in the North Caucasus in Russia, and the Al'metevskiy plant in the Tatar Republic of Russia. These plants produced 350,000 mt/a of bentonite powder or 35% of the U.S.S.R.'s national output of about 1 Mmt.

*Diamonds.*—A 5-year agreement was concluded in July 1990 between Glavalmazzoloto (U.S.S.R. Main Administration of Precious Metals and Diamonds) and De Beers Centenary AG, whereby De Beers' Central Selling Organization would market an estimated $1 billion in Russian rough diamond output annually. This quantity was believed to represent about 95% of the country's rough diamond exports. As part of the deal, De Beers also loaned the U.S.S.R. $1 billion for the modernization of its diamond mining industry.

In 1991, the Russian Republic moved to legitimize its claim to revenues from diamond production. In October, the Russian Republic created a counterpart to the Soviet diamond directorate. The Russian body is known as Rossalmazzoloto. However, the disintegration of the U.S.S.R. at the end of 1991 eliminated competing claims between the Russian Republic and the defunct Union, and shifted the battle over control of diamond revenues to that between the Russian Federation and the Yakut-Sakha Republic, which is a part of the Russian Federation, where practically all diamond mining occurs.

At issue was the division of revenues from the diamond trade. Russian production of rough diamonds, estimated at about 24 M carats, accounted for virtually all of the Soviet total. One-half of this total is gem-quality stones.

The Russian Federation has the potential, with the opening of a major new diamond deposit in northern European Russia, to boost earnings substantially. Here, much attention was focused upon the M.V. Lomonosov deposit, proclaimed the world's largest new source of diamonds. The deposit consists of five diamond-bearing pipes in the Zolotitsa River region in Arkhangel'sk Oblast, 80 km north of Arkhangel'sk. Reserves here are said to equal or exceed those of Yakut-Sakha, with initial production anticipated in the late 1990's. The deposit is reported to contain equal proportions of gemstones and industrial diamonds. The gemstones appear to be of high quality.

*Fertilizers.*—In the U.S.S.R. fertilizer plants were concentrated in the Russian Republic, which produced more than one-half of the country's mineral fertilizers. Besides Russia, three other republics, Byelorussia, the Ukraine, and Kazakhstan, were the country's major mineral fertilizer producers.

The location of mineral fertilizer production coincided with the location of mineral fertilizer raw materials. In 1991, the republics were acquiring greater control over their fertilizer production in regard to both domestic shipments and foreign trade. In all major fertilizer-producing republics, mineral fertilizer production was greater than consumption. The new automony on the part of the republics or the enterprises within the republics over control of fertilizer shipments could directly affect shipments to domestic markets, to other former republics, and to other foreign markets.

A significant portion of mineral fertilizer production was exported. The U.S.S.R. was one of the leading countries in the world in the export of potassium and nitrogenous fertilizers. Although previously both mineral fertilizers and mineral fertilizer raw materials were exported primarily to the CMEA trading bloc, with the breakup of the CMEA and the need for hard currency it appeared that fertilizer exports would now be directed toward world markets.

**Phosphate.**—With explored phosphate reserves of 2.1 billion tons $P_2O_5$, the U.S.S.R. claimed to occupy second place in the world after Morocco in explored phosphate reserves. Sixty percent of the explored reserves was in two major regions, the Khibiny and Kovdor apatite deposits on the Kola Peninsula in the Russian Republic and the Karatau basin of fine-grained phosphorites in Kazakhstan.

In 1991, enterprises on the Kola Peninsula produced all of the apatite concentrate. Enterprises exploiting the Karatau deposit produced approximately 70% of the phosphate rock. About 25% of the remaining phosphate rock was produced at other deposits in the Russian Republic while about 5% of the phosphate rock was produced from deposits in Estonia.

The U.S.S.R. was not planning to increase phosphate fertilizer production but rather was anticipating a more than 10% decrease in output by the year 2000. This would be the result of an anticipated decline in production at the Khibiny apatite deposit on the Kola Peninsula, from 7.5 Mmt $P_2O_5$ in 1990 to 6.2 Mmt $P_2O_5$ in the year 2000. Phosphate production at Karatau was expected to stay at the same level.

Possibilities for increasing phosphate production existed in Estonia, which had some of the largest marine phosphorite deposits in Europe. However, their development had been postponed pending arrival of a satisfactory solution for the environmental and processing problems involved in their development.

In 1991, the Norwegian company Norsk Hydro entered into a joint venture with the Apatit concern on the Kola Peninsula. The venture is intended to extract 500,000 tons of high-quality apatite concentrate for processing into phosphate fertilizer in Norway. Norsk Hydro, which has a 49% interest in the venture, will supply drilling equipment and technology and will train personnel.

**Potash.**—The U.S.S.R. was the world's largest potash producer. The three major potash-producing enterprises were the Uralkaliy and Silvinit associations, which mined the Verkhnekamsk sylvite deposit in the Solikamsk-Berezniki region of the Urals in Russia, and the Byeloruskaliy complex, which mined the Starobinsk sylvite deposit in the Soligorsk region of Byelorussia. Also, a small amount of potash was produced from the Stebnik and Kalush-Golynskiy potassium sulfate deposits in the trans-Carpathian region of the Ukraine.

In the Urals there were seven potash mines, in Byelorussia four mines, and in the Ukraine two mines. Reserves are distributed unevenly at these deposits with 84% of potash reserves in the Urals potash mining region, 7% in the Byelorussian region, 3% in the Ukraine, and 3% in Turkmenistan. Owing to this distribution, major increases in production were planned from the Urals region.

In Turkmenistan at the Karlyuk deposit, development was occurring of an underground solution mine with surface solar pond treatment. In East Siberia north of Lake Baikal, there is a large sylvite deposit where plans call for development of a mining complex with an annual capacity of 1.7 Mmt $K_2O$.

The U.S.S.R. was traditionally a large potash exporter, but the majority of these exports went to the Eastern European countries of the former Soviet trading bloc. New markets must now be found for much of the approximately 2 Mmt/a $K_2O$ that was exported to Eastern Europe. Also, a percentage of the potash produced at the Russian and Byelorussian deposits that was shipped to the other republics now also could be redirected to other markets.

***Fluorspar.***—The major fluorspar deposits in the U.S.S.R. are the Kalanguyskoye, Abagaytuyskoye, Usuglinskoye, and Solonechnoye in the Trans-Baikal region of Russia; the Suppatashskoye and Naugarzanskoye in Uzbekistan; the Khyadarkanskoye in Kirgiziya; the Khinganskoye, Pogranichnoye, and Voznesenskoye in the Russian far east region; and the Tyrnyauz in the Kabardino-Balkar Republic in the North Caucasus region of Russia. Proved reserves (categories A, B, $C_1$) of flurospar ore in the U.S.S.R. at the beginning of 1986 totaled 98.6 Mmt.

Fluorspar was mined by open pit at the Yaroslov mining and beneficiation complex in Russia and by underground mining at the Kalanguyskiy fluorspar mining and beneficiation complex in Chita Oblast' in the Russian far east region. The Takobskiy fluorspar complex in Tadzhikistan and the Kyakhtinskiy mining administration in Buryatiya in Russia were processing exclusively imported ore from Mongolia. The Kalanguyskiy complex also processed some imported ore.

***Limestone.***—Limestone deposits are widely dispersed throughout the former U.S.S.R. Among the largest are the following: the Afanas'yevskoye deposit in Moscow Oblast', with white limestone used in cement production; the Barsukovskoye deposit in Tula Oblast' south of Moscow, with limestone used for fluxing material; the Gur'yevskoye deposit also in Tula Oblast', with limestone used in gravel; and the Okintskoye deposit in Moldavia, with shelly oolitic limestone used in construction material. Also included are the Bodraksko-Al'minskoye deposit in the Crimea in the Ukraine, with soft, white shelly limestone used in construction materials; the Shakhtakhtinskoye deposit in Azerbaidzhan, with gray-yellow and light brown travertine limestone used in construction materials; and the Zhetybayskoye deposit on the Mangyshlak Peninsula in Kazakhstan, with rose, light gray, and gray-yellow porous, shelly limestone used in construction materials.

***Magnesite.***—Reported annual crude magnesite production reached a level of more than 4.6 Mmt in the late 1980's. The Satka group of deposits in Chelyabinsk Oblast' in Russia, which had long supplied the country's needs, was being depleted of magnesite reserves, and total magnesite production at Satka had fallen.

The most promising area for new magnesite development was in East Siberia in Russia, which had 66% of the reserves of high-quality magnesite. The Savinskoye deposit in the Cheremkhovskiy region of Irkutsk Oblast' of Siberia in Russia was of special interest because it contained 27% of the country's reserves of magnesite. This deposit is in a difficult-to-reach region with a severe climate and lacks an adequate labor force. The U.S.S.R. had been a net importer of magnesite, and a significant percentage of the country's magnesite consumption was based on imported magnesite from North Korea.

***Mica.***—Mica output in the U.S.S.R., estimated at approximately 50,000 mt/a in the 1980's, was inadequate to meet

demand, and strategic-grade mica was imported from India. The mica industry included the following four mining and beneficiation complexes all in Russia: Aldan mica in Yakutia, Karel mica in Karelia, Kovdor mica in Murmansk Oblast' on the Kola Peninsula, and Mam mica in Irkutsk Oblast, East Siberia. The pegmatite deposits in the Mamsko-Chuyskiy district in Irkutsk Oblast' contain about 75% of the country's muscovite reserves.

*Perlite.*—Data from the U.S.S.R. indicated that the country during the 1980's produced annually between 600,000 to 650,000 $m^3$ of perlite. Reportedly, one complex, the Aragatskiy enterprise in Armenia, produced 550,000 $m^3/a$ of perlite. Perlite reserves in Armenia, the largest in the former U.S.S.R., were described as "practically inexhaustible." There are numerous other perlite deposits in the Caucasus, central Asia, Kazakhstan, the trans-Carpathians, East Siberia, and the Russian far east.

*Salt.*—The U.S.S.R. was one of the world's leading countries for salt reserves and production. Production had been in the range of 15 Mt/a. Salt development was concentrated in the Donets Basin in the Ukraine with about 40% of the output, the Urals region and East Siberia in Russia, Armenia, and the western Ukraine. The Artemsol' concern in the Donets Basin in the Ukraine, which operated five underground mines, was the main Soviet supplier of salt. Another massive supplier was Lake Baskunchak in Astrakhan Oblast' in Russia, which supplied about one-third of Soviet salt production.

*Sodium Sulfate.*—Turkmenistan had been accounting for more than 35% of the U.S.S.R.'s sodium sulfate production and all of the country's production of epsomite and medicinal Glauber's salt.

Production in Turkmenistan occurred in the Kara-Bogaz-Gol, a vast lagoon off the eastern shore of the Caspian Sea containing one of the world's largest deposits of natural sodium sulfate. In 1980, because of concern for the declining water level of the Caspian Sea, a dam was constructed across the strait through which Caspian water entered the Kara-Bogaz-Gol. The cessation of water inflow from the Caspian Sea resulted in environmental damage to the lagoon not foreseen at the time that the dam was constructed, and it increased the difficulty in mining sodium sulfate and other salts. Efforts to increase water flow to the lagoon had not solved the problem. Soviet scientists predicted that unless adequate water reached the lagoon in the near future, then 80% of the valuable minerals in the lagoon would be irretrievably lost.

Another potential major sodium sulfate source is the Aral Sea in Kazakhstan, but the Aral Sea is drying up and vanishing as a result of a manmade ecological catastrophe.

*Sulfur.*—In the U.S.S.R., byproduct sulfur accounted for more than 50% of sulfur production. Sulfur from natural gas, which accounted for between 25% to 30% of total sulfur output, was to be of increasing importance. Sulfur produced as a byproduct of metallurgy accounted for between 10% and 15% of output, and sulfur as a byproduct of the petroleum industry accounted for about 5% of sulfur output. Sulfur recovery was low in comparison with western levels in many phases of metal, coal, and petroleum processing, resulting in significant losses of sulfur and significant environmental problems.

The principal producers of native sulfur were the Rozdol and Yavorov mining complexes in the western Ukraine, the Gaurdak mining complex in Turkmenistan, and the Volga group of the Kuybyshev sulfur mining complex in Russia. Native sulfur resources are concentrated in four regions: the Carpathian region of the Ukraine, Central Asia, the central Volga region of Russia, and the Russian far east region.

At the Yavorov and Gaurdak plants, approximately 30% of the output of native sulfur was produced by the Frasch process. The development of mines using the Frasch process was to account for the basic growth in native sulfur production. Open pit extraction also was to increase. In the late 1980's, the Gaurdak complex in Turkmenistan produced about 15% of the country's native sulfur. The remaining native sulfur output came primarily from the Ukraine.

*Talc.*—The U.S.S.R. produced an estimated 500,000 mt/a of talc in the 1980's. Only the Onotsk deposit in Irkutsk Oblast' of the Russian Republic produced high-grade iron-free material. The raw material at the Onotsk deposit was shipped for processing to the Miass talc mill in the Urals. Despite large reserves and the development of new mines, the U.S.S.R. imported talc from North Korea and Bulgaria.

The Kirgiteysk deposit in Krasnoyarsk Kray in Russia was the major producer of lower quality talc. The Miass and Shabrovsk deposits in the Urals in Russia ranked second in output. Some talc was mined from the Terti-Mindorskoye and Kvachevskoye deposits in South Ossetia in Georgia. The Medvedevskoy talc deposit in Chelyabinsk Oblast' in Russia was under development.

*Vermiculite.*—Reported vermiculite production reached 97,000 mt/a in the late 1980's, all produced in Russia. The U.S.S.R. claimed to rank first in the world in vermiculite reserves. Vermiculite mining occurred at two of six explored deposits, the Kovdor deposit on the Kola Peninsula and the Potaninskoye deposit in Chelyabinsk Oblast'.

Reserves at these two deposits were reported adequate for 100 years. Perspective deposits for development included the Altyntasskoye and Karatsskoye in the Mugodzharskiy region of Kazakhstan and the Inaglinskoye deposit in Yakutia in Russia.

## Mineral Fuels

*Coal.*—In 1991, coal production in the U.S.S.R. continued its sharp decrease, with production falling in the Republics

of Russia and the Ukraine. Production remained stable in Kazakhstan where strip mining of subbituminous coal increased at the Ekibastuz basin. Coal production fell in the Ukraine's major hard coal-producing region, the Donets basin (Donbas); Russia's major hard coal-producing region, the Kuznetsk basin (Kuzbas); and Kazakhstan's major hard coal-producing region, the Karaganda basin. Production, however, increased in Russia's Kansk Achinsk lignite basin in Siberia, which is planned to be a major future coal supplier.

A significant factor in the decrease in coal output was a national miners' strike that occurred in the spring. However, coal production also was seriously affected by the general economic decline occurring within the country that resulted in shortages of necessary investment funds and material inputs needed to maintain production. *(See tables 9 and 10)*

***Natural Gas.***—In 1991, natural gas production fell only 0.5% from its 1990 level to 811 billion $m^3$. However, this was the first year since World War II that gas production decreased. Natural gas exports in 1991 decreased by 0.5% in comparison with the 1990 level to 4.5 billion $m^3$. Gas consumption in the U.S.S.R. appeared to rise slightly, and the share of gas in total fuel output increased from 1990 to 1991 by almost 2.5% to 45%, widening the lead of gas over oil as the country's major fuel produced. Oil and coal accounted for about 35% and 18%, respectively, of total fuel production with minor fuels such as oil shale, peat, and wood accounting for the remainder.

In West Siberia, the country's main gas-producing region, production continued to increase. West Siberia accounted for more than 70% of the country's gas output. At the large Urengoi Field in West Siberia, there was an increase in gas output from 288 billion $m^3$ in 1990 to 295 billion $m^3$ in 1991. A larger increase occurred at the Yamburg Field in West Siberia, which is under development, where production increased from 159 billion $m^3$ in 1990 to 168 billion $m^3$ in 1991.

In Turkmenstan, the second largest gas-producing republic, gas output decreased because the main fields were being depleted and newer fields were not being developed. In Uzbekestan, however, the country's third largest gas-producing republic, output increased with the development of new deposits in the southern part of the republic. Production also increased in the Republic of Kazakhstan as development proceeded at the republic's major deposit, the Karachaganak Field. In the Ukraine, output again decreased with the depletion of fields; production in the Ukraine peaked in the mid-1970's. New discoveries were reported in the Ukraine's Kharkov oblast, which could increase the Ukraine's gas production potential.

The U.S.S.R., to maintain and increase gas production, was seeking foreign investment for the development of gasfields. Some major regions where foreign investment was being sought included areas in East Siberia, Yakutia, and the Soviet far east. Japanese firms were considering building an export pipeline transmission network from these areas to supply gas to Asian countries. Also, the Soviets were seeking investment in specific areas in Turkmenistan and at the Karachaganak Field in Kazakhstan. At Karachaganak, there are technological problems in producing the gas, which is 4,000 to 5,000 m deep and has a high sulfur content as well as a high condensate content. *(See table 11.)*

***Oil.***—Oil and gas condensate production in 1991 fell by 10% in comparison with that of 1990 to 515 Mmt. According to Soviet officials, the general economic deterioration in the country resulted in a sharp reduction in financial and material inputs for the development of the oil industry. The decline in oil production, however, may be viewed as a culmination of a number of problems resulting from the development of the oil sector under central planning. These problems were greatly exacerbated by the economic deterioration that occurred in the country.

In 1991, oil exports from the U.S.S.R. were, according to the head of the Russian Fuel and Energy Ministry, "completely uncontrolled." Officially reported exports of crude oil totalled 57 Mmt and of petroleum products 9 Mmt. Reports were appearing in the western press that much more oil was exported through unofficial channels. In 1991, official exports of crude oil declined by 52% and of petroleum products by 18% in comparison with the 1990 level.

In the U.S.S.R.'s major oil-producing region of West Siberia, production in 1991 decreased by more than 12% in comparison with 1990 to 329 Mmt. The decline in production in West Siberia was the principal factor in falling oil production in the U.S.S.R. Output, nevertheless, was falling in other regions in the Russian Republic. Output fell by about 5 Mmt in 1991 in the Volga-Urals area, the country's second largest oil-producing region, and production also decreased in the North Caucasus and Komi regions.

Outside of Russia, production rose only in Kazakhstan, where development was occurring of the Tengiz and Kumkol Oilfields.

In Azerbaidzhan, one of the oldest oil-producing regions, production continued to decline; production also fell in most other republics producing small amounts of oil.

In Uzbekistan, however, there was an increase in output from both old and new production areas, including a new area in the Karshi steppe. In one older producing region in the Fergana valley, drillers hit a large gusher in the Min-Bulak Field in Namagan Oblast. One of the new wells at this field blew out, necessitating the aid of both domestic firms as well as that of the U.S. firm Stan Cornelius, Inc. to cap the well.

Although no new major oil pipelines were constructed in 1991, an agreement was reached with Iran to construct a pipeline linking Iran with the Ukraine. Plans also called for constructing a pipeline from the Tengiz Field in

Kazakhstan to Novorossiysk on the Black Sea.

With the breakdown in both transport systems and in interrepublic trade, numerous oil refineries experienced shortages of raw materials. Total oil refinery throughput fell by almost 4% in 1991. Owing to the breakdown in interrepublic trade, refineries such as the Lisichansk in the Ukraine and Mazkeikiai in Lithuania experienced serious shortfalls in crude oil deliveries.

Foreign investment in the petroleum-producing sector was considered an essential element in improving production. The country was seeking foreign investment both in overhauling old wells and in developing new fields. In 1991, only the White Nights joint venture, which included the western firms Philco Energy and Anglo-Suisse and a small joint venture, the Yuganskfrakmaster, involving the Canadian Firm Fracmaster and some investment on the part of Shell Oil, were actually in production.

Foreign investors were either negotiating deals or bidding on tenders in a number of other areas. Some of the major areas included Sakhalin Island, where foreign companies were bidding on the rights to two offshore oilfields and gasfields, the Lunskoye and Piltun-Astokhaskoye Fields. Other areas considered suitable for foreign investment and where foreign firms were in the process of negotiating development rights included East Siberia, Yakutia, the lower Volga region, offshore in the Caspian Sea, and regions of Kazakhstan and Turkmenistan. Some of the major projects for which negotiations were under way or concluded included negotiations by Chevron for the development of the Tengiz Field in Kazakhstan, the awarding of rights to Amoco to engage in a joint venture for offshore development of a field in the Caspian Sea, and an agreement with Elf Acquitain for the exploration and development of fields in the lower Volga region. *(See table 12.)*

## Reserves

The U.S.S.R. used a reserve classification system that was not comparable to that in the United States, and data on reserves for the majority of minerals were 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 refers 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, $C_1$, and $C_2$, and three more, $P_1$, $P_2$, and $P_3$. The first four categories are regarded as reserves by the Soviets. Materials reported in each of these classes, however, 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, "prognoznye 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 were 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. $C_2$ reserves provide a general perspective of the development of mining enterprises but they do not constitute a justification for project planning.

All of these four categories (A, B, $C_1$, $C_2$) are based on the data obtained on an exploration grid of prescribed density (or 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 geological 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, ensuring 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 environmental 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 are known sufficiently well to ensure the conditions of the exploitation, and the hydrogeological environment, as a whole, is 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 minerals cannot be ascertained even by a dense exploratory grid. Quality, types, industrial grades, and technology of benefication 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 + B + $C_1$; categories and reserves are indicated by geological and geophysical evidence confirmed by boreholes.

Depending on the nature of the 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 $C_1$ category.

The Fourth Group Deposits include deposits similar to the Third Group Deposits, but with smaller ore bodies or 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 where categories A and B cannot 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 $C_3$, $D_1$, and $D_2$ for the determination of the prognosticated resources. Categories and the criteria for development are similar to those for other minerals except based on the specific characteristics of oil and gas deposits.

Reported data on Soviet reserves has been located for only a small number of minerals. Table 13 shows estimated Soviet reserves for a selected number of minerals. *(See table 13.)*

## INFRASTRUCTURE

The U.S.S.R., in 1991, had a total of 147,500 km of rail lines, including 54,300 km of electrified lines; 1,837,500 km of highway, of which 883,000 km were hard surfaced; 122,500 km of navigable inland waterways, excluding the Caspian Sea; 86,000 km of crude oil and products pipelines; and 218,700 km of natural gas pipelines. The U.S.S.R. had 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 m, and 660 with runways 1,220 to 2,439 m.

The U.S.S.R. had the longest coastline of any country, with more than 15 open seaports and a large number of inland ports, including Astrakhan, Baku, Kuybyshev, Nizhniy Novgorod, Kazan, Khabarovsk, Krasnoyarsk, Moscow, Rostov, Volgograd, and Kiev. The greater portion of the sea coasts, however, are in sparsely populated 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. faced the problem of depleting older deposits in areas with developed infrastructure while new deposits are 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 had 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 was concentrated in the western part of the country. There were 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 played a vital role in passenger and industrial transport owing to the vast distances and the lack of other transport means.

In some eastern and northern parts of the country, the Soviets relied on a combination of road, rail, river, and sea transport for minerals transport and also had developed a number of deposits depending primarily on air transport for freighting supplies and shipping minerals. For oil and gas, the Soviets had developed extensive pipeline networks that were now in great need of expensive maintenance and repair. Except for oil and gas, 90% or more of all mineral output was transported by rail.

Given the subsidized nature of Soviet economic activity, and the Soviet transport system in particular, it was not possible to assess the costs of mineral transport. However, these costs would play a much larger factor as the country

switched from a policy of central planning that promoted mineral development at almost any cost to a market economy system where production costs would be a crucial factor. In 1991, problems with labor unrest and fuel shortages affected the functioning of the transport network which, in turn, hampered the supply of inputs to and delivery of output from the country's mining and metallurgical enterprises.

## OUTLOOK

As control of mineral resources passes from the Soviet central planners to the new countries and enterprises, the implications for the domestic and world mineral supply will be varied. Owing to the uneven dispersion of mineral production among the new countries, their urgent need for hard currency, and the inability of a significant number of former Soviet domestic mining and metals processing enterprises to pay hard currency for raw materials, there could be significant changes in mineral production, consumption, and trade. For example, nearly all of the U.S.S.R. chrome ore was mined in Kazakhstan, and practically all of its manganese ore was mined in Georgia and the Ukraine, while the Russian Republic produced almost 60% of the country's steel. Now the question has arisen as to the amount of manganese and chrome that will be bought by former Soviet ferroalloys producers and steelmakers in non-hard currency transactions, compared to the amounts that will be sold for hard currency.

As with chrome and manganese, the uneven distribution of production and the varying degrees of dependencies for raw material among the new republics is true for a large number of minerals. The situation is quite complex when one considers, for example, that 50% of the U.S.S.R.'s potash was mined in Byelorussia and that about 40% of the iron ore and about 25% of the coal was mined in the Ukraine. A large percentage of the titanium and magnesium was produced in Kazakhstan and the Ukraine, and all of the antimony metal was produced in Kirgiziya, etc. The complexities increase when one considers that there is a great variance among the republics not only in the types of mines, but among ore grades for specific minerals, mining conditions, and access to energy and transport. These factors will affect the economics of mineral production, consumption, and trade as the mineral industries move in an unknown number of stages from central planning to a market economy system.

Two trends that began before the coup attempt will accelerate. A far greater percentage of mineral output will be sold abroad for hard currency, and many enterprises will seek to exchange their products for needed industrial inputs or consumer goods in barter exchange.

Also, foreign investors now have to directly approach the enterprises as well as local and national officials of the new countries for entry into the former Soviet mineral industry.

The climate for new long-term major investment in mine development and plant construction seems less certain during the present transformation of political, economic, and legal structures. In the longer term, the volatile situation should eventually stabilize with the new countries moving in whole or in part toward a market system. Those foreign companies that have the most knowledge of the region's mineral resources and its mineral industries, that have made the proper contacts at the government and enterprise level, and that also follow the emerging development of market economy institutions, laws, and the new entrepeneurial class, will be best positioned to take advantage of new investment opportunities as they emerge.

In all areas there is the need for investment in technology and equipment as well as the introduction of market economy management techniques to enable former Soviet mineral industries to compete on the world market. If such efficiencies were to be introduced in the mineral industries, as well as other industries, mineral production could more than double while mineral consumption could be cut in half. This of course, would assume a shift to market economy consumption patterns that would again affect the domestic demand for minerals.

A transformation to market economics, however, would require a large reevaluation and reorientation of the structure of the former Soviet mineral industry. Much of the development was conducted at almost any cost to avoid foreign dependency on minerals. The mineral industry, in the way it was developed, staffed, and managed, was part of an entire economic system that did not conform to market economy criteria. The economic viability of enterprises of the former Soviet mineral industries will depend not only on needed investment, but also on an assessment as to whether these enterprises can be developed and operated profitably under market economy conditions.

With the breakup of the U.S.S.R. into 15 countries, each will have its own policies regarding mineral production and trade. The new countries will create their own legislation regarding ownership, foreign investment, commercial law, export licensing, and all of the other aspects necessary for commercial and governmental functioning. The creation of new laws and commercial and governmental structures will be an integral part in the evolution of these new countries' hoped-for transition to market economies.

The resource policies of these new countries will depend in large measure on their resource endowments. Their natural resources will determine the degree of interdependence that they will have to maintain with each other and the rest of the world. Their resource endowments will also be a critical factor in the next decade in determining the amount of foreign trade earnings or deficits that they will accrue and the level of foreign investment in the mineral industries of these countries.

TABLE 1

## U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Aluminum: | | | | | | |
| Ore and concentrate: | | | | | | |
| Bauxite, 26% to 57% alumina | | r5,500 | r5,500 | r5,500 | r5,500 | 5,000 |
| Nepheline concentrate, 25% to 30% alumina[3] | | 1,660 | 1,639 | 1,697 | 1,650 | 1,600 |
| Alunite ore 16% to 18% alumina | | r450 | r450 | r450 | r425 | 400 |
| Alumina | | r5,700 | r5,800 | r5,700 | r5,900 | 35,277 |
| Metal, smelter: | | | | | | |
| Primary | | r3,300 | r3,350 | r3,300 | r 33,523 | 33,251 |
| Secondary | | r800 | r800 | r800 | r800 | 800 |
| Total | | r4,100 | r4,150 | r4,100 | r4,323 | 4,051 |
| Antimony, mine output, recoverable Sb content | tons | r18,000 | r18,000 | r18,000 | 16,000 | 16,000 |
| Arsenic, white ($As_2O_3$) | do. | 8,100 | 8,100 | 8,100 | 7,800 | 7,000 |
| Beryllium: Beryl, cobbed, 10% to 20% BeO | do. | 2,000 | 2,000 | 2,000 | 1,600 | 1,500 |
| Bismuth, mine output, recoverable Bi content | do. | 85 | 85 | 85 | 80 | 70 |
| Cadmium metal, smelter | do. | 3,000 | 2,900 | 2,900 | 2,600 | 2,300 |
| Chromium: | | | | | | |
| Chrome ore, crude[3] | | 4,060 | 4,131 | 4,200 | e4,200 | e4,200 |
| Chrome ore, marketable[3] | | 3,570 | 3,700 | 3,800 | 3,800 | e3,800 |
| Cobalt: | | | | | | |
| Mine output, recoverable Co content | tons | 2,900 | 3,000 | 3,000 | 2,500 | 2,200 |
| Metal, smelter | do. | 5,300 | 5,400 | 5,200 | 4,500 | 4,000 |
| Copper: | | | | | | |
| Ore: | | | | | | |
| Gross weight, 0.5% to 2% Cu | | 91,000 | 93,000 | 93,000 | 87,000 | 78,000 |
| Cu content, recoverable | | r1,000 | r1,000 | r1,000 | r950 | 850 |
| Metal: | | | | | | |
| Blister: | | | | | | |
| Primary | | r1,200 | r1,200 | r1,200 | r1,100 | 950 |
| Secondary | | r150 | 150 | 150 | r150 | 130 |
| Refined: | | | | | | |
| Primary | | r1,250 | r1,250 | r1,250 | r1,100 | 950 |
| Secondary | | 147 | 150 | 150 | r150 | 130 |
| Gold, mine output, Au content[3] | thousand kilograms | r160 | r277 | r304 | r302 | 245 |
| Iron and steel: | | | | | | |
| Iron ore, 55% to 63% Fe[3] | | 250,874 | 249,754 | 241,348 | 236,000 | 199,000 |
| Iron ore, Fe content[3] | | 138,216 | 138,217 | 134,789 | e132,000 | e110,000 |
| Agglomerated products: | | | | | | |
| Sinter[3] | | 154,000 | 154,000 | 151,000 | e148,000 | e125,000 |
| Pellets[3] | | 67,500 | 68,000 | 68,700 | e67,000 | e60,000 |
| Metal: | | | | | | |
| Pig iron and blast-furnace ferroalloys: | | | | | | |
| Pig iron for steelmaking[3] | | 106,026 | 107,008 | 106,723 | e104,000 | e84,000 |
| Foundry pig iron[3] | | 7,214 | 6,903 | 6,550 | r e5,300 | e4,500 |
| Spiegeleisen[4] | | 319 | 20 | 20 | 18 | 15 |
| Ferromanganese[4] | | 3593 | 600 | 600 | 575 | 500 |
| Ferrophosphorus | | 325 | 25 | 25 | 20 | 17 |

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 | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Iron and steel—Continued: | | | | | | |
| Metal—Continued: | | | | | | |
| Total[3 5] | | 113,877 | 114,558 | 113,928 | 110,000 | 89,400 |
| Electric-furnace ferroalloys | | r4,900 | r5,100 | r5,000 | r4,900 | 4,300 |
| Crude steel[3] | | 161,887 | 163,037 | 160,096 | 154,000 | 133,000 |
| Finished rolled steel[3] | | 114,081 | 115,958 | r115,550 | r111,826 | 96,000 |
| Semimanufactures: | | | | | | |
| Wire rods[3] | | 8,800 | 6,535 | 6,158 | e5,800 | e5,000 |
| Pipe stock[3] | | 6,878 | 6,934 | 6,817 | e6,500 | e5,500 |
| Tubes from ingots[3] | | 1,929 | 1,947 | 1,889 | r1,868 | e1,600 |
| Selected end products: | | | | | | |
| Pipes and tubes[3] | | 20,346 | 20,840 | 20,567 | 19,500 | 17,000 |
| Cold-rolled sheet[3] | | 10,795 | 11,214 | 11,346 | r11,178 | e9,500 |
| Lead: | | | | | | |
| Mine output, recoverable Pb content | | 440 | 440 | 440 | 400 | 350 |
| Metal, smelter: | | | | | | |
| Primary | | 475 | 447 | 465 | 420 | 350 |
| Secondary | | 275 | 280 | 280 | 260 | 230 |
| Magnesium metal, including secondary | | 90 | 91 | 91 | 88 | 80 |
| Manganese concentrate:[3] | | | | | | |
| Gross weight | | 9,400 | 9,100 | 9,100 | 8,500 | e7,500 |
| Mn content | | 2,800 | 2,800 | 2,740 | r e2,500 | e2,200 |
| Mercury metal, including secondary | tons | r850 | r850 | r850 | r800 | 750 |
| Molybdenum, mine output, Mo content | do. | r17,000 | r17,000 | r17,000 | r16,500 | 14,000 |
| Nickel: | | | | | | |
| Mine output, Ni content | | 270 | 280 | 280 | r280 | 245 |
| Metal, smelter | | 285 | 290 | 295 | r295 | 260 |
| Platinum-group metals, mine output, Pt content | tons | 124 | 128 | 128 | 120 | 110 |
| Silver metal including secondary | do. | r2,000 | r2,000 | r2,000 | r2,000 | 1,900 |
| Tin: | | | | | | |
| Mine output, recoverable Sn content | do. | 16,000 | 16,000 | 16,000 | 15,000 | 13,000 |
| Metal, smelter: | | | | | | |
| Primary | do. | 18,500 | 18,500 | 18,000 | 16,000 | 13,000 |
| Secondary | do. | 4,000 | 4,000 | 4,000 | 3,700 | 3,200 |
| Total | do. | 22,500 | 22,500 | 22,000 | 19,700 | 16,200 |
| Titanium: | | | | | | |
| Concentrates: | | | | | | |
| Ilmenite | do. | r900,000 | r900,000 | r900,000 | r850,000 | 800,000 |
| Rutile | do. | 10,000 | 10,000 | 10,000 | 9,500 | 8,500 |
| Metal | | 100 | 100 | 100 | 95 | 90 |
| Tungsten concentrate, W content | tons | 9,200 | 9,200 | 9,200 | 8,800 | 8,000 |
| Vanadium metal | do. | 9,600 | 9,600 | 9,600 | 9,000 | 8,000 |
| Zinc: | | | | | | |
| Mine output, recoverable Zn content | | r600 | r600 | r550 | r550 | 475 |
| Metal: | | | | | | |
| Primary | | r700 | r635 | r590 | r580 | 500 |

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 | | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Zinc—Continued: | | | | | | |
| Metal—Continued: | | | | | | |
| Secondary | | 110 | 115 | 115 | r100 | 85 |
| Zirconium metal | | 90 | 90 | 90 | 85 | 75 |
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos, grades I-VII | | 32,552 | 2,600 | 2,600 | 2,300 | 2,100 |
| Barite | | 540 | 540 | 540 | 500 | 450 |
| Boron minerals and compounds: | | | | | | |
| Gross weight | | 200 | 200 | 200 | 190 | 170 |
| $B_2O_3$ content | | 40 | 40 | 40 | 35 | 30 |
| Bromine | | 65 | 65 | 65 | 60 | 55 |
| Cement, hydraulic[3] | | 137,404 | 139,499 | 140,436 | r137,322 | 122,000 |
| Clays: Kaolin including china clay | | 2,000 | 2,000 | 2,000 | 1,700 | 1,500 |
| Corundum, natural | tons | 8,700 | 8,700 | 8,700 | 8,000 | 7,000 |
| Diamond: | | | | | | |
| Gem | thousand carats | r12,000 | r12,000 | r12,000 | r12,000 | 12,000 |
| Industrial | do. | r12,000 | r12,000 | r12,000 | r12,000 | 12,000 |
| Total | | r24,000 | r24,000 | r24,000 | r24,000 | 24,000 |
| Diatomite | | 255 | 260 | 260 | 250 | 225 |
| Feldspar | | 330 | 330 | 330 | 300 | 250 |
| Fluorspar, ore | | 1,400 | 1,400 | 1,400 | 1,350 | 1,200 |
| Fluorspar, concentrate 55% to 96.4% $CaF_2$ | tons | 410,500 | 410,500 | 410,500 | 400,000 | 350,000 |
| Graphite | | 84 | 84 | 84 | 80 | 70 |
| Gypsum[3] | | 4,781 | 4,902 | 4,900 | e4,700 | e4,000 |
| Iodine | tons | 2,000 | 2,000 | 2,000 | 1,800 | 1,500 |
| Lime, dead-burned[3] | | 30,121 | 30,577 | 30,378 | e30,000 | e27,000 |
| Lithium minerals, not further specified | | 55 | 55 | 55 | 50 | 45 |
| Magnesite: | | | | | | |
| Crude | | 4,300 | 4,200 | 4,200 | 4,000 | 3,500 |
| Marketable product | | 1,875 | 1,825 | 1,825 | 1,700 | 1,500 |
| Mica | | 50 | 50 | 50 | 45 | 40 |
| Nitrogen: N content of ammonia | | 20,000 | 20,200 | 19,500 | 18,500 | 17,800 |
| Perlite | | r170 | r170 | r160 | r150 | 140 |
| Phosphate rock: | | | | | | |
| Crude ore: | | | | | | |
| Apatite, 15% $P_2O_5$ | | 351,840 | 352,298 | 51,000 | 49,000 | 46,000 |
| Sedimentary rock | | 324,915 | 326,245 | 25,000 | 24,000 | 23,000 |
| Total | | 376,755 | 378,543 | 76,000 | 73,000 | 69,000 |
| Concentrate: | | | | | | |
| Apatite, 37% to 39.6% $P_2O_5$ | | 20,900 | 21,200 | r21,500 | r20,900 | 19,000 |
| Sedimentary rock, 19% to 30% $P_2O_5$ | | 16,100 | 15,800 | r16,000 | r15,900 | 14,300 |
| Total | | 37,000 | 37,000 | r37,500 | r36,800 | 33,300 |
| Potash: | | | | | | |
| Ore, gross weight[3] | | 68,710 | 68,410 | e62,000 | e55,000 | e50,000 |
| $K_2O$ equivalent[3] | | 10,888 | 11,301 | 10,233 | 9,000 | 8,600 |
| Pyrite, gross weight | | 34,893 | 4,900 | 4,800 | 4,600 | 4,400 |

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 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | |
| Salt, all types[3] | 15,400 | 14,800 | 15,000 | 14,500 | e13,000 |
| Sodium compounds, n.e.s.: | | | | | |
| Carbonate[3 6] | 5,051 | 4,989 | 4,809 | 4,359 | e4,100 |
| Sulfate: | | | | | |
| Natural | 360 | 375 | 375 | 350 | 330 |
| Manufactured | 260 | 270 | 270 | 250 | 240 |
| Sulfur: | | | | | |
| Frasch | 1,100 | 1,100 | 1,100 | 1,000 | 900 |
| Other native | 2,400 | 2,400 | 2,350 | 2,000 | 1,800 |
| S content of pyrite[3 7] | 2,150 | 2,150 | 2,150 | e1,900 | e1,700 |
| Byproducts: | | | | | |
| Of metallurgy | 1,250 | 1,375 | 1,350 | 1,200 | 1,000 |
| Of natural gas | 2,400 | e3,290 | 2,500 | 2,500 | 2,400 |
| Of petroleum | 450 | 450 | 450 | 425 | 380 |
| Total | 9,750 | 10,765 | 9,900 | 9,025 | 8,180 |
| Sulfuric acid[3] | 28,531 | 29,372 | 28,276 | r27,267 | e22,500 |
| Talc | 530 | 530 | 530 | 500 | 450 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Coal:[3] | | | | | |
| Anthracite | 71,544 | 72,274 | 68,043 | e65,000 | e49,000 |
| Bituminous | 523,338 | 527,212 | 508,754 | e478,000 | e400,000 |
| Lignite and brown coal | 164,490 | 172,395 | 163,523 | 160,000 | e180,000 |
| Total[8] | 759,372 | 771,881 | 740,320 | 703,000 | 629,000 |
| Coke: Coke oven, beehive, breeze, gas coke[3] | 83,038 | 81,916 | 80,424 | r78,000 | 64,700 |
| Fuel briquets:[3] | | | | | |
| From anthracite and bituminous coal | 771 | 762 | 751 | e700 | e600 |
| From lignite and brown coal | 4,238 | 5,448 | 5,628 | e5,300 | e4,700 |
| Total | 5,009 | 6,210 | 6,379 | 6,000 | e5,300 |
| Gas, natural, marketed: As reported[3] million cubic meters | 727,000 | 770,000 | 796,000 | 815,000 | 811,000 |
| Oil shale[3] | 30,081 | 28,061 | 28,076 | r e27,000 | e25,000 |
| Peat: | | | | | |
| Agricultural use | 160,000 | 160,000 | 160,000 | 150,000 | 130,000 |
| Fuel use[3] | 11,400 | 17,500 | 16,800 | 11,200 | e10,000 |
| Petroleum: | | | | | |
| Crude: | | | | | |
| As reported, gravimetric units[3] | 624,177 | 624,323 | 607,254 | 570,000 | 515,000 |
| Converted, volumetric units thousand 42-gallon barrels | 4,590,000 | 4,590,000 | 4,460,000 | 4,190,000 | 3,785,000 |
| Refinery products[9] | r465,000 | 475,000 | 470,000 | r455,000 | e400,000 |

eEstimated. rRevised.

[1]Production estimated unless otherwise specified.

[2]Includes data available through Apr. 1993.

[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 include all energy and nonenergy products but exclude losses.

TABLE 2
## U.S.S.R.: PRIMARY ALUMINUM SMELTER CAPACITY AS OF DECEMBER 31, 1991

(Thousand metric tons per year)

| | Capacity |
|---|---|
| Russia: | |
| Bogoslovsk | 162 |
| Bratsk | 844 |
| Irkutsk | 262 |
| Kandalaksha | 63 |
| Krasnoyarsk | 755 |
| Nadvoitsy | 68 |
| Novokuznetsk | 284 |
| Sayansk | 274 |
| Uralsk | 70 |
| Volgograd | 168 |
| Volkhov | 20 |
| Total | 2,970 |
| Ukraine: | |
| Dneprovsk | 110 |
| Tadzhikistan: | |
| Tadzhik (in Tursunzade) | 517 |
| Azerbaidjan: | |
| Sumgait | 58 |
| Grand total | 3,655 |

TABLE 3
## U.S.S.R.: ALUMINA PRODUCTION CAPACITY, BY REPUBLIC AND REFINERY

(Thousands metric tons per year)

| | |
|---|---|
| Russia: | |
| Achinsk | 900 |
| Bogoslovsk | 1,050 |
| Boksitogorsk | 200 |
| Pikalevo | 266 |
| Uralsk | 536 |
| Volkhov | 45 |
| Total | 2,997 |
| Ukraine: | |
| Dneprovsk | 245 |
| Nikolaev | 1,049 |
| Total | 1,294 |
| Kazakhstan: | |
| Pavlodar | 1,090 |
| Azerbaidzhan: | |
| Gyandzhinskiy | 476 |
| Grand total | 5,857 |

TABLE 4
## U.S.S.R. MAJOR BAUXITE, NEPHELINE, AND ALUNITE MINES

(Thousand metric tons per year)

| | Type of mining | Type of ore | Capacity |
|---|---|---|---|
| Russia: | | | |
| North-Urals (Severouralsk) mining company | Underground and open pit | Diaspore bauxites | NA |
| South-Urals (Yuzhnoural) mining company | Underground | Boehmite bauxites | NA |
| Severnaya Onega Mine | Open pit | do. | 800 |
| Khibiny apatite complex | do. | Nepheline | 1,500 |
| Kiya-Shaltyr Mine | do. | do. | NA |
| Sredni-Timan Mine | do. | Boehmite bauxites | 6,500 |
| Kazakhstan: | | | |
| Krasnooktyabrskiy complex | do. | Gibbsite bauxites | NA |
| Turgai complex | do. | do. | NA |
| Azerbaidzhan: | | | |
| Zaglik Alunite complex | do. | Alunite | 500 |

NA Not available.

TABLE 5

## U.S.S.R.: LOCATION OF MAJOR COPPER MINES, CONCENTRATES, SMELTERS, AND REFINERIES

| Republic | Mining | Concentration | Smelting | Refining |
|---|---|---|---|---|
| Armenia | Armtsvetmet complex | Armtsvetmet complex | | |
| Georgia | Madneuli complex | Madneuli complex | | |
| Kazakhstan | Balkhash complex | Balkhash complex | Balkhash complex | Balkhash complex. |
| Do. | Dzhezkazgan complex | Dzhezkazgan complex | Dzhezkazgan complex | Dzhezkazgan complex. |
| Do. | East Kazakhstan copper chemical complex | East Kazakhstan copper chemical complex | | |
| Do. | Irtysh complex | Irtysh complex | Irtysh complex | |
| Do. | Leninogorsk complex | Leninogorsk complex | | |
| Do. | Zhezkent complex | Zhezkent complex | | |
| Do. | Zyryanovsk complex | Zyryanovsk complex | | |
| Russia | Altay complex | Altay complex | | Pyshma and Kyshtym refineries of the Uralelektro copper enterprise. |
| Do. | Bashkir enterprise | Bashkir enterprise | | |
| Do. | Buribai enterprise | Buribai enterprise | | |
| Do. | Gai complex | Gai complex | Mednogorsk enterprise | |
| Do. | Kirovgrad complex | Kirovgrad complex | Kirovgrad complex | |
| Do. | Krasnoural'sk complex | Krasnoural'sk complex | Krasnoural'sk complex | |
| Do. | Noril'sk complex | Noril'sk complex | Noril'sk complex | Noril'sk complex. |
| Do. | Sredneural'sk complex | Sredneural'sk complex | Sredneural'sk complex | |
| Do. | Uchali complex | Uchali complex | | |
| Do. | Urap complex | Urap complex | | |
| Uzbekistan | Almalyk complex | Almalyk complex | Almalyk complex | Almalyk complex. |

TABLE 6
## U.S.S.R.: MAJOR FERROALLOY PRODUCERS

| Republic | Plant | Major commodities production |
|---|---|---|
| Georgia | Zestafoni ferroalloy plant | Manganese sinter, electrolytic manganese, ferromanganese, silicomanganese, medium carbon ferromanganese. |
| Kazakhstan | Aktyubinsk ferroalloy plant | High carbon 60% ferrochrome, 48% ferrosilicochrome, medium-carbon 60% ferrochrome, nitrogen bearing 60% ferro-chrome. |
| Do. | Yermak ferroalloy plant | Ferrochrome, ferrosilicon, ferrosilicochrome. |
| Russia | Chelyabinsk electrometallurgical plant | Low carbon ferrochrome, ferrochrome, 40% foundry ferrosilicochrome, 28% calcium silicide, 15% calcium silicide. |
| Do. | Chusovoy iron and steel plant | Ferrovanadium. |
| Do. | Klyuchevsk ferroalloy plant | 20% aluminothermic ferro-titanium, 60% extra low carbon ferroniobium, 72% ferrotungsten, 97% chromium metal, calcium silicide. |
| Do. | Kosyagora ironworks | Blast furnace ferromanganese. |
| Do. | Kuznetsk ferroalloy plant | Ferrosilicon. |
| Do. | Lipetsk ironworks and steelworks | Do. |
| Do. | Serovsk ferroalloy plant | High carbon ferrochrome, low carbon ferrochrome, medium carbon ferrochrome, ferrosilicochrome. |
| Do. | Tulachermet Scientific and Industrial Association | Ferrosilicon, vanadium alloys. |
| Ukraine | Azovstal iron and steel works | NA. |
| Do. | Nikopol ferroalloy plant | Ferromanganese, silicomanganese, fluxes, electrode mass, manganese sinter, low phosphorus slag. |
| Do. | Stakhanov ferroalloy plant | Ferrosilicon. |
| Do. | Zaporozh'ye ferroalloy plant | 82% silicomanganese, ferrosilicon, 76% ferromanganese, 66% ferrochrome, manganese metal, nitrogen bearing manganese metal. |

NA Not available.

TABLE 7
## U.S.S.R.: REPORTED GOLD DATA

(Metric tons)

| | 1953 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|
| Production | 117.1 | 251.8 | 264.0 | 271.3 | 260.0 | 277.6 | 304.0 | 302.0 |
| Exports | 148.7 | 10.1 | 297.0 | 75.0 | 48.0 | 96.0 | 245.5 | 474.6 |
| Stocks | 2,049.8 | 577.2 | 719.5 | 587.4 | 680.9 | 785.3 | 850.4 | 484.6 |

Source: Moscow News, Moscow, No. 76, Nov. 17-28, 1991, p. 9

TABLE 8

## U.S.S.R.: MAJOR MOLYBDENUM MINING AND PROCESSING

| Republic | Mine | Metallurgical processing |
|---|---|---|
| Armenia | Agarak copper-molybdenum mine | Alaverdy metallurgical plant with roasting and ferro-molybdenum production. |
| | Kadzharan copper-molybdenum mine of Zangezur complex | |
| | Dastakert copper-molybdenum mine | |
| Georgia | | Molybdenum roasting at Zestafoni ferroalloys plant. |
| Kazakhstan | Balkhash copper mining complex | Balkhash metal plant with molybdenum roasting. |
| | Akchatau tungsten-molybdenum mining complex | Akchatau molybdenum metal plant. |
| | Koktenkol'skiy tungsten-molybdenum mine (under development) | Tselinnyy mining-chemical complex producing amonionum molybdate. |
| | Boshchekulskiy molybdenum mine (under development) | |
| Kirgiziya | | Yuzhniy polymetallic complex producing molybdenum sulfides, disulfides, and trisulfides. |
| Russia | Dzhida tungsten-molybdenum mine | Chelyabinsk metallurgical enterprise with molybdenum roasting. |
| | Sorsk molybdenum mining enterprise | Klyuchevsk ferroalloys plant with molybdenum roasting. |
| | Tyrny-Auz tungsten-molybdenum mining enterprise | Skopin plant produces $MoO_3$ and $MoS_2$. |
| | Shakhtaminskoye molybdenum mining enterprise | "Luch" experimental scientific production association in Podol'sk producing molybdenum for chemical uses. |
| Tadzhikistan | Chorukhdayransk tungsten-molybdenum mine | |
| | South Yashransk copper-molybdenum mine | |
| Ukraine | | The 61st Commune plant in Nikolaev (unspecfied output). |
| Uzbekistan | Kalmakyr copper-molybdenum mine of Almalyk complex | Lenin mining and metallurgical works in Tashkent produces molybdenum chemicals and metal powders. |
| | Tungsten-molybdenum mining at the Kotyash and Lyangar deposits | Uzbek refractory and heat resistant materials plant in Tashkent, processes molybdenum metal powder to finished metal and alloy parts. |

TABLE 9

## U.S.S.R.: COAL PRODUCTION BY MAJOR PRODUCING REPUBLICS

(Thousand metric tons)

| Republic | 1990 | | 1991 | |
|---|---|---|---|---|
| | Quantity | Percent of total | Quantity | Percent of total |
| Russia | 386,698 | 55 | 344,740 | 55 |
| Ukraine | 164,811 | 23 | 135,622 | 21 |
| Kazakhstan | 130,507 | 19 | 130,278 | 21 |
| Total | 682,016 | 97 | 610,640 | 97 |

TABLE 10

## U.S.S.R.: COAL PRODUCTION AT MAJOR BASINS

(Thousand metric tons)

| Basin | 1990 | 1991 |
|---|---|---|
| Donets (primarily in the Ukraine and a small part in Russia) | 172,619 | 143,338 |
| Kuznetsk (Russia) | 144,559 | 119,378 |
| Ekibastuz (Kazakhstan) | 81,762 | 82,821 |
| Kansk-Achinsk (Russia) | 51,210 | 54,815 |
| Karaganda (Kazakhstan) | 48,740 | 46,930 |
| Pechora (Russia) | 29,260 | 23,566 |
| Total | 528,150 | 470,848 |

TABLE 11

## U.S.S.R.: 1991 NATURAL GAS PRODUCTION, BY REPUBLIC

(Billion cubic meters)

| Republic | 1991 | Percent of 1990 output |
|---|---|---|
| Azerbaidzhan | 8.6 | 87.0 |
| Byelorussia | .3 | 99.0 |
| Kazakhstan | 7.9 | 111.0 |
| Kirgiziya | .1 | 87.0 |
| Russia | 643.0 | 100.4 |
| Tadzhikistan | .1 | 83.0 |
| Turkmenistan | 84.3 | 96.0 |
| Uzbekistan | 41.9 | 103.0 |
| Ukraine | 24.4 | 87.0 |
| Total | 810.6 | 99.5 |

TABLE 12

## U.S.S.R: REPORTED OIL AND GAS CONDENSATE PRODUCTION, BY REPUBLIC

(Million metric tons)

| Republic | 1991 | Percent of 1990 Output |
|---|---|---|
| Azerbaidzhan | 11.7 | 94.0 |
| Byelorussia | 2.1 | 100.3 |
| Kazakhstan | 26.6 | 103.0 |
| Kirgiziya | .1 | 92.0 |
| Russia | 461.0 | 89.0 |
| Tadzhikistan | .1 | 75.0 |
| Turkmenistan | 5.4 | 97.0 |
| Uzbekistan | 2.8 | 100.8 |
| Ukraine | 4.9 | 94.0 |
| Total | 514.7 | 90.0 |

TABLE 13

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Armenia: | |
| Copper | Mines:<br>Zangezur copper-molybdenum complex (mines Kadzharan deposit).<br>Agarak copper-molybdenum complex.<br>Kafan Mining Directorate.<br>Shamlugskiy Mining Directorate.<br>Akhtal Mining Directorate.<br>Metallurgical processing:<br>Alaverdy plant. |
| Gold | Megradzor, Zod mining complexes. |
| Molybdenum | Zangezur copper-molybdenum complex<br>(mines Kadzharan deposit).<br>Agarak copper-molybdenum complex.<br>Dastakert copper-molybdenum mine.<br>Metallurgical processing:<br>Alaverdy plant. |
| Perlite | Aragatskiy mining and processing complex. |
| Azerbaidzhan: | |
| Aluminum | Zaglik alunite mining directorate<br>(mines nonbauxite aluminum ore).<br>Gyandzhinskiy alumina complex.<br>Sumgait aluminum plant. |
| Bromine-iodine | Baku, Karadag, Neftechala plants. |
| Copper-molybdenum | Paragachayskoye copper-molybdenum deposit. |
| Iron ore | Dashkesanskiy mining-beneficiation complex. |
| Lead-zinc | Gyumyshlugskoye and Agdanrinskoye deposits. |
| Petroleum and natural gas | Offshore Caspian Sea.<br>Caspian shoreline.<br>Ashperon Peninsula.<br>Lower Kura River Valley.<br>Eastern interior (Naftalan, Mirbashir, Kazanbulak Fields). |
| Byelorussia: | |
| Peat (for fuel and agriculture) | Deposits throughout country and 37 fuel briquetting plants. |
| Potash | Starobin region. |
| Steel | Zhlobin minimill. |
| Estonia: | |
| Oil shale | Northeast Estonian Basin. |
| Phosphate | Maardu deposit. |
| Uranium | Sillimae uranium mining and concentrating complex. |
| Georgia: | |
| Barite | Iri and Madneuli regions. |
| Copper | Madneuli deposit. |
| Ferralloys | Zestafoni plant. |
| Lead-zinc | Kvaisi and Madneuli deposits. |
| Manganese | Chiatura basin. |
| Kazakhstan: | |
| Aluminum | Turgai and Krasnooktyabr bauxite mining directorates.<br>Pavlodar alumina plant. |
| Arsenic | Byproduct of lead and copper metallurgical processing. |
| Asbestos | Dzhetygara complex.<br>Chilisay complex. |
| Barite | Karagaili barite-lead deposit. |
| Beryllium metal | Ulbinskiy metallurgical plant in Ust-Kamenogorsk. |

TABLE 13—Continued

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Kazakhstan—Continued: | |
| Bismuth | Byproduct of lead-zinc and copper metallurgical processing. |
| Cadmium | Byproduct of lead-zinc and copper metallurgical processing. |
| Chrome | Donskoye mining and beneficiation complex near Khromtau. |
| Coal | Ekibastuz, Karaganda Basins. |
| Copper | Mining:<br>Balkhash, Dzhezkazgan, Irtysh, Leninogorsk, Zhezkent, and Zyryanovsk mining-beneficiation complexes.<br>East Kazakhstan copper-chemical complex.<br>Metallurgy:<br>Balkhash, Dzhezkazgan smelting and refining and Irtysh smelting enterprises. |
| Ferroalloys | Aktyubinsk, Yermak ferroalloy plants. |
| Gold | Byproduct of polymetallic ores. |
| Iron ore | Sokolov-Sarbayskiy and Lisakovskiy mining-beneficiation complexes. |
| Lead-zinc | Mining:<br>Achisay, Irtysh, Karagaili Leninogorsk, Tekeli, Zyryanovsk, and Zhayrem complexes.<br>Metallurgy:<br>Chimkent, Leninogorsk, and Ust-Kamenogorsk smelting and refining enterprises. |
| Magnesium metal | Ust-Kamenogorsk titanium-magnesium metallurgical plant. |
| Manganese | Dzhezdinskiy mining directorate. |
| Molybdenum | Akchatau and Balkhash mining and metallurgical complexes, Dzhambul mining center. |
| Oil and gas | Mangyshlak Peninsula (Tengiz Field slated for joint-venture development). |
| Phosphate rock | Karatau phosphorite complex. |
| Rhenium | Balkhash complex (byproduct). |
| Silver | Byproduct of polymetallic ores. |
| Steel | Karaganda iron and steel mill. |
| Titanium metal | Ust-Kamenogorsk titanium-magnesium plant. |
| Tungsten | Mining:<br>Akchatau, Karaoba, Koktenkol, Kounrad, and Verkhnye Kayraktin deposits.<br>Processing:<br>Akchatau complex, Balkhash complex, Uspenskiy plant. |
| Uranium | Deposits:<br>Shevchenko, Stepnogorsk, Taboshara<br>Processing centers:<br>Prikaspiskiy ore enrichment center, Tselinny chemical plant. |
| Kirgiziya: | |
| Antimony | Kadamdzhay antimony mining-metallurgical complex. |
| Coal | Twelve coal mining enterprises in operation in different regions, including six open pit mines. |
| Gold | Kirgizstan gold mining complex. |
| Mercury | Khaydarken mercury mining-metallurgical complex. |
| Oil and gas | Mayli-Say region. |
| Uranium | Deposits:<br>Issyk Kul, Kadji-Say, Min-Kush, Tyuamuyun regions<br>Processing plant:<br>Kara Balta |
| Latvia: | |
| Ceramic clays<br>Dolomite<br>Gypsum<br>Limestone for cement | Industrial mineral production occurs at numerous enterprises throughout the country. |
| Peat | Eighty-five peat deposits under exploitation. |
| Lithuania: | |

TABLE 13—Continued

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Latvia—Continued: | |
| Cement<br>Clays<br>Dolomite<br>Limestone<br>Sand and gravel | More than 300 enterprises engaged in production of industrial minerals. |
| Peat | Eleven enterprises exploiting 55 deposits. |
| Moldavia: | |
| Gypsum<br>Limestone<br>Sand<br>Stone | More than 100 deposits exploited for industrial minerals. |
| Steel | Rybnitsa minimill. |
| Russia: | |
| Aluminum | Severouralsk Bauxite production association.<br>Tikhvin, Severnaya Onega and Yuzhnoural bauxite mining directorates.<br>Apatit nepheline complex.<br>Polevoy cryolite plant.<br>Achinsk, Boksitogorsk, Nadvoitsy, Pikalevo, Uralsk, Volkhov, alumina refineries.<br>Bogoslovsk, Bratsk, Irkutsk, Kandalaksha, Krasnoyarsk, Nadvoitsy Novokuznetsk, Sayansk, Uralsk, Volgograd, and Volkhov aluminum plants. |
| Amber | Kaliningrad complex in Kaliningrad Oblast. |
| Asbestos | Uralasbest, Kiyembay, and Tuvaasbest complexes. |
| Beryllium | Deposits in Altay region of West Siberia, Kola Peninsula, Russian far east, Transbaykal, and Urals regions. |
| Bismuth | Byproduct production at Kirovgrad and Mednogorsk copper complexes in Urals. |
| Coal | Kansk-Achinsk, Kuznetsk, Moscow, Pechora, and Yakutsk basins. |
| Cobalt | Noril'sk and Pechenga mixed sulfide deposits.<br>Khovu-Aksy cobalt-arsenide deposit in Tuva Republic. |
| Copper | Mining areas:<br>East Siberia at Norilsk and Talnakh deposits, in South Siberia in Altay mountains.<br>Urals in Bashkir Republic, in Chelyabinsk, Orenburg, and Sverdlovsk Oblasts.<br>Smelters:<br>Gai, Kirovgrad, Krasnouralsk, Mednogorsk, Srednouralsk (Urals), Norilsk (East Siberia), Pechenga, Monchegorsk (Kola Peninsula).<br>Refineries:<br>Kyshtym, Monchegorsk, Moscow, Norilsk, Pyshma. |
| Diamonds | Aykhal, Mirnyy, and Udachnaya areas in the Yakut Republic.<br>Arkhangelsk region. |
| Ferroalloys | Chelyabinsk, Chusovoy, Klyuchevsk, Kosyagora, Kuznetsk, Lipetsk, Serovsk, Tula plants. |
| Fluorspar | Mining and beneficiation complexes:<br>Kalanguyskiy and Kyakhtinskiy in Trans-Baykal region.<br>Yaroslavskiy in Russian Far East. |
| Gold | Mining Regions:<br>Lena, Maritime, Northeast, Transbaykal, Urals, and Yakutian gold production regions. |
| Iron ore | Mining regions:<br>Kursk Magnetic Anomaly (KMA) containing Lebedi, Mikhaylovskiy, and Stoylensk mining and beneficiation complexes.<br>Northwest region containing Olenegorsk, Kovdor, and Kostamushka complexes.<br>Urals region containing Kachkanar, Magnitogorsk, and other complexes.<br>East Siberian region containing Korshunova and Rudnogorsk complexes.<br>West Siberian and far eastern regions with a number of mining complexes. |

TABLE 13—Continued

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Russia—Continued: | |
| Lead-zinc | Mining enterprises:<br>Altay, Buribai, Gai, Kirovgrad, Srednouralsk, and Uchali copper-zinc mining enterprises.<br>Dalpolymetal, Nerchinsk, Sadon, and Salair lead-zinc mining enterprises.<br>Smelters:<br>Chelyabinsk zinc smelter.<br>Dalpolymetal lead smelter.<br>Elektrozink lead-zinc smelter in Caucasus. |
| Magnesite | Satka group of deposits in Chelyabinsk Oblast. |
| Magnesium | Berezniki and Solikamsk plants in Urals. |
| Mica | Aldan complex in Yakut Republic, Karel complex in Ambarnyy and Chupa areas of Karelia.<br>Kovdor complex in Murmansk Oblast.<br>Mam complex in Mamsko-Chuyskiy region in Irkutsk Oblast, East Siberia. |
| Molybdenum | Mining:<br>Dzhida tungsten-molybdenum complex in the Buryat Republic.<br>Sorsk molybdenum complex in Krasnoyarsk Kray, East Siberia Tyrny-auz tungsten-molybdenum complex in the Kabardino-Balkar Republic.<br>Shakhtaminskoye molybdenum mining directorate in Chita Oblast. |
| Natural gas | Astrakhan region in Komi Republic. Orenburg Oblast in Urals.<br>Urengoy, Yamburg, and other deposits in West Siberia. |
| Nickel | Mining areas:<br>Noril'sk in East Siberia.<br>Orsk in Southern Urals.<br>Pechenga on Kola Peninsula.<br>Smelters and refineries:<br>Noril'sk complex (smelting and refining).<br>Pechenga (smelting).<br>Monchegorsk (smelting and refining).<br>Yuzhnouralnikel complex (smelting and refining). |
| Petroleum | Regions:<br>Bashkir Republic.<br>Komi Republic.<br>Kuybyshev Oblast in middle Volga region.<br>Orenburg and Perm Oblasts in Urals.<br>Tatar Republic.<br>West Siberia (principally Tyumen Oblast). |
| Phosphate rock | Khibiny apatite complex and Kovdor iron ore complex on Kola Peninsula.<br>Kingisepp complex in Leningrad Oblast. Lopatino and Yegoryevsk deposits in Moscow Oblast.<br>Polpinskoye deposit in Bryansk Oblast. Verkhnekamsk deposit in Urals. |
| Platinum-group metals | Noril'sk complex in East Siberia and on Kola Peninsula.<br>Metal production at Krasnoyarsk refinery in East Siberia. |
| Potash | Uralkaliy and Silvinit complexes in Urals. |
| Salt | Lake Baskunchak in Astrakhan Oblast. |
| Soda ash | Berezniki and Sterlitamak plants in Urals.<br>Mikhaylovskiy plant in Siberia.<br>Pikalevo plant in Leningrad Oblast. |

TABLE 13—Continued

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Russia—Continued: | |
| Steel | Largest production plants:<br>Northwest region:<br>Cherepovets plant.<br>Central region:<br>Elektrostal, Lipetsk, Staryy Oskol, Tula plants.<br>Volga region:<br>Nizhniy Novgorod, Kulebaki, Volgograd plants.<br>Urals region:<br>Chelyabinsk, Chusovoy, Izhevsk, Magnitogorsk, Nizhniy Tagil, Novotroitsk, Serov plants.<br>West Siberian region:<br>Novokuznetsk, Novosibirsk plants.<br>East Siberian region:<br>Krasnoyarsk, Petrovsk-Zabaykalskiy plants.<br>Far East region:<br>Komsomolsk na Amure plant. |
| Talc | Onotsk deposit in Irkutsk Oblast. Kirgiteysk deposit in Krasnoyarsk Kray. Miass and Shabrovsk deposits in Urals. |
| Tin | Mining and beneficiation complexes:<br>Khingan and Solnechnyy in Khabarovsk Kray.<br>Iultin in Magadan Oblast.<br>Khrustalnyy complex in Primorskiy Kray.<br>Deputatskiy complex in Yakut Republic.<br>Smelters:<br>Novosibirsk in West Siberia.<br>Podolsk and Ryazan in European Center. |
| Titanium | Metal production:<br>Berezniki plant in Urals.<br>Moscow and Podolsk plants in European Center. |
| Tungsten | Mining and beneficiation complexes:<br>Antonovogorsk, Belukha, and Sherlovogorsk in East Transbaykal.<br>Balkan in Urals.<br>Bom-Gorkhon and Dzhida in West Transbaykal.<br>Iultin in Magadan Oblast.<br>Solnechnyy and Vostok-2 in Primorskiy Kray.<br>Tyrny-Auz in Caucasus. |
| Uranium | Aldan, Chupa, Krasnokamensk, Laire Onega, Novogornyy, Sludyanka, Vikhorevka, Vishnevogorsk regions. |
| Vanadium | Kachkanar iron ore mining complex in Urals.<br>Chusovoy and Nizhniy Tagil processing plants in Urals. |
| Tadzhikistan: | |
| Aluminum | Tadzhik (Regar) aluminum plant in Tursunzade. |
| Antimony | Dzhidzhikrutskiy complex. |
| Arsenic | Takeli arsenic mining complex. |
| Bismuth | Bismuth ore mining in Chatkal mountains.<br>Byproduct of polymetallic ores. |
| Cadmium | Byproduct of Kansay lead-zinc mining center. |
| Fluorspar | Takob mining complex. |
| Gold | Darvaza placer mining district. |
| Lead-zinc | Altyn-Topkan, Kansay, and Kurusay mining complexes. |
| Mercury | Dzhidzhikrutskiy complex. |
| Molybdenum | Chorukh-Dayron, South Yashransk mines. |
| Tungsten | Chorukh-Dayron, Maykhura deposits. |
| Uranium | Taboshar uranium mining and processing complex. |

TABLE 13—Continued

## U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

| Commodity | Location of major facilities |
|---|---|
| Turkmenistan: | |
| Bentonite | Oglanly deposit. |
| Bromine and iodine | Cheleken, Nebit-Dag plants. |
| Natural gas | Dauletobad, Shatlyk fields. |
| Sodium compounds | Kara-Bogaz-Gol lagoon. |
| Sulfur | Gaurdak deposit. |
| Ukraine: | |
| Aluminum | Dneprovsk, Nikolayevsk alumina plants.<br>Dneprovsk aluminum plant. |
| Antimony | Nikitovskiy complex. |
| Coal | Donets basin. |
| Ferroalloys | Azovstal, Nikopol, Stakhanov, Zaporozhye plants. |
| Graphite | Zavalyevskiy graphite complex. |
| Iron ore | Krivoy Rog Basin. |
| Magnesium | Zaporozhye titanium-magnesium complex. |
| Manganese | Nikopol, Bolshoy Tokmak basins. |
| Mercury | Nikitovskiy complex. |
| Nickel | Pobuzhskoye deposit.<br>Pobuzhskiy nickel plant. |
| Potash | Kalush-Golynskiy, Stebnik deposits. |
| Salt | Artemsol complex. |
| Soda ash | Krym, Lisichansk, Saki, Slavyansk plants. |
| Steel | Azov, Dneprodzerzhinsk, Donetsk, Kommunarsk, Krivoy Rog, Makeyevka, Mariupol, Zaporozhye plants. |
| Sulfur | Rozdol, Yavorov deposits. |
| Talc | Onotsk deposit. |
| Titanium | Kharkov, Zaporozhye plants. |
| Uranium | Zheltye Vody complex. |
| Zinc | Ukrzinc smelter (secondary production) |
| Uzbekistan: | |
| Bismuth | Ustarasi deposit. |
| Coal | Angren deposit. |
| Copper | Almalyk mining and metallurgical complex. |
| Fluorspar | Toytepa complex. |
| Gold | Muruntau complex. |
| Lead-zinc | Almalyk mining and metallurgical complex. |
| Molybdenum | Do. |
| Natural gas | Bukhara, Gazli deposits, Mubarek deposit and gas processing plant. |
| Uranium | Navoi complex. |

TABLE 14

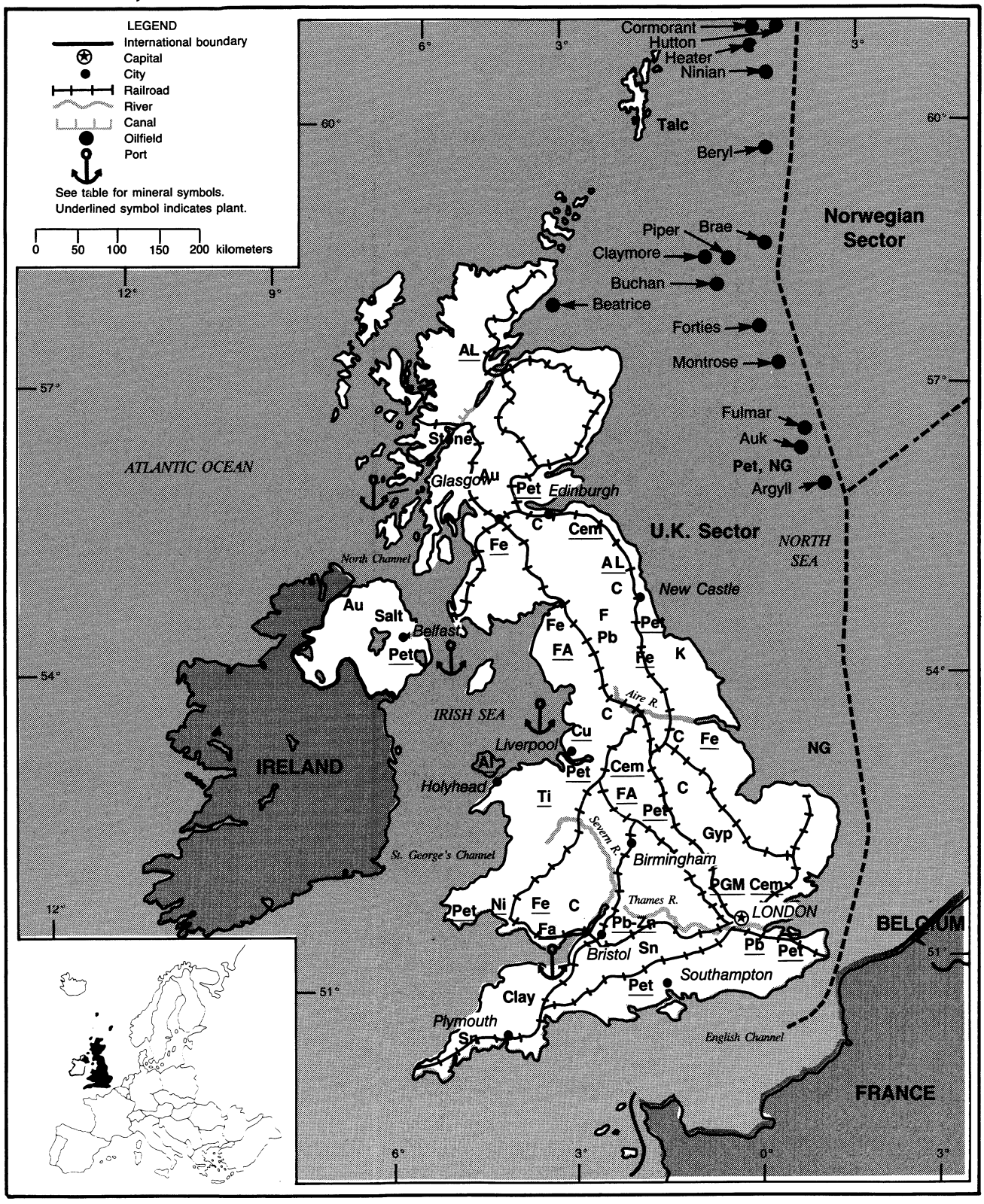
## U.S.S.R.: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

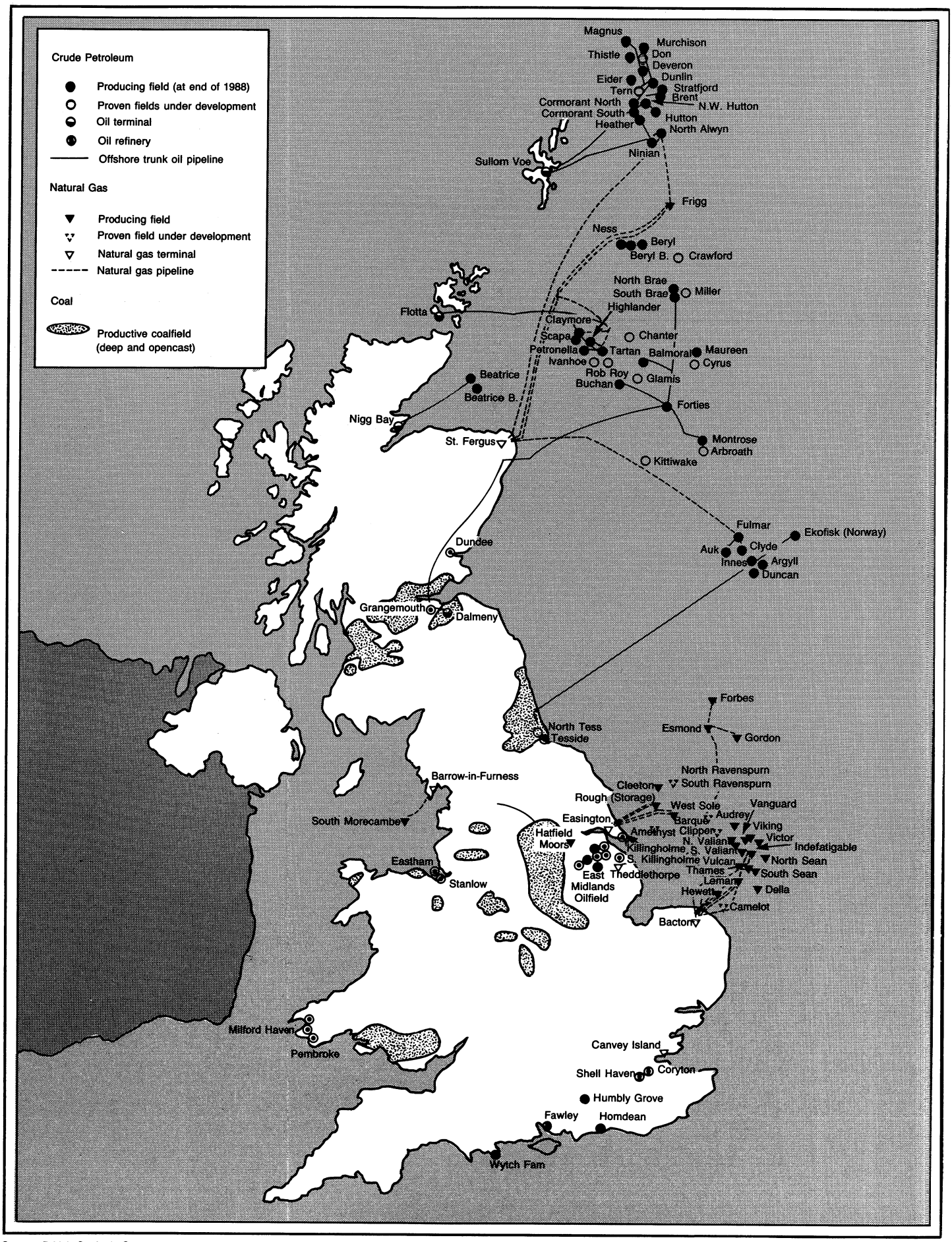
(Thousand metric tons unless otherwise specified)

| Commodity | | Reserves |
|---|---|---|
| Antimony | | 4,200 |
| Asbestos | | 125,000 |
| Barite | | 10,000 |
| Bauxite | | 300,000 |
| Boron ($B_2O_3$ content) | | 28,000 |
| Bromine | | 1,400 |
| Chromium | | 300,000 |
| Cobalt | | 140 |
| Copper | | 37,000 |
| Diamond, industrial | million carats | 40 |
| Fluorspar | | 98,600 |
| Gold | metric tons | 6,220 |
| Gypsum | | 2,000,000 |
| Ilmenite ($TiO_2$ content) | | 5,900 |
| Indium | metric tons | 200 |
| Iodine | do. | 400 |
| Iron ore | million metric tons | 92,100 |
| Lead | | 9,000 |
| Magnesite | | 650,000 |
| Manganese | | 300,000 |
| Mercury | metric tons | 10,000 |
| Molybdenum | | 500 |
| Nickel | | 6,600 |
| Peat | | 5,320,000 |
| Phosphate rock, marketable | | 1,330,000 |
| Platinum-group metals | metric tons | 2,100 |
| Potash ($K_2O$ equivalent) | | 3,600,000 |
| Rare earths | | 19,000 |
| Rhenium | metric tons | 594 |
| Rutile (contained $TiO_2$) | | 2,500 |
| Silver | | 44 |
| Sodium sulfate | | 1,800,000 |
| Sulfur | | 250,000 |
| Tin | | 300 |
| Tungsten | | 280 |
| Vanadium | | 5,000 |
| Yttrium ($Y_2O_3$ content) | | 9 |
| Zinc | | 10,000 |
| Zirconium ($ZrO_2$ content) | | 4,000 |

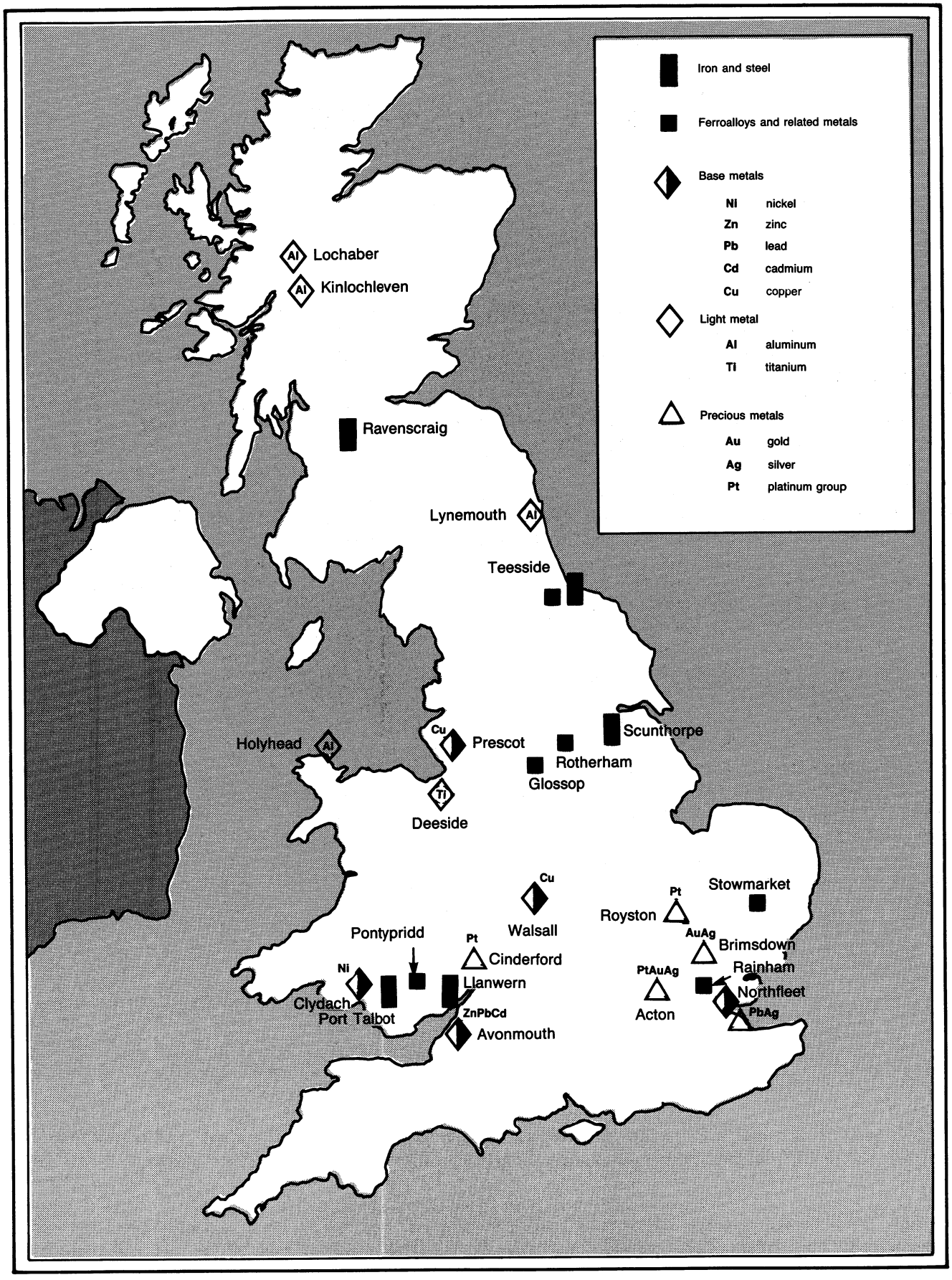
# UNITED KINGDOM

**AREA 244,820 km²** **POPULATION 57.8 million**






Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989




Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989

THE MINERAL INDUSTRY OF THE

# UNITED KINGDOM

By Harold R. Newman

As 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 over the past 20 years because deposits are being 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 offshore United Kingdom sector of the North Sea oilfield, now in its 27th 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.

GDP growth rate declined 1.9% in 1991, making the United Kingdom one of the slowest growing economies among the industrialized nations. The United Kingdom joined the European Exchange Rate Mechanism (EMR) on October 8, 1990, which represents a commitment to attaining low inflation. At yearend 1991, the inflation rate was 6.2% and the unemployment rate was 8.7% of the labor force.

## 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 for sale.

Mineral rights to mineral fuels such as coal, petroleum, and uranium belong to the state. 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 the United Kingdom are privately owned. The exception is gold and silver, the rights to which are vested in the Royal Family and are referred to as Crown Rights. A different situation regarding mineral rights 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 in the United Kingdom 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 privatization of the Central Electric Generating Board (CEGB), which held the monopoly for generating electric power in the United Kingdom. On March 31, 1990, in preparation for privatizing, CEGB was split into two fossil-fueled companies, National Power and PowerGen, and one nuclear generating company, Nuclear Electric. A fourth company, National Grid, operates the transmission system and owns two pumped storage stations. These companies will compete with each other and any other power-generating company that wishes to produce electricity.

Another company being prepared for privatization was BC. The Coal Industry Act of 1990 was given Royal Assent in March 1990. The act allowed the writeoff of BC's massive debt burden; increased the limitations on licenses for private company open pit coal operations from 25,000 tons to 250,000 tons; and

increased 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 3.0% decline in industrial production. The steel sector's operations declined as the downturn in the construction industry depressed the demand for general steels.

Production of tin concentrate decreased as marginal mines were closed. Capper Pass Ltd. closed its tin smelter at Humberside citing the difficulty of getting sufficient supplies of concentrates. Underground coal production decreased when reserves were depleted. BC announced that seven mines were to be closed by yearend 1991. Open pit coal production, on the other hand, continued strongly. Production of crude petroleum remained depressed owing to the continuing effects of the Piper Alpha drilling rig disaster in 1988 and the gas explosion on the Cormorant A drilling platform in 1989. Safety work was continuing. Redevelopment of these areas was expected to be completed by 1993. *(See table 1.)*

## TRADE

The United Kingdom has shifted from being a net exporter as recently as 1986 to being a net importer in 1990-91. Part of the reason for the weaker export performance during the past 3 years have been problems in the United Kingdom sector of the North Sea oilfields. Exports to North America dropped about 20% in the first half of 1991. It was thought this was because of an adverse exchange rate and an oil surplus.

It was expected that the economy would continue to slow further, which should cause the demand for imported consumer goods to decline. The trade balance deficit at yearend was almost $28 billion,[1] down from 1989's deficit of $32 billion. *(See tables 2 and 3.)*

Table 4 shows the impact of selected classes of mineral commodities on the United Kingdom's balance of payments position in relation to the EC and the world. The figures, in thousand dollars, are for 1990 which was the latest year that data were available. *(See 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 1991, direct employment in the mineral industry, including quarrying, was about 120,000 workers. *(See table 5.)*

## 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, operated by 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. The main consuming sector for secondary aluminum ingot is the automotive industry.

Cookson Aluminium PLC was reportedly proceeding with a $5.6 million investment in a new secondary aluminum smelter at its Repton site near Derby. The new smelter will replace the original plant, which has been torn down. The smelter was scheduled to be operational by late 1992 with a design capacity reported to be 30,000 mt/a of secondary ingot.

The company had estimated the new facility would reduce its production costs by one-third and meet the new United Kingdom environmental regulations. The smelter will have a flux-free process and use electric furnaces to produce a salt-free dross. This eliminates the problem of disposing of salt-containing residues in landfills.

Deeside Aluminium Ltd. reported that its $5.6 million expansion project to increase production from the existing 30,000 mt/a to 45,000 mt/a was nearing completion and was expected to be on-stream in early 1992. Deeside produces billet from a mixture of about 80% aluminium scrap and 20% primary aluminum.

The project included an additional direct-chilled casting system, an Inductotherm 6-ton capacity melting furnace, and a Gautschi tilting melting/holding furnace with a 22-ton capacity. Deeside anticipated that the new plant would enable it to broaden product and alloy ranges.

*Copper.*—Anglesey Mining PLC was reportedly continuing with the development of its polymetallic mine on Parys Mountain at Anglesey, North Wales. The company reported that a feasibility study by Kilborn Engineering of Vancouver, Canada, had confirmed the viability of the project. A mine development plan to produce 1,000 mt/d

has been prepared for the shaft development area, which was reported to contain about 2.3 Mmt of the estimated 6 Mmt reserves.

The ore in this area was reported to grade 1.43% copper, 3.43% lead, 6.72% zinc, 78 g/mt silver, and 0.66 g/mt gold and was expected to provide material for the first 7 years of mining. Separate copper, lead, and zinc concentrates would be produced by the proposed dense-media processing plant. The mine development plan scheduled full production 1 year after Anglesey's parent company, Imperial Metals Corp., completed funding arrangements.

*Gold.*—Interest in gold was reflected in the ongoing activities in gold exploration and development in the United Kingdom. Northern Ireland, Scotland, and Wales continued as the three main areas of concentration by companies.

Ennex International PLC was continuing exploration and development efforts on its Cononish project near Tyndrum, about 96 km north of Glasgow, Scotland. The company was continuing a drilling program to locate additional ore zones at depth and to the west of the project. The company was seeking to expand minable reserves to a minimum of 7 years mine life from the current estimated 4 years.

Ennex has filed a planning application that specified an underground mine, supported by surface facilities, and producing about 500 mt/d using both shrinkage and blasthole mining methods. Initial access would be by a 1,000-m adit. Gold would be recovered both in concentrate and doré. Capital cost was estimated to be $20 million with a construction time of 1 year after approval of the planning application.

In other gold-related activities, Andaman Resources PLC was continuing with its exploration program covering 530 square kilometers in the Highlands of Scotland. Exploration emphasis was mainly on alluvial gold localities.

*Iron and Steel.*—Production of iron ore was limited to Peter Bennie Ltd.'s mine in Alberton, Oxfordshire, and a small amount of hematite ore mined by Egremont Mining Co. at the Florence Mine in Cumbria. Primary steel production was based almost entirely on imported iron ore.

British Steel PLC's (BS) integrated steelworks were producing about 20% less than planned levels. BS reported this was due to weakening steel demand and stiff competition in international markets where a sizable percentage of its products are sold. The Central Statistics Office reported that steel consumption in the United Kingdom fell by 13.4% to 12.2 Mmt of finished products. One factor contributing to the drop in consumption was an estimated 6% decline in construction activity.

BS announced that it was intending to cut 810 jobs from the 7,000 work force at the Scunthorpe Works and 360 jobs from the 6,400 work force at the Teesside Works by March 1992. The company had previously announced the closure of the Ravenscraig hot strip mill in March 1991.

In late 1991, BS formally requested the EC Commission to investigate the proposed acquisition of a 20% stake in the state-controlled steel company, Usinor Sacilor of France, by the Credit Lyonnais bank, which is also controlled by the Government of France. BS expressed concerns that the proposed acquisition would create an indirect French Government subsidy to its steel industry and impact competition. The Commission was expected to investigate the proposed acquisition and issue a decision in the near future.

*Tin.*—The continued low price for tin in the world market, the lowest in 35 years, has caused rationalization in the industry. Carnon Consolidated Ltd.'s Wheal Jane Mine, near Truro, was shut down in early 1991. The pumps were turned off, and the mine was being allowed to flood. The mill at Wheal Jane was continuing operations to treat ore from Carnon's South Crofty Mine near Camborne. The South Crofty Mine was the last tin mine operating in the United Kingdom. Geevor PLC's mine near Land's End ceased operation in 1990.

Capper Pass Ltd.'s tin smelter at North Ferriby, Humberside, closed in early 1991. Capper Pass had established itself in the market by producing high-grade tin from low-grade material. The company also processed complex residues. Although Capper Pass was primarily a tin smelter, several other metals were produced, including antimony, bismuth, cadmium, copper, indium, gold, and silver. The closure leaves Billiton's smelter in the Netherlands as the only plant in Europe capable of treating low-grade tin concentrates.

BS announced it was constructing a new electrolytic tinning line in its plant at Trostre, South Wales. The line would be capable of coating strip up to 1,200 mm wide and up to 0.36 mm in thickness. Capacity of the new line was expected to be about 120,000 mt/a. BS is the second largest EC producer of tinplate after Sollac, a subsidiary of Usinor Sacilor of France.

## Industrial Minerals

*Aggregates.*—The United Kingdom, with production of about 22 Mmt/a, is the second largest marine aggregate producer in the world after Japan. The two countries collectively produce from 100 Mmt/a to 120 Mmt/a of marine aggregate which represents approximately 85% of global output. The United Kingdom aggregates are derived from six main areas—Humber, east coast, Thames estuary, south coast, Bristol Channel, and Liverpool Bay. Production is derived almost entirely from six companies operating a total of 50 dredges. Marine aggregates play a major role in the supply of material to southern England where there is a lack of crushed aggregate.

Bardon Group PLC and Evered PLC merged to form a new company, Evered Bardon PLC. The merger resulted in a new, enlarged quarrying operation and placed the new company as one of the largest aggregate producers in the United Kingdom. Barton, a United Kingdom-based company, has operations in the United States, which include five quarries in the Massachusetts area.

Pioneer Aggregates (U.K.) Ltd. commissioned a new aggregate and asphalt processing plant at its Durnford

Quarry near Bristol. Limestone production was increased from 350,000 mt/a to 1 Mmt/a. The asphalt plant will process up to 200 mt/h of material.

*Cement.*—Castle Cement Ltd. was continuing with its project to expand capacity at its Padeswood plant in North Wales to 1.5 Mmt/a from 500,000 mt/a. The capacity increase was scheduled to come on-line in 1994.

Castle was also constructing a cement terminal at West Thurrock on the Thames River. The cement terminal will be the largest of its kind in Europe with a design capability to handle vessels of up to 30,000 dwt and will have a total storage capacity of 40,000 tons. Throughput capacity would be 500,000 mt/a with the potential to double this capacity.

*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). Watts Blake Bearne & Co. PLC (WBB) is the largest producer of ball clay. English China Clays PLC (ECC) is the largest producer of kaolin in the United Kingdom and one of the major producers worldwide.

All mining of ball clay is carried out in Dorset and Devon Counties in the southwest area of the United Kingdom. WBB Devon Clays Ltd. is responsible for the ball clay operations of WBB. The division operates seven open pit mines and three underground mines that have a total combined output of 450,000 mt/a of crude ball clay.

ECC Ball Clays Ltd. is responsible for the ball clay operations of ECC. The division operates five quarries, three underground mines, and two open pit mines with a combined output of 450,000 mt/a of crude ball clay. Seventy percent of the output is exported.

ECC was engaged in a major restructuring exercise in 1991 and announced it was intending to focus its efforts on industrial minerals and construction materials with the main emphasis on ball clay, kaolin, and aggregates. ECC operates 20 open pit kaolin mines, 18 of which are in Cornwall.

ECC International Ltd. operates three underground mines and five quarries in Dorset; four quarries and one underground mine in south Devon; and three open pit mines in north Devon. Total production is about 350,000 mt/a.

Laporte PLC was reported to be investing $32 million in the construction of a clay processing plant at Widnes, Cheshire. The plant, with a capacity of 200,000 mt/a, was scheduled for completion in late 1992 and would produce an activated earth natural material and absorbent granules. The clay feedstock would come from Laporte's quarries in the United Kingdom and Spain.

*Fluorspar.*—Fluorspar mining is concentrated in Derbyshire and the major producer is Laporte Minerals PLC. Laporte operates two underground mines and one open pit mine. The new Milldam Mine came on-stream in late 1991. The company was expecting the mine to produce 85,000 mt/a of ore grading 45% to 50% $CaF_2$. The ore is processed at Laporte's Cavendish Mill near Sheffield.

Other producers include Deepwood Mining Co. Ltd. and Weardale Fluospar Ltd. One producer, Minworth Group PLC, was placed in receivership in early 1991.

*Gypsum.*—British Gypsum, the subsidiary of BPB Industries PLC, is the major producer of gypsum in the United Kingdom. The company has mines in Cumbria, Leicestershire, Nottinghampshire, Staffordshire, and Sussex that produce about 3 Mmt/a of gypsum. With few exceptions, all of this material goes to supply the domestic market.

British Gypsum was nearly finished with its $187 million capital investment program. This included a new mine and a 600,000-mt/a plant at Barrow upon Soar and refurbishing plants at Robertsbridge and Kirkby Thore.

*Potash.*—Cleveland Potash Ltd. (CPL), operates the Boulby Mine in Yorkshire and was the only potash producer in the United Kingdom. The company also mines rock salt, as a coproduct, from an underlying seam in the Boulby Mine. CPL was continuing with construction of a hot-leach filtration plant, a new compactor, and additional screening facilities.

CPL was expecting that these projects, estimated to cost $7 million, would increase granular production by 30% and would improve product quality. This was the first stage of a $10 million capital investment program to improve recovery at the Boulby Mine.

*Salt.*—Imperial Chemical Industries PLC (ICI) is the largest salt producer in the United Kingdom. ICI operates the Winsford Mine in Cheshire, which is one of the largest underground mines in the United Kingdom. Rock salt is mined at the Winsford Mine, which has a capacity to produce 2 Mmt/a. ICI also produces vacuum salt at its Weston Point facility, which is the world's largest single-stream vacuum evaporation operation with a capacity of 1.1 Mmt/a. Brine salt is produced at the Holford, Preesal, and Saltholme facilities for the internal manufacture of chorine, caustic soda, and synthetic soda ash.

British Salt Ltd. is the major white salt producer. The company produces salt, from solution mining, at the Warmington brine field. This is processed at its Middlewich plant, which has a capacity of 825,000 mt/a of undried vacuum and pure, dried vacuum salt.

Irish Salt Mining & Exploration Co. Ltd. produces rock salt from an underground mine at Kilroot, in Northern Ireland, which has a capacity of 300,000 mt/a. The company is an important producer of deicing salt. Irish Salt awarded a contract in 1990 to enlarge the shaft diameter at the mine from 2.0 m to 4.3 m to increase production efficiency. The project, estimated to cost $475,000, was completed in early 1991 by Carnon Contracting, a division of Carnon Consolidated Ltd.

*Sand and Gravel.*—TMC Pioneer Aggregates Ltd., a joint-venture operation between Pioneer Aggregates (U.K.) Ltd. and TMC, was developing what was expected to be the largest sand and gravel operation in the United Kingdom. Production was planned to be between 1 Mmt/a and 2 Mmt/a. The quarry is at Boreham, Essex, and covers 485 ha with estimated reserves of 34 Mmt. The company was running a pilot plant to determine the best operating plan for efficient recovery. Pioneer Aggregates (U.K.) Ltd. owns 26 quarries in the United Kingdom.

*Slate.*—Most of the slate mining activities in the United Kingdom is in north Wales. There are also some mining operations in Cornwall and the Lake District. Penrhyn Quarries Ltd. is near Bangor, north Wales, and is the largest operation, producing about 25,000 mt/a of roof slate. The quarry, 2,415 m by 805 m excavated down to sea level, was considered to be the world's largest quarry. Penrhyn produces more than one-half of the total United Kingdom production of roofing slate. The company exports about two-thirds of its production.

*Talc.*—Alexander Sandison & Sons Ltd. continued to be the only producer of talc in the United Kingdom. Sandison produces from 12,000 to 14,000 mt/a of low-grade talc, containing up to 50% magnesium oxide, from an open pit operation at Crossgoe in the Shetland Islands. The ore is processed by Fordamin Co. Ltd. at its plants at Yate and Stockton. The ore is ground to 300 mesh and is used in fertilizers, ceramics, and general fillers.

Shetlands Talc Ltd., a joint venture between Anglo European Minerals Ltd. and Dalraida Mineral Ventures Ltd., was granted planning permission to exploit a talc-magnesite deposit at Cunningsburgh, Shetland Islands. The company reported that drilling had indicated an estimated 1.2 Mmt of reserves of 95% talc content material with a brightness of 80% to 85%. The company was intending to start flotation testing of bulk samples in 1992. An output of 50,000 mt/a was expected when the mine becomes fully operational.

## Mineral Fuels

*Coal.*—At the end of 1991, there were 65 underground mines operated by BC. This represented a reduction of three from those of the previous year. Privately owned licensed underground mines numbered 156. Also, there were 59 open pit mines operated by 20 different contractors. Twelve open pit mines ceased production, and 13 production contracts for new open pit mines were negotiated.

Since the coal strike of 1984-85, BC has made remarkable progress in improving its competitiveness. Operating costs have been reduced by one-third, and output has risen to more than 5 mt/worker shift. The total work force has been reduced to about 74,000 from almost 300,000 in 1980. Overall productivity in BC's mines was 13% higher in 1991 compared to that of 1990. This compares with increases in the 2 previous years of 4.6% and 9.1%, respectively. Although productivity has shown an impressive rise, total production has been declining since 1983.

BC negotiated a 3-year contract to supply coal to the newly formed electric utilities, National Power and PowerGen. For the first 2 years BC was committed to supply at least 70 Mmt/a of coal and for the third year would supply not less than 65 Mmt/a. The price structure was based on Net Calorific Value, and in real terms, was not anticipated to contain any price increases for the next 3 years. The electricity industry accounts for about 80% of BC's total sales. Coal contributes about 31% toward primary energy consumption.

BC continued with its emphasis on clean coal technology research. The company was continuing research on pressurized fluidized bed combustion techniques. Other clean coal research involved a $315 million joint-venture project between BC, PowerGen, and an engineering company, GEC Alsthom Ltd., which involves combining the fluidized bed technique with a new technique called a "topping cycle."

In the topping cycle, the coal is partly converted into a gas that is fed directly to a gas turbine generator to produce power. The char that remains is fed to a fluidized bed combustor, and heat from the combustor is passed to a steam cycle to drive a turbine to produce further power. The exhaust from the gas turbine may also be used in the hot gas stream that creates the fluidized bed.

The companies believe they can achieve thermal efficiencies of more than 52% using the combined technologies. This would be a 20% efficiency improvement over conventional coal-fired power stations.

All the mines of the Shelby Complex are now in full production. The five separate mines are North Selby, Riccall, Stillingfleet, Whitemoor, and Wistow. Each of the five mines, with total production targeted at more than 11 Mmt, sends its output through two spine tunnels to a drift outside the extraction area. This was the largest such project in Europe. The Wistow Colliery was the first colliery in Europe to mine more than 100,000 tons of coal in a workweek. The record output of 101,203 tons was achieved in 5 working days.

British Coal Opencast's (BCO) new Stobswood Mine in Norththumberland became operational in late 1991. Crouch Mining Ltd. is the contractor operating the open pit mine for BCO. The Stobswood Mine is a replacement for BCO's nearby Butterwell Mine, which was expected to cease operations at yearend 1991.

The mine was expected to produce about 12 Mmt/a over a 15-year period. The coal will be mined from about 28 seams that vary in thickness from 0.13 m to 1.29 m. The overburden to coal ratio is 20:1.

*Natural Gas.*—British Gas PLC (BG) avoided an investigation into its marketing policies by the Government's Monopolies and Mergers Commission by reaching an agreement with the Office of Fair Trading (OFT). BG agreed to reduce its current 90% to 95% share of the contract market to 40% by 1995. This agreement with OFT was intended to bring more

competition into the commercial and industrial gas markets.

BG reported it had accepted the Government's Office of Gas Supply (Ofgas) proposals on a formula that will control gas prices for about 17 million customers for 5 years effective April 1, 1992. The formula covers gas supplies to United Kingdom customers using less than 2.5 billion Btu/a, which would include residential and most commercial customers.

Conoco (U.K.) Ltd. halted production from the Viking A gas production complex in the southern part of the United Kingdom North Sea. Conoco reported the Viking A decision involved several considerations, including safety, age of facilities, and current production volume. Gas production will continue from the Viking B complex, which has five unstaffed satellite platforms.

***Petroleum.***—There were 186 offshore exploration and appraisal wells drilled in 1991. Although this was 17% less than those of the previous year, it was still considered to be a high level of activity.

Total production was slightly below that of 1990. However, there was a trend of improvement with production in the second half of the year significantly higher than that in the first half. Production levels continue to be affected by safety work in the North Sea.

The United Kingdom has an onshore producing oilfield. The Wytch Farm Field in Dorset contains estimated reserves of 400 Mbbl. Exploration and drilling by BP confirmed that the field extends offshore under Poole Bay. The extent and amount of additional reserves had not been reported at yearend.

### Reserves

Reserves of major minerals in the United Kingdom are listed in table 6. *(See table 6.)*

## INFRASTRUCTURE

Rail and trucking transportation is well developed and excellent. The state-owned British Railways (BR) operates a 16,629-km, 1.435-m standard-gauge system with 4,205 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-m-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, referred to as the "Chunnel," is being constructed underneath the English Channel and 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 three tunnels: one running north, one running south, and a service tunnel with connections between the two main tunnels. The tunnel system, which has 38 km 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 $15 billion. Completion of the two railway tunnels was estimated for June 1993, at which time service between Folkestone, United Kingdom, and Calais, France, will begin. The Channel Tunnel linking the two countries will be a vital component of the Single Market 1992 when the EC 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 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.

Redevelopment of the Piper Alpha and Cormorant A areas was expected to be completed by 1992. Additional safety work in the North Sea is expected to continue.

[1]Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of £1.00=US$1.87, the average rate during 1991.

### OTHER SOURCES OF INFORMATION

**Agencies**

British Geologic Survey,
Keyworth, Nottingham NG125GG
United Kingdom

Central Statistics Office
Great George Street
London, SW1P 3AQ
United Kingdom

Department of Economic Development
(Northern Ireland)
Belfast BT1 3AJ
Northern Ireland
United Kingdom

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
United Kingdom

**Publications**

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Central Statistics Office, London:
Annual Abstracts of Statistics, annual.

Monthly Digest of Statistics, monthly.

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Digest of United Kingdom Energy Statistics, quarterly.

Energy Trends, monthly.

Department of Trade and Industry, London:
Overseas Trade Statistics of the United Kingdom, annual.

World Bureau of Metal Statistics, London:
World Metal Statistics, monthly.
Annual Reports of various companies.

TABLE 1

## UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Alumina from imported bauxite | | 109,800 | 114,600 | 116,200 | e115,000 | 110,000 |
| Metal: | | | | | | |
| Primary | | 294,382 | 300,166 | 297,313 | 293,678 | 290,000 |
| Secondary | | 116,744 | 105,764 | 109,695 | 120,854 | 120,000 |
| Cadmium: Metal including secondary | | 498 | 399 | 395 | 400 | 300 |
| Copper: | | | | | | |
| Ore and concentrate, Cu content | | 750 | 732 | 508 | e945 | 600 |
| Metal, refined: | | | | | | |
| Primary | | 54,023 | e49,258 | 48,643 | 46,991 | 48,000 |
| Secondary | | 68,264 | e74,700 | e70,390 | 74,643 | 70,000 |
| Total | | 122,287 | 123,958 | 119,033 | 121,634 | 118,000 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | | 262,700 | 224,100 | 34,297 | e30,000 | 25,000 |
| Fe content | | 58,000 | 49,302 | e8,000 | e6,000 | 5,000 |
| Metal: | | | | | | |
| Pig iron | thousand tons | 12,017 | 13,056 | 12,638 | 12,277 | 12,000 |
| Ferroalloys, blast-furnace: | | | | | | |
| Ferromanganese | do. | 92 | 107 | 143 | e145 | 140 |
| Steel, crude | do. | 17,414 | 18,950 | 18,813 | 17,908 | 216,511 |
| Rolled products | do. | 18,606 | e20,909 | 15,165 | 14,502 | 12,000 |
| Lead: | | | | | | |
| Mine output, Pb content | | 691 | 1,185 | r2,200 | r1,400 | 1,200 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Bullion from imported concentrate | | 35,200 | 34,901 | 34,523 | 42,728 | 40,000 |
| Secondary (refined)[3] | | 201,100 | e201,600 | e200,000 | r113,172 | 110,000 |
| Total | | 236,300 | e236,501 | e234,523 | r155,900 | 150,000 |
| Refined: | | | | | | |
| Primary[4] | | 145,823 | 172,213 | 156,983 | 156,483 | 150,000 |
| Secondary[3] | | 201,131 | 201,632 | e193,500 | 177,801 | 170,000 |
| Total | | 346,954 | 373,845 | e350,483 | r334,284 | 320,000 |
| Magnesium metal, secondary including alloys[e] | | 1,000 | 1,200 | 1,000 | 900 | 800 |
| Nickel metal, refined[e 5] | | 229,500 | 27,700 | 26,100 | 26,800 | 26,000 |
| Silver: Mine output, Ag content | kilograms | 2,031 | 2,113 | 1,689 | e1,500 | 1,000 |
| Tin: | | | | | | |
| Mine output, Sn content | | 4,003 | 3,454 | 3,846 | e4,200 | 4,000 |
| Metal: | | | | | | |
| Primary | | 12,135 | 9,014 | 3,584 | e6,100 | 5,000 |
| Secondary (refined) | | 4,871 | 7,757 | 7,184 | e5,900 | 4,000 |
| Zinc: | | | | | | |
| Ore and concentrate, Zn content | | 6,522 | 5,502 | 5,771 | 6,594 | 6,000 |
| Metal, smelter | | 81,360 | 76,028 | 79,773 | 93,309 | 90,000 |

See footnotes at end of table.

TABLE 1—Contintued

## UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS | | | | | | |
| Barite[6] | | 77,000 | 76,253 | 70,026 | r e70,000 | 65,000 |
| Bromine | | 26,184 | 27,128 | 29,907 | e28,000 | 26,000 |
| Cement, hydraulic | thousand tons | 14,311 | 16,500 | e15,000 | e14,000 | 12,000 |
| Clays: | | | | | | |
| Fire clay[e] | do. | 900 | 1,060 | 1,000 | 1,000 | 1,000 |
| Fuller's earth[e 7] | do. | 213 | 213 | 210 | 2204 | 200 |
| Kaolin (china clay) | do. | 3,059 | 3,278 | e3,140 | 3,037 | 3,000 |
| Ball clay and pottery clay[e] | do. | 2679 | 716 | 780 | 820 | 800 |
| Other, including shale | do. | 18,262 | 18,899 | e18,500 | e17,000 | 17,000 |
| Diatomite[e] | | 350 | 320 | 270 | r240 | 200 |
| Feldspar (china stone) | | 5,692 | 6,267 | 6,470 | e6,500 | 6,000 |
| Fluorspar, all grades[8] | | 120,400 | 103,800 | 122,057 | e120,000 | 75,000 |
| Gypsum and anhydrite[e] | thousand tons | 3,500 | 3,700 | 4,000 | 4,000 | 4,000 |
| Lime: Quicklime and hydrated[e] | do. | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 |
| Nitrogen: N content of ammonia | do. | 1,415 | 1,105 | 1,037 | 1,148 | 1,150 |
| Potash, $K_2O$ equivalent | | r428,200 | r459,900 | r462,000 | r488,000 | 450,000 |
| Salt: | | | | | | |
| Rock | thousand tons | 1,855 | 877 | 594 | e600 | 600 |
| From brine | do. | 1,554 | 1,426 | e1,500 | r e1,200 | 1,200 |
| In brine, sold or used as such | do. | 3,672 | 3,827 | e3,600 | e3,600 | 3,600 |
| Sand and gravel: | | | | | | |
| Common sand and gravel | do. | 117,827 | 136,404 | e135,000 | e122,000 | 120,000 |
| Industrial sand[e] | do. | 23,265 | 4,300 | 4,500 | 4,300 | 4,000 |
| Sodium compounds, n.e.s.: Carbonate, synthetic[e] | do. | 2765 | 1,000 | 1,000 | 1,000 | 1,000 |
| Stone: | | | | | | |
| Crushed: | | | | | | |
| Calcite | do. | e10 | 23 | 17 | e19 | 18 |
| Chalk | do. | 13,444 | 14,516 | e15,000 | e12,500 | 12,000 |
| Chert and flint[e] | do. | 15 | 11 | 12 | 10 | 10 |
| Dolomite[e] | do. | 217,000 | 19,900 | 21,000 | 20,500 | 20,000 |
| Igneous rock[e] | do. | 239,529 | 51,959 | 55,000 | 53,500 | 52,000 |
| Limestone[e] | do. | 2110,641 | 105,816 | 112,000 | 109,000 | 110,000 |
| Sandstone including ganister | do. | 13,824 | 18,901 | 19,593 | e19,000 | 18,000 |
| Slate including fill | do. | 322 | e708 | 590 | e600 | 500 |
| Total | do. | 194,785 | 211,834 | e223,212 | e215,129 | 212,528 |
| Dimension:[e] | | | | | | |
| Igneous | do. | 100 | 128 | 100 | 100 | 100 |
| Limestone | do. | 2244 | 233 | 200 | 200 | 200 |
| Sandstone | do. | 2142 | 183 | 200 | 200 | 200 |
| Slate | do. | 35 | 40 | 50 | 50 | 50 |
| Strontium minerals | | 22,655 | 25,553 | 20,885 | r24,734 | 25,000 |

See footnotes at end of table.

TABLE 1—Continued

## UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1987 | 1988 | 1989 | 1990 | 1991e |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Sulfur, byproduct: | | | | | | |
| Of metallurgy[e] | | [2]51,398 | 55,000 | 52,000 | 50,000 | 45,000 |
| Of petroleum refining | | 119,000 | 129,000 | e130,000 | e125,000 | 120,000 |
| Total[e] | | [2]170,398 | 184,000 | 182,000 | 175,000 | 165,000 |
| Talc, soapstone, pyrophyllite | | 12,529 | 14,182 | 15,413 | 14,781 | 12,000 |
| Titania[e 9] | | [2]225,600 | 230,000 | 225,000 | 225,000 | 200,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal: | | | | | | |
| Anthracite | thousand tons | 2,091 | 1,827 | r1,800 | e1,900 | 1,600 |
| Bituminous including slurries, fines, etc. | do. | 102,344 | 101,964 | r101,135 | r94,397 | 96,127 |
| Lignite | do. | 6 | e18 | r16 | r18 | 16 |
| Total | do. | 104,441 | e103,809 | 102,951 | r96,315 | 97,743 |
| Coke:[e] | | | | | | |
| Metallurgical | | [2]7,585 | 7,610 | 7,572 | r7,500 | 7,000 |
| Breeze, all types | | [2]273 | 277 | 200 | 200 | 200 |
| Fuel briquets, all grades[e] | | [2]1,637 | 1,464 | 1,500 | 1,500 | 1,200 |
| Gas, natural: | | | | | | |
| Marketable[10] | million cubic meters | 47,623 | 45,729 | 44,711 | r50,600 | 51,000 |
| Marketed[11] | do. | 43,690 | 41,761 | 41,228 | r45,771 | 46,000 |
| Natural gas liquids[12] | thousand 42-gallon barrels | 66,039 | 58,035 | r51,086 | r41,830 | 51,040 |
| Petroleum: | | | | | | |
| Crude[13] | do. | 878,099 | 820,515 | 655,530 | r687,000 | 684,750 |
| Refinery products: | | | | | | |
| Liquefied petroleum gases | do. | 17,110 | 19,129 | r19,221 | r18,792 | 19,000 |
| Naphtha including white spirit | do. | 18,123 | 16,728 | r15,359 | r16,209 | [2]21,376 |
| Gasoline | do. | 209,780 | 224,477 | r231,515 | r227,154 | [2]236,241 |
| Jet fuel | do. | 48,504 | 53,800 | e56,800 | 60,328 | [2]56,296 |
| Kerosene | do. | 17,592 | 17,740 | r18,480 | 17,895 | [2]18,957 |
| Distillate fuel oil | do. | 159,828 | 178,480 | r173,706 | r174,594 | [2]194,385 |
| Residual fuel oil | do. | 85,228 | 83,217 | r82,477 | r87,359 | [2]87,945 |
| Lubricants | do. | 6,202 | 6,790 | e7,350 | r6,832 | [2]6,811 |
| Bitumen | do. | 12,459 | 13,908 | r14,501 | r14,871 | [2]13,950 |
| Petroleum coke[e] | do. | [2]2,844 | 2,976 | 3,100 | 3,225 | 3,000 |
| Petroleum wax[e] | do. | [2]449 | 496 | 425 | 315 | 300 |
| Unspecified | do. | 2,100 | 3,563 | e3,570 | e3,985 | 3,600 |
| Refinery fuel and losses | do. | 44,889 | 47,626 | r36,825 | r42,600 | 41,400 |
| Total[e] | do. | [2]625,108 | 668,930 | r663,329 | 674,159 | 703,261 |

[e]Estimated. [r]Revised.

[1]Includes data available through May 1992.

[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]Sales.

[10]Methane, excluding gas flared or reinjected.

[11]Marketable methane, excluding that used for drilling, production, and pumping operations.

[12]Includes ethane, propane, butane, and condensates.

[13]Excludes gases and condensates.

TABLE 2

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 229 | 145 | NA | NA. |
| Alkaline-earth metals | 130 | 50 | — | Ireland 20; Switzerland 19; New Zealand 3. |
| Aluminum: | | | | |
| Ore and concentrate | 14,983 | 1,402 | — | France 1,341; Netherlands 23; Finland 22. |
| Oxides and hydroxides | 55,106 | 53,840 | 3,408 | France 6,340; Sweden 4,753; Netherlands 3,740. |
| Ash and residue containing aluminum | 843 | 793 | — | West Germany 300; Italy 249; France 163. |
| Metal including alloys: | | | | |
| Scrap | 99,334 | 94,452 | 707 | West Germany 25,758; Italy 15,310; France 11,405. |
| Unwrought | 169,195 | 156,600 | 705 | West Germany 68,412; Belgium-Luxembourg 13,224; France 12,463. |
| Semimanufactures | 170,174 | 185,581 | 8,580 | West Germany 35,221; Italy 26,496; Ireland 22,757. |
| Antimony: Metal including alloys, all forms | 167 | 115 | NA | Belgium-Luxembourg 16; Australia 15; unspecified 39. |
| Arsenic: Metal including alloys, all forms | 30 | 92 | 2 | France 24; Spain 21; Finland 20. |
| Beryllium: | | | | |
| Oxides and hydroxides | 314 | 2 | 2 | |
| Metal including alloys, all forms | 2 | 11 | 5 | Cyprus 1; France 1. |
| Bismuth: Metal including alloys, all forms | 413 | 598 | 72 | France 163; Italy 98; West Germany 70. |
| Cadmium: Metal including alloys, all forms | 570 | 621 | 16 | Republic of Korea 212; France 175; Japan 98. |
| Chromium: | | | | |
| Ore and concentrate | 64 | 36 | (2) | Nigeria 20; Norway 16. |
| Metal including alloys, all forms | 3,409 | 3,301 | 1,005 | West Germany 482; Ireland 363. |
| Cobalt: | | | | |
| Ore and concentrate | (2) | 22 | — | All to Ireland. |
| Oxides and hydroxides | 1,200 | 1,413 | 86 | Belgium-Luxembourg 415; West Germany 152; France 139. |
| Ash and residue containing cobalt | 17 | 9 | — | All to West Germany. |
| Metal including alloys, all forms | 1,089 | 1,385 | 83 | France 305; Netherlands 192; Italy 168. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 6 | 3 | — | Mainly to West Germany. |
| Metal including alloys, all forms: | | | | |
| Columbium (niobium)[3] | 1 | 3 | — | Brazil 1; Cayman Islands 1. |
| Tantalum | 48 | 38 | 6 | West Germany 27; Malaysia 3. |
| Copper: | | | | |
| Ore and concentrate | 1,378 | 5,138 | — | Canada 4,826; West Germany 154; France 64. |
| Matte and speiss including cement copper value, thousands | $3 | $7 | $1 | Ireland $4; West Germany $1. |
| Oxides and hydroxides | 813 | 761 | 104 | Belgium-Luxembourg 235; France 113. |
| Sulfate | 1,094 | 870 | 17 | Ireland 234; France 212; Netherlands 73. |
| Ash and residue containing copper | 2,714 | 2,942 | — | Belgium-Luxembourg 1,609; Spain 944; India 217. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Copper—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 127,878 | 111,208 | 90 | West Germany 37,702; Belgium-Luxembourg 26,375; Italy 24,909. |
| Unwrought | 30,450 | 32,651 | 878 | West Germany 9,251; Italy 7,452; France 5,156. |
| Semimanufactures | 112,357 | 121,018 | 4,998 | West Germany 15,943; Ireland 14,766; France 11,578. |
| Germanium: | | | | |
| Oxides and hydroxides | 6 | 4 | — | Netherlands 3. Hong Kong 1. |
| Metal including alloys, all forms | 8 | 6 | 1 | Hong Kong 4; China 1. |
| Gold: | | | | |
| Waste and sweepings value, thousands | $10,563 | $11,069 | NA | NA. |
| Metal including alloys, unwrought and partly wrought kilograms | 924,866 | 828,425 | 13 | Singapore 11,182; Sweden 9,963; Italy 6,558. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 1,528 | 2,442 | 60 | West Germany 1,127; Netherlands 382; Cuba 228. |
| Pyrite, roasted | (2) | 2 | — | Ireland 1. |
| Metal: | | | | |
| Scrap thousand tons | 3,250 | 3,198 | 1 | Spain 1,484; India 397; Malaysia 183. |
| Pig iron, cast iron, related materials | 20,470 | 79,801 | 314 | France 18,314; Belgium-Luxembourg 16,200; West Germany 8,453. |
| Ferroalloys: | | | | |
| Ferrochromium | 850 | 776 | — | Pakistan 186; Mexico 165; France 131. |
| Ferromanganese | 38,237 | 41,389 | 1,502 | Belgium-Luxembourg 19,846; Netherlands 8,438; France 3,056. |
| Ferromolybdenum | 6,853 | 5,282 | 107 | West Germany 2,136; Netherlands 705; Spain 433. |
| Ferronickel | 76 | 5 | — | All to Belgium-Luxembourg. |
| Ferrosilicochromium | 7 | 77 | 34 | France 19; Ireland 12. |
| Ferrosilicomanganese | 673 | 181 | — | Egypt 111; France 46; Finland 22. |
| Ferrosilicon | 2,072 | 1,670 | 13 | Ireland 295; West Germany 264; Portugal 185. |
| Silicon metal | 772 | 894 | 270 | West Germany 219; Belgium-Luxembourg 128. |
| Unspecified | 18,051 | 20,553 | 1,671 | West Germany 3,685; France 3,235; Taiwan 1,793. |
| Steel, primary forms thousand tons | 1,486 | 1,310 | 293 | Greece 330; West Germany 248; Italy 191. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated do. | 1,293 | 1,424 | 88 | Spain 242; West Germany 209; Italy 121. |
| Clad, plated, coated | 746,944 | 763,022 | 15,050 | France 84,589; West Germany 81,132; Spain 58,234. |
| Of alloy steel | 229,907 | 208,396 | 17,880 | West Germany 31,830; Italy 28,597; France 20,891. |
| Bars, rods, angles, shapes, sections thousand tons | 2,053 | 2,582 | 304 | West Germany 306; Belgium-Luxembourg 234. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Metal—Continued: | | | | |
| Rails and accessories | 157,196 | 149,825 | 6,479 | Iran 22,356; India 21,215; Portugal 10,847. |
| Wire | 142,017 | 142,199 | 19,123 | France 15,817; West Germany 11,737; Ireland 10,449. |
| Tubes, pipes, fittings | 734,028 | 579,405 | 22,663 | Netherlands 64,096; West Germany 54,125; Sweden 39,760. |
| Lead: | | | | |
| Ore and concentrate | 5,295 | 1,424 | 8 | France 1,364; West Germany 23; Austria 20. |
| Oxides | 6,095 | 7,616 | 2 | West Germany 1,800; France 1,618; Sweden 833. |
| Ash and residue containing lead | 9,879 | 9,698 | — | Belgium-Luxembourg 9,425; Netherlands 122; |
| Metal including alloys: | | | | |
| Scrap | 29,320 | 20,663 | — | Ireland 7,917; West Germany 3,679; France 2,175. |
| Unwrought | 109,397 | 118,005 | 336 | West Germany 50,653; France 17,002; Austria 8,033. |
| Semimanufactures | 10,318 | 8,810 | 33 | Belgium-Luxembourg 3,180; West Germany 1,811; France 644. |
| Lithium: Oxides and hydroxides | 221 | 275 | — | France 35; West Germany 29; Italy 23. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 158 | 177 | 3 | West Germany 75; Norway 73; Belgium-Luxembourg 23. |
| Unwrought | 1,553 | 663 | 234 | West Germany 77; Japan 70. |
| Semimanufactures | 715 | 646 | 20 | Ireland 237; Iran 74; France 61. |
| Manganese: | | | | |
| Ore and concentrate: Metallurgical-grade | 778 | 394 | — | Italy 230; Spain 80; Syria 51. |
| Oxides | 703 | 442 | (2) | Ireland 217; West Germany 40; Nigeria 36. |
| Metal including alloys, all forms | 2,520 | 1,697 | NA | Australia 635; Italy 383. |
| Mercury | 128 | 176 | 1 | Netherlands 80; Namibia 30; Brazil 20. |
| Molybdenum: | | | | |
| Ore and concentrate: | | | | |
| Roasted | 2,089 | 2,886 | — | Netherlands 1,762; Austria 322; Sweden 306. |
| Unroasted | 376 | 174 | — | Belgium-Luxembourg 139; France 27. |
| Oxides and hydroxides | 676 | 557 | — | Netherlands 317; Austria 140; Belgium-Luxembourg 47. |
| Ash and residue containing molybdenum | 23 | 96 | — | Netherlands 40; Taiwan 28; Belgium-Luxembourg 22. |
| Metal including alloys: | | | | |
| Scrap | 3 | 33 | — | West Germany 29; France 4. |
| Unwrought | 299 | 308 | 56 | West Germany 71; France 56. |
| Semimanufactures | 44 | 57 | 1 | West Germany 29; France 6; Italy 5. |
| Nickel: | | | | |
| Ore and concentrate | 127 | 96 | (2) | Spain 60; Japan 18; Hong Kong 10. |
| Matte and speiss | 4 | 255 | 21 | Sweden 76; Belgium 49; Netherlands 22. |
| Oxides and hydroxides | 655 | 66 | — | Australia 42; Indonesia 16; Netherlands 5. |
| Ash and residue containing nickel | 8,880 | 7,705 | 176 | Canada 5,394; India 917; Netherlands 418. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Nickel—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 4,772 | 5,070 | 1,088 | Sweden 1,507; West Germany 862. |
| Unwrought | | 14,500 | 18,126 | 934 | Belgium-Luxembourg 4,375; Sweden 3,517; West Germany 2,337. |
| Semimanufactures | | 13,898 | 12,817 | 453 | Japan 2,651; France 2,309; West Germany 1,948. |
| Platinum-group metals: | | | | | |
| Ore and concentrate | value, thousands | $284 | $423 | $45 | Switzerland $359; Japan $8. |
| Waste and sweepings | do. | $25,237 | $24,247 | $1,954 | Italy $21,652. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Platinum | kilograms | 34,388 | 45,347 | 5,495 | West Germany 14,515; Japan 7,763. |
| Palladium | do. | 30,086 | 30,371 | 10,057 | West Germany 9,410; Japan 3,019. |
| Rhodium | do. | 2,914 | 3,909 | 1,503 | West Germany 519; Italy 463. |
| Iridium | do. | 6,666 | 2,260 | 276 | Netherlands 488; Japan 474; Italy 419. |
| Rare-earth metals including alloys, all forms | | 100 | 84 | 7 | Ireland 38; Australia 20; West Germany 14. |
| Selenium, elemental | | 226 | 294 | 84 | Spain 59; West Germany 32. |
| Silicon, high-purity | | 31 | 81 | 1 | Ireland 51; West Germany 14; Denmark 6. |
| Silver: | | | | | |
| Ore and concentrate | value, thousands | $7 | $4 | — | All to Ireland. |
| Waste and sweepings | do. | $17,170 | $33,179 | $1,951 | Belgium-Luxembourg $12,563; Japan $6,282; France $3,566. |
| Metal including alloys, unwrought and partly wrought | | 1,602 | 2,848 | 1 | Switzerland 1,287; United Arab Emirates 797; West Germany 437. |
| Tellurium, elemental | | 27 | 21 | 12 | France 4; Spain 2. |
| Tin: | | | | | |
| Ore and concentrate | | 1,944 | 1,426 | — | Malaysia 1,183; Singapore 183; West Germany 31. |
| Oxides | | (2) | 841 | NA | NA. |
| Ash and residue containing tin | | 542 | 251 | — | West Germany 84; Belgium-Luxembourg 75; Netherlands 56. |
| Metal including alloys: | | | | | |
| Scrap | | 613 | 448 | (2) | West Germany 352; Italy 45; India 20. |
| Unwrought | | 6,648 | 6,768 | 80 | Netherlands 4,073; West Germany 746; Italy 304. |
| Semimanufactures | | 2,193 | 3,406 | 2 | Nigeria 2,198; Italy 509. |
| Titanium: | | | | | |
| Ore and concentrate | | 1 | 33 | — | Belgium-Luxembourg 22; Netherlands 10; Japan 1. |
| Oxides | | 36,360 | 26,714 | 9,032 | West Germany 2,739; Italy 2,272. |
| Metal including alloys: | | | | | |
| Scrap | | 2,823 | 1,058 | 362 | Italy 130; West Germany 129. |
| Unwrought | | 1,228 | 1,192 | 372 | West Germany 166; Italy 125. |
| Semimanufactures | | 1,769 | 2,445 | 187 | France 1,000; West Germany 374; Italy 131. |
| Tungsten: | | | | | |
| Ore and concentrate | | 57 | 24 | — | West Germany 20; Israel 2; Sweden 2. |
| Oxides and hydroxides | | 27 | 15 | — | Portugal 11; Spain 2; France 1. |
| Ash and residue containing tungsten | | (2) | 45 | 35 | Spain 10. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Tungsten—Continued: | | | | |
| Metal including alloys: | | | | |
| Scrap | 94 | 371 | 37 | West Germany 195; Sweden 65; Belgium-Luxembourg 46. |
| Unwrought | 3 | 227 | 19 | West Germany 60; Belgium-Luxembourg 43; Switzerland 25. |
| Semimanufactures | 211 | 279 | 19 | Netherlands 86; West Germany 78; France 22. |
| Uranium and thorium: | | | | |
| Ore and concentrate | 438 | 104 | 104 | |
| Metal including alloys, all forms: | | | | |
| Uranium value, thousands | $51,064 | $98,917 | $17,835 | NA. |
| Thorium | 9 | 17 | 12 | France 3; West Germany 1. |
| Vanadium: | | | | |
| Ores and concentrates | 90 | — | | |
| Oxides and hydroxides | 17 | 31 | — | Netherlands 22; Chile 7; Taiwan 2. |
| Ash and residue containing vanadium | 4 | 20 | — | All to Portugal. |
| Metal including alloys: | | | | |
| Scrap | 12 | 1 | — | All to Iran. |
| Semimanufactures | 32 | 22 | 21 | Norway 1. |
| Zinc: | | | | |
| Ore and concentrate | 13,363 | 21,927 | — | Netherlands 13,702; Australia 8,015; Spain 59. |
| Oxides | 5,306 | 6,141 | 50 | Sweden 2,607; Ireland 851; West Germany 663. |
| Blue powder | 2,991 | 221 | 30 | Denmark 306; Saudi Arabia 225; West Germany 224. |
| Matte | 896 | 1,200 | — | Norway 1,181; Belgium-Luxembourg 18. |
| Ash and residue containing zinc | 6,305 | 3,292 | — | Spain 1,181; France 666; Belgium-Luxembourg 604. |
| Metal including alloys: | | | | |
| Scrap | 30,256 | 25,636 | 235 | Taiwan 8,016; West Germany 7,732; India 1,613. |
| Unwrought | 16,339 | 19,085 | 456 | France 5,635; Portugal 2,485; Belgium-Luxembourg 2,256. |
| Semimanufactures | 6,019 | 4,569 | 79 | Belgium-Luxembourg 1,392; West Germany 563; France 352. |
| Zirconium: | | | | |
| Ore and concentrate | 844 | 888 | 128 | Belgium-Luxembourg 225; Spain 162. |
| Oxides | 2,365 | 2,281 | NA | NA. |
| Metal including alloys: | | | | |
| Scrap | 48 | 20 | 17 | West Germany 3. |
| Unwrought | 44 | 29 | 6 | France 19; Sweden 4. |
| Semimanufactures | 125 | 95 | 5 | West Germany 41; France 24; Netherlands 11. |
| Other: | | | | |
| Ores and concentrates | 491 | 72 | — | West Germany 66; France 3. |
| Oxides and hydroxides | 300,504 | 1,670 | NA | NA. |
| Ashes and residues | 12,387 | 15,854 | 872 | Netherlands 7,330; Belgium-Luxembourg 5,495. |
| Base metals including alloys, all forms | 17 | 68 | 22 | Canada 19; Denmark 17. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 1,831 | 1,392 | 4 | Ireland 433; Libya 250; West Germany 109. |
| Artificial: | | | | |
| Corundum | 13,599 | 13,543 | 208 | West Germany 4,719; Netherlands 1,281; Spain 1,033. |
| Silicon carbide | 1,397 | 721 | — | West Germany 333; Namibia 130; Netherlands 76. |
| Dust and powder of precious and semi-precious stones including diamond kilograms | 3,210 | 5,252 | 1,778 | Israel 1,280; India 335. |
| Grinding and polishing wheels and stones | 5,393 | 5,838 | 1,057 | West Germany 1,003; France 637. |
| Asbestos, crude | 274 | 291 | — | Yugoslavia 55; India 43; Taiwan 39. |
| Barite and witherite | 14,572 | 25,365 | — | Angola 7,902; Norway 5,684; Ireland 2,875. |
| Boron materials: | | | | |
| Crude natural borates | 1,252 | 904 | — | France 838; West Germany 25; Italy 20. |
| Elemental | 2 | 22 | — | Belgium-Luxembourg 20; Yugoslavia 2. |
| Oxides and acids | 323 | 212 | (2) | Ireland 88; Saudi Arabia 37; Netherlands 27. |
| Bromine | 2,702 | 3,163 | — | Belgium-Luxembourg 1,381; Netherlands 564; Switzerland 458. |
| Cement | 203,340 | 266,817 | 2,605 | Ireland 208,386; France 8,988; Denmark 7,510. |
| Chalk | 31,454 | 26,516 | 36 | West Germany 5,666; Finland 5,408; Portugal 2,323. |
| Clays, crude: | | | | |
| Bentonite | 49,012 | 62,097 | 618 | Sweden 15,423; West Germany 11,336; Finland 7,636. |
| Chamotte earth | 309 | 488 | — | West Germany 156; Italy 84; France 44. |
| Fire clay | 617 | 877 | 155 | Ireland 165; Ghana 127. |
| Fuller's earth | 33,663 | 33,747 | 30 | Singapore 10,878; West Germany 9,551; Sweden 4,560. |
| Kaolin thousand tons | 3,069 | 3,042 | 15 | Finland 718; West Germany 501; Italy 303. |
| Unspecified | 211,147 | 66,623 | NA | NA. |
| Cryolite and chiolite | 34 | 138 | — | Namibia 78; Ireland 47; Egypt 6. |
| Diamond, natural: | | | | |
| Gem, not set or strung thousand carats | 53,363 | 32,839 | 818 | Belgium-Luxembourg 18,073; India 11,150; Israel 1,023. |
| Industrial stones do. | 23,245 | 27,054 | 5,034 | Ireland 19,600; Senegal 823. |
| Unsorted stones do. | 1,221 | 2,200 | 279 | Belgium-Luxembourg 1,466; Namibia 207. |
| Diatomite and other infusorial earth | 707 | 2,556 | — | Sweden 2,103; Ghana 101; Ireland 92. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 3,142 | 2,447 | (2) | Norway 2,162; Italy 115; Trinidad and Tobago 62. |
| Fluorspar | 6,439 | 3,983 | — | Sweden 1,125; Netherlands 907; West Germany 865. |
| Unspecified | 793 | 341 | — | Ireland 193; Netherlands 47; Portugal 40. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 277 | 3,598 | 142 | Ireland 2,332; Iceland 339; Spain 96. |
| Manufactured: | | | | |
| Ammonia | 76,298 | 166,970 | 22 | Finland 78,797; Denmark 66,100; Belgium-Luxembourg 19,554. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Fertilizer materials—Continued: | | | | |
| Manufactured—Continued: | | | | |
| Nitrogenous | 239,412 | 261,471 | — | France 114,603; Spain 62,747; Ireland 25,316. |
| Phosphatic | 1,007 | 584 | 18 | Ireland 503; Switzerland 18. |
| Potassic | 369,202 | 386,066 | 201 | Ireland 1,967; Belgium-Luxembourg 292; unspecified 382,344. |
| Unspecified and mixed | 378,170 | 411,183 | 1,121 | Ireland 298,381; Finland 59,434; Denmark 42,050. |
| Graphite, natural | 3,416 | 2,888 | 25 | France 859; West Germany 834; Sweden 182. |
| Gypsum and plaster | 17,031 | 16,511 | 290 | Ireland 6,053; Hong Kong 2,587; Netherlands 1,005. |
| Iodine | 75 | 289 | — | France 230; Turkey 20; Spain 10. |
| Kyanite and related materials: | | | | |
| Mullite | 6,212 | 4,740 | 265 | West Germany 2,484; France 424; Italy 316. |
| Unspecified | 62 | 76 | — | West Germany 23; Spain 22; Sweden 17. |
| Lime | 29,297 | 37,373 | — | Cote d'Ivoire 5,936; France 5,656; Ghana 5,066. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 446 | 376 | — | Ireland 165; Nigeria 129; Netherlands 22. |
| Oxides and hydroxides | 89,208 | 75,144 | 10 | Ireland 2,152; France 540; unspecified 71,690. |
| Sulfate | 11 | 10 | — | All to Ireland. |
| Mica: | | | | |
| Crude including splittings and waste | 5,123 | 5,062 | 25 | West Germany 2,346; Belgium-Luxembourg 680; Italy 265. |
| Worked including agglomerated splittings | 142 | 183 | 1 | Ireland 54; Namibia 15; West Germany 15. |
| Nitrates, crude | 985 | 981 | 121 | Ireland 528; Sweden 184. |
| Phosphates, crude | 205 | 677 | 5 | Thailand 277; Ireland 165; West Germany 78. |
| Pigments, mineral: | | | | |
| Natural, crude | 1,150 | 1,019 | 71 | Belgium-Luxembourg 276; Spain 269; Finland 120. |
| Iron oxides and hydroxides, processed | 9,778 | 10,456 | NA | NA. |
| Potassium salts, crude | 1,097 | 40 | — | Mainly to Ireland. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural kilograms | 5,336 | 1,598 | 730 | Belgium-Luxembourg 231; West Germany 186. |
| Synthetic do. | 2,377 | 949 | 750 | Belgium-Luxembourg 165; Thailand 10. |
| Pyrite, unroasted | 76 | 259 | — | Uruguay 67; Sweden 42; France 41. |
| Quartz crystal, piezoelectric kilograms | 226 | 231 | 13 | France 174; West Germany 36. |
| Salt and brine | 285,296 | 325,542 | 106,362 | Sweden 73,328. Ireland 35,685. |
| Sodium compounds, n.e.s.: Sulfate, manufactured | 29,152 | 26,217 | 36 | Colombia 20,450; France 401; Canada 350. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 4,222 | 9,257 | 157 | France 4,142; Ireland 1,793; Netherlands 892. |
| Worked | 2,523 | 12,246 | 2,712 | Ireland 3,316; France 2,029. |
| Dolomite, chiefly refractory-grade | 4,036 | 5,201 | 188 | Spain 2,132; Ireland 1,434. |
| Gravel and crushed rock | 1,731,809 | 2,448,522 | 174 | France 641,558; Belgium-Luxembourg 615,185; West Germany 562,096. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Stone, sand and gravel—Continued: | | | | |
| Limestone other than dimension | 543,482 | 684,034 | 5 | Denmark 254,942; West Germany 114,868; Norway 55,782. |
| Quartz and quartzite | 195 | 330 | — | Ireland 146; West Germany 61; France 58. |
| Sand other than metal-bearing | 93,506 | 104,091 | 612 | Ireland 71,895; Sweden 17,695; France 8,838. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 3,931 | 3,863 | 9 | Netherlands 1,826; Saudi Arabia 610; France 550. |
| Colloidal, precipitated, sublimed | 1,353 | 2,184 | — | France 1,351; West Germany 285; Niger 183. |
| Dioxide | 426 | 258 | — | Ireland 134; Panama 94; West Germany 19. |
| Sulfuric acid | 107,633 | 75,281 | 1,200 | Netherlands 24,914; Ireland 23,084; France 14,621. |
| Talc, steatite, soapstone, pyrophyllite | 1,844 | 1,774 | 4 | Ireland 385; Belgium-Luxembourg 166; Netherlands 114. |
| Vermiculite, perlite and chlorite | 1,412 | 1,122 | — | France 484; Sweden 163; Finland 117. |
| Other: | | | | |
| Crude | 30,301 | 30,538 | 112 | Netherlands 14,535; Ireland 5,223; West Germany 1,472. |
| Slag and dross, not metal-bearing | 1,851 | 116,964 | 909 | West Germany 93,686; Indonesia 3,677; Republic of Korea 3,516. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 32,170 | 21,680 | — | Ireland 13,092; Sweden 7,421; Netherlands 222. |
| Carbon black | 34,476 | 37,186 | 318 | France 9,450; West Germany 4,744; Ireland 4,571. |
| Coal: | | | | |
| Anthracite thousand tons | 337 | 509 | — | France 198; Spain 115; Belgium-Luxembourg 63. |
| Bituminous do. | 1,735 | 1,813 | — | Denmark 366; Morocco 235; Ireland 233. |
| Briquets of anthracite and bituminous coal do. | 129 | 137 | (2) | Norway 108; Sweden 13; Venezuela 7. |
| Lignite including briquets | 1,761 | 3,467 | 1 | West Germany 2,938; Norway 237; Tunisia 59. |
| Coke and semicoke | 393,025 | 301,263 | — | Norway 115,309; Finland 45,978; Sweden 44,239. |
| Gas, natural: | | | | |
| Gaseous thousand cubic meters | 2,312 | 4,692 | — | Netherlands 2,407; West Germany 1,660; Ireland 608. |
| Liquefied do. | 1,901 | 9,405 | — | Portugal 5,992; Norway 3,375; Belgium-Luxembourg 33. |
| Peat including briquets and litter | 23,730 | 36,828 | 189 | Sweden 16,703; France 13,317 Ireland 1,385. |
| Petroleum: | | | | |
| Crude thousand 42-gallon barrels | 372,392 | 409,366 | 112,277 | West Germany 80,129; Netherlands 76,068; France 40,637. |
| Refinery products: | | | | |
| Liquefied petroleum gas do. | 21,240 | 20,163 | 960 | France 4,395; Netherlands 4,247; Portugal 3,059. |
| Gasoline do. | 53,600 | 52,463 | 7,502 | Netherlands 16,579; West Germany 12,197. |
| Mineral jelly and wax do. | 348 | 346 | 20 | Netherlands 53; West Germany 45; Nigeria 20. |
| Kerosene and jet fuel do. | 8,117 | 11,142 | 308 | Ireland 2,938; France 2,221; Netherlands 1,395. |

See footnotes at end of table.

TABLE 2—Continued

## UNITED KINGDOM: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products—Continued: | | | | | |
| Distillate fuel oil | thousand 42-gallon barrels | 73,350 | 75,652 | 7,701 | Italy 17,082; France 15,243; Ireland 11,929. |
| Lubricants | do. | 5,365 | 6,782 | 1,345 | Belgium-Luxembourg 960; West Germany 840. |
| Bitumen and other residues | do. | 346 | 238 | — | Ireland 233; Malaysia 1; Nigeria 1. |
| Bituminous mixtures | do. | 137 | 88 | (2) | Ireland 22; Portugal 5; United Arab Emirates 5. |

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Less than 1/2 unit.
[3]May include rhenium.

TABLE 3

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 2,791 | 3,205 | 1,052 | West Germany 2,000; France 131. |
| Alkaline-earth metals | 395 | 343 | 89 | Netherlands 193; France 38. |
| Aluminum: | | | | |
| Ore and concentrate | 312,834 | 317,487 | 3 | Ghana 226,087; Brazil 25,018; Australia 19,309. |
| Oxides and hydroxides | 676,805 | 642,488 | 575 | West Germany 8,226; Ireland 5,186; unspecified 625,628. |
| Ash and residue containing aluminum | 1,294 | 875 | — | West Germany 856; Japan 19. |
| Metal including alloys: | | | | |
| Scrap | 24,138 | 16,864 | 1,811 | Ireland 8,159; Netherlands 2,505. |
| Unwrought | 235,451 | 241,005 | 1,048 | Norway 131,977; Netherlands 32,600; Iceland 21,991. |
| Semimanufactures | 349,149 | 361,339 | 10,875 | West Germany 104,329; France 68,234; Belgium-Luxembourg 42,617. |
| Antimony: | | | | |
| Oxides | 1,890 | 2,172 | 6 | China 1,555; France 396; Belgium-Luxembourg 98. |
| Ash and residue containing antimony | 169 | 218 | 86 | Belgium-Luxembourg 132. |
| Metal including alloys, all forms | 558 | 604 | 1 | China 467; Turkey 61; Japan 23. |
| Arsenic: Metal including alloys, all forms | 70 | 80 | — | Netherlands 49; China 30; Japan 1. |
| Beryllium: | | | | |
| Oxides and hydroxides | 7 | 6 | 6 | |
| Metal including alloys, all forms | 5 | 3 | 3 | |
| Bismuth: Metal including alloys, all forms | 414 | 449 | 74 | Belgium-Luxembourg 96; West Germany 64; Mexico 36. |
| Cadmium: Metal including alloys, all forms | 943 | 970 | 3 | Netherlands 338; West Germany 162; Canada 130. |
| Chromium: | | | | |
| Ore and concentrate | 170,461 | 154,919 | — | Namibia 144,818; Greece 7,650; Philippines 1,523. |
| Oxides and hydroxides | 466 | 1,014 | NA | NA. |
| Metal including alloys, all forms | 709 | 854 | 34 | France 229; China 220; Japan 217. |
| Cobalt: | | | | |
| Oxides and hydroxides | 500 | 543 | — | Canada 375; Finland 92; Belgium-Luxembourg 34. |
| Ash and residue containing cobalt | 842 | 183 | 23 | West Germany 107; Brazil 33. |
| Metal including alloys, all forms | 2,588 | 3,856 | 270 | Belgium-Luxembourg 1,298; Netherlands 822; Sweden 442. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 2,270 | 1,457 | — | Canada 1,419; Nigeria 13. |
| Ash and residue containing columbium and tantalum | — | 25 | — | All from Belgium-Luxembourg. |
| Metal including alloys, all forms: | | | | |
| Columbium (niobium)[2] | 33 | 25 | 7 | West Germany 17; Belgium-Luxembourg 1. |
| Tantalum | 84 | 84 | 37 | West Germany 22; Japan 7. |
| Copper: | | | | |
| Ore and concentrate | 947 | 1,997 | 2 | Netherlands 1,942; Italy 23; Belgium-Luxembourg 20. |
| Matte and speiss including cement copper | 3 | 68 | — | Italy 40; France 24; West Germany 4. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Copper—Continued: | | | | | |
| Oxides and hydroxides | | 1,780 | 2,349 | 291 | Belgium-Luxembourg 820; Norway 529; West Germany 320. |
| Sulfate | | 4,967 | 4,607 | 485 | Israel 1,043; Taiwan 200. |
| Ash and residue containing copper | | 4,242 | 8,167 | 584 | West Germany 5,252; France 903; Netherlands 851. |
| Metal including alloys: | | | | | |
| Scrap | | 33,148 | 22,018 | 4,047 | East Germany 3,437; France 2,277. |
| Unwrought | | 326,385 | 317,972 | 3,537 | Chile 78,734; Canada 50,629; Peru 42,735. |
| Semimanufactures | | 147,592 | 151,333 | 1,649 | West Germany 50,752; France 26,419; Belgium-Luxembourg 12,610. |
| Gallium: Metal including alloys all forms[3] | | 29 | 33 | 3 | France 13; Belgium-Luxembourg 4; U.S.S.R. 4. |
| Germanium: | | | | | |
| Oxides | | 2 | 28 | — | France 21; Belgium-Luxembourg 3. |
| Metal including alloys, all forms | | 8 | 11 | — | West Germany 8; Belgium-Luxembourg 1. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $446,473 | $192,273 | $10,401 | Uruguay $141,030; Chile $11,268. |
| Metal including alloys, unwrought and partly wrought | | 569 | 2,245 | 59 | Belgium-Luxembourg 1,883; Italy 111. |
| Hafnium: Metal including alloys, all forms | | 5 | 4 | 2 | France 2. |
| Iron and steel: | | | | | |
| Iron ore and concentrate: | | | | | |
| Excluding roasted pyrite | thousand tons | 19,179 | 14,700 | 109 | Australia 3,323; Canada 2,649; Brazil 2,392. |
| Pyrite, roasted | do. | 283 | 236 | — | Sweden 210; Norway 25. |
| Metal: | | | | | |
| Scrap | | 82,046 | 60,246 | 2,267 | West Germany 12,107; Denmark 9,040; Netherlands 8,482. |
| Pig iron, cast iron, related materials | | 23,003 | 23,377 | 1,281 | Sweden 13,284; Netherlands 1,613. |
| Ferroalloys: | | | | | |
| Ferrochromium | | 272,781 | 374,672 | 5,128 | U.S.S.R. 77,643; Norway 67,883; France 28,483. |
| Ferromanganese | | 53,097 | 45,685 | 366 | Norway 22,310; Netherlands 8,085; Republic of South Africa 6,279. |
| Ferromolybdenum | | 638 | 502 | 55 | Belgium-Luxembourg 174; Austria 134; Netherlands 84. |
| Ferronickel | | 19,347 | 19,439 | — | Greece 6,857; Belgium-Luxembourg 2,391; Netherlands 2,240. |
| Ferrosilicochromium | | 19 | 77 | — | France 48; West Germany 23; Ireland 5. |
| Ferrosilicomanganese | | 39,086 | 35,809 | — | Norway 15,468; Republic of South Africa 9,411; Netherlands 5,261. |
| Ferrosilicon | | 86,594 | 99,511 | NA | Norway 100; unspecified 97,561. |
| Silicon metal | | 42,067 | 43,999 | 5 | France 15,650; Norway 9,899; Namibia 8,848. |
| Unspecified | | 13,497 | 13,171 | 613 | West Germany 3,246; France 2,134; U.S.S.R. 1,131. |
| Steel, primary forms | | 387,075 | 341,848 | 965 | Netherlands 152,871; Finland 40,535; West Germany 37,025. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS—Continued | | | | | |
| Iron and Steel—Continued: | | | | | |
| Metal—Continued: | | | | | |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | thousand tons | 1,697 | 1,744 | 2 | West Germany 429; Belgium-Luxembourg 282; Netherlands 265. |
| Clad, plated, coated | do. | 1,050 | 1,039 | 9 | Belgium-Luxembourg 244; West Germany 198; Netherlands 174. |
| Of alloy steel | do. | 400 | 400 | 5 | West Germany 261; France 37; Sweden 34. |
| Bars, rods, angles, shapes, sections | do. | 1,292 | 1,184 | 4 | West Germany 200; Spain 178; France 132. |
| Rails and accessories | | 30,239 | 46,024 | 34 | Poland 22,825; Belgium-Luxembourg 11,828; Sweden 6,509. |
| Wire | | 65,072 | 62,108 | 481 | Belgium-Luxembourg 21,917; France 9,088; West Germany 6,108. |
| Tubes, pipes, fittings | | 595,773 | 630,436 | 7,712 | West Germany 134,422; Netherlands 96,777; Japan 87,428. |
| Lead: | | | | | |
| Ore and concentrate | | 30,117 | 37,158 | 12,067 | Italy 5,246; Ireland 5,100. |
| Oxides | | 1,827 | 549 | 4 | West Germany 510; Italy 16; Austria 8. |
| Ash and residue containing lead | | 9,422 | 6,952 | 1,866 | Belgium-Luxembourg 1,238; Republic of Korea 1,075. |
| Metal including alloys: | | | | | |
| Scrap | | 8,704 | 16,192 | 3,689 | Ireland 2,637; Finland 1,527. |
| Unwrought | | 219,309 | 190,731 | 105 | Australia 159,791; Canada 14,432; Sweden 4,589. |
| Semimanufactures | | 19,368 | 26,103 | 43 | Ireland 16,131; Belgium-Luxembourg 4,546; Netherlands 3,478. |
| Lithium: Oxides and hydroxides | | 692 | 764 | 351 | West Germany 158; China 74. |
| Magnesium: Metal including alloys: | | | | | |
| Scrap | | 2,287 | 961 | 13 | West Germany 267; Netherlands 241; Sweden 156. |
| Unwrought | | 3,992 | 3,875 | 96 | Norway 1,988; Netherlands 650; France 532. |
| Semimanufactures | | 2,273 | 1,811 | 728 | West Germany 242; Yugoslavia 65. |
| Manganese: | | | | | |
| Ore and concentrate, metallurgical-grade | | 275,509 | 318,303 | 27 | Namibia 175,760; Brazil 83,169; Netherlands 42,994. |
| Oxides | | 5,301 | 4,945 | 284 | Ireland 984; Netherlands 646; Mexico 738. |
| Metal including alloys, all forms | | 4,574 | 4,274 | NA | Namibia 1,814; China 1,044; France 828. |
| Mercury | | 89 | 51 | 2 | Spain 31; Italy 7; Denmark 3. |
| Molybdenum: | | | | | |
| Ore and concentrate: | | | | | |
| Roasted | | 4,549 | 3,051 | 51 | Netherlands 2,195; Belgium-Luxembourg 514. |
| Unroasted | | 18,647 | 15,171 | 12,699 | Netherlands 1,273; Belgium-Luxembourg 792. |
| Oxides and hydroxides | | 146 | 160 | 1 | Belgium-Luxembourg 99; Netherlands 54. |
| Ash and residue containing molybdenum | | — | 527 | 3 | Belgium-Luxembourg 319; France 140; Netherlands 66. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Molybdenum—Continued: | | | | | |
| Metal including alloys: | | | | | |
| Scrap | | 1,108 | 124 | 11 | West Germany 51; Austria 45. |
| Unwrought | | 477 | 68 | 27 | Belgium-Luxembourg 17; West Germany 13. |
| Semimanufactures | | 6,960 | 185 | 77 | Austria 76; France 15. |
| Nickel: | | | | | |
| Ore and concentrate | | 1 | 1 | — | All from Netherlands. |
| Matte and speiss | | 37,782 | 46,916 | 150 | Canada 43,876; Australia 1,318; Netherlands 1,159. |
| Oxides and hydroxides | | 818 | 195 | 20 | Canada 128; Netherlands 15. |
| Ash and residue containing nickel | | 1,729 | 777 | 65 | West Germany 433; France 119. |
| Metal including alloys: | | | | | |
| Scrap | | 6,495 | 6,372 | 1,156 | Namibia 1,485; France 528. |
| Unwrought | | 18,977 | 19,008 | 374 | U.S.S.R. 4,054; Namibia 3,334; Austria 2,665. |
| Semimanufactures | | 5,661 | 7,349 | 3,980 | West Germany 1,069; Ireland 269; Australia 260. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $136,725 | $154,481 | $96,519 | Switzerland $10,025; Belgium-Luxembourg $8,862. |
| Metals including alloys, unwrought and partly wrought | kilograms | 205 | 142 | 11 | U.S.S.R. 53; Namibia 43; West Germany 12. |
| Rare-earth metals including alloys, all forms | | 395 | 22 | 3 | China 8; Netherlands 5; Austria 4. |
| Selenium, elemental | | 637 | 657 | 204 | Canada 126; Japan 96. |
| Silicon, high-purity | | 61 | 188 | 1 | Japan 70; Australia 40; West Germany 27. |
| Silver: | | | | | |
| Ore and concentrate[4] | value, thousands | $251 | $3,927 | $265 | Chile $2,071; Norway $1,325. |
| Waste and sweepings[4] | do. | $108,637 | $205,935 | $80,588 | Namibia $19,659; Chile $15,692. |
| Metal including alloys, unwrought and partly wrought | | 1,262 | 2,803 | 130 | Mexico 1,689; East Germany 169. |
| Tellurium, elemental | | 83 | 40 | 5 | Belgium-Luxembourg 14; Netherlands 5. |
| Tin: | | | | | |
| Ore and concentrate | | 18,504 | 13,443 | 60 | Bolivia 9,639; Portugal 2,985. |
| Oxides | | 529 | 146 | — | West Germany 142; Italy 3; France 1. |
| Ash and residue containing tin | | 4,194 | 9,854 | 3,089 | West Germany 2,938; Japan 1,137. |
| Metal including alloys: | | | | | |
| Scrap | | 1,207 | 720 | 135 | Ireland 361; Namibia 105. |
| Unwrought | | 7,767 | 6,095 | 113 | Netherlands 3,505; West Germany 628; Bolivia 547. |
| Semimanufactures | | 951 | 567 | 13 | West Germany 138; Indonesia 129; Malaysia 98. |
| Titanium: | | | | | |
| Ore and concentrate | | 489,357 | 374,616 | — | Australia 245,181; Norway 79,804; Sierra Leone 32,139. |
| Oxides | | 2,883 | 2,767 | 368 | West Germany 498; Italy 280; unspecified 253. |
| Ash and residue containing titanium | | — | 25 | — | U.S.S.R. 14; Sweden 11. |
| Metal including alloys: | | | | | |
| Scrap | | 10,504 | 9,871 | 5,380 | U.S.S.R. 1,367; West Germany 787. |
| Unwrought | | 3,288 | 4,981 | 1,014 | Japan 3,623; U.S.S.R. 249. |
| Semimanufactures | | 2,136 | 2,988 | 1,538 | Japan 618; France 519. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Tungsten: | | | | |
| Ore and concentrate | 85 | 111 | 37 | Bolivia 35; Thailand 20. |
| Oxides and hydroxides | 530 | 88 | 63 | France 20; West Germany 3. |
| Ash and residue containing tungsten | — | 42 | 20 | Netherlands 22. |
| Metal including alloys: | | | | |
| Scrap | 244 | 244 | 17 | West Germany 136; Netherlands 32; Namibia 20. |
| Unwrought | 201 | 179 | 59 | France 82; Austria 49. |
| Semimanufactures | 178 | 194 | 46 | Italy 81; Belgium-Luxembourg 20. |
| Uranium and thorium: Metals including alloys, all forms: | | | | |
| Uranium | 791 | 3,504 | NA | NA. |
| Thorium | 6 | 11 | 11 | |
| Vanadium: | | | | |
| Ore and concentrate | — | 25 | — | All from Netherlands. |
| Oxides and hydroxides | 256 | 226 | 72 | Namibia 92; China 49. |
| Ash and residue containing vanadium | 31 | 1 | — | All from Macau. |
| Metal including alloys: | | | | |
| Scrap | 232 | 1 | 1 | |
| Unwrought | 201 | 239 | 21 | West Germany 217. |
| Semimanufactures | 25 | 18 | 1 | West Germany 11; Japan 6. |
| Zinc: | | | | |
| Ore and concentrate | 207,603 | 278,301 | 51,235 | Peru 77,155; Australia 72,801. |
| Oxides | 7,167 | 7,610 | 25 | West Germany 1,741; Peru 1,272; China 1,243. |
| Blue powder | 966 | 864 | 24 | West Germany 380; Norway 198; Belgium-Luxembourg 70. |
| Ash and residue containing zinc | 21,820 | 27,308 | 3,117 | Spain 16,014; Netherlands 3,481. |
| Metal including alloys: | | | | |
| Scrap | 6,578 | 5,028 | 222 | Belgium-Luxembourg 838; France 693; Australia 547. |
| Unwrought | 133,656 | 128,323 | 60 | Netherlands 35,262; Finland 32,632; Norway 21,559. |
| Semimanufactures | 6,641 | 2,486 | 9 | West Germany 796; France 628; Netherlands 491. |
| Zirconium: | | | | |
| Ore and concentrate | 55,228 | 35,685 | 371 | Namibia 7,809; Australia 7,768; unspecified 19,290. |
| Oxides | 1,170 | 1,160 | 752 | France 350; West Germany 28. |
| Metal including alloys: | | | | |
| Scrap | 60 | 22 | 18 | Japan 3; West Germany 1. |
| Unwrought | 148 | 63 | 18 | France 21; West Germany 21. |
| Semimanufactures | 45 | 55 | 29 | Sweden 11; France 7. |
| Other: | | | | |
| Ores and concentrates | 101 | 18 | — | All From Peru. |
| Oxides and hydroxides | 380 | 8,557 | 1,674 | Belgium-Luxembourg 1,221; China 1,147. |
| Ashes and residues | 17,629 | 2,815 | 1,653 | Italy 194; West Germany 179. |
| Base metals including alloys, all forms | 19 | 47 | 4 | West Germany 17; France 13. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 132,040 | 70,832 | 315 | Greece 35,324; Italy 12,135; Turkey 7,559. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Abrasives, n.e.s.—Continued: | | | | | |
| Artificial: | | | | | |
| Corundum | | 24,284 | 29,685 | NA | NA. |
| Silicon carbide | | 26,412 | 43,357 | 35 | Spain 24,409; Norway 12,605; Netherlands 2,084. |
| Dust and powder of precious and semiprecious stones including diamond | value, thousands | $25,189 | $25,128 | NA | NA. |
| Grinding and polishing wheels and stones | | 9,184 | 10,273 | 265 | West Germany 2,221; Netherlands 1,737; France 1,708. |
| Asbestos, crude | | 19,702 | 16,022 | 58 | Canada 14,428; Zimbabwe 686; Belgium-Luxembourg 131. |
| Barite and witherite | | 113,018 | 217,427 | — | Netherlands 134,444; Morocco 115,528; Ireland 43,962. |
| Boron materials: | | | | | |
| Crude natural borates | | 47,669 | 53,461 | (3) | Turkey 52,371; Belgium-Luxembourg 770; Netherlands 144. |
| Elemental | | 5 | 1 | — | All from Ireland. |
| Oxides and acids | | 13,500 | 11,906 | 367 | Netherlands 8,174; France 1,315; Chile 806. |
| Bromine | | 9,593 | 7,197 | 179 | Israel 6,946; Netherlands 71. |
| Cement | thousand tons | 4,375 | 2,426 | (3) | Greece 422; Ireland 406; France 394. |
| Chalk | | 26,208 | 11,308 | 1 | Denmark 9,439; France 1,117; Switzerland 351. |
| Clays, crude: | | | | | |
| Bentonite | | 117,483 | 154,133 | 27,043 | Greece 65,985; Cyprus 26,649. |
| Chamotte earth | | 41,640 | 46,633 | 10,143 | France 29,742; China 3,961. |
| Fire clay | | 723 | 1,959 | 1,354 | France 356; China 100. |
| Fuller's earth | | 3,582 | 6,114 | 1,451 | West Germany 1,564; Senegal 1,494. |
| Kaolin | | 9,061 | 16,925 | 6,731 | Belgium-Luxembourg 4,527; Netherlands 1,718. |
| Unspecified | | 45,150 | 27,572 | 19,116 | Spain 5,471; Netherlands 1,787. |
| Cryolite and chiolite | | 1,242 | 1,108 | — | All from Denmark. |
| Diamond, natural: | | | | | |
| Gem, not set or strung | value, thousands | $2,816 | $3,082 | NA | NA. |
| Industrial stones | do. | $89 | $73 | NA | NA. |
| Unsorted | do. | $488 | $552 | NA | NA. |
| Diatomite and other infusorial earth | | 39,211 | 35,718 | 3,933 | Denmark 20,961; France 3,835. |
| Feldspar | | 46,376 | 49,010 | — | Sweden 16,961; Finland 15,532; Norway 11,450. |
| Fertilizer materials: | | | | | |
| Crude, n.e.s. | | 15,298 | 9,728 | 16 | France 8,812; Czechoslovakia 215; Ireland 188. |
| Manufactured: | | | | | |
| Nitrogenous | thousand tons | 1,346 | 396 | 6 | Netherlands 120; East Germany 54; Spain 47. |
| Phosphatic | do. | 331 | 390 | — | Tunisia 113; Netherlands 92; Morocco 91. |
| Potassic | do. | 468 | 1,679 | (3) | West Germany 249; East Germany 194; Netherlands 173. |
| Unspecified and mixed | do. | 738 | 744 | (3) | Norway 180; Sweden 67; Belgium-Luxembourg 61. |
| Fluorspar | | — | 4,525 | — | Netherlands 4,221; France 284; China 20. |
| Graphite, natural | | 17,444 | 24,767 | 381 | China 10,918; Madagascar 5,639; Zimbabwe 1,560. |
| Gypsum and plaster | | 203,805 | 431,608 | 5,263 | Spain 244,353; West Germany 115,031; Ireland 42,787. |
| Iodine | | 1,488 | 1,441 | 190 | Japan 999; Belgium-Luxembourg 107. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Kyanite and related materials | | 131,706 | 54,979 | 3,684 | France 24,651; Namibia 21,144. |
| Mullite | | 1,314 | 3,239 | 499 | West Germany 1,624; Belgium-Luxembourg 986. |
| Lime | | 6,901 | 5,673 | 1 | Ireland 4,327; France 1,093; West Germany 96. |
| Magnesium compounds: | | | | | |
| Magnesite, crude | | 15,186 | 22,406 | — | Greece 10,220; France 4,186; Turkey 4,175. |
| Oxides and hydroxides | | 141,713 | 130,355 | 2,316 | Netherlands 39,389; Spain 25,301; Ireland 20,526. |
| Sulfate | | 13,370 | 23,839 | — | West Germany 13,366; East Germany 10,038; Cyprus 429. |
| Mica: | | | | | |
| Crude including splittings and waste | | 20,644 | 20,820 | 39 | China 8,460; India 6,281; France 1,383. |
| Worked including agglomerated splittings | | 572 | 562 | 2 | Belgium-Luxembourg 123; Italy 126; France 105. |
| Nitrates, crude | | 9,945 | 8,094 | (3) | Chile 6,960; West Germany 833; Ireland 141. |
| Phosphates, crude | | 602,425 | 548,126 | — | Morocco 495,381; Tunisia 30,600; France 105. |
| Phosphorus, elemental | | — | 6 | — | All from Japan. |
| Pigments, mineral: | | | | | |
| Natural, crude | | 9,307 | 6,469 | 162 | Austria 1,836; West Germany 1,739; East Germany 604. |
| Iron oxides and hydroxides, processed | | 38,890 | 29,304 | 1,196 | West Germany 16,807; China 2,894. |
| Potassium salts, crude | | 17,274 | 19,605 | — | West Germany 15,868; East Germany 3,737. |
| Precious and semiprecious stones other than diamond: | | | | | |
| Natural | value, thousands | $91,386 | $89,747 | $133 | Switzerland $1,111; Sri Lanka $217; unspecified $87,527. |
| Synthetic | do. | $3,758 | $3,064 | $135 | Switzerland $1,437; West Germany $304; Japan $236. |
| Quartz crystal, piezoelectric | kilograms | 681 | 458 | 4 | Japan 413; Netherlands 20; Denmark 11. |
| Pyrite, unroasted | | 8,928 | 14,325 | NA | NA. |
| Salt and brine | | 140,042 | 166,797 | 285 | East Germany 65,687; West Germany 30,716; Netherlands 20,724. |
| Sodium compounds, n.e.s.: | | | | | |
| Soda ash | | — | 86,082 | NA | NA. |
| Sulfate, manufactured | thousand tons | 1,240 | 1,282 | 54 | West Germany 309; Netherlands 306; Norway 126. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | 155,492 | 297,403 | 2,526 | Norway 157,436; Sweden 72,456; Ireland 29,975. |
| Worked | | 168,031 | 166,183 | 699 | Italy 46,917; Spain 42,106; Portugal 38,526. |
| Dolomite, chiefly refractory-grade | | 164,829 | 182,185 | 57 | Spain 115,217; Norway 59,852; West Germany 2,333. |
| Gravel and crushed rock | thousand tons | 1,134 | 1,564 | (3) | Ireland 501; Norway 317; Netherlands 268. |
| Limestone other than dimension | | 10,928 | 11,598 | (3) | Norway 4,344; France 3,899; Ireland 3,286. |
| Quartz and quartzite | | 9,406 | 10,270 | 31 | West Germany 5,266; Netherlands 2,834; Portugal 620. |
| Sand other than metal-bearing | | 38,875 | 102,619 | 1,589 | Netherlands 52,431; West Germany 10,056. |
| Sulfur: | | | | | |
| Elemental: | | | | | |
| Crude including native and byproduct | | 641,460 | 470,862 | 54 | NA. |
| Colloidal, precipitated, sublimed | | 1,103 | 376 | 19 | France 269; West Germany 64; Belgium-Luxembourg 21. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | | |
| Sulfur—Continued: | | | | | |
| Dioxide | | 232 | 1,883 | — | Sweden 1,372; Netherlands 420; Belgium-Luxembourg 78. |
| Sulfuric acid | | 309,578 | 283,364 | — | West Germany 113,286; Norway 94,266; France 65,819. |
| Talc, steatite, soapstone, pyrophyllite | | 73,588 | 83,413 | NA | France 3,900; Australia 1,175; unspecified 78,140. |
| Vermiculite[6] | | 133,567 | 163,315 | 107 | Italy 70,475; South Africa 40,607; Greece 23,865. |
| Other: | | | | | |
| Crude | | 480,018 | 416,016 | 9,039 | Norway 289,208; Spain 53,706; West Germany 15,469. |
| Slag and dross, not metal-bearing | | 607,909 | 812,468 | 2,756 | Belgium-Luxembourg 336,532; France 215,077; West Germany 60,263. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Asphalt and bitumen, natural | | 12,723 | 12,283 | 1,763 | Trinidad and Tobago 4,189; Ireland 3,174; France 2,005. |
| Carbon: | | | | | |
| Carbon black | | 52,294 | 44,334 | 5,580 | France 17,210; West Germany 9,073; Netherlands 6,482. |
| Gas carbon | | 4,818 | 7,076 | — | France 6,842; Ireland 234. |
| Coal: | | | | | |
| Anthracite | thousand tons | 765 | 634 | 15 | Netherlands 212; West Germany 198; Namibia 106. |
| Bituminous | do. | 11,151 | 11,989 | 4,305 | Australia 2,974; Netherlands 1,069. |
| Briquets of anthracite and bituminous coal | do. | 131 | 120 | 5 | West Germany 53; Netherlands 47; Belgium-Luxembourg 9. |
| Lignite including briquets | do. | 220 | 55 | (5) | East Germany 37; West Germany 6; Namibia 5. |
| Unspecified | do. | 339 | 2,168 | 307 | Netherlands 1,388; Colombia 210. |
| Coke and semicoke | | 540,850 | 304,221 | 39,778 | East Germany 63,770; Netherlands 63,587; Namibia 41,323. |
| Gas, natural: | | | | | |
| Gaseous | million cubic meters | 6,217 | 5,795 | (5) | Mainly from Norway. |
| Liquefied | thousand cubic meters | 70,647 | 51,971 | 50 | Algeria 51,884; Ireland 24. |
| Peat including briquets and litter | | 282,349 | 229,898 | 3 | Ireland 196,548; Netherlands 15,559; Finland 7,000. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 123,749 | 155,322 | — | Saudi Arabia 33,864; Iran 21,980; Nigeria 14,837. |
| Refinery products: | | | | | |
| Liquefied petroleum gas | do. | 12,406 | 16,103 | 36 | Saudi Arabia 3,446; Finland 3,302; Algeria 3,108. |
| Gasoline | do. | 56,483 | 45,208 | 1,492 | Netherlands 15,067; Algeria 9,155; U.S.S.R. 4,820. |
| Mineral jelly and wax | do. | 214 | 328 | 4 | Netherlands 247; West Germany 23; Belgium-Luxembourg 12. |
| Kerosene and jet fuel | do. | 4,051 | 5,718 | 19 | Netherlands 2,808; France 448; Belgium-luxembourg 422. |
| Distillate fuel oil | do. | 9,530 | 11,747 | 255 | U.S.S.R. 5,042; Netherlands 3,011; Norway 845. |
| Lubricants | do. | 12,301 | 7,069 | 343 | Netherlands 3,051; Norway 1,404; Belgium-Luxembourg 660. |
| Residual fuel oil | do. | 74,073 | 87,053 | 419 | U.S.S.R. 20,423; Netherlands 9,272; Sweden 8,104. |

See footnotes at end of table.

TABLE 3—Continued

## UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Petroleum—Continued: | | | | | |
| Refinery products—Continued: | | | | | |
| Bitumen and other residues | thousand 42-gallon barrels | 1,104 | 823 | (5) | France 376; Belgium-Luxembourg 364; Netherlands 29. |
| Bituminous mixtures | do. | 42 | 158 | 3 | Venezuela 70; Denmark 47; France 24. |
| Petroleum coke | do. | 3,318 | 3,342 | 1,963 | Netherlands 584; Belgium-Luxembourg 423. |

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]May include rhenium.
[3]Includes indium and thallium.
[4]May include other precious metals.
[5]Less than 1/2 unit.
[6]Includes perlite and chlorite.

TABLE 4

## UNITED KINGDOM: 1990 BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars)

| Mineral commodity | Exports to European Community | Imports from European Community | Net gain or (loss) | Exports to the world | Imports from the world | Net gain or (loss) |
|---|---|---|---|---|---|---|
| Crude industrial minerals: | | | | | | |
| Feldspar | 130 | 68,401 | (68,271) | 230 | 114,846 | (114,616) |
| Magnesite | 74 | 2,414 | (2,340) | 155 | 3,399 | (3,244) |
| Slate | 1,615 | 314 | 1,301 | 2,079 | 1,154 | 925 |
| Other | 344,055 | 239,111 | 104,944 | 659,651 | 495,174 | 164,477 |
| Total | 345,874 | 310,240 | 35,634 | 662,115 | 614,573 | 47,542 |
| Metalliferous ores: | | | | | | |
| Copper | 654 | 626 | 28 | 2,908 | 720 | 2,188 |
| Lead | 403 | 5,062 | (4,659) | 448 | 14,578 | (14,130) |
| Tin | 374 | 1,670 | (1,296) | 4,843 | 15,641 | (10,798) |
| Zinc | 5,794 | 6,208 | (414) | 9,844 | 102,296 | (92,452) |
| Other (including waste and scrap) | 813,826 | 411,406 | 402,420 | 1,115,796 | 2,504,051 | (1,388,255) |
| Total | 821,051 | 424,972 | 396,079 | 1,133,839 | 2,637,286 | (1,503,447) |
| Nonmetallic mineral manufactures | 1,848,063 | 711,009 | 1,137,054 | 3,671,653 | 4,143,330 | (471,677) |
| Metals: | | | | | | |
| Iron and steel | 3,231,445 | 3,455,957 | (224,512) | 5,433,673 | 4,772,206 | 661,467 |
| Mercury | 1,126 | 253 | (873) | 1,941 | 301 | 1,640 |
| Other nonferrous metals | 2,136,611 | 2,225,740 | (89,129) | 3,925,267 | 5,355,077 | (1,429,810) |
| Total | 5,369,182 | 5,681,950 | (312,268) | 9,360,881 | 10,127,584 | (766,703) |
| Mineral fuels | 8,789,724 | 2,992,705 | 5,797,019 | 13,962,569 | 13,977,661 | (15,097) |

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 5

## UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| 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 Aluminum Ltd. | Ft. William, Kinlochleven, and Lynemouth | 175 |
| Do. | Angelesey Aluminium Ltd. (RTZ Corp. Ltd., 51%; Kaiser Aluminum and Chemical Corp., 49%) | Holyhead, Wales | 113 |
| Aluminum, secondary | Trent Alloys Ltd. (Cookson Group, 100%) | North Cave, Humberside | 30 |
| Do. | Deeside Aluminium Ltd. | Clwyd, Wales | 45 |
| 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 and 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 PLC | Mines and plants in Devon | 3,000 |
| Copper | IMI Refineries 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 (United Kingdom) Ltd., 100%] | Darley Dale, Derbershire | 60 |
| Lead, smelter | Pasminco Ltd. | Avonmouth, Avon | 40 |
| Natural gas billion cubic feet per year | Amoco Ltd., British Petroleum Ltd., Esso (United Kingdom) Ltd., Phillips Petroleum Co. PLC, Shell (United Kingdom) Ltd. | North Sea gasfields | 1,250 |
| Nickel, refined | INCO Europe Ltd. (INCO Ltd., Canada) | Clydach, Wales | 30 |
| Petroleum, crude million 42-gallon barrels per day | Amoco Ltd., British Petroleum Ltd., Chevron Ltd., Esso (United Kingdom) Ltd., Occidental Petroleum Co. Ltd., Shell (United Kingdom) Ltd., Texaco Ltd., Unocal, Inc. | North Sea oilfields | 2.1 |

TABLE 5—Continued

## UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities | Annual capacity |
|---|---|---|---|
| Petroleum, refined million 42-gallon barrels per day | British Petroleum Ltd., Conoco Ltd., Mobil Oil Co. Ltd., and others | 11 refineries in various locations | 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 and Exploration Co. | Carrick Fergus, Northern Ireland | 300 |
| Sand and gravel | TMC Pioneer Aggregates Ltd. | Chelmsford, Essex | 1,000,000 |
| Silica sand | Hepworth Minerals and Chemicals Ltd. | Operations in Cambridgeshire, Chesire, Humberside and Norfolk | 6,000 |
| Steel | British Steel PLC | 5 integrated steelworks in Gwent, Lanark, South Humberside and Cleveland | 16,800 |
| Talc | Alex Sandison and Sons Ltd. | Unst, Shetland Islands | 15 |
| Do. | Shetland Talc Ltd. (Anglo European Minerals Ltd., 50%; Dalriada Mineral Ventures Ltd., 50%) | Cunningsburg, Shetland Islands | 35 |
| 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 |

TABLE 6

## UNITED KINGDOM: RESERVES OF MAJOR MINERALS IN 1991

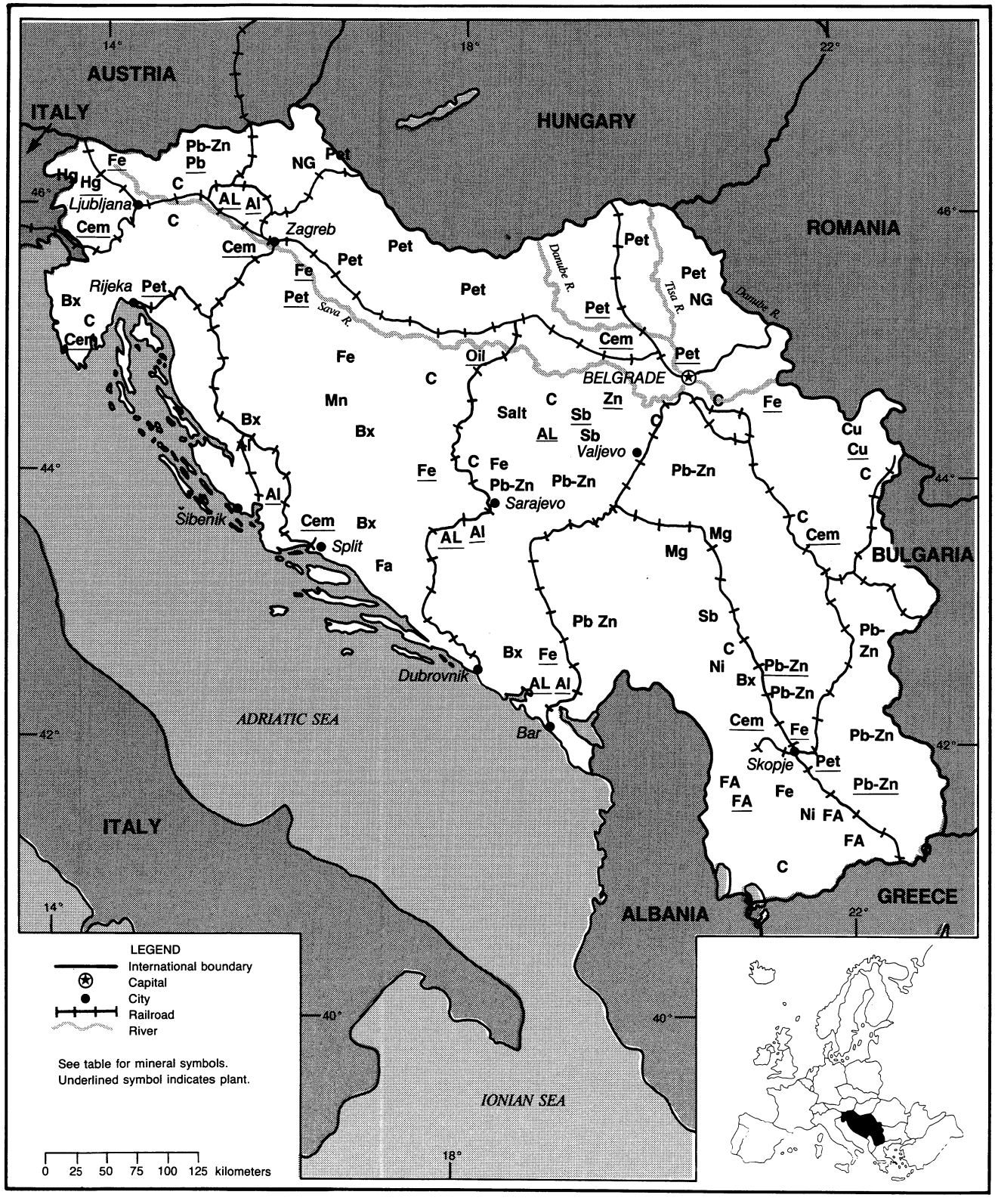
(Million metric tons unless otherwise specified)

| Commodity | | Reserves[e] |
|---|---|---|
| Clays: | | |
| Ball clay | | 300 |
| Fire clay | | 15,000 |
| Kaolin (china clay) | | 2,000 |
| Coal (all) | billion metric tons | 5 |
| Fluorspar | thousand metric tons | 2,000 |
| Natural gas | billion cubic meters | 1,265 |
| Petroleum, crude | | 1,790 |
| Potash ($K_2O$ content) | thousand metric tons | 25,000 |
| Tin (Sn content) | do. | 90 |
| Tungsten (W content) | do. | 20 |

[e]Estimated.

# YUGOSLAVIA

**AREA 256,000 km²** **POPULATION 23.9 million**



THE MINERAL INDUSTRY OF

# YUGOSLAVIA

By Walter G. Steblez

In 1991, the Federal Republic of Yugoslavia experienced a severe crisis as the constituent Republics of Croatia and Slovenia actively began to seek independence from the Yugoslavian Federation. The rapid disintegration of the country, which began in June, resulted in a civil war that was fought throughout the last 6 months of 1991. Reportedly, the country's GDP for 1991 declined by 15% compared with that of 1990, while industrial production fell by 30% during this period. Yugoslavia continued to be one of Europe's leading mining and mineral processing areas with significant capacities in the nonferrous metals and industrial minerals sectors. Clearly, the outbreak of civil war between the seceding Republics of Croatia and Slovenia and the Federal Government as well as secessionist tendencies shown by some of the remaining Republics in the Yugoslav Federation had impacted negatively on the country's production of minerals. Also, concerns were raised regarding the possibility of physical destruction of industrial facilities in areas near the fighting.

## GOVERNMENT POLICIES AND PROGRAMS

At least through the first half of 1991, the Government of Yugoslavia continued reforms begun in 1990 to check the growth of inflation, promote currency convertibility, gradually decentralize the economy, and institute legal status for privatized and non-centrally planned forms of business activity. From July through the end of the year, the Government's energies and efforts were apparently absorbed by political upheavals in the country.

## PRODUCTION

Mineral production declined in all categories of activity in 1991, compared with output levels set in 1990. Official monthly reporting on industrial production results, including those of the mineral sector, was provided through July. Subsequent reports carried data without reporting input from the Republic of Croatia. The production data for 1991 was mostly estimated based on this information as well as on data from other sources that provided some final yearend totals for the country.

Table 1 provides production data that are consistent with those provided in previous Minerals Yearbook Volume III reports for Yugoslavia. Table 2 gives production data by Republic and as a percentage of the total output of the country for 1990, the last year that this type of information was readily available. *(See tables 1 and 2.)*

## TRADE

Yugoslavia's mineral trade in this report was compiled into nine tables from the country's latest available trade returns. Tables 3 and 4 provide a substantial portion of the country's (Serbia and Montenegro) trade returns for 1991 for major mineral commodities for both exports and imports, respectively. For 1990, tables 5 and 8 are compatible with historical trade data that have been provided for previous Minerals Yearbook Volume III reports for Yugoslavia. For 1990, additional data have been presented that give Yugoslavia's exports of mineral commodities after processing (table 6); that is, minerals acquired from abroad (table 10), or toll refined in Yugoslavia and reshipped to the country of origin. Similarly, Yugoslavia's exports for processing (table 7) are those mineral commodities shipped abroad for further processing or refining that would be returned to Yugoslavia for final disposition (table 9). *(See tables 3 through 10.)*

## STRUCTURE OF THE MINERAL INDUSTRY

Table 11 lists the administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1991. *(See table 11.)*

## COMMODITY REVIEW

### Metals

*Aluminum and Bauxite.*—Yugoslavia's bauxite mining, alumina refining, and aluminum smelting facilities were distributed throughout virtually the entire country. Energoinvest operated bauxite mines in the Republics of Bosnia and Hercegovina and Croatia. Rudnici Boksita, Niksic operated bauxite mines exclusively in Montenegro. Jadranski Aluminijum's (Jadral) operations were entirely in Croatia, and RB Kosovo Klina, entirely in Serbia. The total output of the latter operation has been exported because of the unsuitability of the bauxite for domestic refineries. Apart from the deposits exploited by RB Kosovo Klina, which contained a refractory-grade diaspore material, the balance of the country's monohydrate (boehmitic) bauxite deposits were suitable for metallurgical end use. These deposits were formed into lenticular or irregular-shaped bodies occurring in Triassic and Eocene carbonate rocks.

The mounting conflict in Yugoslavia in 1991 did not affect the country's

aluminum industry except at the end of the year when, reportedly, the Boris Kidric aluminum smelter at Sibenik in Croatia was damaged and remained closed through the end of 1991. Other primary smelters in Yugoslavia reportedly continued to operate at nearly full capacity. The conflict during the year, however, disrupted both road and rail freight transport and, to a lesser extent, cargo handling operations at the country's port facilities and, reportedly, had a negative impact on both domestic and foreign consumers.

Reportedly, a more efficient and environmentally safer electrolysis system supplied by Pechiney of France that would replace the system using Soderberg dead-burned electrodes was under construction at the Unial aluminum smelting facilities at Kidricevo in Slovenia. Also, during the year, the Boris Kidric aluminum smelter in Croatia was among several heavy industry facilities in Yugoslavia chosen by the U.S. Agency for International Development to receive financial assistance for the purchase of power conservation equipment that would reduce electric power consumption by 15%. Reportedly, the financial assistance package was to amount to about $30,000.

*Copper.*—The Republics of Serbia and Macedonia were Yugoslavia's only copper-producing areas. The largest producer, Rudarsko Topionicki Bazen's (RTB) Bor mining, beneficiation, and smelting complex in Serbia, accounted for almost 95% of the country's mine output of copper from its Bor, Majdanpek, and Veliki Krivelj open pit mines. A small amount of copper ore was mined and beneficiated at Bucim in Macedonia by Rabotna Organizacija za Rudarstvo i Metallurgija za Baker (RZB Bucim). Copper concentrates from RZB Bucim were smelted and refined at the Bor smelting and refining facilities.

In 1991, efforts to restructure the country's copper industry reportedly were made through the creation of a holding company that would oversee the operation of 18 separate enterprises within the industry and their eventual privatization. Other events in the copper industry included plans to closedown the older open pit operations at the RTB mining, beneficiation, and smelting complex in 1992. The development of the new 3-Mmt/a Cerovo copper mine was reportedly scheduled for completion at the end of 1992, and production would commence in 1993 with ore grading at about 1% Cu. Facility expansion at the Majdanpek copper mine in 1992 would raise copper ore output from 13.5 Mmt/a to 16 Mmt/a.

*Ferroalloys.*—The country's civil war disrupted several ferroalloy producers. Dalmacija Carbide and Ferro Alloy Works near Split in Croatia reported disruptions of production during the year. However, the extent of the production shortfall was not reported. In Slovenia, Tovarna Dusika Ruse (TDR) reported more severe disruptions at the ferroalloy works that produced ferrosilicon and both high- and low-carbon ferrochromium. The major difficulty at the TDR facility involved disruptions in the supply of quartz from quarries in the southern part of Yugoslavia for the production of ferrosilicon (17,000 mt/a). Reportedly, quartz mines local to the ferroalloy operation produced only nominal amounts of material, and these were insufficient to meet its needs. TDR officials also noted that apart from production problems caused by the war, depressed prices for ferrosilicon during the year contributed to the company's decreased exports to convertible currency areas.

In other developments, industry sources reported that Feni-Rudnici i Industrija za Nikel, Celik I Antimon (Feni), Macedonia's nickel mining and processing and ferronickel smelting complex, would restart nickel smelting and refining operations in late 1992 after an 8-year closure. Feni, restructured as a joint stock company renamed FeniMak-Kavadarci, reportedly planned to produce 7,120 mt/a of nickel metal for export. The cost of FeniMak's restructuring and modernization program was reported to have amounted to about $19.5 million.

*Gold.*—Yugoslavia has been a modest producer of gold, in large measure as a byproduct of processing domestic and some imported nonferrous metal ores. The sharp increase of gold production reported for 1990 and 1991 presumably reflected production from newly developed deposits of gold ore in Serbia such as Grabova Reka, Volujski Kluc, and Sveta Barbara.

*Iron and Steel.*—Despite considerable difficulties throughout the year associated with general political unrest, strikes, and civil war in the secessionist Republics of Croatia and Slovenia, Yugoslavia's steel industry, which was represented in every Yugoslav Republic, remained committed to greater integration and rationalization. In 1990, a major study of Yugoslavia's steel industry was undertaken by British Consulting Ltd. to rationalize the country's steel industry and raise its operation to Western European standards.

The study's recommendations included the creation of a single holding company to manage the denationalization of the steel industry, a reduction in the work force in the industry from 83,000 to 35,000, and investment of up to $500 million for modern technology and equipment. In June 1991, Yugoslavia's steel producers formed the Yugoslav Iron and Steel Federation (YISF), an independent association with headquarters in Belgrade. Reportedly, the YISF was organized in June as a limited liability company as a first step toward implementing some of the recommendations provided by the study of British Consulting Ltd. At yearend, Yugoslavia's steel industry, represented by YISF, attempted to maintain routine commercial activity within the country despite the dislocations from the war, which began in the second half of the year. Reportedly, steel mills in the Republics of Bosnia and Hercegovina, Macedonia, Montenegro, and Serbia sought to reestablish severed transportation lines with Austria and Italy by routing freight through Greece to the Port of Salonica. Conversely, formerly routine intra-Yugoslav steel trade between the Republics of Serbia and Slovenia was

reportedly achieved by routing freight through Hungary and Austria.

*Lead and Zinc.*—The dominant share of Yugoslavia's exploitable resources of lead and zinc (Pb-Zn) ore was located and worked in the Republics of Serbia and Macedonia. Serbia's share of the country's total mine production of ore constituted slightly more than 40% in 1991, while that of Macedonia was about 37% of the total.

Bosnia and Hercegovina produced about 17% of the country's total output of Pb-Zn ore, and relatively small amounts of ore were mined in Montenegro and Slovenia. Serbian and Macedonian deposits of Pb-Zn ore are of the hydrothermal metasomatic type in limestone and siliceous rocks. The irregular but compact ore bodies reportedly range in size from several thousand to several million tons. The Trepca deposit in the Kosovo Province of Serbia was the largest Pb-Zn deposit in Yugoslavia. Reportedly, since the mid-1960's, some Pb-Zn ores and concentrates had been imported to meet the needs of the country's smelters and refineries. Additionally, some of Yugoslavia's refinery capacity was used to toll refine lead for foreign consumers.

## Industrial Minerals

Yugoslavia produced a large number of industrial minerals that included barite, bentonite, gypsum, kaolin, magnesite, and pumice for domestic needs as well as exports.

*Magnesite.*—Yugoslavia was an important European producer of magnesite, ranked third after Greece and Spain. The country's operating deposits, all in Serbia, had the combined capacity to produce more than 400,000 mt/a of ore. The largest deposit was operated by Rudnik i Industrija Magnezita "Strezovce" at Beli Kamen. The lenticular ore deposit was measured up to 160 m in thickness, dipping northwest at angles between 40° and 60° with a northeast-southwest strike. The open pit mine was rated to produce 300,000 mt/a of magnesite.

Reportedly, late in the year, deteriorating market conditions and the availability of low-cost Soviet magnesite forced production cutbacks in Yugoslavia's magnesite mining and processing industry. Magnohrom announced a cutback of production at its Rudnik Magnezita "Magnezit" operation at Bela Stena by between 15% and 20%. According to company sources, the cutback was to extend into 1992. Additionally, repair and overhaul of equipment would be performed at the Bela Stena mining and processing operation during this period.

*Stone.*—In April, Yugoslav sources announced the discovery of a major basalt deposit at Kursumlija in Serbia. Exploitable basalt resources reportedly ranged from 25 Mmt to 30 Mmt. Basalt from these deposits would be designated for both the domestic construction industry and export.

## Mineral Fuels

*Coal.*—Reportedly, the Government of Yugoslavia and representatives of the International Bank for Reconstruction and Development (World Bank) conducted negotiations during the year concerning a loan from the World Bank to finance the development of a lignite mine at Tamnava West in Serbia. The project was to include the construction of a mine head thermal power station, technical assistance for powerplant modernization, and long-term lignite mine development in Serbia as well as a long-term regional air quality monitoring program.

In November, the World Bank reportedly approved this project and granted a loan to Yugoslavia to implement most of the programs described above. Upon completion, the proposed mine would produce 7 Mmt/a of lignite; the thermal powerplant would have a rating of 700 MW.

The forces pulling the country apart also disrupted the country's coal trade. Routine U.S. exports of metallurgical coking coal to Yugoslavia were put into abeyance during the second half of the year as the country's Federal authorities directed most of their efforts to put down insurrections, rather than find suitable payment instruments for the coal. In 1990, U.S. shipments of coking coal to Yugoslavia reportedly totaled about 1 Mmt.

*Nuclear Power.*—In mid-1991, the Republic of Slovenia decided to permanently close down the Zirovski Vrh uranium mine at Todraz, following the last shipment of 60 tons of yellowcake to the United States for processing. The Zirovski Vrh uranium mine, Yugoslavia's sole producer of uranium ore, reportedly ceased mine production in 1990 because of environmental concerns. Since then, 200 of the mining enterprise's 460 employees left to seek other employment. The regional Government during this period had not decided about the future status of the remaining employees at the mine. Uranium produced at Zirovski Vrh was consumed by the 650-MW Krsko nuclear powerplant in Slovenia, near the Croatian border. Reportedly, the Government of Slovenia also decided to decommission the nuclear powerplant by 1995, owing partly to difficulties associated with the disposition of nuclear waste.

## Reserves

In view of Yugoslavia's effort to transform its economy to a market-based system, the country's mineral resources 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 non-market economy countries, such as Yugoslavia, political rather than economic consideration was paramount in formulating policies for industrial development. Political directives to discover exploitable mineral resources may have resulted in possible overestimations and other distortions of collected field data. 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 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, $C_1$, and $C_2$, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade.

In category A the "reserves" are known in detail. The ore boundaries are outlined by trenching, exploratory workings, or exploratory boreholes. The depositional environment, the proportion of different commercial grades of ore, and the hydrogeological conditions of the exploitations have been ascertained. The quality and technological properties of the ore have been ascertained in detail, ensuring the reliability of projected beneficiation and production operations.

In category B, the "reserves" in place are explored. The ore bodies are outlined by exploratory workings or boreholes. The depositional environment is known, and the types and industrial grades of ore are ascertained but without details of their distribution. The quality and technological properties of the ore are known sufficiently well to ensure the correct choice of the system for its beneficiation. The general conditions of exploitation and the hydrogeological environment are known in good detail.

In category $C_1$, the "reserves" in place are estimated by a sparse grid of exploratory boreholes or workings. This category also includes "reserves" adjoining the boundaries of A and B categories of ore as well as "reserves" of very difficult deposits in which the distribution of the values of mineral cannot be determined even by a dense exploratory grid. The quality, types and industrial grades, and technology of beneficiation are ascertained tentatively by means of laboratory tests and analyses and by analogy with known deposits of the same type. The general conditions of exploitation and the hydrogeological environment are known tentatively.

The $C_2$ category includes those "reserves" in place that adjoin the explored "reserves" of A plus B plus $C_1$ categories as well as "reserves" indicated by geological and geophysical evidence and confirmed by boreholes. Taking this system into account, Yugoslavia's mineral resources in categories $A+B+C_1$ are given in table 3. *(See table 12.)*

## 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, 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 dwt. 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.

Tables 13 and 14 show the distribution of mineral exports and imports for 1990, respectively, by type of carriage and receiving-exporting areas. This was the last year for which this data presentation would be available. *(See tables 13 and 14.)*

## OUTLOOK

Yugoslavia as a geographic region is likely to remain an important European producer of minerals because of its long history of mining and the prospects of discovering new mineral deposits in significantly large areas that remain to be surveyed adequately. The political future of this region and the types of government structures that will emerge are difficult to foresee. However, Yugoslavia, or its political heirs, in common with other centrally planned economy countries, will require extensive modernization of its infrastructure, giving added value and importance to the construction materials and structural steels sectors in this region.

### OTHER SOURCES OF INFORMATION

**Agency**

Privredna Komora Jugoslavije
(Yugoslav Chamber of Economy)
11001 Belgrade, Terazije 15-23
P.O Box 1003
Savezni Geoloski Zavod (Federal Geological Institute)
Belgrade, Yugoslavia

**Publications**

Indeks (Index), published monthly.
Statisticki Godisnjak (Statistical Yearbook).
Nafta (Petroleum), published monthly.
Celik (Steel), published monthly.

TABLE 1

## YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite | thousand tons | 3,394 | 3,034 | 3,252 | 2,952 | 2,850 |
| Alumina | do. | 1,113 | 1,060 | 1,170 | 1,086 | 1,000 |
| Metal ingot: | | | | | | |
| Primary | | 244,000 | 260,120 | 330,535 | 349,087 | 334,000 |
| Remelted[3] | | 37,084 | 53,229 | 643 | 342 | 1,000 |
| Total | | 281,084 | 313,349 | 331,178 | 349,429 | 335,000 |
| Antimony: | | | | | | |
| Mine and concentrator output: | | | | | | |
| Ore, gross weight | | 48,449 | 37,903 | 42,530 | 19,715 | — |
| Sb content of ore | | 834 | 725 | 798 | 409 | — |
| Concentrate, gross weight | | 1,227 | 1,105 | 1,259 | 530 | — |
| Metal (regulus) | | 1,002 | 1,145 | 1,081 | 248 | 19 |
| Bismuth, smelter output | | 73 | 23 | 40 | 85 | 70 |
| Cadmium, smelter output | | 305 | 405 | 471 | 362 | 280 |
| Chromite: Mine and concentrator output: | | | | | | |
| Ore, gross weight | | 13,172 | 11,538 | 12,721 | 10,843 | 10,000 |
| Concentrate (produced largely from imported ores) | | 59,482 | 46,063 | 36,263 | 33,668 | 33,000 |
| Copper: | | | | | | |
| Mine and concentrator output: | | | | | | |
| Ore, gross weight | thousand tons | 27,745 | 30,056 | 30,078 | 30,169 | 29,610 |
| Cu content of ores | | 130,470 | 103,523 | 138,931 | 140,145 | 140,000 |
| Concentrate, gross weight | | 513,971 | 560,192 | 578,000 | 578,434 | 555,000 |
| Metal: | | | | | | |
| Blister and anodes: | | | | | | |
| Primary | | 103,399 | 106,457 | 101,606 | 105,908 | 100,000 |
| Remelted[3] | | 62,384 | 65,519 | 71,394 | 68,349 | 55,000 |
| Total | | 165,783 | 171,976 | 173,000 | 174,257 | 155,000 |
| Refined: | | | | | | |
| Primary | | 98,805 | 105,595 | 101,877 | 102,221 | 100,000 |
| Remelted[3] | | 40,062 | 39,781 | 49,158 | 49,174 | 34,000 |
| Total | | 138,867 | 145,376 | 151,035 | 151,395 | 134,000 |
| Gold, refined | kilograms | 5,348 | 4,620 | 3,741 | 8,190 | 7,500 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | thousand tons | 5,983 | 5,545 | 5,081 | 4,132 | 'r2,574 |
| Fe content | do. | 1,764 | 1,844 | 1,305 | 1,578 | 850 |
| Iron concentrate, gross weight | do. | 3,247 | 3,332 | 3,170 | 2,750 | 1,700 |
| Metal: | | | | | | |
| Pig iron | do. | 2,867 | 2,916 | 2,896 | 2,313 | 1,258 |
| Ferroalloys: | | | | | | |
| Ferrochromium | | 56,276 | 93,349 | 90,428 | 82,687 | 55,000 |
| Ferromanganese | | 38,041 | 45,078 | 33,868 | 31,822 | 22,000 |

See footnotes at end of table.

TABLE 1—Continued

## YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Iron and steel—Continued: | | | | | | |
| Metal—Continued: | | | | | | |
| Ferroalloys—Continued: | | | | | | |
| Ferronickel | | 9,556 | 15,047 | 17,102 | 11,850 | 8,000 |
| Ferrosilicocalcium | | 487 | 772 | 144 | 835 | 500 |
| Ferrosilicochromium | | 6,240 | 3,668 | 3,815 | 4,199 | 3,000 |
| Ferrosilicomanganese | | 42,528 | 46,804 | 52,588 | 60,601 | 40,000 |
| Ferrosilicon | | 98,843 | 120,522 | 122,179 | 103,188 | 70,000 |
| Silicon metal | | 31,915 | 25,830 | 15,897 | 12,661 | 9,000 |
| Other | | 7,584 | 10,678 | 11,199 | 10,462 | 7,500 |
| Total | | 291,470 | 361,748 | 347,220 | 318,305 | 215,000 |
| Crude steel: | | | | | | |
| From oxygen converters | thousand tons | 1,715 | 1,913 | 1,934 | 1,715 | 1,100 |
| From Siemens-Martin furnaces | do. | 1,301 | 1,158 | 1,100 | 793 | 300 |
| From electric furnaces | do. | 1,351 | 1,416 | 1,466 | 1,101 | 776 |
| Total | do. | 4,367 | 4,487 | 4,500 | 3,609 | [4]2,176 |
| Semimanufactures | do. | 6,260 | 6,066 | 6,164 | 4,893 | 3,500 |
| Lead: | | | | | | |
| Mine and concentrator output: | | | | | | |
| Ore, gross weight (lead-zinc ore) | do. | 3,908 | 3,847 | 4,005 | 3,675 | 3,100 |
| Pb content of ores | | 106,670 | 103,286 | 107,611 | 99,148 | 84,000 |
| Concentrate, gross weight | | 109,119 | 104,596 | 105,271 | 96,890 | 82,000 |
| Metal: | | | | | | |
| Smelter: | | | | | | |
| Primary | | 118,185 | 121,607 | 110,670 | 90,183 | 60,000 |
| Secondary[5] | | 28,423 | 30,430 | 30,641 | 35,888 | 30,000 |
| Total | | 146,608 | 152,037 | 141,311 | 126,071 | 90,000 |
| Refined: | | | | | | |
| Primary, for domestic use and export | | 76,417 | 70,888 | 99,616 | 82,000 | [4]69,186 |
| Secondary[e] | | 36,000 | 39,000 | 18,000 | 17,000 | 15,000 |
| Total | | 112,417 | 109,888 | 117,616 | [e]99,000 | 84,186 |
| Magnesium metal | | 5,932 | 6,176 | 6,105 | 5,788 | 6,000 |
| Manganese ore: | | | | | | |
| Gross weight | | 41,297 | 40,100 | 38,920 | 50,863 | 40,000 |
| Mn content | | 14,452 | 14,036 | 13,622 | 17,802 | 14,000 |
| Mercury | kilograms | 67,016 | 69,980 | 51,000 | 37,000 | 35,000 |
| Nickel:[e] | | | | | | |
| Mine output: | | | | | | |
| Ore, gross weight | thousand tons | 280 | 280 | 290 | 270 | 270 |
| Ni content of ore | | 3,900 | 3,900 | 4,000 | 3,800 | 2,800 |
| Concentrate | | 200,000 | 200,000 | 200,000 | 200,000 | 100,000 |
| Metal: Ferronickel, Ni content | | 2,500 | 4,000 | 5,100 | 3,600 | 2,400 |

See footnotes at end of table.

TABLE 1—Continued

## YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| METALS—Continued | | | | | | |
| Platinum-group metals: | | | | | | |
| Palladium | kilograms | 132 | 142 | — | r130 | 130 |
| Platinum | do. | 24 | 23 | 23 | 21 | 20 |
| Selenium metal, refined | do. | 66,362 | 60,812 | 55,241 | 59,181 | 55,000 |
| Silver metal, refined including secondary | thousand kilograms | 165 | 139 | 127 | 105 | 90 |
| Uranium: | | | | | | |
| Mine output | | 110,011 | 107,365 | 125,995 | 80,457 | — |
| Concentrate | | 83 | 93 | 101 | 58 | — |
| $U_3O_8$ content[e] | | 58 | 65 | e71 | 40 | — |
| Zinc: | | | | | | |
| Zn content of lead and zinc ore | | 87,352 | 91,175 | 94,739 | 83,788 | 69,000 |
| Concentrator output, gross weight | | 118,904 | 117,565 | 115,520 | 108,833 | 90,000 |
| Smelter, primary | | 51,320 | 56,316 | 55,900 | 56,734 | 50,000 |
| Refined, primary and secondary: | | | | | | |
| Smelter | | 9,684 | 11,234 | 12,089 | 18,252 | e7,372 |
| Electrolytic | | 108,383 | 116,290 | 88,450 | 95,453 | 70,900 |
| Total | | 118,067 | 127,524 | 100,539 | 113,705 | 78,272 |
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos, all kinds | | 10,964 | 17,030 | 9,111 | 6,578 | 5,500 |
| Barite concentrate | | 19,270 | 23,350 | 30,509 | 23,601 | 20,000 |
| Cement, hydraulic | thousand tons | 8,963 | 8,840 | 8,657 | 7,954 | 7,100 |
| Clays: | | | | | | |
| Bentonite | | 154,288 | 125,069 | 128,593 | 102,681 | 80,000 |
| Ceramic clay, crude | | 287,887 | 283,689 | 292,784 | 213,302 | 165,000 |
| Fire clay: | | | | | | |
| Crude | | 174,124 | 155,718 | 164,076 | 114,797 | 75,000 |
| Calcined | | 42,092 | 28,188 | 30,760 | 20,291 | 16,600 |
| Kaolin | | 218,851 | 218,673 | 260,141 | 198,513 | 160,000 |
| Feldspar, crude | | 44,912 | 35,614 | 42,246 | r43,650 | 40,000 |
| Gypsum: | | | | | | |
| Crude | | 553,372 | 555,231 | 545,542 | 534,644 | 400,000 |
| Calcined | | 75,396 | 81,245 | 67,130 | 56,591 | 46,000 |
| Lime: | | | | | | |
| Quicklime | thousand tons | 1,790 | 1,268 | 1,625 | 1,453 | 1,300 |
| Hydrated | do. | 708 | 725 | 782 | 670 | 500 |
| Total | do. | 2,498 | 1,993 | 2,407 | 2,123 | 1,800 |
| Magnesite: | | | | | | |
| Crude | | 402,976 | 382,606 | 292,302 | 194,119 | 175,000 |
| Sintered | | 149,000 | 136,746 | 144,218 | 125,440 | 110,000 |
| Caustic calcined | | 10,217 | 11,113 | 11,682 | 9,257 | 8,000 |
| Mica, all grades | | 250 | 807 | 794 | 802 | 800 |
| Nitrogen: N content of ammonia | thousand tons | 937 | 858 | 680 | 549 | 550 |

See footnotes at end of table.

TABLE 1—Continued

## YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS—Continued | | | | | | |
| Pumice and related volcanic materials: | | | | | | |
| Volcanic tuff | | 423,917 | 407,988 | 431,444 | 418,123 | 380,000 |
| Quartz, quartzite, glass sand: | | | | | | |
| Quartz and quartzite | thousand tons | 260 | 226 | 183 | 172 | 150 |
| Glass sand | do. | 2,258 | 1,798 | 3,143 | 2,448 | 2,100 |
| Total | do. | 2,518 | 2,024 | 3,326 | 2,620 | 2,250 |
| Salt: | | | | | | |
| Marine | | 64,672 | 58,286 | 59,512 | 71,345 | 50,000 |
| From brines | | 282,650 | 200,276 | 184,461 | 204,213 | 250,000 |
| Rock | | 153,064 | 126,650 | 133,597 | 99,747 | 90,000 |
| Total | | 500,386 | 385,212 | 377,570 | 375,305 | 390,000 |
| Sand and gravel excluding glass sand | thousand cubic meters | 19,778 | 19,710 | 21,066 | 17,150 | 16,300 |
| Sodium compounds: | | | | | | |
| Soda ash | | 201,539 | 213,891 | 204,050 | 173,158 | 140,000 |
| Sodium bicarbonate | | 19,844 | 18,016 | 19,633 | 15,748 | 15,000 |
| Sodium sulfate | | 37,556 | 41,479 | 50,533 | 37,953 | 35,000 |
| Stone excluding quartz and quartzite: | | | | | | |
| Dimension: | | | | | | |
| Crude: | | | | | | |
| Ornamental | cubic meters | 97,619 | e100,000 | 198,684 | 93,978 | 90,000 |
| Other | do. | 1,585 | e1,500 | 4,204 | 2,613 | 1,500 |
| Partly worked facing | thousand square meters | 3,059 | 3,253 | 3,264 | 3,229 | 2,500 |
| Cobblestones, curbstones, other | thousand cubic meters | 4,846 | e5,000 | 163 | 11 | 15 |
| Dolomite | thousand tons | 645 | 709 | 960 | 804 | 800 |
| Limestone[e] | do. | r7,771 | 8,000 | 8,500 | 8,500 | 7,500 |
| Crushed and broken, n.e.s. | thousand cubic meters | 2,861 | 2,833 | 3,426 | 2,912 | 2,000 |
| Milled marble and other | do. | 4,486 | e5,000 | 7,333 | 6,729 | 5,500 |
| Sulfur, pyrite and pyrrhotite: | | | | | | |
| Pyrite, gross weight | thousand tons | 609 | e610 | 697 | 522 | 145 |
| Pyrrhotite, gross weight | do. | e5 | e6 | 6 | 6 | 5 |
| Sulfur: | | | | | | |
| Sulfur content of pyrite[6] | do. | 256 | e250 | 293 | 219 | 61 |
| Sulfur content of pyrrhotite[6] | do. | 2 | e2 | 3 | e3 | 3 |
| Byproduct: | | | | | | |
| Of metallurgy[e] | do. | 175 | 170 | 175 | 175 | 175 |
| Of petroleum[e] | do. | 3 | e3 | 4 | 3 | 3 |
| Total[e] | do. | r436 | 425 | 475 | 400 | 242 |
| Talc: | | | | | | |
| Crude | | 30,993 | 29,204 | 26,614 | 20,069 | 20,000 |
| Washed | | 28,440 | 27,566 | 24,590 | 17,984 | 17,000 |

See footnotes at end of table.

TABLE 1—Continued

## YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity[2] | | 1987 | 1988 | 1989 | 1990 | 1991[e] |
|---|---|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Carbon black | | 35,078 | 34,797 | 37,505 | 30,624 | 15,000 |
| Coal: | | | | | | |
| Bituminous | thousand tons | 379 | 362 | 293 | 292 | 280 |
| Brown | do. | 12,135 | 11,877 | 10,314 | 12,029 | 8,700 |
| Lignite | do. | 59,359 | 60,352 | 59,896 | 64,054 | 57,000 |
| Total | do. | 71,873 | 72,591 | 70,503 | 76,375 | 65,980 |
| Coke: | | | | | | |
| Metallurgical | do. | 2,570 | 2,827 | 2,955 | 1,965 | 910 |
| Breeze | do. | 220 | 280 | 188 | 183 | 110 |
| Foundry | do. | 170 | 151 | 143 | 128 | 80 |
| Total | do. | 2,960 | 3,258 | 3,286 | 2,276 | 1,100 |
| Gas: | | | | | | |
| Manufactured (excluding petroleum refinery gas): | | | | | | |
| From coke plants | cubic meters | 1,527,961 | e1,480,000 | 1,127,802 | 796,946 | 600,000 |
| From lignite gasification plants | do. | 29,028 | e70,000 | 18,300 | 18,300 | 17,000 |
| Natural, gross production | do. | 3,601,181 | 3,760,097 | 2,884,172 | 2,658,922 | 2,400,000 |
| Natural gas plant liquids: Propane and butane | thousand 42-gallon barrels | 1,173 | 940 | 1,045 | 1,126 | 900 |
| Petroleum: | | | | | | |
| Crude: | | | | | | |
| As reported | thousand tons | 3,867 | 3,681 | 3,396 | 3,145 | 2,900 |
| Converted | thousand 42-gallon barrels | 28,685 | 27,305 | 25,191 | 23,330 | 21,500 |
| Refinery products: | | | | | | |
| Liquefied petroleum gas | do. | 4,424 | e4,000 | 4,219 | 4,431 | 3,200 |
| Gasoline | do. | 34,075 | 35,436 | 56,400 | 62,612 | 49,000 |
| White spirit | do. | 119 | e100 | 144 | 133 | 100 |
| Jet fuel | do. | 2,824 | 2,602 | 2,263 | 2,439 | 1,900 |
| Kerosene | do. | 204 | e200 | 213 | 272 | 200 |
| Diesel | do. | 28,062 | 30,288 | 25,009 | 25,039 | 19,000 |
| Paraffin | do. | 227 | e200 | 223 | 234 | 160 |
| Middle distillate fuel oil | do. | 1,218 | e1,200 | 44,837 | 45,670 | 37,000 |
| Lubricants | do. | 4,830 | 4,802 | 5,102 | 4,799 | 4,000 |
| Residual fuel oil | do. | 39,423 | 40,772 | e40,000 | e40,000 | 35,000 |
| Asphalt and bitumen | do. | 3,776 | 3,580 | 3,834 | 3,386 | 2,000 |
| Petroleum coke | do. | 318 | e300 | 369 | 388 | 300 |
| Other | do. | 2,153 | e2,000 | 3,940 | 3,666 | 3,200 |
| Total | do. | 121,653 | 125,480 | 86,553 | 193,069 | 155,060 |

[e]Estimated. [r]Revised.

[1]Table includes data available through Dec. 1992.

[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]Includes undetermined quantity of secondary raw material.

[4]Reported figure.

[5]Calculated as the difference between reported total and reported primary figure.

[6]Calculated from pyrite and pyrrhotite concentrate using 42% as average sulfur content.

TABLE 2

## YUGOSLAVIA: SHARE OF SELECTED MINERAL PRODUCTION, BY FEDERAL REPUBLIC, FOR 1990

(Percentage)

| Commodity | Republic | | | | | |
|---|---|---|---|---|---|---|
| | Bosnia and Hercegovina | Croatia | Macedonia | Montenegro | Serbia | Slovenia |
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite | 57.7 | 10.5 | — | 30.2 | 1.6 | — |
| Alumina | 68.2 | — | — | 24.9 | — | 6.9 |
| Metal, primary | 25.6 | 22.2 | 1.6 | 23.1 | — | 28.5 |
| Antimony | — | — | — | — | 100.0 | — |
| Copper: | | | | | | |
| Ore and concentrate | — | — | 12.3 | — | 87.7 | — |
| Metal, refined | — | — | — | — | 100.0 | — |
| Gold | — | — | — | — | 99.8 | (1) |
| Iron ore | 98.9 | — | 1.1 | — | — | — |
| Lead and zinc ore | 16.5 | — | 36.9 | 2.6 | 40.2 | 3.7 |
| Lead: | | | | | | |
| Smelter | (1) | — | 25.6 | — | 55.4 | 18.8 |
| Refined | — | — | 26.7 | — | 58.5 | 14.8 |
| Mercury | — | — | — | — | — | 100.0 |
| Silver | — | 2.4 | 14.7 | — | 81.6 | 1.4 |
| Steel, crude: | | | | | | |
| Oxygen converter | 52.9 | — | — | 3.8 | 43.3 | — |
| Open hearth | 61.8 | 31.9 | — | — | 6.3 | — |
| Electric furnace | 2.8 | 15.5 | 16.5 | 19.4 | .6 | 45.8 |
| Zinc: | | | | | | |
| Smelter, secondary | — | — | 100.0 | — | — | — |
| Refined | — | — | 45.3 | — | 53.4 | .7 |
| INDUSTRIAL MINERALS | | | | | | |
| Asbestos | 80.5 | — | — | — | 19.5 | — |
| Barite | 92.1 | 7.9 | — | — | — | — |
| Bentonite | — | 29.4 | 65.3 | (1) | 4.9 | — |
| Cement | 10.0 | 33.0 | 8.1 | — | 34.4 | 14.4 |
| Dolomite | 30.9 | — | 58.1 | — | 10.9 | — |
| Gypsum | 62.7 | 18.6 | 10.2 | — | 8.5 | — |
| Kaolin | 21.4 | — | — | — | 71.8 | 6.8 |
| Magnesite | 4.4 | — | — | — | 95.6 | — |
| Pumice | — | — | 48.7 | — | 35.8 | 15.6 |
| Salt, rock and brines | 100.0 | — | — | — | — | — |
| FUELS | | | | | | |
| Coal: | | | | | | |
| Bituminous | — | 53.0 | — | — | 47.0 | — |
| Brown | 82.8 | (1) | — | (1) | 5.4 | 11.4 |
| Lignite | 13.3 | — | 10.4 | 2.6 | 67.1 | 6.6 |
| Natural gas | — | 74.8 | — | — | 24.3 | .9 |
| Petroleum | — | 66.1 | — | — | 33.8 | (1) |

[1]Less than zero.

Source: Industrijsko Proizvodnja, 1990.

TABLE 3

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1991 | Destinations, 1991 | |
|---|---|---|---|
| | | United States | Other (principal) |
| **METALS** | | | |
| Aluminum: | | | |
| Ore and concentrate | 241,280 | — | Romania 170,368; Czechoslovakia 69,691; Liechtenstein 1,221. |
| Metal including alloys: | | | |
| Scrap | 370 | — | Italy 233; Austria 71; Germany 66. |
| Unwrought | 56,338 | — | Italy 43,875; Netherlands 5,687; Bulgaria 2,634. |
| Semimanufactures | 15,579 | 2,907 | Germany 5,783; Switzerland 2,782; Czechoslovakia 1,189. |
| Antimony: Metal including alloys, all forms | 100 | — | Netherlands 56; France 44. |
| Cobalt: Metal including alloys, all forms | 2 | — | All to Germany. |
| Copper: | | | |
| Ore and concentrate | 1 | (2) | Mainly to United Kingdom. |
| Matte and speiss including cement copper | 522 | — | All to Belgium-Luxembourg. |
| Sulfate | 4,134 | 72 | Equatorial Guinea 1,000; Belgium-Luxembourg 740; Hungary 730. |
| Metal including alloys: | | | |
| Scrap | 829 | — | Mainly to Italy. |
| Unwrought | 72,860 | 5,030 | Italy 43,978; United Kingdom 7,463; Bulgaria 5,643. |
| Semimanufactures | 32,677 | 3,604 | United Kingdom 4,174; U.S.S.R. 3,719; Italy 3,352. |
| Gold: Metal including alloys, unwrought and partly unwrought value, thousands | $259,614 | $96,847 | Germany $85,356; Bulgaria $56,589; United Kingdom $12,148. |
| Iron and steel: | | | |
| Iron ore and concentrate: | | | |
| Excluding roasted pyrite | 144 | — | All to Switzerland. |
| Pyrite, roasted | 44,972 | — | Hungary 30,419; Germany 14,533. |
| Metal: | | | |
| Scrap | 34,910 | — | Italy 30,044; Hungary 3,660; Germany 1,162. |
| Pig iron, cast iron, related materials | 22 | — | All to Italy. |
| Ferroalloys: | | | |
| Ferronickel | 11,622 | — | Germany 9,187; Belgium-Luxembourg 946; Sweden 589. |
| Unspecified | 59 | — | All to Austria. |
| Steel, primary forms | 15,898 | — | Italy 6,274; Turkey 4,831; Germany 2,931. |
| Semimanufactures: | | | |
| Flat-rolled products: | | | |
| Of iron or nonalloy steel: | | | |
| Not clad, plated, coated | 507,897 | — | U.S.S.R. 141,024; Italy 104,870; Turkey 102,315. |
| Clad, plated, coated | 28,970 | — | Italy 17,022; Austria 3,110; Greece 2,981. |
| Of alloy steel | 42 | — | Germany 20; U.S.S.R. 13; Albania 9. |
| Bars, rods, angles, shapes, sections | 30,755 | — | United Kingdom 6,732; Italy 4,120; Iran 3,323. |
| Rails and accessories | 283 | — | Greece 116; Poland 107; Bulgaria 43. |
| Wire | 4,966 | — | Germany 1,960; Austria 1,472; Italy 729. |
| Tubes, pipes, fittings | 36,253 | — | Germany 15,288; Greece 5,302; Italy 4,907. |
| Lead: | | | |
| Ore and concentrate | 5,639 | — | All to Italy. |
| Oxides | 2 | — | Mainly to Greece. |
| Metal including alloys: | | | |
| Unwrought | 13,159 | — | Czechoslovakia 2,520; Italy 2,449; Germany 2,311. |
| Semimanufactures | 218 | — | Cuba 116; Italy 62; Greece 31. |

See footnotes at end of table.

TABLE 3—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1991 | Destinations, 1991 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Magnesium: Metal including alloys, unwrought | | 4,516 | 73 | Germany 1,720; Austria 765; Japan 685. |
| Mercury | value, thousands | $129 | — | Switzerland $55; Bulgaria $53; Hungary $21. |
| Nickel: Metal including alloys: | | | | |
| Scrap | | 121 | — | France 101; Germany 20. |
| Semimanufactures | | 2 | — | Mainly to Germany. |
| Selenium, elemental | | 60 | — | Netherlands 30; United Kingdom 30. |
| Silver: Metal including alloys, unwrought and partly wrought | value, thousands | $6,028 | $17 | Switzerland $2,162; Germany $1,605; United Kingdom $1,014. |
| Tin: Metal including alloys: | | | | |
| Unwrought | do. | $506 | — | Romania $448; U.S.S.R. $57. |
| Semimanufactures | do. | $21 | — | U.S.S.R. $14; Ghana $5; Mongolia $1. |
| Zinc: Metal including alloys: | | | | |
| Scrap | do. | $17 | — | All to Germany. |
| Unwrought | | 8,630 | — | Italy 4,587; Hungary 2,037; Switzerland 1,001. |
| Semimanufactures[3] | | 647 | — | Czechoslovakia 317; Hungary 88; France 73. |
| Other: | | | | |
| Oxides and hydroxides | | 637 | — | Sweden 620; Czechoslovakia 17. |
| Ashes and residues | | 236 | — | Italy 163; Germany 71; France 2. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Dust and powder of precious and semiprecious stones including diamond, | value, thousands | $397 | — | All to United Kingdom. |
| Grinding and polishing wheels and stones | | 31 | 5 | Bulgaria 14; Hungary 5; U.S.S.R. 5. |
| Asbestos, crude | | 1 | — | Mainly to U.S.S.R. |
| Cement | | 14,764 | — | Austria 13,712; Germany 807; U.S.S.R. 239. |
| Chalk | value, thousands | $12 | — | U.S.S.R. $9; Poland $2. |
| Clays, crude: | | | | |
| Bentonite | | 229 | — | U.S.S.R. 190; Tunisia 39. |
| Kaolin | | 1 | — | Mainly to U.S.S.R. |
| Fire clay and unspecified clays | | 18 | — | All to Germany. |
| Fertilizer materials: Manufactured: | | | | |
| Ammonia | | 4,001 | — | Germany 4,000; Libya 1. |
| Nitrogenous | | 74,203 | — | Germany 69,805; Austria 4,298; Hungary 99. |
| Phosphatic | | 10,502 | — | Czechoslovakia 5,155; Germany 2,712; Austria 1,809. |
| Unspecified and mixed | | 234,216 | — | Germany 90,291; Nigeria 80,018; Austria 28,090. |
| Graphite, natural | value, thousands | $9 | — | All to U.S.S.R. |
| Gypsum and plaster | | 327 | — | Do. |
| Lime | | 41 | — | U.S.S.R. 35; Greece 6. |
| Magnesium compounds: | | | | |
| Magnesite, crude | value, thousands | $1 | — | All to Germany. |
| Oxides and hydroxides | | 6,197 | — | Italy 5,770; Romania 289; U.S.S.R. 120. |
| Mica: Crude including splittings and waste | | 1,590 | — | Bulgaria 1,502; Greece 88. |

See footnotes at end of table.

TABLE 3—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1991 | Destinations, 1991 | |
|---|---|---|---|
| | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | |
| Precious and semiprecious stones other than diamond value, thousands | $6 | — | All to Sweden. |
| Pyrite, unroasted | 20,196 | — | All to Germany. |
| Salt and brine | 44 | — | Bulgaria 42; Hungary 1; Mongolia 1. |
| Sodium compounds, n.e.s.: Sulfate, manufactured | 2,680 | — | Germany 1,575; Greece 480; Bulgaria 365. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 2,697 | — | Austria 2,000; Italy 314; Czechoslovakia 200. |
| Worked | 4,494 | — | Germany 2,770; Austria 1,005; U.S.S.R. 326. |
| Gravel and crushed rock | 20,013 | — | Hungary 19,822; U.S.S.R. 174; Germany 17. |
| Sand other than metal-bearing | 2,310 | — | Greece 1,767; Albania 540; U.S.S.R. 2. |
| Sulfuric acid | 11,524 | — | Bulgaria 11,455; Austria 58; Libya 10. |
| Vermiculite | 35 | — | All to U.S.S.R. |
| Other: | | | |
| Crude | 90 | — | France 82; U.S.S.R. 8. |
| Slag and dross, not metal-bearing | 651 | — | All to Italy. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 30 | — | All to Belgium-Luxembourg. |
| Coal: Lignite including briquets | 70,405 | — | Romania 70,357; Albania 48. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 3,260 | — | Greece 1,646; Romania 1,609. |
| Refinery products: | | | |
| Liquefied petroleum gas do. | 101 | — | Italy 50; Romania 41; U.S.S.R. 6. |
| Gasoline do. | 271 | (2) | Austria 189; Hungary 65; Germany 6. |
| Kerosene and jet fuel do. | 102 | 7 | U.S.S.R. 29; France 15; Sweden 7. |
| Distillate fuel oil do. | 21 | — | Mainly to Germany. |
| Lubricants do. | 833 | — | Austria 706; Hungary 46; Indonesia 46. |
| Bitumen and other residues do. | 22 | — | Italy 17; Austria 5. |
| Bituminous mixtures do. | 7 | — | Mainly to Austria. |

NA Not available.

[1]Table prepared by Ronald L. Hatch. This table presents the mineral exports of the Republics of Serbia and Montenegro. These data are not comparable to previous presentations of the former country of Yugoslavia, which included the former Republics of Bosnia and Herzegovina, Croatia, Slovenia, and Macedonia.

[2]Less than 1/2 unit.

[3]May include blue powder.

TABLE 4

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1991 | Sources, 1991 | |
|---|---|---|---|
| | | United States | Other (principal) |
| **METALS** | | | |
| Aluminum: | | | |
| Ore and concentrate | 22,545 | — | Guyana 10,054; China 9,423; Italy 2,820. |
| Oxides and hydroxides | 433 | 14 | Germany 413; Italy 5. |
| Metal including alloys: | | | |
| Unwrought | 12,011 | 22 | U.S.S.R. 10,953; Hungary 504; Italy 275. |
| Semimanufactures | 8,699 | 1,145 | Germany 2,411; U.S.S.R. 2,012; Hungary 1,948. |
| Antimony: Metal including alloys, all forms | 10 | — | All from Italy. |
| Arsenic: Oxides and acids | 69 | — | Belgium-Luxembourg 52; Germany 15; Austria 2. |
| Chromium: | | | |
| Ore and concentrate | 19,389 | — | Albania 15,092; Turkey 4,297. |
| Oxides and hydroxides | 137 | — | Poland 40; Austria 24; United Kingdom 20. |
| Metal including alloys, all forms | 1 | — | Mainly from United Kingdom. |
| Cobalt: | | | |
| Oxides and hydroxides | 3 | — | United Kingdom 2; Germany 1. |
| Metal including alloys, all forms | 7 | — | Austria 9; Germany 6; France 2. |
| Copper: | | | |
| Sulfate | 4,411 | — | U.S.S.R. 4,228; Austria 183. |
| Metal including alloys: | | | |
| Scrap | 73 | — | Switzerland 32; Germany 25; U.S.S.R. 16. |
| Unwrought | 8,565 | — | Chile 3,240; U.S.S.R. 1,735; Zaire 1,038. |
| Semimanufactures | 8,304 | (2) | U.S.S.R. 4,042; Poland 2,460; Egypt 506. |
| Gold: Metal including alloys, unwrought and partly wrought value, thousands | $2,915 | $2,896 | Germany $14; Austria $3. |
| Iron and steel: | | | |
| Iron ore and concentrate excluding roasted pyrite | 293,903 | — | U.S.S.R. 160,736; Peru 133,167. |
| Metal: | | | |
| Scrap | 53,055 | — | U.S.S.R. 25,669; Germany 13,653; Poland 6,929. |
| Pig iron, cast iron, related materials | 14,364 | — | U.S.S.R. 7,527; Poland 3,331; Germany 2,015. |
| Ferroalloys: | | | |
| Ferrochromium | 987 | — | Austria 698; Germany 208. |
| Ferromanganese | 1,078 | — | Germany 474; Switzerland 250; Austria 217. |
| Ferrosilicon | 1,662 | — | Germany 481; Norway 716; Austria 157. |
| Unspecified | 175 | — | Netherlands 60; Germany 59; France 36. |
| Steel, primary forms | 137,112 | — | Czechoslovakia 69,799; U.S.S.R. 57,402; Hungary 9,867. |
| Semimanufactures: | | | |
| Flat-rolled products: | | | |
| Of iron or nonalloy steel: | | | |
| Not clad, plated, coated | 86,087 | — | Czechoslovakia 19,604; Romania 18,268; Germany 15,209. |
| Clad, plated, coated | 20,685 | — | Germany 8,526; Czechoslovakia 6,417; France 3,232. |
| Of alloy steel | 7,764 | (2) | France 3,445; Germany 2,478; Italy 668. |
| Bars, rods, angles, shapes, sections | 57,859 | 120 | Romania 24,320; Czechoslovakia 20,795; U.S.S.R. 3,301. |
| Rails and accessories | 1,452 | — | Poland 654; Austria 599; Bulgaria 189. |
| Wire | 4,615 | — | Germany 1,523; Belgium-Luxembourg 829; Romania 766. |
| Tubes, pipes, fittings | 11,422 | 4 | Germany 2,396; France 2,068; Austria 1,756. |

See footnotes at end of table.

TABLE 4—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1991 | Sources, 1991 | |
|---|---|---|---|
| | | United States | Other (principal) |
| **METALS—Continued** | | | |
| Lead: | | | |
| Ore and concentrate | 1,088 | — | Greece 1,086; France 2. |
| Oxides | 1,557 | — | Austria 1,392; Bulgaria 142; Netherlands 21. |
| Metal including alloys: | | | |
| Scrap | 744 | — | Hungary 616; Germany 104; U.S.S.R. 24. |
| Unwrought | 2,267 | — | Bulgaria 903; Poland 599; U.S.S.R. 411. |
| Magnesium: Metal including alloys: | | | |
| Scrap | 113 | — | Mainly from U.S.S.R. |
| Semimanufactures | 7 | — | Austria 5; Switzerland 2. |
| Manganese: | | | |
| Oxides | 251 | — | France 236; Germany 13; Austria 10. |
| Metal including alloys, all forms | 173 | — | United Kingdom 96; Netherlands 42; China 35. |
| Mercury | (2) | — | Mainly from Austria. |
| Molybdenum: Metal including alloys, semimanufactures | 2 | — | Austria 1; Belgium-Luxembourg 1. |
| Nickel: Metal including alloys, semimanufactures | 147 | — | United Kingdom 76; Germany 45; U.S.S.R. 20. |
| Rare-earth metals including alloys, all forms | 86 | — | All from U.S.S.R. |
| Silver: Metal including alloys, unwrought and partly wrought value, thousands | $99 | — | Italy $80; Germany $11; France $4. |
| Tin: Metal including alloys: | | | |
| Unwrought | 206 | — | Malaysia 105; Germany 57; Mali 20. |
| Semimanufactures | 1 | — | Mainly from Germany. |
| Titanium: | | | |
| Oxides | 336 | — | Czechoslovakia 120; Poland 100; Germany 99. |
| Metal including alloys, semimanufactures | 56 | (2) | U.S.S.R. 45; Italy 10. |
| Tungsten: Metal including alloys, semimanufactures | 1 | — | Mainly from Belgium-Luxembourg. |
| Vanadium: Metal including alloys, all forms value, thousands | $2 | — | All from Germany. |
| Zinc: | | | |
| Ore and concentrate | 19,187 | — | Greece 8,300; Mexico 8,037; Tunisia 2,850. |
| Oxides | 197 | — | Italy 115; Poland 38; Germany 34. |
| Metal including alloys: | | | |
| Unwrought | 2,868 | — | Bulgaria 2,200; Poland 246; Peru 200. |
| Semimanufactures[3] | 56 | 1 | Bulgaria 31; Austria 18; Italy 6. |
| Zirconium: Ore and concentrate | 92 | — | All from Hong Kong. |
| Other: | | | |
| Oxides and hydroxides | 64 | (2) | Bulgaria 40; Germany 20; Switzerland 2. |
| Base metals including alloys, all forms | 3 | — | France 2; Italy 1. |
| **INDUSTRIAL MINERALS** | | | |
| Abrasives, n.e.s.: | | | |
| Natural: Corundum, emery, pumice, etc. | 217 | (2) | Turkey 140; Austria 49; United Kingdom 24. |

See footnotes at end of table.

TABLE 4—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1991 | Sources, 1991 | |
|---|---|---|---|
| | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | |
| Abrasives'n.e.s.—Continued: | | | |
| Artificial: Corundum | 2 | (2) | Italy 1; Switzerland 1. |
| Dust and powder of precious and semi-precious stones including diamond value, thousands | $261 | — | Belgium-Luxembourg $159; United Kingdom $35; Ireland $32. |
| Asbestos, crude | 2,091 | — | Zimbabwe 1,047; Bulgaria 650; U.S.S.R. 263. |
| Barite and witherite | 20 | — | All from Germany. |
| Boron materials: | | | |
| Crude natural borates | 167 | 142 | Netherlands 25. |
| Oxides and acids | 1,384 | — | U.S.S.R. 754; Italy 491; France 22. |
| Cement | 160,611 | — | Bulgaria 87,352; Romania 34,786; Hungary 27,317. |
| Chalk | 100 | — | Mainly from Switzerland. |
| Clays, crude: | | | |
| Bentonite | 3,757 | — | Bulgaria 3,001;Italy 755. |
| Chamotte earth | 196 | — | Germany 194; Hungary 2. |
| Fire clay including unspecified clays | 9,536 | — | Czechoslovakia 6,864; China 2,049; Hungary 286. |
| Kaolin | 14,286 | 113 | Czechoslovakia 5,578; Germany 3,248; Austria 3,042. |
| Diamond, natural: Industrial stones value, thousands | $324 | — | Belgium-Luxembourg $168; Zaire $72; Germany $32. |
| Diatomite and other infusorial earth | 841 | — | Germany 287; Austria 276; United Kingdom 124. |
| Feldspar, fluorspar, related materials: | | | |
| Fluorspar | 695 | — | France 550; Germany 100; Czechoslovakia 40. |
| Unspecified | 16 | — | All from Netherlands. |
| Fertilizer materials: | | | |
| Crude, n.e.s. | 95 | — | Hungary 50; France 45. |
| Manufactured: Ammonia | 68,386 | — | Bulgaria 35,836; Hungary 14,750; U.S.S.R. 12,939. |
| Graphite, natural | 474 | 15 | Germany 307; Czechoslovakia 141; Austria 6. |
| Iodine | 11 | — | Italy 4; Germany 4; Chile 2. |
| Kyanite and related materials: Mullite | 463 | — | Poland 401; Austria 49; Germany 13. |
| Magnesium compounds: | | | |
| Magnesite, crude | 1,533 | — | All from Turkey. |
| Oxides and hydroxides | 1,794 | — | Greece 1,620; Italy 118; France 19. |
| Mica: | | | |
| Crude including splittings and waste | 22 | — | Netherlands 20; India 2. |
| Worked including agglomerated splittings | 13 | — | Austria 6; Belgium-Luxembourg 4; Czechoslovakia 2. |
| Nitrates, crude | 20 | — | All from Bulgaria. |
| Phosphates, crude | 512,714 | — | Syria 155,192; Jordan 132,213; Algeria 97,226. |
| Precious and semiprecious stones other than diamond, synthetic value, thousands | $135 | $54 | Austria $41; Germany $24; Australia $10. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 1,736 | — | Bulgaria 1,031; Italy 503; U.S.S.R. 36. |
| Worked | 1,877 | — | Italy 1,213; Bulgaria 574; Greece 79. |
| Dolomite, chiefly refractory-grade | (2) | — | All from Germany. |
| Gravel and crushed rock | 18,493 | — | U.S.S.R. 14,123; Hungary 4,300; France 44. |

See footnotes at end of table.

TABLE 4—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1991 | Sources, 1991 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Stone, sand and gravel—Continued: | | | | |
| Quartz and quartzite | | 70 | — | Germany 63; Belgium-Luxembourg 5; Austria 2. |
| Sand other than metal-bearing | | 21,669 | 27 | Hungary 8,590; Czechoslovakia 8,123; Germany 4,757. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | | 4,235 | — | Poland 3,598; U.S.S.R. 496; Italy 65. |
| Colloidal, precipitated, sublimed | | 181 | — | Poland 176; Germany 5. |
| Sulfuric acid | | 4,102 | (2) | Mainly from Hungary. |
| Talc, steatite, soapstone, pyrophyllite | | 1,322 | — | Germany 565; Austria 358; Italy 268. |
| Vermiculite | | 7,399 | — | Hungary 6,899; Turkey 500. |
| Other: | | | | |
| Crude | | 446 | 1 | Germany 345; Italy 58; Netherlands 21. |
| Slag and dross, not metal-bearing | | 101,636 | (2) | Bulgaria 91,670; Austria 9,957; Germany 9. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | | 1,042 | — | Bulgaria 1,033; Italy 6; Sweden 3. |
| Carbon black | | 16,373 | 3 | Italy 7,592; Mexico 2,955; Germany 2,316. |
| Coal: | | | | |
| Anthracite | | 9,489 | — | U.S.S.R. 9,081; Italy 408. |
| Bituminous | | 45,803 | — | All from Poland. |
| Lignite including briquets | | 14,347 | — | All from U.S.S.R. |
| Coke and semicoke | | 109,410 | — | Poland 94,578; Czechoslovakia 12,342; Germany 1,307. |
| Gas, natural: Gaseous | million cubic meters | 775 | — | U.S.S.R. 741; Hungary 34. |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 28,565 | — | Libya 11,480; Iran 5,511; U.S.S.R. 4,582. |
| Refinery products: | | | | |
| Liquefied petroleum gas including non-refinery production | do. | 19 | — | Bulgaria 44; U.S.S.R. 41; Germany 33. |
| Gasoline | do. | 2,693 | 6 | Romania 518; Greece 480. |
| Mineral jelly and wax | do. | 6 | — | Poland 2; Bulgaria 1; Germany 1. |
| Kerosene and jet fuel | do. | 240 | — | Hungary 86; Czechoslovakia 68; Panama 45. |
| Distillate fuel oil | do. | 2,328 | — | U.S.S.R. 1,073; Hungary 455; Greece 338. |
| Lubricants | do. | 244 | (2) | Hungary 68; Italy 67; Poland 44. |
| Residual fuel oil | do. | 1,513 | — | U.S.S.R. 1,063; Hugary 136; Egypt 85. |
| Bitumen and other residues | do. | 20 | — | All from Albania. |
| Bituminous mixtures | do. | (2) | — | Mainly from France. |
| Petroleum coke | do. | 247 | 189 | Canada 55; Austria 2. |

[1]Table prepared by Ronald L. Hatch. This table presents the mineral imports of the Republics of Serbia and Montenegro. These data are not comparable to previous presentations of the former country of Yugoslavia, which included the former Republics of Bosnia and Herzegovina, Croatia, Slovenia, and Macedonia.

[2]Less than 1/2 unit.

[3]May include blue powder.

TABLE 5

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 161 | — | | |
| Aluminum: | | | | |
| Ore and concentrate | 600,084 | 506,966 | — | U.S.S.R. 187,095; Romania 55,631; Czechoslovakia 26,237. |
| Oxides and hydroxides | 679,975 | 654,609 | — | U.S.S.R. 462,189; Austria 44,461; France 39,787. |
| Metal including alloys: | | | | |
| Scrap | 1,388 | 580 | — | Italy 376; West Germany 138; Austria 48. |
| Unwrought | 163,255 | 228,582 | — | Italy 173,857; France 21,644; Bulgaria 1,329. |
| Semimanufactures | 85,696 | 74,927 | 13,459 | West Germany 12,581; Czechoslovakia 8,161. |
| Bismuth: Metal including alloys, all forms | 1 | — | | |
| Cadmium: Metal including alloys, all forms | 318 | 33 | — | Netherlands 18; Switzerland 15. |
| Chromium: | | | | |
| Ore and concentrate | 3,124 | — | | |
| Oxides and hydroxides | — | 13 | — | U.S.S.R. 12; Switzerland 1. |
| Metal including alloys, all forms | — | 2 | — | All to U.S.S.R. |
| Cobalt: Metal including alloys, all forms | 7 | 2 | — | All to West Germany. |
| Columbium and tantalum: Tantalum metal including alloys, all forms | (2) | — | | |
| Copper: | | | | |
| Ore and concentrate | 6,191 | 17,479 | — | Kenya 11,175; Bulgaria 5,999; Central African Republic 304. |
| Matte and speiss including cement copper | 2,245 | 8,576 | — | All to Belgium-Luxembourg. |
| Sulfate | 9,360 | — | | |
| Metal including alloys: | | | | |
| Scrap | 1,672 | 1,953 | — | Italy 1,829; Austria 82; West Germany 21. |
| Unwrought | 35,079 | 50,306 | 4,970 | Italy 27,392; Turkey 5,082. |
| Semimanufactures | 37,159 | 37,420 | 3,676 | West Germany 8,662; Italy 3,544. |
| Gold: Metal including alloys, unwrought and partly unwrought value, thousands | $15,499 | $26,177 | $3,510 | West Germany $21,465; Switzerland $1,196. |
| Iron and steel: | | | | |
| Iron ore and concentrate: | | | | |
| Excluding roasted pyrite | 7 | 172,010 | — | Hungary 166,000; Cameroon 6,000; Malta 8. |
| Pyrite, roasted | 46,518 | 73,120 | — | Hungary 32,513; West Germany 23,667; Austria 16,940. |
| Metal: | | | | |
| Scrap | 228,049 | 218,328 | — | Italy 186,791; West Germany 27,990; Switzerland 3,424. |
| Pig iron, cast iron, related materials | 34,827 | 45,431 | 10 | Italy 23,889; Hungary 10,000; Turkey 4,867. |
| Ferroalloys: | | | | |
| Ferrochromium | 70,656 | 78,409 | — | Romania 50,042; Italy 7,665; Austria 6,511. |
| Ferromanganese | 7,897 | 10,229 | 3,311 | Italy 3,944; West Germany 1,750. |
| Ferronickel | 15,650 | 11,479 | — | West Germany 9,494; Austria 1,418; Sweden 318. |
| Ferrosilicomanganese | 25,825 | 22,611 | 12,374 | Turkey 5,070; Italy 2,225. |
| Ferrosilicon | 83,846 | 74,991 | — | Japan 21,431; Korea 12,678; Turkey 12,645. |
| Silicon metal | 9,654 | 8,687 | 1,301 | Italy 3,446; West Germany 3,708. |

See footnotes at end of table.

TABLE 5—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Iron and steel—Continued: | | | | |
| Metal—Continued: | | | | |
| Ferroalloys—Continued: | | | | |
| Unspecified | 5,037 | 4,158 | — | West Germany 2,181; Iran 895; Italy 422. |
| Steel, primary forms | 97,367 | 98,998 | — | Italy 75,748; Libya 10,000; Poland 5,175. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 216,049 | 576,321 | 15,654 | Turkey 161,860; Austria 54,303. |
| Clad, plated, coated | 21,725 | 29,247 | — | Italy 16,645; India 3,373; West Germany 2,490. |
| Of alloy steel | 20,179 | 24,119 | 849 | Italy 12,723; West Germany 3,197; France 2,635. |
| Bars, rods, angles, shapes, sections | 494,246 | 714,943 | 261 | Italy 232,776; Iran 122,652; West Germany 84,232. |
| Rails and accessories | 13,756 | 2,738 | — | Italy 1,270; Romania 378; Poland 282. |
| Wire | 38,365 | 26,490 | 56 | Italy 1,276; West Germany 3,255; Greece 3,162. |
| Tubes, pipes, fittings | 173,856 | 204,706 | 7,970 | West Germany 81,065; Italy 36,949; Austria 13,149. |
| Lead: | | | | |
| Ore and concentrate | 12,059 | 16,039 | — | Italy 9,923; Austria 3,132; Brazil 1,541. |
| Oxides | 8 | (2) | — | Mainly to U.S.S.R. |
| Metal including alloys: | | | | |
| Scrap | 101 | 11 | — | All to Italy. |
| Unwrought | 19,707 | 17,051 | — | Greece 5,944; Czechoslovakia 4,487; Romania 1,967. |
| Semimanufactures | 313 | 328 | — | Greece 185; West Germany 49; U.S.S.R. 41. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | 51 | 33 | — | Italy 21; West Germany 12. |
| Unwrought | 3,695 | 4,811 | 69 | West Germany 1,752; Belgium-Luxembourg 592; Austria 571. |
| Manganese: | | | | |
| Ore and concentrate: Metallurgical-grade | 946 | 5,046 | — | All to Italy. |
| Metal including alloys, all forms | (2) | (2) | — | All to Switzerland. |
| Mercury | 5 | 2 | — | Mainly to Liechtenstein. |
| Molybdenum: Metals including alloys, unwrought including scrap | — | 2 | — | All to Italy. |
| Nickel: | | | | |
| Ore and concentrate | (2) | — | | |
| Metal including alloys: | | | | |
| Scrap | — | 80 | — | All to France. |
| Semimanufactures | 2 | 1 | — | All to U.S.S.R. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands | $19 | — | | |
| Selenium, elemental | 67 | 60 | — | Netherlands 55; West Germany 5. |
| Silver: Metal including alloys, unwrought and partly wrought kilograms | 77,000 | 36,000 | 8,000 | West Germany 15,000; Czechoslovakia 5,000; Iran 4,000. |
| Tin: Metal including alloys: | | | | |
| Unwrought | 11 | (2) | — | Mainly to U.S.S.R. |
| Semimanufactures value, thousands | $8 | $10 | — | U.S.S.R. $4; Iraq $3; Hungary $1. |

See footnotes at end of table.

TABLE 5—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Titanium: Oxides | 6,749 | 2,797 | — | East Germany 2,566. |
| Tungsten: Metal including alloys: | | | | |
| Unwrought including waste and scrap | — | (2) | — | All to Italy. |
| Semimanufactures | (2) | — | | |
| Zinc: | | | | |
| Ore and concentrate | 4,117 | 13,330 | — | Belgium-Luxembourg 7,620; Austria 5,685; Hungary 25. |
| Oxides | 1,505 | 528 | — | Hungary 420; Italy 108. |
| Metal including alloys: | | | | |
| Scrap | 24 | 5 | — | All to Italy. |
| Unwrought | 15,350 | 26,252 | 18 | Czechoslovakia 11,811; Italy 5,708; East Germany 3,974. |
| Semimanufactures[3] | 6,423 | 5,313 | — | Czechoslovakia 3,906; Italy 334; West Germany 289. |
| Other: | | | | |
| Ores and concentrates | (2) | — | | |
| Oxides and hydroxides | 657 | 684 | — | Sweden 581; West Germany 62; Australia 31. |
| Ashes and residues | 1,473 | 1,064 | (2) | Italy 601; Austria 222; Switzerland 133. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 259 | 35 | — | Czechoslovakia 20; U.S.S.R. 15. |
| Artificial: | | | | |
| Corundum | 17,267 | 16,413 | — | Italy 6,468; West Germany 4,048; Poland 680. |
| Silicon carbide | 4,292 | 2,368 | — | West Germany 1,523; Italy 530; Austria 141. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | $2 | $7 | — | All to Belgium-Luxembourg. |
| Grinding and polishing wheels and stones | 4,042 | 5,003 | 126 | Hungary 1,000; France 749; East Germany 666. |
| Asbestos, crude | 1,119 | 73 | — | Spain 53; France 20. |
| Barite and witherite | 9,136 | 4,293 | — | Angola 2,905; Poland 1,388. |
| Boron materials: | | | | |
| Crude natural borates | (2) | (2) | — | Mainly to U.S.S.R. |
| Oxides and acids | 301 | 1 | — | Mainly to Italy. |
| Cement | 786,986 | 924,087 | 519 | Italy 662,967; West Germany 28,269; Iran 1,271. |
| Chalk | 313 | (2) | — | Mainly to U.S.S.R. |
| Clays, crude: | | | | |
| Bentonite | 11,633 | 7,521 | — | Poland 6,448; Greece 461; Austria 284. |
| Chamotte earth | (2) | 1 | — | Mainly to Italy. |
| Kaolin | 193 | 199 | — | West Germany 195; U.S.S.R. 3. |
| Unspecified | 20,952 | 38,452 | — | Mainly to Italy. |
| Cryolite and chiolite | 16 | 22 | — | Malta 20; Austria 2. |
| Diamond, natural: Industrial stones value, thousands | (2) | (2) | — | All to Belgium-Luxembourg. |
| Diatomite and other infusorial earth | 687 | 1,340 | — | All to Austria. |
| Feldspar | 4,635 | 6,356 | — | Greece 5,829; Hungary 378; Italy 144. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 134 | 18 | — | All to West Germany. |

See footnotes at end of table.

TABLE 5—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Fertilizer materials—Continued: | | | | |
| Manufactured: | | | | |
| Ammonia | 6,518 | 1 | — | Mainly to U.S.S.R. |
| Nitrogenous | 337,494 | 202,296 | 20,834 | West Germany 90,204; Morocco 15,500. |
| Phosphatic | 58,276 | 26,143 | — | Czechoslovakia 10,012; Austria 9,739; Bulgaria 2,933. |
| Unspecified and mixed | 602,728 | 317,289 | — | Nigeria 90,771; West Germany 88,063; Austria 27,285. |
| Graphite, natural | (2) | 21 | — | Mainly to France. |
| Gypsum and plaster | 8,163 | 47,137 | — | Hungary 46,909; U.S.S.R. 198; Iraq 23. |
| Lime | 33,321 | 30,400 | — | Hungary 18,101; Italy 11,783; U.S.S.R. 416. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 1 | (2) | — | All to Italy. |
| Oxides and hydroxides | 16,027 | 12,646 | — | Italy 11,124; Albania 1,018; Austria 95. |
| Mica: Worked including agglomerated splittings | (2) | (2) | — | Mainly to U.S.S.R. |
| Phosphates,crude | 2 | 2 | — | All to Bulgaria. |
| Pigments, mineral: Iron oxides and hydroxides, processed | 759 | 986 | — | West Germany 719; Italy 267. |
| Pyrite, unroasted | 30,212 | 32,724 | — | West Germany 32,573; Italy 150. |
| Salt and brine | 34 | 22 | — | Hungary 12; Iraq 8; U.S.S.R. 1. |
| Sodium compounds, n.e.s.: | | | | |
| Soda ash, manufactured | 37,802 | 28,972 | — | West Germany 11,550; Italy 10,699; Greece 3,636. |
| Sulfate, manufactured | 1,758 | 4,493 | — | Italy 1,351; Greece 1,320; Bulgaria 1,197. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 76,741 | 46,266 | 75 | Italy 27,474; Japan 5,299; West Germany 979. |
| Worked | 18,609 | 19,005 | 137 | Austria 5,848; Italy 4,092; West Germany 3,745. |
| Dolomite, chiefly refractory-grade | 1,176 | 600 | — | All to Austria. |
| Gravel and crushed rock | 92,910 | 235,526 | 5 | Italy 192,093; Hungary 19,345; Austria 6,719. |
| Limestone other than dimension | 21 | 40 | (2) | Mainly to Austria. |
| Quartz and quartzite | 1 | 1 | — | Mainly to Italy. |
| Sand other than metal-bearing | 44,535 | 42,157 | — | Austria 24,884; Italy 11,150; Austria 6,719. |
| Sulfur: | | | | |
| Elemental, crude including native and byproduct | 246 | 340 | — | All to Italy. |
| Dioxide | 18 | 132 | — | Do. |
| Sulfuric acid | 17,778 | 59,178 | — | Bulgaria 36,791; Italy 10,970; Austria 10. |
| Talc, steatite, soapstone, pyrophyllite | (2) | (2) | — | All to East Germany. |
| Other: | | | | |
| Crude | 6,578 | 3,255 | — | Austria 2,630; Italy 262; West Germany 230. |
| Slag and dross, not metal-bearing | 6,924 | 9,612 | — | Italy 9,435; Austria 112; West Germany 46. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 28,827 | 17,191 | — | Libya 13,071; Austria 4,027; U.S.S.R. 32. |
| Carbon black | 1,188 | 240 | — | East Germany 238; Italy 2. |

See footnotes at end of table.

TABLE 5—Continued

## YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | | |
| Coal: | | | | | |
| Anthracite | | (2) | — | | |
| Briquets of anthracite and bituminous coal | | (2) | — | | |
| Lignite including briquets | | 349 | 68,894 | (2) | Romania 34,585; Hungary 32,422; Italy 1,885. |
| Coke and semicoke | | 175,202 | 91,357 | — | Algeria 35,867; Italy 31,080; Austria 20,965. |
| Peat including briquets and litter | | 64 | — | | |
| Petroleum refinery products: | | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 521 | 105 | — | Italy 71; Austria 34. |
| Gasoline | do. | 3,584 | 2,857 | (2) | Italy 934; West Germany 821; Austria 718. |
| Mineral jelly and wax | do. | 39 | 33 | — | West Germany 17; Italy 14; Switzerland 1. |
| Kerosene and jet fuel | do. | 269 | 256 | 21 | U.S.S.R. 48; Bulgaria 46; France 28. |
| Distillate fuel oil | do. | 897 | 1,598 | 1 | West Germany 543; Austria 537; Italy 449. |
| Lubricants | do. | 1,700 | 1,178 | (2) | Austria 954; Hungary 21; Czechoslovakia 5. |
| Residual fuel oil | do. | 1,683 | 2,140 | 62 | West Germany 1,059; Italy 532; Panama 249. |
| Bitumen and other residues | do. | 608 | 574 | — | Austria 384; Italy 190. |
| Bituminous mixtures | do. | 13 | 23 | — | Austria 19; Ethiopia 2; U.S.S.R. 1. |
| Petroleum coke | do. | 69 | 57 | — | All to Italy. |

NA Not available.
[1]Table prepared by Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]May include blue powder.

TABLE 6

## YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: | | | | |
| Oxides and hydroxides | 7,103 | 45,959 | — | U.S.S.R. 39,573; Netherlands 6,386. |
| Metal including alloys: | | | | |
| Scrap | — | 663 | — | West Germany 500; Netherlands 101; Italy 25. |
| Unwrought | 2,144 | 1,036 | — | Italy 619; United Kingdom 326; Austria 59. |
| Semimanufactures | 11,033 | 18,571 | 3,333 | U.S.S.R. 3,094; West Germany 2,829. |
| Chromium: Metal including alloys, all forms | 2 | — | | |
| Cobalt: Metal including alloys, all forms value, thousands | — | $10 | — | All to West Germany. |
| Copper: Metal including alloys: | | | | |
| Scrap | 96 | 31 | — | Italy 18; West Germany 13. |
| Unwrought | 25,311 | 30,482 | — | United Kingdom 13,638; Italy 9,828; Greece 2,656. |
| Semimanufactures | 11,771 | 11,655 | 773 | U.S.S.R. 4,596; India 2,182; Czechoslovakia 2,030. |
| Gold: Metal including alloys, unwrought and partly wrought value, thousands | $1,623 | $5,070 | — | West Germany $2,572; India $1,019; Switzerland $881. |
| Iron and steel: Metal: | | | | |
| Scrap | 8,590 | 1,678 | 38 | Austria 983; Italy 570; Switzerland 87. |
| Ferroalloys: | | | | |
| Ferrochromium | 3,238 | — | | |
| Ferromanganese | — | 7,928 | — | All to Hungary. |
| Ferrosilicomanganese | 17,285 | — | | |
| Ferrosilicon | 789 | — | | |
| Unspecified | 29 | — | | |
| Steel, primary forms | 7,348 | 671 | — | Italy 646; West Germany 25. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 497,072 | 545,049 | 90 | Italy 70,306; Austria 23,711; Cambodia 16,000. |
| Clad, plated, coated | 86,221 | 78,591 | 486 | U.S.S.R. 38,952; Italy 22,230; West Germany 13,149. |
| Of alloy steel | 83 | 138 | — | Italy 137; Austria 1. |
| Bars, rods, angles, shapes, sections | 150,177 | 136,386 | — | U.S.S.R. 66,994; Czechoslovakia 16,034; Iran 15,497. |
| Rails and accessories | 105 | — | | |
| Wire | 10,078 | 19,972 | — | Italy 18,065; Czechoslovakia 1,496; France 240. |
| Tubes, pipes, fittings | 34,318 | 36,529 | — | Czechoslovakia 12,232; Hungary 7,433; U.S.S.R. 5,093. |
| Lead: Metal including alloys: | | | | |
| Unwrought | 7,436 | 13,936 | — | Austria 6,822; Switzerland 4,378; Czechoslovakia 1,236. |
| Semimanufactured | — | 1,263 | — | U.S.S.R. 1,188; Cuba 75. |
| Silver: Metal including alloys, unwrought and partly wrought | 19 | 37 | — | Switzerland 27; United Kingdom 6; West Germany 2. |
| Tungsten: Metal including alloys, unwrought | — | 15 | — | All to Italy. |

See footnotes at end of table.

TABLE 6—Continued

## YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Zinc: Metal including alloys: | | | | |
| Unwrought | 27,288 | 27,177 | 98 | United Kingdom 13,058; Switzerland 12,187; Italy 1,279. |
| Semimanufactures | 3,487 | 5,068 | — | West Germany 4,248. |
| INDUSTRIAL MINERALS | | | | |
| Abrasives, n.e.s.: Artificial, corundum | 495 | — | | |
| Cement | 21,328 | 10,411 | — | All to West Germany. |
| Fertilizer materials: Manufactured: | | | | |
| Nitrogenous | 25,935 | 91,105 | — | West Germany 44,199; Denmark 10,950; Turkey 9,042. |
| Unspecified and mixed | 38,320 | 120,804 | — | Nigeria 34,985; West Germany 34,985; Hungary 9,325. |
| Nitrates, crude | — | 2,800 | — | All to Turkey. |
| Stone, sand and gravel: Dimension stone, worked | 2 | 7 | — | All to West Germany. |
| Sulfur: Sulfuric acid | 11,999 | 2,755 | — | All to Bulgaria. |
| Other, crude | — | 1 | — | All to Austria. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon, black | — | 497 | — | All to West Germany. |
| Coke and semicoke | 433,167 | 210,491 | — | Romania 115,367; Italy 44,792; Austria 20,587. |
| Petroleum refinery products: | | | | |
| Liquefied petroleum gas thousand 42-gallon barrels | 39 | 149 | — | Panama 60; West Germany 45; Italy 43. |
| Gasoline do. | 265 | 999 | — | Panama 497; United Kingdom 217; Italy 196. |
| Kerosene and jet fuel do. | 22 | — | | |
| Distillate fuel oil do. | 733 | 861 | — | Panama 362; United Kingdom 263; Italy 159. |
| Lubricants do. | 1 | — | | |
| Residual fuel oil do. | — | 1,310 | — | Panama 849; United Kingdom 270; Italy 145. |

[1]Revised.

[1]Table prepared by Ronald L. Hatch, International Data Section.

TABLE 7

## YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| METALS | | | | | |
| Aluminum: Metal including alloys: | | | | | |
| Scrap | | 39 | — | | |
| Unwrought | | 1,688 | 1,100 | — | West Germany 1,071; Austria 29. |
| Semimanufactures | | 57 | 16 | — | West Germany 14; France 2. |
| Copper: | | | | | |
| Matte and speiss including cement copper | | 5,859 | 623 | — | Belgium-Luxembourg 338; Bulgaria 285. |
| Metal including alloys: | | | | | |
| Scrap | | 383 | 429 | — | Italy 400; West Germany 29. |
| Unwrought | | 203 | 214 | — | Italy 211; West Germany 3. |
| Semimanufactures | | 1,126 | 325 | — | Bulgaria 314; West Germany 10. |
| Gold: | | | | | |
| Waste and sweepings | value, thousands | $46 | $46 | — | All to West Germany. |
| Metal including alloys, unwrought and partly wrought | do. | $136 | $370 | — | Italy $343; West Germany $27. |
| Iron and steel: Metal: | | | | | |
| Scrap | | 539 | 33,685 | — | All to West Germany. |
| Steel, primary forms | | — | 4,371 | — | Bulgaria 4,349; Austria 22. |
| Semimanufactures: | | | | | |
| Flat-rolled products: | | | | | |
| Of iron or nonalloy steel: | | | | | |
| Not clad, plated, coated | | 9,598 | 22,470 | — | All to Italy. |
| Clad, plated, coated | | 5 | — | | |
| Of alloy steel | | — | 3 | — | All to Hungary. |
| Bars, rods, angles, shapes, sections | | 3 | 1 | — | All to Austria. |
| Wire | | 1 | 1 | — | All to Italy. |
| Tubes, pipes, fittings | | 14 | 8 | — | All to United Kingdom. |
| Lead: | | | | | |
| Ore and concentrate | | 4,979 | — | | |
| Metal including alloys, unwrought | | 754 | 28 | — | All to Austria. |
| Platinum-group metals: | | | | | |
| Waste and sweepings | value, thousands | $506 | $3,650 | — | United Kingdom $1,445; Italy $1,116; Austria $760. |
| Metals including alloys, unwrought and partly wrought: | | | | | |
| Platinum | do. | $609 | $449 | — | Austria $357; Netherlands $50. |
| Unspecified | do. | $79 | $80 | — | West Germany $75; Austria $5. |
| Silver: | | | | | |
| Waste and sweepings[2] | do. | $197 | — | | |
| Metal including alloys, unwrought and partly wrought | | 18 | 1 | — | Mainly to West Germany. |
| Tin: Metal including alloys, scrap | | — | 3 | — | All to West Germany. |
| Uranium and thorium: Uranium metal including alloys, all forms | | 147 | 109 | 109 | |
| Other: Ashes and residues | | 233 | 144 | — | Austria 143; West Germany 1. |

See footnotes at end of table.

TABLE 7—Continued

## YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Destinations, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives: | | | | | |
| Artificial: Silicon carbide | | 130 | 62 | — | All to West Germany. |
| Dust and powder of precious and semiprecious stones including diamond | value, thousands | — | $15 | — | All to United Kingdom. |
| Chalk | | 3 | 2 | — | All to France. |
| Clays, crude: | | | | | |
| Kaolin | | 4 | 6 | — | Do. |
| Fire clay and other clays | | — | 10 | — | All to Italy. |
| Gypsum and plaster | | 20 | — | | |
| Phosphates, crude | | — | 33,685 | — | All to West Germany. |
| Stone, sand and gravel: Dimension stone: | | | | | |
| Crude and partly worked | | — | 21 | — | All to Italy. |
| Worked | | — | 1 | — | Do. |
| Talc, steatite, soapstone, pyrphyllite | | — | 1 | — | Do. |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Carbon black | | 1 | — | | |
| Coal: Lignite including briquets | | — | 6,617 | — | All to Hungary. |
| Petroleum refinery products: | | | | | |
| Gasoline, aviation | 42-gallon barrels | 58,557 | 144,509 | — | Hungary 141,127. |
| Lubricants | do. | 42,595 | 40,936 | — | All to Hungary. |

[1]Table prepared by Ronald L. Hatch.
[2]May include other precious metals.

TABLE 8

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Alkali and alkaline-earth metals: | | | | |
| Alkali metals | 2 | 2 | — | Mainly from France. |
| Alkaline-earth metals | 124 | 96 | — | U.S.S.R. 70; France 26. |
| Aluminum: | | | | |
| Ore and concentrate | 691,925 | 439,702 | 160 | Guinea 213,834; Australia 135,488; Austria 55,026. |
| Oxides and hydroxides | 196,112 | 245,465 | 1 | Italy 115,942; Suriname 54,588; Australia 135,488. |
| Metal including alloys: | | | | |
| Scrap | 448 | 204 | 2 | U.S.S.R. 144; Hungary 20; West Germany 20. |
| Unwrought | 13,842 | 16,818 | (2) | U.S.S.R. 10,188; Austria 2,069; Hungary 1,917. |
| Semimanufactures | 9,456 | 13,219 | 29 | U.S.S.R. 6,225; West Germany 2,623; Italy 1,822. |
| Antimony: Metal including alloys, all forms | 66 | 135 | — | Netherlands 68; Kenya 65; Austria 2. |
| Arsenic: | | | | |
| Oxides and acids | 179 | — | | |
| Metal including alloys, all forms | 67 | 27 | — | Kenya 24; Austria 2; Italy 1. |
| Beryllium: Metal including alloys, all forms value, thousands | $7 | $32 | $18 | West Germany $11; Italy $3. |
| Bismuth: Metal including alloys, all forms | 22 | 49 | (2) | Bolivia 21; Belgium-Luxembourg 15. |
| Cadium: Metal including alloys, all forms | 1 | 14 | (2) | Netherlands 10; Kenya 1; West Germany 1. |
| Chromium: | | | | |
| Ore and concentrate | 330,979 | 283,601 | 20 | Turkey 120,070; U.S.S.R. 70,870; Albania 68,255. |
| Oxides and hydroxides | 656 | 344 | (2) | Kenya 100; U.S.S.R. 80; West Germany 72. |
| Metal including alloys, all forms | 18 | 35 | (2) | West Germany 14; Albania 5; U.S.S.R. 5. |
| Cobalt: | | | | |
| Ore and concentrate value, thousands | $1 | — | | |
| Oxides and hydroxides | 47 | 42 | (2) | Netherlands 17; West Germany 9; Finland 5. |
| Metal including alloys, all forms | 73 | 92 | — | Zaire 44; Austria 15; West Germany 7. |
| Columbium and tantalum: | | | | |
| Ore and concentrate | 3 | — | | |
| Metal including alloys, all forms, tantalum | 2 | (2) | — | All from Austria. |
| Copper: | | | | |
| Sulfate | 2,907 | 4,687 | — | U.S.S.R. 4,667; West Germany 15. |
| Metal including alloys: | | | | |
| Scrap | 508 | 705 | 44 | U.S.S.R. 285; Switzerland 185; West Germany 48. |
| Unwrought | 20,594 | 9,226 | 546 | Chile 4,179; U.S.S.R. 1,169; West Germany 723. |
| Semimanufactures | 15,404 | 13,702 | 1 | Poland 5,010; West Germany 4,379; U.S.S.R. 1,084. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| METALS—Continued | | | | |
| Germanium: Metal including alloys value, thousands | $6 | (2) | — | All from West Germany. |
| Gold: Metal including alloys, unwrought and partly wrought do. | $1,838 | $4,128 | $341 | West Germany $2,707; Switzerland $372. |
| Iron and steel: | | | | |
| Iron ore and concentrate excluding roasted pyrite | 2,305,488 | 1,283,436 | — | Brazil 514,569; U.S.S.R. 376,628; Peru 351,062. |
| Metal: | | | | |
| Scrap | 646,385 | 412,769 | 19,926 | U.S.S.R. 216,014; Poland 63,391; West Germany 33,078. |
| Pig iron, cast iron, related materials | 113,468 | 93,256 | — | Czechoslovakia 22,536; U.S.S.R 19,092; Canada 17,014. |
| Ferroalloys: | | | | |
| Ferrochromium | 287 | 2,978 | (2) | West Germany 1,467; Finland 996. |
| Ferromanganese | 2,997 | 6,856 | 124 | Czechoslovakia 1,588; Austria 1,547; West Germany 1,042. |
| Ferronickel | — | 151 | — | Austria 80; Canada 63. |
| Ferrosilicochromium | 3,053 | 3,912 | 24 | U.S.S.R. 3,170; Austria 519; Belgium-Luxembourg 199. |
| Ferrosilicomanganese | 52 | 245 | — | Hungary 194; Austria 25; Switzerland 24. |
| Ferrosilicon | 3,066 | 5,013 | 123 | U.S.S.R. 2,170; West Germany 1,670; Austria 723. |
| Silicon metal | 936 | 1,176 | 3 | West Germany 347; Austria 225; Brazil 200. |
| Unspecified | 2,918 | 2,131 | 7 | Austria 596; West Germany 556; Switzerland 321. |
| Steel, primary forms | 512,194 | 557,777 | — | U.S.S.R. 422,792; Czechoslovakia 82,655; Hungary 34,503. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 535,273 | 455,963 | 453 | Czechoslovakia 142,245; West Germany 96,542; Austria 58,147. |
| Clad, plated, coated | 69,750 | 73,028 | 3 | West Germany 32,308; Austria 10,895; Italy 9,819. |
| Of alloy steel | 33,730 | 27,638 | 154 | West Germany 12,067; Italy 5,983; Austria 2,531. |
| Bars, rods, angles, shapes, sections | 106,801 | 156,278 | 77 | Czechoslovakia 64,838; Romania 25,260; West Germany 15,577. |
| Rails and accessories | 4,642 | 5,575 | — | Poland 3,398; West Germany 1,276; United Kingdom 473. |
| Wire | 27,612 | 24,823 | — | Czechoslovakia 5,662; Italy 4,595; U.S.S.R. 4,288. |
| Tubes, pipes, fittings | 65,635 | 49,343 | 418 | West Germany 13,399; East Germany 12,576; Austria 6,927. |
| Lead: | | | | |
| Ore and concentrate | 6,044 | 6,173 | — | Greece 6, 168; France 5. |
| Oxides | 6,729 | 7,144 | — | Hungary 3,197; Austria 2,804; Switzerland 1,092. |
| Metal including alloys: | | | | |
| Scrap | 3,056 | 5,337 | — | Austria 3,357; East Germany 821; Bulgaria 448. |
| Unwrought | 5,343 | 8,631 | — | Austria 3,499; Peru 999; Poland 999. |
| Semimanufactures | 16 | 21 | — | West Germany 10. |
| Magnesium: Metal including alloys: | | | | |
| Scrap | (2) | 12 | — | All from Belgium-Luxembourg. |
| Unwrought | 94 | 839 | 50 | U.S.S.R. 320; Norway 85; Austria 78. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Magnesium: Metal including alloys—Continued: | | | | |
| Semimanufactures | 27 | 16 | — | West Germany 11; France 3; Austria 2. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 93,015 | 96,127 | — | Botswana 30,313; U.S.S.R. 20,889; West Germany 19,724. |
| Oxides | 503 | 809 | (2) | West Germany 255; Greece 204; France 134. |
| Metal including alloys, all forms | 294 | 304 | (2) | Kenya 115; West Germany 73; Netherlands 73. |
| Mercury | 29 | 48 | — | West Germany 15; Austria 14; Netherlands 8. |
| Molybdenum: | | | | |
| Ore and concentrate, roasted | 28 | 97 | — | Netherlands 94; Austria 3. |
| Metal including alloys: | | | | |
| Unwrought | 2 | 1 | (2) | Mainly from United Kingdom. |
| Semimanufactures | 24 | 23 | 2 | Austria 13; Albania 2; West Germany 2. |
| Nickel: Metal including alloys: | | | | |
| Matte and speiss | 194 | 377 | 20 | Cuba 250; Austria 63; Netherlands 43. |
| Scrap value, thousands | r$6 | — | | |
| Unwrought | 884 | 988 | 45 | Canada 307; U.S.S.R. 248; West Germany 109. |
| Semimanufactures | 639 | 385 | (2) | West Germany 118; United Kingdom 109. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought: | | | | |
| Palladium value, thousands | $2,279 | $1,179 | — | Austria $674; West Germany $358; U.S.S.R. $135. |
| Rare-earth metals including alloys, all forms | 61 | 1 | (2) | Mainly from Austria. |
| Selenium: Elemental | 1 | 1 | — | Mainly form Belgium-Luxembourg. |
| Silver: Metal including alloys, unwrought and partly wrought kilograms | 11,000 | 11,000 | (2) | Austria 6; West Germany 3; Italy 1. |
| Tellurium, elemental and boron value, thousands | $43 | $77 | — | All from West Germany. |
| Tin: Metal including alloys: | | | | |
| Scrap | (2) | — | | |
| Unwrought | 1,134 | 1,110 | 1 | Malaysia 660; West Germany 229; Brazil 102. |
| Semimanufactures | 23 | 18 | (2) | West Germany 15; Italy 2. |
| Titanium: | | | | |
| Ore and concentrate | 52,518 | 23,701 | — | All from Australia. |
| Oxides | 1,623 | 829 | — | West Germany 238; Czecholslovakia 120; Kenya 120. |
| Metal including alloys: | | | | |
| Unwrought including waste and scrap | (2) | 3 | — | Kenya 1. |
| Semimanufactures | 28 | 19 | (2) | Italy 12; West Germany 6. |
| Tungsten: Metal including alloys: | | | | |
| Unwrought | 4 | 3 | (2) | Austria 2; West Germany 1. |
| Semimanufactures | 9 | 10 | (2) | Hungary 2; Japan 2; Austria 1. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS—Continued** | | | | |
| Uranium and thorium: | | | | |
| Oxides and other compounds value, thousands | $2 | $1 | — | All from United Kingdom. |
| Metal including alloys, all forms: | | | | |
| Uranium do. | — | $1,412 | $1,412 | |
| Vanadium: Metal including alloys, all forms do. | $1 | (2) | — | All from West Germany. |
| Zinc: | | | | |
| Ore and concentrate | 54,079 | 55,430 | (2) | West Germany 15,333; Switzerland 14,973; Peru 8,279. |
| Oxides | 1,234 | 2,154 | — | Czechoslovakia 695; West Germany 675; Austria 658. |
| Metal including alloys: | | | | |
| Scrap | 32 | 87 | — | U.S.S.R. 52; Hungary 13; West Germany 12. |
| Unwrought | 13,799 | 11,592 | — | Bulgaria 3,620; West Germany 3,248; Algeria 1,664. |
| Semimanufactures[3] | 233 | 270 | (2) | Austria 95; West Germany 78; Italy 69. |
| Zirconium: | | | | |
| Ore and concentrate | 296 | 221 | — | Australia 119; West Germany 57; Austria 44. |
| Metal including alloys: | | | | |
| Unwrought including waste and scrap | 10 | (2) | — | All from West Germany. |
| Semimanufactures | 1 | 1 | — | Mainly from West Germany. |
| Other: | | | | |
| Ores and concentrates | 1,117 | 423 | — | U.S.S.R. 271; Turkey 150. |
| Oxides and hydroxides | 570 | 533 | 18 | U.S.S.R. 190; West Germany 111; Italy 61. |
| Ashes and residues | 2,295 | 15,305 | — | Albania 14,659; Switzerland 481; Austria 160. |
| Base metals including alloys, all forms | 8 | 3 | (2) | Mainly from West Germany. |
| **INDUSTRIAL MINERALS** | | | | |
| Abrasives, n.e.s.: | | | | |
| Natural: Corundum, emery, pumice, etc. | 1,165 | 1,353 | — | Turkey 888; Italy 400; West Germany 33. |
| Artificial: | | | | |
| Corundum | 2,012 | 1,989 | 15 | U.S.S.R. 866; Poland 403; Austria 364. |
| Silicon carbide | 1,632 | 1,581 | — | West Germany 1,228; Poland 321; Italy 30. |
| Dust and powder of precious and semiprecious stones including diamond value, thousands | $1,668 | $1,199 | — | Switzerland $458; Belgium-Luxembourg $422; Ireland $154. |
| Grinding and polishing wheels and stones | 847 | 1,214 | 2 | Italy 423; Austria 406; West Germany 219. |
| Asbestos, crude | 36,613 | 28,232 | (2) | U.S.S.R. 17,068. |
| Barite and witherite | 7,069 | 181 | — | Italy 65; West Germany 55; Czechoslovakia 40. |
| Boron materials: | | | | |
| Crude natural borates | 39,315 | 46,988 | 7,478 | Turkey 38,635. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **INDUSTRIAL MINERALS—Continued** | | | | |
| Boron—Continued: | | | | |
| Oxides and acids | 5,867 | 5,418 | 1 | Italy 1,508; Turkey 1,140; U.S.S.R. 1,068. |
| Bromine | 12 | 6 | — | Israel 5; France 1. |
| Cement | 156,798 | 268,891 | — | Hungary 145,485; Bulgaria 100,317; Albania 15,644. |
| Chalk | 10,499 | 18,621 | — | Austria 11,964; Switzerland 6,025; France 602. |
| Clays, crude: | | | | |
| Bentonite | 44 | 1,433 | 20 | Bulgaria 1,071; Italy 238; West Germany 62. |
| Chamotte earth | 511 | 537 | — | France 240; United Kingdom 150; West Germany 122. |
| Fire clay including unspecified | 52,311 | 23,702 | 690 | Czechoslovakia 21,119; Poland 500. |
| Kaolin | 80,977 | 76,352 | 2,087 | Czechoslovakia 19,555; Austria 18,629; Greece 10,866. |
| Cryolite and chiolite | 1,210 | 220 | — | Denmark 200; West Germany 20. |
| Diamond, natural: | | | | |
| Gem, not set or strung value, thousands | $754 | $112 | — | Switzerland $57; Belgium-Luxembourg $55. |
| Industrial stones do. | $513 | $1,053 | $1 | Belgium-Luxembourg $714; Ireland $126; West Germany $82. |
| Diatomite and other infusorial earth | 1,051 | 1,422 | 203 | Austria 390; Italy 381; West Germany 224. |
| Feldspar, fluorspar, related materials: | | | | |
| Feldspar | 1,139 | 1,393 | — | Czechoslovakia 900; France 310; Sweden 175. |
| Fluorspar | 4,838 | 6,036 | 20 | Kenya 2,496; West Germany 1,489; East Germany 80. |
| Unspecified | 11 | 2 | — | Mainly from Norway. |
| Fertilizer materials: | | | | |
| Crude, n.e.s. | 20 | 1,033 | — | Austria 488; Italy 357; Netherlands 94. |
| Manufactured: | | | | |
| Ammonia | 157,504 | 129,483 | — | Hungary 42,112; Czechoslovakia 39,972; Bulgaria 35,071. |
| Nitrogenous | 342,265 | 266,217 | — | Czechoslovakia 66,022; Hungary 58,974; Austria 32,990. |
| Phosphatic | 30,719 | 5,888 | — | Romania 5,245; U.S.S.R. 641. |
| Potassic | 442,218 | 412,390 | — | U.S.S.R. 267,579; East Germany 48,154; West Germany 40,634. |
| Unspecified and mixed | 93,396 | 38,667 | 9,998 | U.S.S.R. 15,499; Romania 7,714. |
| Graphite, natural | 2,458 | 1,802 | — | Czechoslovakia 995; West Germany 380; East Germany 160. |
| Gypsum and plaster | 231 | 2,110 | — | Romania 1,082; West Germany 827; East Germany 80. |
| Iodine | 14 | 7 | (e) | West Germany 4; Japan 2; Austria 1. |
| Kyanite and related materials: | | | | |
| Andalusite, kyanite, sillimanite | 259 | — | | |
| Mullite | 4,141 | 1,485 | — | Poland 1,440; Austria 23; West Germany 21. |
| Lime | 25 | 69 | — | Italy 45; Romania 19. |
| Magnesium compounds: | | | | |
| Magnesite, crude | 19,893 | 17,760 | — | Turkey 17,739; Italy 20. |
| Oxides and hydroxides | 10,679 | 8,034 | — | Greece 2,880; Italy 2,284; Norway 1,946. |
| Mica: | | | | |
| Crude including splittings and waste | 72 | 102 | — | West Germany 73; Norway 12; Switzerland 10. |
| Worked including agglomerated splittings | 85 | 65 | (e) | Austria 22; Czechoslovakia 16. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | |
| Nitrates, crude | 480 | 352 | — | Austria 126; East Germany 120; Bulgaria 3. |
| Phosphates, crude thousand tons | 1,235 | 1,066 | — | Morocco 397; Jordan 283; Algeria 178. |
| Phosphorous, elemental | 68 | 13 | — | Italy 10; West Germany 2; Austria 1. |
| Pigments, mineral: Iron oxides and hydroxides, processed | 1,721 | 1,402 | 60 | Spain 514; Belgium-Luxembourg 477; West Germany 203. |
| Precious and semiprecious stones other than diamond: | | | | |
| Natural value, thousands | $57 | $66 | — | Switzerland $25; Belgium-Luxembourg $20; Hong Kong $12. |
| Synthetic do. | $230 | $276 | — | Austria $90; West Germany $66; Austria $52. |
| Pyrite, unroasted | 10,774 | 3,633 | — | Hungary 3,583; Austria 40. |
| Quartz crystal, piezoelectric value, thousands | $166 | $48 | $30 | Bulgaria $9; West Germany $8. |
| Salt and brine | 268,769 | 251,088 | — | Romania 203,035; Tunisia 36,844; Albania 9,185. |
| Sodium compounds, n.e.s.: | | | | |
| Soda ash, manufactured | 91,166 | 94,988 | — | Romania 39,052; Bulgaria 37,707; Austria 6,475. |
| Sulfate, manufactured | 45,873 | 43,835 | — | Austria 11,518; Turkey 9,206; East Germany 8,673. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked | 13,475 | 22,071 | 777 | Zimbabwe 9,630; Italy 4,220; Bulgaria 3,184. |
| Worked | 1,825 | 5,735 | 288 | Italy 3,323; Bulgaria 1,216. |
| Dolomite, chiefly refractory-grade | 70 | 75 | — | Norway 34; West Germany 23; Hungary 18. |
| Gravel and crushed rock | 30,344 | 46,895 | — | Austria 23,524; Hungary 22,547; Italy 610. |
| Limestone other than dimension | | 73 | — | Mainly from Italy. |
| Quartz and quartzite | 1,009 | 1,174 | 6 | West Germany 1,068; Austria 66; Netherlands 15. |
| Sand other than metal-bearing | 109,310 | 120,951 | 684 | Hungary 53,544; Czechoslovakia 43,238; West Germany 15,793. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Crude including native and byproduct | 144,141 | 144,802 | — | Poland 100,442; Iran 9,401; West Germany 2,738. |
| Colloidal, precipitated, sublimed | 73 | 12 | — | West Germany 9; Austria 2. |
| Dioxide | 76 | 63 | — | Italy 38; West Germany 25. |
| Sulfuric acid | 5,338 | 5,041 | — | Hungary 4,980; West Germany 43; Switzerland 17. |
| Talc, steatite, soapstone, pyrophyllite | 4,449 | 4,360 | 12 | Austria 1,547; West Germany 1,226; Italy 1,067. |
| Vermiculite | 17,123 | 9,883 | — | U.S.S.R. 2,988; Hungary 2,963; Greece 2,514. |
| Other: | | | | |
| Crude | 3,768 | 3,437 | 1 | East Germany 1,500; West Germany 572; Austria 437. |
| Slag and dross, not metal-bearing | 97,054 | 250,223 | — | Italy 132,223; West Germany 32,318; Bulgaria 22,870. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 4,760 | 5,673 | 366 | Czechoslovakia 2,938; Albania 1,785. |
| Carbon: | | | | |
| Carbon black | 16,735 | 18,635 | 76 | Italy 11,664; Mexico 3,760; West Germany 2,366. |
| Retort carbon | — | 1 | — | Mainly from U.S.S.R. |

See footnotes at end of table.

TABLE 8—Continued

## YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| INDUSTRIAL MINERALS—Continued | | | | | |
| Coal: | | | | | |
| Anthracite | | 186,579 | 174,121 | — | U.S.S.R. 173,810; West Germany 240; Italy 10. |
| Bituminous | thousand tons | 3,283 | 3,085 | 742 | U.S.S.R. 1,959; Australia 189. |
| Lignite including briquets | | 26,402 | 30,886 | — | Czechoslovakia 20,942; East Germany 9,766; Poland 106. |
| Coke and semicoke | | 93,216 | 34,089 | — | Italy 23,046; Belgium-Luxembourg 7,349; West Germany 2,624. |
| Gas, natural: Gaseous | million cubic meters | 4,283 | 2,200 | 35 | U.S.S.R. 2,136; Hungary 29. |
| Peat including briquets and litter | | 4,704 | 6,734 | — | U.S.S.R. 4,601; Hungary 1,115; Netherlands 980. |
| Petroleum: | | | | | |
| Crude | thousand 42-gallon barrels | 86,156 | 88,598 | 569 | U.S.S.R. 44,709; Iraq 13,793; Iran 10,171. |
| Refinery products: | | | | | |
| Liquefied petroleum gas including nonrefinery production | do. | 491 | 21 | — | Hungary 20. |
| Gasoline | do. | 1,707 | 3,221 | (2) | Italy 800; Romania 665; Greece 552. |
| Mineral jelly and wax | do. | 32 | 37 | (2) | West Germany 16; Hungary 4; Netherlands 3. |
| Kerosene and jet fuel | do. | 778 | 1,057 | 25 | Italy 398; Lybia 285; Hungary 138. |
| Distillate fuel oil | do. | 835 | 1,093 | — | U.S.S.R 335; United Kingdom 201; Panama 189. |
| Lubricants | do. | 543 | 486 | 2 | Hungary 146; Italy 91; Poland 88. |
| Residual fuel oil | do. | 2,556 | 2,638 | — | U.S.S.R. 1,597; Hungary 316; United Kingdom 5. |
| Bitumen and other residues | do. | 2 | 79 | (2) | Hungary 72; Austria 6. |
| Bituminous mixtures | do. | 2 | 8 | (2) | Austria 5; France 2; West Germany 1. |
| Petroleum coke | do. | 694 | 661 | 487 | West Germany 168; United Kingdom 5. |

[1]Revised. NA Not available.
[1]Table prepared by Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]May include blue powder.

TABLE 9

## YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Principal sources, 1990 |
|---|---|---|---|
| Abrasives: Artificial: Silicon carbide | 120 | 24 | All from West Germany. |
| Aluminum: Metal including alloys: | | | |
| Unwrought | 23 | — | |
| Semimanufactures | 940 | 1,048 | All from West Germany. |
| Coal: Lignite, agglomerated briquets | 1,040 | 6,008 | All from Hungary. |
| Copper: Metal including alloys: | | | |
| Unwrought | 743 | 138 | All from Bulgaria. |
| Semimanufactures | 580 | 872 | Italy 513; Bulgaria 309; West Germany 50. |
| Gold: Metal including alloys, unwrought and partly wrought value, thousands | $156 | $193 | Bulgaria $117; West Germany $71; Austria $4. |
| Gypsum and plaster | 2 | — | |
| Iron and steel: Metal: | | | |
| Steel, primary forms | 42,527 | 55 | All from U.S.S.R. |
| Semimanufactures: Flat-rolled products, of iron or nonalloy steel, not clad, plated, coated | 258 | 17,609 | Bulgaria 16,104; U.S.S.R. 1,160; Italy 314. |
| Lead: | | | |
| Oxides | 13 | 21 | All from Austria. |
| Metal including alloys, unwrought | 2,760 | 41 | All from Bulgaria |
| Petroleum refinery products: Lubricants 42-gallon barrels | 4,438 | 483 | All from Hungary. |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought: | | | |
| Platinum value, thousands | $245 | — | |
| Unspecified do. | $1,014 | $1,442 | Austria $1,148; West Germany $261; United Kingdom $32. |
| Silver: Metal including alloys, unwrought and partly wrought | 1 | (2) | Mainly from Bulgaria. |
| Zinc: Metal including alloys, unwrought | 2 | — | |

[1]Table prepared by Ronald L. Hatch, International Data Section. No imports after processing were reported from the United States in 1990.
[2]Less than 1/2 unit.

TABLE 10

## YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|
| | | | United States | Other (principal) |
| **METALS** | | | | |
| Aluminum: | | | | |
| Oxides and hydroxides | 68,731 | — | | |
| Metal including alloys: | | | | |
| Scrap | 20 | 275 | — | Italy 233; Austria 25; U.S.S.R. 17. |
| Unwrought | 2,456 | 5,926 | 852 | U.S.S.R. 1,177; West Germany 819. |
| Semimanufactures | 7,873 | 13,613 | 1,582 | U.S.S.R. 5,937; Romania 1,801; Hungary 1,615. |
| Chromium: Ore and concentrate | 3,500 | — | | |
| Copper: Metal including alloys: | | | | |
| Scrap | 17 | 25 | — | All from Switzerland. |
| Unwrought | 1,256 | 540 | — | Chile 500; Egypt 40. |
| Semimanufactures | 5,119 | 1,532 | 50 | U.S.S.R. 523; West Germany 419; Bulgaria 325. |
| Gold: Metal including alloys, unwrought and partly wrought value, thousands | $2,874 | $2,769 | $1,293 | West Germany $710; Japan $432. |
| Iron and steel: | | | | |
| Iron ore and concentrate | 1,518 | 1,710 | — | All from West Germany. |
| Metal: | | | | |
| Scrap | 18,634 | 31 | — | Italy 27; Austria 3. |
| Ferroalloys: | | | | |
| Ferrochromium | 3,194 | — | | |
| Ferrosilicon | 1,220 | — | | |
| Unspecified | 12 | — | | |
| Steel, primary forms | 163,650 | 161,670 | — | U.S.S.R. 107,836; Czechoslovakia 21,980; Hungary 17,160. |
| Semimanufactures: | | | | |
| Flat-rolled products: | | | | |
| Of iron or nonalloy steel: | | | | |
| Not clad, plated, coated | 125,968 | 106,561 | 97 | U.S.S.R. 88,362; Italy 7,304; United Kingdom 5,015. |
| Clad, plated, coated | 83,567 | 43,211 | — | U.S.S.R. 19,719; West Germany 15,097; Switzerland 7,991. |
| Of alloy steel | 143 | 1,819 | — | West Germany 1,505; Italy 217; Switzerland 86. |
| Bars, rods, angles, shapes, sections | 37,077 | 8,022 | 39 | Austria 5,606; Hungary 819; West Germany 584. |
| Rails and accessories | 26 | — | | |
| Wire | 4,428 | 8,492 | 15 | France 7,002; Italy 840; East Germany 157. |
| Tubes, pipes, fittings | 44,382 | 15,996 | 1,003 | Hungary 6,455; U.S.S.R. 2,996; Austria 2,963. |
| Lead: Metal including alloys: | | | | |
| Scrap | 71 | — | | |
| Unwrought | 24,018 | 18,266 | — | Austria 12,545; Switzerland 3,130; Greece 2,000. |
| Semimanufactures | — | 1,674 | — | U.S.S.R. 1,584; Cuba 90. |
| Manganese: | | | | |
| Ore and concentrate, metallurgical-grade | 35,862 | 35,518 | — | Botswana 34,640; Bulgaria 878. |
| Oxides | 20 | — | | |

See footnotes at end of table.

TABLE 10—Continued

## YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

| Commodity | | 1989 | 1990 | Sources, 1990 | |
|---|---|---|---|---|---|
| | | | | United States | Other (principal) |
| **METALS—Continued** | | | | | |
| Platinum-group metals: Metals including alloys, unwrought and partly wrought | value, thousands | $14 | $365 | — | All from Japan. |
| Silver: Metals including alloys, unwrought and partly wrought | do. | — | $31 | — | All from United Kingdom. |
| Zinc: Metal including alloys: | | | | | |
| Unwrought | | 70,354 | 38,913 | — | Greece 11,308; Peru 10,850; Morocco 6,466. |
| Semimanufactures | | 3,334 | 4,601 | — | West Germany 3,624; Austria 701; Switzerland 158. |
| **INDUSTRIAL MINERALS** | | | | | |
| Abrasives, n.e.s.: Artificial: Corundum | | 400 | — | | |
| Clays, crude: Kaolin | | (2) | — | | |
| Diamond, natural: Gem, not set or strung | value, thousands | $3 | — | | |
| Fertilizer materials: Manufactured: | | | | | |
| Ammonia | | 7,606 | 13,550 | — | Czechoslovakia 5,963; Bulgaria 3,584; U.S.S.R. 3,057. |
| Nitrogenous | | 5,637 | 26,693 | — | Hungary 13,705; Bulgaria 11,420; East Germany 1,568. |
| Potassic | | — | 401 | — | U.S.S.R. 293; East Germany 108. |
| Unspecified and mixed | | 60,178 | 209,822 | 2,940 | Morocco 99,508; Poland 24,704; United Kingdom 19,598. |
| Graphite, natural | value, thousands | $8 | $2 | $2 | |
| Salt and brine | | 193 | 292 | — | All from West Germany. |
| Stone, sand and gravel: | | | | | |
| Dimension stone: | | | | | |
| Crude and partly worked | | — | 101 | — | All from China. |
| Worked | | 2 | 61 | — | Albania 36; West Germany 25. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | | |
| Carbon, black | | — | 2,500 | — | All from Hungary. |
| Coal: Bituminous, coking | | 701,904 | 256,983 | 18,564 | U.S.S.R. 55,351; Hungary 14,068. |
| Coke and semicoke | | 65,284 | — | | |
| Petroleum refinery products: | | | | | |
| Gasoline | 42-gallon barrels | 86,009 | 400 | — | All from United Kingdom. |
| Kerosene and jet fuel | do. | 1,527 | — | | |
| Distillate fuel oil | do. | 171,602 | 249,716 | — | Panama 151,356; United Kingdom 98,360. |
| Lubricants | do. | 1,323 | — | | |

[1]Table prepared by Ronald L. Hatch, International Data Section.
[2]Less than 1/2 unit.

TABLE 11

## YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies | Location of main facilities[1] | Capacity |
|---|---|---|---|
| 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. |
| Do. | Rudnici Boksita, Niksić | Mines in Montenegro at Kusko Brdo, Zagrad, Biocki Stan, Durakov, and other locations | 650. |
| Do. | Jadral, Jadranski Aluminijum | Mines in Croatia at Obrovac, Drniš, and other locations | 450. |
| Cement: | 16 producing enterprises, of which the largest were-- | 20 plants in operation | 13,860. |
| Do. | Dalmacija Cement | Partizan plant at Kaštel Sućurac, Croatia | 1,525. |
| Do. | do. | Prvoborac plant at Solin, Croatia | 884. |
| Do. | do. | "10 Kolovoz" plant at Solin Majdan, Croatia | 440. |
| Do. | do. | Renko Šperac plant at Omiš, Croatia | 140. |
| Do. | Beocinska Fabrika Cementa | Plant at Beocin, Serbia | 2,031. |
| Do. | Fabrika Cementa Novi Popovac | Plant at Popovac, Serbia | 1,613. |
| 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 Ušće, near Baljevac na Ibru, Serbia | 150. |
| Do. | do. | do. | 100. |
| Brown | SOUR Titovi Rudnici Uglja, Tuzla, BiH | Mines in BiH | 12,000. |
| Do. | SOZC, Rudarsko Energetski Kobinat E. Kardelj, Trbovlje, Slovenia | Mines: Sasavski Rudnici at Trbovlje, Hrastnik, Ojstro Senovo, and Kaniž | 1,300. |
| Lignite | SOUR Titovi Rodnici Uglja, Tuzla, BiH | Mines in BiH | 7,000. |
| Do. | SOUR Kolubara, Rudarsko Energetsko Industrijski Kombinat, RO | Opencast mines: Polje B and Polje D | 10,000. |
| Do. | Kolubara Površinski Kopovi | Tamnavski Kopovi (also known as Kolubarski Rudnici Lignita), near Vreoci, Serbia | 14,000. |
| Do. | SOUR Elektroprivreda Kosova, RO Kosovo, Proizvodnja Separacija i Transport Uglja | Opencast mines: Dobro Selo and Belacevac, near Obilić, Serbia | 2,000. |

See footnotes at end of table.

TABLE 11—Continued

## YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies | Location of main facilities[1] | Capacity |
|---|---|---|---|
| Coal—Continued: | Rudarsko Energetski Kombinat Velenje, RO Rudnik Lignita-Velenje | Mine at Velenje, Slovenia | 5,000. |
| Chromite, concentrate | Jugohrom, Hemijsko-Elektrometalurški-Kombinat | Concentrator at Raduša, 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. |
| Do. | do. | Mine and mill at Majdanpek, Serbia | 15,000 ore. |
| Do. | do. | Mine and mill at Veliki Krivelj, Serbia | 8,000 ore. |
| Do. | Bućim, Rabotna Organizacija za Rudarstvo i Metalurgija za Baker | Mine and mill at Bućim, near Radoviš, Macedonia | 7,000 ore. |
| Ferroalloys | Jugohrom, Hemijsko-Elektrometalurški-Kombinat | Plant at Jegunovce, Macedonia | 80. |
| Do. | Elektrobosna, Elektrohemijska i Elektrotermijska Industrija | Plant at Jajce | 80. |
| Iron ore | Rudarsko Metalurški Kombinat Zenica | Mines at Vareš, Ljubija, and Radovan, BiH | 5,000. |
| Do. | Skopje Rudnici i Zeljezarnica Skopje | Mines at Tajmište, Demir Hisar, and Damjan, Macedonia | 1,000. |
| 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. |
| Do. | do. | Mills at Kriva Feja, Lece, Rudnik, Badovac, Leposavic, Zvecan, and Maravce, Šuplja Stijena | 3,160. |
| Do. | Energoinvest | Mine and mill at Srebrenica, BiH | 300. |
| Do. | Rudarsko Metalurško Prepobotuvacki, Kombinat Zletovo-Sasa: | | |
| Do. | 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 Metalursko 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. |

See footnotes at end of table.

TABLE 11—Continued

## YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies | Location of main facilities[1] | Capacity |
|---|---|---|---|
| Lead, metal—Continued: | 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 kilometers northwest of Cacak, Serbia | 120 concentrate. |
| 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. |
| Manganese, ore | Mangan-Energoinvest | Mine and concentrator at Buzim, BiH | 100. |
| Mercury metric tons | Rudnik Zivega Srebra, Idrija | Mine and smelter in Idrija, Slovenia | 15,000.[2] |
| Natural gas million cubic feet | Industrija Nafte (INA) | Natural gas fields in Croatia: Bogšic Lug, Molve, and others | 70,000. |
| Do. do. | Naftaplin (Naftagas), RO za Istrazivanje, i Proizvodnju Nafte i Gasa | Natural gas fields in Serbia: Kikinda and others | 30,000. |
| Nickel, ore | Feni-Rudnici i Industrija za Nikel, Celik i Antimon | Mine and opencast mine near Kavadarci, Macedonia[3] | 2,300. |
| Do. | do. | Ferronickel plant at Kavadarci, Macedonia[3] | 16,000.[3] |
| Petroleum: | | | |
| Crude thousand barrels per day | Industrija Nafte (INA) | Oilfields in Croatia and Slovenia: Benicanci, Zutica, Struzec, Ivanic Grad, Lendava, and others | 70. |
| Do. do. | Naftagas, Naftna Industrija | Oilfields in Serbia: Kikinda and others | 30. |
| Refined do. | Industrija Nafte (INA): | | |
| Do. do. | Rafinerija Nafte Rijeka | Refineries at Urinj and Rijeka, Croatia | 160. |
| Do. do. | Rafinerija Nafte Sisak | Refinery at Sisak, Croatia | 150. |
| Do. do. | Rafinerija Nafte Lendava | Refinery at Lendava, Slovenia | 16. |
| | Naftagas, Naftna Industrija: | | |
| Do. do. | Rafinerija Nafte Pancevo | Refinery at Pancevo, Serbia | 110. |
| Do. do. | Rafinerija Nafte Novi Sad | Refinery at Novi Sad, Serbia | 28. |
| Do. do. | Energoinvest: Rafinerija Nafte Bosanski Brod | Refinery at Bosanski Brod, BiH | 100. |
| Pig iron | Rudarsko Metalurški Kombinat Zenica (RMK Zenica) | 4 blast furnaces at Zenica, BiH<br>2 blast furnaces at Vareš, BiH | 2,250.<br>100. |
| Do. | do. | Electric reduction furnaces at Iljaš, BiH | 100. |
| Do. | Metalurški Kombinat, Smederevo | Blast furnace at Smederevo, Serbia | 720. |
| Do. | Metalurški Kombinat "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 Zeljezarnica Skopje | 5 Elkem electric furnaces at Skopje, Macedonia | 430. |

See footnotes at end of table.

TABLE 11—Continued

## YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

| Commodity | Major operating companies | Location of main facilities[1] | Capacity |
|---|---|---|---|
| Salt metric tons | Hemijski Kombinat "Sodaso," Rudnik Soli i Solni Bunari | Rock salt: Mines at Tušanj, BiH | 120,000. |
| Do. cubic meters | do. | Production from brine at Tuzla, BiH | 2,000,000. |
| Do. | Solana "Pag," Solana "Ante Festin" | Marine Salt: Pag Island, Croatia | 13. |
| Steel, crude million metric tons | Rudarsko Metalurški Kombinat Zenica | Plant at Zenica, BiH | 2,060. |
| 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 Smleter plant and refinery at Titov Veles, Macedonia | 65. |
| Do. | Hemijska Industrija Zorka | Electrolytic plant at Šabac, Serbia | 40. |

[1]BiH Bosnia i Hercegovina.
[2]Flasks per year.
[3]Closed in 1984.
[4]Nickel in ferronickel.

TABLE 12

## YUGOSLAVIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1991

| Commodity | Capacity (thousand metric tons) |
|---|---|
| Antimony, ore | 12,000 |
| Bauxite | 150,000 |
| Coal (in standard coal equivalent) | 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 |

TABLE 13

## YUGOSLAVIA: DISTRIBUTION OF MINERAL EXPORTS IN 1990, BY TYPE OF CARRIAGE AND RECEIVING AREAS

(Thousand metric tons)

| Type of carriage/commodity | Receiving area | | | | | |
|---|---|---|---|---|---|---|
| | Total | EC | EFTA | Turkey | CMEA | Non-European countries |
| Automobile-truck: | | | | | | |
| Iron ore and scrap iron | 41 | 20 | 3 | 1 | 2 | 15 |
| Nonferrous metal ores and concentrates | 31 | 26 | 3 | — | 1 | 1 |
| Metals | 221 | 181 | 23 | 2 | 8 | 7 |
| Industrial minerals, crude | 42 | 32 | 3 | — | 3 | 4 |
| Lime, cement, and other construction materials | 342 | 265 | 38 | 2 | 37 | 2 |
| Fertilizers | 7 | 6 | 1 | — | — | — |
| Solid fuels | 1 | — | — | — | — | — |
| Crude petroleum | 45 | 31 | 12 | — | 2 | — |
| Refined petroleum products and gas | 1 | — | — | — | — | — |
| Tars and crude chemicals from coal and natural gas | 16 | 13 | 2 | — | — | — |
| Railway: | | | | | | |
| Iron ore and scrap iron | 448 | 235 | 12 | — | 201 | — |
| Nonferrous metal ores and concentrates | 273 | 13 | — | — | 260 | — |
| Metals | 1,111 | 721 | 104 | 1 | 285 | — |
| Industrial minerals, crude | 106 | 23 | 4 | — | 80 | — |
| Lime, cement, and other construction materials | 239 | 130 | 37 | 2 | 69 | — |
| Fertilizers | 85 | 33 | 13 | — | 38 | — |
| Solid fuels | 307 | 95 | 33 | — | 179 | — |
| Crude petroleum | — | — | — | — | — | — |
| Refined petroleum products and gas | 452 | 103 | 237 | — | 112 | — |
| Tars and crude chemicals from coal and natural gas | 92 | 15 | 54 | — | 23 | — |
| Inland waterways: | | | | | | |
| Iron ore and scrap iron | 118 | 13 | 3 | — | 102 | — |
| Nonferrous metal ores and concentrates | 79 | 51 | 1 | — | 27 | — |
| Metals | 442 | 30 | 9 | — | 403 | — |
| Industrial minerals, crude | 40 | 2 | 1 | — | 37 | — |
| Lime, cement, other construction materials | 56 | 39 | 16 | — | 1 | — |
| Fertilizers | 146 | 99 | 26 | — | 21 | — |
| Solid fuels | 11 | — | 7 | — | 4 | — |
| Crude petroleum | 402 | 130 | 200 | — | 72 | — |
| Refined petroleum products and gas | 33 | 5 | 27 | — | — | — |
| Tars and crude chemicals from coal and natural gas | 1 | — | — | — | 1 | — |
| Maritime: | | | | | | |
| Iron ore and scrap iron | 76 | 15 | 2 | 7 | 1 | 51 |
| Nonferrous metal ores and concentrates | 368 | 87 | 38 | 9 | 220 | 14 |
| Metals | 454 | 210 | 19 | 69 | 35 | 121 |
| Industrial minerals, crude | 223 | 221 | — | 1 | — | 1 |
| Lime, cement, and other construction materials | 758 | 703 | 6 | 26 | 1 | 22 |
| Fertilizers | 466 | 207 | 10 | 23 | 12 | 214 |

See footnotes at end of table.

TABLE 13—Continued

## YUGOSLAVIA: DISTRIBUTION OF MINERAL EXPORTS IN 1990, BY TYPE OF CARRIAGE AND RECEIVING AREAS

(Thousand metric tons)

| Type of carriage/commodity | Receiving area | | | | | |
|---|---|---|---|---|---|---|
| | Total | EC | EFTA | Turkey | CMEA | Non-European countries |
| Maritime—Continued: | | | | | | |
| Solid fuels | 71 | 27 | — | 1 | 3 | 40 |
| Crude petroleum | 78 | 78 | — | — | — | — |
| Refined petroleum products and gas | 831 | 729 | 22 | — | 5 | 75 |
| Tars and crude chemicals from coal and natural gas | 2 | 2 | — | — | — | (1) |

[1]Less than 500 tons.

Source: Data derived from International Goods Transport SFRY-EC 1990, Belgrade, 1991.

TABLE 14

## YUGOSLAVIA: DISTRIBUTION OF MINERAL IMPORTS IN 1990 BY TYPE OF CARRIAGE AND EXPORTING AREAS

(Thousand metric tons)

| Type of carriage/commodity | Exporting area | | | | | |
|---|---|---|---|---|---|---|
| | Total | EC | EFTA | Turkey | CMEA | Non-European countries |
| Automobile-truck: | | | | | | |
| Iron ore and scrap iron | 6 | 5 | 1 | — | — | — |
| Nonferrous metal ores and concentrates | 4 | 2 | 1 | — | 1 | — |
| Metals | 58 | 45 | 11 | — | 3 | — |
| Industrial minerals, crude | 29 | 12 | 10 | 1 | 6 | — |
| Lime, cement, and other construction materials | 131 | 81 | 17 | 2 | 30 | 1 |
| Fertilizers | 4 | 3 | — | — | 2 | — |
| Solid fuels | 13 | 12 | — | — | — | — |
| Crude petroleum | 45 | 10 | 8 | — | 27 | — |
| Refined petroleum products and gas | 1 | — | — | — | — | — |
| Tars and crude chemicals from coal and natural gas | 12 | 5 | 2 | — | 5 | — |
| Railway: | | | | | | |
| Iron ore and scrap iron | 448 | 235 | 12 | — | 201 | — |
| Nonferrous metal ores and concentrates | 273 | 13 | — | — | 260 | — |
| Metals | 1,111 | 721 | 104 | 1 | 285 | — |
| Industrial minerals, crude | 107 | 23 | 4 | — | 80 | — |
| Lime, cement, other construction materials | 186 | 85 | 35 | — | 66 | — |
| Fertilizers | 85 | 33 | 13 | — | 38 | — |
| Solid fuels | 307 | 95 | 33 | — | 179 | — |
| Crude petroleum | — | — | — | — | — | — |
| Refined petroleum products and gas | 452 | 103 | 237 | — | 112 | — |
| Tars and crude chemicals from coal and natural gas | 92 | 15 | 54 | — | 23 | — |

TABLE 14—Continued

## YUGOSLAVIA: DISTRIBUTION OF MINERAL IMPORTS IN 1990 BY TYPE OF CARRIAGE AND EXPORTING AREAS

(Thousand metric tons)

| Type of carriage/commodity | Exporting area | | | | | |
|---|---|---|---|---|---|---|
| | Total | EC | EFTA | Turkey | CMEA | Non-European countries |
| Inland waterways: | | | | | | |
| Iron ore and scrap iron | 410 | — | 1 | — | 409 | — |
| Nonferrous metal ores and concentrates | 54 | 1 | 1 | — | 52 | — |
| Metals | 1,212 | 11 | 9 | — | 1,192 | — |
| Lime, cement, other construction materials | 1 | 1 | — | — | — | — |
| Fertilizers | 615 | — | — | — | 615 | — |
| Solid fuels | 221 | — | — | — | 221 | — |
| Crude petroleum | 18 | — | — | — | 18 | — |
| Refined petroleum products and gas | 218 | 3 | 3 | — | 212 | — |
| Maritime: | | | | | | |
| Iron ore and scrap iron | 1,624 | 129 | 38 | 90 | 139 | 1,228 |
| Nonferrous metal ores and concentrates | 950 | 140 | 69 | 51 | 53 | 636 |
| Metals | 290 | 103 | 9 | 7 | 66 | 104 |
| Industrial minerals, crude | 273 | 47 | 8 | 40 | 72 | 106 |
| Lime, cement, and other construction materials | 28 | 9 | — | — | 8 | 11 |
| Fertilizers | 446 | 1 | — | — | — | 445 |
| Solid fuels | 3,029 | 150 | — | — | 1,895 | 984 |
| Crude petroleum | 8,780 | 32 | 76 | 1,221 | 3,569 | 3,881 |
| Refined petroleum products and gas | 2,194 | 252 | 7 | 265 | 1,251 | 418 |
| Tars and crude chemicals from coal and natural gas | 6 | — | — | — | — | 6 |

## 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/beryl | Be |
| Bismuth | Bi |
| Bitumen (natural) | Bit |
| Boron | B |
| Bromine | Br |
| Cadmium | Cd |
| Calcium/calcite | Ca |
| Carbon black | CBl |
| Cement | Cem |
| Cesium | Cs |
| Chromite | Cr |
| Clays | Clay |
| Coal | C |
| Cobalt | Co |
| Columbium (niobium) | Cb |
| Copper | Cu |
| Corundum | Cn |
| Cryolite | Cry |
| Diamond | Dm |
| Diatomite | Dia |
| Dolomite | Ds |
| Emerald | Em |
| Emery | E |
| Feldspar | Feld |
| Ferroalloys | FA |
| Ferrochrome | FeCr |
| Ferromanganese | FeMn |
| Ferronickel | FeNi |
| Ferrosilicon | FeSi |
| Fertilizer | Fz |
| Fluorspar | F |
| Gallium | Ga |
| Garnet | Gt |
| Gemstones | Gm |
| Germanium | Ge |
| Gold | Au |
| Graphite | Gr |
| Gypsum | Gyp |
| Indium | In |
| Iron and steel | Fe |
| Iron ore | Fe |
| Jade | J |
| 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 |
| Marl | Ma |
| Mercury | Hg |
| Mica | M |
| Molybdenum | Mo |
| Natural gas | NG |
| Natural gas liquids | NGL |
| Nepheline syenite | Neph |
| Nickel | Ni |
| Nitrates | Nit |
| Nitrogen (ammonia plants) | N |
| Ochre | Oc |
| 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 |
| Pozzolana | Pz |
| Pumice | Pum |
| Pyrite | Py |
| Pyrophyllite | Pyrp |
| Quartz or quartzite | Qtz |
| Rare earths | RE |
| Rhenium | Re |
| Salt | Salt |
| Sand and gravel | S/Gvl |
| Sandstone | Ss |
| Selenium | Se |
| Sepiolite, meerschaum | Sep |
| Serpentine | Serp |
| Shale | Sh |
| Silicon | Si |
| Sillimanite | Slm |
| Silver | Ag |
| Soapstone | So |
| Soda ash, trona | NaAsh |
| Sodium sulfate | $NaSO_4$ |
| Stone | St |
| Strontium | Sr |
| Sulfur | S |
| Talc | Tc |
| Tantalum | Ta |
| Tellurium | Te |
| Thorium | Th |
| Tin | Sn |
| Titanium (rutile or ilmenite) | Ti |
| Titanium dioxide (processed) | $TiO_2$ |
| Tungsten | W |
| Umber | Um |
| Uranium | U |
| Vanadium | V |
| Vermiculite | Vm |
| Wollastonite | Wo |
| Yttrium | Y |
| Zinc | Zn |
| Zircon | Zr |

## MAP LEGEND

| | |
|---|---|
| Symbol = | Mine, including beneficiation plants, wells |
| Circled Symbol = | Group of producing mines or wells |
| Underlined Symbol = | Processing plant or oil refinery, including smelters and metal refineries |
| (Symbol) = | Undeveloped significant resource |

## UNITS OF MEASURE AND ABBREVIATIONS

### Unit of Measure

a = year
° API = American Petroleum Institute gravity
bbl = barrel(s)
cal = calorie(s)
c = centi (prefix)
cm = centimeter(s)
$m^3$ = cubic meter(s)
d = day(s)
dwt = ton(s), deadweight
G = giga (prefix)
GW = gigawatt(s)
GW•h = gigawatt hour(s)
g = gram(s)
g/mt = gram(s) per metric ton
ha = hectare(s)
k = thousand
kcal = kilocalorie(s)
kg = kilogram(s)
kL = kiloliter(s)
km = kilometer(s)
$km^2$ = square kilometer(s)
kmt = thousand metric ton(s)
kV = kilovolt(s)
kW = kilowatt(s)
kW•h = kilowatt hour(s)
L = liter(s)
M = mega (prefix)
MW = megawatt(s)
MW•h = megawatt hour(s)
m = meter(s)
M = million
Mmt = million metric ton(s)
$m^2$ = square meter(s)
mt = ton(s), metric
SCE = standard coal equivalent
V = volt
W = watt
W•h = watt hour

### Abbreviation

API = American Petroleum Institute
EC = European Community
EFTA = European Free Trade Association
FTA = Free Trade Agreement
GATT = General Agreement on Tariffs and Trade
GDP = gross domestic product
GNP = gross national product
LNG = liquefied natural gas (methane)
LPG = liquefied petroleum gas (propane-butane)
NAFTA = North American Free Trade Agreement
OECD = Organization for Economic Cooperation and Development
OPEC = Organization of Petroleum Exporting Countries
UN = United Nations
UNDP = United Nations Development Program