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MINERAL INDUSTRIES OF

EUROPE AND CENTRAL EURASIA

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

1993

UNITED STATES DEPARTMENT OF THE INTERIOR • Bruce Babbitt, Secretary

BUREAU OF MINES

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

U.S. GOVERNMENT PRINTING OFFICE

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Preface

This edition of the Minerals Yearbook records the performance of the worldwide minerals industry during 1993 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 is included.

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

Volume III, International Review, contains the latest available mineral data on more than 175 foreign countries and discusses the importance of minerals to the economies of these nations. The reports also incorporate location maps, industry structure tables, and an outlook section.

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. Due to budget constraints detailed mineral trade statistics by country will no longer be included in this publication. However, in the future abbreviated trade data for the major mineral trading countries will be made available by electronic or other means. For information on trade statistics call the Chief, Section of International Data at (202) 501-9700.

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.

Rhea L. Graham, Director

Acknowledgments

The Country Specialists in the Division of International Minerals, U.S. Bureau of Mines, in preparing the International Review regional books of Volume III of the Minerals Yearbook, 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 U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support is provided by the staff of the Section of International Data, Division of Statistics and Information Services.

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

George J. Coakley
Chief, Division of International Minerals

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Vitae

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., where he 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 the Polytechnic University. He has also done graduate work in Metallurgy and Materials Science at New York 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.

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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 46 countries: the 12 nations of the European Union (EU) (Belgium, Denmark and 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 (EFTA) (Austria, Finland, Iceland, Norway, Switzerland, and Sweden); Malta; the 12 Central European economies in transition (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, Macedonia, Poland, Romania, Serbia and Montenegro, Slovakia, and Slovenia); and the countries of Central Eurasia (Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgystan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan).

Western Europe

Western Europe, as defined here, includes the 12 nations of the EU and the 7 nations of EFTA. It is the single largest trading area and consumer of raw materials in the world. Western Europe's mining sector is no longer as important to the area's economy as it once was and increasingly relies on North and South America, Africa, and Australia to supply raw materials for its significant minerals processing industry. In this respect, as the major consumer of raw materials, Western Europe is the single most important determinant of global 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 Russia as a major smelter and refiner of metals. On December 31, 1992, trade barriers between the 12 EU nations were eliminated and, as expected, 1993 saw a continuation of the rationalization, privatization, mergers, and acquisitions that have been ongoing in Western Europe for the last decade. The United Kingdom's commitment to rationalization of its coal industry, for example, was demonstrated by the fact that, at the end of 1993, only 22 underground coal mines were in operation in the United Kingdom, compared with 50 in 1992, and overall productivity in British coal mines was reportedly 17% higher than in 1990. Germany and France also continued to close down their less efficient coal mines, but appeared somewhat less aggressive than their British counterparts in cutting back on subsidies to their respective coal industries. Pushed by the European Union's efforts to rationalize the steel sector and eliminate subsidies, European steel companies were cutting back on competition through mergers, acquisitions, cutbacks, and marketing agreements. France's Usinor Sacilor, which, in the last decade, has grown to become the world's second largest steel producer (after Nippon Steel), continued to lead the push for increased rationalization of the industry. In 1993, Sollac, a subsidiary of Usinor Sacilor, took over 30% of Spain's Barcelonesa de Metales, and Ilva S.p.A., Italy's fourth largest manufacturing company, and Europe's third largest steel producer, continued its efforts at rationalization through restructuring and cutbacks and was continuing to seek foreign investors to assist in privatization efforts. Germany continued to spend in the order of $100 billion per year in restructuring eastern German industry. The Treuhandanstalt, the German Government agency in charge of privatizing a large number of eastern German companies, reportedly will be closed in 1994. In the western part of Germany, two of the country's largest steel companies and engineering firms, Hoesch AG and Friedrich Krupp AG merged. Only Greece, in the European Union, was showing a reversal in efforts to denationalize its industrial sector.

Central Europe

In Central Europe, rationalization and, where possible, privatization were ongoing. There also were concerted efforts at controlling environmental pollution and seeking to reverse some of the environmental destruction that had gone unabated since the 1940's. Virtually every Central European country had new environmental laws prepared and, of far greater importance, was seeking to enforce these laws. As CMEA members, many of these countries, in fact, had had strict environmental laws. The laws just had not been enforced effectively. It now appears that, in many Central European countries, these laws are being enforced. In Poland, for example, most operations at the Huta Bobrek steel mill, as reported by "Metals Bulletin," were closed down reportedly for environmental reasons in 1993. The Polish Government had given an ultimatum to Huta Bobrek in June 1992 to limit radically pollution from mill operations within one year. When these limits were not effected to the Government's satisfaction in the required time, the plant was shut down. Restructuring and modernization of existing facilities were ongoing throughout the region. Modernization was being funded through several sources. These included foreign partners, local and foreign banks, and international financial institutions—specifically the World Bank and the European Bank for Reconstruction and Development. With the notable exception of the newly formed republics of the former Yugoslavia, which were either still in civil war or feeling the effects of that war, and Albania, which has not yet been able to effectively restructure its economy, the gross domestic products (GDP) of many Central European countries were apparently reaching levels of stability and growth after years of continued decline as these countries were apparently beginning to successfully develop into market economies. Poland, the Czech Republic, and Hungary were all beginning to show economic stability and, as a measure of this, were accepted as associate member countries of the EU. In Poland, historically the largest producer of steel in Central Europe, steel production, which had decreased almost 43% between 1986 and 1992, showed a slight increase between 1992 and 1993 for the first time in six years. In fact, other than the Czech Republic, which had a slight decrease in steel production in 1993, all other Central European countries, outside of the former Yugoslavia and Albania, showed some increases in steel production over the previous year. It should also be added that Central European nations, which had come to rely on low priced Russian energy and, to varying degrees, on their own high sulfur lignite reserves to fill a significant part of their energy needs during the last fifty years, were now running into difficulty with regard to these sources of energy. Firstly, they were coming under increasing pressure to install expensive coal cleaning processes in order to continue to use high sulfur lignite while controlling sulfur emissions. Secondly, they were facing increased cutbacks in Russian petroleum. As a result, most of these nations, with the notable exception of Slovakia, which was about to have access to low priced energy from the new Danube dam project, cut back on energy consumption in general and high energy minerals production in particular. Hungary, for example, ceased producing primary aluminum by yearend. The fact that these countries are apparently successfully reducing, and even eliminating, production of those minerals which they do not have a natural comparative advantage to produce efficiently, will serve to make the industries that survive more competitive and profitable. It also will mean the opening of future markets to western (and Central Eurasian) producers of those products that cannot be produced competitively in Central Europe.

Central Eurasia

Central Eurasian mineral production is dominated by three countries: Russia, Kazakhstan, and Ukraine. Russia and Kazakhstan are major international minerals producers in a wide ranging variety of minerals. Ukraine is a major producer of iron ore, coal, manganese, and ferrous products. Also of importance as a mineral producer is Uzbekistan, which is the world's seventh largest gold producer. Azerbaijan and Turkmenistan are important fuel mineral producers; and Kyrgystan, Armenia, Georgia, and Tajikistan produce several minerals of international significance; the three Baltic states (Estonia, Latvia, and Lithuania) and Moldova are relatively unimportant minerals producers, but are increasingly becoming important transshipment points and entrepots for minerals; Belarus, except for potash, has no international significance in mineral mining or refining. Like Central Europe, Central Eurasia also was seeking to adapt to market economy structures. Unlike the Central European nations, some of which have a previous history of market economics and border on some of the most advanced economies in the world, a number of Central Eurasian nations have no experience with modern-day market economics and are surrounded by neighbors who also lack this experience. In addition, approximately one third of the Central Eurasian nations were at war or suffering serious civil disorders which made economic growth difficult, if not impossible. As a result, with the notable exception of Turkmenistan, which was a major supplier of natural gas to other Central Eurasian nations and showed an 8% increase in GDP in 1993, none of the Central Eurasian countries showed increased growth in their economies. Some, however, were able to restructure their economies to attract foreign investors and receive support for restructuring of various industries from the World Bank and the European Bank for Reconstruction and Development. Minerals traders are among the most active westerners in this part of the world and, according to recent CRU International Ltd. publications, there have been a significant number of successful contractual agreements involving toll refining of a variety of ores in Kazakhstan, Russia, and Uzbekistan. Those western companies which have invested in Central Eurasia have generally sought to do so in gold tailings reprocessing and refining and petroleum extraction. In some instances this has been done to ensure that part of the copper or aluminum smelter capacity, in which they have been toll refining intermediate products, will be available to them in future years. Projects involving U.S. companies include Newmont Mining Corporation's Murantau gold joint venture project in Uzbekistan and Chevron Corporation's efforts to invest in Kazakhstan's petroleum sector. Overall, however, foreign investment in the Central Eurasian mineral sector, other than petroleum, has been relatively minor. Reduced internal consumption and the need for hard currency on the part of local governments have encouraged exports of current minerals production. These added exports have helped depress the international prices of several commodities, including aluminum, magnesium, nickel and titanium. In the case of aluminum, Russia, as well as some Western companies, reportedly cut back on production during the year, somewhat alleviating the downward price trends in the international aluminum markets. The World Bank and the European Bank for Reconstruction and Development have been active in supporting environmental programs in many of the Central Eurasian countries. Moreover, surrounding countries, particularly the Scandinavian nations, which are concerned about environmental pollution from Central Eurasia affecting their environment, have offered to fund some of the cleanup. Of particular concern has been the Chernobyl nuclear facility in Ukraine and other nuclear reactors throughout the region, in addition to sulfur dioxide emissions from nickel production facilities in the Kola peninsula in northwestern Russia.

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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, New York American Metals Market, daily.
Financial Times, London, England.
Institution of Mining and Metallurgy, London, England:
Transactions, monthly.
Bulletin, monthly.
Interfax-America, Inc., Denver, Colorado:
Interfax Business Report, daily.
Interfax Financial Report, weekly.
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Interfax Petroleum Report, weekly.
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Mining Journal Ltd., London, England:
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Gornaya Entsiklopediya, 5 Volumes.
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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.
U.S. Joint Publications Research Service, Arlington, Virginia:
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 CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1993[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 (gross weight)	Crude steel (gross weight)	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite (gross weight)	Primary metal	Mine	Refined	Mine	Refined
Western Europe:												
European Union (EU):												
Belgium	—	8,213	10,250	—	—	—	—	—	—	298	—	127
Denmark-Greenland	—	—	604	—	—	—	—	—	—	—	—	—
France	2,100	12,679	17,179	—	—	7	—	458	—	53	—	280
Germany	11	26,968	37,622	—	—	—	—	552	—	632	—	334
Greece	575	—	940	—	—	11	1,700	148	—	—	26	—
Ireland	—	—	325	—	—	—	—	—	—	—	48	12
Italy	—	11,066	25,701	—	—	—	97	170	—	100	12	197
Luxembourg	—	2,411	3,292	—	—	—	—	—	—	—	—	—
Netherlands	—	5,406	6,001	—	—	—	—	229	—	—	—	24
Portugal	1	385	750	—	—	—	—	—	160	—	—	4
Spain	1,166	5,411	12,646	—	—	—	1	355	4	180	26	111
United Kingdom	6	11,808	16,693	—	—	28	—	239	—	47	1	364
Total EU	3,859	84,347	132,003	—	—	46	1,797	2,151	164	1,310	113	1,453
European Free Trade Association:												
Austria	320	3,000	3,700	—	—	—	—	—	—	51	1	15
Finland	—	2,400	3,100	500	—	15	—	—	11	73	—	—
Iceland	—	—	—	—	—	—	—	91	—	—	—	—
Norway	1,360	73	502	—	—	57	—	814	9	37	2	—
Sweden	9,800	2,600	4,300	—	—	—	—	82	89	99	113	88
Switzerland	—	70	1,000	—	—	—	—	45	—	—	—	6
Total EFTA	11,480	8,143	12,602	500	—	72	—	1,032	109	260	116	109
Total Western Europe	15,339	92,490	144,605	500	—	118	1,797	3,183	273	1,570	229	1,562
Central Europe												
Albania	85	10	5	282	—	—	2	—	3	—	—	—
Bosnia and Herzegovina	70	100	115	—	2	—	100	15	—	—	—	—
Bulgaria	180	900	1,400	—	—	—	—	—	36	13	45	55
Croatia	—	20	74	—	—	—	2	26	—	—	—	—
Czech Republic	39	5,000	7,500	—	—	—	—	—	—	1	1	20
Hungary	—	1,413	1,752	—	38	—	561	28	—	11	—	—
Macedonia	1	20	50	5	—	—	—	—	7	—	12	8
Poland	—	6,175	9,937	—	—	—	—	47	350	404	63	67
Romania	130	3,191	5,400	—	125	—	185	116	25	23	15	17
Serbia and Montenegro	—	62	183	—	—	2	102	26	70	51	9	6
Slovakia	350	3,000	3,000	—	—	—	—	60	1	28	2	—
Slovenia	—	—	350	—	—	—	—	80	—	—	—	4
Total Central Europe	855	19,891	29,766	287	165	2	952	398	492	531	147	177
Central Eurasia:												
Armenia	—	—	—	—	—	—	—	—	1	—	—	—
Azerbaijan	150	—	200	—	—	—	—	20	—	—	—	—
Belarus	—	—	800	—	—	—	—	—	—	—	—	—
Estonia	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 1—Continued
EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1993[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 (gross weight)	Crude steel (gross weight)	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite (gross weight)	Primary metal	Mine	Refined	Mine	Refined
Central Eurasia—Continued:												
Georgia	—	300	200	—	1,000	—	—	—	3	—	1	—
Kazakhstan	9,000	4,000	4,000	2,900	50	—	500	—	250	310	160	160
Kyrgyzstan	—	—	—	—	—	—	—	—	—	—	—	—
Latvia	—	—	—	—	—	—	—	—	—	—	—	—
Lithuania	—	—	—	—	—	—	—	—	—	—	—	—
Moldova	—	—	250	—	—	—	—	—	—	—	—	—
Russia	40,000	40,000	58,000	121	—	189	4,000	2,900	540	690	35	70
Tajikistan	—	—	—	—	—	—	—	300	—	—	2	—
Turkmenistan	—	—	—	—	—	—	—	—	—	—	—	—
Ukraine	36,000	30,000	30,000	—	5,000	5	—	90	—	—	—	—
Uzbekistan	—	—	600	—	—	—	—	—	70	65	20	—
Total Central Eurasia	85,150	74,300	94,050	3,021	6,050	194	4,500	3,310	864	1,065	218	230
Total Europe and Central Eurasia	101,344	186,681	268,421	3,808	6,215	314	7,249	6,891	1,629	3,166	594	1,969
Total United States	35,116	48,155	88,793	—	—	5	W	3,695	1,801	2,253	362	1,239
Total world	517,058	527,907	725,129	10,001	21,757	842	105,550	19,816	9,352	11,375	2,926	5,420
Western Europe as a percent of world total	3.0	17.5	19.9	5.0	0.0	14.0	1.7	16.1	2.9	13.8	7.8	28.8
Central Europe as a percent of world total	.2	3.8	4.1	2.9	.8	.2	.9	2.0	5.3	4.7	5.0	3.3
Central Eurasia as a percent of world total	16.5	14.1	13.0	30.2	27.8	23.0	4.3	16.7	9.2	9.4	7.5	4.2
Europe and Central Eurasia as a percent of world total	19.6	35.4	37.0	38.1	28.6	37.3	6.9	34.8	17.4	27.8	20.3	36.3

TABLE 1—Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1993[1]

(Thousand metric tons unless otherwise specified)

	Zinc (metal content)		Industrial minerals			
	Mine	Smelter production	Hydraulic cement	Nitrogen (N content of ammonia)	Phosphate rock, (gross weight)	Potash (K_2O equivalent)
Western Europe:						
European Union (EU):						
Belgium	—	210	7,750	400	—	—
Denmark-Greenland	—	—	2,100	—	—	—
France	15	336	22,000	1,800	—	1,000
Germany	—	381	36,649	2,100	—	2,900
Greece	22	—	12,618	57	—	—
Ireland	194	—	1,600	400	—	—
Italy	3	270	42,000	1,000	—	84
Luxembourg	—	—	750	—	—	—
Netherlands	—	207	3,400	2,400	—	—
Portugal	—	3	7,600	150	—	—
Spain	160	258	26,000	450	—	600
United Kingdom	—	105	10,000	900	—	530
Total EU	394	1,770	172,467	9,657	(²)	5,114
European Free Trade Association						
Austria	16	1	5,100	400	—	—
Finland	20	171	1,100	10	600	—
Iceland	—	—	100	9	—	—
Norway	14	129	1,368	315	—	—
Sweden	173	—	2,200	—	—	—
Switzerland	—	—	4,000	35	—	—
Total EFTA	223	301	13,868	769	600	—
Total Western Europe	617	2,071	186,335	10,426	600	5,114
Central Europe:						
Albania	—	—	200	15	—	—
Bosnia and Herzegovina	—	—	150	2	—	—
Bulgaria	25	47	2,500	1,100	—	—
Croatia	—	—	1,683	345	—	—
Czech Republic	5	1	6,000	200	—	—
Hungary	—	1	2,500	300	—	—
Macedonia	16	7	500	—	—	—
Poland	170	150	12,228	1,500	—	—
Romania	32	14	6,837	1,333	—	—
Serbia and Montenegro	6	7	1,088	120	—	—
Slovakia	3	1	2,500	200	—	—
Slovenia	—	3	950	—	—	—
Total Eastern Europe	257	231	37,136	5,115	—	—
Central Eurasia:						
Armenia	—	—	200	—	—	—
Azerbaijan	—	—	400	—	—	—
Belarus	—	—	1,900	500	—	1,900
Estonia	—	—	500	100	—	—
Georgia	2	—	700	—	—	—

See footnotes at end of table.

TABLE 1—Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS FOR 1993[1]

(Thousand metric tons unless otherwise specified)

	Zinc (metal content)		Industrial minerals			
	Mine	Smelter production	Hydraulic cement	Nitrogen (N content of ammonia)	Phosphate rock, (gross weight)	Potash (K_2O equivalent)
Central Eurasia—Continued						
Kazakhstan	250	240	4,000	—	4,000	—
Kyrgyzstan	—	—	700	—	—	—
Latvia	—	—	300	—	—	—
Lithuania	—	—	1,500	250	—	—
Moldova	—	—	1,500	—	—	—
Russia	170	220	60,000	8,000	8,900	2,600
Tajikistan	—	—	300	—	—	—
Turkmenistan	—	—	1,100	—	—	—
Ukraine	—	12	22,000	1,200	—	160
Uzbekistan	70	65	6,000	1,309	—	—
Total Central Eurasia	492	537	101,100	11,359	12,900	4,660
Total Europe and Central Eurasia	1,366	2,839	324,571	26,900	13,500	9,774
Total United States	513	380	72,400	12,865	35,494	1,506
Total world	6,895	7,174	1,300,643	91,497	131,641	20,864
Western Europe as a percent of world total	8.95	28.87	14.33	11.39	0.46	24.51
Eastern Europe as a percent of world total	3.73	3.22	2.86	5.59	—	—
Central Eurasia as a percent of world total	7.14	7.49	7.77	12.41	9.80	22.34
Europe and Central Eurasia as a percent of world total	19.81	39.57	24.95	29.40	10.26	46.85

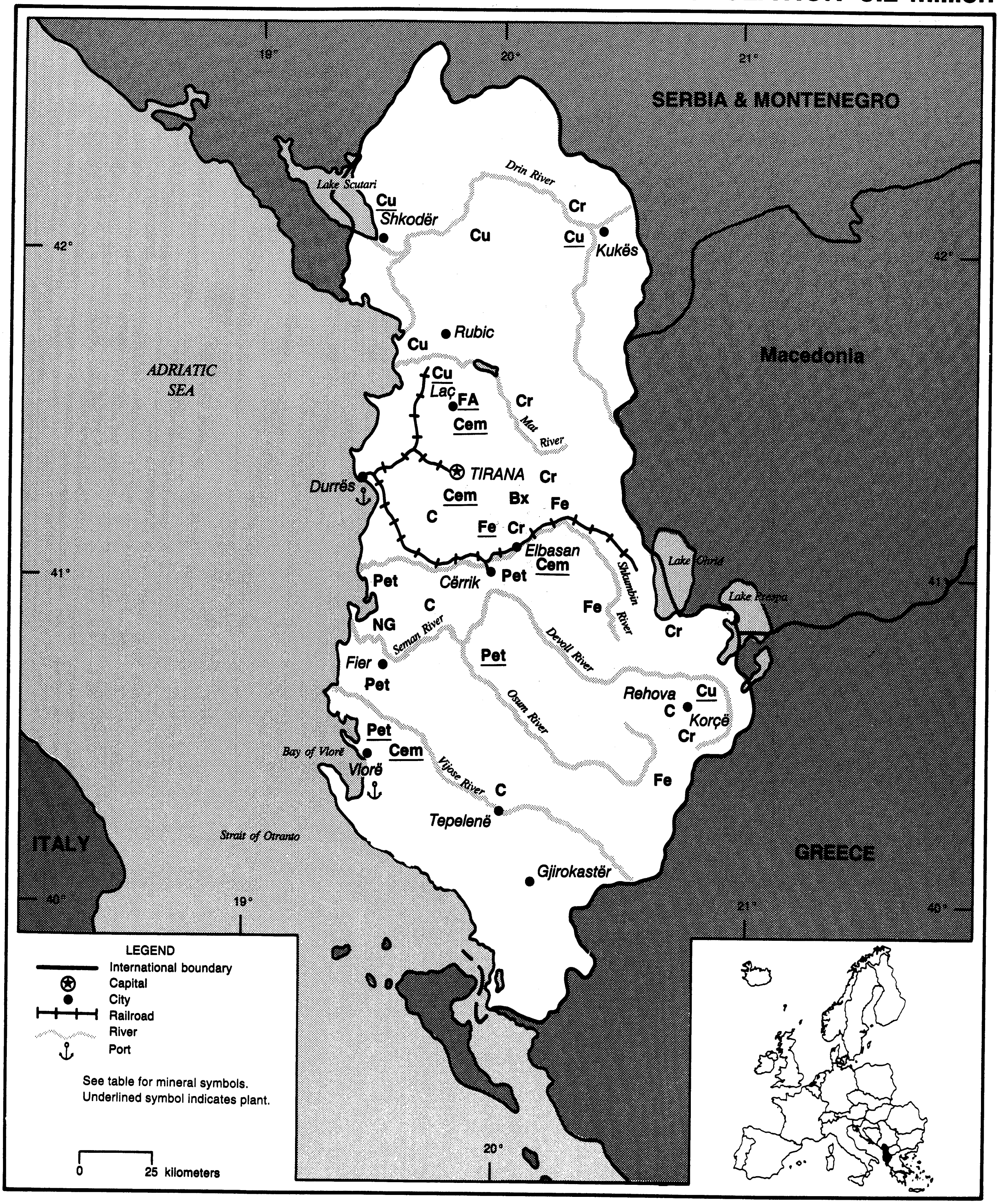
W Withheld to avoid disclosing company proprietary data; value included in "Total world."

[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 1993, in thousand metric tons: France—350; Germany—100; Luxembourg—520. Thomas slag averages about 16% P_2O_5 content. World phosphate rock production averaged slightly more than 31% P_2O_5.

ALBANIA

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



THE MINERAL INDUSTRY OF

ALBANIA[1]

By Walter G. Steblez

In 1993, Albania's economy showed little improvement compared with that of 1992, when industrial production in the country virtually came to a halt. Although the overall performance of Albania's mining and mineral processing industries in 1993 improved somewhat relative to that of 1992, the output by these sectors of industry was still well below production levels that were achieved in past years. In a decending order of value, petroleum, ferrochromium, chromite, and nickeliferous iron ore were the country's principal mineral commodities.

GOVERNMENT POLICIES AND PROGRAMS

Legislation was adopted in August 1992 that was to liberalize foreign investment in the country. The main issues appeared to involve the degree to which the Government of Albania would be willing to cede unrestricted corporate decisionmaking power to private investors, including foreign corporations. This particularly would be applicable to decisions such as whether or not to scrap major facilities in the country's minerals industry and start anew, instead of "modernizing" a given installation. Another key issue that was considered was whether or not mining and heavy industry of any kind is necessary in a country where, reportedly, agriculture and a tourist industry could generate substantial amounts of the country's income. In 1993, under an agreement with the International Bank for Reconstruction and Development (World Bank), Albania reported the establishment of the Agency for Restructuring Enterprises at the Ministry of Industry, Mines and Energy (MIME). The restructuring effort under this program was to examine about 30 enterprises with weak financial structures and provide both technical and financial assistance that would include expertise from specialists from the World Bank.

ENVIRONMENTAL ISSUES

The environmental landscape of Albania is similar in kind but not in degree to that of other former centrally planned economy countries of Eastern Europe that were former members of the Council for Mutual Economic Assistance (CMEA). The most serious point sources of environmental pollution were industrial sites such as mining, beneficiation, smelting, and refining complexes (chromite, copper, iron ore, etc.), the Elbasan iron and steel plant, petroleum refineries, lignite-fired thermal electric power stations, and chemical plants. With technology even further out of date than that at similar facilities in former CMEA countries, Albania's industrial facilities were probably not only less efficient than those in other Eastern European countries, but also more polluting. The chief distinction between heavy industry in Albania and that in other former Eastern European members of CMEA was that of scale, with Albania's industrial development having been significantly less extensive than that in the former CMEA countries. Consequently, the impact of environmental pollution generated by domestic industries in Albania from 1950 to 1992 has been relatively minor. Moreover, relatively large areas of the country have been described as pristine from an environmental standpoint.

PRODUCTION

Following the virtual collapse of the country's centrally planned economy in 1992, mineral industry output in 1993 in all sectors and stages of operation remained marginal during the initiation of the country's economic transition to a market system. Any substantial future gains in Albania's mineral output would depend largely on more fundamental decisions relative to the overall direction of the country's economic development. *(See table 1.)*

TRADE

Prior to 1992, mineral export was the most significant element in Albania's foreign commerce. With a poor manufacturing base, Albania's sole means of acquiring imported machinery and equipment was mostly through exports of chromite, ferrochromium, copper, and nickeliferous iron ore. Consequently, Albania's economy had been substantially dependent on world commodity price fluctuations. The country's highest value added exports consisted largely of ferrochromium and copper wire and cable.

Owing to low output levels by the country's mineral industry in 1992 and 1993, the level of Albania's mineral exports, presumably, also was accordingly low during this period.

STRUCTURE OF THE MINERAL INDUSTRY

Albania's mineral industries continued to constitute the dominant sector of the country's overall industrial structure. In 1993, Albania's mineral industry remained entirely state-owned and operated. Table 2 lists the administrative bodies as well as subordinate units of production of the main branches of the country's mineral industry as they appeared in 1991. The economic viability of many of these facilities is doubtful, and the final organizational structure of the industry must still be determined. *(See table 2.)*

COMMODITY REVIEW

Metals

Chromite.—Although some chromite deposits and outcroppings can be found throughout Albania, the country's principal commercial chromite deposits are in the north-central and northern parts of the country in ultrabasic massifs in the Midrita area. The mainly podiform ore was mined at seven mining districts, of which Bulquize and Batra, about 30 km northeast of Tirana, represented about two-thirds of Albania's total production capacity. Albanian ore graded from 18% to 43% Cr_2O_3. Lumpy ores grading 39% to 42% Cr_2O_3 and concentrates grading from 50% to 53% Cr_2O_3 have been designated for export. Albania's largest and richest chromite mine at Bulquize produced between 450,000 and 500,000 mt/a of ore prior to 1991. About one-half of the ore was suitable for direct shipment; the balance was divided equally for beneficiation and for shipment as feedstock for the Burrel ferrochromium plant. In recent years, chromite extraction had become more difficult because of the declining availability of ore suitable for open pit mining; the increasingly complex geological environment at underground mining operations, especially at the Bulquize Mine; and the need for modern machinery and equipment.

The situation in Albania's chromite mining and processing sector in 1993 improved only marginally compared with that of 1992. In 1992, the country's chromite mining and processing sector, like virtually all sectors of its industry, faced nearly total collapse and financial exhaustion. In August 1992, it was reported that the country's largest producer of marketable ore, the Bulqize chromite mining and beneficiation complex, had been operating at barely 25% of capacity at a rate of about 100,000 mt/a. Reportedly, both Government and industry specialists realized that without large-scale foreign investment Albania's chromite-producing sector would not be able to increase output and would eventually have to be abandoned. As an initial step toward restructuring, in 1992, the country's entire chromite mining and processing sector was combined into a quasi-corporate entity, Albchrome, under MIME. The Government of Albania restructured the financial basis of the chromite mining industry by allowing Bulqize and presumably all other chromite mining and processing entities to retain 40% of income from sales as opposed to only 2% prior to 1993. Despite efforts by the European Bank for Reconstruction and Developement (EBRD) to assist the Government of Albania to commercially restructure and denationalize the chromium industry as well as the rest of the economy, Albania's Government has been moving very slowly to accomodate reform suggestions of the EBRD as well as those of potential investors in the chromite industry. Namely, no fixed or adopted legislation has existed either in respect to mining, foreign investment and/or ownership, and environmental laws. Legislation, such as it was, that addressed these issues reportedly existed only in various draft stages, and could be completed no earlier than by yearend 1993. Owing to a lack of guarantees provided by mining and foreign investment legislation, by June 1993, only two perspective foreign investors reportedly remained interested in the country's chromite industry: Sumitomo of Japan and Considar, an international trading house. Apparently, Samancor and CMI of South Africa, Ilva/Techint of Italy, and other investors withdrew their earlier offers to establish joint ventures with Albania's chromite producing and processing enterprises.

In respect to noncommercial foreign activity, Albanian and Turkish officials signed an agreement during the year in Ankara to conduct joint geological and mining surveys in both Albania and Turkey during the period from 1993 to 1994.

Copper.—In 1993, Saudi Arabia reportedly sent representatives of its Saudi Cable Group to Albania in June to explore possible cooperation with Albaker, Albania's quasi-corporate entity responsible for all of the country's copper mining and processing operations. The experts from the Saudi Cable Group planned to conduct preliminary studies to assess a proposed joint venture. In October, representatives of Saudi Arabia's Government confirmed plans to invest $10 million toward the modernization and further development of Albania's copper cable and wire manufacturing industry for the development of Albania's telecommunications industry. This investment reportedly would be handled under the auspices of the Islamic Bank of Saudi Arabia and was viewed as an initial step to possible future Saudi Arabian investments in Albania.

Iron and Steel.—Production of iron ore in 1992 and 1993 reportedly had ceased owing to both depressed international demand and dated and inefficient production technology. This resulted in the corresponding closure of the Elbasan nickel and cobalt refinery as well as a large quayside stockpile of ore at the port of Durres.

From 1992 through 1993, the output of iron and steel at the Elbasan steelworks declined sharply from the already low output levels of 1991, reportedly because of outdated and worn plant and equipment and the lack of available funds needed to import coking coal for the Elbasan steelworks. As a result, operations at the Elbasan ironmaking and steelmaking facility in 1992 and 1993 had practically ceased. Little data have been available relative to the future prospects of this operation.

Industrial Minerals

Albania's industrial minerals sector remained in the early stages of development. In recent years, Albanian officials indicated that future investment would be aimed at developing facilities to exploit the country's asbestos, fluorite, kaolin, magnesite, phosphate, and quartz deposits. In September 1993, the Government of Albania reported that about $18 million would be provided by the World Bank and $8 million by Kuwait for the renovation of 85 km of the country's automobile road system. The project, which entailed the use of domestic quarry products, was developed with the assistance of the World Bank and would involve many domestic as well as some foreign enterprises. Albania has produced sufficient amounts of sand, gravel, and dressed stone for domestic use.

Mineral Fuels

Albania produced lignite, hydroelectric power, natural gas, and petroleum, which, in past years, in view of low domestic fuel consumption, allowed the country to be a net exporter of energy. In recent years, owing to reduced hydroelectric power output resulting from several years of drought, a general downturn in petroleum production, and increasing indigenous energy requirements, Albania's energy status became less favorable.

Albpetrol, Albania's state-owned petroleum producer, reportedly concluded a joint-venture contract with the Global Marine Co. of the United States to perform drilling operations for all petroleum companies prospecting in Albania's offshore waters. Both partners in the joint venture were to have equal shares in the enterprise and share profits equally. This agreement follows a similar one in 1992 with the Western Geophysical Co., also of the United States, to conduct seismic geophysical surveys onshore.

In midyear, it was announced that the Austrian half (OMV Exploration) of the German-Austrian consortium, Deminex-OMV, acquired full control of offshore Rodoni Block No. 1. The Rodoni Block No. 1 was originally awarded to Deminex-OMV in 1991.

Reserves

Albania'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 former centrally planned economy countries, including Albania, past policies for industrial development often had more to do with political than economic considerations. For a detailed explanation of the system that has been used in the former CMEA countries for measuring reserves see the chapter on Russia in this volume.

OUTLOOK

Albania's mineral industry is labor-intensive and in need of large infusions of capital. The country conspicuously was behind other former Eastern European centrally planned countries in terms of both political and economic reforms.

The country's capital stock reportedly was antiquated with a technological level dated to the extent that several outside technical observers felt that modernizing many of the country's mineral industries, given the country's low ore grades, would not appreciably benefit the country's economy. The viability of the country's mineral industry, in the context of market economics, will depend on a full reevaluation of the country's mineral deposits.

TABLE 1

ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Bauxite[e]		25,000	26,000	20,000	4,000	2,000	25,000
Chromium:							
Chromite, gross weight[e]	thousand tons	900	[3]910	[r]587	[r]322	[3]282	900
Marketable ore	do.	294	295	[r]121	[r]58	[3]82	350
Concentrate	do.	173	157	[r]88	[r]49	[3]33	250
Ferrochromium	do.	39	24	[r]25	[r]22	[3]35	45
Cobalt:[e]							
Mine output, Co content[4]		600	600	600	20	10	600
Plant production, Co content[5]		10	20	15	3	1	25
Copper:							
Ore:							
Gross weight	thousand tons	1,136	931	[r]566	[r]240	500	1,200
Concentrate[e]		[3]62,000	49,000	[r]16,500	[r]7,800	14,000	65,000
Cu content[e]		14,000	11,500	[r]3,700	[r]11,800	3,300	16,000
Metal, primary:							
Smelter		15,312	[r]11,800	4,800	[r]2,300	[3]2,300	16,000
Refined[e]		[3]14,512	10,900	4,400	[r]1,200	1,000	15,000

See footnotes at end of table.

TABLE 1
ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Iron and steel:							
Iron ore, nickeliferous:							
Gross weight	thousand tons	1,179	930	[e]750	[e]200	150	1,300
Fe content[e]	do.	520	410	350	88	85	650
Metal:							
Pig iron		179,000	96,000	[e]50,000	[e]10,000	10,000	600,000
Crude steel[e]		112,000	65,000	35,000	5,000	5,000	150,000
Rolled steel[e]		[3]92,500	60,000	30,000	1,000	1,000	95,000
Nickel:[e]							
Mine output, Ni content		11,200	8,800	7,500	150	75	12,000
Plant production, Ni content		5,400	5,500	5,000	100	50	6,000
Metal, Ni cathode		1,800	2,500	2,200	50	20	2,600
INDUSTRIAL MINERALS							
Cement, hydraulic[e]	thousand tons	[3]754	750	600	200	200	800
Clay, kaolin[e]		9,000	5,000	2,000	500	500	10,000
Dolomite[e]		400,000	[3]397,000	350,000	50,000	50,000	400,000
Fertilizer, manufactured:[e]							
Phosphatic		[3]165,000	100,000	75,000	10,000	10,000	170,000
Urea		[3]92,000	50,000	25,000	4,000	4,000	100,000
Nitrogen: N content of ammonia[e]		110,000	100,000	80,000	15,000	15,000	120,000
Olivinite		52,000	56,000	[e]45,000	[e]300	300	60,000
Phosphate rock (12% to 15% P_2O_5)[e]		25,000	10,000	9,000	1,500	1,500	30,000
Pyrite, unroasted[e]		48,800	[3]48,000	23,000	[r3]9,600	7,000	50,000
Salt[e]		80,000	[3]85,000	55,000	5,000	10,000	90,000
Sodium compounds n.e.s.: Soda ash, calcined[e]		[3]27,000	27,000	16,000	150	150	30,000
Sulfuric acid[e]		[3]82,000	70,000	50,000	1,000	1,000	90,000
MINERAL FUELS AND RELATED MATERIALS							
Asphalt and bitumen, natural[e] [6]	thousand tons	900	900	500	100	100	1,000
Coal: Lignite	do.	2,193	2,071	[r]1,098	[r]300	[3]83	2,200
Gas, natural, gross production[7]	million cubic meters	312	243	[r]141	[e]100	100	300
Petroleum:							
Crude:							
Weight	thousand tons	1,129	1,069	[e]700	[e]500	500	900
Converted	thousand 42-gallon barrels	7,533	7,132	[e]4,670	[e]3,300	3,300	6,000
Refinery products[e]		9,000	5,000	3,000	1,000	1,000	9,000

[e]Estimated.
[1]Table includes data available through Mar. 1994.
[2]In addition to the commodities listed, a variety of industrial minerals and construction materials (common clay, 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]Reported figure.
[4]Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.
[5]Figures represent cobalt content of estimated production of commercially marketable cobalt salts produced within Albania from domestically mined nickeliferrous iron ore.
[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 1993

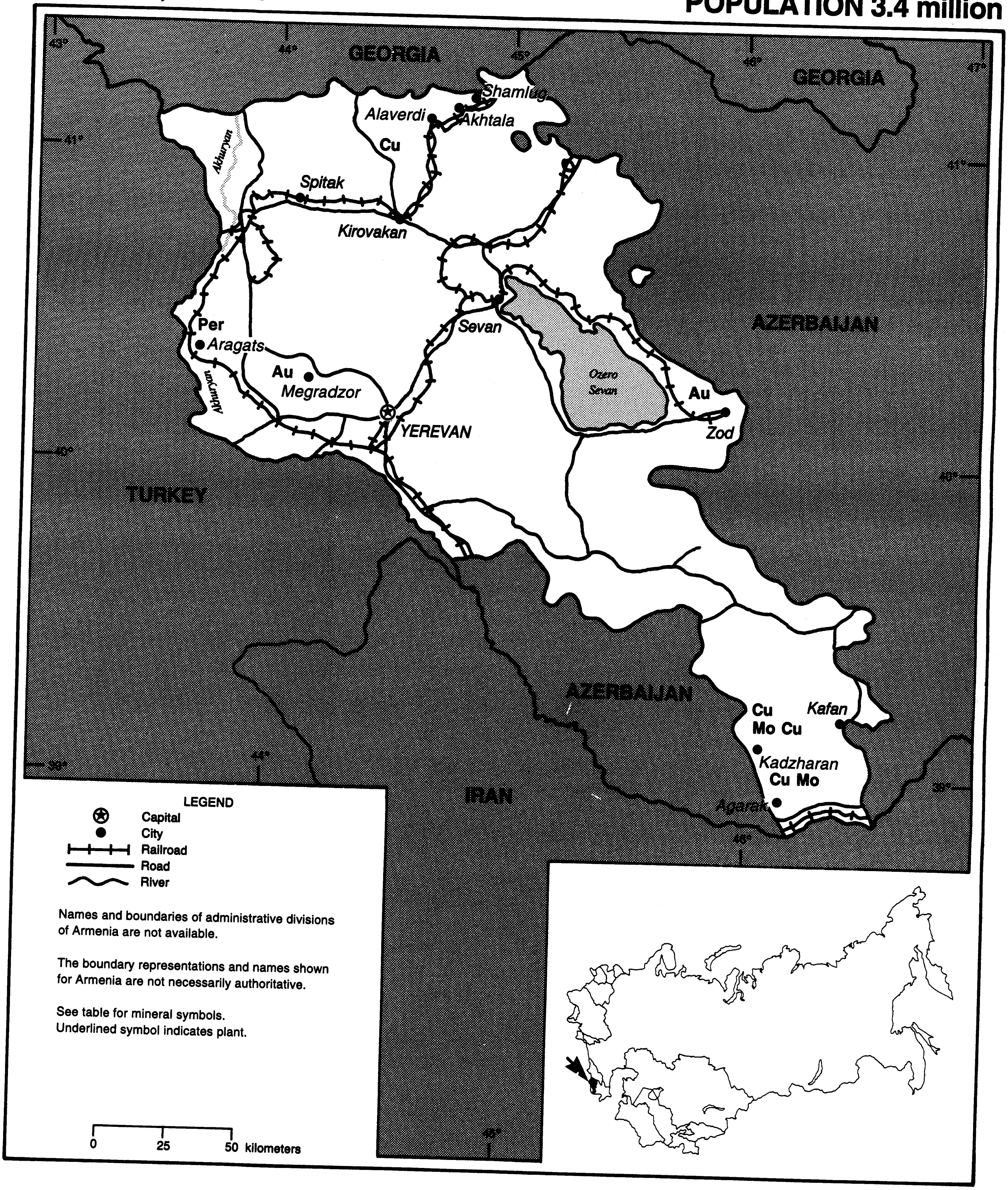
(Thousand metric tons unless otherwise specified)

Commodity		Location of main facilities	Annual capacity
Cement		Elbasan, 32 km[1] 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	450
Do.		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		Fushe-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 north 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	4
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 and Guri Pergjrgjur), 25 km east of Tirana	500
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

[1]km = kilometer(s).

ARMENIA

AREA 29,800 km² **POPULATION 3.4 million**



THE MINERAL INDUSTRY OF

ARMENIA[1]

By Richard M. Levine

Armenia had practically no mineral fuel production and was dependent on imported coal, gas, and oil, which led to significant economic difficulties in 1993. Armenia's gross domestic product (GDP) in 1993 reportedly was only 41% of its 1991 level and its industrial output only 46% of its 1991 level.[2]

Fuel supplies were not reaching Armenia through its neighboring countries of the former U.S.S.R. of Azebaijan and Georgia because of Azerbaijan's blockade of fuels passing through Azerbaijan and because a portion of the remaining fuel supplies shipped via Georgia were diverted for use by Georgia. Explosions also occurred on the Georgian section of the pipeline providing gas to Armenia, which further curtailed gas supplies to Armenia. Dwellings and many institutions and enterprises were only receiving a few hours of their required fuel supply per day with fuel supplied fully to only the most critical functions.[3] According to the Armenian Minister of Energy and Fuels, as a result of the transportation blockade and explosions on the gas pipelines, Armenia only received of the planned quantity the following: 27% of fuel oil; 11% of gasoline; 23% of diesel fuel; 16% of aviation fuel; 27% of lignite; and 22% of natural gas and of liquefied gas each.[4]

GOVERNMENT POLICIES AND PROGRAMS

Armenia has a wide range of mineral reserves that it is hoping to develop with the assistance of foreign investment. These include for metals: iron, copper and molybdenum, lead and zinc, and gold and silver; for industrial minerals: bentonite, diatomite, perlite, and zeolite; for semiprecious stones: agate, amethyst, jade, obsidian, and turquoise; for building stones a variety of granitoids and marbles; and secondary materials from waste from mining operations.[5]

To secure its supply of natural gas in light of Azerbaijan's blockade, chaotic conditions in neighboring Georgia and parts of the Caucasus Mountains region of Russia, and not well-developed relations with Turkey, Armenia was trying to obtain loans to finance the construction of a natural gas pipeline from Tabriz in Iran to Mekhri in Armenia that could supply Armenia with 2 to 3 billion cubic meters of natural gas per year.[6]

PRODUCTION

Armenia's mineral industry was involved primarily in mining nonferrous and industrial minerals. Armenia has large molybdenum reserves and was mining one-third of the former U.S.S.R.'s output of molybdenum. The molybdenum is associated with copper, but Armenia also separately mines copper-zinc deposits. Armenia has a native gold mining industry, and byproducts from nonferrous ore mining include barite, gold, lead, rhenium, selenium, silver, tellurium, and zinc.

Armenia had a large metallurgical industry that was mostly shut down in the late 1980's for environmental reasons. Armenia had been the second largest producer of copper sulfate and third largest producer of refined copper among the republics of the former U.S.S.R. Armenia also had been producing primary aluminum and aluminum products and foil, but production of primary aluminum had ceased.

Armenia has a large industrial minerals industry and was the largest producer of perlite in the former U.S.S.R. It also produced a number of other industrial minerals, including clays, diatomite, dimension stones, limestone, salt, and semiprecious stones. Armenia, reportedly, also has significant high-quality iron ore reserves, which have not yet been exploited. (*See table 1.*)

STRUCTURE OF THE MINERAL INDUSTRY

The Armenian program to privatize its economy was making slow progress. The President of Armenia declared that Armenia was greatly behind in this process, with only land and housing having been privatized. Plans called for privatization of industrial enterprises to begin.[7] (*See table 2.*)

COMMODITY REVIEW

Fuels

Coal.—Owing to the country's critical energy shortage, the Government decided to reopen in January 1993 the Idzhevan coking coalfield with estimated reserves of 10 million tons; the field had not been exploited since the late 1940's. Coal extraction was projected to be about 250,000 tons per year. The energy crisis in Armenia had resulted in increased exploration work in the Gugark region. The coal reserves in this region are at a depth of 100 to 150 meters.

Industrial Minerals

Diamonds.—Armenia's diamond cutting and polishing factory in Nor Achin received its diamond supply from Yakut-Sakha in Russia. The plant is one of Armenia's most important export-producing industries. Uncut diamonds imported from Yakut-Sakha, after cutting and polishing, are exported to Russia, Europe, and the United States. Armenia's diamond cutting industry was experiencing difficulties because of a curtailment of supplies from Russia, and negotiations were under way with Russia's diamond industry to ensure supplies.[8]

Metals

Gold.—Armenia's gold mining enterprises, reportedly, were working at only 25% of their capacity. Previously, Armenia had been producing about 2 tons of gold annually from the Zod and Megradzor deposits. In 1993, Armenia began exploration of the new Mardzhansk goldfield, which will increase Armenia's gold reserves.[9]

Nuclear Power.—In March 1994, Armenia signed an accord with Russia for assistance in restarting its Medzamor nuclear powerplant, which had been closed because of safety concerns following Chernobyl and the earthquake in Armenia. However, due to Armenia's acute energy shortage, a study was conducted regarding the feasibility of restarting the plant, which concluded that it was safe to do so. Russia will supply nuclear fuel to the plant and assist Armenia in setting up controls over nuclear materials and the nuclear power facilities. Armenia, reportedly, pledges not to use the nuclear materials received from Russia to produce weapons or to attain any military objective.[10] The startup of this plant remains controversial because of a number of countries and international organizations having concerns about safety issues.

Oil and Natural Gas.—Reported findings of oil and gas reserves in Armenia led the Armenian Government to undertake further exploratory work to confirm these findings and, if possible, to produce oil and gas. The Haynavt Corp. was set up in the United States to conduct exploratory work in Armenia, and an agreement also was signed with Greece to provide equipment for exploration. At yearend, funding for transporting the equipment to Armenia was being sought.[11]

Reserves

Reserves in Armenia were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the report on Russia. (*See table 3.*)

INFRASTRUCTURE

Armenia's severely strained economic conditions and fuel and minerals supply situation were in large measure due to Armenia's being landlocked and surrounded by hostile or unstable countries or countries with which Armenia had not adequately developed political and economic relations. Armenia has 1,254 kilometers of borders with Azerbaijan to the east, 566 kilometers of borders with Azerbaijan to the south, 268 kilometers of borders with Turkey and 35 kilometers of borders with Iran to the south, and 164 kilometers of borders with Georgia to the north.

None of these bordering states were secure as either stable or friendly routes of transshipment of supplies to Armenia because of the warfare in Nagorno Karabakh that affected relations with Azerebaijan and Turkey, problems of civil unrest in Georgia and the North Caucasus that affected shipments to Armenia, and the lack of traditional economic and transport ties with Turkey and Iran. More than 85% of Armenia's raw materials supplies from the countries of the former U.S.S.R. had been shipped by rail through Azerbaijan and 15% by rail through Georgia. Formerly, a large percentage of Armenia's oil and natural gas supply was piped via Azerbaijan and the remainder was piped via Georgia. To export its raw materials and manufactures, Armenia must contend with the same political and economic factors that affect imports.

OUTLOOK

The future development of Armenia's mineral industry as well as its general economic development depend on the resolution of the conflict in Nagorno Karabakh with Azerbaijan, the resolution of issues of civil unrest in Georgia and the North Caucasus, and the development of political ties with Turkey and Iran in a manner that will permit Armenia to have normal economic and transport relationships with its bordering states. Armenia has considerable potential to further develop its mineral industry and to supply both the countries of the former U.S.S.R and world markets with nonferrous metals, but the development of these industries will depend on adequate fuel supplies and secure means for exporting this output. Although suffering from political problems outside its borders, Armenia also could be viewed as one of the potentially most stable of the new countries of the former U.S.S.R. Its population, being more than 90% of Armenian ethnic origin and having a long historical tradition, a strong sense of unity brought about by historical oppression, and a large Armenian diaspora in western countries, has a stronger cohesiveness and sense of nationhood than many other countries of the former U.S.S.R.

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[1]Text prepared July 1994.

[2]Interfax Statistical Report. June 3-10, 1994, p. 2.

[3]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Nov. 26, 1993, p. WD/4.

[4]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). May 5, 1994, p. 2, Respublika Armeniya, Yerevan, Apr. 28, 1994, p. 1.

[5]The Academy of Sciences of Armenia (Yerevan). The Premise for the Development of Foreign Economic Relations of the Republic of Armenia 1992.

[6]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). Dec 15, 1993, p. 4, YERKIR, Yerevan, Oct 29, 1993, p. 4.

[7]Summary of World Broadcasts, British Broadcasting Corp. Jan, 28, 1994, p. WB/2, Rossiyskiye Vesti, Moscow, Jan. 20, 1994.

[8]Interfax Mining Report, Sept. 17-24, 1993, p. 3.

[9]———. Mar. 11-18, 1994, p. 5, work cited in footnote 8.

[10]Foreign Broadcast Information Service, U.S. Govt, (Washington, DC). Mar. 22, 1994, p. 50. Itar-tass, Mar. 21, 1994.

[11]———. Dec. 15, 1993, p. 4, YERKIR, Yerevan, Oct. 29, 1993, p. 4.

TABLE 1
ARMENIA: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Bentonite		200,000	100,000	400,000
Cement		500,000	200,000	1,000,000
Copper ore:				
Gross weight, 0.5.% Cu		2,000,000	500,000	10,000,000
Gold	kilograms	500	500	2,000
Limestone		1,000,000	500,000	2,000,000
Molybdenum, mine output, Mo content		1,000	500	5,000
Perlite		50,000	10,000	200,000
Salt		100,000	50,000	200,000

[e]Estimated.

TABLE 2
ARMENIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location of main facilities	Annual capacity
Copper ore: Gross weight, 0.5% Cu	Kafan copper mining directorate	Kafan	[1]10,000,000
Do.	Shamlug mining directorate	Shamlug	
Do.	Akhtala mining directorate	Akhtala	
Do.	Zangezur copper-molybdenum complex mining Kadzharan deposit	Kadzharan	
Do.	Agarak copper-molybdenum mining and processing complex	Agarak	
Gold	Zod mining complex	Zod	[2]2
Do.	Megradozor deposit	Megradzor	
Molybdenum (Mo content of ore)	Zangezur copper-molybdenum complex mines Kadzharan deposit	Kadzharan	[2]5,000
Do.	Agarak copper-molybdenum mining complex	Agarak	
Perlite	Aragats mining and beneficiation complex	Aragats	200,000

[1]Copper ore total from all enterprises.
[2]Total for both enterprises.

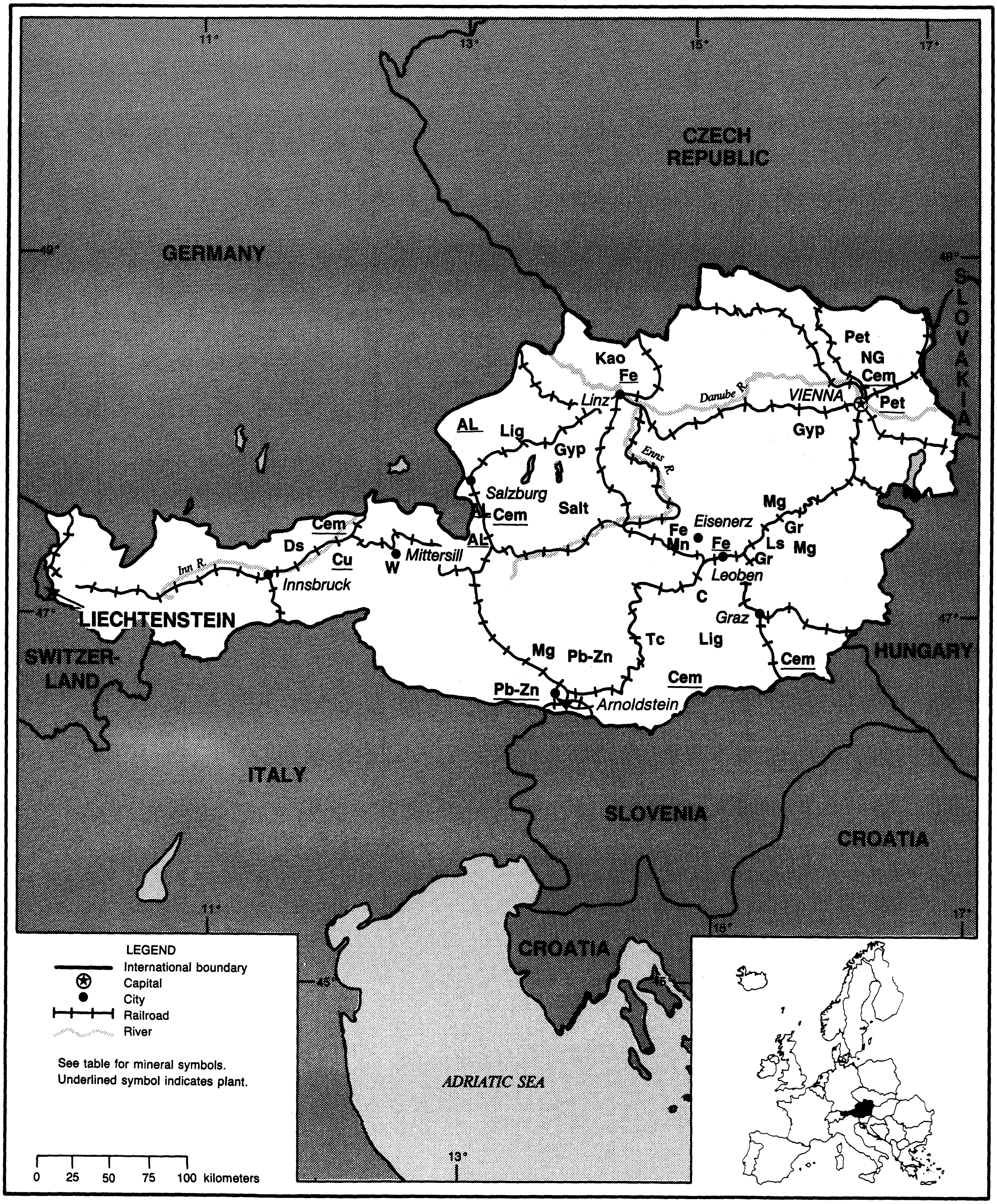
TABLE 3
ARMENIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Mineral		Quantity
Copper ore		150,000
Molybdenum		60 to 70
Natural gas	million cubic meters	32,000
Perlite		160,000
Petroleum		64,000
Salt		400,000
Zinc		20 to 25

AUSTRIA

AREA 84,000 km² **POPULATION 7.7 million**



THE MINERAL INDUSTRY OF

AUSTRIA

By Jozef Plachy

To compensate for a decline in the metalliferous industry in 1993, Austria increased industrial mineral production. The mineral industry of Austria continued to supply about one-third of the country's consumption. It contributed about 1% of the gross domestic product, of which one-fourth was by mining alone. Although employment in Austria's mining industry dropped 25% in 1992, there was only a slight declined in 1993 to about 6,500 at yearend.

GOVERNMENT POLICIES AND PROGRAMS

All of the metalliferous ore mines and most of the industrial mineral mines in Austria are owned by a state holding company, the Osterreichische Industrieholding Aktiengesellschaft (OIAG). Most of the downstream industries, including steel, were under the state-owned Austrian Industries (AI). Faced with mounting losses, AI closed down most of Austria Metall AG, the integrated aluminum group, and moved Osterreichische Mineralolverwaltungs AG (OMV), the largest oil and petrochemicals company in Austria, back under OIAG. Relieved of these two main burdens, AI was preparing for privatization.

OIAG followed suit by closing unprofitable mines and smelters, selling off shares in foreign operations, and reducing the work force.

PRODUCTION

At the beginning of 1993, there were 298 mines (plus 4 oil and gas companies) regulated by the Mining Authority, of which 6% were underground, 90% open pit, and 4% both surface and underground mines. The Austrian mineral industry, mining and processing together, employs about 10,700 people.

Domestic economic slowdown and increased foreign competition, mainly from Eastern European countries, led to the closing of several Austrian metalliferous mines, including the only lead-zinc and tungsten mines. The only remaining active metalliferous ore mine is the iron ore mine in Erzberg. There was an increase in production of some industrial minerals during the past few years. This was due to a change in mining law. Hydrocarbon production remained at about the same level as that in 1992. Because of the deterioration of world crude oil prices, exploratory drilling was temporarily suspended. *(See table 1.)*

TRADE

As a relatively mineral-poor country, Austria relies heavily on imports. The value of imported raw materials and semifinished goods in 1993 was about twice as much as the export value. About three-quarters of trade in mineral commodities was with other European countries, primarily Germany.

STRUCTURE OF THE MINERAL INDUSTRY

Passage of the amended Austrian Mining Law of 1975 represented the first step in the restructuring and privatization of the mineral industry. According to this amendment, raw material mining and processing is divided into three categories: (1) property-independent minerals, (2) federal minerals, and (3) property-bound minerals.

The property-independent category includes all the metallic ores and select industrial minerals. Raw materials were excluded from the right of disposal by the landowner, and they may be explored and extracted by any person fulfilling certain legal requirements. Some of the mining and processing companies in this category are wholly or partially owned or controlled by OIAG.

Federal mineral raw materials, which are the property of the Government, are hydrocarbons, salt, thoriumferous, and uraniferous raw materials. Prospecting and mining of these minerals, with the exception of salt, may be performed by any person under a contract signed by the Federal Minister of Economic Affairs. Exploration and production of rock salt is under the jurisdiction of the state-owned Osterreichische Salinen Aktiengesellschaft.

Property-bound minerals consist of industrial minerals not included in the other two categories. In accordance with the new mining law, the industrial minerals of lesser quality were included in the state statistics starting in 1991. Because of numerous additions, a list of new mines was not yet available by yearend 1993. According to the Supreme Mining Authority of the Ministry of Economic Affairs, preliminary information indicates about 160 new companies and a few hundred new mines. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—Owing to environmental considerations, the rising cost of electric energy, and inexpensive imported raw material, the AI decided in 1992 to close the primary aluminum smelter at Ranshofen. The Lend smelter was bought, at the end of 1992, by a local management group from Alusuisse-Lonza Holdings Ltd. and converted into a secondary smelter. Scrap is augmented by imported ingots, the quantity of which depends on the quality of available scrap and requested grade of final product. The plant consists of a smelter, using Soderberg technology, and two casthouses equipped with a 4-ton crucible furnace, three oil-fired furnaces, and a new 10-ton closed furnace installed in 1991. Feed is imported aluminum ingots and domestic scrap. The 1993 capacity was about 15,000 mt/a, producing mainly tanks for fuel and compressed air.

Copper.—In September 30, 1993, Metall Mining Corp. of Canada acquired a 40.35% interest in the Montanwerke Brixlegg. The secondary copper smelter, one of the largest in Europe, relies solely on alloy scrap, copper blister, copper-bearing dust, and copper scrap sourced domestically and from Germany and Italy. In 1993, a modernization program increased the capacity of the casting plant from 38,000 mt/a to 50,000 mt/a of copper cathode. At an estimated cost of $6.5 million, an expansion to the tankhouse was planned that would increase production by one-third to more than 70,000 mt/a.

Iron Ore.—Since 1992, the Steirischen Erzberg Mine, operated by the Government-owned Voest-Alpine Erzberg Ges.m.b.H., has been strip mined. The estimated proven and probable ore reserves of iron ore, grading 32% Fe and about 2% Mn, amount to about 25 Mmt and 150 Mmt, respectively. Ore is beneficiated locally and shipped by rail to the nearby Donawitz and Linz steel mills for production of self-fluxing sinter, averaging 50% iron and 3% manganese. An iron ore delivery contract with Voest-Alpine Stahl Ges.m.b.H., the operator of both mills, was renewed in 1993 for 5 years. This should ensure iron ore production until 1998, depending on the outcome of the privatization of Voest-Alpine Stahl.

Lead and Zinc.—Bleiberger Bergwerks-Union AG (BBU) Rohstoffgewinnungs Ges.m.b.H. has closed the only lead-zinc mine at Schlaining, Burgeland, and is in the process of closing the smelter at nearby Arnoldstein. Since the second half of 1991, the Government-owned company has suffered substantional losses due to the price depreciation of its main product zinc, as well as lead and germanium. As a part of restructuring and cost cutting by OIAG, the mine was closed at the end of September 1993. Presently, BBU is involved in selling land and other assets to cover the cost of closing the mine and primary smelter.

Steel.—As part of privatization, AI, the Government-owned parent of Voest-Alpine Stahl Ges.m.b.H., is creating a new holding company to be named Neue AI. The new company will exclude special steel producer Bohler-Uddeholm and stainless tubemaker Scholler-Bleckmann, which are to be sold separately.

Voest-Alpine Ges.m.b.H. consists of two steel plants at Donawitz and Linz. The Donawitz steelworks is equipped with three blast furnaces (total capacity of 2 Mmt/a), three basic oxygen converters (1.2-Mmt/a capacity), and two continuous casting machines. The Linz steel plant has five blast furnaces (total capacity of 2.99 Mmt/a), three 130-ton basic oxygen converters (3.35-Mmt/a capacity), two continuous casting machines, and a number of rolling mills.

Tungsten.—On March 1993, production was suspended in one of the largest tungsten mines in Europe, located at Mittersill near Salzburg. Because of low grade ore and because the mine, which is operated by Wolfram Bergbau und Huttengesellschaft m.b.H., is in a national park, thus necessitating strict environmental procedures, the production cost was higher than the prevailing world market price. By suspending instead of closing the mine, production could resume anytime when the market price for tungsten would ensure profitable operation.

Industrial Minerals

Fertilizers.—The fertilizer operations of the chemical division of OMV came under economic pressure from the less expensive imports from Eastern Europe while at the same time the demand for fertilizers was declining. As a result, OMV will shut down capacity and reduce output from current levels of about 1 Mmt/a to between 600,000 mt/a and 700,000 mt/a.

Graphite.—About three-fourths of the country's graphite production was supplied by the open pit mine at Trandorf, owned by Industrie und Bergbaugesellschaft Pryssok & Co. The crushed graphite, associated with silicates, contains about 55% carbon. When used in a blast furnace, carbon serves as a fuel and reducing agent, while silicates neutralize the basic ore.

The other two mines, Kaisersberg and Trieben, are both underground operations. The graphite at both mines occurs in a large number of small lenses, making mechanization difficult and keeping the output per employee-hour very low. Because of its high carbon content (70% to 80%), raw graphite is processed into valuable pulverized graphite.

Gypsum.—The estimated 1993 production of 800,000 tons, about 85% gypsum and 15% anhydride, was supplied by eight mines, in the northern Alps, between Mooseg in the west and Preinsfeld in the east, near Vienna. Most of the output was reportedly open pit mined.

Erste Salzburger Gipswerks-Gesellschaft Christian Moldan KG is the largest supplier of domestic gypsum and anhydride. Production from its two adjacent mines—an underground mine at

Abtenau and the Moosegg open pit mine-averages about 270,000 mt/a. During the past few years, exploration for new deposits in the area of existing mines was successful in the case of anhydride but not gypsum.

Kaolin.—The entire output of kaolin was produced by two mines and by reclaiming old dumps. The open pit mine at Aspang-Zobern, owned by Aspanger Baustoffe und Mineralien Ges.m.b.H., produced about three-fourths of total output. The deposit of the kaolinlike material, called leucosphenite, consists of several 10-m to 40-m-thick seams. The average leucosphenite to waste ratio is about 2.5:1.

The smaller mine at Kriechbaum-Weinzierl, 20 km east of Linz, is owned by Osterreichische Kaolin und Montanindustrie AG. Average production is about 100,000 mt/a of raw kaolin, clays, and quartz sand, from which about 80,000 mt/a of kaolin is processed. About 70% of this material is used by the paper industry. The company's exploration will reportedly result in the opening of a new mine next year, close to the present mine.

Kaolinite slurry from both mining operations is transported through pipeline to a processing plant at Eisthofen, 10 km from Schwertberg.

Magnesite.—The largest convergence of magnesite mines is in the Steiemark region in southeast Austria. After a recent merge of three companies, Veitsch-Radex AG was the largest magnesite mining enterprise. It owns five mines, of which Breitenau, Gulsen, and Millstatteralpe/Radentheim are in operation, while production at the Hochfilzen and Hohentauren Mines was suspended in 1993 owing to a domestic steel industry crisis.

With an output of about 470,000 mt/a, the Breitenau Mine is the largest magnesite operation in Austria. The roughly tabular deposit with a thickness of about 200 m, dipping at about 25°, and 550 m long, is mined with a room-and-pillar method in slices with backfilling from bottom to top. All underground machinery is trackless. A total of about 110 people are employed at the mine site, with underground productivity of about 30 tons per shift.

The second largest mine in 1993 was Millstatteralpe/Redentheim in southern Austria. The massive ore body, with a length of 600 m, a height of 450 m, and an average thickness of 50 m dipping between 45° and 80°, is mined by block caving.

Quartz.—After recent closing of the Spital/Drau Mine, there are only two major quartz mines in Austria, both operated by Quartzwerke Gesellschaft m.b.H.: Zelking/Melk and St Georgen. Both mines have a capacity between 15,000 mt/a and 20,000 mt/a. Zelking/Melk is in lower Austria, 80 km west of Vienna. Production includes quartz, sand, and feldspar. In addition to two major mines, a number of smaller mines are owned and operated by either Quartzwerke Gesellschaft m.b.H. or other independent companies.

Salt.—Salt is one of three minerals that is the property of the Federal Government. The exploration, production, and trade of all salt is controlled by Government-owned Osterreichische Salinen Aktiengesellschaft (OSAG). At present, salt is obtained from three underground mines and one brine well in central Austria. The latest well began leaching operations in 1992. The new deposit, within the brinefield of Lauffen, is near other producing wells.

Talc.—Since the merge in 1989, Naintsch Mineralwerke Ges.m.b.H. has been the only talc producer in Austria. All three mines it operates are in Styria. The capacity of the largest talc mine, Rabenwald, 35 km northeast of Graz, is about 110,000 mt/a. Production is from open pit, with a ratio of talc to overburden about 1:38. After screening and hand sorting, raw talc is transported by ropeway to a 90,000-mt/a-capacity processing plant in Oberfeistritz. The rest of the raw talc is processed at Lassing.

The underground mine at Lassing produces a dolomite-talc mixture with a high degree of whiteness. Near Liezen, 110 km northwest of Graz, the 20,000-mt/a-capacity mine is using an underhand cut-and-fill mining method.

Mineral Fuels

Coal.—In Austria, three companies produce lignite: Graz-Koflacher Eisenbahn und Bergbaugesellschaft m.b.H. (GKB); Wolfsegg-Traunthaler Kohlenwerks Gesellschaft m.b.H. (WTK); and Salzach-Kohlenbergbau Gesellschaft m.b.H. (SAKOG). The coal is used exclusively by local powerplants.

The Trimmelkam underground mine, owned by SAKOG, was flooded in 1992. The company never recovered from the damage, and the mine was closed in 1993. It followed an earlier closing of GKB mines at Karlschacht and Zangtal. Because of declining domestic demand due to increased competition from other forms of energy and environmental problems, only two mines remained open by the end of 1993.

The Oberdorf Mine, operated by GKB, is an open pit mine in western Styria, west of Graz. Average production from two areas, East pit and West pit, is about 1.4 Mmt/a. Overburden is removed by bucket wheel excavators to conveyor belts. Coal is excavated by a fleet of hydraulic backhoes and loaded directly to a mobile conveyor belt for transportation to the preparation plant.

At the Schmitzberg underground mine near Ampflwang, operated by WTK, 2-m- to 3-m-thick seams are mined by the longwall method. Belt conveyors are used under ground and above ground to transport the coal to the preparation plant.

Petroleum.—All the production of crude oil in 1993 came from existing wells. Owing to the deteriorating crude oil prices, all drilling activities in 1993 were aimed at finding natural gas. However, in spite of serious efforts to discover domestic resources, none of the exploration wells encountered economically recoverable reserves. Because of mounting losses, OMV will embark on drastic restructuring. The combined losses from its business operations and the restructuring will reportedly cost about $420 million.

Reserves

Exploitable crude oil reserves were estimated at 15.3 Mmt with natural gas reserves of 19.6 billion m^3 (including about 200 Mm^3 of residual gas from oil refining. *(See table 3.)*

INFRASTRUCTURE

Austria is a landlocked country, and nearly all transportation is on railroads and highways. The total length of railroad consists of 5,410 km of standard-gauge and 339 km of narrow-gauge tracks. About 98% of the railroad is Government-owned and more than 50% is electrified. The length of roads totaled 95,412 km, of which 34,612 km is primary highway network (autobahn, Federal, and provincial roads), while the rest is unpaved communal roads. The only navigable river is the Danube, with ports in Linz and Vienna.

OUTLOOK

Because of Austria's long mining tradition, geological conditions are well known. There is minimal likelihood of discovery of large new mineral deposits. Future mining activities will most probably be concentrated in industrial minerals, mainly for domestic use. It is hoped that the tax reform, slated for the beginning of 1994, will attract new private investment for the mineral industry of Austria. The reform will reportedly raise the main corporate tax from 30% to 34% but will eliminate several profit based taxes and simplify other taxes.

OTHER SOURCES INFORMATION

Agency

Bundesministerium fur Wirtschaftliche Angelegenheiten (Oberste Bergbehorde-Roh-und Grundstoffe)
Lansatrasse Haupstrasse 55-57
A-1031 Wien, Austria

Publications

Osterreichische Montan Handbuch, 1993, Wien, Austria.

Economic Survey by OECD (Organization for Economic Co-operation and Development), 1993, Paris, France.

TABLE 1

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum metal:							
Primary		92,933	89,434	80,379	32,881	—	
Secondary		34,100	35,700	33,600	[r]44,400	12,000	15,000
Total		127,033	125,134	113,979	77,281	12,000	15,000
Antimony, mine output, Sb content of concentrate		350	352	—	—	—	—
Cadmium, metal		49	44	19	—	—	—
Copper:							
Smelter, secondary		39,100	41,000	44,800	49,500	50,000	50,000
Refined:							
Primary		7,178	8,690	8,079	5,705	3,000	10,000
Secondary		39,089	41,013	44,758	48,975	48,000	50,000
Total		46,267	49,703	52,837	54,680	51,000	60,000
Germanium, Ge content of concentrate	kilograms	5,900	5,000	[e]5,000	—	—	—
Gold, metal	do.	86	[r]58	60	[r]158	[e]150	100
Iron and steel:							
Iron ore and concentrate:							
Gross weight	thousand tons	2,410	[r]2,311	2,130	1,627	[2]1,500	2,000
Fe content	do.	761	653	481	[e]370	300	450
Metal:							
Pig iron	do.	3,823	3,452	[r]3,441	[r]3,074	3,000	3,500
Ferroalloys, electric-furnace	do.	15	12	[e]12	[e]12	12	15
Crude steel	do.	4,718	[r]4,241	[r]3,897	[r]3,600	3,500	4,500
Semimanufactures	do.	3,732	3,719	[e]3,500	3,360	3,300	3,500
Lead:							
Mine output, Pb content of concentrate		1,571	1,494	[r]1,152	[r]920	600	—
Metal:							
Smelter:							
Primary		9,371	5,165	[r] [e]5,500	[r] [e]3,800	2,000	—
Secondary		12,166	15,934	[r] [e]14,608	[r] [e]17,761	14,000	—
Total		21,537	21,099	[r]20,108	21,561	16,000	—
Refined:							
Primary		[e]10,000	[r]8,391	[r]6,346	[r] [e]5,700	2,000	—
Secondary		[e]12,000	[r]15,120	[r]16,333	[r] [e]18,200	13,000	—
Total		22,000	[r]23,511	[r]22,679	23,900	15,000	—
Manganese, Mn content of domestic iron ore		46,287	42,669	[e]40,000	[r]30,752	30,000	35,000
Silver, metal		17	[r]22	29	[r]22	20	30
Tungsten, mine output, W content of concentrate		1,517	1,378	1,314	[r] [e]1,400	300	350
Zinc:							
Mine output, Zn content of concentrate		14,783	16,727	[r]14,827	[r]13,511	5,400	—
Metal, refined		26,102	26,041	16,586	[r]5,000	6,000	—
INDUSTRIAL MINERALS							
Cement, hydraulic	thousand tons	4,749	4,903	5,016	5,020	5,000	5,500
Clays:							
Illite	do.	243	191	217	276	300	300

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Clays—Continued:							
Kaolin:							
Crude	thousand tons	492	473	352	344	350	400
Marketable	do.	85	81	[r]72	[r]65	65	70
Other	do.	17	31	3,459	[r]3,445	3,500	3,500
Feldspar, crude		7,251	8,788	10,429	11,059	11,000	11,000
Graphite, crude		15,307	22,705	19,750	19,547	19,500	21,000
Gypsum and anhydrite, crude		805,654	751,645	654,594	[r]792,334	800,000	800,000
Lime	thousand tons	1,622	1,637	[e]1,600	1,716	1,700	1,700
Magnesite:							
Crude	do.	1,205	1,179	961	[r]995	1,000	1,000
Sintered or dead-burned	do.	360	[r]441	[r]337	[r]261	250	300
Caustic calcined	do.	60	55	[r]57	[r]54	50	50
Nitrogen: N content of ammonia[e]	do.	410	410	400	400	400	400
Pigments, mineral: Micaceous iron oxide		10,924	9,936	10,200	9,475	9,500	10,000
Pumice (trass)		8,130	8,954	8,204	7,493	7,500	8,000
Salt:							
Rock	thousand tons	1	1	1	1	1	1
In brine	do.	647	674	[r]698	[r]662	650	700
Sand and gravel:							
Quartz sand	do.	819	818	2,090	[r]5,884	6,000	6,000
Other sand and gravel	do.	16,057	[r]16,782	17,001	17,428	17,500	18,000
Total	do.	16,876	[r]17,600	19,091	[r]23,312	23,500	24,000
Sodium compounds, n.e.s.:[e]							
Soda ash, manufactured	do.	150	150	150	150	150	150
Sulfate, manufactured	do.	120	120	120	120	120	120
Stone:[2]							
Dolomite	do.	1,654	1,880	5,085	[r]5,873	6,000	6,000
Quartz and quartzite	do.	263	249	464	[r]511	550	600
Other:							
Limestone and marble	do.	NA	NA	15,371	[r]19,330	20,000	20,000
Basalt	do.	NA	NA	3,674	[r]4,098	4,100	4,500
Marl	do.	NA	NA	2,780	[r]2,640	2,500	3,000
Undifferentiated	do.	12,700	12,800	10,651	10,570	15,000	15,000
Total	do.	[r]14,617	14,929	[r]38,025	[r]43,022	48,150	49,100
Sulfur:							
Byproduct:							
Of metallurgy		12,064	11,974	[r][e]10,700	[r][e]8,200	8,000	8,000
Of petroleum and natural gas		[r]6,900	[r]5,600	[r]7,149	[r]8,683	8,700	9,000
Total		[r]18,964	[r]17,574	[r]17,849	[r]16,883	16,700	17,000
Talc and soapstone, crude		133,078	133,971	161,425	[2]145,664	150,000	150,000
MINERAL FUELS AND RELATED MATERIALS							
Coal, brown and lignite	thousand tons	2,066	2,448	2,081	[r]1,751	1,500	1,680
Coke	do.	1,771	1,725	[r]1,669	[r]1,486	1,400	1,500

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Gas, natural:							
Gross	million cubic meters	1,323	1,288	1,329	1,441	1,500	1,500
Marketed[e]	do.	1,020	1,081	1,100	1,100	1,200	1,200
Oil shale		570	475	290	430	500	500
Petroleum:							
Crude	thousand 42-gallon barrels	8,075	[r]8,010	8,926	8,229	8,000	8,000
Refinery products:							
Liquefied petroleum gas	do.	[e]6,000	5,288	[e]5,000	205	200	6,000
Gasoline	do.	19,935	22,237	[e]22,000	20,896	20,000	25,000
Kerosene and jet fuel	do.	2,226	2,398	[e]2,500	3,033	3,000	3,500
Distillate fuel oil	do.	20,920	22,504	[e]23,000	18,776	18,000	25,000
Lubricants	do.	—	416	[e]500	205	200	500
Residual fuel oil	do.	9,912	11,353	[e]11,000	4,757	5,000	15,000
Bitumen	do.	1,487	1,474	[e]1,500	3,099	3,000	5,000
Unspecified	do.	75	75	[e]75	1,859	2,000	2,500
Refinery fuel and losses	do.	2,387	2,124	[e]2,000	2,472	2,200	3,000
Total	do.	62,942	67,869	[e]67,575	55,302	53,600	85,500

[e]Estimated. [r]Revised. NA Not available.
[1]Table includes data available through May 1994.
[2]Excluding stone used by the cement and iron and steel industries.

TABLE 2

AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Salzburger Aluminum G.m.b.H.	Smelter at Lend	15
Cement	Perlmooser Zementwerke AG	Plants at Kirchbichl, Mannesdorf, Retznei, and Rodaun	3,000
Do.	Gebr. Leube Portlanzementwerke	Plant at Gartenau	700
Do.	Zementwerke Eiberg	Plant at Eiberg	600
Do.	Wietersdorfer Zementwerke	Plant at Wietersdorf	600
Coal	Graz-Koflacher Eisenbahn und Bergbaugesellschaft m.b.H.	Oberdorf Mine	1,400
Do.	Wolfsegg-Traunthaler Kohlenwerks AG Gesellschaft m.b.H.	Ampflwang Mine	280
Copper	Austria Metall AG (Government 100%)	Plant at Brixlegg	50
Graphite	Industrie und Beergbaugesellschaft Pryssok & Co. KG	Trandorf Mine at Muhldorf	15
Do.	Grafitbergbau Kaisersberg Franz Mayr-Melnhof & Co.	Kaisersberg Mine	3
Do.	Grafitbergbau Trieben G.m.b.H.G.	Trieben Mine	3
Gypsum	Erste Salzburger Gipswerk-Gesellschaft Christian Moldan KG	Abtenau and Moosegg Mines	300
Do.	Rigips Austria G.m.b.H.	Grundlsee, Puchberg, Unterkainisch, and Weisenbach Mines	250
Do.	Knauf Gesellschaft m.b.H.	Hinterstein Mine	160
Iron ore	Voest-Alpine Erzberg G.m.b.H. (Government 100%)	Erzberg Mine at Eisenerz	2,000

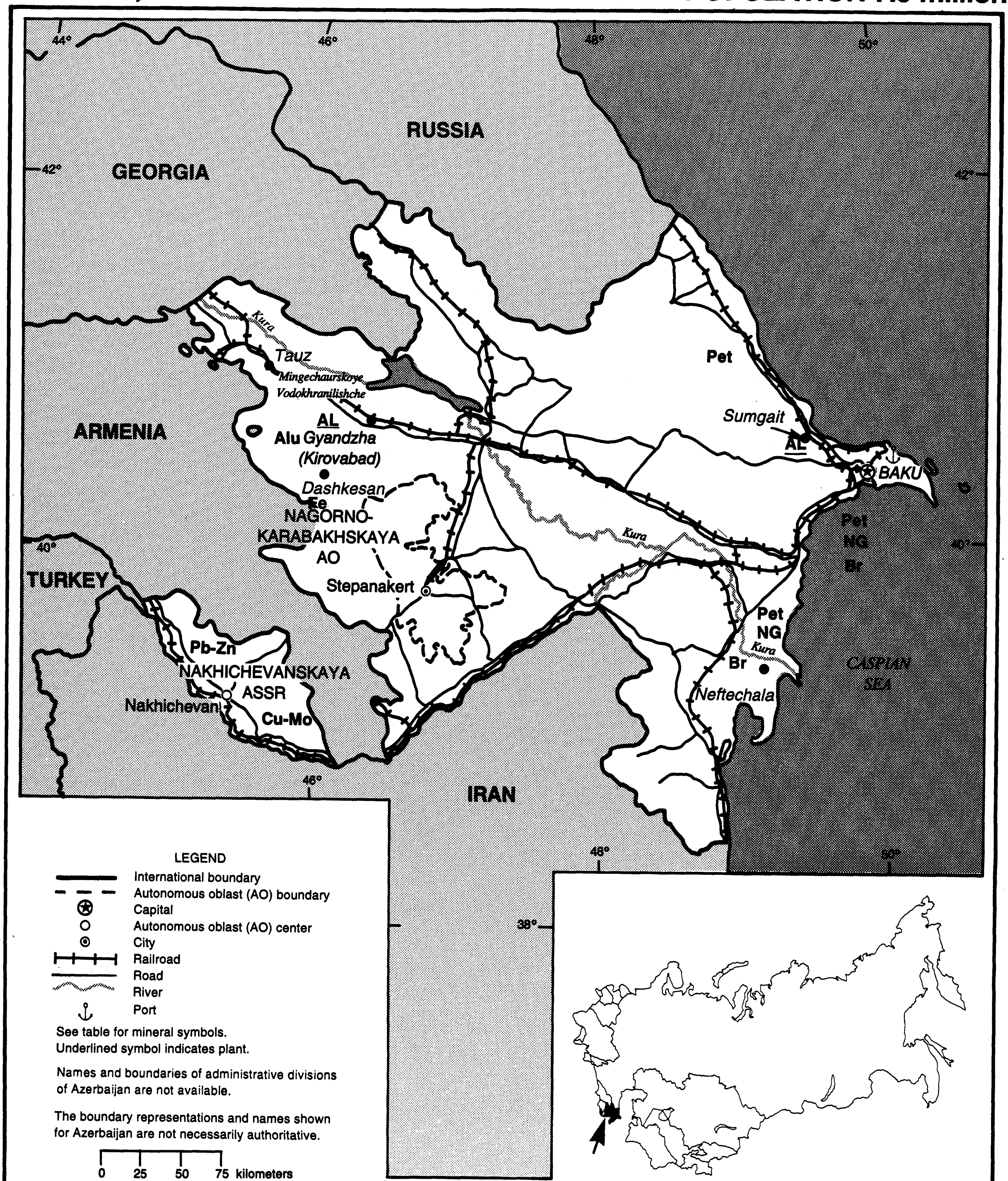
TABLE 2—Continued
AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Magnesite	Veitscher Magnesitwerke AG (Radex Austria AG, 51%)	Mines at Breitenau and Hohentauren	550
Do.	Tiroler Magnesite AG (Radex Austria AG 100%)	Hochfilzen Mine	250
Do.	Radex Austria AG (Osterreichische Magnesit AG 100%)	Millstatteralpe Mine	200
Steel	Voest-Alpine Stahl G.m.b.H. (Government 100,%)	Plants at Donawitz and Linz	4,500

AZERBAIJAN

AREA 86,600 km² **POPULATION 7.5 million**



THE MINERAL INDUSTRY OF

AZERBAIJAN[1]

By Richard M. Levine

According to data from the Ministry of Economics, in 1993 industrial production decreased 6.8% compared with that of 1992, while national income fell 13.4%. Oil production decreased almost 7%, and gas production decreased by more than 13%. The decline, reportedly, was most severe in the chemical, metallurgical, and oil industries.[2] Petroleum products accounted for most of the country's export revenues, while the country mainly imported foodstuffs.[3] In September, the Azerbaijan National Assembly voted to join the Commonwealth of Independent States (CIS).

PRODUCTION

Azerbaijan, since the late 19th century, has been an important oil and gas producer. Azerbaijan is also a producer of alunite, alumina and aluminum, copper, iron ore, molybdenum, lead and zinc, and industrial minerals, including bromine and iodine, clays, gypsum, limestone, marble, sand and gravel, decorative building stone, and precious and semiprecious stones.

STRUCTURE OF THE MINERAL INDUSTRY

Azerbaijan prepared a draft privatization program for 1994 that envisions privatizing 8,000 enterprises in the service, trade, and health care sectors, and also privatizing a number of production enterprises and unfinished construction projects. Large- and medium-sized enterprises are to be converted to joint stock companies. A type of voucher system will be used that will enable citizens to use certain allocated funds only for the purpose of purchasing stock in enterprises being privatized.[4]

COMMODITY REVIEW

Aluminum.—Azerbaijan produces aluminum from native alunite ore mined from open pits. It requires more than 6 tons of alunite ore to produce 1 ton of alumina, and alunite processing is relatively energy intensive. Alunite processing was started under the former Soviet system that made mineral production a priority irrespective of production costs. Nevertheless, the 450,000-ton-per-year-capacity Gyandzha refinery in Azerbaijan, originally built to process alunite, was expanded in the late 1970's to process imported bauxite rather than alunite. Now, only one section at Gyandzha, with a capacity to produce 100,000 tons per year of alumina, processes alunite. The alumina from Gyandzha is shipped to the Sumgait aluminum smelter in Azerbaijan and to the Tajik aluminum smelter in Tajikistan. Political unrest in the Caucasus, however, has interfered with shipments to Tajikistan and sharply reduced the amount of alumina shipped there.

The Sumgait smelter in Azerbaijan has a 50,000-ton-per-year capacity. In 1993, Azerbaijan produced an estimated 20,000 tons of primary aluminum, 8,000 tons of which was exported to other former U.S.S.R. states under intergovernmental agreements. Aluminum exports to the west provided revenues, mainly used for food purchases.

The firm Kaiser Engineering from the United Kingdom engaged in a feasibility study for the renovation of the Sumgait aluminum plant. Azerbaijan reportedly paid for the study with 1,200 tons of primary aluminum.

The existing production capacity at the Gyandzha alumina refinery in Azerbaijan of 450,000 tons per year will be more than adequate for supplying Sumgait. According to the study, reconstruction of the electrolysis shop could result in an increase in aluminum output, to 100,000 tons per year.[5]

Because of a lack of foreign exchange, Azerbaijan was forced to back out of a project to build the Dian-Dian bauxite-alumina project in Guinea. Other participants include Kazakhstan, Russia, and Ukraine. The project would have provided Azerbaijan with 700,000 tons per year of bauxite for its alumina refinery in Gyandzha. The Gyandzha refinery has the capacity to produce 450,000 tons per year of alumina, of which 300,000 tons was being produced from bauxite imported from Brazil. Imports, however, reportedly as of December 1993, had almost ceased, owing in part to the armed conflict in neighboring Georgia, which is preventing bauxite supplies from entering at the Black Sea port of Poti. At yearend, Azerbaijan was seeking funds to continue its participation in the Dian-Dian project, which would provide a cheaper source of bauxite than Brazilian imports.

Azerbaijan reportedly was exporting 9,000 tons of its 20,000-ton aluminum output on world markets, which could provide some revenue for its continued participation in this project.[6]

Gold.—Plans call for the construction of Azerbaijan's first bullion plant in Baky (Baku)[7] that will produce gold of 99.9% purity, with the capacity to produce 5 tons of bullion per year. Other precious metals, including silver, also will be produced at this plant. The plant is projected to produce at design capacity in

3 to 4 years.[8]

Iron Ore.—Iron ore is mined at the Dashkesan open pit, Azerbaijan's sole source of iron ore. Reserves at Dashkesan are reportedly 230 million tons. Azerbaijan plans to increase iron ore output, but currently lacks customers for its ore. Its former customer, the Rustavi steel mill in Georgia, has halved its output. Azerbaijan has one steel mill in Sumgait, but the steel mill is only operating at one-third capacity.

The state concern Metallurigya, which represents the Azerbaijan iron and steel industry, is planning a joint venture with a German company to produce iron pellets. Plans call for initially building a sintering plant.[9]

Natural Gas.—In 1993, Azerbaijan reportedly produced 6.8 billion cubic meters of natural gas, short of the planned target of 7.25 billion cubic meters.[10] Azerbaijan yearly consumed previously 7 billion cubic meters of gas from Russia and Turkmenistan and 3 billion cubic meters from Iran. In 1993, Azerbaijan was deeply in debt to Turkmenistan and Russia for gas shipments.

Petroleum.—In 1993, Azerbaijan reportedly produced 10.3 million tons of crude oil, of which offshore production totaled 8.3 million tons. Total output was 97.6% of planned output, with offshore production achieving 96.9% of the planned target and inland production 100.3% of the planned target. Refineries in Azerbaijan processed 9.97 million tons of crude oil, which was 97.5% of the processing plan target for refineries.[11]

A western oil consortium reportedly headed by the British-Norwegian alliance of British Petroleum/Statoil and comprised of companies from the United States and Turkey has been planning to develop two offshore oilfields with reported estimated recoverable oil reserves of 4.4 billion barrels; for the past 3 years the consortium has been negotiating with the State Oil Company of the Azerbaijani Republic (SOCAT) concerning a production-sharing agreement.[12] In November, SOCAT and Russia's Lukoil Oil Co. signed documents for cooperation in the development of Azerbaijan's oil resources. According to these documents, Russia will be entitled to have a percentage of the shares of development consortiums with western oil companies.[13]

Reserves

Azerbaijan's most significant reserves in terms of value are its oil and gas reserves; a number of foreign firms are involved in negotiations and projects to develop these reserves. Azerbaijan also has numerous other mineral resources, including for metals: alunite, arsenic, cobalt, copper, chromite, iron ore, lead and zinc, manganese, mercury, molybdenum, and tungsten, and for industrial minerals and nonmetallic minerals: barite, clays, refractory-grade dolomite, gypsum, kaolin, limestone, pyrite, salt, and zeolites and semiprecious stones, including amethyst, andalusite, and garnet, and a range of building materials.

INFRASTRUCTURE

Azerbaijan has its eastern border on the Caspian Sea, which is an inland sea bordered also by Kazakhstan, Russia, and Turkmenistan, with no direct access to ocean routes. Azerbaijan's main port on the Caspian Sea is in the city of Baky. To the west, Azerbaijan is bordered by Armenia and Georgia, with the Nakhichevan district of Azerbaijan entirely surrounded by Armenia and Turkey and cut off from the rest of Azerbaijan.

Oil and gas products are shipped through Azerbaijan to other countries of the former U.S.S.R. via pipelines. Azerbaijan is well situated to maintain commercial relations either via the Caspian Sea, via pipelines, or overland routes with Russia and countries of Central Asia and the Caucasus. It is now prevented from fully fulfilling this function because of the political and military turmoil from the warfare in the predominately Armenian enclave of Nagorno-Karabakh within Azerbaijan that in 1993 spread to a larger portion of the country.

OUTLOOK

Although Azerbaijan has been an oil and gas producer since before the Russian revolution, there are still indications that there are significant undeveloped hydrocarbon reserves offshore in the Caspian Sea. Upon acquiring independence, Azerbaijan has been trying to attract foreign investors to participate in the development of these reserves. It now appears that a number of major companies will engage in development of Azerbaijan's oil and gas resources, which will be a significant source of revenue for the country.

The development of Azerbaijan's other mineral industries is more problematic. Aluminum production, for example, which is based in part on domestically mined alunite, may prove unprofitable under market economy conditions. Development of Azerbaijan's other metallic and industrial mineral industries also now will have to be scrutinized in terms of market economic factors, including transport costs that may impede the development of these industries; there still will be domestic markets for a number of Azerbaijan's industrial minerals and also markets in the newly independent states of the former U.S.S.R. for mineral commodities from Azerbaijan. It also remains to be determined if Azerbaijan will be able to begin integrating its economy, including its mineral sector, with Turkey and other countries of the Mideast, with which Azerbaijan shares cultural, religious, and geographic affinities. For Azerbaijan to make significant progress in its program for economic development, it will have to resolve issues of political instability brought about to a large extent by the continuing warfare in Nagorno-Karabakh.

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[1]Text prepared July 1994.

[2]Summary of World Broadcasts, p. WA/5, Jan. 1994, 28 RIA News Agency, Moscow, Jan. 11, 1994.

[3]Foreign Broadcast Information Service, Mar. 31,

1994, p. 5. Bakinskiy Rabochiy, Baku, Mar. 4, 1994, p. 2.3.

[4]Foreign Broadcast Information Service, May 5, 1994, p. 10, Bakinskiy Rabochiy, Baku, Apr. 29, 1994, p. 1.

[5]Interfax Mining Report, Oct. 22-29, 1993, p. 7.

[6]Interfax Mining Report, Dec. 3-10, 1993, p. 7.

[7]New names or spellings for locations will be used when available, and the older version will appear in parenthesis following the new name the first time the name appears.

[8]Foreign Broadcast Information Service, Jan. 14, 1994, p. WD 13, Russia, TV channel, Moscow, in Russian, 0530 gmt, Dec. 23, 1993.

[9]Interfax Mining Report, Oct. 22-29, 1993, p. 8.

[10]Interfax Petroleum Report, Jan. 7-14, 1994, p. 20.

[11]Interfax Petroleum Report, Jan. 7-14, 1994, p.21.

[12]Foreign Broadcast Information Service, 24 May 1994, p. 67, AFP, Paris, May 24, 1994.

[13]Foreign Broadcast Information Service, Nov. 22, 1993, p. 71, TURAN, Baku, in English Nov. 1993.

TABLE 1

AZERBAIJAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Alumina		300,000	200,000	450,000
Aluminum		25,000	20,000	50,000
Alunite		300,000	200,000	600,000
Cement		600,000	400,000	1,000,000
Gypsum		100,000	75,000	200,000
Iodine		50	40	100
Iron ore, marketable		400,000	300,000	1,000,000
Limestone		1,000,000	700,000	2,000,000
Natural gas	million cubic meters	7,000	6,800	10,000
Petroleum		11,000,000	10,300,000	12,000,000
Salt		50,000	40,000	100,000
Steel, crude		300,000	200,000	700,000

[e]Estimated.

TABLE 2

AZERBAIJAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

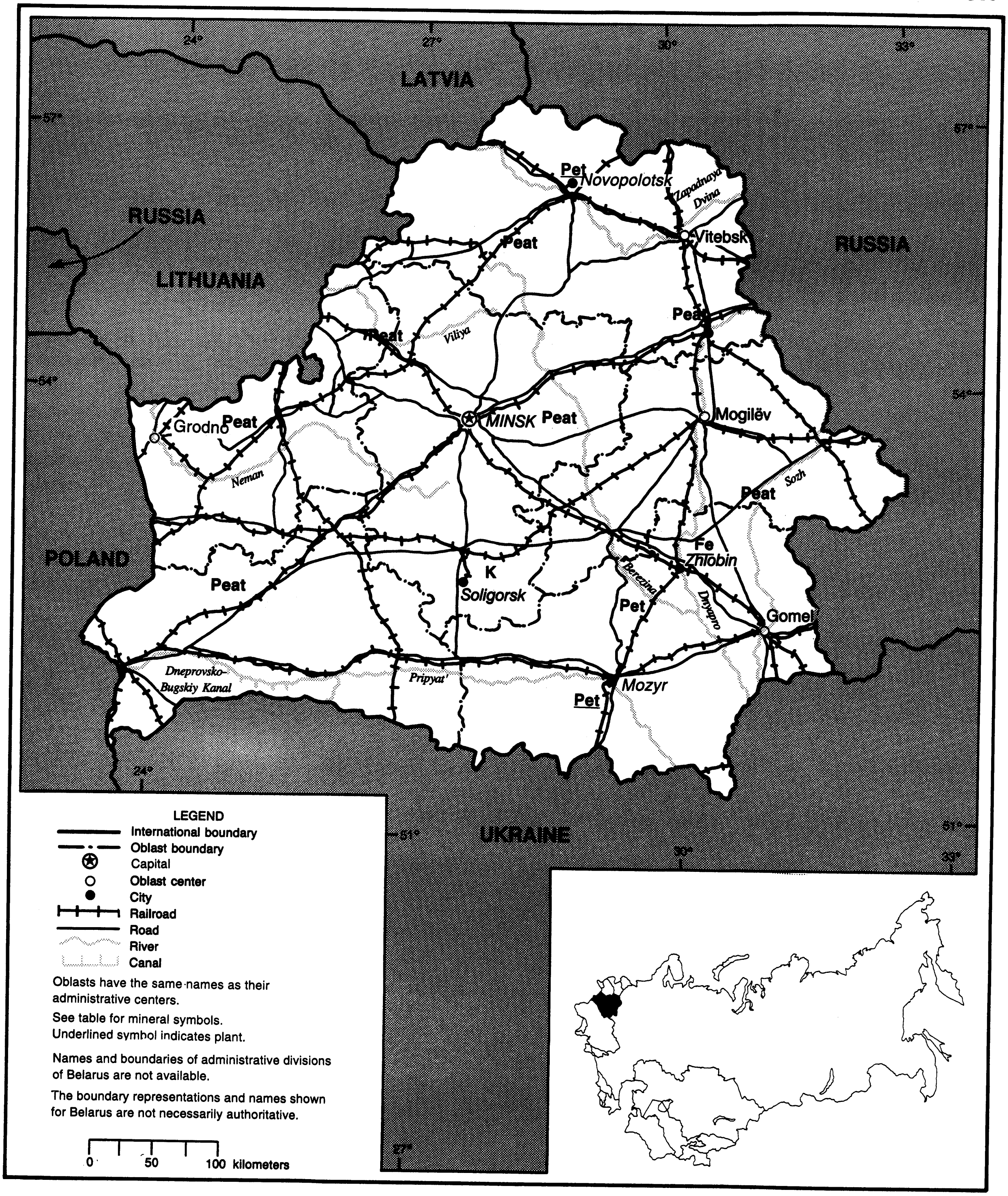
(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity* (Jan. 1, 1994)
Aluminum		Sumgait smelter	Sumgait	50,000.
Alumina		Gyandzha refinery	Gyandzha	450,000.
Alunite ore		Zaglik alunite mining directorate	Zaglik	600,000
Cement		Karadag cement plant	Karadag	1,000,000 (total for both plants).
Do.		Tauz	Tauz	
Iodine and bromine		Baku, Karadag, Neftechala plants	Process oil well brines at plants in Baky, Karadag, and Neftechala	30,000 bromine. 100 iodine.
Iron ore, marketable		Dashkesan Mining Directorate	Dashkesan region	1,000,000.
Petroleum	million tons	Produced at 40 deposits on land and 12 offshore deposits in Caspian Sea	Land deposits on Ashperon Peninsula, in the Nizhnekurin Valley and at the Muradkhanly and Zagly-Zegva deposits	12.
Natural gas	billion cubic meters	do.	do.	10.

*Estimated.

BELARUS

AREA 207,600 km² **POPULATION 10.4 million**



THE MINERAL INDUSTRY OF

BELARUS[1]

By Richard M. Levine

In Belarus, mineral production consisted primarily of the mining of potash and peat and the production of steel at one minimill. A salient factor in Belarus' economy is its reliance on Russia for more than 90% of its fuel and energy supplies. In 1993, Belarus was heavily in debt to Russia for supplies of gas and oil.

GOVERNMENT POLICIES AND PROGRAMS

At the beginning of 1993, the Government of Belarus passed a "Program to Accelerate Geological Exploration to Develop the Raw Material Base," which calls for exploration and development of coal, iron ore, industrial minerals, rare metals, and oil and gas deposits.

The program calls for developing lignite deposits with an estimated 1 billion metric tons of coal and the exploration of the Okolovskoye iron deposit, believed to have total reserves of 1 billion tons of ore with an iron content of 26% to 27%. Plans for iron ore development call for constructing a shaft at the deposit to produce 14 million tons per year of ore yielding close to 4 million tons per year of concentrate.

The program also calls for the development of a rare metals deposit in the Homyel' (Gomel)[2] region to produce beryllium and rare metals of the cerium group, for exploration and assessment of kimberlite fields in the south and central regions of the country, and for exploration of new oilfields and gasfields. Plans also call for increasing production of potash.

The Government of Belarus approved a program for accelerating geological exploration for oil and gas. Estimates are that oil reserves in Belarus total 160 million tons. The program envisages a considerable expansion of exploratory drilling.

Belarus, which has no gold reserves, is planning a program to produce gold and other precious metals from nonferrous scrap and is also planning to mine and process amber. The gold and amber will be used to supply Belarus's jewelry industry, which plans to expand its domestic market as well as enter export markets.[3]

ENVIRONMENTAL ISSUES

Belarus was working with international agencies, including the World Bank, to acquire loans for a program to monitor and clean up the environment. Environmental problems related to Belarus potash mining and petroleum refining industries were to be treated with these funds.

PRODUCTION

Mineral production in Belarus apparently declined along with national income and general industrial output. There was a reported decrease in potash production, which was Belarus' main mineral product, and reported decreases in crude steel and cement production. Oil and gas production, however, reportedly remained at about their 1992 level. *(See table 1.)*

STRUCTURE OF THE MINERAL INDUSTRY

Belarus planned to begin the privatization of state property in April 1994. In an attempt to avoid some of the problems in the Russian voucher issue, citizens of Belarus will be issued personalized privatization vouchers that cannot be exchanged for money. Belarus' privatization program calls for the privatization of retail trade, public catering, service enterprises, enterprises in light industry, the food industry, motor transport, and construction. Large enterprises, however, will first undergo what is termed denationalization, which will involve the issuance of stock. However, this stock will not be offered to the public until a much later date. Small enterprises, on the other hand, will be sold at public auctions with competitive bidding.[4] *(See table 2.)*

TRADE

In 1993, Belarus' foreign trade turnover decreased by 19% compared with that of 1992. Mineral products consisting primarily of fertilizers and petroleum products were among Belarus' main exports.[5]

COMMODITY REVIEW

Peat was produced primarily in the form of peat briquettes used for fuel, although peat also was mined for agricultural use. In the 1980's, Belarus was producing more than 4 million tons of peat per year for fuel, which was about one-third of the production of peat for fuel in the former U.S.S.R. The largest briquetting plant was the Starobinsk plant with a capacity to produce 240,000 tons per year of briquettes; in addition, there were 36 other briquetting plants.

In 1993, Belarus reportedly produced 2 million tons of crude oil, which was about the same level as 1992 production.[6] In 1993, Belarus reportedly produced 300 million cubic meters of natural gas, which was also about the same level as 1992 production.[7]

Belarus, which reportedly has oil reserves of about 160 million tons, was allocated $6 million by the European Bank for Reconstruction and Development (EBRD) to purchase geophysical equipment needed for exploration. It has been speculated that the Prypyats (Pripyat') trough in southwest Belarus may hold an additional 360 million tons of reserves. Currently, deterioration is occurring at oilfields with water encroachment now averaging 65% and reaching as high as 80% at older fields.

The state oil production agency Belneftekhim has drawn up a program to prevent a decline in oil production, which includes increasing exploration and modernizing geophysical equipment. Belneftekhim is not counting on large investments by foreign companies because of the low level of current and projected future oil production.[8]

In 1994, oil production is projected to remain at 2 million tons, but is then projected to decline to 1.7 million tons per year between 1995-2000 and to 1.3 million tons per year between 2001-2010. Belarus has 55 explored oilfields, 18 of which are producing and 22 of which are in an initial development stage.[9]

Belarus during the 1980's produced about one-half of the potash in the former U.S.S.R.; its annual output was more than 5 million tons per year of K_2O. Potash production in Belarus reportedly began decreasing from 5 million tons K_20 in 1990 to 4.1 million tons in 1991, 3.3 million tons in 1992, and 1.9 million tons in 1993. Exports of potash, however, outside the territory of the former U.S.S.R. remained at a high level during this period with reported exports in terms of K_2O in 1990 of 1.8 million tons, 1.1 million tons in 1991, 1.4 million tons in 1992, and 1.4 million tons in 1993.

In 1992, the system for exporting potash changed as control of exports passed from Agrokhimeksport's Kaliy firm to the fertilizer manufacturers. Then, in 1993, the potash producers formed their own closed joint stock company, the International Potash Co. (IPC), to export potash. The headquarters of the IPC is in Moscow and there is a branch headquarters in Minsk. The Beloruskaliy association has a 32% share in the IPC. The IPC exports potash from both Russia and Belarus.

Beloruskaliy has lost many of its former markets in the countries of the former U.S.S.R. and Eastern Europe because the agricultural sectors in these countries lack the ability to pay for potash. Even in Belarus potash consumption has fallen as the production and consumption of mixed and complex fertilizers has declined with Belarus's inability to purchase nitrogen and phosphate raw materials to produce these fertilizers.

Reserves in Belarus were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified under this system as reserves would not necessarily correspond to the western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. *(See table 3.)*

INFRASTRUCTURE

Belarus is a landlocked state on the western edge of the former U.S.S.R. bordering Poland to the west, Lithuania and Latvia to the north, Russia to the east, and Ukraine to the South. Its major means for overland mineral transport are 5,570 kilometers of rail line, not including industrial lines, and 98,200 kilometers of highways, of which 66,100 kilometers is hard surfaced. Belarus receives most of its gas and oil via pipelines. The country is well situated to transship minerals via land to and from Europe owing to its rail, road, and pipeline connections to Eastern Europe.

OUTLOOK

Belarus is heavily dependent on the countries of the former U.S.S.R. for its mineral and fuel requirements and will have to maintain and further develop forms of economic cooperation with these countries to provide for its mineral requirements. The only mineral currently produced in Belarus that is being marketed in any substantial quantity on world markets is potash. Although cooperation with the countries of the former U.S.S.R. will remain the mainstay of Belarus' mineral supply, Belarus also will seek to encourage foreign investment from outside the former U.S.S.R. when it believes there is a potential for developing its domestic mineral industry.

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[1]Text prepared July 1994.

[2]New names and spellings for cities and regions in Belarus will be used whenever possible based on the availability of information; the old name will be given in parenthesis the first time the new name is used in this report. The old names will appear on the map, which is the latest U.S. Government-base map of this series issued as of the date of the preparation of this report.

[3]Interfax Mining Report. June 10-17, 1994, pp. 12, 13.

[4]Foreign Broadcast Information Service, U.S. Govt. publication, Washington, DC. Dec. 13, 1993, p. 68. Sovetskaya Belorussiya, Minsk, Oct. 29, 1993, p. 2.

[5]Interfax Statistical Report. June 10-17, 1994, pp. 2-11.

[6]———. Mar. 7, 1994, p. 4.

[7]See work cited in footnote 5.

[8]Interfax Petroleum Report. Feb. 4-11, 1994, p. 10.

[9]———. Apr. 1-8, 1994, p. 4.

TABLE 1
BELARUS: PRODUCTION OF MINERAL COMMODITIES[e]

(Thousand metric tons unless otherwise specified)

Commodity	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Cement	2,300	1,900	2,500
Nitrogen (N content of ammonia)	700	500	1,000
Peat (fuel use)	4,000	4,000	5,000
Petroleum: Crude	2,000	2,000	2,000
Refined	20,000	14,000	40,000
Potash, K_2O content	3,300	1,900	5,000
Salt	360	300	400
Steel: Crude	1,100	800	1,200
Pipe	80	44	100
Natural gas million cubic meters	300	300	300

[e]Estimated

TABLE 2
BELARUS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Volkovysskiy plant	Volkovysskiy	1,100
Do.	Krichevskiy plant	Krichevskiy area	1,100
Nitrogen, N content of ammonia	Grodno "Azot" Association	Hrodna (Grodno) region	1,000
Peat (fuel use)	Production at 37 enterprises producing mainly briquetes	do.	[1]5,000
Petroleum (crude)	Belarusneft Association	do.	2,000
Petroleum (refining)	Mozyr refinery	Mazyr (Mozyr)	[2]40,000
Do.	Novopolotsk refinery	Navapolatsk (Novopolotsk)	
Potash (K_2O content)	Belaruskaliy Association	Soligorsk area	5,000
Steel (crude)	Belarus electric steelworks	Zhlobin	700

[1]Total peat for fuel use production.
[2]Total for both refineries.

TABLE 3
BELARUS: MAJOR MINERAL RESOURCES FOR 1993[e]

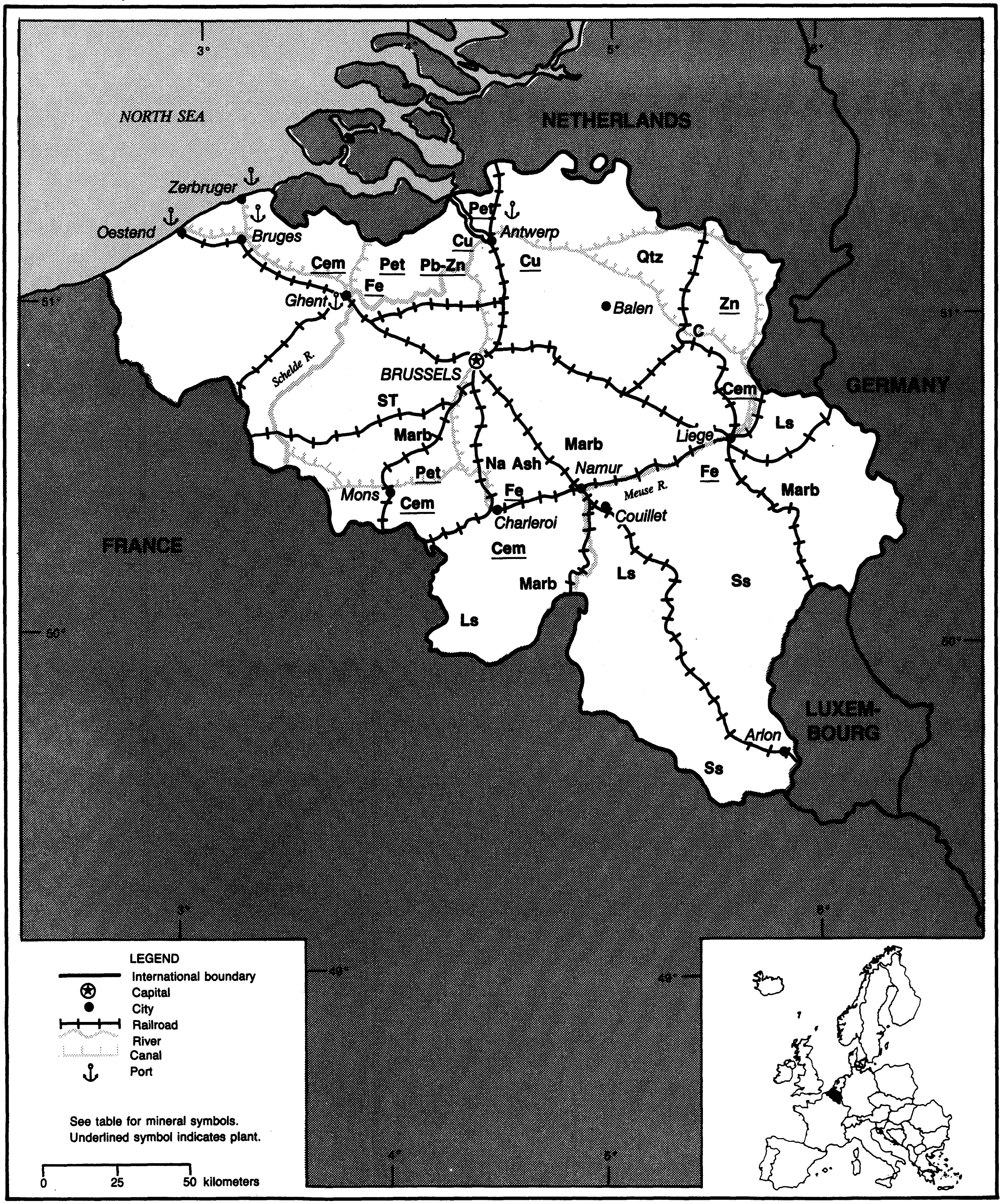
(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Coal	1,000,000
Iron ore	1,000,000
Oil shale	11,000,000
Peat	1,100,000
Petroleum	160,000
Potash; K_2O content	260,000
Salt	20,000,000

[e]Estimated.

BELGIUM

AREA 30,500 km² **POPULATION 9.9 million**



THE MINERAL INDUSTRIES OF

BELGIUM AND LUXEMBOURG

By William Zajac

BELGIUM

Belgium did not escape the effects of the bad international economic market in 1993. As an export-oriented economy, the country suffered from a loss of markets, especially in the other European Union (EU) countries, for many of its products. Not only did Belgium loose markets as a result of the worldwide recession, but lower commodity prices on the international market reduced the value of the materials that have been traditional money earners. For example, the prices of lead and zinc, two materials of which Belgium is a net exporter, both reached the lowest levels in several years. The price of lead on the London market dropped one-third between 1992 and 1993 (by almost one-half between 1990 and 1993) and the price of zinc dropped by almost one-quarter between 1992 and 1993 (by more than one-third between 1990 and 1993.)

As can be seen in table 2, Belgium relies on imported materials for the majority of its nonferrous metals processing sector. It is a net exporter of lead and zinc, but even though it is a major producer of refined copper, it still must import refined copper to feed its copper semimanufacturing plants and is entirely reliant on imported materials to satisfy its needs of aluminum, nickel, and tin. (*See table 2.*)

Government Policies and Programs

The loss of income in 1993 from its exported processed materials has caused problems for the Belgian Government. As one of the more socialized states, the Government of Belgium had some of the proportionally largest debts in Europe. The Government's expenses have traditionally, by mandate, included child allowances, health insurance, pensions, meal tickets, mandated vacations, mandated cost-of-living increases, et al. These expenses, coupled with the drop in the price for many of its exported materials, have caused the Government to propose drastic, for Belgium, measures. Late in 1993 the Government proposed cutting the cost of social programs by 1% of the gross domestic product (GDP) by 1996, starting with a 0.5% cut in 1994. It also has proposed tax increases, a real wage freeze in 1995-96, and reduced cost-of-living adjustments. These proposed measures were not met with approval by the work force and were the cause of several general strikes in Belgium against the Government as the year ended. Nothing had been resolved as the year ended with the work force feeling betrayed by the proposed withdrawal of many of its benefits and the Government becoming desperate to do something about the ever-mounting Government debt. At the level of the debt at the end of 1993, the Belgian Government was paying 40% of the annual budget on the interest of the debt alone, and the debt itself had reached 147% of the GDP.

Environmental Issues

Environmental policy in Belgium is the responsibility of the Federal Ministry of the Environment as well as its comparable ministries in the two separate regions of the country, Flanders and Wallonia.

Individual companies assume the responsibility of environmental protection in their own areas of concern. For example, the Petrofina Group incorporated technology into its new petroleum refinery in Antwerp that not only cuts the sulfur oxide emissions to one-half those formerly produced during the refining process, but also during the consumption of the product. The same Group also is involved in managing the ecological consequences of previous industrial activities in an efficient and economical manner and has initiated or been involved in 20 cleanup projects.

Production

Production of mineral commodities generally stagnated or dropped in Belgium during the year in review. Even the materials supplied to the construction industry domestically and abroad showed little to no growth despite the continued building boom in Germany, Belgium's principal trading partner. The high cost of production in Belgium that results from the generous social benefits are a definite contributing factor to these costs, making Belgian products more expensive in international markets than those of many other countries, especially the newly emerging nations of the former Eastern bloc. As an importer and processor of raw materials, Belgium cannot afford to increase the value added to these materials to an extent that the prices become uncompetitive on the international market. (*See table 1.*)

Trade

International trade data for Belgium are covered in the context of the Belgian-Luxembourg Economic Union (BLEU) and as such contain the exports, reexports, and imports of Luxembourg as well. Although trade data for 1993 has not been made available, little is expected to have changed from previous years, other than a decline in both the volume and value. Traditionally, Germany, France, the Netherlands, the United Kingdom, Italy, and the United States, in that order, have been Belgium's six leading destinations for exports, based on value. For imports, based on value, Germany, France, the Netherlands, the United Kingdom, the United States, and Italy, in that order, have been the six principal sources of imports.

Structure of the Mineral Industry

Table 5 (*see table 5*) shows the principal plants with their locations and capacities of mineral industry concerns in Belgium. The only mining operations left in Belgium in 1993 were in the production of sand and gravel and the quarrying of stone. The metal processing sector of the industry runs principally on imported raw materials, whether metal concentrates or scrap for smelting and refining or metal for forming and casting. For example, Belgium produces no primary aluminum and only a small quantity of secondary aluminum, but annually produces more than 300,000 tons of aluminum semimanufactures in the form of wire, rods, bars, sections, plate, sheet, and strip. The sand and gravel and stone industries principally supply the domestic market and neighboring countries, with exports of some of the less common types of stone, such as marble and the Belgian blue-grey limestone called "petit-granit," to worldwide destinations.

Commodity Review

Metals.—**Copper.**—Partially as a result of sales by Societe Generale de Belgique (SGB) of stock in Union Miniere SA (UM), UM is planning to concentrate its activities in its copper and specialty metals division and put less emphasis on its zinc division. The aim of the company is not necessarily to increase production of copper and specialty metals, but rather to make the production facilities at Olen one of the most cost-effective copper refineries in the world. The plant at Olen formerly took much of its feed from Zaire, but now this accounts for only about 30% of the refiner feed, with the rest coming from within Belgium, from UM's part-owned mine in Mexico, and from scrap and spot contracts.

The Olen copper refinery includes continuous smelting and refining facilities for blister copper and copper scrap and has a cellhouse capacity of 330,000 mt/a and a casting facility of 480,000 mt/a. The casting facility handles cathodes from the Olen cellhouse and other sources; the main products are slab, billet, and wire rod.

Lead.—Although the production of primary refined lead in Belgium increased somewhat in 1993, the financial results of the refiners did not, a result of the low lead prices on the international market. Production of secondary lead again increased as a result of the battery recycling and secondary lead plant of Campine SA. The first full year of operation of the plant was 1993, and the company reported achieving the production tonnage forecast and satisfactory sales returns but negative final results as a consequence of the low lead prices.

Steel.—Steel production continued to drop in Belgium in 1993, again attributable to the generally poor economic situation worldwide, EU over-capacity, and the cheaper imports from the countries of eastern Europe. Plans to help the companies through the difficult times had not been well received by the work force. For example, at the steelplant of Usine Gustave Boel, a strike was called early in December and no end was to be seen at yearend. The principal reason for the strike was the planned closure of the company's sinter and coke plants, a measure that management claimed was needed to ensure the survival of the steelworks.

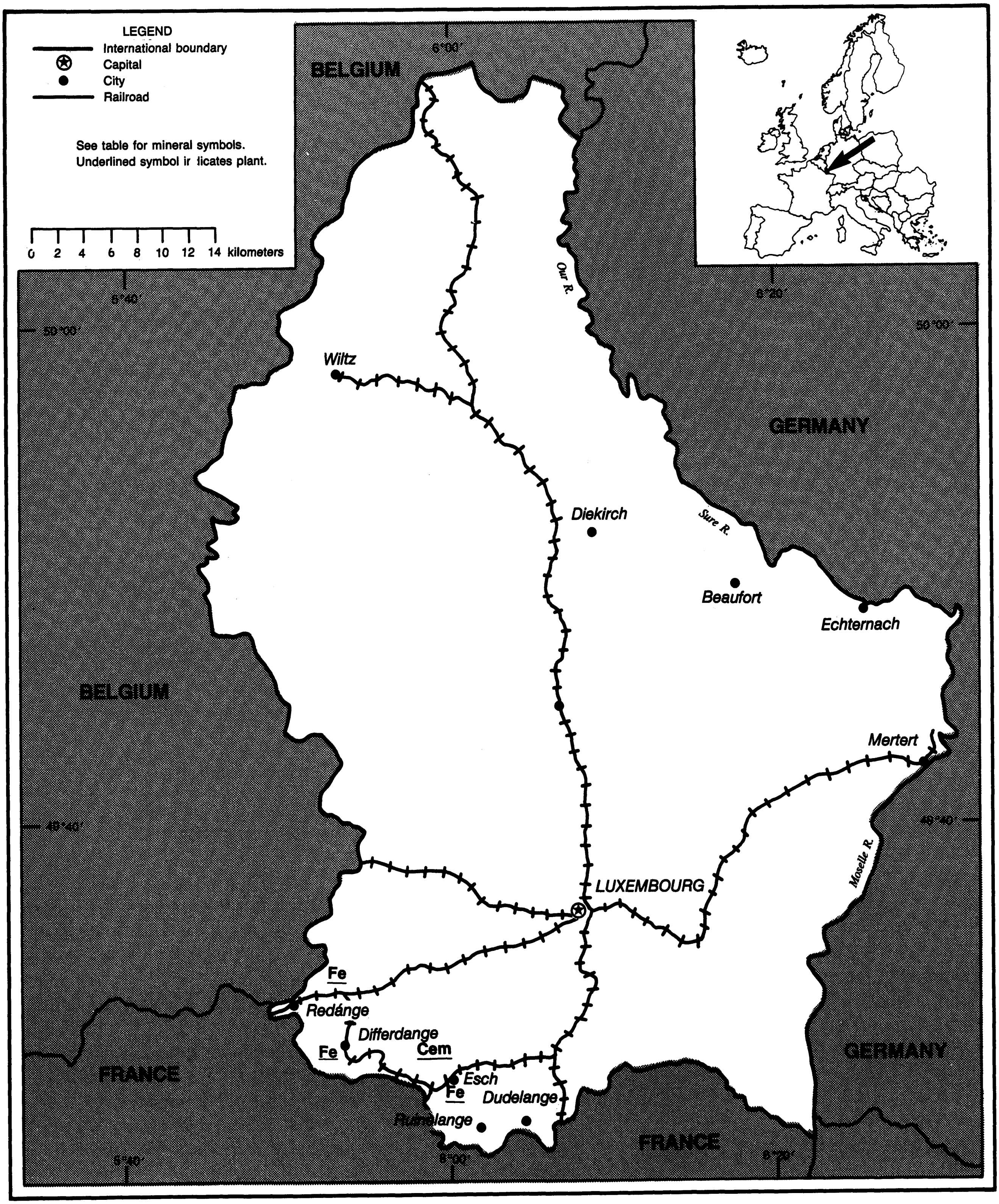
Industrial Minerals.—**Diamond.**—Belgium, and specifically Antwerp, retained its position in 1993 as the world's leading diamond center and reported a turnover of diamonds valued at $17.1 billion, an 8% increase over that of 1992 as reported in Diamond International. Exports and reexports of unworked diamond by Belgium to the United States decreased with regard to carat weight in 1993 but increased in value, indicating shipments of larger, more valuable stones. Exports and reexports of worked diamonds to the United States in 1993 increased both in carat weight and value. The increase in shipments to the United States was primarily a result of the improving economic situation in the United States during 1993. An interesting aspect of Belgium's diamond trade was the large increase of unworked stones imported from Russia in 1993. Imports of crude stones from Russia increased by more than 22,000% in 1993 based on carat weight and almost 7,000% based on value. Imports of worked stones also increased, but not so dramatically. In this case, the situation in the diamond market closely reflects that of the metals market in that the former U.S.S.R. states increased, to a great extent, shipments of base materials for processing and/or forming in countries that have not traditionally been their principal trading partners. Belgium's international trade in diamonds between 1991 and 1993 is shown in tables 4 and 5. (*See tables 4 and 5.*)

Mineral Fuels.—With the closing of the last coal mines in Belgium in 1992, the country has become entirely dependent on imported primary energy with the only energy-related industry being that of processing imported materials, principally crude petroleum.

Reserves.—Belgium has no economically exploitable reserves of metal ores or primary energy. The only mining remaining in the country is the production of sand and gravel and the quarrying of some stone, principally specialty marbles and the Belgian blue-grey limestone called "petit granit." Other than scrap generated domestically, almost all raw materials for the minerals industry must now be imported.

LUXEMBOURG

AREA 2,600 km² **POPULATION 392,000**



Infrastructure

The Belgian National Railways (SNCB) operates 3,667 km of 1.435-m standard-gauge track, 2,563 km double track, 1,978 km electrified, and 191 km 1.000-m gauge track, all Government owned. The country has a total of 103,396 km of roadways, of which 1,317 km is limited access, divided highways; 11,717 km is national highways; 1,362 km is provincial roads; and 38,000 km is paved and 51,000 km is unpaved rural roads. The inland waterway system consists of 2,043 km, of which about 1,528 km is in regular use. There is 1,167 km of pipelines for petroleum products, 161 km for crude petroleum, and 3,300 km for natural gas. The principal ports are Antwerp, Brugge, Ghent, Oostende, and Zeebrugge. In 1993, the merchant marine consisted of 23 ships of 1,000 gross weight tons or more totaling 96,949 gross weight tons, of which 10 were cargo, 5 were chemical tankers, 5 were petroleum tankers, 2 were liquefied gas tankers, and 1 was a bulk carrier.

Outlook

The economic outlook for Belgium for the next few years is impossible to predict because of all the uncontrollable factors involved. Being an export-oriented economy, Belgium relies heavily on the markets in its trading partners, and if they do not recover economically, then Belgium will remain in a recession until they do. Much also depends on the will of the Belgian Government to adhere to its economic plan announced late in 1993 and its ability to bring the Belgian economy in line with the requirements of the Maastrict Agreement for the economic and monetary union of the members of the EU.

LUXEMBOURG

Luxembourg's mineral industry consists principally of processing raw materials and was dominated by the steel company ARBED S.A., part of the ARBED Group of companies with interests in steelmaking and products, cement, copper foil production, engineering and steel construction, mining, information systems, trading, et al. Since its creation in 1882, ARBED has been the largest industrial group in the Grand Duchy of Luxembourg. The steel group had a turnover of $2.7 billion in 1993, compared with the turnover of $2.8 billion in 1992, and recorded a loss of $165 million in 1993 compared with a loss of $103 million in 1992. Steel production in the group's European and Brazilian steel companies rose, however, by almost 10% in 1993 to 7.8 Mmt.

Production

Luxembourg's mineral industry has been dominated by the steel company ARBED, which produces pig iron from imported iron ore, crude steel, and stainless steel and is involved in many other areas of the economy, such as the cement and brickmaking industries. The country has also traditionally produced sand and gravel and crushed and dimension stone, but data on the actual production of these materials have not been published since the 1987 production year. However, national statistics indicate that about 0.2% of the national work force (or about 400 persons) is engaged in the extraction of nonmetallic minerals and produced products valued at about $30 million. (*See table 6.*)

Trade

As a member of BLEU, trade statistics for Luxembourg are inextricably linked with those of Belgium, and therefore are not able to be listed individually.

Structure of the Mineral Industry

Luxembourg's principal producers of mineral industry products are shown in table 7. (*See table 7.*)

Commodity Review

The iron and steel sector remained the most important industrial sector of the economy. The apparent increase in the production of pig iron and steel was, in reality, an adjustment owing to downtime caused by the relining of furnaces in 1992. Steel production in Luxembourg remained below that of the past several years. Despite the bad market for steel, ARBED has contracted with Mannesmann Demag Huttentechnik for a new steelmaking plant to be built in two phases. The electric furnace steelmaking plant will replace an existing oxygen furnace at Differdange. The project includes a double-vessel direct current electric arc furnace with eccentric bottom tapping, a dust collection system for the steelmaking shop, the building itself including a noise suppression system to meet Luxembourg's environmental protection requirements, crane systems, a new scrapyard, and all associated systems and equipment. When finished, possibly in late 1994, the plant is expected to have a capacity of 1.25 Mmt/a of steel.

Infrastructure

Luxembourg is a landlocked country with 270 km of 1.435-m standard-gauge, 162 km double track, and 162 km electrified railways operated by the Luxembourg National Railways (CFL). The country has a total of 5,108 km of roadways, of which 4,995 km is paved, 57 km is gravel, and 56 is earth. A pipeline of 48 km delivers petroleum refinery products. The only waterway is the Moselle River, of which 37 km in Luxembourg is navigable and the only port is the river port Mertert. In 1993, the merchant marine consisted of 53 ships of 1,000 gross weight tons or more and totaled 1,570,466 gross weight tons. Of the total, 8 were bulk carriers, 8 were liquefied gas tankers, 6 were combination bulk carriers, 6 were petroleum tankers, 5 were container ships, 5 were roll-on-roll-off carriers, 4 were chemical tankers, 4 were refrigerated cargo ships, 3 were combination ore/oil carriers, 2 were cargo ships, and 2 were passenger carriers.

OTHER SOURCES OF INFORMATION

Agencies

Administration des Mines, Ministere des

Affaires Economiques (Administration of Mines, Ministry of Economic Affairs) Brussels, Belgium
Institute National des Industries Extractives (National Institute of Extractive Industries) Liege, Belgium
Service Geologique de Belgique (Belgian Geological Service) Brussels, Belgium
Service Central de la Statistiques et des Etudes Economiques (STATEC) (Central Statistical and Economic Studies Service) Luxembourg, Luxembourg

Publications

Annales des Mines de Belgique: Administration des Mines (Annals of Mines: Administration of Mines) Brussels, Belgium, biannual.
Bulletin de Statistiques: Institute National de Statistique (Statistical Bulletin: National Institute of Statistics) Brussels, Belgium, monthly.
Statistiques Industrielles: Institute National de Statistique (Industrial Statistics: National Institute of Statistics) Brussels, Belgium, monthly.
Statistiques du Commerce Interieur and des Transports: Institute National de Statistiques (Statistics of Interior Commerce and Transport: National Institute of Statistics) Brussels, Belgium, monthly.
Diamond International, London, United Kingdom, various issues.
Annuaire Statistique (Annual Statistics), STATEC, Luxembourg, Luxembourg.
Bulletin de Statec, STATEC, Luxembourg, Luxembourg, monthly.
Indicateurs Rapides (Rapid Indicators), STATEC, Luxembourg, Luxembourg.

TABLE 1

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum, secondary including unspecified metals	7,355	7,905	7,391	[e]7,000	[e]4,000	5,000
Arsenic, white	[e]3,500	[e]3,000	[e]2,500	[e]2,000	[e]2,000	2,000
Bismuth, metal	[e]800	[e]750	[e]700	[e]700	[e]700	1,000
Cadmium, primary	1,764	1,956	1,807	1,550	1,573	1,550
Copper:						
Blister:						
Primary	—	[e]1,500	[e]1,000	[r][e]800	[e]800	2,000
Secondary	[e]93,400	[e]103,000	[e]105,000	[r][e]102,000	[e]102,400	110,000
Total	[e]93,400	[e]104,500	[e]106,000	[r][e]102,800	[e]103,200	112,000
Unwrought, total of smelter and refined, primary and secondary, including including alloys	563,328	542,458	477,972	471,314	452,000	500,000
Refined, primary and secondary including alloys	329,200	331,857	297,593	[r]306,190	298,900	612,000
Of which secondary (WBMS)	88,000	102,000	106,000	[r]102,800	103,200	110,000
Iron and steel:						
Pig iron	8,868,000	9,416,000	9,354,000	[r]8,533,000	8,213,000	9,000,000
Ferroalloys: Electric furnace ferromanganese in world table	[r][e]30,000	[r][e]25,000	[r][e]25,000	[r][e]25,000	[e]25,000	30,000
Steel:						
Crude	10,952,815	11,419,158	11,334,883	10,333,600	10,250,000	14,000,000
Hot-rolled products	10,536,000	10,966,800	10,831,200	[r]10,336,000	9,745,000	12,000,000
Lead:						
Smelter:						
Primary[3]	[r][e]64,000	[r][e]65,600	[r][e]69,800	[r][e]75,400	[e]76,000	70,000
Secondary[4]	[e]22,800	[e]21,800	[e]20,000	[e]20,000	[e]20,000	20,000
Total	[r][e]86,800	[r][e]87,400	[r][e]89,800	[r][e]95,400	[e]96,000	90,000
Refined:						
Primary	72,669	69,812	78,124	[e]75,297	[e]75,880	80,000
Secondary	36,771	37,000	32,560	[e]41,000	[e]51,000	45,000
Total	109,440	106,812	110,684	116,297	126,880	125,000
Selenium	[e]250	[e]250	[e]250	[e]250	[e]250	300
Tin metal, secondary including alloys	5,976	6,063	4,426	[e]5,260	[e]5,000	5,000

See footnotes at end of table.

TABLE 1—Continued

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued						
Zinc:						
Slab:						
Primary	286,900	289,700	297,600	217,200	210,100	250,000
Secondary (possibly remelted zinc)	19,124	66,832	87,453	93,420	[e]90,000	135,000
Total	306,024	356,532	385,053	310,620	[e]300,100	385,000
Powder	40,932	52,632	52,416	[r]43,700	[e]43,000	50,000
Other, nonferrous: Precious metals, unwrought, n.e.s.[5] kilograms	1,110,276	1,348,788	1,305,926	[e]1,675,000	[e]1,500,000	2,000,000
INDUSTRIAL MINERALS						
Barite	[e]40,000	[e]35,000	[e]35,000	[e]30,000	[e]30,000	50,000
Cement, hydraulic	6,720,168	6,929,256	7,184,234	8,072,718	7,750,000	9,000,000
Clays: Kaolin	165,520	[e]175,000	260,000	[e]325,000	[e]300,000	350,000
Lime and dead-burned dolomite: Quicklime	1,968,000	2,076,000	2,021,000	1,871,000	[e]1,750,000	2,250,000
Nitrogen: N content of ammonia	292,300	273,600	272,400	[r]390,000	[e]400,000	550,000
Sodium compounds:						
Soda ash	[e]380,000	[e]375,000	[e]380,000	[e]375,000	[e]375,000	500,000
Sulfate	[e]255,000	[e]250,000	[e]260,000	[e]250,000	[e]250,000	400,000
Stone, sand and gravel:						
Calcareous:						
Dolomite	4,770,852	4,294,236	4,033,802	3,984,354	[e]4,000,000	5,000,000
Limestone	28,944,000	31,896,000	34,255,000	33,394,000	[e]33,400,000	50,000,000
Marble:						
In blocks cubic meters	624	480	358	232	[e]250	650
Crushed and other	72	72	80	[e]80	[e]80	100
Petit granite (Belgian bluestone):						
Quarried cubic meters	1,074,636	989,448	864,476	1,214,400	[e]1,200,000	1,500,000
Sawed do.	67,716	70,524	67,683	[e]90,000	[e]90,000	100,000
Worked do.	11,520	10,848	11,994	[e]15,000	[e]15,000	25,000
Crushed and other do.	692,856	530,604	598,854	[e]800,000	[e]800,000	1,000,000
Porphyry, all types	3,789,756	3,934,920	3,971,777	4,127,000	[e]4,000,000	5,000,000
Quartz and quartzite	322,192	204,308	402,780	[e]500,000	[e]500,000	750,000
Sandstone:						
Rough stone including crushed	2,244,480	2,080,476	2,663,044	[e]2,400,000	[e]2,400,000	3,500,000
Paving	13,860	17,628	14,386	[e]14,000	[e]14,000	50,000
Sand and gravel:						
Construction sand	9,264,000	9,336,000	9,163,000	[e]9,200,000	[e]9,200,000	15,000,000
Foundry sand	595,818	528,000	489,000	[e]525,000	[e]525,000	750,000
Dredged sand	937,394	589,200	2,305,300	[e]2,300,000	[e]2,300,000	3,500,000
Glass sand	1,908,747	2,028,000	2,065,000	[e]1,950,000	[e]1,950,000	3,000,000
Other sand	2,532,000	2,580,000	2,785,000	[e]2,800,000	[e]2,800,000	4,000,000
Gravel, dredged	4,800,000	4,128,000	4,192,000	4,899,000	[e]5,000,000	7,500,000
Sulfur:						
Byproduct:						
Elemental	[e]160,000	[e]160,000	[e]160,000	[e]160,000	[e]160,000	300,000

See footnotes at end of table.

TABLE 1—Continued

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Sulfur—Continued:							
Byproduct—Continued:							
Other forms		[e]160,000	[e]150,000	[e]140,000	[e]140,000	[e]140,000	200,000
Total		[e]320,000	[e]310,000	[e]300,000	[e]300,000	[e]300,000	500,000
Sulfuric acid, oleum		1,947,348	1,905,732	1,935,921	1,906,281	[e]2,000,000	3,000,000
MINERAL FUELS AND RELATED MATERIALS							
Carbon black		[e]1,800	[e]1,700	[e]1,700	[e]1,700	[e]1,700	5,000
Coal, bituminous		1,892,689	1,035,832	636,000	226,100	—	—
Coke, all types		5,458,820	5,420,351	4,887,000	2,693,000	[e]500,000	5,000,000
Gas:							
Manufactured	thousand cubic meters	660,240	654,612	565,293	550,541	[e]550,000	750,000
Natural (byproduct of coalmining):							
Gross	do.	20,139	[e]19,000	[e]11,000	[e]7,500	—	—
Marketable	do.	11,552	10,874	6,694	[e]4,000	—	—
Petroleum refinery products:							
Liquefied petroleum gas	thousand 42-gallon barrels	[r]5,870	[r]5,139	[r]5,313	[r]4,327	4,338	15,000
Aviation gasoline	do.	113	70	12	—	—	—
Naphtha and white spirit	do.	[r]16,686	[r]14,816	[r]12,232	[r] [e]8,600	[e]9,200	25,000
Gasoline	do.	45,327	[r]44,812	[r]50,023	52,377	48,374	135,000
Jet fuel	do.	13,296	11,496	12,360	13,720	11,400	37,000
Kerosene	do.	450	605	690	566	597	2,000
Distillate fuel oil	do.	72,705	76,316	81,911	[r]80,538	79,941	215,000
Refinery gas	do.	4,524	4,071	3,809	[e]3,500	[e]3,500	10,000
Residual fuel oil	do.	38,269	[r]37,529	[r]48,498	[r]44,842	44,016	120,000
Bitumen	do.	4,623	5,155	5,055	[e]4,000	[e]4,000	10,000
Other	do.	[e]12,000	[e]11,000	[e]10,000	[e]8,500	[e]8,500	23,000
Refinery fuel and losses	do.	[r] [e]-12,000	[r] [e]-12,000	[r]-11,958	[r]-12,329	-11,711	10,000
Total, net[6]	do.	[r] [e]201,862	[r] [e]199,008	[r] [e]217,944	[r] [e]208,668	[e]202,160	602,000

[e]Estimated. [r]Revised.

[1]Table includes data available through May 15, 1994.

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

[3]Data not reported; derived by taking reported total lead output plus exports of lead bullion less imports of lead bullion.

[4]Data represent secondary refined lead output less 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 remelting, but data are not adequate to permit differentiation.

[5]Includes gold, platinum-group metals, and silver.

[6]Totals may not add to detail shown owing to independent rounding.

TABLE 2

BELGIUM: PRODUCTION, CONSUMPTION, AND IMPORT DEPENDENCE OF SELECTED NONFERROUS METALS

(Thousand metric tons and percent)

Metal	1992	1991	1990
Aluminum, primary:			
Production	—	—	—
Consumption	291.8	323.0	317.8
Import dependence, percent	100.0	100.0	100.0
Copper, refined:			
Production	306.2	297.6	331.9
Consumption	371.8	372.0	395.9
Import dependence, percent	17.6	20.0	16.2
Lead, refined:			
Production	98.9	99.3	92.0
Consumption	64.1	71.7	63.0
Import dependence, percent	net export	net export	net export
Nickel, smelter:			
Production	—	—	—
Consumption	21.4	19.6	21.3
Import dependence, percent	100.0	100.0	100.0
Tin, smelter:			
Production	—	—	—
Consumption	2.5	2.6	2.1
Import dependence, percent	100.0	100.0	100.0
Zinc, metal:			
Production	217.2	397.6	289.7
Consumption	189.0	200.0	177.6
Import dependence, percent	net export	net export	net export

Source: METALLSTATISTIK 1982-92, Metallgesellschaft AG, Frankfurt am Main, Germany.

TABLE 3
BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cadmium, metal	Vieille-Montagne NV	Balen-Wezel	1,550
Do.	NV Metallurgie Hoboken-Overpelt SA (NV MHO SA)	Overpelt	600
Cement	Major companies:		8,400
Do.	Cimenteries CBR SA (Societe Generale de Belgique, or SGB)	Plants at Lixhe, Mons/Obourg, Harmignies, Marchienne, Ghent, et al.	3,200
Do.	Ciments d'Obourg SA	Plants at Obourg and Thieu	[1]2,800
Do.	Compagnie des Ciment Belge (Ciments Francais)	Plant at Gaurain-Ramecroix	2,400
Copper	Metallurgie Hoboken-Overpelt SA (Union Minière SA-58.37%)	Smelter at Antwerp-Hoboken, Refinery at Olen	50, 330
Do.	Metallo-Chimique NV	Smelter at Beerse	80
Dolomite	Carsambre SA Dolomeuse	Quarry at Floreffe	300
Do.	do.	Quarry at Marche les Dames	600
Do.	do.	Plant at Namur	37
Do.	SA de Marche les Dames	Quarries at Vezin and Sclaigneaux Andenne	300
Do.	do.	Plant at Vezin	35
Do.	SA des Dolomies de Marche-les-Dames	Quarry at Nameche	300
Do.	do.	Plant at Nameche, of which—	
Do.	do.	Soft-burned	500
Do.	do.	Dead-burned	200
Do.	SA Dolomies de Villers-le-Gambon	Quarry at Villers-le-Gambon	300
Lead, metal	Metallurgie Hoboken-Overpelt SA (Union Minière SA)	Smelter at Antwerp-Hoboken, refinery at Antwerp-Hoboken	90, 125
Petroleum, refined 42-gallon barrels per day	Refineries:		602,000, of which:
Do. do.	Fina Raffinaderji Antwerp	Refinery at Antwerp	(268,000)
Do. do.	SA Esso NV	do.	(239,000)
Do. do.	Belgian Refining Corp.	do.	(80,000)
Do. do.	Nynas Petroleum NV	do.	(125,000)
Steel:	Companies:		14,000, of which:
Do.	Cockerill Sambre SA (Government, 98%)	Plants at Liège and Charleroi	(5,000)
Do.	Sidmar NV (Belgian Government 28.11%; ARBED in Luxembourg, 66.97%)	Plant at Ghent	(3,960)
Do.	Usines Gustave Boël NV	Plant at La Louviere	(2,020)
Do.	Forges de Clabecq SA	Plant at Clabecq	(1,500)
Do.	SA Fabrique de Fer de Charleroi	Plant at Charleroi	(600)
Do.	ALZ NV	Plant at Genk-Zuid	(360)
Do.	New Tubemeuse (NTW) SA	Plant at Flemalle	(300)
Zinc, metal	Vieille-Montagne SA (Union Minière SA)	Smelter at Balen-Wezel	385

[1]Includes the capacity of the company SA Ciments de Haccourt.

TABLE 4
BELGIUM: EXPORTS AND REEXPORTS OF DIAMOND FOR 1991-93

Destinations	1991 Quantity (carats)	1991 Value (thousands)	1992 Quantity (carats)	1992 Value (thousands)	1993 Quantity (carats)	1993 Value (thousands)
Sorted, unworked or simply sawn, cleaved, or bruted:						
Hong Kong	826,699	$68,129	629,001	$44,217	477,509	$35,538
India	55,944,848	1,192,145	53,749,387	1,117,313	[e]70,000,000	1,600,534
Israel	4,650,085	1,229,877	5,900,172	1,516,278	6,229,748	1,607,974
Malaysia	306,856	52,818	377,084	61,178	503,912	64,101
Republic of South Africa	67,529	39,319	65,925	33,504	19,500	50,355
Sri Lanka	381,230	55,805	539,147	76,899	374,532	96,844
Switzerland	72,529	10,962	404,372	10,944	198,640	36,970
Thailand	827,822	145,072	898,454	143,205	121,760	187,035
Tunisia	39,565	6,477	30,998	4,949	611,370	2,536
United Kingdom	9,948,627	789,986	6,119,348	585,850	4,994,308	457,268
United States	699,559	222,512	508,033	230,431	444,952	305,256
Unspecified	1,975,812	114,099	809,961	83,781	[e]1,117,488	108,009
Total	75,741,161	3,927,201	70,031,882	3,908,549	85,093,719	4,552,420
Worked but not mounted or set:						
Germany	351,113	229,612	312,968	202,109	291,177	206,639
Hong Kong	440,643	358,295	649,215	499,156	628,371	522,620
Israel	351,656	246,045	305,570	217,631	343,104	239,861
Italy	155,681	87,021	151,852	75,783	183,623	92,023
Japan	627,450	652,467	450,296	502,218	442,993	535,531
Switzerland	284,755	275,131	282,612	251,494	369,696	287,190
Thailand	195,390	161,173	116,186	70,335	196,912	118,347
United Kingdom	162,918	140,493	138,778	104,358	223,098	185,254
United States	1,386,304	1,106,494	1,414,597	990,572	1,663,570	1,229,193
Unspecified	690,667	419,725	716,532	426,728	797,690	498,111
Total	4,646,577	3,676,456	4,538,606	3,340,384	5,140,234	3,914,769

[e]Estimated.

Source: Diamond International, Nov.-Dec. 1992, No. 20; July-Aug. 1993, No. 24; and Mar.-Apr. 1994, No. 28, London, United Kingdom.

TABLE 5
BELGIUM: IMPORTS OF DIAMOND FOR 1991-93

Sources	1991		1992		1993	
	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)
Natural rough, unsorted, and sorted, unworked or simply sawn, cleaved, or bruted:						
Angola	257,800	39,094	636,812	146,825	712,724	135,281
Australia	7,996,982	50,524	8,474,381	60,208	7,932,624	53,214
Brazil	641,552	27,602	NA	NA	NA	NA
Commonwealth of Independent States[1]	75,955	19,669	59,880	6,132	1,404,919	48,470
Congo	3,275,824	158,588	NA	NA	NA	NA
Côte d'Ivoire	946,578	88,801	868,163	88,322	683,691	101,520
Israel	1,238,483	212,020	1,285,198	218,260	1,829,278	301,674
Liberia	658,565	134,615	1,909,299	293,704	5,006,234	290,143
Sierra Leone	534,173	118,039	831,366	179,446	344,626	79,637
Switzerland	959,633	106,280	796,144	45,720	1,447,859	153,544
United Kingdom	32,905,846	2,423,576	24,899,237	1,947,833	38,511,282	2,374,185
United States	2,365,808	116,565	1,133,411	81,343	1,572,907	138,508
Zaire	17,766,223	548,141	[2]18,907,387	[2]589,438	[2]18,709,867	[2]701,208
Unspecified	1,217,415	424,700	5,376,045	617,886	6,912,948	702,489
Total	70,840,837	4,468,214	65,177,323	4,275,117	85,068,959	5,079,873
Worked but not mounted or set:						
Commonwealth of Independent States[1]	363,463	374,458	347,981	376,082	389,695	399,963
Germany	127,828	84,999	144,809	88,732	112,761	80,396
Hong Kong	309,799	144,769	304,550	155,800	301,396	178,502
India	1,464,058	516,187	1,296,681	425,226	1,754,266	560,059
Israel	461,323	406,195	428,031	383,840	468,803	463,780
Republic of South Africa,	188,405	164,496	128,845	141,251	109,185	142,333
Sri Lanka	162,935	73,700	199,477	83,269	247,229	113,874
Switzerland	114,911	157,580	89,610	122,299	131,777	165,732
Thailand	236,606	129,942	264,194	124,560	333,893	161,665
United Kingdom	85,520	100,703	89,838	84,817	118,300	132,571
United States	478,706	377,037	429,423	356,088	479,240	384,989
Unspecified	589,078	420,724	530,838	342,769	597,834	431,478
Total	4,582,632	2,950,790	4,254,277	2,684,733	5,044,379	3,215,342

NA Not available.
[1]Since Apr. 1992; formerly U.S.S.R.
[2]Includes Congo.

Source: Diamond International, Nov.-Dec. 1992, No. 20; July-Aug. 1993, No. 24; and Mar.-Apr. 1994, No. 28, London, United Kingdom.

TABLE 6

LUXEMBOURG: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Cement, hydraulic	590,193	635,571	687,786	[e]720,000	[e]750,000	750,000
Gypsum and anhydrite, crude	[e]450	[e]400	[e]400	[e]400	[e]400	450
Iron and steel: Metal:						
Pig iron	2,683,800	2,645,200	[r]2,463,000	2,256,000	2,411,000	3,000,000
Steel:						
Crude	3,720,920	3,560,290	3,379,000	3,068,000	3,292,000	5,320,000
Semimanufactures	4,113,051	3,950,035	3,787,000	3,590,000	3,650,000	4,000,000
Phosphates: Thomas slag:						
Gross weight	672,141	602,877	[r]535,518	[r]519,000	[e]555,000	575,000
P_2O_5 content	120,985	108,518	[r] [e]95,000	[r] [e]93,000	[e]100,000	105,000

[e]Estimated. [r]Revised.

[1]Table includes data available through May 15, 1994.

[2]Construction materials such as dimension stone and sand and gravel are also produced, but the amounts are no longer reported and no basis exists for the formulation of reliable estimates of output levels.

TABLE 7

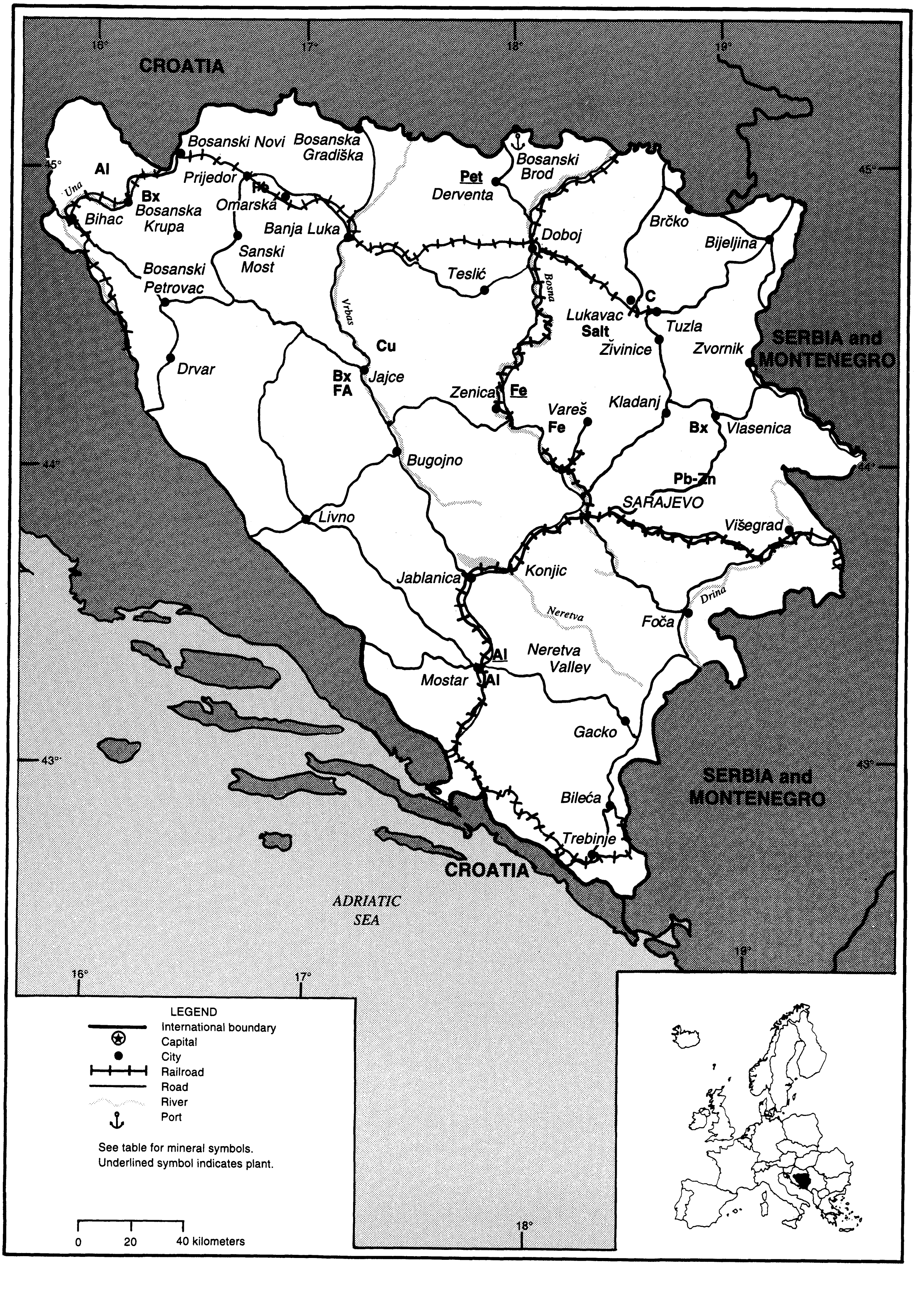
LUXEMBOURG: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	SA des Ciments Luxembourgeois (ARBED, 50%; SGB, 25%)	Plant at Esch-sur-Alzette	450
Do.	Intermoselle SARL (ARBED, 33%)	Plant at Rumelange	1,000
Steel	Acieries Reunies de Burbach-Eich-Dudelange (ARBED) (SGB, 25%; Belgian Government, 31%; and others)	Plants at Differdange, Dudelange, Esch-Schifflange, and Esch-Belval	5,320

BOSNIA and HERZEGOVINA

AREA 51,233 km² **POPULATION 4.4 million**



THE MINERAL INDUSTRIES OF

BOSNIA AND HERZEGOVINA[1]

By Walter G. Steblez

In 1993, the country remained under extreme duress caused by the continuation of the civil war. Before the outbreak of the civil war, Bosnia and Herzegovina was a major producer of minerals and heavy industrial products in the former Yugoslavia. In 1993, the operational status of many of these industries, however, was uncertain largely because of the continuous fighting that reportedly occurred in close proximity to these facilities. Reportedly, the damage incurred by the country's industry and infrastructure had been severe. According to information supplied by sources in Serbia and Montenegro, the Serbian- controlled areas of Bosnia and Herzegovina (about 70% of the country's total territory), known as the "Srpska republic," controlled substantial proportions of Bosnia and Herzegovina's mineral resources. According to the Bosnian-Serb Chamber of Commerce, the share of mineral resources within Serbian-dominated areas of Bosnia and Herzegovina were as follows: bauxite, 12%; brown coal, 37%; gypsum, 88%; iron ore, 68%; lead and zinc ore, 35%; lignite, 12%; and quartz, 89%.[2]

GOVERNMENT POLICIES AND PROGRAMS

The Government of Bosnia and Herzegovina was placed under extreme hardship by warfare that affected practically every district in the country. Presumably, when and where possible, the Government provided assistance to industries, including those in the minerals sector, that could help maintain employment and assist in the country's defense.

PRODUCTION

The production table for Bosnia and Herzegovina was compiled from data presented in a variety of statistical publications of the former Yugoslavia through 1991. The major portion of the country's production statistics however was obtained from "Industrijska Proizvodnja," an annual statistical compendium published in Belgrade through 1990 that presented production data by constituent Federal republics, as well as by total output for the former Yugoslavia. Statistical information of the country's mineral production for 1992-93 was not available because of the war. Estimates were based on known capacities and available press reports concerning the status of industrial operations in the country. *(See table 1.)*

TRADE

Detailed official information concerning foreign trade for 1993 was unavailable.

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the apparent administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1993. *(See table 2.)*

COMMODITY REVIEW

Metals

Before the dissolution of the Federal Republic of Yugoslavia and the subsequent civil war, Bosnia and Herzegovina was a major center of metallurgical industries in the former Yugoslavia. The country's total output of steel, in recent years, ranged between 38% and 39% of total steel production for Yugoslavia during the same periods. The Rudarsko Metalurški Kombinat plant at Zenica, with a combined production capacity in excess of 2 Mmt/a, in 1990 accounted for 53% of the former Yugoslavia's output of steel produced in oxygen converters and 62% produced by open-hearth method.

Bosnia and Herzegovina also was a major producer of bauxite, alumina, and aluminum in the former Yugoslavia, respectively accounting for about 58%, 68%, and 26% of total output of these commodities in the former Yugoslavia in 1990. Production of bauxite, alumina, and aluminum was administered by Energoinvest. Bauxite was produced at mines in Vlasenica, Jajce, and Bosansksa Krupa, among others. Alumina refineries were operated at Birac-Zvornik and Mostar; the aluminum smelter also was at Mostar, the center of the aluminum fabricating and aircraft industries in the former Yugoslavia. Other production of nonferrous metals included only a relatively small amount of lead and zinc ore mined and milled at Srebrenica, the focal point of major battles during the year.

Industrial Minerals

Bosnia and Herzegovina was a major producer of asbestos, barite, gypsum, and salt, accounting respectively for about 81%, 92%, 63%, and 100% of the total output of these commodities in the former Yugoslavia in 1990. The country also produced cement, clays, dimension stone, dolomite, sand and gravel, as well as other industrial minerals that met most of its industrial needs.

Mineral Fuels

Bosnia and Herzegovina's SOUR Titovi Rudnici Uglja Tuzla, the country's dominant coal producer, mined brown coal and lignite that were consumed primarily by the country's thermal electric power stations. Bosnia and Herzegovina's refineries, operated by Energoinvest at Bosanski Brod, were entirely dependent on deliveries of natural gas and petroleum from outside the country. Reportedly, the Bosanski Brod refineries were extensively damaged in April during local fighting.

Reserves

The eventual transformation of Bosnia and Herzegovina's economy to a market-base system, will require a reevaluation of the country's mineral resources from a market perspective. For a detailed presentation of the system that was used to determine reserves in the former Yugoslavia, see the reserve section in "The Mineral Industry of Russia" in this volume.

INFRASTRUCTURE

Bosnia and Herzegovina's inland system of ways and communications consisted of railroads, highways, and waterways. Although data in respect to the total lengths of the railroad and inland waterway systems have not yet been reported officially, the highway and road system reportedly consisted of 21,168 km of paved, gravel, and earth-surfaced road, of which 11,436 km was paved, 8,146 km was gravel, and 1,586 km was earth surfaced. The country was entirely landlocked and did not possess a merchant marine fleet. Pipelines for the carriage of petroleum were 174 km in length; however, data for those carrying natural gas were not available.

OUTLOOK

Most of Bosnia and Herzegovina's heavy industrial facilities, including those in the minerals sector, reportedly had been heavily damaged during the year. Although the extent of the damage was not clear, general information released from the areas of conflict showed significant destruction of the country's infrastructure and massive dislocations of regional populations. The process of reconstruction that should follow the resolution of the country's conflicts should be extensive and would call for maximum use of the country's domestic sources of metals, industrial minerals, and fuels.

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[1]Text prepared in July 1994.
[2]Foreign Broadcast Information Service (FBIS). EEU-94-071, Apr. 13, 1994, p. 40, from Politika (Belgrade) Mar. 15, 1994, p. 14.

OTHER SOURCES OF INFORMATION

Agency

Energoinvest, SP
Sarajevo 71000 Tvornicka 3, vidi str. 74.
Bosnia and Herzegovina

Publication

Privredni Adresar SFRJ, 27/1991 (Trade Directory of Yugoslavia), Belgrade, 1991.

TABLE 1
BOSNIA AND HERCEGOVINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Bauxite	1,908,000	[e]1,703,000	900,000	200,000	100,000	2,500,000
Alumina	804,000	[e]735,000	500,000	100,000	50,000	900,000
Metal, ingot; primary and secondary	82,000	[e]89,000	84,000	30,000	15,000	90,000
Iron and steel:						
Ore and concentrate:						
Ore, gross weight	4,668,000	[e]4,088,000	2,500,000	500,000	250,000	5,000,000
Ore Fe content	1,603,000	[e]1,578,000	800,000	150,000	70,000	1,700,000
Agglomerate	2,376,000	[e]1,894,000	1,000,000	200,000	50,000	2,500,000
Metal:						
Ferroalloys:						
Ferrosilicon	40,000	[e]34,000	17,000	5,000	1,000	45,000
Silicon	14,000	[e]12,000	7,000	2,000	200	15,000
Pig iron	1,639,000	[e]1,284,000	1,000,000	150,000	100,000	1,700,000
Crude steel:						
From oxygen converters	1,006,000	[e]907,000	600,000	100,000	90,000	1,100,000
From Siemens-martin furnaces	715,000	[e]490,000	150,000	30,000	20,000	750,000
From electric furnaces	31,000	[e]251,000	18,000	5,000	5,000	250,000
Total	1,752,000	[e]1,648,000	768,000	135,000	115,000	2,100,000

See footnotes at end of table.

TABLE 1—Continued

BOSNIA AND HERCEGOVINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Iron and steel—Continued:							
Metal—Continued:							
Crude Steel—Continued:							
Semimanufactures[e]		[3]1,376,000	1,100,000	800,000	200,000	150,000	1,500,000
Lead:							
Mineral concentrator output:							
Ore, gross weight (Pb Zn ore)		487,000	[e]608,000	300,000	50,000	10,000	650,000
Pb content of ores		8,692	[e]11,068	5,000	800	200	13,000
Pb concentrate		11,475	[e]14,999	7,000	2,000	400	16,000
Metal, smelter, primary and secondary		1,012	[e]260	400	250	100	1,200
Manganese ore:							
Gross weight		38,920	[e]50,863	40,000	10,000	2,000	60,000
Mn content		13,622	[e]17,803	14,000	3,500	600	18,000
Zinc:							
Zinc content of Pb-Zn ore		12,303	[e]15,232	10,000	2,000	350	16,000
Concentrate output, gross weight		19,584	[e]25,035	13,000	3,000	600	26,000
INDUSTRIAL MINERALS							
Asbestos, all kinds		5,603	[e]3,966	4,400	500	500	6,000
Barite concentrate		22,772	[e]23,601	17,000	3,000	2,000	25,000
Cement	thousand tons	793	[e]797	750	150	150	800,000
Clays:							
Bentonite		10,000	[e]—	6,000	1,000	800	15,000
Ceramic clay, crude		228,000	[e]140,000	100,000	20,000	20,000	250,000
Kaolin:							
Crude		93,000	[e]31,000	19,000	3,000	3,000	95,000
Calcined[e]		17,000	12,000	10,000	1,500	1,500	20,000
Gypsum:							
Crude		310,000	[e]370,000	230,000	50,000	30,000	400,000
Calcined		31,000	[e]47,000	21,000	4,000	3,000	50,000
Lime	thousand tons	512	[e]520	350	50	50	500
Magnesite, crude		12,000	[e]16,000	10,000	2,000	2,000	20,000
Nitrogen: N content of ammonia		29,000	[e]25,000	20,000	5,000	2,000	30,000
Quartz, quartzite, glass sand		570,000	[e]324,000	400,000	50,000	50,000	600,000
Salt, all sources		318,000	[e]303,000	300,000	70,000	50,000	350,000
Sand and gravel, excluding glass sand	thousand cubic meters	3,600	[e]2,500	2,500	500	500	4,000
Sodium compounds:							
Soda ash		204,050	[e]173,000	140,000	25,000	20,000	250,000
Caustic soda[e]		[3]99,000	95,000	70,000	20,000	10,000	100,000
Sodium bicarbonate[e]		15,000	15,000	10,000	2,000	1,000	20,000
Stone, excluding quartz and quartzite:[e]							
Dimension: Crude:							
Ornamental	square meters	[3]294,000	3,000,000	250,000	50,000	20,000	300,000
Other	cubic meters	[3]16,000	16,000	15,000	5,000	2,000	20,000
Crushed and brown, n.e.s.	thousand cubic meters	[3]3,217	3,000	3,000	500	500	3,500

See footnotes at end of table.

TABLE 1—Continued

BOSNIA AND HERCEGOVINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Sulfur: Byproduct of metallurgy[e]		9	9	8	2	1	10
MINERAL FUELS AND RELATED MATERIALS							
Coal:							
Brown coal	thousand tons	9,615	[e]9,626	9,500	2,500	1,000	10,000
Lignite	do.	8,359	[e]8,531	8,000	2,000	1,500	10,000
Coke	do.	2,506	[e]1,750	850	150	100	3,000
Refinery products[e]	thousand 42-gallon barrels	20,000	23,000	18,000	2,000	—	25,000

[e]Estimated.
[1]Table includes data available through July 1994.
[2]In addition to commodities listed, common clay was also produced, but available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

TABLE 2

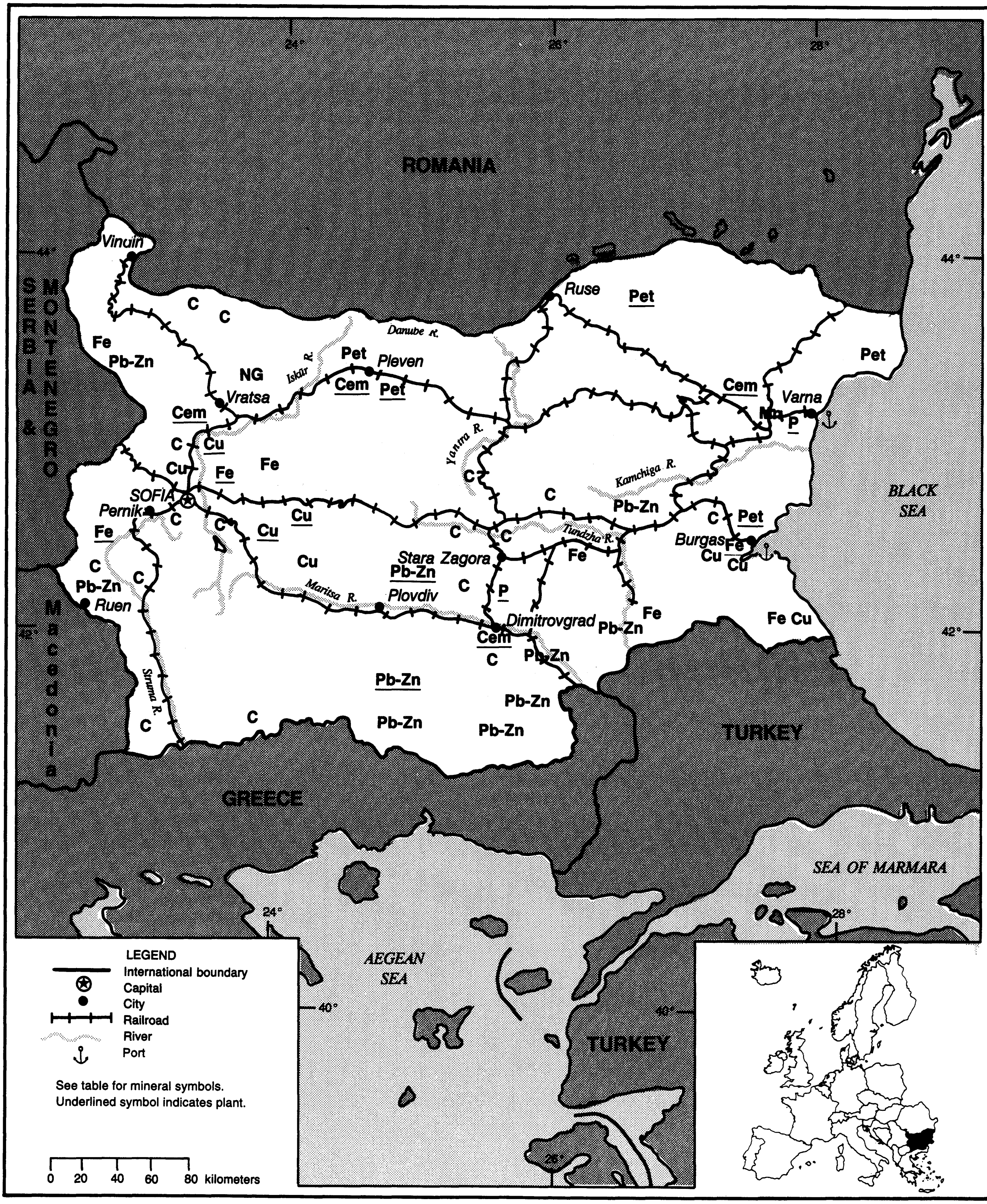
BOSNIA AND HERCEGOVINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Energoinvest	Plants at Birac-Zvornik, BIH	600
Do.		do.	Plant at Mostar, BiH	280
Aluminum		do.	Smelter at Mostar, BiH	92
Bauxite		do.	Mines in BiH at Vlasenica, Jajce, Bosanska Krupa, Posusje, Listica, Citluk, and other locations.	2,000
Coal:				
Brown		SOUR Titovi Rudnici Uglja, Tuzla, BiH	Mines in BiH	12,000
Lignite		do.	do.	7,000
Cement		Gik Hidrogradnja, Tvornica Cementa BiH	Plant at Kakanj	650
Ferroalloys		Elktrobosna, Elektrohemijska i Eletrotermijska Industrija	Plant at Jajce	80
Iron ore		Rudarsko Metalurski Kombinat Zenica	Mines at Vares, Ljubija, and Radovan, BiH	5,000
Lead-zinc ore		Energoinvest	Mine and mill at Srebrenica, BiH	300
Manganese, ore		Mangan-Energoinvest	Mine and concentrator at Buzim, BiH	100
Petroleum:				
Refined	thousand barrels per day	Energoinvest: Rafinerija Nafte Bosanski Brod	Refinery at Bosanski Brod, BiH	100
Pig iron		Rudarsko metalurski Kombinat Zenica (RMK Zenica)	4 blast furnaces at Zenica, BiH 2 blast furnaces at Vares, BiH	2,250 100
Do.		do.	Electric reduction furaces at Iljas, BiH	100
Salt		Hemijski Kombinat "Sodaso," Rudnik Soli i Solni Bunari	Rock salt: Mines at Tusanj, BiH	120,000
Do.	cubic meters per year	do.	Production from brine at Tuzla, BiH	2,000,000
Steel, crude		Rudarsko Metalurski Kombinat Zenica	Plant at Zenica, BiH	2,060

BULGARIA

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



THE MINERAL INDUSTRY OF

BULGARIA

By Walter G. Steblez

In 1993, Bulgaria continued to produce modest amounts of nonferrous metal ores and concentrates that met most domestic needs, as well as relatively small quantities of iron and manganese ores. The country also mined and quarried a variety of industrial minerals that included asbestos, barite, fluorspar, gypsum, and limestone, largely for domestic consumption. However, most of the country's requirements for iron ore, steel, and mineral fuels had to be met through imports.

The transition of Bulgaria's economy to a market-based system from 1990 to 1993 was accompanied by a declining trend in industrial production, including the production of most mineral commodities. This largely reflected a structural adjustment of the economy that since 1990 began to replace central economic planning with market-sensitive economic goals. Additionally, the dissolution of a guaranteed Council of Mutual Economic Assistance (CMEA)-based barter trading network, and, in a number of cases, environmental considerations, also added constraints on industrial production.

The issue of Bulgaria's national income and industrial production accounts, as well as those of several other former CMEA member countries during this period, was less than clear because of the uncertainty as to whether or not the country's accounting system(s) fully reflected actual economic transformations that had occurred. In 1993, Bulgaria reported a decline in the total value of industrial production of 10% compared with that of 1992. However, the aggregated value of output of electric power generation, ferrous and nonferrous metals mining and processing, and chemical and petrochemical industries was reported to have risen by 8%, compared with that of 1992. These industries, reportedly, had accounted for 45% of the country's total industrial production in 1993.[1] Activities in the country's minerals industries included foreign investment interest in Bulgaria's base and precious-metal resources as well as in its offshore natural gas and petroleum deposits. Additionally, Government policies and environmental issues had acquired added importance during the country's transition to a market-based economic system, especially in respect to investment laws and pollution abatement in the mining and processing sectors.

GOVERNMENT POLICIES AND PROGRAMS

In 1993, the Government of Bulgaria continued to implement social and market economic reforms that began in 1989. Issues pertaining to decentralization and denationalization of the economy, as well as the need to redress decades-long problems associated with industry-generated environmental pollution, were among those that dominated the Goverment's domestic agenda in 1993. The process of privatization mainly was carried out under the provisions of two laws: (1) "Bulgarian Law No. 215, 1991 on Conversion of State Enterprises" that relates to private trade associations holding and/or using state property and their conversion to commercial companies; and (2) "Bulgarian Law on Transformation and Privatization of State-Owned and Municipal Enterprises of 3/92" that pertains to the establishment of a legally designated privatization agency, the evaluation and transformation of state-owned enterprises, the sale of shares and stocks owned by the state and municipalities, and the sale total assets or discreet parts of state-owned enterprises.[2] These laws also would have direct bearing on the process of denationalization of the country's minerals industry enterprises. However, delays in adopting new mineral resource and mining legislation have continued to impede more rapid foreign investment in the country's minerals industry.

ENVIRONMENTAL ISSUES

The interdependence between the future of the minerals industry of Bulgaria and the abatement of pollution from industrial point sources remained an important issue in Bulgaria in 1993. As in other former member countries of CMEA, the development of heavy industries in Bulgaria, including those for steel production and the mining and processing of metals, fossil fuels, and industrial minerals, was carried out largely without reference to market economy or environmental considerations from 1946 to 1989. Government programs such as rapid industrialization, central economic planning, and associated policies resulted in the loss of flexibility in Bulgaria's industry, including the minerals sector, needed to maintain competitiveness with market economy countries.

In common with other former CMEA-member countries, Bulgaria's industry, compared with those of market economy countries, became relatively inefficient and polluting. Although, in many cases, the Government's environmental policies were codified into law, these laws were rarely, if ever, enforced. Industrial pollution in Bulgaria has been severe, largely from point sources associated with nonferrous metals mining, processing, and smelting operations; steelmaking; low-grade, coal-burning electric powerplants; as well as the country's cement and chemical industries.

As in other former centrally planned economy countries of Europe, severe air pollution has been caused by the use of high-sulfur, low-grade coal and lignite to power the country's thermal electric power stations. Reportedly, concentrations of SO_2 in Bulgaria were the highest in the former CMEA block, with the exception of Poland. In all areas affected by coal-burning point sources of atmospheric pollution, concentrations of SO_2, NO_x, and particulates, reportedly, were above the health safety level. In 1989, Bulgaria reported the emission of 1.7 Mmt of SO_2, 0.3 Mmt of NO_x, and more than 2 Mmt of other pollutants. Additionally, only 1 out of the 13 major rivers in the country was found to be relatively clean. The rest of Bulgaria's rivers were contaminated to varying degrees along numerous stretches by heavy industry's discharges, including those from open pit mines, as well as agricultural runoff. Heavy metals also leached from industrial dumps and mine tailings dumps had seriously compounded an already severe water quality problem in the country caused by Bulgaria's relatively poor sewage treatment system. Very high concentrations of lead and arsenic have been found in surface waters near Mikhaylovgrad and Vratsa in northwestern Bulgaria and in central Bulgaria near the mining region of Srednogorie. Radioactive wastes also had been discharged into the Danube River from the Kozloduy nuclear electric powerplant.

Waste and mine tailings dumps were a major source of soil and ground water contamination. The extent of mine waste and tailings dumps in Bulgaria reportedly had exceeded an area of 84,948 ha. Significant uncontained concentrations of heavy metals at many of these facilities were found to be leaching into ground water. It was estimated that about 2.5 Mmt of hazardous waste has been generated annually in Bulgaria.

The latest available data, for 1992, showed that the total level of pollution generated during that year was 30% to 40% less than that in 1991. However, this was attributed primarily to a decline in the level of the country's industrial output during this period. Secondary factors that led to the decline of pollution in 1992 were closures of several major polluting industrial facilities, substantial nationwide investment in new waste treatment technology, and much stricter enforcement of environmental laws and regulations by the Government.

The country's environmental movement was an important element in the general reform process that began in 1989. In response to the public's environmental concerns, the Government of Bulgaria added its commitment to actively clean up and protect the environment through the adoption of articles 15 and 55 of the Constitution of July 1991 and the enactment of the Environmental Protection Law, No. 86/18.10.1991.

Because of the anticipated high cost of cleaning up areas contaminated by mining and minerals processing activities, the large debts accumulated at the country's nonferrous metal mining and processing facilities, and the low, uneconomic grades of ore at most of these deposits, the Government of Bulgaria drafted a preliminary plan to close most of the country's mining industry. However, following workers' strikes and negotiation in reponse to this plan in 1992 and 1993, the question of this plan's implementation had yet to be resolved by yearend. Among the minerals-related environmental activities that were reported in 1993 was the establishment of a recycling center at Pazardjik in southern Bulgaria. The recyling center would have the capacity to clean up the entire western Thracian valley and would be able to process 600 mt/d of waste. About 40% of the waste designated for recyling at this facility would consist of metals, glass, and plastics.[3] The application of modern technology was another approach that was proposed for sharply abating pollution-related hazards associated with mining and mineral processing. This approach was highlighted in early 1993, when Navan Resources PLC (Navan) of Ireland proposed the use of a bacterial leaching system to treat concentrates produced from arseniferous copper ore at Chelopech to recover copper and gold values, thereby eliminating the need to smelt the arsenic-bearing concentrate.[4]

PRODUCTION

The factors that had contributed to the largely negative trend in the country's output of mineral commodities from 1989 to 1992 remained in effect in 1993; namely, a structural reformation of Bulgaria's economy from a centrally planned to a market-based system and the adjustment of Bulgaria's foreign trade toward the world market. Although the steep decline of production of most mineral commodities (1989-91) appears to have somewhat abated during 1993, a great amount of uncertainty remained about the future viability of the country's minerals industries. The tension between the social cost associated with widespread and hazardous environmental pollution and that associated with widespread and extended unemployment that would arise from a rapid large-scale closure of mineral industry facilties had not been resolved adequately. This was primarily because of serious shortages of capital needed for both pollution containment and facility modernization to increase efficiency and competitiveness. About 10,000 mineworkers, members of the Confederation of Independent Unions, went on strike at yearend to protest nonpayment of wages and the Government mining decree of 1992 to close 47 mine in the near term. Reportedly, designated representatives of the Government promised to promptly settle the matter and to issue a revision of the 1992 decree on mine closure.[5]

TRADE

Until 1989, the largest share of Bulgaria's foreign trade was conducted within the CMEA barter-based trading system. Since 1989, Bulagaria's foreign trade was expanded to include Western Europe and other regional markets.

However, in respect to mineral trade, former CMEA countries, especially the former republics of the U.S.S.R., were Bulgaria's principal sources of mineral raw materials and mineral fuels. Ferroalloys, steel, and metal ores and concentrates were important mineral commodities that Bulgaria continued to trade with former centrally planned economy countries of Europe, but regular imports of natural gas and petroleum from Russia and other republics of the former U.S.S.R. remained critical to Bulgaria's economy. To underscore the continued importance of mineral trade with former CMEA countries, in 1993, Bulgaria projected trade losses by its metals industry to amount to about $65 million in 1993, solely from the trade embargo imposed on Serbia and Montenegro in 1992 by the United Nations.[6]

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 1992. *(See table 2.)*

COMMODITY REVIEW

Metals

Copper.—Bulgaria continued to produce copper from ores mined at the Asarel-Medet, Burgas, and Elatzite mining complexes. Recently, the Chelopech mining and processing operation was closed for environmental reasons stemming from hazardous levels of arsenic in the ore. However, during the year, it was announced that Navan Resources Plc of Ireland was seriously interested in acquiring the major portion of the equity in the operation because of the gold content in the ore, also promising to address the environmental pollution issue at this site (see Gold section). In Bulgaria, 95.7% of the copper was mined in open pit mines and 4.3% in underground mines. Underground copper mining was done by sublevel stoping (64%), cut-and-fill stoping (22%), and longwall stope (12%).[7]

Gold.—Foreign mining companies from Australia, Canada, Finland, and the Republic of South Africa, among others, showed interest in developing Bulgaria's gold and gold-bearing polymetallic deposits during the year. The Anglo American Corp. of South Africa and Outokumpu of Finland, reportedly, conducted prospecting and survey work in areas of central and southwestern Bulgaria.[8] In October, it was anounced that the Falcona Co. of Australia signed a letter of intent with Bulgaria's state-owned Madzharovo Ltd. Mining Co. to explore and develop gold- and silver-bearing polymetallic ores in the Khaskovo region, near Madzharovo. Madzharovo Ltd. had already been mining lead and zinc ore in the vicinity. According to Bulgarian industry spokespersons, the deposits described in the agreement had not been developed because of shortages of capital. Representatives of Falcona Co. stated that the company's terms of participation would require 51% of the joint-venture's equity, but that the company would be willing to invest annually $4 million during the first 4 years of the venture. Lacking a clear mining law, the final agreement would have to provide Falcona with long-term guarantees subject to approval by the Government of Bulgaria.[9]

At yearend, Navan Resources Plc of Ireland concluded an agreement with Bulgaria's state-owned Chelopech Ltd. to develop the arseniferous gold-copper deposit at Chelopech. Reportedly, Bulgaria's Parliament approved the agreement, which would give Navan Resources a 40% equity stake in the joint venture in return for Navan's investment to provide a bacterial-leaching plant. Additionally, a Navan Resources spokesperson indicated that the company may be willing to increase its equity to 68% by increasing its investment in the project. Resources at the Chelopech deposit were determined to contain about 62 Mmt of ore grading 0.98% copper, 2.48 g/mt gold, and 6.72 g/mt of silver.[10] Construction would begin in 1994 and would take approximately 2 years to complete.

In 1993, according to Bulgaria's National Bank, the country's gold reserves amounted to about 31 tons. The bank also announced plans to send the country's gold reserves abroad for remolding and stamping in accordance with international standards.[11]

Iron and Steel.—By the end of 1992, several major rationalization programs within Bulgaria's steel industry had been accomplished. Stomana Iron & Steel Works at Pernik, the country's second largest steel producer, closed its seven open-hearth furnaces and produced steel exclusively from its electric arc furnaces. The Kremikovtsi Iron & Steel Works, the country's largest steel producer, cuts back it rolling capacity from 4.4 Mmt/a to 2.2 Mmt/a. In 1993, Kamet, formerly the Blagoj Popov steel mill, sought joint-venture partners during the year to help fund operations at a new smelting facility and rolling mill. Discussions also were held by Kamet with the World Bank for Reconstruction and Development and the European Bank for Reconstruction and Development concerning financing this project. Reportedly, Kamet's goals were to produce 150,000 mt/a of finished steel that would include tool, stainless, and other alloy steel.

Lead and Zinc.—From the environmental standpoint, Bulgaria's lead and zinc industry continued to have difficulties. Limitations on output from certain operations at mining and beneficiation complexes such as that at Gorubso were to continue until the environmental damage is rectified. However, the cutback of production also has meant layoffs of mine workers, often in the same area where the environmental damage had occurred. In some cases this resulted in apparently contradictory situations with workers militating to preserve their jobs, on the one hand, and demanding rapid restitution of the environment, on the other.[12] For 1993, KCM SA, Bulgaria's state-owned commercial enterprise with overall responsibility for the country's lead and zinc operations, reported zinc production to have amounted to 46,700 tons, lead—32,000 tons, and cadmium—200 tons. KCM also indicated that zinc production would increase to 54,000 tons in 1994, but that lead and cadmium output would remain at about 1993 production levels. Overall, production in this sector would remain at these levels until 1995—the cleanup timetable on the industry imposed by Bulgaria's Ministry of the Environment.[13]

Manganese.—Manganese production at Bulgaria's Obrotchishte deposit ceased in August 1992 because of a sharp decline in domestic demand as well as the loss of traditional export markets, especially that in the former Yugoslavia (Serbia and Montenegro). Ferromanganese producers in Serbia and Montenegro reportedly were major importers of manganese from Bulgaria until the UN imposed an embargo on that country. In late 1993, however, the formation of a joint venture was announced among Euraust (BHP Group) of Perth Australia; Bulgaria's state-owned manganese mine operator, Mangan AD; and a private Bulgarian firm, Balkan Mining Consultants. The respective distribution of the stock in the joint venture (Bulgaust Mangan) was set at 31%, 49%, and 20%. with Euraust given the option to acquire Madan AD's equity. Bulgaust Mangan would restart mining operation at Obrotchishte in 1994, and initial sales would be oriented toward the steel industries of neighboring countries, although some interest was reportedly expressed by potential importers in Western Europe. Potential resources at the Obrotchishte deposit were delineated at about 84 Mmt of manganese ore, grading about 28% Mn.[14]

Industrial Minerals

Bulgaria produced a variety of industrial minerals that included bentonite, dolomite, fluorite, gypsum, kaolin, marble, and perlite, largely for domestic consumption. Industrial minerals will obtain a greater prominence in the country's economy owing to the eventual needs of the construction materials and chemical sectors to meet the country's requirements for a modern infrastructure.

Mineral Fuels

Following the closure of Bulgaria's uranium mines because of high operational costs, the remaining uranium concentrate (500 tons) that had been produced from domestic mining operations had been stockpiled for possible future use. But because of the environmental hazards associated with the continued storage of this material and the lack of domestic technology needed to process the concentrate into fuel, the Government of Bulgaria decided to sell the stockpiled uranium concentrate at world market prices.[15]

Reserves

For a detailed explanation of the system that has been used in the former CMEA countries for measuring reserves, see the chapter on Russia in this volume. Bulgaria's mineral resources in categories $A+B+C_1$ are given in table 3. *(See table 3.)*

INFRASTRUCTURE

Bulgaria's inland system of ways and communications consisted of 43,161 km of railroads, highways, and waterways. The railroad system consisted of 4,049 km of 1.435-m standard-gauge track and 245 km of narrow-gauge track. About 908 km of the total was double track and 2,342 km was electrified. The highway system consisted of 33,397 km of hard-surface roads, including 228 km of superhighways, and 4,045 km of earth roads. There were also 470 km of inland waterways, with ports at Ruse, Vidin, and Lom on the Danube River. The country's merchant fleet consisted of 108 ships totaling 1,240,204 gross register tons or 1,872,723 dwt. These included 32 cargo, 2 container, 5 roll-on/roll-off ships; 16 petroleum, oils, and lubricant tankers; 2 railcar carriers; and 48 bulkers. The country's major ports were at Burgas, Varna, and Varna West. Bulgaria's pipeline system consisted of 192 km of crude petroleum pipe, 418 km of refined products pipe, and 1,400 km of pipe for natural gas.

OUTLOOK

Given years of official neglect of severe industrial pollution and associated health-related problems, the new democratically elected Government of Bulgaria determined not to continue the industrial policies of the former Communist Government. To survive, the country's minerals industry had to meet two major criteria: (1) social demands for strict observance of industrial environmental standards, and (2) market demands that require industrial enterprises to strictly meet the specific needs of consumers of their output. It has become clear that Bulgaria's mineral industry, in meeting the aforementioned criteria, would become smaller in scale, more efficient, and less polluting.

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[1]U.S. Embassy, Sofia, Bulgaria. State Dep. Telegram R 101049Z, Feb. 1994.
[2]NTIS, Legal Text Service. Central and Eastern Europe and Russia and Independent States. Winter/Spring 1994.
[3]U.S. Embassy, Sofia, Bulgaria. State Dep. Telegram R 081315, Oct., 1993.
[4]E&MJ, Jan. 1993, p. 14.
[5]Metal Bulletin. Dec. 16, 1993, p. 7.

[6]Mining Journal (London). Aug. 6, 1993, p. 90.
[7]Georgiev, K. Mining Industry of Bulgaria. Oruktos Ploutos (Athens), 85/1993, pp. 44-51.
[8]SWB EE/W0292. July 29, 1993, p. A/7, from "Standard News, July 20, 1993.
[9]———. EEW/0304. Oct. 21, 1993, p. WB/2, from BTA 1106 GMT, Oct. 11, 1993.
[10] Metal Bulletin. Nov. 25, 1993, p. 14.
[11]Mining Journal (London). Feb. 19, 1993, p. 129
[12]Metal Bulletin. Sept. 6, 1993, p. 6.
[13]Mining Journal (London). Jan. 21, 1994, p. 46.
[14]Industrial Minerals (London). Nov. 1993, p. 10.
[15]U.S. Embassy Sofia, Bulgaria. State Dep. Telegram R 101049Z, Feb. 1994.

OTHER SOURCES OF INFORMATION

Agencies

The Geological Institute of the Bulgarian Academy of Science
Sofia, Bulgaria
Lead and Zinc Co.
Plovdiv, Bulgaria
Polimet
Sofia, Bulgaria

Publications

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

TABLE 1
BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992[e]	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum metal, secondary	7,402	4,554	[r]2,052	[r]2,000	2,000	8,000
Bismuth metal	48	[e]45	[e]40	40	40	50
Cadmium metal, smelter	235	309	232	200	200	350
Copper:						
Ore:						
Gross weight, thousand tons	12,634	8,712	[e]15,500	12,000	12,000	16,000
Cu content, do.	39	z33	47	36	36	50
Concentrate:						
Gross weight, do.	296	200	[e]360	270	250	400
Cu content, do.	39	26	46	35	33	49
Metal, primary and secondary:						
Smelter	59,200	30,300	27,800	25,000	25,000	65,000
Refined	55,800	24,333	[r]12,849	13,000	13,000	65,000
Gold metal[e], kilograms	2,500	2,400	2,000	2,000	2,000	2,500
Iron and steel:						
Iron ore:						
Gross weight, thousand tons	1,613	1,079	[r] [e]800	[r]800	800	1,000
Fe content, do.	[r]483	321	[r]182	[r]180	180	300
Iron concentrates, do.	589	447	[r]270	[r]250	250	900
Metal:						
Pig iron for steelmaking, do.	1,484	1,143	[r]943	[r]900	900	1,700
Ferroalloys, electric furnace, ferrosilicon[e], do.	[3]45	[r]18	[r]28	[r]20	20	50
Steel, crude, do.	2,899	2,185	1,615	1,550	1,400	3,000
Semimanufactures, rolled, do.	3,029	2,156	[r]1,309	[r]1,300	1,300	3,400
Lead:						
Mine output, Pb content	65,300	[r]65,500	[e]50,000	45,000	45,000	70,000
Concentrate:[e]						
Gross weight	[4]81,400	81,000	62,300	60,000	60,000	95,000
Pb content	[4]57,000	57,000	43,600	39,000	39,000	65,000
Metal, refined, primary and secondary	101,477	66,570	[r]56,223	55,000	55,000	120,000
Manganese ore:						
Gross weight	32,400	39,000	[r] [e]34,000	[r]17,000	—	50,000
Mn content	10,800	11,000	[r] [e]8,700	[r]4,000	—	12,000
Molybdenum, mine output, Mo content[e]	190	150	120	120	120	150
Silver, mine output, Ag content[e]	59	54	37	35	35	60
Tin metal	64	64	[r]22	[r]20	20	85
Uranium, oxide, U content[e]	700	700	700	600	600	700
Zinc:						
Mine output, Zn content	39,700	34,700	29,100	29,000	25,000	45,000
Concentrate:[e]						
Gross weight	79,200	79,000	70,000	70,000	65,000	80,000
Zn content	[4]41,000	35,000	31,000	31,000	30,000	50,000
Metal, smelter, primary and secondary	[r]94,996	75,457	[r]58,730	[r]47,000	47,000	100,000
INDUSTRIAL MINERALS						
Asbestos	300	500	[e]400	400	400	600
Cement, hydraulic, thousand tons	5,036	4,710	[r]2,374	[r]2,500	2,500	6,000

See footnotes at end of table.

TABLE 1—Continued

BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992[e]	1993[e]	Annual capacity[e] (Jan. 1, 1994)
Clays: Kaolin	do.	203	186	[r]106	[r]110	110	300
Gypsum and anhydrite:							
Crude	do.	538	494	[r]63	[r]65	70	600
Calcined		114	102	[r]41	[r]40	40	120
Lime: Industrial	thousand tons	1,538	1,557	[r]1,034	[r]1,000	1,000	1,700
Nitrogen: N content of ammonia	do.	1,326	1,309	[r]1,093	[r]1,100	1,100	1,500
Pyrites, gross weight[e]	do.	180	180	170	170	150	200
Salt, all types	do.	93	93	[e]90	90	80	100
Sodium carbonate, calcined	do.	1,153	1,046	[r]893	[r]900	900	1,200
Sulfur:[e]							
S content of pyrites		70,000	70,000	60,000	60,000	50,000	80,000
Byproduct, all sources		60,000	60,000	50,000	50,000	50,000	70,000
Total		130,000	130,000	110,000	110,000	100,000	150,000
MINERAL FUELS AND RELATED MATERIALS							
Coal, marketable:							
Anthracite	thousand tons	63	43	[r]42	40	40	70
Bituminous	do.	130	100	[r]86	90	[r]90	140
Brown	do.	4,596	3,705	[r]3,092	3,000	3,000	5,000
Lignite	do.	29,509	27,827	[r]25,231	25,000	25,000	32,000
Total	do.	34,298	31,675	[r]28,451	[r]28,130	28,130	37,210
Coke	do.	1,561	1,376	[r]738	[r]800	800	1,600
Gas, natural, marketed-million cubic meters		[r]9	[r]14	[r]10	[r]10	10	20
Petroleum:							
Crude: As reported	thousand tons	73	60	[r]58	50	50	70
Refinery products[e]	thousand 42-gallon barrels	110,000	65,000	20,000	20,000	20,000	110,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Apr. 1994.
[2]In addition to the commodities listed, barite, chromite, fluorspar, 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]Prior to 1990 ferromanganese and several unspecified ferroalloys were produced; since 1990 Bulgaria has reported only the production of ferrosilicon.
[4]Reported figure.

TABLE 2

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Reka Devnia	Devnia	1,825.
Do.	Zlatna Panega	Panega	1,300.
Do.	Others	Temelkovo, Dimitrovgrad, Pleven and 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.

See footnote at end of table.

TABLE 2—Continued

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Copper:				
Concentrate (Cu content)		Medet-Asarel Co	Panagurishte, Pazardzhik district	25.
Do.		Chelopech Ltd	Srednogorie, Sofia district	5.
Do.		Bradtze	Malko Turnovo	2.
Do.		Elatzite-Med Ltd	Srednogorie, Sofia district	15.
Do.		Rosen	Burgas, near the Black Sea	1.
Do.		Tsar Asen	Srednogorie, Sofia district	2.
Do.		Burgaskii Mines Ltd. Zidrovo	Burgas, near the Black Sea	0.5.
Metal, refined		Georgi Damyanov	Srednogorie, Sofia district	120.
Iron ore		Kremikovtsi Iron and Steel Combine	Kremikovtsi	2,000.
Lead-zinc:				
Concentrate (Pb and bZn content)		Gorubso Co.	Erma Reka, Kurdjali, Laki, and Rudozem all in Madan area near Greek border	59 Pb, 47 Zn.
Do.		Madzharovo Ltd	Near Plovdiv	3 Pb, 2 Zn.
Do.		Ossogovo Ltd	Ossogovo mountains, western Bulgaria	3 Pb, 2 Zn.
Do.		Ustrem Ltd	On Thundza river, eastern Bulgaria	3.5 Pb, 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		Mangan Ltd. (Obrotchishte)	Varna district	50.
Natural gas		Ministry of Power Supply	Chiren field, in the northwest	([1]).
Petroleum:				
Crude		do.	do.	([1]).
Refined	barrels per pay	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.		Stomana Iron & Steel Works	Pernik	1,300.

[1]Insignificant capacity.

TABLE 3

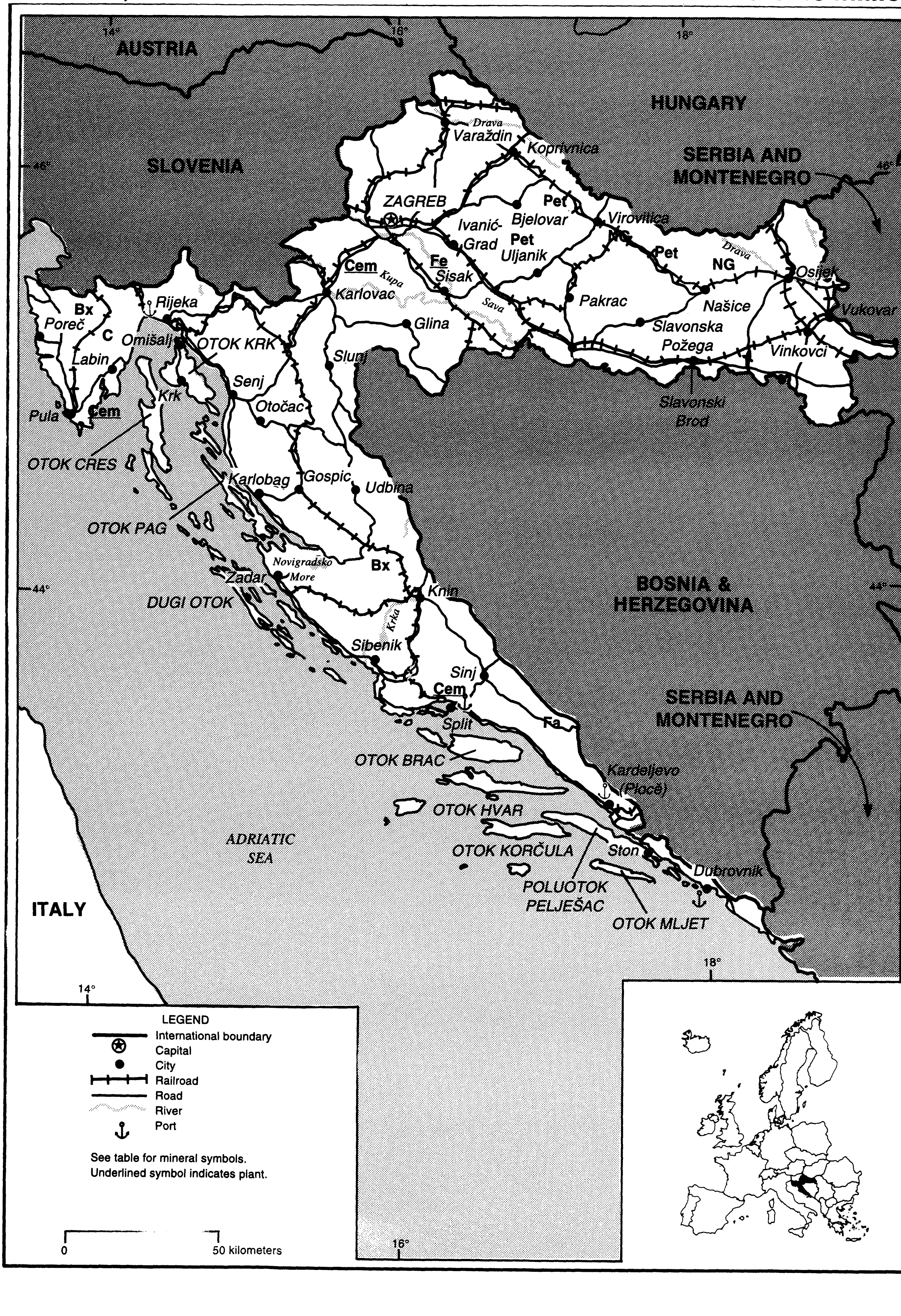
BULGARIA: APPARENT RESOURCES OF SELECTED MINERAL COMMODITIES FOR 1993

(Thousand metric tons)

Commodity	Resources
Barite	30,000
Bentonite	55,000
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	31,000
Zinc, contained in ore	1,400

CROATIA

AREA 56,538 km² **POPULATION 4.8 million**



THE MINERAL INDUSTRY OF

CROATIA[1]

By Walter G. Steblez

Prior to the dissolution of Yugoslavia, Croatia was Yugoslavia's chief producer of natural gas and petroleum, a leading producer of iron and steel, and a producer of a variety of industrial minerals that included bentonite, cement, and gypsum. However, from mid-1991 to early 1992, Croatia was actively involved in a civil war mainly within the country's own borders. The mainly Serbian population in Croatia's Kraina region declared independence from Croatia when certain issues concerning Serbian autonomy within this region apparently were not resolved. By mid-1992, the United Nations supervised a cessation of hostilities within Croatia on the basis of status quo. However, the economy of Croatia reportedly was damaged severely by the conflict. The country's minerals industry reportedly suffered extensive damage at facilities in the aluminum, petroleum, and steel sectors, as well as from shortages of raw materials that were obtained in the past from other republics of the former Yugoslavia. Reportedly, in 1993 the economic situation had not been significantly rectified and there was little activity in the country's minerals producing sectors.

GOVERNMENT POLICIES AND PROGRAMS

In view of the civil war that was fought within Croatia for nearly 1 year, the country's Government presumably focused most of its attention on maintaining Croatia's integrity and independence. Some activities by the Government apparently were directed at maintaining mineral industry operations when possible to support the country's war effort and help to maintain socially acceptable levels of employment. However, few details were available during the year concerning specific Government policies that addressed economic reform and long-term plans to rationalize the major enterprises in Croatia's mineral industry.

PRODUCTION

The production table for Croatia was compiled from data presented in a variety of statistical publications of the former Yugoslavia through 1991. The major portion of the country's production statistics, however, was obtained from "Industrijska Proizvodnja," an annual statistical compendium published in Belgrade through 1990 that presented production data by constituent Federal republics, as well as by total output for the former Yugoslavia. In addition, statistical production data were obtained from "Statisticki Ljetopis" 1994 published by the Central Bureau of Statistics in Zagreb, Croatia, for a limited number of commodities through 1993. Although stoppages and dislocations in Croatia's mineral industry were reported from mid-1991 through 1992 by a variety of sources published outside of the former Yugoslavia, some production was believed to have occurred at most of the country's mineral industry facilities, although at perhaps significantly reduced levels of output in 1992 and 1993. *(See table 1.)*

TRADE

The former domestic Yugoslav market was an important element in Croatia's mineral trade. With the dissolution of Yugoslavia, commerce with the country's former domestic trading partners became classified as foreign trade. Moreover, trade with Croatia's former trading partners in the former constituent republics of Yugoslavia largely had become untenable because of the civil war in Croatia during 1991-92 and in the republic of Bosnia and Hezegovina during 1991-93. Additionally, international trade embargoes were levied against several republics of the former Yugoslav federation that were Croatia's traditional commercial partners. Consequently, Croatia sought to orient its trade to a greater degree toward markets in Western Europe. According to partial trade data for 1993 that was made available by Croatia's Central Bureau of Statistics, the country's exports of non-fuel raw materials (most metals and industrial minerals) were valued at about US$ 237 million, or about 6.1% of total exports. Exports of mineral fuels and lubricants in 1993 were valued at US$ 377 million, or about 10% of total exports. Analogously, in 1993, Croatia's imports of raw materials and mineral fuels and lubricants were valued respectively at US$ 176 million and US$ 461 million, or about 3.8% and 9.9%, respectively, of total imports.

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the apparent administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1992. *(See table 2.)*

COMMODITY REVIEW

Metals

Energoinvest operated bauxite mines in

the Republics of Bosnia and Hercegovina and Croatia. Jadranski Aluminijum's (Jadral) operations were entirely in Croatia. 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.

At yearend 1991, Croatia reported extensive damage to the Boris Kidric aluminum smelter at Sibenik as a result of the fighting. The smelter reportedly remained closed through 1993 and Croatian authorities have not indicated when the operation would be restarted. Before the conflict damaged the aluminum smelter at Sibenik, Croatia's primary aluminum smelting capacity was approximately 25% of the total for the former Yugoslavia.

Reportedly, Croatia's steel industry facilities were severely damaged in the fighting at the SP MK Zeljezare Sisak in the central part of the country and at the Jadranska Zelejezara at Split on the Dalmatian coast. Because of the damage sustained by the country's steel plants during the fighting from 1991 to 1992 and the loss of traditional markets in the former Yugoslavia, industry officials indicated that steel production at these facilities had declined by more than 50% compared with that of 1990. Dalmacija Dugi Rat Carbide and Ferro Alloy Works (Dalmacija), a producer of ferrochromium near Split in Croatia, also reported disruptions of production during the period of military conflict. From December 1992 to November 1993, shortages of electric power forced the cessation of operations at Dalmacija. Similarly, operations at the Pef Sibenik ferromanganese plant were interrupted for 6 months in 1993 because of power shortages in the Dalmatian Provinces of Croatia.

Industrial Minerals

Croatia produced sufficient quantities of cement, clays, lime, nitrogen, pumice, stone, and other industrial minerals to meet most of the needs of the country's construction and construction materials industries, as well as some of the requirements of the domestic chemical industry. The importance of industrial minerals will grow because of needs of postwar reconstruction and rationalization of Croatia's economy, including its infrastructure.

Mineral Fuels

Croatia's natural gas and petroleum industry apparently did not suffer sustained damage during the fighting in 1991-92 and production of both natural gas and petroleum reportedly continued, but at reportedly somewhat lower levels of output. In 1993, industry spokespersons indicated that domestic production of natural gas and petroleum was sufficient to meet one-half of the country's needs for these fuels. The major foreign supplier of petroleum to Croatia during the year was Iran.

Reserves

The transition of Croatia's economy to a market-based system will require a reevaluation of the country's mineral resources from a market perspective. For a detailed presentation of the system that was used to determine reserves in the former Yugoslavia, see "The Mineral Industry of Russia" in this volume.

INFRASTRUCTURE

Croatia's inland system of ways and communications consisted of 35,554 km of railroads, highways, and inland waterways. The railroad system consisted of 2,698 km of 1.435-gauge track, of which about 930 km was electrified. The highway and road system amounted to a total of 32,071 km of surface, of which of paved surface amounted to 23,305 km; 8,439 km was gravel and 327 km was earth surfaced. The country's merchant marine fleet consisted of 11 ships totaling 65,5601 dwt. Pipelines for crude petroleum were 670 km in length, while those for refinery products and natural gas were 310 km and 20 km, respectively.

OUTLOOK

The future profile of Croatia's mineral industries will depend on the final resolution of the political and territorial dispute between the Government of Croatia and the leadership of the predominantly Serbian population in the Kraina region, as well as on the extent to which policies of the Government of Croatia will effect a transition of the country's economy to a market-based economic system.

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[1]Text prepared July 1994.

OTHER SOURCES OF INFORMATION

Agency

Central Bureau of Statistics Zagreb, Croatia

Publications

Statisticki Ljetopis 1992 (Statistical Yearbook for 1992) Zagreb, Croatia.

TABLE 1

CROATIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Bauxite		365,514	309,109	112,379	6,878	[3]1,690	450,000
Metal, ingot; primary and secondary		72,719	74,037	54,530	20,406	[3]25,956	90,000
Iron and steel:							
Concentrate, Fe agglomerate		[e]340,000	[e]248,000	150,000	75,000	70,000	350,000
Metal:							
Ferroalloys:							
Ferrochromium		63,837	37,532	72,849	56,456	[3]27,336	65,000
Ferromanganese		33,868	[e]31,822	[e]22,000	[e]10,000	10,000	35,000
Ferrosilicomanganese		52,588	[e]60,601	[e]60,000	[e]15,000	40,000	70,000
Pig iron		239,999	209,308	69,132	[r]20,000	20,000	250,000
Crude steel:							
From Siemens-Martin furnaces		296,601	253,205	94,394	—	—	200,000
From electric furnaces		189,852	170,328	119,759	101,942	[3]73,815	320,000
Total		486,453	423,533	214,153	101,942	73,815	520,000
Semimanufactures[e]		577,000	450,000	300,000	[r]183,000	[r]173,000	600,000
Silver[e]	kilograms	[3]3,400	2,000	1,600	800	500	3,500
INDUSTRIAL MINERALS							
Barite concentrate[e]		3,400	2,500	2,200	1,500	1,500	3,500
Cement	thousand tons	2,891	2,653	1,705	1,768	[3]1,683	3,000
Clays:							
Bentonite[e]		[3]36,000	30,000	15,000	10,000	10,000	40,000
Ceramic clay[e]		[3]18,000	10,000	15,000	10,000	10,000	20,000
Fire clay, crude[e]		[3]63,000	43,000	50,000	30,000	30,000	70,000
Gypsum:							
Crude[e]		[3]109,000	99,000	80,000	50,000	50,000	120,000
Calcined[e]		[3]17,000	11,000	11,000	7,000	7,000	20,000
Lime	thousand tons	490	436	261	144	[3]156	500
Nitrogen: N content of ammonia	do.	471	345	348	426	[3]345	500
Pumice and related materials, volcanic tuff[e]		700	700	650	600	500	800
Quartz, quartzite, glass sand		318,454	234,352	159,410	39,592	[3]23,344	350,000
Salt, all sources		17,512	24,030	18,250	28,585	[3]29,643	30,000
Sand and gravel, excluding glass sand	thousand cubic meters[e]	[3]3,607	3,000	2,000	2,000	2,000	4,000
Stone, excluding quartz and quartzite:							
Dimension: Crude:							
Ornamental	cubic meters	1,587,000	1,705,000	1,508,000	1,178,622	[3]1,133,873	1,600,000
Crushed and brown, n.e.s.	thousand cubic meters	6,896	6,250	4,448	3,283	[3]4,156	7,000
Other[e]	cubic meters	48,000	45,000	30,000	25,000	20,000	50,000
Sulfur, byproduct of petroleum[e]		2,000	2,000	2,000	2,000	2,000	2,500
MINERAL FUELS AND RELATED MATERIALS							
Carbon black		37,505	30,624	18,783	13,479	[3]17,123	40,000
Coal:							
Bituminous	thousand tons	160	155	146	120	[3]105	250
Brown	do.	27	—	—	—	—	—
Lignite	do.	10	—	—	—	—	—

See footnotes at end of table.

TABLE 1—Continued
CROATIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Coal—Continued							
Coke	do.	767	556	442	409	[3]420	800
Natural gas, gross production	million cubic meters	2,177	1,989	1,839	1,820	[3]2,068	2,300
Petroleum:[e]							
Crude:							
As reported	thousand tons	2,299	2,079	1,903	1,743	[3]1,729	2,800
Converted-thousand 42-gallon barrels		17,061	15,422	14,116	14,094	[3]12,826	21,000
Refinery products	do.	65,000	65,000	43,000	[r]35,000	40,000	70,000

[e]Estimated.
[1]Table includes data available through July 1994.
[2]In addition to commodities listed, common clay and diatomite also were produced, but available information was inadequate to make reliable estimates of output levels.
[3]Reported figure.

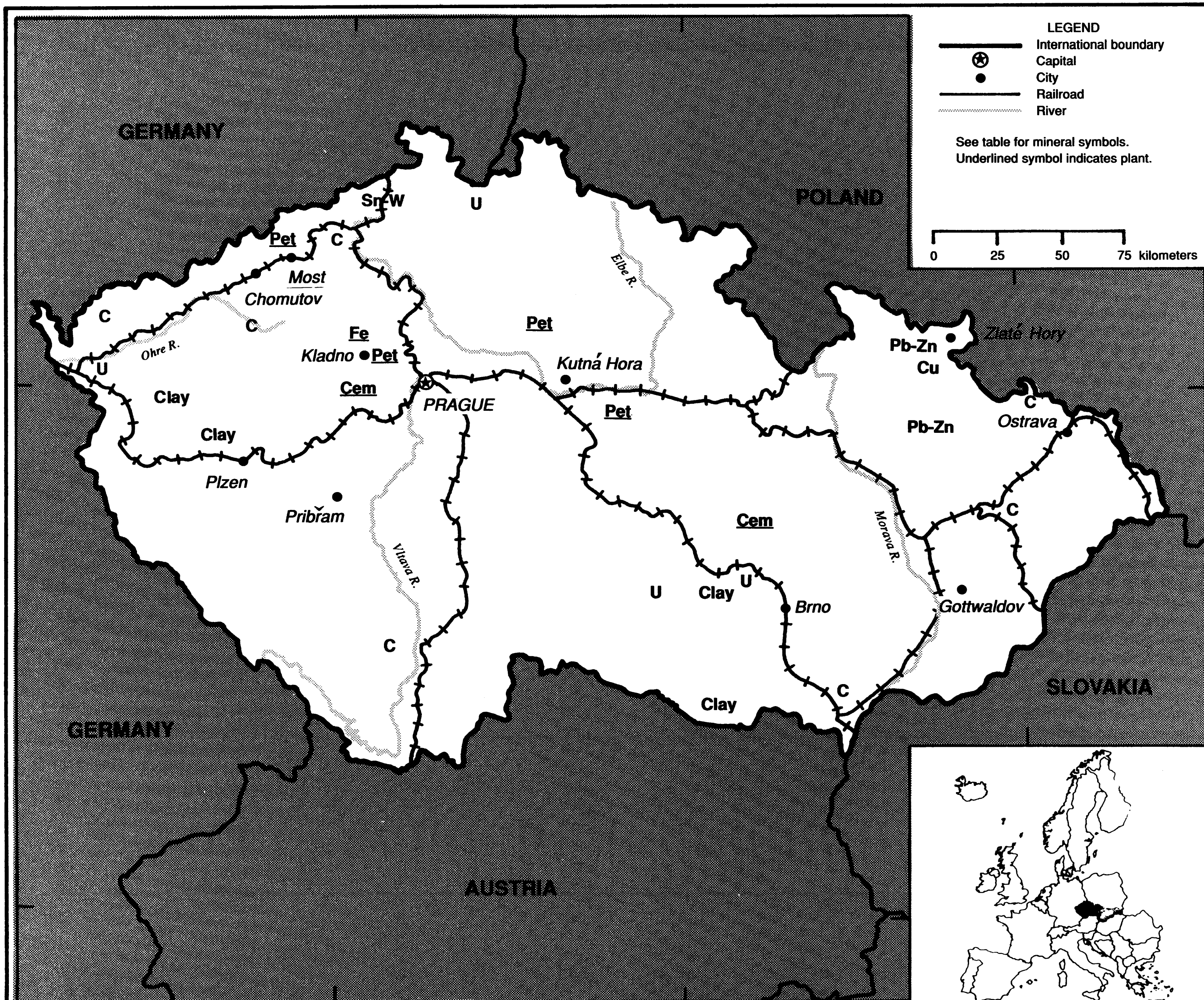
TABLE 2
CROATIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum		Boris Kidric, Tvornica Lakih Metala	Smelter at Sibenik, Croatia	75
Bauxite		Jadral, Jadranski Aluminijum	Mines in Croatia at Obrovac, Drnis, and other locations	450
Coal:				
Bituminous		Istarski Ugljenokopi Rasa	Mines at Labin and Potpican, Croatia	500
Cement		Dalmacija Cement	Partizan plant at Kasel Sucurac, Croatia	1,525
Do.		do.	Provoborac plant at Solin, Croatia "10 kolovoz" plant at Solin Majdan,	884 440
Do.		do.	Renko Sperac plant at Omis, Croatia	140
Natural gas	million cubic feet	Industrija Nafte (INA)	Natural gasfields in Croatia: Bogsic Lug, Molve, and others	70,000
Do.		Naftaplin (Naftagas), RO za Istrazivanje, i Proizvodnju Nafte i Gasa	Natural gasfields in Serbia: Kikinda and others	30,000
Petroleum:				
Crude,	thousand barrel per day	Industrija Nafte (INA)	Oilfields in Croatia and Slovenia: Benicanci, Zutica, Struzec, Ivanic Grad, Lendava, and others	70
Refined				
Do.		Industrija Nafte (INA): Rafinerija Nafte Rijeka	Refineries at Urinj and Rijeka, Croatia	160
Do.		Rafinerija Nafte Sisak	Refinery at Sisak, Croatia	150
Pig iron		Metalurski Kimbinat "Zeljezara Sisak"	2 blast furaces at Sisak, Croatia	235
Salt, cubic meters	per year	Solana "Pag," Solana "Ante Festin"	Marine Salt Pag Island, Croatia	13
Steel, crude		SP MK Zeljezare Sisak	Plant at Sisak, Croatia	401
Do.		Jadranska Zelejezara Split	Plant at Split, Croatia	120

CZECH REPUBLIC

AREA 78,303 km² **POPULATION 10.4 million**



THE MINERAL INDUSTRY OF

CZECH REPUBLIC

By Walter G. Steblez

Based entirely on full political consensus and bilateral agreement, the start of 1993 witnessed the complete dissolution of Czechoslovakia into its constituent parts: the Czech Republic and Slovakia. Of the two former components of Czechoslovakia, the Czech Republic was the dominant industrial province with a substantially greater territory and larger population base. The Czech Republic also possessed a tradition of industrial and technological excellence that began in the 19th century and was not entirely dissipated during the years of central economic planning. The Czech Republic has been a major steel producer and machine tool builder in Eastern Europe, as well as one of the most important producers of industrial minerals and construction materials in the region. During the past 3 years, there has been a significant and ongoing process of investment in the country's industrial minerals sector by industrial minerals producers in member countries of the European Union (EU).

With central economic planning no longer a factor in the country's development, industrial production continued to decline, or more accurately, increasingly adjust to market demand. The process of transition to a market economy also necessitated an adjustment to new statistical reporting requirements, which, reportedly, in many cases have not been fully applied nor uniformly followed.[1] This resulted in a number of adjustments in the calculation of the country's national income and industrial production accounts owing to overstatement of the economy's underperformance. Reportedly, in 1993, the latest official calculation of industrial production indicated a 5.3% decline compared with that of 1992. The output of energy represented 10.8% of total industrial production in 1993; that of metals and semimanufactures reached 14.3% of total industrial output.[2] The process of restructuring and denationalizing the country's minerals industry continued in 1993 together with foreign investment in the metals and industrial minerals sectors.

GOVERNMENT POLICIES AND PROGRAMS

Taking into account the new economic climate that began to emerge in the Czech Republic, the Government began to develop pragmatic programs to bring about the rapid denationalization of the country's economy and, where necessary, the modernization of industrial processes. Realizing that foreign investment could be an appropriate vehicle to help achieve both ends, the Government began to widen the dissemination of public information, much of which was unavailable during the rule of the Communist regime. To help address the needs of the country's minerals industries, the Ministry of industry of the Czech Republic, under advisement from its Department of Minerals Resources and Geological Survey, issued a publication, titled, "Mineral Commodity Summaries of the Czech Republic." This document was patterned on similar publications by the U.S. Bureau of Mines and those of several other major market economy countries. Additionally, this report was published in English and has supplied information on mineral characteristics, domestic production and use, deposits and reserves, outlook, main world producers, and possible substitutions for metal-bearing ores, industrial minerals and rocks, building materials, and fossil fuels.[3]

ENVIRONMENTAL ISSUES

The interdependence between the future of the minerals industry of the Czech Republic and the abatement of industrial point sources of pollution remained an important issue in the country in 1993. As in other former member countries of the Council for Mutual Economic Assistance (CMEA), the development of heavy industries in the Czech Republic, including those for steel production and the mining and processing of metals, fossil fuels, and industrial minerals, was carried out largely without reference to market economy or environmental considerations from 1946 to 1989. Government programs such as industrialization, central economic planning, and associated policies resulted in the loss of flexibility in industry, including the minerals sector, needed to maintain competitiveness with market economy countries. The Czech Republic's industry, compared with those of market economy countries, became relatively inefficient and polluting. Although, in many cases, the Government's environmental policies were codified into law, these laws were rarely, if ever, enforced. Industrial pollution in the Czech Republic has been severe, largely from point sources associated with steelmaking; low-grade, coal-burning electric powerplants; as well as the country's cement and chemical industries. As in other former centrally planned economy countries of Europe, severe air pollution resulted from the use of high-sulfur, low-grade coal and lignite to power the country's thermal electric power stations.

Despite the division of Czechoslovakia

into separate countries, legislation adopted since 1990 to protect the environment has remained operative. CSFR Law No. 309/91 on the Protection of the Atmosphere from Polluting Substances (9/91) codifies regulations concerning air pollution: defines sources of pollution and sets pollution limits; defines legal obligations of pollution source operators; and defines air pollution control authorities and fees and penalties associated with atmospheric pollution. Czechoslovak Law on Environment of 12/91 sets the basic definitions and principles regarding environmental protection as well as the obligations of "legal and physical persons (bodies)" for protecting the environment during the use of natural resources.

In 1992, the Government allocated $360 million for environmental protection, an increase of about 38% compared with that of 1991.[4] Pollutant emission standards were linked to those of the United States and the EU, and the Government's energy consumption strategies included greater use of natural gas and nuclear energy as well as greater research on the development and economic use of clean coal technologies. One of the major environmental debates in 1993 concerned the completion of the Temelin nuclear electric power station. Opponents of expanding the country's nuclear power industry raised the issue of potential environmental hazards associated with the use of nuclear power—the threat of accidents associated with human error and problems associated with the storage of nuclear wastes. Advocates for the completion of the Temelin nuclear power station raised the concern for the environmental consequences associated with the continued large-scale reliance on domestic coal and lignite if the station were to remain unfinished. The debate reportedly, was decided in favor of completing the nuclear power station. Environmental issues relative to specific mineral commodities also have been presented in subsequent sections of this report.

PRODUCTION

The decline in the production of most minerals continued in 1993, but at a generally slower rate than that in 1991 and 1990. The decline in the output of minerals remained consonant with the country's reordered economic priorities during the Czech Republic's transition to a market economic system. Arguably, one of the factors that had prevented even a greater decline of output in industry was social opposition to rapid closure of economically and environmentally unsustainable industrial facilities.

TRADE

By yearend, the value of total exports of the Czech Republic was expected to increase by about 20% compared with that of 1992 and the value of imports by slightly more than 9%. Although the Federal Republic of Germany remained the Czech Republic's largest trading partner in terms of total exports and imports, Russia maintained its position as a major supplier of mineral and mineral fuel commodities. In April, the Czech Republic and Russia concluded a trade agreement, valid through 1998, that would provide deliveries of 8 billion m^3/a of natural gas from Russia to the Czech Republic. Also, a separate commercial agreement fixed the delivery of Russian petroleum to the Czech Republic for 1993 at 7 Mmt.

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 1993. (*See table 2.*)

COMMODITY REVIEW

Metals

Gold.—Following the dissolution of Czechoslovakia, the disposition of Czechoslovakia's state-owned gold reserves became an important issue concerning both the Czech and Slovak Governments. Reportedly, at the beginning of the year, an agreement was reached between the Czech Republic and Slovakia to divide the former Czechoslovak gold reserves according to a 2:1 ratio. This formulation was to divide the 105-ton reserve by allotting about 70 tons to the Czech Republic and 35 tons to Slovakia. Approximately 7.5 tons of gold was a major source of dispute with the Czech Republic claiming that it must be considered part of the 105 tons of gold that was owned by the former Czechoslovakia. Slovakia, however, contended that the 7.5 tons of gold in question was a sum that was donated to the Government of Slovakia during Slovakia's previous period of separate statehood from 1939 through 1944.[5]

In July, an agreement was reached between the Czech mining interest Bohemia Dulni and the Prime Equities International Corp. (PEIC) of Vancouver, Canada, that would allow PEIC to acquire 80% of the interest in the Kasperske Hory gold deposit in the Czech Republic. Approximately 10 km south of Pribram, the Kasperske Hory deposit was determined to contain resources amounting to 9.3 Mmt of ore grading 7.5 g/mt of ore. According to PEIC, its financial obligation for the transaction would be met through the issuance of 60,000 shares of PEIC stock. Also, the company reportedly would pay an annual fee following the start of production. PEIC also indicated that given its understanding of the geological characteristics of the deposit as well as environmental constraints and transportation problems in the region, the deposit would be viable economically only if the price of gold were to remain at about $400/ton or higher. The company further indicated that it would conduct a drilling program to delineate additional reserves at Kasperske Hory.[6]

Iron and Steel.—The rationalization and denationalization of the Poldi Iron and Steel Works was among the major issues in the Czech Steel industry during the year. Various strategies to promote privatization that have been proposed by Lazard Freres of France, consultants to the Czech Government, had been considered. Initial expectations of participation in Poldi's privatization effort by western steel companies did not materialize reportedly because of rigid joint-venture conditions (minimum investment levels, etc.) set by the Government of the Czech Republic and the management of Poldi.[7] The Poldi Iron and Steel Works actually consisted of two adjacent operations (Poldi I and Poldi II) that were combined during their nationalization in 1946. Poldi I produced special steels, while Poldi II produced largely structural steels. Plant equipment at Poldi I included two electric arc furnaces—one 40-ton unit and a 30-ton unit—two 8-ton induction furnaces, two off-line open-hearth furnaces. Additionally, a 25-ton VOD vessel, a vacuum degassing unit, and an electroslag remelting plant were also installed at the Poldi I facility. Poldi II was equipped with a 100-ton electric arc furnace, a computer-controlled ladle refining unit, one bloom caster, a blooming mill, and a heavy section mill; the medium section mill was put off line for an indefinite period.[8] The plan for Poldi's denationalization originally involved the division of the enterprise into 19 separate companies that would be sold and/or privatized individually.[9] In September, following an official call for tenders, the Czech construction and machine building company, Bohemia Art, won the bid for control of 66% of Poldi, indicating that it would be focusing its commercial activities in the Kladno region and that it would maintain a certain level of steel production at Poldi. Because of the low level of orders, Poldi reportedly had operated at well below 50% of capacity during the year.

The initial reorganization plans at the Nova Hut Steelworks envisaged the division of the company into four main parts that were each to form joint ventures with foreign companies to capitalize and develop discreet product lines. As in other parts of this industry, downsizing production and mergers have been necessary elements during the industry's transition to market-driven enterprises. Nova Hut has reduced its wire rod output from 550,000 mt/a to 400,000 mt/a and is planning to reduce the output of long products to about 1 Mmt/a, given the steelwork's capacity to produce about 4 Mmt/a of long products.[10] Plans also called for the elimination of two of Nova Hut's four open-hearth furnaces and their replacement with one or possibly two electric arc furnaces to provide feedstock for the company's proposed new hot-strip mill. The new hot-strip mill at Nova Hut would be a major part of the company's effort to build a minimill at its Ostrava facilities. The project would involve U.S. shareholder participation in the estimated $700 to $800 million program. The proposed leasing arrangement at Ostrava was to involve the use of Czech Government-backed debt sold through a U.S. bank to U.S. investors.

The reaction to the rationalization and denationalization program in the Czech steel industry by labor has not been as volatile as in several other former centrally planned economy countries in the region. However, in March 1993, about 1,500 workers, members of the Ostrava branch of the Association of Trade Union Organizations of North Moravia and the Trade Union of Mining, Geology, and Oil Industry Workers, held a protest demonstration to voice disapproval of proposed liquidation of mining and certain steelmaking operations, indicating that this would deprive employees of social guarantees and also would have a negative impact on the local economies in the region.[11]

Other foreign commercial activities during the year included the formation of a joint venture at yearend between Teplarny AG of the Czech Republic and Neumayer Fliesspressen GmbH, the German subsidiary of Hoogovens Groep BV of the Netherlands, to produce cold-extruded steel products for the automotive and mechanical engineering sector in Western Europe and in the Czech Republic. This project reportedly was aimed at shoring up Neumayer's position as a supplier to the automotive and machine building industries that recently had reported financial losses. The proposed plant would be established at Oslavany near Brno, and production was to start in the fourth quarter of 1994. However, neither the cost of the plant nor its capacity were disclosed.[12] In July, a joint venture was created by the Czech Republic's ferroalloys producer Mnisek and a Japanese consortium consisting of Japan Metals & Chemicals (JMC), Japan International Development Organization (Jaido), and the trading house Nissho Iwai. The new joint venture, known as Nikom, would increase the production of ferrovanadium (FeV) in the Czech Republic for export to Japan, as well as for sales to Europe and other parts of Asia. Mnisek's capacity to produce FeV would be raised from 1,500 mt/a to 2,000 mt/a. Part of the capitalization of the venture would cover the installation of a new furnace and associated equipment to achieve this capacity. Total investment on the part of the Japanese consortium was to amount to about US$4 million. The distribution of equity in Nikom would give Mnisek 50% of the joint venture's equity, 30% would be alloted to Nissho Iwai, and JMC and Jaido would be alloted 10% each.[13]

Among the most important foreign commercial issues during the year was the imposition of quotas on exports of steel from the Czech Republic and Slovakia to the EU. Given the sharp increase of exports of steel products to the EU by the Czech and Slovak steel industries in 1992 compared with those of 1991, Eurofer, the EU's steel industry association, petitioned the EU Commission to impose import quotas on Czech and Slovak steel products. The EU's monthly average imports of wire rod in 1992 from the Czech and Slovak Republics reached 16,000 tons compared with 12,000 tons in 1991. Similarly, the EU's imports of hot-rolled coil reached 29,000 tons compared with 11,000 tons in 1991 and those of cold-rolled sheet reached 14,000 tons compared with 7,000 tons in 1991. Reportedly, large tonnages of steel have been entering the EU market through Hungary, which has had a high steel export quota to the EU relative to the output level of Hungary's steel industry. (See steel section in the Mineral Industry of Hungary for 1993).[14] In early 1993, the EU imposed temporary anti-dumping quotas on steel imports from Eastern Europe. According to Czech steel industry spokespersons, the duty of 30.4% was sufficiently high to have virtually prevented the Czech Republic's exports of steel to the EU.[15] Although the Czech side indicated that it was willing to accommodate the EU to bring the duties down to 15% to 17%, the EU's proposed export tonnage quotas from the Czech and Slovak Republics were to extend at least through 1995. However, this policy reportedly was not well received by the designated representatives of the Czech Republic, who indicated that the Czech Republic's association agreement with the EU of March 1992 called for free trade by 1995. Moreover, in bilateral talks between Czech steel producers such as Poldi and Austrian, German, and Italian representatives, the issue of cutting Czech production and/or capacity apparently was not met positively by the Czech side despite promises of social aid to displaced workers. In respect to Italy, spokespersons for the Czech industry reportedly alleged that the Italian industry has had a far greater level of Government subsidy than its Czech counterpart, placing the steel industry of the Czech Republic at a competitive disadvantage.[16]

Uranium.—According to official Government sources, the country had 17 uranium deposits as of January 1, 1973. Three deposits were operational; that is, having operated at least through 1993. The two major areas containing uranium deposits are at Rozna in Western Moravia (hydrothermal mineralization), and at Hamr near Straz pod Ralskem in Northern Bohemia (uranium-bearing sandstones bounded by chalks). There are also resources of uranium near the Krusne Hory range associated with tertiary sediments. About 60% of the uranium was extracted through underground mining and the balance, at Hamr, by means of in situ underground chemical leaching. Total commercial resources were measured at about 139,000 tons of uranium metal contained in the ore.[17]

In view of the transition of the Czech economy to a market economy system, the cessation of Russian purchases of Czech uranium for processing, low world market prices for uranium, as well as Slovakia's decision to buy the abundant and less expensive Russian material, the future of this sector would depend on the continued operation of the Dukovany nuclear electric power station and the completion of construction of the Temelin nuclear power station in 1995. In 1993, domestic consumption by the country's nuclear power industry amounted to about 400 tons of uranium, according to the state nuclear power utility, Ceske Energeticke Zavody (CEZ). Uranium has been supplied to CEZ by the Czech Republic's state-owned uranium mining company, Diamo. Upon completion of the Temelin 1 and 2 reactor blocks, uranium consumption was expected to rise to 700 mt/a.[18] Following a lengthy study and discussion concerning the downsizing of the uranium mining industry, the Czech Government decided to reduce Diamo's output of uranium by approximately 50%, because of the company's high production cost and low uranium prices. The cut in production would be achieved without resorting to permanent closures of mining and processing facilities. Diamo officials indicated that the Hamr underground mine and the adjacent chemical processing plant for in situ leaching at Straz pod Ralskem would be placed on a care-and-maintenance basis until a final decision concerning Hamr's operation is made at the end of 1994.[19] Diamo's two mines at Rozinka, however, would continue to operate during this period.

Industrial Minerals

Cement.—Reportedly, in early 1993, Cimenteries CBR of Belgium formally acquired a 33% stake in Cementarny a Vapenky Mokra, the largest cement producer in the Czech Republic, indicating that it intended to raise its interest in the company to 51% by 1994.[20] CBR and other EU cement and construction materials manufacturers already had invested substantially in the Czech Republic's cement and construction materials industries during the past 3 years. These investments were viewed favorably because of the country's rich resources of industrial minerals, a relatively modern and technologically advanced industrial minerals processing and manufacturing sector, and labor costs that were substantially below those in the EU.

Fluorspar.—The Czech Republic remained the largest producer of fluorspar among the former CMEA-member countries of Eastern Europe. Fluorspar was mined by Rudne Doly Flurit Teplice (Rudne), a subsidiary of the large Government-owned industrial minerals producer, Rudny Dole Pribram. The annual mine production capacity of fluorspar amounted to 78,000 tons. The Moldava (45,000 mt/a), Bestvina (18,000 mt/a), and Jilove (15,000 mt/a) Mines were the country's principal fluorspar producers. With total mine production of fluorspar in 1992 having reached 61,000 tons, mine production in 1993 was expected to decline to about 52,000 tons. However, finished, marketable product in 1993 was expected to increase.[21] The production of acidspar (97.5% to 98.5% CaF_2; maximum 1% SiO_2) was expected to increase from 16,900 tons in 1992 to 22,000 tons in 1993; metspar (80% to 90% CaF_2) production would increase from 18,500 tons in 1992 to 20,600 tons in 1993. The former product has been used in both the domestic and Western European chemical industries. Acidspar sales to Western Europe were expected to reach 10,000 tons in 1993. Also, a small amount of acidspar (600 mt/a) is sold to the country's glassmaking industry for application in fluxing. Metspar, on the other hand, is consumed in the steel industries of the Czech Republic and other former CMEA Eastern European countries.[22] Additionally, a small amount of course-grained product has been produced for use in powder metallurgy and in the production of electrodes. Reportedly, Rudne management concluded that the future market for course-grained fluorspar would be favorable and planned to double the production capacity of this product during the 1993-94 period.

Graphite.—Used in the manufacture of electrodes, composite materials, lubricants, pastes, refractories, and other products, graphite was mined in the Czech Republic at four deposits in the Cesky Krumlov region in Southern Bohemia by Grafit Netolice, a subsidiary of the large Government-owned industrial minerals producer, Rudne Doly Pribram. Amorphous graphite has been produced from two of six commercial deposits and crystalline graphite was produced from two of the three commercial-grade properties. The decline of both domestic demand and exports has accounted for the reported drop in the country's graphite production in 1992. The mine production of amorphous graphite declined to 13,000 tons from 30,000 tons in 1991, while the output of crystalline graphite declined from 17,000 tons in 1991 to 7,000 tons in 1992.[23] Reportedly, in 1993, Grafit Netolice, foreseeing more favorable market conditions, indicated plans to increase the production of crystalline flake and microcrystalline powder graphite designated for the production of emulsions, graphite foils, emulsions, and lubricants. The company operated graphite processing plants at Netolice and Tyn nad Vltavou near Ceske Budejovice with the capacity to produce 10,000 mt/a of marketable product.[24]

Stone, Sand and Gravel.—Reportedly, in September, Wimpey Minerals (Wimpey), a division of George Wimpey PLC of the United Kingdom, reached an agreement with the National Property Fund of the Czech Republic to acquire an initial 34% equity share in Severokamen AS, a major producer of quarry products in northern Bohemia. The value of the transaction was estimated at about US$2 million. Additionally, Wimpey would be allowed to increase its share in Severokamen's equity to 50% after 2 years following the initial share acquisition for an additional $1.5 million.[25] Upon the acquisition of the initial Severokamen stock, Wimpey could take over the management of the enterprise. Wimpey also reported plans to invest approximately $7.6 million into Severokamen's operations over the subsequent 10-year period, largely for a modernization program that would include the replacement of trucks at most operations with a conveyor transport system. Severokamen's resources amounted to 520 Mmt commercial quarry material that included 400 Mmt of hard rock and 120 Mmt of sand and gravel. The acquisition of Severokamen SA by Wimpey Minerals has been part of an investment process in recent years by Western European companies in the industrial minerals sectors of several transitional economy countries (Czech Republic, Hungary, and Poland) in anticipation of substantial growth in the building and construction needs in these countries. Most of Severokamen's production has been consumed domestically; however, exports to nearby markets in eastern Germany reportedly began in 1991 and were expected to reach 400,000 tons during the first full year of operation of the Wimpey-Severokamen Co.[26]

Mineral Fuels

Coal.—In the Czech Republic, the brown coal-lignite-producing areas were at Brno, Kladno, Most, Plzen, Skokolov, and Trutnov. 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.

Bituminous coal was mined entirely underground (longwall method) at the East Bohemia, West Bohemia, Kladno, and Ostrava-Karvina Coalfields. The Kladno and Ostrava-Karvina Coalfields were the largest producers of bituminous coal, respectively accounting for about 6% and 88% of the country'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.

In 1993, the Ostrava-Karvina Mines Co. (OKD) management announced plans to gradually eliminate coal mining at the Dola Odra Mine and to substantially reduce output at the Fucik Mine at Precvald. The local mine workers' trade union responded to the plan by pointing to potential social unrest stemming from the possible loss of about 2,000 jobs and the lack of reliable social programs to help retrain and reemploy redundant mine workers. Reportedly, it was decided to close the Dola Odra Mine on December 31, 1993.[27]

Foreign commercial activity in the coal industry in 1993 included an agreement between Northwest Mine Services Ltd. (Northwest) of Calgary, Canada, and the Czech Government to initiate a study of environmental issues relative to coal mining and coal mine reclamation. Northwest would conduct an assessment of mining-generated environmental pollution in the Black Triangle, a vast area of severe ecological degradation covering an area of 850 km^2 in northern Bohemia, as well as areas in the adjacent parts of Germany and Poland. In 1993, reportedly only 35% of land used for mining and other industrial use in this region was in the processing of being reclaimed.[28] Northwest's study also would include proposals to revise the country's mining and commercial legislation that would permit future market-driven mining operations to include the development of a general reclamation strategy as well as the rehabilitation of mined-out properties.[29]

Nuclear Energy.—According to officials of the Czech Power Co. (CEZ), about $1.5 billion would be allocated for the completion of the Temelin nuclear power station from 1993 through 1997. It also was decided to establish a safe, permanent burial site for spent nuclear fuel from the Dukovany and later from the Temelin nuclear powerplant on Czech territory by 2030. Temporary storage depots were to be established in 1995 and 2005. In past years, spent nuclear fuel was sent for storage to the former

U.S.S.R..[30]

Petroleum.—In May, a consortium of petroleum-producing companies, consisting of AGIP S.P.A., Conoco LTD., and Total Oil Holdings LTD., submitted an investment proposal to the Ministry of Industry and Trade of the Czech Republic involving an investment of $2.5 billion over a 10-year period in the country's petroleum and petrochemical sectors. About $1.6 billion would be earmarked for investment in the Chemopetrol Co. in Litvinov and $800 million in Kaucuk Kralupy Co. (Kralupy Rupper Co.). The investment proposal also included an unspecified allocation of funds to help finance the construction of the Ingolstadt-Kralupy petroleum pipeline.[31] Reportedly, the Ministry of Industry and Trade undertook the study of this proposal and a number of similar proposals during the year. In May, the Government also decided to grant guarantees of credit worth about $230 million to a consortium of banks involved in financing the construction of the Ingolstadt-Kralupy pipeline, as well as about $260 million from the National Property Fund to capitalize the Mero Iki Co. of Kralupy that will operate the pipeline. The proposed pipeline would be 340 km in length and would carry 10 Mmt/a of petroleum.[32]

Reserves

Taking into account the Czech Republic'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 former CMEA countries, including the Czech Republic, the prior policies for centrally planned industrial development often had more to do with political than economic considerations. For a detailed explanation of the system that has been used in the former CMEA countries for measuring reserves, see the chapter on Russia in this volume. The Czech Republic's mineral resources are given in table 5. (*See table 5.*)

INFRASTRUCTURE

The Czech Republic's inland system of ways and communications consisted of 65,324 km of railroads and highways. The country's railroad system consisted of 9,434 km of track. The highway and road system was 55,890 km in total length. 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. The pipeline network included 5,400 km of pipe for natural gas.

OUTLOOK

The near-term outlook for the Czech Republic's economy and mineral industry appears good, especially in comparison to most other former centrally planned economy countries of Eastern Europe. The country's highly focused and vigorous economic restructuring program apparently has stimulated substantial foreign investment in the country's minerals industries—a trend that is likely to continue for the foreseeable future. With scientific and technical excellence as one of the main components of the country's cultural tradition, the Czech Republic can be expected to extend its influence throughout the region known as Eastern Europe as well as the republics of the former U.S.S.R. Industries such as steel, ceramics, construction materials, and associated quarry products should continue to meet the needs of both the country's domestic and foreign customers.

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[2]———. EEU-94-051, Mar. 16, 1994, p. 4, from Hospodarske Noniny (Economic News) Prague, Mar. 11, 1994, p. 7.

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[4]British Broadcasting Corporation (BBC) SWB. EE/W0269, Feb. 18, 1993, p. A/4, from CTK 2028 GMT, Feb. 10, 1993.

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[8]Metal Bulletin Monthly. Aug. 1993, p. 27.

[9]Work cited in footnote 8.

[10]Metal Bulletin. Jan. 13, 1994, p. 20.

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[12]American Metal Market. Dec. 12, 1993, p. 6.

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[15]Foreign Broadcast Information Services. EEU-93-047, p. 17, from CTK, Prague, 2208 GMT Mar. 11, 1993.

[16]Metal Bulletin. Oct. 25, 1993, p. 40.

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[20]Industrial Minerals. Aug. 1993, p. 13.

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[22]Work cited in footnote 21.

[23]Mineral Commodity Summaries of the Czech Republic. Geofond, Ministry of the Economy of the Czech Republic (Prague: May 1993) pp. 95-97.

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[26]Work cited in footnote 25.

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Federalni statisticky urad (Federal Statistical Department)
Sokolovska 142
18613 Prague 8
Czech Republic

Ministerstvo zahranicneho obchodu (Ministry of Foreign Trade)
Politickych veznu 20
11001 Prague 1
Czech Republic

GEOFOND
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17021 Prague 7
Czech Republic

TABLE 1
CZECH REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
Antimony, mine output, Sb content[e]		300	250	400	250	250	500
Antimony, metal		253	216	324	223	220	450
Copper:							
Mine output:							
Ore, gross weight		308,000	178,000	—	—	—	—
Concentrate:							
Gross weight		5,532	3,422	—	—	—	7,000
Cu content		1,100	684	—	—	—	1,800
Metal:							
Refined, primary as byproduct from noncopper ores		1,200	800	600	500	500	1,500
Gold metal[e]	kilograms	105	187	564	521	550	600
Iron and steel:							
Iron ore:							
Gross weight	thousand tons	84	93	102	64	160	150
Fe content	do.	55	60	66	42	39	35
Metal:							
Pig iron	do.	6,396	6,106	5,316	[e]5,500	5,000	10,000
Ferroalloys, total electric furnace[e]	do.	1	—	1	1	1	6
Crude steel	do.	10,724	9,996	7,964	[e]7,500	7,500	12,500
Semimanufactures	do.	9,459	9,031	7,167	[e]7,000	7,000	12,000
Lead:							
Mine output, Pb content		4,600	2,300	2,100	1,100	1,000	5,000
Concentrate, gross weight		2,227	2,045	2,011	[e]2,000	2,000	3,500
Pb content of concentrate		1,136	1,043	1,026	[e]1,000	1,000	1,800
Metal, secondary		26,008	23,665	17,835	24,000	20,000	30,000
Mercury		2	2	—	—	—	2
Silver	kilograms	20,800	16,200	8,900	6,200	6,000	22,000
Tin:							
Mine output, Sn content		468	590	15	—	—	600
Metal, primary and secondary		562	613	118	[e]115	115	120
Tungsten, mine output, W content		75	84	12	—	—	85
Uranium, mine output, U content		2,502	2,243	1,827	1,631	1,500	2,600
Zinc:							
Mine output:							
Ore (Pb-Zn), gross weight		489,000	452,000	353,000	[e]220,000	250,000	550,000
Zn content of ore		6,500	7,500	8,500	4,400	4,500	9,000
Concentrate, gross weight		9,768	10,259	9,760	[e]9,000	9,000	11,000
Zn content[e]		4,800	5,000	4,800	4,400	4,000	6,000
Metal, secondary		1,296	978	811	1,070	1,000	1,500
INDUSTRIAL MINERALS							
Barite		1,800	1,000	[e]1,000	[e]—	—	2,000
Cement, hydraulic	thousand tons	6,788	6,434	5,619	[e]6,000	6,000	7,600
Clays:							
Bentonite	thousand tons	168	159	125	135	130	250
Kaolin	do.	3,642	3,455	2,913	2,530	2,500	4,000
Diamond, synthetic[e]	carats	5,000	5,000	5,000	5,000	5,000	5,500
Fertilizer, manufactured:							
Nitrogenous, N content		256,616	245,138	181,501	[e]180,000	180,000	300,000

See footnotes at end of table.

Table 1—Continued
CZECH REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Fertilizer, manufactured—Continued							
Phosphatic, P_2O_5 content		185,437	146,074	46,341	[e]40,000	40,000	200,000
Potassic, K_2O content		53,321	51,258	23,131	[e]20,000	20,000	70,000
Mixed		156,670	154,334	55,315	[e]50,000	50,000	200,000
Feldspar		139,000	115,000	130,000	152,000	150,000	200,000
Fluorspar		44,600	18,500	31,700	22,000	20,000	50,000
Graphite		66,000	39,000	47,000	[e]20,000	20,000	100,000
Gypsum and anhydrite, crude		720,000	661,000	569,000	[e]660,000	650,000	810,000
Lime, hydrated and quicklime	thousand tons	2,044	2,278	2,154	[e]2,500	2,500	3,000
Nitrogen: N content of ammonia[e]		300,000	250,000	200,000	200,000	200,000	350,000
Salt		222,000	209,000	184,000	[e]180,000	180,000	250,000
Stone:							
Limestone and other calcareous stones	thousand tons	16,277	15,448	11,461	11,134	11,000	19,000
Quarry stone, not further described	thousand cubic meters	14,373	11,790	6,777	[e]8,000	8,000	16,000
Sulfur, byproducts, all sources[e]		20,000	20,000	20,000	20,000	20,000	25,000
MINERAL FUELS AND RELATED MATERIALS							
Coal:							
Bituminous	thousand tons	34,935	30,714	25,769	24,691	25,000	50,000
Brown and lignite	do.	88,946	80,205	77,488	69,519	70,000	100,000
Coke:							
Metallurgical	do.	6,176	4,168	3,695	[e]3,500	3,500	7,000
Unspecified	do.	1,686	3,117	2,740	[e]2,800	2,800	3,500
Fuel briquets from brown coal	do.	1,147	1,051	892	[e]800	800	2,000
Gas:							
Manufactured, all types	million cubic meters	6,334	5,939	5,376	[e]5,000	5,000	7,000
Natural, marketed[3]	do.	125	125	125	132	130	135
Petroleum:							
Crude:							
As reported	thousand tons	45	47	64	80	80	100
Converted	thousand 42-gallon barrels	305	319	434	542	550	600
Refinery products[e]	do.	120,000	[3]95,462	90,000	90,000	90,000	150,000

[e]Estimated.
[1]Table includes data available through Apr. 1994. In addition to the commodities listed, arsenic, diatomite, dolomite, illite, sodium compounds, sulfuric acid, talc, and zeolite are produced, but information is inadequate to make reliable estimates of output levels.
[2]Reported figure.
[3]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
CZECH REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities	Annual capcaity
Antimony:				
Ore		Krasna Hora	Central Bohemia	NA
Cement		Cizkovice, Hranice, Karlov Dvor, Lochkov, Pracovice, and Velary	Bohemia	3,500
Do.		Bystre, Malomerice, Mokra, Ostrava-Kunice, and Zahorie	Moravia	2,800
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
Lignite		JLD administration	Hodonin, south Moravia	5,000
Copper:				
Ore		Zlate Hory	North Moravia	300
Lead-zinc, ore		Horni Benesov and Zlate Hory	do.	400
Lead, metal secondary, refined		Kovohute Pribram	Pribram	26
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
Steel, crude		Nova Hut sp (Ostrava)	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.		Zelezarny Bila Cerkev	Hradek-Rokycany	300
Do.		Zelazarny 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
CZECH REPUBLIC: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1993

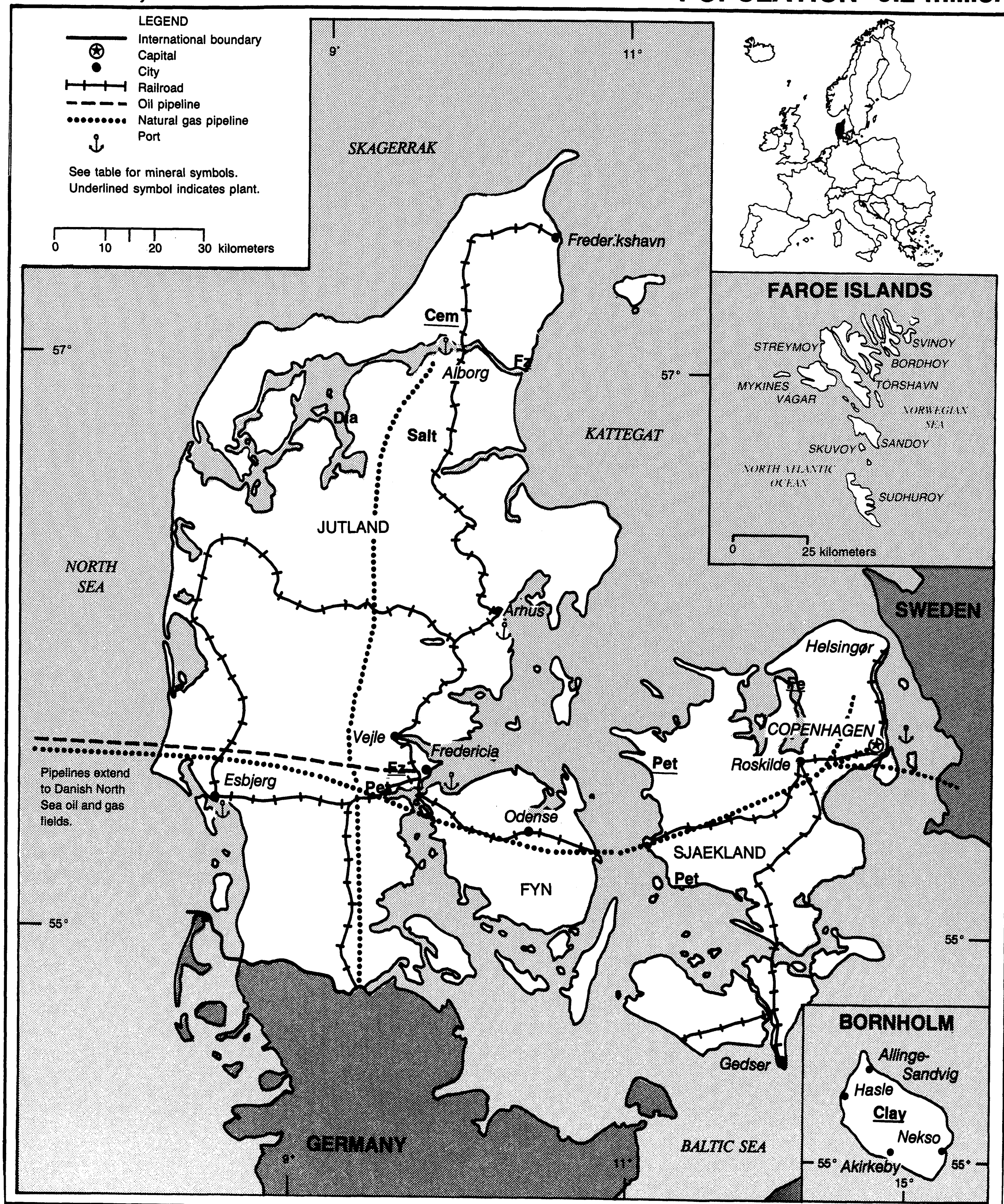
(Thousand metric tons unless otherwise specified)

Commodity		Resources
Antimony, in ore	metric tons	153
Barite		2,416
Clays:		
Bentonite		242,312
Kaolin		946,530
Refractory		1,480,558
Copper, in ore		55
Coal:		
Bituminous		9,164,000
Brown		6,762,000
Lignite		599,000
Diatomite		5,144
Feldspar		81,163
Fluorspar		3,347
Gold, in ore	kilograms	102,673
Graphite		5,923
Gypsum		427,010
Iron ore (magnetite, 65% to 70% Fe)		12,751
Limestone		5,481,054
Natural gas (Mm^3)		22,138
Nickel, in ore		62
Petroleum		55,314
Polymetallic ore:		
Pb content		108
Zn content		475
Ag content		451
Sand:		
Glass		174,971
Foundry		312,410
Tin-tungsten ore:		
Sn content		41
W content		2
Uranium, metal in ore		139
Wollastonite		2,906

Source: Primarily, Mineral Commodity Summaries of the Czech Republic, Prague, May 1993; and Gornaya Entsiklopediya, Moscow: Sovetskaya Entsiklopediya, 1991.

DENMARK

AREA 43,000 km² **POPULATION 5.2 million**



THE MINERAL INDUSTRIES OF

DENMARK, FAROE ISLANDS, AND GREENLAND

By William Zajac

DENMARK

The mining and quarrying and the minerals processing sectors traditionally have not been a driving factor in Denmark's economy. Employment in all aspects of the minerals industry (mining and quarrying, basic metal industry, etc.) accounts for about 2% of total employment in Denmark.

Government Policies and Programs

On May 18, 1993, the Danish public reversed its earlier rejection of the Maastricht Treaty, thereby confirming Denmark's commitment to continued European cooperation and integration. However, despite acceptance of the treaty, Denmark reserved the right to participate in the third phase of the European Economic and Monetary Union (EMU). Therefore, when and if, a common European Union (EU) currency and Central Bank materialize, the Danes will again vote on whether to participate.

Continued close cooperation with the other members of the EU is very important for Denmark because they are the major market for the country's extremely important export activities. For example, in 1992, 82% of the steel produced in Denmark was exported. Of the total exported, 67% was to other EU member countries and 33% was to non-EU member countries. The same is true for other minerals and mineral products such as cement, of which 58% of Danish production was exported in 1992.

Environmental Issues

The Danes are a very environmentally conscious people. The mining and metals industry, as other elements of the country, work closely with the Ministry of Environment in Copenhagen. For example, the Danish Steel Works continued its efforts to improve the environment both within the plant and in the surrounding area. A common goal of the steelworks, as with other industrial concerns, is to make use of as much of the raw material taken into the plant and to use any byproducts, such as flue dusts, that can possibly be used. Industry works closely with not only the Federal Ministry of Environment, but also with local and community governments and citizen groups to minimize any adverse effects to the environment.

Structure Of The Mineral Industry

The structure of the Danish mineral industry, showing its major components, is shown in table 3. (*See table 3.*)

Commodity Review

Metals.—Crude steel production in Denmark increased by 2.4% in 1993 compared with that of the previous year. This increase was a result of the easing of the global recession during 1993 and the resultant increase in the export of Denmark's steels for the consumer market. Denmark's steel industry was small compared to the majority of other EU countries, and, as a result of its size, was not affected by the proposed cuts being studied by the European Commission in its effort to make the EU steel industry more competitive with those of other countries.

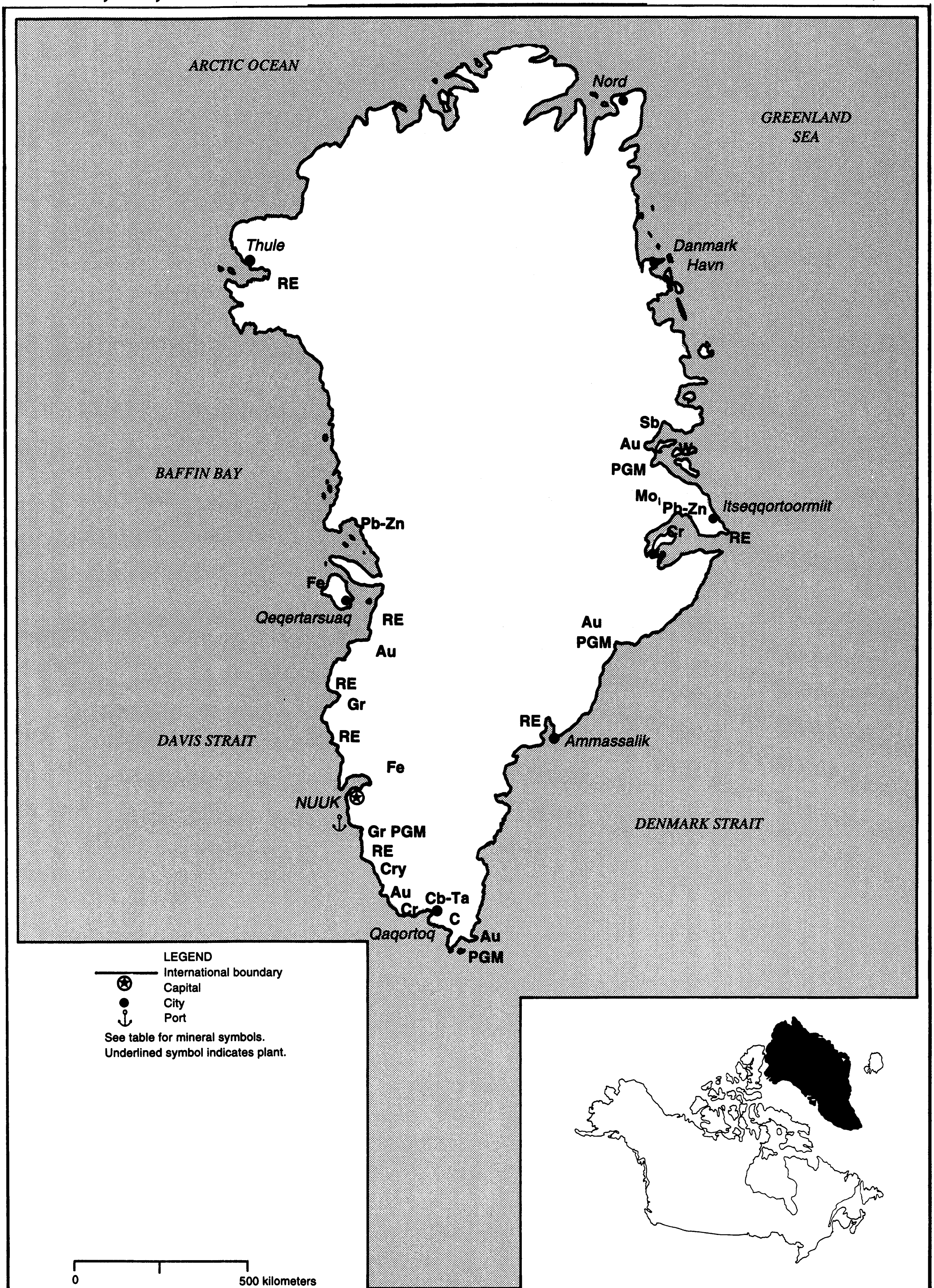
Industrial Minerals.—Cement production in Denmark in 1993 reportedly remained at about the same level as during the previous year. A slowdown in the domestic construction industry was offset by continued demand in the eastern states of Germany, where construction projects continued to proliferate.

Mineral Fuels.—Crude petroleum in Denmark in 1993 increased by 6.4% compared to that of the previous year, and natural gas production increased by 11%. The rise in crude petroleum production made Denmark self-sufficient in petroleum, with production exceeding consumption for the first time, and the 1993 level of petroleum production was expected to continue. The increase in natural gas production in 1993 enabled Denmark to continue exports of about 20% of production at the same time as increasing income. The Danish state energy board forecast, in late 1993, that by 1997 it expected Denmark to produce 141% of its petroleum and natural gas needs, enabling the country to achieve a balance in its energy trade (exports of oil and natural gas minus imports of coal) for the first time. An expansion program announced in late 1993 aims to increase Denmark's North Sea gas output to 7 m^3/a by 1997.

In 1992, Denmark's domestically produced electricity was generated 97.06% by conventional thermal plants, 2.85% by renewable sources (solar, wind, etc.), and 0.09% by hydropower. The thermal powerplants use Danish petroleum and natural gas and imported coal. In 1992, Denmark imported 12.1 Mmt of anthracite and bituminous coal at

GREENLAND

AREA 2,175,600 km² **POPULATION 57,000**



a cost of about US$475 million.[1] The United States has traditionally been the supplier of the largest amount of coal to Denmark and is likely to continue as such, but Denmark has been looking to cut costs associated with imported coal. One result of that search was a contract between SK Power's Copenhagen plant and British Coal for an annual supply of 100,000 tons, about the amount Denmark has been importing from the United Kingdom per year under all contracts.

Dansk Olie & Naturgas began studying the possibilities of expanding the pipeline through which Danish crude petroleum is landed from its North Sea fields. The capacity of the pipeline in 1993 was 180,000 bbl/d with 92% utilization.

Reserves.—Denmark has no known economically exploitable reserves of metal ores but has large reserves of nonmetallic materials such as chalk, diatomaceous earths, limestone, and sand and gravel. No reserve figures are available for these materials because of the varied uses for them and the changing technologies that produce marketable products from the raw materials. Reserve figures for materials such as sand and gravel would cover an extremely wide range, depending on the prospective use of the sand and gravel, whether for landfill, industrial use, building material, etc. At the beginning of 1993, reserves of crude petroleum were given at 730 Mbb land reserves of natural gas were given at 197 million cubic meters, all offshore.

Infrastructure

Denmark has a well-developed, modern transportation system. Rail lines total 2,770 km, of which 2,120 km was operated by the Danish State Railways and 650 km was privately owned and operated. The rails were 1.435-m standard gauge and 121 km of the Danish State Railways was rail ferry service. Highways consisted of 66,482 km, of which 64,551 km was concrete, bitumen, or stone block and 1,931 km was gravel, crushed stone, or improved earth. Inland waterways totaled 417 km. Pipelines totaled 1,388 km, of which 110 km was for crude petroleum, 578 km was for petroleum refinery products, and 700 km was for natural gas. The Danish merchant marine totaled 328 vessels of 1,000 gross weight tons or over, totaling 5,043,277 gross weight tons (7,230,634 dwt). Of the total vessels, 13 were short-sea passenger vessels, 102 cargo, 19 refrigerated cargo, 47 container, 37 roll-on/roll-off, 1 railcar carrier, 33 petroleum tankers, 18 chemical tankers, 36 liquified gas tankers, 4 livestock carriers, 17 bulk carriers, and 1 combination bulk carrier. Denmark's principal ports were Ålborg, Århus, Copenhagen, Esbjerg, and Fredericia and there were numerous secondary and minor ports.

Outlook

The focus of the Government elected in 1993 was on reducing unemployment. The program introduced tax reform and labor market growth incentives. The Government expected that these reforms would reduce unemployment in 1994 to 11.4% from 12.2% in 1993, and lead to economic growth of close to 3% in 1994, based on an assumption of an almost 4% private consumption growth. Several new environmental taxes were introduced and will offset income tax revenue losses. Preferential refinancing of high-interest mortgage loans with low-interest loans, advancement of public investments, Government subsidization of home services work, and granting of risk capital to business and entrepreneurs were all expected to stimulate domestic demand.

FAROE ISLANDS

The Faroe Islands, a self-governing overseas administrative division of Denmark, has no known mineral reserves. However, the Faroe Islanders decided in 1993 to open their offshore area for petroleum exploration. This decision followed a settlement of a dispute with Denmark, whereby responsibility for licensing was formally handed over to the local parliament, the Lagting. However, still to be settled is a dispute with the United Kingdom over a wide strip of sea between the Faroe Islands and the Shetland Islands. Allegedly, a number of international oil companies are interested in exploring the Faroese area despite the harsh conditions and the considerable downtime that is endemic in that area.

The principal involvement to date of the Faroe Islands in the international minerals industry has been as a market for imported materials to support the local, fishing-based economy. These imports are principally fuels, fertilizer materials, and building products such as cement.

GREENLAND

Government Policies and Programs

Since the cessation of mining activities in 1990, Greenland, a self-governing overseas administrative division of Denmark, has been looking for a means of diversifying its economy, based almost entirely on fishing and hunting. Recent legislation has created favorable licensing terms and investment rules, and this together with a very varied geology has attracted mineral exploration to Greenland. Exploration activity has revealed the potential for economic exploitation of antimony, barite, beryllium, chromite, coal, columbium, copper, cryolite, diamond, gold, graphite, ilmenite, iron, lead, molybdenum, nickel, platinum-group metals, rare earths, tantalum, thorium, tungsten, uranium, zinc, and zirconium. One of the more spectacular discoveries during 1993 was an extensive zinc deposit covering an area extending at least 5 km, at shallow depth, and containing 10% zinc. The deposit is at Peary Land and is the world's most northerly known mineral deposit. Despite the location, ship operators claim that several months of sea access would be possible each year.

Feasibility studies continued in 1993 on the possibility of a 170,000-mt/a zinc refinery near Nuuk that would treat Canadian concentrates that are currently being treated in Europe. The refinery would use locally available hydroelectricity, and the use of pressure-leach technology and underground waste storage would minimize environmental pollution. The refinery would be Greenland's largest ever industrial project, and the Government views the project very favorably.

Infrastructure

Greenland is the largest island in the world, but the majority of the land is inaccessible. The total land area is 2,175,600 km^2 with 341,700 km^2 ice free. The remainder of the island is covered by an icecap up to 3,000 m thick.

The population of Greenland is concentrated on the southern half of the west coast of the island. The cities are served by a system of air and sea links. All major cities and towns have modern harbor facilities. The 80 km of highways on the island is within cities but do not connect cities. The only vessel in Greenland's merchant marine, a 1,778-dwt refrigerated cargo ship, operates under the registry of Denmark.

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[1]When necessary, conversions were made at the rate of Danish krone (Dkr) to U.S. dollars at the rate of Dkr 6.5=US$1.00.

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Agencies

Danmarks Geologiske Undersogelse
(Geological Survey of Denmark)
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Danmarks Statistik
Sejrogade 11 Copenhagen, Denmark
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Ministry of Economic Affairs
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Geological Survey of Greenland
Oster Voldgade 10
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Greenland Home Rule Government
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DK-3900 Nuuk Greenland

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TABLE 1

DENMARK: SALES OF DOMESTICALLY PRODUCED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Cement, hydraulic		2,004,000	1,656,000	2,016,000	2,072,081	[e]2,100,000	3,000,000
Chalk		[e]250,000	[e]275,000	[e]310,000	354,989	[e]350,000	400,000
Clays:							
Fire clay		[e]2,000	[e]2,000	[e]2,000	2,036	[e]2,000	3,000
Kaolin		16,029	17,423	17,057	3,503	[e]3,500	25,000
Other		[e]250	—	—	1,467	[e]1,500	2,000
Cryolite		[e]18,000	[r]—	[r] [e]15,000	—	—	—
Diatomaceous materials:							
Diatomite		[e]6,000	[e]1,000	[e]1,000	[e]1,000	[e]1,000	85,000
Moler		[e]75,500	[e]97,000	[e]95,000	[e]95,000	[e]95,000	100,000
Extracted moler[3]	thousand cubic meters	151	194	[e]190	[e]190	[e]190	250
Gas:							
Manufactured	terajoules	1,850	1,780	[e]1,700	[e]1,700	[e]1,700	2,000
Natural:							
Gross[3]	million cubic meters	5,330	5,140	5,760	[r]6,200	6,350	7,000
Marketable	do.	2,836	2,914	3,723	3,847	4,270	4,500
Iron and steel metal: Steel:[3]							
Crude		625,000	610,000	633,000	591,000	604,000	650,000
Semimanufactures		619,000	539,000	518,000	525,000	511,000	600,000
Lime, hydrated and quicklime		131,000	134,000	156,000	163,000	[e]160,000	190,000
Natural gas plant liquids[3]	thousand 42-gallon barrels	[e]38,900	[e]37,500	[e]42,000	[e]43,500	[e]48,000	50,000
Peat		[3]259,155	[3]224,789	[e]200,000	[3]194,983	[e]190,000	250,000
Petroleum:							
Crude[3]	thousand 42-gallon barrels	42,304	45,387	51,929	58,227	64,632	70,000

See footnotes at end of table.

TABLE 1—Continued

DENMARK: SALES OF DOMESTICALLY PRODUCED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Petroleum—Continued:							
Refinery products:							
Liquefied petroleum gas	thousand 42-gallon barrels	1,624	1,659	1,670	[r]1,496	[e]1,500	1,500
Gasoline	do.	11,951	11,203	13,184	[r]13,005	[e]13,000	13,200
Naphtha	do.	2,414	2,134	1,292	[r]1,105	[e]1,100	1,100
Mineral jelly and wax	do.	([4])	([4])	([4])	4	[e]4	5
Jet fuel	do.	1,992	[r]1,984	[r]1,496	[r]1,176	[e]1,200	1,200
Kerosene	do.	411	[r]605	[r]209	[r]171	[e]170	170
Distillate fuel oil	do.	25,357	24,543	27,878	[r]29,840	[e]30,000	30,500
Refinery gas	do.	1,989	1,940	[r] [e]1,700	[r] [e]1,700	[e]1,700	1,700
Lubricants	do.	[e]3	[e]310	[e]318	324	[e]300	300
Residual fuel oil	do.	16,217	14,785	[r]13,7853	[r]14,572	[e]15,000	15,300
Bitumen and bituminous mixtures	do.	291	164	61	63	[e]60	100
Petroleum coke	do.	[e]3	[e]3	[e]3	3	[e]3	5
Total	do.	[r] [e]62,252	[r] [e]59,330	[r] [e]61,564	[r] [e]63,459	[e]64,037	65,100
Phosphates, crude, gross weight		[e]1,000	528	329	—	—	—
Salt, all forms		551,871	522,206	550,150	528,429	[e]525,000	600,000
Sand and gravel:[3]							
Onshore	thousand cubic meters	27,979	22,444	[e]22,000	[e]20,000	[e]20,000	30,000
Offshore	do.	7,701	6,223	[e]6,000	[e]5,000	[e]5,000	10,000
Total	do.	35,680	28,667	[e]28,000	[e]25,000	[e]25,000	40,000
Of which: Sand, industrial (sales)	do.	221	133	[e]130	[e]125	[e]125	250
Stone:							
Dimension (mostly granite)[3]	cubic meters	370	810	[e]500	[e]385	[e]385	500
Limestone:							
Agricultural		[e]1,800,000	1,482,000	[e]1,000,000	806,169	[e]800,000	2,000,000
Industrial		[e]180,000	205,000	[e]210,000	217,411	[e]215,000	500,000
Sulfur, byproduct		18,842	12,118	6,264	9,916	[e]10,000	25,000

[e]Estimated. [r]Revised.

[1]Table includes data available through Apr. 15, 1994.

[2]The commodity "Soda ash" has been deleted from this table because there is no indication that it is now being, or has been for several years, produced. If it is produced, the entire amount is probably consumed by the producer and none enters the market.

[3]Production.

[4]Less than ½ unit.

TABLE 2

GREENLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Lead: Concentrate, Pb content		24,120	16,000	—	—	—	—
Silver: In lead concentrate, Ag content	kilograms	14,712	9,176	—	—	—	—
Zinc: Concentrate, Zn content		71,500	47,850	—	—	—	—

[1]Table includes data available through Apr. 1994.

TABLE 3

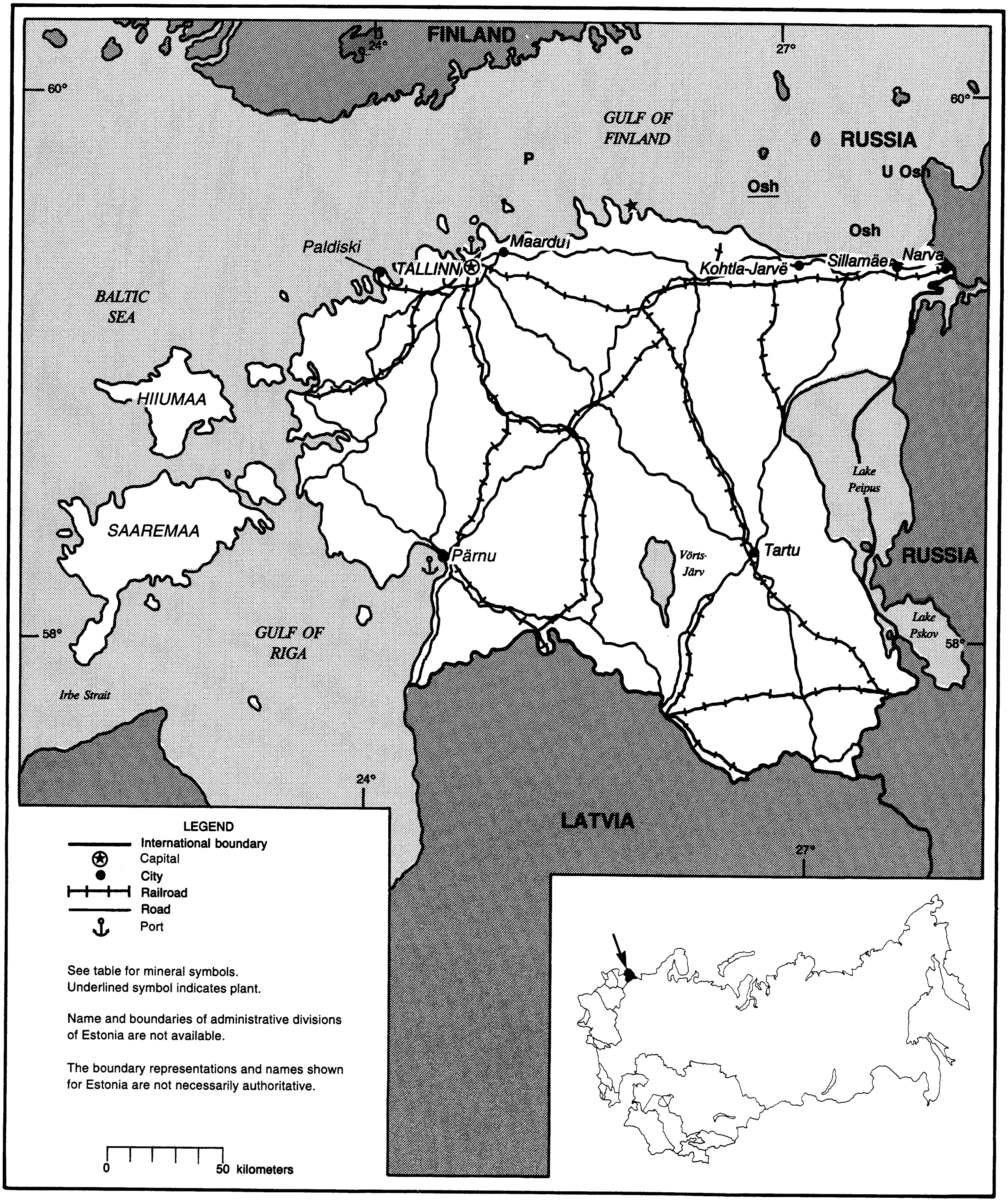
DENMARK: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aalborg Portland A/S	Plant at Rordal	3,000
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
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	2,550
Petroleum:				
Crude	barrels per day	Dansk Undergrunds Consortium	Dan, Gorm, Rolf, Skjold and Tyra oilfields, Danish North Sea	127,000
Refined		A/S Dansk Shell	Fredericia	55,000
Do.		Kuwait Petroleum		
		Refining A/S	Gulfhavn	56,500
Do.		Statoil A/S	Kalundborg	65,000
Salt		Dansk Salt I/S	Mine (brine) at Hvornum, processing plant at Mariager	600
Steel		Danish Steel Works Ltd. (Det Danske Stalvalsevaerk A/S)	Plant at Frederiksvaerk	650

ESTONIA

AREA 45,100 km² **POPULATION 1.6 million**



THE MINERAL INDUSTRY OF

ESTONIA[1]

By Richard M. Levine

Estonia's mineral industry consisted primarily of mining oil shale, peat, and industrial minerals, including clays, limestone, and sand and gravel. Phosphate mining in Estonia has recently ceased because of environmental concerns. Oil shale was a major source of energy, but its use was causing serious environmental problems. In 1993, the Estonian economy appeared to begin to stabilize as the rate of inflation slowed, trade became balanced, and the growth rate in unemployment decreased. Estonia's success in these areas was attributed to monetary and economic reforms.[2]

GOVERNMENT POLICIES AND PROGRAMS

Estonia, in the spring of 1994, became an associate member of the European Union (EU); it was hoped this membership would accelerate the integration of Estonia's economy into the world economic system. In September 1993, Estonia signed the Baltic Free Trade Agreement that would come into effect in April 1994. Estonia, however, was considering establishing quotas on exports of oil shale, clay, gravel, and quartz sands.[3]

ENVIRONMENTAL ISSUES

In an apparent attempt to upgrade the Government's role in environmental protection, Estonia was planning to transform its Environment Protection Department into a new Environment Protection Ministry.[4] In December, Estonia signed an agreement with Finland for cooperation in incidents of sea pollution, and a protocol was also signed to draft an environmental and action plan for 1994.[5]

PRODUCTION

In 1993, mining output fell by almost 25% with more than a 25% decrease in peat production and more than a 20% decrease in oil shale production, which were the two major sources of domestic energy production.[6] Production ceased for a number of goods, including phosphate fertilizer and sulfuric acid.[7] *(See table 1.)*

TRADE

In 1993, Estonia continued to shift its foreign trade patterns as less than 25% of trade turnover was with the CIS in comparison with 97% within the U.S.S.R. in 1989.[8] Reportedly, nonferrous metals reexported from Russia and other countries of the former U.S.S.R. remained Estonia's fifth largest category of exports. These metals reportedly often are obtained illegally from Russia.[9]

Estonia's fourth largest export commodity was fuels, which unlike nonferrous metals, generally reportedly were purchased legally from Russia and then resold in the West for a profit.[10] Oil refinery products and coal were Estonia's third largest category of imports.[11] Natural gas was imported from Russia in accordance with agreements with Russia's Gazprom organization. According to a report in the Russian newspaper, energy shortages in Estonia were not only the result of the increase in price for Russian fuel, but also resulted from Estonian firms preferring to reexport fuel for hard currency rather than supply domestic consumers.[12]

STRUCTURE OF THE MINERAL INDUSTRY

Estonia was formulating plans to privatize its industries, and the Estonian Privatization Agency has held international competitions at which enterprises were sold to the highest bidders.[13] In March 1994, the Estonian Economic Minister stated at a press conference that out of 180 large state-owned enterprises in Estonia, only 2 that are distilleries would remain under state ownership.[14] *(See table 2.)*

COMMODITY REVIEW

Industrial Minerals

Cement.—Estonia's cement firm is planning to increase cement exports in 1994. Internal demand for cement fell from 840,000 tons per year to only 150,000 tons per year.[15]

Phosphate.—Ground phosphate for direct application had been produced at the Maardu deposit east of Tallinn, but, both as a result of the depletion of this deposit and the serious environmental effects of phosphate mining, production had ceased. Plans were being considered to develop two new deposits, the Toolse and Kabala, in the Rakvere area, but no decision had been made to develop these deposits because of serious environmental concerns.

Mineral Fuels

Oil Shale.—Estonia was the major producer of oil shale in the former U.S.S.R., producing 80% of the former Soviet total output. Eighty percent of the oil shale is used for energy generation and the remaining 20% for chemical production. About one-half of the oil shale was mined from open pits and the other one-half from underground mines with five mines and three open pits in operation. More than 60% of the ore undergoes beneficiation. The main consumers of oil shale are the Pribaltiskiy and Estonskaya powerplants, the Kohtla-Järve and Kiviyli oil shale processing plants, the oil shale chemical plant in the city of Slantsy in Russia, and a heating plant in Kohtla-Järve. Estonia was experiencing serious environmental problems because of its use of oil shale for fuel in powerplants, but Estonia at present does not have any good economic alternatives to its use of oil shale.

Reserves

Reserves in Estonia were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section on the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Estonia, which has a 1,939-kilometer-long Baltic coastline to the west, is bounded on the east by Russia and to the south by Latvia. The major maritime ports are Tallinn and Parnu. The inland port of Narva is on the Narva River, which flows into the Gulf of Finland about 80 kilometers from Narva. Estonia had, as of 1990, 1,030 kilometers of rail lines and 30,300 kilometers of highways, of which 29,200 kilometers is hard surfaced. Pipelines supply oil and natural gas from Russia. Ethnically, the population is, reportedly, as of 1989 61.5% Estonian, 30.3% Russian, and less than 2% Belarussians, Ukrainians, Finns, and other nationalities.

OUTLOOK

Estonia is the one Baltic State that has significant fuel production from its oil shale and that also has significant phosphate reserves that could be of economic significance. However, both of these industries pose serious environmental problems, and the future of both of these mineral industries will depend on a resolution of these problems. If adequate solutions are not found, then Estonia will be left with mineral industries similar to other Baltic States, which mainly mine peat and construction materials. If solutions are found, then Estonia will be able to continue supplying a much larger percentage of its fuel requirements than other Baltic countries and also could become a phosphate exporter.

As the Baltic State closest to Scandinavia and also on the western border of the former U.S.S.R., Estonia is well positioned to develop economic ties with northern Europe as well as with Russia and the other Baltic States. Estonia's economic ties will depend on its process of economic transformation and the processes of economic transformation occurring in neighboring countries of the former U.S.S.R. Its future economic ties also will depend to some extent both on political and economic decisions in Scandinavian and other European countries regarding the amount of assistance and cooperation that will be given to the Baltic countries for integrating their economies with the market economies of Western Europe and on the activities of foreign investors on developing industries in these countries.

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[1]Text prepared June 1994.

[2]Foreign Broadcast Information Service (Washington, DC). Jan. 31, 1994, p. 89; ARIPAEV, No. 146, Dec. 24, 1993, pp. 46, 47.

[3]Radio Free Europe/Radio Liberty Research Report. News Briefs. Feb. 14-18, 1994, p. 18.

[4]Foreign Broadcast Information Service (Washington, DC). May 17, 1994, p.67; WS, Tallinn, May 13, 1994.

[5]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Dec. 24, 1994, p. WE/4; Estonian Radio, Tallinn, Dec. 8, 1993.

[6]Foreign Broadcast Information Service (Washington, DC). Jan. 14, 1994, p. 66; ARIPAEV, No. 7, Dec. 1, 1993, p. 8.

[7]———. Mar. 28, 1994, p. 54; EESTI STATISTIKA, No. 12, 1993.

[8]———. Jan. 14, 1994, p. 67; ARIPAEV, No. 7, Dec. 1, 1993, p. 8.

[9]Estonia, Tallinn. Jan. 12, 1994, p. 2.

[10]Work cited on footnote 9.

[11]Work cited in footnote 5. Mar. 3, 1994, p. 32.

[12]Izvestiga, Moscow, Feb. 4, 1994, p. 4.

[13]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Apr. 1, 1994, p. WB/2; Estonian Radio, Tallinn, Mar. 24, 1994.

[14]———. Apr. 1, 1994, p. WB/2; ETA News agency, Tallinn, Mar. 18, 1994.

[15]Interfax Business Report, Interfax-America, Dever, Colorado. Sept. 23, 1993, p. 5.

TABLE 1
ESTONIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Amnonia, nitrogen content		117,000	100,000	250,000
Cement		482,700	354,200	1,500,000
Clays:				
For bricks	cubic meters	100,000	90,000	150,000
For cement		70,000	60,000	100,000
Oil shale		18,800,000	14,700,000	25,000,000
Peat		3,000,000	2,200,000	6,000,000
Sand and gravel	cubic meters	15,000,000	14,000,000	25,000,000
Silica sand, industrial		30,000	25,000	50,000

[e]Estimated.

TABLE 2

ESTONIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Amnonia, nitrogen content		Kohtla-Jäve nitrogenous fertilizer plant	Kohtla-Jarve	250
Cement		Kunda plant	Kunda	1,500
Limestone, for cement		Punane and Kunda deposits	Punane-Kunda region	NA
Oil shale		Estonslanets associations, includes seven mines, four open pits, and five beneficiation plants	Kohtla-Järve region	25,000
Peat		388 deposits under exploitation	Production in all regions of country, but major facilities in northern and southeastern part of country	6,000
Phosphate rock		Maardu (operation, suspended)	Maardu	500
Sand, for glass		Piuza deposit	Southeastern part of country	50
Sand and gravel	cubic meters	Production at more than 700 deposits, largest enterprises: Silikat association exploiting Tallinn deposit	Tallinn region	2,000,000
Do.		Akhtmeskiy industrial materials complex exploiting Pannyarve deposit	Pannyarve region	1,500,000
Do.		Vyrukivi plant exploiting Abissaare, Koryusmyae, Pyussapalu deposits	Southeastern part of country	1,500,000
Do.		Tartu construction materials plant exploiting Vooremyagi and Kukemetsa deposits	Tartu region	800,000

NA Not available.

TABLE 3

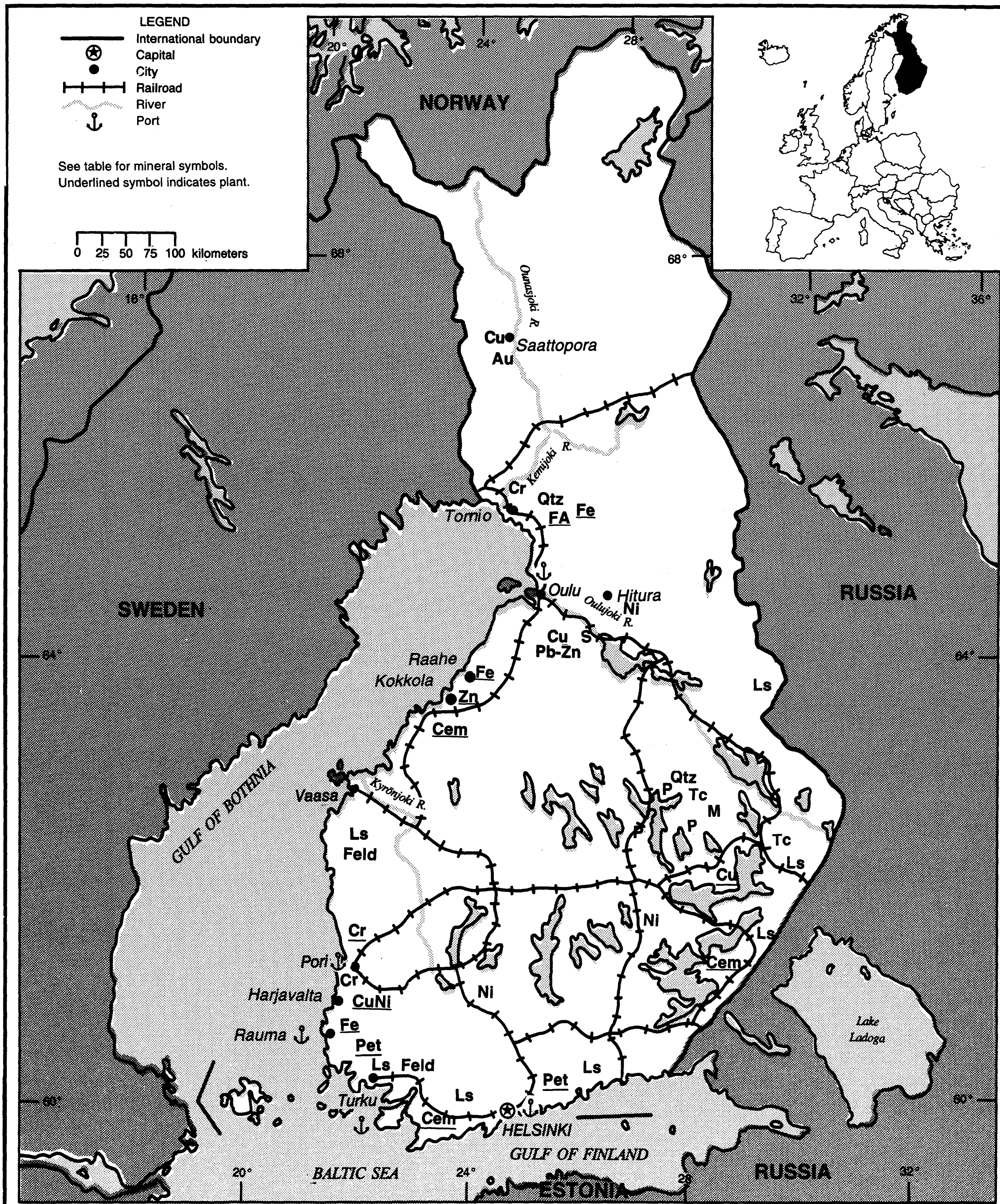
ESTONIA: RESERVES OF MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Resources
Clays:		
For ceramics	cubic meters	40,000,000
For cement		65,000
Oil shale		5,700,000
Peat		2,000,000
Phosphate ore, 12% P_2O_5 content		1,300,000

FINLAND

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



THE MINERAL INDUSTRY OF

FINLAND

By Jozef Plachy

Generally, ore deposits in Finland are limited, mostly located below the ground, and hard to mine and enrich. Consequently, the mineral industry contributes only about 0.3% of the gross domestic product[1] (metals, 62%; industrial minerals, 14%; and peat, 12%). However, in spite of the relative scarcity of energy resources and raw materials, Finland exerts considerable influence on the global mining industry. Because of the mining company Outokumpu Oy and the mining supplier Finnminers, Finland is a world leader in underground mining technology, ore processing, and metallurgy.

GOVERNMENT POLICIES AND PROGRAMS

According to the 1992 amendment to the Finnish Mining Law, any individual, corporation, or foundation having its principal place of business or central administration within the European Economic Area (EEA) will enjoy the same rights to explore and exploit deposits of minerals and ores as any Finnish citizen or corporation. The new law will become operational simultaneously with the acceptance of Finland into the European Union (EU).

At the end of 1993, despite privatization, Government involvement in the mineral industry of Finland was still considerably higher than in other EU countries. State-owned companies—Finnminers Group, Kemira Oy, Outokumpu Oy, and Rautaruukki Oy—dominate the domestic mineral industry. Government-founded organizations—the State Geological Research Institute and the State Technological Research Center—are active in exploration and research.

PRODUCTION

Domestic raw materials account for about one-half of the value of raw materials used annually by the Finnish industry. Due to the continued recession, mainly in the construction industry, the overall production of minerals declined slightly in 1993. *(See table 1.)*

TRADE

In view of the diminishing supply of indigenous metalliferous raw materials, most of the feed for smelters had to be imported (100% of iron concentrate, 80% of zinc concentrate, 70% of copper concentrate, and 60% of nickel matte and concentrate). Steel and metal product exports account for about 10% of total exports.

Sales of mining equipment and technology have been expanding outside of national borders. In 1993, between 80% and 90% of Finnminers' business was in overseas countries. Similarly, about 90% of Outokumpu's sales are generated in markets outside of Finland.

STRUCTURE OF THE MINERAL INDUSTRY

Different segments of Finland's mineral industry are dominated by Outokumpu Group (base metals and mining technology), Finnminers Group (hard-rock drilling/loading and ore processing), Rautaruukki Group (steel production), and Kemira (chemicals).

Outokumpu Group is a vertically integrated base metal producer, employing about 16,000 people in 25 countries generating about $3 billion in sales.[2] It is divided into four segments: Base Metals, Copper Products, Stainless Steel, and Technology. As reserves at its Finnish mines have diminished, Outokumpu has increased its overseas mining interests, through purchase and through exploration and development. In addition to domestic mines (Enonkoski, Hitura, Kutemajarvi, Pyhasalmi, Saattopora, and Vammala), Outokumpu has mining interests in Australia (Forrestania and Thalanga), Chile (Zaldivar), Ireland (Tara), Norway (Grong), and Sweden (Viscaria). The increased profits from overseas operations, due to the devaluation of the Finnish markka, were negated by continued stagnation of the domestic construction industry, which uses about 50% of Outokumpu's production of zinc, 36% of copper, and between 10% and 15% of its stainless steel.[3]

Finnminers Group is a promotional organization for most of the major manufactures of mining and processing equipment. It functions under the auspices of Finnish Foreign Trade Association. Particular strengths of Finnminers Group are hard-rock drilling and loading, especially for underground mining (Tamrock); specially designed and built support vehicles (Normet); crushing and grinding equipment (the Nordberg Group); and screening and materials handling (Roxon Oy).

Rautaruukki Group is a highly integrated steel corporation with exports and operations abroad accounting for about 75% of its net sales. Rautaruukki's three largest divisions—Steel, Thin Sheet, and Tubular Products and Sections—contribute about 85% of its net sales. Rautaruukki is raising about $58 million through share issue that will improve its balance and reduce the Finnish Government's stake in the group from 86.8% to 81.1%.

Kemira, the largest chemical enterprise in Finland, specializes in fertilizers, fibers, and pigments. It has production plants in 13 countries on 3 continents. About 50% of Kemira's sales is generated by Kemira Agro, which produces fertilizers. During its 33 years, the Kemira TiO_2 Division became the fifth largest producer of titanium oxide in the world. *(See table 2.)*

COMMODITY REVIEW

Metals

Chromium.—The only chromite mine in Finland, Outokumpu's Kemi Mine on the coast of Gulf of Bothnia, has proven and probable reserves of about 65 Mmt, while estimated additional mineral resources amount to 80 Mmt.[4] The ore grade is about 26% chromium trioxide and the chromium-iron ratio is reportedly 1.55:1.[5] Despite low metal content, production is economical, because of open pit excavation, selective mining, large average thickness of the deposit (40 m), and optimum location—40 km from the Tornio ferrochrome plant and 20 km from Ajos port. Run-of-mine production in 1993 was 1 Mmt, which was beneficiated to about 200,000 tons of 33% Cr_2O_3 upgraded lumpy ore, 300,000 tons of 42% Cr_2O_3 metallurgical-grade concentrate, and 10,000 tons of foundry sand.[6]

During the past 10 years, exploration efforts have been concentrated largely in northern Finland. Chromite layers have been encountered in the Kukkola, Tornio, Penikat, Koitelainen, and Burakovski intrusions.

Cobalt.—Outokumpu sold its entire 96% interest in the Outokumpu-Mooney Group (OMG) in October 1993. The shareholding was sold to international investors through a NASDAQ listing in the United States for $129 million.[7] OMG is reportedly the world's largest producer of cobalt and nickel chemicals with a capacity of 2,500 mt/a in cobalt and 6,000 mt/a in nickel chemicals. In addition to the Kokkola plant in Finland, OMG owns production facilities in France and the United States.

Copper.—There are no copper mines in Finland and the only two polymetallic mines containing copper are Pyhasalmi in central Finland and Saattopora in the northern part of the country. Owing to diminishing indigenous copper resources, Outokumpu Copper Resources has invested heavily in domestic and overseas exploration. In the overseas exploration, the primary recipient of investment was Chile, where Outokumpu is coowner of the Zaldivar copper deposit. The main zone reportedly contains estimated proven reserves of 158 Mmt of ore grading 0.89% copper.[8] The mine, scheduled to start production in the second half of 1995, will be managed by Compania Minera Zaldivar, which is jointly owned by Outokumpu and Placer Dome Inc. of Canada. Outokumpu also is involved in two additional deposits in Chile: Pinta Verde (estimated 200 Mmt of 0.62% copper[9]) and Santa Catalina (possible 100 Mmt sulfide and oxide ore of 1.1% copper content[10]).

All concentrates, domestic and imported, are smelted at Outokumpu's Harjavalta or Pori plants, both in the southwestern part of Finland. To process the increased imports, Outokumpu has decided to expand and modernize both plants. Approximately 15 million new shares will be issued to finance it. Copper smelting capacity will be increased from 100,000 mt/a to 160,000 mt/a,[11] while the cathode copper capacity of the electrolytic refinery will increase by 55,000 mt/a to 125,000 mt/a.[12] The $312 million project should be completed by 1996.

Ferrochromium.—Like chromite mining, ferrochromium production started in 1968 at Tornio, 40 km away from the mine. The plant feeds molten ferrochrome into the adjacent steel melting shop of Outokumpu Polarit. Smelting takes place in an enclosed, highly energy-efficient submerged arc furnace. Production in 1993 was 218,000 tons,[13] 17% higher than that in 1992.

Outokumpu is planning to target the North American market in a bid to increase charge chrome sales to make up some of the European market share lost to the former U.S.S.R. and South Africa.

Gold.—Investment in gold exploration in the 1990's led to the discovery of the Pampalo gold deposit (0.8 Mmt grading 7 g/mt[14]) and a number of potential deposits at Ilomantsi district (Hattu schist belt) and in northern Finland (Kuusamo schist belt).

The Kutemajarvi gold deposit at Orivesi, in the Tampere schist belt in southern Finland, is estimated to contain 430,000 tons of ore averaging 7.2 g/mt of gold.[15] Open pit mining by Outokumpu reportedly began in October 1993 and is expected to yield about 2,500 kg[16] of gold during a 3-year period. The ore is transported to nearby Vammala, where it will be processed after nickel beneficiation will end in mid-1994.

Nickel.—At present, there are three nickel mines in Finland, all owned by Outokumpu Oy. Because of the high magnesia content of Hitura ore (11% Mg[17]), the concentrate is used by the nearby Kokkola plant for manufacture of nickel chemicals. The nickel concentrates from two other mines, Enonkoski and Vammala, are either smelted at the Harjavalta smelter or used in the manufacture of stainless steel at the Tornio plant. The Enonkoski underground nickel-copper mine at Laukunkangas in southern Finland produces about 0.8 Mmt/a run-of-mine ore and should be exhausted by 1994. Locally produced concentrate (40,000 mt/a to 60,000 mt/a of 10% Ni and 25% Cu) is trucked to the Harjavalta smelter, 400 km away. Production at the Vammala underground mine, 170 km north of Helsinki, has been steadily declining and also should close by mid-1994.

Because of imminent closure of ingenious mines, raw material for the expanded Harjavalta nickel smelter will be sourced from two mines in Australia, primarily from Outokumpu's wholly owned Forrestania nickel mine and through a long-term purchase agreement for concentrates from Western Mining Corp.'s Mount Keith nickel mine.

Domestic and foreign concentrates and matte are processed at Outokumpu's Harjavalta smelter. Concentrate is smelted in a flash furnace and Pierce-Smith converters, matte is granulated, and acid is leached and refined by electrowinning. As part of a $312 million expansion and modernization project, the Harjavalta nickel smelting capacity will grow from 18,000 mt/a to 32,000 mt/a[18] by 1996. Existing facilities will be modernized, considerably reducing emission and nearly doubling output.

Steel.—All steel production in Finland is from imported iron ore and concentrates. Two-thirds is sourced in the form of fines from Sweden's LKAB and the balance from Russia (pellets from Kostamus and fines from Olenogorsk). The largest producer of steel is the highly integrated steel corporation, Rautaruukki Oy. Its three largest divisions—Steel, Thin Sheet, and Tubular Products and Sections—contribute more than 85% of its net sales. They all utilize the crude steel produced at Rautaruukki's 2.2-Mmt/a-capacity[19] Raahe Steel Works, which consists of a coking plant, blast furnaces, a steel plant, a plate rolling mill, and a strip rolling mill. Production in 1993 was 2.2 Mmt,[20] a 5% increase over that of 1992. In 1993, the Thin Sheet Div. produced 763,000 tons[21] of cold-rolled, galvanized, and coil-coated sheets, and the Tubular Products and Sections Div. produced 505,000 tons[22] of welded tubes and cold-formed sections. About 30% of the steel for tubular products is purchased from other steelworks.

Outokumpu's Stainless Steel is a fully integrated mine-to-mill operation consisting of three business sectors: Outokumpu Chrome, Outokumpu Polarit, and JA-RO. Outokumpu Polarit, adjacent to the ferrochrome plant in Tornio, produces stainless and acid-resistant hot- and cold-rolled plates, sheets, and strip. The 1993 production of steel slabs was 371,000 tons[23] (hot rolling capacity 500,000 mt/a[24]) and 228,000 tons of cold-rolled products (the capacity of two mills is about 250,000 mt/a[25]). In 1993, the oldest annealing and pickling lines were renovated, and a decision was made to install a new cold-rolling mill by the end of 1995. JA-RO in Pietarsaari and Veteli produced about 19,000 tons of stainless welded tubes and fittings.

Zinc.—After closure of the Vihati Mine in 1992, Finland was left with only the Pyhasalmi Mine, 380 km north of Helsinki. The polymetallic sulfide ore deposit amounts to 6.4 Mmt of contained metal, graded 2% zinc, plus 0.9% copper, 39% pyrite, and some gold and silver.[26] Average production is about 20,000 mt/a of contained zinc and 8,000 mt/a of contained copper. The zinc concentrate is shipped by rail to the Kokkola smelter while copper concentrate is transported to the Harjavalta smelter. Because of diminishing reserves, Outokumpu's Tara Mine in Ireland is gaining in importance. At present, together with the Pyhasalmi Mine, they supply about 80% of the feed for the Kokkola smelter.

The Kokkola smelter came on-line in 1969. Current average production is about 170,000 tons of zinc, plus 600 tons of cadmium, 80 tons of mercury, and about 30 tons of selenium.[27] The smelter is close to the sea, an important asset because 85% to 90% of output is exported.

Industrial Minerals

Cement.—In 1993, the Partek Cement Oy was sold to Swedish Euroc. Partek Cement was created in 1992, when cement operations of Partek Minerals Oy and Metra Corp. were combined in a single company. The company had three production plants: in Pargas (0.7-Mmt/a capacity), in Virkkala (0.7-Mmt/a capacity), and in Lappeenranta (0.5-Mmt/a capacity). About 30% of production is supplied to sister companies (Partek Vetonit and Partek Betonila) for manufacturing concrete products. Because of a projected 5% to 10% decline in Finnish construction activity in 1994, on top of a 15% to 20% decline in 1993, Euroc has decided to close the Virkkala plant in January 1994.[28]

Mica.—The only producer of mica in Finland is Kemira Oy. At its Siilinjarvi apatite mine, mica is extracted during the wet beneficiation of apatite from crude ore. The ore contains approximately 10% apatite, 16% calcite, 3% dolomite, 65% different micas, and 6% other silicates.[29] After separation from crude ore, mica is wet ground and fractionated to specified particle sizes. Production amounts to about 10,000 mt/a of coarse-grade mica and about 5,000 mt/a of fine-ground, mostly muscovite, mica. The fine-ground mica is used to manufacture pearl lustre pigment at the 12,000-mt/a-capacity plant near Kemira's titanium dioxide plant in Pori.

Mineral Fuels

Finland is one of the highest energy consumers in Western Europe and only about one-third of its energy requirements is covered by indigenous sources, namely hydro and nuclear power, peat, and wood. All the other energy sources—coal, natural gas, and petroleum—are imported. About 29% of energy consumption in 1992 was met by oil, 22% by nuclear energy, 13% by hydropower, 10% by natural gas, and 9% by coal.[30] Most of the energy is used by industry (46%), followed by heating (23%) and transportation (13%). About 60% of industry's need for energy is used to produce pulp and paper.

Electric Energy.—The latest addition to the network of powerplants is the 560-MW Meri-Pori coal-fired powerplant.[31] The boiler plant went into service in February 1993, followed by the turbine plant in March and was fully operational by November of the same year. Although sulfur and nitrogen emissions are very low, no viable system has been developed to significantly reduce carbon dioxide.

Natural Gas.—All natural gas is imported from Russia, via pipeline to Tampere, a large industrial city north of

Helsinki. It accounted for 10% of total energy consumption. The pulp and paper industry as well as district heating plants are major users. Import and distribution are managed by Neste Oy.

Nuclear Power.—Finland operates four nuclear reactors, two in Olkiluoto in western Finland and two at Loviisa in the eastern part of the country. It supplies about 29% of the electricity generated in Finland.

A total of 3,500 MW of additional electric generation capacity will be needed in Finland by the year 2005, according to a recent survey by the Ministry of Trade and Industry. Because of Finland's lack of indigenous energy resources and minimal potential for additional hydropower plants, nuclear power and timber gasification have been viewed as the best alternatives for future powerplants.

Peat.—Despite a small contribution to total energy consumption (4.5%), peat plays a major role in Finland's economy. It is the lowest priced fuel and more than 10 Mha, about one-third of the total surface area of the country, is classified as peatland. However, only about 5% to 6% of this area is suitable for large-scale peat production, amounting to about 70 billion m^3.[32] About 85% of the production is milled peat, and the rest is sod peat. Of the total production, about 95% is used for fuel, while the remainder is used in agriculture. Milled peat can be used in boilers ranging in size from 5 MW to 400 MW.

Petroleum.—All crude oil is imported, mainly from Norway (44%) and the United Kingdom (33%). It is refined in two refineries operated by the Government-owned Neste Oy and in the southern coast of Finland. Finnish industries are gradually replacing oil with natural gas and electric energy; thus, the proportion of oil in total energy consumption decreased from 56% in 1973 to about 30% in 1993.

Reserves

Metalliferous metal reserves in Finland are slowly being depleted. Only the Pyhasalmi and Kemi Mines have enough reserves to last past the end of the century. New discoveries, few of commercial quantities, are mostly in precious metals. Only reserves of industrial minerals are abundant, mainly apatite, peat, and phosphate rock. *(See table 3.)*

INFRASTRUCTURE

Finland has a total of 5,924 km of railroads, of which 1,445 km is electrified and 480 km is multiple track. Nearly 99% is state-owned and operated by the Finnish State Railways. Most of the 103,000 km of highways are in the more densely populated southern part of the country. Out of the total 6,675 km of inland waterways, about 3,700 km is suitable for steamers. The merchant marine consists of 80 ships, including 26 roll-on/roll-off, 17 cargo, 18 tanker, and 7 bulk ships. There are five major ports (Helsinki, Oulu, Pori, Rauma, and Turku), six secondary ports, and numerous minor ports.

OUTLOOK

According to current estimates, the Saattopora gold mine and the Vammala and Enonkoski nickel mines will be closed in 1994, leaving the Hitura nickel mine, the Kemi chromite mine, and the Pyhasalmi polymetallic mine operating beyond this century. To fully utilize the expanding capacity of smelters, domestic exploration has been intensified and mineral activities in foreign countries were expanded. During the past 2 years, the Geological Survey of Finland has identified four metallic ore deposits and four occurrences of industrial minerals. The most promising is the nickel-copper deposit near Sodankyla, particularly the multimetal occurrence at Keivitsa, where preliminary exploration suggests at least 50 Mmt and possibly 100 Mmt of contained copper and nickel, plus platinum and gold.[33] Together with the outcome of foreign investment, proven nickel, copper, and zinc reserves owned by Outokumpu totaled 550 Mmt as of early 1993.

Because of 3 long recession years, privatization has been deferred until company shares will be more valuable. The future privatization is more a widening of ownership, because the state intends to keep more than 50% of the shares in most of the companies.

---

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[5]Outokumpu Chrome Oy. Kemi Mine, Finland. pp. 24-25.

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[9]Mining Magazine, Panorama: Outokumpu's Chilean Copper Venture. V. 167, No. 5, Nov. 1992, pp. 304-305.

[10]Mining Journal, Development: Outokumpu's Santa Catalina Name Change. V. 320, No. 8228, June 11, 1993, p. 25.

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[12]Page 11 of work cited in footnote 2.

[13]Page 14 of work cited in footnote 2.

[14]Mining Journal. Focus and Comment: Nordic Opportunities. V. 322, No. 8267, Mar. 18, 1994, pp. 198-199.

[15]Mining Magazine. New Gold Mine To Open in Finland. V. 169, No. 2, Aug. 1993, p. 6.

[16]Work cited in footnote 15.

[17]Outokumpu Finnmines Oy. Hitura Mine, Finland. pp. 25-27.

[18]Page 11 of work cited in footnote 2.

[19]Rautaruukki, Annual Report 1993. p. 35 of 50.

[20]Page 35 of work cited in footnote 19.

[21]Page 38 of work cited in footnote 19.

[22]Page 40 of work cited in footnote 19.

[23]Page 14 of work cited in footnote 2.

[24]Outokumpu News. Outokumpu Steel: Strength From Inegration. V. 30, No. 2/93, Feb. 1993, p. 12.

[25]Work cited in footnote 24.

[26]Page 11 of work cited in footnote 2.

[27]U.S. Department of State telegram from Helsinki, R 140454Z July 1993, Quantity of Minerals Produced in Finland.

[28]Euroc. Annual Report 1993, p. 21.

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Agencies

Central Statistical Office of Finland
SF-00101 Helsinki, Finland
Geological 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

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Bulletin of Statistics, Central Statistical Office.
Outokumpu, Annual Report, 1993.
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TABLE 1
FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum metal, secondary		27,989	23,900	[r]22,100	27,300	22,000	45,000
Cadmium metal, refined		612	569	593	590	600	700
Chromite:							
Gross weight:							
Lump ore[e]	thousand tons	353	347	320	250	200	340
Concentrate	do.	140	[e]137	[e]133	229	300	320
Foundry sand[e]	do.	20	20	20	20	20	40
Total	do.	513	504	473	499	520	700
Cr_2O_3 content:							
Lump ore[e]	do.	92	90	[r]90	54	45	60
Concentrate	do.	65	[e]64	[r]60	143	180	145
Foundry sand[e]	do.	15	15	[r]15	3	3	6
Total	do.	172	[e]169	[r] [e]165	200	228	211
Cobalt, metal, powder, and salts		1,295	1,300	1,503	[2]2,100	2,150	2,500
Copper:							
Mine output, Cu content		14,459	12,611	[r]11,732	9,274	11,100	10,000
Metal:							
Smelter		79,470	90,180	[r]90,055	121,900	107,200	160,000
Refined		55,689	65,103	[r]64,455	79,900	73,400	155,000
Gold metal	kilograms	2,510	2,813	[r]2,200	1,595	1,700	3,000
Iron and steel: Metal:							
Pig iron	thousand tons	2,284	2,283	2,331	2,452	2,400	3,000
Ferroalloys, ferrochromium	do.	169	157	190	187	210	230
Steel, crude	do.	2,921	2,861	2,890	3,077	3,100	3,550
Semimanufactures, rolled	do.	2,452	2,486	[e]2,478	2,300	2,300	2,500
Lead: Mine output, Pb content		[e]2,567	[e]1,700	[r]1,300	576	500	600
Mercury		159	141	74	85	85	150
Nickel:							
Mine output, Ni content		10,480	11,524	[r]9,900	9,870	7,000	10,000
Metal, electrolytic		13,355	16,882	13,850	14,781	14,800	21,250
Platinum-group metals:[e]							
Palladium	kilograms	100	100	100	100	100	100
Platinum	do.	60	60	60	60	60	60
Selenium metal	do.	27,969	31,160	35,000	30,000	30,000	35,000
Silver metal	do.	31,127	28,508	[r]30,000	27,200	29,300	30,000
Zinc:							
Mine output, Zn content		[e]58,430	51,700	[r]55,500	30,785	20,000	25,000
Metal		162,508	174,923	170,400	170,500	171,000	170,000
INDUSTRIAL MINERALS							
Barite		1,614	—	—	—	—	—
Cement, hydraulic	thousand tons	1,596	1,666	1,324	1,129	1,100	1,670

See footnotes at end of table.

TABLE 1—Continued

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Feldspar		54,581	52,630	[r]53,000	47,500	45,000	50,000
Lime	thousand tons	[e]224	[e]225	[r]225	241	250	300
Mica[e]		15,000	15,000	[r]15,000	5,100	5,000	15,000
Nitrogen: N content of ammonia		41,600	23,300	[e]23,600	10,000	10,000	20,000
Phosphate rock, apatite concentrate:							
Gross weight	thousand tons	580	546	472	555	600	700
P_2O_5 content	do.	214	[e]201	[r]170	201	215	250
Pyrite, gross weight	do.	730	672	724	653	650	700
Sodium sulfate[e]	do.	33	33	33	30	30	35
Stone, crushed:							
Limestone and dolomite:							
For cement manufacture	do.	2,107	[e]2,397	[r]2,000	1,554	1,500	2,000
For agriculture	do.	1,188	[e]1,269	[r]950	796	750	1,000
For lime manufacture	do.	464	[e]439	[r]400	364	350	500
Fine powders	do.	579	[e]648	[r]510	475	450	500
Metallurgical	do.	25	[e]1	[r]4	2	2	5
Total	do.	4,363	4,754	3,864	3,191	3,052	4,005
Quartz silica sand	do.	274	276	201	169	160	250
Sulfur:							
S content of pyrite	do.	306	357	[r]369	350	350	400
Byproduct:							
Of metallurgy	do.	180	237	227	225	225	250
Of petroleum	do.	[e]41	[e]42	[r]40	32	32	40
Total	do.	527	636	[r]636	607	607	690
Sulfuric acid	do.	[e]1,392	[e]1,325	[r]1,300	1,320	1,300	1,500
Talc	do.	398	385	361	371	370	400
Wollastonite		21,634	29,844	[r]28,000	27,800	28,000	30,000
MINERAL FUELS AND RELATED MATERIALS							
Peat:							
For fuel use	thousand tons	4,590	4,500	2,308	5,103	5,000	6,000
For agriculture and other uses	do.	451	330	220	355	350	500
Petroleum refinery products[e]	thousand 42-gallon barrels	[2]74,000	72,500	73,000	73,000	73,000	75,000

[e]Estimated. [r]Revised

[1]Table includes data available through May 1994.

[2]Reported figure.

TABLE 2
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Ammonia		Kemira Oy (Government 100%)	Plant at Oulu	75
Cement		Partek Cement oy (Partek Corp. 50% and Metra Corp. 50%)	Plants at Lappeenranta, Pargas, and Virkkala	1,670
Chromite		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Mine at Kemi	700
Cobalt, powder and salt		Outokumpu-Mooney Group (Outokumpu 96%)	Smelter at Kokkola	3
Copper:				
Ore, Cu content		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Mines at Pyhasalmi and Saattopora	10
Metal		do.	Smelters at Harjavalta and Pori	160
Feldspar		Lohja Oy (Metra Corp. 100%)	Mines and plants at Haapaluoma, Kemio, and Peraseinajok	50
Ferrochrome		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Smelter at Tornio	230
Gold, Au content	tons	do.	Mine at Saattopora	1
Limestone		Partek Minerals Oy (Partek Corp. 100%)	Mines at Kolari, Lappeenranta, and Pargas	1,900
Do.		Lohja Oy (Euroc, 100%)	Mines at Mustio and Sipoo	1,650
Do.		Rauma-Repola Oy	Mine at Turnio	300
Mercury		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Smelter at Kokkola	150
Mica		Kemira Oy (Government 100%)	Mine at Siilinjarvi	15
Nickel:				
Ore, Ni content		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Mines at Enonkoski, Hitura, and Vammala	10
Metal		do.	Smelter at Harjavalta	20
Phosphat[e] apatite		Kemira Oy (Government 100%)	Mine at Siilinjarvi	600
Pyrite		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Mine at Pyhasalami	500
Quartz and quartzite		Lohja Oy (Euroc, 100%)	Mines at Kemio and Nilsia	250
Selenium		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Smelter at Pori	35
Silver		do.	Do.	30
Steel		Rautaruukki Oy (Government 81%)	Plant at Raahe	2,100
Do.		Fundia AB (Norsk Jenverk AS of Norway 50% and Rautaruukki 50%)	Plants at Aminnefors, Dalsbruk, and Koverhar	850
Do.		Ovako Oy (SKF 50%, Wartsila 25%, and Fiskas 20%)	Plant at Imatra	600
Talc		Finnminerals Oy (Euroc 50% and Yhtyneet 50%)	Mines at Lahnaslampi, Lipsavaara, Luikanlahti, and Polvijari	400
Wollastonite		Partek Minerals Oy (Partek Corp. 100%)	Mine at Lappeenranta	30
Zinc, ore, Zn content		Outokumpu Oy (Government 57.5% and Insurance Co. 16%)	Mine at Pyhasalami	35

TABLE 3
FINLAND: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

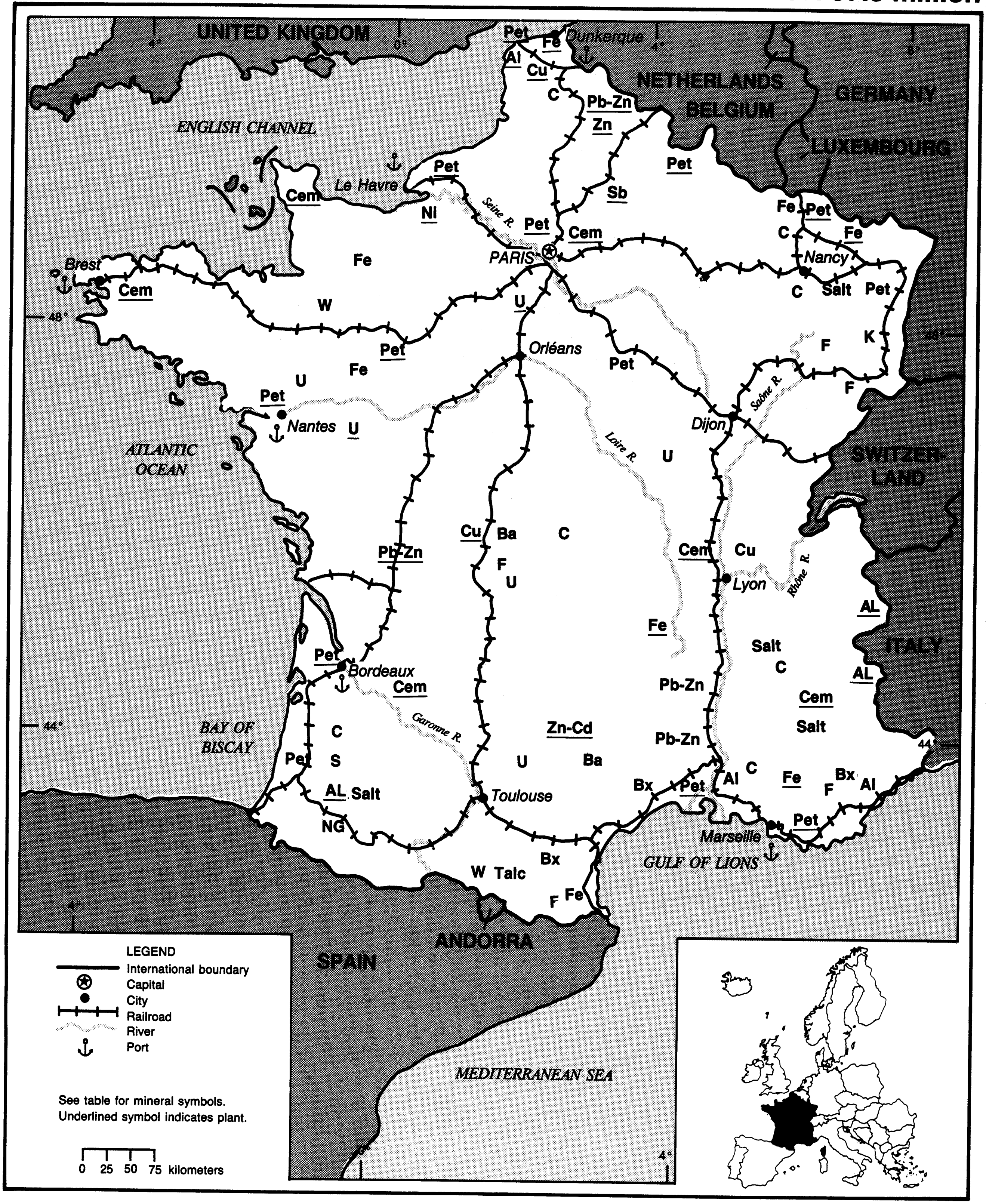
(Million metric tons unless otherwise specified)

Commodity		Reserves
Apatite		350
Chromium		140
Clays	billion cubic meters	100
Copper, metal content	thousand tons	60
Gold, metal content	tons	6
Nickel, metal content	thousand tons	14
Peat	billion cubic meters	70
Phosphate rock		100
Silver, metal content		90
Talc	tons	40
Wollastonite		24
Zinc, metal content	thousand tons	130

FRANCE

AREA 547,000 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 owing 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.

French economic growth has been slowing down since 1991 although real gross domestic product (GDP) growth has matched the average for Organization for Economic Cooperation and Development (OECD) countries for the past 5 years. The GDP was expected to decline by 1% from the previous year's 1.2%.

The French economy has performed well relative to its European neighbors. One bright spot was the rate of inflation, which was about 2.2% at midyear. This was one of the lowest rates in the European Union (EU). The country does face a serious problem with unemployment, which was estimated at 12% of the work force at yearend.

GOVERNMENT POLICIES AND PROGRAMS

The French Government was continuing to reduce the budget deficit with policies 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 the advent of the unified European internal 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 (EU) standard rate of 18.6%. Many state-controlled industries have made significant strides in preparing themselves for the unified European internal market.

France's 1993 privatization law prevents the Government from selling more than 20% of a firm's capital to non-EU investors. However, the law does not prevent private EU investors from selling their shares to non-EU investors. Shares already held by non-EU investors are not affected by the 20% limit.

In addition, the Government retains the right to block sales of any assets considered essential to the national interest and to exert control over company management, even after privatization is completed.

ENVIRONMENTAL ISSUES

The main aims of the National Environmental Plan of 1990 were to cut air pollution by 20% to 30%, to increase the share of treated household waste by 60% as compared with the current 40%, and to improve waste recycling. The special depreciation allowance of 50% during the first year for environmental investment has been extended to air and water pollution control equipment.

Also, a law has been proposed by local authorities to introduce a tax on the dumping of solid waste as well as a prohibition on the dumping of untreated waste.

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. Bauxite is no longer mined in France.

The coal and iron ore industries were affected by cheaper foreign sources and the depletion of domestic resources. Coal mining is in the hands of Charbonnages de France (CdF), a state-owned company. As a result of the high cost of underground production in comparison to cheaper imported coal, CdF was maintaining its policy of investing in high productivity mines and closing uneconomic operations.

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 former 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 the OECD countries were continuing. There were also strong commercial relations between France and the United States. The continuing recession in Germany, France's largest exporting trading partner, had a significant impact. Exports from France to Germany declined by an estimated 4%.

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 single European market resulted in numerous mergers, closures of operations, and co-operative ventures as companies sought ways to obtain competitive advantages. Some industries that have benefitted 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; CdF; Compagnie Generale des Matieres Nucleaires (Cogema); Gaz de France (GdF); Rhône-Poulenc S.A.; Bureau de Recherches Geologiques et Minieres (BRGM) and its subsidiary; Compagnie Francaise des Mines S.A. (*See table 5.*)

The Government was proceeding with a privatization program involving 21 large state-controlled companies. Included among these were SNEA, Rhône-Poulenc, and Usinor-Sacilor. The selloff was to begin on a company-by-company basis, with the Government hoping to raise about $7.25 billion[1] the first year.

COMMODITY REVIEW

Metals

Alumina and Bauxite.—French bauxite production had ceased altogether by the beginning of 1993. 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.—At a reported average cost of $1.27/kg, France was considered the lowest cost aluminum-producing country in Europe. The main reasons were lower energy costs and advanced technology.

The Government was proceeding with privatization plans for Pechiney, albeit slowly. The reported reason was that the holding company could not be ceded to private shareholders until it was broken down into smaller entities.

Pechiney was continuing with plans to build specialized foundries for aluminum beverage can recycling. One went on-stream in 1993 at Nogueres at the site of a previous primary aluminum smelter. The foundry has a reported capacity to process 30,000 mt/a of used beverage cans. Cost of the project was estimated to be $710,000.

Antimony.—The Gagneraud Mine at Brouzils, Vendee, 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 and the 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.

Ferroalloys.—Societe Europeenne d'Alliages pour la Siderurgie's (SEAS) new 110,000-mt/a high-carbon ferromanganese and silicomanganese plant was in operation in 1992. The plant, on a 23-ha 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's steelmaking operations.

Société du Ferromanganèse de Paris-Outreau (SFPO) and Samancor S.A. of South Africa entered into an agreement to produce ferromanganese. Samancor will supply between 80,000 and 100,000 mt/a of high-grade ore to SFPO from which SFPO will produce 40,000 to 80,000 mt/a of medium-carbon ferromanganese. SFPO was expected to use the existing blast furnaces at its facility in Boulogne to convert the ore.

Gold.—Gold mining in France was mostly concentrated in Societe des Mines du Bourneix's operations in the Saint-Yrieix la Perche district south of Limoges. 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 completed construction of 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.

It was announced that Mines et Cyanurations de Salsigne (MCS), a joint venture between Peter Hambro PLC of the United Kingdom and Ranger Exploration and Eltin PLC of Australia, had resumed production. The mine, which has open pit and underground operations, was formerly owned by Société des Mines et Produits Chimiques de Salsigne (MPCS). After MPCS went bankrupt, the mining and processing operations were taken over by the aforementioned consortium.

A $17 million capital investment program was underway by MCS and involved a new 500,000-mt/a processing plant and extension of the underground workings.

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.

Lormines S.A. continued with its planned reorganization, and production was about 5 Mmt for 1994 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.

In midyear 1993, the Government listed Usinor-Sacilor, along with Pechiney, Rhone-Poulenc SA, and others, as companies to be privatized. This was not expected to take place before 1996 and would depend on market conditions.

Also, the policy of limiting foreign investment to 20% in privatized companies was lifted. One condition, the "golden share" concept, remained. Any such share taken by the Government would have an unlimited lifespan and would allow it to reject hostile takeover bids.

The European Commission approved the joint reorganization of the production and sales of long steel products by Arbed SA of Luxembourg and Usinor-Sacilor. Under the arrangement, each of the companies would withdraw from certain steel product sectors, allowing the other to be the sole supplier for the two groups. Under the agreement Arbed would end the production and sales of rails and wire rod and Usinor-Sacilor would end the production and marketing of sheet piling and girders.

Also, the Commission gave its approval for Sollac, a subsidiary of Usinor-Sacilor, to take a 30% stake in Barcelonesa de Metales SA of Spain. The Commission ruled that the acquisition did not violate antitrust laws even though Usinor-Sacilor is a principal supplier to the Bamesa Group, of which Barcelonesa is a member. The reason given was that competition in the Spanish and Portuguese market would be maintained by other distributors and low market entry barriers.

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 1993; three are in France and one is in Spain. CFF supplies about 4 Mmt/a of ferrous scrap, which is about 40% of the total French market.

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 concentrations 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 obtained. A production rate of 300,000 mt/a was planned by BRGM. Production was scheduled to begin in early 1994 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, 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), a division of Cogema, 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 mt/a metal content of uranium. 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 1993. 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 that were distinguished by different alumina and iron oxide content. These products were sold to the refractory and ceramic industries.

Barite.—The primary barite 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) calcium carbonate plant at Saint-Croix-de-Mareui became fully operational in 1992. 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-processed 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. 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.

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 ceramics industry.

Other producers were Ste. des Feldspaths du Midi and Ste. des Feldspaths du Morvan. They produce feldspar for the ceramics industry and have annual capacities of 80,000 mt/a and 50,000 mt/a, respectively.

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 Bastîde-a-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.

The other main producer is Societe Industrielle du Centre's Rossignol Mine in Chaillac. The mining operation extracts ore from a 1,000-m-long vein. The facility reportedly has the capacity to process 50,000 mt/a of crude ore to produce both metallurgical-grade and acid-grade feldspar.

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 and accounts for almost one-half of the total gypsum produced. 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 ones 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 mined in the Charante Basin to the southwest, producing more than 1 Mmt/a.

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 byproduct mica.

Potash.—Mines de Potasse d'Alsace S.A. (MDPA) was the principal producer of potash with two mines, Marie-Louise and Amelie, located 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 (CSMSE) at Varangeville in northeastern France.

Talc.—Talc 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 Talc de Luzenac S.A. As a result of this, in 1991, RTZ Corp. became one of the major talc producers in the world.

Talc 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, CdF was proceeding with further rationalizations, which resulted in reduced production. The Lorraine basin produced 8.4 Mmt of coal and the Centre-Midi basin 1.6 Mmt of coal. The Provence basin accounted for 1.9 Mmt of lignite. CdF was planning 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 agencies of the former U.S.S.R. 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 various republics of the former U.S.S.R. to begin a 5-year petroleum exploration program starting in the early 1990's. The company would explore 6,400 ha of territory in the west of Kazakhstan and in Russia. Elf also was planning to eventually develop refinery distribution and petrochemical operations.

In 1992, onshore petroleum production was mainly from the Paris Basin, which produced an estimated 13 Mbbl, and the Aquitaine Basin, which produced an estimated 7 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 five 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. (*See table 6.*)

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 sea ports 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 and full operation of the Channel Tunnel. The tunnel, constructed underneath the English Channel, connects 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 yearend 1993, at which time service between Coquelles and Folkestone would commence. The Channel Tunnel connecting the two countries will be a vital infrastructure component when the EU becomes a single marketplace of 320 million people.

OUTLOOK

One of the world's most developed economies, France was an advocate for the EU and the European single 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 EU 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 Ff5.76=US$1.00, the average rate in 1993.

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.
Annuaire de Statistique Industrielle.
Annual Reports: BRGM, CdF, Imetal, Entreprise Miniere et Chimique, SNEA, Total, and Usinor Sacilor.
Chronique de la Recherche Miniere.
Matieres Premieres Minerales.

TABLE 1
FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Bauxite, gross weight	thousand tons	550	[r]490	[r]9	—	—	—
Alumina:							
Crude	do.	624	[r]606	[r]538	508	476	1,000
Calcined	do.	479	[r]467	[r]414	391	367	500
Metal:							
Primary	do.	334	325	286	418	458	500
Secondary	do.	225	208	217	227	220	300
Antimony metal including regulus		6,910	6,520	[r]760	1,425	1,200	10,000
Arsenic, white[e]		[3]10,000	[r]6,480	[r]2,0000	[r]2,000	2,000	5,000
Bismuth metal		100	[e]70	[r]50	—	—	100
Cadmium metal		170	187	[e]271	252	137	300
Cobalt metal:							
Powder		165	[e]175	[r]175	226	225	300
Chloride		165	150	123	150	200	
Copper:							
Mine output, Cu content		[r] [e]300	[r] [e]300	[r]300	100	100	300
Metal:							
Blister, secondary[e]		8,400	6,600	[r]5,800	6,100	6,200	10,000
Refined:							
Primary		16,363	[e]18,034	[r] [e]19,600	27,700	26,300	40,000
Secondary[e]		26,800	26,000	30,000	29,000	27,000	30,000
Total		43,163	[e]44,034	[r] [e]49,600	56,700	53,300	70,000
Gold, mine output, Au content	kilograms	3,537	[r] [e]5,426	[r]4,800	3,060	3,034	5,000
Iron and steel:							
Iron ore and concentrates:							
Gross weight	thousand tons	9,368	8,729	[r]7,472	[3]5,707	3,520	7,500
Fe content	do.	2,810	[e]2,793	[r]2,316	1,697	2,100	5,000

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Iron and steel—Continued:							
Metal:							
Pig iron	thousands tons	15,071	14,415	13,646	[3]13,051	12,679	15,000
Ferroalloys:							
Blast furnace: Spiegeleisen and ferromanganese	do.	325	[e]324	[e]320	300	250	300
Electric furnace:							
Ferrochrome	do.	[e]18	[r]25	[r]23	7	10	25
Ferromanganese	do.	[e]27	e36	[r]30	60	30	50
Ferrosilicon	do.	130	[r]117	[r]106	98	75	100
Silicon metal	do.	72	[r]64	[r]64	66	60	75
Other[e]	do.	79	50	50	50	50	50
Total[e]	do.	651	[r]616	[r]593	581	475	600
Steel ingots and castings	do.	19,335	19,015	18,434	[3]17,961	17,179	19,500
Semimanufactures	do.	17,691	16,774	16,678	16,172	16,000	18,000
Lead:							
Mine output, Pb content		1,122	1,187	1,725	—	—	—
Smelter:							
Primary		149,300	[e]136,800	[e]140,000	130,000	125,000	150,000
Secondary[e]		20,000	20,000	30,000	25,000	25,000	50,000
Total[e]		169,300	156,800	170,000	155,000	150,000	200,000
Refined:							
Primary: Soft lead		149,300	162,260	[e]154,500	160,500	158,000	180,000
Secondary:							
Softlead		52,100	[e]47,612	[e]57,500	49,400	41,500	80,000
Pb content of antimonial lead		76,910	[e]60,598	[e]71,500	74,160	80,500	100,000
Total		278,310	[e]270,470	[e]283,500	284,060	280,000	360,000
Magnesium metal including secondary		[e]14,600	[e]14,000	[r]14,000	13,700	13,000	15,000
Nickel metal		[r]8,632	[r]8,540	[r]7,400	6,800	6,800	10,000
Silver:[e]							
Mine output, Ag content:							
Lead and zinc concentrates	kilograms	19,200	20,500	[r] [3]23,600	13,300	1,000	25,000
Mixed copper, gold, silver concentrates	do.	5,000	5,000	[r]5,000	3,000	2,000	5,000
Total	do.	24,200	25,500	[r] [3]28,600	16,300	2,000	30,000
Metal, Ag content of final smelter products[e]	do.	25,000	22,200	[r] [3]20,000	14,100	14,000	25,000
Tin, smelter output of solder and other alloys, secondary[e]		[3]2,670	2,560	2,400	2,000	1,000	2,500
Uranium:							
Mine output, U content		3,219	[e]2,820	[r]2,300	2,080	2,000	2,000
Chemical concentrate, U_3O_8 equivalent		3,763	3,323	[r]2,530	2,880	2,600	3,000
Zinc:							
Mine output, Zn content		26,706	23,851	[e]27,109	16,500	1,380	20,000
Metal including secondary:							
Slab		265,800	263,136	[e]299,600	318,700	305,300	350,000
Dust[e]		9,000	8,600	9,000	8,000	9,000	10,000
INDUSTRIAL MINERALS							
Barite		111,800	[e]92,500	[r]90,000	96,200	96,000	100,000

See footnotes at end of table.

TABLE 1—Continued
FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Bromine, elemental[e]		18,000	3,100	[r,3]3,000	3,200	3,000	5,000
Cement, hydraulic	thousand tons	26,835	26,388	[r]26,507	21,165	19,300	26,000
Clays:							
Bentonite[e,4]		5,000	10,000	[r,3]10,000	6,000	5,000	10,000
Kaolin and kaolinitic clay (marketable)	thousand tons	[e]346	[e]367	[r]360	334	325	350
Refractory clay, unspecified	do.	[e]15	[e]16	[r]15	8	8	15
Diamonds: Synthetic, industrial[e]	thousand carats	4,000	5,000	4,000	3,500	3,500	5,000
Diatomite[e]	thousand tons	250	250	[r,3]250	[r]85	90	250
Feldspar, crude[e]	do.	360	420	[r,3]400	282	300	500
Fluorspar:							
Crude	do.	449	[e]515	[r]400	296	275	500
Marketable:							
Acid and ceramic-grade	do.	[e]158	[e]145	[r]150	118	100	200
Metallurgical-grade	do.	[e]62	[e]113	[r]50	15	25	50
Total	do.	220	[e]258	[r]200	133	125	250
Gypsum and anhydrite, crude	do.	5,684	[e]5,796	[r]5,600	5,160	5,000	6,000
Kyanite, andalusite, related materials[e]	do.	50	50	50	50	50	50
Lime: Quicklime, hydrated lime, dead-burned dolomite[e]	do.	[3]3,084	3,000	3,000	3,000	3,000	3,000
Mica[e]		8,000	7,000	[r,3]6,000	12,000	8,000	12,000
Nitrogen: N content of ammonia	thousand tons	1,476	1,586	[r]1,604	1,848	1,800	2,000
Pigments, mineral, natural: Iron oxide[e]		15,000	15,000	14,000	12,000	12,000	15,000
Phosphates: Thomas slag	thousand tons	701	488	[r]538	356	350	500
Potash:							
Gross weight (run-of-mine)	do.	8,791	[e]9,468	[r]9,500	8,570	8,200	9,000
K_2O equivalent (run-of-mine)[e]	do.	1,400	1,400	1,400	1,400	1,100	1,500
K_2O equivalent (marketable)	do.	1,195	1,292	[r]1,129	1,141	950	1,500
Pozzolan and lapilli[e]	do.	400	336	[r,3]400	404	400	400
Salt:							
Rock salt[e]	do.	910	790	[r,3]800	103	100	1,000
Brine salt (refined)	do.	1,138	[e]1,155	[r]1,000	1,651	1,600	2,000
Marine salt	do.	1,914	[e]1,298	[r]1,200	1,156	1,200	2,000
Salt in solution	do.	4,305	[e]3,362	[r]3,500	3,206	3,200	5,000
Total[e]	do.	8,267	6,605	[r,3]6,500	6,116	6,100	10,000
Sodium compounds:[e]							
Soda ash	do.	780	[r,3]1,180	[r,3]1,140	1,100	1,000	1,200
Sodium sulfate	do.	120	[r,3]120	[r,3]93	77	75	100
Stone, sand and gravel:							
Limestone, agricultural and industrial[e]	do.	7,000	7,000	6,000	6,000	6,000	10,000
Slate, roof[e]	do.	60	40	[r,3]50	45	50	100
Sand and gravel:[e]							
Industrial sands, total	do.	7,500	3,500	[r]3,500	6,300	6,200	10,000
Other sand and gravel, alluvial	do.	210,000	[3]208,500	[r]219,240	197,100	200,000	250,000
Sulfur, byproduct:							
Of natural gas	do.	647	[e]666	[r]794	770	700	1,000

See footnotes at end of table.

TABLE 1—Continued
FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Sulfur, byproduct—Continued:							
Of petroleum	thousand tons	239	[e]233	[r]225	230	200	500
Of unspecified sources[e]	do.	150	150	180	150	150	150
Total[e]	do.	1,036	1,049	[r]1,199	1,150	1,050	1,650
Talc:							
Crude		329,960	[e]328,100	[e]310,000	300,000	240,000	350,000
Powder[e]		270,000	287,000	280,000	260,000	200,000	300,000
MINERAL FUELS AND RELATED MATERIALS							
Asphaltic material[e]		43,000	44,500	[r] [3]45,000	39,400	40,000	50,000
Carbon black[e]		180,000	252,000	250,000	200,000	200,000	250,000
Coal, including briquets:							
Anthracite and bituminous coal	thousand tons	11,471	10,488	[r]10,128	9,480	8,700	10,000
Lignite	do.	2,168	2,256	[r]1,963	1,570	1,700	2,000
Total	do.	13,639	12,744	[r]12,091	11,050	10,400	12,000
Briquets[e]	do.	825	540	500	500	500	500
Coke, metallurgical	do.	5,340	5,208	[r]5,053	5,080	5,000	10,000
Gas, natural:							
Gross	million cubic meters	4,406	4,334	[r]4,097	3,300	3,300	5,000
Marketed	do.	3,073	3,031	[r]2,845	2,280	2,300	—
Natural gas liquids[e]	thousand 42-gallon barrels	[3]3,983	4,000	3,600	3,800	3,700	4,000
Peat[e]	thousand tons	200	200	200	200	200	200
Petroleum:							
Crude	thousand 42-gallon barrels	23,639	22,036	[r]21,240	21,913	22,000	24,000
Refinery products:							
Liquefied petroleum gas	do.	30,102	[e]32,492	[e]30,000	30,000	30,000	35,000
Gasoline, all kinds	do.	129,515	[e]140,820	[e]145,000	145,000	146,000	150,000
Jet fuel[e]	do.	[3]30,000	39,976	40,000	40,000	40,000	40,000
Kerosene	do.	372	[e]462	[e]500	500	500	500
Distillate fuel oil	do.	208,768	[e]210,372	[e]210,000	200,000	200,000	250,000
Heavy fuel oil	do.	76,732	[e]76,510	[e]75,000	76,000	76,000	100,000
Other products	do.	40,041	[e]42,000	[e]40,000	40,000	40,000	50,000
Refinery fuel and losses	do.	26,537	[e]20,286	[e]20,000	20,000	20,000	25,000
Total[e]	do.	[3]542,067	562,918	560,500	551,500	552,500	650,500

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994
[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: 1992 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	6,754	2,414	4,340	7,556	6,704	852
Magnesite	62	839	(777)	105	1,205	(1,100)
Slate	2,112	619	1,493	2,431	640	1,791
Other	465,260	413,724	51,536	616,214	768,030	(151,816)
Total	[2]474,188	417,596	56,592	626,306	776,579	(150,273)
Metalliferous ores:						
Copper	309	1,711	(1,402)	313	1,897	(1,584)
Lead	32	4,205	(4,173)	41	41,713	(41,672)
Tin	—	—	—	261	—	261
Zinc	3,716	44,013	(40,297)	3,716	213,685	(209,969)
Other (including waste and scrap)	933,316	495,982	Z437,334	1,050,581	1,440,976	(390,395)
Total	937,373	545,911	391,462	1,054,912	1,698,271	(643,359)
Nonmetallic mineral manufactures	280,182	587,349	(307,167)	619,174	921,119	(301,945)
Metals:						
Iron and steel	5,805,959	5,726,561	79,398	8,539,207	6,756,764	1,782,443
Mercury	226	362	(136)	370	521	(151)
Other nonferrous metals	[2]2,855,730	2,967,694	(111,964)	3,769,629	5,209,130	(1,439,501)
Total	8,661,915	8,694,617	(32,702)	12,309,206	11,966,415	342,791
Mineral fuels	3,484,692	4,771,219	(1,286,527)	5,373,922	20,560,567	(15,186,645)

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

TABLE 3
FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity
Alumina	Aluminium Pechiney (Government)	Plant at Gardanne, Bouches-du-Rhone Province	700.
Aluminum		Aluminum smelters at Saint-Jean-de Maurienne, Savoie Province	120.
Do.	do.	Nogueres, Pyrenees Atlantiques Province	115.
Do.	do.	Lannemezan, Hautes-Pyreness Province Auzat, Ariege Province	63. 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 Herault 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—	80 plants, including—	23,253, including.
Do.	Ciments La Farge France	15 plants Largest at St. Pierre-La-Cour	(7,815), (1,160).
Do.	Societe des Ciments Français	13 plants Largest at Gargenville	(6,190), (1,100).

See footnote at end of table.

TABLE 3—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity
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.
Do.	Societe Francaise d'Affinage du Cuivre (Afficuivre)	Smelter at Poissy, Yvelines Province	11.
Do.	Affinerie Sud-Ouest	Fire refinery at Toulouse	2.
Feldspar	Denain-Anzin Minéraux S.A	Mine and plant at St. Chely d'Apcher, south of Clermont-Ferrand	55.
Ferroalloys	Societe du Ferromanganese de Paris-Outreau	Plant at Boulogne-sur-Mer	420.
Do.	Pechiney Electrometallurgie (Pechinery, Government)	12 plants at Bellegarde 27 furnaces	387.
Do.	Chromeurope SA	Plant at Dunkerque	25.
Fluorspar	Societe d'Enterises, Carrieres et Mines, de L'Esterel (SECME)	Fonsante Mine near Adrets d'Esterel, Var Province	150.
Do.	Denain-Anzin Mineraux	Mine and plant at Escaro, Pyrenees-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-a-Olette, Pyrenees-Orientales Province	80 concentrate.
Do.	Compagnie Miniere Dong Trieu	Mine at Lussac-Les-Eglises	NA.
Do.	Compagnie Française des Minerais d'Uranium (CFMU)	Mine at Autun in Saone-et-Loire	50.
Gold, ore	Societe des Mines du Bourneix (Government)	Mines in the district of Saint Yrieix La Perche, Limoges	1,700 kg 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, Garcenville, Trith-St.-Leper	8,432.
Do.	Asocmetal, Unsinor-Sacilor (100%)	Dunkerque, Fos-Sur-Mer, Hagondange, St. Etienne	1,355.
Lead, metal	Societe Miniere et Metallur-gique de Penarroya	Imperial Smelter, Noyelles Godault	150.
Lead-zinc, ores	Societe Miniere et Metallur-gique de Penarroya SA	Mines and plants at Les Mailines, Near Granges, Gard Province.	50 (Pb).
Do.	do.	Saint-Salvy, Tarn Province	100 (Zn).
Magnesium metal	Societe Française d'Electro- Metallurgie, Pechinery (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.

See footnote at end of table.

TABLE 3—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

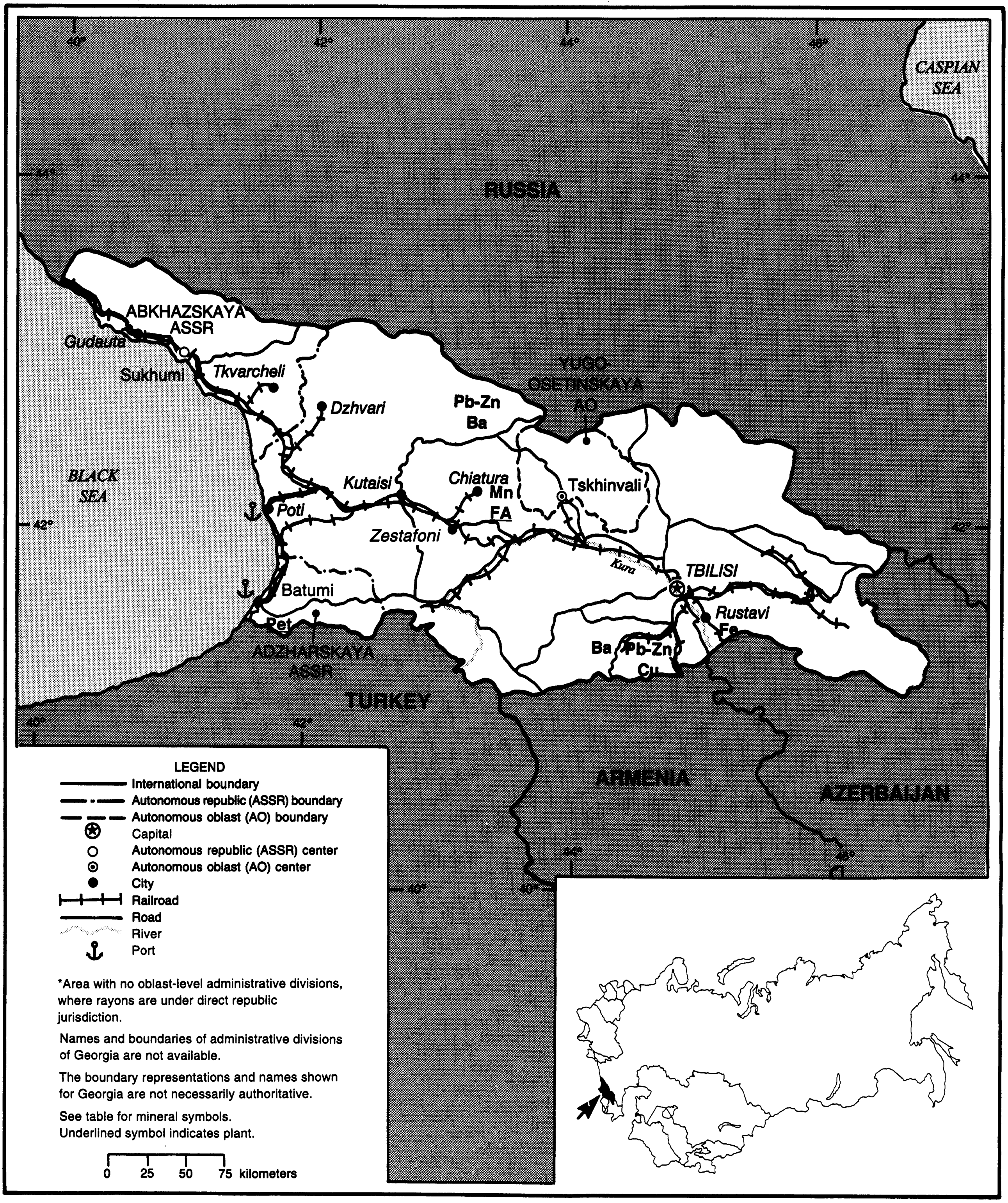
(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies (ownership)	Location of main facilities	Annual capacity
Petroleum:				
Crude		Elf Aquitaine	Oilfields in Paris Basin	1,000.
Refined	barrels per day	Compagnie Française 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 Siene-Maritime Province	285,300.
			Berre, Bouches-du-Rhone Province	270,000.
Do.	do.	Elf-France	Refineries at Petite Couronne, in	119,000,
			Donges, Loire-Atlantique Province	199,000.
			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
		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 (KwO).
Salt, Rock		Compagnie des Salins du Midi et des Salines de L'Est (C.S.M.S.E.)	Varangeville mine at Sain-Nicolas- de-Port in Neurthe-et Moselle Province	9,000.
Sulfur		Societe Nationale Elf Aquitaine (SNEA)	Byproduct from natural gas desulfuri zation at Lacq, Aquitaine	3,000.
Talc		Talcs de Luzenac S.A	Trumouns, near Ariege	400.
Uranium		Compagnie Generale des Matieres Nucleaires, (Cogema) (Government)	Mines at Limousin	1,013 (U_3O_8).
Do.		do.	Vendee	500 (U_3O_8).
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, Azeyron	110.

NA Not available.

GEORGIA

AREA 69,700 km² **POPULATION 5.6 million**



THE MINERAL INDUSTRY OF

GEORGIA[1]

By Richard M. Levine

Georgia has a diverse mineral industry, producing fuels, ferrous and nonferrous metals, ferroalloys, and industrial minerals. Georgia is a major producer of manganese from the Chiatura deposit, although reserves of high-grade ore are almost depleted. The manganese is used in Georgia for ferroalloy production at the Zestafoni ferroalloys plant. A small amount of iron ore also is mined. At the Madneuli complex in Georgia, a copper-barite polymetallic ore deposit is exploited for copper, barite, and a range of byproduct minerals, including gold and silver. Production of lead and zinc occurs at the Kvaisi lead-zinc deposit, and arsenic is mined from the Lukhumskoye and Tsanskoye deposits. Georgia also produces a range of industrial minerals, including bentonite, diatomite, talc, and zeolites and semiprecious stones. Georgia also produces some coal, gas, and oil.

GOVERNMENT POLICIES AND PROGRAMS

To deal with severe problems of energy supply, Georgia drew up a program for energy development that calls for development of a large number of small fuel and power engineering projects, including small hydroelectric powerplants, and small coal processing installations, including briquetting plants.[2]

Construction reportedly was commencing of an oil terminal at Poti. The terminal reportedly will be able to process 60,000 to 70,000 tons of diesel fuel, which will enable Poti to compete with the Russian Black Sea Ports of Tuapse and Novorossiysk.[3] In October, the President of Georgia announced that Georgia would become a member of the Commonwealth of Independent States (CIS). It originally was not a member of the CIS.

ENVIRONMENTAL ISSUES

The Georgian Government reportedly decided to introduce a single state system to monitor the environment. The system will observe and assess the state of the environment as well as make forecasts.[4]

PRODUCTION

In 1993, the Georgian economy and mineral industry were beset not only by the problems resulting from the breakdown in the centrally planned economic system of the former U.S.S.R., but also by political and ethnic conflicts. These conflicts impeded both Georgia's economic growth and its transition to a market economy. Reportedly, in 1993 Georgia's gross domestic product (GDP) was only 36% of its 1991 level and its industrial output was 40% of its 1991 level.[5]

It is estimated that production of most mineral commodities decreased because of the political and economic turmoil and shortages in fuel and other material supplies. A number of mining and metallurgical operations had curtailed operations, including the Chiatura manganese mining complex, the Zestafoni ferroalloys plant, the Rustavi steel mill, and the Azot nitrogenous fertilizer complex. *(See table 1.)*

STRUCTURE OF THE MINERAL INDUSTRY

Georgia was formulating plans to privatize its industrial sector. However, according to reporting as of March 1994, Georgia planned to leave under state control for the near future the transport, natural gas, power engineering, and bread production sectors.[6] *(See table 2.)*

COMMODITY REVIEW

Copper.—Copper is produced at the Madneuli mining and beneficiation complex, which has the capacity to produce about 12,000 tons of copper in concentrate annually. In 1993, production fell to an estimated 3,000 tons of copper in concentrate. Georgia reportedly was shipping copper in concentrate to Russia and Switzerland in exchange for gold, presumably to build its bullion stocks.[7]

Gold.—Gold production in Georgia was estimated to have fallen from 1.9 tons in 1991 to about 1 ton in 1993. Plans call to increase gold output in 1994 by 500 kilograms and to increase output to 4 tons by 1997. Production occurs at the Madneuli complex, where gold is produced as a byproduct of polymetallic ores containing copper, lead, and zinc. An Australian firm, Resources Consortium, has negotiated a joint venture with Madneuli to provide technology to increase gold extraction from ore mined at Madneuli.[8]

Manganese.—It was reported in June 1993 that manganese production had stopped at least temporarily at the Chiatura manganese production association because of shortages of fuel and equipment.[9]

Natural Gas.—Georgia imported all of its natural gas requirements from Turkmenistan, but fell behind on its payments.

In 1993, Georgia only obtained

between 11.5 and 12 million cubic meters of gas per day, although it required between 23 and 24 million cubic meters per day. Owing to lack of payment, Turkmenistan was threatening to further curtail its gas supply to Georgia.[10]

Petroleum.—According to the chairman of the Georgian Oil Department (Saknavtobi), Georgia had between 320 million and 340 million tons of oil reserves. Reportedly, agreements had been reached with United States and British firms on exploitation of deposits, with Austrian partners on construction of an environmentally sound oil refinery near Samgori, and with a United States-Israeli firm on reconstruction of oil pipelines. The chairman stated that Georgia could become self-sufficient in oil in 1 or 2 years.[11]

Reserves

Georgia has a diverse range of mineral resources, many of which have not yet been exploited. Mineral resources in Georgia include antimony, arsenic, barite, bentonite, copper, diatomite, dimension stone, hard and brown coal, iron, lead, manganese, mercury, peat, petroleum, precious and semiprecious stones, talc, zeolites, and zinc. Reserve figures for most metals are still not available. For the few metals for which data have been located, Georgia reportedly has manganese reserves of 240 million tons grading 17% to 25% Mn at the Chiatura deposit, hard coal reserves of 335 million tons at the Tkibuli and Tkvarcheli deposits, gold reserves of 260 tons in the Madneuli and Bolnisi regions, and silver reserves of 1,500 tons. Table 3 lists the available reserve figures, which are mostly for industrial minerals.

Reserves in Georgia were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. *(See table 3.)*

INFRASTRUCTURE

Georgia, which has its western border on the Black Sea, is bordered to the north by Russia, to the east by Azerbaijan, and to the south by Armenia and Turkey. The Caucasus mountains form the major part of the terrain. Through its ports of Batumi, Poti, and Sukhumi on the Black Sea, Georgia is able to ship its output to world markets. The port at Batumi is a major shipment center for refinery products. Georgia had, as of 1990, not including industrial railroads, 1,570 kilometers of railroads that is all electrified and 33,900 kilometers of highways, of which 29,500 kilometers was hard surfaced. One special means of transport employed in Georgia is aerial cables, of which there are about 100 in operation, with a number used at mineral production sites.

OUTLOOK

Georgia has significant mineral deposits, but the future of its mineral industry first will depend on the country establishing political and economic stability to permit a more secure investment climate. If this stability is established, Georgia's favorable location on the Black Sea should enable it to reach world markets at reasonable cost, and it already possesses supply routes to the countries of the former U.S.S.R. Georgia can produce manganese and ferromanganese that could be sold on world markets. However, most of Georgia's manganese reserves of high grade oxide ores are depleted and production has declined sharply over the past decade. The expansion of this industry in the future will depend on the development of carbonate ores from which it is more difficult to obtain a commercial product. Georgia also either produces or has reserves of a number of metals and nonmetallic minerals that could possibly compete on world markets. It will be necessary to assess Georgia's mineral production and reserves in terms of production costs and available markets to determine the viability of Georgia's mineral industry as Georgia makes the transition to a market economy.

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[1]Text prepared July 1994.

[2]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Jan. 7, 1994, pp. WD/2, 3, Georgian Radio, Tbilisi, Dec. 31, 1993.

[3]Interfax Statistical Report. June 3-10, 1994, p. 2.

[4]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). June 25, 1993, p. A/13, Radio Tbllisi, June 16, 1993.

[5]———. British Broadcasting Corp. (Reading, England). Jan. 28, 1994, p. WE/2, Sakartvelos Respublika, Tbilisi, Jan. 14, 1994.

[6]———. British Broadcasting Corp. (Reading, England) Mar. 18, 1994, p. WA/4, Iberia news agency, Tbilisis, Mar. 14, 1994.

[7]Interfax Mining Report, Interfax-America, Denver, Colorado. Dec. 17-31, 1993, p. 5.

[8]Pages 3 and 4 of work cited in footnote 7.

[9]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England) June 25, 1993. p. A/16.

[10]Foreign Broadcast Information Service, U.S. Govt. publication, Washington, DC, Jan. 26, 1994, p. 65, Tbilisi radio, Jan. 22, 1994.

[11]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England) Feb. 4, 1994, p. WD/6, Georgian Radio, Tbilisi, Jan. 27, 1994.

TABLE 1
GEORGIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacitye (Jan. 1, 1994)
Arsenic, mine output		1,500	1,000	2,000
Barite		40,000	30,000	70,000
Bentonite		150,000	100,000	200,000
Cement		1,000,000	700,000	1,500,000
Coal		181,000	150,000	300,000
Copper, Cu content of concentrate		5,000	3,000	12,000
Diatomite		75,000	50,000	150,000
Gold	kilograms	1,500	1,000	2,000
Iron and steel:				
Steel, crude		500,000	200,000	1,500,000
Pig iron		500,000	200,000	1,000,000
Lead, Pb content of ore		800	500	1,200
Manganese ore, marketable		1,200,000	1,000,000	2,000,000
Mn content of ore		350,000	250,000	600,000
Petroleum, crude		150,000	120,000	200,000
Zinc, Zn content of ore		2,000	1,500	3,000

eEstimated.

TABLE 2
GEORGIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Arsenic	Mine output: Lukhumi deposit, upper Racha region; Tsana deposit, lower Svanetiya region		2,000 (total).
Do.	Metallic arsenic and arsenic compounds: Racha, Racha region		NA.
	Tsana mining and chemical plants, lower Svanetiya region		NA.
Barite	Chordskoye deposit	Onskiy rayon	70,000.
Bentonite	Gumbrskoye and Askanskoye deposits	Gumbra, Askana regions	200,000.
Cement	Rustavi cement plant	Rustavi	1,500,000.
Coal	Tkibuli-Shaorskoye, Tkvarchelskoye, Akhaltsikhskoye deposits	Tkibuli, Tkvarcheli, Akhaltsikhe regions	300,000.
Copper (copper content of ore)	Madneuli complex	Madneuli region	12,000.
Diatomite	Kisatibskoye deposit	Kisatibi region	150,000.
Ferroalloys	Zestafoni plant	Zestafoni(now Zestap'oni)	100,000 (ferromanganese).
Do.	do.	do.	250,000 (silicomanganese).
Do.	do.	do.	250,000 (manganese sinter).
Gold	Madneuli complex	Madneuli region	2.
Lead-zinc	Kvaisi deposit	Kvaisi region	1,200 (lead).
Do.	do.	do.	3,000 (zinc).
Manganese, ore	Chiatura complex	Chiatura region	2,000,000.
Petroleum, crude	About 60 wells accounting for 98% of output	Mirzaani, Teleti, Supsa regions	200,000.
Steel, crude	Rustavi steel mill	Rustavi	1,500,000.

NA Not available.

TABLE 3

GEORGIA: ESTIMATED RESERVES OF MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Barite ore	22,000
Bentonite	17,000
Coal:	
Hard	335,000
Brown	70,000
Diatomite	10,000
Gold	.26
Lead, ore, 1.6% Pb	2,600
Manganese ore, 17% to 25% Mn	240,000
Petroleum	330,000
Silver	1.5
Talc	2,000
Zeolites	33,000
Zinc, ore, 3.8% Zn	2,600

GERMANY

AREA 356,900 km²

POPULATION 80.4 million

THE MINERAL INDUSTRY OF

GERMANY

By William L. Zajac

Germany continued to suffer during 1993 from the effects of the international recession and the unexpectedly large financial burden of unification. The global recession, particularly in Germany's fellow European Union (EU) member countries, cut into revenues earned from exports, the driving force behind Germany's economy. The country also continued to face difficulties in incorporating and modernizing the new Federal States, and the tremendous costs of about US$110 billion annually have only added to the problems caused by the recession. The costs include not only modernizing plants and the social benefits for those who lost jobs as a result of closing or cutting down at obsolete or inefficient plants and operations, but also the costs associated with cleaning up pollution and bringing the eastern States up to the social standards of the western States.

The gross domestic product (GDP) in Germany in 1993 dropped by 1.3% for the country as a whole. Because the old and new countries were still not entirely comparable in 1993, data for both parts were still being collected by the Federal Bureau of Statistics. The GDP dropped by 1.9% in the western States and rose by 6.3% in the eastern States during 1993. Comparable figures for 1992 were rises of 1.6% for the western States and 9.7% for the eastern States. All German GDP in 1993 was the equivalent of US$1,880 billion, of which 91.2% was accounted for by the western States and 8.8% by the eastern States.

GOVERNMENT POLICIES AND PROGRAMS

The primary concern for the German Government during 1993 was stabilization of the economy despite all the negative forces at work, a task that had to fight not only the global recession but also the incorporation of the eastern States into the Federal Republic. The agency responsible for privatizing the former East German state holdings, the Treuhandanstalt (Trustee Agency), presented its last budget to the Bundestag late in 1993. The primary purpose of the agency, privatization, was to be completed at the end of 1994, and the agency is slated to be dissolved. This last budget shows revenues of the equivalent of US$6.5 billion and expenditures of about US$30 billion. By law, the agency has a budget ceiling of US$22.5 billion, thus an additional US$1 billion had to be cut from expenditures to meet the cap. The budget for 1994 puts more emphasis than in the past on modernization measures and environmental cleanup. Privatization, modernization, and liquidation efforts will cost about US$18 billion, and interest payments are scheduled to rise to US$6.2 billion from US$3 billion in 1993.

The total accumulated debt of the agency will amount to about US$162 billion by the end of 1994. This amount includes net expenditures of US$76 billion for privatization and modernization efforts; US$47 billion in outstanding debts accumulated by East German companies taken over by the agency; US$35 for other expenditures, which include environmental cleanup; and US$3.6 billion in interest charges.

At the end of 1993, the Treuhandanstalt still held about 1,000 eastern German companies that employed about 125,000 persons. Solutions were being found for all but 320 of the companies, and privatization had been completed for 97% of the more than 12,000 companies originally held by the agency.

ENVIRONMENTAL ISSUES

Policies dealing with the environment in Germany are the bailiwick of the Minister for the Environment. With regard to mining, environmental concerns are addressed under the Federal Mining Law and its provisions for environmental impact assessments that are to be done before mining can start. The objective of the environmental impact assessment is the identification and evaluation of all environmental consequences of a planned project, taking into account various design options, including the zero option. The process in Germany, as in other countries, is a risk for the concern involved because there is no guarantee that after the completion of the assessment, involving considerable time and resources, that the project will be approved. Under the provisions of the Federal Mining Law, the following are required in conjunction with the assessment:

- description of the expected environmental consequences;
- data to support the identification and estimate of the consequences;
- description of the preventive measures for avoidance, reduction, equalization, or substitution of the consequences;
- data concerning the environment and its components;
- data on alternatives to the planned project; and
- difficulties associated with gathering the necessary data.

Other than in mining, changes have been proposed in Germany's recycling law, which covers households and small businesses but excludes industrial wastes, and the changes are scheduled to be reviewed in early 1994. As passed in late 1990, the law requires, as of January 1, 1996, 70% of aluminum, glass, and tinplate (up from 20%, 30%, and 40% respectively as of Jaunary 1, 1993) to be recycled according to the system established. The law is causing problems, however, because the Germans cannot process all the waste collected (including board composites, board/paper, and plastics), and some of the countries to which it is being exported are complaining about the waste being "dumped" in their countries, harming their domestic recycling efforts. The eventual target for the recycling would remain the same for January 1, 1998, in the proposed amendment to the law, but the increase would be more gradual, in three steps instead of two.

Another potential problem for the German recycling law is that it has higher targets than that of the draft recycling law of the EU. The Germans believe that this is allowed under provisions of the Treaty of Rome, but other EU members challenge this claim. No determination had been made on this claim at the end of the year. The general opinion seemed to be, however, that the EU rules on waste would be toward setting flexible, 5-year targets for overall recovery of waste rather than fixed percentages for each type of waste and by avoiding the use of materials that become waste. The EU ministers were trying to avoid the problems that have been arising in Germany because of its ambitious percentages for different types of recovery-reuse, recycling, incineration, or other. Another point that has been holding up agreement on a recycling law for the EU is the opposition by some members of an energy tax that would be part of the law and that would be aimed at cutting greenhouse gas emissions.

PRODUCTION

Various forces, both external and domestic, worked on the German metals and minerals industries, resulting in generally decreasing production as less raw materials and fuel were needed to feed industries that were producing less. Ongoing recession in Germany's principal export markets and low prices internationally for its products and cheaper products from countries with lower production costs caused production cuts in areas such as metals, while a continued construction boom in the eastern States caused production increases in building products. Decreased output of such consumer goods as automobiles required less raw or semifinished products. Production figures for Germany's mineral industry are shown in table 1. *(See table 1.)*

TRADE

Preliminary data on German trade from the Statistisches Bundesamt show that exports of goods during 1993 declined by 4.4% compared with those of 1992 and imports of goods declined by 12.8% during the same time. The balance of payments increased to the equivalent of US$148 billion in 1993 from US$130 billion during the previous year.

STRUCTURE OF THE MINERAL INDUSTRY

The structure of the industry in Germany, the principal companies operating in the production and processing of metals and minerals, is shown in table 2. The restructuring and privatization of the facilities in the eastern States continued in 1993, with the Treuhandanstalt retaining control of some of the companies until they are closed or sold. Most of the producing and processing facilities still in operation in the eastern States are small compared with those in the western States, except for the lignite and potash operations, which are large by any standards. (*See table 2.*)

COMMODITY REVIEW

Metals

Aluminum.—Germany's aluminum industry suffered as a result of the ongoing recession within and outside the country's borders, the fall in demand for aluminum in the construction industry, and the rise in imports of the metal from the countries of the former U.S.S.R. The production cuts and smelter closings called for to try to bridge the gap between supply and demand in Germany and other aluminum-producing nations were counteracted by new capacity coming on-stream and reaching full production in nations not agreeing to cuts. The large amount of metal entering the market from the nations of the former U.S.S.R. not only added to the market imbalance, but also contributed to a lower price for the metal, thus cutting into aluminum producers' revenues. Primary aluminum prices hit an 8-year low in 1993, and at the end of the year, stocks of primary aluminum held by the London Metal Exchange were almost 2.5 million tons.

Steel.—The German steel industry suffered along with the other basic industries in 1993, with both structural changes and the economic downturn in the EU continuing to depress this industry. Capital equipment, construction, motor vehicles, and packaging, the major steel-consuming industries, all recorded a large decline in their activities. This decline, combined with a drop in the prices of steel products (20% to 30%, depending on product, compared with prices in 1990), kept most of the steel companies in debt again in 1993. The industry was also subjected to a restructuring plan under the auspices of the European Commission, an effort to set up financial mechanisms to encourage voluntary capacity reduction. In addition to the capacity reduction, which had not taken effect by the end of the year, significant public assistance was granted to manufacturers of flat rolled products in Germany (and in other countries) in an effort to maintain social stability by preventing further job losses and thereby higher unemployment. The assistance was granted in exchange for pledges to reduce operations that were running at inefficient capacities.

In the eastern States, considerable efforts continued to prevent the closing of the largest steel plant in what had been the German Democratic Republic, the EKO Stahl AG plant in Eisenhüttenstadt. In 1991, the plant had a raw steel capacity of 2 Mmt/a and a rolled steel capacity of 2.5 Mmt/a. At the end of the year, the Treuhandanstalt had granted sole negotiation rights for the takeover of the plant to Riva, a private Italian steel group, against competition from German manufacturers. The Riva proposal was that it would buy 60% of EKO Stahl while the Treuhandanstalt would retain 40%. Together the two concerns would invest US$740 million in building a hot-rolling mill (the equivalent of a minimill) with an annual capacity of about 900,000 tons. Riva would also guarantee 3,600 jobs, 1,700 of which would be at the steel mill. In 1990, EKO Stahl employed more than 12,000 persons. Other German steel producers were criticizing the plan, saying that it would merely be another competitor in the country's steel sector and would add to the existing overcapacity. The European Commission had yet to review the plan to ensure that the project did not add to the overcapacity in the German steel industry, that its investments contained no hidden subsidies, and that the plan was economically viable.

Uranium.—Although the mining of uranium has dropped to very low levels in Germany, production in the eastern States (the former German Democratic Republic) had been among the highest in the world. Under a joint project with the then-U.S.S.R., the Germans produced about 5,000 tons of contained uranium each year between 1946 and 1990 using a chemical leaching process in the southern Harz Mountains. Production has stopped, but the legacy of the mining continues. Cleanup efforts have started on the tailings left from the years of mining, an effort never undertaken by the operators of the mine. In addition to stabilizing and decontaminating the tailings, which had been piled outside the mineshafts, a major effort is needed to decontaminate the water supply in the area. To begin with, channels were created in the piles of tailings to channel rainwater away from the mines and to prevent their flooding and adding to the underground water contamination. In 1993, the equivalent of about US$22 million was spent on the cleanup (about US$24 million in 1992) and involved the cooperation of Australia, Canada, the Czech Republic, France, and the United States. These five countries were awarded about 80% of the contracts for the cleanup to ensure the independence of the scientific work involved, which is expected to take about another 3 years. In toto, the German Government expects to spend the equivalent of about US$8 billion on the project. In 1993, the cleanup produced 200 to 250 tons of yellowcake, which is to be marketed internationally, and the entire cleanup is expected to produce 2,400 to 2,800 tons of yellowcake.

Industrial Minerals

Amber.—In 1974, amber was discovered in the worked out areas of the Bitterfeld brown coal mine Goitsche in Saxony-Anhalt. The seam containing the amber was 0.1 to 1.6 m thick and had an average content of 300 to 400 g/m^3 of crude amber. Production began in 1975 and ended in May 1993, with total production of crude amber amounting to 622.5 tons and prepared amber amounting to 434.7 tons. After being sized and prepared, the amber was sent to Ribnitz-Damgarten on the Baltic Sea where it was fashioned into jewelry. Starting in 1988, pieces under 13 mm were used to make an amber lacquer. No information has been given as to the value of the amber produced or the jewelry fashioned therefrom. Production at the site of prepared amber, in kilograms, was as follows: 1975—1,000; 1976—5,387; 1977—9,664; 1978—11,098; 1979—16,974; 1980—27,455; 1981—35,445; 1982—39,283; 1983—49,231; 1984—34,858; 1985—36,111; 1986—29,917; 1987—29,758; 1988—35,117; 1989—36,310; 1990—8,654; 1991—9,391; 1992—9,802; and 1993—9,239.

Potash.—The potash industry in Germany was in an unsettled state during 1993 as a result of the poor economic conditions and the restructuring of the industry in the eastern States. After many months of study by the European Commission and uncertainty in the outcome of a proposed merger, the Commission near the end of the year approved the merger of Kali und Salz AG (K&S) and Mitteldeutsche Kali AG (MdK) into the new company Kali und Salz GmbH. The Commission determined that the dominant position of K&S in the German market for agricultural potash would have been reinforced, even in the absence of the merger, because it would have taken over the market share of MdK if MdK had withdrawn from the market, which would have been the case because no other concern seemed to be willing to acquire MdK. The Commission also stated that the merger would help the area's social and economic cohesion at a time when the eastern States were suffering from a severe structural weakness.

The new company will operate six potash mines in Germany with a total capacity of 3.65 Mmt/a of K_2O by 1997, after closings and restructuring. The mines remaining in operation would be the Zielitz and Unterbreizbach Mines in the eastern States and the Hattorf, Neuhof-Ellers, Sigmundshall, and Wintershall Mines in the western States. The Commission approved an injection of about US$930 million into the new company. Of the total, about US$605 million would be a direct capital contribution to restore profitability, and this amount would be monitored to ensure that it was spent only on the mines operated by the former MdK. At the end of the restructuring, the work force at the former MdK mines is expected to be about 3,000 persons, down considerably from the 30,000 persons in the mid-1980's. The approval of the merger and the restructuring plan also ended labor disruptions and actions by employees of the former MdK, especially the persons working at the Bischofferode Mine in Thuringia. When MdK announced that the mine was slated to be closed at the end of 1993, the miners and their supporters staged demonstrations and hunger strikes to protest the decision. These actions were taken despite the fact that the company said that all 700 persons employed there would be transferred to other company subsidiaries or be given compensation. The mine was closed at the end of the year, and the miners accepted payments or new positions. Although the mine itself has been closed, its economic reserves, estimated to be able to last for another 50 years, will be accessed by an 11-km gallery from the Hattorf Mine in Hesse.

The German potash producers also searched for new markets for their product during the year. One result of the search was a contract with fertilizer producers in India to provide more than 400,000 tons of potash in a 6-month period beginning in October 1993. This contract is important because the Germans must find new markets to help stimulate growth to replace the ones in the eastern part of Europe that were lost when the eastern States merged with the western States of Germany.

Mineral Fuels

Lignite production in the eastern States of Germany has dropped by 62.8% compared with production in 1988, just before unification, and by 31.3% compared with production in 1991, the first full year of unification, while production in the western States has remained fairly steady, dropping in 1993 mainly as a result of the poor economic conditions. Part of the decrease in the eastern States has been from the collapse of the industrial base that depended on the lignite as an energy source for plants and factories. However, a far more crucial reason is the pollution generated by not only the mining but also the policies of the former Government that did not consider the consequences of the neglect of the infrastructure of industrialization. Before unification, lignite mining, all opencast, covered 1,280 km^2 or 1.2% of the land area of the country. The lignite, high in sulfur, was burned in powerplants to produce electricity, in homes in the form of briquets for heat and cooking, and as a power source for factories. Not only did the mining scar the earth and the burning pollute the air, but the empty pits were allowed to fill with water or were used as dump sites for chemical and other plants. The water that collected in the pits very soon became contaminated with sulfuric acid and/or the waste dumped there by local industries, and that water, in turn, flowed into rivers and seeped into underground domestic water sources. The task facing the Governments, local as well as Federal, is not only closing the mines and finding jobs for or retraining those who worked there, but also the cleanup of the pollution and making the land again fit for cultivation. Plans and methods to do this have been proposed, but the major obstacle is the money involved. The proposal has been to split the costs between the local and Federal Governments. For localized contamination of cases that are not life-threatening, the local Governments would provide 40% of the costs of cleanup and the Federal Government would provide 60% of the cost. For cases that are more difficult and hazardous, the local Governments would provide 25% and the Federal Government would provide 75% of the costs. The total costs, estimated for the next 5 years at about US$9 billion, have been disputed by local critics, saying that the pollution is not as bad as initially thought and cite the levels of spending so far on the sites. These arguments have been countered, however, with the arguments that not much has been spent because the local Governments have been having trouble raising the necessary money, they are reluctant to close some existing mines because that would exacerbate the unemployment problem, and some of the urgency has been lost because the area does not look so bad since so many of the factories and other polluters have shut down.

Those who have been encouraging rapid cleanup cite the example of the Ruhr region of the western States. It also once was heavily polluted because of mining and industrialization, but has been cleaned up and has been turned into a services sector and tourist attraction, with lakes formed by water pumped out of closed mines. Another obstacle to closing more mines is the German Mining Inspectorate, which oversees the operation and closing of mines, and now oversees the mines in the former German Democratic Republic. The Inspectorate has very specific regulations that govern the closing of mines, and it is in the interest of all concerned to meet the regulations. The Treuhananstalt, or other new owners of the mines, must meet all the requirements of reclaiming or recultivating the mines before the land can be sold, and the prospects of finding a buyer for land that is so heavily polluted is slim.

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. Of the total, the Autobahn consists of 8,290 km, national highways consist of 43,786 km, state highways consist of 99,447 km, and municipal, country, and secondary roads consist of 439,386 km. The railroad system consists of 45,468 km of track, about 90% of which is Government owned. Of the total, 44,769 km is 1.435-m standard-gauge and 699 km is 1.000-m gauge track. Pipelines include a 3,644-km line for crude petroleum, 3,946 km for refined products, and 97,564 km for natural gas. Inland waterways and canals consist of 7,541 km and have 31 major ports, with the Kiel Canal an important connection between the Baltic and North Seas and the Rhein-Main-Danube Canal a connection between the North Sea and the Black Sea. Major maritime ports include Hamburg, Rostock, Bremerhaven, Bremen, and Wilhelmshaven, which together account for about 70% of total merchandise traffic. In 1993, the German merchant marine consisted of 565 ships of 1,000 gross tons or more, totaling 4,928,759 gross tons. Of the total, 303 were cargo ships, 134 were container ships, 28 were roll-on/roll-off cargo ships, 21 were chemical tankers, 17 were liquefied natural gas tankers, 12 were bulk carriers, 10 were refrigerated cargo carriers, 9 were oil tankers, 7 were barge carriers, 6 were combination bulk carriers, 5 were combination ore/oil carriers, 5 were railcar carriers, 5 were short-sea passenger carriers, and 3 were passenger ships.

The recently opened Rhein-Main-Danube Canal exceeded all expectations in its first full year of operation, exceeding the forecasts for maritime traffic for the year 1997. During 1993, about 4.5 Mmt of freight and a total of 1,000 passenger ships navigated the canal. Officials predicted that the tonnage would rise dramatically when the embargo against the former Yugoslavia is lifted and that within 10 years the canal would have to be expanded to handle the traffic.

OUTLOOK

Germany's economy will most likely remain in recession until the general world economy improves enough that the demand for German consumer products increases to levels that can stimulate the German production sector. Economic indicators at the end of the year were more positive than they had been for the past several quarters, giving rise to the hope that the recession had reached bottom and growth would soon start. Unification is costing the western States the equivalent of about US$100 billion per year, and although the GDP of the eastern States is growing, it is growing from such a low level that the growth is not having a significant effect on the economy of the country as a whole. Restructuring industries to be more efficient, in the western States as well as in the eastern States, results in an increasing number of jobs being lost, which in turn cuts into the available resources of the Federal Government in the form of payments for unemployment compensation, retraining, and other social costs.

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[1]Where necessary values have been converted from Deutschemark (DM) to US dollars (US$) at the rate of DM1.653=US$1.00, the average rate during 1993.

OTHER SOURCES OF INFORMATION

Agencies

Statistisches Bundesamt (Federal Statistics\ Office)
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Bundesanstalt für Geowissenschaft und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
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Bundesministerium für Forschung und Technologie (Federal Ministry for Research and Technology)
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Bundesministerium für Wirtschaft, Abteiling III, Energiepolitik, Mineralische Rohstoffe (Federal Ministry for Economics, Section III, Energy Policy and Mineral Raw Materials)
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Publications

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TABLE 1
GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Alumina, Al_2O_3 equivalent:						
Calcined:						
Eastern states	69,000	27,000	XX	XX	XX	XX
Western states	964,017	921,567	XX	XX	XX	XX
Total	XX	XX	863,222	856,972	840,038	900,000
Hydrate: Western states	1,173,993	1,172,808	1,148,310	1,119,898	1,109,978	1,530,000
Metal:						
Primary:						
Unalloyed:						
Eastern states	53,930	19,731	XX	XX	XX	XX
Western states	[r]742,011	720,256	XX	XX	XX	XX
Total	XX	XX	690,321	602,791	551,931	700,000
Alloyed: Western states[2]	[r]527,151	[r]526,736	[r]511,356	[r]524,901	474,585	600,000
Secondary:						
Eastern states	53,802	51,580	XX	XX	XX	XX
Western states (unalloyed and alloyed)	[r]537,376	[r]538,901	XX	XX	XX	XX
Total	XX	XX	[r]541,644	[r]535,280	408,120	600,000
Arsenic, white: Ar_2O_3 content: Western states	[e]360	[e]360	[e]300	[e]300	[e]300	500
Cadmium metal, refinery:						
Eastern states	26	17	XX	XX	XX	XX
Western states, including secondary	1,208	973	XX	XX	XX	XX
Total	XX	XX	1,060	941	1,069	1,200
Cobalt metal including alloys: Western states	733	[3]1,303	[3]975	[3]815	[3]602	1,200
Copper:						
Mine output, Cu content:						
Eastern states	7,906	3,564	—	—	—	—
Western states (recoverable)	122	3	—	—	—	—
Total	XX	XX	—	—	—	—
Metal:						
Smelter:						
Primary:						
Eastern states	[e]20,100	[e]14,000	XX	XX	XX	XX
Western states	176,900	183,600	XX	XX	XX	XX
Total	XX	XX	171,900	[r]178,100	[e]175,000	250,000
Secondary: Western states	79,000	70,000	[e]70,000	[e]70,000	[e]70,000	100,000
Refined: Primary including secondary:						
Eastern states	93,600	56,700	XX	XX	XX	XX
Western states	475,162	476,242	XX	XX	XX	XX
Total refined	XX	XX	[r]521,545	581,469	631,891	650,000
Of which secondary in Western states	279,100	[r]272,200	[r]318,300	[r]345,400	361,482	450,000
Gold, mine output, Au content:						
Eastern states kilograms	2,047	1,751	XX	—	—	—
Western states do.	[e]16	[e]18	XX	—	—	—
Total do.	XX	XX	[e]10	—	—	—

See footnotes at end of table.

TABLE 1—Continued

GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued						
Iron and steel:						
Ore and concentrate: Western states:						
Gross weight	[r]105,574	83,473	[r]120,334	[r]109,468	[e]75,000	100,000
Fe content	[r]14,780	11,686	[r]16,841	[r]15,326	[e]10,500	14,000
Metal:						
Pig iron:						
Eastern states	2,732,000	2,163,000	XX	XX	XX	XX
Western states	32,112,000	29,585,000	XX	XX	XX	XX
Total	XX	XX	30,608,000	28,538,000	26,968,000	30,000,000
Ferroalloys:						
Eastern states	130,000	125,000	54,000	[e]10,000	[e]10,000	20,000
Western states (includes speigeleisen, unspecified crude iron, and blast furnace ferromanganese with 2% or more carbon)	536,000	[e]441,000	[e]357,000	[e]353,000	[e]350,000	500,000
Of which ferrochromium:						
Eastern states	[e]22,000	[e]21,000	—	—	—	—
Western states	[e]33,350	[e]37,500	[e]33,650	[e]26,500	[e]25,000	30,000
Steel, crude:						
Eastern states	7,829,000	5,546,000	XX	XX	XX	XX
Western states	41,073,000	38,435,000	XX	XX	XX	XX
Total	XX	XX	42,169,000	[r]39,711,000	37,622,000	45,000,000
Semimanufactures:						
Eastern states	[e]5,600,000	[e]4,000,000	XX	XX	XX	XX
Western states	31,702,000	29,729,000	XX	XX	XX	XX
Total	XX	XX	32,741,000	31,400,000	29,857,000	35,000,000
Lead:						
Mine output, Pb content, recoverable:						
Western states	7,420	7,146	[r]5,933	[r]1,485	—	—
Metal:						
Smelter:						
Eastern states	[e]20,000	[e]15,000	XX	XX	XX	XX
Western states	170,200	162,100	XX	XX	XX	XX
Total	XX	XX	160,800	175,300	129,800	250,000
Refined, primary:						
Eastern states	40,100	45,500	XX	XX	XX	XX
Western states	170,200	162,100	XX	XX	XX	XX
Total	XX	XX	[r]171,210	175,300	174,585	250,000
Secondary: Western states	179,700	186,700	201,700	179,000	159,486	300,000
Nickel:						
Mine output, Ni content: Eastern states	1,476	872	—	—	—	—
Metal, refined: Eastern states	2,271	1,657	850	—	—	—
Platinum-group metals:						
Mine output, metal content: Eastern states kilograms	2,592	2,023	[e]1,100	—	—	—
Metal, refined: Western states do.	[e]68,000	[e]65,000	[e]65,000	[e]65,000	[e]60,000	75,000

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued						
Selenium metal						
Eastern states	[e]25	[e]15	XX	XX	XX	XX
Western states	[e]100	[e]110	XX	XX	XX	XX
Total	XX	XX	[e]110	[e]125	[e]120	200
Silver:						
Mine output, Ag content: (recoverable)						
Eastern states kilograms	53,000	35,000	XX	XX	—	—
Western states do.	6,173	5,633	XX	XX	—	—
Total do.	XX	XX	4,477	[r]960	—	—
Metal, refined:						
Eastern states do.	172,000	175,000	XX	XX	XX	XX
Western states do.	[e]600,000	[e]600,000	XX	XX	XX	XX
Total do.	XX	XX	[e]700,000	[e]630,000	[e]600,000	800,000
Tin:						
Mine output, Sn content: Eastern states	2,413	1,806	118	—	—	—
Metal: Primary including secondary:						
Eastern states	3,470	2,862	XX	XX	XX	XX
Western states	300	[r]500	XX	XX	XX	XX
Total	XX	XX	700	[r]700	100	250
Uranium concentrate, U_3O_8 content:						
Eastern states	4,481	[r]2,972	XX	XX	XX	XX
Western states	57	11	XX	XX	XX	XX
Total	XX	XX	10	[r]232	[e]225	500
Zinc:						
Mine output, Zn content: Western states:						
Analytic content	63,900	58,200	53,987	14,288	—	—
Recoverable content	53,754	49,141	[r]46,861	[r]11,767	—	—
Metal:						
Eastern states	18,500	12,700	XX	XX	XX	XX
Western states (including secondary)	353,483	337,596	XX	XX	XX	XX
Total	XX	XX	345,712	383,117	380,948	430,000
INDUSTRIAL MINERALS						
Abrasives:						
Natural: Pumice: Western states	330,000	318,000	366,000	591,000	647,000	650,000
Natural: Pumice: Western states	330,000	318,000	366,000	591,000	647,000	650,000
Artificial corundum: Western states[2]	91,806	87,374	68,542	58,592	58,931	100,000
Barite, marketable:						
Eastern states (contained $BaSO_4$)	89,400	[r]61,433	XX	XX	XX	XX
Western states	144,106	147,836	XX	XX	XX	XX
Total	XX	XX	163,691	[r]157,014	147,614	200,000
Boron materials; Processed borax, $Na_2B_4O_7$ $10H_2O$ content: Eastern states	[e]4,000	[e]4,000	[e]3,000	[e]2,000	[e]2,000	3,000
Bromine: Western states	2,000	1,500	[e]1,500	[e]750	[e]750	1,650
Cement:						
Clinker: Western states (intended for market)	1,300,000	1,310,000	1,052,000	1,221,000	1,114,000	200,000
Hydraulic:						
Eastern states	12,264,000	7,228,000	XX	XX	XX	XX

See footnotes at end of table.

TABLE 1—Continued

GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued						
Cement—Continued:						
Hydraulic—Continued:						
Western states	28,499,000	30,456,000	XX	XX	XX	XX
Total	XX	XX	34,396,000	37,529,000	36,649,000	59,000,000
Chalk, crude including ground:						
Eastern states	370,000	[e]300,000	XX	XX	XX	XX
Western states	421,000	412,000	XX	XX	XX	XX
Total	XX	XX	[e]600,000	[e]516,000	440,000	750,000
Clays:						
Bentonite: Western states[2]	[r]584,898	[r]576,947	[r]582,618	[r]581,169	[e]575,000	750,000
Bleaching and Fuller's earth: Western states[2]	636,000	653,000	708,000	673,000	[e]670,000	800,000
Ceramic clay:						
Eastern states	345,000	[e]300,000	XX	XX	XX	XX
Western states	2,707,000	3,037,000	XX	XX	XX	XX
Total	XX	XX	[e]2,998,000	3,119,000	3,292,000	4,000,000
Fire clay:						
Eastern states	766,000	[e]400,000	XX	XX	XX	XX
Western states	1,058,000	1,110,000	XX	XX	XX	XX
Total	XX	XX	1,084,000	[r]1,276,000	1,191,000	2,000,000
Kaolin, marketable:						
Eastern states	[e]308,000	[e]200,000	XX	XX	XX	XX
Western states	737,645	684,183	XX	XX	XX	XX
Total	XX	XX	683,505	[r]663,782	836,000	1,200,000
Unspecified and other:						
Eastern states	621,000	[e]400,000	XX	XX	XX	XX
Western states	569,000	533,000	XX	XX	XX	XX
Total	XX	XX	761,000	571,000	888,000	1,000,000
Diatomite:						
Eastern states	11,000	[r]14,000	XX	XX	XX	XX
Western states	46,800	49,800	XX	XX	XX	XX
Total	XX	XX	[r]47,479	[r]51,721	[e]50,000	100,000
Feldspar:						
Eastern states:						
Feldspar sand	74,000	[e]70,000	[e]65,000	[e]50,000	[e]50,000	75,000
Feldspar stone	10,000	[e]10,000	[e]10,000	[e]10,000	[e]10,000	20,000
Western states: Marketable including byproduct	332,638	337,572	328,788	[r]324,747	[e]320,000	500,000
Fluorspar:						
Eastern states	[r]93,762	[r]61,830	[r]15,515	—	—	—
Western states:						
Acid-grade	67,050	[r]75,750	[e]54,000	[e]50,000	[e]48,500	75,000
Metallurgical-grade	7,450	[r]9,550	[r]7,000	[r]3,051	[e]1,500	6,000
Total	XX	XX	[r]76,515	[r]53,051	[e]50,000	71,000
Graphite: Western states:						
Crude	[e]15,800	[r]19,314	15,807	[r]11,963	[e]10,000	20,000

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued						
Graphite—Continued:						
Marketable[4]	[e]45,000	47,332	45,355	36,909	35,508	55,000
Gypsum and anhydrite, marketable:						
Eastern states	2,678,000	[e]2,300,000	XX	XX	XX	XX
Western states	2,201,000	2,172,000	XX	XX	XX	XX
Total	XX	XX	[e]4,211,000	[r] [e]4,353,000	2,678,000	5,000,000
Lime, quicklime, dead-burned dolomite:						
Eastern states	3,407,000	[e]3,000,000	XX	XX	XX	XX
Western states	7,033,000	6,893,000	XX	XX	XX	XX
Total	XX	XX	7,532,000	7,542,000	7,483,000	10,000,000
Magnesium salts (byproduct of potash mining):						
Eastern states	[e]775,000	[e]585,000	XX	XX	XX	XX
Western states	[r]1,102,880	[r]1,126,038	XX	XX	XX	XX
Total	XX	XX	[r]1,548,442	[r] [e]1,035,290	793,000	1,250,000
Nitrogen: N content of ammonia:						
Eastern states	1,200,000	[r]1,021,000	XX	XX	XX	XX
Western states	1,732,117	1,671,444	XX	XX	XX	XX
Total	XX	XX	2,123,331	2,112,524	2,100,495	2,750,000
Phosphate materials:						
Phosphatic fertilizers, P_2O_5 content:						
Eastern states	287,000	54,000	XX	XX	XX	XX
Western states	253,000	872,564	XX	XX	XX	XX
Total	XX	XX	[e]735,681	[e]738,160	[e]730,000	850,000
Thomas slag: Western states:						
Gross weight	122,000	128,000	[r]142,000	[r]120,000	[e]100,000	150,000
P_2O_5 content	18,000	19,000	[r]21,000	18,000	[e]15,000	25,000
Pigments, mineral, natural: Western states	7,596	6,218	7,043	[r]10,100	[e]5,000	6,000
Potash:						
Crude, gross weight:						
Eastern states	32,783,247	[r]26,189,873	XX	XX	XX	XX
Western states	26,001,719	26,105,195	XX	XX	XX	XX
Total	XX	XX	41,321,715	[r]37,280,109	30,434,000	52,500,000
Crude, K_2O content:						
Eastern states	3,852,484	[r]3,138,211	XX	XX	XX	XX
Western states	2,752,295	[r]2,796,288	XX	XX	XX	XX
Total	XX	XX	4,673,363	[r]4,259,322	[e]4,000,000	6,000,000
Marketable, K_2O content:						
Eastern states	[r]3,199,849	2,653,280	XX	XX	XX	XX
Western states	[r]2,187,987	[r]2,307,361	XX	XX	XX	XX
Total	XX	XX	3,855,395	[r]3,472,898	2,900,000	450,00
Pyrite, marketable concentrate, gross weight:						
Eastern states	230,000	[e]135,000	XX	XX	—	—
Western states	342,051	301,778	XX	XX	—	—

See footnotes at end of table.

TABLE 1—Continued

GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued						
Pyrite—Continued:						
Total	XX	XX	219,179	[r]52,932	—	—
Salt, marketable:						
Evaporated:						
Eastern states	[r]60,300	[r]44,772	11,496	7,854	XX	XX
Western states	941,000	785,000	778,000	807,000	813,000	XX
Rock and other:						
Eastern states	[r]5,130,739	[r]4,081,139	2,442,565	1,983,432	XX	XX
Western states	10,997,147	10,808,186	11,747,212	10,296,109	11,207,018	XX
Total	XX	XX	[r]14,979,273	[r]13,094,395	12,020,018	16,500,000
Sodium compounds, n.e.s.:						
Soda ash, manufactured:						
Eastern states	[r]917,000	[r]850,000	XX	XX	XX	XX
Western states	1,443,129	1,435,766	XX	XX	XX	XX
Total	XX	XX	[e]1,948,496	[e]1,639,044	1,586,350	2,500,000
Sulfate, manufactured:						
Eastern states	[e]175,000	[e]170,000	XX	XX	XX	XX
Western states	172,178	167,120	XX	XX	XX	XX
Total	XX	XX	[r]145,943	[r]113,660	106,784	250,000
Stone, sand and gravel:						
Stone:						
Dimension, crude and partly worked:						
Western states[2]	170,761	188,776	176,691	178,245	197,783	250,000
Dolomite:						
Eastern states	612,000	[e]450,000	[e]300,000	—	—	—
Western states	848,000	934,000	1,033,000	914,000	917,000	1,500,000
Limestone, industrial:						
Eastern states	24,423,000	[e]15,000,000	6,409,000	10,247,000	XX	15,000,000
Western states	48,075,000	48,716,000	51,697,000	52,813,000	59,918,000	60,000,000
Quartz and quartzite:						
Eastern states	46,000	[e]15,000	—	[e]7,500	[e]7,500	12,500
Western states	300,000	283,000	26,000	22,000	[e]22,000	50,000
Slate:						
Eastern states	98,000	[e]75,000	[e]50,000	[e]35,000	XX	65,000
Western states	20,588	11,638	14,623	20,420	66,909	40,000
Sand and gravel:						
Building sand and gravel:						
Eastern states	97,034,000	[e]50,000,000	25,687,000	40,598,000	XX	65,000,000
Western states	158,249,000	159,091,000	163,039,000	170,938,000	213,479,000	225,000,000
Gravel including terrazzo splits:						
Eastern states	24,496,000	[e]22,000,000	20,133,000	29,869,000	XX	65,000,000
Western states	129,778,000	128,176,000	131,804,000	140,091,000	134,151,000	200,000,000
Sand:						
Foundry:						
Eastern states	2,156,000	[e]1,100,000	[e]500,000	—	—	—
Western states	3,406,000	2,915,000	2,846,000	2,761,000	2,398,000	4,000,000

See footnotes at end of table.

TABLE 1—Continued

GERMANY: PRODUCTION OF MINERAL COMMODITIES1

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued						
Stone, sand and gravel—Continued:						
Sand and gravel—Continued:						
Sand:						
Industrial (glass):						
Eastern states	1,196,000	[e]750,000	594,000	543,000	XX	750,000
Western states	6,356,000	6,481,000	7,065,000	7,402,000	7,370,000	10,000,000
Sulfur:						
Pyrites, S content:						
Eastern states	34,000	[e]20,000	—	—	—	—
Western states	[r]180,000	[e]130,000	[e]95,000	[e]25,000	—	—
Byproduct:						
Eastern states	[e]300,000	260,000	83,968	99,649	XX	XX
Western states	1,186,665	1,140,335	1,102,628	1,038,874	1,170,580	XX
Of which from natural gas and petroleum	946,854	858,056	905,300	1,015,853	1,137,130	XX
Total	XX	XX	[r] [e]1,281,596	[r] [e]1,163,523	1,170,580	4,000,000
Sulfuric acid: (SO_3)						
Eastern states	[r]681,611	[r]351,825	XX	XX	XX	XX
Western states	3,297,671	3,230,614	XX	XX	XX	XX
Total	XX	XX	3,072,521	3,035,872	2,876,353	4,000,000
Talc and steatite: Western states	20,520	21,378	[r]22,626	[r]23,509	21,000	50,000
Other: Eastern states	6,110,000	[e]4,000,000	[e]2,500,000	[e]1,000,000	3,089,750	2,500,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural: Western states	19,298	19,287	19,703	15,078	[e]15,000	25,000
Carbon black: Western states[2]	401,853	394,365	379,561	376,384	334,620	500,000
Coal:						
Anthracite and bituminous, marketable:						
Western states	71,428,367	70,158,527	[r]66,480,669	[r]65,898,855	60,288,000	75,000,000
Coal:						
Lignite:						
Eastern states	[r]300,700,000	248,924,000	XX	XX	XX	XX
Western states	109,912,974	107,599,595	XX	XX	XX	XX
Total	XX	XX	[r]279,410,997	[r]241,751,000	221,748,000	325,000,000
Coke:						
Of anthracite and bituminous coal:						
Eastern states	1,223,000	1,100,000	XX	XX	XX	XX
Western states	18,384,000	17,580,000	XX	XX	XX	XX
Total	XX	XX	15,872,000	[r]14,728,000	12,144,000	15,000,000
Of lignite:						
Eastern states	5,216,000	[e]4,100,000	XX	XX	XX	XX
Western states	135,100	174,000	XX	XX	XX	XX
Total	XX	XX	861,954	[r]284,000	186,000	500,000
Fuel briquets:						
Of anthracite and bituminous coal: Western states	723,479	756,000	860,385	677,000	585,000	750,000

See footnotes at end of table.

TABLE 1—Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Fuel briquets—Continued:							
Of lignite:							
Eastern states		47,236,276	[e]47,000,000	XX	XX	XX	XX
Western states		[r]2,214,000	2,397,000	XX	XX	XX	XX
Total		XX	XX	21,049,232	[r]12,224,000	9,933,000	15,000,000
Gas:							
Manufactured:							
Eastern states	million cubic meters	6,968	5,851	XX	XX	XX	XX
Western states:							
Blast furnace	do.	[r]43,940	[r]39,522	XX	XX	XX	XX
Coke oven	do.	4,455	4,250	XX	XX	XX	XX
Total	do.	XX	XX	44,052	42,937	[e]42,000	55,000
Natural:							
Gross:							
Eastern states	do.	[r]10,006	[r]6,723	XX	XX	XX	XX
Western states	do.	16,388	16,016	XX	XX	XX	XX
Total	do.	XX	XX	21,366	[r]21,103	20,075	30,000
Marketed:							
Eastern states	do.	[e]7,750	6,713	XX	XX	XX	XX
Western states	do.	14,716	14,711	XX	XX	XX	XX
Total	do.	XX	XX	19,998	[r]17,628	17,500	25,000
Peat: Western states:[1]							
Agricultural use		2,836,000	[r]2,982,200	2,875,900	2,717,850	2,738,757	3,000,000
Fuel use		232,275	237,787	[e]225,000	187,509	180,459	250,000
Petroleum:							
Crude:							
Eastern states	thousand 42-gallon barrels	355	295	XX	XX	XX	XX
Western states	do.	27,231	26,046	XX	XX	XX	XX
Total	do.	XX	XX	25,187	[r]23,453	22,037	29,200
Refinery products:							
Liquefied petroleum gas:							
Eastern states	do.	3,271	3,016	XX	XX	XX	XX
Western states	do.	[r]26,149	[r]26,291	XX	XX	XX	XX
Total	do.	XX	XX	[r]29,060	30,787	32,780	35,000
Gasoline including aviation:							
Eastern states	do.	41,616	39,950	XX	XX	XX	XX
Western states	do.	[r]176,074	[r]193,423	XX	XX	XX	XX
Total	do.	XX	XX	[r]211,319	[r]215,458	213,609	225,000
Naphtha:							
Eastern states	do.	NA	NA	XX	XX	XX	XX
Western states	do.	62,887	63,998	XX	XX	XX	XX
Total	do.	XX	XX	[r]61,005	69,079	76,136	85,000
Mineral jelly and wax:							
Eastern states (sales)	do.	[e]750	[e]700	XX	XX	XX	XX
Western states (sales)	do.	3,820	3,829	XX	XX	XX	XX
Total (sales)	do.	XX	XX	3,062	4,265	3,930	4,500

See footnotes at end of table.

TABLE 1—Continued

GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Petroleum—Continued:							
Kerosene and jet fuel:							
Eastern states (kerosene only 1989-90)	thousand 42-gallon barrels	93	[e]85	XX	XX	XX	XX
Western states (sales)	do.	15,783	18,785	XX	XX	XX	XX
Total	do.	XX	XX	18,228	[r]17,833	20,622	25,000
Distillate fuel oil:							
Eastern states	do.	47,856	[e]46,250	XX	XX	XX	XX
Western states	do.	240,549	252,629	XX	XX	XX	XX
Total	do.	XX	XX	308,404	308,674	344,465	350,000
Refinery gas:							
Eastern states	do.	4,411	4,312	XX	XX	XX	XX
Western states (sales)	do.	28,296	27,546	XX	XX	XX	XX
Total	do.	XX	XX	[e]32,314	[e]34,527	35,146	40,000
Lubricants:							
Eastern states	do.	3,507	3,430	XX	XX	XX	XX
Western states	do.	4,343	4,673	XX	XX	XX	XX
Total	do.	XX	XX	4,860	5,110	4,690	5,000
Nonlubricating oils:							
Eastern states	do.	[e]200	[e]150	XX	XX	XX	XX
Western states	do.	5,805	7,842	XX	XX	XX	XX
Total	do.	XX	XX	7,243	7,292	6,189	8,000
Residual fuel oil:							
Eastern states	do.	27,672	[e]19,980	XX	XX	XX	XX
Western states	do.	56,068	58,048	XX	XX	XX	XX
Total	do.	XX	XX	75,900	89,822	91,807	100,000
Refinery products:							
Bitumen and other residues:							
Eastern states	do.	4,606	[e]4,400	XX	XX	XX	XX
Western states	do.	[r]17,110	17,232	XX	XX	XX	XX
Total	do.	XX	XX	[e]22,047	[e]23,201	23,055	23,500
Bituminous mixtures:							
Eastern states	do.	[e]330	[e]300	XX	XX	XX	XX
Western states	do.	872	918	XX	XX	XX	XX
Total	do.	XX	XX	1,417	1,214	1,097	1,500
Petroleum coke: Western states	do.	7,961	8,245	8,661	8,626	8,944	9,000
Unspecified: Western states[2]	do.	15,159	19,075	[r]20,129	19,437	15,872	21,000
Total:							
Eastern states	do.	[r][e]134,019	[r][e]122,338	XX	XX	XX	XX
Western states	do.	[r]660,877	[r]702,535	XX	XX	XX	XX
Total	do.	XX	XX	[r][e]802,023	[r][e]834,170	878,341	932,500

[e]Estimated. [r]Revised. NA Not available. XX Not applicable.
[1]Table contains data available through June 30, 1994.
[2]Production in eastern States has historically been confidential; no basis exists for reliable estimation.
[3]Sales.
[4]Includes production from imported materials.

TABLE 2

GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	VAW Aluminium AG (special aluminas)	Plant at Schwandorf	430.
Do.	Aluminium Oxid Stade GmbH (VAW, 50%)	Plant at Stade	750.
Do.	Martinswerke GmbH (fused alumina, Alusuisse, 100%)	Plant at Bergheim	350.
Aluminum	VAW Aluminium AG	Smelters at: Innwerke at Töging, Elbewerke at Stade, Rheinwerke at Neuss, Lippenwerke at Lünen (secondary)	310.
Do.	Leichtmetall-Gesellschaft mbH (Alusuisse, 100%)	Smelter at Essen-Borbeck	135.
Do.	Hamburger Aluminium-Werke GmbH (VAW, 33%)	Smelter at Hamburg	120.
Cement	38 companies, the major ones are:	64 mills (grinding) including	59,000.
Do.	Heidelberger Zement AG	Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kiefersfelden, et al.	(9,200).
Do.	Dyckerhoff AG	Plants at Amoneburg, Gollheim, Neuwied, Neubeckum, et al.	(7,250).
Do.	E. Schwenk, Zementwerke KG	Plants at Allmendingen, Karlstadt, and Mergelstetten	(6,000).
Do.	Anneliese Zementwerke AG	Plants at Ennigerloh-Nord, Ennigerloh-Sud, Geseke, and Paderborn	(3,500).
Coal: Anthracite and bituminous	Four companies:	About 27 mines, including:	72,500, 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 Ibbenbüren	(2,500).
Copper	Norddeutsche Affinerie AG (Metallgesellschaft, 35%; M.I.M. Holdings, 35%; Degussa, 30%)	Smelter and refinery, both at Hamburg	290, 350.
Do.	Hüttenwerke Kayser AG	Refinery at Lünen	120.
Lead	Metaleurop Weser Blei GmbH	Smelter and refinery at Nordenham	113, 120.
Do.	Berzelius Metallhütten GmbH	QSL smelter at Stolberg	75.
Do.	do.	Refinery at Duisberg	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	105,000.
Do.	Braunsweigische Kohlen-Bergwerke AG	Surface mines in Helmsted Basin: Alversdorf, Helmstedt, Schöningen, Offledben, and Buschhaus	4,500.
Do.	LAUBAG (Lausitzer Braunkohle AG)	Surface mines in Lausitz Basin: Cottbus, Glückauf, Oberlausitz, Senftenburg, and Welzow	115,500.
Do.	MIBRAG (Vereinigte Mitteldeutsche Braunkohlenwerke AG)	Surface mines in Bitterfeld Basin: Borna, Deuben, Geisetall, and Regis	100,000.
Natural gas million cubic meters	Brigitta Erdgas und Erdöl GmbH, and Ellwerath 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.
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).

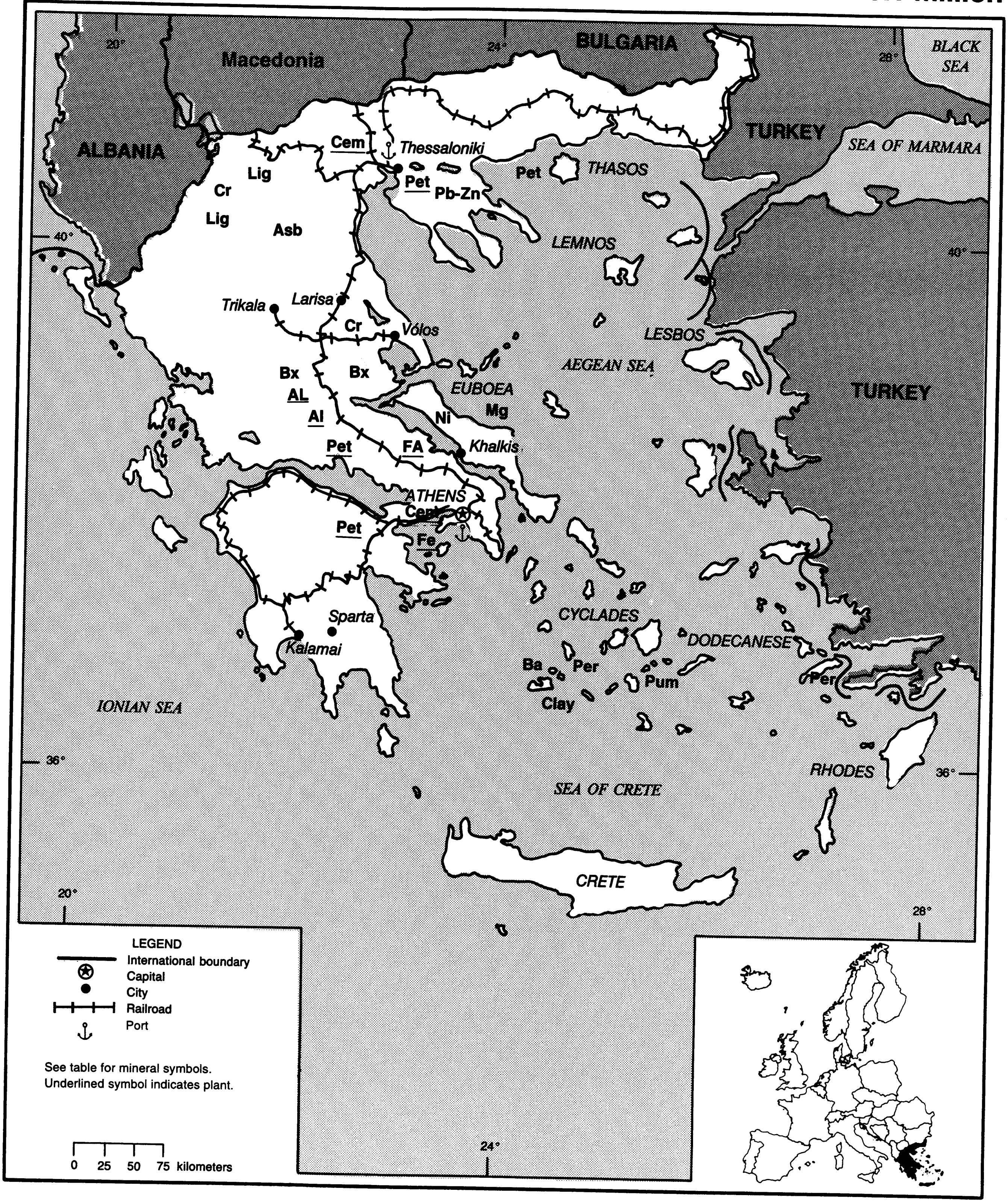
TABLE 2—Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:			
Refined 42-gallon barrels per day	About 25 companies, of which the largest:	20 refineries	2,062,000 including:
Do. do.	Deutsche Shell AG	Refineries at Godorf, Hamburg, and Grasbrook	(256,000).
Do. do.	Esso AG	Refineries at Karlsruhe and Ingolstadt	(245,000).
Do. do.	Ruhr Oel AG	Refinery at Gelsenkirchen	(215,500).
Do. do.	Erdoel Raffinerie Neustadt GmbH	Refinery at Neustadt-Donau	(145,000).
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 Thüringen	3,500 K_2O.
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, 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.	Klöckner-Werke AG	Plants at Bremen and Osnabruck	(4,200).
Zinc	Ruhr-Zink GmbH	Refinery at Datteln	200.
Do.	Berzelius Metallhütten GmbH	Imperial smelter and fire refinery at Duisburg	100.
Do.	Metaleurop Weser Zink GmbH	Refinery at Nordenham	130.

GREECE

AREA 132,000 km² **POPULATION 10.1 million**



THE MINERAL INDUSTRY OF

GREECE

By William Zajac

The metals sector of Greek industry is a small but important part of the national economy. Bauxite is the most important of Greek metal deposits, but there are also some deposits of chromium, gold, iron, lead, nickel, and zinc. Aluminum is the only refined metal produced other than steel and therefore is of the greatest importance in the metals sector. Most of the companies in Greece that deal in metals production, fabrication, or processing are fairly well established and are expected to weather the global recession that affected so many companies in other nations.

The Greek industrial minerals sector is far more prominent in the national economy than is the metals sector. Internationally competitive output of products are, or can be again, of asbestos, bentonite, common clays, magnesite, marble, perlite, and pumice, with bentonite, magnesite, perlite, and pumice also being very important export products.

GOVERNMENT POLICIES AND PROGRAMS

National elections in Greece in October 1993 resulted in the ouster of the Conservative Government and a return to power of the Socialist Party. The consequences of this shift in power had not yet been determined at the end of the year, but statements by members of the new Government indicated that major changes were to be expected. Of importance to the minerals industry was the probable reversal of the former Government's efforts to privatize industry, in particular companies such as Public Power Corp. (PPC) and General Mining & Metallurgical Co., S.A. (LARCO), the nickel producer. Even before the change in Government, the privatization plans were beset with problems, ranging from legal obstacles to labor union and political opposition. Of the 200 companies offered for sale, only about 70 had been sold by the latter part of 1993, and although most of those sales were direct, when the new Government took power, the Athens stock exchange had become involved with the disposals. The principal reason for the Athens stock exchange being involved with the sales was a result of fears that foreigners would gain control of Greek industry.

PRODUCTION

Production of mineral commodities in Greece is closely tied to the export market. During 1993, low prices on the international market, increased availability from the former centrally controlled countries of eastern Europe, and high domestic energy costs had a dampening effect on many of the commodities produced in Greece. For example, production of bauxite has dropped by about one-third in 4 years, principally as a result of the loss of the markets of eastern Europe, and production in 1993 was almost entirely to satisfy domestic demand. (*See table 1.*)

TRADE

The U.S. Bureau of Mines has not received any detailed trade data for Greece in the recent past, but general information indicates that the other members of the European Union (EU) have strengthened their positions as the principal destinations and sources of Greek mineral exports and imports. Typically, Greece exports slightly more than one-half of its steel production, about 60% of that going to other EU countries, 20% going to North America, and the remainder going around the rest of the world. Trade is an important aspect for survival of the Greek steel industry, as it is for other sectors of the minerals industry. There are only four steel producers in Greece, and their survival depends on the domestic construction industry and exports.

In 1993, the domestic construction industry fell on hard times owing to the overall poor economic conditions, and exports remained at about the same level as recent former years, but extreme pressure was put on the industry because of cheaper steel materials entering the Greek market from the central and eastern European countries that have recently lost their steel-consuming markets. Even with the plans for the restructuring of the EU steel industry, Greece, being on the periphery of the EU steel market, is thus far more vulnerable to a loss of export markets than other countries. Perlite is another example. The majority of Greek output of perlite is shipped to expanding plants in other EU member states, with some material going to the Middle East and North America. If those plants lose customers, then Greek perlite production will necessarily be curtailed.

In 1992, according to information published by the Organization for Economic Cooperation and Development (OECD), Greek exports totaled the equivalent of US$9,525 million (US$8,021 million in 1990), of which 4.4% (5.7% in 1990) was crude mineral products, 4.7% (5.2% in 1990) was iron and steel products, and 3.0% (3.5% in 1990) was aluminum. In 1992, Greek imports totaled the equivalent of US$22,470 million (US$19,701 million in

1990), of which 3.3% (4.8% in 1990) was for crude mineral products and 9.8% (7.4% in 1990) was for petroleum and petroleum products.

ENVIRONMENTAL ISSUES

Environmental concerns are under the supervision of the Minister of Environment, Town Planning and Public Works. Much of the environmental protection comes under the policies of the individual industrial concerns. For example, Silver & Barite Ores Mining Co. only mines kaolin at its operations on Milos island during the winter to keep dust levels down. The Government decision to import natural gas from Russia and possibly Algeria was based, in part, on the fact that it is so much cleaner to burn than the traditional lignite.

STRUCTURE OF THE MINERAL INDUSTRY

The major companies with major equity owners are shown in table 2 of this chapter. (*See table* 2.)

COMMODITY REVIEW

Metals

Alumina, Aluminum, and Bauxite.—With the loss of many of the markets for Greek bauxite, other means for use of the material have been explored. One plan involved the construction of an alumina plant to be built northwest of Athens. Majority investment in the plant is to come from Russia, which also would hold 51% interest in the company, Hellenic Alumina Industry (Elva). Plans are for the plant to produce 700,000 tons per year, all of which would be shipped to Russia. Greece's aluminum producer, Aluminium de Grece, continued in 1993 its ongoing battle with the PPC over the cost of the electricity consumed and reached an agreement only near the end of the year. Aluminium de Grece, under a longstanding agreement, was charged for power by PPC using a formula that links the prices of hydroelectric power, lignite, and the London Metal Exchange (LME) 3-month contract price for aluminum. However, neither party involved agreed to the result of the formula, and the two parties had been in and out of court regarding this price regularly. Late in the year, an agreement was reached whereby power costs would be linked to the LME price of aluminum. The agreement was to last until the end of 1999. Although aluminum production increased in 1993, Aluminium de Grece claimed that power costs amounted to 30% of production costs and that the company would not be able to survive if this percentage rises, especially considering the low-cost aluminum metal being shipped out of Russia and other low-cost producers. In 1992, the company reported a loss of $800,000 compared with a reported profit of $12.6 million in 1991. Late in 1993, Bauxite Parnasse announced the decision to increase the capacity of its bauxite mine from 1.8 million tons to 3 million tons annually.

Nickel.—LARCO, the state-run nickel producer, has been suffering from high production costs, allegedly the highest in the Western World, and the future of the company is in question. The company was on a list of companies to be privatized, but the change in Government in October 1993 put that plan into question based on what is called the company's "strategic importance." No decision had been made by yearend what policy the new Government would propose. The PPC charges LARCO for power based on the LME's 3-month nickel price and month-to-month inflation in Greece. However, the forces of lower international nickel prices, strikes for higher wages, and lack of money to pay severance to lower the work force have combined to cause a serious cash shortage for the company and reportedly prevented it from paying its power bills.

Industrial Minerals

Asbestos.—After a period of being closed, the Zidani asbestos mine was reopened in March 1993 under a 5-year lease (with an option for an additional 5 years) to Hellenic Mineral Mining Corp. Ltd., which has subcontracted the mining operation to Arkoumanis. The product of the Zidani Mine is exported to other European countries, the Far East, the Middle East, Southeast Asia, and Brazil and has a steady market because the fibers from the Zidani Mine are suitable for mixed applications, such as asbestos cement pipes, roofing applications, et al.

Marble.—The Greek marble industry was one that continued to expand in 1993. Greece's marble industry plays a leading role in the international dimension stone market as a result of the marble's wide range of colors and suitability for a wide range of uses. Although restrictions have been placed on the siting of quarries with regard to populated areas, the industry has a large number of participants, consisting of large, well-staffed concerns to small family businesses that supply crude material to processing facilities. The facilities of the industry have evolved into three areas: the quarrying of marble blocks, the cutting of marble blocks, and the sales of the blocks and resulting products. Prior to a few years ago, all exports of marble from Greece were in the form of raw or unfinished product, but the industry has evolved into one that in 1992 exported only 20% in rough slab and block form, the remainder being in finished products fashioned to the customers' specifications. Greek marble is available in a variety of colors—white, semiwhite, graywhite, gray, ash, black, beige, brown, pink, red, green, and multicolored—and is produced in almost all areas of the country, from the north at the border with Bulgaria to the island of Crete.

Mineral Fuels

Construction of a natural gas pipeline by Russians to bring gas from Russia to Greece continued during 1993, but the project fell more behind schedule. Initially, the gas supply was to begin in 1992 and during 1993 was pushed back to at least 1995. The plan calls for two powerplants in Athens to be refitted to use the gas and two new gas-fired powerplants to be built in the suburbs of Athens and one to be built in the north of the country. Also planned are special gas storage facilities and an industrial infrastructure that would distribute gas to concerns using lignite. Plans now call for the supply of 650 million cubic meters in 1995 and 1.4 billion cubic meters in 1996.

Reserves

Mineral reserves in Greece are shown in table 3. (*See table 3.*)

OUTLOOK

The outlook for the mining and minerals industry in Greece remained very uncertain at the end of 1993. The new Government initially said that all privatization plans would be canceled but later said that some would be continued, not specifying which. Many of the state-owned concerns remained deeply in debt and were being run in an outdated and inefficient manner. The privatization plans were apparently one of the principal reasons for the change in Government because a large majority of the public did not agree with the plans and feared takeovers by foreigners. The new Government must decide if it is willing and able to continue to support these inefficient operations, and if so, where to get the finances to continue to do so.

OTHER SOURCES OF INFORMATION

Agencies

The Institute of Geology and Mineral Exploration (IGME)
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Aluminium de Grece S.A.
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Organization for Economic Cooperation and Development
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Publications

Hellenic Marble Directory.
Mineral Wealth, various issues, 1992.
OECD Economic Surveys-Greece 1993, Organization for Economic Cooperation and Development.

TABLE 1

GREECE: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Bauxite	2,550,015	2,495,940	2,132,716	[r]2,042,000	[e]1,700,000	2,000,000
Alumina, Al_2O_3 equivalent	521,000	587,000	624,600	[r]611,500	[e]510,000	600,000
Metal:						
Primary	144,833	149,674	152,368	152,838	147,690	160,000
Secondary	[e]7,000	2,882	[e]3,000	[e]3,000	[e]3,000	5,000
Chromite:						
Run-of-mine	187,322	177,400	113,378	—	—	—
Marketable products:						
Direct-shipping ore	[e]15,000	[e]13,000	[e]5,500	—	—	—
Concentrate	47,324	22,400	31,669	—	—	—
Iron and steel:						
Iron ore and concentrate, nickeliferous: Fe content[3]	820,000	860,600	814,600	[e]610,000	[e]575,000	600,000
Metal:						
Ferroalloys:						
Ferrochromium	43,579	30,300	[r e]10,500	—	—	—
Ferronickel	41,200	60,500	64,020	65,000	[e]45,000	60,000
Steel, crude	957,000	999,000	980,000	924,000	940,000	3,750,000
Lead:						
Mine output, Pb content by analysis	24,500	26,200	31,700	[r]28,300	26,400	31,000
Metal:						
Smelter, primary	5,600	—	—	—	—	—
Refined:						
Primary	5,600	—	—	—	—	—
Secondary	1,400	—	—	—	—	—
Total	7,000	—	—	—	—	—
Manganese:						
Ore, crude:						
Gross weight	18,925	[r]14,020	13,540	[e]11,000	[e]10,000	16,000
Mn content	[e]6,000	[r e]4,500	[e]4,480	[e]3,500	[e]3,000	4,800
Concentrate:						
Gross weight	3,034	5,400	3,840	[e]3,000	[e]2,500	4,000
Mn content	1,487	[e]2,500	1,882	[e]1,450	[e]1,200	2,500
Nickel:						
Ore:						
Gross weight	2,013,021	2,112,725	2,023,678	1,800,000	1,570,000	3,000,000
Ni content of nickeliferous iron ore	18,900	18,500	24,284	[r]18,700	12,600	35,000
Metal: Ni content of ferronickel	16,097	15,727	16,005	15,400	10,900	17,000
Silver: Mine output, Ag content	61	63	70	[r]62	59	65
Tin: Metal, secondary	800	700	200	200	[e]200	500
Zinc: Mine output, Zn content by analysis	24,600	26,700	[r]30,000	[r]26,000	22,000	25,000

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS						
Abrasives, natural: Emery	[e]7,000	[e]7,000	7,855	[e]7,500	[e]7,000	12,000
Asbestos:						
Ore	4,500,000	4,320,000	400,000	—	[e]50,000	75,000
Processed	73,300	65,993	[r]4,733	—	—	—
Barite:						
Ore, crude	1,247	1,617	1,309	[e]1,000	[e]1,000	10,000
Concentrate	1,218	[r]1,218	763	[e]500	[e]500	5,000
Cement, hydraulic	12,535,000	13,561,000	[r]11,808,000	[r]10,668,000	12,618,000	16,850,000
Clays:						
Bentonite:						
Crude	1,096,177	592,684	600,286	[e]600,000	[e]600,000	850,000
Processed	529,802	[e]500,000	474,796	[e]450,000	[e]450,000	650,000
Kaolin:						
Crude	67,234	169,986	189,235	[e]100,000	[e]100,000	120,000
Processed	6,946	[r]4,198	[e]20,000	[e]10,000	[e]10,000	15,000
Feldspar	28,903	17,608	[r]11,800	[e]15,000	[e]15,000	45,000
Fluorspar, grade unspecified	450	[r]—	[r]—	[r]—	—	—
Gypsum and anhydrite	540,637	450,149	[e]450,000	[e]400,000	[e]400,000	600,000
Magnesite:						
Crude	903,593	696,900	590,188	[e]250,000	[e]250,000	818,000
Dead-burned	214,945	150,300	118,602	[e]50,000	[e]50,000	60,000
Caustic-calcined	111,826	119,200	130,801	[e]55,000	[e]55,000	60,000
Nitrogen: N content of ammonia	[e]242,000	[e]257,000	210,200	[r]139,500	57,400	300,000
Perlite:						
Crude	390,849	[e]360,000	369,495	[e]325,000	[e]325,000	765,000
Screened	217,305	[e]240,000	286,404	[e]250,000	[e]250,000	580,000
Pozzolan (Santorin earth)	786,083	[r]794,642	536,320	[e]500,000	[e]500,000	800,000
Pumice	640,152	[r]665,489	445,143	[r][e]700,000	[e]500,000	700,000
Pyrites, gross weight	97,051	[r][e]100,000	[e]60,000	[e]55,000	[e]50,000	150,000
Salt, all types	148,265	150,000	[e]150,000	[e]125,000	[e]100,000	300,000
Silica sand	61,144	[r]93,600	[r][e]10,000	[r][e]10,000	[e]10,000	35,000
Sodium compounds:						
Carbonate	[e]900	[e]900	[e]900	[e]750	[e]750	1,000
Sulfate	[e]6,000	[e]6,000	[e]6,000	[e]6,000	[e]6,000	10,000
Stone: Marble cubic meters	365,146	[r][e]370,000	[r][e]375,000	[r][e]385,000	[e]400,000	500,000
Sulfur:						
S content of pyrites	57,150	[r]60,000	35,332	[e]25,000	[e]20,000	60,000
Byproduct:						
Natural gas	[e]135,000	[e]135,000	[e]125,000	[e]120,000	[e]120,000	150,000
Petroleum	[e]5,000	[e]5,000	[e]6,000	[e]5,000	[e]5,000	7,500
Total	[e]197,150	[r][e]200,000	[e]166,332	[e]150,000	[e]145,000	157,500
Talc and steatite	10,518	1,114	790	[e]700	[e]700	10,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Lignite	49,772,000	49,909,300	50,537,241	[r][e]54,500,000	[e]54,500,000	65,000,000
Lignite briquets	155,000	160,000	[e]162,000	[e]175,000	[e]175,000	250,000

See footnotes at end of table.

TABLE 1—Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Coke: Gashouse		[e]16,000	[e]16,000	[e]16,000	[e]15,000	[e]15,000	25,000
Gas:							
Manufactured, gasworks		[e]18	[e]18	[e]18	[e]18	[e]18	50
Natural	million cubic meters	185	191	180	[e]160	[e]160	450
Natural gas plant liquids	thousand 42-gallon barrels	754	661	545	325	[e]325	1,000
Petroleum:							
Crude:							
As reported	thousand metric tons	927	825	843	[r]687	562	820
Converted	thousand 42-gallon barrels	6,666	5,935	6,065	[r]4,942	4,043	5,850
Refinery products:							
Liquefied petroleum gas	do.	4,396	4,478	5,951	[e]4,500	[e]4,500	18,400
Gasoline	do.	26,648	[r]28,722	26,588	[e]20,000	[e]20,000	75,000
Naphtha	do.	5,177	4,675	1,921	[r]3,426	[e]3,400	15,000
Mineral jelly and wax	do.	39	24	[r]24	[e]15	[e]15	155
Jet fuel	do.	14,768	[r]13,408	[r]11,256	[r]10,600	[e]10,600	40,500
Kerosine	do.	101	171	[r]39	[r]101	[e]100	500
Distillate fuel oil	do.	27,848	27,117	[r]24,320	[r]28,244	[e]28,200	110,000
Refinery gas	do.	2,605	2,754	2,797	[e]2,100	[e]2,100	7,500
Lubricants	do.	1,148	1,323	1,106	[e]800	[e]800	2,900
Residual fuel oil	do.	37,243	37,269	[r]35,984	[r]35,191	[e]35,000	152,000
Bitumen	do.	1,703	1,479	2,048	[r] [e]1,500	[e]1,500	5,500
Petroleum coke	do.	754	748	[r]726	[e]525	[e]525	2,000
Other	do.	616	644	506	[e]400	[e]400	1,400
Refinery fuel and losses	do.	3,460	[r]5,555	[r]4,398	[r]5,337	[e]5,500	6,545
Total	do.	[r]126,505	[r]128,365	[r]117,662	[r] [e]112,739	[e]112,640	410,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 15, 1994.
[2]In addition to the commodities listed, other crude construction materials are produced, but no basis exists for estimation of production.
[3]This is the iron content of the nickeliferous ore mined for its nickel content. There is no indication that this iron content is recovered except as the iron content of ferronickel.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(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. (Pechiney of France, 60%)	Distomon, in Boeotia area	640
Aluminum	do.	do.	160
Asbestos	Asbestos Mines of Northern Greece S.A. (MAVE) (Hellenic Industrial Development Bank-Government, 95%; International Finance Corp., 5%)	Mines at Zidani, near Kozani Plants at Zidani, near Kozani	110 100
Barite	Silver and Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Milos Island	10

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
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
Do.	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 Plants	180
		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. (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	do.	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. (operations suspended in 1992)	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

TABLE 2—Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Perlite	Silver and Baryte Ores Mining Co. S.A.	Kos and Milos Islands Plant at Pireaus	250 300
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 & Co.	Kos Island	75
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	140,00 0
Do.	Petrola Hellas S.A.	Eleusis	100,00 0
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)	1,500 300 200
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.	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 1993

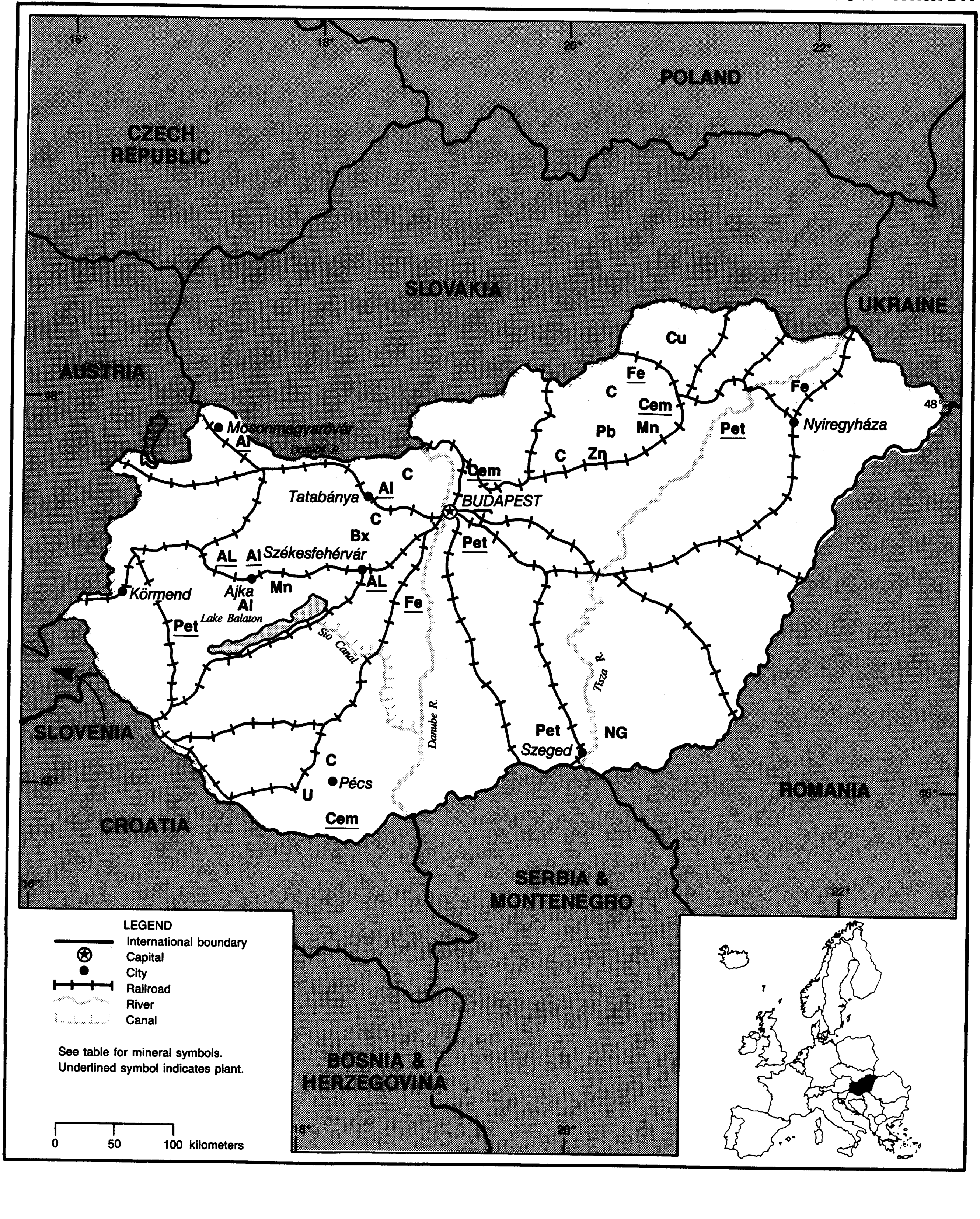
(Million metric tons)

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

Hungary remained a modest European producer of fossil fuels, industrial minerals, and metals. However, by European standards, the country continued to produce significant amounts of bauxite and alumina in 1993, but the output of these commodities declined during the year owing to both a decline in market demand and environmental constraints. Given Hungary's strong commitment to structurally reform the economy, mining and manufacturing activities in 1993 generally continued to conform to international financial criteria. In 1993, the decline in the value of industrial output that was reported in the past several years was halted, and by yearend, industrial production increased by 4% compared with that of 1992.[1]

The level of national energy consumption remained a major economic concern because of the country's need to import a substantial share of its annual fuel requirements. In 1993, total energy consumption rose marginally (1%) compared with that of 1992; however, the share of energy consumed by industry in 1992 showed a slight decline, while that consumed by the country's households and the public services sector increased by 2.7%. There was an overall decrease in the consumption of coal and nuclear energy, chiefly produced domestically, and a growth in the consumption of natural gas and petroleum, largely imported from Russia. In 1993, Hungary's net reliance on imported energy increased from 49% in 1992 to 52%. The rise in unemployment also has been a major concern during the country's transition to a market economy system. By the end of 1993, the rate of unemployment reportedly had declined from the level recorded in 1992, but the average real wages in industry, on the other hand, declined by about 3.5% during this period.[2]

GOVERNMENT POLICIES AND PROGRAMS

In 1993, the Government of Hungary remained committed to the process of restructuring and denationalizing its state-owned industrial assets. In respect to the country's minerals industry, the Government's plan has been to decouple all branches of this industry from state control except those considered to be of strategic importance to the country, namely, the Hungarian Oil and Gas Co. (MOL) and the Mecsek Ore Mining Co., Hungary's uranium ore mining and processing firm.[3] The country's restructuring and denationalization process has been notably successful in the coal mining industry at Tatabanya, Hungary's first private mining company since the end of World War II, as well as at other coal mining areas that chiefly had been designated to become subsidiaries of the country's thermal electric power utilities.[4]

ENVIRONMENTAL ISSUES

The overall neglect of the environment by Hungary's former Government from 1948 to 1989 resulted in considerable degradation of the country's air, and, in some cases, ground and surface waters from industrial point sources such as chemical plants, mines, steel mills, and refineries. The use of high-sulfur brown coals and lignites at the country's thermal electric power stations heavily contributed to high concentrations of SO_2, NO_x, and suspended solid particulate, which, in 1988, were measured at 1,230,900 tons, 259,000 tons, and 420,000 tons, respectively. Reportedly, in 1992, the Government of Hungary was in the process of drafting new legislation to address the country's environmental pollution issues. The draft of the new law, titled, "the Basic Laws on the Environment," reportedly would establish regulations on environmental protection, conservation, and regional development. Government agencies that have been responsible for enforcing existing regulations concerning environmental protection included the Ministry of the Environment and Regional Planning (KTM) and the Hungarian Mining Office (MBH). KTM could help only in the enforcement of existing environmental protection legislation prescribed by other ministries of the Government. In respect to mining and minerals, Hungary's Ministry of Industry and Commerce had the primary responsibility for establishing environmental regulatory standards. The chief responsibility of MBH was that of a certifying agency. Reportedly, MBH could review only technical developmental and operational plans, which had to include provisions concerning environmental protection and land restoration by responsible entities, and oversee their compliance.

PRODUCTION

Hungary's generally declining trend in minerals output was largely the result of the continuing structural adjustment to an emerging market-based economic system. The country's commodity production trends have been showing a growing correspondence to market demand as opposed to industrial output during the period of central economic planning, when production targets were set without reference to costs, efficiency, and other economic variables. (*See table 1.*)

TRADE

Preliminary results of Hungary's foreign trade in 1993 showed a $3.6 billion trade deficit for the year. In terms of Hungary's total imports for 1993, Russia reestablished its position as the largest exporting area to Hungary, replacing Germany during the year. This was mainly because of the significant trade debt owed to Hungary by the former U.S.S.R., which Russia principally had assumed, that resulted in substantial shipments of natural gas as well as minerals and other commodities to Hungary that did not carry payment obligations.[5]

STRUCTURE OF THE MINERAL INDUSTRY

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

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Although the country's bauxite mining and alumina processing industries remained the major components of Hungary's metals mining and processing operations and remained significant on the European scale of production of these commodities, the future of this industry continued to remain in doubt in 1993. By yearend, the country was no longer a producer of primary aluminum because of energy cost considerations and only continued to produce secondary metal at its Inota facility at about 27,000 to 30,000 mt/a. Since the start of Hungary's transition to a market economy, issues such as environmental pollution and production costs for producing bauxite, alumina, and aluminum, and world prices for aluminum had become constraining factors to these operations in contrast to past years. The continuation of the post-Soviet Russian/Hungarian alumina for aluminum agreement apparently was a major reason these operations could be profitably maintained.

Negotiations that began during 1992 to form a joint-venture semimanufactures operation in Hungary between HUNGALU and the Aluminum Company of America (Alcoa) of the United States concluded in an agreement at the end of December 1992, and the new joint venture Alcoa-Kofem Kft. came into existence in early January 1993. The joint venture was based at the Kofem Light Metal Works, a subsidiary of HUNGALU at Szkesfehervar.[6] Earlier, in 1991, HUNGALU invested $15 million into the Kofem operation for modernizing the hot mill, raising the capacity of the cold-rolling mill and adding a 6,000-mt/a extrusion press. Alcoa indicated that it initially would invest $50 million for additional technological improvements. Subsequently, the Alcoa-Kofem joint venture planned to invest an additional $146 million into the operation through 1998 to further improve quality and environmental and safety standards. The Alcoa-Kofem joint venture was to be managed by Alcoa Nederland Holding of the Netherlands to bring the operation to standards similar to those at the Alcoa plant in the Netherlands. The range of products at the new facility would include common alloy sheet, coil, and extrusions, as well as finished products. The new company's products initially would be earmarked mainly for export to Western European markets.

Copper.—Although Hungary no longer mined copper in the Recsk area in the northern part of the country, the deep-lying Recsk ore body (900 to 1,100 m) 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. Owing to high development costs, in recent years Hungary has actively sought joint-venture participation to help capitalize the development of this deposit.

Iron and Steel.—In 1993, Hungary's iron and steelmaking industries continued to be under duress from domestic financial obligations, reduced subsidies by the Government, export interruptions caused by the civil war in the former Yugoslavia, and strong domestic competition from steel imports from other former member countries of the Council for Mutual Economic Assistance (CMEA). To protect the country's domestic steel producers from lower priced steel exports from other former CMEA countries, the Government imposed strong import quotas in July on products from Russia and other former republics of the U.S.S.R. that are members of the Commonwealth of Independent States (CIS), Romania, and the Czech and Slovak republics.[7] However, the quotas did not have an immediate effect on the domestic steel market because Hungarian consumers reportedly stocked up on imported steel before the quotas went into effect.

Dunaferr (Dunai Vasmu/ Danube Iron and Steel Works) reportedly showed greater strength in 1993 than other enterprises in Hungary's steel industry. At midyear, Dunaferr reportedly operated at about 90% of capacity, encountering major difficulties mainly from some disruptions of its exports along the shipping route on the section of the Danube River flowing through UN-sanctioned Serbia. The modernization of steelmaking at Dunaferr continued during the year. The addition of a sixth stand at the company's hot-strip mill was completed, reducing the thickness of sheet steel to 1.8 mm from 2.0 mm, and further technical improvements at the hot-strip mill were intended to lower the thickness of sheet steel to 1.6 mm. The state ownership of Dunaferr was shared largely between banks and local governmental bodies. To promote the denationalization of the company two proposals were under review during the year. The first would offer 75% of the company's value in a stock issuance on the Budapest stock exchange. The second proposal involved the possible sale of major parts of the Dunaferr steelworks as separate companies.[8] Other issues that concerned Dunaferr in 1993 included the announcement of plans by the Samsung Corp. of the Republic of Korea in October to invest $25 million in Dunaferr to further modernize the plant and the decision by Dunaferr's management to substitute coal from Poland and the Czech Republic for domestic Mecsek coal at the steelmill because of the higher quality and lower price of the imported products.[9] The Diosgyöer Stock Co. (Dimag) steelworks faced the greatest difficulties in the country's steel industry as a shortage of operational funds nearly forced the company into total liquidation during the first half of the year. However, in May, Dimag was able to obtain credit from Austria with a guarantee from the Government of Hungary that would allow production to continue at the steelworks and also would allow modernization of the company's production lines to continue.

Manganese.—The Urkut manganese mine in the Bakony Mountains continued to produce mainly carbonate ores. The significant decline in Hungary's manganese ore output in the 1992-93 period continued to reflect the decline in the country's barter-based trade with former CMEA members. In past years, most of Hungary's manganese was designated for export to fellow CMEA-member countries because Hungary lacked the necessary facilities and electric power to domestically produce electric furnace ferromanganese.

Industrial Minerals

Bentonite.—The Navan Resources PLC of Ireland announced plans during the year to expand its industrial minerals mining operations in Hungary (fire clay, glass sand, gypsum, and perlite) by developing the undeveloped bentonite deposit at Egyhazaskeso. The Egyhazaskeso deposit was determined to contain 6 Mmt of recoverable high-quality bentonite that would be used in the manufacture of light, high-strength construction materials. It was reported that Navan was seeking a partner with experience in the construction materials sector to help develop this deposit. The development costs for the Egyhazaskeso deposit had been estimated at about $2.3 million.[10]

Cement.—In September, the Hungarian Cement Federation reported that the country's cement industry was showing an overall recovery of demand in 1993. According to the federation's spokesperson, the denationalization of the cement industry has involved very strong foreign investment in the industry that should continue. To date, German interests had bought almost 100% control of the Beremond Cement and Lime Co. and the Duna Cement and Lime Co. Swiss and German companies also had acquired a one-third interest in the Belapatfalva Cement Works, and another Swiss company acquired a one-third interest in the Hejocsaba Cement plant and a 50% interest in the Labatlan plant.

Mineral Fuels

Coal.—In 1993, the Tatabanya coal mining enterprise reportedly became Hungary's first privatized major mining company. Apart from closure of unprofitable coal mining operations and the privatization of smaller profitable units, the Government continued its plan to rationalize the coal mining industry by integrating the remaining major coal producers with nearby thermal electric power stations.

Natural Gas and Petroleum.— Hungary continued to rely on Russia to deliver a major portion of its needs of natural gas and petroleum. Hungary's imports of natural gas and petroleum from Russia in 1993 were to amount to about 5 Mmt of petroleum and 5 Mm^3 of natural gas. In May, Hungary's Natural Gas and Petroleum Industry experts announced the discovery of a commercially valuable petroleum deposit with associated natural gas, containing 5 Mm^3 of natural gas and 1 Mmt of petroleum, in Bacs-Kiskun County.

Reserves

Taking into consideration Hungary's transition to a market economy system, the country's mineral resources will 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 could take Hungary a number of years to determine its real mineral reserves from a market economy standpoint. For a detailed explanation of the system that was used in former CMEA countries for measuring reserves see that chapter on Russia in this volume. *(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-m standard-gauge track. According to the most recent data, in 1992, of the total volume of freight carried in Hungary by railroads, the transport of fuels constituted 29.7%; ores and other mining products, 9.5%; construction materials, 5.5%; and iron and steel and nonferrous metal products, 9.3%.[11]

Hungary also had maritime port access on the Baltic Sea in Poland at Gdansk and Gdynia, as well as at Rostock in the former German Democratic Republic. Major ports on the Danube were at Budapest and Dunaujvaros. In 1992, of the total marine freight transported, mineral fuels constituted 10.1%; ores and mining-related products, 18.1%; construction industry's products, 44%; and iron and steel products and nonferrous metals, 14.5%.

Hungary's highways had a total length of 130,000 km, of which 28,701 km was part of the national highway system. In 1992, of the total freight carried by the country's highway system, the transport of mineral fuels constituted 7.8%; ores and mining-related products, 57.6%; the construction industry's products, 16.3%; and iron and steel and nonferrous metals, 1.3%.

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 1992, mineral fuels carried by the country's pipelines constituted 80.8% of total carriage by pipeline.

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 rely on integrated steel mills.

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[1]SWB EEW/0322. Mar. 3, 1994, p. WA/2 from MTI News (Budapest) 0720 GMT, Feb. 26, 1994.

[2]———. EEW/0319. Feb. 10, 1994, p. WA/3.

[3]Mining Journal (London). Feb. 4, 1994, p. 90.

[4]Work cited in footnote 4.

[5]SWB. EEW/0321. Feb. 24, 1994, p. WA/0321, from MTI News (Budapest) 1721 GMT, Feb. 17, 1994.

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[6]Metals Bulletin Monthly. Apr. 1993, p. 60.

[7]Metal Bulletin. Aug. 26, 1993, p. 33.

[8]———. July 26, 1993, p. 15.

[9]SWB. EEW/0305. Oct. 28, 1993, p. WA/4, from MTI News (Budapest) 1510 GMT, Oct. 20, 1993.

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[10]Industrial Minerals. Sept. 1993, pp. 18-19.

[11]Magyar statisztikai evkonyv 1992 (Statistical Handbook for Hungary 1992). Budapest, 1993, p. 160.

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TABLE 1
HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1993)
METALS							
Aluminum:							
Bauxite, gross weight	thousand tons	2,644	2,559	2,037	1,721	[3]561	2,500
Alumina, gross weight, calcined basis	do.	882	826	[r]635	548	[3]421	900
Metal:							
Primary		75,195	75,162	63,318	26,865	[3]27,87	30,000
Secondary[e]		[3]31,000	30,000	32,000	20,000	z25,000	35,000
Total[e]		[3]106,195	105,162	95,318	46,865	52,879	65,000
Copper, metal:							
Smelter, secondary[e]		100	100	100	100	100	150
Refined including secondary		13,137	12,817	[e]12,000	[e]12,000	11,000	13,500
Gallium, metal[e]	kilograms	4,100	4,100	3,600	3,500	2,500	6,000
Gold, mine output, Au content[e]	do.	600	600	500	500	500	600
Iron and steel: Metal:							
Pig iron:							
For steel industry	thousand tons	1,927	[r]1,697	[r]1,314	[r]1,176	[3]1,407	2,000
For foundry use	do.	27	15	4	6	6	20
Total	do.	1,954	[r]1,712	[r]1,318	[r]1,182	1,413	2,020
Ferroalloys:[e 4]							
Ferrosilicon		9,000	9,000	7,000	7,000	7,000	9,000
Silicon metal		2,000	2,000	1,000	1,000	1,000	2,000
Other		1,000	1,000	500	500	500	500
Total		12,000	12,000	8,500	8,500	8,500	11,500
Steel:							
Crude	thousand tons	3,356	2,963	1,931	1,559	[3]1,752	3,000
Semimanufactures, rolled only	do.	2,539	2,176	[r]1,535	1,660	[3]1,835	2,800
Manganese ore:							
Run of mine:							
Gross weight		108,327	117,400	54,783	32,000	[3]38,00	120,000
Mn content[e]		20,000	22,000	10,000	5,800	6,800	29,000
Concentrate:							
Gross weight		84,000	60,000	30,000	18,000	18,000	85,000
Mn content[e]		27,000	18,000	9,300	5,400	5,400	28,000
Vanadium, metal[e]		300	300	200	200	200	300
Zinc: Metal, smelter, secondary[e]		[3]1,374	1,300	1,200	1,000	1,000	1,500
INDUSTRIAL MINERALS							
Cement, hydraulic	thousand tons	3,857	3,933	2,529	2,236	2,500	6,200
Clays:							
Bentonite:							
Raw		59,973	36,600	18,097	23,000	[3]9,404	75,000
Processed		47,175	28,600	14,127	[e]15,000	7,000	55,000
Kaolin:							
Raw		24,824	18,000	9,400	14,000	[3]142	30,000
Processed		3,788	3,100	4,815	[e]5,000	100	6,000
Gypsum and anhydrite[e]		113,000	112,000	110,000	110,000	110,000	115,000
Lime, calcined	thousand tons	878	831	[r]571	[r]446	300	900

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1993)
INDUSTRIAL MINERALS—Continued							
Nitrogen: N content of ammonia	thousand tons	673	445	319	261	300	700
Perlite		108,678	93,000	87,750	83,000	[3]80,000	120,000
Refractory materials, n.e.s.:							
Chamotte products	thousand tons	101	77	28	[e]25	25	110
Chrome magnesite products	do.	32	29	9	[e]10	10	40
Sand and gravel:							
Gravel	thousand cubic meters	7,720	5,557	2,968	[e]3,000	3,500	10,000
Sand:							
Common[e]	do.	400	400	200	200	200	600
Foundry	thousand tons	649	543	181	184	[2]15	600
Glass	do.	791	705	600	660	[3]260	900
Sodium compounds:							
Hydroxide (caustic soda)		204,044	193,063	[r]169,681	138,640	125,000	250,000
Sulfate[e]		9,000	8,000	6,000	6,000	6,000	10,000
Stone:							
Dimension, all types	thousand tons	4,677	4,025	3,350	[e]3,500	3,500	6,000
Dolomite	do.	917	778	454	[e]500	500	12,000
Limestone	do.	7,259	6,572	4,328	[e]4,300	4,000	9,000
Quartzite	do.	24	31	586	[e]500	500	600
Sulfur:							
From pyrite[e]		1,000	1,000	900	900	800	1,100
Byproduct, elemental, all sources[e]		10,000	9,000	8,000	8,000	8,000	10,000
Total[e]		11,000	10,000	8,900	8,900	8,800	11,100
Sulfuric acid		482,421	244,051	129,430	91,702	95,000	500,000
Talc[e]		12,000	10,000	10,000	10,000	10,000	12,000
MINERAL FUELS AND RELATED MATERIALS							
Asphalt, natural[e]		550,000	500,000	400,000	400,000	350,000	600,000
Carbon black[e]		5,000	5,000	4,000	4,000	4,000	6,000
Coal:							
Bituminous	thousand tons	2,127	1,736	1,695	1,274	[3]940	1,800
Brown	do.	12,020	10,373	9,953	7,574	[3]6,287	12,000
Lignite	do.	5,883	5,469	5,327	6,988	[3]6,894	7,500
Total	do.	20,030	17,578	16,975	15,836	14,121	21,300
Coke:							
Coke oven:							
Metallurgical	do.	602	564	611	719	650	800
Other[e]	do.	150	150	150	150	150	150
Total[e]	do.	752	714	761	869	800	950
Gashouse[e]	do.	210	200	200	200	150	250
Total coke	do.	962	914	961	1,069	950	1,200
Fuel briquets	do.	1,983	1,761	1,924	[r]682	300	2,000
Gas: Natural, marketed	million cubic meters	6,176	4,932	5,041	4,932	7,000	7,500
Natural gas liquids:							
Natural gasoline	thousand 42-gallon barrels	5,500	5,000	5,000	5,000	5,000	6,000
Liquefied petroleum gas	do.	2,400	2,300	2,000	2,000	2,000	2,500

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1993)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Peat, agricultural use[e]	thousand tons	70	65	65	65	65	100
Petroleum:							
Crude:							
As reported	do.	1,966	1,974	1,893	1,825	1,700	2,000
Converted	thousand 42-gallon barrels	13,152	13,206	12,664	12,209	11,400	13,400
Refinery products:[5]							
Liquefied petroleum gas	do.	3,909	3,840	[r]3,500	[r]3,500	3,000	4,000
Gasoline, including naphtha	do.	11,033	12,343	[e]11,000	[e]11,000	10,000	13,000
Kerosene and other light distillates	do.	2,542	2,373	[r]2,000	[r]2,000	2,000	3,000
Distillate fuel oil	do.	22,902	20,411	[e]18,000	[e]18,000	16,000	24,000
Lubricants	do.	1,302	1,156	[e]1,000	[e]1,000	1,000	1,400
Residual fuel oil	do.	12,075	10,263	[r]8,000	[r]8,000	7,000	13,000
Paraffin and petrolatum	do.	236	207	[r]200	[r]200	200	300
Asphalt and bitumen	do.	3,115	2,866	[r]2,000	[r]2,000	2,000	4,000
Total[e]	do.	57,114	53,459	45,700	45,700	41,200	62,700

[e]Estimated. [r]Revised.

[1]Table includes data available through Mar. 1994.

[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 1993

(thousand of metric tons unless otherwise specified)

Commodity	Major operating companies (all state-owned)	Location of main facilities	Annual capacity
Alumina	HUNGALU (Hungarian Aluminum Corp.)	Ajka Timföldgyár plant, about 120 km southwest of Budapest, near Lake Balaton	450
Do.	do.	Almasfuzitö Timföldgyár plant, near the Czechoslovak border, 63 km northwest of Budapest	350
Do.	do.	Moson-Magyarovar plant, in northwest corner of Hungary, about 12 km from Austrian and Czechoslovak border	75
Aluminum, primary	do.	Inota plant, near Varpalota, 75 km southwest of Budapest	46
Bauxite	HUNGALU (Hungarian Aluminum Corp.): Bakony Mining Enterprise	Bakony District, extending roughly 100 km northeast along Lake Balaton	1,500
Do.	Fejér County Mining Enterprise	Fejér County, Vértes District, about 60 km south of Budapest	1,060
Cement	Cement es Mészmüvek	Bélapátfalva, near Miskolc, 125 km northeast of Budapest	1,200
Do.	do.	Beremend, 45 km south of Pécs	1,100
Do.	do.	Hejöcsaba, 150 km northeast of Budapest	1,600
Do.	do.	Lábatlan, 20 km north of Tatabánya	500
Do.	do.	Selyp, 50 km north of Budapest	60
Do.	do.	Tatabánya, 80 km west of Budapest	500

TABLE 2—Continued

HUNGARY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(thousand of metric tons unless otherwise specified)

Commodity		Major operating companies (all state-owned)	Location of main facilities	Annual capacity
Cement—Continued:		Cement es Mészmüvek	Vác, 50 km north of Budapest	1,200
Coal:				
Bituminous and lignite		Magyar Szénbányászati Tröszt (MSZT) (Hungarian Coal Mining Trust)	Tatabánya and Oroszlány coal mining region, 45 km west of Budapest	8,957
Do.		do.	Mecsek coal mining region, near Pécs and Komló, north of the Yugoslav border	3,100
Do.			Borsod coal mining region, 130 km northeast of Budapest	5,200
Lignite		do.	Thorez opencast mine at Visonta, 80 km northeast of Budapest	7,000
Manganese ore		Orszagos Erc-es Asvanybanyak (National Ore and Mineral Mines)	Urkut manganese ore mines, 120 km southwest of Budapest	160
Natural gas, million	cubic feet	Hungarian Oil and Gas Co. (MOL)	Szeged and Algyö gasfields, southern Hungary	151,960
	do.	do.	Hajduszoboszó gasfield, 180 km east of Budapest	49,440
	do.	do.	Smaller gasfields: Szánk, Kardoskut, Békés, Berefurdõ, and others	38,740
Petroleum:				
Crude	million barrels	do.	Szeged-Algyö field, near Romanian-Yugoslav border; 50% of total capacity	7
Refined		Subsidiaries of MOL:		
Do.	do.	Danube Petroleum Refining Co	Százhalombatta	54.8
Do.	do.	Tisza Petroleum Refining Co	Leninaváros	21.9
Do.	do.	Zala Petroleum Refining Co	Zalaegerszeg	3.7
Steel		Dunai Vasmu (Danube Steel Works)	60 km south of Budapest	1,400
Do.		Ostag - Ozdi Acelmu Rt	120 km northeast of Budapest	700
Do.		Dimag - Diosgyöer Stock Corp	Diosgyöer, 145 km northeast of Budapest	954
Do.		Cepel Iron and Steel Works	Budapest	171

TABLE 3

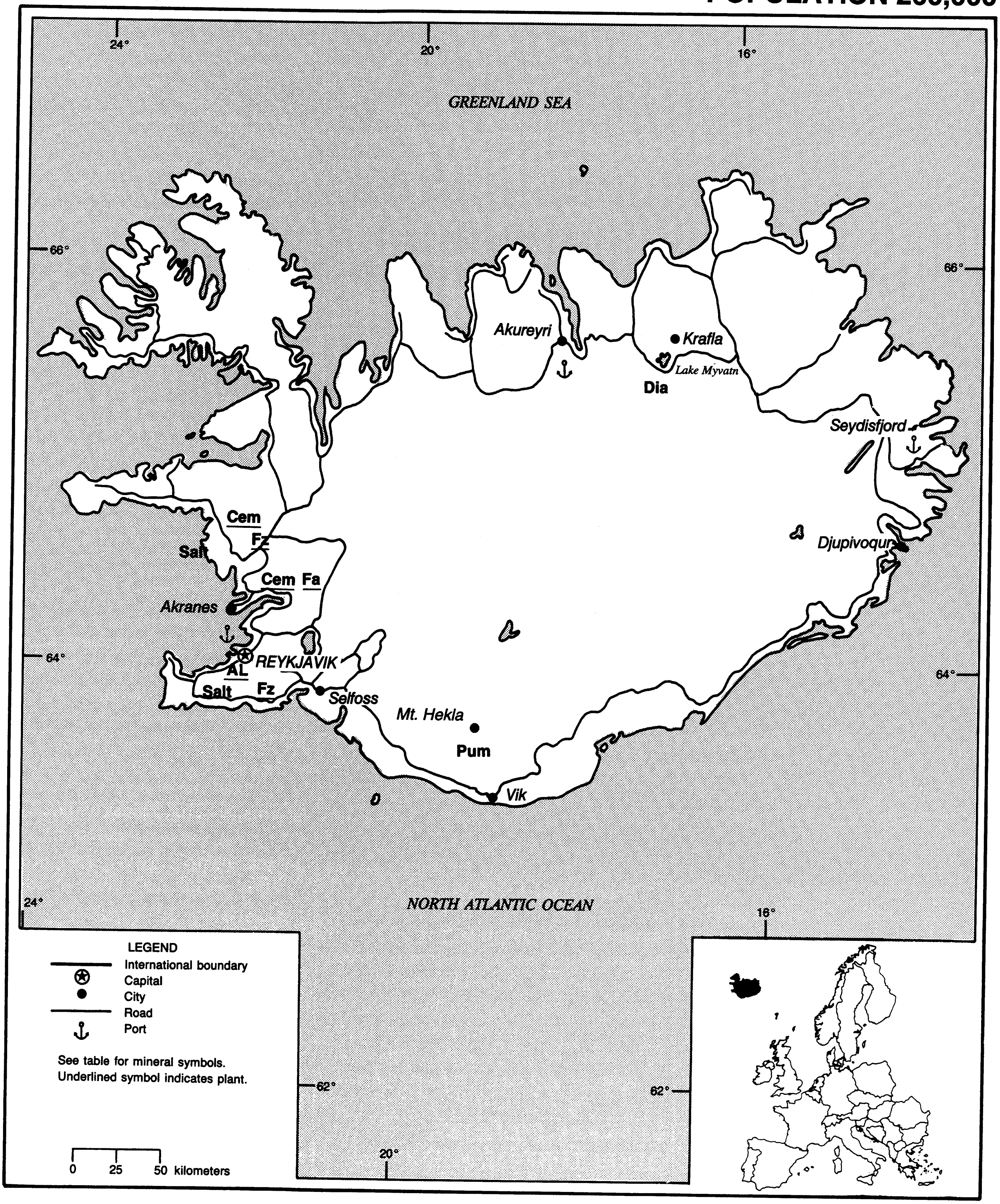
HUNGARY: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1993

(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 gascubic meters	126.7
Petroleum	158.0
Bentonite	15.9
Kaolin	15.7
Perlite	18.1

ICELAND

AREA 103,000 km² **POPULATION 260,000**



THE MINERAL INDUSTRY OF

ICELAND[1]

By Jozef Plachy

The mineral industry of Iceland, owing to abundant hydroelectric and geothermal energy and lack of indigenous resources, is largely composed of metal production from imported raw materials. Nearly all production of aluminum and ferrosilicon is exported. However, all production of industrial minerals, with the exception of diatomite, is used by local industries.

GOVERNMENT POLICIES AND PROGRAMS

The mineral mining and processing industry consists of private (local or foreign) and Government-owned enterprises. Following the trend of other European countries, Iceland is trying to privatize aspects of its mineral industry. A more aggressive approach is usually reserved for companies owned and operated by the Government than those where the Government is only a silent, albeit major partner. As a first step, a holding company is being created, with a board of directors invested with decisionmaking accountability.

Most of the Government's policies are aimed at utilization of inexpensive indigenous energy. For this purpose, the Government is offering attractive terms to foreign companies for investing in energy-intensive ventures. These efforts have already led to an agreement to build a new aluminum smelter and resulted in a favorable feasibility study for laying an electric transmission line to Scotland.

PRODUCTION

While the export-oriented production of aluminum and ferrosilicon remained about the same or has increased slightly, the production of industrial minerals, influenced by the domestic economy, has been declining since the early 1990's. *(See table 1.)*

TRADE

Owing to the custom union and geographical proximity to the European Union, most of Iceland's trade is with Europe. The exports of aluminum, diatomite, and ferrosilicon constitute about 12% of the value of Iceland's total exports.

STRUCTURE OF THE MINERAL INDUSTRY

Most of the major mineral industry enterprises in 1993 were still either wholly or partially state-owned. The remainder were either foreign owned and locally operated or, in the case of some of the smaller businesses, locally owned and operated. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—In 1993, Islenzka Alfelagid hf-Icelandic Aluminium Co. Ltd. (ISAL) was the only manufacturer of aluminum metal from alumina imported mainly from Australia. The 96,000-mt/a-capacity smelter at Straumsvik near Hafnarfjordur (17 km southwest of Reykjavik) is owned by Alusuisse-Lonza Holding Ltd. of Switzerland. Recent improvements include covering of the smelting pots in 1992 and installing a direct casting line to process all production into rolled slab.

In 1992, an agreement was signed between the Atlantal Group, consisting of AVAX Inc. (subsidiary of Alumax of Georgia, USA), Hoogovens BV of Netherlands, and Granges AB of Sweden, and the Icelandic Government to build a 200,000-mt/a-capacity primary aluminum smelter. However, the start of construction at the 100-ha site at Keilisnes on the Reykjanes peninsula, south of Reykjavik, has been postponed until sometime between 1995 and 1997, owing to low aluminum prices.

Ferrosilicon.—The Icelandic Alloys (Islenska jarnblendifelagid hf) at Grundartangi, western Iceland, has two 48,000 kV·A electric reduction furnaces for production of 75% ferrosilicon. During the past few years, the plant has been operating well below the 65,000-mt/a capacity, and consequently losing money (about $8 million in 1991). Nearly all ferrosilicon is exported, while most of the microsilica from the scrubbing equipment is used in the nearby cement plant.

Steel.—After only 1 year of operation, the Icelandic Steel Co. (Islenska Stalfelagid) in Hafnarfjordur, 15 km southwest of Reykjavik, ceased production in 1992 and went into receivership. Although a number of foreign companies and a local construction company had expressed an interest in the 22,000-mt/a-capacity secondary steel producer, the future of the plant remained undecided at yearend 1993.

Industrial Minerals

Cement.—The main ingredient for cement production at the 115,000-mt/a-capacity Iceland State Cement Works (Sementsverksmidja Rikisins) in Akranes is underwater at the Hvalfjordur fjord. At a depth of 30 m to 35 m lies a commercial concentration of shell sand, which, in combination with other indigenous materials and imported gypsum, meets most of Iceland's cement needs. At the present rate of production, the reserve should last until the year 2020.

Diatomite.—The entire production of diatomite is supplied by Diatomite Plant Ltd. (Kisilidjan hf) at the northeast part of the country, in Myvatnssveit near Lake Myvatn. During the summer months, the diatomaceous earth is pumped from the bottom of the lake and dried in kilns, using geothermal energy, to 99% solid matter. Production license has been extended until the year 2010 but restricted to specific areas of the lake because of adverse effects on sediment displacement. After the present deposit is exhausted, the operation was expected to transfer to the nearby Bollar area where there are estimated reserves expected to last from 60 to 70 years.

Pumice.—All production of pumice in Iceland is concentrated around Mount Hekla, 110 km east of Reykjavik. The 28-Mm^3 deposit was formed during a volcanic eruption in 1104. The density of the dry, loose pumice is 320 kg/m^3, suitable for light concrete and building blocks. With an annual production of about 35,000 tons, Eldber hf, a joint venture of Jardenfnaidnadur hf and Unternehmensbeteiligungen GmbH of Germany, is the largest producer in Iceland. Pumice in the quarry is 4 m to 6 m thick, covered with an overburden of a maximum of 1 m.

Salt.—In 1993, Akzo NV of the Netherlands acquired a majority (58%) interest in Icelandic Salt Co., near Svartsengi, 50 km southwest of Reykjavik. The salt is produced from seawater extracted from an underground reservoir at a depth of about 1,500 m. The resulting salt has a high concentration of potassium and magnesium compounds with a low level of sodium.

Reserves

The known mineral reserves of Iceland consist solely of industrial minerals, mainly construction materials.

INFRASTRUCTURE

All of Iceland's major cities are on the coast, mainly in the western part of the country, around the capital of Reykjavik. Consequently, most of the 11,543 km of road are in western Iceland. The secondary transportation mode is aviation, owing to the absence of railroads and to a large area with sparse population. However, out of 89 airports in the country, only 4 have permanent surface runways.

Iceland is also heavily dependent on sea transportation. In addition to numerous small, local ports, it has well-equipped major ports in Akureyri, Hafnarfjordur, Keflavik, Reykjavik, Seydisfjordur, and Siglufjordur. The merchant marine has 10 ships totaling 53,037 dwt. It includes three cargo, three refrigerated cargo, two roll-on/roll-off cargo, one oil tanker, and one chemical tanker.

OUTLOOK

Iceland will continue to concentrate on processing energy-intensive imported mineral commodities because of abundant hydroelectric and geothermal energy and lack of significant mineral resources. In addition to the already approved aluminum smelter, a framework for construction of a 25,000-mt/a silicon metal plant is being debated by the Parliament.

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[1]Text prepared Apr. 1994.

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Central Bank of Iceland
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TABLE 1
ICELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992[r]	1993[e]	Annual capacity[e] (Jan. 1, 1994)
Aluminum metal, primary[2]		88,477	86,773	88,768	89,478	91,000	96,000
Cement, hydraulic[3]		[r]116,015	114,045	106,174	99,803	100,000	115,000
Diatomite		24,900	26,107	23,106	19,946	19,000	24,000
Ferrosilicon		72,007	62,791	50,299	51,651	52,000	65,000
Nitrogen: N content of ammonia		9,482	8,292	8,917	8,712	8,700	9,000
Pumice and related volcanic material:							
Pumice		56,845	28,237	33,354	33,514	34,000	35,000
Scoria		367	657	389	462	500	500
Salt[e]		2,500	2,500	3,000	[4]4,205	4,500	4,500
Sand:							
Basaltic	cubic meters	[r]150	50	50	—	—	—
Calcareous, shell	do.	119,420	111,005	106,020	85,794	80,000	150,000
Sand and gravel	thousand cubic meters	4,421	4,008	3,661	3,657	3,600	4,000
Silica dust[5]		[r]12,237	11,222	10,654	10,231	10,000	11,000
Stone, crushed:							
Basaltic		91,000	105,000	116,700	108,600	100,000	150,000
Rhyolite	cubic meters	25,811	24,424	22,984	18,175	18,000	25,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994.
[2]Ingot and rolling billet production.
[3]Sales.
[4]Reported figure.
[5]Byproduct of ferrosilicon.

TABLE 2
ICELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	ISAL (Alusuisse-Lonza Holding Ltd., 100%)	Straumsvik	96
Cement	Sementsverksmidja Rikisins (Government, 100%)	Akranes	200
Diatomite	Kisilidjan hf (Government, 59.8%)	Myvatnssveit	24
Fertilizer	Aburdarverksmidja Rikisins (Government, 100%)	Gufunes	60
Ferrosilicon	Islenska jarnblendifelagid hf (Government, 55%, Elkem A/S, 30%)	Plant at Grundartangi	65
Pumice	Eldber hf (Jardenfnaidnadur hf, 51%)	Mt. Hekla	35
Do.	Pumice Products Ltd. (B.M. Valla Ltd., 100%)	do.	32
Salt	Icelandic Salt Co. (Akzo NV of Netherlands, 58%)	Plant at Svartsengi	6

TABLE 3
ICELAND: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

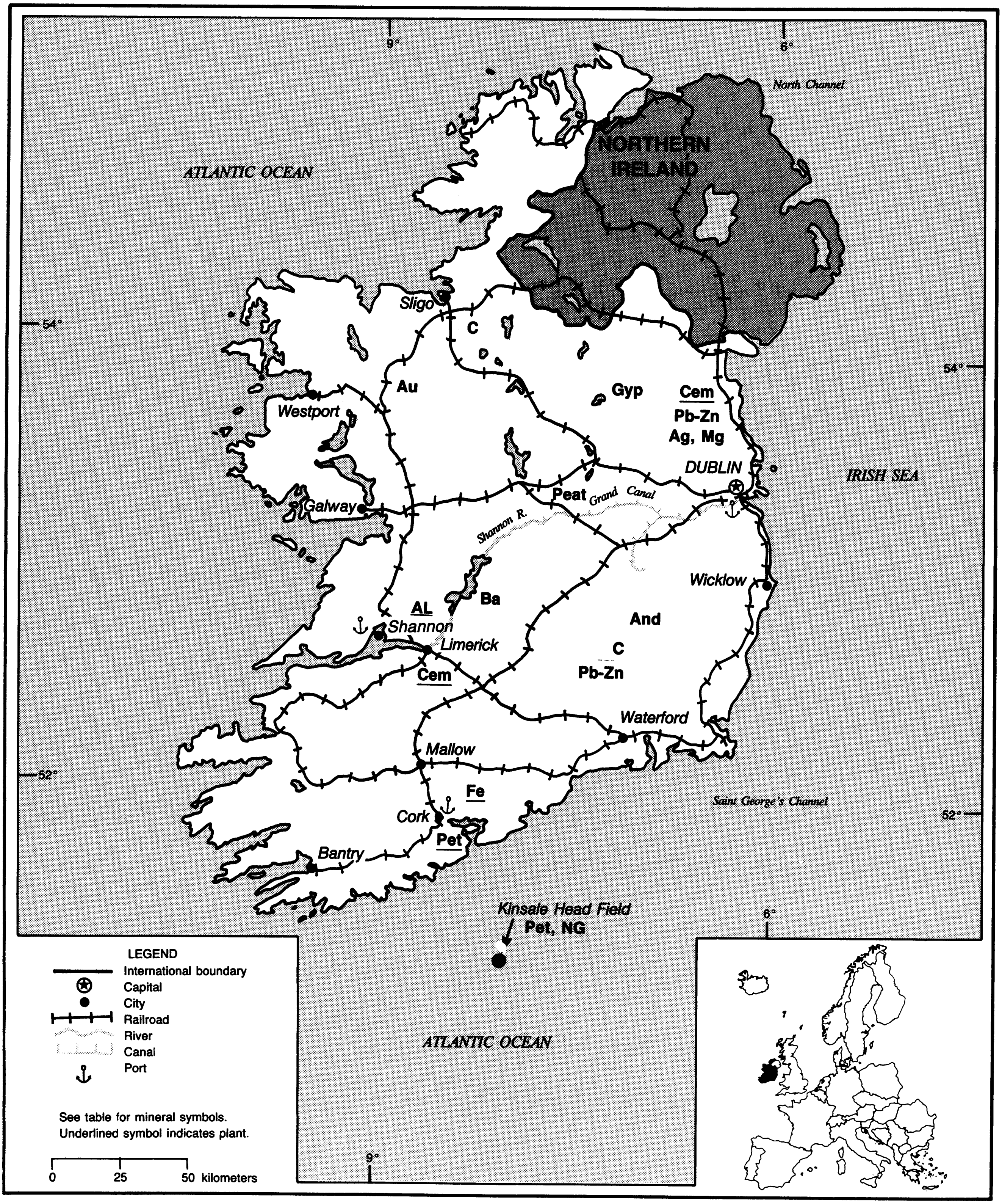
(Million metric tons unless otherwise specified)

Commodity		Amount[e]
Diatomite		2.5
Shell sand		2.5
Perlite		48
Pumice	million cubic meters	28

[e]Estimated.

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 1993. The country continued its significance in the European Union (EU) as a producer of mined lead and zinc. Although the range of minerals exploited in the country 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 gross national product growth was estimated to have been 2.2%. The Irish economy has shown a very creditable performance with a sustained rate of growth of 2.5% to 3% in past years.

GOVERNMENT POLICIES AND PROGRAMS

As a member of the EU, Ireland was a full participant in the program to complete the single European market, and the country was continuing in those efforts.

The Government was expected to continue to receive EU funding support to assist in constructing and upgrading infrastructure projects, including roads, ports, telecommunications, and indigenous energy development.

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.

ENVIRONMENTAL ISSUES

The European Community (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 on 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 prior to issuance. Also, prospectors are required to complete an environmental audit.

Legislation to set up an Environmental Protection Agency was enacted in 1992, and mineral extraction will be licensed by the agency for discharges to air and water, for noise emissions, and for waste. The Department of Energy will assess the adequacy of any EIA's submitted.

The EIA is not confined to mineral operations. Some other operations that would be impacted are cement plants, ironworks, steelworks, and foundries with a batch capacity of 5 mt/d or more; integrated chemicalworks; glassworks where capacity exceeds 5,000 mt/a; and artificial mineral fiber factories.

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 metals and industrial minerals projects were awaiting the granting of planning permission and mining leases before moving into development and 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 1993. External trade was more diversified than in the past, thus reducing exposure to changed economic conditions in individual overseas markets.

Although Ireland was supportive of the single European 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. EU measures most likely to impact on Ireland's interests are fiscal harmonization and proposals for economic and monetary union. Ireland has been a full participant in the European Monetary System (EMS) 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.

STRUCTURE OF THE MINERAL INDUSTRY

Ireland has traditionally been a rural-based economy, and farm products continued to contribute significantly to the total export value in 1993. 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 in respect to mineral resources and has a proven geological potential for a variety of minerals. In 1993, the country was a significant producer of 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 persons in 1993. *(See table 2.)*

COMMODITY REVIEW

Metals

Alumina.—Aughinish Alumina Ltd. (AAL) had, for the most part, completed its $12 million[1] 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. The refinery is currently producing 950,000 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 companies, Glencar Exploration PLC and Andaman Resources PLC, were continuing with gold exploration projects in Mayo County.

Burmin Exploration PLC was continuing its exploration and development project near Lecanvey. The company estimated the deposit contained 498 Mmt of ore grading 1.5 g/mt of gold.

MIM Holdings of Australia and Navan Resources PLC of Ireland 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 previously planned major plant renewal. Technical upgrading of mining and processing operations continued; however, Tara stated no further investment or increased zinc production was contemplated before 1995. The Tara Mine, at Navan, is one of the largest lead-zinc producers in Europe.

Arcon International Resources PLC, formerly Conroy Petroleum and Natural Resources PLC, was proceeding with plans to develop its deposit in County Kilkenny after receiving planning permission from the Kilkenny County Council. The company submitted a planning application 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. Mine construction was expected to take 19 months to complete and would provide 200 jobs.

The company's estimated cost of bringing the Galmoy Mine into production in 1995 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.

The joint-venture project of Ivernia West PLC and Minorco S.A. was continuing. Ivernia reported that drilling results on the Lisheen ore body in County Tipperary had increased estimated reserves to 22 Mmt of ore grading 12.5% zinc, 2.4% lead, and 38 g of silver per ton of ore. The drilling program was expected to continue into 1994.

The joint venture was proceeding with a full feasibility study and an Environmental Impact Statement. This would form the basis for the planning application for the Lisheen Mine development. 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. Privatization of Irish Steel was still under consideration. The company was in negotiations with its work force over a rationalization and investment program. The company went from four to three shifts in both its melting shop and rolling mill and was continuing with its $25 million investment to improve operating efficiency.

Industrial Minerals

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 Div. (Ireland), a subsidiary of De Beers Consolidated Mines (Pty) Ltd. of South Africa, and GE Superabrasives Ireland, a subsidiary of General Electric Co. of the United States.

A range of abrasives is 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 continued with open pit mining of the Knocknacran gypsum 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. Reserves at Gypsum's two other mines had been exhausted and they were closed.

Ivernia West PLC submitted a planning application with 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 220 MMcfd, is Ireland's only source of natural gas. IGB is the largest single primary energy supplier to the industrial sector.

A frontier licensing round covering acreage in the Erri and Slyne Troughs off the northwest coast was under way. New incentives include abolition of royalities, the tax on profits reduced to 25% and a 25-year retroactive exploration incentive allowing all exploration costs incurred in Ireland over the past 25 years to be offset against future production.

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$1.48, the average rate for 1993.

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Dame Street
Dublin 2, Ireland

Geologic Survey of Ireland
Beggars Bush
Haddington Road
Dublin 4, Ireland

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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		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan 1, 1994)
METALS							
Alumina	thousand tons	841	[e]885	[e]981	[r]1,007	1,103	1,000
Iron and steel: Steel, crude	do.	324	326	307	[r]257	[4]326	350
Lead:							
Mine output, Pb content		[e]32,100	35,300	39,900	[r]42,900	48,400	50,000
Metal, refined, secondary		[e]12,000	[e]15,000	11,600	12,000	12,000	15,000
Silver, mine output, Ag content	kilograms	[e]7,247	[e]8,000	10,500	13,100	13,000	15,000
Zinc, mine output, Zn content		[e]168,000	166,500	187,500	194,500	194,100	225,000
INDUSTRIAL MINERALS[2]							
Barite	thousand tons	82	101	94	70	53	100
Cement, hydraulic[e]	do.	1,600	1,625	1,600	1,600	1,600	2,000
Gypsum	do.	300	394	[e]342	[e]343	318	500
Lime[e]		111,300	112,000	110,000	110,000	100,000	150,000
Nitrogen: N content of ammonia	thousand tons	386	[e]395	[r]429	[e]400	400	450
Sand and gravel[e] [3]	do.	7,400	7,500	7,000	7,000	7,500	10,000
Stone and other quarry products:[e]							
Limestone[3]	do.	[4]8,874	9,000	8,500	9,000	8,500	10,000
Other[4] [5]	do.	[4]1,967	2,000	2,000	2,000	2,000	5,000
MINERAL FUELS AND RELATED MATERIALS							
Coal, anthracite and bituminous[e]	do.	[4]43	45	6	10	10	25
Gas, natural: Marketed	million cubic meters	[e]56	57	56	[e]56	58	75
Peat:							
For horticultural use	thousand tons	[r]265	[r]229	[r]249	[e]300	300	500
For fuel use:[e]							
Sod peat[6]	do.	[r] [4]1,389	[r]1,410	[r]1,000	1,200	1,000	1,500
Milled peat[7]	do.	[r] [4]6,374	[r]5,020	[r]3,767	5,000	5,500	7,500
Total	do.	[r] [4]7,763	[r]6,430	[r]4,767	6,200	6,500	9,000
Peat briquets[e]	do.	[4]355	400	400	400	400	400
Petroleum refinery products:[8]							
Liquefied petroleum gas	thousand 42-gallon barrels	244	294	[e]250	[r]404	400	500
Naphtha	do.	408	497	400	[r]349	350	500
Gasoline, motor	do.	2,831	3,022	3,000	[r]3,065	3,000	3,000
Distillate fuel oil	do.	4,118	4,602	4,500	[e]4,000	4,000	5,000
Residual fuel oil	do.	3,257	4,049	4,000	[e]4,000	4,000	5,000
Refinery fuel and losses	do.	[e]400	425	400	[e]375	400	500
Total[e]	do.	11,258	12,889	12,550	[r]12,193	12,150	14,500

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994.
[2]Ireland also produces significant quantities of synthetic diamond and is the major overseas supplier of this material to the United States. However, output is not quantitatively reported, and available general information is inadequate to make reliable estimates of output levels.
[3]Excludes output by local authorities and road contractors.
[4]Reported figure.
[5]Includes clays for cement production, fire clay, granite, marble, rock sand, silica rock, and slate.
[6]Includes production by farmers and by Bord Na Mona.
[7]Includes milled peat used for briquet production.
[8]From imported crude oil.

TABLE 2

IRELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of facility	Annual capacity
Alumina		Aughinish Alumina Ltd.	Aughinish Island, County Limerick	800
Barite		Magcobar Ireland Ltd.	Silvermines, County Tipperary	240
Cement		Irish Cement Ltd.	Plants in Limerick and Platin	2,000
Lead-zinc		Tara Mines Ltd.	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.	Refining at Whitegate, near Cork	56,000
Steel		Irish Steel Ltd.	Plant at Haulbowline, near Cork	350

ITALY

AREA 301,300 km² **POPULATION 58.1 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, and potash and the manufacturing of steel products were also of world significance.

In 1993, the Italian economy continued to experience a reduction in growth, due primarily to high internal interest rates, lower private and public consumption, and a deceleration of investment. The unemployment rate was about 11% 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 also is 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, manganese, and zinc were mined in 1993 although production was declining significantly. Italmagnesio SpA's Dosseni magnesium mine remained closed throughout 1993. Reportedly, the closure was for economic and environmental reasons. Italmagnesio's magnesium alloy and anode production continued.

Industrial mineral production remained the most important sector with overall output remaining more or less constant. Domestic production of natural gas, petroleum and lignite continued to increase. Italy's most notable contribution to global mineral commodity supplies continued to be its production of processed materials based on imported raw materials. *(See table 1.)*

In 1993, the country ranked sixth globally in steel production and was third after France and the United Kingdom among European Union (EU) producers. Also, Italy ranked seventh globally in cement output and first in crude oil refining capacity among EU producers.

Italy increasingly has become dependent on its trade with other EU countries. It has been estimated that Italy's share of total exports going to EC partners has increased from 48% in 1981 to more than 60% in 1992. *(See table 2.)*

STRUCTURE OF THE MINERAL INDUSTRY

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 3.)*

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. Alumix operated five smelters: one at Bolzano, one at Porto Marghera, and two at Fusina, all of which are near Venice, and one at Portoscuso in Sardinia.

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 on Italy's several secondary aluminum producers.

Copper.—Italian refined copper production has remained fairly consistent. Enirisorse S.p.A., formerly Nuova Samim S.p.A., was the largest producer of refined copper, lead, and zinc metal in Italy, employing almost 3,350 workers. Enirisorse produced about 55% of Italian copper metal. Virtually all of the country's output was derived from scrap, ashes, slags, and other residues.

Enirisorse also produced antimony metal, bismuth, gold, and silver. All sources of Enirisorse'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 Enirisorse 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 Enirisorse at its Porto Marghera copper-zinc plant, near Venice. Copper cathode capacity at the plant reportedly was increased to 60,000 mt/a in 1991. In an attempt to reduce the 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 for lead and zinc concentrates. Within Italy, most lead and zinc concentrate production came from Enirisorse's mines in Sardinia. Enirisorse'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 Enirisorse at the Paderno Dugnano and Marcianise plants, whose capacities were 50,000 mt/a and 35,000 mt/a, respectively.

In 1993, Enirisorse operated the country's largest zinc smelter in Crotone. This smelter was acquired from Pertusola Sud S.p.A. in 1990. This acquisition expanded Enirisorse's control over the country's lead and zinc industry. Enirisorse operated four zinc plants with a total capacity of 349,000 mt/a. The company also produced cadmium and germanium.

Steel.—Italy was the third largest producer of crude steel in the EC, after France and the United Kingdom. About 40% of steel in Italy was produced by basic oxygen furnaces and 60% 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 was imported in 1993, 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 marked 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 about 10.6 Mmt/a, Ilva was the sixth largest steel producer in the world. Flat products were the company's main strength, with Taranto being one of the largest flat-rolled steel centers in the world. Ilva employed about 46,000 workers in 1993. Almost 20% of the company's steel was exported. Ilva continued to be a major importer of metallurgical coal, primarily from the United States.

Ilva was in the process of divesting itself of facilities to make long products and go almost entirely to light, flat-rolled products. The company reportedly was considering private investment into the company's core business and the sale or closure of the rest. Investors could be either domestic or foreign. At year-end, details of the privatization were being considered by the Government.

Several Italian and foreign steel companies have expressed interest in buying Ilva Laminati Pianti, flat products, and Acciai Speciali Terni, stainless steel products, of the Ilva group. Presentation of preliminary non-binding offers are due in February 1994.

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. Owing 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 1993. The future of the mine reportedly was uncertain because of environmental problems. With the Government's announcement of new legislation that would result in the termination of chrysotile and amphibole applications within Italy, the mine most likely will remain permanently closed.

Barite.—There were mainly three operating companies in Italy producing barite: Mineraria Baritina S.p.A., with mines at Trentino, Monte Elto, and Primaluna, east of Milan; Samatec S.p.A., with one mine at Mastricarro in Calabri and one mine at Schilipario in the Alps; 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.

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 EU, 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 Carrera area. Unimin imported bauxite from Brazil and China, kyanite from Brazil, flint clay and kaolin from China, and andalusite from the Republic of 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 comes from Industria Chimica 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. Montmorillonite clay (white bentonite) was quarried at S'Aliderru in northwestern Sardinia. Caffaro S.p.A., operating in Sardinia, was Italy's only producer of acid-activated montmorillonite. The clay was shipped to the company's plant at Porto Marghera, near 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 the manufacturing of tile. Industria Chimica 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 total 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 France, Germany, 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 in the Gerrai region, about 40 km from Cagliari, Sardinia. Six mines were in operation in 1992: 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.

Assets and operations of Mineraria Silius were taken over by Nuova Mineraria Silius S.p.A. in early 1992. However, the Sardinian regional autonomous government maintained its majority share in the company's equity. 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 has 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 geographic area producing white marble was in the Apuan Alps in Tuscany, particularly near the town of Carrara. The Lazio region, Lombardy, the Po Valley, Puglia, the Island of 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 continued to decrease. The main reason for the decline was the result of a severe drought that has restricted availability of process water to the plants. At yearend, the three underground mines that were operating in Sicily were 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 a 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 Lipari, with an output of about 70,000 mt/a.

Pyrite.—Pyrite was mined almost exclusively by Solmine S.p.A. at its Compiano and Niccioleta underground mines in Tuscany. The Niccioleta Mine was closed in late 1992 because of mineral reserve depletion and associated problems. Production is now concentrated at the Compiano Mine. 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, Solvay S.p.A., and Societa Montecatina. 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. Societa Montecatina operated the Timpa del Salto salt brine chamber at Calabria. The ultrapure (99.9% NaCl) salt was shipped to the Endichem plant at Porto Marghera to produce chlorine and sodium.

Sulfur.—Italy, once the world's leading producer of mined sulfur, was a modest producer of sulfur in 1993, 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 Solmine S.p.A.'s Campiano Mine 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 near Turin. The talc, mined from metamorphic rocks, has been of very high quality. Talco owned 10% interest in an open pit mine at Orani, in Sardinia, with the other 90% belonging to the Sardinian Mining Board. Talco Sarda S.p.A. also operated a mine at Orani. Talco e Grafite Val Chisone S.p.A. operated an underground mine at Fontane, and Industria Mineraria Italiana S.p.A. (IMI) operated mines at Largone and Predaccia in Val Malenco, northern Italy. About 35% of IMI's production reportedly was 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 Electria (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, at Pietrafitta in Umbria and at St. Barbara in Tuscany, operated by ENEL for use in domestic electricity production. Carbosulcis S.p.A.'s subbituminous underground coal mine in Sardinia was closed. The Italian government reportedly was considering the viability of developing this coalfield. Italy was heavily dependent on imported coal, mostly from the United States and the Republic of 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% was 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, petroleum, 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 1992. Highways totaled 294,410 km. Superhighways totaled 5,900 km, and 7,010 km of Italy's roads was 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 is expected to continue to decline. 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 EU.

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. The ceramics sector will continue to be important, particularly regarding exports.

Domestic output of natural gas, crude petroleum, and petroleum refinery products is 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	1989	1990	1991	1992	1993e	Annual capacitye (Jan. 1, 1994)
METALS						
Aluminum:						
Alumina	722,226	752,000	804,596	r762,400	840,000	900,000
Bauxite	11,761	338	e8,600	r97,500	90,100	100,000
Metal:						
Primary	219,500	231,900	205,636	207,000	155,600	250,000
Secondary	390,000	349,600	343,000	353,100	350,000	400,000
Antimony: Oxides, gross weight[2]	856	940	861	1,172	1,000	1,200
Bismuth metal	46	34	45	r20	15	25
Cadmium metal, smelter	776	691	658	742	517	800
Copper: Metal, refined, all kinds	83,300	83,000	e82,500	e76,000	90,300	125,000
Iron and steel: Metal:						
Pig iron thousand tons	11,795	11,883	10,856	10,462	[3]11,066	15,000
Ferroalloys:						
Blast furnace:						
Ferromanganese	r—	r—	—	—	—	—
Silicon pig irone	1,000	1,000	600	500	500	1,000
Electric furnace:						
Ferrochromium	87,331	53,103	47,192	60,315	53,504	64,000
Ferromanganese	40,958	41,837	14,145	e10,000	10,000	15,000
Ferrosilicon	65,171	39,761	12,648	e12,000	12,000	12,000
Silicomanganesee	47,000	56,000	55,000	50,000	50,000	50,000
Silicon metal	e19,000	e13,000	6,200	10,000	10,000	10,000
Othere	15,000	14,500	14,500	12,000	12,000	15,000
Totale	275,460	219,201	150,285	154,815	148,004	167,000
Steel, crude thousand tons	25,213	25,439	25,046	24,904	[3]25,701	26,000
Semimanufactures do.	22,000	23,105	23,817	23,331	22,000	24,000
Lead:						
Mine output, Pb content	17,544	16,042	14,200	r e16,000	7,400	20,000
Metal, refined:						
Primary	74,205	64,591	111,696	102,000	89,900	115,000
Secondary	112,000	102,200	96,500	84,300	92,900	100,000
Total	186,205	166,791	208,196	186,300	182,800	215,000
Magnesium:						
Mine output, Mg content	7,096	7,921	3,912	—	—	—
Metal, primary	5,768	5,725	r3,919	r1,211	1,200	5,000
Manganese, mine output:						
Gross weight	5,899	6,657	8,340	r8,346	8,300	10,000
Mn content	1,475	1,664	2,350	r2,087	2,000	2,500
Silver metal kilograms	97,036	103,400	176,475	r128,716	50,000	150,000
Zinc:						
Mine output, Zn content	43,258	43,043	36,349	r35,032	3,100	5,000
Metal, primary	259,481	264,395	263,775	252,600	270,000	275,000
INDUSTRIAL MINERALS						
Asbestos	44,348	3,862	e15,000	—	—	—
Barite	60,331	44,345	88,486	r74,884	75,000	100,000
Brominee	400	400	400	300	300	400

See footnotes at end of table.

TABLE 1—Continued
ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Cement, hydraulic	thousand tons	39,385	39,975	[r]40,806	[r]41,347	42,000	42,500
Clays, crude:							
Bentonite	thousand tons	234	228	385	[e]360	300	400
Refractory excluding kaolinitic earth-do.		559	641	462	[e]400	400	400
Fuller's earth	do.	44	4	23	[r]28	30	50
Kaolin	do.	64	67	49	[r]53	50	75
Kaolinitic earth	do.	19	18	16	[e]15	15	25
Diatomite[e]		25,000	25,000	23,000	26,000	25,000	25,000
Feldspar		1,350,733	1,605,431	1,304,203	[r]1,687,000	1,600,000	1,800,000
Fluorspar:							
Acid-grade		66,600	81,822	60,650	[e]55,000	35,000	75,000
Metallurgical-grade		59,679	40,661	37,868	[e]25,000	25,000	50,000
Total		126,279	122,483	98,518	[e]80,000	60,000	125,000
Gypsum	thousand tons	1,231	1,262	[e]1,2850	[e]1,300	1,200	1,500
Lime, hydrated, hydraulic and quicklime[e]	do.	3,900	3,850	3,800	3,600	3,600	4,000
Nitrogen: N content of ammonia	do.	1,446	1,197	1,147	[e]1,098	1,000	1,200
Perlite[e]		71,000	71,000	70,000	65,000	65,000	70,000
Pigments, mineral: Iron oxides, natural[e]		850	850	800	700	700	800
Potash, crude salts:							
Gross weight	thousand tons	1,730	661	429	[e]940	600	1,000
K_2O equivalent	do.	208	138	63	[e]126	84	250
Marketable product, K_2O equivalent	do.	112	51	31	86	80	100
Pumice and related materials:[e]							
Pumice and pumiceous lapilli	do.	700	725	700	600	700	750
Pozzolan	do.	4,500	4,500	4,500	4,500	4,500	4,500
Pyrite, all types, gross weight	do.	836	806	553	[r]441	400	500
Salt:							
Marine, crude[e] [3]	do.	685	680	450	500	500	750
Rock and brine	do.	3,501	3,752	3,504	[r]3,211	3,200	4,000
Sand and gravel:[e]							
Volcanic sand	do.	100	100	100	100	100	100
Silica sand	thousand tons	4,500	4,300	4,200	4,000	4,000	4,500
Other sand and gravel		124,000	124,000	125,000	125,000	125,000	125,000
Sodium compounds:[e]							
Soda ash	thousand tons	615	610	600	600	500	600
Sodium sulfate	do.	130	125	125	125	125	125
Stone:[e]							
Dimension:[5]							
Calcareous:							
Alabaster	do.	25	20	20	20	20	25
Marble in blocks:							
White	do.	1,650	1,700	1,600	1,700	1,600	1,700
Colored	do.	1,900	1,950	1,900	1,800	1,900	2,000
Travertine	do.	1,150	1,150	1,100	1,000	1,000	1,000

See footnotes at end of table.

TABLE 1—Continued
ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacitye (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Stone—Continued:							
Other:							
Granite	do.	2,500	2,500	2,500	2,500	2,500	2,500
Sandstone	do.	1,800	1,800	1,800	1,800	1,800	1,800
Slate	do.	120	120	120	120	120	120
Crushed and broken:							
Dolomite	do.	900	900	800	[r]700	700	1,000
Limestone	do.	120,000	120,000	120,000	125,000	120,000	125,000
Marl for cement	do.	10,500	[5]12,601	[3]13,123	[r 5]14,095	14,000	15,000
Serpentine	do.	1,500	1,500	1,500	1,500	1,500	1,500
Quartz and quartzite	do.	250	250	250	250	250	250
Sulfur: Recovered as elemental and in compounds:							
S content of pyrite	do.	325	290	[e]200	[e]180	175	300
Byproduct, oil refining and other sources[e]	do.	315	[3]297	280	290	300	300
Total[e]	do.	640	587	480	470	475	600
Talc and related materials		145,888	151,566	161,200	[r]173,000	165,000	175,000
MINERAL FUELS AND RELATED MATERIALS							
Asphalt and bituminous rock, natural		[e]45,000	39,756	39,330	[e]36,000	38,000	45,000
Carbon black[e]		155,000	155,000	150,000	140,000	130,000	150,000
Coal:							
Lignite	thousand tons	1,485	1,493	1,554	[r]1,139	1,000	1,500
Subbituminous (Sulcis coal)		69,420	56,300	172,400	[r]108,722	120,000	150,000
Coke, metallurgical	thousand tons	[e]5,900	6,205	5,771	[e]5,350	5,000	6,000
Gas, natural	million cubic meters	16,978	17,296	17,398	[e]18,150	18,000	18,500
Natural gas liquids[e]	thousand 42-gallon barrels	400	400	400	400	400	400
Petroleum:							
Crude	thousand 42-gallon barrels	31,197	31,619	29,344	[e]30,000	31,000	32,000
Refinery products:							
Liquefied petroleum gas	do.	24,638	26,251	24,580	[e]25,000	24,000	25,000
Gasoline	do.	135,498	153,149	151,513	[e]150,000	152,000	160,000
Naphtha	do.	16,168	15,355	15,782	[e]16,000	16,000	16,000
Jet fuel[e]	do.	[3]16,624	17,000	16,000	16,000	16,000	16,000
Kerosene[e]	do.	[3]31,007	31,500	30,000	30,000	28,000	30,000
Distillate fuel oil	do.	191,140	216,318	221,569	[e]220,000	218,000	225,000
Residual fuel oil	do.	154,898	154,512	148,278	[e]150,000	150,000	150,000
Other	do.	61,292	33,649	32,165	[e]35,000	35,000	35,000
Refinery fuel and losses[e]	do.	[3]40,089	41,500	40,000	38,000	39,000	40,000
Total[e]	do.	[3]671,354	689,234	679,887	680,000	678,000	697,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994.
[3]Reported figure
[2]Antimony content is 83% of gross weight.
[4]Does not include production from Sardinia and Sicily estimated at 200 thousand tons annually
[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 information 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: 1992 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	2,420	3,567	(1,147)	3,395	18,148	(14,753)
Magnesite	1,299	1,159	140	1,805	3,772	(1,967)
Slate	552	2,051	(1,499)	4,102	2,655	1,447
Other	165,813	498,151	(332,338)	377,913	1,055,678	(677,765)
Total	170,084	504,928	(334,844)	387,215	1,080,253	(693,038)
Metalliferous ores:						
Copper	740	1,045	(305)	1,154	5,165	(4,011)
Lead	1	1,906	(1,905)	42	27,719	(27,677)
Zinc	12	34,877	(34,865)	2,323	146,058	(143,735)
Other (including waste and scrap)	109,989	967,669	(857,680)	207,226	1,969,730	(1,762,504)
Total	110,742	1,005,497	(894,755)	210,745	2,148,672	(1,937,927)
Nonmetallic mineral manufactures	780,247	296,169	484,078	1,868,828	477,871	1,390,957
Metals:						
Iron and steel	3,207,917	4,170,415	(962,498)	5,676,022	6,261,154	(585,132)
Mercury	146	309	(163)	169	331	(162)
Other nonferrous metals	1,088,802	2,228,117	(1,139,315)	1,619,539	4,236,832	(2,617,293)
Total	4,296,865	6,398,841	(2,101,976)	7,295,730	10,498,317	(3,202,587)
Mineral fuels	1,368,651	2,417,661	(1,049,010)	3,455,591	19,240,610	(15,785,019)

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

TABLE 3
ITALY: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 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, Sardinia; at Porto Marghera, Venice	720
Aluminum	Alumix S.p.A. (EFIM)	Smelters at Portoscuso, 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
Bauxite	Sardabauxiti S.p.A.	Mine at Olmendo, Sardinia Island	350

TABLE 4

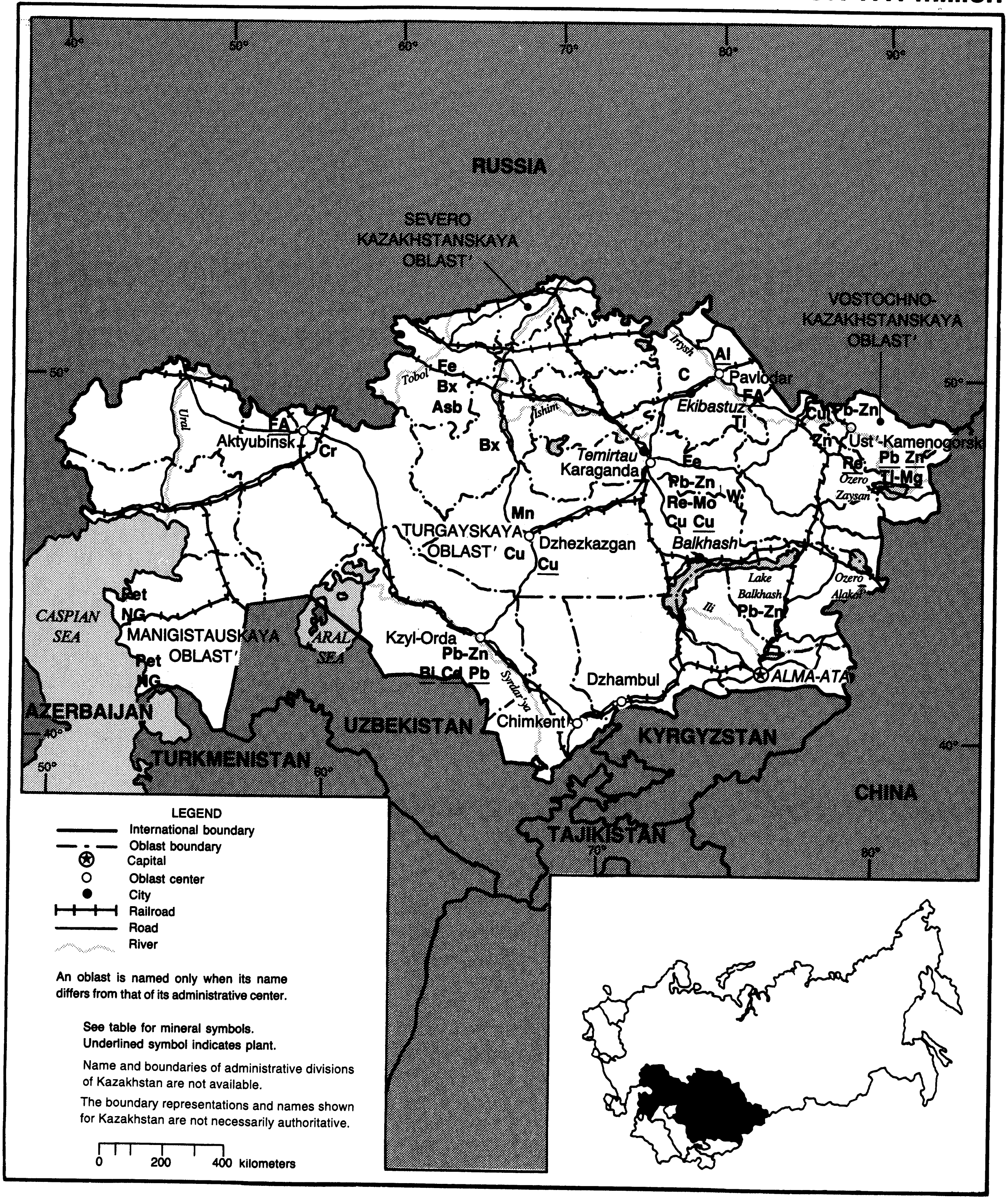
ITALY: ESTIMATED RESERVES[1] OF MAJOR MINERAL COMMODITIES IN 1993

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.

KAZAKHSTAN

AREA 2,717,300 km² **POPULATION 17.1 million**



THE MINERAL INDUSTRY OF

KAZAKHSTAN

By Richard M. Levine

Kazakhstan, which after Russia was the second largest country in land area to form from the republics of the U.S.S.R., is endowed with large reserves of a wide range of minerals. Kazakhstan, along with Russia, was one of the major mineral producing republics of the former U.S.S.R. and produced a major portion of the former U.S.S.R.'s output of a number of metals, including beryllium, bismuth, cadmium, chromite, copper, ferroalloys, rhenium, titanium, lead, magnesium, uranium, and zinc. It had significant production of a number of other metals, industrial minerals, and fuels, including arsenic, barite, coal, gold, tungsten, molybdenum, natural gas, oil, and phosphate rock.

Despite Kazakhstan's potential to be one of the world's leading oil-producing and exporting countries, in 1993 Kazakhstan was suffering from a severe energy shortage. At present, Kazakhstan has no oil refineries and all of its oil production pipelines flow to Russia.

GOVERNMENT POLICIES AND PROGRAMS

The President of Kazakhstan listed four priority areas for foreign investment with the first being the energy sector; the second, processing facilities for agricultural and farm products; and the third and fourth, investment in gold resources and the nonferrous metals mining and metallurgical sector. Major western oil companies, including Chevron Corp., have either invested or are considering investment possibilities in the development of Kazakhstan's hydrocarbon resources.[1]

Kazakhstan announced a plan for developing its metals industries. This plan calls for developing reserves of bauxite, copper, iron, lead and zinc, and titanium raw materials. Kazakhstan was planning to finance part of this development by attracting foreign investment.[2] Also, in 1994, Uzbekistan and Kyrgyzstan formed the Central Asian Union to reduce tariffs in the region and to coordinate fiscal and monetary policies.

ENVIRONMENTAL ISSUES

Kazakhstan's program for development of its metals mineral base calls for a number of measures to improve environmental protection at mining and metallurgical facilities. Under this plan, the Leninogorsk lead-zinc mining and metallurgical complex plans to improve its sulfur recovery and sulfuric acid production facilities; the Ust-Kamenogorsk titanium-magnesium plant plans to construct a shop to recover gaseous emissions and to upgrade its smelters; the Ust-Kamenogorsk lead-zinc plant and the Irtysh copper smelter plan to improve recovery of gaseous emissions; and the Ust-Kamenogorsk lead-zinc plant plans to eliminate effluents from its water. Also under the plan, the Chimkent lead plant plans to introduce recycling technology for lead and plans to build a burying facility for arsenic wastes; and the Balkhash copper plant plans to renovate its electrolysis shop and put in facilities for cleaning sulfuric gases and recycling the sulfur.[3]

PRODUCTION

Kazakhstan experienced decreasing output in 1993 with gross domestic product reportedly decreasing 13% compared with that of 1992 and industrial output decreasing 16.1%. In 1993, according to the few available production statistics at the time of this report, there were decreases in output for most mineral commodities. Reportedly, the following decreases were reported for 1993 compared with 1992: caustic soda, 59%; cement, 38% coal, 12%; mineral fertilizers, 65%; natural gas, 18%; crude petroleum, 11%; finished steel, 21%; and sulfuric acid, 50%.[4] *(See table 1.)*

TRADE

Kazakhstan reported a 15% decrease in exports and a 24% decrease in imports in 1993 compared with 1992 and an overall positive trade balance of $912.3 million that was 11% less than that in 1992. Mineral products reportedly accounted for 41% of total exports.[5] In 1993, there were reported decreases in exports of mineral commodities with decreases in exports of coal, coke, copper, lead, petroleum products, rolled steel, and sulfuric acid and zinc.[6] *(See table 2.)*

Kazakhstan set export quotas for mineral products to countries outside the former U.S.S.R for 1994 that are higher than the level of exports in 1993. *(See table 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

In 1993, three ministries were involved in the development of mineral resources. These were the Ministry of Geology and Conservation of Natural Resources (MINGEO), the Ministry of Energy and Fuel, and the Ministry of Industry. In the summer of 1994 the President of Kazakhstan signed a decree that divided the Ministry of Energy and Fuel into a Ministry for the Oil and Gas Industry and a Ministry for the Energy and Coal Industries.

In the current system, which is similar to the Soviet system with some name changes, the Ministry of Geology is responsible for mineral exploration and management of mineral reserves, the Ministry of Energy and Fuel and its successor ministries are responsible for production of hydrocarbons, and the Ministry of Industry is responsible for ore production. In the area of foreign investment, MINGEO will be acting as the coordinating agency, and all applications by foreign mining firms, reportedly, will be filed with MINGEO.[7]

Kazakhstan's privatization program entailed the issuing of vouchers to the population. Privatization funds also are being established through which it will be possible to invest vouchers for shares of privatized enterprises. At the beginning of 1994, the Government of Kazakhstan's State Property Committee (GKI) decided to speed up the process of privatization by issuing tenders for domestic and foreign investors for buying 38 of the country's largest enterprises, including many major mineral producing enterprises. (*See table 4.*)

COMMODITY REVIEW

Aluminum.—The Pavlodar alumina plant in Kazakhstan was the largest producer of alumina in the former U.S.S.R. with a capacity of produced 1.2 Mmt/a of alumina. In 1993, it produced an estimated 1 Mmt of alumina. The Pavlodar plant also produced 40% of the gallium output of the former U.S.S.R. The Pavlodar plant uses domestic, Commonwealth of Independent States (CIS), and imported bauxites. The Pavlodar plant is considering constructing an integrated aluminum smelter with a capacity of 215,000 mt/a. The initial plans were to develop an aluminum smelter when the plant was constructed in 1959, but the Ministry of Nonferrous Metallurgy decided instead to construct aluminum smelters in Tajikistan and at Sayanogorsk in Russia. Pavlodar ships most of its alumina to Russia to Sayanogorsk and Novokuznetsk, and some to Bratsk.

Owing to a shortage of domestic bauxites to supply Pavlodar, the plan for the development of the metals base of Kazakhstan announced in 1994 calls for developing the Taldy-Aschisay Mine with a projected capacity of 400,000 mt/a of bauxite and to expand production at the Bela and Eastern Ayatsky Mines to raise their outputs to 600,000 mt/a each.[8]

Asbestos.—Besides Russia, Kazakhstan was the only other producer of asbestos in the former U.S.S.R. with production occurring at the Dzhetygara complex in Kustanay oblast. Reserves at Kustanay were reportedly 29.1 Mmt that comprised more than 20% of asbestos reserves in the former U.S.S.R. Production at Dzhetygara in 1993 was reportedly 325,000 tons.[9]

Chromite.—The Donskoy complex in Kazakhstan produced more than 95% of the chromite output of the former U.S.S.R. In 1993, chromite output at Donskoy reportedly fell to 2.9 Mmt compared with 3.5 Mmt in 1992. Plans call for producing 4 Mmt by the year 2000. Production occurs at three open pit mines and one underground mine. Underground mining accounted for almost one-half of the 1993 output, and it is envisaged that underground mining will account for three-fourths of output by the year 2000.[10]

The Kazakhstan Government, in a reorganization plan, formed the Donskoy chrome mining complex and the Aktyubinsk ferroalloys plant into a new holding company called Kramds. One stated purpose of this move is to improve marketing of output, and another stated purpose is to coordinate production between the Donskoy complex, a major chromite producer, and Aktyubinsk, a ferrochrome producer.[11]

The Donskoy complex reportedly exported about 500,000 tons of chromite in 1993 compared with about 800,000 tons in 1992; plans called for increasing exports to more than 1 Mmt in 1994. The Yermak and Aktyubinsk ferroalloy plants in Kazakhstan consumed about 70% of Donskoy's output, but these plants reportedly pay five times less than other consumers. However, Government orders stipulate that Donskoy must supply these plants.[12]

Copper.—Kazakhstan had about one-third of both the copper mining and metal production capacity of the former U.S.S.R. Production came from two main enterprises, the Dzhezkazgan and the Balkhash enterprises in central Kazakhstan.

The Dzhezkazgan copper mining and metallurgical complex, which has a capacity to produce an estimated 250,000 mt/a of copper metal, exports reportedly about one-half of its output to Belarus, Russia, and Ukraine at only 60% of the world price in barter exchange for equipment for oil extraction and ore smelting. Dzhezkazgan sought to raise the price of its copper exports but was prohibited by the Government from raising its price.[13] The rest of its copper is exported to fabricators outside of the former U.S.S.R.

In 1993, the Dzhezkazgan enterprise was trying to obtain London Metal Exchange (LME) registration for its copper, which was being held up reportedly because of packaging problems for the cathode. In 1993, Dzhezkazgan had contracts to toll smelt copper from a number of countries, including Chile and Bulgaria. The copper concentrates smelted at Dzhezkazgan, which come primarily from the enterprise's own mines, have a high sulfur content, and Dzhezkazgan is seeking to address the environmental problems that have been caused by sulfurous emissions.[14]

Development was being planned at the Samarskoye copper-gold deposit with reported reserves of between 1.5 and 2.5 Mmt of ore with reportedly 610,000 tons of reserves of copper in ores grading 1.86% copper and over 250,000 tons of copper in ores grading 0.69% copper. The gold content of the ore reportedly ranges from 0.5 to 1.5 g/mt. Development was planned with financing in part from Japan's Eximbank which was considering loaning money for development of this deposit.[15]

As part of its program to develop the country's metals base announced in 1994, plans call for developing a new mining complex at the Fifty Years of October copper deposit, part of the Balkhash copper enterprise. This new complex is projected to produce 2.3 Mmt/a of ore for the production of more than 40,000 mt/a of copper. Plans also call for developing mining and beneficiation complexes at the Aktogay and Bozshakol copper deposits in eastern Kazakhstan with reported respective projected capacities of 125,000 mt/a and 60,000 mt/a of copper. Also under this program it is planned to complete development of the Ainini and Aktsispass copper mines, which are part of Dzhezkazgan, with reported respective capacities of 32,000 mt/a and 51,000 mt/a of copper.[16]

Ferroalloys.—Kazakhstan, which produced practically all of the chromite in the former U.S.S.R., has a large ferroalloy industry producing chrome and silica-based ferroalloys at the Yermak and Aktyubinsk ferroalloy plants. Of Kazakhstan's total production of more than 1 Mmt of ferroalloys, less than 10% of this production is consumed domestically. Exports of ferrosilicon from Kazakhstan have been of concern for the past decade and have resulted in a number of trade actions and sanctions against these exports. In December 1992, the U.S. International Trade Commission issued a preliminary determination that ferrosilicon from Kazakhstan was being sold or was likely to be sold in the United States at less than fair market value.

Gold.—Reportedly, Kazakhstan plans to increase its gold output from its reported 1993 level of 13 mt/a to 50 mt/a by the end of 1998. Output in 1993 reportedly was 30% to 35% higher than that in 1991. It is not clear if this gold production figure accounts for all byproduct gold and gold produced by nonstate-run artels in Kazakhstan. It is probable that this figure of 13 tons reported by Interfax refers only to gold produced by the state gold mining concern Altynalmaz, which is comprised of 20 gold mining enterprises.[17] Total Kazakhstan gold production in 1993 is estimated to be 25 tons.

The Kazakhstan Government and the country's main native gold producer, Altynalmaz, were drawing up a program called "Gold of Kazakhstan." In Kazakhstan, reportedly 162 deposits have been explored, of which 118 are lode and 44 mixed. At present, 76 deposits are under development. Kazakhstan is seeking foreign investment to develop small-and medium-size deposits. Initial plans call for development of the Bakyrchik, Vasilkovskoye, and Akbakaiskoe deposits with the aid of foreign investors. The program also calls for increasing output of refined gold at the Tselinny plant in the Akhmola region and at the Ust-Kamenogorsk lead-zinc plant.[18]

Regarding joint ventures, firms involved included the following: the Australian firm Minproc and the U.S. firm Chilevich International Corp., which were drawing up a development plan for the Bakyrchik deposit; the Canadian firm Gold Belt Resources, which entered into a venture to extract gold from slag in the Leninogorsk region; and the Swedish firm Boliden Contech, a subsidiary of Trelleborg, which was assisting with the construction of a new precious-metals plant at the Balkhash copper mining and metallurgical complex.[19]

Iron Ore.—Kazakhstan in the summer of 1994 announced a program for development of its metals mineral base. This program calls for expanding production of iron ore at the Sokolovsko-Sarbay mining and beneficiation complex by increasing capacity from the current 15 Mmt/a to 20 to 25 Mmt/a of iron ore concentrates. In 1993, this complex reportedly produced 7.8 Mmt of iron ore concentrate. The program also calls for increasing pellet production at Sokolovsko-Sarbay to 12 Mmt/a.

Under this program Kazakhstan also plans to expand iron ore output at the Western Karazhal iron ore mine and to build a new beneficiation plant. This plant will be designed to process 6 Mmt of ore and produce 3.8 Mmt of concentrate. Plans also call for constructing a beneficiation plant at Kachar with an initial output capacity of 7 Mmt/a of concentrate and a final capacity of 17 Mmt/a of concentrate. The program further envisions stabilizing output at the Ken-Tobe Mine at 700,000 mt/a by modernizing facilities.[20]

Lead and Zinc.—Kazakhstan was the major lead- and zinc-producing republic of the former U.S.S.R., mining more than 60% of the lead and 50% of the zinc and smelting more than 90% of the lead and almost 50% of the zinc in the former U.S.S.R. Production occurred primarily in eastern Kazakhstan. Serious production problems were cited in eastern Kazakhstan where enterprises were reportedly nearing insolvency because of high fuel prices and heavy debt. These enterprises include several of the largest lead- and zinc-producing enterprises of the former U.S.S.R., including the Leninogorsk and Zyryanovsk mining and metallurgical complexes.

At Leninogorsk, reportedly since 1989, there has been a 67.5% drop in lead production, a 26.9% drop in zinc production, a 50% drop in gold production, and a 36% drop in silver production. The plant is reportedly only operating at 30% to 40% of its capacity with capacity utilization falling to 25% in the fourth quarter of 1993.

Both the Leninogorsk and Zyryanovsk complexes reportedly have large reserves that could be developed if investment funds were available. The Leninogorsk complex reportedly has an additional 35 Mmt of ore reserves if developed to a depth of 1 km.

The Leninogorsk complex was seeking to engage in joint ventures to develop three deposits. Foreign investment was being sought to provide state-of-the-art technology and equipment to develop these deposits. The first is the Dolinnnoye lead-zinc deposit that reportedly contains byproduct gold that grades at 5 g/mt of gold with total gold reserves of 22 tons.[21]

The second is the Chekmar deposit at the Leninogorsk complex, which has a projected capacity of 3 Mmt/a of lead and zinc ore. According to the management of the Leninogorsk complex, annual metal production from Chekmar ore is projected to be 40,400 tons of zinc, 12,800 tons of lead, 2,500 tons of copper, 380 kg of gold in alloys, and 14 tons of silver in alloys. Of this projected capacity 60% was to be produced from open pits. Infrastructural development work at this deposit has already begun.

The third deposit for which Leninogorsk is seeking foreign investment is the Novo-Leninogorsk deposit with the copper, lead, and zinc content of the ore reportedly 0.16%, 1.43%, and 4.04% respectively, and the gold content of 1.54 g/mt and silver content of 32.8 g/mt. Furthermore, this deposit, according to the management at Leninogorsk, contains barite-polymetallic ore comprising 20% of total reserves grading 33.45% barite with the respective contents of copper, lead, zinc, gold, and silver in the barite-polymetallic reserves 0.20%, 2.8%. 6.45%, 2.22 g/mt tons, and 114.8 g/mt respectively. It was projected that a mining complex could be developed based on this deposit that could produce 1.25 Mmt/a of ore for the production of 52,398 tons of barite, 789 tons of copper, 11,027 tons of lead, 36,112 tons of zinc, 1,284 kg of gold, and 27,853 kg of silver.[22]

At the Zyryanovsk complex, plans call for completing development of the Maleyevsky lead-zinc deposit. Reportedly Switzerland's Marc Rich and Australia's Normand-Poseiden are planning to set up a joint venture to develop this deposit. This deposit is one of the larger known undeveloped polymetallic deposits in eastern Kazakhstan, and Kazakhstan had been seeking Western investors to join in its development.[23]

Other deposits slated for development include the Artemovskiy deposit, part of the East Kazakhstan Copper and Chemical complex, with a projected capacity of 800,000 mt/a of lead and zinc ore and the Shalkiya deposit in southern Kazakhstan with a reported projected capacity to produce 3 Mmt/a of lead and zinc ore.[24]

Kazkhstan was successfully marketing the Kivcet autogenous lead smelter developed by the VNIITSVETMET Institute in Ust-Kamenogorsk during the Soviet period. Cominco Ltd., the Canadian lead and zinc producer, will install the Kivcet smelter at its Trail smelting facility. The new Kivcet smelter is projected to increase smelting capacity from the present 100,000 tons to 120,000 tons and at the same time reportedly will reduce emissions by 70% to 80%.[25]

Rare Metals.—Kazakhstan plans to significantly increase production of a number of rare metals. Kazakhstan reportedly accounted for 76.7% of the former U.S.S.R.'s reserves of rhenium, 78.4% of its bismuth reserves, 37% of its cadmium reserves, 35.3% of its gallium reserves, 27% of its beryllium reserves, 20% of its selenium reserves, and 14.1% of its tellurium reserves. By 1998, Kazakhstan plans to increase rhenium production by 10% to 15%, gallium production by 25% to 30%, and scandium and vanadium production by 30%.[26]

At the Dzhezkazgan copper mining complex, along with copper the complex produces byproduct bismuth, cadmium, gold, osmium, rhenium, and silver. These byproduct metals are produced at Dzhezkazgan with the exception of silver and gold, which are sent to the Ust-Kamenogorsk plant in Kazakhstan for processing. Also, there is no complete metallurgical cycle at Dzhezkazgan for producing rhenium or osmium metal. At present, Dzhezkazgan produces ammonium salts of rhenium for use in the oil industry and as catalysts in alloy production for the space industry.[27]

In February 1994, reportedly the Aktau chemical and hydrometallurgical plant that produces uranium, scandium, and rare-earth metals stopped production at its rare-earth metals shop for a lack of orders and because a large number of specialists engaged in rare-earth metals production quit working at the plant. Government assistance was being requested to prevent shut down of the mines.[28]

Titanium.—The Ust-Kamenogorsk plant, with an estimated capacity of 35,000 mt/a of titanium sponge, reportedly had produced 40% of the titanium sponge in the former Soviet Union.[29] Titanium raw material for titanium production came from Ukraine and other raw materials from Russia; curtailments in raw materials shipments have caused raw material shortages at Ust-Kamenogorsk.[30]

In 1993, the Kazakhstan Government reported creating a program for the development of its titanium industry. The program calls for the development of ilmenite deposits, including the Kara-Otkel and Peschanka deposits in eastern Kazakhstan and the Shekash ilmenite-zirconium deposits in the Aktyubinsk region of Kazakhstan. The program further calls for the completion, renovation, and expansion of current metallurgical facilities at the Ust-Kamenogorsk plant with the goal of increasing sponge production capacity by 25% and the creation of titanium dioxide production capacity.[31]

In the summer of 1994, as part of its program for developing its base and nonferrous metals industries, the Government announced plans to develop a mining and beneficiation complex at the Shekash deposit with the capacity to produce 6,000 tons of ilmenite, 11,200 tons of rutile, and 1,100 tons of zirconium during the 1995-97 period.

The program also called for completion of the Kara-Otkel mining and beneficiation complex in eastern Kazakhstan with a capacity reportedly to produce 100,000 tons of ilmenite, 20,000 tons of rutile and 14,000 tons of zirconium concentrate in 1996 and for the completion of the Kokchetav mining and beneficiation complex with the annual capacity to produce 41,000 tons of ilmenite, 18,000 tons of rutile, and 31,000 tons of zirconium concentrate.[32]

Mineral Fuels

Coal.—Kazakhstan was the former U.S.S.R.'s third largest coal producer after Russia and Ukraine. In 1993, coal production reportedly totaled 112 Mmt a 12% decrease compared with 1992 output. Kazakhstan reportedly plans to maintain coal production at the 1993 level of 112 Mmt, of which 75 Mmt is from the Ekibastuz basin that is comprised primarily of subbituminous coals; the remainder is primarily bituminous coal, including coking coal from the Karaganda basin.[33] Both Ekibastuz and Karaganda are administered by the state corporation Kazakhstanugol formed in February 1992, which were subordinate to the Ministry of Energy and Fuel.

Ekibastuz is comprised of four open pits, the largest of which is the Bogatyr with a production of about 50 Mmt/a. Reserves at Ekibastuz are reportedly 7 billion tons with coals ranging from gas through gas-fat, fat and coking, to lean caking. The coal is high in ash content but low in sulfur content.

At Karaganda, production primarily is from underground mines that are practically all mechanized longwall mines, but surface mining is increasing. Karaganda produces both thermal and metallurgical coals. Reserves are reportedly 25 billion tons. Karaganda is comprised of 26 underground mines and three open pits. The underground mines vary in size from about 500,000-mt/a output to more than 3 Mmt/a output. The three open pits are the Chekinsky, reportedly producing about 2 Mmt/a; the Molodezhnyy, producing 4.5 Mmt/a; and the Shubarkolsky, producing more than 3 Mmt/a.[34]

Petroleum.—In 1993, Kazakhstan produced 23 Mmt of crude oil, an 11% drop in production from 1992. The drop in oil production was caused reportedly by an inability to obtain production equipment that was all produced in Russia and Azerbaijan as well as by a lack of funds.[35]

The Chevron Corp., which is engaged in a joint venture to develop the Tengiz Oilfield, was still seeking to establish a pipeline route for exporting its oil. The Tengiz project was reportedly producing about 30,000 bbl/d. Chevron's projected output for this field was 130,000 bbl/d by yearend 1994 and 700,000 bbl/d by the year 2000. Many of the wells that Chevron inherited at Tengiz had to be plugged because of danger of explosions. Despite these difficulties, Chevron was exporting oil from Tengiz by shipping oil to Russia in exchange for oil available for export from a Black Sea port.[36]

In 1993, Siberian oil refineries failed to fulfill an agreement for returning refinery products to Kazakhstan. Furthermore, Russia was negotiating to obtain an equity share in oil development in Kazakhstan.[37]

Uranium.—Kazakhstan reportedly produced 2,700 tons of uranium in 1993 compared with 3,000 tons in 1992. Kazakhstan, Russia, and Uzbekistan each produced about one-third of the uranium output of the former U.S.S.R. Plans called for Kazakhstan to develop its own nuclear powerplants that would operate on domestically supplied fuel and thus reduce Kazakhstan's uranium exports.[38]

In 1994, Kazakhstan announced an agreement with Kyrgyzstan for the period 1994-2000 under which Kazakhstan's uranium mines will ship 1,000 mt/a of uranium concentrate with a 40% to 45% uranium content to the Kara-Balta plant in Kyrgyzstan for processing. The Kazakhstan National Atomic Energy and Industry Co. (KNAEIC) will market the processed product, uranium oxide, with Kazakhstan reportedly receiving 71% of the profits and Kyrgyzstan 29%.[39]

Reserves

Kazakhstan has large reserves of a wide range of important mineral commodities. These reserves have made Kazakhstan one of the most important mineral producing countries of the former U.S.S.R. Actual reserve figures or reserve estimates, however, are currently not available for most nonferrous metals and hydrocarbons because the former U.S.S.R. classified reserve figures as state secrets.

INFRASTRUCTURE

Kazakhstan, which is approximately four times as large as the State of Texas, is the second largest country in land area and fourth most populous to form from the former U.S.S.R. Kazakhstan borders Russia to the north, China to the east, and Kyrgyzstan, Uzbekistan, and Turkmenistan to the south. Although landlocked, Kazakhstan borders two major inland seas, the Aral and the Caspian.

The Aral Sea, however, is drying up as a result of a major environmental catastrophe. The drying up of the Aral Sea is resulting in the contamination of agricultural lands and populated regions by salts and contaminants blown from the dry sea bottom. It is also causing climate changes that are less conducive to agriculture, including hotter temperatures and less rainfall.

Major lakes in Kazakhstan include the Alakol, Balkhash, and Zaysan. There are about 4,000 km of navigable river routes. The major rivers are the Ertis (Irtysh),[40] Syrdarya, Ishim, Ile, (Ili) and (Chu); these rivers are important sources of hydroelectric power and provide water for irrigation.

As of 1990, Kazakhstan had 14,460 km of railroads, not including industrial lines, and 189,000 kms of highways, of which 80,900 km was dirt roads. In 1992, the country had more than 2,800 km of crude oil pipelines and more than 3,400 km of gas pipelines.

Covering a large area, Kazakhstan extends from the Volga River to the Altai Mountains and from plains in western Siberia to desert in central Asia. The climate in Kazakhstan has wide temperature variations both between the northern and southern parts of the country and between summer and winter temperatures. In the coldest northern regions winter temperatures average -20°C in comparison with -1°C in the south while in summer the climate in the northern part averages 18°C while in the south it averages 29°C.

The population of Kazakhstan is almost evenly split between Kazakhs and Russians with each comprising about 40% of the total population. The remaining ethnic groups are primarily other Slavic groups and German Russians.

OUTLOOK

The outlook for Kazakhstan's mineral industry could be quite favorable given the size and variety of its mineral reserves and the fact that Kazakhstan has a wide range of mineral commodities that it produces in excess of its consumption needs and which could be exported. Most of these minerals are exported to the C.I.S. countries, particularly Russia, although a larger percentage of these minerals now are being shipped to world markets.

Kazakhstan has the potential to be a much larger supplier of minerals to world markets if it diverts trade away from the C.I.S. and further develops its mineral reserves. Several factors are important. As Kazakhstan makes the transition to market economy criteria, it is not yet clear as to what percentage of its mineral production would be economically competitive under market economy conditions, particularly given the cost of transporting these minerals to world markets. Also, by trading its minerals within the C.I.S., Kazakhstan is able to obtain a large number of commodities needed by other sectors of its economy at below world market prices and may consider this as favorable terms of trade.

Also, a number of Kazakhstan's mineral industries will require substantial investment to become major world suppliers. For example, Kazakhstan has large petroleum reserves that require considerable investment and state-of-the-art technology to develop. The exploitation of Kazakhstan's large petroleum reserves is already being planned with the participation of the United States' Chevron Corp., and this development will be a significant source of fuel and hard currency earnings. Kazakhstan now has significant production of a wide range of ferrous and nonferrous metals and is capable of increasing production of these metals if investment is made in developing deposits and mines and in renovating metallurgical facilities.

It still remains to be seen to what extent foreign investors can be attracted to participate in the development of some of Kazakhstan's major mineral industries, including its copper and lead-zinc industries. Kazakhstan's future as a major world mineral producer will depend in large measure on its ability to attract investment to develop and renovate its mineral industries.

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[1]Foreign Broadcast Information Service (Washington, DC). Mar. 22, 1994, p. 47. Daily Telegraph (London). Mar. 21, 1994, p. 28.

[2]Interfax Mining and Metals Report (Denver, Colorado). June 24-July 1, 1994, pp. 11-12.

[3]Work cited in footnote 2.

[4]Interfax Statistical Report (Denver, Colorado). June 10-17, 1994, p. 14.

[5]———. (Denver, Colorado). Mar. 7, 1994, pp. 20-21.

[6]Work cited in footnote 4.

[7]Mining Journal (London). Mar. 11, 1994, p. 11. IMR. June 10-17, 1994, p. 2.

[8]Work cited in footnote 2.

[9]Interfax Mining and Metals Report (Denver, Colorado), Dec. 17-31, 1993, p. 7.

[10]Work cited in footnote 2.

[11]———. (London), Sept. 20, 1993, p. 15.

[12]Work cited in footnote 10.

[13]Foregin Broadcast Information Service (Washington, DC). Jan. 14, 1994, p. WD 15, Kazakh Radio, Alma-Ata, Dec. 21, 1993.

[14]Metal Bulletin. (London). May 3, 1993, p. 6.

[15]Interfax Business Report (Denver, Colorado). Apr. 4, 1994, p. 7.

[16]Work cited in footnote 2.

[17]Interfax Mining and Metals Report (Denver, Colorado). Feb. 11-18, 1994, p. 5

[18]Work cited in footnote 17.

[19]Interfax Mining and Metals Report (Denver, Colorado). Nov. 26-Dec. 3, 1993, p. 9. (Mining Journal London). Mar. 11, 1994, p. 10.

[20]Work cited in footnote 2.

[21]Interfax Mining and Metals Report (Denver, Colorado). Feb. 25-Mar. 3-4, 1994, pp. 8-9.

[22]The Role of a Partner in a Joint Venture, an unpublished paper by the management of the Leninogorsk Complex, 1994, available at the Bureau of Mines

[23]Interfax Mining and Metals Report (Washington, DC). July 8-15, 1994, pp. 7-8.

[24]Work cited in footnote 2.

[25]Metal Bulletin, (London). Mar. 10, 1994, p. 5

[26]Interfax Mining and Metals Report (Denver, Colorado). Sept. 10-17, 1993, p. 13.

[27]Metal Bulletin, May 3, 1993, p. 9.

[28]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Feb. 25, 1994, WD 11 Kazakh TV, Feb. 16, 1994.

[29]Interfax Mining and Metals Report. (Denver, Colorado). Feb. 5-12, 1993, p. 15-16. American Metal Market, (New York), Feb. 2, 1994.

[30]———. (Denver, Colorado). Feb. 5-13, 1993.

[31]———. (Denver, Colorado). July 3-10, 1992, p. 10.

[32]Work cited in footnote 2.

[33]Interfax Mining and Metals Report (Denver, Colorado). Mar. 19-25, 1994, p. 6.

[34]Mining Magazine, June 1994, pp. 357-358.

[35]Interfax Petroleum Report (Denver, Colorado). Jan. 14-21, 1994, p. 25

[36]Wall Street Journal (New York, New York), Feb. 2, 1994, p. A6.

[37]Financial Times, (London). Mar. 25, 1994, p. 18.

[38]Interfax Mining and Metals Report (Denver, Colorado). Sept. 10-17, 1993, p. 7.

[39]———. (Denver, Colorado). June 17-24, 1994, p. 2.

[40]New names and spellings are given when available. The old names will appear in parentheses the first time the new name is used.

TABLE 1
KAZAKHSTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity	1992	1993	Annual capacitye (Jan. 1, 1994)
METALS			
Alumina	1,100,000	1,000,000	1,200,000
Arsenic trioxide	2,000	2,000	2,500
Bauxite	500,000	500,000	600,000
Beryllium, metal	NA	NA	NA
Bismuth	55	50	70
Cadmium	1,000	1,000	1,200
Chromite	3,500,000	2,900,000	3,800,000
Copper:			
Mine output, metal content	250,000	250,000	400,000
Metal:			
Smelter	310,000	310,000	400,000
Refined	310,000	310,000	400,000
Ferroalloys:			
Ferrochromium	600,000	600,000	650,000
Ferrosilicon	600,000	600,000	700,000
Gold	24	25	30
Iron and steel:			
Pig iron	4,300,000	4,000,000	5,000,000
Steel, crude	5,800,000	5,000,000	6,300,000
Steel, finished	4,100,000	3,400,000	4,700,000
Iron ore, marketable	17,300,000	17,000,000	25,000,000
Lead:			
Mine output, metal content	170,000	160,000	250,000
Metal, smelter, primary	160,000	160,000	250,000
Metal, secondary	NA	NA	NA
Magnesium	20,000	20,000	45,000
Manganese ore, marketable	35,000	50,000	200,000
Molybdenum, mine output, metal content	3,000	3,000	6,000
Silver	900	900	1,200
Tin, mine output, metal content	500	500	700
Titanium, metal	25,000	25,000	35,000
Tungsten, metal, W content	500	500	800
Zinc:			
Mine output, metal content	250,000	250,000	350,000
Metal	240,000	240,000	300,000
INDUSTRIAL MINERALS			
Asbestos, all grades	400,000	325,000	1,000,000
Barite	200,000	200,000	300,000
Boron	100,000	90,000	120,000
Cement	6,500,000	4,000,000	9,000,000
Fluorspar	100,000	90,000	120,000
Phosphate rock	7,000,000	4,000,000	10,000,000
Sulfur	200,000	150,000	300,000
MINERAL FUELS			
Coal	127,000,000	112,000,000	150,000
Natural gas million cubic meters	8,800	9,000	10,000
Petroleum, crude	26,000,000	23,000,000	28,000,000
Uranium concentrate, U content	3,000	2,700	3,500

eEstimated. NA Not available.

TABLE 2
KAZAKHSTAN: REPORTED MINERAL EXPORTS OUTSIDE OF THE C.I.S.

(Metric tons)

Commodity	Quanitity		
	1993	1992	1991
Chromite	373,000	NA	NA
Copper	20,000	109,500	117,400
Lead	31,000	55,800	29,100
Zinc	84,000	73,500	24,300

NA Not available.

Source: Interfax Mining and Metals Report, Jan. 21-28, 1994, p. 12; Mining Journal, June 18, 1993, p. 448.

TABLE 3
KAZAKHSTAN: 1994 METAL REPORT QUOTAS,

(Metric tons)

Commodity	Quota
Alumina	200,000
Chromite	1,100,000
Coal	2,500,000
Copper	146,000
Ferroalloys	650,000
Iron pellets	2,000,000
Tin plate	80,000
Zinc	134,000

Source: Interfax Mining and Metals Report, Feb. 25-Mar. 4, 1994, p. 7

TABLE 4
KAZAKHSTAN: METAL-PRODUCING ENTERPRISES TO BE PRIVATIZED THROUGH TENDERS

Name of Enterprise	Major product (s)
Aktyubinsk ferroalloy plant	Ferrochrome.
Donskoy chromite mining complex	Chromite.
Akbakay mining and processing complex	Gold.
Irtysh polymetallic ore mining and processing complex	Copper concentrate, zinc concentrate, zinc metal.
Balkhash copper mining and metallurgial complex	Copper concentrate, copper metal.
East Kazakhstan copper and chemical complex	Copper concentrate, zinc concentrate, zinc metal.
Karaganda steel mill	Crude steel, finished steel.
Shalkiya underground mine	Lead-zinc ores.
Sokolov-Sarbay mining and processing complex	Iron ore concentrate, pellets.
Yermak ferroalloy plant	Ferrosilicon, ferrochrome.
Tekeli lead-zin mining and processing complex	Lead concentrate, zinc concentrate.
Achisay polymetallic mining and processing complex	Lead concentrate, zinc concentrate.
Pavlodar alumina plant	Alumina.
Turgay bauxite mining complex	Bauxite.
Ust-Kamenogorsk titanium-magnesium complex	Titanium metal, magnesium metal.

TABLE 5

KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity
Alumina	Pavlodar alumina refinery	Pavlador	1,200,000.
Arsenic, trioxode	Chimkent polymetallic enterprise and other nonferrous metallurgical enterprises	Shymkent (Chimkent)	3,500.
Asbestos	Dzhetygara complex	Kustanay oblast	1,000,000 total.
Do.	Chilisay complex	Aktyubinsk phosporite basin	
Barite	Karagailinskiy mining and beneficiation complex	Karagaili region	
Do.	Tujuk Mine	Alma-Ata region	300,000 total.
Do.	Achisay polymetallic complex	Kentau region	
Bauxite	Turgai, Krasnooktyabr bauxite mining complexes	Central Kazakhstan	600,000 total.
Beryllium, metal	Ulbinskiy metallurgical plant	Öskemen (Ust-Kamenogork)	NA.
Bismuth, metal	Ust-Kamenogorak lead-zinc metallurgical plant	do.	70 total.
Do.	Leninogorsk Lead Smelter	Leninogorsk	
Cadmium	Leninogorsk mining and beneficiation complex	do.	1,200.
Chromite	Donskoy mining and beneficiation complex	Khromtau region	3,800,000.
Coal	Karaganda basin	Central and north-central part of the country	50,000,000.
Do.	Ekibastuz basin	do.	85,000,000.
Do.	Maykuben basin	do.	10,000,000.
Do.	Turgay basin	do.	1,000,000.
Copper, mining, re-coverable copper content	Balkhash	Balkhash region	200,000.
Do.	Dzhezkazgan	Dzhezkazgan region	250,000.
Do.	Irtysh	Irtysh region	10,000.
Do.	Leninogorsk	Leninogorsk region	15,000.
Do.	Zhezkent	Zhezkent region	25,000.
Do.	Zyryanovsk mining and beneficiation complex	Zyryanovsk region	5,000.
Do.	East Kazakhstan copper-chemical complex	Ust-Kamenogorsk region	10,000.
Copper: Metallurgy, metal	Balkhash	Balkhash region	150,000.
Do.	Dzhezkazgan	Dzhezkazgan region	250,000.
Do.	Irtysh smelting and refining complex	Irtysh region	40,000.
Ferroalloys	Aktyubinsk plant	Aqtöbe (Aktyubinsk)	High-carbon, 60%, ferrochrome, 150,000; medium-carbon 60% ferrochrome, 130,000,
Do.	Yermak plant	Ermak (Yermak)	Ferrosilicon, 700,000; ferrosilicochrome, 700,000; high-carbon ferrochrome 400,000.
Gallium	Pavlodar alumina plant	Pavlodar	NA.
Gold	Byproduct of polymetallic ores and native gold mining	Colocated with nonferrous metals mining and small native gold depoisit	30.
Iron and steel:			
Pig iron	Karaganda Steelworks	Karaganda	5,000,000.
Do.	Sokolovsko-Sarbayskiy, lisakovskiy mining and metallurical complexes	Kustanay oblast	25,000,000 total.

See footnote at of end table.

TABLE 5—Continued

KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity
Lead and zinc, mining: (recoverable lead and zinc content of ore)	Achisay	Kentau and Karatau regions	Lead 40,000, zinc 20,000.
Do.	Akchatau	Balkhash region	Lead 10,000, zinc 30,000.
Do.	Irtysh	Ust-Kamenogorsk region	Lead 10,000, zinc 50,000.
Do.	Karagaili	Karagaili region	Lead 20,000 zinc 55,000.
Do.	Leninogorsk	Leninogorsk region	Lead 60,000, zinc 120,000.
Do.	Tekeli	Tekeli, Taldi-Kurgan regions	Lead 20,000, zinc 30,000.
Do.	Zhayrem	Zhayrem region	Lead 30,000, zinc 50,000.
Lead and zinc, mining:			
Do.	Zhezkent	Semipalatinsk region	Lead 10,000, zinc 40,000.
Do.	Zyryanovsk complex	Zyryanovsk region	Lead 20,000, zinc 40,000.
Do.	East Kazakhstan copper-chemical complex	Ust-Kamenogorsk region	Zinc 15,000 (lead currently not recovered).
Do.	Kounrad Mine	Balkhash complex	6,000 total.
Do.	Karaobinskoye deposit	Karaoba region	
Do.	Sayak deposit	Sayak region	
Molybdenum, metal	Akchatau molybdenum metal plant	Dzhezkazgan oblast	NA.
Petroleum and natural gas	Aktyubinskneft	Aktyubinsk region	28,000,000 (total crude oil), 10 billion cubic meters (total natural gas)
Do.	Embaneft	Embinskiy districk	
Do.	Mangyshlakneft	Mangyshlak Peninsula	
Do.	Tengiz deposit	Tengiz region	
Phosphate rock	Karatau production association	Dzhambul and Chimkent oblasts	10,000,000 total.
Do.	Chilisay mining directorate	Aktyubinsk phosphorite basin	
Rare metals (columbium, indium, selenium, telurium)	Aktau complex	Shevchenko	NA.
Do.	Belogorsky rare metals plant Chimkent polymetallic plant	Belogorsk Shymkent	NA.
Do.	Ust-Kamenogorsk lead-zinc plant	Öskemen	NA.
Do.	Akchatau mining and beneficiation complex	Dzhezkazgan oblast	NA.
Rhenium	Balkhash copper mining and metallurgical complex	Balqash (Balkhash)	NA.
Tantalum	Yermak ferroalloy plant	Ermak	NA.
Tin	Akchatau mining and beneficiation complex	Akzhal deposit, Dzhezkazgan oblast	700.
Titanium, metal	Ust-Kamenogorsk titanium-magnesium plant	Oskemen	35,000.
Silver, byproduct	Ust-Kamenogorsk	do.	1,200 total.
Do.	Leninogorsk	Leninogorsk	
Do.	Chimkent metallurgical plants	Shymkent	

See footnote at of end table.

TABLE 5—Continued
KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

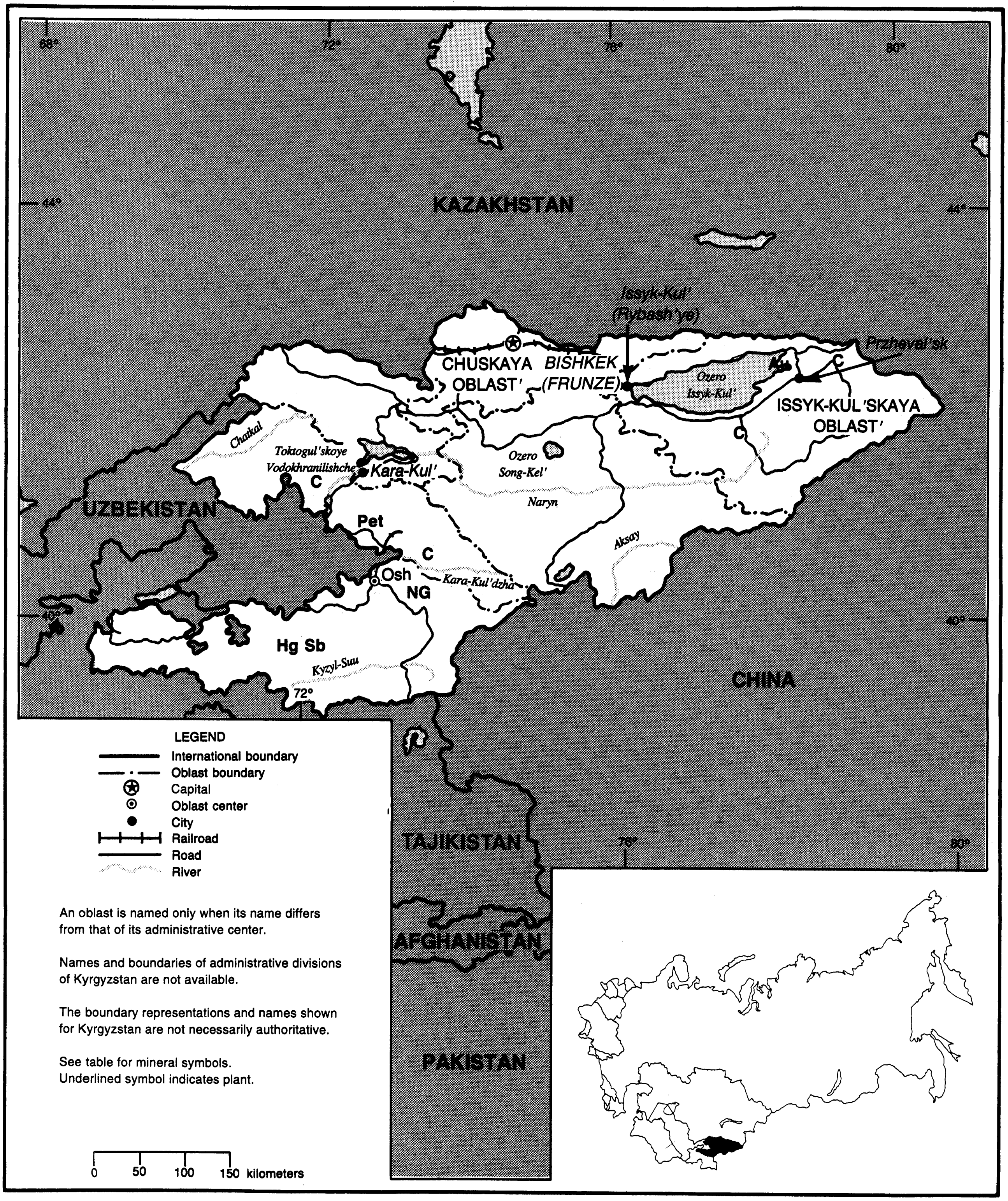
(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity
Uranium, U content	Stepnogosk	Stepnogosk	3,500 total.
Do.	Shevchenko	Shevchenko	
Do.	Taboshara	Taboshara	
Do.	Prikaspiskiy ore enrichment center	Shevchenko	
Do.	Tselinny chemical complex	Stepnogosk	

NA Not available.
[1]New names and spellings are given when available. The old name will appear in parentheses the first time the new name is used.

KYRGYZSTAN

AREA 198,500 km² | **POPULATION 4.6 million**



THE MINERAL INDUSTRY OF

KYRGYZSTAN[1]

By Richard M. Levine

Kyrgyzstan played a leading role in the former U.S.S.R. in the production of two nonferrous metals, mercury and antimony. Along with some industrial minerals, Kyrgyzstan also produced coal, gas, and oil, but was still significantly dependent on imported energy.

The Kyrgyzstan economy has been severely affected by the breakup of the U.S.S.R. with gross domestic product (GDP) reportedly shrinking by 30% in 1993 in comparison with 1991 and with industrial output decreasing by 44% over this period; inflation in 1993 was running at 20% to 30% per month.[2] Despite these economic difficulties, Kyrgyzstan was one of the most advanced of the new states of the former U.S.S.R. in pursuing economic reform.

GOVERNMENT POLICIES AND PROGRAMS

In 1993, Kyrgyzstan launched its own economic reforms, switching to its own currency and beginning a program of rapid privatization. Plans call for attracting large amounts of Western investment to develop the country's gold lode deposits. In October 1992, the major mineral producing enterprises combined to form the Kyrgyzaltyn concern.[3]

In December, the Prime Minister of Kyrgyzstan resigned following accusations that the Government was exporting part of its gold reserves through a Swiss company to deposit in banks as security for foreign loans. The Kyrgyzstan President formed a new Government that supported the goals of promoting economic reform as well as rebuilding economic ties with the other former Soviet republics.

In January 1994, Kyrgyzstan announced that it was joining a Central Asian Union with Uzbekistan and Kazakhstan. The goals of this Union include abolishing tariffs on trade with these countries and coordinating fiscal and monetary policies.[4]

PRODUCTION

In 1993, according to the few statistics available on mineral production at the time of this report, there were decreases in fuel production compared with 1993 with oil production decreasing 22% to 90,000 tons, natural gas production decreasing 43% to 40 million cubic meters, and coal production decreasing 20% to 1.7 million tons; there was also a reported 39% decrease in cement production, to 700,000 tons.[5] *(See table 1.)*

STRUCTURE OF THE MINERAL INDUSTRY

Based on an edict issued in June 1993, Kyrgyzstan began to privatize and denationalize its economy in July. By the end of 1993 approximately 30% of state property had been privatized, including 71% of retail trade and services and 41% of industrial property; a more aggressive effort was being planned for 1994, particularly for privatizing industry.[6] *(See table 2.)*

COMMODITY REVIEW

Metals

Antimony.—Kyrgyzstan produced all of the former U.S.S.R.'s antimony metal, although most of the raw materials were imported from Russia and some from Tajikistan. Production occurred at the Kadamzhay complex with the capacity to produce an estimated 16,000 tons per year of antimony. Demand for antimony in the former U.S.S.R. has fallen sharply, and the Kadamzhay plant in 1993 reportedly exported about 8,000 tons of antimony to world markets. Antimony shipments from Kyrgyzstan reportedly were arriving late because of transport difficulties.[7]

Gold.—In 1993, Kyrgyzstan reportedly produced 1.5 tons of gold compared with 1.2 tons in 1992 and plans to increase gold production to 3 tons in 1994.[8] The Kyrgyzstan Government has drafted a plan to increase gold production to between 20 to 25 tons by the year 2000.

Kyrgyzstan plans to achieve this increase by attracting Western capital investment in its gold mining sector. As of January 1993, Kyrgyzstan had explored and confirmed reserves at 27 deposits, including 13 lode and 14 placer deposits. Six deposits, Dzherui, Ishytamberdy, Kumtor, Levoberezhny, Makmal, and Taldy-Bulak, accounted for 90% of the country's reserves, with Kumtor alone assessed as the world's eighth largest gold deposit.[9]

Kyrgyzstan already has formed a joint venture with Canada's Cameco Corp. to develop the Kumtor deposit with reported reserves of more than 700 tons and projected annual production of 15.5 tons from open pit mining. Plans also called for developing underground mining with a reported projected output of 7.3 tons per year. The deposit is also reported to contain 102 tons of platinum, 247 tons of palladium, 389 tons of silver, 1,509 tons of tellurium, 55,841 tons of tungsten trioxide, and almost 7 million tons of pyrite sulfur. Kyrgyzstan also has formed a joint venture with the U.S. firm

Morrison Knudson to develop the Dzherui deposit, Kyrgyzstan's second largest following Kumtor.[10]

Plans call for renovation of the Makmalzoloto mining enterprise, which mines Kyrgyzstan's only operational gold lode deposit. Production at Makmal had fallen from 3.4 tons in 1988 to 1.2 tons in 1993. In the spring of 1994, the Makmalzoloto gold mining complex announced that the Canadian firm Kilborn would participate in a modernization program that reportedly would double gold output.

Tin.—Kyrgyzstan, which accounts for 18% of the former U.S.S.R.'s tin reserves, had to halt exploration for tin because of lack of funds. Kyrgyzstan is developing two tin deposits, the Uchkoshkon with estimated reserves of 30,000 tons of tin averaging 0.54% tin and the Trudovoye with estimated reserves of 25,000 tons of tin averaging 0.64% tin. At the end of the 1980's, construction began at the Sarydzhas tin mining and beneficiation complex, but the project is not yet completed.[11]

Reserves

Kyrgyzstan has significant reserves of a number of mineral commodities, but data are not yet available to make adequate estimates of these reserves. Kyrgyzstan's most significant reserves in terms of values are its gold reserves. However, Kyrgyzstan also has reserves of metals, including antimony, bauxite, copper, iron, lead and zinc, mercury, tin, and tungsten; of industrial minerals, including barite, fluorspar, graphite, magnesite, salt, talc, and a range of construction materials, precious and semiprecious stones including rubies, topaz, and many other types; and fuels, including coal, gas, oil, oil shale, and peat.

INFRASTRUCTURE

Kyrgyzstan is a landlocked country bordering Tajikistan and China to the south, Uzbekistan to the east, and Kazakhstan to the north. The major form of transport is truck transport. As of 1990, Kyrgyzstan had 30,300 kilometers of roads, of which 22,600 was paved or graveled, and only 370 kilometers of railroad lines. More than 97% of freight transport was by truck. A gas pipeline passes through Kyrgyzstan from Uzbekistan to Kazakhstan. Kyrgyzstan is a mountainous country with mountains comprising three-fourths of its territory. Many of the major mineral deposits are in mountainous regions with difficult transport problems.

OUTLOOK

Kyrgyzstan has large gold reserves slated for development, which should provide a significant source of hard currency earnings. The future of several of Kyrgystan's other major mineral industries, however, is in doubt. Its antimony industry was dependent on ores imported primarily from Russia, and Russia is now planning to construct its own facilities to process these ores. Also, with mercury, Kyrgyzstan's main customer, Russia, is planning to develop its own metallurgical facilities to process Russian ore and make Russia self-sufficient in mercury. With the worldwide decreasing demand for mercury, it does not seem likely that Kyrgyzstan will easily find other outlets for its mercury production; therefore, it is in question as to whether Kyrgyzstan could continue to produce its present quantities of mercury and antimony.

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[1]Text prepared July 1994.
[2]Interfax Statistical Report. June 3-10, 1994, p. 2.
[3]Interfax Mining Report. Dec. 10-17, 1993, p. 9.
[4]Radio Free Europe/Radio Liberty News Briefs. Jan. 10-21, 1994, p. 10.
[5]Interfax Statistical Report. Mar.7, 1994, p. 7.
[6]Foreign Broadcast Information Service, U.S. Govt. publication, Washington, DC. Sept. 22, 1993, p. 66.
SLOVO KYRGYZSTANA, June 18, 1993, p. 1.
[7]Metal Bulletin (London). Dec. 9, 1993, p. 16.
[8]Interfax Business Report, Interfax-America, Denver, Colorado. Dec. 17, 1993, p. 5.
Metal Bulletin (London). Dec. 23, 1993, p. 9.
[9]Interfax Mining Report. Dec. 10-17, 1993, p. 9.
[10]———. Dec 17-31, 1993, pp. 11-13.
[11]———. Nov. 26-Dec. 3. 1993, p. 8.

TABLE 1
KYRGYZSTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Antimony:				
Mine ouput, metal content		2,000	1,600	4,000
Metal		11,000	11,000	16,000
Cement		1,100,000	700,000	1,500,000
Coal		2,100,000	1,700,000	4,000,000
Gold	kilograms	1,200	1,500	3,000
Mercury:				
Mine output, metal content		300	250	500
Metal		400	350	650
Natural gas	million cubic meters	60	40	100
Petroleum, crude		110,000	90,000	150,000

[e]Estimated.

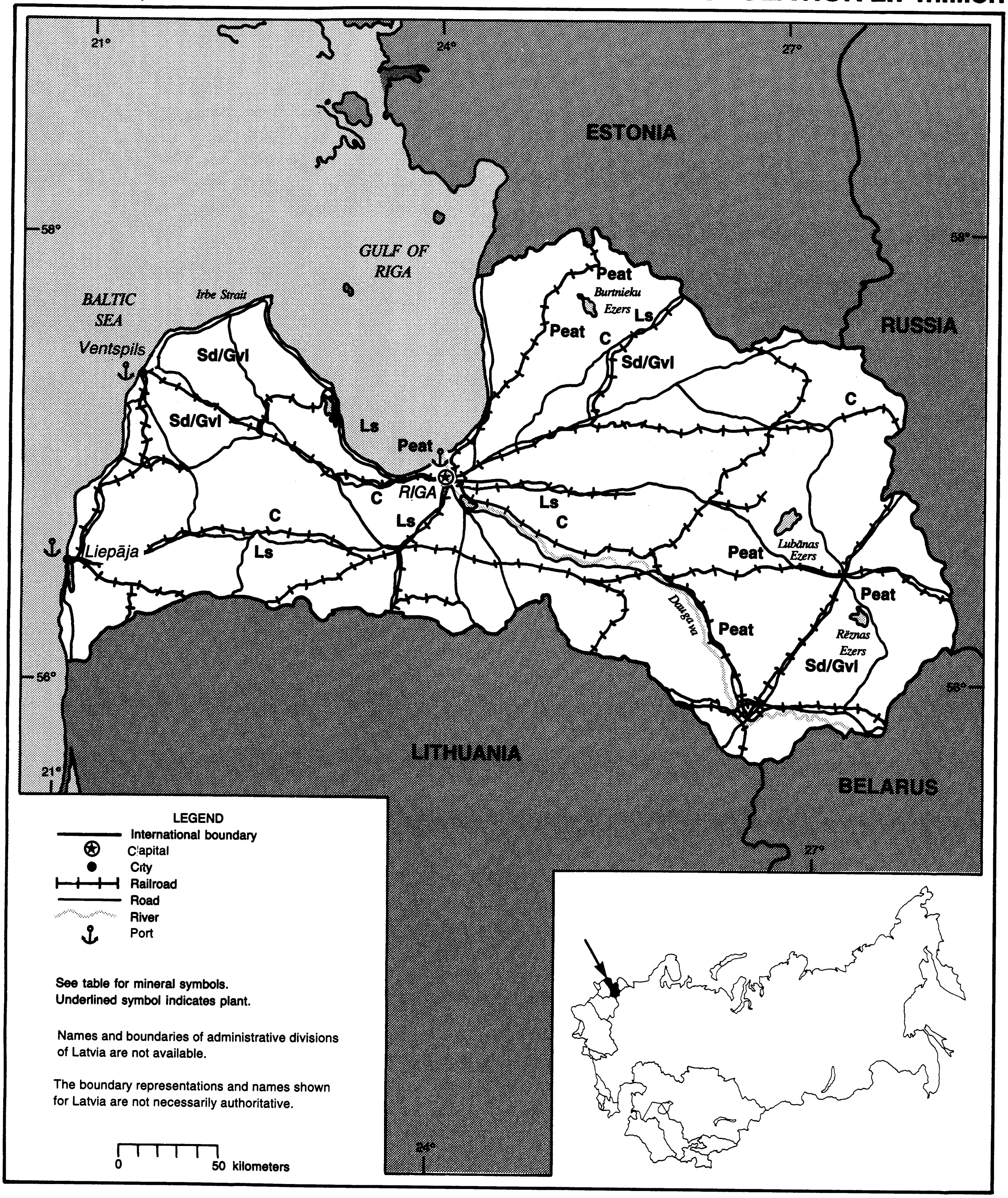
TABLE 2
KYRGYZSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Antimony, metal	Kadamzhay mining and metallurgical complex	Kadamzhay	16,000.
Cement	Kantskiy cement plant	Kantskiy region	1,500,000.
Gold	Kyrgyzstan gold mining complex	Toguz-Toro intermontaine basin of Tien Shan Mountains	5.
Mercury, metal	Khaydarkan mining and metallurgical complex	Khaydarkan	650.
Natural gas and petroleum million cubic meters	Approximately 300 wells: major deposits include Changyr-Tashskoye	Western Kyrgyzstan near Mayli-Say	100 (natural gas).
Do.	Izbaskentskoye, Mayli-Suyskoe, Chigirchikskoye Karagachskoye, Togap-Beshkentskoye, Suzaskoye	do.	150,000 (petroleum).
Coal, brown	Production at 12 mining enterprises including six open pits at the following deposits: Abshirskoye, Almalykskoye, Dzhergalinskoye, Kok-Yangakskoye, Kyzyl -Kiyskoye, Min-Kushskoye, Sogutinskoye, Sulyuktinskoye, Tash-Kumyrskoye, Tegenekskoye deposits.	Southwestern, central, and northeastern Kyrgyzstan	4,000,000 total.

LATVIA

AREA 64,100 km² **POPULATION 2.7 million**



THE MINERAL INDUSTRY OF

LATVIA[1]

By Richard M. Levine

Latvia has a small mineral industry engaged primarily in mining peat and industrial minerals, including clays, dolomite, gypsum, limestone, sand for glass and brick production, and sand and gravel for construction uses. In 1993, industrial output continued to decline, with 80% of Latvian enterprises as of October 1993 reporting a fall in production compared with the same period in 1992.[2]

GOVERNMENT POLICIES AND PROGRAMS

In September 1993, Latvia signed the Baltic Free Trade Agreement that would come into effect in April 1994. Nevertheless, Latvia intended to place tariffs on gypsum and limestone exports.[3] In 1994, Latvia became an associate member of the European Union (EU).[4] Latvia also was in the process of preparing a free trade agreement with the EU, slated to go into effect in January 1995, that will enable Latvia to export goods to the EU without customs tariffs. However, agricultural goods and textiles are not covered by this agreement.

ENVIRONMENTAL ISSUES

In March 1994, environmental ministers from eight countries adjoining the Baltic Sea proposed creating a joint coastal strip outside populated regions to preserve the natural life of the region. Activities deemed to harm the environment in this zone, including mineral extraction, construction of buildings, marinas, roads, and campsites, would be banned.[5]

PRODUCTION

Latvia supplies about 85% of the raw materials for its cement industry. In the mid-1980's, reportedly, there were 3 clay mines producing bricks and drainage pipes, 85 peat deposits under exploitation producing peat for both fuel and agricultural use, a gypsum mining and processing complex, a number of dolomite mines, and 22 sand and gravel pits. Except for the output from these mineral industries, Latvia is dependent on imported fuels and other minerals for practically its entire mineral supply. (*See table 1.*)

TRADE

One major source of revenue from minerals has been the transshipment from Latvia of minerals produced in Russia and other new countries of the former U.S.S.R. to world markets. A percentage of these shipments was made without the authorization of the Government of the countries where the mineral production occurred.

In 1993, Latvia experienced a negative balance of trade, which was primarily the result of the decrease in refined petroleum products exports transshipped through Latvia. Energy and fuel were Latvia's most important import category, totaling 45.3% of total imports with 98% of these imports coming from countries of the former U.S.S.R., including Estonia and Lithuania. The bulk of Latvia's exports was the result of transit trade with refined petroleum products comprising 12.8% of exports, which was the largest single category of exports. Official figures state that nonferrous metals exports comprised only 0.5% of total exports.[6]

STRUCTURE OF THE MINERAL INDUSTRY

Privatization was occurring in Latvia, although reportedly more slowly than in the other Baltic States of Estonia and Lithuania. Privatization vouchers were being issued and the World Bank reportedly granted Latvia credits to attract experts to speed up the privatization process.[7] (*See table 2.*)

COMMODITY REVIEW

Mineral Fuels

Natural Gas.—In 1993, Latvia reportedly owed Russia more than $27 million for natural gas deliveries and Russia agreed to remit this debt in return for a part interest in Latvia's large natural gas storage facility at Incukalns as well as the gas pipelines transversing Latvian territory.

Petroleum.—In April 1994, Latvia signed agreements with the Amoco Overseas Exploration Co. to explore for and develop oil resources on the Latvian-Swedish sea border. Latvian ownership of this area could possibly be questioned by both Sweden and Lithuania.[8]

In 1993, Latvia and Russia agreed to establish joint ventures for oil refining and transport. The new joint venture for transport will operate export pipelines transversing Latvia. In 1993, Russia shipped about 9 million tons of crude oil equaling about 12% of its exports and 10 million tons of petroleum products equalling 30% of its exports through Latvia to the Latvian port of Ventspils. Russia and Latvia also agreed to form a joint stock company to produce, refine, and transport oil and petroleum products.

The petroleum products will be refined at the Novopolotsk refinery in Belarus, which was one of the largest refineries in the former U.S.S.R. with the capacity to produce 24 million tons of refinery products. In 1993, this refinery was operating at only 60% of its capacity.[9]

Reserves

Reserves in Latvia were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Latvia is bounded on the west by the Baltic Sea and Gulf of Riga, to the north by Estonia, to the south by Lithuania, and to the east by Russia and Belarus. Latvia is one of the major outlets for exports of raw materials from the countries of the former U.S.S.R. from its ports of Ventspils and Liepaja on the Baltic Sea, Riga on the Gulf of Riga, and the city of Daugavpils on the Daugava River, which flows to Riga. Crude oil and refined products are shipped to Latvia via pipeline.

OUTLOOK

Latvia has to find a means of acquiring affordable fuel and other mineral raw materials. When Latvia became free of Soviet control, it lost access to its supply of minerals at subsidized prices, which has caused considerable hardship for the Latvian economy. The question that is now central for the Baltic States as well as the other countries of the former U.S.S.R. is the forms of economic and political cooperation that they will seek with each other and with the rest of the world to alleviate the serious problems caused by the breakdown in the former Soviet supply system and the loss of former Soviet bloc markets.

One major source of revenue from minerals has been the transshipment from Latvia of minerals produced in Russia and other new countries of the former U.S.S.R. to world markets. Some revenues from these shipments could be lost to Latvia if the countries of the former U.S.S.R. are able to exert tighter control over mineral exports.

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[1]Text prepared July 1994.

[2]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Nov. 12, 1993, p. WA/4, Estonian News Agency, Oct. 25, 1993.

[3]Radio Free Europe/Radio Liberty Research Report. News Briefs. Feb. 14-18, 1994, p. 18.

[4]Foreign Broadcast Information Service, U.S. Govt. publication, Washington, DC. May 12, 1994, p. 67, Tallinn BNS.

[5]Radio Free Europe/Radio Liberty Research Report. News Briefs. Mar. 7-11, 1994, p. 15.

[6]Foreign Broadcast Information Services, U.S. Govt. publication, Washington, DC. Apr. 11, 1994, pp. 52, 53. Dienas Bizness, Riga, Feb. 21, 1994, p. 19.

[7]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Aug. 20, 1993, p. c/1.

[8]Radio Free Europe/Radio Liberty Research Report. New Briefs. Apr. 5-8, 1994, p. 14.

[9]Interfax Petroleum Report, Interfax-America, Denver, Colorado. Feb. 25-Mar. 4, 1994, p. 4.

TABLE 1
LATVIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity* (Jan. 1, 1994)
Cement		400,000	300,000	1,000,000
Clays	cubic meters	700,000	500,000	1,000,000
Gypsum		350,000	300,000	500,000
Limestone		1,000,000	700,000	1,500,000
Peat		3,500,000	3,000,000	4,000,000
Sand and gravel	cubic meters	1,500,000	1,000,000	2,000,000
Silica sand, industrial:				
For silica bricks	do.	50,000	40,000	80,000
For glass		30,000	25,000	50,000

*Estimated

TABLE 2
LATVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity*
Clays (for cement)		Broceni, Liberty deposits	Broceni region	325,000 total for both deposits.
Gypsum		Saurieshi deposit	Southeast of Riga	500,000.
Limestone (for cement)		Satini-Sesile deposit, Kumas deposit	Broceni region	325,000 total for both deposits.
Peat		Production at 85 deposits, the largest of which are Lielays, Medema, Olgas, Sedas, and Skrebelyu-Skruzmanyu	Northeastern and southeastern parts of the country	4,000,000 total.
Sand and gravel	cubic meters	Production at 22 open pits, the largest of which are Garkalane, Ellerne, Yaunsaty Yanopolye-Tuchi, and Kurzemye	Deposits located in all regions of the country	2,000,000 total.

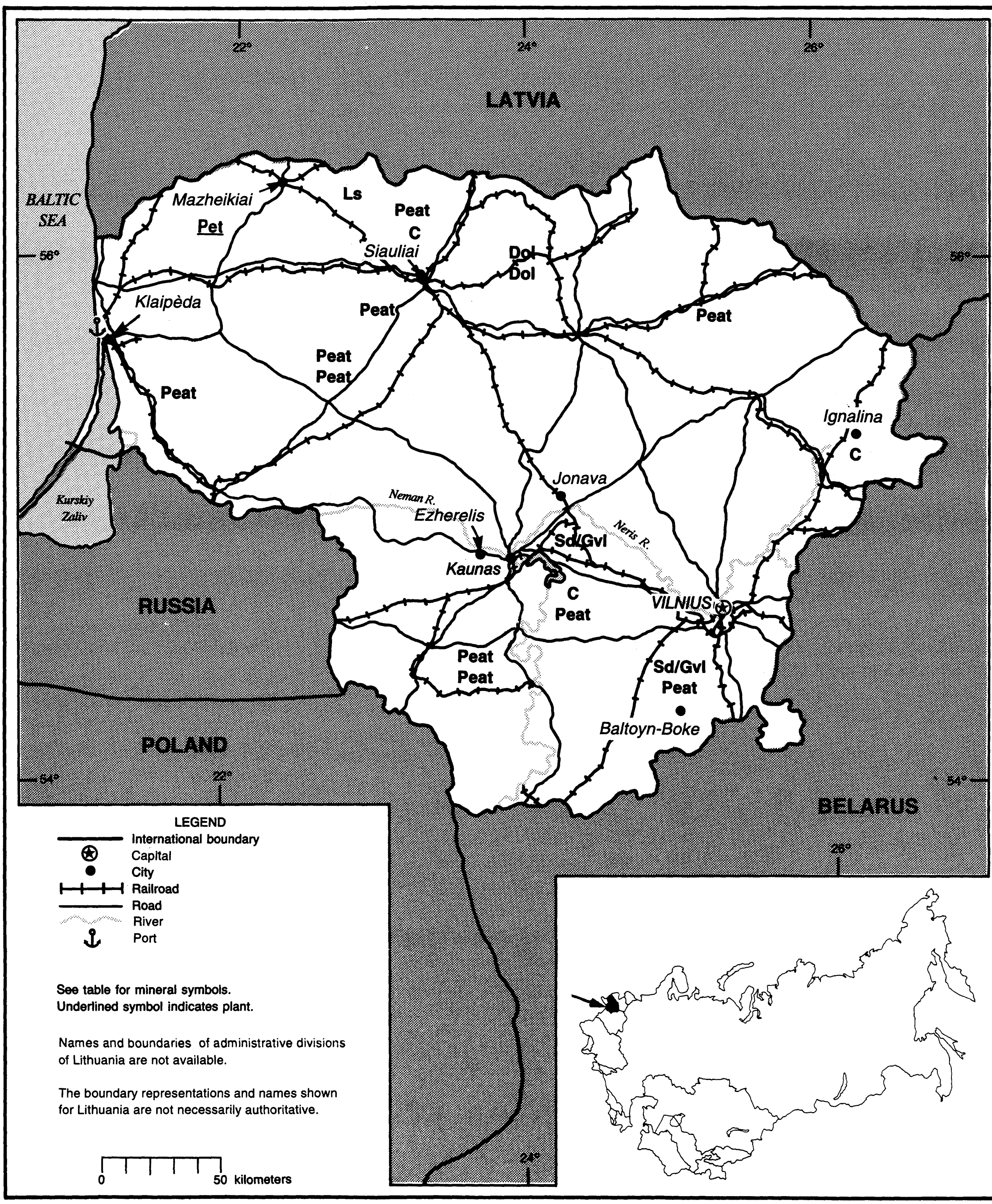
TABLE 3
LATVIA: RESOURCES OF MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Quantity
Clays for cement		10,100
Clays for ceramics	cubic meters	79,100,000
Gypsum		715,000
Peat		346,000

LITHUANIA

AREA 65,200 km² **POPULATION 3.8 million**



THE MINERAL INDUSTRY OF

LITHUANIA[1]

By Richard M. Levine

In 1993, the gross national product (GNP) in Lithuania reportedly was only 43% of the 1989 level, and inflation during the year reportedly was 1,163%.[2] Although not a major mineral producer, Lithuania in 1993 served as a major transshipper to Western markets of minerals from Russia and other countries of the former U.S.S.R., and by shipping minerals from Lithuania and other Baltic States it was possible to circumvent these Governments' export regulations. Lithuania suffered a serious shortage of energy in 1993 as oil, natural gas, coal, and fuel for the Ignalina nuclear powerplant had to be purchased at world prices, and accordingly, there was a significant decline in economic activity.

GOVERNMENT POLICIES AND PROGRAMS

In May 1994, Lithuania was to become an associate member of the European Union (EU). Lithuania also was planning to sign a free trade agreement with the EU in the summer of 1994. Through such measures it was hoped that Lithuania would accelerate its integration with the EU. In September 1993, the three Baltic States signed a free trade agreement that would take effect in April 1994.[3]

ENVIRONMENTAL ISSUES

The Lithuanian Department for Environmental Protection entered into an agreement with the Polish Ministry for Environmental Protection for cooperation between the two agencies in 1994 and 1995. The agreement calls for cooperation in environmental and radiation monitoring, cooperation in environmental protection in border regions, and control of the illegal transport of waste across borders.[4]

The Ignalina nuclear power plant in Lithuania, a graphite-moderated pressure-tube reactor (RMBK), provides a large percentage of the country's electric generation capacity. Both foreign and domestic concern was expressed over the safety of the Ignalina reactor. Sweden allocated funds to promote safety at the plant by financing a safety monitoring service.[5]

PRODUCTION

The mining industry of Lithuania extracted peat and industrial minerals, including clays and sand and gravel. The industrial minerals industry was of significant magnitude as Lithuania ranked fourth among the republics of the former U.S.S.R. in the production of lime, fifth in the production of cement, and sixth in the production of bricks. There were more than 290 enterprises engaged in the production of industrial minerals, including nitrogenous fertilizer, and more than 240 sand and gravel deposits under exploitation. (*See table 1.*)

TRADE

Although Lithuania produced almost no metals, it was again a major metals exporter in 1993, transshipping metals produced in Russia to world markets. In 1993, fuels, metals, and other mineral products totaling 831 million litas accounted for the largest percentage of Lithuania's exports. Fuels and other mineral products, mainly imported from Russia, comprised a large percentage of Lithuania's imports.[6] Lithuania was badly in arrears in paying for Russian fuel shipments, with Lithuania in February 1994 reportedly owing Russia about $30 million for natural gas.[7] Lithuania imported natural gas from Russia in accordance with agreements signed with Russia's Gazprom organization.

To curb the flow of reexported material from Lithuania, a percentage of which was sent to Lithuania illegally according to the laws of the producing countries, particularly Russia, Lithuania established regulations imposing export duties of 5% on metals and 15% on metal scrap. Also, a review of export licenses was undertaken to curb these shipments. Lithuania, according to a report in Metal Bulletin, August 5, 1993, p. 8, had been under intense diplomatic pressure from Russia to ban all reexports.

STRUCTURE OF THE MINERAL INDUSTRY

Lithuania was engaged in a program to privatize its state-owned property using a voucher system to enable its own citizens to acquire property. The country also was encouraging foreign investment and was enacting legislation to grant and protect property rights of foreign firms. (*See table 2.*)

COMMODITY REVIEW

Mineral Fuels

Peat.—Peat was extracted by 11 enterprises exploiting 55 deposits. Large enterprises included the Siauliai, which exploited the Didisis-Tiryalis and Sulinkyu deposits; the Yezherel'skoe, which exploited the Yezherelis and Palyes deposits; the Jonavskoe, which exploited the Paraystis and Didisis-Raystas deposits; and the Baltoyn-Bokeskoe, which exploited a deposit of the same name.

Petroleum.—Oil exploration had been underway in Lithuania for more than 30 years. Exploration for oil continued in 1993. Reportedly, 19 oil deposits have been found that are capable of producing between 4 to 5 Mmt/a of crude oil.[8] Foreign investment was being sought for future oil development.

The Mazheikiai oil refinery in Lithuania, the only refinery in the Baltic States, has a capacity to process 12 Mmt/a of oil. The Mazheikiai oil refinery was built with plans for extracting oil in Lithuania. Mazheikiai processed slightly more than 5 Mmt of oil in 1993. The Russian company Lukoil was Mazeikiais's main supplier. According to a contract with Lukoil, 20% of the refinery products was to go to Lithuania and the remaining 80% would be marketed by Russia. In 1994, Mazheikiai plans to process more than 8 Mmt with 6 Mmt obtained from Lukoil and the remainder purchased from commercial sources.[9]

Reserves

Reserves in Lithuania were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Lithuania, which is bordered on the west by the Baltic Sea, also has a small portion of its western border on the Baltic Sea cut off by the Russian province of Kaliningrad oblast, which is entirely enveloped by Lithuania and Poland. To the south Lithuania is bordered by Poland, to the south and east by Belarus, and to the north by Latvia. Lithuania does not share a common border with Russia except for the province of Kaliningrad oblast, and to reach Kaliningrad from Russia by land necessitates passing through not only Lithuania, but also either Latvia or Belarus.

Lithuania's major port on the Baltic Sea is Klaipeda and its major inland port is Kaunas at the confluence of the Neris and Nemen Rivers. Lithuania has 2,100 km of rail lines, not including industrial rail lines, and 44,200 km of highways, of which 35,500 km is hard surfaced. Its telecommunications network is one of the best developed networks among the former Soviet republics.

The population of Lithuanian is reportedly ethnically 80.1% Lithuanian, 8.6% Russian, 7.7% Polish, 1.5 Belarusian, and 2.1% other nationalities.

OUTLOOK

Lithuania is engaged in a difficult process of economic transformation and is assessing its economic relations, including its mineral supply needs, in terms of both its long-range goal of becoming a market economy country integrated with the market economy countries of Europe and its present necessity to receive a significant portion of its fuel and raw material requirements from the countries of the former U.S.S.R. The pace of this transformation is one of the major political as well as economic problems confronting Lithuania. The raw material supply situation, particularly for fuels, is a crucial element in these considerations. Without adequate fuel supplies from Russia, Lithuania has found it difficult to generate economic growth and to prevent economic decline and a lowering of the living standard. Therefore, Lithuania will be seeking to maintain its mineral supplies from Russia and other countries of the former U.S.S.R. and will be engaged in both economic and political decisions as to how to best achieve its goal of economic transformation while preventing economic hardships and disruptions.

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[1]Text prepared June 1994.

[2]Foreign Broadcast Information Service (Washington, DC). Nov. 30, 1993, p. 73; Respublika, Vilnius, Nov. 16, 1993, No. 221, p. 8.

[3]Radio Free Europe/Radio Liberty Research Report. News Briefs. Feb. 14-18, 1994, p. 18.

[4]Summary of World Broadcast. British Broadcasting Corp. (Reading, England) Apr. 8, 1994, p. WE/2. PAP New Agency, Warsaw, Mar. 31, 1994.

[5]———. Mar. 25, 1994, p. WD/5; Lithuania Radio, Mar. 18, 1994.

[6]Izvestiya, Moscow, Dec. 9, 1993, p. 1.

[7]Summary of World Broadcast. British Broadcasting Corp. (Reading, England). Feb. 11, 1994, p. WD/4; Lithuanian Radio, Feb. 2, 1994.

[8]———. Nov. 19, 1993, p. WD/4; Lithuania Radio, Vilius, Nov. 11, 1993.

[9]———. Jan. 7, 1994, p. WD/5.

TABLE 1

LITHUANIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Ammonia, nitrogen content	275,000	250,000	500,000
Cement	2,000,000	1,500,000	2,500,000
Clays:			
For bricks cubic meters	700,000	500,000	1,500,000
For concrete aggregates do.	300,000	200,000	500,000
For cement	800,000	600,000	1,500,000
Limestone	5,000,000	4,000,000	8,000,000
Peat	1,500,000	1,500,000	2,000,000
Petroleum:			
Refinery producers	5,000,000	5,000,000	12,000,000
Sand and gravel million cubic meters	15	10	20
Sand, for glass	80,000	60,000	150,000

[e]Estimated.

TABLE 2
LITHUANIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity[e]
Ammonia, nitrogen content	Jonava nitrogenous fertilizer plant	Jonava	500.
Cement	Akmyantsementas enterprise	Akmyane	2,500.
Clays (for brick production) cubic meters	Production at 19 deposits with the largest production facilities: The Daugelskoye plant exploiting the Daugelai deposit	Daugelai	1,500,000 (total for 19 deposits).
Do.	The Ignalinskoye plant exploiting the Dinsa deposit	Ignalina region	
Do.	The Tauragskoye deposit exploiting the Taurage deposit	Taurage region	
Clays (for concrete aggregates) cubic meters	Krunay deposit	Krunay region in central Lithuania	500,000
Clays (for cement)	Saltiniskiai deposit	Saltiniskiai region	1,500.
Limestone	Karpenai deposit for cement production	Karpenia region	8,000.
Peat	Production at 11 enterprises exploiting 55 deposits Largest enterprises are: Siauliai exploiting Didisis-Tiryalis and Sulinkiu deposits	Siauliai region	350.
Do.	Ezherelskoye exploiting Ezherelis and Pales deposits	Ezherelis region	400.
Do.	Ionovskoye exploiting Paraistis and Disisis-Raystas deposits	Paraistis region	300.
Do.	Baltoyi-Bokeskoye exploiting Baltoyi and Vokeskoye Baltoyi-Boke region deposits		300.
Petroleum products	Mazheikiai petroleum refinery	Mazheikiai	12,000.
Sand and gravel million cubic meters	246 deposits under exploitation. Largest enterprises: Trakaijskoye association exploiting Serapinshkes deposits	Trakai region	20 (total for 246 deposits).
Do.	Rizgonskiy plant and Yurbarkskiy plant exploiting Rizgonys and Kalnenay deposits	Rizgonys region	
Sand (for glass)	Anyksciai deposit	Anyksciai	150.

[e]Estimated

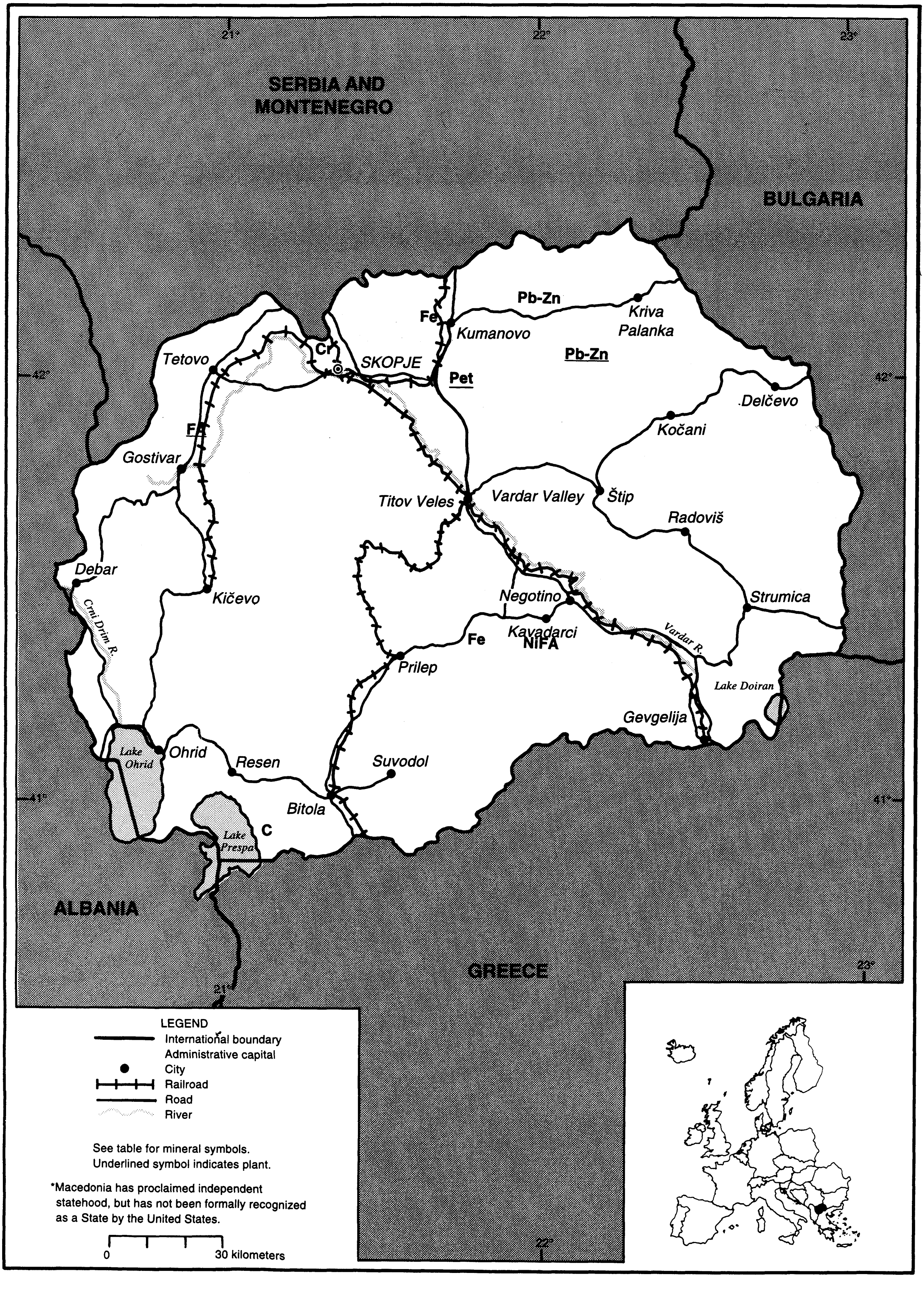
TABLE 3
LITHUANIA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Resources
Limestone		277,000
Peat		327,000
Clays (for bricks)	cubic meters	70,000,000
Sand and gravel	do.	408,000,000

Macedonia*

AREA 25,333 km² **POPULATION 2.2 million**



THE MINERAL INDUSTRY OF

MACEDONIA[1]

By Walter G. Steblez

Following secession from Yugoslavia in early 1992, Macedonia encountered serious difficulties with respect to international recognition, owing to Greece's demand that the term "Macedonia" be applied only to the northern province of Greece bordering with the former Yugoslav Republic of Macedonia. The political dispute with Greece over the "Macedonia" eponym resulted in a de facto trade embargo because of Greece's reported closure of its border to Macedonia coupled with the international economic sanctions placed against Serbia and Montenegro with which Macedonia has a common border.

The Republic of Macedonia had been a major producer of minerals in the former Yugoslavia. Macedonia's output of major minerals in 1990 (the last year for which comparative statistical information was available) as a percent of total output for Yugoslavia amounted to 12.3% for copper ore, 36.9% for lead and zinc ore. Output of smelter and refined lead amounted to 25.6% and 26.7%, respectively, for the same period; silver amounted to 14.7%; and zinc smelter secondary and zinc refined output was 100% and 45.3%, respectively, of total production. Additionally, steel (electric furnace) production was 16.5% of total output. With respect to industrial minerals, Macedonia's production of bentonite, dolomite, gypsum, and pumice in 1990 amounted to 65.3%, 58.1%, 10.2%, and 48.7%, respectively, of the former Yugoslavia's total production.

The country's production of lignite in 1990 represented 10.4% of the former Yugoslavia's total output that year but was the only fossil fuel that was produced. The dislocation of the former Yugoslavia's mineral industry and commerce in 1992 continued through the end of 1993 and resulted in apparently significant shortfalls in minerals production in Macedonia as well as in other former constituent republics.

GOVERNMENT POLICIES AND PROGRAMS

Although the primary concern of the Government of Macedonia was reportedly the issue of international recognition, apparently some effort continued to be directed at maintaining levels of industrial production that would ensure minimally acceptable levels of unemployment.

PRODUCTION

The production table for Macedonia was compiled from data presented in a variety of statistical publications of the former Yugoslavia through 1991. The major portion of the country's production statistics, however, was obtained from "Industrijska Proizvodnja," an annual statistical compendium published in Belgrade through 1990 that presented production data by constituent federal republics, as well as by total output for the former Yugoslavia. *(See table 1.)*

TRADE

Owing to the virtual trade embargo that developed around Macedonia, detailed official information concerning foreign trade for 1993 largely was unavailable.

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the apparent administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1993. *(See table 2.)*

COMMODITY REVIEW

Apart from reports concerning several mineral industry closures at yearend, available reports dealing with the country's mineral production described substantial idle capacities in 1993 in both the iron and steel and nonferrous metals sectors of the country's mineral industry. Owing to the depletion of its coal stocks and inability to obtain supplies from outside the country, Fenimak, the country's nickel producer, announced the closure of its operations at yearend 1993.

The transition of Macedonia's economy to a market-based system will require a reevaluation of the country's mineral resources from a market perspective. For a detailed presentation of the system that was used to determine reserves in the former Yugoslavia, see "The Mineral Industry of Russia" in this volume.

INFRASTRUCTURE

Macedonia's inland system of ways and communications consisted of railroads and highways and waterways. Although information concerning the total lengths of the railroad and inland waterway systems was not yet available, the highway and road system reportedly consisted of 10,591 km of paved, gravel, and earth-surfaced road, of which 5,091 km was paved, 1,404 km was gravel, and 4,096 km was earth surfaced. The country was entirely landlocked and possessed neither a merchant marine fleet nor pipelines for carriage of natural gas and petroleum.

OUTLOOK

Macedonia had not been directly affected by the civil war that occurred in the former Yugoslavia, and the country's industries and infrastructure remained intact. However, owing to Macedonia's relative political isolation and commercial restrictions with respect to Greece and Serbia and Montenegro, few markets appear to be available that can absorb the output of the country's mineral industry.

[1]Text prepared in July 1994.

OTHER SOURCES OF INFORMATION

Agency

Ministry of Industry
Skopje, Macedonia

Publications

Industrijska Proizvodnja, 1988-1990, published in Belgrade (Serbia and Montenegro).

TABLE 1

MACEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991[e]	1992[e]	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum: Metal, ingot; primary an secondary		5,384	5,487	5,000	4,000	2,000	6,000
Antimony: Mine and concentrate ouput:[e]							
Ore, gross weight		3,400	[3]1,500	—	—	—	3,500
Concentrate, gross weight		60	[3]25	—	—	—	100
Cadmium, smelter output[e]	kilograms	280	210	160	110	100	300
Chromite:							
Ore, gross weight		12,721	10,843	6,000	6,000	5,000	15,000
Concentrate (produced largely from imported ores)		22,934	22,058	14,000	10,000	3,000	25,000
Copper: Mine and concentrator output:							
Ore, gross weight	thousand tons	3,826	[3]3,706	3,852	3,000	2,500	4,000
Cu content of ore		8,876	8,634	9,200	7,200	7,000	9,000
Concentrate, gross weight		41,956	36,434	36,000	30,000	25,000	45,000
Iron and steel:							
Iron ore:							
Gross weight	thousand tons	[r]412,000	44,000	25,000	20,000	20,000	50,000
Fe content of ore[e]		80,000	3,000	1,000	1,000	1,000	5,000
Concentrate[e]		65,000	55,000	30,000	15,000	15,000	70,000
Pellets[e]		[3]60,991	50,000	25,000	10,000	10,000	65,000
Agglomerate		79,000	31,000	20,000	5,000	5,000	80,000
Metals:							
Ferroalloys:							
Ferrochromium, low C		5,862	5,757	3,359	3,958	4,400	7,000
Ferrosilicochromium		3,815	4,199	2,000	1,500	—	4,000
Ferrosilicon		57,605	51,812	35,000	30,000	20,000	60,000
Silicon		4,344	1,802	1,800	1,000	1,000	5,000
Total		71,626	63,570	42,159	36,458	25,400	76,000
Pig iron		139,000	53,000	50,000	20,000	20,000	150,000
Crude steel:							
From oxygen converters		139,000	65,000	65,000	20,000	20,000	150,000
From electric furnaces		85,000	182,000	80,000	30,000	30,000	100,000
Total		224,000	247,000	145,000	50,000	50,000	250,000
Semimanufactures[e]		84,000	65,000	45,000	20,000	20,000	100,000
Lead:							
Mine and concentrate output:							
Ore, gross weight (Pb, Zn ore)		1,330,000	1,357,000	900,000	400,000	400,000	1,500,000

See footnotes at end of table.

TABLE 1—Continued

MACEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991[e]	1992[e]	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Lead—Continued:							
Pb content or ore		45,000	47,000	30,000	12,000	12,000	55,000
Concentrate, gross weight		32,000	33,000	20,000	15,000	15,000	35,000
Smelter, primary and secondary		31,000	33,000	18,000	10,000	10,000	35,000
Refined, primary and secondary		19,000	22,000	14,000	8,000	8,000	25,000
Nickel: Metal, Ni content of FeNi[e]		—	—	—	450	3,500	5,000
Silver	kilograms	16,973	15,495	12,000	10,000	10,000	18,000
Zinc:							
Zn content of Pb Zn ore		30,000	32,000	18,000	16,000	16,000	40,000
Concentrator output, gross weight		23,000	23,000	15,000	8,000	8,000	25,000
Metal:							
Zn, smelter, primary		55,900	56,734	50,000	30,000	30,000	60,000
Zn, refined, primary and secondary:							
Smelter		12,089	[3]18,252	7,372	7,000	7,000	20,000
Electrolytic		38,101	34,148	32,000	25,000	25,000	40,000
INDUSTRIAL MINERALS							
Cement	thousand tons	769	639	600	500	500	900
Clays:							
Bentonite		76,000	67,000	45,000	40,000	35,000	80,000
Feldspar		34,000	30,934	30,000	20,000	15,000	40,000
Gypsum:[e]							
Crude		[3]67,000	58,000	44,000	30,000	30,000	75,000
Calcined		[3]19,000	15,000	11,000	7,000	7,000	25,000
Lime		69,000	47,000	40,000	20,000	20,000	75,000
Pumice and related materials: Volcanic tuff[e]		250,000	250,000	200,000	100,000	75,000	300,000
Sand and gravel, excluding glass	thousand cubic meters	135	194	150	130	130	250
Stone, excluding quartz and quartzite:							
Dimension: Crude:							
Ornamental	square units	[e]464,000	450,000	400,000	300,000	200,000	500,000
Crushed and brown, n.e.s.	thousand cubic meters	[e]927	900	700	400	400	1,000
Other	cubic meters	[e]20,000	20,000	15,000	10,000	10,000	25,000
Sulfur: Byproduct of metallurgy[e]	thousand tons	9	9	8	6	6	12
Talc:							
Crude		26,614	20,069	20,000	15,000	10,000	30,000
Washed		24,590	17,984	17,000	10,000	7,000	28,000
MINERAL FUELS AND RELATED MATERIALS							
Lignite	thousand tons	5,687	[r]6,635	6,000	5,000	5,000	7,000
Refinery products[e]	thousand 42-gallon barrels	14,000	15,000	12,000	10,000	8,000	16,000

[e]Estimated. [r]Revised.

[1]Table includes data available through July 1994.

[2]In addition to commodities listed, common clay and diatomite also are produced, but available information was inadequate to make reliable estimates of output levels.

[3]Reported figure.

TABLE 2
MACEDONIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

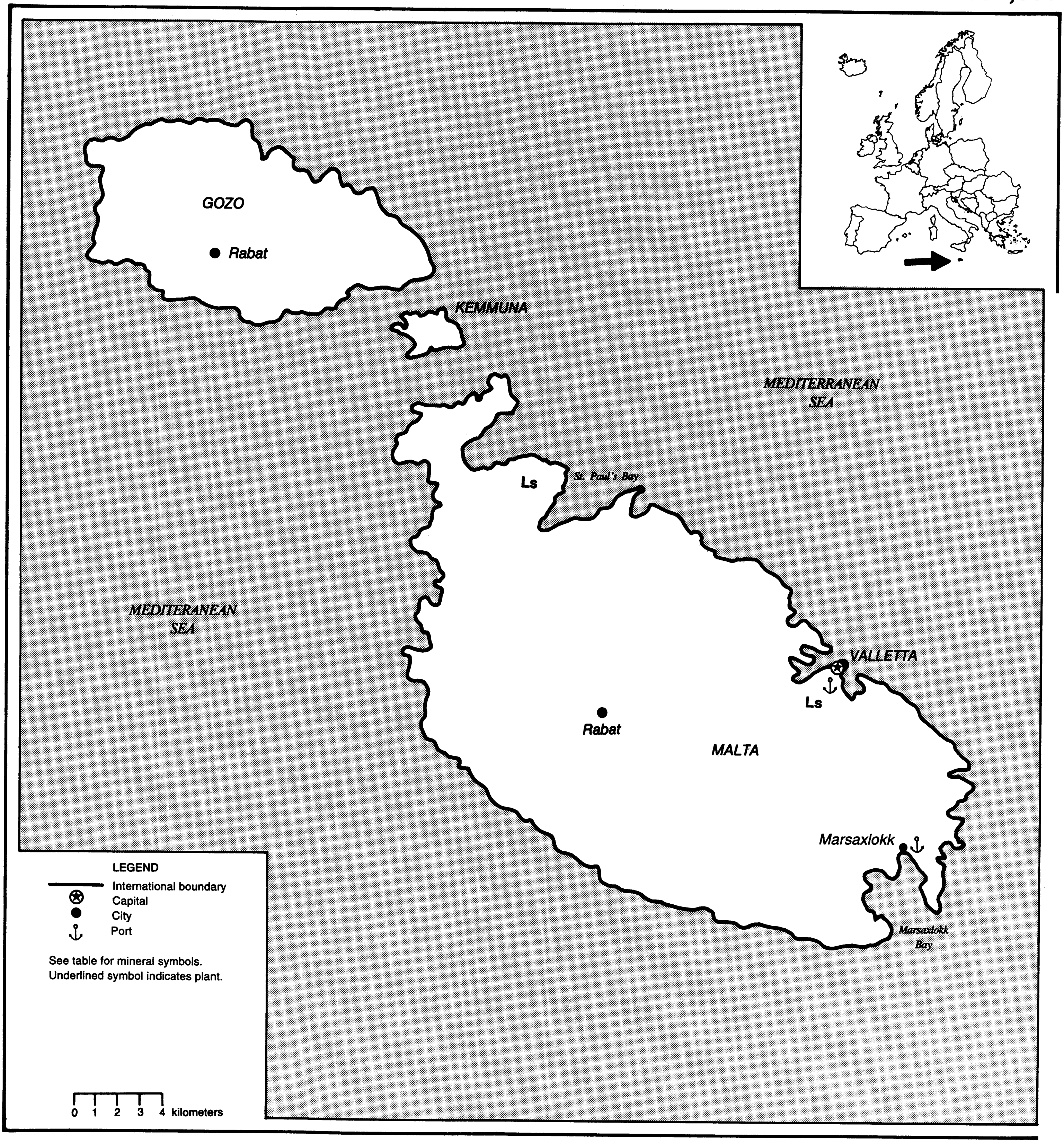
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities	Annual capacity
Cement	Azbestcementa "Usje" Preduzece za Proizvodnju Cementa	Plant at Skopje	2,190
Chromite, concentate	Jugohrom, Hemijsko-Elektrometalurski-Kombinat	Concentrator at Radusa, Macedonia	150
Copper ore	Bucim, Rabotna Organizacija za Rudarstvo i Metalurgija za Baker	Mine and mill at Bucim, near Radovis, Macedonia	7,000
Ferroalloys	Jugohrom, Hemijsko-Elektrometalurski-Kombinat	Plant at Jegunovce, Macedonia	80
Iron ore	Skopje Rudnici i Zeljezarnica Skopje	Mines at Tajmiste, Demir Hisar, and Damjan, Macedonia	1,000
Lead-zinc ore	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
Lead metal	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter at Titov Veles, Macedonia	40
Do.	do.	Refinery at Titov Veles, Macedonia	40
Nickel:			
Ore	Feni-Rudnici i Industrija za Nikel, Celik i Antimon	Mine and opencast mine near Kavadarci, Macedonia	2,300
Metal	do.	Ferronickel plant at Kavadarci, Macedonia	[1]16
Pig iron	Skopje, Rudnici i Zeljezarnica Skopje	5 Elkem electric furances at Skopje, Macedonia	430
Steel, crude	do.	Plant at Skopje, Macedonia	980
Zinc metal	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter plant and refinery at Titov veles, Macedonia	65

[1]Nickel in ferronickel.

MALTA

AREA 320 km² **POPULATION 357,000**



THE MINERAL INDUSTRY OF

MALTA

By Jozef Plachy

The importance of Malta's mineral industry rests mainly on trade and storage of crude oil and refinery products. The mineral industry, consisting mainly of limestone and salt production, contributes less than 0.5% to the gross domestic product.

About 20 hardstone limestone quarries produce crushed aggregates for use in road construction and in concrete using conventional drilling and blasting techniques. Stone is crushed, screened, and used for the manufacture of lime or as an additive in concrete, mostly by independent producers. A small amount is processed in kilns for use in mortar. Softstone, locally known as "Franka" stone, quarries number about 60. They produce building blocks for local construction industries at an annual rate of about 300,000 tons.

Trade and storage of petroleum and refinery products are concentrated at Marsaxlokk Bay, on the southern coast of Malta. To complement the new blending facility, a new terminal, accommodating vessels of up to 100,000 dwt, was built by a Maltese-German joint venture in 1992. Future plans include doubling the container capacity to 500,000 containers at a cost of about $250 million.

With help from foreign companies, the Maltese Government is exploring off-shore areas for crude oil. The first contract was with American Oil Company (AMOCO), followed in 1992 by an agreement with Shell Malta, a subsidiary of Royal Dutch Shell, and its Saudi Arabian partner Nimir.

Malta's efforts to become a full member of the European Union will compel the Government to cut state subsidies, remove protective tariffs, and end monopolies. This may adversely affect the small-scale limestone industry, but it should help procure investments for Marsaxlokk Freeport.

TABLE 1

MALTA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
Limestone[e]	thousand tons	[r,3]2,429	[r]2,400	[r]2,350	[r]2,300	2,200	2,500
Salt[e]	tons	30	[3]30	30	30	30	30

[r]Revised.

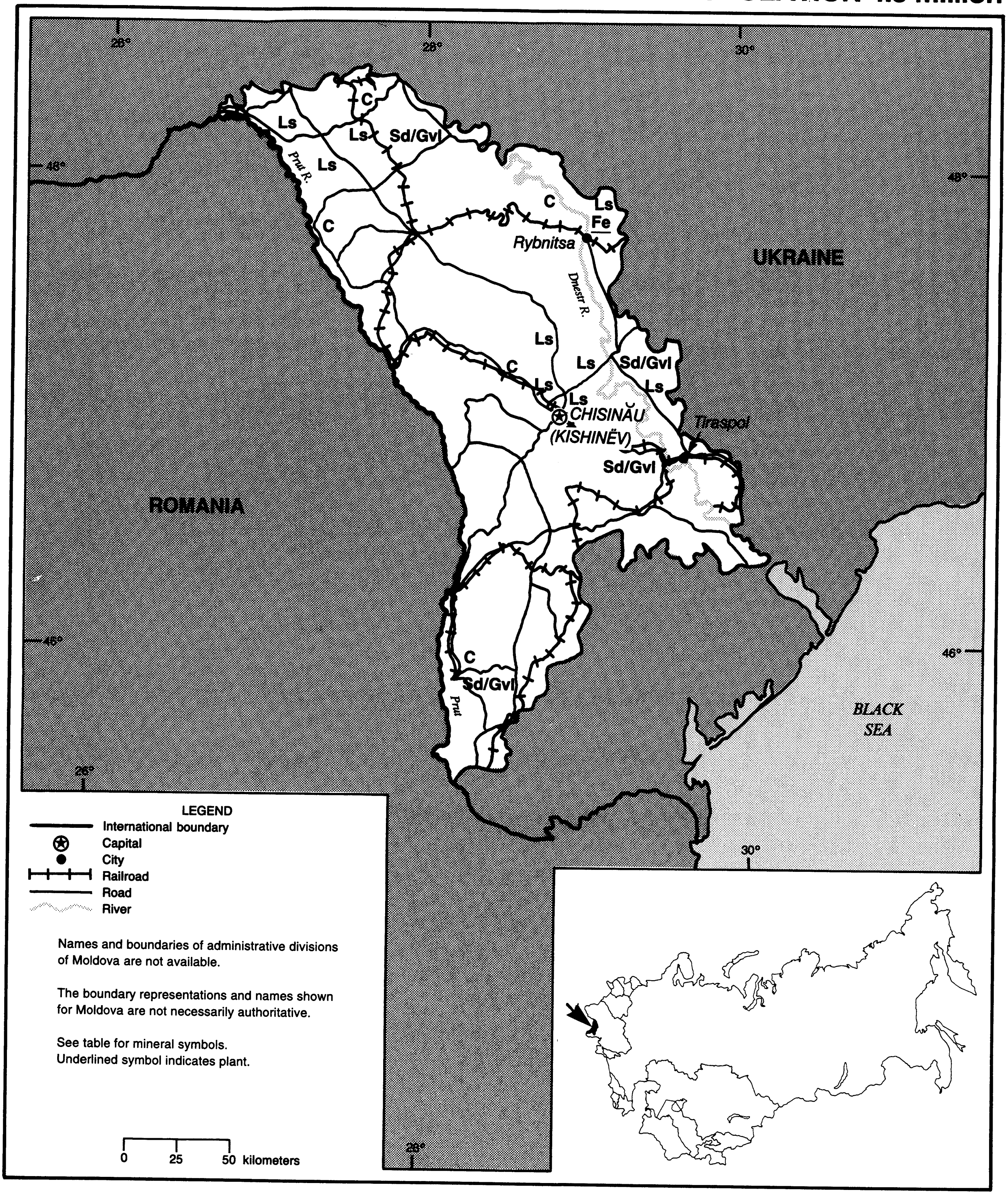
[1]Table includes data available through Mar. 1994.

[2]In addition to listed commodities, a small amount of cement, fertilizer, lime, and plaster is produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

MOLDOVA

AREA 33,700 km² **POPULATION 4.5 million**



THE MINERAL INDUSTRY OF

MOLDOVA[1]

By Richard M. Levine

Moldova's economy in 1993 showed some signs of recovery as industrial production reportedly increased by 4.2% compared with that of 1992.[2] In 1993, Moldova reportedly was facing its worst energy crisis since World War II with norms for electric energy consumption reduced by 40%. Dwellings, institutions, and transport networks were seriously affected by the energy shortages. In 1993, Moldova was still importing practically all of its energy requirements from Russia, which was reducing exports of mineral fuels to Moldova.[3]

In 1993, Moldova reportedly paid below world market prices for Russian oil and gas, but nevertheless was not able to meet its payments for these commodities. For 1994, Moldova signed a trade agreement with Russia to pay world market prices for oil and gas, although it appears that the energy shipments will be exchanged for products from Moldova rather than actual hard currency.[4] In August, Russia imposed excise and value added taxes on agricultural imports from Moldova, which was not at this time a member of the Commonwealth of Independent States (CIS). These taxes reportedly cost Moldova more than 40 billion rubles in lost exports, a serious loss to the economy.[5]

In October 1993 at a meeting of the World Bank sponsored Consultative Group comprised of the Western donor countries and the main international financial institutions, a World Bank press release stated that Moldova received praise for its impressive economic reform program. Reportedly, because of the strength of its reform program and the demonstration effect that Moldova's program could have regionally, the World Bank announced a new $60 million loan to Moldova.[6]

GOVERNMENT POLICIES AND PROGRAMS

For 1993, Moldova signed a bilateral agreement with Russia whereby Russia would supply Moldova with fuels, ferrous and nonferrous metals, and other raw materials in exchange for refrigerators, tractor trailers, food, tobacco products, and wine.

Moldova for a part of 1993 was not a member of the CIS, but in 1994 again joined the CIS because of the belief that not doing so would lead to the loss of Russian and other CIS markets through the imposition of prohibitive taxes and tariffs on Moldova's agricultural products and to the loss of access to Russian mineral and fuel supplies.[7] Besides joining the CIS, in a general election held in February 1994, Moldova voted against merging with Romania.[8]

PRODUCTION

Moldova has a small mineral industry, the output of which, according to Soviet statistics, accounted for less than 1% of the value of Moldova's industrial output in the mid-1980's.

The mineral industry was primarily engaged in the mining and production of industrial minerals, including cement, dimension stone, gypsum, limestone, and sand and gravel. There are more than 100 deposits in Moldova being exploited for industrial minerals. Moldova also has a steel minimill in Rybnitsa. Moldova had been receiving more than 90% of its industrial raw materials and more that 98% of its fuels from other regions of the former U.S.S.R. (*See table 1.*)

STRUCTURE OF THE MINERAL INDUSTRY

In 1993, the Government launched a privatization program in which bonds, similar to Russia's privatization vouchers, were issued to Moldova's citizens. As of May 1994 reportedly more than 300 state enterprises had been turned into stockholding companies.[9] (*See table 2.*)

COMMODITY REVIEW

Reserves in Moldova were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economic system that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Moldova is on the western edge of the former U.S.S.R. It is bordered by Romania to the west and is otherwise encircled by Ukraine. It was the second smallest in area of the republics of the former U.S.S.R. Moldova has one major waterway, the Dnestr River, which flows through Belarus, Moldova, and Ukraine to the Black Sea southwest of Odessa.

Moldova shares a common border with Romania, and the Moldovan language is a form of the Romanian language. Although more than 65% of its population is ethnic Moldovan, 13% of the population is ethnic Russian and 14% ethnic Ukrainian. Because of its location, history, and ethnicity, Moldova has cultural and economic links with Romania as well as with Ukraine, Russia, and the other CIS states.

OUTLOOK

Moldova is almost entirely dependent on outside sources for its mineral raw material requirements with it current mineral supply coming almost entirely from the countries of the former U.S.S.R. Although Romania has a significant petroleum extraction and refining industry that could somewhat improve Moldova's petroleum supply, Romania also needs to import petroleum to supply its refineries and is by no means in the league of an oil-rich country. Romania, too was dependent on the former U.S.S.R. for the majority of its mineral requirements. Thus, Moldova's mineral supply situation, for the near future, still will be linked to its trade with the countries of the former U.S.S.R.

---

[1]Text prepared July 1994.

[2]Foreign Broadcast Information Service,(Washington, DC). Mar. 25, 1994, p. 8, ROMPRES, 1156 gmt, Mar. 24, 1994.

[3]———. Nov. 22, 1993, p. 62, Besapress in English, Nov. 20, 1993, Chisinau.

[4]Wall Street Journal. (New York). Feb. 8, 1994.

[5]Radio Free Europe/Radio Liberty Research Report. New Briefs, Nov. 1-5, 1993 p. 19.

[6]———. News Briefs, Oct. 25-29, p. 19.

[7]Page 11 of work cited in footnote 5.

[8]Interfax Business Report. Mar. 1, 1994, p. 2.

[9]Foreign Broadcast Information Service, (Washington, DC). May 19, 1994, p. 68, Interfax in English, 1403 gmt, May 18, 1994.

TABLE 1

MOLDOVA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Cement		1,700	1,500	2,500
Cement raw materials:				
Clays		400	350	500
Limestone		1,500	1,400	2,000
Gypsum		300	250	500
Sand and gravel	thousand cubic meters	5,000	4,000	6,000
Steel, crude		400	250	700

[e]Estimated.

TABLE 2

MOLDOVA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity[e]
Cement	Rybnitsa cement plant	Rybnitsa	2,500,000.
Gypsum	Krivskiy and Drepkauskiy gypsum mines	In northwest corner of Moldova	500,000 (total of both mines).
Steel, crude	Moldova steel plant	Rybnitsa	700,000.

[e]Estimated.

TABLE 3

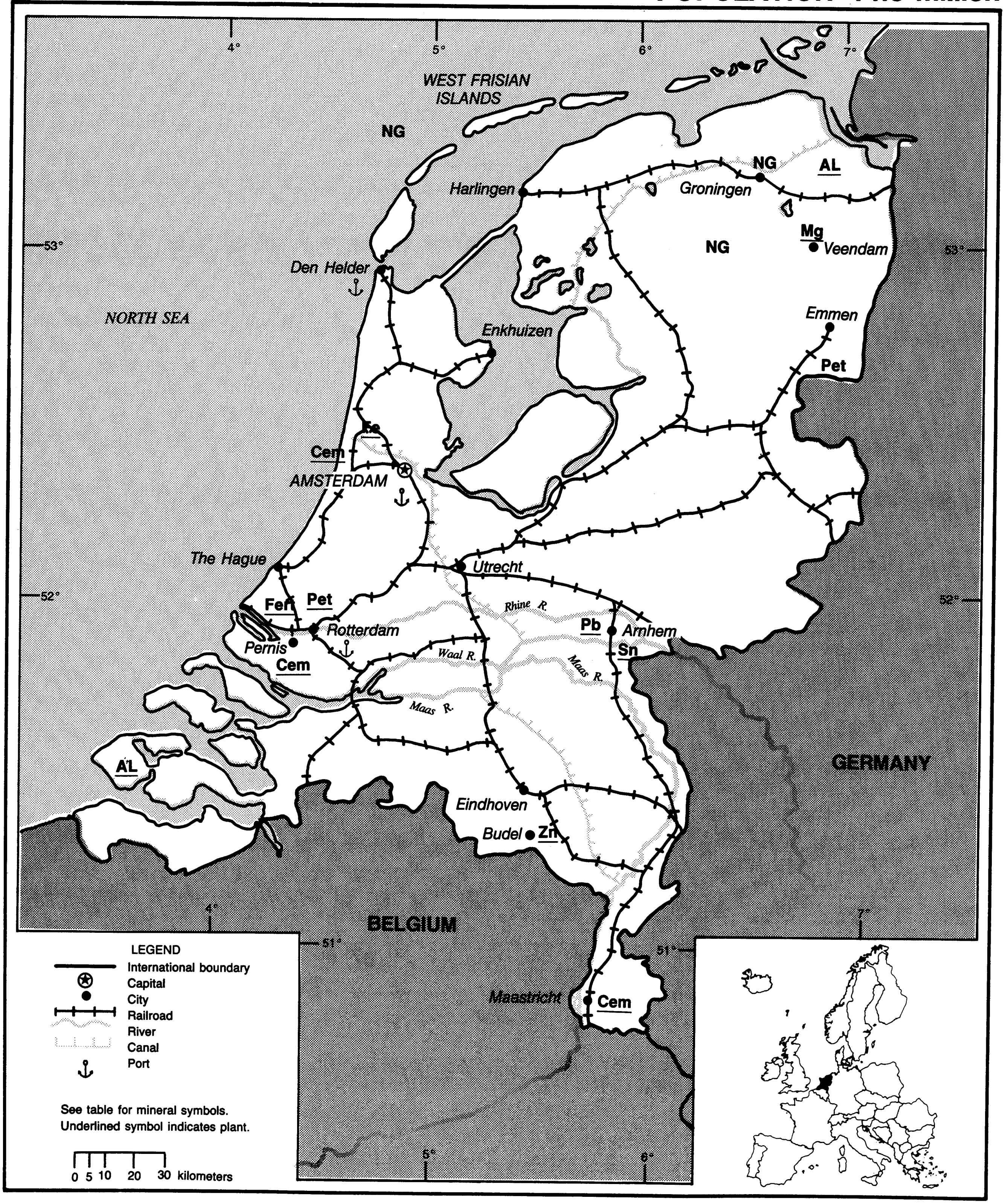
MOLDOVA: RESOURCES OF MINERAL COMMODITIES FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Resources
Coal, brown		38,000
Diatomite		29,000
Gypsum		54,000
Sand for glassmaking		17,000
Sand and gravel	thousand cubic meters	295,000

NETHERLANDS

AREA 34,000 km² **POPULATION 14.8 million**



THE MINERAL INDUSTRY OF

THE NETHERLANDS

By William Zajac

During 1993, the Dutch economy grew by 0.2% compared with growth of 1.4% during the previous year. Although the growth rate declined compared with those of recent past years, the Netherlands' economy fared better than those of many other countries around the world in that it showed growth, albeit modest. However, exports, the traditional driving force behind the Netherlands' economy, declined during 1993 and domestic consumption grew to fill the gap and prevented a decline in the economy.

Although the Netherlands is not a major producer of metallic or nonmetallic minerals or mineral products with respect to global production, it is very important as a producer of natural gas and petroleum for the European market and plays a major role as a transshipment center for material entering and leaving continental Europe. Rotterdam, in particular, is extremely important as a shipping and storage center. With the ever expanding inland transportation systems, goods entering or leaving Rotterdam can originate in or be destined for almost anywhere in continental Europe. With regard to storage, copper is a good example. At the end of 1993, 25.9% (49.6% in 1992 and 50.9% in 1991) of refined copper stocks at London Metal Exchange (LME) warehouses in Europe were in Rotterdam.

GOVERNMENT POLICIES AND PROGRAMS

General elections in the Netherlands were scheduled for the spring of 1994, and in late 1993 all four major political parties published draft platforms, all of which stressed the need to boost employment, improve competitiveness, reduce the deficit, and create conditions for sustained noninflationary growth.

ENVIRONMENTAL ISSUES

Environmental policy in the Netherlands is the responsibility of the Ministry of Housing, Planning, and the Environment, and protecting and upgrading the quality of the environment is of high priority to the citizens of the Netherlands. In addition to protecting the environment, the Dutch are also concerned with remedying the practices of the past. For example, as part of the approval process for the construction of a new hydrocracker at a petroleum refinery in Rotterdam, the site was first required to be cleaned up and measures had to be taken to reduce ground water contamination. The contamination by medium-to-heavy and very heavy oil was the result of more than 25 years of refining activity at the site. The decontamination process was to be carried out on-site, not only to protect the refinery from any possible liability, but also to prevent the necessity of transporting the contaminated soils on public roads and the limited applications for soils treated to remove contaminants.

PRODUCTION

Production of mineral commodities generally remained stagnant or dropped slightly in the Netherlands during the year in review. The high cost of generous social benefits contributes to the production costs of Dutch products, making them, more and more, less competitive on the world market, especially with the increased competitiveness of the newly emerging nations of the former Eastern Bloc.

TRADE

Trade data for 1993 are not yet available to the U.S. Bureau of Mines, but little is expected to have changed from previous years except for volume and value. Based on value, the five main destinations for exports and reexports from the Netherlands were Germany (28.8% of the total), Belgium-Luxembourg (14.3%), France (10.6%), the United Kingdom (9.2%), and Italy (6.4%). The United States was sixth on the list of destinations for exports and reexports, accounting for 4.1% of the total. In 1992, the five main sources of all imports by the Netherlands were, based on value, Germany (25.2% of the total), Belgium-Luxembourg (14.2%), the United Kingdom (8.6%), France (7.9%), and the United States (7.8%).

With respect to mineral commodities exported and reexported in 1992, based on value, crude nonmetallic materials accounted for 0.3% of the total, ores and other metal-bearing raw materials accounted for 0.8%, energy materials accounted for 8.6%, iron and steel products accounted for 2.3%, and nonferrous metals and semimanufactured products thereof accounted for 1.3%. For imports of mineral commodities in 1992, based on value, crude nonmetallic materials accounted for 0.6% of the total, ores and other metal-bearing raw materials accounted for 0.9%, energy materials accounted for 8.6%, iron and steel products accounted for 2.6%, and nonferrous metals and semimanufactured products thereof accounted for 1.3%. The three largest export and reexport classifications in 1992, based on value, were machinery (23.8% of the total), living animals (18.0%), and chemicals (15.9%). The three largest import classifications in 1992, based on value, were machinery (31.6% of the total), living animals (10.8%), and chemicals (10.7%).

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 shows the principal plants with their locations and capacities of mineral industry concerns in the Netherlands. The only mining operations left in the Netherlands in 1993 were in the production of peat, salt, and sand and gravel. The metal processing sector relies almost exclusively on imported raw materials, not only ores and concentrates, but also scrap and unrefined and refined metals. To use zinc as an example, actual consumption of the metal in the Netherlands in the past few years has been about 40% of domestic production, while the net export balance of slab zinc has been about 55% to 60% of domestic production for the past few years. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—Production of primary aluminum in the Netherlands has been declining steadily for the past few years, partly as a result of the high production costs in the country and the growth of the secondary aluminum industry in the Netherlands. The production of secondary aluminum consumes only about 5% of the energy needed to produce primary aluminum and the Dutch, being very environmentally aware, have begun a more conscientious program of recycling than had been true in the past. Not only is the collected, used aluminumwares a feed for the domestic secondary aluminum industry, but it is also a valuable export commodity. The Netherlands consistently has exported more old and new aluminum scrap than it has imported.

The aluminum producer, Hoogovens Aluminium BV, announced in late 1993 that it planned to cut costs at its smelter that were designed to reduce the plant's prospective losses to a level equal to its depreciation allowance, without cutting production. The company also announced that it had reached an agreement with the Dutch Government (which then had a 12% stake in the company but which rose to 17% later in the year) to cut energy costs at the smelter by 20% in an agreement that links energy costs to the price of aluminum. The cut was aimed at returning the plant to profitability while the market remains oversupplied and prices low.

Steel.—The steel division of Hoogovens, Hoogovens IJmuiden BV, announced late in 1993 that its financial situation had improved somewhat as a result of an increase in prices for its products and improved export conditions in overseas markets. Despite the improvement, the company announced a further cut of 1,800 positions within the next three years, which, combined with cuts in 1992 and earlier in 1993, will bring total job cuts to 5,300, or 22% of the company's work force. In addition to its other problems, an ore carrier sank in late 1993 and Hoogovens suffered a loss of 140,000 tons of high-flux pellets from Canada that were destined for tests in its blast furnace. Hoogovens has its own pelletizing capability, but very little of that can be used for the production of high-flux pellets. The tests were being conducted to see if in the future the IJmuiden blast furnaces could operate on a pellet-only supply mix, which would necessitate using imported pellets. Trial shipments had been received from other overseas suppliers, but this was the only shipment scheduled from Canada. Company officials indicated that the closure of the company's pelletizing capabilities was not imminent but also pointed out that environmental pressures had been building on the steelmaker's sintering activities in the Netherlands.

Zinc.—The zinc producer Budelco BV won a reprieve from closure late in 1993 when the Provincial and Federal Governments approved its storage solutions for jarosite, a toxic byproduct of zinc production. The plant produces about 100,000 mt/a of jarosite, an iron-bearing waste material rich in cadmium, and won approval to store the material in a fourth pond until 1998, by which time the company expects to develop a suitable treatment process for the material. Current technology to treat the material would raise the smelter's cost by 25% to 30% and thereby make it uncompetitive with other zinc smelters worldwide. The company is also studying the feasibility of using a zinc concentrate with a very low iron content if technical and economic studies show it to be suitable. If it is, the smelter could use the concentrate starting in 1998 and thus comply with the Netherlands Government policy of having no chemical waste disposal after the year 2000. If the plan had not been approved, the smelter would probably had been closed; but now it will continue to produce at current levels, despite the call for cuts in European zinc production to eliminate an oversupply.

Mineral Fuels

Natural gas is the most important mineral fuel produced in the Netherlands. In addition to domestic consumption, the gas is exported and provides the equivalent of about U.S.$4 billion each year in export sales, or about 3% of total exports. The gas is produced from 27 offshore facilities in the North Sea and 20 onshore installations. In 1993, offshore production accounted for 21.2% (18.8% in 1992) of total production and onshore production accounted for 78.8% (81.2% in 1992) of the total. The total exploration and appraisal wells drilled by the Netherlands in 1993 declined by 30% compared with the number drilled in 1992 and by 67% compared with the number drilled in 1991.

This drop in exploration is, according to the Netherlands Oil and Gas Exploration and Production Association (Nogepa), a result of the Dutch Government fiscal and contract terms for gas production being too restrictive to ensure a reasonable level of exploration work. As reported in the Petroleum Economist, a study carried out by Nogepa indicated that changes in the terms by which the Government's Gasunie buys all the gas produced in the country, together with revisions to state participation and the fiscal regime, could revitalize offshore work and allow up to 25 marginal fields to be developed. The study identified 75 marginal offshore fields that cannot be developed under the present system because they are too small, too far from pipelines, or have poor productivity. The association argues that Gasunie's purchase conditions should be revised to remove depletion controls and the requirement that forces operators to provide field capacity to meet 150% of the average annual production rate. The resulting larger number of wells, larger pipelines, increased compression capacity, and increased contracting requirements for shared facilities push up development and operating costs. Nogepa recommends that fields should be allowed to produce on a best-effort basis, with production limited only by normal reservoir management considerations and that production and transport facilities should be sized appropriately.

Reserves

The Netherlands has no commercially exploitable reserves of metal ores, and the reserves of sand and gravel cannot be "measured" as such because the variety of uses changes the definition of "commercially exploitable" to the extent that the figures are, at best, misleading. Reserves of natural gas at the beginning of 1993 were given as 2,007 billion m^3 and reserves of petroleum were given as 144,650 kbbl.

INFRASTRUCTURE

The Netherlands' rail system has a total of 2,994 km of track, of which 1,957 km is electrified and 1,800 km is double track. The Netherlands Railway operates 2,828 km of 1.435-m standard gauge, and 166 km is privately owned. Highways in the country total 108,360 km, of which 92,525 km is paved (2,185 km limited access, divided highways) and 15,835 km is gravel and crushed stone. Inland waterways consist of 6,340 km, of which 35% is usable by craft of 1,000-ton capacity or larger. Pipelines consist of 418 km for crude petroleum, 965 km for petroleum products, and 10,230 km for natural gas. The Dutch merchant marine consists of 344 ships of 1,000 gross tons or more totaling 2,762,000 gross tons. Of the total, there were 193 cargo ships, 30 refrigerated cargo ships, 26 container ships, 23 oil tankers, 22 chemical tankers, 13 roll-on/roll-off vessels, 11 multifunction large load carriers, 10 liquefied gas tankers, 6 bulk carriers, 4 combination bulk carriers, 3 short-sea passenger vessels, 2 specialized tankers, and 1 livestock carrier. In addition to vessels registered in the Netherlands, Dutch-owned ships are also registered in the Netherlands Antilles. The major maritime ports of the Netherlands are Amsterdam, Den Helder, Eemshaven, IJmuiden, Rotterdam, and Vlissingen. There are 29 inland ports. Of the major maritime ports, Rotterdam is by far the most active.

OUTLOOK

With the uncertain economic situation around the world, forecasts of economic or other performance are speculative at best. Much depends on the recovery prospects of the Netherlands' trading partners because so much depends on the country's processing of imported raw materials and the market for the value-added products. The Netherlands did not suffer as much from the global recession as some of the other industrialized countries, due, to a large part, to the country's policy of restraining wage increases and an increase in domestic consumption that helped offset drops in exports. Also helping was the fact that much of the Dutch economy, as well as exports, rely on the agricultural sector. For example, 30% of exports to Germany, the Netherlands' largest export market, consist of food or other agricultural products and therefore were not as affected by the recession in that country as suppliers of industrial products were. The expanded German market brought about by the unification of the Germanys was a great boost to the agricultural sector of the Netherlands's economy because of the enthusiasm of the eastern Germans for Dutch fresh vegetables and food products.

OTHER SOURCES OF INFORMATION

Agencies

Rijks Geologische Dienst
(Geological Survey of the Netherlands)
Spaarne 17
2000 AD Haarlem
Telephone: 23 300 300
Fax: 23 351 614

Ministerie van Economische Zaken
Inspecteur Generaal der Mijnen
(Ministry of Economic Affairs,
Inspector General of Mines)
Bezuidenhoutseweg 30
2594 AV The Hague

Centraal Bureau voor de Statistiek
(Central Bureau of Statistics)
Prinses Beatrixlaan 428
2270 AZ Voorburg
Telephone: 3 37 38 00
Fax: 3 87 74 29

Publications

Statistical Yearbook of the Netherlands, Central Bureau of Statistics.

Maanadstatistiek van de Industriek (Monthly Statistical Bulletin of Manufacturing), Central Bureau of Statistics.

Maanadschrift (Monthly Bulletin), Central Bureau of Statistics.

Various company annual reports, including Koninklijke Nederlandsche Hoogovens en Staalfabrieken NV (Royal Netherlands Hoogovens and Steel Works NV).

TABLE 1

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum metal:						
Primary	274,100	269,992	263,910	235,134	229,300	276,000
Secondary	130,158	[3]134,221	[3]114,279	[3]151,400	[3]150,300	200,000
Cadmium metal, primary	505	590	549	594	526	650
Iron and steel:						
Ore, sintered (from imported ore)	4,042,200	4,061,100	3,950,200	[e]4,100,000	[e]4,000,000	4,500,000
Metal:						
Pig iron including blast-furnace ferroalloys (if any)	5,163,100	4,959,900	4,696,500	4,852,000	5,406,000	5,500,000
Steel:						
Crude	5,680,600	5,411,800	5,171,300	5,438,000	6,001,000	6,100,000
Semimanufactures	5,116,400	5,005,200	4,909,500	[e]5,000,000	[e]5,200,000	5,500,000
Lead metal, refined, secondary	41,500	44,100	33,700	[r]23,500	24,200	41,000
Tin metal:						
Primary	4,529	5,900	4,800	—	—	—
Secondary	200	[e]200	[e]200	[r][e]200	—	—
Total	4,729	[e]6,100	[e]5,000	[r][e]200	—	—
Zinc metal, primary	[3]202,962	[3]208,532	[3]211,082	[3]210,000	[3]206,700	215,000
INDUSTRIAL MINERALS						
Cement, hydraulic	3,540,600	3,728,900	3,546,000	3,410,000	[e]3,400,000	5,220,000
Magnesium compounds: (Billiton Refractories)						
Chloride	[e]125,000	[e]125,000	126,000	[e]125,000	[e]125,000	140,000
Oxide	[e]90,000	[e]90,000	90,000	[e]90,000	[e]90,000	100,000
Nitrogen: N content of ammonia	2,900,838	3,188,209	3,032,522	[r]2,587,656	[e]2,400,000	3,500,000
Salt, all types	3,756,000	3,653,000	3,417,000	[r]3,628,000	[e]3,500,000	4,000,000
Sand, industrial	25,647,000	25,137,000	[e]25,000,000	[e]20,000,000	[e]20,000,000	25,000,000
Sodium compounds, n.e.s.:						
Carbonate, synthetic	[e]400,000	[e]400,000	[e]400,000	[e]400,000	[e]400,000	400,000
Sulfate:						
Natural	[e]22,000	[e]22,000	[e]22,000	[e]22,000	[e]20,000	50,000
Synthetic	[e]15,000	[e]15,000	[e]15,000	[e]15,000	[e]15,000	600,000
Sulfur:						
Elemental byproduct:						
Of metallurgy	[e]125,000	[r][e]125,000	[r][e]125,000	[r][e]125,000	[e]125,000	200,000
Of petroleum and natural gas	[e]260,000	[e]285,000	[e]290,000	[e]290,000	[e]290,000	400,000
Total	[e]385,000	[r][e]410,000	[r][e]415,000	[r][e]415,000	[e]415,000	600,000
Sulfuric acid, 100% H_2SO_4	[e]1,150,000	[e]1,150,000	[e]1,150,000	[e]1,150,000	[e]1,150,000	2,000,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	114,000	112,100	111,200	[e]110,000	[e]100,000	200,000
Coke, metallurgical	2,898,000	2,736,000	2,933,000	2,918,000	[e]2,900,000	3,500,000
Gas:						
Manufactured million cubic meters	10,016	10,272	9,570	[e]9,500	[e]9,500	15,000
Natural:						
Gross do.	73,089	74,137	82,649	[r]82,020	83,410	85,000
Marketed do.	71,715	72,238	81,666	81,829	[e]83,000	82,000
Natural gas liquids thousand 42-gallon barrels	[r]4,907	[r]5,127	[r]5,336	[r]5,556	6,763	8,000

See footnotes at end of table.

TABLE 1—Continued

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Peat, agricultural		[e]300,000	[e]300,000	[e]300,000	[e]300,000	[e]300,000	450,000
Petroleum:							
Crude	thousand 42-gallon barrels	23,113	24,081	22,207	[r]19,392	18,246	30,500
Refinery products:							
Liquefied petroleum gas	do.	29,870	31,784	29,708	[r]31,308	31,645	36,000
Mineral jelly and wax	do.	693	590	[r]401	[e]600	[e]600	700
Gasoline, motor	do.	70,890	72,930	74,333	73,484	[e]74,000	85,000
Naphtha and white spirit	do.	91,732	85,629	82,918	[r]83,062	72,905	96,000
Jet fuel	do.	42,848	40,048	38,296	[r]39,832	39,488	46,000
Kerosene	do.	4,123	3,387	2,581	[r]1,775	2,015	2,100
Refinery gas	do.	22,153	23,364	[r]20,801	[e]21,240	[e]21,240	24,000
Lubricants	do.	4,242	4,186	3,983	[r]3,493	[e]3,500	4,000
Distillate fuel oil	do.	129,521	116,689	131,132	[r]136,637	139,868	160,000
Residual fuel oil	do.	93,720	88,878	96,330	[r]97,975	99,134	115,000
Bitumen	do.	4,933	4,290	4,012	[r]4,381	[e]4,400	5,000
Unspecified	do.	25,165	29,148	[e]25,000	[e]25,000	[e]25,000	26,200
Total[4]	do.	519,889		[r][e]509,494	[r][e]518,788	[e]513,795	600,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 15, 1994.
[2]In addition to the commodities listed, the Netherlands produces construction materials such as sand and gravel, but output is not reported and no basis exists to make reliable estimates of output.
[3]Sales.
[4]Detail may nmot add to detail shown owing to independent rounding.

TABLE 2

NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facility	Annual capacity
Aluminum, primary	Hoogovens Aluminium BV	Smelter at Delfzijl	98
Do.	Pechiney Nederland BV	Smelter at Vlissingen	178
Cadmium tons	Budelco BV (Australian Overseas Smelting Pty Ltd, 50%; Kempensche Zinkmaatschappij Zincs de la Campine BV, 50%)	Plant at Budel-Dorplein	650
Cement	ENCI Nederland BV (Eerste Nederlandse Cement Industrie NV)	10 plants at Maastrict	2,700
Do.	Cementfabriek IJmuiden BV	3 plants at Ijmuiden	1,600
Do.	Cementfabriek Rozenburg BV	2 plants at Rozenburg	920
Lead	Hollandse Metallur-gische Industrie Billiton BV	Electrolytic plant at Arnhem	35
Do.	Billiton Witmetaal BV	Electrolytic plant at Naarden	6
Magnesia	Billiton Refractories BV	Plant at Veendam	100
Do.	MAF Magnesite BV	Plant at Vlaardingen	40
Natural gas million cubic meters per day	Nederlandse Aardolie Maatschappij BV (NAM)	Groningen, Leeuwarden Assen, and other onshore gasfields, and several offshore wells in the North Sea	225

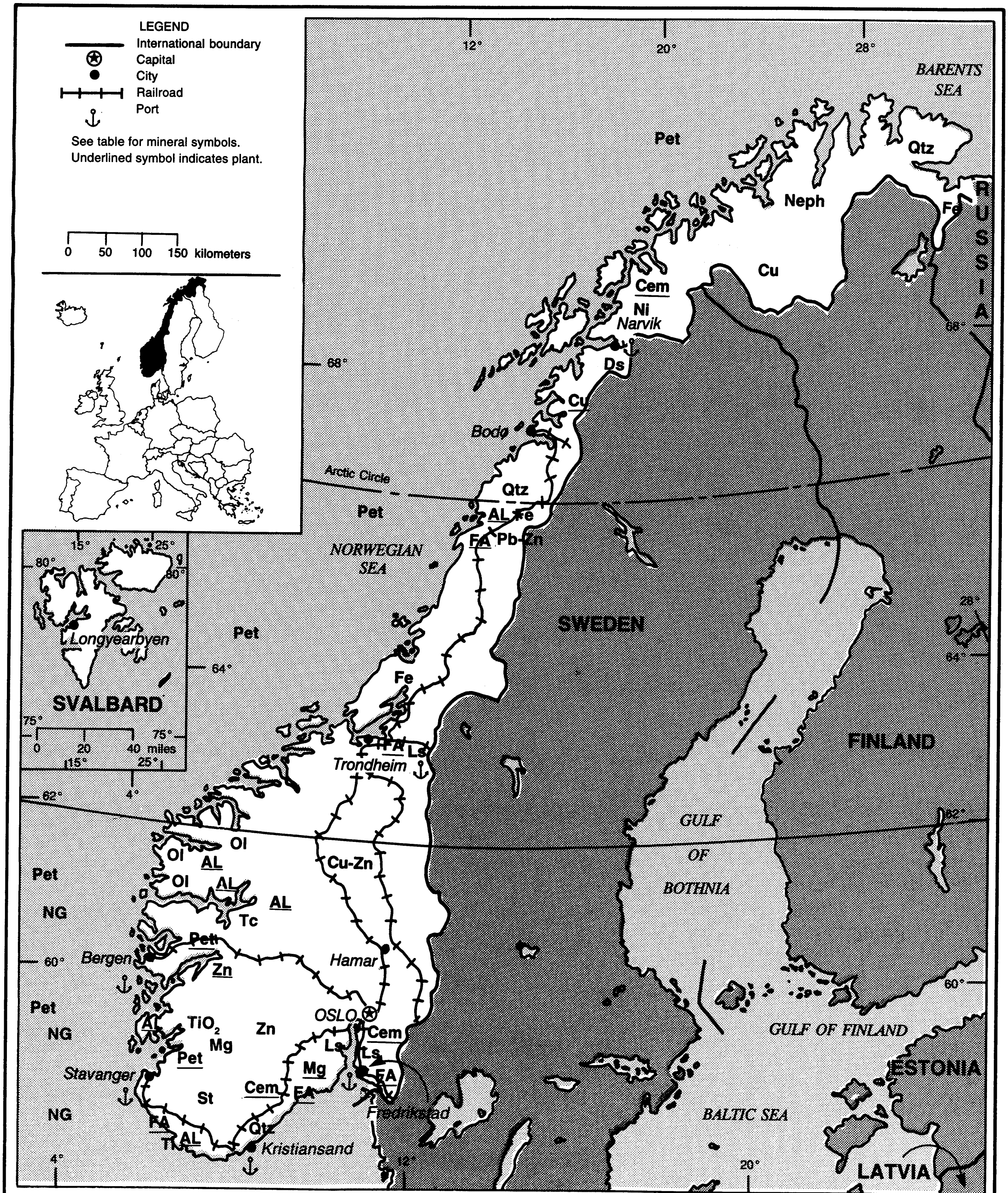
TABLE 2—Continued
NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facility	Annual capacity
Petroleum, crude barrels per day			766 wells (204 producing) including:	83,500
Do.	do.	AMOCO, CONOCO, and UNOCAL	North Sea fields: Haven, Helder, Helm, Hoorn, Kotter, Logger, and Rijn	(63,000)
Do.	do.	NAM	Onshore fields: Berkel, DeLier, Ijselmonde, Meerkapelle, Pernis West, Pinacker, Rotterdam, Schoonebeck, Werkendam, and Zoetemeer	(20,500)
Refineries		6 companies, of which the major ones are:		1,230,500
Do.	do.	Netherlands Refining Co.	Refinery at Rotterdam	(446,000)
Do.	do.	Shell Nederland Raffinaderij BV	Refinery at Pernis	(374,000)
Do.	do.	Esso Nederland BV	Refinery at Rotterdam	(175,000)
Do.	do.	Total Raffinaderij Nederland NV	Refinery at Vlissingen	(150,000)
Salt		Akzo Salt and Basic Chemicals BV	Mines at	4,000
			Hengelo	(2,000)
			Delfzijl	(2,000)
Sodium:				
Carbonate, synthetic		do.	Plant at Delfzijl	380
Sulfate, synthetic		do.	do.	600
Steel		Hoogovens IJmuiden BV	Plant at IJmuiden	6,100
Zinc		Budelco BV (Pasminco Europe BV, 50%; Kempensche Zinkmaatschappij Zincs de la Campine BV, 50%)	Plant at Budel-Dorplein	215

NORWAY

AREA 324,000 km² **POPULATION 4.2 million**



THE MINERAL INDUSTRIES OF

NORWAY

By Jozef Plachy

Historically, natural resources have been the basis of most major industrial developments in Norway. In 1993, as in previous years, mainland mining contributed about 1% to the gross domestic product (GDP). Readily available hydroelectric power and ice-free ports give competitive advantages to energy intensive industries, namely production of aluminum, ferroalloys, magnesium, and silicon metal.

Since the discovery of North Sea oil in the late 1960's, petroleum production has become the most important mineral activity in Norway. However, the economic significance of the offshore hydrocarbon production has always fluctuated with world market prices; in 1993 it accounted for about 17% of GDP.

GOVERNMENT POLICIES AND PROGRAMS

Because of impending membership in the European Economic Area and anticipated membership in the European Union, the Norwegian Government is reviewing its tax and mining laws with the intent of becoming more competitive and conforming to other countries' laws. For example, the Government now refunds up to 50% of the cost of exploration drilling, and additional grants will provide up to 35% of the capital cost of development of certain minerals and areas (mainly north of Trondheim). Mineral rights are obtained by filing for claims and maintained by paying small annual fees. The national income tax on profits from mining operations totals 28%, plus 7.5% to 13.5% of municipal and county taxes. Royalties on mineral production are 0.1% on sale value but do not exceed $1,000 per 0.25% km^2.[1]

PRODUCTION

Because no major new mines replaced those that have been exhausted, production of nonferrous ores during 1993 continued to decline. This decline of metal mining has been offset partially by an increase in industrial minerals production. In the processing industry, production declined slightly while profit, owing to devaluation of the krone, posted a modest increase. *(See table 1.)*

TRADE

The Norwegian economy remained highly dependent on foreign trade. More than half of the GDP is derived from it, compared with about 16% for the United States. About 75% of the minerals consumed in Norway is imported. Commodity imports are dominated by alumina/bauxite and apatite/phosphate. Exports were helped by a 5.4% devaluation of the krone in December 1992. Petroleum represented about 45% of exports, followed by chemicals and various raw materials, metals, and semimanufactures.

STRUCTURE OF THE MINERAL INDUSTRY

At the beginning of 1993, a number of new structures were created, including the Ministry of Industry and Energy (MIE), the Norwegian Industrial and Regional Development Fund, and the Norwegian Research Council.[2] The new MIE replaces the former Ministries of Petroleum and Energy and of Industry. Its legal department administers the state's shareholdings in Norsk Hydro A/S, A/S Olivin, and other Government owned-companies.

Despite recent changes, the Government's involvement in the mineral industry remains relatively high, especially in offshore hydrocarbon production. The Norwegian Government, through the state-owned Den norske stats olieselskap A/S (Statoil), controls all hydrocarbon production and refining. The rest of the mineral industry is dominated by the state-owned Norsk Hydro A/S and the publicly owned Elkem A/S.

Norsk Hydro A/S is the largest diversified industrial complex in Norway. Its divisions and subdivisions are grouped together in four segments, reflecting the company's core business areas: Agriculture (production of ammonia and fertilizer); Oil and Gas (Exploration/ Production and Refining/Marketing); Light Metals (Hydro Aluminium, Magnesium Division, and Hydro Energy); and Petrochemicals. Norsk Hydro's operating income in 1993 was about 50% higher than in 1992, mainly owing to lower production cost, higher oil production, and a rise in the exchange rate for the U.S. dollar.

Elkem A/S is one of the world's leading metals and materials companies with a strong hydroelectric energy base and significant global presence through its 20 plants on three continents. Elkem's production is divided into six divisions: Aluminum, Carbon/Materials, Energy, Ferrosilicon, Manganese/Chrome and Special Metals, and Silicon Metal. During 1993, two share issues were completed, bringing $135 million in new equity. Net sales in 1993 were only slightly higher than those in 1992, but income was $54 million against a loss of $12 million in 1992. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—Both Norwegian producers, Elkem and Norsk Hydro, were affected by stagnating demand and increased exports from the former U.S.S.R. Oversupply from Western markets during the past few years led to a significant fall in prices (10% drop in 1993) for primary aluminum.

With an annual capacity of 680,000 tons, Norsk Hydro is the larger of Norway's two primary aluminum producers. Its aluminum division consists of four wholly owned and one partly owned smelters in Ardal (180,000 mt/a), Hoyanger (70,000 mt/a), Husnes (85,000 mt/a), Karmoy (220,000 mt/a), and Sunndal (125,000 mt/a). In anticipation of increasing demand, Hydro Aluminium is planning to increase capacity at the Soral and Sunndalsora plants. The capacity at the jointly owned Soral plant in Husnes (50% Alusuisse and 49% Hydro Aluminium) will increase by 15,000 mt/a to 100,000 mt/a. At the Sunndalsora plant, Hydro Aluminium has decided to invest $6.6 million in a new continuous homogenizing facility. By the end of 1995 the plant's billet production capacity should increase from 125,000 mt/a to 170,000 mt/a.

At the end of 1992, a new aluminum scrap recycling furnace was commissioned by Hydro Aluminium at the Holmestrand rolling mill. The new gas-fired furnace raised the remelting capacity to 90,000 mt/a.[3]

The second largest producer, Elkem Aluminium ANS, division of Elkem A/S, operates two aluminum smelters in Farsund and Mosjoen with a combined capacity of about 200,000 mt/a.[4] Both plants are jointly owned by Elkem and Alcoa (Aluminum Company of America). Production in 1993 was 201,000 tons, about the same level as in 1992.

Copper.—Two of Outokumpu's three copper mines in Norway discontinued production in 1993 because reserves were depleted. The A/S Bidjovagge Gruber Mine was bought by Outokumpu's subsidiary, Norsulfid A/S, in 1984. Since then, annual ore production averaged about 325,000 tons (1% to 2% copper and 1 g/mt to 4 g/mt gold) from which about 3,000 tons of copper and about 850 kg of gold were produced.[5] The second Outokumpu mine that closed in 1993 was Tverrfjellet, operated by Folldal Verk A/S.[6] The closure marks the end of 345 years of mining in and around Folldal. Ore production averaged about 400,000 mt/a containing about 1.5% copper and 1.1% zinc. The only remaining Outokumpu-owned copper mine, the largest sulfide mine in Norway, is Joma Mine operated by Grong Gruber. Production started in 1972, and during the past three years averaged about 540,000 mt/a grading 1.33% copper and 2.12% zinc. In 1993, Grong Gruber opened the Gjersvik deposit about 30 km from its existing Joma Mine at Royrvik, near the Swedish border. The capacity of the mine's concentrator had to be increased to 600,000 mt/a to accommodate additional ore.[7] Production will total about 25,000 mt/a of copper concentrate and 15,000 mt/a of zinc concentrate.[8]

Ferroalloys.—Despite a slight upturn in prices for ferromanganese and ferrosilicon during the second half of 1993, Norwegian producers experienced high losses, albeit lower than in 1992.

Ferromanganese.—Elkem's total production of manganese alloys, including silicomanganese, exceeded 400,000 tons in 1993.[9] On April 15, 1993, to secure long-term supplies of manganese ore at stable prices, Elkem formed a joint company with Australian Broken Hill Proprietary Company Limited (BHP). Under the agreement, Groote Eylandt Manganese Sales Pty. Ltd., owned by BHP (51%) and Elkem (49%), agreed to supply manganese ore for Elkem's manganese smelting plants. In return, the two ferromanganese plants in Norway, Elkem Sauda and Elkem PEA (in Porsgrunn), 400,000 mt/a combined capacity, were transferred to a new holding company, Elkem Mangan KS, in which Elkem holds 51% interest and BHP holds 49%.[10]

Ferrosilicon.—With production of more than 300,000 tons,[11] Elkem's market share in 1993 for ferrosilicon in the Western World remained about 13%. High production cost caused by low-capacity utilization was alleviated with lower cost of imported coke. About half of the coke now used by Elkem's four ferrosilicon plants in Norway is directly imported from China.

Because of the depressed ferrosilicon market, one of the two furnaces at the Rana Metall's Finnfjord Smelterverk was left idle for part of 1993, even though the company had repaired the damage caused by explosion in late 1992.

Iron Ore.—Norwegian iron ore mines A/S Sydvaranger, Rana Gruber A/S, and Fosdalen Bergverk A/S produce about 2.2 Mmt/a of iron ore concentrates. The largest producer, A/S Sydvaranger, is in northern Norway close to the Finnish border. The total annual output is about 1.4 Mmt, most of which is exported to Germany and the United Kingdom. A small amount, about 100,000 mt/a, is converted into 72% iron concentrate for powder metallurgy. The mine is expected to close in 1996.

The recently privatized Rana Gruber A/S produces about 2 Mmt/a of crude ore, graded 33% to 34% iron. The final product, 0.8 Mmt/a of concentrates, is sold mainly to the German and French steelworks. A small amount, about 10% to 15%, is sold to the powder metallurgy market. Reserves are estimated to amount to about 300 Mmt.

Magnesium.—The magnesium market was affected in 1993 by weak economic development in market economy countries and continued high exports from the former U.S.S.R. and China. This has led to a buildup of stocks, production cutbacks, and low prices. Low price for the primary magnesium was offset by a higher U.S. dollar exchange rate. In the fall of 1993 the antidumping duty on magnesium exported to the United States by Hydro Magnesium, a division of Norsk Hydro, was reduced from 31.33% to 21%.[12]

In 1993, Hydro Magnesium completed its preliminary feasibility study of a magnesium recycling plant at Heroya in Norway. However, a decision on construction has reportedly not been made.

Nickel.—For 2 years, starting in 1993, Nikkel og Olivin AS, near Narvik, will be under Norsulfid management. After 2 years, Norsulfid, a subsidiary of Outokumpu, has an option to buy the company if further reserves are found. The underground mine is currently producing about 600,000 mt/a of ore with a content of 0.6% nickel and 0.15% copper.[13] Concentrate production amounts to about 16,000 mt/a containing 10% to 12% nickel.[14] Concentrate is exported to Finland for smelting.

Additional nickel is extracted from the ilmenite ore at the Tellnes Mine, owned and operated by Titania A/S. About 10,000 mt/a of sulfide ore is produced with an average content of 5% nickel and 2% copper.

Nickel matte and concentrates, imported mostly from Canada and Botswana, are processed at the Falconbridge Nikkelverk AS in Kristiansand. Matte is ground and nickel dissolved by chlorine leaching. Nickel solution is purified and metal is recovered by electrowinning. In addition to about 60,000 mt/a of refined nickel cathode, copper, cobalt, and precious metals are produced at the refinery.

Silicon Metal.—The Silicon Metal Division of Elkem, with a 1993 production of about 125,000 tons, has about a 20% market share of the Western World demand for silicon metal. The total capacity of its three plants in Norway (Bremanger, Fiskaa, and Meraker) and one in the United Kingdom is presently 140,000 mt/a.

Titanium.—Titania A/S is one of two ilmenite hardrock producers in the world. Its Tellnes mine production averages about 3 Mmt/a from which about 700,000 tons[15] of ilmenite concentrate is produced annually with a 44.5% titanium dioxide content. The ore body is a 2.3-km long lens with 18% titanium dioxide, 2% magnetite, and 0.25% sulfide.[16] Crude ore is transported from the mine by conveyor belt and by a 4-km-long pipeline to silos at the loading pier on the southwestern coast of Norway. More than half of the concentrate is exported, with the remainder used for slag (25%) and pigment production (20%).

Zinc.—The only sulfide mine containing lead and zinc is in Bleikvassli, 40 km south of Mo i Rana. The beneficiation plant's capacity is about 15,000 mt/a of zinc concentrate and 7,000 mt/a of lead concentrate.[17] During 1993, production was partially discontinued, owing to low prices. The mine, sold by A/S Sydvaranger to the employees of the mine, has reasonable reserves for its small production and is likely to survive.

Industrial Minerals

Norway has a long coastline with excellent ports and favorable geology for producing and exporting many industrial minerals. This, coupled with the opening of the mineral industry to foreign investors, is ensuring a steady growth of industrial mineral output and is attracting interest from international producers.

Fertilizer.—During 1993 Hydro Agri, Norsk Hydro's Agricultural Division, ceased ammonia production at Glomfjord, the company's last electrolytically based ammonia plant. With completion of all the planned closures and capacity and work force reduction (by 900 in 1993), the fixed cost of fertilizer production was lowered to below the 1991 level.

In the fall of 1993 Hydro Agri and the Italian company Enichem Agricoltura signed a letter of intent to form a joint fertilizer company.

Nepheline Syenite.—North Cape Nefelin A/S is one of the world's largest producers of nepheline syenite. It was recently purchased by the U.S. company Unimin, a subsidiary of Sibelco, and renamed North Cape Minerals. Production at the underground mine started in 1961, and by 1992 it reached about 350,000 mt/a. The lens deposit is 1,700 m long, 300 m wide, and about 500 m deep. Proven reserves amount to approximately 300 Mmt. The deposit consists of perthitic potassium feldspar (56%), nepheline (34%), and other minerals.[18] Ore is transported by conveyor belt to a dressing plant, where it is dried, crushed, magnetically separated, and milled.

Olivine.—One of the world's largest deposits of olivine is on the southwest coast of Norway. It covers an area of about 6 km^2 and represents estimated reserves of 2 billion tons. The average mineral content is 92% olivine, 5% pyroxene and serpentine, 1.5% chlorite, and 1% spinel.[19]

The 1993 production of nearly 3 Mmt represents about 50% of world production. Three producers serve the Norwegian market, the largest of which is A/S Olivin, at Aheim in Sunnmore. The 2.5-Mmt/a-capacity open pit mine is 4 km from the plant and the harbor; olivine is transported by conveyor belt in a tunnel. The other two producers, Franzefoss Burk A/S and Industrimineraler A/S, are mining the nearby deposits of Lefdal and Stranda, respectively.

Stone.—The Sokndal area, favorably located on the southwestern coast of Norway, is emerging as a premier location for producing crushed stone. In addition to the established Rekefjord Verk, Titania A/S has been negotiating with Alpine Process Technology Ltd. to utilize the overburden from its Tellnes titanium open pit mine. Further, British Tarmac PLC, together with Norwegian partners, is planning to invest about $95 million in a quarry near the outlet of Jossingfjord. It is anticipated that Norwegian aggregate exports will rise from 2 Mmt/a to about 10 Mmt/a.

Talc.—A majority interest in Norwegian Talc Minerals was purchased by Pluess-Staufer AG of Switzerland. The company already owns Hustadmarmor A/S, a producer of 580,000 tons of calcite annually. New acquisitions included the Altermark talc mine, Hammerfall (group of 0.5 Mmt/a dolomite producers near Bodo), and a diversified grinding plant in Knarrevik.

Mineral Fuels

Offshore hydrocarbon production will remain Norway's principal economic activity for the next several decades. As of January 1, 1993, total reserves on the Norwegian Continental Shelf consisted of 1,270 Mmt of crude oil, 2,314 billion m^3 of natural gas, and 115 Mm^3 of natural gas liquids.[20] At current extraction rates, Norwegian reserves of petroleum and natural gas will last about 20 and 115 years, respectively.

A total of 26 exploration wells was completed in 1993—18 wildcat wells and 8 appraisal wells. During the year, the Norwegian Government approved the development of the Gullfaks and Gyda Sor fields and granted permission for the laying of the Troll pipeline. Total investment in hydrocarbon production in 1993 was about $7.5 billion.

Natural Gas.—The only primary gasfield that started operation in 1993 was the Sleipner East. It contains recoverable reserves of 46.2 billion m^3 of natural gas, 27 Mm^3 of crude oil, and 15 Mmt of natural gas liquids (LPG). Future production is expected to reach about 7 Mm^3/a of gas and 1.6 Mmt/a of condensate. Gas is piped through the Statpipe/Norpipe system to Emden in Germany and through the newly constructed Zeepipe to Zeebrugge in Belgium. This will increase Germany's leading share of Norwegian natural gas exports, which at the beginning of 1993 was about 36.6%, followed by France (23.1%) and the United Kingdom (18.2%).

A total of 25.8 billion m^3 of natural gas was exported in 1993. This export is projected to increase to about 50 billion m^3 by the turn of the century and to 75 billion m^3 by the year 2010. The increased export will be handled by Norpipe, Zeepipe, and Europipe. Phase 1 of Zeepipe construction, the connection between Sleipner Field and Zeebrugge in Belgium, was put into service on October 1, 1993. Europipe, after delays caused by environmental problems, should be operational by the end of 1995. The 1-m-diameter pipeline will run parallel to Norpipe, from Sleipner Field to Etzel in Germany.

Petroleum.—The fall in the oil price during 1993 was offset by a slight increase of production and a higher dollar exchange value. Three fields began operation in 1993. Brage Field, operated by Norsk Hydro, has an estimated recoverable reserve of 46.2 Mm^3 of crude oil and 1.7 billion m^3 of gas. Production should reach 85,000 bbl/d by 1994. The crude oil from Brage Field is piped via the Oseberg Transportation System to Sture terminal in Oygarden on the Norwegian coast, while gas is piped to Germany through the Statpipe/Norpipe. The second field, Draugen, is the only producing field in the Norwegian Sea. It has recoverable reserves of 91.9 Mm^3 of oil and 4.4 Mm^3 of gas. According to A/S Norske Shell, operator and 21% owner of the field, production in 1994 should reach 90,000 bbl/d.

Two additional fields, Lille Frigg and Tordis, are slated to begin production in 1994. Tordis Field, the largest of the two, has estimated recoverable reserves of 31 Mm^3 of oil and 1.1 billion m^3 of gas. The planned production is about 56,000 bbl/d.

A pipeline connecting Troll Oilfield with Mongstad terminal on the west coast of Norway was approved by the Government in December 1993. The 85-km-long pipeline with 157,000-bbl/d capacity is expected to be operational by the end of 1995.

The Norwegian refining industry consists of three refineries: Statoil Mongstad (7 Mmt/a capacity), Esso Norge AS refinery on Slagenat Tonsberg (4.5 Mmt/a), and Norske Shell AS refinery at Sola (2.5 Mmt/a capacity).

Reserves

There were no new major discoveries in 1993, so resources and reserves of minerals, except hydrocarbons, did not change. *(See table 3.)*

INFRASTRUCTURE

Most of Norway's land transportation is concentrated in the better developed southern portion of the country. In the less populated northern part, bisected by many fjords and mountain ranges, the arctic conditions make the development of modern surface transportation infrastructure difficult. Therefore, more than one-half of Norway's 79,540 km of roads is gravel, crushed stone, or earth. Almost all of the 4,223 km of standard-gauge railroad track is electrified, mainly because energy costs are low and for environmental reasons. With one exception (Narvik), all the major ports for the 867 ships of Norway's merchant marine are in the southern portion of the country. The largest ports include Bergen, Fredrikstad, Kristiansand, Oslo, Stavanger, and Trondheim.

The transportation system between the Norwegian Continental Shelf and Europe consists of natural gas pipeline to Emden, St. Ferguson, and Zeebrugge and crude oil and condensate pipeline to Cruden Bay and Teesside.

OUTLOOK

Most mines have been closed for economic reasons, and the possibility of finding new deposits suitable for traditional mining techniques is rather low. Because more stringent environmental laws further limited traditional extraction, Norway has invested in new technologies for mineral production. The most promising is bioleaching, which is suitable for recovery of metals from low-grade resources, either as in situ or as heap leaching.

According to a recent study, production of crude oil and natural gas liquids will peak in 1996 at 2.85 Mbbl/d, 19% above that of 1993. Annual Norwegian gas sales are forecast to reach 63 billion m^3 by early in the next century, more than double the 1993 level. After 13 years of drilling 52 exploratory wells in the Barents Sea, only small amounts of natural gas were discovered and further exploration may be suspended.

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OTHER SOURCES OF INFORMATION

Agencies

Norges geologiske undersokelse
P.O. Box 3006 Lade 7002
Trondheim, Norway

The Ministry of Industry and Energy
P.O. Box 8148 Dep. 00330
Oslo 1, Norway

Publications

Economic Bulletin.
Fact Sheet 1994.
Norsk Hydro A/S, Profile Magazine, monthly.
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Norzik A/S, Annual Report 1994.

TABLE 1

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Primary	863,354	845,068	832,558	812,850	814,000	870,000
Secondary	67,305	49,036	63,066	57,043	51,987	70,000
Cadmium, smelter	207	286	227	247	240	300
Cobalt	1,946	1,830	1,983	2,293	2,414	2,500
Copper:						
Mine output:						
Concentrate	91,008	97,614	84,592	49,645	36,000	40,000
Cu content	16,497	19,745	17,393	12,668	8,676	9,000
Metal, primary and secondary:						
Smelter	34,980	36,458	38,445	39,259	37,205	40,000
Refined	34,980	36,458	38,445	39,259	37,205	40,000
Gallium[e] kilograms	5,000	4,000	—	—	—	—
Gold do.	703	802	[e]800	[e]800	[e]800	1,000
Iron and steel:						
Iron ore and concentrate:						
Gross weight thousand tons	2,358	2,081	2,209	2,152	2,162	3,500
Fe content do.	1,532	1,352	1,435	1,403	1,360	2,250
Metal:						
Pig iron do.	240	[r]54	[r]61	[r]70	73	100
Ferroalloys:						
Ferrochromium	—	[r]60,000	[r]83,000	[r]102,000	80,000	140,000
Ferromanganese	220,591	213,266	173,212	202,680	226,018	250,000
Ferrosilicomanganese	270,305	223,310	226,737	213,106	218,566	235,000
Ferrosilicon (75% basis)	398,744	397,520	377,455	367,034	399,559	480,000
Silicon metal	100,194	76,601	[e]65,000	[e]60,000	[e]60,000	70,000
Other[e]	14,000	14,000	14,000	14,000	14,000	15,000
Total	1,003,834	984,697	939,404	958,820	998,143	1,190,000

See footnotes at end of table.

TABLE 1—Continued
NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Iron and steel—Continued:							
Metal—Continued:							
Steel, crude	thousand tons	678	376	438	446	502	600
Semimanufactures, rolled[e]	do.	[2]556	350	300	300	290	500
Lead, mine output:							
Concentrate		6,012	5,699	6,739	[r]7,083	3,200	3,500
Pb content		3,188	3,017	3,517	3,767	1,698	2,000
Magnesium, primary		49,827	48,222	44,322	30,404	27,300	50,000
Nickel:							
Mine output:							
Concentrate		13,000	23,391	21,156	31,306	31,719	35,000
Ni content		780	3,100	2,200	3,398	3,462	3,500
Metal, primary		54,886	57,812	58,730	55,686	56,817	60,000
Platinum-group metals[e] [3]	kilograms	1,555	1,500	1,500	1,500	1,500	1,500
Titanium:							
Ilmenite concentrate	thousand tons	930	814	625	[r]708	713	750
TiO_2 content	do.	412	361	277	318	[e]153	350
Zinc:							
Mine output:							
Concentrate		29,324	34,124	36,690	[r]41,055	29,000	30,000
Zn content		15,023	17,546	18,886	21,058	14,327	15,000
Metal, primary		120,404	125,052	124,916	127,564	129,192	137,000
INDUSTRIAL MINERALS							
Cement, hydraulic	thousand tons	1,375	1,261	1,147	1,266	1,368	2,145
Feldspar[e]		90,000	90,000	90,000	100,000	100,000	100,000
Graphite		1,800	[e]5,000	6,930	[r]7,000	6,500	10,000
Lime, hydrated, and quicklime[e]	thousand tons	100	100	100	100	100	195
Mica, flake[e]		3,000	3,000	3,000	3,000	3,000	3,000
Nepheline syenite[e]	thousand tons	[2]262	250	[r]300	[r]350	350	350
Nitrogen: N content of ammonia	do.	[r]382	431	384	343	315	400
Olivine sand[e]	do.	2,000	[r]2,900	[r] [2]2,505	[r] [2]2,789	2,955	3,300
Pyrite	do.	244	303	306	247	92	300
Stone, crushed:[e]							
Dolomite	do.	550	525	600	650	650	850
Limestone	do.	4,200	[r] [2]4,070	4,000	3,500	3,500	3,500
Quartz and quartzite	do.	800	800	800	900	900	1,000
Sulfur:							
Pyrite, S content[e]	do.	[2]122	125	[r]121	125	125	130
Byproduct of:[e]							
Metallurgy	do.	75	75	75	75	75	75
Petroleum	do.	13	15	15	15	15	15
Total	do.	210	215	211	215	[e]215	220
Talc, soapstone, steatite[e]	do.	100	100	80	60	50	96
MINERAL FUELS AND RELATED MATERIALS							
Coal, all grades	thousand tons	413	358	389	449	314	450
Coke, all grades	do.	[e]50	—	—	—	—	—

See footnotes at end of table.

TABLE 1—Continued

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Gas, natural:							
Gross	million cubic meters	31,964	27,817	28,315	[r]27,732	28,775	30,000
Marketed[4]	do.	28,700	25,400	[e]25,000	27,736	28,500	30,000
Peat:[e]							
For agricultural use	thousand tons	30	30	30	30	30	30
For fuel use	do.	1	1	1	1	1	1
Petroleum:							
Crude[5]	thousand 42-gallon barrels	560,252	609,381	679,184	793,553	827,645	850,000
Natural gas liquids	do.	22,707	33,060	17,204	17,200	25,342	17,500
Refinery products:							
Naphtha	do.	4,504	[e]4,200	[e]4,200	4,200	[e]4,000	5,000
Gasoline	do.	14,917	27,134	23,228	28,087	[e]28,000	30,000
Kerosene	do.	6,682	8,327	[e]8,300	8,134	[e]8,200	10,000
Distillate fuel oil	do.	34,072	44,502	44,769	[r]47,274	[e]47,500	50,000
Residual fuel oil	do.	11,102	9,444	9,961	[r]11,209	[e]11,200	15,000
Other[e]	do.	4,300	[2]4,093	4,000	4,000	4,000	5,000
Refinery fuel and losses[e]	do.	4,000	4,000	4,000	4,000	4,000	5,000
Total[e]	do.	79,577	101,700	[e]98,458	[e]106,904	[e]106,900	120,000

[e]Estimated. [r]Revised.
[1]Table includes data available through July 1994.
[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 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Hydro Aluminum A/S (Norsk Hydro A/S, 70%)	Smelters at Ardal, Hoyanger, Karmoy, and Sunndalsora	595
Do.	Elkem Aluminium (Elkem A/S, 50%; and Alcoa 50%)	Smelters at Farsund and Mosjoen	200
Do.	Sor-Norge Aluminium A/S (Alusuisse, 50%; and Hydro Aluminium 49%)	Smelter at Odda	85
Cadmium	Den Norske Zinkkompani A/S (Boliden Ab, 100%)	Smelter at Odda	.3
Cement	Norcem A/S	Plants at Brevik and Kjopsvik	2,145
Coal	Store Norske Spitsbergen Kulkompani A/S	Mines at Longyearbyen and Svea	450
Cobalt	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	2.5
Copper:			
Ore, Cu content	Grong Guber A/S (Norsulfid A/S, 100%)	Mines at Royrvik and Gjersvik	8
Do.	Nikkel og Olivin AS (Norsulfid A/S, 100%)	Mine at Narvik	1
Metal	Nikkelverk A/S (Falconbridge Nickel Ltd., 100%)	Smelter at Kristiansand	40
Dolomite	Franzefoss Bruk A/S	Mine at Ballagen	350
Do.	Norwegian Holding A/S	Mines at Hammerfall, Logavlen, and Kvitblikk	500
Feldspar	Franzefoss Bruk A/S	Mine at Lillesand	100

TABLE 2—Continued
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Ferroalloys		Elkem Rana (Elkem A/S, 100%)	Ferrochromium plant at Mo i Rana	140
Do.		Elkem Sauda (Elkem A/S, 51%; BHP, 49%)	Ferromanganese plant at Sauda	250
Do.		Elkem PEA (Elkem A/S, 51%; BHP, 49%)	Ferromanganese plant at Porsgrunn	200
Do.		Elkem Salten (Elkem A/S, 100%)	Ferrosilicon plant at Straumen	85
Do.		Elkem Bjolvefossen (Elkem A/S, 100%)	Ferrosilicon plant at Alvik	60
Do.		Elkem Thamshavn (Elkem A/S, 100%)	Ferrosilicon plant at Orkanger	60
Do.		Finnfjord Smelterverk, Rana Metal (Fesil, 100%)	Ferrosilicon plant at Mo i Rana	140
Do.		A/S Hafslung Metal (Fesil, 100%)	Ferrosilicon plant at Sarpsborg	75
Do.		Ila og Lilleby Smelterverk (Fesil, 100%)	Ferrosilicon plant at Finnsnes	60
Do.		Oye Smelterverk (Tinfos Jernverk A/S, 100%)	Silicomanganese plant at Kvinesdal	135
Graphite		Elkem Skaland (Elkem A/S, 100%)	Skaland Mine on Senja Island	10
Iron, metal		Ulstein Jernstoperi A/S	Hordvikneset	10
Iron ore		Rana Gruber A/S (Norsk Jernverk Holding A/S, 100%)	Mine at Mo i Rana	2,000
Do.		A/S Sydvaranger (Government, 87.45%)	Bjornevatn Mine at Kirkenes	1,500
Lead ore, Pb content		A/S Bleikvassli Gruber (A/S Sydvaranger, 100%)	Mine at Bleikvassli	2
Lime		Hylla Kalkverk (Nikolai Bruch A/S, 100%)	Verdal/Trondheim Mine and plant	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
Limestone		Norcem A/S	Dalen, Bjorntvedt, and Kjopsvik mines	1,600
Do.		Vardelskalk A/S (Franzefoss Burk A/S, 100%)	Sandvika Mine	800
Do.		Breivik Klakverk A/S	Visnes and Glaerum mines	500
Magnesium		Norsk Hydro A/S (Government, 51%)	Plant at Porsgrunn	50
Natural gas	million cubic meters	Den norske stats oljeselskap A/S	Gama, Gullfaks, Sleipner Ost, and Statfjord fields	12,270
Do.	do.	Phillips Petroleum Company Norway	Ekofisk Field	9,900
Do.	do.	Elf Petroleum Norge A/S	Frigg, Heimdal, and Ost-Frigg fields	5,750
Do.	do.	Norsk Hydro Produksjon A/S	Troll-Oseberg Field	2,600
Do.	do.	BP Petroleum Development of Norway	Gyda and Ula fields	1,040
Do.	do.	Esso Norge A/S	Odin Field	1,000
Do.	do.	Amoco Norway A/S	Hod and Valhall fields	910
Nepheline syenite		North Cape Nefelin A/S (Unimin Corp., 100%)	Mine at Stjernoy	350
Nickel:				
Ore, Ni content		Nikkel og Olivin AS (Norsulfid A/S, 100%)	Mine at Narvik	2.5
Do.		Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	1
Metal		Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	60
Olivine		A/S Olivin	Aheim Mine at Sunnmore	2,500
Do.		Franzefoss Bruk A/S	Lefdal Mine at Bryggja	500
Do.		Idustrimineraler A/S	Stranda Mine at Nordfjord	300
Petroleum	barrels per day	Den norske stats oljeselskap A/S	Gullfaks, Statfjord, Tommeliten, and Veslefrikk fields	1,069,300
Do.	do.	Norsk Hydro Produksjon A/S	Brage, Mime, and Oseberg fields	566,200
Do.	do.	Phillips Petroleum Company Norway	Ekofisk field	237,500
Do.	do.	Saga Petroleum A/S	Snorre field	170,000
Do.	do.	BP Petroleum Development of Norway	Gyda and Ula fields	155,000
Do.	do.	A/S Norske Shell	Draugen field	90,000
Pyrite		Folldal Verk A/S (Norsulfid A/S, 100%)	Mine at Hjerkinn	300

TABLE 2—Continued
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Quartzite	Elkem Tana (Elkem A/S, 100%)	Mine at Tana	540
Do.	Elekm Marnes (Elkem A/S, 100%)	Mine at Sandhornoy	200
Do.	Vatnet Kvarts A/S	Mine at Nordland	150
Do.	Snekkevik Kvartsbrudd	Mine at Kragero	110
Steel	Fundia AB (Norsk Jenverk, 50%; Rataruukki, 50%)	Plants at Christiania, Spigerverk, Mandal Stal, and Mo i Rana	600
Talc	A/S Norwegian Talc (Pluess-Staufer AG, 51%)	Mine/plant at Altermark/Knarrevik and Framfjord	90
Do.	Kvam Minerals A/S	Mine/plant at Kvam	6
Titanium, concentrate	Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	850
Zinc:			
Ore, Zn content	Grong Guber A/S (Norsulfid A/S, 100%)	Mines at Royrvik and Gjersvik	10
Do.	A/S Bleikvassli Gruber (A/S Sydvaranger, 100%)	Mine at Bleikvassli	5
Metal	Norzik A/S (Boliden Mineral AB, 50%)	Smelter at Odda	137

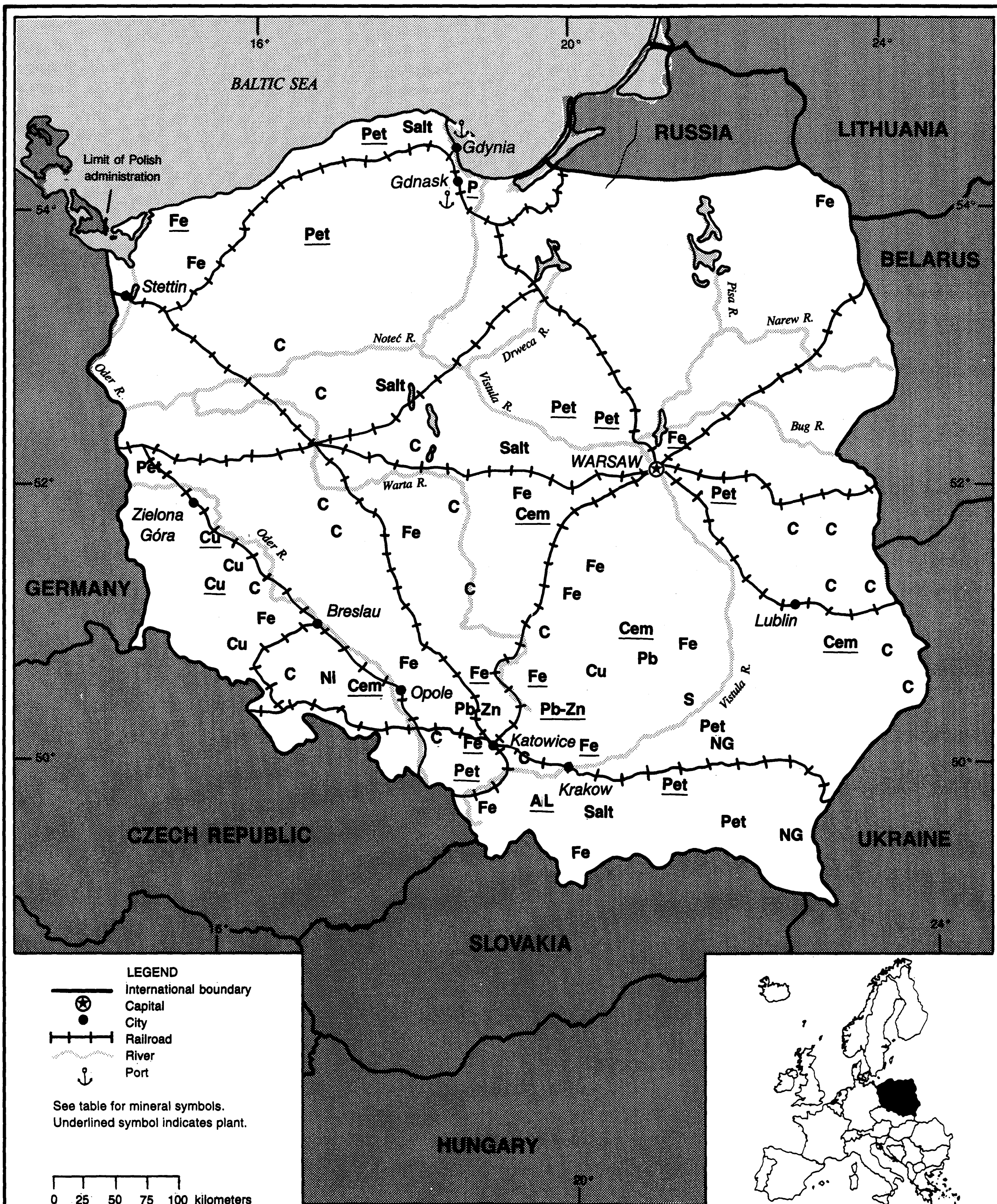
TABLE 3
NORWAY: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

(Million metric tons unless otherwise specified)

Commodity		Reserves
Copper-zinc ore		25
Iron ore		930
Natural gas	cubic meters	2,140
Nepheline syenite		300
Olivine		2,000
Petroleum		1,270

POLAND

AREA 312,000 km² **POPULATION 38 million**



THE MINERAL INDUSTRY OF

POLAND

By Walter G. Steblez

In 1993, Poland was the second largest producer of copper in Europe and Central Eurasia and was ranked among the top 10 world producers in terms of mine output and refined metal production, respectively. Similarly, the country was the 3d largest mine producer of zinc in Europe and Central Eurasia, and was ranked as the 11th largest world mine zinc producer. Poland also was considered to be among the top 10 mine producers of silver in the world and among the top 6 world producers of sulfur. Additionally, Poland was among the leading producers of lime, nitrogen (in ammonia), and salt in Europe and Central Eurasia. In respect to mineral fuels, Poland remained among the seven largest producers of bituminous coal in the world.

On balance, Poland's economy in 1993 improved compared with the country's economic results for 1992. However, in respect to the country's mineral industries, the official index of the value of industrial production for 1993 showed declines for all sectors of mining and minerals processing. The index's components covering metals mining and quarrying, coal and peat mining, and base metals production showed declines of 11.1%, 11.6%, and 5.9%, respectively, during this period, despite a 5.5% increase in the total value of industrial production in 1993 compared with that of 1992.[1]

GOVERNMENT POLICIES AND PROGRAMS

Sharp focus on the country's minerals development-related policy appeared to have been lacking mainly because of Poland's remaining heavy environmental pollution burdens and concerns over current and future threats to the environment from the minerals and other heavy industries. One of the major impediments to greater investment by foreign entities in Poland's mineral industry reportedly has been the absence of market sensitive mining and exploration laws. Operative legislation in 1993 consisted of the Geological Act of 1960 and the Mining Act of 1953 (both amended in March 1991). The Geological Act pertained to exploration, and the Mining Act related to mine development. Both legislative acts were meant to serve the needs of a centrally planned economy country. New mining and geological acts reportedly were only in a draft stage in 1993, and it could take 5 years or longer to fully implement them.[2]

The Government of Poland continued to promote the decentralization and denationalization of the economy, as well as the growth of both the domestic and export markets. The share of the country's gross domestic product (GDP) generated by the private sector grew from 41% in 1991 to more than 45% in 1992, and was expected to exceed 50% in 1993. Similarly, the share of employment in the private sector, excluding agriculture, amounted to 40.3% and 44.4% in 1991 and 1992, respectively.[3] The growth of the private sector's share in industry continued during this period but was modulated by social demands concerned with a slower denationalization process for large-scale, state-owned heavy industry enterprises such as those in mining, metals production, and machine building.

Environmental protection also remained a very important component of the Government's plans to restructure the country's economy.

ENVIRONMENTAL ISSUES

The latest available data (1991) published by the Government on environmentally polluting wastes generated by the country's minerals industries suggested some improvement concerning this issue in 1991 compared with that of 1990. Total wastes generated by the minerals industry in 1991 reportedly amounted to 128.3 Mmt compared with 143.8 Mmt in 1990, representing a reduction of about 11%. However, the reduction of waste from minerals industry point sources during this period was more likely the result of a general decline in output in the industry rather than rapid assimilation of pollution abatement technology. About 51.1% of the total waste in 1991 was reprocessed commercially, 4% was neutralized, and 48.5% was stored. Of the total waste produced by the minerals industry in 1992 (128.3 Mmt), 58.6 Mmt was generated by the mining, quarrying, and processing sector; 28.2 Mmt by the barite, coal, copper, lead and zinc, and sulfur washing and beneficiation operations; and 24.1 Mmt consisted of mineral dust and fly ash and slag generated by the electric power generating sector. Compared with that of 1990, the amount of waste generated by these categories of activity in 1991 represented declines of about 10%, 5%, and 11%, respectively.

Poland's bituminous coal is generally a low-sulfur product that only reaches or slightly exceeds a sulfur content of 1% at fewer than 10 mines out of more than 70 operating bituminous coal mines in the country. Sulfur contained in pyrite has constituted from 50% to 60% of the total sulfur in the mined hard coal. The pyrite hosted primarily in waste rock and dirt bands associated with the coal seams is removed through routine beneficiation; however, the chief environmental pollution problems associated with Poland's bituminous coals appear to be connected with coal fines that are not beneficiated. Reportedly, in 1992, the construction of fines preparation plants at four coal mines producing bituminous coal with the highest sulfur content was near completion. Further desulfurization of coal, however, would require acquisition of foreign technology.[4]

Approximately 25% of thermal electric power generated in Poland is based on the burning of lignite (all from Belchatow), a much lower grade fuel with a measurably higher sulfur and ash content. In December 1992, representatives of Poland's Ministry of Industry and Commerce, the Ministry of the Environment, and the management of the Turow thermal electric power station signed an agreement to undertake the modernization of the powerplant and at the same time undertake measures to protect the environment. The Turow powerplant, with a design capacity to produce 2,000 MW, was based entirely on the burning of lignite. The plan called for the modernization of 6 of Turow's 10 power units using more environmentally benign technology. The Turow modernization program was scheduled to last from 1993 to 2001 and would serve as a carefully monitored model for the entire energy-producing sector.

In 1993, actions by the Government to enforce the country's environmental laws included the closure of most operations at the Huta Bobrek steel mill. In June 1992, the Government issued Huta Bobrek an ultimatum to radically limit pollution from the mills operations by June 30, 1993. This deadline, however, was not met, thus forcing the shutdown.[5]

PRODUCTION

The curtailment of Poland's declining trend of mineral output in 1989, 1990, and 1991, noted in 1992, apparently continued in 1993. Among the major metals, continued recovery was evident in the output of primary aluminum, refined copper, and steel. The production of lead and zinc also remained at about the same level as that of 1992. Among the major industrial minerals, the decline of sulfur output, compared with that of 1992, was wholly consistent with the decline in production of sulfur from the non-Frasch operations and their impending closure during the year. The production of most mineral fuels also remained at levels comparable to those achieved in 1992. (*See table 1.*)

TRADE

Aggregated commodity trade returns available for 1992 indicated that exports of metals rose by 20% compared with those of 1991 and constituted 16.8% of Poland's total exports. Poland's imports of metals during the same period rose by about 19%, constituting 4.5% of the country's total imports for 1992. Exports of industrial minerals (chemical and construction use) remained essentially at the same level as those of 1991, constituting about 4.5% of total exports for 1992. Imports of industrial minerals, however, rose significantly, by about 72%, compared with those of 1991, constituting 2.3% of total imports. Similarly, exports of mineral fuels rose by about 13% compared with those of 1991 and constituted about 10.6% of total exports for the year, while imports of mineral fuels rose by about 19%, constituting about 17% of total imports for 1992.

STRUCTURE OF THE MINERAL INDUSTRY

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

COMMODITY REVIEW

Metals

Copper.—In 1993, Poland's copper industry continued to restructure its operations with the long-term view toward full privatization. The industry's rationalization, which entailed essentially the creation of a corporate profile at KGHM Polska Miedz SA (KGHM), created serious worries and concerns on the part of the company's work force and labor unions that large-scale layoffs were impending. Another source of concern to the industry during the year was the moribund copper market, which, reportedly, displayed the lowest copper prices in most recent years. This situation was increasingly aggravated by large sales of metal by producers in Kazakhstan, Russia, and Uzbekistan. Further aggravation to KGHM's management during this period was caused by the unions, which in April demanded a 30% pay increase above the pay rates of December 1992.[6]

Reportedly, discussions between Poland's KGHM and potential OECD copper and other minerals producers and/or investors continued to proceed in fits and starts with the major obstacle being the social consequence of rapidly restructuring this giant enterprise with 28,000 employees, and consequently, major union opposition to unfettered foreign ownership of KGHM. Reportedly, ASARCO Incorporated of the United States in early 1993 indicated that it would no longer continue "management" and direct investment discussions with KGHM but would continue discussions relative to technical assistance and joint ventures only.[7]

In 1993, reportedly, the Western Mining Corp. of Australia was among the latest companies to offer joint-venture proposals to KGHM, but no deal as yet has been announced. Late in the year, new management at KGHM indicated that it was no longer interested in foreign investment capital in restructuring the company. KGHM's management indicated that it would seek domestic and/or neutral foreign capital [e.g., the European Bank for Reconstruction Development (EBRD)] to acquire the estimated US$800 million to modernize the company's operations.[8] Major developments at KGHM during the year were as follows: (1) the promotion of a policy to transform nine of KGHM's subsidiary maintenance divisions to public limited companies (as preparation for their privatization and spinoff); (2) the adoption of western bookkeeping methods—prepared by BDO Binder Accountancy of the United Kingdom; and (3) the reestablishment of KGHM's connections in the former Soviet area by opening an office in Moscow to market both copper and technology to this region. Foreign commercial activities in this sector included negotiations between South Africa's Copper Tubing Africa (CTA) and Poland's Hutmen Non-Ferrous Works in Wroclaw involving the sale to Hutmen of CTA's continuous casting and copper tube extruding assemblies.[9]

A new refining unit for precious metals, using technology from Boliden Contech of Sweden, was commissioned late in the year. Reportedly, the $20 million plant that had been under development since 1991 would annually produce 1,000 tons of silver, 300 kg of gold, and about 50 tons of selenium from tailings that previously were exported for processing.

Iron and Steel.—By yearend 1992, the restructuring program for Poland's steel industry achieved concrete results. For example, in 1992, Lucchini Siderurgica S.p.A. of Italy purchased a 51% stake in Huta Warszawa of Poland. The long-term restructuring plan proposed by a Canadian-led consortium envisaged a profitable output of steel of about 11.7 Mmt/a by the year 2000. The main element of the restructuring plan was to be a proposed merger of the Sendzimir and Katowice steel mills. The proposed merger would eliminate redundant and obsolete operations and functions at both facilities and would help reduce the number of employees in the steel sector by 80,000 by the end of the decade.[10] In mid-1993, Lucchini announced the first phase (reportedly costing $200 million) of a modernization program at Huta Lucchini-Warszawa that was to change the operation's production profile by replacing two of the steelwork's five 65-ton open-hearth furnaces with one 85-ton electric arc furnace coupled with a ladle furnace and a continuous casting unit. The new electric furnace was scheduled for commissioning in May 1994 and would have the capacity to produce 500,000 mt/a of low- and medium-alloy steels. In early 1993, spokespersons for Huta Sendzimira (Sendzimir), formerly, Nowa Huta im. Lenin, indicated that the installation of a new continuous caster was to begin in March. Reportedly, the new slab caster would be fully operational within 30 months (1996) of the start of construction. The unit would be installed by SMS Schloemann Siemag of Germany. It was envisaged that savings from the new unit would amount to $50 million annually with a 14% increase in output. Reportedly, Sendzimir's management studied proposals by Davy, Voest Alpine, among others, to modernize its hot strip mill shop.[11]

Foreign commercial activity in 1993 included negotiations between Rautaruukki of Finland and Polish authorities to build a coated thin-sheet processing unit in Skierniewice, 70 km from Warsaw. Reportedly, Rautaruukki planned to operate the facility, whose products will be consumed primarily in the building sector, as sole owner. Production startup was scheduled for yearend 1993.

Because of increased domestic demand for steel scrap, the Government of Poland has placed export quotas on iron and steel scrap. In the third quarter of the year, this amounted to about 150,000 tons, and the export quota system for scrap is likely to remain in place for the foreseeable future owing to a vigorous restructuring of Poland's steel industry with emphasis toward greater use of electric arc furnaces, which rely on scrap.[12]

In other developments, representatives of the United Kingdom's steel and construction materials industries complained to their Government about its decision to use lower cost Polish manufactured steel and steel fabrications in a major public building project, especially at a time, it was claimed, when the British steel and construction industries lost 150 companies and 50,000 jobs during the country's multiyear period of recession. British Steel PLC threatened to end its participation in the EC's restructuring plan for steel unless stronger action is taken against foreign state subsidized steel producers.

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. In late 1992, the future of Poland's Boleslaw lead and zinc mining and smelting complex in Bukowno was viewed as being uncertain because of depletion, environmental pollution, the need for new technology, and depressed markets.[13] Reportedly, to modernize the complex, and in particular the smelter, would require extensive investments costing millions of dollars. The issue that fueled debate concerning the recapitalization of this facility pertained to the viability of the mining and beneficiation components of the complex. The Boleslaw mining and beneficiation operations probably will close in 5 years because of depletion; those at Olkusz in 10 years. This would leave the Pomorzany mine as the only operational lead and zinc mining operation in the country and would necessitate import of concentrates for the smelter in 10 years. The nearby, reportedly rich Zawierce deposit (34.5 Mmt, 4.9% Zn + 2.0% Pb) may have to remain a reserved resource indefinitely because of strong local opposition to its development for environmental reasons. The nearby environmental degradation over past years by Poland's lead and zinc industry reportedly had been extensive, although recent investments amounting to about $8.2 million were directed toward the removal of old polluting revolving furnaces at the smelter and replacing them with an environmentally beneficial Larox concentrate drying process from Finland.[14] This system involves sealing the concentrate circuit to contain emissions. Reportedly, a second Larox process was to be purchased in the near future.

Industrial Minerals

Barite.—Because of a severe financial situation, Polish sources report production stoppage at the Boguszow barite mine in Walbrzych Province.[15] A declaration of bankruptcy was expected by the end of September. Yearend status of this facility, Poland's only producer of barite, was not clear.

Cement.—Following its strategy in the Czech Republic in 1991 and 1992, Cimenteries CBR (CBR) of Belgium reportedly purchased major shares in two of Poland's major cement plants. In July, CBR agreed to pay $52.5 million for 30% and 42% stakes, respectively, in the Gorazdze and the Strzelce Opolskie cementworks that have accounted for approximately one-quarter of the country's cement production capacity. CBR also reported a willingness to purchase an additional 21% of the shares in the Gorazdze plant in 1997 and an additional 38% in the Strzelce Opolskie plant, which uses a more expensive wet-process technology. The total value of the acquisitions in 1997 would amount to about $32 million. Reportedly, CBR also planned recapitalization at Gorazdze and Strzelce that would amount to $44 million and $19 million, respectively.[16] Fearful of potential large-scale layoffs during the industry's postprivatization rationalization, the country's Solidarity trade union branch at Gorazdze resisted complete takeover of the Gorazdze plant through strike alerts and support of the plant's employee and management "Initiative Group" (IG) attempting to acquire the plant with loans from both local and foreign banks. In late July, the Ministry of Privatization partially acceded to the demands of the IG, reportedly, officially agreeing to allocate 10% of the equity of the plant free of charge to the plant's employees with the remaining 30% of the plant to be sold to the IG and the Polish Development Bank through the Warsaw Stock Exchange. In October, it was reported that CBR had sold 43% of its equity in the two plants to Germany's largest producer of construction materials, Heidelberger Zement.[17] The Ministry of Privatization also announced a plan involving the sale of the Orazow cement plant, which has produced about 15% of the country's total output (both Gorazdze and Orazow are among the most modern cement producing facilities in Poland) to a group of domestic investors headed by the Polish Development Bank.

According to the Ministry of Privatization, Miebach Projektgesellschaft Mbh of Dortmund, Germany, purchased 80% of the equity in the Odra SA cement enterprise in Opole for approximately $3.5 million. The balance of the equity, 20%, was to be sold to the enterprise's employees at a discounted price. Additionally, Miebach had undertaken environmentally benign investments at the facility reportedly worth about $18 million.[18]

Silica.—A final agreement was reportedly concluded in Warsaw in June on the full funding amounting to $171,500,000 for the float glass project at Sandomierz in Tarnobrzeg Province. The Pilkington Sandoglas Co. Ltd. is the name of the new corporate entity. Pilkington PLC of the United Kingdom is to control 40% of the equity in the works, the European Bank for Reconstruction and Development and the International Finance Corp. are to control 15% of the equity each, and the State Treasury of Poland will retain 30%.[19]

Sodium Compounds.—In February, Poland's Ministry of Privatization offered two soda ash plants for privatization.[20] The soda ash plant at Janikowo had a capacity rated to produce 500,000 mt/a of soda ash (50% of total sales is to the domestic market); the plant at Inowroclaw was rated to produce 346,000 mt/a of dense soda ash. Moreover, the Ministry of Privatization has offered about 80% of the shares of the two companies for purchase by foreign investors. Because of the importance of soda ash in the glass manufacturing process, the large-scale joint venture between Pilkington PLC of the United Kingdom and HSO Sandomierz of Poland to build a 140,000-mt/a flat glass plant, and the relatively low cost to operate these plants, a number of European investors expressed interest in the proposal. The Kujawy limestone quarry would continue to supply both plants with limestone.

Sulfur.—Poland remained among the largest producers of sulfur in the world. 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 1993, Poland's Ministry of Industry and Trade announced plans to restructure the sulfur industry. This would involve the liquidation of the Machow open pit mine (including the dehydration of the quarry and land restoration). Sulfur production would continue at the Frasch mines at Jeziorko and Grzybow.

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. The governing factors bearing on the future of Poland's coal industry are depletion (or near depletion) at a significant number of the country's bituminous coal mines and the availability of investment capital to develop mines and deposits with the best likelihood of operating profitably. Within the context of the country's transition to a market economy system, in 1992 and 1993 the restructuring of Poland's coal mining sector involved the division of the bituminous coal mining and processing sector into eight companies, each consisting of between 7 and 13 mines. Reportedly, the criteria that were used to determine the distribution of mines by company included the mines' proximity to each other, the feasibility of using common equipment and materials, the maximum exploitation of deposits, and greatest capability of reemploying workers from closed mines.[22] The actual restructuring program began with the decision to close seven mines determined to be beyond any chance to become profitable. However, the social costs associated with rapid closures coupled with organized protests and strikes by trade unions have put considerable restraints on this process. It should be borne in mind, however, that such restraints, given other imperatives of the economy (continued high reliance on coal until after 2000, and the need to capitalize current profitable mines and new deposits), must be short term, also given the reported average US$70/mt of produced coal subsidies issued by the Government to money-losing coal mining enterprises.

Poland, consonant with other former centrally planned economy countries, was a very inefficient consumer of energy. In terms of grams of coal equivalent per U.S. dollar of GDP, Poland's specific primary energy consumption was four times higher than that of Germany, with the solid fuel component of total primary energy consumption amounting to 80%.[23] However, the study of relative efficiency of the country's production and consumption of coal and other commodities and products continues to pose serious challenges for analysis, because relative efficiency would have to pertain to market economy OECD countries. Here, comparative elements such as cost of production and labor productivity are hard to measure when comparative values used to measure costs, etc., are still relatively not comparable. However, given these facts, labor productivity for coal production, measured in units of output per worker(s), shows Poland to have a level of productivity in 1989 of only about 8.2% of that of the United States during that year, 6.9% of that of Canada, and about 5.9% of that of Australia.

Natural Gas.—Because of the country's need for greater amounts of domestically produced energy as well as the constraints on the choice of energy carriers, dictated by environmental protection concerns, Poland's energy-producing sector devoted a great deal of attention and work during the year toward developing the country's commercial coalbed methane (CBM) deposits. To achieve this end, Poland's Ministry of Environmental Protection and Natural Resources and Forestry auctioned prospecting concessions at about 12 coal deposits in the Silesian coal basin. Apparently, the richest CBM deposit to date has been found in the Rybnik Coalfield.[24] In recent years, reportedly less than 30% of the gas was recovered at the mines; about 3,000 Mm^3/a was lost. Resources of CBM are believed to approximate those of conventional natural gas, which are the basis for annually producing about 4,000 Mm^3 of gas. Given the approximate 7,000 Mm^3 of gas imported from Russia each year, the development of the country's CBM resources reportedly could reduce natural gas imports by as much as 75% in the near term.

Late in the year, it appeared that Amoco of the United States would take the lead in capitalizing Poland's CBM development in the Upper Silesian coal basin. The agreement, signed by Amoco Poland Ltd. and Poland's Ministry of Environmental Protection, Natural Resources and Forestry, delineated a 49,000-ha contract area in south-central Poland, about 20 km south of Katowice. The agreement calls for the drilling of at least 15 wells in this zone over a 3-year period. Additionally, Amoco was the first western company to sign a conventional petroleum and natural gas exploration agreement in October 1992, which called for an expenditure of about $20 million by Amoco, also over a 3-year period at two exploration parcels. The first tract covered about 688,000 ha southwest of Warsaw; the second, southwest of Lublin near the Ukrainian border, covered about 393,000 ha. The finalization of both agreements, however, reportedly would follow a resolution of a number of tax and foreign exchange issues.

According to press reports, the Ministry of Industry and Commerce in early 1993 concluded that too high a percentage of domestically generated electric power has come from coal.[25] Reportedly, only 8% of the country's electric power has been generated from the use of natural gas. Coal burning in recent years has accounted for 65% of Poland's electric power generation; lignite, 14%; and petroleum, 13%. However, chiefly because of environmental considerations, the future use of natural gas in this domain was envisaged to rise from 11,000 Mm^3 to 37,000 Mm^3 by 2010. The rise in the expected consumption of natural gas in Poland would be accounted for by some increases in domestic production as aforementioned, but the largest increase in gas consumption would probably derive from greater imports from Russia through a proposed Poland-transiting pipeline from Russia to Germany, or from the North Sea via a proposed British pipeline construction project that would carry natural gas onshore to Denmark, across the Baltic, and hence to Poland. The later scenario reportedly would cost about US$2.5 billion. Although the Russian deal appeared to have been significantly cheaper—one-half the cost of the Baltic project—Polish officials in early 1993 appeared to have favored the British proposal as being overall more advantageous to Poland. However, by August the country's policy appears to have shifted again in favor of the Russian deal that was to be formalized during Russia's Presidential state visit to Warsaw.

Petroleum.—Reportedly, Poland's annual imports of petroleum in recent years have amounted to 12 Mmt. In 1992, the largest share of imported petroleum was obtained from Iran. About 1 Mmt was obtained from the United Kingdom for the country's Plock refinery by the Ciech-Petrolimpex Co. of

Poland. Imports during this period from Russia were substantially lower than in previous years.[26]

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. For a detailed explanation of the system that has been used in the former CMEA countries for measuring reserves, see the chapter on Russia in this volume. Poland's mineral resources are given in table 3.

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 1993 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.

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[9]Metal Bulletin Monthly. Apr. 1993, p. 93.
[10]———. Oct. 12, 1992, p. 19.
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[12]———. Aug. 16, 1993, p. 11.
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Warsaw, Poland
Kombinat Gorniczo Hutniczy Miedzi
Lubin, Poland

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TABLE 1
POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum metal, primary		47,800	45,974	45,800	43,600	[3]46,900	55,000
Cadmium metal, primary		[r]555	373	[r]364	[r]370	350	600
Copper:							
Mine output, Cu content, recoverable		[r]401,000	[r]370,000	[r]359,000	[r, e]360,000	350,000	470,000
Metal:							
Smelter, including secondary		[r]396,000	[r]351,400	[r]373,100	[r, e]383,000	380,000	399,000
Refined, including secondary		390,268	[r]346,100	[r]378,500	387,000	[3]404,000	410,000
Gold:[e]							
Mine output, Au content, recoverable	thousand kilograms	30	30	30	30	30	35
Metal, smelter[4]	kilograms	175	175	175	175	175	400
Iron and steel:							
Iron ore and concentrate, gross weight		7,400	2,400	([5])	—	—	—
Metal:							
Pig iron	thousand tons	9,488	8,658	6,355	6,351	[3]6,175	10,000
Ferroalloys:[e]							
Blast furnace	do.	75	75	[r]55	[r]35	50	80
Electric furnace	do.	175	140	140	124	120	185
Steel:							
Crude	do.	15,094	13,625	[r]10,432	9,867	[3]9,937	19,000
Semimanufactures:							
Rolled excluding pipe	do.	11,272	9,836	8,036	[r]7,550	[3]7,620	13,000
Pipe	do.	971	567	519	[r]520	[3]477	1,000
Lead:							
Mine output, Pb content, recoverable		[r]65,800	61,344	[r]63,600	[r, e]63,000	63,000	65,000
Metal:							
Smelter		[r]83,300	[r]70,300	[r]55,100	54,800	54,000	78,000
Refined		78,200	64,800	50,800	53,700	[3]67,400	92,000
Silver, mine output, Ag content, recoverable	thousand kilograms	1,003	832	899	798	767	1,100
Zinc:							
Mine output, Zn content		[r]203,700	[r]177,800	[r]171,800	[r, e]170,000	170,000	220,000
Metal, refined, including secondary		163,727	[r]132,200	[r]126,000	134,600	[3]150,400	243,000
INDUSTRIAL MINERALS							
Barite		57,900	25,316	18,300	[r]15,700	16,000	70,000
Cement, hydraulic	thousand tons	17,125	12,518	[r]12,012	[r]11,908	[3]12,228	18,000
Clays and clay products:							
Bentonite	do.	[r]93	[r]69	[r]38	[r, e]40	40	100
Fire clay	do.	856	523	443	[r]362	350	1,000
Kaolin	do.	[r]62	48	[r]48	[e]45	45	70
Products[e]	do.	550	300	300	300	300	600
Feldspar[e]		50,000	45,000	40,000	45,000	40,000	50,000
Gypsum and anhydrite, crude[6]	thousand tons	[r]1,416	[r]916	[r]788	[r]843	800	1,500
		4,421	3,200	2,413	[r]2,526	2,500	5,000
Magnesite, crude		24,100	23,300	8,100	[r]12,900	14,000	25,000
Nitrogen: N content of ammonia	thousand tons	2,360	1,962	1,531	[r]1,490	1,500	2,500
Salt:							
Rock	do.	995	556	556	[r]582	[3]719	1,400

See footnotes at end of tables.

TABLE 1—Continued
POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993e	Annual capacity e (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Salt—Continued:							
Other	thousand tons	3,675	3,499	3,284	r3,305	3 3,075	5,000
Total	do.	4,670	4,055	3,840	r3,887	3 3,794	6,400
Sodium compounds, n.e.s.:							
Carbonate (soda ash)	do.	1,005	968	962	r929	950	1,100
Caustic soda (96% NaOH)	do.	452	404	324	r326	3 296	500
Stone:							
Dolomite	do.	4,000	4,989	r2,219	r2,500	2,500	5,000
Limestone	do.	12,788	8,631	7,624	r7,823	8,000	15,000
Sulfur:							
Native:							
Frasch	do.	4,276	4,027	3,302	r2,282	3 1,501	5,500
Other than Frasch	do.	588	637	633	r635	400	700
Total	do.	4,864	4,664	3,935	2,917	3 1,901	6,200
Sulfur:							
Byproduct:							
From metallurgy	do.	r220	r200	r200	r e200	200	260
From petroleum	do.	r33	r28	r28	r e25	25	30
Total	do.	r253	r228	r228	r e225	225	290
From gypsum e	do.	20	10	10	10	10	20
Total sulfur e	do.	r5,137	4,902	r4,173	r3,152	2,136	6,510
MINERAL FUELS AND RELATED MATERIALS							
Coal:							
Bituminous	do.	177,628	147,624	140,269	r131,531	3 130,631	180,000
Lignite and brown	do.	71,816	67,584	69,350	66,852	3 68,105	75,000
Total	do.	249,444	215,208	209,619	r198,383	3 198,736	255,000
Coke:							
Coke oven	do.	r16,548	13,713	11,428	r11,081	3 10,256	18,000
Gashouse e	do.	350	350	300	300	300	350
Total e	do.	r16,898	14,063	11,728	r11,381	10,556	18,350
Fuel briquets, all grades	do.	632	199	r125	r95	100	650
Gas:							
Manufactured:							
Town gas	million cubic meters	109	r76	r27	r21	25	150
Coke oven gas	do.	6,456	5,475	r4,702	r4,563	4,500	6,000
Natural, marketed	do.	5,368	3,866	4,134	r4,019	3 4,948	5,500
Natural gas liquids: e							
Natural gas	thousand 42-gallon barrels	50	30	30	30	30	60
Propane and butane	do.	30	30	30	30	30	40
Peat: Fuel and agricultural e	thousand tons	50	50	50	50	50	60

See footnotes at end of table.

TABLE 1—Continued

POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Petroleum:							
Crude:							
As reported	thousand tons	159	163	158	[r]199	[3]235	250
Converted	thousand 42-gallon barrels	1,180	1,209	1,172	[r]1,477	1,744	1,855
Refinery products[7]	do.	95,844	80,874	85,658	[r]93,000	99,000	100,000

[e]Estimated. [r]Revised.

[1]Table includes data available through Apr. 1994.

[2]In addition to the commodities listed, antimony, cobalt, germanium, a variety of crude nonmetallic construction materials, and carbon black also are produced, but available information is inadequate to make reliable estimates of output levels. Poland also may 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]Less than 1/2 unit.

[6]Includes building gypsum, as well as an estimate for gypsum used in production of cement.

[7]Includes virtually all major products; excludes some minor products as well as refinery fuel and losses.

TABLE 2

POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	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 Lubin 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, Lubin, Polkowice, Pudna, and Sieroszowice	1,900.
Metal, refined	KGHM	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 Bolelaw, Olkuz-Pomorzany, and Trzebionka)	125 Pb, 225 Zn.
Metal:			
Pb, refined	do.	Smelters and refineries at Miasteczko Slaskie, Szopienice, and Orzel Bialy	115.
Zn, refined	do.	Smelters and refineries at Boleslaw, Silesia, and Szopienice	145.
Natural gas million cubic meters	Ministry of Mining and Energy	Gasfields at pre-Carpathian foothills, Carpathian Mountains Lowlands, near Ostrow Wielkopolski, Poznan, and Trzebnica, north of Wroclaw	6,000.

TABLE 2—Continued

POLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Petroleum:				
Crude	million barrels	Ministry of Mining and Energy	Oilfields in northern lowlands, near the Baltic Sea; sub-Carpathian and Carpathian Mountains	1.4.
Refined		do.	Refineries at Glinik, Mariampolski, Jasto, Jealicze, Warinsky, Czechowice, Gdansk, etc.	125.
Salt, all types		Ministry of the Chemical Industry	Main mines at Inowroclaw, Klodowa, and Wapno in central Poland	6,500.
Silver		Zaklady Metalurgiczne Trzebinia	Refined from dore 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.

TABLE 3

POLAND: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES IN 1993

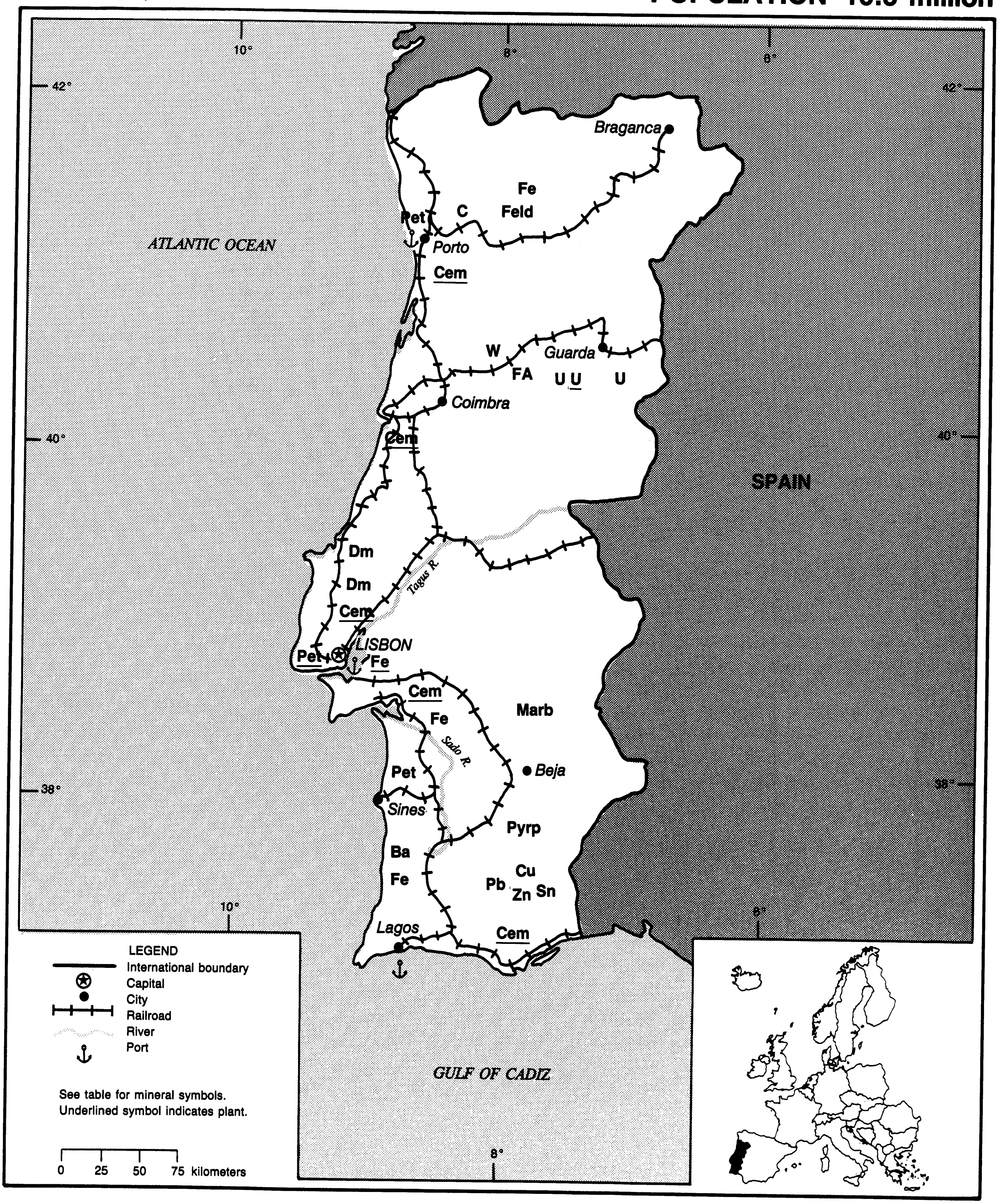
(Thousand metric tons)

Commodity		Resources
Barite		5,061
Clay, refractory		69,000
Coal:		
Bitiminous		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
Limestone and marls		16,951
Nickel, contained in ore		5,900
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

Sources: Bilans Zasobow Kopalin i Wod Podziemnych w Polsce, Warsaw, 1990. (Official data, valid for Dec. 1989). Maly Rocznik Statystyczny (Concise Statistical Yearbook of Poland) Warsaw, 1992.

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 with 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, after being one of the fastest growing economies in the European Union (EU) during the past 6 years and achieving an annual average gross domestic product (GDP) expansion of 3.7%, one percentage point above the EU average, experienced an economic contraction in 1993.

Portugal posted a real GDP growth of 1.0% in 1992. The annual inflation rate was about 7%, and the reported unemployment rate was 6.2%. The slowdown was attributed to two major factors: the recession in the EU, which accounts for 75% of Portugal's foreign trade, and a significant decline in private domestic investment.[1]

ENVIRONMENTAL ISSUES

The Government has started to put more emphasis on stringent environmental regulations and monitoring as strong growth was intensifying pressures on the environment. Major polluting industries are cement, cork, paper, tanning, and the ceramic industries in Sines, Lisbon, Porto, and the Barreiro-Seixal areas.

The implementation of the Framework Law on the Environment, which focuses on improving water quality, is practically complete. An environmental financial package subsidizing investment in pollution control equipment by up to 50% of outlays is under consideration. Apart from tighter regulation of water pollution, new legislation concerning air pollution, environmental impact assessments, waste, and nature conservation has been passed.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued with legislation that would privatize many public companies. The privatization program, begun in 1989, continued to accelerate. The biggest operation was the sale of 60% of Banco Epirito Santo, which netted the Government an estimated $610 million.[2] Other privatizations included a 25% share of Petroleos de Portugal (Petrogal), the state oil company.

The Government expected that privatization would continue. On the block are cement, chemical, steel, and financial firms, as well as a further 26% share of Petrogal. 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.

There is no uniform procedure for privatization procedures. Some companies are sold on the stock market and others are negotiated with prequalified bidders. A major concern of the Government has been to ensure that Portuguese groups are not overwhelmed by foreign investors with substantially more finances. Maximum foreign ownership percentages set are normally on a case-by-case basis. The Government may retain a substantial voice in management of selected firms.

PRODUCTION

Sociedade Mineira de Neves-Corvo S.A.R.L. (Somincor) continued to produce copper and tin at the Neves-Corvo Mine. Pirites Alentejanas S.A.R.L. was the largest producer of pyrite; Siderúrgia Nacional S.A.R.L. (SN) produced iron and steel; Beralt Tin and Wolfram (Portugal) Ltd. continued tungsten production; and Cimentos de Portugal, S.A. was an important producer of cement. Minas de Jalles S.A. continued to suspended its gold operation owing to low gold prices and lack of sufficient reserves. The Jalles Mine, in the Tres Minas gold district, was the only mine in Portugal producing gold as a primary product.

With the exception of copper, ferroalloys, dimension stone, 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 1992, the latest year for which complete data were available, Portugal's major markets continued to be France, Germany, and the United Kingdom, while its major suppliers were Germany, Spain, and France, respectively. Portuguese trade with Spain continued to increase because of mutual tariff and nontariff liberalization.

Table 2 shows the impact of selected classes of mineral commodities on Portugal's balance of payments position in relation to the EU 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 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. Deposits are divided into two groups: concessionable deposits that are the "minerals" and nonconcessionable deposits that are sand, gravel, and clays. Nonconcessionable deposits are considered the property of the land owner, and concessionable deposits are the property of the State. The Government collects certain royalties from concessionable deposits.

All requests for exploration permits or concessions must have specific work programs and investment commitments. The General Directorate for Geology and Mines (DGGM) is the central department of the Ministry of Industry and Energy and regulates the mineral industry, collects statistics, and grants exploration licenses and mining concessions. About 32,000 people are employed by the mineral industry, including mining and processing. (*See table 3.*)

COMMODITY REVIEW

Metals

Copper.—The Neves-Corvo Mine, which started operations in 1989, was continuing production at the end of 1993. 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 that owns 49% of the joint venture.

The mine is designed to produce 1.3 Mmt/a of raw ore, 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.

A railway track linking the Neves-Corvo Mine with the national railway system was completed. Production was being shipped by rail directly to port loading facilities for export.

Pirites Alentejanas S.A.R.L.'s metals concentrate plant at Aljustrel came on-stream in 1992 and the company stated it had planned to process up to 1.2 Mmt/a of copper, zinc, and lead-silver ore from its Moinho ore body. However, technical problems affected the plant operation so that planned levels of production of mineral concentrates recovered from pyrites produced by the mine were not attained. At yearend, the company was continuing with efforts to solve the problems.

Iron and Steel.—The Portuguese iron and steel operation was nationalized in 1975 and continues to function as a public entity incorporated as Siderúrgia Nacional S.A.R.L. (SN). The main goal of SN is to ensure its viability beyond the transition period of 1992, as mentioned in Portugal's Act of Accession to the EU.

The Government changed SN into a public limited company as a major step toward privatization. The Government was intending to sell 80% of SN to a single buyer while reserving 10% for the work force and 10% for the Government under a "golden share" option.

Lusosider, a joint-venture company consisting of Usinor Sacilor of France and Cia Espanola de Laminacion of Spain, was the sole bidder to acquire the 80% majority shareholding. The amount of the bid or other details were not available; however, it is believed to include proposals for restructuring SN's operation. The Government was studying the offer, and a decision was expected in the near future.

Tin.—Somincor's tin concentrator was inaugurated in May 1990. The facility includes three stages of crushing, grinding, tabling, 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 1 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.

Tungsten.—Beralt Tin and Wolfram (Portugal) S.A. was the only producer of tungsten in 1993. However, Beralt was reducing production because of market conditions for wolframite. This decision was the result of a depressed market and a reduction in prices in 1992.

Beralt was proceeding with development work at its Panasqueira Mine at Barroca Grande 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. This would enable the company to increase production in the future if justified by market conditions.

Industrial Minerals

The industrial mineral sector is a modern and efficient producer of a variety of materials, most notably ceramics and dimension stone. The dimension stone industry continued as a very important segment of the mining industry in terms of value and was developing an import/export trade. 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.

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.

Mineral Fuels

Coal accounts for about 4% of total energy consumption. Most coal is imported although there are some domestic reserves. Empresa Carbonifera de 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 to close the mine at the end of 1994 because of high production costs and difficult mining conditions.

There is a growing demand for coal because the electricity sector is switching away from oil. There are no gas reserves and no nuclear powerplants 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.

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. (*See table 3.*)

Reserves

Reserves of major minerals are listed in table 4. (See table 4.)

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.

It has been calculated that almost $22,350 million will be invested in infrastructure improvements during the next few years. The main thrust will be the modernization of the country's ports. Major seaports are Lisbon, Porto, and Sines. These ports are considered very important in a country where the main movement of goods is by sea. Other areas include improving the highways and bridges of the national motorway network. Portugal has about 74,000 km of usable highways, of which 84% is paved.

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. Copper, gold, kaolin, lead, lithium, pyrites, and tin are some of the minerals targeted for exploration.

The Iberian Pyrite Belt, which extends from the southwest coast of Portugal near Setubal to the Guadalquivir River near Seville, Spain, is a prime area for this exploration activity. However, in the short term, Portugal is expected to be a net importer of mineral resources.

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[1]Organization for Economic Co-Operation and Development, OECD Economic Survey, Portugal, 1993, p. 55.

[2]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc160=US$1.00, the average exchange rate for 1993.

OTHER SOURCES OF INFORMATION

Agencies

Ministry of Industry and Energy
Rua da Horta Seca, 15
1200 Lisbon, Portugal
General Directorate of Geology and Mines
Rua Antonio Enes, 7
1000 Lisbon, Portugal
Geological Survey of Portugal
Rua Academia das Ciencias, 19-2
1200 Lisbon, Portugal

Publications

Ministry of Industry and Energy, Lisbon:
Bulletin of Industrial Statistics, monthly.
Bulletin of Statistics, monthly.
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		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Arsenic, white[e]		[2]199	200	200	150	150	200
Beryl concentrate, gross weight[e]		4	4	4	4	4	10
Copper:							
Concentrate:							
Gross weight		411,836	651,750	654,129	609,242	[2]615,434	1,300,000
Cu content		103,718	162,938	164,768	[r]147,700	150,100	500,000
Metal:[e]							
Smelter:							
Primary		[r]—	[r]—	[r]—	[r]—	—	—
Secondary		2,000	2,000	2,000	[r]1,000	1,000	2,000
Total		[r]2,000	[r]2,000	[r]2,000	[r]1,000	1,000	2,000
Refined, primary		6,000	1,000	[r]300	[r]—	—	—
Gold: Mine output, Au content[e]	kilograms	295	350	160	147	—	350
Iron and steel:							
Iron ore and concentrate:							
Gross weight: Manganiferous		13,178	12,480	[e]11,600	[e]10,000	8,000	10,000
Fe content:							
Hematite and magnetite		[e]1,106	—	—	—	—	—
Manganiferous		4,689	[e]4,443	4,376	[e]2,000	1,000	2,000
Total[e]		5,795	4,443	[2]4,376	2,000	1,000	2,000
Metal:							
Pig iron	thousand tons	[r]377	339	251	402	385	400
Ferroalloys: Ferromanganese[e]		[2]13,170	[2]12,480	[r]—	[r]—	—	10,000
Crude steel	thousand tons	762	744	541	749	750	1,000
Lead: Refined, secondary[e]		7,000	6,000	[r]5,000	[r]7,400	8,300	5,000
Manganese: Mn content of iron ore[e]		1,800	1,200	1,200	500	500	1,000
Silver, mine output, Ag content	kilograms	19,300	42,200	[e]42,600	[r]38,200	35,000	40,000
Tin:							
Mine output, Sn content		63	[r]1,300	[r]3,100	[r]6,560	[r]10,122	15,000
Metal, primary and secondary[e]		62	[2]1,404	[r]1,000	[r]1,000	1,000	1,500
Titanium, concentrates:[e]							
Gross weight		111	45	40	30	25	50
Content of TiO_2		55	22	20	18	15	25
Tungsten, mine output, W content[e]		[2]1,376	1,400	1,400	1,870	[2]1,280	1,500
Uranium concentrate: U content[e]		[2]124	130	125	125	125	150
Zinc: Smelter, primary[e]		[2]5,000	5,500	[r]2,100	[r]2,900	2,800	5,000
INDUSTRIAL MINERALS							
Barite[e]		[2]1,729	1,220	900	[r]378	[r]350	1,500
Cement, hydraulic	thousand tons	[r]6,743	[r]7,277	[r]7,473	[r]7,638	7,600	9,000
Clays:							
Kaolin[3]		58,297	73,849	[e]74,000	[e]70,000	60,000	75,000
Refractory[e]		50,000	50,000	50,000	50,000	50,000	50,000
Diatomite[e]		2,990	2,190	2,200	[r]1,850	[r]1,860	3,000
Feldspar		65,854	43,954	[e]45,000	[e]40,000	45,000	50,000
Gypsum and anhydrite[e]		300,000	300,000	300,000	[r]416,829	[r]458,512	500,000

See footnotes at end of table.

TABLE 1—Continued

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993*	Annual capacity* (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Lime, hydrated and quicklime*		200,000	200,000	200,000	200,000	200,000	200,000
Lithium minerals: Lepidolite		18,264	10,614	*10,000	*9,000	9,000	20,000
Nitrogen: N content of ammonia*		151,000	198,200	198,300	100,300	150,000	200,000
Pyrite and pyrrhotite (including cuprous), gross weight		199,018	144,190	138,760	*140,000	135,000	150,000
Salt:*							
Rock		583,670	523,300	524,800	525,000	530,000	600,000
Marine		150,000	125,000	125,000	125,000	125,000	125,000
Total		733,670	648,300	649,800	650,000	655,000	725,000
Sand*		5,000	5,000	5,000	5,000	5,000	5,000
Sodium compounds, n.e.s.:*							
Soda ash		155,000	150,000	150,000	150,000	150,000	175,000
Sulfate		55,000	50,000	50,000	50,000	50,000	50,000
Stone:*							
Basalt	thousand tons	[2]86	85	80	80	75	100
Calcareous:							
Dolomite	do.	100	100	100	100	100	100
Limestone, marl, calcite	do.	15,000	14,000	15,000	15,000	15,000	15,000
Marble	do.	700	650	700	800	750	1,000
Diorite	do.	1,500	1,500	1,500	1,200	1,200	1,500
Gabbro	do.	50	50	50	50	50	50
Granite	do.	[2]6,752	6,800	6,800	6,700	6,600	6,800
Graywacke	do.	18	20	18	20	20	25
Ophite	do.	58	60	60	50	50	50
Quartz	do.	10	10	10	10	10	10
Quartzite	do.	600	575	600	500	500	600
Schist	do.	100	100	100	100	100	100
Slate	do.	32	30	30	30	35	40
Syenite	do.	25	25	25	25	25	25
Sulfur:*							
Content of pyrites		[2]90,752	95,000	96,000	95,000	94,000	100,000
Byproduct, all sources		3,000	3,000	4,000	4,000	4,000	5,000
Total		93,752	98,000	100,000	99,000	98,000	105,000
Talc		8,063	7,926	*8,000	9,166	[2]9,349	10,000
MINERAL FUELS AND RELATED MATERIALS							
Coal, anthracite*	thousand tons	258	276	237	221	[2]206	250
Coke, metallurgical*	do.	160	160	160	150	150	150
Gas, manufacturede	million cubic meters	136	136	136	130	125	150
Petroleum refinery products:*							
Liquefied petroleum gas	thousand 42-gallon barrels	[2]4,338	[2]4,628	4,500	4,600	4,500	5,000
Gasoline	do.	[2]14,646	[2]14,646	10,000	12,000	14,000	15,000
Jet fuel	do.	[2]5,791	[2]5,158	5,000	5,200	5,000	6,000
Kerosene	do.	225	230	225	230	225	250
Distillate fuel oil	do.	[2]21,365	[2]21,440	22,000	21,000	20,000	25,000
Residual fuel oil	do.	[2]22,637	[2]22,810	21,000	20,000	20,000	25,000

See footnotes at end of table.

TABLE 1—Continued
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
All other products	thousand 42-gallon barrels	9,000	8,800	9,000	8,600	8,800	10,000
Refinery fuel and losses	do.	4,000	3,600	3,800	3,400	3,500	4,000
Total	do.	82,002	81,312	75,525	75,030	76,025	90,250

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994.
[2]Reported figure.
[3]Includes washed and unwashed kaolin.

TABLE 2
PORTUGAL: 1992 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	$139	$1,715	($1,576)	$139	$2,422	($2,283)
Magnesite	—	645	(645)	—	673	(673)
Slate	773	19	754	988	37	951
Other	50,800	59,319	(8,519)	70,091	84,703	(14,612)
Total	51,712	61,698	(9,986)	71,218	87,835	(16,617)
Metalliferous ores:						
Copper	91,505	1	91,504	222,447	2	222,445
Lead	1,708	—	1,708	1,708	—	1,708
Tin	146	—	146	12,944	—	12,944
Zinc	—	—	—	—	177	(177)
Other (including waste and scrap)	36,716	8,478	28,238	43,127	29,712	13,415
Total	130,075	8,479	121,596	280,226	29,891	250,335
Nonmetallic mineral manufactures	188,459	37,480	150,979	276,546	74,923	201,623
Metals:						
Iron and steel	94,112	738,776	(644,664)	122,352	844,561	(722,209)
Mercury	15	19	(4)	15	36	(21)
Other nonferrous metals	35,162	312,680	(277,518)	43,178	432,993	(389,815)
Total	129,289	1,051,475	(922,186)	165,545	1,277,590	(1,112,045)
Mineral fuels	325,286	607,335	(282,049)	545,827	2,456,119	(1,910,292)

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

TABLE 3
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (ownership)	Location of 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 Mineira 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	Pirites Alentejanas S.A.R.L. (Government, 82%; Boliden AB, 10%; others, 8%)	Mines at Aljustrel	500
Steel, crude	Siderurgia Nacional S.A.R.L. (Government, 100%)	Ironworks and steelworks at Seixal and Maia	1,000
Tin	Sociedade Mineira 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	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

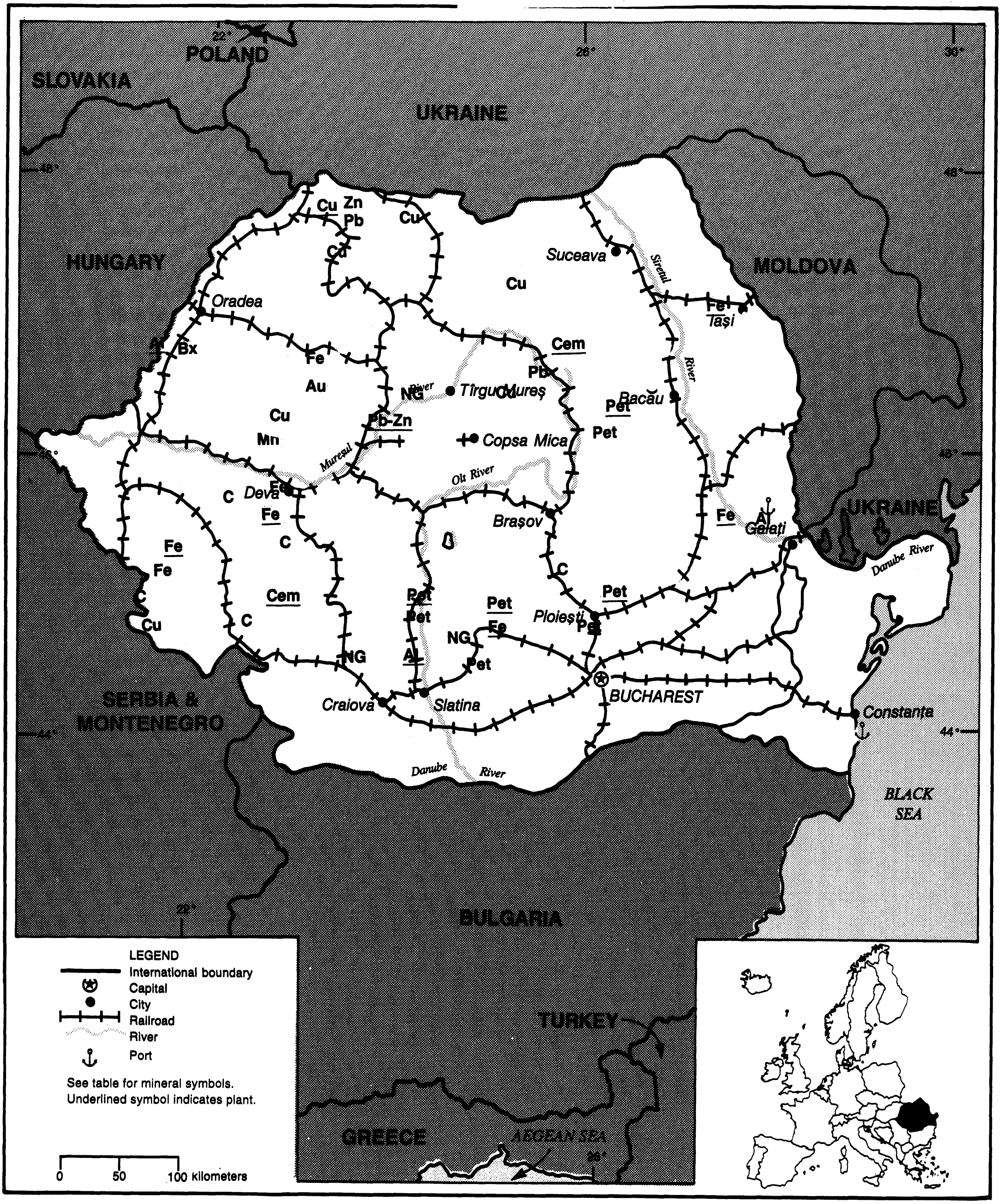
TABLE 4
PORTUGAL: RESERVES OF MAJOR MINERAL COMMODITIES IN 1993

(Million metric tons ore)

Commodity	Annual capacity
Copper	32.5
Lead	5.0
Tin	3.0
Zinc	3.3

ROMANIA

AREA 238,000 km² **POPULATION 23.4 million**



THE MINERAL INDUSTRY OF

ROMANIA

By Walter G. Steblez

Romania remained a modest producer of copper, iron, lead-zinc, and manganese ores and bauxite during 1993. The country's output of petroleum was substantial by European standards despite a continuing decline caused by both depletion and a lack of technology needed for increasing the recovery of petroleum. In 1993, Romania's development of a market economy system continued to be the major activity within the country. However, in contrast with the past 2 years, the rapid decline of industrial production, resulting from the country's transition to a market economy system from central industrial planning was apparently slowed down. Also, the country's transition to a market-based economic system forced sharp reductions of Government subsidies to large sectors of industry, including those involving the minerals sector.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Romania continued to decentralize and denationalize the country's economy. The sale of state-owned enterprises was handled by Romania's National Agency for the Privatization and Development of Small and Medium Sized Enterprises. Formerly centralized state-owned enterprises were grouped into state-owned commercial companies, joint-venture enterprises with foreign participation, and the so-called "Regies autonomes." The designation "state commercial company" included small- to midsized enterprises that were to be in the process of denationalization. The "Regies autonomes" included utilities such as telecommunications, electric power industry, postal services, and mass transportation; military industries; and mining and mineral industries. "Regies autonomes" were to continue to be owned and operated by the Government but could lease or sell some assets to increase their profitability.

ENVIRONMENTAL ISSUES

Romania's industries, compared with those of market economy countries, were relatively inefficient and polluting. The country's steelworks, nonferrous metals processing plants, low-rank-coal-fired powerplants, cement factories, and petroleum refineries were among the heaviest polluters in the country's industrial sector. According to estimates made in 1990 by the Romanian Ministry of the Environment, the country's average annual discharge of pollutants included 138 Mmt of noxious emissions (including 134 Mmt of CO_2, 1.8 Mmt of SO_2, 870,000 tons of NO_x, 8,500 tons of ammonia, and 2,300 tons of phenol).[1] Additionally, "hot spots" of environmental pollution in Eastern Europe included a number of industrial centers in Romania associated with the production of nonferrous metals such as Baia Mare, Copsa Mica, and Zlatna. Baia Mare's smelting and refining operations in 1990 reportedly emitted between 30,000 and 50,000 tons of SO_2 and more than 3,000 tons of metallic dust, which included 450 tons of lead and several dozen tons of arsenic cadmium and zinc. Similarly, but to a lesser extent, the Zlatna copper smelter and refinery, reportedly, has been releasing annually hundreds of tons of lead and copper into the atmosphere. Modernized in the mid-1980's, the Zlatna smelting and refining operation was somewhat better equipped than that of Baia Mare to handle copper concentrates containing relatively high values of cadmium, lead, and zinc. But perhaps the most serious environmentally polluted zone in the country was that around Copsa Mica, which has been a major center for the country's petrochemical industry, as well as the location of Romania's Imperial lead and zinc smelter and refinery. The annual discharge of pollutants from these facilities that was reported in 1990 amounted to about 30,000 tons, containing formic and sulfuric acids, as well as dust bearing cadmium, copper, lead, and zinc. Additionally, in the mining sector, severe environmental damage had been caused by untreated tailings and overburden dumps. Reportedly, the use of outdated processing technology and relatively low mineral recovery allowed significant amounts of potentially useful metal and other mineral components to be discharged into the environment, largely into the soil and aquifer. In many cases, the application of modern minerals processing technology at the country's tailings and overburden dumps reportedly could help abate the high level of environmental degradation. A major issue concerning environmental legislation in Romania as well as that in other former Council for Mutual Economic Assistance (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 former CMEA members, nevertheless, by most accounts, the lack of enforcement was extensive in all cases.

In Romania, primary environmental regulations, contained within the 1973 Law on the Environment (Law No. 9), outline the basic provisions concerning the country's environmental protection. Many of the environmental protection provisions in this legislation generally had been considered too strict to be enforceable, especially those pertaining to ambient air quality standards. After 1989, the Government of Romania established the Ministry of the Environment (Law 264/1991, Ministerul Medliului), whose principal responsibilities were to include enforcement of environmental regulations through inspections and levies of fees and fines. Given the current lack of comprehensive emission standards from industrial point sources of pollution, enforcement often has proved problematic. Additionally, effective inspections by agencies of the Ministry of the Environment were reduced further by the assessment of fines that reportedly were too low to be consequential.[2] In 1993, a draft of a new environmental law was under parliamentary study and consideration.

In 1993, following a Greenpeace revelation that significant quantities of chemical wastes had been shipped from Germany to Romania, the Government of Romania passed legislation banning the import of specific wastes. Reportedly, 600 tons of paints, lacquers, pesticides, caustic soda, and phenolic acids were shipped to Romania from Germany in 1993. The Government of Romania exempted those wastes that are imported for domestic processing; but the import of these wastes would require a license.[3]

PRODUCTION

In 1993, the declining trend of Romania's minerals production appeared to have been slowed down substantially. Factors such as shortages of foreign exchange required for imports of raw materials (largely natural gas and petroleum), the relatively slow pace of transition to a market economy system, as well as the loss of the CMEA-based mineral commodity trade continued to adversely affect Romania's heavy industries. In 1993, Romania's entire mineral industry continued to be owned and operated by the state either as directly Government-owned entities or as state-controlled corporations or companies in the process of denationalization. *(See table 1.)*

TRADE

At yearend, Romania and the International Monetary Fund (IMF) agreed on terms and conditions for IMF loans to Romania, reportedly worth $696 million. According to the terms of this agreement, Romania must formally adopt requisite legislation to accord with IMF regulations before any monies will be released. The release of IMF funds to Romania was stopped in 1991, owing to the IMF's dissatisfaction with the pace and content of Romania's reform program. In 1993, however, the IMF noted a greater degree of price liberalization, reduction of subsidies, and amendment of the tax system. Additionally, the Government indicated a greater resolve to reduce inflation, which had an annual rate of more than 300% during the year; to increase industrial production (down by 50% in 1993 compared with that of 1989); and to increase the rate of denationalization through the sale of state-owned enterprises.[4]

In October, the U.S. House of Representatives voted to restore most-favored-nation (MFN) trading status to Romania. In past years, Romania'a principal mineral exports to the United States were semimanufactured steel and petroleum refinery products.

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

Metals

Aluminum and Bauxite.—Romania continued to operate both open pit and underground bauxite mines at Dobresti-Oradea. In previous years, domestic bauxite was blended with small quantities of bauxite imported from the former Yugoslavia (Serbia and Montenegro) to be used as a feedstock at the Oradea alumina refinery. However, owing to the international trade embargo placed on Serbia and Montenegro, this source of bauxite was no longer available and resulted in a feedstock shortage to Romania's industry. Imported feedstock was used exclusively at the Tulcea 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, while the Oradea refinery produced a small quantity of hydrated alumina in addition to the metallurgical-grade product. Romania's only primary aluminum smelter was at Slatina in the southeastern part of the country. In 1993, Alro SA, Romania's aluminum producer, canceled the company's previous plans to reduce the plant's operating potlines from four to two. According to industry spokespersons, the Slatina smelter would continue to produce about 110,000 mt/a of primary aluminum until the year 2000 at a small profit. The smelter, with an installed capacity of 263,000 mt/a of aluminum, has had to reduce output by more than one-half because of steep increases in energy costs since 1989.[5] Alro SA also reported that it was evaluating feasibility studies drafted by Pechiney of France, Norsk Hydro of Norway, and other European companies to modernize the Slatina smelter, thereby making it more attractive to potential foreign investors.

To abate the serious pollution caused by the aluminum refining and smelting operations, the industry planned to invest about $100 million to retrofit major facilities over a 3- to 5-year period. The work was to begin following the introduction of new accounting procedures and an independent audit of the enterprises' assets.

Copper.—Romania continued to mine

copper largely in two districts: the northeastern part of the country that included mines at Baia Sprie, Cavnic, and Lesul Ursului, and in the 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 have been smelted and refined at Baia Mare and Zlatna. The serious pollution problems associated with the country's metals sector continued to affect the country's copper industry as well. The volume of fugitive flue and other gases at the Baia Mare smelter reportedly continued to be severe as was the volume of dust leaked into the environment. The former effluent contained up to 6% Zn and 2% Pb as well as large quantities of cadmium. The major issue at Baia Mare has been the use of copper concentrates, which were beyond the capacity of the smelter to handle.[6]

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. In 1993, about 0.9 Mmt of low-grade ore (26% Fe) was washed and concentrated to produce about 130,000 tons of concentrate, grading 50% Fe. Consequently, more than 95% of the iron and steel industry's iron ore requirement was met through imports. The former U.S.S.R. (particularly Russia and Ukraine) traditionally had been Romania's chief supplier of iron ore, accounting for more than 50% of total imports of iron ore.

Following two years of continual decline in steel output, 1992 ended with a note of optimism for Romania's steel industry. Yearend activity in the industry showed marked growth in the volume of steel exports at relatively favorable prices. The main contractors for Romania's steel products were buyers from North Africa, China, and the Middle East. An even greater growth in Romania's exports of steel products to these areas mainly was limited by reported shortfalls of iron ore and other raw material deliveries to Romania's steel mills.[7] In 1992 and 1993, foreign trade transactions were no longer a state monopoly, a fact that reflected the transitional process of the country's economy toward decentralization, denationalization, and gradual adoption of market economy mechanisms. Although the entirely state-owned foreign trade organization (FTO) Metalexportimport continued to handle a substantial amount of the country's steel trade, such formerly state-owned FTO's as Metanef and Mondexim had been semiprivatized and conducted significant portions of the country's steel trade during this period.

On balance, however, Romania's steel industry continued to encounter many (largely structural) problems during the country's transition to a market economy. Reportedly, the Department of Metallurgy of the Ministry of Industry had drafted a preliminary plan to rationalize the country's steel industry. The main thrust of this plan was to firmly establish Sidex Galati (Galati) as the center of the country's crude steel production that would account for about 60% of total crude steel output. The Hunedoara iron and steel complex was to become the center of long products production and annually contribute approximately 20% of the country's total crude steel production. The reorganization plan envisaged the remaining crude steel output (20%) to be distributed among the Calarasi, Cimpia Turzii, Otelu Rosu, and Tirgiviste steel mills.[8] Additionally, this plan called for the complete decommissioning of all remaining open-hearth steel production capacities (28% of steelmaking in 1993) as well as other outdated facilities and equipment in the steel industry. The unavailability of sufficient amounts of foreign exchange was the principal drawback to realizing many of these proposals. Export sales by the steel sector and foreign participation in the industry by yearend 1993 had been insufficient to generate the funds needed for the steel industry's modernization program. According to Siderom, the state holding company for the country's steel industry, the restructuring plan for the steel industry from 1993 to 2002 would cost about $ 2.7 billion.

Compared with other former CMEA members, such as Poland, foreign participation in Romania's steel industry was minimal, and that which did occur reportedly experienced difficulties in negotiating through Romania's legal system. The principal foreign commercial arrangement with Romania's steel industry involved Celmag, an Italian steel trading group that formed a joint venture, called Easteel SA, with Romanian parties in 1992. Through the Easteel joint-venture arrangement, Celmag acquired a 49% share in Romania's steel producer Socomet (formerly, Otelu Rosu) with the aim of exporting billet from Otelu Rosu following the steel plant's modernization. The remaining shares were allocated to Stima, a Romanian machine tool producer, 4%; Socomet, 29.25%; Siderom, 15.75%; and Acciaieria San Marco, a subsidiary of Celmag, 2%. The steel mill's old electric furnaces were to have been replaced during 1993 with new electric arc furnaces supplied by Ing. Leone Tagliaferri & C SpA.[9] Additionally, the modernization of Otelu Rosu's 240,000-mt/a "550" rolling mill was scheduled for 1994. The cost of modernization reportedly would amount to $40 million and was to be provided by Celmag in the form of equipment, engineering services, technical knowhow, as well as arrangements for hard currency funds. However, Easteel's problems at the Otelu Rosu operation reportedly became increasingly apparent in the early part of 1993, involving overland transportation time lags for the mill's products, local cash transfer and conversion delays, as well as fuel shortages in the country that forced significant cutbacks in the plant's production. These issues apparently limited the operation's exports in the early part of the year to 10,000 tons of billet to Lebanon. In April, Celmag encountered further problems as the Government of Romania appealed to Romania's Supreme Court in an effort to force Celmag to make its initial financial installment of its investment in the Easteel project entirely in cash.

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 also have been produced. In 1993, gold production reportedly reached 4 tons, possibly from increased placer operations.

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% and 75% Pb and Zn and serious environmental pollution in 1993 continued to be associated with the country's lead and zinc industry.

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.

Reportedly, until 1989 all facts concerning Romania's industrial diamond-producing industry were classified as a state secret. However, following the revolution of 1989, more details concerning this sector have been reported. The Dacia Diamond Enterprise was created in 1980 after 5 years of research and development. In 1993, the enterprise operated under the auspices of the Ministry of the Interior and had been assigned the status of a military unit only to protect the enterprise's technology as a state secret. Because of the decline in Romania's industrial output from 1989 to 1993, the corresponding domestic demand for industrial diamonds had fallen significantly. By yearend 1992, 95% of the enterprise's output was earmarked for export. The value of the company's diamond exports in 1991 reportedly amounted to $6 million.[10] Reportedly, diamond production had virtually ceased at the end of 1992 because of falling domestic and foreign demand, and there had been no indication in 1993 that the status of this industry had significantly changed.

Mineral Fuels

Natural Gas and Petroleum.—According to industry spokespersons, total recoverable reserves of petroleum at deposits currently under exploitation in Romania amounted to about 206 Mmt, which would be sufficient to last more than 30 years at a production rate of 6.5 Mmt/a. It was believed that additional significant resources of both natural gas and petroleum could be found in structures at depths greater than 3,000 m. Romania, perhaps the world's oldest petroleum producer, reached its apogee of both petroleum and natural gas production in 1976, when the country produced more than 14 Mmt of petroleum and 1.33 trillion cubic feet of natural gas. From 1976 through 1989, Romania's output of both commodities had declined by reportedly more than 40%. The decline of production was attributed to depletion as well as to outdated oilfield technology.[11] Soon after the revolution of 1989, Romania began to develop a program to allocate potentially commercial petroleum and natural gas properties to outside investors. In 1990, the first licensing round was initiated covering 12 onshore blocks of property and 3 offshore blocks. By yearend 1993, contracts for four blocks presented in the first licensing round had been signed, covering concessions for Amoco Production Co. (Amoco) of the United States, a subsidiary of the Amoco Corp., Enterprise Oil Exploration Co. of the United Kingdom, and Shell Romania Exploration BV of the Netherlands. In August 1992, Amoco concluded a contract with the Romanian Government that would permit the company to explore and operate potential production facilities in block 7 in the Bend Area in the Carpathian Mountains Northeast of Bucharest. The actual contract reportedly called for production sharing with ARCO on a 50% basis. According to Amoco geologists, the petroleum resources in this producing area amounted to 3.5 billion barrels, and are hosted in Oligocene age Kliwa sandstones overlaid with sequences of evaporites and shales. The Kliwa sandstone in Amoco's block 7 had not been penetrated previously during drilling operations. Enterprise Oil Exploration of the United Kingdom was awarded two offshore blocks (13 and 15) in the Black Sea in September 1992, offered during the first licensing round. Enterprise was the majority partner with Canadian Oxy (Occidental Petroleum), holding 65% of the interest in the venture. Enterprise was also the operating entity in the partnership. Blocks 13 and 15 are in what has been referred to as the Babadag Basin. The former, "Pelican Block," covers 2,980 km^2 in water depths of up to 60 m. The latter, "Midia Block," covers an area of 4,080 km^2 with water depths of up to 120 m. Since the award of the contract, Enterprise has conducted 1,500 km of 2-D seismic work on block 13 and 4,300 km on block 15. The first test well was reportedly scheduled to begin operation in the second half of 1994. Shell Romania Exploration BV of the Netherlands signed a production-sharing contract with the Romanian Government in August 1992, covering block 10 in the Transylvanian Basin, an area of approximately 5,800 km^2, between the cities of Bistrita, Tigru Mures, and Cluj Napoca. On the Romania side, Nimir Petroleum Co. Romania Ltd. acquired a 50% interest in the block in March 1993. The provisions of the agreement called for exploration work to be done at the section underlying the Miocene salt sequence. The overlying section already had been explored extensively by Romgaz, which subsequently produced large amounts of natural gas from the Upper Miocene sands. Shell company spokespersons reported that the company intended to allocate US$40 million for this work.[12] In 1993, a number of other foreign firms were negotiating for or expressing interest in further block properties. Reportedly, Gandalf Explorers International Ltd. of Houston negotiated with Romanian authorities in August for the rights to an exploration and production-sharing contract at block F at Moinesti (1,781 km^2) that was offered in the third round of offerings. Also, bids were received from Hardman Resources, Maxxus Energy, Norcen of Calgary (Canada), and Triton Energy for Blocks B/Tirgoviste, C/Pitesti, and A/Ploesti, offered in the fourth round.

According to Romania's petroleum industry sources, supplies of crude petroleum from domestic and foreign sources in 1993 would amount to approximately 18 Mmt and in 1994 to 20.6 Mmt (equal to the level achieved in 1990).[13] These amounts are considerably less than the country's total rated refining capacity of 32.7 Mmt/a. With domestic production of crude petroleum having fallen to less than 7 Mmt/a, the country must import greater volumes of feedstock for its refineries. In 1991, a holding company, Rafirom S.A., was created to reorganize a number of state-owned enterprises in the petrochemical sector (including refineries), and associated engineering, maintenance, and sales entities.

The total catalytic cracking capacity for Romania's refineries amounted to 121,260 bbl/d and that of catalytic reforming 100,843 bbl/d. Reportedly, restructuring priority in the country's important petroleum refining industry would be given to Arpechim SA, Petrobrazi SA, Petromidia SA, Petrotel SA, and Rafo SA.[14] Among the total number of refineries, these constitute the country's newest and largest operations. Collectively, they can process 20.5 Mmt/a of high-sulfur crude petroleum in units installed after 1960 and an additional 7.5 Mmt/a of low-sulfur crude petroleum in older refining units.

Romanian sources indicated that as of the 1st of July Romania's debt to Russia incurred through past shipments of natural gas amounted to US$62 million, down from $80 million earlier in the year.[15] Following negotiations in July in Moscow to liquidate the extant debt, Romania signed contracts worth $36 million obligating shipments of unspecified goods to Russia. The additional $25 million would be paid in cash by yearend 1993. Meanwhile, deliveries of Russian gas to Romania were to continue.

Reportedly, Romania sold its rights to a rich Libyan oilfield to Spain's Repsol SA during the year. The oilfield was secretly acquired by the Romanians in the early 1980's in a deal that was to include a barter-type arrangement of Romanian goods in exchange for crude petroleum. This was essentially an arms for oil exchange. When Romania's arms shipments to Libya ceased after the revolution of 1989, so did the shipments of crude petroleum to Romania.[16]

Nuclear Energy.—Construction of Romania's Cernavoda nuclear powerplant continued in 1993. The first 685-MW Candu reactor unit was scheduled to begin operation in 1995. When the subsequent four 685-MW reactor blocks are completed, the Cernavoda power station would account for about one-third of the country's generated electric power. According to representatives of Romania's national electric company, approximately 250 domestic enterprises had contributed to the country's nuclear program. Both nuclear fuel and heavy water would be manufactured in Romania. Also, the country's uranium resources were reported to be sufficient to operate the Cernavoda nuclear powerplant for 30 years. In 1993, reportedly three workers died and one was injured following an accident at the Romag Heavy Water Plant in Drobeta-Turnu Severin. However, few details relative to the cause of the accident were released.

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 former centrally planned and other nonmarket 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. For a detailed explanation of the system that was used in former CMEA countries for measuring reserves, see that chapter on Russia in this volume.

INFRASTRUCTURE

Romania's inland transportation system consisted of 85,798 km of railroads, highways, and inland waterways. The railroad system included 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 River) consisted of 1,724 km with riverine ports at Giurgiu, Drobeta-Turnu Severin, and Orsova. Seaports on the Black Sea coast were Braila, Constanta, Galati, 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 as well as an impetus to develop a more efficient steel industry. Also, the modernization of the country's potentially rich natural gas and petroleum industries could reduce substantially future imports of foreign mineral fuels.

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[4]Wall Street Journal. Dec. 10, 1993.

[5]Mining Journal. Aug. 20, 1993, p. 118.

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[7]Metal Bulletin. Nov. 12, 1992, p. 23.

[8]———. Aug. 26, 1993, p. 23.

[9]———. Jan. 11, 1993, p. 19.

[10]BBC SWB EE/W0287, p. A/8, from Rompres 1010 GMT, June, 1993.

[11]AAPG EXPLORER (Tulsa) Nov. 1993, pp. 12, 14-15, 20.

[12]Work cited in endnote 11.

[13]U.S. Embassy, via State Dept. Telegram, (Uncl.) R171139Z, Aug. 1993.

[14]Work cited in endnote 13.

[15]Foreign Broadcast Information Service (FBIS)-EEU-93-143, July 28, 1993, from TINERETUL LIBER, July 23, 1993, p. 3.

[16]———.EU-93-161. Aug 23, 1993, from EVENIMENTUL ZILEI. Aug. 16, 1993, p. 8.

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TABLE 1

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Bauxite, gross weight		313,000	[r]242,800	200,400	175,120	[3]184,500	500,000
Alumina, calcined, gross weight		611,000	440,000	413,000	279,667	[3]293,174	620,000
Ingot including alloys:							
Primary		[r]269,000	168,000	[r, e]113,000	111,992	[3]116,060	275,000
Secondary		[r]13,000	10,000	[r, e]7,000	6,706	[3]3,700	15,000
Total		282,000	178,000	[r]120,000	118,698	119,760	290,000
Bismuth, mine output, Bi content[e]		65	40	[r]55	50	40	70
Cadmium metal, smelter[e]		186	40	[r]10	[r]10	10	200
Copper:							
Mine output, Cu content		[r, e]47,000	[r]31,974	[r]27,154	[r]25,030	[3]25,361	50,000
Metal:							
Smelter:							
Primary[e]		[r]38,000	[r]27,325	27,800	[r]23,436	[3]25,193	40,000
Secondary[e]		1,500	1,000	1,000	1,000	1,000	2,500
Total		[r]39,500	[r]28,325	[e]28,800	[r]24,436	26,193	42,000
Refined:							
Primary[e]		[r]42,000	[r]40,347	[r]29,838	[r]21,000	20,000	42,000
Secondary[e]		[r]6,000	[r]4,000	[r]4,000	[r]3,079	3,000	8,000
Total		[e]48,000	[r]44,347	[r]33,838	[r]24,079	23,000	50,000
Gold, mine output, Au content	kilograms	[r]6,000	[r, e]3,000	[r, e]3,000	3,700	[3]4,000	6,000
Iron and steel:							
Iron ore:							
Gross weight	thousand tons	2,482	2,002	[r, e]1,400	[r]1,250	904	2,500

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Iron and steel—Continued:							
Iron ore—Continued:							
Content (26% Fe)	thousand tons	645	[r]275	[r]199	[r]180	130	650
Metal:							
Pig iron	do.	9,052	6,355	[r]4,536	3,111	[3]3,191	9,500
Ferroalloys:[e]							
Ferrochromium		[r]26,849	[r]20,633	[r]20,380	[3]6,977	[3]3,907	44,000
Ferrosilicon		50,000	40,000	[r]30,000	[3]23,318	[3]23,560	50,000
Ferromanganese		80,000	60,000	[r]40,000	[3]27,130	[3]16,390	80,000
Ferrosilicomanganese		40,000	30,000	30,000	[3]28,159	[3]22,040	40,000
Silicon metal		4,400	4,000	[r]1,000	[r] [3]430	400	4,500
Steel:							
Crude	thousand tons	14,411	9,761	[r]7,110	[r]5,372	[3]5,400	16,000
Semimanufactures:							
Castings and forgings, finished[e]	do.	1,300	1,000	1,000	[3]370	350	1,500
Pipes and tubes	do.	1,360	1,041	[r] [e]600	[r] [e]200	200	1,400
Rolled products	do.	[r]11,371	[r]7,542	[r] [e]5,500	4,800	[3]4,120	13,000
Lead:							
Mine output, Pb content		[r]37,679	[e]24,700	[r]16,177	16,834	15,000	40,000
Smelter, primary		24,908	12,549	[r]10,300	13,944	13,500	40,000
Lead:							
Refined:							
Primary		[r]24,908	[r] [e]15,688	[r] [e]13,205	[r]14,416	[3]11,818	42,000
Secondary		[r]16,192	[e]5,000	[r] [e]4,000	[r]1,750	[3]5,610	20,000
Total		[r]41,100	[r]20,688	[r]17,205	[r]16,166	17,428	62,000
Manganese:							
Ore, gross weight	thousand tons	219	[r]213	[r]120	[r] [e]100	[3]125	250
Concentrate:[4]							
Gross weight	do.	48	40	[r]20	[r]15	15	50
Mn content	do.	12	10	[r]5	[r]4	4	20
Silver, mine output, Ag content[e]		[r]100	[r]80	[r]80	[3]73	[3]70	100
Zinc:							
Mine output, Zn content		54,467	[r]36,048	[r]26,871	[r]25,030	31,500	55,000
Metal, smelter, primary and secondary		29,849	11,464	[r]8,739	[r]11,616	[3]14,071	66,000
INDUSTRIAL MINERALS							
Barite		25,250	[r] [e]65,000	[r] [e]70,000	118,100	[3]12,050	120,000
Cement, hydraulic	thousand tons	13,265	10,838	7,300	6,900	[3]6,837	14,000
Clays:[e]							
Bentonite		[r]175,000	150,000	150,000	120,000	120,000	200,000
Kaolin		400,000	250,000	250,000	200,000	200,000	450,000
Diamonds, synthetic industrial[e]	thousand carats	5,000	3,000	3,000	[3]—	[3]—	5,000
Diatomite		49,975	[r] [e]40,000	[r] [e]30,000	14,530	[3]9,972	50,000
Feldspar		59,960	[e]45,000	[r] [e]40,000	27,715	[3]87,701	65,000
Fluorspar[e]		18,000	12,000	12,000	15,000	15,000	25,000
Graphite		10,000	[e]6,000	[e]6,000	2,300	[3]3,162	15,000

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Gypsum[e]	thousand tons	1,400	800	800	[r]800	100	1,500
Lime	do.	3,983	3,028	[e]3,000	[r][e]3,000	3,000	4,500
Nitrogen: N content of ammonia	do.	2,736	1,786	[e]1,800	[e]1,100	[3]1,333	3,000
Pyrites, gross weight	do.	897	[r][e]900	[r][e]900	965	[3]560	1,000
Salt:							
Rock salt[e]	do.	2,000	2,000	[r]1,000	[3]900	[3]808	2,000
Other	do.	3,038	2,262	[r][e]3,000	1,590	[3]1,378	4,000
Total	do.	5,038	4,262	[r][e]4,000	2,490	2,186	6,000
Sand[e]	do.	[r][3]1,500	[r]1,500	4,000	4,000	[3]4,404	5,000
Sodium compounds, n.e.s.:							
Caustic soda	do.	763	552	[e]500	[e]500	500	800
Soda ash, manufactured, 100% Na_2CO_3 basis	do.	889	632	[e]600	[e]700	700	900
Sulfur:							
S content of pyrites[e]	do.	[r]350	[r]350	[r]350	[r]385	[3]225	400
Byproduct, all sources[e]	do.	[3]375	[r]300	[r]250	200	200	400
Total[e]	do.	[r]725	[r]650	[r]600	[r]585	425	800
Sulfuric acid	do.	1,687	1,111	[e]1,100	[e]1,000	1,000	2,000
Talc		45,638	[r][e]20,000	[r][e]10,000	6,330	[3]9,000	50,000
MINERAL FUELS AND RELATED MATERIALS							
Carbon black		77,000	58,000	[r][e]50,000	[r][e]50,000	[3]27,357	110,000
Coal:							
Run-of-mine:							
Anthracite and bituminous	thousand tons	11,583	5,950	[r][e]5,100	[r]5,500	5,500	12,000
Brown	do.	899	677	[r][e]550	[r]570	600	1,000
Lignite	do.	53,980	34,220	[r][e]29,000	[r]35,000	35,000	55,000
Total	do.	66,462	40,847	[r][e]34,650	[r]41,070	41,100	68,000
Washed (produced from above):							
Anthracite and bituminous:							
For coke and semicoke production	do.	3,218	1,351	[r][e]1,200	[r][e]1,077	1,100	4,000
For other uses	do.	5,082	3,096	[r][e]2,500	[e]3,000	3,000	6,000
Brown	do.	843	640	[r][e]514	540	[3]579	900
Lignite	do.	52,200	33,097	[r][e]28,200	33,700	[3]34,945	55,000
Total	do.	61,343	38,184	[r][e]32,414	[r][e]38,317	39,624	62,000
Coke:							
Metallurgical	do.	5,322	3,700	[r]2,388	2,642	[3]2,403	5,500
Other	do.	548	278	[e]300	[r][e]200	[3]266	700
Total	do.	5,870	3,978	[r][e]2,688	[r][e]2,842	2,669	6,200
Fuel briquets (from brown coal)[e]	do.	750	500	450	400	[3]70	800
Gas, natural:							
Gross:							
Associated	million cubic meters	10,729	9,182	[r][e]7,500	[r][e]7,000	7,000	10,000
Nonassociated	do.	22,222	19,154	[r][e]16,500	[r][e]15,136	15,000	20,000
Total	do.	32,951	28,336	[r][e]24,000	[r][e]22,136	22,000	30,000
Marketed[e]	do.	29,500	21,000	23,000	20,000	20,000	25,000

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS—Continued							
Petroleum:							
Crude:							
As reported	thousand tons	9,173	7,928	[r]6,791	[r]6,614	6,700	7,000
Converted	thousand 42-gallon barrels	[r]68,853	59,508	[r]50,973	[r]49,645	50,590	51,000
Refinery products	do.	195,939	154,055	[r]99,948	[r e]95,000	95,000	250,000

[e]Estimated. [r]Revised.
[1]Includes data available through Feb. 1994.
[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 1988 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 INDUSRTY OF ROMANIA FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (all state owned)	Location of facilities	Annual capacity
Alumina	Ministry of Metallurgical Industry	Plant at Oradea, near Hungary's 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 Hungary's border	350
Cement	Ministry of Industry	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 Ukraine's 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 Ukraine's and Hungary's 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

TABLE 2—Continued
STRUCTURE OF THE MINERAL INDUSRTY OF ROMANIA FOR 1990

(Thousand metric tons unless otherwise specified)

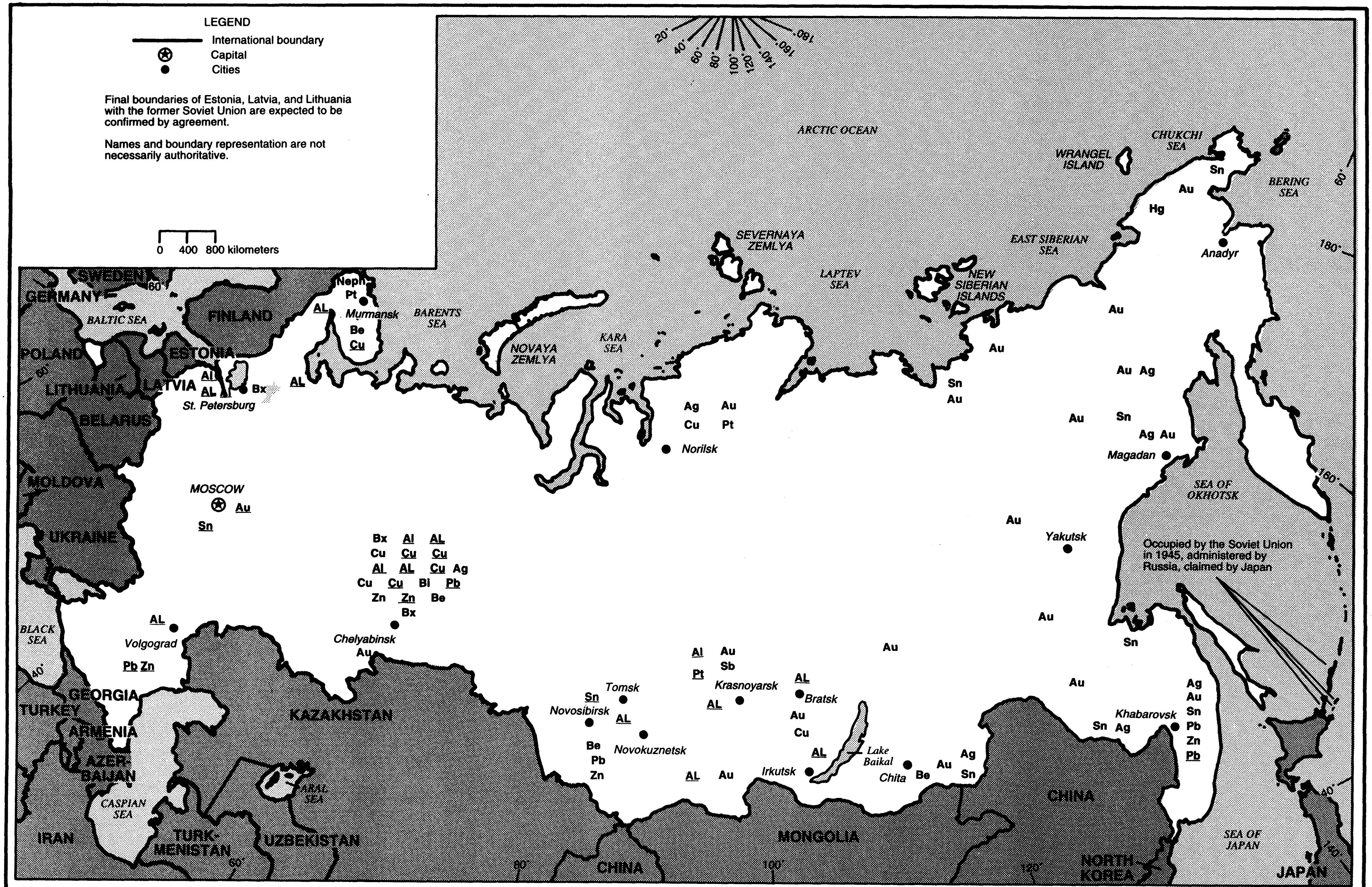
Commodity	Major operating companies (all state owned)	Location of facilities	Annual capacity
Lead in ore	Ministry of Mines	Baia Mare Mine, near Ukraine's and Hungary's borders	24
Do.	do.	Balan Mine, 50 kilometers southwest of Piatra Neamt	10
Lead metal	Ministry of Metallurgical Industry, Uzina Chimica 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.	Ploesti Field, 50 km north of Bucharest	249,000
Petroleum, crude barrels per day	Ministry of Petroleum and Gas	Ploesti-Teleajen, Pitesti, and Tirgoviste Fields, in Prhova Valley around Bucharest; Bacau Field at Bacau, east-central Romania near the Siretul River; and West Carpathian Field, southeast Carpathian Range, between the west bank of the Olt River and Tirgu Jiu	250,000
Petroleum products do.	do.	Refineries at Brazi, Pitesti, Suplacu, Barcau, Borzesti, Brasov, Cimpina, Darmanesti, G. Gheorghiu Dej-Onesti, Ploesti, Teleajen, and Navodari	533,000
Steel	Ministry of the Metallurgical Industry:		
	Galati Steel Complex	Danube River, north of Braila, near the Ukrainian border	10,000
Do.	Hunedoara Steel Complex	West-central Romania, near Calan	4,000
Do.	Resita Steel Plant	Southwestern Romania, about 20 kilometers southwest of Caransebes	1,200
Do.	Calarasi Steel Plant	Near the Bulgarian border close to the Danube	600
Zinc in ore	Ministry of Mines, Baia Mare Mining Complex	Baia Mare, near Ukraine's and Hungary's borders	60
Zinc metal	Ministry of Metallurgical Industry, Uzina Chimica Metalurgica	Imperial Smelter at Copsa Mica, Tirnava River, central Romania	66

ADMINISTRATIVE DIVISIONS OF RUSSIA

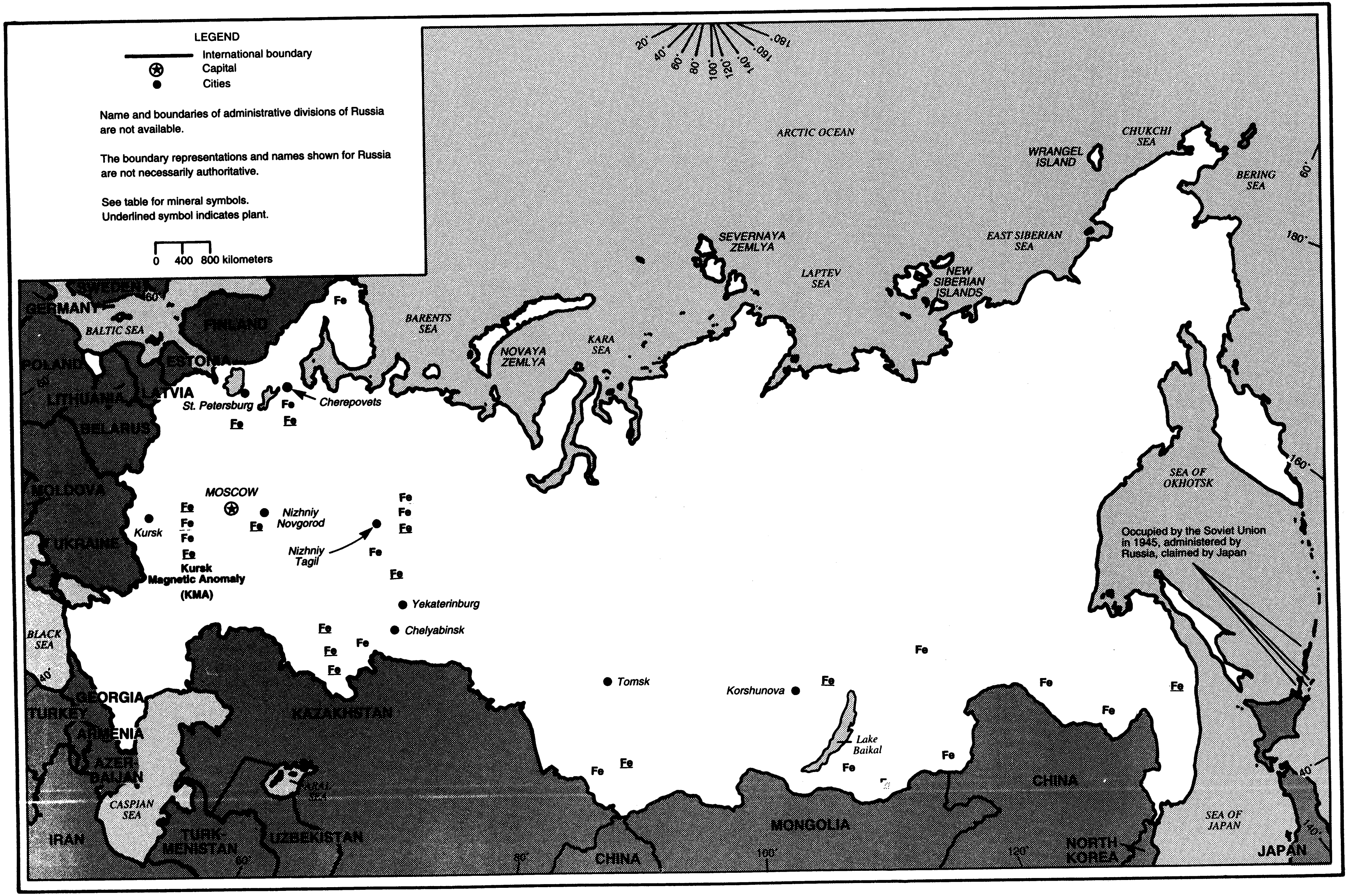
AREA 17,075,200 km² **POPULATION 149.5 million**

Names and boundary representation are not necessarily authoritative.

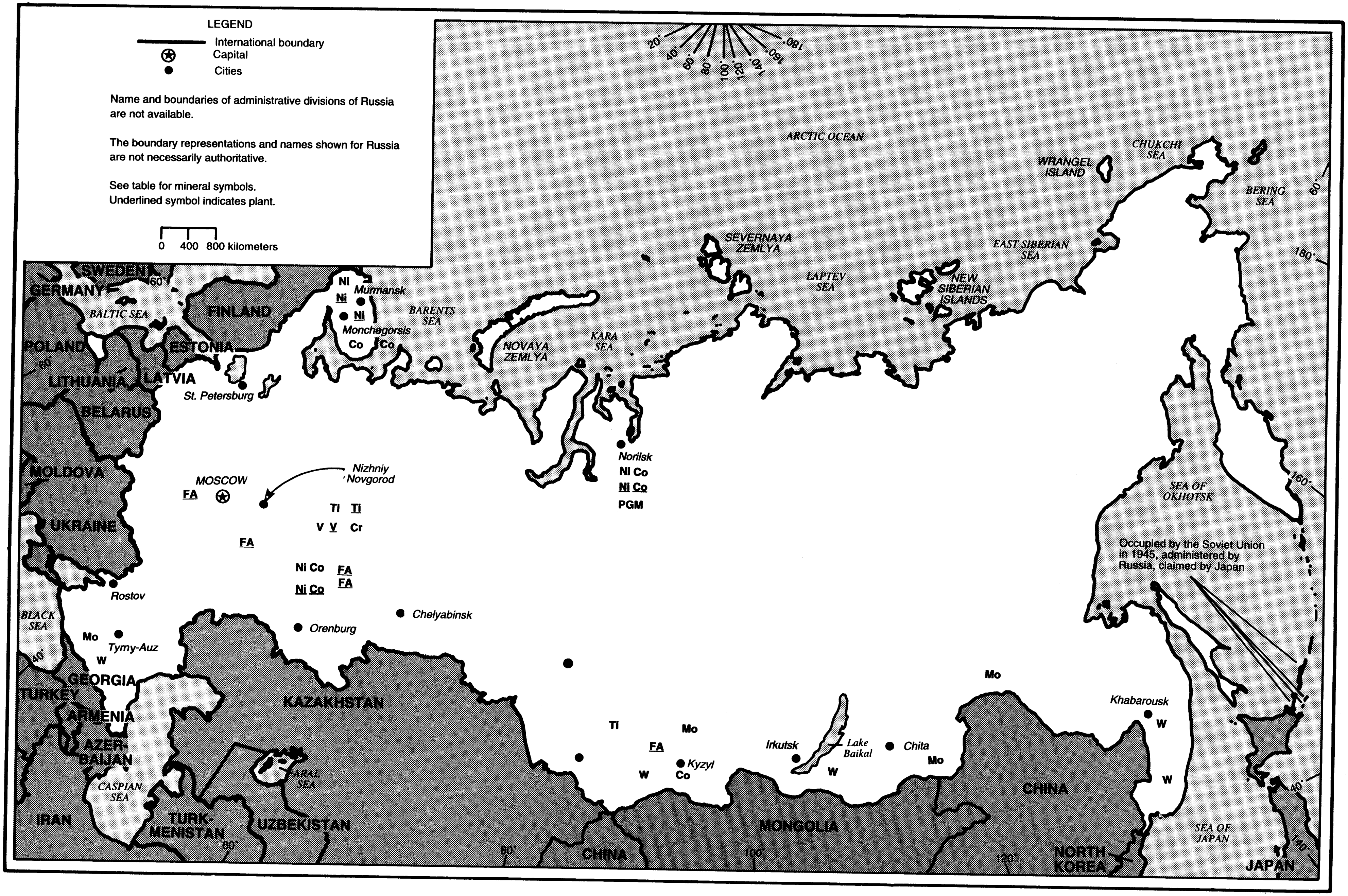
RUSSIA — NONFERROUS AND PRECIOUS METALS



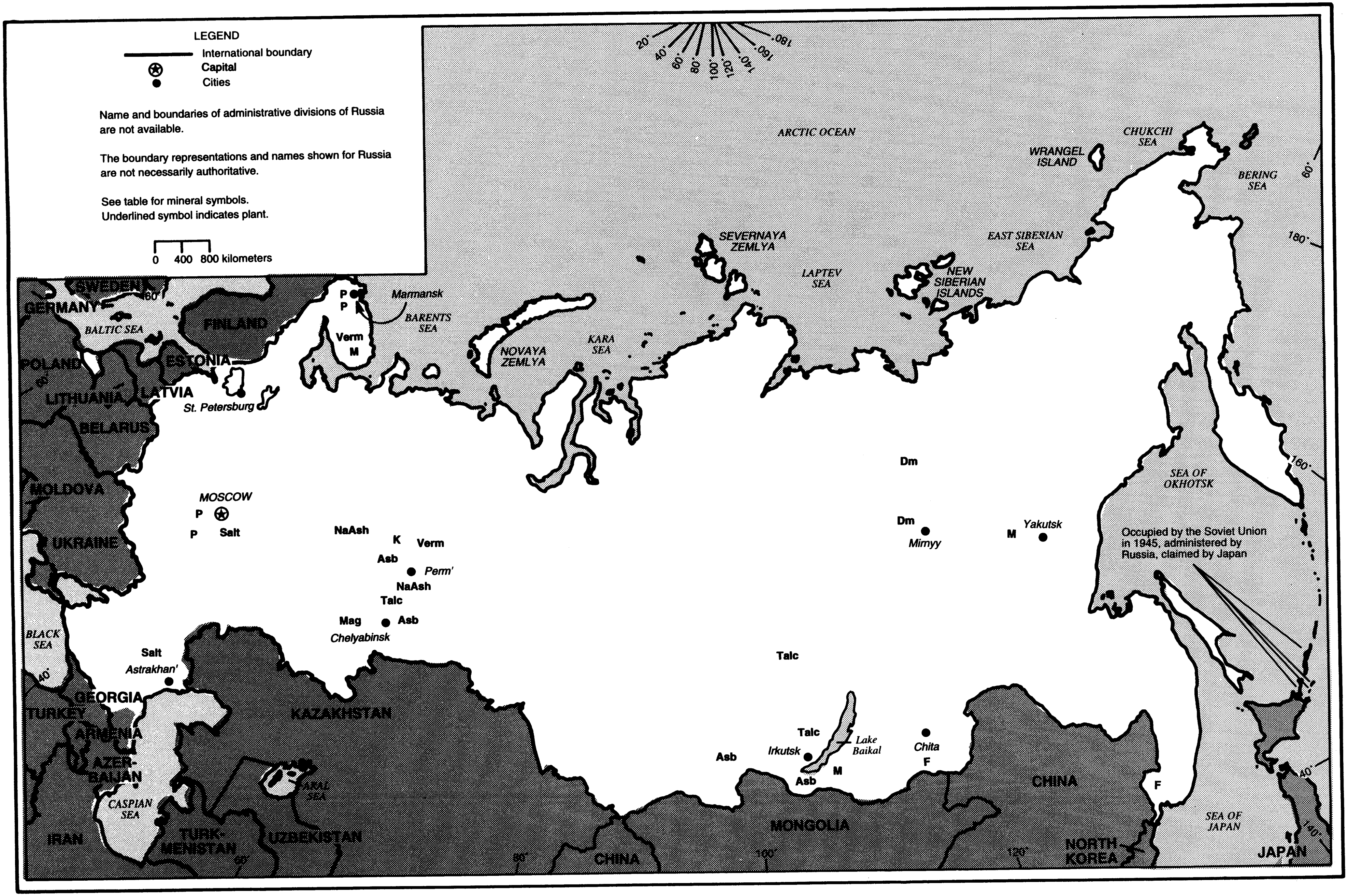
RUSSIA — IRON ORE AND STEEL



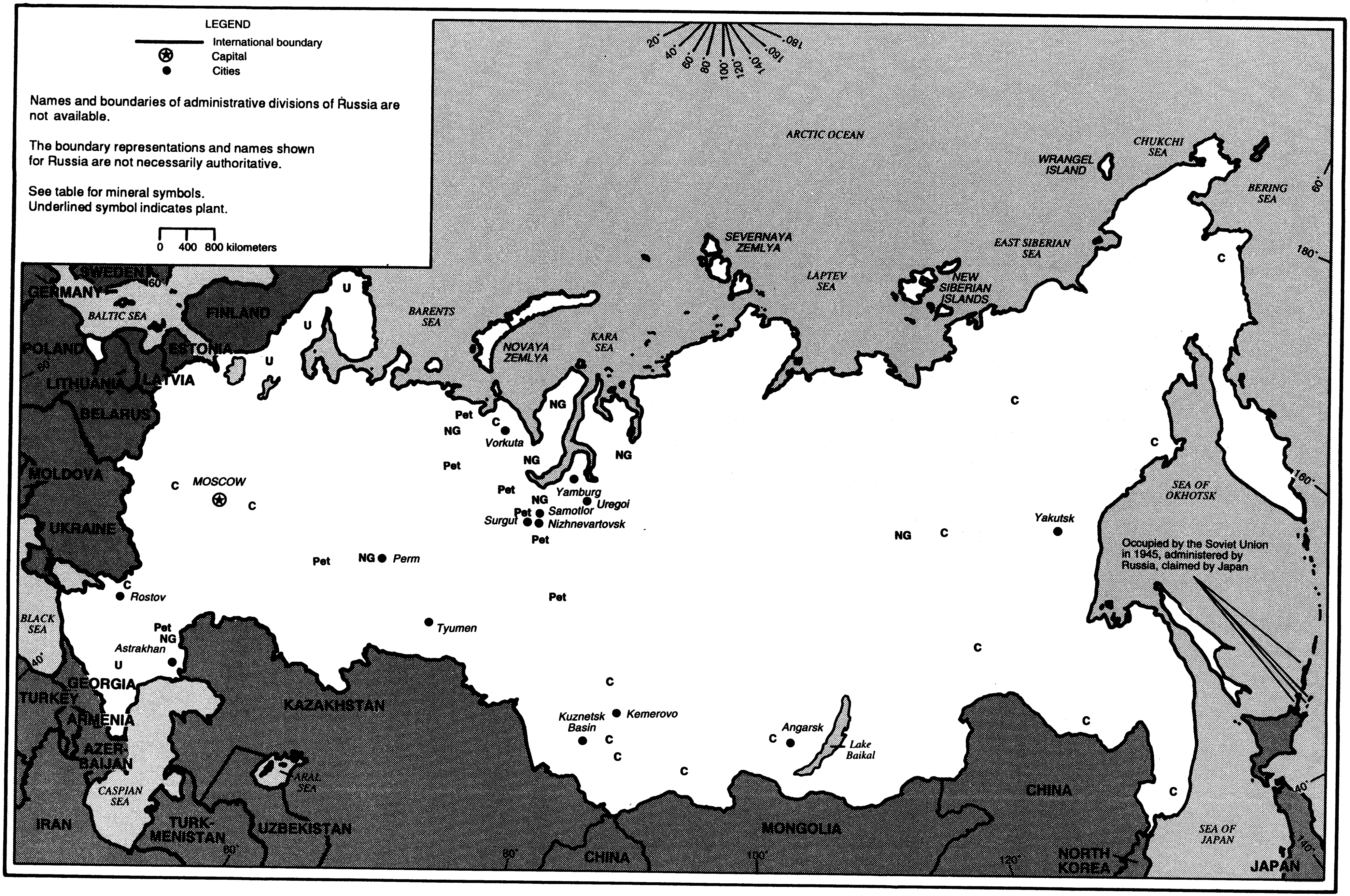
RUSSIA — FERROALLOY METALS



RUSSIA — INDUSTRIAL MINERALS



RUSSIA — MINERAL FUELS



THE MINERAL INDUSTRY OF

RUSSIA

By Richard M. Levine

Russia occupies more than 75% of the territory of the former U.S.S.R., and accordingly is the inheritor of a large percentage of the mineral resources of the former U.S.S.R. Russia is a large mineral producer, accounting for a large percentage of the Commonwealth of Independent States (C.I.S.) production of a range of mineral products, including aluminum, bauxite, cobalt, coal, diamonds, natural gas, mica, nickel, oil, platinum-group metals, tin and a host of other metals, industrial minerals, and fuels. Still, significant mineral deposits were located in other republics. For certain minerals, Russia was significantly or entirely dependent on the output of other republics for its mineral supply, particularly metals from Soviet Central Asia, the Caucasus, and Ukraine. For example, Russia must import almost all of its needs for antimony metal, chromite, manganese, mercury, titanium and zirconium raw materials from other former Soviet republics. For other minerals such as alumina, copper, lead, molybdenum, and zinc, a large percentage of the production came from other former republics. The other republics, in turn, were significantly dependent on Russia for a large percentage of their minerals, particularly oil and gas. With the breakup of the U.S.S.R and the disruption of interrepublic trade, Russia experienced shortages of raw material inputs that had been supplied by other former republics. These breakdowns of supply contributed to the decrease in production of a number of mineral commodities.

In 1993, Russia's economic decline reportedly slowed but was still considerable. Reportedly, gross domestic product (GDP) decreased 12% compared with an 19% decrease in 1992 and industrial output decreased 16.2% compared with an 18% decrease in 1992.[1]

Russia was proceeding with the transformation of its economy, and much of its statistical reporting system was both in disarray and geared toward the former system. Thus, it is difficult to compare the effects of reported decreases in output with other indicators that may show increased efficiency in production, distribution, and consumption.

The following trends were apparent in the Russian mineral industry in 1993:

1. Large exports of a wide variety of minerals produced, stockpiled, toll smelted, or transshipped for hard currency at the same time that mineral production was decreasing in almost all mineral production sectors.
2. Domestic shortages of minerals as the mineral producers in Russia and the other new countries of the former U.S.S.R. preferred to export their mineral output for hard currency instead of fulfilling obligations to supply other states of the former U.S.S.R. or industries within their own countries.
3. A reorientation of domestic mineral consumption with metal producing, fabricating, and manufacturing industries, particularly those involved in defense industries, producing less and hence consuming less metal.
4. Large impacts on U.S. and world markets as increased mineral exports from Russia and the countries of the former U.S.S.R. entered world markets. Increased mineral exports from Russia that had the most impact on world markets included aluminum, cobalt, ferroalloys, magnesium, nickel, potash, titanium, and uranium.

GOVERNMENT POLICIES AND PROGRAMS

The Russian Government drew up a plan for the development of the country's mineral and raw material base and geological services for 1993-95 and up to the year 2000. Foreign investors have been interested mainly in developing oil, gas, gold, and diamond deposits, but the Russian Committee for Geology and the Use of Underground Resources (Roskomnnedr) stated that Russia should try to seek investment in other types of mineral deposits by creating a legal base that would give investors more incentives and better protection of their investment.[2]

The breakdown of former ties between the republics and the transition to market economic practices have left Russia with shortages of raw materials and mineral products. For some of these raw materials such as barite, chromite, feldspar, high-quality china clays, manganese, native sulfur, and titanium raw materials, Russia has known reserves that it could develop, but these reserves generally are not adequate to compensate, at least in the near future, for production from the other former republics.[3]

For the range of other nonfuel minerals, Russia needs investment to modernize and increase production both to compensate for the loss of production from other former republics and to make these industries cost-effective producers and competitors on world markets. Attracting investment to Russia's nonfuel minerals sector will be a crucial element for the future survival and transformation of these industries.

ENVIRONMENTAL ISSUES

The Russian Minister of

Environmental Protection and Natural Resources stated that the environmental situation in Russia was "highly alarming" as 15% of Russia's territory was declared an ecological disaster zone and one-half of the country's arable land reportedly is unsuitable for agriculture. However, he denied that the ecological situation had worsened during the past 3 years. A number of measures were announced to improve monitoring of the environment, including the passage by the Russian Government of a resolution on the establishment of a single state system of environmental monitoring that will be entrusted to the Russian Ministry of Environmental Protection and Natural Resources.[4]

PRODUCTION

Significant decreases in output were reported for most mineral commodities in 1993 compared with those of 1992. *(See table 1.)* The only major exceptions were for primary aluminum and lead. *(See table 2.)*

TRADE

In 1993, Russia was able to maintain a favorable trade balance, primarily obtained from increasing its exports of mineral products. Russia reportedly exported 79.7 million tons of crude oil beyond the boundaries of the former U.S.S.R. which was 20.4% more than that in 1992. In 1993, petroleum product exports totaled 34.5 million tons compared with 25.3 million tons in 1992, and natural gas exports in 1993 totaled 96 billion cubic meters compared with 88 billion cubic meters in 1992.

Again in 1993, there was an increase in exports of mineral commodities from Russia that were seriously affecting world markets and bringing about calls for action to curtail these exports. Of primary concern were exports of aluminum, magnesium, nickel, potash, and titanium. With the falling demand for nonferrous metals in Russia, the nonferrous industries relied on exports to bring in revenues. *(See table 3.)*

According to the Government decree "On Measures to Liberalize Foreign Economic Activities," issued in the fall of 1993, export restrictions were eliminated for the majority of commodities but retained for the export of oil and gas, petroleum products, and nonferrous metals with the exception of tin, tungsten, and molybdenum; nonferrous metal alloys and powders; and semifinished and rolled products with the exception of some forms of rolled aluminum and copper foil.[5] On March 10, 1994, the Russian Government confirmed the 1994 export quotas for the mineral commodities listed in table 4. *(See table 4.)*

Russia made an effort to tighten controls of mineral exports by reducing the number of enterprises licensed to export raw materials. By yearend the total number of licensed exporters had decreased from 700 to 550. Six Government regulations also were put in place to halt the theft of products and equipment containing nonferrous metals that were being sold as scrap.[6]

Russia established a nonferrous metals exchange in Moscow in 1992, reportedly modeled on the London Metal Exchange (LME). In 1992, the exchange had a turnover of 5 billion rubles and traded about 30,000 tons of aluminum, 15,000 tons of copper, and 7,000 tons of nickel. Tonnages of other metals were much smaller. Trade turnover for the first half of 1993 on the exchange was reported at 3 billion rubles.[7]

Owing to decreased output in many nonferrous metallurgical sectors, Russia used its underutilized metallurgical capacity for toll smelting foreign materials, including copper, magnesium, titanium, zinc, and other metals.[8]

STRUCTURE OF THE MINERAL INDUSTRY

The Chairman of the Russian State Property Management Committee declared in March 1994 that under the privatization program 15,000 large industrial enterprises and more than 80,000 small enterprises had been privatized.[9] Plans for 1994 called for 70% of Russia's industrial enterprises to be privatized by midyear 1994, according to the Russian State Property Management Committee.[10] Privatization generally has involved the transformation of enterprises into entities termed joint stock companies through the sale or free issuance of stock in set percentages to the workers and management and also, depending on the enterprise, to Government and private interests. *(See table 5.)*

COMMODITY REVIEW

Aluminum.—In 1993, aluminum output reportedly increased slightly over the 1992 level to about 2.9 million tons. Production of secondary aluminum, however, reportedly fell by almost 50% compared with that of 1992.[11] Concerns over the negative effect of increased Russian exports on the western aluminum industry arose as aluminum prices fell sharply. A number of countries undertook measures to curtail Russian aluminum exports. Starting in August and lasting through November, the European Union (EU) put a restrictive quota of 60,000 tons on C.I.S. exports of aluminum to the EU.

Following the EU action, multilateral talks were held with western aluminum-producing nations. At a meeting of major aluminum-producing countries in January 1994, it was agreed that an excess supply of aluminum existed and that the principal response would be commercial decisions developed by companies on an individual basis. Russia agreed to reduce its production by 500,000 tons in 1994, but only as part of a global reduction. It was announced that three Russian smelters, the Novokuznetsk, Uralsk and Volgograd, had begun production cuts. Russia agreed to begin with a first-stage 300,000-ton reduction.

Cobalt.—Russia's cobalt mine output in 1993 was estimated to be 3,300 tons and refined cobalt production was estimated to be 4,000 tons compared with an estimated 4,000 tons and an estimated

4,500 tons, respectively, in 1992.

Reportedly, 80% of Russia's cobalt mine output is produced by the Norilsk mining and metallurgical complex. Russian refined cobalt production capacity was estimated to be 8,000 tons. There had been a sharp decrease in cobalt consumption with the fall in defense industry consumption and a significant decrease in cobalt production resulting from the economic problems experienced by the industry. Toll smelting was enabling Russia to use excess capacity that formerly was used to smelt domestic material as well as Cuban material for which shipments had been curtailed.[12] With the fall of domestic consumption of cobalt in Russia, which apparently has far exceeded the decrease in production, Russia has switched from being a net importer to a large net exporter of cobalt.

Copper.—Copper mining in Russia is centered in three regions, the Norilsk region in East Siberia, the Kola Peninsula, and the Urals. These regions have integrated production cycles with copper smelting and refining facilities. The Norilsk region was by far the largest copper mining region, with 40% of total C.I.S. production, followed by the Urals with 13% of total C.I.S. production. Despite a sharp decrease in copper production, there was an even sharper fall in copper consumption, which, combined with the desire to earn hard currency, made large quantities of copper available for export.

Reportedly in 1993, Russia exported 159,251 tons of refined copper compared with 235,000 tons in 1992; one-third of these exports went to other former Soviet republics. Reported copper consumption was 725,000 tons in 1992 and 522,000 tons in 1993.[13]

Russia, which used to receive a considerable portion of its copper raw materials for its metallurgical industry from other former republics, possessed excess processing capacity when supplies were curtailed. Russia used a portion of this excess capacity to toll process copper. Although exact figures for toll processing are not available, the western press reported Russia toll refining between 50,000 to 60,000 tons of copper cathode for export to western Europe and India.[14]

In April 1994, it was announced that a commission of Russian Government experts, including representatives of the Russian Committee for Geology and the Use of Underground Resources, the Ministry of Economics, the Russian Metallurgy Committee, and the Ministry of Foreign Economic Relations were investigating the tender awarded to the Udokan Mining Co. (UMC) for the development of the Udokan deposit. The investigation was focusing on the development policies of UMC and its arrangement to sell annually 200,000 tons of the projected 273,000-ton annual copper output to China.[15]

Gold.—According to a report by the Russian Committee for Precious Metals and Stones (Roskomdragmet), Russia in 1993 produced 149.5 tons of gold compared with 146.2 tons in 1992 and 184 tons in 1989. Of this 149.5 tons of production, reportedly gold mining enterprises produced 136 tons, 8.5 tons was produced as a byproduct of nonferrous metals processing, and 5 tons was recovered from recycled material. Russia's gold reserves as of May 27, 1994, reportedly consisted of 157.2 tons held by Roskomdragmet and 150 tons held by the Russian Central Bank. Different reserve numbers, however, have been issued by Russian sources, which are 50 to 100 tons higher.[16]

In 1993, the independent prospecting artels accounted for 60% of all gold production in comparison with 50% in 1992. Much of the decrease in output from state firms was compensated for by increased output from these artels.[17] Despite their large role in gold production, again in 1993 the artels reported being in financial distress because of delays in being paid for their gold output that had to be sold to the Government, the rapid rise in energy costs, an unfavorable taxation system, and a host of other economic factors that were leading the artels to abandon developing deposits.[18]

In May, control of Russia's gold mining enterprises was placed officially under the jurisdiction of the Russian Committee for Precious Metals and Stones, although a number of functions of the gold mining industry remained under the jurisdiction of other agencies. For example, control over the utilization of gold deposits remained under the jurisdiction of the Russian State Committee for Geology and the Use of Mineral Resources.[19]

In Magadan oblast, including the Chukotka autonomous district, Russia's chief gold producing region, production reportedly fell by 8% to 40.037 tons of gold in 1993 compared with 43.507 tons of gold in 1992.[20]

In the Yakut-Sakha republic, the country's second largest gold producer, gold production in 1993 was reportedly 32 tons and was planned to remain at this level in 1994.[21] Yakut-Sakha reportedly has 10% of the country's gold reserves, and it announced tenders to develop 20 gold placer deposits.[22]

At yearend, the Russian President signed a decree to reorganize the country's marketing of precious metals and stones.

According to the terms of the decree, the Central Bank of Russia acquires the right in accordance with the Ministry of Finance to issue licenses to other banks to conduct sales of precious metals and stones. The decree also calls for the establishment of a Russian precious-metals exchange and for drawing up proposals whereby it will be possible to sell gold to foreign participants in gold mining enterprises in accordance with their share of the profits.[23]

In 1993, western firms for the first time appeared to gain actual rights to develop Russian gold deposits. One of the first firms to acquire such rights was Australia's Star Technology, which negotiated a joint venture with Lenzoloto to mine reserves.

During the year a large number of gold properties were put up for development through tenders, including such major gold deposits as the Sukhoy Log deposit reportedly with an estimated 600 tons of reserves.[24]

Other firms that were active in Russian

gold development include the Cypriot company, Transpacific Resources Ltd., which has set up a joint venture to process gold mine tailings from the Belei region of Chita oblast east of Lake Baikal.[25] Also, reportedly Canada's Echo Bay Minerals Corp. has agreed to engage in a joint venture with the Russian Ministry of Industry to develop the Kyuchyus lode deposit 90 kilometers from the town of Kular in northern Yakut-Sakha. Reportedly, the ore grade for this project averages 8.7 grams of gold per ton, and the ore also reportedly contains silver as well as high levels of antimony, arsenic, and mercury. Environmental considerations will play a major role in development plans.[26]

The U.S. company Cyprus-Amax Minerals was planning to develop the Omolon alluvial gold mining project near Magadan with the aid of insurance from the Overseas Private Investment Corp. (OPIC). The Omolon project reportedly will mine and process ore into a gold-silver doré that will be sold to the Russian Committee for Precious Metals and Stones.[27]

In September, the Russian Government issued gold certificates for sale by banks to individuals, organizations, and foreigners. The total amount issued in gold certificates reportedly was the equivalent of 100 tons of gold, and the face value of one certificate reportedly is 10 kilograms of 0.9999-carat gold. The sale price is based on the gold price on the London market and the dollar rate of the Central Bank of the Russian Federation.[28]

Iron and Steel.—In 1993, crude steel output was reportedly 58 million tons, finished steel output, 43 million tons; and steel pipe output, over 8 million tons. In 1993, the Russian steel industry reportedly was operating at 63% of its capacity; plans called for producing at 50% of capacity in 1994.[29]

Russia was exporting iron and steel products, and steel mills in the United States reportedly were using imported Russian pig iron.[30] In February 1994, it was announced that the EU had imposed an interim antidumping duty on Russian pig iron.[31]

An assessment by the Russian Committee for Metallurgy indicated that only 10% to 15% of Russia's total volume of finished steel products would be competitive on world markets in part because of the high inputs of energy and other resources used in production. In 1993, open-hearth furnaces accounted for 51% of steel; oxygen converters, 35%; and electric furnaces, 14%.[32] Russian exports included direct-reduced iron (DRI) from the Oskol DRI and electric steel mill with Oskol reportedly exporting 250,000 tons of DRI to Europe. Oskol reportedly has the capacity to increase DRI exports to 600,000 tons per year. Problems, however, were reported in shipping Russian DRI, which is prone to oxidation and overheats in shipment if it gets wet.[33]

Russia reported plant cutbacks and closures in its steel industry. Particular problems were reported at Siberian steel mills; for example, it was reported that the special steels producer Sibelektrik Stal in Krasnoyarsk, East Siberia, with the capacity to produce 110,000 tons of crude steel, was closed owing to a major cutback in orders from defense industries.[34]

Magnesium.—There was a reported over 15% drop in magnesium output in 1993 compared with that of 1992.[35] Approximately 70% of the magnesium production reportedly was exported.[36] Exports from Russia and Ukraine entering world markets were considered by western producers to be a serious destabilizing factor, and western producers were cutting back on production.[37] In the spring of 1994, the U.S. Government decided to withdraw General System of Preferences (GSP) status for magnesium imports from Russia under the provision that such status may be withdrawn if imports of a product total more than 50% of the value of all U.S. imports of that product; in the case of Russian magnesium, in 1993 it equaled 67.5% of total U.S. imports.[38] Also, in the spring of 1994, U.S. magnesium producers filed an antidumping petition against magnesium from Russia and Ukraine with the U.S. International Trade Commission and the U.S. Department of Commerce.

Manganese.—Russia, which in 1993 needed more than 1.1 million tons of manganese, was left with no domestic manganese ore production after the breakup of the U.S.S.R. All manganese was mined in Georgia, Kazakhstan, and Ukraine. Ukraine was the only former U.S.S.R. source of supply as manganese imports from war-ravaged Georgia declined and production from Kazakhstan was not of significant magnitude. Ukraine, however, was experiencing its own production problems, and the Ukrainians were demanding near world market prices for their manganese. Therefore, Russia was conducting talks with an Australian manganese company on importing manganese.[39]

To secure its manganese supply, Russia is now planning to develop its own manganese mining industry, beginning with the development of deposits in the northern Urals basin where there are eight deposits with reportedly more than 40 million tons of confirmed manganese reserves averaging 21% to 22% Mn. Other deposits slated for development include the Usin deposit in southwestern Siberia with total reserves of 150 million tons of ore.

Development of the Ivdelskoye deposit has begun in the Urals. This deposit was initially developed during World War II but has not been exploited since. The ore body is close to the surface and can be developed by open pit mining. Initial projected output is 2.5 million tons per year of ore, which will be beneficiated at the Serov metallurgical plant.

In addition, plans also call for constructing a manganese sulfate plant near the town of Shchekino, south of Moscow. This plant would process large amounts of blast furnace wastes produced at the Kosya Gorya metallurgical plant, north of Shchekino, that produces blast furnace ferromanganese.[40]

Nickel.—It was reported to the International Nickel Study Group that there was a 22% drop in nickel production in 1993 compared with that in 1992, with 1993 refined nickel products output reported to be 189,000 tons. For 1993, it was reported that nickel mine output was 243,000 tons; refined nickel, 160,000 tons; ferronickel, 17,000 tons; nickel in oxide sinter, 10,000 tons; nickel chemicals, 2,000 tons; and nickel in concentrates, matte, or other intermediate forms apparently for export, 38,000 tons. Nickel exports were reportedly 110,000 tons in 1993 compared with 133,000 tons in 1992.[41] These export figures, however, could exclude sizable amounts of nickel including nickel that could have been exported unofficially in shipments of ferronickel and nickel-bearing scrap or illegal exports of unwrought nickel.

The major producer of nickel ore is the Norilsk complex, which includes mining and metallurgical enterprises in East Siberia near the city of Norilsk above the Arctic Circle, on the Kola Peninsula, and in the city of Krasnoyarsk. The Norilsk complex produces about 85% of Russia's nickel output, and the remaining 15% is produced by the Yuzhuralnikel complex in the southern Urals comprised of facilities at Orsk, Rezh, and Ufaley. In 1993, reportedly the Uzhuralnikel complex was producing at only one-third of its 40,000- ton-per-year capacity.[42] The three Urals operations were privatized in 1993.

In October, a fire occurred at a smelter in Norilsk, but officials there claimed that this would not affect output. Nevertheless, production at Norilsk continued to decline in 1993.[43] In 1994, Russia began privatizing the entire Norilsk complex, with employees, management, former employees, and the general public each being allocated the right to a specific percentage of the shares. The Russian Government, however, for a 3-year period reportedly will retain 38% of the shares.[44]

The city of Norilsk in East Siberia has a population of 263,000, of whom 126,000 are employed by the Norilsk enterprise. Of these 45,000 workers form the basic work force employed directly in mining and metallurgy.[45]

A consortium comprised of Norway's Elkem Technology and Kravner Engineering and Sweden's Boliden Contech in December was awarded the tender to renovate the Pechenganikel plant on the Kola Peninsula to reduce pollution. At the Pechenga plant, plans call for a large reduction in the current level of 250,000 tons per year of H_2SO_4 emissions. A sulfuric acid plant will be built to utilize these emissions.[46]

On February 11, 1994, it was reported in the U.S. Federal Register that the restrictions on the importation of and certification requirements for nickel and nickel-bearing materials originating in the U.S.S.R. or its successor states had been lifted. A total ban on imports of unfabricated nickel and nickel-bearing materials into the United States from the U.S.S.R. was imposed in 1983 because Soviet nickel exports could contain Cuban nickel processed in the U.S.S.R. In 1990, the ban was modified so that nickel accompanied by special certification could be imported into the United States. The latest action removes this certification requirement.

Platinum-Group Metals.—Platinum output in 1993 reportedly decreased by about one-third compared with that in 1991.[47] Practically all of the former U.S.S.R.'s platinum-group metals (PGM) production was a byproduct of nickel and copper mining of mixed sulfide ores at the Norilsk complex in East Siberia in Russia. Reportedly, the platinum-group metals deposits in the Norilsk region contain an average of about three parts palladium to one part platinum with the rhodium content ranging from 1% to 11% of the total platinum-group metals, depending on the deposit. The few placer deposits that are currently being mined, on the other hand, are almost all platinum.[48]

In 1994, the process began of privatizing the Norilsk complex including all of its production units. However, initially the Krasnoyarsk metallurgical plant in East Siberia that produces all of Russia's PGM attempted to seek independence from the Norilsk complex. This move reportedly was motivated in part by concerns of regional officials in the Krasnoyarsk Kray that privatization would reduce revenues from the plant.[49]

The Russian Committee for Geology and Underground Resources announced the discovery of new platinum-group metals deposits, some at which development had begun. Exploration has revealed platinum in a placer deposit in the Khabarovsk region described as "unique in world terms, both by its size and its reserves." Also reported was the discovery of other placer deposits in the Khaborovsk region and on the Kamchatka Peninsula.[50]

Silicon.—Russian silicon metal exports to the United States went from almost zero in 1992 to 24,188 tons from January to November 1993. Most of the Russian material was lower grade and went into the secondary aluminum sector, where it supplied about one-third of U.S consumption in this sector in 1993.

Tin.—Although large tin reserves reportedly exist in Kazakhstan, Kyrgyzstan, and Tajikistan as well as Russia, Russia contains about 80% of the reserves and mined more than 90% of the tin in the former U.S.S.R. Russia also had the only tin smelters at Novosibirsk, Podolsk, and Ryazan. Russian tin mining is centered in the Russian Far East, which contains 95% of Russia's known reserves.

The most important tin mining region in the Russian Far East is the area west of the city of Komsomolsk on the Amur River that includes four major lode deposits. These are the Solnechnyy, which is Russia's largest, and the Festival'noye, Pereval'noye, and the Khingan deposits. Other important tin mining districts in the Russian Far East are the Deputatskiy in the Yakut-Sakha Republic, which ranks second in reserves, the Kavalerovo district in the Maritime Kray, the Yul'tin-Pevek district on the Arctic coastline of the Chukchi okrug, and the Kolyma district where mining has practically ceased.

Tin production in Russia has fallen sharply since the breakup of the U.S.S.R. Between 1992 and 1994, according to a report in the Interfax Mining and Metals Report, 8 of Russia's 12 tin mines have shut down owing to high taxes and energy and transport costs.[51] It is not clear, however, from this Interfax report if these were permanent or temporary shutdowns.

One major tin producer that was experiencing serious difficulties was the Khrustalnyy tin mining complex in the Maritime Kray. It reportedly has reduced its output from 4,000 tons in 1992 to a projected 1,500 tons in 1994. At the Khrustalnyy complex, reserves reportedly are almost depleted and their tin content averages only 0.29% compared with other tin mines in the region averaging 0.6%. These factors, coupled with high energy costs and what Khrustalnyy considered to be an unfavorable arrangement with its main customer, the Novosibirk smelter, were reportedly causing a deep economic crisis at Khrustalnyy. Other tin producers besides Khrustalnyy also were finding their arrangements with the Novosibirsk smelter economically disadvantageous.[52] The Novosibirsk smelter, which had its efforts to privatize thwarted by the Russian Government and had been accused of monopolistic control, was reportedly in the summer of 1994 attempting to unite Russia's tin mining and metallurgical enterprises into a single financial and industrial group to improve their financial situation.[53]

The Novosibirsk smelter is by far the largest producer of tin metal in the former U.S.S.R. About 10% of Novosibirsk's capacity in 1993 was used to toll smelt concentrates from Bolivia, Portugal, and Southeast Asia. In 1993, the Novosibirsk smelter reportedly exported about 1,000 tons of tin.[54]

Titanium.—Russia had been receiving its titanium raw materials from Ukraine and had a program to develop its own titanium raw material resources to alleviate this dependency. A Russian-Singapore joint venture, Marina, together with the Baikal-Amur Mainline railroad (BAM) and a business association from the village of Tynda in the BAM region, began the development of titanium raw material reserves in the vicinity of the BAM railroad.[55] The Uraltitan-93 company established to develop the Medvedskoye ilmenite deposit near the towns of Kusa and Zlatoust in the Urals began development in April 1994; the complex reportedly will have a final design capacity to mine and process 5.5 million tons per year of ore to produce 80,000 tons per year of concentrate.[56]

The negative impact of increased exports of titanium products in 1993 on titanium prices raised concerns among U.S. and world producers. In October the United States granted Russia General System of Preferences (GSP) status, which allows Russian titanium to enter the United Stated duty free. In December, four companies called the Titanium Producers Coalition asked for the withdrawal of this status for titanium products, and the resolution of the issue was pending at yearend.[57] Reuters reported that one of Russia's largest producer of titanium products, the Tirus Company formerly known as the Verkhnaya Sada Metallurgical Association, plans to triple its level of exports in 1994.

Tungsten.—Russia reportedly was considering reducing capacities at its tungsten mining enterprises owing to the decline in the economies of the C.I.S. countries and to the economic problems in the tungsten industry. Russia reportedly has six enterprises producing tungsten concentrates. The Tyrnyauz tungsten-molybdenum mining complex in the North Caucasus is Russia's main tungsten producer while the Dzhidinsky tungsten-molybdenum complex in Buryatiya reportedly accounts for 13% of tungsten output. Russia's biggest source of tungsten, the Tyrny-Auz scheelite mine in the North Caucasus, apparently remained in operation in 1993. The majority of the output from Tyrny-Auz is processed into ammonium paratungstate and oxide at the Nalchik plant in the North Caucasus.[58] At Dzhidinsky, tungsten facilities remained in operation in 1993 despite a strike threat. Mining apparently had stopped at the Lermontov deposit in Primorye in the Russia Far East, which had produced reportedly about 15% of Russia's tungsten output.[59]

Small amounts of Russian tungsten reportedly were being exported to world markets with oxide, usually yellow or trioxide, being the major product marketed by Russia. Russia reportedly had large stocks of tungsten metal totaling several thousand tons and was reportedly seeking to increase exports in 1994.[60]

Vanadium.—Uncertainties concerning the quantity of Russian vanadium exports to world markets in 1993 were a source of concern. Russia has an estimated capacity to produce 17,000 tons of vanadium with 1993 production estimated at 10,000 tons.[61]

Zinc.—Development began of the Aleksandrinskoye copper-zinc deposit in Chelyabinsk oblast with reported reserves of 160,000 tons of recoverable copper in ore averaging 4.3% Cu and 190,000 tons of recoverable zinc in ore averaging 4.9% Zn. Development rights were awarded by tender to a joint-venture consortium comprised of Sweden's Envromin AB and Raznomin AB, the Russian-Swedish joint venture Ordmed, Russia's Chelyabinsk electrolytic zinc plant, the Chelyabinsk open pit mining research and design institute, the Magnitogorsk metallurgical plant, and the Mednogorsk copper and sulfur plant.[62]

Zirconium.—Russia's Kovdor iron ore mining and enrichment complex on the Kola Peninsula entered into a joint venture with the Norwegian company DM Trading to construct a plant to process baddeleyite concentrate near the Norwegian city of Navrik.[63] A discovery was reported of a zircon-ilmenite sands deposit near the town of Tara in Omsk oblast in Siberia. Reportedly, mineral reserves are large enough to supply Russia and also export. This deposit was reportedly the richest in Russia, and the first test batch of zircon-illmenite concentrate has been obtained and analyzed.[64]

A feasibility study was being conducted for the development of a mining and beneficiation complex for exploiting titanium-zirconium deposits in the Gagino and Lukoyanov districts of the Nizhny Novgorod region. The complex reportedly is projected to have a design capacity to produce 37,100 tons of zircon, 12,000 tons of rutile, and 200,000 tons of ilmenite per year with first output planned in 1998.[65]

Industrial Minerals

Barite.—Russia was planning to solicit foreign investment for development of the Khoilinskoye barite deposit with reserves estimated at 10 million tons with an 84% barite content. Barite production at Khoilinskoye was projected to reach 160,000 tons per year by 1999. The feasibility study envisages exporting about 55% of the barite output.[66]

Boron.—The Primorskiy industrial association Bor, with a design capacity of about 140,000 tons per year of boric acid, produced about 85% of the boric acid in the former U.S.S.R. There are two other smaller boron production enterprises in Russia, the Amur River complex with a reported capacity of 8,000 tons per year of boric acid and the Alga River Chemical complex with a capacity of 12,000 tons per year of boric acid.

The Bor association produces 11 types of boron-related chemicals with boric acid, boric anhydride, calcium borate, and datolite concentrate the major products. About 50% of Bor's output was consumed in Russia and the other 50% supplied to other parts of the former U.S.S.R. and to former Soviet bloc countries. In 1993, the Bor association apparently was operating at about 70% of its design capacity owing to the economic decline in the former U.S.S.R. Plans, however, call for the Bor association to expand output to meet anticipated growth in demand in the C.I.S. as this region's economy recovers. Apparently, the Bor association contains adequate reserves for 100 years of production at its current level.

Diamonds.—In the Yakut-Sakha Republic, which produces almost all of Russia's diamond output, production has been falling in recent years. Long-range plans call for increasing output, in part, by increasing mining and processing capacity. In 1994, production is planned to stabilize at its current level.[67]

Despite plans to restore production levels, the long-range prospects in Yakut-Sakha for increasing output reportedly are not that promising. According to analysts at Alamzy Rossii-Sakha, which is the country's only major diamond producer, despite planned additions to capacity the poor state of reserves in Yakut-Sakha will result in a 30% to 40% decrease in diamond output from this region after the year 2008. The Mir, Aykhal, and Internatsionalnoye pipes in Yakut-Sakha are nearly depleted, and since 1991 production has been leveling off at the Udachnoye pipe. All of these aforementioned pipes are the major diamond-producing pipes in Yakut-Sakha. Extracting the remaining resources left in these pipes is now much more capital intensive and involves shifting to underground mining. Furthermore, development of new reserves in Yakut-Sakha involves long-term development that is environmentally questionable.

Regarding new development in Yakut-Sakha, there is one major new diamond pipe under development, the Yubeleynaya. The new Yubileynyy mining and beneficiation complex is planned to go on-stream in 1994. Development also is occurring of the first stage of the Yebelyakh placer mine, which is projected to be commissioned in 1995.[68]

Plans also call for Yakut-Sakha to establish a diamond exchange in 1994 to market gem diamonds and jewelry as well as sell secondary rough diamonds from unused stones from boxes bought by Yakut cutting plants.[69] Also in Yakut-Sakha, it is planned to construct five additional cutting plants.[70]

The development of diamond reserves in the Arkhangelsk region of Russia will partly compensate for the decrease in output in Yakut-Sakha.[71] A tender was announced to explore and develop five diamond-bearing areas in Arkhangelsk oblast in the European North, the site of a recent diamond discovery reported in some sources to be as large as the deposits in Yakut-Sakha. Western companies were not allowed to participate in the tender although some western firms were seeking ways to participate by forming partnerships with Russian companies.[72]

The Australian firm Ashton Mining, which had been prospecting for diamonds in Karelia along Russia's border with Finland, won a tender to acquire a 20% share in any industrial diamond deposit that it finds. Exploration reportedly was occurring across the entire territory of Karelia, and the samples are being studied in Australia.[73]

The Krasnoyarsk oblast government has decided to set up a joint stock company to begin mining two deposits in Krasnoyarsk oblast, East Siberia. One deposit is near the town of Baykit in the north of the oblast and the other is in the Sayano-Partizanskiy region in the south of the oblast. It was projected that the two deposits would produce as much as 1,000 carats by early 1994.[74]

In the area of diamond sales, Russia maintained its agreement with the De Beers Central Selling Organization to market 95% of Russia's rough diamond output. Nevertheless, considerable concern was expressed that Russian diamonds were appearing outside this channel that had the potential to destabilize the market.[75] The head of the Russian Committee on Precious Metals and Stones (Roskomdragrmet), Leonid Gurevich, stated that this was not the case and that Russia was only marketing industrial diamonds outside De Beers' channels.[76]

Phosphate.—During the 1980's the Khibiny Apatit complex on the Kola Peninsula was mining 60 million tons of ore annually and producing between 19 and 20 million tons per year of apatite concentrate with a P_2O_5 content of more than 39%. More than 3 million tons per year of concentrate was exported. With the breakup of the U.S.S.R., however, there has been a precipitous drop in apatite concentrate production with apatite concentrate production falling about 60% compared with peak 1980's levels and exports decreasing by more than two-thirds. Apatite concentrate production in 1992 at Khibiny reportedly was 10.8 million tons and in 1993 was estimated to be 8.5 million tons. Plans call for production in the near future to stabilize at about 11 million tons of concentrate. Exports reportedly fell from 3.21 million tons in 1989 to 785,744 tons in 1992; the majority of these exports were to former Soviet bloc countries, but Norway and Sweden also in recent years have made large purchases.

At the Apatit complex there are five groups of mines, the Kirovsk and Yukspor open pits and the Rasvumchorr, Koashva, and Nyorkpakh underground mines; the latter which produces a low-grade ore is almost inactive. The Rasvumchorr Mine is operated as a joint venture with Norsk Hydro. The Apatit complex operates three apatite-nepheline beneficiation plants called ANOF #1, 2 and 3, with ANOF #1 and 3 now closed because of low demand.[77]

Potash.—Russia reportedly produced 2.6 million tons of potash in 1993 compared with 3.5 million tons in 1992 and 4.1 million tons in 1991. Potash was produced by the Uralkaliiy and Silvinit enterprises, in the Perm region of the Urals, that mine the Verkhnekamsk deposit.

The Uralkalliy enterprise consists of three mining directorates and the Kama joint venture, and the Silvint enterprise is comprised of three mining directorates. Reserves at Verkhnekamsk were reportedly adequate for another 100 years of potash mining. Potash is mined underground at a depth of 250 to 500 meters.

Russia reportedly exported 1.8 million tons of potash in 1993 to countries outside the former U.S.S.R., the same level of exports as in 1992 and 1991. Russia also reportedly discontinued importing potash from Belarus in 1993.

With the drop in production and the decrease in imports from Belarus, Russia's potash consumption has fallen considerably. This drop in consumption was attributed to economic problems in the agricultural sector, which lacks the funds to purchase potash. There is considerable concern about the long-term detrimental effects of potash deprivation on the soil. In 1993, there was reportedly a deficit of almost 1.6 million tons of potash for the agricultural sector and the use of potash fertilizer reportedly reached the critical level for sustaining agriculture.

Mineral Fuels

Coal.—Russian coal production in 1993 reportedly decreased by 9.4% compared with that of 1992.[78] Coal production in 1993 was about 300 million tons, and output was projected to decrease to 250 million tons in 1994.

Conditions in coal mines were reportedly deteriorating with both the danger and labor intensivity of mining increasing. Out of 270 open pit mines in operation, 60 had been mined for more than 20 years without any renovation. In 1994, it was stated that the industry faces shutting down 42 no longer viable open pit mines with a total capacity of more than 11 million tons per year and a work force of 48,000.[79]

Labor problems again arose in 1993 with workers complaining of not being paid, which resulted in strikes and the threat of strikes.

The demand for coal for power generation is expected to increase by 30% to 40% by the year 2000. Priorities for the Russian coal industry include developing environmentally clean methods of coal production, introducing technology in coal preparation plants to produce cleaner and more calorific fuels, and improving the efficiency of coal utilization. The coal industry reportedly needs to renovate and reequip existing mines and beneficiation plants and to develop new large-scale mines using advanced mining technology.

Natural Gas.—The decrease in natural gas production that began in 1992 continued in 1993. Total Russian gas production according to preliminary reporting was 617.4 billion cubic meters in 1993, which was 22.7 billion cubic meters less than that produced in 1992. This decrease was attributed to the general decline in industrial production and the inability of gas consuming enterprises to make timely payments for their gas.

As of November 1993, reportedly the gas concern Gazprom was owed 1.5 trillion rubles. Along with the lack of funds to increase and maintain production, reserves at a number of Russia's major gasfields were being depleted.

A major decrease in gas production occurred in the main producing area of West Siberia, where there was a 16.3 billion cubic meter decrease in production in 1993 compared with that in 1992. In Russsia's main gas-producing region in West Siberia, Tyumen oblast, production decreased by 3.1% compared with that in 1992, while at the Urengoigazprom Association, which exploits Russia's largest gas field, the Uregoi Field in West Siberia, production decreased 8.6% compared with that in 1992.[80]

Nevertheless, the gas sector was the only energy sector that was considered to have a near-term potential to increase output. Plans called for gas output to increase to 634 billion cubic meters in 1994.[81]

In 1993, Russia reportedly exported 96 billion cubic meters of natural gas, of which about one-third of these exports went to formerly centrally planned economy countries and the rest to market economy countries.[82]

The Russian Government has decided to construct a gas pipeline network from the Yamal Peninsula in West Siberia across Belarus and Poland to western Europe, which will enable Russia to increase gas exports to western Europe and also have an additional pipeline route to Europe in addition to the one that now transverses Ukraine.[83] In 1993, after Russia demanded payment for gas from Ukraine in hard currency at world market prices, Ukraine started drawing for its own use Russian gas in transit across Ukraine to western Europe. Russia and

Ukraine eventually reached an agreement on payment and transit fees.

The concession to develop the large offshore Barents Sea Shtokmanovskoye Field was awarded to a Russian consortium. The field, according to a feasibility study, has 2.5 trillion cubic meters of reserves, making it reportedly the world's fifth largest gasfield.

In spring 1994, Russia's monopoly gas-producing association, Gazprom, began the process of privatization, offering its shares to employees, the Russian Government, the management of the Gazprom Concern, indigenous populations in certain regions, and others in specified ratios. At present, foreign investors are barred from purchasing shares.

Nuclear Power.—Russia reported one-half the number of unplanned shutdowns at nuclear powerplants in 1993, compared with 1992, and the number of reported emergencies caused by human error dropped from 14 in 1992 to 6 in 1993.[84] The Vice President of the firm Rosenergoatom, Yevgeny Ignatenko, attributed this to the implementation of the state program for the modernization of nuclear powerplants and to retraining their personnel. However a lack of funds posed serious problems for acquiring spare parts and introducing new technologies.

Despite these improvements, 20,000 violations of nuclear safety were registered by the Russian Federal Nuclear and Radiation Safety Inspectorate, which visited 14,500 Russian enterprises using nuclear materials or radioactive substances. These visits resulted in the shutdown of 78 enterprises. A major reason cited for violations and accidents was lack of money. Many nuclear powerplants were not receiving payment for their output, and the state was not allocating adequate funds to raise the safety level at powerplants. Reportedly, there was also a lack of legislation governing the safe use of nuclear power and the treatment of radioactive wastes.[85]

Petroleum.—Oil extraction in Russia totaled 357 million tons, including the output of joint ventures, and was projected to decrease to 327 million tons in 1994.

Russia reportedly exported 79.7 million tons of oil outside the C.I.S., which increased hard currency earnings on oil exports in 1993 compared with those in 1992. Russia's exports of oil to other C.I.S. states was 40.4 million tons in 1993, only 53% of its 1992 level of exports to the C.I.S. Russia fell short of its trade agreements to supply the C.I.S. by 16.6 million tons, with Ukraine not receiving 7 million tons; Belarus, 4.9 million tons; and Kazakhstan, 3.4 million tons. The inability of Ukraine and Belarus to pay was cited as the major reason for the shortfall in deliveries.

Reportedly, the Russian oil industry was comprised of 840 oilfields with 148,000 oil wells, 48,300 kilometers of main oil pipeline, and 28 oil refineries that can refine more than 300 million tons of oil per year. The oil industry and its auxiliary services employed about 900,000 people.[87]

In Russia's main oil-producing region of Tyumen oblast, oil production decreased compared with that of 1992 by 35.6 million tons to 224.7 million tons, a 13.7% decrease.[88] At other existing production areas reserves were being depleted, reportedly with reserves in the Volga basin and Urals 68% depleted; in the Caucasus, 83% depleted; and in the Komi Republic, 48% depleted. In West Siberia, which has 73% of recoverable reserves, reserves average 40% depletion at operating fields. The accessibility and quality of the remaining reserves in West Siberia were less than at fields under exploitation with the remaining reserves often in small, deep fields in rock with low permeability and complex structures.[89]

The Russian Government attempted to restructure the Russian oil industry by placing most of the state enterprises under the control of a large holding company Rosneft that is comprised of three holding companies called Lukoil, Yukos, and Surgutneftgas.

A number of western firms were participating in oil development in Russia in areas that include West Siberia, the Komi Republic, and the Russian Far East. Of major interest in 1993 was acquiring development rights on Sakhalin Island in the Russian Far East.[90]

Uranium.—The end to the 50-year secrecy restrictions on information on uranium production and reserves was announced. The ban covered all aspects of the uranium mining industry, including mentioning where the employees worked and even mentioning the industry in publications.[91]

In March 1994, the U.S. Department of Commerce announced a new agreement applying to Russian uranium shipments whereby imports of Russian uranium must be matched in equal portions with newly produced U.S. uranium, and any given sale would be made up of equal amounts of Russian and U.S. material.[92] This agreement is an amendment to the 1992 U.S.-Russian antidumping suspension agreement and replaces the price-linked import quota system.[93]

Reserves

Russia used the Soviet reserve classification system which was not comparable to that used 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 separated deposits into one of two categories, "balansovyye" or "zabalansovyye." The former word literally translated means balance, referring 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 were 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, "prognoznyye resursy" (prognosticated resources), together with "zabalansovyye" material from categories A, B, C_1, and C_2, correspond very roughly to the western term "resources."

Mining and construction of mining enterprises and the appropriate capital investment 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, and 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 the 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 first 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 environment is known, and types and industrial grades of the ore are ascertained, but without details of their distribution. Quality and technological properties of the ore 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 beneficiation are ascertained tentatively by means of analyses and laboratory tests and by analogy with known deposits of the same type. General conditions of exploitation and general hydrogeological environment of the deposit are known tentatively.

Category C_2 means that the reserves in place are adjoining the explored reserves of A + 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 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 category A 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 they are based on the specific characteristics of oil and gas deposits.

Reported data on Russian reserves have been located for only a small number of minerals. Table 5 shows estimated Russian reserves for a selected number of minerals. *(See table 5.)*

INFRASTRUCTURE

Russia had a total of 158,100 km of rail lines of which 71,300 km were only for servicing specific industries; 893,000 km of highway, of which 677,000 km is hard surfaced; more than 100,000 km of navigable inland waterways; about 48,000 km of crude oil pipelines and 15,000 km of product pipelines; and 140,000 km of natural gas pipelines.

Russia had the longest coastline of any country, with more than 15 open seaports, including Arkhangelsk, Kaliningrad, Murmansk, Nakhodka, Novorossiysk, St. Petersburg, Vladivostok, and others and a large number of inland ports, including Astrakhan, Kazan, Khabarovsk, Krasnoyarsk, Kuybyshev, Moscow, Nizhniy-Novgorod, Rostov, and Volgograd. The greater portion of the sea coasts, however, is 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.

Russia faces 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 Russia's extensive transportation network, the country has no cross-country road system and practically no developed road networks in most of the northern and northeastern portions of the country. Furthermore, most of the entire rail network is concentrated in the western part of the country. There are only two rail lines transversing the eastern part of the country, the trans-Siberian and the Baikal Amur Mainline (BAM), with the BAM only partially operational and lacking connecting lines to areas of potential mineral development. Air transportation plays a vital role in passenger and industrial transport owing to the vast distances and the lack of other transport means.

In some eastern and northern parts of the country, the Russians rely on a combination of road, rail, river, and sea for minerals transport and also the Soviets 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 are now in great need of expensive maintenance and repair.

OUTLOOK

The Russian mineral industry was still in a state of transition toward adopting market economy critieria for mineral production, including freeing prices, introducing private ownership, and encouraging foreign investment. Although further along these roads than most of the other former republics of the U.S.S.R., Russia was still making the legal and institutional changes needed for this transition.

Russia has been exporting to world markets increasing quantities of mineral commodities while production of these commodities is decreasing. The Russian Government is trying to exert greater control over mineral exports through a licensing system to ensure supplies to domestic producers and to ensure collection of revenues from these exports. It remains to be seen how successful the Russian Government will be in exerting these controls.

Russia is still a major supplier of mineral commodities to the countries of the former U.S.S.R. and to eastern Europe, often below world market prices. Whether this situation will continue or whether Russia will seek to obtain world market prices for its minerals will depend on the development of economic ties between the countries of the former U.S.S.R. and Soviet bloc. If these countries attempt to reintegrate their economies rather than seek integration with the larger world market, than a significant portion of Russia's mineral production will be consumed within the region of the former Soviet bloc.

Currently, a significant percentage of Russia's mineral production is dependent on either raw material supplies, processing facilities, or equipment from other countries of the former U.S.S.R.. These countries, in turn, are dependent on Russian supplies. Rapid disengagement may prove to be too costly, particularly when good alternative solutions are not in place. The pace of this disengagement, if it occurs, will determine, for example, what percentage of chromite Russia will obtain at favorable rates from Kazakhstan rather than at world market prices or the percentage of oil that Russia will ship to other countries of the former Soviet bloc rather than sell on world markets.

In the area of foreign investment, Russia is still developing and implementing its policies and regulations regarding foreign investment in mineral development. The pace of foreign investment will be greatly dependent on the implementation of policies that will secure the rights of foreign investors. Russia, with adequate investment, has the potential to greatly increase mineral output, but this will depend on the implementation of a more secure investment environment regarding ownership rights, taxation levels, export licenses, and a range of other issues.

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TABLE 1
RUSSIA: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity (Jan. 1, 1994)
METALS				
Aluminum:				
Ore and concentrate:				
Bauxite, 26% to 57% alumina		4,000	4,000	4,500
Nepheline concentrate, 25% to 30% alumina		1,000	800	1,600
Alumina		3,100	3,500	4,000
Metal, smelter:				
Primary		2,700	2,900	3,600
Secondary		350	200	400
Total		3,050	3,100	4,000
Antimony, mine output, recoverable Sb content	tons	10,000	6,000	12,000
Arsenic,white (As_2O_3)	do.	3,000	2,000	4,000
Beryllium: Beryl, cobbed, 10% to 20% BeO	do.	1,100	800	1,600
Bismuth, mine output, recoverable Bi content	do.	5	3	6
Cadmium metal, smelter	do.	800	700	1,500
Chromium: Chrome ore, marketable	do.	122,800	120,800	150,000
Cobalt:				
Mine output, recoverable Co content	do.	4,000	3,300	7,000
Metal, smelter	do.	4,500	4,000	8,000
Copper:				
Ore: Cu content, recoverable		750	600	900
Metal:				
Blister:				
Primary		800	640	1,000
Secondary		50	50	100
Refined:				
Primary		800	640	1,000
Secondary		50	50	100
Gold, mine output, Au content	kilograms	146,200	149,500	200,000
Iron and steel:				
Iron ore, marketable[2]		86,700	75,000	110,000
Iron ore, Fe content		49,000	40,000	50,000
Agglomerated products:				
Sinter		NA	NA	NA
Pellets		NA	NA	NA
Metal:				
Pig iron and blast-furnace ferroalloys:				
Pig iron for steelmaking		44,000	40,000	60,000
Ferromanganese		200	150	600
Electric furnace ferroalloys		1,200	1,000	1,500
Crude steel[2]		67,000	58,000	90,000
Finished rolled steel[2]		46,800	43,000	60,000
Semimanufactures: Pipes and tubes[2]		9,200	8,400	12,000
Lead:				
Mine output, recoverable Pb content		30	35	40
Metal, smelter:				
Primary		35	40	50
Secondary		40	30	50

See footnotes at end of table.

TABLE 1—Continued

RUSSIA: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity (Jan. 1, 1994)
METALS—Continued				
Magnesium metal, including secondary		32	30	60
Mercury metal, including secondary	tons	70	60	80
Molybdenum, mine output, Mo content	do.	5,000	4,800	8,000
Nickel:				
Mine output, recoverable Ni content	do.	280,000	243,000	340,000
Nickel, products	do.	243,000	189,000	330,000
Platinum-group metals:				
Platinum	tons	20	15	25
Palladium	do.	55	40	70
Others	do.	6	4	8
Silver metal including secondary	do.	800	700	1,000
Tin:				
Mine output, recoverable Sn content	do.	6,000	5,000	10,000
Metal, smelter:				
Primary	do.	6,000	5,000	10,000
Secondary	do.	1,500	1,000	3,000
Total	do.	7,500	6,000	13,000
Titanium, metal	do.	25,000	17,000	40,000
Tungsten concentrate, W content	do.	4,000	3,500	6,000
Vanadium metal	do.	11,000	10,000	17,000
Zinc:				
Mine output, recoverable Zn content		150	170	200
Metal:				
Primary		140	160	200
Secondary		60	60	100
INDUSTRIAL MINERALS				
Asbestos, grades I-VII		1,500	1,000	2,000
Barite		NA	NA	NA
Cement, hydraulic		64,000	60,000	90,000
Clays: Kaolin including china clay		NA	NA	NA
Corundum, natural		NA	NA	NA
Gem	thousand carats	9,000	8,000	12,000
Industrial	do.	9,000	8,000	12,000
Total	do.	18,000	16,000	24,000
Diatomite		NA	NA	NA
Feldspar		100	70	150
Fluorspar, concentrate 55% to 96.4% CaF_2		100	70	150
Graphite		15	10	20
Gypsum		1,800	1,500	3,000
Lime, dead-burned		NA	NA	NA
Lithium minerals, not further specified		NA	NA	NA
Magnesite: Marketable product		1,100	800	1,500
Mica		35	30	50
Nitrogen: N content of ammonia		8,800	8,000	12,000
Phosphate rock:				
Apatite concentrate, 37% to 39.6% P_2O_5		11,000	9,000	16,000

See footnotes at end of table.

TABLE 1—Continued

RUSSIA: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity	1992	1993	Annual capacity (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued			
Phosphate rock—Continued:			
Sedimentary rock, 19% to 30% P_2O_5	500	400	1,000
Total	11,500	9,400	17,000
Potash: K_2O equivalent	3,500	2,600	5,000
Pyrite, gross weight	NA		
Salt, all types	4,000	3,500	6,000
Sodium compounds, n.e.s.:			
Carbonate	3,000	2,500	5,000
Sulfate:			
Natural	NA	NA	NA
Manufactured	NA	NA	NA
Sulfur:			
Frasch	NA	NA	NA
Other native	100	100	200
S content of pyrite	NA	NA	NA
Byproducts:			
Of metallurgy	250	200	400
Of natural gas	1,800	1,800	2,500
Of petroleum	NA	NA	NA
Total	NA	NA	NA
Sulfuric acid	10,000	8,000	13,000
Talc	NA	NA	NA
Vermiculite	60	50	100
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous	270,000	250,000	300,000
Lignite and brown coal	60,000	50,000	80,000
Total[3]	330,000	300,000	380,000
Coke: Coke oven, beehive, breeze, gas coke	NA	NA	NA
Fuel briquets:			
From anthracite and bituminous coal	NA	NA	NA
From lignite and brown coal	NA	NA	NA
Gas, natural, marketed: As reported[2] million cubic meters	640,100	617,400	650,000
Oil shale	4,000	3,000	5,000
Peat:			
Agricultural use	NA	NA	NA
Fuel use	7,000	6,000	10,000
Petroleum:			
Crude:			
As reported, gravimetric units[2]	395,000	357,000	400,000
Converted, volumetric units thousand 42-gallon barrels	2,900,000	2,600,000	2,900,000
Refinery products[4]	300,000	270,000	300,000

NA Not available.
[1]Production estimated unless otherwise specified.
[2]Reported in Russian sources.
[3]Run-of-mine coal.
[4]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

REPORTED PRODUCTION OF MINERAL COMMODITIES IN 1993 AS A PERCENTAGE OF 1992[1]

Commodity	Percentage
Aluminum, primary	100.1
Aluminum, secondary	52.5
Coke, 6% moisture	91.3
Copper, refined	73.0
Graphite electrodes	84.8
Iron ore	92.8
Lead	120.3
Magnesium	85.3
Molybdenum concentrates	95.3
Nickel	78.0
Pig iron	88.4
Steel:	
Raw	88.3
Finished	72.8
Pipes	91.3
Titanium:	
Sponge	68.7
Rolled	49.0
Tungsten concentrate	59.1

[1]The reported percentage changes of production in this table do not always correspond with other reported information. Therefore, production numbers estimated in Table 1 are not always in accord with these percentages, as they may be based on other sources.

Sources: Interfax Mining Report, Jan. 28-Feb. 4, 1994, p. 13.

TABLE 3

RUSSIA: 1993 REPORTED EXPORTS OF SELECTED NONFERROUS METALS

Commodity	Quantity (tons)
Aluminum	1,219,458
Copper, refined	159,251
Nickel	110,000
Tin	5

Source: Preliminary figures from the Russian Ministry of Foreign Economic Relations, reported by Interfax Mining Report, Apr. 1-8, 1994, p. 16. Russian delegation report to International Nickel Study Group, Apr. 22, 1994.

TABLE 4

RUSSIA: 1994 RUSSIAN EXPORT QUOTAS ON SELECT MINERAL COMMODITIES

Commodity	Quantity (tons)
Aluminum	796,000
Copper	155,000
Magnesium	19,000
Nickel	140,000
Petroleum	91,550,000

Source: Interfax Business Report, Mar. 15, 1994, p. 3 Kommersant, Moscow, Mar. 12, 1994, pp. 1, 2.

TABLE 5

RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Alumina	Achinsk	Achinsk in East Siberia	900,000.
Do.	Bogoslovsk	Urals	1,050,000.
Do.	Boksitogorsk	European north	200,000.
Do.	Nadvoitsy	Nadvoitsy in Karelia	266,000.
Do.	Uralsk	Kamensk region	536,000.
Do.	Volkhov	Volkhov, east of St. Petersburg	45,000.
Aluminum, primary	Smelters:		
Do.	Volkhov	do.	20,000.
Do.	Uralsk	Kamensk	70,000.
Do.	Bogoslovsk	Krasnoturinsk	162,000.
Do.	Novokuznetsk	Novokuznetsk	284,000.
Do.	Kandalaksha	Kola Peninsula	62,500.
Do.	Nadvoitsy	Nadvoitsy in Karelia	68,000.
Do.	Volgograd	Volgograd	168,000.
Do.	Irkutsk	Sherekov, near Irkutsk	262,000.
Do.	Krasnoyarsk	Krasnoyarsk	755,000.
Do.	Bratsk	Bratsk	843,800.
Do.	Sayansk	Sayanogorsk	274,000.

See footnotes at end of table.

TABLE 5—Continued

RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity		Major operating facilities	Location	Annual capacity[e]
Apatite, concentrate		Khibiny apatit association	Kola Peninsula	15,000,000.
Do.		Kovdor iron ore mining association	do.	700,000.
Asbestos		Kiyembay	Orenburg Oblast	500,000.
Do.		Tuvaasbest	Tuva Republic	250,000.
Do.		Uralasbest	Central Urals	1,100,000.
Bauxite		North-Urals mining company	Severouralsk region	NA.
Do.		South-Urals mining company	South Urals region	NA.
Do.		Severnaya Onega mine	Northwest region	800,000.
Boron		Bor Association	Maritime region	140,000 (boric acid).
Do.		Amur River complex	Far East	8,000 (boric acid).
Do.		Alga River Chemical Complex	do.	12,000 (boric acid).
Chromite		Saranov complex	Saranov	200,000.
Coal		Basins:		
Do.		Donets (east)	Rostov Oblast	30,000,000.
Do.		Kansk Achinsk	East Siberia	50,000,000.
Do.		Kuznetsk	West Siberia	160,000,000.
Do.		Moscow	Moscow region	15,000,000.
Do.		Neryungri	Yakut-Sakha Republic	15,000,000.
Do.		Pechora	Komi Republic	30,000,000.
Do.		South Yakutia	Yakut-Sakha Republic	17,000,000.
Cobalt, mining complexes		Norilsk complex Tuva complex	East Siberia and Kola Peninsula Tuva Republic	7,000 total.
Copper, metal (smelting and refining complexes		Kirovgrad (smelting)	Kirovgrad	150,000.
Copper, mining and beneficiation complexes (Cu content of concentrates)		Buribai Enterprise	Buribai region	5,000.
Do.		Gai Complex	Gai region	40,000.
Do.		Kirovgrad Complex	Kirovgrad region	12,000.
Do.		Krasnouralsk Complex	Krasnouralsk region	12,000.
Do.		Norilsk Complex	Norilsk region	400,000.
Do.		Sredneuralsk Complex	Ekatrinenburg region	12,000.
Do.		Uchali Complex	Uchali region	40,000.
Do.		Urap Complex	Stavropol region	7,000.
Do.		Krasnouralsk (smelting)	Krasnouralsk	60,000.
Do.		Kyshtym (refining)	Kyshtym	40,000.
Do.		Norilsk (smelting and refining)	Norilsk	350,000.
Do.		Pyshma (refining)	Pyshma	350,000.
Do.		Severonikel (smelting)	Monchegorsk	20,000.
Do.		Sredneuralsk (smelting)	Revda	140,000.
Diamonds	thousand carats	Yakutalmaz association	Aykhal, Mirnyy, Udachnaya areas of Yakut-Sakha republic	10,000 gem.
Do.		do.	do.	10,000 industrial.
Feldspar		Deposits: Lupikko	Karelia	NA.
Do.		Kheto-Lanbino	do.	NA.
Ferroalloys		Kosaya Gora Iron Works	Kosaya Gora	200,000.
Do.		Kuznetsk ferroallloy plant	Novokuznetsk	400,000.

See footnotes at end of table.

TABLE 5—Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Ferroalloys—Continued:			
Do.	Lipetsk Iron and steel works	Lipetsk	NA.
Do.	Serov ferroalloy plant	Serov	NA.
Do.	Tulachermet Scientific and Industrial Association	Tula	NA.
Do.	Chelyabinsk Electrometallurgical plant	Chelyabinsk	350,000.
Do.	Chusovoy Iron and steel plant	Chusovoy	NA.
Do.	Klyuchevsk ferroalloy plant	Dvurechinsk	160,000.
Fluorspar	Mining and beneficiation complexes:		
Do.	Abagaytuy	Transbaikal	NA.
Do.	Kalanguy	do.	NA.
Do.	Kyakhtinsky	do.	NA.
Do.	Usugli Yaroslavsky	do. Far East	NA. NA.
Gold kilograms	Gold mining regions:		
Do.	Yakut-Sakha	Yakut-Sakha Republic	200,000 total.
Do.	Buryat	Buryat Republic	
Do.	Magadan	Magadan oblast	
Do.	Krasnoyarsk	Krasnoyarsk region	
Do.	Maritime Tuva	Maritime region Tuva Republic	
Iron ore	Mining areas:		
Do.	Kursk Magnetic Anomaly (KMA) containing following enterprises:		50,000,000 total KMA.
Do.	Mikhailovka Lebedi Stoilo	Zheleznogorsk Gubkin do.	
Do.	Northwest containing following enterprises:		22,000,000 total.
Do.	Olenogorsk	Olenogorsk	Northwest.
Do.	Kostomuksha Kovdor	Kostomuksha Kola Peninsula	
Do.	Siberia (east) containing the following mining enterprises:		18,000,000 total.
Do.	Korshunovo Rudnogorsk	Zheleznogorsk Rudnogorsk	
Do.	Siberia (west) including the following mining enterprises:		Siberia (east and west).
Do.	Abakan	Abaza	
Do.	Sheregesh	Sheregesh	
Do.	Tashtagol Teya	Tashtagol Vershina Tei	
Do.	Urals containing following mining enterprises:		22,000,000 total
Do.	Akkermanovka	Novotroitsk	Urals.
Do.	Bakal	Bakal	
Do.	Goroblagodat	Kushva	
Do.	Kachkanar Magnitogorsk Peshchanka	Kachkanar Magnitogorsk Rudnichny	

See footnotes at end of table.

TABLE 5—Continued

RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity		Major operating facilities	Location	Annual capacity[e]
Lead-zinc (recoverable (metal content of ore)		Mining complexes: Altay mining and beneficiation complex	Altay mountains region, South Siberia	2,000 lead, 1,000 zinc.
Do.		Dalpolymetal mining and beneficiation complex	Maritime region	20,000 lead, 25,000 zinc.
Do.		Nerchinsk polymetallic complex	Chita Oblast	7,000 lead, 12,500 zinc.
Do.		Sadon lead-zinc complex	Severo-Ossetiya	5,000 lead, 14,000 zinc.
Do.		Salair mining and beneficiation complex	Kemerovo Oblast	2,000 lead, 10,500 zinc.
Lead, metal		Dalpolymetal lead smelter	Rudnaya in the Maritime district	20,000.
Do.		Elektrozinc lead smelter	Vladikavkaz in North Caucasus	30,000.
Magnesite		Satka deposit	Chelyabinsk Oblast	3,800,000.
Magnesium, metal		Berezniki plants	Berezniki	60,000 total.
Do.		Solikamsk plants	Solikamsk	(Both locations).
Mica		Mining complexes:		
Do.		Aldan	Yakut-Sakha Republic	NA.
Do.		Karel	Karelia	NA.
Do.		Kovdor Mam	Kola Peninsula Irkutsk complex	NA. NA.
Molybdenum, mining enteprise		Dzhida tungsten-molybdenum mine	West Transbaikal	NA.
Do.		Sorsk molybdenum mining enterprise	Sorsk region	NA.
Do.		Tyrny-Auz tungsten-molybdenum mining enterprise	North Caucasus	NA.
Do.		Shakhtaminskoye molybdenum mining enterprise	Chita Oblast	NA.
Natural gas	billion cubic meters	Regions:		
Do.		Komi Republic	Komi Republic	8.0.
Do.		Norilsk area	Norilsk area	5.5.
Do.		North Caucasus	North Caucasus	6.0.
Do.		Sakhalin	Far East	2.0.
Do.		Tomsk Oblast	West Siberia	.5.
Do.		Tyumen Oblast including:	do.	575.
Do.		Medvezhye field	do.	75.
Do.		Urengoi field	do.	300.
Do.		Vyrngapur field	do.	17.
Do.		Yamburg field	do.	170.
Do.		Urals	Urals	45.
Do.		Volga Yakut-Sakha	Volga region Yakut-Sakha Republic	6. 1.5.
Nepheline syenite		Apatit complex	Kola Peninsula	1,500,000.
Do.		Kiya-Shaltyr mine	Goryachegorsk region, east Siberia	NA.
Nickel, mining enterprise (Ni in ore)		Norilsk Nickel association	Norilsk region and Kola Peninsula	300,000.
Do.		Yuzhuralnikel association	Southern Urals	20,000.
Nickel, metal (smelting and refining complexes)		Norilsk Nikel (smelting and refining)	Norilsk	160,000 (smelting), 100,000 (refining).
Do.		do.	Pechenga	50,000 (smelting).
Do.		do.	Monchegorsk	50,000 (smelting), 140,000 (refining).
Do.		Yuzhuralnikel association (smelting and refining)	Southern Urals	60,000 (smelting), 50,000 (refining).

See footnotes at end of table.

TABLE 5—Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Platinum-group metals:			
Ore	Norilsk Nikel association	Norilsk region	
Metals	Krasnoyarsk refinery of Norilsk Nikel association	Krasnoyarsk	130 (total metal).
Potash, K_2O	Uralkaliy	Verknekamsk deposit	3,000,000.
Do.	Silvinit	Solikamsk-Berezniki region of Urals	2,000,000.
Petroleum	Producing regions:		
Do.	European Russia, Astrakhan	Northern Caspian Sea Basin	700,000.
Do.	Bashkortostan	Urals	28,000,000.
Do.	Checheno-Ingush Republic	North Caucasus	4,500,000.
Do.	Dagestan	North Caucasus	700,000.
Do.	Kaliningrad Oblast	Baltic coast	1,800,000.
Do.	Komi Republic	Northwest	15,000,000.
Do.	Krasnodar Kray	North Caucasus	2,000,000.
Do.	Orenburg Oblast	Urals	13,000,000.
Do.	Perm Oblast	do.	12,000,000.
Do.	Samara	Volga region	16,000,000.
Do.	Saratov Oblast	do.	1,500,000.
Do.	Stavropol Kray	North Caucasus	2,000,000.
Do.	Tatarstan	Volga region	40,000,000.
Do.	Udmurt Republic	Urals	9,000,000.
Do.	East Siberia:		
Do.	Tomsk Oblast	Tomsk Oblast	11,000,000.
Do.	West Siberia:		
Do.	Tyumen Oblast:	Tyumen Oblast	300,000,000.
Do.	Kogolym field	do.	34,000,000.
Do.	Krasnoleninskiy field	do.	12,000,000.
Do.	Langepas field	do.	30,000,000.
Do.	Megion field	do.	18,000,000.
Do.	Nizhnevartovsk field	do.	70,000,000.
Do.	Noyabrsk field	do.	37,000,000.
Do.	Purneftegaz field	do.	12,000,000.
Do.	Surgut field	do.	48,000,000.
Do.	Uray field	do.	8,000,000.
Do.	Varegan field	do.	10,000,000.
Do.	Sakhalin Island	Sakhalin Island	2,500,000.
Soda ash	Sterlitamak plant	Sterlitamak	NA.
Do.	Mikhaylovskiy plant	Siberia	NA.
Do.	Pikalevo plant	Leningrad Oblast	NA.
Steel, crude	Amurstal	Komsomolsk na Amur	1,600,000.
Do.	Asha	Asha	450,000.
Do.	Beloretsk	Bashkir Republic	380,000.
Do.	Chelyabinsk	Chelyabinsk	7,000,000.
Do.	Gorky	Nizhniy-Novgorod	78,000.
Do.	Guryevsk	Guryevsk	160,000.
Do.	Karaganda	Karaganda	6,300,000.

See footnotes at end of table.

TABLE 5—Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Steel, crude—Continued:			
Do.	Kuznetsk	Novokuznetsk	4,700,000.
Do.	Lipetsk	Lipetsk	9,900,000.
Do.	Lysva	Lysva	350,000.
Do.	Magnitogorsk	Magnitogorsk	16,200,000.
Do.	Nizhniy Tagil	Nizhniy Tagil	8,000,000.
Do.	Nizhniy Sergi	Nizhniy Sergi	300,000.
Do.	Novosibirsk	Novosibirsk	1,100,000.
Do.	Omutninsk	Omutninsk	210,000.
Do.	Orsko-Khalilovo	Novotroitsk in Orenburg Oblast	4,600,000.
Do.	Oskol Electric Steel	Stary Oskol	1,450,000.
Do.	Petrovsk-Zabaikalskiy	Petrovsk-Zabaikalskiy	426,000.
Do.	Revda	Revda	281,000.
Do.	Salda	Sverdlovsk Oblast	1,900.
Do.	Serov A.K.	Serov	1,000,000.
Do.	Serp i Molot	Moscow	70,000.
Do.	Severskiy	Polevskoy in Sverdlovsk Oblast	825,000.
Do.	Sibelektrostal	Krasnoyarsk	110,000.
Do.	Sulin	Sulin	280,000.
Do.	Taganrog	Taganrog	925,000.
Do.	Tulachermet-Scientific and Industrial Association	Tula	18,400.
Do.	Verkh-Isetskiy	Ekatrinenburg	132,000.
Do.	Volgograd	Volgograd	2,000,000.
Do.	Vyksa	Vyksa	540,000.
Do.	West Siberian	Novokuznetsk	6,900,000.
Do.	Zlatoust	Zlatoust in Chelyabinsk Oblast	1,200,000.
Talc	Deposits:		
Do.	Onotsk	Irkutsk Oblast	NA.
Do.	Kirgiteysk	Krasnoyarsk Kray	NA.
Do.	Miass	Chelyabinsk Oblast	NA.
Do.	Shabrovsk	Sverdlovsk Oblast	NA.
Tin, mining and beneficiation complexes	Khingan	Khabarovsk Kray	NA.
Do.	Solnechnyy	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do.	Khrustalnyy	Maritime region	NA.
Do.	Deputatskiy	Yakut-Sakha Republic	NA.
Tin, smelters	Novosibirsk	Novosibirsk	NA.
Do.	Podolsk	Podolsk	NA.
Do.	Ryazan	Ryazan	NA.
Titanium, metal	Berezniki plant	Berezniki	35,000.
Do.	Moscow plant	Moscow	NA.
Do.	Podolsk plant	Podolsk	NA.

See footnotes at end of table.

TABLE 5—Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Tungsten, mining and beneficiation complexes (W content of concentrates)	Antonovogorsk	East Transbaikal	80.
Do.	Balkan	Urals, northeast of Magnitogorsk	40.
Do.	Belukha	East Transbaikal	60.
Do.	Bom-Gorkhom	West Transbaikal	85.
Do.	Dzhida	do.	750.
Do.	Iultin	Magadan Oblast	175.
Do.	Sherlovogorsk	East Transbaikal	40.
Do.	Solnechnyy	Southern Khabarovsk region	40.
Do.	Tyrny-Auz	North Caucasus	3,000.
Do.	Vostok-2	Maritime region	1,200.
Tungsten, metal	Nalchik plant	Caucasus	NA.
Vanadium, ore	Kachkanar iron ore mining complex	Urals	NA.
Vanadium, metallurgical processing facilities	Chusovoy plant	do.	17,000. total metal.
Do.	Nizhniy Tagil plant	do.	
Zinc (non associated with lead), metal content of ore	Bashkir copper-sulfur complex	Sibai in southern Urals	5,000.
Do.	Buribai copper-zinc mining complex	Buribai in southern Urals	1,500.
Do.	Gai copper-zinc mining and beneficiation complex	Gai in Southern Urals	25,000.
Do.	Kirovgrad copper enterprise	Kirovgrad in central Urals	1,200.
Do.	Sredneuralsk copper complex	Revda in central Urals	5,000.
Do.	Uchali copper-zinc mining and beneficiation complex	Uchali in southern Urals	90,000.
Zinc, metal	Chelyabinsk electrolytic zinc plant	Chelyabinsk	190,000.
Do.	Elektrozink plant	Vladikavkaz in North Caucasus	100,000.

[e]Estimated. NA Not available.

TABLE 6

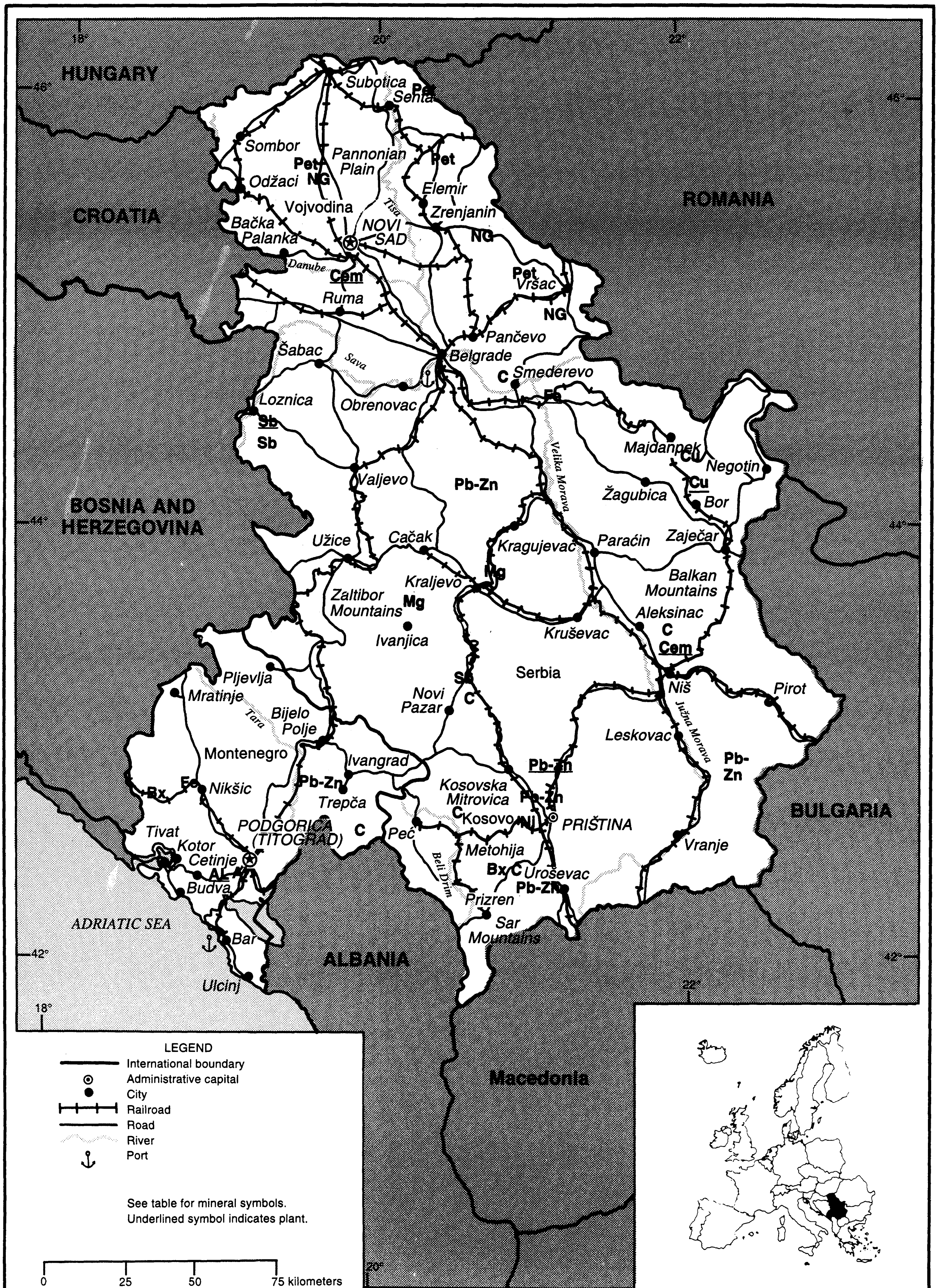
RUSSIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity		Quantity
Antimony		3,000
Asbestos		100,000
Bauxite		250,000
Cobalt		135
Copper		20,000
Diamond, industrial	million carats	35
Fluorspar		60,000
Iron ore	million metric tons	55,000
Lead		3,000
Magnesite		585,000
Manganese		15,000
Molybdenum		250
Nickel		6,300
Peat		160,000,000
Phosphate rock, marketable		240,000
Platinum-group metals	metric tons	2,000
Potash (K_2O equivalent)		3,000,000
Silver		17
Tin		265
Tungsten		230
Vanadium		5,000
Zinc		4,000

SERBIA and MONTENEGRO

AREA 102,350 km² **POPULATION 10.6 million**



THE MINERAL INDUSTRIES OF

SERBIA AND MONTENEGRO

By Walter G. Steblez

In 1993, owing to severe economic dislocations caused by the international trade embargo against Serbia and Montenegro, the country, with significant European capacities to produce refined aluminum, copper, lead, silver, and zinc, was forced to cut back industrial capacity utilization by an average of about 30%.

Reportedly, Serbia and Montenegro's gross domestic product (GDP) declined from US$23.4 billion in 1990 to $9.5 billion in 1993.[1] In 1993, the country's GDP declined by 30% compared with that of 1992—the sharpest decline of any year during this period. Limitations imposed on Serbia and Montenegro's mineral industries by the dissolution of the Yugoslav state, civil war, and the international embargo clearly had a depressive effect as closures and stoppages were reported in the country's ferroalloy, steel, and nonferrous metals-producing sectors. However, some activity was noted in the industrial minerals sector, where commercially useful deposits that were discovered and developed in recent years were put into operation. Additionally, geological survey and exploration work was conducted to locate new deposits of natural gas and petroleum.

GOVERNMENT POLICIES AND PROGRAMS

To ensure the availability of needed raw materials and equipment to the economy and to prevent potentially large-scale social unrest from occurring from rapid industrial closures and bankruptcies, the Government of Serbia and Montenegro apparently maintained the operation, to the extent possible, of the country's heavy industries, including those in the minerals sector. Few details, however, were available during the year concerning specific Government policies addressing economic reform and long-term plans to rationalize the major enterprises in Serbia and Montenegro's mineral industry.

The principal activities of the Government during the year involved military and international political issues related to the civil war that occurred in the former Yugoslavia. The usual efforts and programs of the Government, dealing with long-term economic reform and environmental protection and reclamation issues, were subordinated to the needs of a virtual war economy. The civil war, fought from 1991 though 1993, had dislocated routine domestic and foreign commerce because of the international embargo as well as the physical destruction of commercial and residential properties in large areas of Bosnia and Herzegovina and, to a lesser extent, Croatia. Without access to former domestic customers in the other republics of the former Yugoslavia, nor to international markets, large stockpiles of industrial goods had reportedly accrued during the year, which necessitated sporadic as well as long-term closures of some of the country's production capacities during the year.

ENVIRONMENTAL ISSUES

Given the civil war that has occured on the territory of the former Yugoslavia, little information has been made available on the industry-generated environmental pollution or the status of environmental remediation. On the other hand, it has been reasonable to categorize the environmental situation in Serbia and Montenegro as being similar to that of other former centrally planned economy countries where environmental protection issues obtained a much lower status and level of concern in past years than in Western European market economy countries. Significant soil, water, and atmospheric contamination had been caused by the country's heavy industry, including mining and other minerals industry branches.[2] The use of low grades of coal and lignite at the country's industrial and electric-power generating facilites has raised the emmission of SO_2 to levels that reportedly were twice that in Western Europe. Concentrations of both SO_2 and NO_x had been consistently far in excess of safety guidelines set by the World Health Organization. Uncontained emmissions from the country's nonferrous metals processing plants and smelters also contributed to acid rain, which has damaged many outlying forested areas.

Because of the civil war and associated international economic embargo of Serbia and Montenegro, funds necessary for even routine maintenance of tailings ponds and hazardous waste dumps were no longer available, and the likelihood of a widespread ecological disaster occurring has increased significantly. In 1992, an ecological disaster reportedly was narrowly avoided at the Brskovo Lead and Zinc Mine at Mojkovac in Montenegro when a swollen Tara River damaged a 100-meter section of a retaining dam at the mine tailing dump that contained an estimated 3.5 Mm^3 of highly toxic wastes (arsenic, cadmium, cyanides, lead, mercury, sulfides, etc.). Reportedly, the European Union (EU) approved a loan of $135,000 for repair of the dam. Long-term plans were reviewed for eliminating the tailings dump entirely from the proximity of the Tara River to prevent similar situations from occurring.

Should the Tara River become contaminated by the contents of the tailings dump, it reportedly would poison the downstream ecosystems along the entire length of the Danube riverine system.

PRODUCTION

Because of international trade sanctions, Serbia and Montenegro was forced to curtail the production of durable goods to a substantial degree during 1993, owing to the country's inability to openly export its manufactured goods or import needed raw materials for its industry. By midyear, the production level of the country's machine-building industry already had declined by 63% compared with the same period in 1992. Reportedly, passenger automobile and bus production had ceased and the output of trucks was at a level that was well below 50% of that during the same period in 1992. Also, shipbuilding activity declined to the level of repair and maintenance needed by the country's merchant vessels. The growth of both stockpiles and material shortages resulted in the sharpest decline of production of most minerals in recent years.[3] *(See table 1.)*

TRADE

The issue of Serbia and Montenegro's official foreign commerce and trade was moot in both 1992 and 1993 because of the international trade embargo. In the years preceding the dissolution of Yugoslavia and the subsequent civil war, the country was an important minerals trader in both Eastern and Western Europe.

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 for 1992. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Serbia and Montenegro's bauxite mining, alumina refining, and aluminum smelting facilities were chiefly in Montenegro. Rudnici Boksita Niksic operated bauxite mines in Montenegro, and RB Kosovo Klina operated mines in Serbia. The entire output of the latter operation in the past had 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, Montenegro'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.

In 1993, a very limited level of production reportedly was maintained at the country's bauxite mining, alumina refining, and aluminum smelting facilities at Niksic and Podgorica in Montenegro.[4]

Copper.—Serbia and Macedonia were the former Yugoslavia's principal copper-producing areas. Rudarsko Topionicki Bazen's (RTB) Bor mining, beneficiation, and smelting complex in Serbia accounted for all of the country's mine output of copper from its Bor, Majdanpek, and Veliki Krivelj open pit mines. On balance, the country's copper industry in 1993 appeared to be somewhat more robust than other branches of the metals producing sector. Compared with that of 1992, the production of copper ore in 1993 declined by slightly more than 20%.

Iron and Steel.—Serbia and Montenegro's iron and steel industry was among the sectors of the country's minerals industry that underwent the strongest decline in 1993. The production of pig iron, crude steel, and semimanufactures declined by 88%, 72%, and 76%, respectively compared with that of 1992. Denied the important formerly domestic markets in the republics of Bosnia and Herzegovina, Croatia, Macedonia, and Slovenia, as well as access to international commerce, the country's steel industry was forced into rapid contraction, marked by several industrial closures. The Boris Kidric Steelworks at Niksic in Montenegro underwent stoppages in April and November owing to shortages of fuel and other raw materials caused by the international embargo, as well as to a domestic transportation strike that interrupted deliveries of iron and steel scrap to the plant.[5] It was presumed that operations at the Cikatovo nickeliferous iron ore mine and ferronickel smelter in Glogovac also may have been interrupted or completely stopped during the year because most of the ferronickel produced at this facility was supplied to the Boris Kidric Steelworks.[6]

Lead and Zinc.—Serbia and Montenegro's share of the former Yugoslavia's total mine production of ore constituted slightly more than 40% in 1990. The country's 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 country's largest Pb-Zn deposit. 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 Serbia and Montenegro's refinery capacity had been used to toll refine lead for foreign consumers. In 1993, mine production of Pb-Zn ore declined by about 58% and the output of smelter lead and refined zinc by about 73% and 50%, respectively, compared with output levels of 1992.

Industrial Minerals

Serbia and Montenegro produced a large number of industrial minerals that included barite, bentonite, gypsum, kaolin, magnesite, and pumice for domestic needs as well as exports.

Reportedly, the development of a

basalt quarry had been completed during the year at Stragari near Kursumlija in Serbia. A crushing unit was installed at the site, and production was expected to begin by yearend. The material mined at Stragari was to be used in the production of insulation. Potential resources of basalt at this site were estimated at 5 Mm^3.[7]

Mineral Fuels

The negative trends that were discernible in the country's economy and minerals industry during the year were generally less descriptive of the country's fuel and energy sectors. The decline in the output of coal, natural gas, and petroleum, based on preliminary mid- and endyear results, was considerably less than that in the extraction and processing of metallic ores and nonmetallic minerals.[8] This was largely because of the "necessity" status of mineral fuels for the economy of Serbia and Montenegro. In past years, the country was a net importer of energy, mainly in the form of natural gas and petroleum that had been embargoed since 1992. Consequently, greater priority was given for the domestic production of fuels. Reportedly, the embargo did deny the country's petroleum industry needed imports of chemicals and spare parts, which caused problems for this sector throughout the year.[9] In early 1993, officials of Serbia's petroleum industry reportedly allocated US$123 million for exploration at 11 potential petroleum deposits.[10]

Reserves

The eventual development and transformation of Serbia and Montenegro's economy to a market-based system would require a reevaluation of the country's mineral resources from a market perspective. Reserves, as defined by market economies, are mineral deposits that can be mined at a profit under existing conditions with existing technology. In centrally planned and other nonmarket economy countries, such as the former 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. For a detailed explanation of the system that was used for measuring reserves, see the chapter on Russia in this volume.

INFRASTRUCTURE

Serbia and Montenegro's inland system of ways and communications consisted of 49,966 km of railroads and highways. The country's inland waterway system was another important component of this network. Although data in respect to the total length of the inland waterway system had not yet been officially reported, it was reported that a total of 11.6 Mmt of freight was carried on this system in 1991. The railroad system consisted of 3,947 km of 1.435-m-gauge track, of which 277 km was double track and 1,339 km was electrified. The highway and road system consisted of 46,019 km of paved, gravel, and earth-surfaced road, of which 26,949 km was paved, 10,373 km was gravel, and 8,697 km was earth surfaced. The country's merchant marine fleet consisted of 43 ships amounting to 1,449,049 dwt. Pipelines for crude petroleum were 415 km in length, while those for refinery products and natural gas were 130 km and 2,110 km, respectively.

OUTLOOK

Serbia and Montenegro in the long term could remain an important European producer of minerals because of its long history of mining and sufficient resources of a number of metalliferous and industrial minerals. The political future of the country and the types of Government structures that will emerge are difficult to foresee. However, in the postcivil war and/or postembargo period, Serbia and Montenegro will require extensive modernization of its infrastructure, giving added value to the construction materials and structural steels sectors in the country.

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[1]British Broadcasting Corporation SWB. EEW/0330, Apr. 28, 1994, p. WC/1, from Tanjug (Belgrade). 1217 GMT Apr. 25, 1994.

[2]Federal Secretariat for Development, Environment Division. Yugoslavia, National Report to the United Nations Conference on Environment and Developmemt, 1991.

[3]Foreign Broadcast Information Service. EEU-93-104, June 2, 1993, p. 53, from Ekonomska Politika (Belgrade). May 10, 1993, p. 21.

[4]Metal Bulletin Monthly. Feb. 1994, p. 59.

[5]Foreign Broadcast Information Service. EEU-93-080, Apr. 28, 1993, p. 54.

British Broadcasting Corporation SWB. EEW/0310, Dec. 2, 1993, p. WC/1, from Tanjug (Belgrade) 1518 GMT Nov. 18, 1993.

[6]Metal Bulletin Monthly. July 1993, p. 35.

[7]Industrial Minerals. Sept. 1993, p. 81.

[8]Foreign Broadcast Information Service. EEU-93-093, May 17, 1993, p. 45, from Belgrade Domestic Service, 0752 GMT May 15, 1993.

[9]Work cited in footnote 8.

[10]British Broadcasting Corporation. SWB. EE/W0265, Jan. 21, 1993, p. A/7, from Tanjug. 1010 GMT Jan. 11, 1993.

OTHER SOURCES OF INFORMATION

Agencies

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).

TABLE 1

SERBIA AND MONTENEGRO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Bauxite, gross weight	979,940	940,000	900,000	792,000	[3]102,000	1,000,000
Alumina, calcined, gross weight	267,000	269,000	208,000	[r]197,000	50,000	275,000
Metal, ingot, primary and secondary	74,000	81,000	[r]75,792	[r]66,947	[3]25,778	90,000
Antimony:						
Mine and concentrate ouput:						
Ore, gross weight	[e]40,000	[e]20,000	—	—	—	40,000
Sb content of ore	798	405	—	—	—	800
Concentrate, gross weight	[e]1,259	[e]530	—	—	—	1,500
Metal	1,081	248	19	10	—	3,000
Bismuth, metal	40	85	70	60	30	100
Cadmium	133	100	60	8	8	150
Chromite, concentrate (produced largely from imported ores)	13,329	11,610	4,250	—	—	20,000
Copper:						
Mine and concentrator output:						
Ore, gross weight thousand tons	26,252	26,463	25,758	23,085	[3]18,189	28,000
Cu content of ore	130,000	132,000	[e]100,000	90,000	70,000	135,000
Concentrate, gross weight	536,000	542,000	519,000	[r]423,000	390,000	600,000
Metal:						
Blister and anodes:						
Primary	101,606	105,908	[r]95,800	[r]79,953	40,000	120,000
Remelted	71,394	68,349	[r]58,724	[r]47,967	20,000	75,000
Total	173,000	174,257	[r]154,524	[r]127,920	60,000	195,000
Refined:						
Primary	101,877	102,221	[r]95,079	[r]78,560	30,000	120,000
Remelted	49,158	49,174	[r]39,114	[r]36,203	21,300	50,000
Total	151,035	151,395	134,193	114,763	[3]51,300	170,000
Gold, refined kilograms	[r]4,346	[r]8,173	[r]6,920	[r]7,330	7,000	8,500
Iron and steel:						
Ore and concentrate: Agglomerate	1,350,000	1,196,000	[r]685,995	[3]665,406	300,000	1,500,000
Metal: Ferroalloys:						
Ferronickel	17,102	11,850	11,775	6,481	5,000	20,000
Pig iron	881,000	767,000	526,000	[r]512,000	[3]62,000	1,000,000
Crude steel	1,170,000	1,012,000	725,000	[r]665,000	[3]183,000	1,500,000
Semimanufactures	2,019,000	1,856,000	[r]867,000	[r]733,000	[3]174,000	2,500,000
Lead:						
Mine and concentrate output:						
Ore, gross weight (Pb, Zn ore)	1,920,000	1,573,000	1,237,000	[r]804,000	[3]337,000	2,700,000
Pb content of ore	48,000	39,000	[r]33,910	[r]22,661	8,500	50,000
Concentrate, gross weight	58,000	46,000	[r]43,089	[r]25,504	12,500	160,000
Metal:						
Smelter, primary and secondary	89,000	70,000	51,000	30,000	8,100	100,000
Refined, primary and secondary	70,000	48,000	[r]44,091	[r]23,265	[3]6,393	100,000
Magnesium: Metal	6,105	5,788	[r]5,360	[r]4,055	4,000	8,000
Nickel: Metal, Ni content of Fe Ni[e]	5,100	3,600	2,400	2,000	2,000	6,000

See footnotes at end of table.

TABLE 1—Continued

SERBIA AND MONTENEGRO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Platinum-group metals:							
Palladium	kilograms	199	130	[r]155	[r]130	50	200
Platinum	do.	23	21	[r]22	[r]19	10	50
Selenium	do.	55,241	59,181	[r]64,140	[r]57,800	25,000	70,000
Silver	do.	[e]109,000	85,896	69,918	66,420	[3]25,144	150,000
Zinc:							
Zn content of Pb, Zn ore		42,000	33,000	[r]31,428	[r]19,718	6,000	50,000
Concentrator output, gross weight[e]		68,000	51,000	50,000	36,000	13,000	150,000
Refined zinc		69,000	61,305	38,648	[r]14,182	[3]6,985	130,000
INDUSTRIAL MINERALS							
Asbestos, all kinds		1,502	1,353	1,767	[r]1,175	2,000	5,000
Cement	thousand tons	2,931	2,723	2,411	2,036	[3]1,088	3,000
Clays:							
Bentonite		16,000	5,000	[r]260	[r]200	200	20,000
Ceramic clay		64,000	61,000	[r]51,213	[r]50,343	20,000	70,000
Fire clay:							
Crude		95,000	68,000	67,000	[r]97,000	40,000	100,000
Calcined		30,760	20,291	[e]16,600	[r][e]30,000	10,000	35,000
Kaolin:							
Crude		135,000	143,000	[r]153,000	[r]112,000	30,000	140,000
Washed[e]		24,000	18,000	15,000	13,000	5,000	30,000
Feldspar, crude		14,490	12,716	9,309	[r]5,111	3,000	16,000
Gypsum, crude		56,782	45,541	42,595	[r]47,865	20,000	60,000
Lime	thousand tons	846	671	680	565	[3]318	1,100
Magnesite:							
Crude	do.	352	252	210	185	[3]55	600
Caustic calcined		11,682	9,257	10,034	[r]12,958	5,000	30,000
Mica, all grades		794	802	[r]541	[r]281	300	900
Nitrogren, N content of ammonia	thousand tons	180	179	170	[r]148	120	400
Pumice and related volanic materials, volanic tuff		103,000	150,000	[r]102,000	[r]109,000	50,000	200,000
Quartz, sand	thousand tons	1,771	1,467	1,249	[r]922	300	2,000
Salt, all sources		32,864	43,815	34,603	46,945	[3]38,867	50,000
Sand and gravel excluding glass sand	thousand cubic meters	10,132	8,655	7,037	5,343	[3]1,668	13,000
Sodium compounds:							
Caustic soda		90,600	88,427	51,332	23,176	[3]4,086	95,000
Sodium sulfate		[e]25,000	[e]20,000	[r]18,951	[r]10,948	5,000	30,000
Stone, excluding quartz and quartzite:							
Dimension: Crude:							
Ornamental	square meters	[r]439,000	356,000	234,000	278,000	[3]213,000	500,000
Crushed and broken, n.e.s.	thousand cubic meters	4,676	4,222	4,059	[r]2,872	2,000	5,000
Other	cubic meters	15,419	13,607	10,445	[e]10,000	5,000	30,000

See footnotes at end of table.

TABLE 1—Continued
SERBIA AND MONTENEGRO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Sulfur:[e]							
Sulfur content of pyrite	thousand tons	292	219	61	[r]3	3	350
Byproduct:							
Metallurgy	do.	155	155	140	130	110	160
Petroleum	do.	1	1	1	1	1	1
Total	do.	448	375	202	[r]134	114	511
MINERAL FUELS AND RELATED MATERIALS							
Coal:							
Bituminous	thousand tons	132	137	122	102	[3]73	450
Brown	do.	768	676	690	703	[3]523	1,700
Lignite	do.	43,603	44,678	39,598	39,300	[3]36,829	45,000
Natural gas, gross production million cubic meters		660	646	749	846	[3]962	1,000
Petroleum:							
Crude:							
As reported	thousand tons	1,090	1,063	1,100	1,165	[3]1,148	1,300
Converted	thousand 42-gallon barrels	8,086	7,885	8,160	8,642	8,516	10,000
Refinery products[e]	do.	55,000	55,000	45,000	25,000	15,000	60,000

[e]Estimated. [r]Revised.
[1]Table includes data available through July 1994.
[2]In addition to commodities listed, common clay and diatomite also are produced, and tellurium may be recovered as a copper refinery byproduct, but available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

TABLE 2
SERBIA AND MONTENEGRO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand of metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Kombinat Aluminijuma Titograd	Plant at Titograd, Montenegro	200.
Aluminum	do.	Smelter at Titograd, Montenegro	100.
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	Rudnici Boksita, Niksic	Mines in Montenegro at Kutsko Brdo, Zagrad, Biocki Stan, Durakov Dol, and other locations	650.
Coal:			
Bituminous	Ibarski Rudnici Kamenog Uglja	Mines at Jarando and Usce, near Baljevac na Ibru, Serbia	250.
Lignite	SOUR Kolubara, Rudarsko Energetsko Industrijski Kombinat, RO	Opencast mines: Polje B and Polje D	10,000.
Do.	Kolubara Povrsinski 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 Obilic, Serbia	2,000.

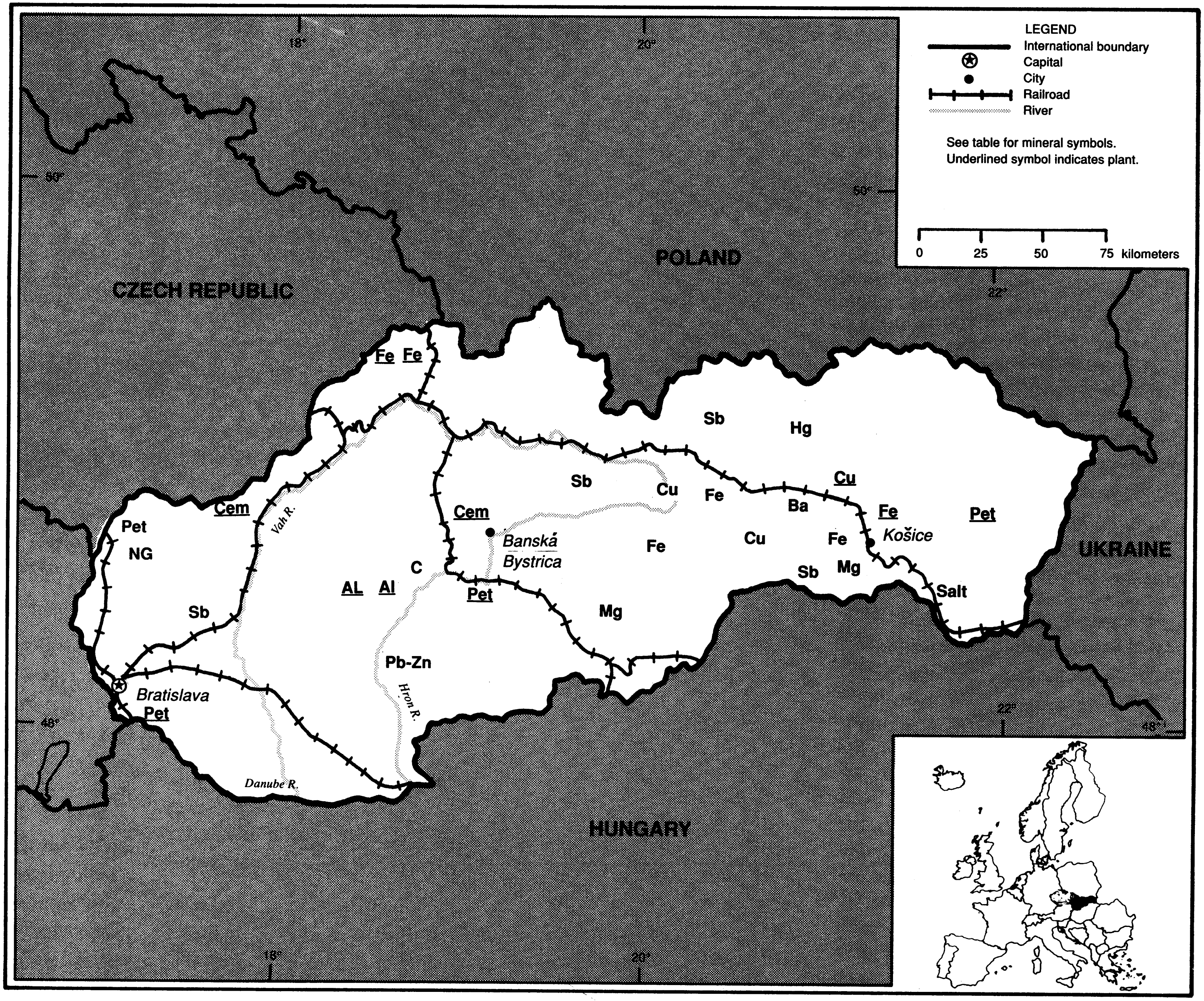
TABLE 2—Continued
SERBIA AND MONTENEGRO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand of metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Becinska Fabrika Cementa	Plant at Beocin, Serbia	2,031.
Do.		Fabrika Cementa Novi Popovac	Plant at Popovac, Serbia	1,613.
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.
Lead-zinc ore		Rudarsko-Metalursko-Hemijski Kombinat za Olovo i Cink Trepca	Mines at Ajvalija, Kopanaonik, Badovac; Trepca, Blagodat, Lece; Veliki Majdan, Tisovak; and Kisnica, Rudnik, Veliki, and Majdan, Suplja Stijena	5,000.
Do.		do.	Mills at Kriva Feja, Lece, Rudnik, Badovac, Leposavic, Zvecan, and Maravce, Suplja Stijena	63,160.
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.
Magnesite		Rudnici Magnezita "Sumadija"	Mine and plant at Sumadija, 20 kilometers northwest of Cacak	120 conc.
Do.		Rudnik i Industrija Magnezita "Strezovce"	Opencast mine at Beli Kamen, Strezovce, near Itiova Metrovica, Serbia	300.
Do.		do.	Sinter plant at Strezovce	40.
Do.		Magnohrom, Rudnik Magnezita "Magnezit"	Mine at Bela Stena, Baljevac na Ibru, Serbia	30.
Natural gas	million cubic feet	Naftaplin (Naftagas), RO za Istrazivanje, i Prozvodnju Nafte i Gasa	Natural gasfields in Serbia: Kikinda and others	30,000.
Petroleum:				
Crude	thousand barrels per day	Naftagas, Naftna Industrija	Oilfields in Serbia: Kikinda and others	30.
Refined		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.
Pig iron		Metalurski Kombinat, Smederevo	Blast furance at Smederevo, Serbia	720.
Steel, crude		do.	Plant at Smederevo, Serbia	600.
Zinc metal		Rudarsko Metalursko Hemijski Kombinat Olova i Cinka Trepca, Metalurgija Cinka	Electrolytic plant at Titova Metrovica, Serbia	40.
Do.		Hemijska Industrija Zorka	Electrolytic plant at Sabac, Serbia	40.

SLOVAKIA

AREA 48,845 km² **POPULATION 5.4 million**



THE MINERAL INDUSTRY OF

SLOVAKIA[1]

By Walter G. Steblez

By European standards, Slovakia was a modest producer of ferroalloys, iron and steel, nonferrous metals, and mineral fuels such as coal and petroleum. However, the country was a significant regional producer of a broad range of industrial minerals that were sufficiently abundant for both domestic and export markets.

Based entirely on full political consensus and bilateral agreement between its constituent republics, Czechslovakia formally separated into Slovakia and the Czech Republic at the start of 1993. With an area and population about 60% and 50%, respectively, of that of the Czech Republic, Slovakia's industrial base also was substantially smaller than that of the Czech Republic. In 1993, the country's continued but gradual transition to a market economy system required further alignment of industrial output and other economic indicators with market needs. Because of this adjustment, the country's gross domestic product in 1993 registered negative growth, falling by slightly more than 4%, compared with that of 1992.[2] Activities in the country's mineral industry included closures in the nickel-cobalt sector as well as foreign investment interest in the aluminum, gold, and steel sectors of the mineral industry.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Slovakia maintained most policies and programs dealing with the rationalization and denationalization of the economy that were adopted by the preceding Government of Czechoslovakia. However, these reforms were implemented by the Government of Slovakia at a generally slower rate than that adopted in the Czech Republic. Apart from the domestic privatization program through the Government's State Property Fund, the Government continued to encourage foreign investment in the country's mineral and other industrial projects by allowing joint ventures and the full acquisition of former state-owned properties.[3]

ENVIRONMENTAL ISSUES

Environmental pollution from industrial point sources, including those associated with the mineral industry, remained an important issue for the country in 1993. As in other former centrally planned economy countries of Europe, severe air pollution in Slovakia has been caused by the extensive use of high-sulfur, low-grade coal and lignite to power the country's thermal electric power stations and by the country's chemical and metallurgical industries.

Despite the division of Czechoslovakia into separate countries, legislation adopted since 1990 to protect the environment has remained operative. CSFR Law No. 309/91 on the Protection of the Atmosphere from Polluting Substances (9/91) codified regulations concerning air pollution; defined sources of pollution and set pollution limits; defined legal obligations of pollution source operators; and defined air pollution control authorities and fees and penalties associated with atmospheric pollution. Czechoslovak Law on Environment of 12/91 established the basic definitions and principles regarding environmental protection as well as the obligations of "legal and physical persons (bodies)" for protecting the environment during the use of natural resources.

To ensure effective control and management of severe regional environmental pollution, in April Slovakia and Poland signed a cooperative agreement on environmental protection. Both countries agreed to work toward eliminating threats to the environment that could have an impact beyond each country's border.

PRODUCTION

In 1993, following major economic adjustments to market economy requirements in 1992, the drop in output of most mineral commodities in Slovakia appeared to have slowed considerably compared with that of 1992. Additionally, the reduction in the rate of production decline in 1993 also was partially the outcome of a more cautious approach to implementing market economy reforms by the country's political leadership. *(See table 1.)*

TRADE

Despite the increasing orientation of the country's foreign commerce toward Western European market economy countries in recent years, Russia as well as other former member countries of the Council for Mutual Economic Assistance (CMEA) remained Slovakia's chief partners in mineral commodity trade. Russia continued to be Slovakia's principal supplier of natural gas and petroleum, and Hungary and Ukraine were, respectively, major suppliers of bauxite and iron ore to Slovakia's metal industries.

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 1993. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—In September, ZSNP AS, Slovakia's aluminum producer at Ziar nad Hronom, the European Bank for Reconstruction and Development (EBRD), and Norsk Hydro Aluminium AS (Norsk) of Norway concluded an agreement to form a new corporate entity, Slovalco, from Slovakia's state-owned aluminum producer. According to this agreement, EBRD would provide $125 million and Norsk $15 million to complete the modernization of Slovalco's aluminum plant. Norsk would control 10% of the company's shares and would participate in Slovalco's operations dealing with the production and marketing of aluminum.[4] Norsk has been involved in the modernization of the Ziar nad Hronom aluminum reduction facility since 1986. Through 1992, about 65% of the aluminum facility's modernization had been completed. Subsequently, the company's financial shortages forced a temporary halt to further modernization. At full capacity, the modernized facility would be able to produce 108,500 mt/a of primary metal as opposed to 70,000 mt/a prior to the completion of the modernization program. Furthermore, aluminum production could be raised to 132,000 mt/a by additionally smelting secondary metal. Significantly, Norsk management has indicated that this program would serve as a model for similar future investment considerations in other former European CMEA-member countries.

Gold.—Following the dissolution of Czechosovakia, the disposition of Czechoslovakia's state-owned gold reserves became an important issue concerning both the Czech and Slovak Governments. Reportedly, at the beginning of the year, an agreement was reached between the Czech Republic and Slovakia to divide the former Czechoslovak gold reserves according to a 2:1 ratio. This formulation was to divide the 105-ton reserve by allotting about 70 tons to the Czech Republic and 35 tons to Slovakia. Approximately 7.5 tons of gold was a major source of dispute, with the Czech Republic claiming that it must be considered part of the 105 tons of gold that was owned by the former Czechoslovakia. Slovakia, however, contended that the 7.5 tons of gold in question was a sum that was donated to the Government of Slovakia during Slovakia's previous period of separate statehood from 1939 through 1944.[5]

In 1993, Hodrusa Ore Mines (Hodrusa), the state-owned mining operation in central Slovakia, announced plans to form a joint venture with Keylock Resources Inc. (Keylock) of Calgary, Canada, to mine gold in the central part of the country. Hodrusa, a producer of copper, gold, and silver, upon achieving full privatization in 1994, intended to sell 50% of its shares to Keylock. Reportedly, Keylock already had financed experimental drilling at the Rozalia Mine at Banska Bystrica that produced about 66 kg of gold in 1992. Yearend output of gold by Hodrusa had been expected to reach 220 kg.

Iron and Steel.—One of the most important foreign commercial issues concerning Slovakia's steel industry during the year was that of quotas on exports of steel from Slovakia and the Czech Republic to the European Union (EU). Given the sharp increase of exports of steel products to the EU by the Slovak and Czech steel industries in 1992 compared with those of 1991, Eurofer, the EU's steel industry association, petitioned the EU Commission to impose import quotas on Slovak and Czech steel products. The EU's monthly average imports of wire rod in 1992 from the Slovak and Czech Republics reached 16,000 tons compared with 12,000 tons in 1991. Similarly, the EU's imports of hot-rolled coil reached 29,000 tons compared with 11,000 tons in 1991, and that of cold-rolled sheet reached 14,000 tons compared with 7,000 tons in 1991. Reportedly, large tonnages of steel have been entering the EU market through Hungary, which has had a high steel export quota to the EU relative to the output level of Hungary's steel industry.[6] In early 1993, the EU imposed temporary antidumping quotas on steel imports from Eastern Europe. The EU's proposed export tonnage quotas from the Slovak and Czech Republics were to extend at least through 1995. To help promote its sales to Western Europe, Slovakia's only integrated steel producer, VSZ Kosice (VSZ), formerly the East Slovakia Iron and Steel Works, formed an equal share joint venture with Future Steel Trading Ltd. of the United Kingdom. The joint venture, VSZ UK, would function as the sole source of steel exports from Slovakia to Ireland and the United Kingdom. VSZ Kosice also held talks with Italy's Government-owned steel producer, Ilva S.p.A., to create a similar joint venture for marketing VSZ's electric steel products. Similar discussions during the year also reportedly were held with metallurgical companies in France, the Netherlands, and Spain.[7] Additionally, VSZ also acquired the Finow rolling mill in eastern Germany as a wholly owned subsidiary operation.[8] To help offset the EU's export restrictions on its steel products in 1993, VSZ reported having exported 800,000 tons of rolled steel to China and other Far Eastern countries.[9]

Nickel and Cobalt.—The process for decommissioning the Sered nickel and cobalt enterprise (Niklova Huta) was initiated in July. Relatively high transportation costs for Albanian nickeliferrous iron ore that primarily had been used at this facility and the lack of a major domestic consumer of nickel were cited among the reasons for the enterprise's closure.[10]

Industrial Minerals

Industrial mineral products that should continue to have a significant role in the country's domestic and export markets include cement, gypsum, lime, magnesite, perlite, and stone.

Mineral Fuels

In April, the Government approved a

plan for denationalizing the country's coal mining industry. Under the provisions of this plan, the Ministry of Industry would oversee the privatization of the coal mining sector beginning in 1994, but also would impose stricter regulations requiring compliance with environmental regulations by industry than has been the case in past years. It was envisaged that coal production would be maintained at slightly more than 4 Mmt/a, but that the country's consumption of coal would eventually decrease from about 11 Mmt/a to slightly more than 6 Mmt/a. The status of the former Czechoslovakia's natural gas transit pipeline from Russia was settled by industry representatives of the Czech and Slovak Republics in early January with the decision to place the administration of the pipeline under the authority of the Slovak Gas Co. About two-thirds of the gas supplied by this pipeline would be consumed in Slovakia and one-third in the Czech Republic.[11]

Reserves

Taking into account Slovakia's efforts at transition to a market economy, the country's mineral reserves will have to be reevaluated under market economy conditions. 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 former CMEA countries, including Slovakia, the prior policies for centrally planned industrial development often had more to do with political than economic considerations. For a detailed explanation of the system that has been used in the former CMEA countries for measuring reserves, see the chapter on Russia in this volume.

OUTLOOK

Slovakia's mineral industries should continue to supply the country with steel, industrial minerals, and mineral fuels that gain importance during the modernization of the infrastructure and the transition of the economy to a market system.

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[1]Text prepared June 1994.
[2]BBC SWB. EEW/0323, Mar. 10, 1994, p. WA/2, from Press Agency of the Slovak Republic 1355 GMT, Feb. 28, 1994.
[3]FBIS. WEU-93-168, Sept. 1, 1993, p. 22, from Republika, Aug. 26, 1993, p. 4, and Slovensky Dennik Aug. 24, 1993, p. 5.
[4]Alu News (Hydro Aluminium). No. 3, Oct. 1993, p. 2.
[5]FBIS. Mining Journal (London). Jan. 15, 1993, p. 47. EEU-056 Mar. 25, 1993, p. 11, from Bratislava Rozhlasova Stanica Slovensko, 1100 GMT Mar. 24, 1993.
[6](See steel section in the Mineral Industry of Hungary for 1993.) Metal Bulletin. Jan. 25, 1993, p. 21.
[7]———. May 10, 1993, p. 19, and Feb. 8, 1993, p. 21. New York Times. June 19, 1993, p. 4.
[8] BBC SWB. EEW/0300, Sept. 23, 1993, p. WA/2, from Pravda of Bratislava, Aug. 26, 1993.
[9]———. EEW/0322, Mar. 3, 1994, p. WA/2, from CTK, Prague, 1444 GMT, Feb. 26, 1994.
[10]———. EEW/0289, July 8, 1993, p. A/8, from CTK, 1033 GMT, July 1, 1993.
[11]———. EEW/0264, Jan. 14, 1993, p. A/7, from CTK 1647 GMT, Jan. 6, 1993.

TABLE 1
SLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Alumina		205,000	175,000	186,600	142,685	140,000	210,000
Aluminum ingot, primary		32,576	30,067	49,387	60,425	60,000	69,000
Antimony, mine output, Sb content[e]		250	400	450	450	450	500
Cobalt metal		50	59	60	68	—	75
Copper:							
Mine output:							
Ore, gross weight		435,000	339,000	225,000	156,000	150,000	475,000
Concentrate:							
Gross weight		15,363	13,477	11,313	2,205	2,000	18,000
Cu content[e]		3,500	3,100	2,600	[2]537	500	4,500
Metal:							
Smelter, primary[e]		5,500	[2]4,300	3,500	3,000	3,000	6,000
Refined, primary and secondary		26,920	24,606	25,273	28,061	28,000	30,000
Gallium metal	kilograms	2,000	1,345	[e]1,400	[e]1,300	[e]1,300	3,000
Gold metal[e]	do.	15	18	18	18	18	20
Iron and steel:							
Iron ore:							
Gross weight	thousand tons	1,674	1,728	1,627	1,350	1,300	1,800
Fe content	do.	470	480	[e]460	[e]370	350	500

See footnotes at end of table.

TABLE 1—Continued
SLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993e	Annual capacitye (Jan. 1, 1994)
METALS—Continued							
Iron and steel—Continued:							
Metal:							
Pig iron	thousand tons	3,515	3,561	3,163	3,020	3,000	3,700
Ferroalloys, total electric furnace	do.	166	169	162	122	120	270
Ferrochromium[3]	do.	30	32	34	38	35	50
Ferromanganese	do.	100,159	101,600	90,000	70,000	65,000	120,000
Crude steel	do.	4,741	4,779	4,107	3,020	3,000	4,800
Semimanufactures	do.	3,524	3,524	3,275	e3,100	3,000	3,600
Lead, mine output:							
Concentrate, gross weight		3,124	3,853	4,634	e3,500	3,500	5,000
Pb contente		1,600	2,000	2,400	1,800	1,800	2,500
Mercury		129	124	75	60	50	150
Nickel metal, primary		3,800	2,970	e2,400	1,621	—	5,000
Zinc:							
Mine output:							
Ore, gross weight		193,000	212,000	180,000	e180,000	175,000	200,000
Concentrate, gross weight		4,369	5,164	6,851	e6,900	6,500	7,000
Zn contente		1,900	2,300	3,100	3,100	2,900	1,500
Metal, secondary		1,296	978	811	1,070	1,000	1,500
INDUSTRIAL MINERALS							
Barite		50,800	87,000	e85,000	31,313	30,000	100,000
Cement, hydraulic	thousand tons	4,100	3,781	2,680	e2,500	2,500	4,500
Clays:							
Bentonitee		33,000	29,000	25,000	25,000	25,000	35,000
Kaolin		20,000	26,000	e25,000	e25,000	25,000	30,000
Diamond, synthetice	carats	5,000	5,000	5,000	5,000	5,000	5,000
Dolomite	thousand tons	4,742	4,646	e4,500	e4,500	4,500	6,000
Fertilizer, manufactured:							
Nitrogenous, N content		268,383	268,759	175,199	e175,000	170,000	300,000
Phosphatic, P_2O_5 content		110,206	110,797	121,988	e120,000	120,000	130,000
Potassic, K_2O content		55,099	54,526	11,494	e11,000	10,000	70,000
Mixed		253,961	246,718	55,725	e50,000	50,000	300,000
Gypsum and anhydrite, crude		102,000	102,000	75,000	e75,000	75,000	110,000
Lime, hydrated and quicklime	thousand tons	1,072	1,072	1,076	e1,070	1,070	1,100
Magnesite, crude		642,000	561,000	328,000	1,267,000	1,200,000	2,500,000
Nitrogen: N content of ammoniae		300,000	250,000	200,000	250,000	200,000	350,000
Perlite		62,000	54,000	e50,000	e50,000	50,000	70,000
Pyrite, gross weighte		100,000	100,000	100,000	100,000	100,000	120,000
Salt		—	93,000	73,969	e70,000	70,000	100,000
Stone:							
Limestone and other calcareous stones	thousand tons	8,505	6,487	4,206	e4,500	4,500	15,000
Quarry stone, not further described	thousand cubic meters	10,531	8,389	5,197	e5,000	5,000	12,000
Zeolite		22,000	26,000	e25,000	e25,000	25,000	30,000

See footnotes at end of table.

TABLE 1—Continued
SLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS							
Coal, brown and lignite	thousand tons	5,269	4,766	4,148	[e]4,000	3,500	6,000
Coke:							
Metallurgical	do.	1,954	2,005	1,844	[e]1,800	1,800	2,500
Unspecified	do.	302	335	331	[e]300	300	500
Gas, manufactured, coke oven	million cubic meters	972	981	912	[e]900	900	1,100
Petroleum:							
Crude:							
As reported	thousand tons	97	73	72	[e]70	70	100
Converted	thousand 42-gallon barrels	658	495	488	[e]475	475	700
Refinery products[e]	do.	55,000	40,000	40,500	40,500	40,500	70,000

[e]Estimated.
[1]Table includes data available through April 30, 1994. In addition to the commodities listed, arsenic, diatomite, feldspar, illite, sodium compounds, sulfur, sulfuric acid, and talc are produced, but information is inadequate to make reliable estimates of output levels.
[2]Reported figure.
[3]May include some FeCrSi and FeNi, if any was produced.

TABLE 2
SLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

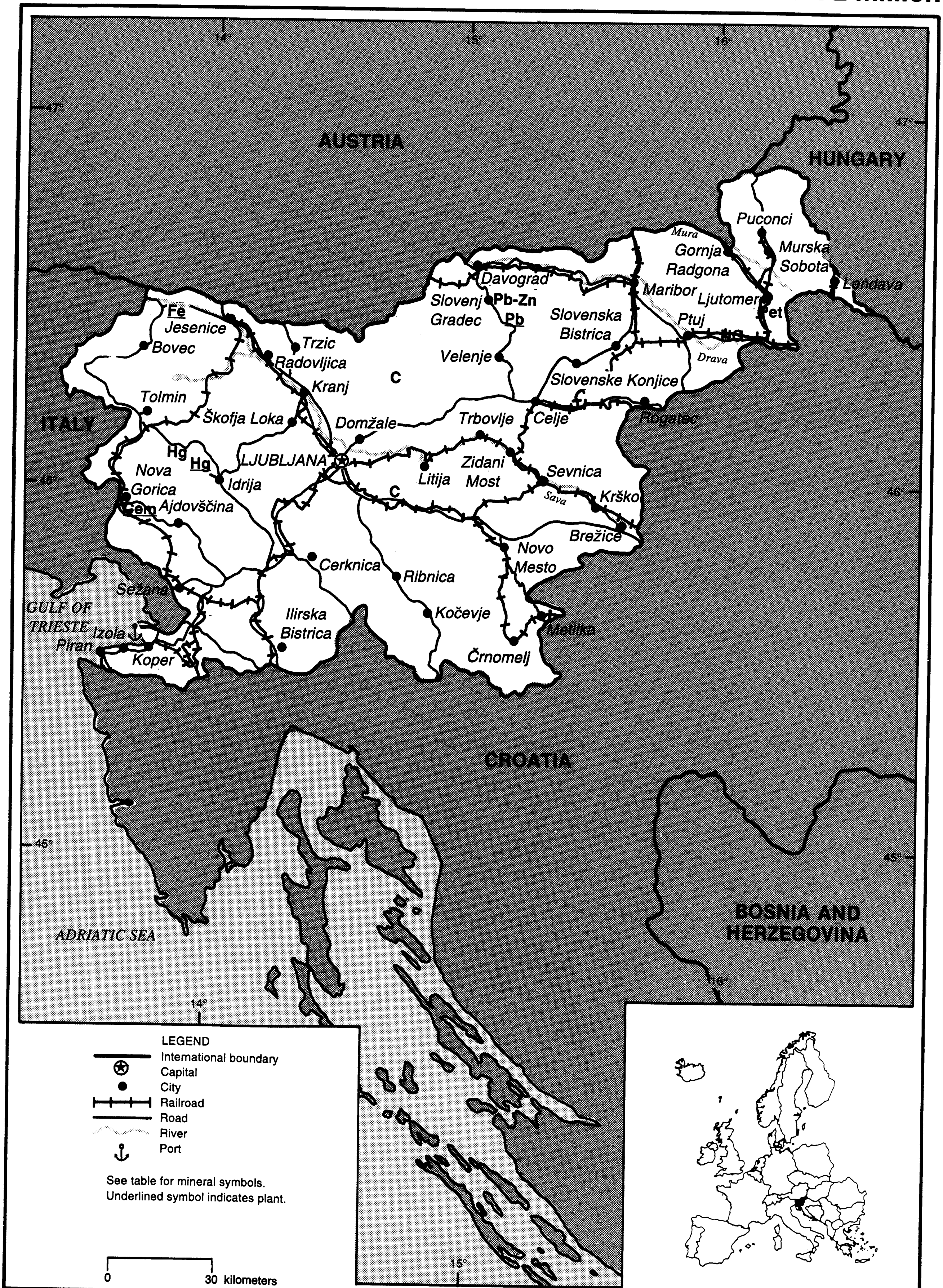
(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location[2]	Annual capacity
Aluminum		ZSNP AS Aluminum Works	Ziar nad Hronom, central Slovakia	60
Antimony:				
Do.		Liptovska Dubrava	Central Slovakia	50
Do.		Pezinok	West Slovakia	50
Smelter		Vajskova	Central Slovakia	2
Cement		Lietavska Lucka, Stupava, and Turna	Slovakia	5,400
Coal:				
Brown		ULB administration	Prievidza, central Slovakia	6,800
Copper:				
Ore		Slovinky, Hodrusa-Hamre, and Rudnany	Central Slovakia	500
Refinery		Krompachy	do.	27
Galium	kilograms	ZSNP AS 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		Banska Stiavnica	do.	200
Magnesite		SMZ administration	East Slovakia	550
Mercury	metric tons	Dudnik, Malachov, and Rudnany	Central Slovakia	150
Nickel, smelter		Niklova Huta	Sered, south Slovakia	5
Petroleum:				
Refinery		Bratislava, Strazske, and Zvolen	Slovakia	NA
Steel, crude		Vychodoslovenske Zeleziarne sp (East Slovak Iron and Steel Works)	Slovakia, Kosice	4,000
Do.		Svermove Zeleziarne	Slovakia, Podbrezova	600

NA Not available.
[1]All mining companies are Government owned.
[2]Names and Locations of mines and crude oil refineries are identical.

SLOVENIA

AREA 20,296 km² **POPULATION 2 million**



THE MINERAL INDUSTRY OF

SLOVENIA[1]

By Walter G. Steblez

Slovenia was a modest producer of minerals within the framework of the minerals industry in the former Yugoslavia. According to data on industrial production for 1990, the last year for which complete comparative production statistics for Yugoslav Republics were available, Slovenia produced about 29% of the former Yugoslavia's primary aluminum and 46% of the total electric furnace steel output. Although industrial minerals and fossil fuels were produced, to meet industrial requirements the country was a net importer of many of these commodities. Slovenia, reportedly, had the most modern and technologically advanced fabricating industry among the republics of the former Yugoslavia and a per capita national income equal to about twice the average of the former Yugoslavia.

GOVERNMENT POLICIES AND PROGRAMS

In 1993, the Government of Slovenia continued efforts to limit economic dislocations, in terms of employment, production, and foreign commerce, caused by the disintegration of Yugoslavia. Concurrently, the Government sought to limit the rate of inflation and to bring the country's economy in line with Western European market practices. Enterprises in the country's mineral industries no longer were required to produce at all costs as many of them did under central planning in the former Yugoslavia. Closure of unprofitable operations reportedly would be continued as had been the case with mercury and uranium mining. In 1993, the Government reportedly did attempt to create financial incentives for foreign investors in the country's steel industry.

ENVIRONMENTAL ISSUES

Major concern over environmental issues in Slovenia reportedly had warranted the inclusion of provisions for protecting the environment in the country's constitution. The constitution stressed the importance of protecting the environment and defined the Government's role in controlling the quality of the country's environment. In 1993, the draft of the Environmental Protection Law outlined the Government's general policies for protecting the environment and specified systems for commercial natural resource use, the establishment of an inspection directorate, and the establishment of provisions for monitoring, environmental impact assessments, and research. The Slovenian Ministry of Environmental Protection and Physical Planning was established to undertake this work. Major sources of pollution included the use of lignite and brown coal, nonferrous metals processing, and the petrochemical sectors.

PRODUCTION

The production table for Slovenia was compiled from data presented in "Statisticni Letopis Republike Slovenije" (The Statistical Abstract of the Republic of Slovenia) for 1992 and in a variety of earlier statistical publications of the former Yugoslavia through 1991. *(See table 1.)*

TRADE

The former domestic Yugoslav market was an important element in Slovenia's mineral trade. With the dissolution of Yugoslavia, commerce with the country's former domestic trading partners became classified as foreign trade. Moreover, trade with Slovenia's former trading partners in the former constituent republics of Yugoslavia largely had become untenable because of the civil wars in the Republics of Bosnia and Herzegovina and Croatia in 1991-93 and international trade embargoes levied against several republics of the former Yugoslav federation that were Slovenia's traditional commercial partners. Consequently, Slovenia sought to orient its trade to a greater degree toward markets in the European Union.

STRUCTURE OF THE MINERAL INDUSTRY

Table 2 lists the apparent administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1993. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum and steel were the major metal commodities produced in Slovenia. Slovenia produced alumina and aluminum at the refinery and smelter operated by Unial, Tvornica Glinice i Aliminija Boris Kidric in Kidricevo. Lacking a domestic bauxite mining industry, Slovenia in past years relied on bauxite mined in other constituent republics of the former Yugoslavia. In common with other raw materials produced in the former Yugoslav republics that Slovenia's processing and manufacturing sectors depended on, the need for obtaining new sources of bauxite continued to be a concern for the country's aluminum industry.

Slovenia's steel industry consisted of

three steel mills operated by Zdruzeno Podjetje Slovenske Zeljezare at Jesenice, Ravna na Kuroskem, and Štore. The combined capacity at the facilities was about 800,000 mt/a of steel. Although open-hearth steel capacity at the Jesenice steel mill amounted to about 300,000 mt/a, only a small portion of this capacity had been utilized in recent years. More than 90% of the steel produced in the country was at electric furnaces at the three steel mills that used steel scrap as a feedstock. Ferroalloys were produced at the Tovarna Dusika Ruse ferroalloys plant. In recent years, the production of ferrosilicon was reported to have been reduced by 75% to about 4,000 mt/a; that of ferrochromium was reduced by about 50% to about 8,000 mt/a, half of which has been designated for export. The company reportedly also produced very small quantities of low-C ferrochromium and ferrosilicomanganese. Most of the company's ferrochromium production has been sold directly to the country's stainless steel producer, Slovenia Steel; some reportedly has been exported to Austria. On the other hand, the country's entire output of ferrosilicon has been consumed by its domestic steel producers.

Industrial Minerals

Apart from being a substantial producer of glass sand (about 400,000 mt/a), Slovenia was a modest producer of clays, gypsum, ornamental stone, and other industrial minerals, mostly for domestic uses.

Mineral Fuels

Slovenia was the only republic in the former Yugoslav federation to have produced all forms of commercial energy carriers: coal, lignite, natural gas, petroleum, and uranium. The production of uranium, however, was discontinued in 1991. The country generated electricity by means of hydroelectric power stations and conventional as well as nuclear thermal electric power stations. In December 1993, the management of Elektrogospodarstvo Slovenije reportedly announced plans to close the country's nuclear power station at Krsko owing to a shortage of capital to operate the facility and a lack of a suitable location for the storage of radioactive waste.

Reserves

The transformation of Slovenia's economy to a market-based system, will involve a reevaluation of the country's mineral resources from a market perspective. For a detailed description of the system that was used to measure reserves in the former Yugoslavia, see the chapter on the Mineral Industry of Russia in this volume.

OUTLOOK

Slovenia had not been severely affected by the civil war that occurred in the former Yugoslavia, and the country's industries and infrastructure remained mostly intact. Because of Slovenia's relatively advanced industry and infrastructure, the country should adapt more easily to Western European economic practices than most other former centrally planned economy countries in Central Europe. The country's mineral industries, apart from the steel industry, will likely have even a smaller profile in the economy than in previous years.

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[1]Text prepared in July 1994.

OTHER SOURCES OF INFORMATION

Agency

Mining Institute of Ljubljana Ljubljana, Slovenia

Publications

Rudarsko-Matalurski Zbornik (Mining and Metallurgy Quarterly for Geology, Mining, and Metallurgy) Ljubljana, Slovenia.

Statisticni Letopis Republike Slovenije (Statistical Abstract of the Republic of Slovenia) Ljubljana, Slovenia.

TABLE 1

SLOVENIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS						
Aluminum:						
Alumina	[r]99,000	83,000	[r] [e]48,000	[r] [e]45,000	40,000	120,000
Metal, ingot; primary and secondary	[r]97,637	[r]99,508	[r]90,164	85,000	80,000	160,000
Iron and steel:						
Metal: Ferroalloys:						
Ferrochromium	20,880	16,734	12,518	[r]17,104	9,000	25,000

See footnotes at end of table.

TABLE 1—Continued

SLOVENIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued						
Iron and steel—Continued						
Metal—Continued:						
Ferrosilicochromium	—	—	—	—	—	25,000
Ferrosilicocalcium[e]	[3]144	835	500	400	200	1,000
Ferrosilicon	24,980	16,901	[r][e]8,000	[r][e]6,000	4,500	25,000
From electric furnaces	751,000	504,000	[r]287,000	350,000	350,000	800,000
Semimanufactures[e]	[3]533,000	[r]300,000	[r]200,000	[r]100,000	100,000	600,000
Lead:						
Mine and concentrator output:						
Ore, gross weight (Pb Zn-ore)	148,000	137,000	[r]162,000	152,225	—	300,000
Pb content of ores	2,974	2,239	[r][e]2,600	2,000	—	6,000
Concentrate, gross weight	3,593	2,744	[r][e]2,500	1,774	—	6,000
Metal:						
Smelter, primary and secondary	19,360	23,726	[r][e]15,000	6,000	6,000	25,000
Refined, primary and secondary	7,845	[r]12,163	[r]9,571	4,000	4,000	15,000
Mercury[e] kilograms	[3]51,000	37,000	9,000	[r]7,000	[3]—	90,000
Silver do.	3,624	1,432	[e]800	400	—	5,000
Uranium:						
Mine output, gross weight ore	125,995	80,457	—	—	—	130,000
Concentrate	101	58	—	—	—	110
U_3O_8 content[e]	71	40	[3]—	—	—	75
Zinc:						
Zinc content of Pb-Zn ore	4,679	4,097	[e]2,500	1,550	—	5,000
Concentrate output, gross weight	6,493	6,255	[e]6,000	5,567	—	7,000
Zn alloys from smelter[e]	[3]3,200	3,000	3,000	2,500	2,500	4,000
INDUSTRIAL MINERALS						
Cement thousand tons	1,175	1,142	[e]973	950	950	1,500
Clays:						
Ceramic clay, crude	2,942	2,944	[e]2,500	2,500	2,000	3,000
Fire clay, crude	4,597	3,124	[e]3,000	3,000	3,000	6,000
Kaolin:						
Crude	26,736	13,559	15,000	15,000	10,000	30,000
Washed[e]	7,000	5,000	5,000	5,000	4,000	10,000
Gypsum, crude[e]	16,000	16,000	12,000	10,000	10,000	17,000
Lime thousand tons	493	472	[e]350	250	250	500
Pumice and related materials, volcanic tuff[e]	105,000	100,000	90,000	50,000	40,000	110,000
Quartz, quartzite, glass sand:						
Quartz and quartzite	18,759	11,383	[e]12,000	10,000	10,000	20,000
Glass sand	483,000	390,000	[e]350,000	300,000	200,000	500,000
Total	501,759	401,383	[e]362,000	310,000	210,000	520,000
Salt, all sources[e]	[3]—	3,500	[r]8,000	8,000	8,000	10,000
Sand and gravel, excluding glass sand thousand cubic meters	2,899	2,519	[e]2,300	2,000	2,000	5,000
Stone, excluding quartz and quartzite:[e]						

See footnotes at end of table.

TABLE 1—Continued

SLOVENIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
MINERAL FUELS AND RELATED MATERIALS							
Dimension: Crude:							
Ornamental	cubic meters	593,000	r359,000	r382,000	300,000	300,000	600,000
Other	do.	3,700	3,500	3,000	3,000	3,000	5,000
Crushed and brown, n.e.s.	thousand cubic meters	1,669	1,700	1,500	1.000	1,000	3,000
Coal:							
Brown coal	thousand tons	1,652	1,372	r1,252	r1,100	1,100	2,500
Lignite	do.	4,617	4,210	r3,906	4,000	4,000	6,000
Natural gas, gross producing	million cubic meters	r34	24	r19	20	20	35
Petroleum:							
Crude:							
As reported	thousand tons	r2,653	r2,545	r2,399	r2,400	2,400	3,500
Converted	thousand 42-gallon barrels	r19,700	r19,000	r18,000	r18,000	18,000	22,000
Refinery products[e]	do.	4,500	4,700	3,800	3,800	3,500	5,000

[e]Estimated. [r]Revised.

[1]Table includes data available through July 1994.

[2]In addition to commodities listed, common clay also was produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TABLE 2

SLOVENIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

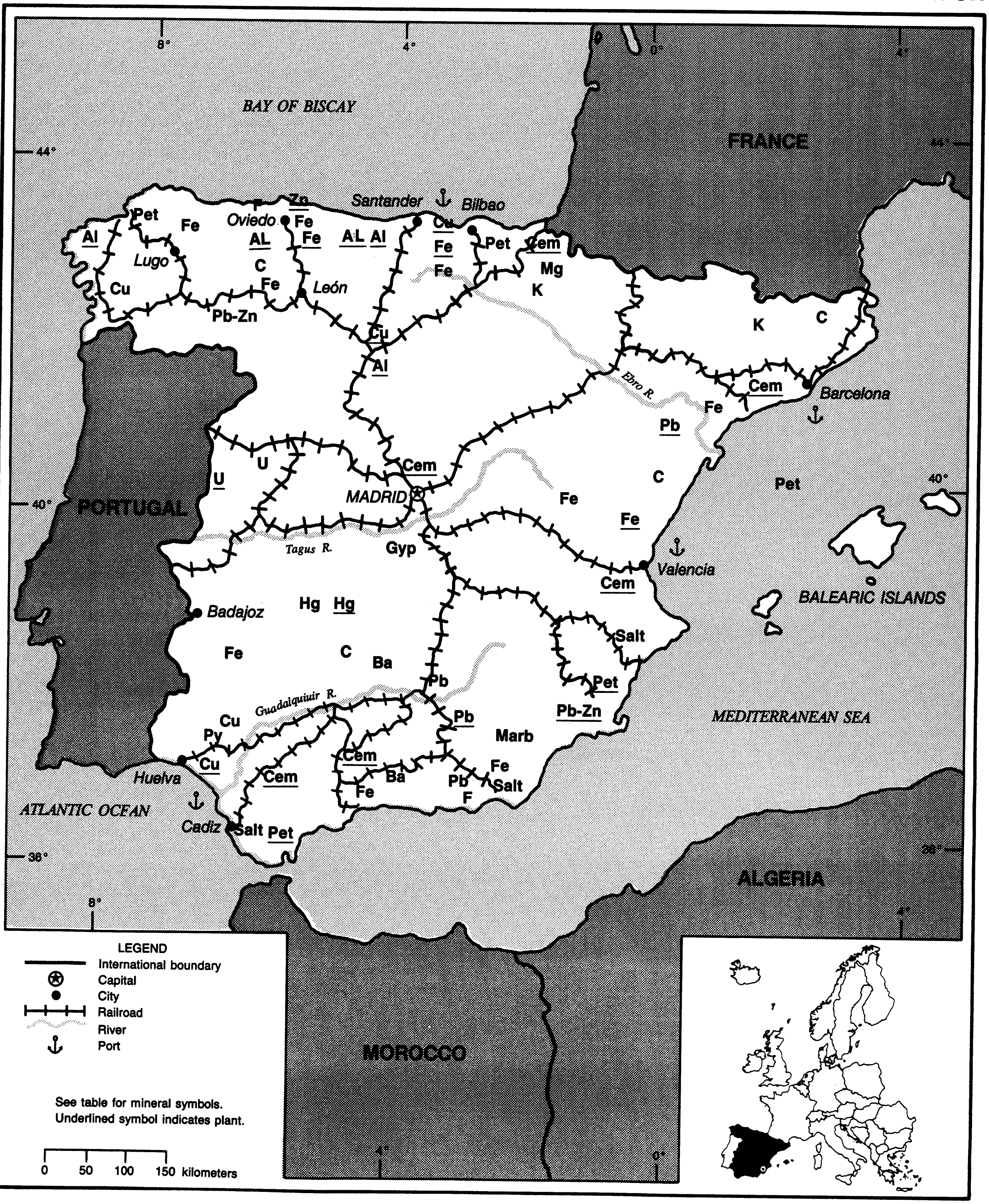
Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Unial, Tvornica Glinice i Aluminija Boris Kidric	Plant at Kidricevo, Slovenia	120
Aluminum	do.	Smelter at Kidricevo, Slovenia	72
Coal:			
Brown	SOZC, Rudarsko Energetski Kombinat E. Kardelj, Trobovlje, Slovenia	Mines: Sasavski Rudnici at Trbovlje, Hrastnik, Ojstro, Senovo, and Kanizarnica	1,300
Lignite	Rudarsko Energetski Kombinat Velenje, RO Rudnik Lignita-Velenje	Mine at Velenje, Slovenia	5,000
Cement	Salonit Anhovo	Plant at Anhovo, Slovenia	1,120
Lead-zinc ore	Rudnik Svinca, Topilnica, Mezica	Mine and mill near Mezica, Slovenia	400
Lead metal	Rudnik Svinca in Topilnica, Mezica	Smelter at Mezica, Slovenia	35
Do.	do.	Refinery at Mezica, Slovenia	30
Mercury	Rudnik Zivega Srebra, Idrija	Mine and smelter in Idrija, Slovenia	[1]15,000
Petroleum:			
Refined	Industrija Nafte (INA): Rafinerija Nafte Lendava	Refinery at Lendava, Slovenia	[2]16
Pig iron	Zdruzeno Podjetje Slovenske Zelezarne	2 blast furaces at Zelazara, Jesenice, Slovenia	300
Do.	Zelezara Store	Electric reduction furnaces at Store pri Celju, Slovenia	290
Steel, crude	Zdruzeno Podjetje Slovenske Zelezarne	Plant at Jesenica, Slovenia	500
Do.	do.	Plant at Ravne, Slovenia	162
Do.	do.	Plant at Store, Slovenia	140

[1]Flasks per year.

[2]Thousand barrels per day.

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 in Western Europe. The area is geologically very complex, and this increases its potential for mineral resources. The Iberian Pyrite Belt is 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 European Union (EU) 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 primarily owing to the influx of English and French foreign capital.

In 1993, Spain continued as one of Europe's important mineral producers of base metals and industrial minerals. The country was the EU's major producer of mercury and tantalite and the only significant producer of natural sodium sulfate. The country's entry into the EU meant that many industries had to adjust to economic realities and prepare to compete in the European single market. Sectors particularly affected by this were the coal, fertilizer, and steel 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 EU countries, and access to EU markets. As a result of a general slowdown in activity in several industrial sectors, Spain had a real gross domestic product increase of less than 1% in 1993.

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 EU average unemployment rate. Unemployment at yearend was estimated to be about 23% of the working population.

Investment-led economic growth has provided some relief to the unemployment problem. During the past 5 years, Spain has enjoyed one of the higher investment-led output growth rates in the Organization for Economic Cooperation 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 a very high oil dependency ratio, energy supply was a high priority of the Government. The 1990-95 National Energy Plan (PEN) seeks to reduce this ratio by shifting to natural gas and using renewable sources of energy more intensively. Five new coal-fired powerplants were scheduled to be built, and it was expected they would use imported coal.

PRODUCTION

The mineral industry operated in numerous regions throughout the country. The estimated value of Spanish mineral production in 1991, the latest year that full data were available, was about $374,000 million.[1] Fifty percent of this value was attributed to the mineral fuels sector; 10% to the metals sector; and 40% to the industrial minerals sector, including ornamental stone. The number of persons employed in the minerals resource sector in 1992, the latest date data were available, was reported to be 67,000.

Within the EU, Spain was the largest producer of mined lead and zinc and a major producer of pyrites; it also had the highest level of self-sufficiency with respect to mineral raw materials. However, the majority of mining sectors were in crisis. The mercury mines at Almadén, after a long tradition in the history of mining in Spain, were closing down. The output of lead, zinc, and copper ore that were important to the Spanish economy in the past were reduced. The number of large working mines is small and, owing to the economic situation, continues in a downward trend.

Spain has a diversity of deposits both in metallic and nonmetallic minerals, so this trend could be reversed in the future. There is an appreciable amount of exploration being carried out in various parts of the country.

The industrial growth in the EU

contributed to the demand for quarried 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 EU. More than 50% of the differences between Spanish tariffs and EU Common Market external tariffs had been removed with complete elimination planned by 1994. Table 2 shows the impact of selected classes of mineral commodities on Spain's balance of payments position in relation to the EU and the world. *(See tables 2.)*

Table 3 shows the estimated reserves of selected minerals. *(See table 3.)* Spain was a large importer of mineral fuels, and it was expected that this situation would continue as the demand for energy increased. About 15% of consumption was satisfied by imported coal. Spain received about 80% of its gas supplies from Algeria and Libya, with the remaining supply provided from domestic production.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is composed of state- 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. *(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 near San Ciprian, produced alumina, primary aluminum in standard sheets and ingots, and special alloys. Inespal was to be reformed into a new holding company with four operating subsidiaries: Aluminio Espanol, Inespal Extrusion, Inespal Conversion, and Inespal Productos Planos.

Difficult times continued for Inespal because of increased electricity cost, increases in Spain's interest rates, and weak world aluminum prices. To reduce costs, the company announced a 39,000-ton cutback in primary aluminum and was reportedly considering either closing one of its two potlines at Avilès or dividing the cutback equally between the Avilès and La Coruña plants. The company was considering reducing its work force by an unspecified number. Negotiations were ongoing with the trade unions. The company also asked for a reduction in its current electricity tariff of \$0.06/kW•h.

Industria Navarra del Aluminio (Inasa), a 77% owned subsidiary of Reynolds International Inc., completed a \$25 million expansion of its aluminum foil operation at its Pamplona plant. This expansion raises Inasa's foil capacity to 18,600 mt/a.

Copper.—Rio Tinto Minera S.A. (RTM) operated a smelter and refinery at Huelva with a capacity of 150,000 mt/a of copper, 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 transformed copper ore into raw copper and then refined the copper in an electrolysis plant.

RTM, a subsidiary of Freeport-McMoran Copper and Gold Inc. of the United States, was undertaking a two-phase expansion of the Huelva complex. The first phase would be an expansion of capacity from the current 150,000 mt/a to 180,000 mt/a of metal production to be completed by mid-1995. The second phase would further increase capacity to 270,000 mt/a. The refinery also would be expanded to increase the production of copper cathodes from 135,000 mt/a to 215,000 mt/a. The overall smelter and refinery expansions are scheduled to be completed in 1996 at an estimated cost of \$215 million.

Almagrera S.A. announced the development of an open pit copper mine in the Province of Huelva. Reserves have been estimated by the company to be 5 Mmt of ore averaging 3% copper with byproduct zinc. The project, consisting of the mine, equipment, access roads, and processing plant, was estimated to cost \$22 million with a startup scheduled for 1995.

Electrolisis de Metales S.A. (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, nickel, and tin. 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 were continuing with their joint-venture gold exploration project in the Almeria Province of southern Spain. Navan, with 80% interest, would participate as operator in the exploration of a 150-km^2 area. 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 g/mt of gold.

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.

Golden Shamrock Mines of Australia, which owned 62% of CAM and Banco Central Hispano of Spain, which owned 38% of CAM, sold their respective shares to CAM's management and employees. CAM managers will hold 56% interest and employees will hold 44% interest in the company. A plan was drawn up for capital investments of $6 million over 2 years to improve existing operations.

CAM was continuing with 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.—The Spanish steel industry was continuing in its efforts to adapt to the economic environment and realities of the Common Market in Europe. The industry was completely integrated into the EU except for some issues such as residual tariffs and an EU Commision request for a reduction in steelmaking capacity.

Corporacion de la Siderurgia Integral (CSI) is the state holding company 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.

CSI has presented a three-point proposal to the EU Commission for ratification. The three conditions were as follows: (1) the closure of AVH's flat products works at Ansio in mid-1995 rather than in 1997; (2) a total net reduction in steelmaking capacity of 1.3 Mmt rather than the 2.3 Mmt as requested by the Commission and approval by the Commission for construction of a new 1 Mmt/a hot-strip mill at Sestao that would replace the current blast furnace-based operations with an SMS-Nucor process electric furnace and thin slab caster; and (3) total state aid would be limited to $2.8 billion compared to the original request of $3.6 billion, and job cuts by CSI would total 9,700 people.

The plan is based on a forecast of no growth in Spanish steel demand for the period 1990-98 and requires the approval of both the Spanish Government and the EU.

Mercury.—Spain is the only mercury producer in the EU. Work 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 1994, 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 mercury sales and prices continued to aggravate MAYASA's economic problems at its mines. MAYASA was reported to have stopped production and was selling any requirements from stockpiled material.

Zinc.—Asturiana de Zinc S.A. is the largest refined zinc producer in the EU and accounts for approximately 4% of the world's zinc production. Asturiana's San Juan de Niva smelter has a capacity of 320,000 mt/a. The company's nearby Reocin Mine supplies 45% of the feed concentrates. Another 40% was supplied by Exminesa's Rubiales and La Troya Mines. However, La Troya closed at yearend 1992 and extraction was limited at Rubiales.

The other supply source, Curragh Resources's Sa Dena Hes Mine in Canada, ceased when that mine stopped production. Austuriana announced that, as a result of the difficult concentrate supply situation, it would cut its 1994 zinc production by 70,000 tons.

Sociedad Minera y Metlúrgica de Peñarroya España S.A. closed its 90,000-mt/a primary lead smelter at Cartagena, and the company filed for temporary receivership. The country has gone from being self-sufficient in primary lead a few years ago to not presently having primary lead refining capacity. However, secondary lead production has risen significantly and now satisfies more than 50% of domestic consumption needs.

Industrial Minerals

Ammonia.—The major Spanish nitrogen producer, Fesa Fertilizantos Españoles S.A., continued with the company's rationalization plan. After completion of rationalization the restructured company, to be named Fertiberia SL, would consist of seven of Fesa's operating units along with existing inventories. Fesa will remain as an operating company and retain all past liabilities. Fesa was negotiating with Morocco's Office Cherifienne des Phosphates regarding the possibility of a partnership in Fertiberia. 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, the Barcelona Olympics, and associated infrastructure projects 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.

It was reported that a large number of civil construction projects were awaiting tenders, which would indicate a positive area for growth. Cementos Mexicanos S.A. purchased Valenciana de Cementos S.A., one of the country's largest producers, for an estimated $1,700 million. This represented the largest and first really significant acquisition in Spain by a North American cement producer.

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.

Explotaciones Ceramicas Españolas S.A. (ECESA) and Caolines de Vimianzo

S.A. (CAVASA) are two of the largest kaolin producers in Spain. ECESA produces about 90,000 mt/a from its operations at Burela de Cabo, Lugo Province, and CAVASA produces about 100,000 mt/a from its operations at Vimianzo, Cap Finisterre, Galicia Province. Both companies produce ceramic, fiberglass, and paper-grade kaolin. ECESA also produces a range of kaolins for porcelain and earthware.

Other Industrial Minerals.—Spain is the world's largest producer of slate, and, along with Greece, Italy, and Portugal, provides a significant volume of the world's supply of granite and marble. Increased infrastructure construction has led to a growing importance of aggregates, and the ornamental rock sector continued to enjoy a steady demand despite the economic situation.

RTM was continuing exploration of a rare-earths deposit in Galicia. The Monte Galineiro deposit reportedly contained neodymium and yttrium used for superconducting materials. The deposit also was 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 EU. 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. 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, has a high sulfur content. Imported coal, mainly from the Republic of South Africa, was about 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 to utilize domestic lignite in their operations.

The number one coal producer is the Government-owned company Hunosa, and the number one lignite producer is the 65% Government-owned company Endesa. The largest private-sector coal producer is Sociedad Hullera Vasco Leonesa.

Under its Future Plan, Hunosa was reducing output, closing less profitable mines and concentrating on the most profitable deposits, and reducing its payroll in an attempt to lower its production costs. Endesa started up its new Corta Gargello open pit mine at its mines in Andorra.

Natural Gas.—The energy contribution of domestic natural gas historically has 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 about 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 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 oilfield, and Ayoluengo, an onshore field, were the only two producing fields. There has been little effort to discover new reserves since Amoco Inc. and Chevron Inc. withdrew from Spanish exploration in 1989.

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 by 1995. The project, estimated to cost $40 million, was being subsidized by the EU 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.

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 the rest 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 Barcelona, Bilboa, Cadiz, Cartagena, Gijon, Huelva, and Tarragona.

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 EU. There is an appreciable amount of exploration work being carried out in various areas. This is expected to continue.

The lower labor costs in Spain and the abundant natural resources have fueled growth above the EU average growth rate. The fears of an overheated economy have resulted in the tightening of the country's fiscal policy by the Government. By joining the EU, 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 137.8=US$1.00, the average exchange rate in 1993.

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

Ministerio de Industria y Energia, Madrid:
Estadistica Minera de Espana, annual.
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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
PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Bauxite		[r]970	[r]864	[r] [e]600	[r]—	—	—
Alumina[2]		949,125	1,001,605	[e]1,003,000	[r]959,100	1,060,000	1,000,000
Metal:							
Primary		352,435	353,302	355,150	359,022	355,000	375,000
Secondary		44,410	63,318	[e]72,000	80,747	90,000	100,000
Cadmium metal		[r] [e]361	[r] [e]355	[r]344	[r]361	340	375
Copper:							
Mine output, Cu content		28,519	10,877	7,716	9,818	3,800	10,000
Metal:							
Blister:[e]							
Primary		120,000	110,000	111,100	110,000	110,000	125,000
Secondary		32,300	[3]40,300	38,000	40,000	40,000	50,000
Total		152,300	150,300	149,100	150,000	150,000	175,000
Refined:							
Primary		[e]115,700	[e]116,000	[r]111,100	[r]134,325	137,200	150,000
Secondary		[e]50,000	50,000	[r]38,000	[r]44,775	42,000	50,000
Total		[e]165,700	[e]166,000	[r]149,100	[r]179,100	179,200	200,000
Gold, mine output, Au content	kilograms	8,566	6,814	7,402	6,582	6,200	7,500
Iron and steel:							
Iron ore and concentrates (including byproduct concentrate):							
Gross weight	thousand tons	4,563	[e]3,030	3,915	3,648	[3]2,480	5,000
Fe content	do.	2,128	1,438	1,840	1,715	1,166	2,000
Metal:							
Pig iron	do.	5,535	5,542	5,404	5,076	[3]5,411	6,000
Ferroalloys, electric furnace	do.	161	157	[e]160	[e]140	150	175
Steel:							
Crude	do.	12,765	12,718	12,933	12,295	[3]12,646	13,000
Castings and forgings	do.	182	169	[e]170	[e]160	165	200
Total		12,947	12,887	[e]13,103	[e]12,455	12,811	13,200
Semimanufactures	do.	11,012	11,341	11,146	10,753	10,000	12,000

See footnotes at end of table.

TABLE 1—Continued

PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan.1,1994)
METALS—Continued							
Lead:							
Mine output, Pb content		62,783	58,482	[e]46,000	47,000	26,200	50,000
Metal:[e]							
Primary		[3]62,032	60,000	[r]110,000	[r]62,000	54,000	65,000
Secondary		[3]52,500	50,000	[r]59,000	[r]58,000	62,400	60,000
Mercury:							
Mine output, Hg content	kilograms	1,224,053	—	—	—	—	1,250,000
Metal	do.	967,100	961,515	[r] [e]52,000	[r] [e]36,000	18,000	1,000,000
Silver, mine output, Ag content	do.	668,298	[e]500,000	[r] [e]208,000	[r] [e]160,000	150,000	250,000
Tantalum minerals (tin byproduct):[e]							
Gross weight	do.	10,000	10,000	8,000	8,000	6,000	10,000
Ta content	do.	2,600	2,600	2,000	2,000	1,500	3,000
Tin:							
Mine output, Sn content		56	27	12	11	—	—
Metal, primary[e]		[3]1,767	600	600	600	500	500
Titanium dioxide[e]		37,000	30,000	30,000	30,000	25,000	30,000
Tungsten, mine output, W content		58	10	—	—	—	—
Uranium, mine output, U_3O_8 content		273	269	[e]260	219	200	250
Zinc:							
Mine output, Zn content		266,724	257,500	[r] [e]261,300	[r]201,800	160,000	250,000
Metal, primary and secondary		246,400	252,700	[r] [e]262,200	[r]365,868	258,000	300,000
INDUSTRIAL MINERALS							
Barite		6,745	11,285	[e]9,000	10,000	10,000	15,000
Bromine[e]		300	300	300	250	200	300
Cement, hydraulic, other than natural	thousand ton	27,374	28,092	[r]28,008	[r]25,067	26,000	28,000
Clays:							
Attapulgite[e]		[3]23,990	30,000	25,000	25,000	20,000	25,000
Bentonite		143,389	151,226	[e]150,000	[e]150,000	150,000	150,000
Kaolin, marketable:							
Crude[e]		[3]40,530	125,000	125,000	125,000	125,000	125,000
Washed		395,805	423,357	[e]413,000	[e]350,000	350,000	400,000
Refractory, not further described		500,000	500,000	500,000	600,000	500,000	600,000
Other[e]	thousand tons	10,000	10,000	10,000	10,000	10,000	10,000
Diatomite and tripoli		83,943	107,561	[e]60,000	36,000	38,000	100,000
Feldspar		198,274	214,152	192,000	204,000	200,000	225,000
Fluorspar:							
Gross weight:							
Acid-grade		162,741	144,010	107,000	108,000	80,000	150,000
Metallurgical-grade		9,584	9,681	[e]5,000	[e]5,000	5,000	10,000
Total		172,325	153,691	[e]112,000	[e]113,000	85,000	160,000
CaF_2 content:							
Acid-grade		158,400	144,010	[e]150,000	[e]100,000	100,000	150,000
Metallurgical-grade		7,452	7,394	[e]7,000	[e]5,000	5,000	10,000
Total		165,852	151,404	[e]157,000	[e]105,000	105,000	160,000
Gypsum and anhydrite, crude	thousand tons	[e]5,500	7,808	8,054	7,750	7,500	10,000
Kyanite, andalusite, related materials[e]		3,500	3,600	3,600	3,600	3,000	3,500

See footnotes at end of table.

TABLE 1—Continued
PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Lime, hydrated and quicklime[e]	thousand tons	1,200	1,200	1,200	1,200	1,200	1,200
Magnesite:							
Calcined		165,881	158,828	[e]145,000	123,000	125,000	150,000
Crude		430,778	444,350	[e]445,000	[e]400,000	400,000	500,000
Mica		951	913	[e]300	[e]250	250	1,000
Nitrogen: N content of ammonia	thousand tons	552	466	557	479	450	500
Pigments, mineral:[e]							
Ocher		8,400	[3]8,993	8,600	8,200	8,000	10,000
Red iron oxide		20,000	20,000	20,000	18,000	16,000	20,000
Potash, K_2O equivalent		741,454	[r]685,700	[r]585,200	[r]593,600	600,000	750,000
Pumice[e]		[3]828,408	900,000	800,000	800,000	700,000	1,000,000
Pyrite, including cuprous, gross weight	thousand tons	941	1,638	1,358	862	800	1,500
Salt:							
Rock, including byproduct from potash works	do.	2,496	2,519	[e]2,500	[e]2,870	2,800	3,000
Marine and other	do.	594	858	[e]900	[e]900	900	1,000
Sand and gravel: Silica sand[e] [4]	do.	2,400	2,200	2,200	2,200	2,200	2,500
Sepiolite		494,647	515,340	[e]500,000	[e]500,000	500,000	500,000
Sodium compounds, n.e.s.:							
Soda ash, manufactured	thousand tons	483	527	[e]500	[e]500	500	500
Sulfate:							
Natural:							
Glauberite, Na_2SO_4 content		298,500	475,752	[e]450,000	[e]425,000	400,000	500,000
Thenardite, Na_2SO_4 content		240,105	240,688	[e]250,000	[e]250,000	250,000	250,000
Manufactured[e]		160,000	150,000	150,000	150,000	150,000	150,000
Stone:[e]							
Calcareous:							
Chalk	thousand tons	[3]429	400	400	350	350	400
Dolomite	do.	[3]4,371	4,000	4,000	4,500	4,000	4,500
Limestone	do.	[3]112,439	115,000	115,000	175,000	160,000	175,000
Marble	do.	1,500	[3]2,345	[3]2,210	[3]1,990	2,000	2,500
Marl	do.	[3]5,105	6,000	600	600	500	1,000
Basalt	do.	[3]2,356	2,500	2,500	2,500	2,500	2,500
Granite	do.	[3]7,609	[3]1,183	[3]1,150	[3]980	1,000	1,500
Ophite	do.	[3]2,184	2,000	2,000	1,500	1,500	2,500
Phonolite	do.	[3]678	750	750	700	500	1,000
Porphyry	do.	[3]678	700	700	600	500	1,000
Quartz	do.	[3]923	900	900	1,800	1,600	2,000
Quartzite	do.	[3]881	700	700	1,000	1,000	1,000
Sandstone	do.	[3]1,967	1,800	1,800	1,700	1,600	2,000
Serpentine	do.	[3]420	400	400	450	400	500
Other	do.	[3]43,853	28,000	30,000	30,000	30,000	45,000
Strontium minerals:[e]							
Gross weight		[3]35,134	35,000	30,000	20,000	15,000	35,000
Sr_2O_4 content		[3]32,323	31,000	28,000	18,000	12,000	15,000
Sulfur:							
S content of pyrites	thousand tons	894	748	[e]800	[e]700	675	1,000

See footnotes at end of the table.

TABLE 1—Continued
PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
INDUSTRIAL MINERALS—Continued							
Sulfur—Continued:							
Byproduct:[e]							
Of metallurgy	thousands tons	235	248	252	258	250	300
Of petroleum	do.	80	149	105	90	100	150
Of coal (lignite) gasification	do.	2	2	2	2	2	5
Total[e]	do.	1,211	1,147	899	860	679	1,455
Talc and steatite[e]		[3]71,660	70,000	70,000	70,000	65,000	75,000
MINERAL FUELS AND RELATED MATERIALS							
Coal (marketable):							
Anthracite	thousand tons	5,519	5,758	5,950	[r]6,450	6,000	10,000
Bituminous	do.	13,605	9,160	12,550	[r]8,650	8,500	15,000
Lignite	do.	17,275	20,870	21,071	[r]18,530	19,000	22,000
Total	do.	36,399	35,788	39,571	[r]33,630	33,500	47,000
Coke, metallurgical[e]	do.	3,000	3,000	3,000	2,500	2,500	2,500
Gas, natural (marketed)	million cubic meters	1,150	1,553	1,288	1,297	1,200	1,500
Peat[e]		75,000	77,000	75,000	70,000	70,000	80,000
Petroleum:							
Crude	thousand 42-gallon barrels	7,564	7,593	7,615	7,818	7,800	8,000
Refinery products:							
Liquefied petroleum gas	do.	21,541	20,056	[e]20,000	[e]20,000	20,000	20,000
Naphtha	do.	13,294	15,062	[e]15,000	[e]16,000	15,000	15,000
Gasoline, motor	do.	78,464	80,376	[e]80,000	[e]75,000	75,000	80,000
Jet fuel[e]	do.	27,000	30,000	30,000	25,000	25,000	30,000
Kerosene[e]	do.	28,000	29,000	29,000	30,000	30,000	30,000
Distillate fuel oil	do.	100,151	109,408	[e]110,000	[e]110,000	100,000	125,000
Residual fuel oil	do.	89,417	92,907	[e]92,000	[e]90,000	90,000	100,000
Other	do.	30,093	30,128	[e]30,000	[e]30,000	30,000	30,000
Refinery fuel and losses[e]	do.	12,000	12,000	12,000	12,000	12,000	15,000
Total[e]	do.	399,960	418,937	418,000	408,000	397,000	445,000

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 1994.
[2]Reflects aluminum hydrate.
[3]Reported figure.
[4]Includes sand obtained as a byproduct of feldspar and kaolin production.

TABLE 2
SPAIN: 1992 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	1,016	4,259	(3,243)	1,147	9,306	(8,159)
Magnesite	1,559	186	1,373	1,892	326	1,566
Slate	171	36	135	357	82	275
Other	221,417	177,214	44,203	303,669	421,866	(118,197)
Total	224,163	181,695	42,468	307,065	431,580	(124,515)

See footnotes at end of table.

TABLE 2—Continued

SPAIN: 1992 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)
Metalliferous ores:						
Copper	215	39,200	(38,985)	9,282	254,645	(245,363)
Lead	6,917	20	6,897	9,904	39	9,865
Tin	—	1,189	(1,189)	1	10,902	(10,901)
Zinc	13,899	7,040	6,859	31,221	127,233	(96,012)
Other (including waste and scrap)	150,466	526,453	(375,987)	213,563	1,011,349	(797,786)
Total	171,497	573,902	(402,405)	263,971	1,404,168	(1,140,197)
Nonmetallic mineral manufactures	302,710	155,692	147,018	542,758	327,896	214,862
Metals:						
Iron and steel	1,558,044	1,978,980	(420,936)	2,784,335	2,513,606	270,729
Mercury	1,271	452	819	3,756	743	3,013
Other nonferrous metals	858,438	1,037,501	(179,063)	1,156,928	1,352,288	(195,360)
Total	2,417,753	3,016,933	(599,180)	3,945,019	3,866,637	78,382
Mineral fuels	1,164,945	1,260,273	(95,328)	2,102,717	10,832,166	(8,729,449)

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

TABLE 3

SPAIN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

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 1993

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Alumina Española S.A.	Alumina plant at San Ciprián, Lugo	800.
Aluminum	Aluminio Española S.A.	Electrolytic plant at San Ciprián, Lugo	180.
Do.	Empresa Nacional del Aluminio (Endasa) S.A.	Electrolytic plant at Avilés	110.
Do.	do.	Electrolytic plant at La Coruña	25.
Do.	Aluminio de Galicia S.A.	Electrolytic plant at Sabiñánigo	78.
Do.	do.	do.	14.
Coal:			
Anthracite	Approximately 95 producers, including		6,100, including
	65 producers in Province of León, of which the largest are		(3,400).
Do.	Antracitas Gaiztarro S.A.	Mines at Miria and Paulina	(385).
Do.	Minero-Siderúgica de Ponferrada S.A.	NA	(230).
	13 producers in Province of Oviedo of which the largest are—		(1.900).
Do.	Antracita de Gillón S.A.	NA	(500).
Do.	González y Diez S.A. 14 producers in Province of Palencia, of which the largest are—	Mines: Grupo Minero de Tineo	(130). (600).
Do.	Antracita de Gillón S.A.	Mines at La Velilla	(135).
Do.	Sdad. Minera San Luis	Mines at Trueno and Cecilia	(61).
Do.	Nacional de Carbon del Sur (Encosur)	Rampa 3 and Pozo San Jose Mines, in Province of Córodpoba-Empresa	(200).
Bituminous	88 producers, of which the largest is—	Mines and plants in Provinces of Ciudad Real, Córdoba, León, Oviedo, Palencia, and Seville	14,000, including
Do.	Hunosa S.A.	Various mines and plants	(3,300).
Lignite	Empresa Nacional de Electricidad Endesa	Mines: Grupo Minero de Purnyrd, La Coruna	25,000.
Barite	Minas de BAritina S.A. (Kali-Chemie of West Germany, 100%)	Mine and plant in Espiel area, Córdoba	50.
Cement	Approximately 36 cement companies, of which the largest is—	54 plants, including—	44,000, including
Do.	Asland S.A.	5 (Asland) plants, of which the largest ones are—	(6,600).
Do.	do.	Plant at Puerto de Sagunto, Valencia	(2,000).
Do.	do.	Plant at Villaluenga de la Sagra, Toledo	(2,000).
Copper:			
Metal	Rio Tinto Minera S.A. (Freeport McMoRan Inc., 65%; Ercros Group, 35%)	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.
Do.	do.	Electrolytic refinery at Palencia	32.
Ore	Rio Tinto Minera S.A. (Freeport McMoRan Inc., 65%; Ercros Group, 35%)	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 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Fluorspar		Fluoruros S.A. (Bethlehem Steel Corp., 49%) Asturias	Plant at Caravía, near Colunga,	250 (ore).
Do.		do.	Opencast mines at San Lino and Val Negro, and underground mine at Eduardo, near Caravía—all in Asturias	200 (ore)
Do.		do.	Plant at Collada, Gijón Mines at Veneros Sur and Corona, Gijón	200 (ore).
Iron ore		Compañia Andaluza de Minas S.A. (Mokta 62%)	Mine at Alguife, Granada	4,000.
Do.		Altos Hornos de Vizcaya S.A. (U.S. Steel, 25%)	Nine mines in Province at Vizcaya	4,000.
Do.		Compañia Minera Siderúrgica de Ponferrada S.A.	Eight mines in Province of León	3,000.
Do.		Minera del Andévalo S.A.	Opencast mine at Coba, Huelva	2,000.
Lead:				
Metal		Sociedad Minera y Metalúrgica de Peñarroya de España, S.A. (Penar-roya, France, 98%)	Smelter at Cartagena, Murcia	60.
Do.		do.	Refinery at Cartqagena, Murcia	60.
Do.		Compañia La Cruz, Minas y Fun-daciones de Plomo S.A.	Smelter at Lineares, Jaén	40.
Do.			Refinery at Lineares, Jaén	40.
Do.			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 Unión, Murcia	25.
Do.		Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcollar, Sevilla	21.
Do.		Exploracion Minera International Expana S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	16.
Magnesite		Magnesitas de Rubian S.A.	Plants at Zubiri	100.
Do.		do.	Mines and plant near Sarria, south of Lugo	220.
Mercury		Minas de Almaden y Arrayanes S.A. (Government, 100%)	Mine and smelter at Almadén	70,000 flasks.
Petroleum:				
Crude	barrels per day	Chevron S.A.	Oilfield at Casablaca	300.
Refined	do.	Repsol Petroleo S.A. (Repsol)	Refineries at Escombreras	200,000.
Do.	do.	do.	Puertollano	140,000.
Do.	do.	do.	Tarragona	260,000.
Do.	do.	Refineria de Petroleos del Norte S.A. (Petronor)	Refinery at Somorrostro	240,000.
Do.	do.	Compañia Espanola de Petroleos S.A.	Refinery at Santa Cruz de Tenerife	160,000.
Do.	do.	do.	Refinery at Algeciras	160,000.
Do.	do.	Petroleos del Mediterraneo S.A. (Petromed)	Refinery at Castellón de la Plana	120,000.
Do.	do.	Compania Iberica Refinadora de Petroleos S.A. (Petroliber)	Refinery at La Corruña	140,000.
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 Riot Tinto S.A.	Mines at Balsareny/Sallent and Cardona	2,000 (ore).
Pyrite		Compañia Espanola de Minas de Tharsis	Mines and plants at Tharsis and Zarza, near Seville	1,300.
Do.		do.	Plant at Huelva	600.
Do.		Rio Tin to Minera S.A. (Uniòn Ex-plosivios Rito Tinto, 75%; Rio Tinto Zinc, 25%)	Mines and plant at Rio Tinto, near Seville	900.

See footnotes at end of table.

TABLE 4—Continued

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

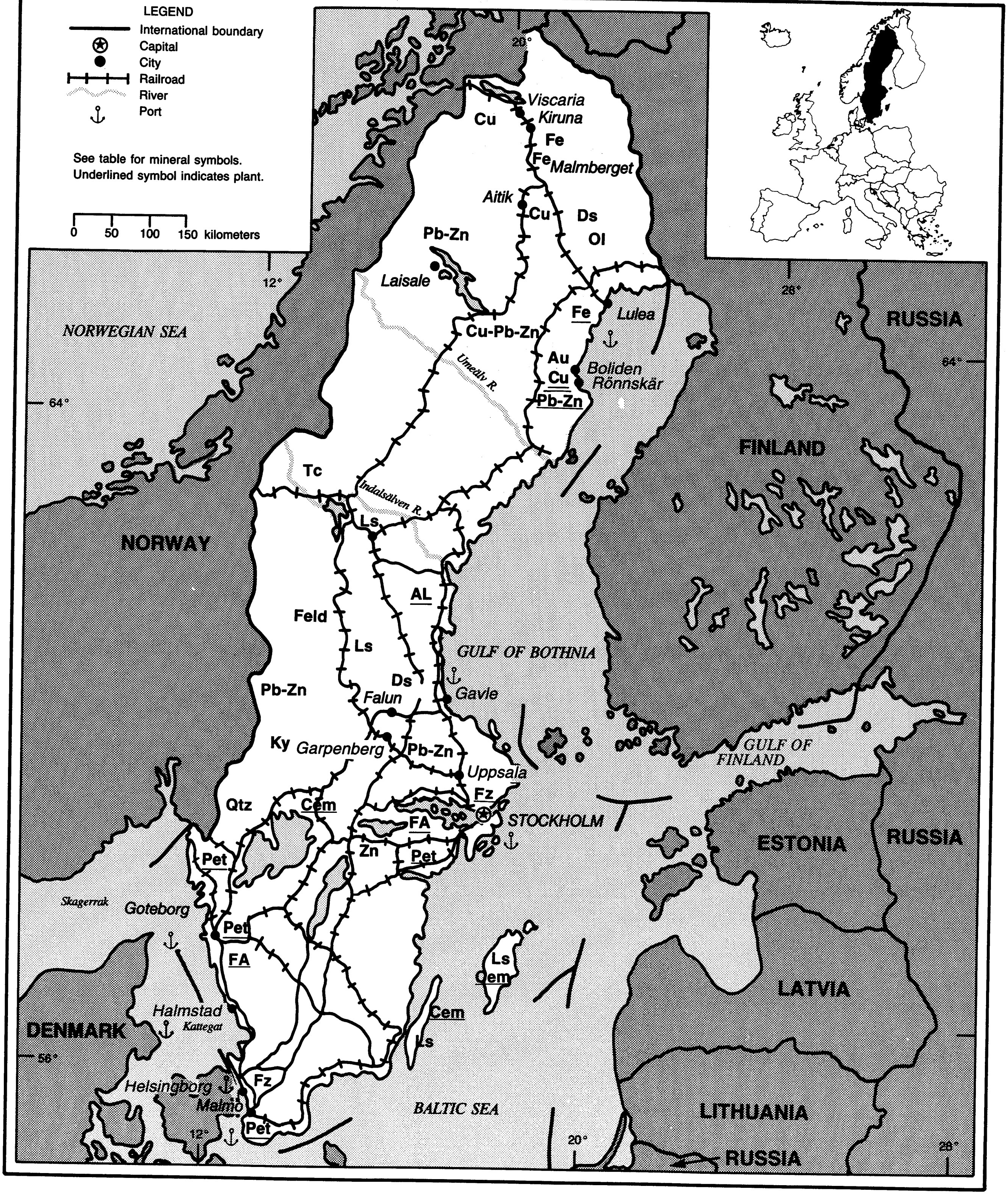
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
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 Vilecas near Madrid	200.
Do.	do.	Plant at Villecas near Madrid	200.
Steel	Empresa Siderúrgica S.A. (Ensidesa)	Plants at Aviles, Veriña and Mieres in Oviedo, and Moreda, Gijón	6,000.
Do.	Altos Hornos de Viscaya S.A. (U.S. Steel, about 20%)	Ironworks and steelworks at Sestao, Bilbao	1,500.
Uranium metric tons	Government	Mines and plant near Ciudad Real	500. (U_3O_8).
Zinc:			
Metal	Real Cia. Asturiana de Minas S.A.	Electrolytic zinc plant at San Juan Nueva	200.
Ore	do.	Reocin mines and plants near Torrelavega, Santander	500 (ore).
Do.	An daluza de Piritas S.A. (APRSA)	Open pit mine at Aznalcollar, Sevilla	3,500 (ore).
Do.	Exploracion Minera International España S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	500 (ore).
Do.	Sociedad Minera y Metalurgica de Peñarroya-Espana S.A.	Mines and plants at Montos de los Azules y Sierra de Lujar, San Agustin	220 (ore).

NA Not available.

SWEDEN

AREA 449,000 km² **POPULATION 8.5 million**



THE MINERAL INDUSTRY OF

SWEDEN

By Jozef Plachy

Sweden is endowed with significant deposits of iron ore, certain base metals (copper, lead and zinc), gold, and industrial minerals (dolomite, feldspar, granite, ilmenite, kaolin, limestone, quartz, and wollastonite). It is known for its long tradition and broad knowledge in mining, metallurgy, and metal processing, specifically high-quality steel. Because of inadequate indigenous resources, Sweden relies heavily on imports of hydrocarbons; in response to this, it has developed substantial hydroelectric generating capacity.

GOVERNMENT POLICIES AND PROGRAMS

Over the past years, Sweden has been bringing its mineral policy closer to European Union (EU) standards. It ceased Government funding of mineral exploration and turned it over to the private sector. It abolished participation of the state in mining enterprises (the so-called "crown shares") and revoked all taxes and royalties, except the normal corporate income tax. On January 1, 1993, the Government invalidated previous limitations on ownership of real estate. It extended exploration and mining of a wide range of minerals to foreign participation.

However, the privatization of some Government-held companies was slowed by continued economic recession. While Svenskt Stal AB (SSAB) was privatized in 1993, the iron ore giant Luossavaara-Kiirunavaara AB (LKAB) will likely remain Government-owned for a few more years.

PRODUCTION

To remain competitive, during the past few years the Swedish mining industry instituted dramatic changes resulting in increased profitability in spite of the recent recession. Employment has been halved, to about 6,000 persons, and more efficient production methods were introduced, raising the value of processed ore by 400% per employee.[1]

In 1993, Sweden produced 28.3 Mmt of iron ore and about 20.1 Mmt of nonferrous sulfide ore. It represented about one-half of West European production of iron ore, about one-third of copper and lead ore, and about one-fifth of its zinc ore. The comparative metal production was somewhat lower; however, Sweden was still the leading producer of copper and lead in Western Europe. In relation to domestic consumption, the gold, lead, and zinc content of indigenous ore production exceeds the consumption of these metals in Sweden, while copper production covers about 50% and silver about 60% of consumption. *(See table 1.)*

TRADE

About 13% of Sweden's exports is supplied by the mineral industry, one-third of which is steel related. Because Sweden has no zinc smelter, one of the largest metalliferous ore exports is zinc ore and concentrate, shipped mostly to Norway and other near-by European countries. To achieve high efficiency in processing of certain minerals, indigenous ore production is supplemented by imported raw material, usually imported duty free.

STRUCTURE OF THE MINERAL INDUSTRY

The structure of the two largest mineral industry enterprises in Sweden—Boliden AB and LKAB—has remained essentially unchanged.

Boliden AB, a subsidiary of the privately owned Trelleborg Group, is predominately a nonferrous mining and processing company. It also trades in concentrates, metals, and other products and provides engineering, plants, and equipment on a worldwide basis. Boliden AB consists of Boliden Mineral, Boliden International, and Boliden Metals. At the end of 1993, Boliden Mineral operated 10 mines, 4 concentrators, and 1 smelter. The metal content of Boliden's 20.1 Mmt/a ore production amounted to less than 2% of world production. During 1993, the Kedtrask and Enasen mines and Kristineberg concentrator were closed. Boliden International is responsible for several wholly or partially owned foreign mines, (wholly owned Aznalcollar in Spain and part-owned Sukhaybarat in Saudi Arabia), while Boliden Metal is responsible for the manufacture and worldwide sale of metal products.

The Government-owned LKAB is one of the world's leading producers of highly upgraded iron ore products. It operates two mining complexes, ore dressing and pelletizing plants in Kiruna and Malmberget, a pelletizing plant in Svappavaara, and shipping ports in Lulea and Narvik (Norway), and it owns several other subsidiaries in the mining industry. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—Radical cost cutting at the Sundsvall smelter by Granges Aluminum in 1992—30% work force reduction and 20% production cutback—resulted in a profitable 1993.[2] The 99,000-mt/a-capacity[3] Sundsvall smelter is a combination of two adjacent plants, using Soderberg and prebake technology. Plant 1 was converted to prebake technology in 1987 and produces about 25% of output on 56 pots.[4] Plant 2, built in 1963 and later expanded, produces 75% of output on 262 pots powered by 112 kA.[5] About 80% of production goes to Granges' downstream extrusion sector, the Sapa group, consisting of 12 companies.

Although secondary aluminum production has been declining in Sweden, a 90% recycling rate[6] of aluminum beverage cans is still one of the highest in the world. It has been achieved by close cooperation between the producer of canstock (Finspong), the can manufacturer (PLM Fosie), the collection company (Returpak and PLM Fosie), and the secondary smelter (Gotthard Aluminium and Finspong).

Copper.—Swedish copper production is dominated by the Aitik open pit mine in the northern part of the country, 100 km north of the Arctic Circle. The main open pit, the largest in Europe, is reportedly 2,500 m long, 915 m wide, and 230 m deep. With a proven reserve of about 200 Mmt,[7] this Boliden Mineral-owned mine should operate well into the next century. The low average content of copper (0.38%) is offset by 0.22 g/mt of gold and 4 g/mt of silver.[8] After a recent investment of about $80 million, the capacity was increased by about 25%, to 16.5 Mmt/a.[9] A giant crusher is reportedly utilized directly in the mine. A conveyor line transports the crushed ore through a 700-m tunnel to an intermediate storage area near the concentrator. The 1993 production of 200,000 mt/a of concentrate contained about 58,000 tons of copper, nearly 2 tons of gold,[10] and about 38 tons of silver. The concentrate is sent to Boliden's Ronnskar smelter, where it accounts for more than one-half of its feed, which in 1993 amounted to 334,000 tons. The average recovery of copper is reportedly about 90%, with a 50% recovery of gold and a 70% recovery of silver. By next year, Boliden Minerals will decide on a 40% expansion of the copper tankhouse to 140,000 mt/a, which would bring it into line with furnace capacity.[11]

Viscaria and the adjacent Pahtohavare Mine, 5 km west of Kiruna, is the second largest copper mining complex in Sweden. Both mines are owned by Outokumpu of Finland. In 1993, Viscaria produced about 627,000 mt/a of ore containing about 2.8% copper while Pahtohavare's output amounted to 102,000 tons. Open pit mining at Pahtohavare ceased in February 1993, and development of underground mining began 2 months later. Resources in the area are estimated at 1.3 Mmt of contained metal at an average grade of 2.5% Cu.[12] With an addition of adjacent small deposits and a 95% utilization of existing capacity, the mine should remain operational until 1995.

In 1993, the Enasen Mine in Halsingland and the concentrator in Kristineberg were closed. During the last years of operation, the ore production at the Enasen Mine averaged about 200,000 mt/a, resulting in about 9,500 tons of copper concentrate, which in 1991 contained 1,157 tons of copper, 371 kg of gold, and 1,320 kg of silver.[13]

Remaining copper-containing polymetallic mines, in order of production, include Kristineberg, Garpenberg, Renstrom, and Langdal. In 1993, a decision was reportedly made to develop the Petiknas polymetallic ore deposit. The ore body is estimated to have about 6 Mmt[14] of reserves containing copper, lead, zinc, and small amounts of precious metals.

Gold.—Terra Mining AB owns Western Europe's largest gold mine—the Bjorgdal Mine. It is about 300 km south of the Arctic Circle in northern Sweden. Crude ore production in 1993 amounted to 0.9 Mmt, yielding 2,537 kg of gold.[15] The vein-type deposit is close to the surface, allowing opencast mining. This, coupled with improved gold content in the lower levels (from 2.56 g/mt in 1990 to 3.32 g/mt in 1993[16]) and large-scale ore processing, allowed the production cost to be lowered to 4,662 $/kg from 6,719 $/kg in 1992.[17] Because proven and probable reserves reportedly will last for only 7 years, Terra Mining has been engaged in extensive exploration, which resulted in identification of 60 prospective deposits. The most important deposit is at Pahtavaara, Finland. It reportedly has proven reserves of about 700,000 tons at a grade of 3.33 g/mt.[18] In addition to Bjorgdal Mine, there is the Akerberg gold mine, Holmtjarn and Kankberg mines with complex ore containing gold, and a number of other Boliden mines with precious metal content, all in northern Sweden.

Iron Ore.—Crude iron ore production in 1993 amounted to 28.3 Mmt, a 0.3 Mmt increase over that of the previous year. Deliveries amounted to about 20.1 Mmt, of which 3.7 Mmt went to domestic consumers.[19] The 15% decline of the price of iron ore in 1993 was alleviated by a higher exchange rate for the U.S. dollar. About 50% of production and 60% of sales are in the form of pellets. The majority consists of olivine pellets and the rest of iron-rich direct reduction pellets. The remainder is sold either as low-phosphorus ($<0.05\%$ P) sinter fines or high-phosphorus ($>1\%$ P) sinter fines or lump ore.

All the iron ore production in Sweden came from the Kiruna mining complex (18.3 Mmt of crude ore from Kiirunavaara, Leveaniemi, and Luossavaara mines) and the Malmberget Mine (10 Mmt), both owned and operated by LKAB. The Kiruna ore body, the larger of the two deposits, is approximately 4 km long, 80 m thick, and 2,000 m deep.[20] The deposit consists principally of magnetite (average 60% iron content) with minor hematite, and amounts to an estimated 460 Mmt.

LKAB is investing $510 million in a new transportation network below the present main level and new concentrating and pelletizing plants. The new underground hauling level, at a depth of 1,045 m, is expected to begin operation in 1997, and pelletizing capacity is anticipated to expand by 4 Mmt/a by 1995.[21] Because of inadequate environmental controls at the existing loading terminal, a new port facility is to be built farther out of the town of Lulea. The construction is to start at the end of 1994 and was expected to be completed in about 3 years.

Lead.—Most of the 1993 production of 150,000 tons of lead concentrate was sourced from Laisvall Mine. With a 1993 production of 1.75 Mmt[22] of crude ore, Laisvall Mine is one of the largest lead mines in Europe. In northern Sweden, the ore deposit (5 km long, 3.5 km wide, and up to 90 m deep[23]) consists of three major zones of mineralization, unevenly disseminated in sandstone. The ore grade ranges from 0% to 40% lead, with an average metal content of 4.26% lead, 10 g/mt of silver, and 0.74% zinc. Because part of the deposit is under a lake and therefore inaccessible without emptying the lake, minable reserves are expected to last for only about 4 years. Annual production averages about 85,000 tons of lead concentrate and 21,000 tons of zinc concentrate.[24] The metal content of the concentrates produced is about 66,200 tons of lead, 12 tons of silver, and 12,500 tons of zinc. Lead concentrate is transported by truck and railway to the Ronnskar smelter, where it supplies about three-fourths of total feed. Sweden does not have a zinc smelter, so all Swedish zinc concentrate is shipped to foreign smelters, mainly to the 50%-owned Norzik smelter in Norway.

Other mines producing lead from polymetallic ore deposits, in order of production, include Garpenberg, Renstrom, Langdal, and the newly opened mine at Petiknas.

Because of market prices, Boliden AB has reportedly decided to reduce lead production at its Ronnskar smelter by about 10,000 mt/a. Production in 1993 was about 50,000 tons against the capacity of about 70,000 mt/a.

In 1993, about 54,000 tons of lead batteries was collected, from which 37,500 tons of secondary lead was produced at the Boliden Bergsoe smelter in Landskrona.

Nickel.—Sweden produces no nickel ore. The small production of nickel metal and alloy is from imported concentrate, mainly from Norway. About 90% of nickel consumption, which in 1993 was about 17,000 tons, is reportedly used in stainless and special steel.[25]

Steel.—SSAB is Scandinavia's leading manufacturer of commercial steel. Most production consists of steel sheet and plate, produced mainly in two SSAB subsidiaries: Tunnplat and Oxelosund. A small amount of steel sheet is processed by subsidiaries Plannja and Dickson PSC. The 2-Mmt/a SSAB Tunnplat is an integrated steel company with a coking plant, blast furnaces, and rolling mill for slab and heavy plate in Lulea and a sheet manufacturing plant in Borlange. In 1993, it produced 1.7 Mmt of crude steel, 881,000 tons of hot-rolled plates, 467,000 tons of cold-rolled sheets, and 361,000 tons of metal-coated sheets.[26] About 149,000 tons of the metal-coated sheet was subsequently plastic-coated in Borlange or Finspang. SSAB Oxelosund's plants include a coking plant, ore-based metallurgy unit, a rolling mill for heavy plates, and a number of plants for sheet rolling. In 1993, production amounted to 1.3 Mmt of slabs and 514,000 tons of heavy plate, 90% of which was exported.[27] Due to the weakening of the Swedish krona and a 7% increase of steel consumption in Sweden, SSAB has turned a small loss in 1992 into a profit of about $100 million in 1993.

Since its establishment in 1992, the Scandinavian long products group Fundia, consisting of Sweden's Fundia AB, Finland's Dalsbruk Oy, and Norway's Norsk Jenverk AS, has reduced its work force by about 1,200 and initiated economies of scale by concentrating core production at specific sites while increasing the quality of final products. At present, Fundia's output of 1.65 Mmt/a of finished steel is split approximately 45% rebar, 20% merchant bar, 15% wire rod, 10% billet, and 10% structural steel.[28] Most of merchant and low alloy bars are originated in Sweden, mainly at the Smedjebacken mill. Recent additions have raised the meltshop capacity to 625,000 mt/a.[29] Round bars are produced in the range 10 to 90 mm, square bars 12 to 55 mm, and flats from 15 to 250 mm wide by 3 to 60 mm thick.[30] The Smedjebacken mill supplies billets to smaller mills at Boxholm, Forsbacka, and Hallstahammar.

Avesta Sheffield AB, joint stainless steel enterprise of Sweden's Avesta and British Steel created in 1992, reported a loss of about $13 million in 1993. It has reportedly closed one of three melting shops at Degerfros in Sweden and expanded the capacity at Avesta at the cost of $46 million.[31] It has not been decided yet if the planned expansion at Avesta will match the 185,000-mt/a melting capacity being closed at Degerfros. A tentative 3-year plan to double the hot rolling capacity at the Steckel mill to about 700,000 mt/a was unveiled in 1993.[32]

Sandvik, the specialty steel and carbide tools producer, has reportedly increased its 1993 profits by 67%.[33] The high increase was partly due to the weakening of the Swedish krona.

Zinc.—There are eight mines in Sweden producing ore with various zinc content. Ore is beneficiated in Askersund, Boliden, Garpenberg, and Laisvall. All zinc concentrate is exported, mainly to Norway, Finland, and Belgium-Luxembourg.

The largest mine, Zinkgruvan Mine, is owned and operated by Vieille-Montagne Sverige AB, a Swedish subsidiary of the Belgian mining and smelting company. The deposit, at the northern end of Lake Vattern, consists of three main sections: (1) soon to be closed Kanakkagruvan to the west, (2) recently discovered Burkland, and (3) the main ore body that accounts for the bulk of production. The average ore grading is 1.6% lead, 40 g/mt of silver, and 9.9% zinc.[34] The 1993 crude ore production of 675,000 tons was locally concentrated, resulting in 126,000 tons of 55% zinc concentrate and 24,000 tons of 68% lead concentrate.[35] Both concentrates are trucked to a port on Lake Vattern for shipping through inland waterways to either Belgium (zinc concentrate) or to be sold on open market (lead concentrate).

The second largest producer of concentrate is in Boliden, in northern Sweden. It processes about 1.3 Mmt/a of polymetallic ore from Kristineberg (460,000 mt/a) and other adjacent mines. Annual production amounts to about 70,000 tons of zinc concentrate (55% Zn), plus 27,000 tons of copper concentrate (20% Cu), 8,500 tons of lead concentrate (46% Pb), and 75,000 tons of pyrite.

Industrial Minerals

Cement.—All cement in 1993 was produced in three plants owned by Cementa: at Degerhamn on the Island of Oland, Skovde on the mainland, and Slite on the Island of Gotland. The concession for the Slite plant was renegotiated in 1993 requiring further reduction of nitrogen and sulfur emissions. Due to decline of domestic construction, cement shipments reportedly declined by about 16% to about 1.325 Mmt/a.[36] Consequently, production at the Skovde plant was reduced by 0.2 Mmt/a. Increased exports, high exchange rate of the U.S. dollar, and substantial cost reductions limited the effects of declining shipments in the Swedish market. Euroc, the parent company of Cementa, headquartered in Malmo, Sweden, acquired Finland's exclusive producer of cement and its major construction material producer, Partek Cement and Lohja.

Feldspar.—The most recent feldspar mine is the Backegruvan Mine in central Sweden. Berglings Malm & Mineral AB (BMM) began development of the estimated 50-Mmt deposit[37] in 1989 and production began in 1992 with a total output of 35,000 tons. The high-purity, homogenous pegmatite ore, with low levels of iron, is extracted by the open pit method. Production in 1993 was about 75,000 tons of feldspar, 30,000 tons of quartz with 0.03% of Fe_2O_3, and 7,000 tons of muscovite.[38] Processing is by froth flotation at the nearby abandoned iron ore mine. Feldspar is available in sand and milled form.

The other two mines include Hojderna and Limbergsbo. Hojderna, owned by BMM, is near Skinnskatteberg, and Limbergsbo, operated by Forshammar AB, is 23 km north of Lindesberg. Composition of both deposits is about 60% to 70% feldspar, 25% to 30% quartz, and 5% to 10% muscovite.

Graphite.—Although there was no production of graphite in 1993, a number of potential deposits are under exploration. The most promising is Raitajaervi, close to the Finnish border and Arctic Circle. A concession was obtained by newly formed Norrbotten Grus & Grafit AB, based in Haaparanda. The deposit is about 6 km long and 1.5 km wide, containing an estimated 600,000 tons of ore with carbon content of 10% to 20%.[39] Exploration continues at the Lehtodelkae deposit, about 80 km north of Raitajaervi. Ore thickness is up to 150 m with a carbon content of 19% to 23%.

Sweden's first graphite production will probably start at Kringeltjarn, near Edsbyn in Gavleborgs county. Anro Graphite AB will start constructing a beneficiation plant and a separate screening plant in 1994. Extraction from the 2.6-Mmt deposit, graded about 10% carbon,[40] should start in 1995.

Limestone.—Limestone production is divided into sand (Yxhult), blocks (Aketorp, Borghamn, and Horn), and aggregates. Most of the quarries are in central Sweden, with three at the southern part of the country, six on the Baltic islands of Gotland and Oland, and one in northern Sweden. Because most limestone aggregates are used to make cement, the two largest mines are near a cement plant on the Island of Gotland. With a production of 2.5 Mmt/a, Storugns, on the northern part of the island, is the largest of the two, while the Slite quarry produces about 2.4 Mmt/a of limestone.

Mineral Fuels

Coal.—Coal production in Sweden is up to 30,000 mt/a. It is extracted as a byproduct of clay production by Hoganas Corp. at Skane. It is mainly used locally by the Perstrop Co., with a small remainder used at the nearby Helsingborg heating plant. Coal reserves are about 30 Mmt.

Peat.—Swedish peatlands cover 6.4 Mha,[41] about 15% of the country's total land area, of which about 865,000 ha is suitable for commercial production. At present, 7,900 ha is in production, of which 6,100 ha is used for fuel and 1,800 ha for agriculture peat.[42] Extraction is covered by different legislation depending on whether it is used for energy or for agriculture. Every application for harvesting must contain an after-use strategy.

About 60% of production is in the form of sod peat, and the remainder is milled peat. About 80% of Sweden's annual peat production is used for energy purposes, mainly in cogeneration plants for electric power and district heating. In 1993, about 50 local authorities and industrial enterprises used peat as a fuel and produced about 120 MW of power and 190 MW of heat.[43]

Petroleum.—Crude oil production in Sweden in 1993 was about 3,000 m^3. Estimated reserves reportedly amount to about 30,000 tons, mainly on the Island of Gotland.

Nearly all of the 20 Mm^3 of crude oil that is refined annually is imported, mainly from Norway, with a small amount from Russia and the Middle East. Three of the five refineries are around the southern port city of Goteborg. The largest refinery, owned by Skandinaviska Raffinaderi AB, with an annual capacity of 200,000 tons of crude oil, is in Lysekil, 70 km north of Goteborg.

Reserves

In 1993, the State Mining Property Commission transferred exploration to individual enterprises, either local or foreign. Because of the resulting delay in exploration, reserves of major mineral commodities in Sweden remained unchanged in 1993. *(See table 3.)*

INFRASTRUCTURE

Sweden has a well-developed transportation system, especially in the southern part of the country. It includes 97,400 km of highway and 12,000 km of railroads. Because about 23% of foreign trade is carried by trains and trucks, the Government made plans to invest $13 billion in infrastructure over the next 10 years. About one-half will be allocated for main highways and $4 billion for railways, where annual cargo of 7.5 Mmt was expected to double by the year 2000.

In addition to its long coastline, Sweden maintains about 2,050 km of inland waterways. Ports are either privately or municipally owned, or a combination of the two. There are 50 general ports and 130 minor ports; about 65% of the total flow of cargo is handled by the five biggest ports—Goteborg, Helsingborg, Lulea, Stockholm, and Malmo. Truck-ferries are the fastest growing form of transportation, increasing by 8% to 10% per year.

OUTLOOK

The privatization of the mineral industry in Sweden, based on the Minerals Act of July 1992, has been slowed but not abandoned. Sweden's anticipated membership in the EU, which will eliminate tariffs on Swedish trade with EU countries, will help domestic industry and should provide additional incentives for capital investment. The improved efficiency, coupled with foreign investment, should make the Swedish mineral industry exceedingly competitive in the world market.

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TABLE 1

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum metal:							
Primary		96,982	96,300	96,912	77,210	[2]81,857	98,000
Secondary		[r]33,000	[r]30,000	[r]22,200	[2]16,500	[2]16,500	45,000
Arsenic, trioxide, refined[e]		10,000	[r]7,000	[r]2,500	[r]—	—	—
Copper:							
Mine output, Cu content		69,489	74,283	81,650	88,569	[2]88,677	90,000
Metal:							
Smelter:							
Primary		69,977	76,385	68,113	77,804	[2]76,298	100,000
Secondary		24,623	31,615	29,437	20,596	[2]22,102	40,000
Total		94,600	108,000	97,550	98,400	[2]98,400	140,000
Refined:							
Primary		69,977	66,278	67,587	71,634	76,300	100,000
Secondary[e]		[2]24,623	31,000	29,000	30,000	22,486	30,000
Total		94,600	97,278	96,587	101,634	[2]98,786	130,000
Gold:							
Mine output, Au content	kilograms	5,120	6,326	6,247	[r]6,083	6,500	7,100
Metal, primary[3]	do.	8,122	7,946	[r]6,858	[r] [e]7,000	7,000	9,000
Iron and steel:							
Iron ore and concentrate:							
Gross weight	thousand tons	21,763	19,877	19,328	[r]19,277	[2]18,728	28,500
Fe content	do.	14,124	12,901	[r]11,088	[r]9,785	9,800	12,500
Pyrite, roasted	do.	387	375	[r]462	[r] [e]500	500	500
Pig iron and sponge iron	thousand tons	2,638	2,736	2,812	[r]2,735	2,600	3,000
Ferroalloys:							
Ferrochromium		153,800	117,680	120,884	[r]133,000	[2]127,543	150,000
Ferrosilicon		[r]20,996	[r]18,736	[r]21,145	[r] [e]22,000	22,000	25,000
Total		[r]174,796	[r]136,416	[r]142,029	[r]155,000	149,543	175,000
Steel, crude	thousand tons	4,692	4,454	4,248	4,356	4,300	5,000
Semimanufactures, rolled[e]	do.	4,200	4,000	4,000	4,000	4,000	4,500
Lead:							
Mine output, Pb content		88,967	98,259	91,127	106,200	[2]113,100	115,000
Metal:							
Smelter:							
Primary:							
Crude[e]		[2]1,294	1,200	1,000	1,000	1,000	1,500
Refined[e]		58,000	55,800	55,000	55,000	49,000	63,500
Total[e]		59,294	57,000	56,000	56,000	50,000	65,000
Secondary[e]		30,000	27,500	26,000	26,000	37,500	40,000
Total smelter[e]		89,294	84,500	82,000	82,000	87,500	105,000
Refined:							
Primary		48,694	47,466	49,168	46,800	46,800	50,000
Secondary		22,706	22,134	38,835	44,300	[2]37,700	45,000
Total		71,400	69,600	88,003	91,100	[2]84,500	95,000

See footnotes at end of table.

TABLE 1—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS—Continued							
Molybdenum, oxide, roasted, Mo content		3,082	[e]3,000	[r]2,158	[r]4,283	[e]4,000	4,500
Nickel, metal:							
Unwrought, secondary		279	298	[r]244	[r][e]250	250	300
Alloy, primary		572	610	[r]490	[r][e]500	500	600
Selenium, elemental, refined		23	29	[r]23	[r][e]25	25	30
Silicon metal[e]		[r][3]13,421	10,000	[r]—	[r]—	—	—
Silver:							
Mine output, Ag content	kilograms	227,715	242,685	239,321	[r]281,600	[2]277,3002	300,000
Metal, primary[3]	do.	302,177	274,467	[r]292,632	[r][e]300,000	300,000	300,000
Tin, metal:							
Unwrought		149	364	[r]23	[r][e]20	20	350
Alloy		1,270	1,482	[r]1,241	[e]1,500	2,000	2,000
Tungsten: Mine output, W content[e]		80	—	—	—	—	
Zinc: Mine output, Zn content		173,515	164,128	161,170	163,500	[2]173,300	190,000
INDUSTRIAL MINERALS							
Cement, hydraulic	thousand tons	2,431	2,475	[r]2,395	[r][e]2,200	[2]2,200	3,400
Clays: Kaolin		106	108	[e]100	[e]100	100	100
Feldspar, salable, crude and ground		38,437	41,197	[r]32,945	[r][e]45,000	90,000	100,000
Fertilizer, manufactured:							
Nitrogenous	thousand tons	333	401	[r]312	[r][e]300	300	350
Phosphatic	do.	94	91	[r]92	[e]90	90	100
Mixed	do.	524	514	[r]468	[e]500	500	500
Kyanite[e]		6,000	6,000	6,000	6,000	6,000	10,000
Lime	thousand tons	656	603	[r]506	[r][e]500	500	520
Olivine	do.	[e]120	100	114	[e]120	120	120
Phosphate rock (byproduct):							
Gross weight	do.	71	7	—	—	—	—
P_2O_5 content	do.	26	3	—	—	—	—
Pyrite, gross weight	do.	301	252	89	[r]37	—	—
Quartz	do.	52	378	[r]11	[r][e]10	10	15
Sodium sulfate, synthetic[e]	do.	100	100	100	100	100	100
Stone:							
Dimension, mostly unfinished:							
Granite	do.	101	113	[r]109	[e]100	100	110
Limestone	do.	5	6	[r]12	[r][e]10	10	15
Slate	do.	28	26	[r]23	[e]20	20	25
Other	do.	36	29	[r]31	[e]30	30	30
Crushed:							
Dolomite	do.	328	321	[r][e]—	[r][e]—	—	—
Granite	do.	6,110	6,358	[r]4,915	[r][e]5,000	5,000	5,000
Limestone:							
For cement manufacture	do.	1,179	1,175	[r]1,208	[e]1,200	1,200	1,200
For lime manufacture	do.	660	760	[r]600	[r][e]600	600	700

See footnotes at end of table.

TABLE 1—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
Stone—Continued:							
Crushed—Continued:							
Limestone—Continued:							
For other construction and industrial uses	thousands tons	2,138	1,954	[r]1,922	[e]2,000	2,000	2,000
Chalk (ground)	do.	34	29	[r]40	[e]30	40	40
For agricultural uses (ground)	do.	320	347	[r]264	[r] [e]250	250	300
For other uses (ground)	do.	81	96	[r]88	[e]100	100	100
Total	do.	4,412	4,361	[r]4,122	[r] [e]4,180	4,190	4,340
Quartzite	do.	994	1,234	[r]1,474	[r] [e]1,500	1,500	1,500
Sandstone[e]	do.	50	50	50	50	50	50
Undifferentiated	do.	13,883	24,945	[r]28,963	[r] [e]30,000	30,000	30,000
Other	do.	845	718	[r]715	[e]700	700	750
Sulfur:							
S content of pyrite	do.	144	121	43	[e]38	40	50
Byproduct:[e]							
From metallurgy	do.	125	125	125	125	125	125
From petroleum	do.	40	40	40	40	40	40
Total[e]	do.	309	286	208	203	205	215
Sulfuric acid, gross weight		902	855	[r]928	[e]900	1,000	1,000
Talc, soapstone		17,975	15,021	[r]19,159	[e]20,000	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS							
Carbon black	thousand tons	[r]36	[r]33	[e]26	[r]25	25	30
Coal, anthracite and bituminous	do.	—	11	[r]28	[r] [e]30	30	30
Coke, metallurgical	do.	473	318	305	[e]300	300	400
Gas, manufactured:							
Coke oven gas	million cubic meters	460	501	[r]514	[e]500	500	550
Blast furnace gas	do.	3,526	3,723	[r]4,326	[r] [e]4,500	4,500	5,000
Peat:							
Agricultural use	thousand tons	227	250	263	[e]260	250	300
Fuel[e]	do.	[2]1,450	1,400	1,400	[e]1,400	1,400	1,500
Petroleum:							
Crude	thousand 42-gallon barrels	19	19	19	[e]20	20	20
Refinery products:							
Liquefied petroleum gas	do.	1,856	2,552	2,946	[e]3,000	3,000	3,000
Naphtha	do.	1,632	503	226	[e]500	500	1,000
Gasoline, motor	do.	32,122	31,801	31,330	[e]31,500	31,500	33,000
Jet fuel	do.	4,130	4,202	2,390	[e]2,500	2,500	4,000
Kerosene	do.	245	113	38	[e]50	50	250
Distillate fuel oil	do.	52,551	46,526	80,742	[e]81,000	81,000	82,000
Residual fuel oil	do.	26,855	24,895	27,254	[e]28,000	28,000	30,000
Other[e]	do.	[2]4,488	4,500	4,000	4,000	4,000	5,000
Refinery fuel and losses[e]	do.	11,300	11,300	10,000	10,000	10,000	15,000
Total[e]	do.	135,179	126,392	158,926	160,550	160,550	173,250

[e]Estimated. [r]Revised.

[1]Table includes data available through June 1994.

[2]Reported figure.

[3]Includes only that recovered from indigenous ores excluding scrap.

TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Granges Aluminum (Granges AB)	Sundsvall smelter at Kubikenborg	99
Cement		Cementa AB (Euroc, 100%)	Plants at Degerhamn, Skovde, and Slite	3,400
Copper:				
Ore, Cu content		Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Aitik, Garpenberg, Langdal, Kristineberg, Petiknas, and Renstrom	70
Do.		Outokumpu Oy	Mine at Viscaria/Pahtohavara	20
Metal		Boliden Mineral AB (Trelleborg AB, 100%)	Refinery at Ronnskar	100
Feldspar		Forshammar Mineral AB (Ernstrom Mineral AB, 100%)	Mine and plant at Riddarhyttan	75
Ferroalloys		Vargon Alloys AB	Plant at Vargon	175
Gold:				
Ore, Au content	tons	Terra Mining AB (Norsk Hydro A/S, 61.7%)	Bjorgdal Mine at Skelleftea	2.5
Do.		Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Aitik, Akerberg, Holmtjarn, and Kankberg	2.6
Metal		Boliden Metals AB (Trelleborg AB, 100%)	Refinery at Ronnskar	9
Iron ore		Luossavaara-Kiirunavaara AB (Government, 100%)	Mines at Kiruna and Malmberget	28,500
Iron and steel		Svenskt Stal AB (Government, 47.8%)	Steelworks at Lule, Oxelosund, and Domnarvet	3,500
Kyanite		Svenska Kyanite AB (Svenska Mineral, 100%)	Quarry at Halskoberg	10
Lead:				
Ore, Pb content		Boliden Mineral AB (Trelleborg AB, 100%)	Minea at Boliden, Garpenberg, Laisvall, Langdal, and Petiknas	115
Metal		Boliden Metals AB (Trelleborg AB, 100%)	Smelter at Ronnskar	95
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.		BP Raffinaderi AB	Refinery at Goteborg	100,000
Do.		Shell Raffinaderi AB	do.	82,000
Do.		AB Nynas Petroleum	Refineries at Goteborg, Malmo, and Nynashamn	54,000
Silver, metal		Boliden Metals AB (Trelleborg AB, 100%)	Refinery at Ronnskar	300
Zinc, ore, Zn content		Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Garpenberg, Laisvall, and Langdal	120
Do.		Vieille-Montagne Sverige AB	Zinkgruvan Mine at Ammeberg	70

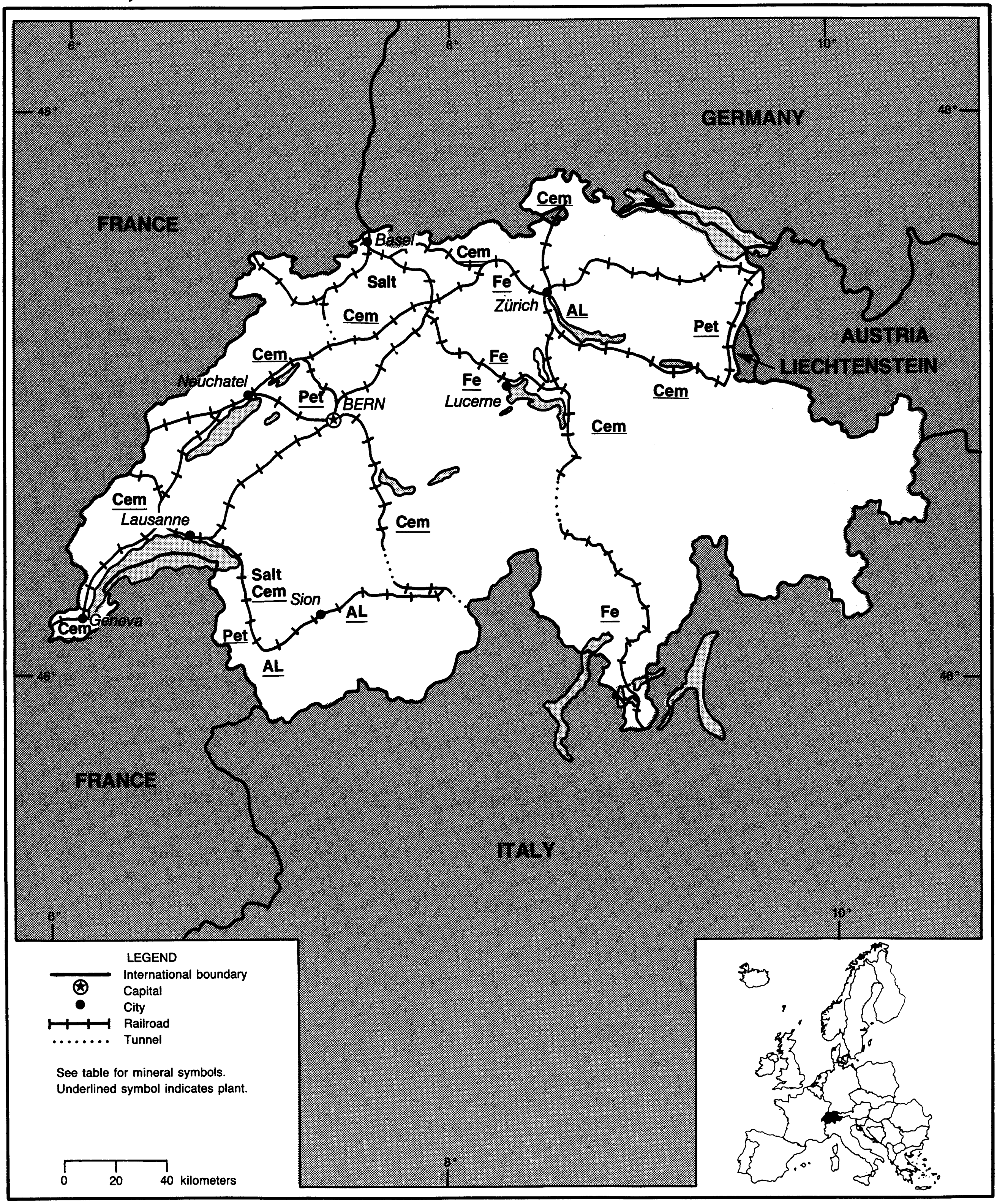
TABLE 3
SWEDEN: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

(Million metric tons)

Commodity	Reserves
Copper ore	300
Iron ore	850
Lead ore	45
Zinc, metal	15

SWITZERLAND

AREA 41,000 km² **POPULATION 6.8 million**



THE MINERAL INDUSTRY OF

SWITZERLAND[1]

By Jozef Plachy

The mineral production of Switzerland is limited mainly to commodities required for construction, including cement, clays, gravel, gypsum, lime, salt, and sand. Nonferrous metal production (aluminum and lead) is being phased out.

GOVERNMENT POLICIES AND PROGRAMS

The Swiss Government's involvement in the mineral industry reflects the environmental concerns of the population. A 10-year moratorium on new nuclear powerplants was passed in 1991. Concern about the greenhouse effect has limited the construction of thermal powerplants. The same concern about environmental pollution reportedly caused the planned termination of all smelting activities.

PRODUCTION

All metal production in Switzerland is either from imported raw materials (aluminum and steel) or from scrap (lead). Production of industrial minerals was largely affected by the building industry, and it remained about the same as in 1992. *(See table 1.)*

TRADE

Because of self-imposed environmental restrictions, in addition to a lack of natural resources, Switzerland is heavily dependent on imports of mineral commodities. Its most important trading partners, in order of importance, are Germany, France, the United Kingdom, and Italy. The United States continued to occupy fifth place, accounting for about 6% of Swiss imports.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is owned either privately or by regional governments (cantons). Cantonal or local governments grant mining or processing licenses and directly operate electrical powerplants, water resources, gas utilities, and local transportation facilities.

COMMODITY REVIEW

Metals

Aluminum.—Alusuisse-Lonza Holding AG (Aktien Gesellschaft) is the only producer of primary aluminum and a major producer of aluminum semimanufactures. Its Aluminium Division continued restructuring with an aim of eliminating lossmaking operations and reducing costs. It was decided that the primary aluminum smelter in Steg will cease operations in 1994, followed by closure of the Chipis smelter. Both will reportedly become casthouses for downstream operations. As a consequence, most of the primary aluminum will be sourced from the wholly owned Icelandic Aluminium Co. and jointly owned Sor-Norge Aluminium A/S in Norway. Due to the reduced primary metal production, the increased volume of bauxite from the wholly owned Mokanji Mine in Sierra Leone and alumina from Gove, Australia (70% Alusuisse-Lonza and 30% Gove Alumina Ltd.), will be sold to third parties.

At the end of 1992, Alusuisse-Lonza closed its only aluminum recycling plant at Refonda, operated by its subsidiary Metallwerke Refonda AG. For years, the 40,000-mt/a-capacity smelter was operating at a loss because the insufficient domestic supply of scrap had to be augmented with costly imports.

Steel.—The steel industry in Switzerland is characterized by a relatively small domestic market and a high degree of specialization. There are four steelworks in Switzerland: Ferrowohlen AG (150,000-mt/a capacity), Von Moos Stahl AG (300,000-mt/a capacity), and Von Roll Group (two steelworks of total 750,000-mt/a capacity). Only about 50% of consumption is covered by domestic production. Most consumption (about 30%) consists of rebar and reinforcing mesh. Ferrowohlen AG, in Wohlen near Zurich, began construction of a hot strip mill in 1991, but, because of environmental concerns, at the end of 1993 the mill was still idle. Ferrowohlen AG is now a long products mill only, casting its own billet to make bar and wire rod.

The restructuring of the Von Roll Group, consisting of Von Roll Ltd. in Gerlafingen and Monteforno Acciaierie e Laminatoi SA in Bodio, continued in 1993 with a decision to modernize the steelmaking facility in Gerlafingen. Planned investments reportedly include installing a new Fuch electric arc furnace, increasing crude steel capacity from 370,000 mt/a to 600,000 mt/a.

Industrial Minerals

Cement.—More than one-half of Switzerland's cement production capacity is controlled by Holderbank Management and Consulting Ltd., Zurich. It has more than 30 cement plants on 4 continents. Two of its wholly owned subsidiaries, the Bunder Cementwerke AG and Cementfabrik Holderbank, are the two largest cement plants in Switzerland.

Salt.—Salt production and trade in Switzerland is a cantonal monopoly. The smaller of two producers, the 50,000-mt/a-capacity Bex in the Rhone Valley, is in Vaud Canton and is the sole supplier of salt for this canton. Salt from the 350,000-mt/a-capacity Schweizerhalle, near Basel in the Alps, supplies the rest of the cantons. All cantons, except Vaud, are stockholders in the Salt Council, which controls the mining operations at Schweizerhalle, salt distribution, and imports. Revenues derived from a set sale price are distributed between cantons according to consumption.

INFRASTRUCTURE

Switzerland is a highly developed country with an excellent network of highways and railways. Because of its geographical location, Swiss highways, totaling 62,145 km, bear a high proportion of transit traffic. To reduce air pollution, mainly in the Alpine valleys, the Swiss Government proposed a total ban on transit truck traffic by the year 2004. It is to be replaced by an expansion of the national rail system, presently measuring 4,418 km. Expansion plans include a new 57-km-long tunnel under Gotthard pass, extending the tunnel under Simplon pass, and upgrading existing rail lines. These improvements would also help the domestic trucking industry, where a weight limitation (maximum of 28 tons per vehicle) makes road transport comparatively expensive.

OUTLOOK

The high production cost and environmental restrictions are pricing Swiss smelters out of the metal market. The closure of the secondary aluminum smelter in 1992 will reportedly be followed by termination of the primary aluminum and secondary lead smelters and some of the less efficient steelworks.

[1]Text prepared Apr. 1994.

OTHER SOURCES OF INFORMATION

Publications

Alusuisse-Lonza Holding Ltd. Annual Report 1993.
Annuaire Statistique de la Suisse.
Erdol-Vereinigung (EV) Geschaftsbericht 1992.
Von Roll. Annual Report 1992.

TABLE 1
SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan. 1, 1994)
METALS							
Aluminum:							
Primary	tons	71,328	71,602	65,877	52,148	45,000	40,000
Secondary	do.	31,700	34,400	35,800	10,700	—	—
Iron and steel:							
Pig iron and blast furnace ferroalloys[e]		70	70	70	70	70	90
Electric-furnace ferroalloys[e]		5	5	5	5	5	5
Steel, crude		916	970	955	1,050	1,000	1,200
Semimanufactures, rolled products[e]		1,300	1,100	1,000	1,000	1,000	1,100
Lead, refined, secondary	tons	1,500	5,700	5,000	6,400	6,500	7,000
INDUSTRIAL MINERALS							
Cement, hydraulic		5,461	5,206	4,700	4,260	4,000	4,950
Gypsum[e]		230	230	230	200	200	250
Lime		30	26	[e]40	[e]30	40	40
Nitrogen: N content of ammonia		[e]32	32	33	31	35	35
Salt		243	254	[e]250	276	300	400
Sulfur, from petroleum refining	tons	3,700	3,700	[3]3,999	3,160	3,000	4,000
MINERAL FUELS RELATED MATERIALS							
Gas:							
Manufactured	million cubic meters	11	—	—	—	—	—
Natural	do.	5	—	—	—	—	—
Petroleum refinery products:							
Liquefied petroleum gas	thousand 42-gallon barrels	1,518	1,612	2,264	1,989	2,000	2,500
Gasoline	do.	6,180	6,450	9,805	8,331	8,500	9,000

See footnotes at end of table.

TABLE 1—Continued
SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1989	1990	1991	1992	1993[e]	Annual capacity[e] (Jan 1, 1994)
MINIERAL FUELS AND RELATED MATERIALS—Continued							
Petroleum refinery products—Continued:							
Liquefied petroleum gas	thousand 42-gallon barrels	1,518	1,612	2,264	1,989	2,000	2,500
Gasoline	do.	6,180	6,450	9,805	8,331	8,500	9,000
Naphtha	do.	—	80	—	—	—	80
Jet fuel	do.	2,018	1,832	2,101	1,958	2,000	2,500
Kerosene	do.	15	15	—	—	—	—
Distillate fuel oil	do.	9,134	8,478	10,197	9,544	9,500	10,000
Residual fuel oil	do.	2,827	3,545	6,179	5,516	5,500	6,000
Bitumen	do.	926	872	916	812	800	1,000
Other refinery products	do.	1	1	—	—	—	—
Refinery fuel and losses	do.	882	882	1,991	2,181	2,200	2,500
Total[3]	do.	23,501	23,767	33,453	30,331	30,500	33,580

[e]Estimated.
[1]Table includes data available through May 1994.
[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]Total of listed products only.

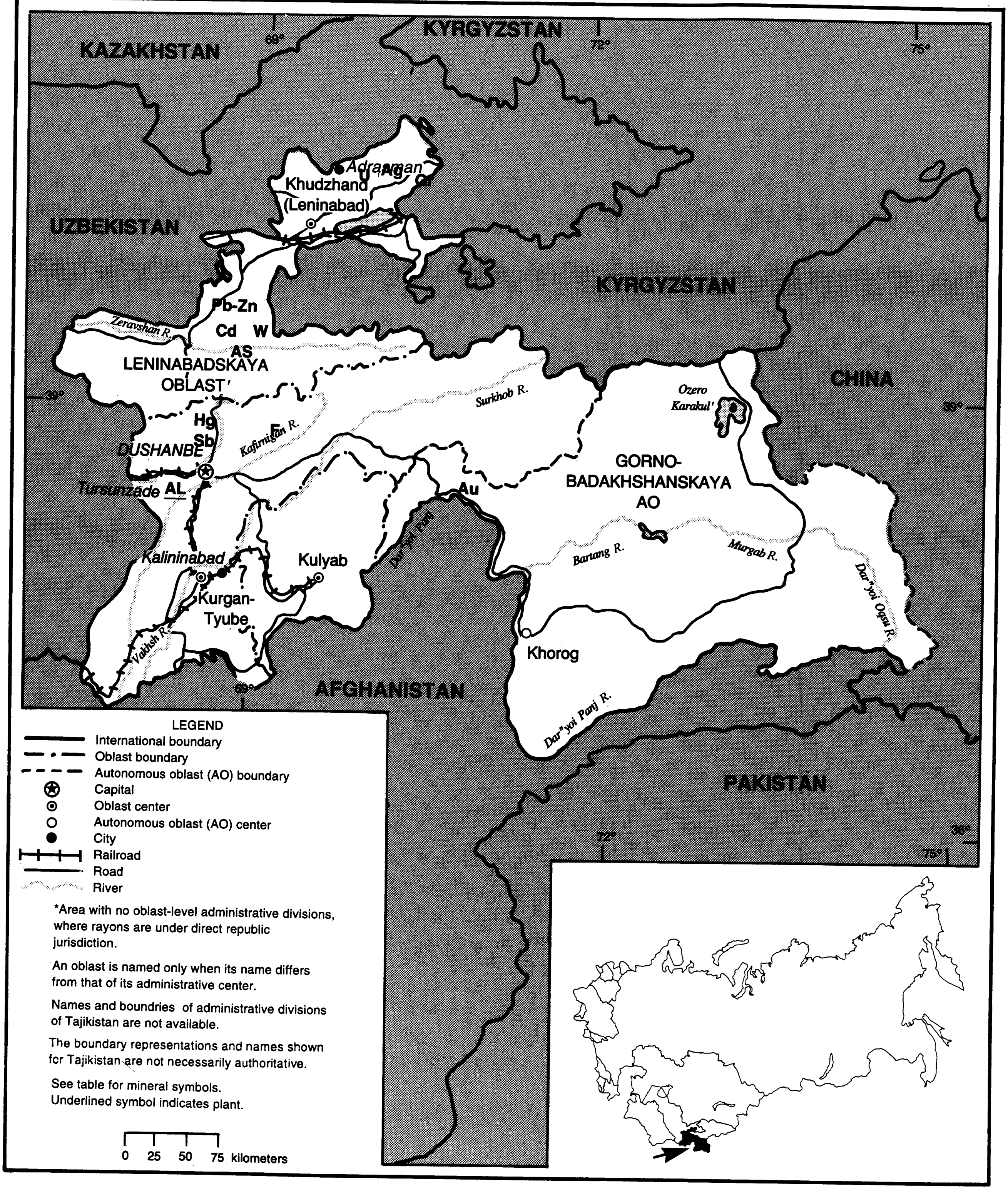
TABLE 2
SWITZERLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Alusuisse-Lonza Holding AG	Smelters at Chipis and Stag	40
Cement		Bunder Cementwerke AG (Holderbank Management and consulting Ltd., 100%)	Plant at Untervaz	700
Do.		Cementfabrik Holderbank AG	Plant at Rekingen	700
Refinery, petroleum	billion barrels per day	Reffinerie du Sud-Ouest SA (Compagnie Francaise des Petroles, 49%; British Petroleum, 49%)	Refinery at Collombey	40,000
Do.		Reffinerie de Cressier SA (Kninklijke Nederlandsche Petroleum Maatschappij NV, 100%)	Refinery at Cressier	36,000
Salt		Zentralbureau des Vereins der Schweizerischen Rheinsalinen (Government, 100%)	Saline at Schweizerhalle	350
Do.		La Societe des Mines (Canton of Vaud, 100%)	Saline at Bex	50
Steel		Monteforno Acciaierie e Laminatoi SA (Von Roll Group, 93.6%)	Plant at Bodio	380
Do.		Von Roll Group	Plant at Gerlafingen	370
Do.		Von Moss Sthal AG	Plant at Emmenbrucke	300
Do.		Ferrowohlen AG	Plant at Wohlen	150

TAJIKISTAN

AREA 143,100 km² **POPULATION 5.7 million**



THE MINERAL INDUSTRY OF

TAJIKISTAN[1]

By Richard M. Levine

In 1993, Tajikistan was engulfed in a civil war, which according to some estimates, has resulted in tens of thousands of deaths. The civil war in Tajikistan has brought major economic disruption to the country and its mineral industries and sharply curtailed efforts to attract foreign investment. Gross domestic product in 1993, compared with that of 1992, reportedly fell by 21% and industrial output declined by 19.5%.[2] Tajikistan's two principal hard currency earning exports were aluminum and cotton, and problems with the production of both these commodities were seriously affecting the country's economy.

PRODUCTION

Nonferrous metals mining was the leading sector of Tajikistan's mineral industry, with Tajikistan producing antimony, mercury, molybdenum, tungsten, rare and precious metals, and other metals. Tajikistan also produced oil, gas, coal, and industrial minerals.

In 1993, reportedly there were reported decreases in fuel output compared with that of 1992, with 1993 reported crude oil production decreasing 32% to 40,000 tons, natural gas production decreasing 41% to 50 million cubic meters, and coal production decreasing 9% to 200,000 tons. There also was reportedly a 41% decrease in cement production to 300,000 tons, a 63% decrease in caustic soda production to 6,000 tons, and a 63% decrease in mineral fertilizer output calculated in 100% nutrient value to 20,000 tons.[3] *(See table 1.)*

STRUCTURE OF THE MINERAL INDUSTRY

In November, the Tajikistan Council of Ministers adopted a decision on the privatization and denationalization of propery, which it stated was proceeding slowly and was considered one of the factors contributing to the decline in production. The Council of Ministers instructed the State Committee for the Management of State Property of the Republic of Tajikistan, together with ministries, departments, enterprises, and local authorities, to bring about the widespread privatization of large- and medium-size enterprises by setting up joint stock companies, holding companies, and joint enterprises involving foreign investors.[4] *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum.—The Tajik aluminum plant in Tursunzade, with a capacity of 500,000 tons per year of aluminum, produced about 300,000 tons of aluminum in 1993, 25% below the production target of 400,000 tons. Problems were attributed to difficulties in acquiring raw materials.

The major sources of raw materials for the Tajik plant are outside the country, and Government aid is considered crucial to the survival of the plant, particularly ensuring advanced payments for raw materials. Also considered critical is restoring ties with its traditional raw material suppliers, Azerbaijan, Russia, and Ukraine. The Tajik plant also had dealings with a number of western firms for raw materials, including the Swiss company Woralco, Sweden's Euromin, and the United Kingdom's Consup Commodities Ltd. and Swan Metals Ltd.[5] Besides problems with raw materials supply, the Tajik plant is experiencing a significant loss of its skilled workers as many Russian and other non-Tajik workers have fled because of the civil war.

Plans call for the Tursunzade plant to produce 350,000 tons of aluminum in 1994, but problems with a blockade of 350 rail cars supplying the plant with needed raw materials in early 1994 almost brought production to a halt and will make it more difficult for the plant to achieve its 1994 production target. Another major problem for the plant will be its electrical supply, which used to be supplied at virtually no cost from Kazakhstan, Kyrgyzstan, and Uzbekistan. These new countries no longer want to ship their electricity to Tajikistan at subsidized prices.

The majority of the plant's output is exported, with 70% of exports going to world markets and the remaining 30% to other Commonwealth of Independence States. Exports in 1993 reportedly totaled 255,230 tons, and plans called for maintaining this level of exports in 1994.[6]

Gold.—Tajikistan planned to increase gold production to 1.5 tons in 1994 and to 8 tons in the year 2000. Previously only placer deposits had been mined in Tajikistan, but these were mostly depleted and plans called for switching to mining lode deposits. Most of these deposits are suitable for surface mining. Discussion was underway with western firms on joint ventures in gold development.[7]

The Canadian-based company Gulf International Minerals, which had an agreement with the Tajik Gold joint-stock company to provide technical assistance to upgrade existing operations at the Kansay Mine to increase output, reportedly shipped its first batch of gold concentrates from this mine. Gulf international also completed a review of other Tajik gold deposits and signed another joint venture with the Govemnment for retreatment of gold tailings from the Darvaz placer mining district containing the country's largest alluvial deposits.[8] Tajikistan was planning to construct gold processing and refining facilities; previously all of its gold was sent to Russia for processing. Reportedly, the Khudzhand uranium mining and refining association, Vostokredmet, was converting to gold refining. Reportedly, the construction of a gold refining production line was almost complete.[9]

Reserves

Tajikistan has reserves of a wide range of metals and industrial minerals as well as mineral fuels. Information at the present time, however, is not adequate to estimate the quantities of these reserves. For metals, reserves include alunite, antimony, bauxite, bismuth, copper, gold, iron, lead, manganese, mercury, molybdenum, nepheline syenite, nickel, rare metals, silver, tin, tungsten, and zinc; for nonmetallics, barite, boron, construction materials, dolomite, fluorspar, phosphates, precious and seimiprecious stones, and salt; and for mineral fuels, coal, natural gas, oil shale, peat, petroleum, and uranium.

INFRASTRUCTURE

Tajikistan is a landlocked country bordered on the west by Uzbekistan, on the north by Kyrgyzstan, on the east by China, and on the south by Afghanistan. As of 1990, the country had 29,900 km of highways, of which 24,400 km was hard surfaced. It had 480 km of broad-gauge railroads and 420 km of narrow-gauge railroads. A railroad connects the capital of Tajikistan, Dushanbe, with Termez, Uzbekistan, on the Afghanistan border; from there rail lines connect to Tashkent from where connections can be made with other countries of the former U.S.S.R. The terrain consists of mountains and valleys dominated by the Pamir and Altay Mountains, the western Fergana Valley in the north, and the Kafirnigan and Vakhsh Valleys in the southeast. The climate ranges from semiarid to polar in the Pamir Mountains.

OUTLOOK

Until issues of political and economic stability are resolved, further development of Tajikistan's mineral industries and attraction of foreign investment will remain difficult. Tajikistan has the potential to remain a major aluminum producer and exporter and could become a major silver producer. It contains one of the world's largest silver deposits, the Adrasmanskoye deposit, which the country hopes to develop with the aid of foreign investment.

For other minerals, despite its variety of reserves, Tajikistan's distant location from world markets and major transport arteries will result in transport and infrastructure development costs being major factors in assessing the viability of mineral development in Tajikistan.

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[1]Text prepared July 1994.

[2]Interfax Statistical Report, Interfax—America, Denver, Colorado. Feb. 4-11, 1994, p. 3.

[3]——. Mar. 7, 1994, p. 8.

[4]Foreign Broadcast Information Service, U.S. Govt. (Washington DC). Nov. 13, 1993, p. 63, Radio Tajikistan, Nov. 23, 1993.

[5]Interfax Mining Report, Interfax—America, Denver, Colorado. Oct. 8-15, 1993, p. 11.

[6]Interfax Business Report, Interfax—America, Denver, Colorado. Feb. 11, 1994, p. 5.

[7]——. Apr. 29, 1994, p. 8.

[8]Mining Journal (London). Jan. 28, 1994, p. 59.

[9]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Moscow TV, Dec. 9, 1993, p. WD16.

TABLE 1

TAJIKISTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Aluminum		400,000	300,000	500,000
Antimony, metal content of ore		1,500	1,200	2,000
Bismuth		20	16	25
Cement		500,000	300,000	700,000
Coal		220,000	200,000	450,000
Gold	kilograms	500	400	2,000
Gypsum		500,000	400,000	600,000
Lead, metal content of ore		2,000	1,600	2,500
Mercury, metal content of ore		100	80	150
Natural, gas	million cubic meters	85	50	100
Petroleum, crude		60,000	40,000	100,000
Sand and gravel	cubic meters	4,000,000	3,500,000	5,000,000

[e]Estimated.

TABLE 2

TAJIKISTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

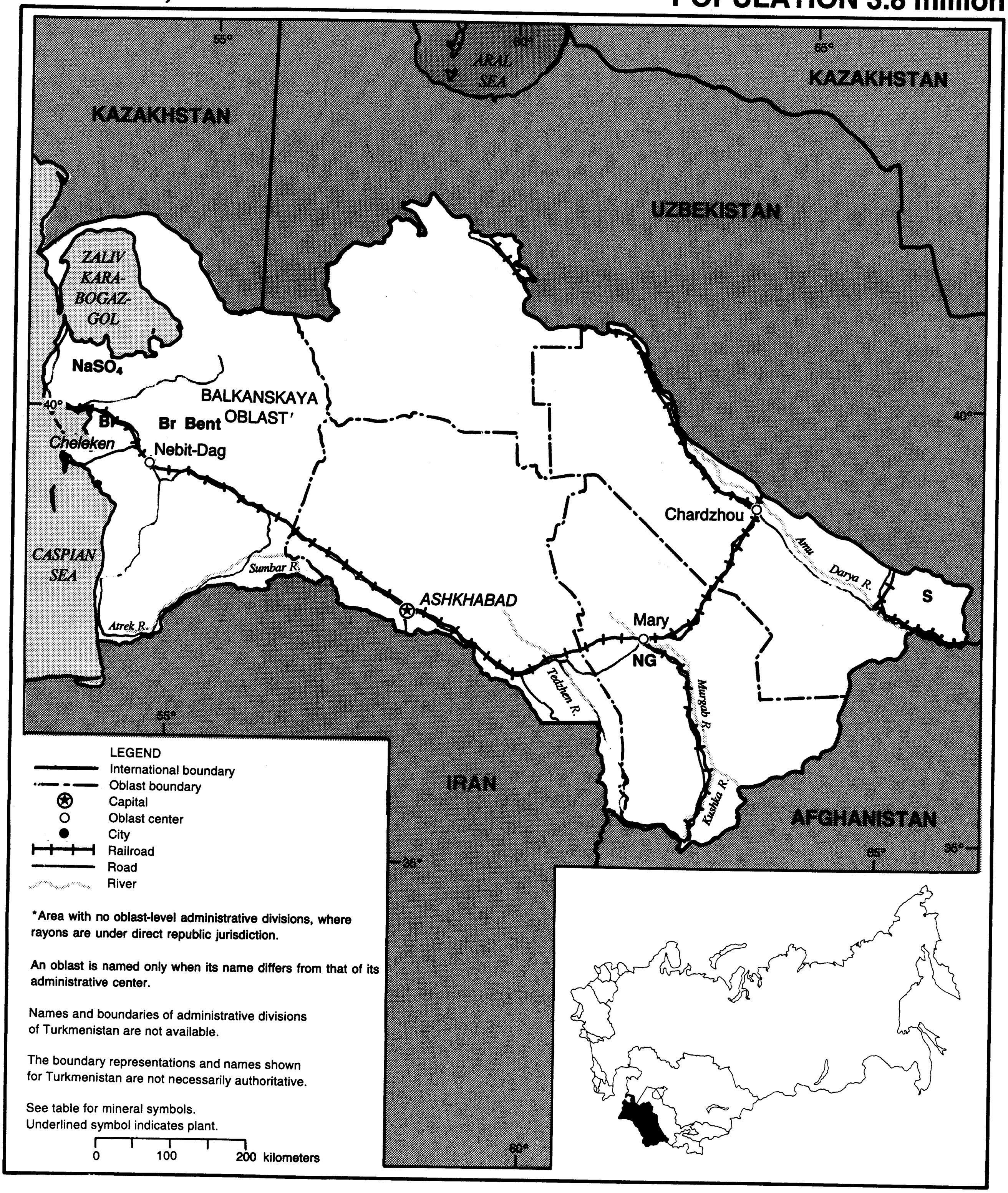
(Metric tons)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Tajik aluminum plant	Tursunzade	500,000.
Antimony	Anzob mining and beneficiation complex	Dzhizhikrutskoye deposit	2,000.
Bismuth, metal	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	25.
Do.	Isfara hydrometallurgical plant	Isfara	
Coal	Shurabskoye brown coal	Shurab region	700,000.
Do.	Fan-Yagnobskoye hard coal, deposits	Pyandzh region	
Copper	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	NA.
Gold	Tajikzoloto mining-beneficiation	Darvaz, Rankul placer deposits, southern part of country	2.
Lead	Leninabad mining and metallurgical complex	Yuzhno-Yangikanskiy deposit	2,500
Mercury	Anzob mining and beneficiation complex	Dzhizhikrutskoye deposit	150.
Molybdenum	Leinabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	NA.
Petroleum and natural gas	16 oil-gas deposits under exploration, including Ravatskoye, Ayritanskoye, Madaniyatskoye	Fergana depression	100,000 (total petroleum), 100,000,000 cubic meters (total natural gas).
Do.	Shaambary Beshtentyakskoye, Uzunkhorskoye, Kichik-Bel-skoye	Southern Tajik depression	
Zinc	Leninabad mining and beneficiation complex	Yuzho-Yangikanskiy deposit	NA.

[e]Estimated. NA Not available.

TURKMENISTAN

AREA 488,100 km² **POPULATION 3.8 million**



THE MINERAL INDUSTRY OF

TURKMENISTAN[1]

By Richard M. Levine

The mineral industry of Turkmenistan is based primarily on the extraction of natural gas with production also of oil and a number of important industrial minerals, including iodine and bromine, sodium sulfate and other sodium compounds, sulfur, table salts, gypsum, clays, and construction materials.

After Russia, Turkmenistan had been the second largest producer of natural gas among the republics of the former U.S.S.R. Turkmenistan, with its large production of natural gas and its gas and oil reserves, has its own source of domestic fuel and is able to achieve significant earnings from the export of natural gas.

Turkmenistan was one of the few Commonwealth of Independent States (CIS) countries to experience positive growth in industrial output in 1993 with a reported 8% increase in gross domestic product (GDP) and 5% increase in industrial output.[2]

GOVERNMENT POLICIES AND PROGRAMS

In November, Turkmenistan adopted a long-term program for the development of its oil and gas industry that calls for a great increase in production into the next century. The program calls for oil production to reach 28 million tons by the year 2000. The program also calls for the further development of the Krasnovodsk oil refinery and the Chardzhou refinery, with the latter only beginning operations in 1992. Refining capacity is projected to increase from its current level of 11 million tons per year to 18 million tons per year. Natural gas production is reportedly projected to reach 130 billion cubic meters by the year 2000, which is double the current output. Turkmenistan is planning these increases with capital from joint ventures with western firms.

The Turkmenistan Government reportedly planned in early June 1994 to offer tenders on oil and gas reserves in 7 of its largest geological tracts comprising 23 tender blocks covering about 1.5 million square kilometers. These blocks constitute about one-third of the country's area for oil and gas reserves. One-half of the blocks for tender is offshore in the Caspian Sea.[3]

PRODUCTION

In 1993, Turkmenistan reportedly increased output of its main mineral product, natural gas, by 9% compared with that of 1992. Based on the few other reported statistics, Turkmenistan also increased output of cement and mineral fertilizers, but reportedly decreased output of electricity, petroleum and petroleum products, and sulfuric acid. *(See table 1.)*

STRUCTURE OF THE MINERAL INDUSTRY

In 1994 Turkmenistan reportedly was preparing to embark on a limited program of privatization in trade and industry. Trade enterprises were to be sold at auction and small industrial enterprises with less than 100 persons would be bought by their work force or sold to citizens of Turkmenistan or foreigners. Enterprises with more than 100 employees would be turned into joint stock companies with the state retaining a controlling interest.[4] *(See table 2.)*

COMMODITY REVIEW

Plans call for the Iran Industrial Co. to build a kaolin clay enrichment plant in Nebit Dag with the capacity to produce 20,000 tons of marketable china clay. Turkmenistan now imports considerable quantities of china, earthenware products, and packaging material that uses kaolin from other former Soviet republics. This new plant, reportedly, will make Turkmenistan self-sufficient in kaolin.[5]

Plans call for Turkmenistan to begin development of its own coal reserves in 1994 to eliminate its import dependency on other countries, particularly Russia and Kazakhstan. Turkmenistan is importing about 100,000 tons of coal per year. Development is planned for the Tuarkyrskoye deposit in the northwest near the border with Kazakhstan, with reported reserves of 800 million tons. In 1994, Turkmenistan plans to begin development of the first section of the deposit with reserves reportedly of 25 million tons at a depth of about 200 meters. A feasibility study for developing the deposit is being drafted by the Iranian Ministry of the Mining Industry, and Iran is assisting in development plans. After satisfying its own needs, Turkmenistan plans to export coal to nearby parts of Afghanistan, Kazakhstan, Russia, and Uzbekistan.[6]

Construction began on the country's first steel mill, which will produce bars for reinforced concrete for export to Afghanistan, Iran, and other CIS countries. The plant is being built in conjunction with a Turkish construction company.[7]

Natural gas production in Turkmenistan in 1993 reportedly increased 9% compared with that of 1992 to 65 billion cubic meters; it had reached a level of 90 billion cubic meters at the end of the 1980's. In 1993, Turkmenistan was a major supplier of natural gas to other CIS countries, including Azerbaijan, Georgia, and Ukraine, which were sharply in arrears in paying with CIS countries reportedly owing $1.5 billion as of March 1994. Because of lack of payment, Turkmenistan had suspended or was considering suspending or curtailing gas exports to a number of these countries. At present all of Turkmenistan's gas exports are piped through Russia, which has exerted pressure on Turkmenistan to supply other CIS states with gas. Turkmenistan was negotiating to construct a pipeline through Iran and Turkey in an effort to reach export markets in Europe without having its gas transported through Russia.

Turkmenistan's most important reserves are of gas, oil, and industrial minerals, including barite, bentonite, bromine, iodine, sodium compounds, and sulfur. Oil reserves are primarily along the Caspian Sea coast while gas reserves are along the Caspian coast and in the northern and eastern parts of the country. Turkmenistan has been actively soliciting foreign investment to develop its hydrocarbon reserves.

INFRASTRUCTURE

Turkmenistan borders the Caspian Sea to the west, Iran and Afghanistan to the south, and Uzbekistan and Kazakhstan to the north. Turkmenistan is landlocked because the Caspian Sea lacks direct outlets to the world's oceans. Turkmenistan, which is slightly larger in area than the State of California, as of 1990 had 2,120 kilometers of rail lines and 23,000 kilometers of highways, 18,300 km of which was hard surfaced. The terrain in Turkmenistan is flat to rolling sandy desert with dunes. Cotton is grown in the irrigated western region of the country where the Karakumskiy canal is fed by the Amu Darya River.

OUTLOOK

Owing to its large reserves of oil and gas, which apparently will be developed with the aid of foreign investment, Turkmenistan will be able to derive significant revenues from these industries as well as have adequate domestic fuel supplies. Turkmenistan's revenues should increase further if Turkmenistan builds an alternate pipeline route that bypasses the countries of the former U.S.S.R. and enables Turkmenistan to more freely export natural gas and seek new export markets. Turkmenistan also has large reserves of sodium compounds that it may be able to market outside, as well as within, the countries of the former U.S.S.R.

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[1]Text prepared July 1994.

[2]Interfax Statistical Report. Feb. 4-11, 1994, p. 3.

[3]Interfex Petroleum Report. June 3-10, 1994, p. 12.

[4]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). May 20, 1994, p. WB/1, ITAR-TASS, May 14, 1994.

[5]Interfax Mining Report, Interax-America, Denver, Colorado. Dec. 10-17, 1993, p. 4.

[6]Foreign Broadcast Information Service, U.S. Govt. publication, Washington, DC. Mar. 29, 1994, p. 45, Selskaya zhizn, Mar. 24, 1994, p. 5.1.

[7]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). June 18, 1993, p. A/12, Radio Moscow World Service, June 13, 1993.

TABLE 1

TURKMENISTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Bentonite		70,000	50,000	100,000
Cement		1,000,000	1,100,000	1,200,000
Gypsum		300,000	200,000	650,000
Natural gas	million cubic meters	60,000	65,000	90,000
Petroleum: Crude		5,200,000	4,400,000	11,000,000
Refined		5,800,000	4,500,000	5,500,000
Sodium sulfate		100,000	70,000	150,000
Sulfur		300,000	200,000	350,000

[e]Estimated.

TABLE 2

TURKMENISTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Bentonite		Oglaninskoye deposit	Oglany	100,000.
Gysum		Krasnovodsk deposit	Krasnovodsk	250,000.
Do.		Wastes from Gaurdak sulfur deposit	Gaurdak	400,000.
Natural gas	billion cubic meters	Deposits: Achakskoye, Gygyrlinskoye, East and West Shatlykskiye, North and South Naipskiye, Dauletabad-Donmezskoye	Northeastern, eastern, southeastern, and southwestern part of country	90 total.
Petroleum: Crude		Deposit: Nebit Dag, Cheleken, Kum Dag, Koturtepinskoye, Barsa-Gelmesskoye, Burunskoye, Kuydzhikskoye, Gograndagskoye, Okaremskoye, Kamyshldzhinskoye	Southwestern part of country on Caspian Sea	5,500,000 total.
Refined		Chardzhou refinery	Chardzhou	6,000,000.
Do.		Krasnovodsk refinery	Krasnovodsk	5,000,000.
Sodium sulfate		Karabogaz Sulfate Association	Kara-Bogaz-Gol (Gararbogazköl)[1] Gulf	150,000.
Sulfur		Gaurdak deposit	Gaurdak	350,000.

[1]New spelling in brackets.

UKRAINE

AREA 603,700 km² **POPULATION 51.8 million**

THE MINERAL INDUSTRY OF

UKRAINE

By Richard M. Levine

Ukraine was a large producer of a number of important mineral products, including coal, iron ore, manganese ore, and steel and ferroalloys. It also was a lesser producer of a number of other mineral products, including ilmenite and rutile-zirconium ores, nickel and mercury ores, uranium ore, titanium, magnesium, mercury and nickel metal, and a large number of industrial minerals, including graphite, potash, salt, dolomite and limestone fluxes, kaolin, quartz, and a variety of building materials.

In 1993, according to the report of the Ministry of Statistics of Ukraine, gross domestic product decreased by 14% and national income by 15% compared with those of 1992. Ukraine imported practically all of its oil requirements from Russia and its natural gas requirements from Russia and Turkmenistan. Ukraine fell badly behind in paying for these fuel imports and experienced curtailments of its natural gas supply, with Turkmenistan particularly reluctant to continue shipments. As a result of a decrease in fuel extraction and the curtailment of fuel imports, production of petroleum refinery products decreased by 39%, with gasoline production decreasing 35%; diesel fuel, 24%; and boiler fuel, 40%. The reduction in fuel created a tense situation regarding production with particularly negative effects on metallurgy.[1]

GOVERNMENT POLICIES AND PROGRAMS

The President of Ukraine signed a decree permitting the export for sale of unclassified data on mineral resources with the State Committee for Geology being given the right to sell this material to foreign entrepreneurs on competitive terms with the proper customs documents. It was not specified as to which information was unclassified and which was classified.[2]

PRODUCTION

In 1993, compared with 1992, reportedly oil production decreased 5%; coal production, 13%; coke production, 17%; and gas production, 8%. Ukraine's oil and gas production formerly accounted for approximately 10% and 20%, respectively, of the country's consumption.[3] (*See table 1.*)

STRUCTURE OF THE MINERAL INDUSTRY

In 1993, reportedly 68% of industrial enterprises were owned by the state, and privatization in all spheres was proceeding at a slow pace.[4] Ukraine's major iron ore and manganese mining industries as well as its limestone mining industry for fluxing limestone, were organized into the Ukrrudprom Concern. This concern contains 44 enterprises, including transport, explosives, research, and auxiliary enterprises and employs 140,000 persons. (*See table 2.*)

COMMODITY REVIEW

Metals

Aluminum.—Ukraine's Cabinet of Ministers approved the program for the development of the aluminum industry in 1993 and until the year 2000 developed by the Ministry of Industry jointly with other ministries. It was projected that the level of aluminum consumption in Ukraine would increase to 500,000 tons per year, and that commissioning new aluminum production capacity was of great importance.

Ukraine, reportedly, has the capacity to produce 1,245,000 tons of alumina, 110,000 tons of primary aluminum, and 165,000 tons of secondary aluminum. Secondary aluminum is produced at a number of secondary aluminum plants that are part of the joint ventures Intersplav, Ukrgermetand, and Obimet. Output of secondary aluminum reportedly had fallen from 140,000 tons in 1990 to 72,000 tons in 1992.[5]

Despite its production of primary and secondary aluminum, Ukraine was experiencing shortages of alloys and semifinished aluminum products that it previously was receiving from Russia. Ukraine was planning to increase production capacity for both primary aluminum and semifinished aluminum products.[6] As part of this development, Ukraine was planning to introduce improved environmental controls in aluminum production.

Also, it was considered to be of great importance for Ukraine to participate in the development of the Dian Dian bauxite deposit in Guinea owing to Ukraine's need to import raw materials for aluminum production.[7] The Zaporozhye aluminum plant, Ukraine's only aluminum producer, began purchasing equipment to modernize production from Italy's FATA Association, including equipment for a planned facility to produce aluminum foil and packaging material.[8]

Ferroalloys.—Ukraine is a major producer of ferroalloys with more than 40% of the former U.S.S.R.'s electric furnace capacity. Although producing more than 2 million tons of ferroalloys, consumption of ferroalloys in Ukraine was only about 1 million tons. A large portion of Ukraine's ferroalloy production is based on domestically produced manganese, but Ukraine still had to import chrome and a large number of other alloying elements from other former republics. More than 80% of the former U.S.S.R.'s manganese-containing ferroalloys was produced in Ukraine. Large exports of silicomanganese from Ukraine caused concerns in western markets and led the European Union (EU) to consider antidumping action. Much of the silicomanganese was produced at the Nikopol ferroalloys plant that announced it was shutting down operations during the winter of 1993-94 because of energy shortages.[9]

In the beginning of 1994, the U.S. International Trade Commission commenced an antidumping investigation of silicomanganese imports from Ukraine. Ukraine, in response to these concerns, reportedly was considering reducing its silicomanganese exports. The primary mechanism for reducing exports was to be the issuing of export licenses only to specified firms. The total export quota reportedly was to be 200,000 tons of silicomanganese in 1994.[10]

In December 1992, the U.S. International Trade Commission issued a preliminary determination that ferrosilicon exports from Ukraine were being sold in the United States at less-than-fair value.

Iron and Steel.—Ukraine's steel industry was in need of modernization because 55% of steel still was produced in open-hearth furnaces; oxygen converters accounted for almost all the rest. Only about 8% of steel was continuously cast. Ukraine was planning to modernize its steel industry, and a significant component of this modernization was to introduce better pollution control measures. The modernization program also calls for closing inefficient steel mills and cutting the size of the work force. By the year 2000 it was planned to reduce the work force by 140,000 persons and to reduce it by another 50,000 persons by 2010.[11]

Ukraine's steel industry was seeking alternative markets for its steel products as demand for steel fell sharply in the countries of the former U.S.S.R. In 1993, Ukraine was seeking markets in Africa, Europe, and the Far East with North Africa becoming a strong market for Ukrainian iron and steel products. Ukraine's iron and steel products are being shipped to world markets from Black Sea ports and also from Baltic ports.[12] In February 1994, the EU approved a resolution imposing a provisional antidumping duty on Ukrainian iron that would be imposed when Ukrainian iron was priced at less than 149 ecu per ton on CIF terms.[13]

Iron Ore.—In 1993, Ukraine produced 65 million tons of iron ore, of which 17 million tons was high-grade direct-shipping ore produced from underground mines and 48 million tons was concentrate. Iron ore production had decreased considerably since the late 1980's, and the mines were working at about one-half of their total capacity of about 125 million tons per year of iron ore. The iron content of direct-shipping ore averaged 58%, and the iron content of the concentrate averaged 65%. There were six main open pit mining and beneficiation complexes and four underground mining complexes. Approximately 75% of the output was from open pits and the remaining 25% from underground mines. Ukraine exported about 25% of its output with the majority of its exports going to countries of the former U.S.S.R. and to former Soviet bloc countries of Eastern Europe. Approximately 50% of this trade with former Soviet republics and bloc countries was on a barter basis.

Plans call for commissioning the Krivoy Rog pelletizing plant in southwest Ukraine in 1995. This plant, the construction of which started as a joint project of the U.S.S.R. and the Eastern European members of the former Council for Mutual Economic Assistance (CMEA), was planned to pelletize hematite ores from the Novokrivorozhskiy and Yuzhniy open pit mining and benefeciation complexes, which were being stored in dumps. After the breakup of the U.S.S.R. and the end of the CMEA, Germany backed out of the project, jeopardizing its completion. Apparently the project will now proceed without Germany. The plant is projected to produce about 10 million tons per year of concentrate with a 60% iron content and 10 million tons per year of pellets with the fluxed pellets having a 60% to 62% iron content and the nonfluxed pellets a 65% iron content.[14]

Manganese.—Ukraine's manganese concentrate production in 1993 was approximately 5 million tons, which was down from its former level of about 7.5 million tons in the late 1980's. Exports comprised about 10% of output with the majority of the exports still going to former Soviet republics and the former Soviet bloc countries of Eastern Europe. Approximately 70% of manganese output was from open pit mines and the remaining 30% from underground mines. There were two major manganese mining and beneficiation complexes in operation, the Marganets and Ordzhonikidze; the Bolshoy Tokmak manganese complex was being developed and reportedly had begun production.

Titanium.—The Zaporozhye titanium and magnesium plant, Ukraine's only titanium producer, planned to double exports of titanium sponge in 1993 with exports projected to reach 8,000 tons. The Zaporozhye plant, which has a 20,000-ton-per-year design capacity, was projected to produce only 10,000 tons of titanium sponge in 1993. In 1992, production reportedly was 12,000 tons.[15]

Mineral Fuels

Ukraine annually requires 118 billion cubic meters of natural gas and almost 60 million tons of oil, but Ukraine only has the capacity to produce about 25 billion cubic meters of gas and 5 million tons of oil annually.[16] According to Ukraine's Ministry of Economics, the fuel industry was the number one priority sector in need of foreign investment. A list of priority projects for foreign investment was drawn up. These include renovation of the Shebelinsk gas processing plant;

construction of a gas processing plant at the Poltava field; reconstruction of the gas transport system to improve pipeline transport; development of the Odessa gas field in the northwestern Black Sea; construction of a complex to produce high-octane unleaded gasoline at the Drogobych oil refinery; and construction of an offshore oil refinery near Odessa.[17]

Ukraine was planning to increase its role as a transshiper of energy products to Europe as it reached an agreement with Turkey to merge its pipeline network with one being built in Turkey for transporting Mideast petroleum to Europe using the Odessa transshipment terminal and Ukraine's pipeline network to Europe. It is planned that Ukrainian experts will participate in the construction of the Turkish pipeline.[18]

Coal.—Coal production in 1993 reportedly was 115.7 million tons, compared with 164.8 million tons in 1990. According to the Ukrainian Academy of Sciences, Ukraine requires 170 million tons of coal annually for the full-scale operation of its thermal powerplants. Ukraine is now exploring the possibility of replacing nuclear plants with powerplants using clean-burning coal technology.[19]

Ukraine's Government adopted a plan for the development of the coal industry to the year 2005 that calls for national output to reach 155 million tons by 2005. The Donetsk Basin, Ukraine's major coal mining region covering an area of 60,000 square kilometers, at its peak was producing more than 200 million tons per year and was the former U.S.S.R.'s major supplier of hard coal, with significant production and reserves of anthracite and coking coal.

To stabilize and increase coal output, investment is needed in mine renovation. The commercial reserves in Ukraine are considered among the deepest and hardest to develop in the world.[20] The dips are steep, and there is a propensity for methane outbursts. Mechanization is not very advanced, and there is a great need for investment in this area.

Nuclear Power.—According to Ukraine's President, Ukraine's nuclear powerplants saved the country from a catastrophic energy supply situation by generating more than 40% of the country's electric power. Ukraine's five nuclear powerplants generated 75 billion kilowatt hours of electricity in 1993 compared with 74.26 billion kilowatt hours in 1992. Prior to the cutback in fossil fuel supplies from other former republics, nuclear power accounted for about 30% of electric power generation. Ukraine's five nuclear powerplants have a total capacity of 12.8 million kilowatts.

Practically all of Ukraine's nuclear powerplants were experiencing a shortage of nuclear fuel. Ukraine does mine uranium, but it must now be sent to Russia, which has facilities to process and enrich the fuel. Ukraine's President stated that this problem with nuclear fuel supply would be solved because of the trilateral agreement signed with Russia and the United States whereby Ukraine would remove its nuclear warheads and in return would be supplied nuclear fuel for its powerplants.

Faced with a severe crisis in energy supply, in 1992 Ukraine suspended its moratorium on commissioning new nuclear powerplant capacity, which had been adopted in August 1990.[21] In April 1994, it was announced that Ukraine's Government apparently had decided to shut down the remaining nuclear reactors at the Chernobyl powerplant, although according to a Ukrainian official it could require a number of years to actually shut down the plant.[22]

Uranium.—Ukraine, which reportedly contains about 8% of the former U.S.S.R.'s uranium reserves, was planning to resume uranium production, according to a Government resolution "On Measures To Stabilize Energy Supply in the Economy," passed in May 1994. The Vostochniy mining and beneficiation complex in Zheltye Vody reportedly had switched to producing iron ore concentrate as a result of the collapse of the U.S.S.R. and the conversion of defense industry enterprises. However, Ukraine decided to resume uranium production because of a shortage of fuel at its nuclear powerplants. The State Nuclear Power Committee was considering proposals to purchase equipment and licenses for technology for nuclear fuel production and the storage of processed fuel.[23]

Regarding exports of uranium, in 1993, the U.S. Government ruled that Ukraine was selling uranium other than highly-enriched uranium to the United States at less-than-fair value and thus was subject to antidumping duties.

Reserves

Ukraine has reserves of a wide range of metals, industrial minerals, and mineral fuels. Its major reserves are of iron ore, manganese ore, sulfur, and coal. It also has significant reserves of graphite, mercury, nickel, potash, and a number of important industrial minerals. Information at the present time, however, is not adequate for estimating reserves for a number of these mineral commodities. The reserve estimates that are available were assessed according to the Soviet reserve classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economy that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the Western definition of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Ukraine, with an area about the size of Texas and a population of more than 50 million people, is the second largest country in population to form out of the former U.S.S.R. Ukraine shares borders to the north with Belarus and Russia, to the east with Russia, to the south with

Moldova, and to the west with Hungary, Poland, Romania, and Slovakia. Located on the western border of the former U.S.S.R., Ukraine has good railroad, highway, and pipeline connections with Eastern Europe, and to the south on the Black Sea, Ukraine has port facilities for trade on world markets. Major ports include Ilichevsk, Izmail, Kerch, Kherson, Mariupol, and Odessa. The Dnieper is the major river flowing through Ukraine to the Black Sea. A major gas pipeline network connects the major gas-producing regions of west Siberia in Russia to Ukraine from where the gas is exported to European countries.

OUTLOOK

Although possessing one of the largest mineral industries in the former U.S.S.R., Ukraine's mineral industry faces great economic difficulties in making the transition to a market economy. Its coal industry, although it produced about 40% if the coal in the former U.S.S.R., was in large part uneconomic even in Soviet terms because of the depth of the mines and the thinness of the seams. However, Ukraine now is looking more to its coal resources as a source of future domestic fuel supply as it attempts to find alternatives to nuclear power. Ukraine will be seeking ways to increase coal utilization while introducing greater efficiency and safety in this sector.

Its iron ore and manganese industries mine primarily low-grade or low-quality ore with which it will be difficult to compete on world markets, and its steel and ferroalloy industries are in need of modernization. If adequate investments are made, it may be possible to efficiently produce concentrates and products that meet world standards, but the cost of such investments will have to be assessed in terms of the potential profitability of these industries. The same issues apply to modernizing Ukraine's steel and ferroalloys industries. Nevertheless, Ukraine does have markets for its ferrous ore and metal in the countries of the former U.S.S.R. and the former Soviet bloc countries of Eastern Europe, and maintaining these markets as well as establishing other new markets will be of importance to these industries in surviving this transition period.

Ukraine also possesses reserves of minerals that either have not been developed yet or fully developed that could offer as good if not better opportunities for future development. These resources include reserves of gold, graphite, titanium, and a wide range of industrial minerals.

Given the large size of Ukraine's current mineral industry, the near-term economic well being of the country will depend to a significant degree on the result of efforts to either invest in Ukraine's mineral industries to make them competitive and profitable or on developing means for down scaling these industries and converting production to other products. Major serious social and economic consequences could result if these mineral industries collapse without effective alternate programs in place to ameliorate the effects of such a transition.

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[1]Text prepared July 1994.

[2]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). Mar. 14, 1994, Pravda Ukrainy, Kiev, in Russian, Feb. 8, 1994, p. 3.

[3]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Jan. 14, 1994, p. WD/15, Radio Ukraine World Service, Kiev, in Ukrainian, 1700 gmt, Jan. 1, 1994.

[4]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). May 13, 1994, p. 49, ITAR-TASS, May 12, 1994.

[5]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Feb. 18, 1994, p. WD/1, ITAR-TASS, Feb. 11, 1994.

[6]Page 6 of work cited in footnote 5.

[7]Interfax Mining Report. Jan. 7-14, 1994, p. 5.

[8]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Jan. 7, 1994, p. WC/8, Holos Ukrayiny, Kiev, Dec. 23, 1993, p. 2.

[9]Interfax Mining Report. June 2-10, 1994, p. 10.

[10]Metal Bulletin, (London). Dec. 23, 1993, p. 9.

[11]———. July 15, 1993.

[12]Interfax Mining Report. June 3-10, 1994, p. 21.

[13]Metal Bulletin (London). Aug. 5, 1993, p.14.

[14]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). p. WD/6, Economic News Agency, Moscow, Feb. 24, 1994.

[15]Interfax Mining Report. Sept. 10-17, 1993, p. 5.

[16]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). Feb. 25, 1994, p. WD/1, Ukrainian Radio, Kiev. Feb. 15, 1994.

[17]Interfax Petroleum Report. Mar. 25-Apr. 1, 1994, p. 14.

[18]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). Mar. 16, 1994, p. 36, Ukrinform in English, 1551 gmt, Mar. 14, 1994.

[19]New York Times (NY). Apr. 10, 1994, p. 12.

[20]Interfax Mining Report. Apr. 1-8, 1994, p. 9.

[21]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). Mar. 21, 1994, pp. 29, 30, Pravda Ukrainy, in Russian, Mar. 1994, p. 2.

[22]New York Times (NY). Apr. 10, 1994, p. 12.

[23]Interfax Mining Report. May 13-20, 1994, p. 3.

TABLE 1
UKRAINE: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Alumina		1,200,000	1,200,000	1,245,000
Aluminum:				
Primary		100,000	100,000	110,000
Secondary		72,000	70,000	165,000
Total		172,000	170,000	275,000
Cement		17,000,000	22,000,000	25,000,000
Coal		134,000,000	115,700,000	143,000,000
Of which coking coal		54,900,000	50,000,000	60,000,000
Coke		27,500,000	23,000,000	30,000,000
Graphite		50,000	40,000	80,000
Iron ore		75,700,000	65,000,000	125,000,000
Magnesium		15,000	13,000	30,000
Manganese, marketable ore		5,819,000	5,000,000	7,000,000
Mercury		100	80	120
Natural gas	thousand cubic meters	20,900,000	19,000,000	25,000,000
Nickel, Ni content of ore		5,000	4,500	8,000
Nitrogen (N content of ammonia)		1,300,000	1,200,000	1,500,000
Petroleum, crude		4,474,000	4,300,000	5,000,000
Pig iron		35,300,000	30,000,000	50,000,000
Potash K_2O content		200,000	160,000	220,000
Steel:				
Crude		41,700,000	30,000,000	55,000,000
Finished		29,500,000	20,000,000	40,000,000
Pipe		5,087,000	4,500	6,000,000
Sulfur, native		1,200,000	1,000,000	1,500,000
Titanium:				
Ilmenite concentrates		200,000	180,000	250,000
Metal		12,000	10,000	20,000
Zinc, metal		20,000	12,000	25,000
Zirconium concentrates		75,000	70,000	100,000

[e]Estimated.

TABLE 2
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity
Alumina	Nikolayev refinery	Nikolayev (Mykolayiv)[1]	1,000,000.
Do.	Zaporozhye (Dneprovsk) refinery	Zaporozhye	245,000.
Aluminum, primary	Zaporozhye (Dneprovsk) smelter	do.	110,000.
Coal:			
Hard	Donets coal basin with about 225 mines produces more than 90% of Ukraine's coal	Donetskaya (Donets'ka),[1] Dnepropetrovskaya (Dnipropetrovs'ka),[1] Luganskaya (Luhans'ka)[1] oblasts	130,000,000.
Do.	L'vov-Volynskiy basin produces remainder from 18 mines	Western Ukraine	6,000,000.
Brown	Dneprovskoye Basin	Central Ukraine	7,000,000.
Dolomite	Novotroitskoye, Severskoye mining administrations	Novotroitskoye deposit, Yamskoye deposit	3,000,000 (total).
Do.	Dokuchayevskiy Flux-dolomite complex	Yelenovskoye and Stylskoye deposits	
Graphite	Zavalyevskiy graphite complex	Zavalyeviskiy deposit	80,000.
Iron ore	Underground mining:		
Do.	Krivbassruda production association with 16 mines	Kryvoy Rog Basin	30,000,000.
Do.	Eksplutatsionnaya Mine of the Zaporozhskiy iron ore complex	do.	3,500,000.
Do.	Open pit mining: Yuzhniy, Novokrivorozhskiy, Tsentralny, Severnyy, Inguletskiy, Poltaviskiy and Kamysh-Burunskiy mining and beneficiation complexes	do.	90,000,000, (total).
Magnesium	Zaporozhye plant Khlorvinil concern	Zaporozhye Kalush	10,000. 20,000.
Manganese ore, marketable	Ordzhonikidze, Marganets mining and beneficiation complexes	Nikopol Basin	7,000,000 (total).
Do.	Tavricheskiy mining and beneficiation complex (under development)	Bol'shoy Tomak Basin	
Ferroalloys	Nikopol ferroalloys plant	Nikopol	250,000 (ferromanganese).
Do.	do.	do.	1,200,000 (silicomanganese).
Do.	do.	do.	3,000,000 (manganese sinter).
Do.	Stakhanov plant	Lugansk	NA (ferrosilicon).
Do.	Zaporozhye plant	Zaporozhye	300,000 (ferrosilicon); 160,000 (silicomanganese; NA (ferrochrome); NA (ferromanganese); 40,000 (manganese metal).
Mercury	Nikitovskiy mining and metallurgical complex	Donets Basin	120.
Nickel	Pobuzhhskiy mining and metallurgical complex, comprising three open pit mines and smelter	Pobuga region	10,000 (ferronickel).
Potash	Khlorvinil production association, Stebnik potash plant	Pricarpathian region	300,000 (K_2O).
Steel, crude	Azovstal plant, Dneprovsk plant, Donetsk plant, Kommunarsk plant, Kryvoy Rog plant, Makeyevka plant, Mariupol plant, Zaporozhya plant	Mariupol, Dneprodzerzhinsk, Donetsk, Kommunarsk (Alchevs'k),[1] Kryvoy Rog, Makeyevka, Mariupol, Zaporizhya	7,000,000. 6,000,000. 2,000,000. 4,500,000. 14,000,000. 4,000,000. 7,000,000. 5,000,000.

See footnotes at end of the table.

TABLE 2—Continued
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity
Sulfur	Sera production association	Rozdol mining complex mines, Rozdol, Soroks, Zhidachev deposits, Yavorov complex mines, Nemirov and Yazov deposits in L'vovskaya (L'vivs'ka)[1]	1,500,000 (total).
Titanium, ilmenite and zircon-rutile-ilmenite ores	Irshanskiy mining and beneficiation complex, Verkhnedneprovskiy mining and metallurgical complex	and Kiev (Kyyivs'ka)[1] oblasts	250,000 (total).
Titanium, metal	Zaporozhye plant	Zaporozhye	20,000.
Uranium	Zheltye Vody complex	Northern part of Kryvoy Rog Basin	NA.
Zinc	Ukrzink plant	Konstantinovka (Kostyantynivka)[1]	25,000.

NA Not available.
[1]New name or spelling given if available in parenthesis

TABLE 3
UKRAINE: RESERVES OF MINERAL COMMODITIES FOR 1993

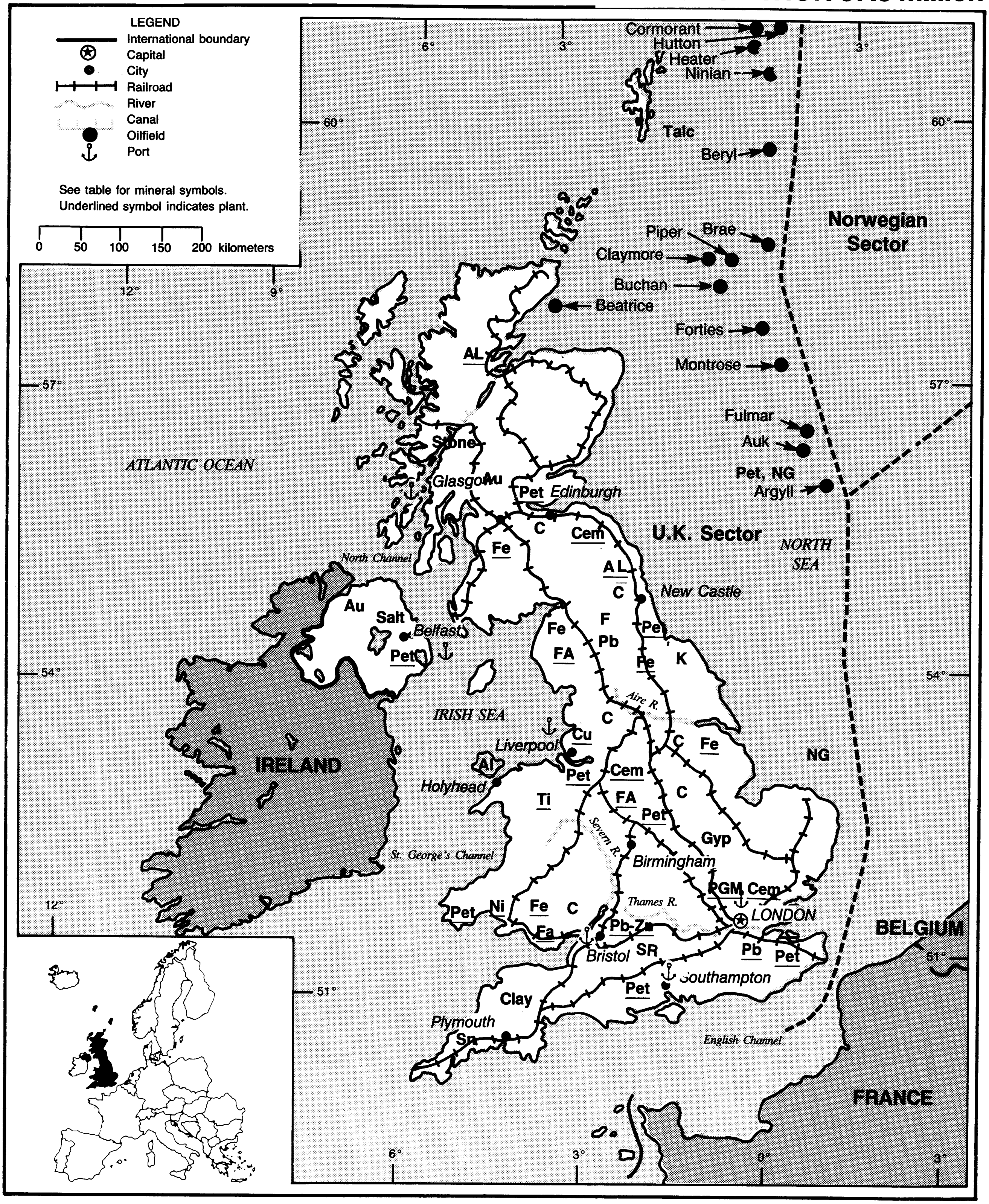
(Thousand metric tons unless otherwise specified)

Commodity	Quantity
Bentonite	112,400
Clays, refractory	492,700
Coal:	
Hard	48,780,000
Brown	3,650,000
Dolomite	439,000
Graphite	96,500
Gypsum	440,700
Iron ore	26,850,000
Kaolin	294,100
Limestone, for fluxing	2,720,000
Manganese ore	2,210,000
Potash	2,800,000

UNITED KINGDOM

AREA 244,820 km²

POPULATION 57.8 million



THE MINERAL INDUSTRY OF

THE UNITED KINGDOM

By Harold R. Newman

As a result of a rather complex geologic history, the United Kingdom has historically been well endowed with mineral resources. Metallic ore deposits were typically small and of relatively high grade. Mining of nonferrous minerals, particularly copper and tin, has been ongoing since the Bronze age. Mine production of nonferrous minerals has been declining 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 29th 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.

Gross domestic product (GDP) growth rate registered a 1.8% increase in 1993 as the United Kingdom's economy was improving after nearly 3 years of recession.

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 Great Britain 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 (BS), formerly British Steel Corp., the Government was proceeding with privatization plans for BC.

PRODUCTION

The significant events of 1993 were the publication of the Government's White Paper, "The Prospects for Coal—Conclusions of the Government's Coal Review" and the Coal Industry Bill, which were related to the privatization of BC.

BC consists of six underground mining groups and the Opencast Executive, which is responsible for open pit mining. BC owns most of the coal reserves in the country and licenses and collects royalties from the privately owned mines. At the end of 1993, only 22 underground mines were in production compared with 50 underground mines in 1992. BC was undergoing a colliery review procedure for these remaining mines.

The privatization plan was based on a five-way auction with five regional underground mine and open pit packages based on mines and sites in the Scotland, Wales, the North East, Central Yorkshire, and Nottinghamshire coalfields.

The steel sector's operations showed a moderate improvement as the demand for steel increased. BS was reportedly utilizing 76% of its production capacity. Production of tin concentrate continued from the one remaining tin mine. Open pit coal production continued strongly. In underground coal operations, production decreased as reserves were depleted even though overall productivity increased almost 17%.

Production of crude petroleum increased as redevelopment of the areas effected by the Piper Alpha drilling rig disaster in 1988 and the gas explosion on the Cormorant A drilling platform in 1989 was completed. *(See table 1.)*

TRADE

The United Kingdom has shifted from being a net exporter as recently as 1986 to being a net importer. Part of the reason for the weaker export performance has been problems in the United Kingdom sector of the North Sea oilfields. Other contributing factors were adverse currency exchange rates with trading partners and a petroleum surplus. The United Kingdom foreign trade is dominated by petroleum.

It was expected that the economy would experience a slow rate of growth and gradually move out of recession. This could cause the demand for imported consumer goods to increase. Table 2 shows the impact of selected classes of mineral commodities on the United Kingdom's balance of payments position in relation to the European Union (EU) and the world. The figures, in thousand dollars[1], are for 1992, the latest year that data were available. *(See table 2.)*

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) was formerly responsible for mineral fuels that include coal, natural gas, and petroleum and also responsible for the issuing of licenses for the exploration, appraisal, and production of natural gas and petroleum.

These DOE functions were absorbed by DTI, which now has this responsibility. A new Metals and Minerals Branch was formed to oversee these activities.

DOE 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 1993, direct employment in the mineral industry, including quarrying, was about 100,000 workers. *(See table 3.)*

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.

British Alcan was continuing to look for an economic long-term source of material for its power station which supplies electricity to its smelter at Lynemouth. Alcan reportedly was considering buying the nearby Ellington colliery and had entered into talks with BC.

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 completed construction of its new secondary aluminum smelter at Repton near Derby. The new smelter replaced the original plant, which had been torn down. The smelter went into operation in 1993 and was reported to have a design capacity of 45,000 mt/a of secondary ingot.

Gold.—Activities in gold exploration and development in the United Kingdom decreased in 1993. Northern Ireland, Scotland, and Wales continued as the three main areas of concentration by companies. Scotland was the most active area with 10 exploration licenses in effect.

Ennex International PLC's Cononish project near Tyndrum, about 96 km north of Glasgow, Scotland, received planning permission from the Sterling District Council. The project was to undergo final review by the Secretary of State for Scotland.

Ennex had filed a planning application that specified an underground mine, supported by surface facilities, and production of about 500 mt/d using 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.

The deposit was estimated to contain 514,000 tons of ore with an average grade of 9.4 g/mt gold and 52.9 g/mt silver. The company was continuing a drilling program to locate additional ore zones at depth and to the west of the project.

Omag Minerals Ltd. applied for planning permission for its open pit operation at Omag, Northern Ireland. The two-part inquiry concluded in November, and the Commission to the Inquiry was expected to send its recommendation to DOE by mid-1994.

Drilling and trenching on a mineralized quart vein reportedly outlined estimated reserves of 350,000 tons of ore with a grade of about 8 g/mt of gold and 29 g/mt of silver. Omag reported that this quantity was considered sufficient for about 7 years of production.

Iron and Steel.—Production of iron ore was limited to a small amount of hematite ore mined by Egremont Mining Co. at the Florence Mine in Cumbria. Production of Jurassic ironstone ceased after 1992. Primary steel production was based on imported iron ore.

BS's integrated steelworks were producing at about the same level as last year. BS reported this was because of moderate steel demand and stiff competition in international markets where a sizable percentage of its products are sold. The U.S. Department of Commerce imposed a preliminary dumping duty of 71.84% on rail imports from BS. If this duty is upheld, it would seriously affect the export of rails by BS to the United States. This business amounts to about 1% of BS's general steels division's total sales.

Also, if BC does close a majority of its collieries as it was announced this would cause a decrease in consumption of steel in the United Kingdom mining sector. This market represents about 1.5% of the total apparent consumption of finished steel in the country and the restructuring of the coal mining industry could significantly reduce domestic steel purchases.

Lead and Zinc.—MIM Holdings (UK) Ltd. purchased the Avonmouth lead-zinc smelter from Pasminco Ltd. for about $72 million. The Avonmouth plant is the world's largest Imperial Smelting Process (ISP) smelter. The plant has a capacity of 55 kmt/a of lead and 120 kmt/a of zinc. MIM also has a joint venture interest in an ISP smelter in Germany.

The purchase of the Avonmouth plant will provide another in-house outlet for the bulk lead-zinc concentrates produced from MIM's Mount Isa/Hilton complex in Australia.

Tin.—The mill at Carnon Consolidated Tin Mines Ltd.'s Wheal Jane Mine was continuing operations to treat ore from Carnon's South Crofty Mine near Camborne. The Wheal Jane Mine was closed in 1991.

South Crofty produces about 2,100 mt/a of concentrate and sends it to the Wheal Jane mill, which produces a 58% grade of tin concentrate. The concentrate is then shipped to Malaysia.

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 to 120 Mmt/a of marine aggregate, which represents approximately 85% of global output. Marine aggregate production amounts to about 10% of total production in the United Kingdom. The marine 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 6 companies operating about 50 dredges. Marine aggregates play a major role in the supply of material to southern England where there is a lack of crushed aggregate.

DOE has made proposals to limit the growth of land-based quarrying in England and Wales by 20% over the next 20 years. The proposals included the expansion of coastal super quarries, such as Foster Yoeman Ltd.'s Glensanda quarry at Oban, Scotland, and the use of recycled material in construction.

Redlands Aggregates Ltd. requested planning permission to develop a coastal super quarry at Lingarabay, Scotland. The proposed quarry has estimated reserves of 600 Mmt of anorthosite. Capacity of the proposed project would be about 1 Mmt/a and rising over a number of years to between 5 Mmt/a and 12 Mmt/a.

Cement.—There were signs that the recession in the building and construction industry, which severely restricted raw material demand, appeared to be over. An upturn in house building suggests that the concrete block market may be one of the first to recover. The block market is one of the largest for concrete products.

Castle Cement Ltd., with more than 25% of the domestic market, reportedly was operating at near full capacity. Castle has taken steps to improve operational efficiency through rationalization, cost reduction and increased flexibility and has centralized its activities with the development of a national rather than a works-based management structure.

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.

As part of ECC's concentration on chemicals and minerals operation, the company acquired the U.S. specialty chemicals producer Calgon Inc. for an estimated $300 million and reported it was planning to sell its construction business.

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 completed its rationalization and restructuring activities and was focusing 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 the Wareham Basin in Dorset; four quarries and one underground mine in the Bovey Basin in south Devon; and three open pit mines in the Petrockstowe Basin in north Devon. Total production is about 350,000 mt/a. Sixty-five percent of this production is from the Bovey Basin.

Fluorspar.—Fluorspar mining is concentrated in Derbyshire from the Southern Pennine Orefield, and the major producer is Laporte Industries PLC.

Laporte operates two underground mines and one open pit mine. The new Milldam Mine came on-stream in early 1992. 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.

The only other major producer was Weadale Fluorspar Ltd. Swan Industrial Minerals Ltd., who was working the open pit fluorspar-barite deposits acquired from the former Deepwood Mining Co. Ltd., went into receivership at yearend 1993.

Gypsum.—British Gypsum Ltd. (BG), 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.

BG completed 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. BG closed its Gotham and Fauld plasterboard plants and commenced construction on facilities at Kirkby Thore and East Leake to process desulfogypsum from power stations.

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. Production is about a 2:1 potash-to-salt ratio. CPL was continuing with 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 chlorine, 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.

Sand and Gravel.—TMC Pioneer Aggregates Ltd., a joint venture operation between Pioneer Aggregates (UK) Ltd. and TMC, was continuing to develop 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 located at Boreham, Essex, and covers 480 ha with estimated reserves of 34 Mmt. Pioneer Aggregates 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 around 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.—Alex 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 Unst 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.

Mineral Fuels

Coal.—At the end of 1993, there were 22 underground mines operated by BC as compared with 50 the previous year. Also, there were 45 open pit mines operated by contractor companies.

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 tons per worker-shift. The total work force, in 1993, has been reduced to about 60,000 from almost 300,000 in 1980. Overall productivity in BC's mines was 17% higher in 1993 compared to that of 1990. Although productivity has shown an impressive rise, total production has been declining since 1983.

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.

BC negotiated a 5-year contract to supply coal to the newly formed electric utilities, National Power and PowerGen. BC would supply 40 Mmt/a of coal for the first 2 years, and for the remaining 3 years 30 Mmt/a would be supplied. The electricity industry accounts for 84% of BC's total sales. Coal contributes about 30% toward primary energy consumption.

Natural Gas.—A group of seven petroleum and natural gas companies were studying the feasibility of a natural gas interconnector between the United Kingdom and continental Europe. The Government had indicated its support for the project in the context of the future integration of European trade in natural gas. The 243 km, $425 million, 15-billion-$m^3$/a-capacity natural gas pipeline would go from the Bracton terminal, Norfolk, to Zeebrugge, Belgium.

Petroleum.—The 14th Licensing Round took place with 484 blocks in the United Kingdom sector of the North Sea oilfields offered for bidding. The Department of Trade and Industry awarded 110 blocks. Twenty-five blocks went to United Kingdom companies, 14 blocks went to EU companies and 16 blocks went to non-EU companies.

There were 74 offshore exploration and 57 appraisal wells drilled in the first 9 months of 1993. There was a reduction in exploration activity as a result of the change in the United Kingdom tax regime and declining oil prices.

Elf Enterprise Caledonia restarted production of oil and gas from the Piper Field in the Central North Sea through the Piper B platform, 5 years after the Piper A platform was destroyed. The new platform incorporates all the design requirements and safety factors specified by DTI for new offshore platforms.

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 of additional reserves had not been reported at yearend.

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-gauge 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," has been constructed underneath the English Channel and was undergoing trial runs by trains carrying freight. The Channel tunnel 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 transported through the tunnel will move by rail. The Channel Tunnel linking the two countries was expected to be a vital component of the European single market concept.

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 expected to continue 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.

The Government publication "UK Strategy for Sustainable Development" is expected to be a significant framework for the development of mineral resources. There will be further efforts to raise the level of environmental management and to maximize the best use of natural resources, including use of recycled materials and alternate sources of energy.

[1]Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of (£)1.00=US$1.45, the average rate during 1993.

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

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

Annual Reports of various companies.
British Geologic Survey, Keyworth: United Kingdom Mineral Yearbook, annual.
Central Statistics Office, London: Annual Abstracts of Statistics, annual.
Monthly Digest of Statistics, monthly.
CSO Minerals, annual.
Department of Energy, London: 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.

TABLE 1
UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	1991	1992	1993[e]	Annual capacity[e] Jan. 1, 1994
METALS						
Aluminum:						
Alumina from imported bauxite[e]	[2]116,200	115,000	110,000	100,000	100,000	125,000
Metal:						
Primary	297,313	293,678	293,512	[r]244,168	[2]239,099	300,000
Secondary	109,695	120,854	[r]162,678	[r]251,805	[2]274,402	300,000
Cadmium: Metal including secondary	395	438	449	[r]383	[2]458	500
Copper:						
Ore and concentrate, Cu content	508	955	294	—	—	—
Metal, refined:						
Primary	48,643	46,991	16,606	10,363	[2]10,629	50,000
Secondary	70,390	74,643	53,454	31,704	[2]35,949	75,000
Total	119,033	121,634	70,060	42,067	[2]46,578	125,000
Iron and steel:						
Iron ore:						
Gross weight	34,297	55,000	59,400	[r]39,600	29,200	25,000
Fe content	[e]8,000	12,100	12,580	[r]8,610	[2]6,130	10,000
Metal:						
Pig iron thousand tons	12,638	12,277	11,883	11,351	[2]11,808	12,000
Ferroalloys, blast-furnace:						
Ferromanganese do.	143	144	178	[r]137	125	150
Steel, crude do.	18,813	17,908	16,474	[r]16,212	[2]16,693	17,000
Rolled products do.	15,165	14,502	19,542	13,972	14,000	15,000
Lead:						
Mine output, Pb content	2,161	1,377	1,020	[r] [e]1,000	500	1,000
Metal:						
Smelter:						
Bullion from imported concentrate	34,523	42,728	40,304	42,164	[2]42,773	50,000
Secondary (refined)[e] [3]	200,000	[2]113,172	110,000	100,000	[2]154,453	150,000
Total[e]	234,523	[2]155,900	150,304	142,164	197,226	200,000
Refined:						
Primary[4]	156,983	155,873	164,338	198,805	[2]209,560	250,000
Secondary[3]	[e]193,500	173,505	146,676	147,990	[2]154,453	200,000
Total	[e]156,983	329,378	311,014	346,795	364,013	450,000
Magnesium metal, secondary including alloys[e]	1,000	900	800	800	500	1,000
Nickel metal, refined[e] [5]	26,100	26,800	29,030	28,000	28,000	30,000
Silver: Mine output, Ag content kilograms	1,689	[e]1,500	565	—	—	—
Tin:						
Mine output, Sn content	3,846	3,400	2,326	[r] [e]2,000	[2]2,232	2,000
Metal:						
Primary	3,584	[e]6,100	1,661	—	—	—
Secondary (refined)	7,184	[e]5,900	3,575	100	100	100
Zinc:						
Ore and concentrate, Zn content	5,771	6,673	1,078	—	—	—
Metal, smelter	79,773	93,309	100,651	96,813	[2]105,391	125,000

See footnotes at end of table.

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] Jan. 1, 1994
INDUSTRIAL MINERALS							
Barite[6]		70,026	[r]67,551	85,505	[r]76,723	55,000	100,000
Bromine		29,907	[e]28,000	29,328	[r]29,903	[2]27,423	30,000
Cement, hydraulic	thousand tons	[r]16,849	[e]14,000	[r]11,662	[r]10,720	10,000	12,000
Clays:							
Fire clay	do.	1,052	[r]892	867	[e]800	800	1,000
Fuller's earth[7]	do.	[e]210	204	189	[e]190	[2]187	250
Kaolin (China clay)	do.	[e]3,140	3,037	2,911	[r]2,521	[2]2,577	3,000
Ball clay and pottery clay[e]	do.	780	820	[2]729	740	[2]746	1,000
Other, including shale[e]	do.	18,500	[e]17,000	[2]13,038	12,000	12,000	15,000
Diatomite[e]		270	240	[2]220	[r]120	100	250
Feldspar (china stone)		6,470	[e]6,500	6,417	[e]8,000	[2]5,433	10,000
Fluorspar, all grades[8]		122,057	[r]118,498	77,903	85,000	65,000	125,000
Gypsum and anhydrite[e]	thousand tons	4,000	4,000	[2]3,500	3,000	3,000	4,000
Lime: Quicklime and hydrated[e]	do.	2,800	2,800	2,800	2,500	2,500	3,000
Nitrogen: N content of ammonia	do.	1,037	1,148	1,011	869	900	1,000
Potash, K_2O equivalent		462,000	488,000	[r]495,000	[r] [e]524,000	530,000	500,000
Salt:							
Rock	thousand tons	1,148	1,102	1,635	[e]1,500	1,200	1,500
From brine	do.	1,344	1,341	1,319	[e]1,200	1,300	1,200
In brine, sold or used as such	do.	4,228	3,991	3,874	[r]3,401	3,200	3,600
Sand and gravel:[e]							
Common sand and gravel	do.	135,000	122,000	[2]106,363	[2]88,898	95,000	150,000
Industrial sand	do.	4,500	4,300	[r]3,900	[r]3,615	4,000	5,000
Sodium compounds, n.e.s.: Carbonate, synthetic[e]	do.	1,000	1,000	1,000	1,000	1,000	1,000
Stone:							
Crushed:							
Calcite[e]	thousand tons	17	19	[2]8	[r]4	6	25
Chalk	do.	13,877	13,129	10,317	9,171	10,000	15,000
Chert and flint	do.	[e]12	14	5	—	—	—
Dolomite	do.	21,271	20,674	19,454	18,539	19,000	25,000
Igneous rock	do.	54,490	57,395	53,821	[e]48,630	50,000	75,000
Limestone	do.	111,393	102,641	93,431	[e]86,000	90,000	100,000
Sandstone including ganister	do.	19,593	18,042	16,607	[e]11,586	12,000	25,000
Slate including fill	do.	590	359	293	326	[2]388	500
Total[e]	do.	221,243	212,273	[2]193,936	174,256	181,394	240,525
Dimension:[e]							
Igneous	do.	100	100	[2]127	100	100	100
Limestone	do.	200	200	[2]243	200	200	200
Sandstone	do.	200	200	200	200	200	200
Slate	do.	50	50	67	60	60	100
Strontium minerals		20,885	24,734	[e]2,000	[r] [e]2,000	1,000	5,000
Sulfur, byproduct:[e]							
Of metallurgy		61,000	64,000	65,000	60,000	72,000	100,000
Of petroleum refining		115,000	135,000	140,000	175,000	200,000	150,000
Total		176,000	199,000	205,000	235,000	272,000	250,000

See footnotes at end of table.

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	1991	1992	1993[e]	Annual capacity[e] Jan. 1, 1994
INDUSTRIAL MINERALS—Continued							
Talc, soapstone, pyrophyllite		15,413	14,781	10,818	[r]5,216	[2]5,317	10,000
Titania[e] [9]		225,000	225,000	200,000	150,000	150,000	225,000
MINERAL FUELS AND RELATED MATERIALS							
Coal:							
Anthracite	thousand tons	[r]2,060	[r]1,945	1,864	[r] [e]1,600	1,500	18,000
Bituminous including slurries, fines, etc.	do.	[r]99,059	[r]92,434	94,280	83,272	66,750	70,000
Lignite	do.	16	18	3	3	2	10
Total	do.	[r]101,135	[r]94,397	96,147	[r]84,875	68,252	71,810
Coke:							
Metallurgical		7,572	[r]7,521	7,011	[e]6,500	6,500	7,500
Breeze, all types		[e]200	[r]208	152	[e]150	150	200
Fuel briquets, all grades[e]		1,500	1,500	[2]1,198	1,000	1,000	1,500
Gas, natural:							
Marketable[10]	million cubic meters	44,711	50,600	69,300	[e]64,140	76,325	80,000
Marketed[11]	do.	41,228	45,771	55,330	[e]50,226	59,768	—
Natural gas liquids[12]	thousand 42-gallon barrels	51,086	41,830	51,353	[e]58,340	60,000	65,000
Petroleum:							
Crude[13]	do.	655,530	687,015	684,420	[e]706,500	748,890	800,000
Refinery products:							
Liquefied petroleum gases	do.	19,221	18,792	19,302	[e]18,200	19,000	20,000
Naphtha including white spirit	do.	15,359	16,209	21,376	[e]25,840	26,000	30,000
Gasoline	do.	231,515	227,154	236,241	[e]237,830	238,000	250,000
Jet fuel	do.	[e]56,800	60,328	56,296	[e]61,450	62,000	65,000
Kerosene	do.	18,480	17,895	18,957	[e]19,000	20,000	25,000
Distillate fuel oil	do.	173,706	174,594	194,385	[e]191,350	190,000	200,000
Residual fuel oil	do.	82,477	87,359	87,945	[e]82,500	83,000	90,000
Lubricants	do.	[e]7,350	6,832	6,811	[e]8,140	8,200	8,500
Bitumen	do.	14,501	14,871	13,950	[r] [2]14,156	15,000	16,000
Petroleum coke[e]	do.	3,102	3,225	3,102	[r] [2]2,943	3,000	3,500
Petroleum wax[e]	do.	425	315	291	[2]488	500	600
Unspecified[e]	do.	3,570	3,985	4,340	3,300	3,500	4,000
Refinery fuel and losses	do.	36,825	44,842	45,675	[e]42,500	42,000	45,000
Total[e]	do.	663,331	676,401	708,671	707,697	710,200	757,600

[e]Estimated. [r]Revised.
[1]Includes data available through July 31, 1994.
[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: 1992 BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand dollars)

Mineral commodity	Exports European Community	Imports European Community	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	90	—	90	135	—	135
Magnesite	708	2,542	(1,834)	1,201	6,082	(4,881)
Slate	1,320	233	1,087	2,466	2,693	(227)
Other	350,099	252,863	97,236	643,817	456,030	187,787
Total	352,217	255,638	96,579	647,619	464,805	182,814
Metalliferous ores:						
Copper	402	397	5	444	432	12
Lead	107	—	107	547	—	547
Tin	32	13	19	10,607	24	10,583
Zinc	51	858	(807)	213	82,023	(81,810)
Other (including waste and scrap)	401,151	419,595	(18,444)	797,301	1,966,026	(1,168,725)
Total	401,743	420,863	(19,120)	809,112	2,048,505	(1,239,393)
Nonmetallic mineral manufactures	1,704,528	231,772	1,472,756	3,120,171	353,355	2,766,816
Metals:						
Iron and steel	3,287,348	3,316,952	(29,604)	5,310,271	4,426,211	884,060
Mercury	91	287	(196)	483	299	184
Other nonferrous metals	1,852,984	1,935,366	(82,382)	3,097,104	4,559,600	(1,462,496)
Total	5,140,423	5,252,605	(112,182)	8,407,858	8,986,110	(578,252)
Mineral fuels	7,791,533	2,727,604	5,063,929	12,245,506	12,303,762	(58,256)

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

TABLE 3
UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(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 Aluminium Ltd.	Ft. William, Kinlochleven, and Lynemouth	175
Do.	Angelesy Aluminium LTD. (RTZ Corp. Ltd., 51%; Kaiser Aluminum & Chemical Corp., 49%)	Holyhead, Wales	113
Aluminum, secondary	Trent Alloys Ltd. (Cookson Group 100%)	North Cave, Humberside	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 & 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

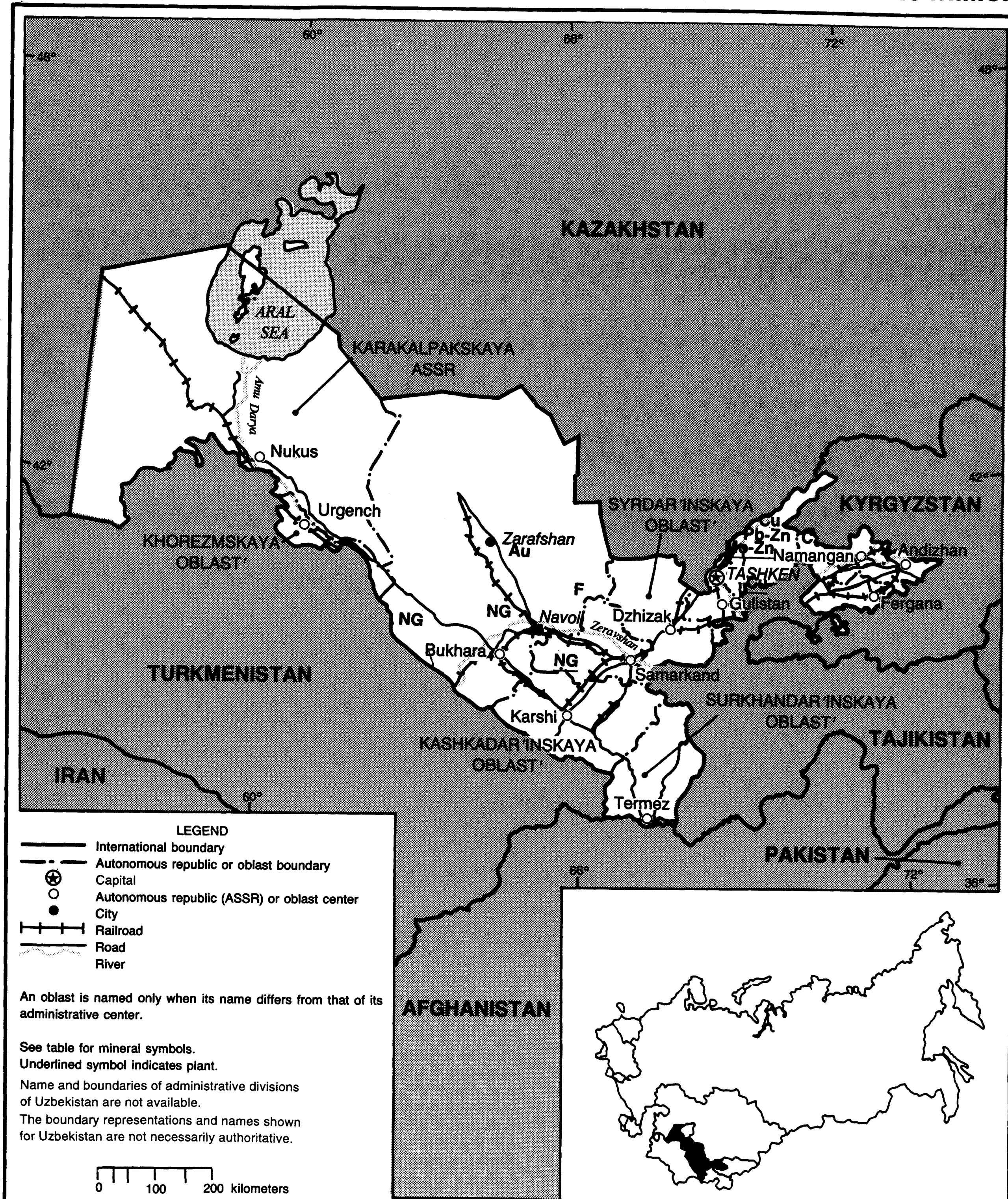
TABLE 3—Continued
UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
China clay (kaolin)	ECC Group PLC	Mines and plants in Devon	3,000
Copper	IMI Refiners Ltd.	Refinery at Walsall, West Midlands	80
Ferroalloys	British Steel PLC	Teesside, Cleveland	80
Do.	Murex Ltd.	Rainham, Essex	25
Do.	London and Scandinavian Metallurgical Co. Ltd.	Rotherham, South Yorkshire	30
Fluorspar	Weadale Fluorspar Ltd.	Mines in Derbyshire	50
Do.	Laporte Industries	Mill at Stoney Middleton, Mines in Derbyshire	70
Gypsum	British Gypsum Ltd.	Mines in Midlands, Cumbria, and Sussex	3,500
Lead, refined	Britania Refined Metals Ltd.	Northfleet, Kent	165
Lead, secondary	H.J. Enthoven and Son Ltd. (Billiton U.K.) Ltd., 100%)	Darley Dale, Derbyshire	60
Lead, smelter	MIM Holdings (UK) Ltd.	Avonmouth, Avon	55
Natural gas billion cubic feet	Amoco Ltd., British Petroleum Ltd., Esso (U.K.) Ltd., Phillips Petroleum Co. PLC, Shell (U.K.) 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 (U.K.) Ltd., Occidental Petroleum Co. Ltd., Shell (UK) Ltd., Texaco Ltd., Unocal, Inc.	North Sea oilfields	2.1
Petroleum, refined do.	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 & Exploration Co. Ltd.	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, Chesphire, Humberside, and Norfolk	6,000
Steel	British Steel PLC	4 integrated steel-works in Gwent, Lanark, South Humberside, and Cleveland	16,800
Talc	Alex Sandison & Sons Ltd.	Unst, Shetland Islands	15
Do.	Shetland Talc Ltd. (Anglo European Minerals Ltd., 50%; Dalriada Mineral Ventures Ltd., 50%)	Cunningsburg, Shetland Islands	35
Tin, ore	Carnon Consolidated Tin Mines Ltd.	South Crofty Mine, Cornwall	1,800
Titanium, sponge	Deeside Titanium Ltd.	Plant at Deeside, Clyde	5
Zinc, smelter	MIM Holdings (UK) Ltd.	Avonmouth, Avon	120

UZBEKISTAN

AREA 447,400 km² **POPULATION 21.6 million**



THE MINERAL INDUSTRY OF

UZBEKISTAN

By Richard M. Levine

Uzbekistan was the third most populous state of the former U.S.S.R. and the fourth largest in land area. It is well endowed in mineral wealth. It is the world's seventh largest producer of gold, which is a significant source of foreign currency earnings. Besides gold, Uzbekistan was a large producer of nonferrous metals and natural gas. The nonferrous metals industry includes the mining of bismuth, copper, lead, molybdenum, tin, tungsten, and zinc and the production of copper and zinc metals at the Chirchik metals plant. Uzbekistan produces mineral fuels, including coal, gas, oil, and uranium, and has one of the former U.S.S.R.'s largest gas processing facilities at Mubarek. Uzbekistan also produces significant quantities of industrial minerals, including feldspar and fluorspar, as well as a range of minerals for the construction industry.

Despite its significant mineral industry, Uzbekistan imports about 65% of its material and technical resources from Russia. In 1993, Uzbekistan's imports from Russia included coal, oil, and ferrous and nonferrous metals.[2]

Reported economic indicators for Uzbekistan do not show as steep a production decrease as occurred in other states of the former U.S.S.R. For 1993, Uzbekistan reported a 13% decrease in gross domestic product and a 3% decrease in industrial output compared with 1992.[3]

GOVERNMENT POLICIES AND PROGRAMS

Uzbekistan is planning a major program to develop its mineral resources by attracting foreign investment. These particularly include gold deposits because Uzbekistan reportedly was the former U.S.S.R.'s second leading producer, with an output of up to 80 tons per year and reportedly several thousands tons of exploitable gold reserves. The program also calls for development of copper, lead and zinc, and tungsten deposits.[4]

Uzbekistan reportedly has six explored gold deposits and three explored silver deposits that it is seeking to develop. The country also has 33 rare-earth metals deposits and 32 nonferrous metals deposits, including the third largest copper reserves of the former U.S.S.R. The country has seven explored tungsten deposits. A significant number of deposits have not been developed, including feldspar, phosphorite, silver, and strontium deposits.[5]

To facilitate investment, in May 1994 the Uzbek parliament passed a new law "On Foreign Investments and Guarantees for Foreign Investments."[6] In an effort to strengthen interregional trade and ties, Kazakhstan, Kyrgyzstan, and Uzbekistan formed the Central Asian Union to reduce tariffs in the region and to coordinate fiscal and monetary policies.[7]

ENVIRONMENTAL ISSUES

Uzbekistan's mineral industry has generated considerable waste, which poses environmental problems. Reportedly, mining and metallurgical enterprises annually generate about 1.3 billion tons of waste out of a total annual generation of 2 billion tons of waste. Annually, about 50 million to 60 million tons of strippings and tailings from mining are dumped on an area of about 10,000 hectares. The coal mining operation at Angren annually mines a large quantity of byproduct kaolin, which is now being stored in heaps. Metallurgical plants in Uzbekistan annually emit about 350,000 tons of waste metal. The large heaps of slag, tailings, mud, ash, and other waste from mining are now using potential agricultural land, are a source of soil pollution and pollution of surface and subsurface waters, and generate atmospheric dust. Facilities and equipment to treat these wastes are generally lacking.[8]

PRODUCTION

In 1993, some decreases were reported in mineral output while a few mineral products reported increases, according to data available at the time of this report. This situation was unlike many other former Soviet republics, which had almost no increases and more severe decreases in mineral output. Although decreases were reported in the production of cement, coal, mineral fertilizers, steel, and sulfuric acid, increases were reported in the production of natural gas and petroleum.[9] (*See table 1.*)

STRUCTURE OF THE MINERAL INDUSTRY

In 1993, the Government maintained control of the majority of large enterprises in key sectors of the economy, including mining and metallurgy, but promoted privatization of retail services, light industry, and private housing. In 1994, the Government planned to begin privatizing larger state enterprises. The privatization program for 1994 still stresses the need for state support for privatized enterprises. Reportedly, for some enterprises public joint stock companies will be formed in which the Government, the work force, and foreign partners will be able to own shares. (*See* table 2.)[10]

COMMODITY REVIEW

Coal.—Although Uzbekistan possesses fairly large coal reserves, estimated to be more than 2 billion tons, it does not meet its needs for coal from domestic production. Coal consumption in Uzbekistan is about 8.5 million tons per year while output in 1993 was only 4.7 million tons. Almost all of the country's coal is mined from the Angren brown coal deposit, where output was 4.1 million tons in 1993.

Production at Angren reportedly fell 30% in 1993. Problems were cited in acquiring mining equipment, which is mainly produced in the other countries of the former U.S.S.R. Coal is mined at Agren from both underground and open pit operations; its ash content is between 20% to 25%.

The remaining coal is mined in the Surkhondaryo[11] (Surkkhandar'inskaya) region of southern Uzbekistan, which contains the Baysunskoye deposit, the country's second largest, where coal is mined underground. Coal from Baysunskoye, which has a 5% to 7% ash content and a 0.7% sulfur content, is considered superior to that from Angren. It is planned to further develop the Baysunskoye deposit, not only as a source of fuels, but also as a source of raw materials for chemical products.[12]

Copper.—Uzbekistan was the former U.S.S.R.'s third largest producer of copper. Practically all reserves are in three porphyry deposits, the Kalmakyrskoye, Sarychekinskoye, and Dalnee, with total reserves reportedly estimated at 1.4 million tons of copper. The Almalyk mining and metallurgical enterprise exploits the Kalmakyrskoye and Sarychekinskoye deposits with an average grade of 0.42% copper. The copper beneficiation plant at Almalyk is designed to process 30 million tons per year of ore. Almalyk produces blister and refined copper. Almalyk now is preparing to exploit the Dalnee deposit graded at 0.36% copper. Furthermore, in 1993, geologists reported exploring two major new copper deposits in the eastern part of the Tashkent region in central Uzbekistan.[13]

Iron and Steel.—Plans call for renovating the Bekabad steel mill, with work already begun on renovation of the electric furnaces. Bekabad's rolled steel is consumed in Uzbekistan, in other countries comprising the Commonwealth of Independent States (CIS), and in Europe and Asia, Its reinforced steel has been exported to the United Kingdom, China, Israel, and Japan, among other countries.[14]

Gold.—Statistics on gold production on Uzbekistan are now being reported, but the situation still remains unclear because of conflicting reports. In various reports from apparently official sources, reported annual gold output in 1993 has ranged from 40 to 80 tons. A report by the state statistical service stated that 65 tons of gold is extracted annually.[15] However, it is not clear if this figure also included byproduct gold production which would raise gold output closer to the higher quoted figures.

Western investors were participating in gold development in Uzbekistan. Gold production will be significantly increased by employing leaching technology to the large dumps at Uzbekistan's major gold field, the Muruntau deposit. The Newmont Mining Corp. of the United States is engaged in a joint venture in Uzbekistan to process the material in these dumps. The European Bank for Reconstruction and Development (EBRD) announced that it intends to help finance the Newmont joint venture. Production from the Newmont joint venture was scheduled to begin in 1995.[16]

The United Kingdom's Lonrho PLC signed an agreement with Uzbekistan to develop two lode deposits using biological leaching. Reportedly, these two deposits combined will produce 15 tons of gold per year with reserves sufficient for 27 years of production. Operations are planned to begin in 1998.[17]

Kaolin.—The Angren coal deposit contains considerable kaolin reserves, which the country was seeking to develop. In midyear, a contract was signed with a Turkish company to build a turnkey plant to process the kaolin. Also, negotiations were reported with other western companies to construct processing facilities, including a Canadian and a British company.[18]

Lead and zinc.—Uzbekistan was the third largest Lead and zinc producer of the countries of the former U.S.S.R., but reportedly accounted for under 10% of CIS lead and zinc output and reserves. Reserves reportedly total 1.1 million tons of lead and 750,000 tons of zinc. Practically all lead and zinc reserves are in the Uch-Kulak deposit in the Jizzakh (Dzhizak) region in central Uzbekistan and the Khandiza deposit in the Qashqadar'yo (Kashkandar'inskaya) region in southern Uzbekistan. At the Dalnee section, one of two sections at the Uch-Kulak deposit that accounts for more than 80% of Uzbekistan's lead output and about 70% of its zinc output, the metal content of the ore reportedly ranges between 1.8% and 4.8% for lead and 2.3% and 3.5% for zinc. In the other remaining section of Uch-Kulak, the metal content of the ore reportedly ranges from 1.6% to 3% for lead and from 1.2% to 2.3% for zinc. An open pit at the deposit has a design capacity to mine 1.1 million tons per year of ore. Ore from both the Uch-Kulak and Khandiza deposits are sent to Almalyk for processing. Khandiza reportedly contains about 18% of the country's lead reserves and 29% of its zinc reserves with an average metal content of 3.2% lead and 6.3% zinc.[19]

Molybdenum.—Uzbekistan reportedly has the fourth largest molybdenum reserves of the countries of the former U.S.S.R. with reserves reportedly estimated at 20,000 tons. Molybdenum is mined as a byproduct from the Koytashskoye, Kalmakyrskoye, and Sary-chekinskoye copper deposits—with the molybdenum graded at the deposits, respectively, at 0.022%, 0.004%, 0.005%, and 0.007%. These three deposits reportedly have a combined capacity to produce 900 tons per year of molybdenum and reportedly with reserves estimated to be adequate for 29, 22, and 5 years, respectively. Uzbekistan reportedly had the capacity to produce 5.4% of total CIS molybdenum output.[20]

Petroleum.—Construction of a major oil refinery was under way in the Bukhoro (Bukhara) region, planned by the end of the decade to eliminate Uzbekistan's need to import petroleum products. There is one refinery in operation in Farghona (Fergana), which supplies about one-half of the country's needs for petroleum products. Commissioning of the first stage of the new refinery is targeted for 1996.[21]

Silver.—Uzbekistan has the fourth largest silver reserves of the countries of the former U.S.S.R., after Russia, Kazakhstan, and Tajikistan. Along with silver in polymetalic ores, Uzbekistan apparently has a number of native gold-silver deposits. Among these, reportedly, are the following deposits; Kosmanachi, Okchistpes, and Vysokovoltnoye.[22]

Tungsten.—Uzbekistan has two tungsten mining and processing enterprises, the Ingichka and Koytash, with reported design capacities for mining and processing of 500,000 tons and 165,000 tons of ore per year, respectively. Uzbekistan reportedly had produced 6% of the tungsten output of the former U.S.S.R. The largest deposit is the Ingichkinskoye deposit, with reportedly 54% of the country's reserves with the average tungsten trioxide content of the ore 0.619%; the tungsten trioxide content of the ore is reportedly 0.55% at the Karatyubinskoye and 0.39% at the Yakhtonskoye deposits.[23]

Reserves

Uzbekistan has a diverse range of mineral resources. For metals, these include bismuth, copper, gold, iron, lead-zinc, molybdenum, silver, strontium, tin, and tungsten; for industrial minerals, bentonite, feldspar, fluorspar, graphite, kaolin, salt, and talc; and for fuels, coal, natural gas, petroleum, and uranium.

Table 3 lists the available reserve estimates. Reserves in Uzbekistan were assessed according to the Soviet classification system, which is not comparable to the system used in the United States. The economic criteria used in this system were designed for a centrally planned economy that did not account for production costs in the same way as a market economy system. Minerals classified in this system as reserves would not necessarily correspond to the western definition of reserves (i.e., material economically exploitable under present market prices with existing technology). For a full explanation of the Soviet reserve classification system, refer to the reserve section in the chapter on Russia. (*See table 3.*)

INFRASTRUCTURE

Uzbekistan is bordered by Kazakhstan to the north, Turkmenistan to the south, and Kyrgyzstan and Tajikistan to the east. This landlocked country contains a portion of the Aral Sea, the world's fourth largest inland sea, which is in the process of drying up as a result of one of the world's worst environmental catastrophes. The drying up of the Aral Sea is causing serious economic and health problems. Agricultural lands and the population of portions of Uzbekistan are being affected by salts and contaminants blown from the dry sea bottom and also by climatic changes resulting in a hotter, dryer climate less favorable for agriculture. The Aral Sea is fed by two major rivers: the Amu Darya, which flows through Uzbekistan, and the Syrdarya, which flows through Kazakhstan, A significant portion of the waters from these was being diverted for irrigation, which was one of the instigating causes for the drying up of the Aral Sea.

As of 1990, Uzbekistan had 3,460 km of railroads, not including industrial lines, and 78,400 km of highways, of which 67,000 km was hard surfaced. The country also has an extensive gas pipeline network, and natural gas provides about two-third of the country's energy.

OUTLOOK

Uzbekistan is in a more favorable position regarding its balance of trade than some other countries of the former U.S.S.R. because of its large gold output and reserves. Gold will contribute even more to Uzbekistan's economy as production increases to possibly double its current level. Still, many of Uzbekistan's other mineral industries are faced with problems similar to those in other former Soviet republics. Its nonferrous metals industries and industrial minerals industries are facing shrinking markets in the states of the former U.S.S.R. as well as a breakdown in the former system that supplied parts and equipment as well as subsidies to these mineral industries. These industries must now assess their ability to compete on world markets, and in particular it will be necessary to assess energy and transport costs in determining the viability of these mineral industries.

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[1]Text prepared July 1994.

[2]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). p. A/3, Jun. 11, 1993, Interfax News Agency, Jun. 6, 1993.

[3]Interfax Statistical Report. June 3-10, 1994, p. 2.

[4]Interfax Mining Report, Interfax-America, Denver, Colorado. Sept. 17-24, 1993, p. 12.

[5]———. Mar. 11-18, 1994, pp. 14, 15.

[6]———. May 13-20, 1994, p. 4.

[7]Radio Free Europe/Radio Liberty Research Report, News Briefs, Jan. 10-21, 1994, p. 10.

[8]Interfax Mining Report, Interfax-America, Denver, Colorado. Mar. 11-18, 1994, p. 16.

[9]Interfax Statistical Report. Mar. 7, 1994, p. 10.

[10]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). p. WB/3, Apr. 1, 1993, APN Uzbekistan News Agency, Mar. 16, 1994.

[11]New names and spellings for cities and regions in Uzbekistan will be used whenever possible based on the availability of information; the old name will be given in parenthesis the first time the new name is used in this report. The old names will appear on the map which is the latest U.S. Government base map of this series issued as of the date of the preparation of this report.

[12]Interfax Mining Report, Interfax-America, Denver, Colorado. Oct. 1-8, 1993, p. 6.

[13]———. Sept. 10-17, 1993, p. 5.

[14]Summary of World Broadcasts, British Broadcasting Corp. (Reading, England). p. WD/6, May 27, 1994, Uzbek Radio, Tashkent, May 22, 1994.

[15]———. Nov. 26, 1993, p. WD/10, Radio Moscow in Russian, Nov. 17, 1993. IBR, Feb. 11, 1993, p. 3,

———. Nov. 18, 1993. Mayak Radio, Moscow, p. WD/10.

[16]American Mining Congress Journal. Washington, DC, Jan. 1, 1994, p. 24.

[17]Interfax Mining Report. May 13-20, 1994, p. 5.

[18]———. Oct. 1-8, 1993, p. 7.

[19]———. Sept. 17-24, 1993, p. 12.

[20]Work cited in footnote 18.

[21]Foreign Broadcast Information Service, U.S. Govt. (Washington, DC). Jan. 14, 1994, p. WD/10, APN Uzbekistan News Agency, Tashkent, In Russian, Jan. 5, 1994, 1108 gmt.

[22]Work cited in footnote 19.

[23]Work cited in footnote 18.

TABLE 1

UZBEKISTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1992	1993	Annual capacity[e] (Jan. 1, 1994)
Bismuth		15	10	20
Cement		6,000,000	5,300,000	7,000,000
Coal		6,000,000	4,700,000	7,000,000
Copper:				
Metal content of ore		75,000	70,000	100,000
Blister		70,000	65,000	130,000
Refined		70,000	65,000	130,000
Feldspar		80,000	70,000	120,000
Fluorspar		100,000	90,000	150,000
Gold		75	75	85
Kaolin		7,000,000	6,000,000	8,000,000
Lead, metal content of ore		20,000	20,000	40,000
Molybdenum, mine output metal content		700	650	900
Natural gas	million cubic meters	40,000	45,000	50,000
Petroleum, crude		3,300,000	4,000,000	5,000,000
Steel, crude		650,000	600,000	1,100,000
Tungsten, W content of ore		700	650	1,200
Zinc:				
Metal content of ore		50,000	45,000	80,000
Metal, smelter output		55,000	50,000	120,000

[e]Estimated

TABLE 2
UZBEKISTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1993

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity[e]
Bismuth	Ustarasayskoye deposit	Chatkalo-Kuraminskiy Region	20.
Coal	Central Asian coal association (mining) Angren brown coal deposit Baysunskoye deposit	Angren Region Surkhondaryo Region	6,000,000, 1,000,000.
Copper, metal content of ore	Almalyk mining-metallurgical complex	Kalmakyrskoye, Sarychekinskoye deposits	100,000.
Metal	Almalyk refinery	Olmaliq (Almalyk)[1]	130,000.
Feldspar	Karichasayskoye and other deposits	Deposits in Samarqand (Samarkand) and Toshkent (Tashkent) regions and Karakal-pakstan (Karakalpakskaya ASSR)	120,000.
Fluorspar	Agata-Chibargatinskoye, Naugiskenskoye deposits	East of Toshkent (Tashkent)	150,000.
Gold	Muruntau deposit	Nawoiy (Navoi) region	85.
Kaolin	Central Asian coal association	Angren deposit	8,000,000.
Lead-zinc, metal content of ore	Almalyk mining and metallurgical complex	Uchkulachskoye deposit	40,000 (lead).
Do.	do.	do.	80,000 (zinc).
Zinc metal	Almalyk refinery	Olmaliq (Almalyk)	120,000.
Molybdenum	Almalyk mining and metallurgical complex, Koytash tungsten-molybdenum mine	Kalmakyrskoye, Koytashskoye, Sarychekinskoye deposits	900.
Natural gas liquids	Mubarek gas processing plant	Mubarek	1,200,000.
Petroleum and natural gas	More than 40 oil and gas deposits and more than 15 gas deposits under exploitation	Oil deposits in Farghona and Surkhondaryo regions, major gas deposits: Dzharkakskoye, Gazlinskoye, Mubarekskoye, and Shurtanskoye	50 billion cubic meters (natural gas).
Do.	do.	Oil deposits: Khaudagskoye, Uchkyzylskoye, Kokaytinskoye in Surkhondaryo region; Palvantashskoye, Yashiy Alamyshikskoye, Sharikhan-Khodzhiabadskoye in Farghona region	5,000,000 (petroleum).
Steel, crude	Bekabad steel mill	Bekabad	1,100,000.
Tin	Karnabskoye, Lapasskoye deposits	Karnab Region	NA.
Tungsten, W content of ore	Koytashskoye, Ingichkinskoye Lyangarskoye, Karatyubinskoye Yakhtonskoye deposits	Ingichka, Koytash, Lyangar regions	1,200.
Tungsten, metal	Chirchik metals plant	Chirchiq (Chirchik)	NA.
Sulfur	Mubarek gas processing plant complex	Mubarek	2,000,000.
Uranium	Navoi mining complex	Nawoiy (Navoi) region	NA.

[e]Estimated. NA Not available.
[1]New names and spellings for locations will be used whenever available; old names will appear in parentheses.

TABLE 3
UZBEKISTAN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1993

(Thousands metric tons unless otherwise specified)

Commodity	Quantity
Bentonite	3,900
Coal:	
Bituminous	53,000
Brown	2,000,000
Copper, in ore	1,500
Feldspar	37,000
Gold	2
Graphite	2,300
Kaolin	46,000,000
Lead, in ore	1,100
Molybdenum, in ore	20
Potash, K_2O content	93,500
Salt	8,870,000
Sodium sulfate	65,900
Tungsten, W content of ore	35
Zinc, in ore	750

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	Dol
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
Ilmenite	Il
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
Rutile	Ru
Salt	Salt
Sand and gravel	Sd/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	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
Wonderstone	Ws
Yttrium	Y
Zinc	Zn
Zirconium	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 resource

UNITS OF MEASURE AND ABBREVIATIONS

Unit of Measure	Symbol
American Petroleum Institute gravity	• API
barrels	bbl
calories	cal
centi (prefix)	c
centimeters	cm
cubic or cubed	^{3}(superscript)
cubic meters	m^3
day	d
giga (prefix)	G
gigawatt	GW
gigawatt hours	GW•h
gram	g
grams per metric ton	g/mt
gravity	
hectare	ha
kilo (prefix)	k
kilocalories	kcal
kilograms	kg
kiloliter	kL
kilometer	km
kilovolts	kV
kilowatts	kW
kilowatt hours	kW•h
liter	L
mega (prefix)	M
megawatts	MW
megawatt hours	MW•h
meter	m
million	M
million metric tons	Mmt
square or squared	^{2} (superscript)
square meters	m^2
square kilometers	km^2
standard coal equivalent	SCE
thousand	k
thousand metric tons	kmt
tons, deadweight	dwt
tons, metric	mt
volt	V
watt	W
watt hour	W•h
year	a

Name or Term	Abbreviation
American Petroleum Institute	API
Asia and Pacific Economic Cooperation	APEC
Association of Southeast Asian Nations	ASEAN
Council for Mutual Economic Assistance	CMEA
European Community	EC
European Free Trade Association	EFTA
Free Trade Agreement	FTA
General Agreement on Tariffs and Trade	GATT
gross domestic product	GDP
gross national product	GNP
liquefied natural gas (methane)	LNG
liquefied petroleum gas (propane-butane)	LPG
North American Free Trade Agreement	NAFTA
Organization for Economic Cooperation and Development	OECD
Organization of Petroleum Exporting Countries	OPEC
United Nations	UN
United Nations Development Program	UNDP

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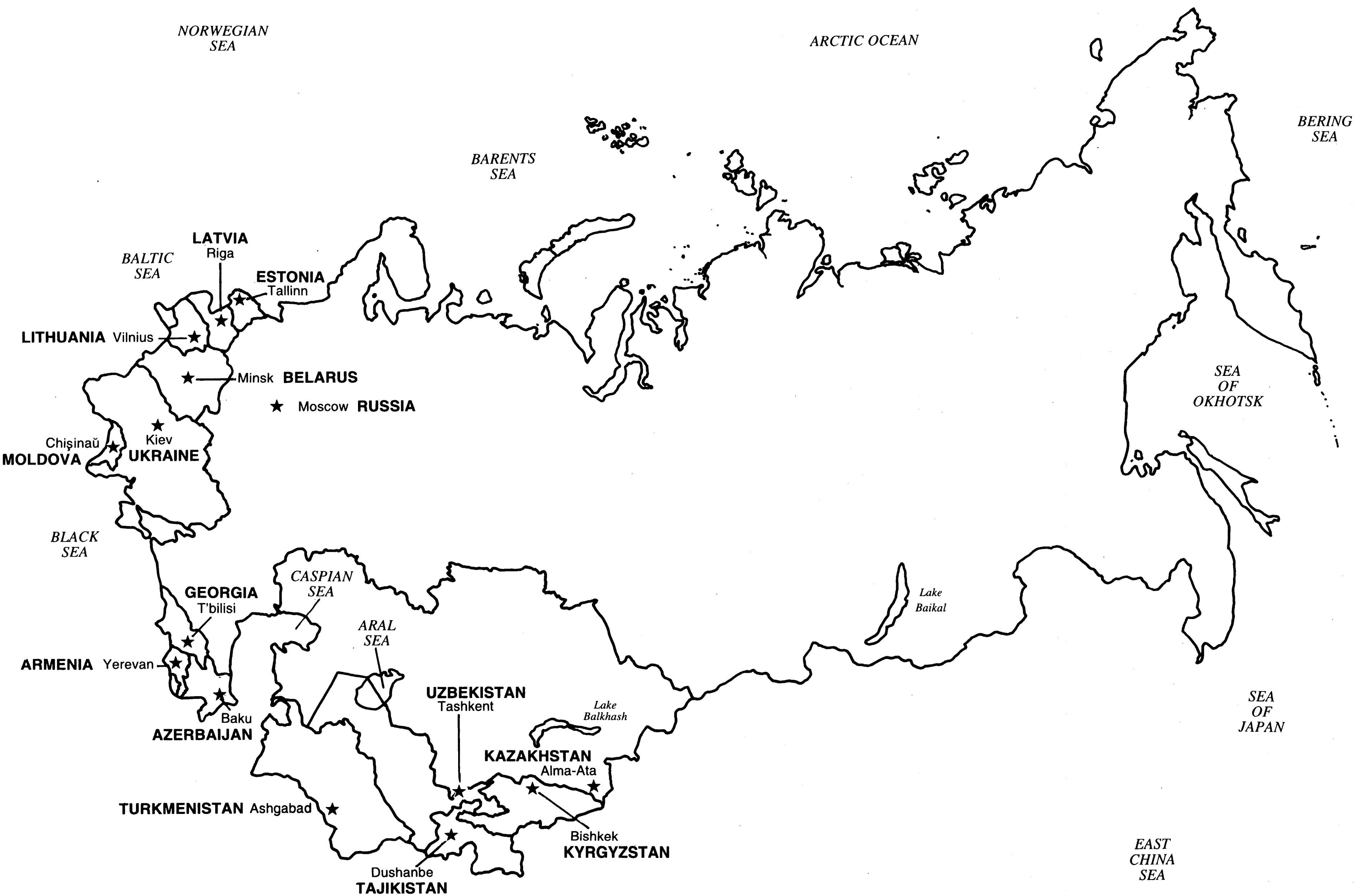
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