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MINERAL INDUSTRIES OF

ASIA AND THE PACIFIC

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

1992

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.

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Preface

This edition of the Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 1992 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains chapters on virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on advanced materials, nonrenewable organic materials, and nonferrous metals recycling also were added to the Minerals Yearbook series beginning with the 1989, 1990, and 1991 volumes, respectively. A new chapter on materials recycling has been initiated in this 1992 volume. In addition, a chapter on survey methods used in data collection with a statistical summary of nonfuel minerals and a chapter on trends in mining and quarrying in the metals and industrial mineral industries are included.

Volume II, Area Reports: Domestic, contains chapters on the minerals industry of each of the 50 States, 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, Minerals Yearbook—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. Since the 1989 International Review, this volume has been presented as six reports: Mineral Industries of the Middle East, 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, and Minerals in the World Economy. The reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Mineral Perspectives Series quinquennial regional books, which are being discontinued.

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

Acknowledgments

The U.S. Bureau of Mines, in preparing these Volume III Minerals Yearbook Reports—International Review, 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.

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

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

George J. Coakley
Chief, Division of International Minerals

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Vitae

Edmond Chin's experience with the U.S. Bureau of Mines has been as a research chemist, and as a commodity, country, and state analyst. A career employee of the Bureau, he is chief of the Branch of Asia and the Pacific.

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MINERAL INDUSTRIES OF

ASIA AND THE PACIFIC

By Staff, Branch of Asia and the Pacific

INTRODUCTION[1]

Resources

The countries of Asia and the Pacific have large resources of diverse minerals. Australia and China have extensive mineralization that are commercially being exploited. The major minerals in Australia with known reserves adequate for both domestic demand and export markets include bauxite, clays, copper, diamond, gold, iron ore, lead, manganese, mineral sands (titanium minerals), nickel, salt, silver, tin, uranium, and zinc. China is the world leader in proven reserves of antimony, barite, magnesite, molybdenum, rare earths, titanium (ilmenite), tungsten, and vanadium. It also has about 55 billion tons of iron ore, albeit with an average grade of only 30% to 35% elemental iron content. With the exception of chromium and copper, China has significant resources of a wide array of minerals and metals, based on its production and/or export capability for these commodities.

Additionally, India has significant resources of bauxite and mineral sands; Indonesia, bauxite, copper, nickel, and tin; Malaysia, tin and associated titanium; Mongolia, copper, fluorspar, and lead-zinc; New Caledonia, nickel; New Zealand, gold and iron sand; North Korea, magnesite; Papua New Guinea, copper, gold and mineral sands; Philippines, copper, chromite, and gold; and Sri Lanka, gemstones. Moreover, there appears to be extensive mineralization in Burma (Myanmar), Cambodia, Laos, Thailand, and Vietnam, but they have yet to be definitively delineated.

Those countries having little mineral resources are Hong Kong and Macau, Japan, Republic of Korea, Singapore, and Taiwan, which are the "tigers" of Asia as well as being the advanced economy countries of the region.

The region overall lacks large resources of fuels. Although there is oil and natural gas, it has, however, large resources of anthracite and bituminous coal. Oil and/or natural gas occurs in recoverable quantities in Afghanistan, Australia, Brunei, China, India, Indonesia, Malaysia, and perhaps offshore Burma and Vietnam. There are world class coal deposits in Australia, China, India, and Mongolia as well as coal occurrences in Indonesia, North Korea, and New Zealand (lignite).

PRODUCTION

The area is a significant producer of minerals and metals. In general, it produces more than 50% of the world's output of barite, fluorspar, graphite, ilmenite, magnesite, mined tin, mined tungsten, and refined zinc. It produces between 25% and 50% of the world's output of bauxite and alumina; cement; copper metal; gold; iodine; iron ore, pig iron, and crude steel; mined and refined lead; mined manganese; mined and refined nickel; salt; rutile; and mined zinc. *(See table 1.)*

The countries of Asia and the Pacific account only for 11% of the world's output of petroleum and 9% for that of natural gas. On the other hand, they account for more than 90% of the world's output of anthracite and 45% for the world's output of bituminous coal.

CONSUMPTION

Japan is by far the largest single consumer of minerals and metals in the Asia and Pacific region. It accounts for about 40% of the total crude steel consumption and generally for 50% of the consumption of the major nonferrous metals in the region. Likewise, Japan accounts for a large percentage of the consumption of industrial minerals and fuels in the region. Most of Japan's consumption of minerals, metals, and fuels is for the manufacture of goods for export. The second largest consumer is China, accounting for about 30% of the total crude steel consumption and about 20% of the consumption of nonferrous metals. It is also a large consumer of industrial minerals and fossil fuels --coal, oil, and natural gas. Consumption in China is for internal use and generally not for export. Per capita consumption is very low in China, and only the surfeit in production is available for external shipment.

As a measure of demand for metals, the largest steel-consuming activity is nonresidential construction followed by automobile manufacture. A steep dip in business investments and in consumer spending have affected steel demand with the decline in activity of steel using industries in north Asia. However, Japan was to increase spending on public works for 10 years from 1991 and China was to increase steel imports from 2.4 million tons in 1992 to 4 million tons in 1993. In addition, metal demand was to increase as a result of construction in Hong Kong, Taiwan, and the Association of Southeast Asia Nations (ASEAN) countries.

A bloc of countries, consisting of Australia, India, the Republic of Korea, Taiwan, and Thailand, account for virtually the bulk of the remainder of the consumption of minerals and metals in the region.

TRADE

The region as a whole accounts for about 20% of the value of overall world commerce. The foci of the eight major trade areas in the region center on Japan, China, Hong Kong, the Republic of Korea, Taiwan, the countries of the ASEAN (Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand); and Australia and New Zealand. The value of Japan's total trade alone was $573 billion in 1992. The collective trade value for Hong Kong, the Republic of Korea, and Taiwan, the little dragons of Asia, amounted to $508 billion, followed by more than $350 billion for that of ASEAN. China's overall trade was $166 billion, with much of its export value originating from the free trade zones around Guangzhou in Guangdong Province in southern China. In the Southern Hemisphere, the combined trade value of total trade of Australia and New Zealand was close to $106 billion.

Japan has the largest trade surplus with the United States. This is followed, in order by China, Indonesia, Taiwan, Australia, and New Zealand. Moreover, the member nations of the Asia Pacific Economic Cooperation (APEC) have at present loosely banded together to promote economic cooperation, trade, and investment in the Pacific basin. The APEC countries are Australia, Canada, China, Hong Kong, Japan, the Republic of Korea, New Zealand, Taiwan, the United States, plus all the member nations of ASEAN.

During 1992, there were lower level discussions between APEC nations to prepare for a ministerial-level meeting for economic development in the region. A high-level meeting was set for late 1993 for APEC members. In October 1992, the economic ministers of ASEAN met in Manila, Philippines, and agreed on a two part schedule for reducing intra-ASEAN tariffs: a two-stage tariff reduction plan that will continue until the year 2008, and an accelerated tariff reduction schedule for 15 product categories to be carried out over 10 years until the year 2003. Both are scheduled to begin on January 1, 1993.

The countries in the region that are large net exporters of minerals are Australia--alumina, coal, diamonds, ilmenite, refined lead, monazite, rutile, and zinc zircon; Indonesia--bauxite, copper concentrate, nickel matte, LNG, and tin metal; Malaysia--bauxite, LNG, oil, and tin metal; Mongolia--copper and molybdenem concentrates and fluorspar; New Zealand--aluminum and iron sand and steel semi-manufactures; and the Philippines--chromite,copperconcentrate, and nickel. China only exports the surplus over its domestic demand, which included antimony, barite, refractory bauxite, fluorspar, magnesite, rare earths, and tungsten. Hong Kong and Singapore are trading city states (entrepots), while Japan, Republic of Korea, and Taiwan are importers of mineral products that are used in the production of finished manufactures for export.

As of December 1992, nations in the region that were contracting parties to the General Agreement on Tariffs and Trade (GATT) were Australia, Bangladesh, Burma, Hong Kong, India, Indonesia, Japan, Republic of Korea, Macau, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, and Thailand. China, Taiwan, and Mongolia were seeking full memberships in GATT. Countries applying the GATT on a "de facto" basis were Cambodia, Fiji, Kiribati, Papua New Guinea, and Solomon Islands.

OUTLOOK

The outlook for mineral development in Asia and the Pacific includes a good potential for petroleum in coastal Asia, particularly in the South China Sea--China and Vietnam. There is a potential for an increase in hard-rock mining in Australia (barring environmental constraints); China; India; Papua New Guinea (barring civil unrest); the countries of Indochina, which include Burma, Thailand, and Vietnam; and the landlocked country of Mongolia. According to the Canadian newspaper, The Northern Miner, there are advantages in investing in mineral projects in Indochina. The advantages in investing in Thailand are excellent international reputation and infrastructure; lack of currency controls; little graft; good mining/investment legislation and incentives; and the presence of money, technical expertise, and political connections. After Thailand, there are advantages in investing in Laos and Vietnam, in that order. On the other hand, investing in Burma and Cambodia has a disadvantage as a result of political instability.

The mineral mining and processing industries of the region are sizable and will continue to expand. The countries of Asia and the Pacific as a whole will expand in their consumption of minerals, metals, and fuels in the manufacture of value added goods for each country's domestic market as well as for the world market.

In addition to APEC and ASEAN, other organizations that promote economic well-being in the area include Asian Development Bank, Colombo Plan, the U.N. Economic and Social Commission for Asia and the Pacific, South Asian Association for Regional Cooperation, and the South Pacific Commission.

[1]E. Chin and Pui-Kwan Tse.

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

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ABECOR Group Country Reports.
British Broadcasting Corp., London:
Summary of World Broadcasts,
Far East Weekly Economic Report.
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TABLE 1

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1992

(Thousand metric tons unless otherwise specified)

Country	Aluminum			Barite	Cement	Coal		Copper	
	Bauxite	Alumina	Metal			Anthracite	Bituminous	Mine, Cu Content	Refined, primary
Afghanistan	—	—	—	2	115	—	170	5	—
Australia	39,950	11,623	1,216	11	5,412	—	205,000	326	295
Bangladesh	—	—	—	—	273	—	—	—	—
Bhutan	—	—	—	—	127	—	—	—	—
Brunei	—	—	—	—	—	—	—	—	—
Burma	—	—	—	16	465	—	56	5	—
Cambodia	—	—	—	—	—	—	—	—	—
China	2,700	1,600	1,100	1,800	304,000	190,000	920,000	300	560
Christmas Island	—	—	—	—	—	—	—	—	—
Fiji	—	—	—	—	90	—	—	—	—
Hong Kong	—	—	—	—	1,600	—	—	—	—
India	4,850	1,700	490	620	50,000	—	210,000	55	47
Indonesia	804	—	173	—	17,280	—	22,357	281	—
Japan	—	316	19	—	88,253	—	7,598	12	1,046
Korea, North	—	—	—	100	17,000	70,000	—	16	20
Korea, Republic of	—	—	2	(1)	42,650	11,970	—	(1)	209
Laos	—	—	—	—	7	—	—	—	—
Malaysia	331	—	—	11	8,366	—	74	29	—
Mongolia	—	—	—	—	110	—	580	105	—
Nauru	—	—	—	—	—	—	—	—	—
Nepal	—	—	—	—	196	—	—	—	—
New Caledonia	—	—	—	—	65	—	—	—	—
New Zealand	—	—	242	—	579	—	2,750	—	—
Pakistan	3	—	—	32	7,793	—	2,751	—	—
Papua New Guinea	—	—	—	—	—	—	—	193	—
Philippines	—	—	—	500	6,500	—	1,510	123	122
Singapore	—	—	—	—	1,900	—	—	—	—
Solomon Islands	—	—	—	—	—	—	—	—	—
Sri Lanka	—	—	—	—	817	—	—	—	—
Taiwan	—	—	—	—	21,464	—	335	—	—
Thailand	—	—	—	46	21,832	22	—	—	—
Vietnam	—	—	—	—	3,000	5	—	—	—
Total	48,638	15,239	3,242	3,138	599,894	271,997	1,373,181	1,450	2,299
Share of world total, percent	5 47	38	17	58	49	91	45	16	25
United States	W	5,185	4,042	316	78,734	3,116	589,629	1,761	1,721

See footnotes at end of table.

TABLE 1—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1992

(Thousand metric tons unless otherwise specified)

Country	Fluorspar	Gold, mine, Au content[2]	Graphite	Iodine	Iron			Lead		Magnesite	Manganese ore, Mn content
					Ore, gross weight	Pig	Steel, crude	Mine, Pb content	Refined, primary		
Afghanistan	—	—	—	—	—	—	—	—	—	—	—
Australia	—	240	—	—	110,000	6,000	6,322	548	245	820	570
Bangladesh	—	—	—	—	—	—	36	—	—	—	—
Bhutan	—	—	—	—	—	—	—	—	—	—	—
Brunei	—	—	—	—	—	—	—	—	—	—	—
Burma	—	1	—	—	—	—	—	5	2	—	(1)
Cambodia	—	—	—	—	—	—	—	—	—	—	—
China	1,600	140	220	(1)	197,600	72,000	80,000	385	330	2,600	3,500
Christmas Island	—	—	—	—	—	—	—	—	—	—	—
Fiji	—	3	—	—	—	—	—	—	—	—	—
Hong Kong	—	—	—	—	—	—	350	—	—	—	—
India	25	2	70	—	54,000	15,000	18,450	25	30	550	530
Indonesia	—	38	—	(1)	288	—	3,171	—	—	—	—
Japan	—	9	—	7	40	73,144	98,131	19	219	—	(1)
Korea, North	41	5	38	—	10,500	6,600	8,100	75	70	1,600	—
Korea, Republic of	(1)	23	83	—	222	19,323	28,054	14	63	—	—
Laos	—	—	—	—	—		—	—	—	—	—
Malaysia	—	4	—	—	320	—	1,250	—	—	—	—
Mongolia	277	—	—	—	—	—	—	—	—	—	—
Nauru	—	—	—	—	—	—	—	—	—	—	—
Nepal	—	—	—	—	—	—	—	—	—	25	—
New Caledonia	—	—	—	—	—	—	—	—	—	—	—
New Zealand	—	10	—	—	2,000	—	600	—	—	—	—
Pakistan	5	—	—	—	—	1,100	1,000	—	—	6	—
Papua New Guinea	—	71	—	—	—	—	—	—	—	—	—
Philippines	—	24	—	—	—	—	250	—	—	1	14
Singapore	—	—	—	—	—	—	—	—	—	—	—
Solomon Islands	—	(1)	—	—	—	—	—	—	—	—	—
Sri Lanka	—	—	3	—	—	—	—	—	—	—	—
Taiwan	—	—	—	—	—	5,292	10,705	—	—	—	—
Thailand	56	—	—	—	427	—	719	28	—	—	4
Vietnam	—	—	—	—	—	—	120	—	—	—	—
Total	2,004	570	414	7	375,397	198,459	257,258	1,099	959	5,602	5,602
Share of world total, percent	52	25	73	41	40	40	36	34	32	[5]50	28
United States	51	329	—	2	55,593	47,377	84,322	408	305	W	—

See footnotes at end of table.

TABLE 1—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1992

(Thousand metric tons unless otherwise specified)

Country	Mercury, mine, Hg content[2]	Mica	Nickel		Petroleum crude[4]	Natural gas[6]	Salt	Tin[2]	
			Mine, Ni content	Refined[3]				Mine, Sn content	Refined, primary
Afghanistan	—	—	—	—	—	2,600	12	—	—
Australia	—	—	64	45	193	22,000	8,000	6,400	250
Bangladesh	—	—	—	—	1	5,740	320	—	—
Bhutan	—	—	—	—	—	—	—	—	—
Brunei	—	—	—	—	59	9,500	—	—	—
Burma	—	—	(1)	—	6	1,000	260	130	189
Cambodia	—	—	—	—	—	—	40	—	—
China	800	—	37	29	1,050	16,000	28,100	43,000	38,000
Christmas Island	—	—	—	—	—	—	—	—	—
Fiji	—	—	—	—	—	—	—	—	—
Hong Kong	—	—	—	—	—	—	—	—	—
India	—	—	—	—	235	11,600	9,503	—	—
Indonesia	—	—	78	39	551	73,089	630	29,400	31,915
Japan	—	—	—	48	6	2,159	1,405	—	821
Korea, North	—	—	—	—	—	—	590	—	—
Korea, Republic of	—	8	—	—	—	—	772	—	—
Laos	—	—	—	—	—	—	8	300	—
Malaysia	—	5	—	—	241	23,000	—	14,339	45,598
Mongolia	—	—	—	—	—	—	17	190	—
Nauru	—	—	—	—	—	—	—	—	—
Nepal	—	—	—	—	—	—	7	—	—
New Caledonia	—	—	113	7	—	—	—	—	—
New Zealand	—	—	—	—	14	5,000	80	—	—
Pakistan	—	—	—	—	24	15,585	862	—	—
Papua New Guinea	—	—	—	—	—	—	—	—	—
Philippines	—	—	15	—	3	—	450	—	—
Singapore	—	—	—	—	—	—	—	—	—
Solomon Islands	—	—	—	—	—	—	—	—	—
Sri Lanka	—	(1)	—	—	—	—	122	—	—
Taiwan	—	8	—	7	(1)	630	26	—	—
Thailand	—	—	—	—	10	8,643	313	11,484	10,679
Vietnam	—	—	—	—	—	—	350	800	500
Total	800	21	307	175	2,393	196,546	51,867	106,043	127,952
Share of world total, percent	[5]27	11	33	32	11	9	28	[5]59	70
United States	W	85	7	—	2,617	503,350	34,784	W	—

See footnotes at end of table.

TABLE 1—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED MINERAL COMMODITIES, 1992

(Thousand metric tons unless otherwise specified)

Country	Titanium		Tungsten mine, W content[2]	Zinc	
	Ilmenite	Rutile		Mine, Zn content	Refined, primary
Afghanistan	—	—	—	—	—
Australia	1,500	190	160	1,028	330
Bangladesh	—	—	—	—	—
Bhutan	—	—	—	—	—
Brunei	—	—	—	—	—
Burma	—	—	375	2	—
Cambodia	—	—	—	—	—
China	150	—	17,000	670	630
Christmas Island	—	—	—	—	—
Fiji	—	—	—	—	—
Hong Kong	—	—	—	—	—
India	300	10	11	75	80
Indonesia	—	—	—	—	—
Japan	—	—	347	134	645
Korea, North	—	—	1,000	200	175
Korea, Republic of	—	—	247	22	253
Laos	—	—	—	—	—
Malaysia	338	—	(1)	—	—
Mongolia	—	—	260	—	—
Nauru	—	—	—	—	—
Nepal	—	—	—	—	—
New Caledonia	—	—	—	—	—
New Zealand	—	—	—	—	—
Pakistan	—	—	—	—	—
Papua New Guinea	—	—	—	—	—
Philippines	—	—	—	—	—
Singapore	—	—	—	—	—
Solomon Islands	—	—	—	—	—
Sri Lanka	33	3	—	—	—
Taiwan	—	—	—	—	—
Thailand	3	(1)	70	62	60
Vietnam	—	—	—	—	10
Total	2,324	203	19,470	2,193	2,183
Share of world total, percent	[5]65	[5]46	[5]63	31	63
United States	W	W	W	552	272

W Withheld to avoid disclosing company proprietary data.
[1]Less than 1/2 unit.
[2]Metric tons.
[3]Includes Ni content of intermediate products but excludes ferroalloy.
[4]Million 42-gallon barrels.
[5]Excludes U.S. production.
[6]Thousand cubic meters.

AFGHANISTAN

AREA 647,500 km² **POPULATION 16.1 million**

THE MINERAL INDUSTRY OF

AFGHANISTAN

By Chin S. Kuo

The country's economy and infrastructure were 80% ruined after 14 years of civil war. As of yearend, Afghanistan had three separate ethnic and economic regions based on support from the former Soviet Central Asian republics in the north, Pakistan in the east, and Iran in the west.

Investment in the country's economic development amounted to Af7.5 billion from domestic sources and $26 million[1] in foreign aid. The fighting in Kabul led to a severe drop in international aid. The United Nations asked for help in the repatriation of refugees; only $40 million was pledged by donor countries.

Russia cut back grain and fuel supplies to Afghanistan despite contracts for many basic items. Afghan traders from Kabul obtained food and fuel by buying from neighboring Turkmenistan, Uzbekistan, and Tajikistan and by large-scale trade, mostly smuggling, from Pakistan. The Iranian Province of Khorassan supplied the city of Herat and the Shia inhabitants of Hazarajat in central Afghanistan with fuel, food, and other consumer goods under an economic and trade agreement.

The country's rich reserve of natural gas, estimated at 2,000 billion m^3, is near the Sheberghan and Sar-i-Pol areas in the north. Production capacity was reported to be about 2,400 Mm^3/a. Natural gas was transmitted to a fertilizer plant in Mazar-e-Sharif for domestic use.

Before April, the Ministry of Mines and Industries signed agreements with a number of interested countries to sell natural gas, for which the country has an abundant reserve. Later, a deal was signed for the supply of Afghan natural gas to Uzbekistan after Uzbek technicians helped repair damaged gas pumping stations and pipelines. The sale of precious stones also was considered by the Najibullah regime to help increase state revenue.

The distribution of fuel and kerosene, which were ready to be shipped from Hayratan, resumed after transport disruption and highway security problems were overcome. The country overspent by 7% for the payment of oil products. Afghanistan was totally dependent on imports of fuel from its neighboring countries. Owing to fuel shortage, there were only a few plants operating, and cottage industries had collapsed. The food distribution system was paralyzed, and food shortage was expected because of heavy fighting in Kabul.

Afghanistan has discovered some industrial minerals, precious metals, and gemstones during the occupation of the former U.S.S.R. Among them were asbestos, barite, beryl, gold, lapis lazuli, mica, silver, sulfur, and uranium.

A copper mine and smelter project at Ainak set up by the former Soviets mined 150,000 mt/a of copper ore from a reserve estimated at 360 Mmt grading 0.7% to 1.5% copper. Afghanistan has other reserves such as coal and iron ore, but little development has been done to exploit these mineral commodities. Proven and probable coal reserves were estimated to be 500 Mmt. Coal production was increased to 300,000 mt/a using mining equipment from Czechoslovakia. Rich reserves of iron ore were estimated at 1,700 Mmt.

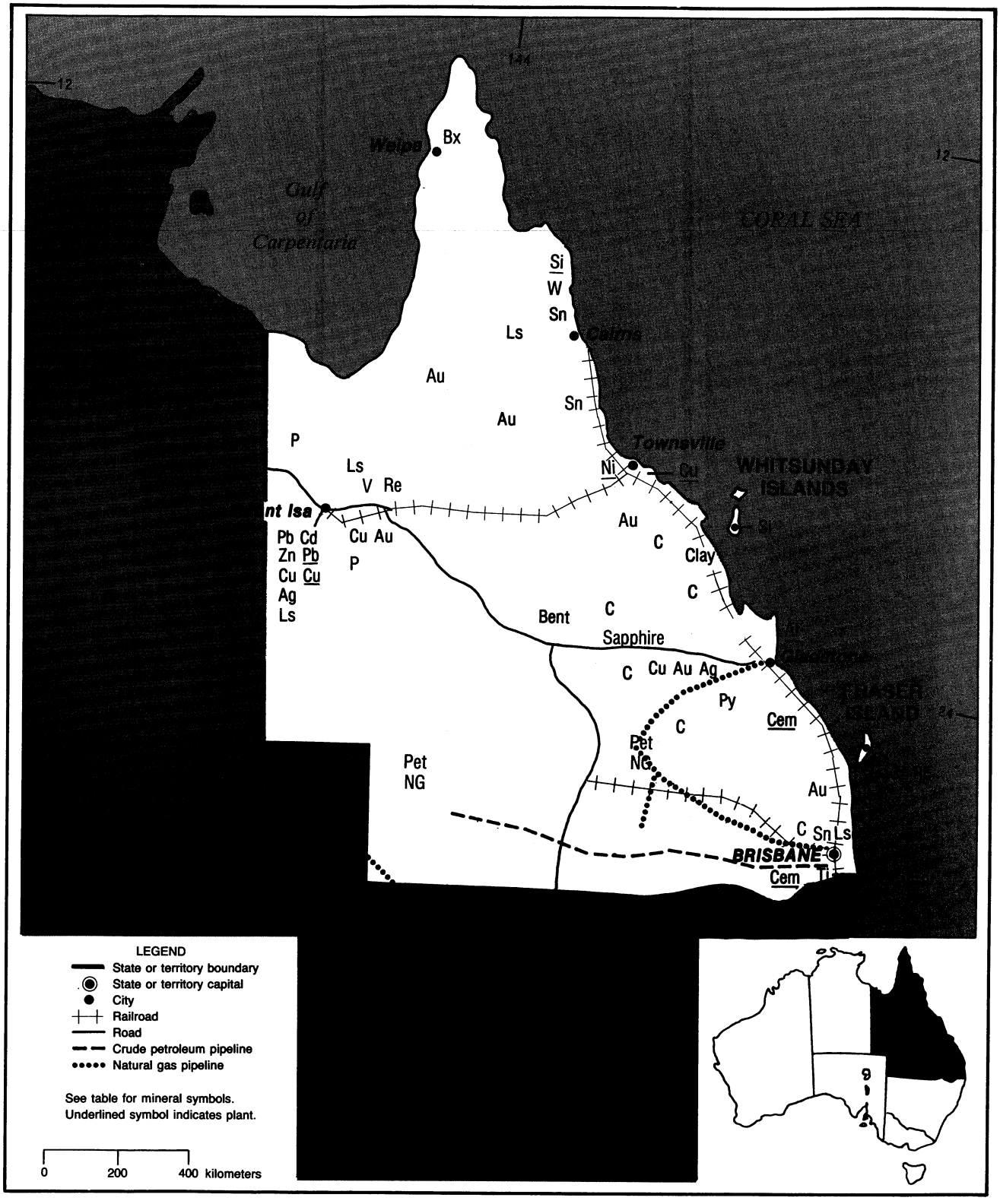
Iran gave a credit of $50 million to Afghanistan. Part of it was to be spent on repairing the 135-km Herat-Dughan road on the Iranian border. The reconstruction of the road was to play a key role in trade between the two countries and in facilitating the return home of Afghan refugees.

[1]Where necessary, values have been converted from Afghan afghanis (Af) to U.S. dollars at the rate of Af550=US$1.00 for 1992.

AUSTRALIA

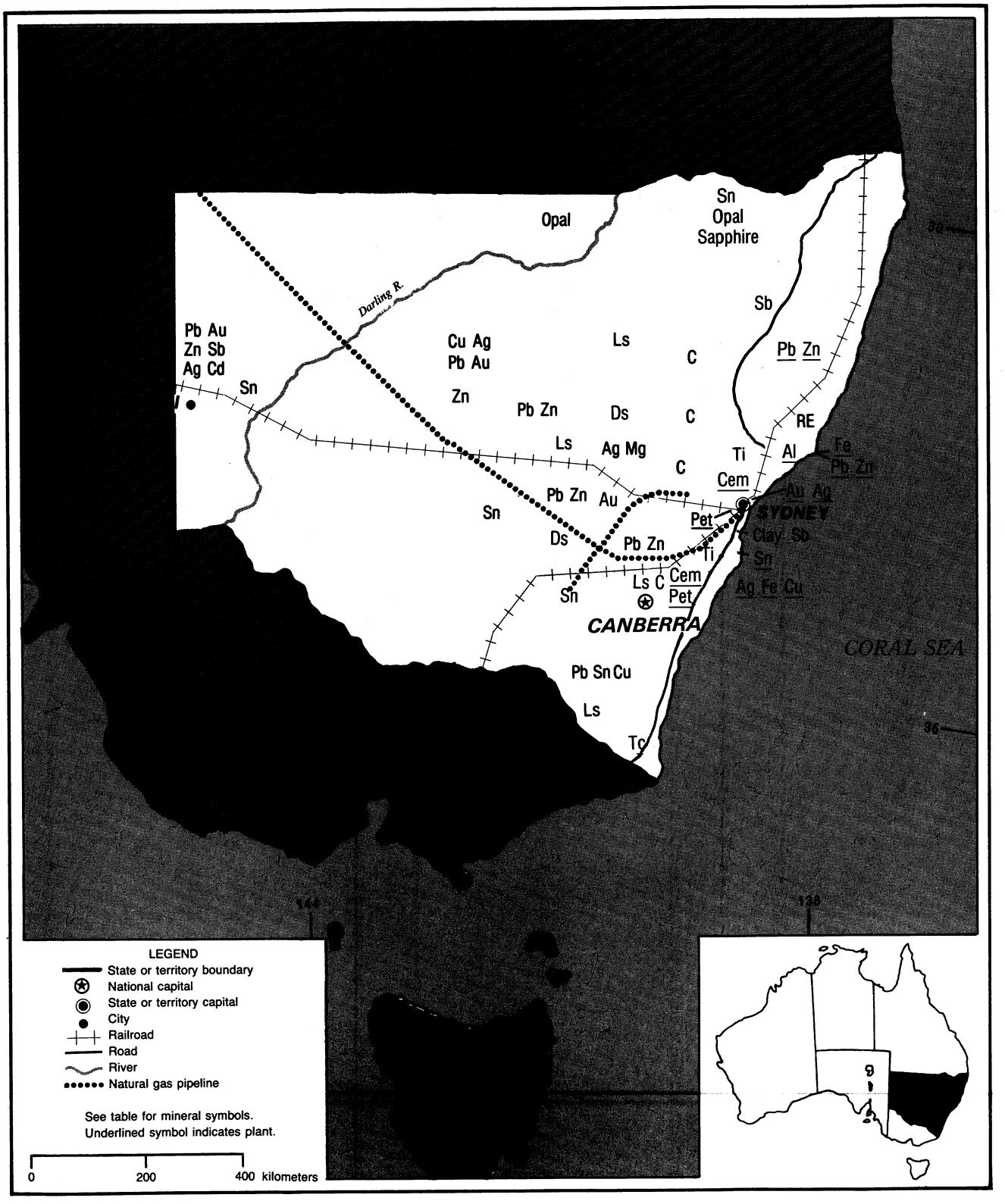
AREA 7,686,850 km² **POPULATION 17.6 million**

QUEENSLAND



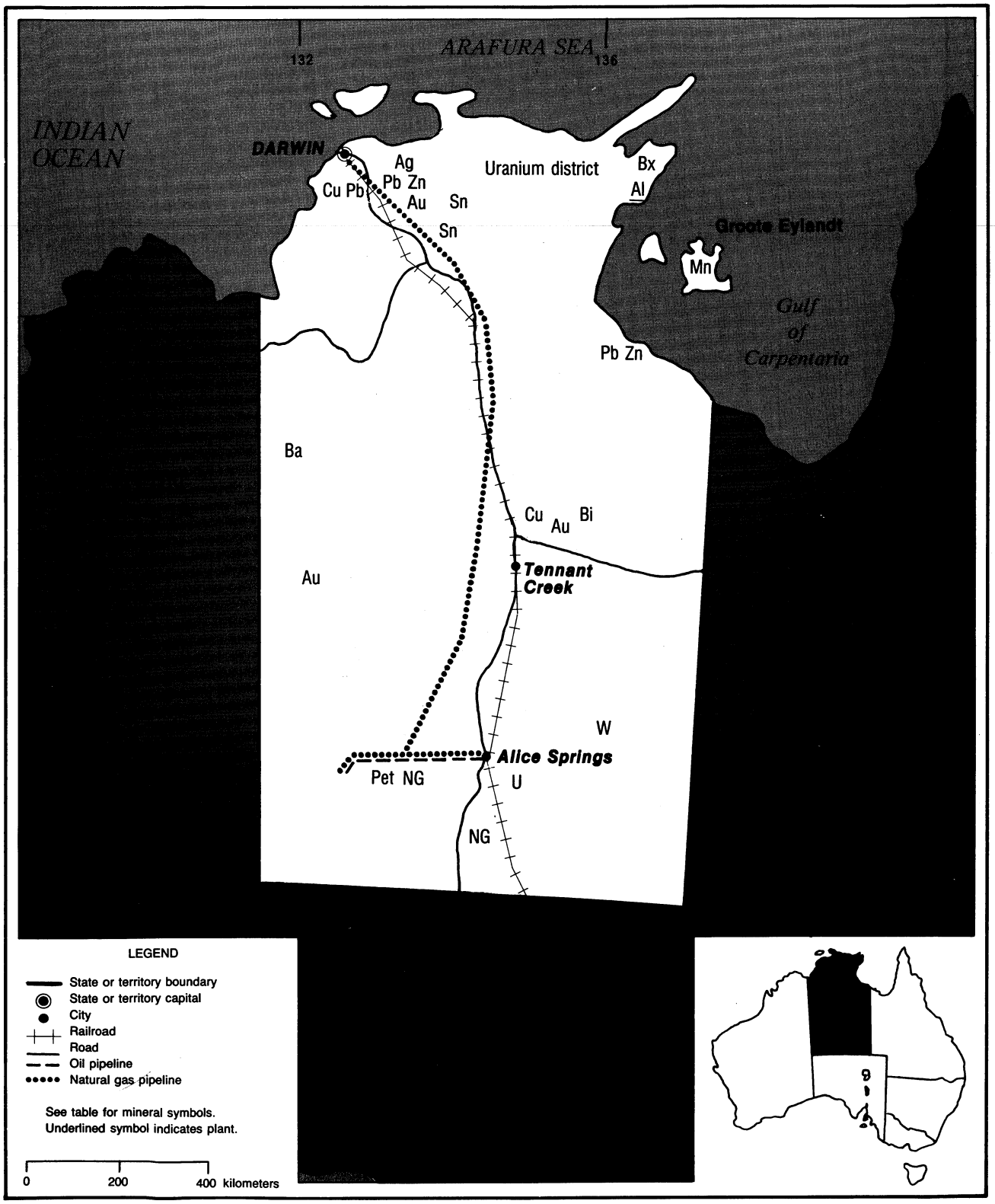
MINERAL SITES AND PIPELINES OF THE STATE OF QUEENSLAND

NEW SOUTH WALES



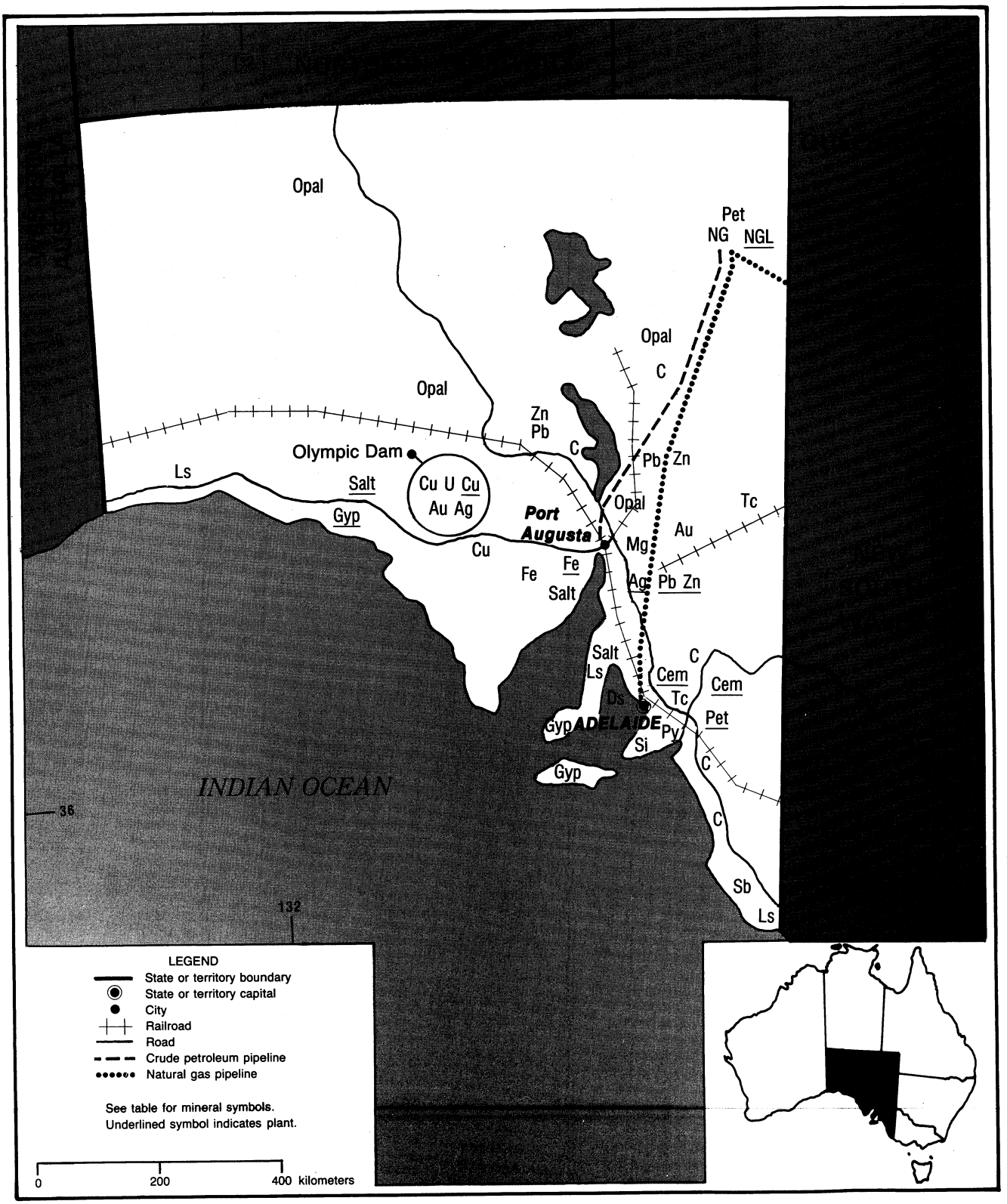
MINERAL SITES AND PIPELINES OF THE STATE OF NEW SOUTH WALES

NORTHERN TERRITORY



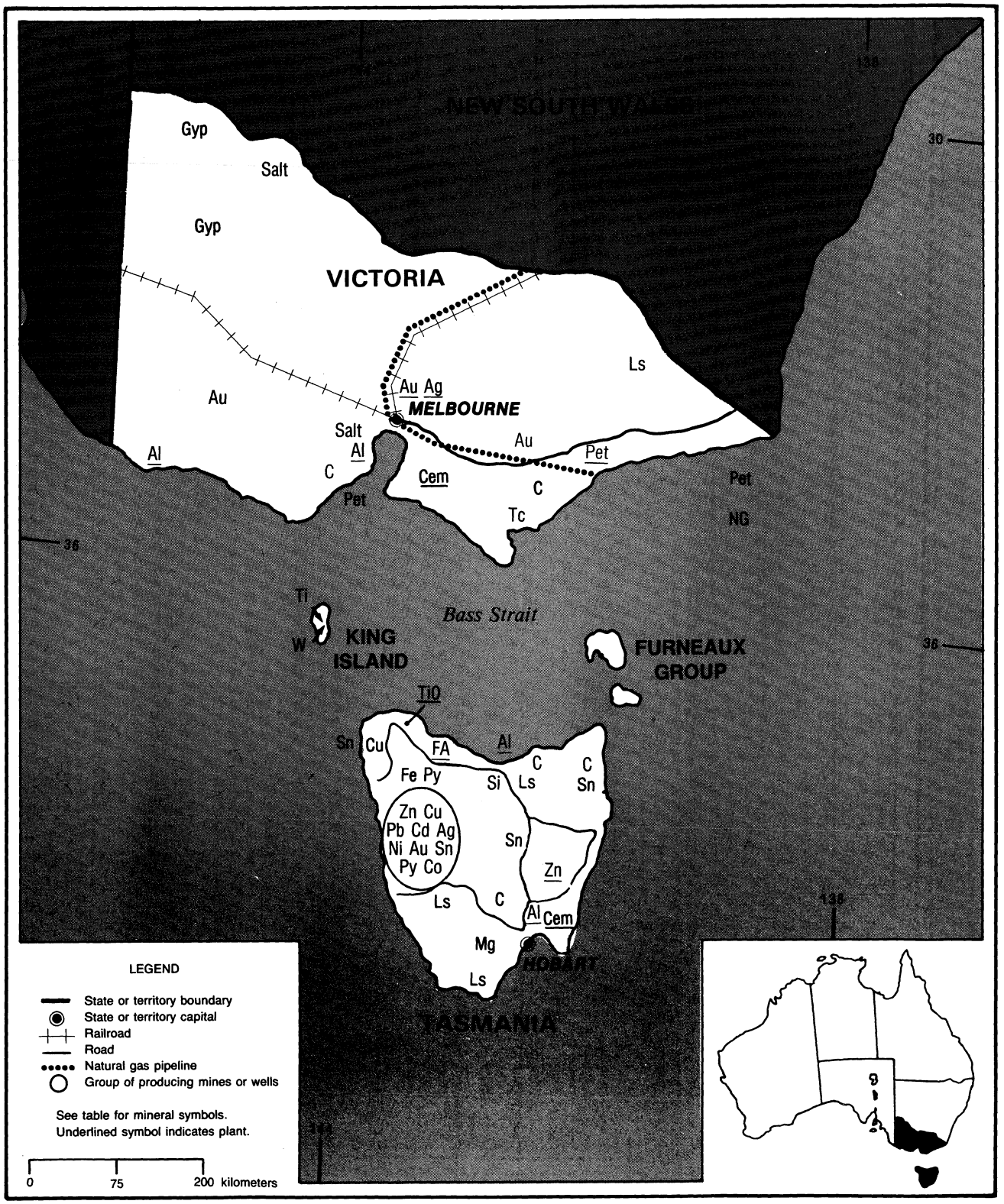
MINERAL SITES AND PIPELINES OF THE TERRITORY OF THE NORTHERN TERRITORY

SOUTH AUSTRALIA



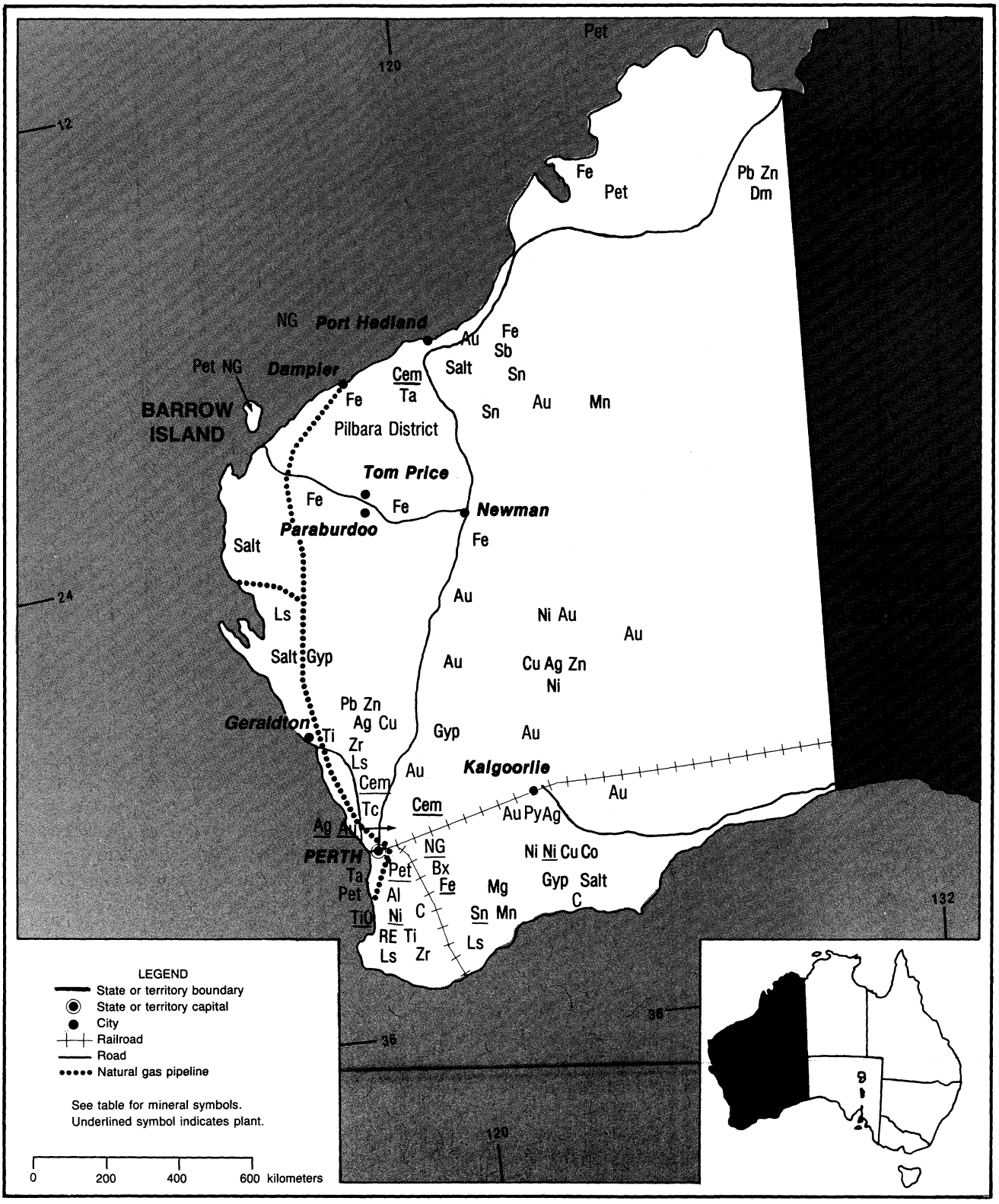
MINERAL SITES AND PIPELINES OF THE STATE OF SOUTH AUSTRALIA

TASMANIA AND VICTORIA



MINERAL SITES AND PIPELINES OF THE STATES OF TASMANIA AND VICTORIA

WESTERN AUSTRALIA



THE MINERAL INDUSTRY OF

AUSTRALIA

By Travis Q. Lyday

Australia is well endowed with a wide range of mineral commodities. Although the country has been an important producer of base metals and gold since the past century, the Australian minerals industry has experienced a period of significant and sustained growth since the mid-1960's. The growth of the Asian market, in particular the steel and base metals industries in Japan, placed the country among the world's main producers of a number of minerals.

The depression in the Australian mining industry that began in 1990 continued throughout 1992, with net profits, operating revenues, exploration expenditures, and employment continuing, overall, to fall.

The Australian minerals industry is heavily export-oriented, with about 70% of production destined for overseas markets. Mineral exports are heavily concentrated into just four commodity groups: alumina, aluminum, and bauxite; coal; gold; and iron ore.

Ownership of mineral rights in Australia is divided between State ownership in State onshore areas and Commonwealth ownership in Territories and in offshore areas. However, the Commonwealth's responsibility for minerals in the Northern Territory (NT), except for uranium, has been transferred to the Government of the NT.

GOVERNMENT POLICIES AND PROGRAMS

The Australian High Court in Canberra ruled in June against the concept that Australia was legally uninhabited before the arrival of Europeans in the 18th century. In the landmark Mabo decision, named for a Torres Strait Islander who began seeking recognition of his land rights in 1982, the Court ruled that native title had not been automatically extinguished under the principle of Terra Nullius, or unoccupied land, which held that Australia was an empty land in which the Aboriginal population had no legal claim when Europeans began settling in 1788. Under the Mabo ruling, where Aborigines could prove a close and ongoing association with their traditional lands, native title may be valid.

PRODUCTION

In 1992, Australia was the world's leading producer of alumina, bauxite, diamond, ilmenite, mined lead, monazite, opal, rutile, sapphire, and zircon. It remained in the top five in producing aluminum, mined gold, iron ore, manganese, mined nickel, uranium, and mined zinc. The country also continued to be among the top 10 in the production of mined antimony, coal, mined copper, mined tin, salt, and mined silver.

The output of minerals produced in 1992 generally was mixed, with most commodities showing either a slight increase or decrease over those of 1991, and production of the remainder commodities staying about the same as those of the previous year. Of the major mineral commodities produced in Australia in 1992, only the production of ilmenite and tin increased more than 5% over 1991 levels. Iron ore, nickel, tungsten, and uranium production decreased more than 5% from 1991 levels. The decreases were, in general, more profound than were the increases. *(See table 1.)*

TRADE

Australia relied heavily on the export of the majority of its mineral production to bolster economic growth. It continued to be the premier exporter of alumina, coal, ilmenite, refined lead, monazite, rutile, and zircon, as well as maintaining its lead in iron ore exports, which it reclaimed from Brazil in 1991. Using plentiful resources of coal, liquefied natural gas, and uranium, Australia remained one of the few market economy countries to be a net exporter of mineral fuels, enabling the country to retain a favorable trade balance in energy products.

Coal remained Australia's largest mineral export earner in 1992, followed by refined gold, iron ore, and bauxite, respectively. The richness and diversity of the Australian minerals sector contributed about $19.4 billion[1] to the country's economy in fiscal year 1992,[2] an increase of almost 23% over that of the previous year. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Australian minerals industry covers just about the whole spectrum of minerals, from major industrial minerals (ilmenite, rutile, and zircon), base metals (copper, lead, and zinc), ferrous metals (iron ore, manganese, and nickel), nonferrous metals (aluminum and tin), precious metals (gold and silver), fuel minerals (coal and uranium), to gemstones (diamond, opal, and sapphire). It is one of the world's principal producers and suppliers of ores, concentrates, and refined metals. Australia is estimated to rank fifth in the value of nonfuel mineral production after the former U.S.S.R., the United States, the Republic of South Africa, and Canada. The value of mineral production, including fuels, was estimated to rank eighth in the world.

The Australian mining industry is based on a system of free enterprise, with private companies involved in exploration, mine development, production, mineral processing, and marketing. A number of foreign companies in mineral ventures in Australia are affiliates or subsidiaries of U.S. companies. Foreign companies currently control a majority of the mining, smelting, and refining sectors and a significant portion of the petroleum and natural gas sectors.

Many of Australia's mineral industries are fully integrated, producing ores, concentrates and other intermediate products (e.g., alumina), and refined metal or other end products (e.g., cut-and-polished gem diamond) within the country. In 1992, there were six alumina refineries and aluminum smelters each; four copper smelters and refineries each; two principal gold refineries; three principal primary lead-zinc smelters and/or refineries; one manganese ferroalloy plant; one nickel smelter and two nickel refineries; three principal crude steel plants; one primary tin smelter and refinery each and two secondary tin refineries; and two silver refineries.

The Australian Constitution contains no specific reference to natural resources, and like the U.S. Constitution, all powers not specifically assigned to the Commonwealth automatically reside with the States. Therefore, the ownership of mineral resources in Australia generally resides with the State or Territory in which they occur. The major exception concerns offshore resources beyond the territorial limit, where Commonwealth jurisdiction prevails. Thus, the individual States and Territories administer the minerals industries within their borders, including issuing exploration and development permits; overseeing mining operations; ensuring compliance with health, safety, and environmental regulations; and levying royalties and taxes.

However, the Federal Government can restrict mineral exports for the good of the country and, therefore, has de facto control over most mineral production. *(See table 4.)*

COMMODITY REVIEW

Metals

Antimony.—The only antimony mines operating in Australia remained New England Antimony Mines Ltd.'s Comet and Hillgrove Mines near Hillgrove, an old gold mining area in northern New South Wales (NSW). In addition to about 105,000 tons of antimony concentrates, the mines also produced arsenopyrite and gold.

Bauxite, Alumina, and Aluminum.—Australia remained the unchallenged world leader in bauxite production for the 22d consecutive year, producing more than 40% of the production of the market economy countries. Although other substantial, but as yet undeveloped, deposits are known, bauxite mining was limited during the year to three principal regions in Australia: the huge Weipa deposit in the north of the Cape York Peninsula, Queensland (QLD); the Gove operation across the Gulf of Carpentaria in Arnhem Land, NT; and the bauxite mines southeast of Perth in the Darling Ranges, Western Australia (WA).

Australia also continued to dominate the world alumina market in 1992, producing from six refineries more than one-third of Western World production. The NT and QLD each had one refinery; the remaining four were in WA.

Aluminum in Australia was produced at six smelters operating in NSW, with two; QLD and Tasmania (TAS), one each; and Victoria (VIC), two.

Bauxite, together with its value-added products alumina and aluminum, remained for the fourth year in a row the nation's next most important export, after coal.

Alcoa of Australia Ltd. completed the expansion project at its Wagerup refinery, WA, in December, 2 months ahead of schedule and under budget. The expansion lifted the refinery's capacity by 630,000 tons, to 1.5 Mmt/a, and, due to economies of scale, it has become one of the most cost-efficient refineries in the world.

Tomago Aluminium Co. Pty. Ltd., the operator of the consortium owning the Tomago smelter near Newcastle, NSW, had in place at yearend all of the pots constituting the third potline, which will increase the capacity of the smelter by 140,000, to 380,000 mt/a of aluminum. The 1-km-long potline extension added 280 pots to the previous two potlines, each of which consisted of 240 pots. Most of the work for the buildings, including the casting house and the electrical substation (which was expanded to deliver 630 MW of power, up from 400 MW), and other general facilities related to the expansion also had been completed by yearend. The almost 60% expansion will make the Tomago smelter, commissioned in 1983, the largest in Australia when the third potline comes on-line in early 1993.

Comalco Ltd. and its joint-venture partners began studying the possibility of adding a potline at the 230,00-mt/a Boyne Island, QLD, smelter following an agreement to purchase the nearby State-owned Gladstone power station, a prerequisite for considering a viable expansion. However, no expansion was expected to be realized for several years.

Comalco also was considering two opposing options regarding its wholly owned smelter at Bell Bay, TAS. The company was negotiating with the State Government for more favorable power rates to refurbish and expand the smelter; yet Comalco also had not ruled out altogether the possibility of closing the aging smelter.

Copper.—Mine production of copper in Australia continued to be from operations that produced other metals, either as the primary product or as a coproduct.

The Benambra underground copper-zinc mine, VIC's first-ever significant base metal operation, was officially opened in December. The mine is in the far northeast of the State, high in the Victorian Alps, adjacent to the Alpine National Park. Although it is located in an environmentally sensitive area, the joint-venture partners in the project demonstrated such responsibility and sensitivity toward safeguarding the environment in its planning that resistance

to the project was negligible. Commissioning of the concentrator began in late October, and during November and December the treatment plant produced 6,500 tons of concentrate, well on target for handling the proposed 200,000-mt/a ore input.

The stage 2 expansion project at the Olympic Dam, South Australia (SA), copper-uranium mine, envisioned during initial mine planning, was successfully completed during the year. Production of copper was proceeding at a rate exceeding the design capacity of 66,000 mt/a by a comfortable margin at yearend.

At yearend, the joint venture was managed by WMC (Olympic Dam Operations) Pty. Ltd., owned jointly by WMC (Olympic Dam Corp.) Pty. Ltd., a subsidiary of Western Mining Corp. Holdings Ltd. (WMCH), 51%, and BP Australia Ltd., a subsidiary of BP Minerals Ltd. of the United Kingdom, 49%. However, BP announced in December its intention to sell its interest to the Minorco Group. This gave WMCH 90 days to exercise its preemptive right to purchase BP's share at the same price and conditions as those offered to Minorco. No decision was announced by yearend.

Southern Copper Ltd.'s Port Kembla smelter project in NSW finally seemed to be approaching at yearend its design capacity of 80,000 mt/a. The more than $100 million project had been plagued by industrial relation problems during construction, followed by commissioning difficulties. An explosion and subsequent fire also delayed development.

North Broken Hill-Peko Ltd. (NBHP) announced in December the long-awaited development approval for its Northparkes copper-gold project in NSW. The mine will be developed in three stages over a 4-year period at a cost of $150 million, first producing gold bullion, expected to be poured in March 1994. The mine was expected to be producing copper-gold concentrates, containing 27% copper and 37 g/mt gold, toward the latter part of 1995 at the rate of 34,000 mt/a. Production in the fourth year was expected to increase to 110,000 tons of concentrates containing 45,000 tons of copper as well as significant gold. The mine was expected to have a 21-year life.

Gold.—Despite the gold industry's predictions during the mid-1980's that removal of the tax-exempt status on gold mining profits would decimate what was then Australia's fastest growing export industry, there has been little impact on production since the tax was implemented January 1, 1991. Australia's gold production was just 17 tons in 1980, but the country's third gold rush, during the 1980's, increased production to a record high of almost 243 tons in 1990. Although production of gold fell to just above 234 tons in 1991, the first year of the tax, much of the decrease was caused by many producers accelerating mining and high grading their operations during 1990 to get the maximum yield possible before the tax took effect. According to the latest official statistics,[3] gold production was 241 tons in fiscal year 1991 and 240 tons in fiscal year 1992. Thus, there has not been a marked reduction in the production of gold since the tax was enacted.

WA retained its dominance as the country's largest gold-producing State, generating more than 75% of national production. Several of its larger mines, e.g., Boddington, the Kalgoorlie Super Pit, Kambalda, Mount Magnet, and Telfer, individually exceeded the total production of NSW, SA, VIC, and TAS. QLD maintained its lead over the NT as Australia's second biggest gold mining State.

In WA, the Kalgoorlie Super Pit and the Telfer Mine both overtook the Boddington Mine to become the State's and Australia's largest gold producers. Mount Leyshon and The Granites Mines remained the leaders in gold production in the NT and QLD, respectively. The Temora Mine remained NSW's leading producer. Gold produced from the Olympic Dam Mine in SA was the most in the State, although the mine primarily was considered a copper mine. The mainstay of Victorian gold output was the Stawell Mine. Gold output from TAS remained almost entirely a byproduct of base metal mining, predominantly from the Mount Lyell copper mine. Table 5 gives the 15 largest gold mines in Australia in 1992. *(See table 5.)*

Despite depressed conditions in the international precious-metal and numismatic markets, Australia sold out two issues of its precious-metal bullion collector coins during the year. They were the 1992 1/10-oz and 1/4-oz issues of the Australian Nugget gold bullion coin. The coin series has been minted in Perth by Australian Gold Refineries, a division of the Western Australian Mint, which is a subsidiary of the Gold Corp. of Australia, an agency of the WA State government, since 1987. The sellouts, considering the depressed climate of the precious-metals investment and numismatic markets, reflected the enthusiasm of both the collector and investor for the unique bullion coin policy that Australia introduced in 1990 with its bullion collector coins series.

Under this policy, which applies to all gold Australian Nugget, platinum Australian Koala, and silver Australian Kookaburra coins containing 1 oz of metal or less, the designs are changed each year and mintages are limited to a predetermined number of coins, regardless of demand. In addition to its bullion collector series, the mint at Perth issues a bullion investor series of Australian Nuggets, Australian Koalas (introduced in October 1992), and Australian Kookaburras (introduced in April 1992) containing 2 oz, 10 oz, and 1 kg of metal intended solely for investment and which are produced in unlimited quantities without changing the design from year to year.

Iron Ore.—Australian iron ore production continued to be heavily concentrated in the Hamersley Range of the Pilbara District, WA, which accounted for more than 95% of the country's total. Iron ore also was produced at the Iron Duke Mine in the South Middleback Ranges near Whyalla, SA, and at the Savage River Mine in northwestern TAS.

Australia retained its position in 1992 as the world's leading iron ore exporter, edging out Brazil for the second straight year. With an 8.0% decrease to 106.6 Mmt, Australia's iron ore exports for the year were less than 1 Mmt more than

Brazil's 106.0 Mmt, which also decreased substantially from those of 1991.

Hamersley Iron Pty. Ltd., Australia's leading iron ore producer, increased its production to a record-high 50.4 Mmt in 1992, marginally beating its own record set the year before. The production record was set despite a month-long strike in midyear.

The WA government passed legislation at yearend that enabled Hamersley to resume development of the Marandoo deposit, 35 km northeast of its Mount Tom Price Mine. Development of the deposit was significantly delayed because of sacred-site claims by the Karijini Aboriginal community. Startup of the mine was expected early in 1995. Production capacity was planned to be about 10 Mmt/a, which will, in part, compensate for the planned reduction in output at the Mount Tom Price Mine, Hamersley's main iron ore mine.

BHP Iron Ore Pty. Ltd. began shipping iron ore from the Yandi Mine in March. The mine's production capacity, initially 5 Mmt/a, was expected to double by April 1994. BHP Iron also decided to develop the Yarrie deposit, at a capacity of 5 Mmt/a, to compensate for the closure of the 4-Mmt/a Koolan Island operation in Yampi Sound, where operations ceased at yearend.

Robe River Mining Co. Pty. Ltd., the third-ranked iron ore exporter and majority owner of the huge Pannawonica-Deepdale Mines, began developing its Mesa J deposit. Upon completion, expected in mid-1993, Robe River's annual production capacity will increase from 25 Mmt/a to about 32 Mmt/a.

Lead and Zinc.—Most lead and zinc ore mined in Australia continued to be from operations that produced both, since the two metals commonly occur in associated minerals in the same ore bodies. Only the small (10,000 mt/a) Beltana Mine in SA and the Scuddles Mine at Golden Grove in WA mined just one of the two, namely zinc. However, Scuddles also produced byproduct copper, gold, and silver. Zinc was the main product of all the lead-zinc mines in operation during the year.

Australia was the most important lead concentrate producer in the industrialized world, with about 20% of the total, and was second in the production of zinc concentrate, with about 15% of the total, in 1992. In refined production, Australia ranked fifth in zinc and eighth in lead, excluding lead bullion.

MIM Holdings Ltd., 70%, and ANT Minerals Pty. Ltd., 30%, announced in November plans to develop one of the world's largest zinc-lead-silver deposits at McArthur River in the northeast corner of the NT, about 100 km south of the Gulf of Carpentaria and 230 km west of the QLD border.

The mine is envisioned to be an underground operation producing about 1.5 Mmt/a of ore, yielding 350,000 tons of bulk concentrate containing 160,000 tons of zinc, 45,000 tons of lead, and 50,000 kg of silver, by early 1995. The concentrate will be transported 120 km by road to the Gulf of Carpentaria coast and barged to ships moored 30 km offshore. Construction was scheduled to begin in early 1993.

ANT Minerals was established to hold the 30% combined interests of the Japanese joint-venture partners, composed of Nippon Mining and Metals Co. Ltd. and wholly owned Toyoha Mines Co. Ltd., 15%; and Marubeni, Mitsubishi Materials Corp., and Mitsui and Co. Ltd., 5% each. The project will be managed by Mount Isa Mines Ltd. (MIM), a wholly owned subsidiary of MIM Holdings, which has established McArthur River Mining Pty. Ltd. to act as the operator.

Nicron Resources Ltd. deferred in December complete implementation of the expansion program at its Woodcutters Mine 80 km south of Darwin and was to cut back production in response to lower zinc and lead prices. Ore production will be reduced from the originally planned 660,000 mt/a to 500,000 mt/a.

Magnesium.—A major magnesium industry was being developed at Kunwarara, 55 km from Rockingham, QLD. In March, a plant began operating at an annual capacity of 100,000 mt/a of dead-burned magnesia (MgO) and 15,000 mt/a of electrofused MgO. Feed for the plant was mined at the Kunwarara magnesite deposit, discovered in 1985 by Queensland Metals Corp. NL (QMC) and developed in March 1991 by the Queensland Magnesia joint venture, known as QMAG. The QMAG shareholders were Pancontinental Mining Ltd., 40% and the operator; QMC, 50%; and Radex Australia Pty. Ltd., a subsidiary of Radex Heraklith AG of Austria, 10%.

Manganese.—The Radio Hill and Lox deposits of the Woodie Woodie operation near Nullagine in the Pilbara region, WA, were depleted. Mining progressed to the Cracker deposit, for which a heavy-medium separation plant was installed for control of silica and overall product quality. Portman Mining Ltd. managed the operation and shared ownership equally with Gayna Park Pty. Ltd., a Hancock Mining Pty. Ltd. subsidiary.

Metallurgical-grade ore production recommenced at the Millidie Mine, 100 km north of Meekatharra in the Peak Hill region of WA, in the latter part of the year. Valiant Consolidated Ltd. and Sabminco NL, as equal partners, acquired the mine in February from King Mining Corp.

Nickel.—The Australian nickel industry in 1992 consisted of two main producers, Western Mining Corp. Ltd. (WMC) and the Queensland Nickel Joint Venture (QN). A third, Outokumpu Oy of Finland, was scheduled to commence production in early 1993.

WMC remained the country's dominant nickel miner and main nickel metal producer. WMC operated nickel sulfide mines and mills centering on the Kambalda and Leinster regions of WA; a nickel smelter at Kalgoorlie, WA; and a refinery at Kwinana, WA. Kambalda Nickel Operations (KNO), a division of WMC, operated several mines in the Kambalda area and Leinster Nickel Operations (LNO), also a division of WMC, operated the Rocky's Reward and Perseverance Mines, near Leinster. The basically inactive Leinster Mine, an underground mine mothballed in 1986, was converted and mined as an open cut

on a shallow ore body.

WMC continued its $165 million expansion program of doubling mine output from LNO to 2 Mmt/a to produce 35,000 mt/a of contained nickel; increasing its Kwinana refinery south of Perth from a nominal capacity of 35,000 mt/a to 42,000 mt/a; and upgrading the smelter at Kalgoorlie to produce approximately 80,000 mt/a of nickel in matte, containing 67% nickel, from an annual throughput of 630,000 tons of concentrate. These programs were expected to be completed by yearend 1993. The proposed $72 million upgrading of the KNO was put on hold until the WA government amended the Western Australian Mines Regulation Act to allow continuous working rosters in existing underground mines. Kambalda was working on a 5-day workweek basis, unlike all the other States. Output was expected to reach 35,000 mt/a by mid-1995.

QN's nickel mine at Greenvale, 25 km west of Townsville, ceased production late in the year, and its Yabulu refinery at Townsville was importing most of its lateritic ore requirements from Gebe Island in Indonesia and La Grande Terre, the main island of New Caledonia. About 15% of the refinery's throughput was derived locally from the Brolga Mine. Port augmentation at Townsville and upgrading of the rail facilities to Yabulu were underway at yearend to ensure that the imported ore feedstock is handled efficiently. Plans for a new offshore unloading facility adjacent to the refinery at Halifax Bay were rejected at midyear because of environmental concerns. Virtually all refinery output was exported as nickel in oxides.

As a result of a public float late in 1992, equity interest in QN was held by Queensland Nickel Pty. Ltd., 80%, and the Queensland Government, 20%.

Outokumpu will operate its Forrestania nickel deposits, about 375 southeast of Perth, WA, as a 50-50 joint venture between two wholly owned subsidiaries, Outokumpu Australia Pty. Ltd. and Outokumpu Western Australia Pty. Ltd. It was expected to produce about 8,000 mt/a of nickel in concentrate for export to Outokumpu's Harjavlta refining facilities in Finland.

AGIP Australia Pty. Ltd.'s Radio Hill Mine and smelting operation, about 40 km south of Karratha, WA, was placed on care and maintenance in January following its commissioning in September 1991. The project was considered to be the prototype for testing MIM's ISASMELT technology for producing nickel-copper matte. However, the project's closure was predominantly due to depressed nickel prices and a $31 million cost overrun, rather than the technology of the smelter.

The Spargoville Mine, near Widgiemooltha to the west of WMC's Kambalda operations, came on-stream early in the year, but soon was placed on care and maintenance because of the depressed nickel market. The mine was owned by the Amalg Syndicate consisting of five partners.

Dominion Mining Ltd. was seeking a joint-venture partner to commence development of its Yakabindie nickel sulfide project in WA.

Mine development was started at Mount Keith, WA, regarded as the world's largest low-grade sulfide nickel deposit, with production expected to begin in early 1995. Outokumpu Metals and Resources Oy of Finland was expected to take 50% of the first 10 years of production, with the balance to be treated at WMC's Kalgoorlie smelter.

Platinum and Palladium.—No Australian mines were primary producers of platinum or palladium in 1992. A small amount, about 1,000 kg/a of platinum and 600 kg/a of palladium, continued to be produced as a byproduct from the treatment of nickel ore by WMC at Kalgoorlie, WA.

Australia launched in October a series of new coins containing 2 oz, 10 oz, and 1 kg of platinum to match similar denominations in its gold Australian Nugget coins. The legal tender platinum bullion coins, known as the Australian Koala, already were being minted in five sizes (1/20th oz, 1/10th oz, 1/4 oz, 1/2 oz, and 1 oz), as was the Australian Nugget. Australian Gold Refineries produced the coins at the Perth Mint.

Silver.—Australia launched in April a series of new coins containing 2 oz, 10 oz, and 1 kg of silver to match similar denominations in its gold Australian Nugget coins. The legal tender silver bullion coins, known as the Australian Kookaburra, already were being minted in five sizes (1/20th oz, 1/10th oz, 1/4 oz, 1/2 oz, and 1 oz), as was the Australian Nugget. Australian Gold Refineries produced the coins at the Perth Mint.

Steel.—BHP Steel Ltd. was the only integrated steel producer in Australia during the year. BHP Steel's contribution to total world steel output was relatively small, having three integrated steelworks producing less than 1% of world production in 1992. However, BHP Steel ranked 15th among the world's largest steel producers in 1992, advancing from 17th the previous year. Australia ranked as the 22d largest steel-producing country in the world in 1992, up from 23d in 1991.

The first stage of BHP Steel's 250,000-mt/a minimill at Rooty Hill on the outskirts of Sydney, NSW, was being commissioned at yearend following the first melt in September. Initially it will provide billets for BHP Steel's Newcastle, NSW, steelworks and for rolling mills in Brisbane, QLD, and Kwinana, WA, for upgrading to finished products. After completion of the second stage in a few years' time, the Rooty Hill mill will produce rod and bar products for the Sydney metropolitan area.

The Governments of WA and China agreed in September to conduct a feasibility study for the construction of a 2-Mmt/a direct reduction iron plant in the Pilbara region of WA. The study was considering the vicinity of Port Lambert as the most logical site because of the existing infrastructure as well as the possibility of revitalizing the Robe River pellet plant to provide the feedstock. This plant has been mothballed since 1979 when a severe drop in prices made it uneconomical.

Tantalum.—Gwalia Consolidated Ltd. terminated all soft-rock operations in mid-December at its Greenbushes tantalum

open pit in WA, and the soft-rock treatment plant was closed. Expansion of the mine to 1 Mmt/a from the present 0.8 Mmt/a will make Gwalia Consolidate the world's major supplier of tantalum concentrates. The Greenbushes operation contains the largest known tantalum reserves in the established market economy countries.

Tin.—The Renison Mine near Zeehan, TAS, the world's largest hard-rock underground tin mine, remained Australia's main tin producer. The Greenbushes Mine in southwestern WA also produced tin in addition to kaolin, lithium, and tantalum.

At the 10th meeting of members of the Association of Tin Producing Countries (ATPC), held in Jakarta, Indonesia, in September, it was announced that ATPC members would increase tin exports in 1993 to a total of 89,400 tons, slightly up from 1992's 87,091 tons. ATPC members agreed to continue their quota scheme, introduced in 1987, designed to reduce world tin stocks to about 20,000 tons by the end of 1993. Australia's allowable tin exports, according to the agreement, increased to 6,500 tons in 1993 from 5,985 tons in 1992.

Vanadium.—The WA government gave approval in September for Precious Metals Australia Ltd. (PMA) to develop its Wagoo Hills Mine at Windimurra, 80 km southeast of Mount Magnet. The project was expected to cost about $40 million and will include development of a new coal mine at Mingenew, 120 km to the west, for use as an energy source for the vanadium plant. PMA expected to develop the coal mine first to provide revenue while the more complex vanadium mine and plant was under construction. When completed, Wagoo Hills will be Australia's sole vanadium producer. Production was planned at 3,700 mt/a of vanadium pentoxide high-purity fused flake and byproducts, including 22,000 mt/a of sodium sulfate, 2,000 mt/a of sodium zeolites, and an estimated 375,000 mt/a of titanohematite ore beginning in early 1993. PMA was seeking to capture at least 10% of the international market and provide approximately $700 million in export earnings over the 30-year life of the mine.

Industrial Minerals

Diamond.—The mammoth Argyle Mine in the Kimberley region of WA again retained in 1992, for the seventh consecutive year, its position as the world's biggest single-mine producer of diamond with another record-high production. Argyle produced 39 million carats from the combined treatment of AK-1 lamproite pipe ore and its derived alluvium in the lower reaches of the Smoke and Limestone Creeks that drain the pipe. AK-1 production accounted for 36.6 million carats from 7 Mmt of ore. Alluvial production for the year contributed 2.4 million carats from 3.5 Mmt of ore. Both AK-1 and alluvial ore grades were lower in 1992 than in 1991, reflecting the gradual decline in ore grades as mining progressed deeper in the pipe and declining alluvial grades with increasing distance of mining from the AK-1 source. About 5% of production was of gem quality, including a small proportion of the intense pink stones; 40% was near gem quality and 55% was industrial quality.

The Argyle Mine was owned and operated by Argyle Diamond Mines Pty. Ltd., a joint venture of CRA Ltd., 59.7%, and Ashton Mining Ltd., 40.3%. Argyle sold most of its gem quality and about 80% of its near gem quality white diamonds to De Beers' Central Selling Organization (CSO) under a 5-year marketing contract, signed in mid-1991, through Argyle Diamond Sales Ltd. (ADS), a company jointly owned by CRA, 59.75%, and Ashton, 40.25%. Argyle retained the right to sell the few handfuls of the very rare, intense pink diamonds unique to the Argyle Mine, as well as the more common yellow to brown stones, which are marketed as *Argyle Champagne* or *Argyle Cognac* diamonds, depending upon the specific color. These diamonds were cut and polished, using traditional techniques and automated laser cutting machines, at ADS's small facility in Perth. Most of the remaining portion of the near gem quality and all of the industrial-grade stones were sold on the open market through ADS's Antwerp, Belgium, office. A small proportion of the near gem quality material was toll processed overseas through ADS, before being sold on the open market.

Argyle announced in December a 2-year program to increase the AK-1 processing plant capacity a further 2 Mmt/a, about 30%, at a cost of approximately $70 million. The increased capacity will enable diamond production to be maintained, offsetting the decline in ore grade with depth of the AK-1 pipe. Commissioning of the upgraded plant was scheduled to commence in May 1994.

Australia's only other significant producing diamond mine, Normandy Poseidon Ltd.'s Bow River Mine 25 km northeast of the Argyle Mine, also produced another record-high production, recovering more than 1 million carats, 14% more than the previous year.

All of Bow River's output was marketed under a sales agreement with the CSO. About 20% of the Bow River production was gem quality, with a consistent percentage of pink diamonds, 70% was industrial grade, and 10% was bort. Bow River diamonds were recovered from buried diamondiferous gravels that originated from the AK-1 pipe.

Gemstones.—Australia continued to be the world's leading producer of natural sapphire, which was mined in the New England (Inverell-Glen Innes) District of NSW and near the town of Anakie in QLD. It produced about 70% of the world's rough sapphire supply output, with about 90% of the uncut gems being exported to Thailand, the recognized world leader for cutting and marketing. Australia processed only about 1% of its production.

Between 80% and 90% of the world's natural opal was mined in Australia, mostly from three fields in SA at Andamooka, Coober Pedy, and Mintabie. In NSW, Lightening Ridge was the world's sole source of black opal. A small quantity of opal also was produced in central QLD.

In addition to the important deposits of opal and sapphire, Australia also produced a variety of other gemstones, including amethyst, aquamarine, chrysoprase, emerald, garnet, rhodonite, topaz, and zircon. The world's largest resource of nephrite jade was at Cowell on the Eyre Peninsula in SA.

Graphite.—Gwalia Consolidated acquired the 49% interest held by its former partner, Warrior International Ltd., to become sole owner of the Esperance (formerly Munglinup) graphite project, 80 km east of Ravensthorpe on the south coast of WA. Gwalia Consolidated was seeking firm sales contracts at yearend before proceeding with development and operation of an open pit mine and 10,000-mt/a plant, both of which already have been approved by the Western Australian Department of Mines. If Gwalia Consolidated decides to go ahead with the project, first production would be in June 1994.

Salt.—Dampier Salt (Operations) Pty. Ltd. supplied more than one-half of Australia's salt exports, 70% of which go to Japan, from its solar operations at Dampier Field, on Mistaken Island near Dampier in the Pilbara area, and Lake Macleod Field, near Carnarvon, both in WA. Indonesia, the Republic of Korea, and Taiwan received the bulk of the remaining exports.

Mineral Fuels

Coal.—The coal industry remained Australia's largest foreign-exchange earner, accounting for more than one-quarter of export revenues from the minerals sector and about 15% of the country's export earnings. Australia also retained its position as the world's largest exporter of coal, setting another record of more than 126 Mmt shipped in 1992, an increase of 5% over that of 1991. Coking coals accounted for almost 55% of shipments, about the same as that in 1991. Australia was the world's sixth largest producer of coal (all grades) in 1992, ranking behind China, the United States, the former U.S.S.R., Germany, and Poland. NSW and QLD remained virtually Australia's only coal-exporting States. A large share of production in NSW was from underground mines, while most of the mines in QLD were open cut. QLD remained the leading Australian coal exporting State.

The Queensland Ministry of Resources signed a research agreement near yearend with the New Energy and Industrial Technology Development Organization of Japan. The agreement, directed at finding new exploration technology to delineate coal seams, will be a significant boost to the State's $4 billion per year coal industry.

Petroleum and Natural Gas.—Production from Australia's largest energy development undertaking, the massive North West Shelf Gas Project (NWS Gas) on the continental shelf about 140 km offshore of Dampier, WA, continued to climb steadily during the year. NWS Gas consisted primarily of providing natural gas to WA through the State Energy Commission of Western Australia, supplying liquefied natural gas (LNG) to Japan, and producing gas condensate for domestic and international refineries.

NWS Gas achieved several major milestones in 1992, including producing in June the 10-millionth metric ton of LNG; delivering in October the 200th cargo of LNG to Japan; successfully siting the Goodwyn A platform in early November, the second offshore production facility, which was expected to be fully operational during the first part of 1993, in the Goodwyn Gasfield; completing and successfully testing the onshore facilities related to the Goodwyn A platform; completing the construction, which commenced in September 1989, in November of the third and final LNG processing train on the Burrup Peninsula at a cost of almost $700 million, but more than $100 million under budget; and commencing service in December of the *Northwest Seaeagle*, the sixth specialized vessel for transporting LNG to Japan, with the seventh and last ship scheduled to enter service in 1994.

The joint venture of BHP Petroleum Pty. Ltd., Inpex Alpha, and Mobil Australia Pty. Ltd. received approval in December for a Production License in the Griffin Oilfield, offshore of WA. The project was to develop proved and probable reserves of 125 Mbbl of crude oil and 2.0 Gm^3 of natural gas and be the largest crude oil project in Australia since 1980 in Bass Strait, VIC. A natural gas pipeline was to link with the shore, the first time this was to be done in Australia. The first oil production was expected by February 1994.

The total number of petroleum exploration and development wells drilled during 1992 (169) was 21% lower than the number drilled during 1991 (215). The number of onshore exploration wells drilled in 1992 (80) was 34 less than that in 1991 (114). However, the number of offshore exploration wells drilled (39) was 3 more than the number drilled in 1991 (36). The total number of exploration wells drilled in 1992 (119) decreased 21% from the number drilled in 1991 (150). The total number of development wells drilled (50) was 15 less than that in 1991 (65). The total meters drilled for exploration and development wells in 1992 (363,546) was 21% less than that drilled in 1991 (459,573). In seismic survey activity during 1992, the total number of line km recorded (188,145) increased by 15% compared with that of 1991 (163,642). The level of offshore activity in 1992 (182,777 line km) was almost 18% greater than the corresponding level achieved during 1991 (155,415 line km).

Uranium.—The Commonwealth Government's policy of restricting uranium production to three sites remained in effect throughout the year. The mines involved continued to be the operational Olympic Dam Mine in SA and the Ranger Mine in the Alligator Rivers region of the NT. The third permissible site, Queensland Mines Ltd.'s Nabarlek Mine, also in the Alligator Rivers region of the NT, was depleted of reserves and closed in 1988. Thus, the "three mines" policy was in practice a "two mines" policy, as the export permit holders, Energy Resources of Australia Ltd. (ERA) and the consortium of WMCH-BP were the only ones with

viable mines. The Commonwealth Government had de facto control over uranium mining by controlling the licenses for the export of uranium-bearing ores and by prohibiting further downstream involvement in the nuclear fuel cycle, including enrichment or other value-added processes.

ERA, a 65%-owned subsidiary of NBHP, stockpiled the ore mined at its Ranger operation for most of the year owing to an overabundance in world supplies. Milling was expected to resume early in 1993.

The stage 2 upgrade of the Olympic Dam polymetallic (copper, gold, silver, and uranium) mine in SA came on-stream 3 months ahead of schedule in midyear, 10% below budget. Ore throughput was increased from 1.6 Mmt/a to 2.2 Mmt/a, increasing uranium oxide output to 1,400 mt/a from 1,200 mt/a. The expansion was envisioned at the outset when the mine was first being developed in 1985.

Reserves

Australia has a sound resource base of a diverse range of minerals. It is self-sufficient in most minerals of economic importance. However, in spite of extensive exploration, the country still appears to be deficient in chromite, mercury, mica, platinum-group metals, and sulfur. Major minerals with known reserves adequate for domestic demand and exports include bauxite, clays, coal, copper, diamond, gold, iron ore, lead, manganese, mineral sands, natural gas, nickel, salt, silver, tin, uranium, and zinc. *(See table 6.)*

INFRASTRUCTURE

The communications-transportation infrastructure of Australia was well developed. There was 837,872 km of roads, including 243,750 km paved; 228,396 km gravel, crushed stone, or stabilized-soil surface; and 365,726 km unimproved earth. Inland waterways, of which there was about 8,368 km usable for mainly small, shallow-draft craft, were of little importance to the transportation industry.

The Government-owned railway system consisted of 40,478 km of track, 16,201 km of which was standard gauge. There was 1,130 km of electrified rail. A few hundred km of rail was privately owned, most of which served the iron ore industry in WA. There were 237 principal airports with permanent-surface runways out of an aggregate of 481 in the country. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport, Fremantle, Geelong, Hobart, Launceston, Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 17 petroleum, oils, and lubricant tankers; 2 chemical tankers; 4 liquefied gas tankers; 1 combination ore-oil tanker; and 30 bulk ore freighters.

Pipelines included 5,600 km for natural gas; 2,500 km for crude oil; and 500 km for refined oil products. Electric generating capacity in 1991 was 40,000 MW.[4]

In remote areas where mines, mills, or smelters are usually located, an individual mining company must provide its own infrastructure, such as housing, roads, railways, port facilities, and various community services.

OUTLOOK

Many sectors of the Australian mining industry, including aluminum, coal, copper, gold, iron ore, lead-zinc, manganese, mineral sands, nickel, tin, and tungsten, face an uncertain future owing to weak commodity prices, rising costs of production, large inventories on world markets, and/or insufficient infrastructure. However, Australia was expected to remain a significant world supplier of these and other mineral resources in which it is abundantly endowed well into the 21st century.

Probably the largest single potential detriment to the resource sector in the years ahead is the strong environmental movement in the country. Although ores and processed minerals have been accounting for almost one-half of export income, increasingly strong antimining sentiment continues to impede investment in the mining and minerals sector, with the result that exploration and development activities are decreasing as they become more difficult to conduct. This will have a very significant effect on the development of large greenfield projects that will be needed to maintain the impetus of the mining and processing sectors.

Declining gold prices, a shortage of exploration funds, and the end of the Federal gold tax exemption will likely bring to an end the Australian gold boom built during the 1980's. This boom, which saw the rise of annual gold production from a base of just 5 tons at the beginning of the decade to the record-high output of more than 240 tons in 1990, was primarily based on the mining of near-surface, low-grade deposits of limited life. The boom also resulted from reworking old deposits that became economically viable again by the treatment of the tailings of past mining operations using modern, especially carbon-in-leach and carbon-in-pulp, technology. Many of these gold deposits and tailings areas have neared the end of their economic lives because of high grading at many operations to beat the gold tax, as well as the exhaustion of reserves at many locations.

The gold tax and other impediments, such as increasingly restricted access to lands either for environmental reasons or land rights issues to conduct proper exploration programs, will also mean even fewer funds will be available for exploration and capital investment, and this will translate into a reduction in production.

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[1]Where necessary, values have been converted from Australian dollars (A$) to U.S. dollars at the yearend rate of $A1.4482=US$1.00.

[2]Australia's fiscal year begins on July 1 and ends on June 30 of the year stated.

[3]Australian Bureau of Agricultural and Resource Economics, Canberra.

[4]U.S. Central Intelligence Agency, Washington, DC: The World Fact Book 1992, pp. 21-22.

OTHER SOURCES OF INFORMATION

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Publications

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Australian Bureau of Statistics, Belconnen:
Mineral Production, Australia, Fiscal year.

Australian Bureau of Statistics, Belconnen:
Production Statistics, Preliminary, Monthly.

TABLE 1

AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	36,192	38,584	41,391	40,503	[2]39,950
Alumina	do.	10,511	10,800	11,231	11,713	[2]11,623
Metal, refined:						
Primary	do.	1,150	1,244	1,234	1,235	[2]1,216
Secondary		46,800	48,400	32,900	22,500	[2]22,600
Antimony, Sb content of ores and concentrates		1,320	1,360	1,420	r1,500	1,500
Bismuth, mine output, Bi content e		400	500	400	400	—
Cadmium:						
Mine output, Cd content		1,709	1,685	2,100	2,500	[2]2,516
Metal, smelter (refined)		855	696	638	1,076	[2]1,003
Cobalt: e						
Mine output, analytic content of:						
Nickel ore		[2]2,104	r1,900	r1,400	r1,100	700
Nickel concentrate		400	300	300	300	300
Zinc concentrate		[2]70	r70	r70	r70	70
Total		2,574	r2,270	r1,770	r1,470	1,070
Recovered cobalt, including that from imported source material		1,200	r1,100	r1,100	1,200	1,350
Columbium-tantalum concentrate, gross weight		226	555	r529	r703	600
Copper:						
Mine output, Cu content	thousand tons	238	296	330	311	[2]326
Metal:						
Smelter:						
Primary	do.	178	204	192	197	200
Secondary e		[2]10,506	10,000	10,000	10,000	10,000
Refined:						
Primary	thousand tons	196	210	247	252	[2]295
Secondary		26,667	r35,000	r24,000	r35,000	[2]32,000
Gold:						
Mine output, Au content	kilograms	156,951	203,563	244,137	234,218	240,000
Metal:						
Refined:						
Primary	do.	140,384	197,382	254,583	e250,000	250,000
Secondary	do.	10,235	18,220	18,670	e20,000	20,000
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	96,064	105,810	110,508	117,134	110,000
Fe content	do.	61,244	67,313	69,766	68,732	70,000
Metal:						
Pig iron	do.	5,730	6,094	6,125	5,647	6,000
Ferroalloys: e [3]						
Ferromanganese		[2]58,000	[2]67,000	70,000	55,000	55,000
Ferrosilicon		18,000	20,000	20,000	20,000	20,000
Silicomanganese		44,000	r55,000	r65,000	r65,000	65,000
Total		120,000	r142,000	r155,000	r140,000	140,000
Steel, crude	thousand tons	6,399	6,735	6,666	6,018	[2]6,322
Semimanufactures e		6,000	6,500	3,000	3,000	3,000

See footnotes at end of table.

TABLE 1—Continued

AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
METALS—Continued						
Lead:						
Mine output, Pb content	thousand tons	465	495	565	571	[2]548
Metal:						
Primary:						
Bullion, for export	do.	191	183	195	182	[2]172
Refined	do.	168	178	212	220	[2]245
Total	do.	359	361	407	402	[2]417
Secondary excluding remelt	do.	17	18	20	18	[2]19
Manganese ore (metallurgical):						
Gross weight	do.	1,985	2,124	r1,920	1,482	1,200
Mn content	do.	945	1,011	r909	701	570
Nickel:						
Mine output, Ni content	do.	62	67	67	69	[2]64
Metal, smelter (refined Ni and Ni content of oxide)	do.	42	44	45	46	[2]45
Platinum-group metals:e						
Palladium, Pd content	kilograms	[2]411	400	400	400	400
Platinum, Pt content	do.	[2]106	100	100	100	100
Total	do.	[2]517	500	500	500	500
Rare-earth metals, monazite concentrate:e						
Gross weight		[2]11,872	13,000	11,000	r7,000	7,000
Monazite content		[2]11,039	12,000	10,200	r6,000	6,500
Silver:						
Mine output, Ag content		1,117	1,075	1,138	e1,180	[2]1,245
Metal, refined		297	376	419	e400	400
Tin:						
Mine output, Sn content[4]		7,009	7,709	7,377	5,700	[2]6,400
Metal, refined:						
Primary		439	424	312	268	250
Secondarye		300	300	200	300	250
Titanium concentrates, gross weight:						
Ilmenite	thousand tons	1,610	1,696	1,602	1,363	[2]1,500
Leucoxene		11,742	18,000	19,000	18,000	[2]22,000
Rutile		230,637	243,000	245,000	201,000	[2]190,000
Tungsten, mine output, W content		1,261	1,371	1,086	237	160
Uranium, mine output, U content		3,531	3,656	3,529	3,776	3,500
Zinc:						
Mine output, Zn content	thousand tons	759	803	r937	1,048	[2]1,028
Metal, smelter:						
Primary	do.	302	294	304	r322	[2]330
Secondary		e3,700	5,500	r4,500	r4,500	[2]4,500
Zirconium concentrates, gross weight	thousand tons	480	511	437	292	[2]283
INDUSTRIAL MINERALS						
Abrasives, natural:e						
Beach pebble		1,000	1,000	1,500	2,000	2,000
Garnet		16,000	16,000	20,000	25,000	25,000
Barite[e]		[2]10,970	11,000	11,000	11,000	11,000
Cement, hydraulic	thousand tons	6,400	r6,900	r7,068	r6,108	[2]5,412

See footnotes at end of table.

TABLE 1—Continued

AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[e]
INDUSTRIAL MINERALS—Continued						
Clays:[e]						
Bentonite and bentonitic clay		r [2]35,671	35,000	35,000	35,000	35,000
Brick clay and shale	thousand tons	[2]8,483	8,500	8,000	8,000	8,000
Cement clay and shale	do.	450	500	500	500	500
Damourite clay		100	100	100	100	100
Fire clay[5]		25,000	25,000	25,000	25,000	25,000
Kaolin and ball clay[5]		r [2]159,067	185,000	200,000	r190,000	180,000
Other[5]	thousand tons	1,000	1,000	1,000	1,000	1,000
Diamond:						
Gem	thousand carats	17,413	17,540	17,331	17,978	[2]17,750
Industrial	do.	17,413	17,540	17,331	17,978	[2]22,250
Total	do.	34,826	35,080	34,662	35,956	[2]40,000
Diatomite[e]		[2]11,117	12,000	10,000	11,000	11,000
Feldspar including nepheline syenite[e]		[2]15,877	12,500	16,000	16,000	15,000
Gemstones, other than diamond:[e]						
Opal	value, thousands	$50,000	$60,000	$90,000	$85,000	$85,000
Sapphire	do.	$15,000	$15,000	$20,000	$10,000	$10,000
Other	do.	$2,500	$3,000	$800	$900	$900
Total	do.	$67,500	$78,000	$110,800	$95,900	$95,900
Gypsum[e]	thousand tons	[2]1,634	1,800	1,800	2,000	2,000
Kyanite[e]		500	500	750	800	800
Lime[e]		1,100,000	1,500,000	1,500,000	1,500,000	1,500,000
Magnesite[e]		[2]56,446	55,000	60,000	r100,000	820,000
Nitrogen: N content of ammonia		385,800	343,600	385,300	r e414,000	391,000
Perlite, crude[e]		[2]4,736	5,000	5,000	5,000	5,000
Phosphate rock		13,000	8,000	16,000	4,000	4,000
Salt	thousand tons	7,165	7,069	7,227	7,791	8,000
Sillimanite[e 6]		[2]75	80	100	100	100
Spodumene, concentrate[e]		30,000	40,000	40,000	[2 7]40,736	[2 7]42,516
Stone, sand and gravel:[e]						
Construction sand[8]	thousand tons	28,000	30,000	30,000	30,000	30,000
Gravel[8]	do.	15,000	15,000	15,000	15,000	15,000
Dolomite	do.	[2]859	1,000	1,000	1,000	10,000
Limestone:						
For cement	do.	[2]5,512	6,000	6,000	6,000	6,000
For other uses	do.	[2]5,294	6,000	6,000	6,000	6,000
Silica in the form of quartz, quartzite, glass sand	do.	[2]1,969	2,000	2,000	2,000	2,000
Other:[8]						
Crushed and broken stone	do.	65,000	65,000	65,000	65,000	65,000
Dimension stone	do.	100	100	100	100	100
Unspecified	do.	30,000	30,000	30,000	30,000	30,000
Sulfur: Byproduct:[e]						
Metallurgy	do.	200	200	200	200	200
Petroleum	do.	9	10	10	10	10
Total	do.	209	210	210	r210	210
Talc, chlorite, pyrophyllite, steatite[e]		[2]205,381	200,000	205,000	216,000	215,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand tons	176,604	190,084	199,212	207,395	205,000

See footnotes at end of table.

TABLE 1—Continued

AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal—Continued:						
Lignite	thousand tons	43,450	48,252	47,725	49,569	50,000
Total	do.	220,054	238,336	246,937	256,964	255,000
Coke, metallurgical	do.	3,866	4,073	r4,527	e4,000	4,000
Fuel briquets[e]	do.	750	750	750	750	750
Gas, natural, marketed	million cubic meters	15,384	17,806	20,726	21,687	22,000
Natural gas liquids	thousand 42-gallon barrels	24,648	23,701	22,973	22,261	22,500
Peat[e 8]		[2]10,133	11,000	11,000	11,000	11,000
Petroleum:						
Crude	thousand 42-gallon barrels	189,570	178,638	210,629	198,821	[2]193,450
Refinery products:						
Gasoline:						
Aviation	do.	1,207	1,314	1,353	959	1,000
Motor	do.	100,530	101,109	103,401	106,576	105,000
Jet fuel	do.	20,624	20,027	21,818	23,298	23,000
Kerosene	do.	465	358	846	315	300
Distillate fuel oil	do.	62,426	64,615	67,523	68,857	69,000
Residual fuel oil	do.	13,240	15,102	15,673	17,374	17,000
Lubricants	do.	3,900	3,969	4,208	4,226	4,000
Liquefied petroleum gas	do.	4,944	5,101	4,851	5,646	5,500
Bitumen	do.	3,371	3,780	3,550	3,288	3,000
Unspecified	do.	7,076	6,328	5,558	6,760	6,500
Refinery fuel and losses	do.	5,755	5,132	2,314	5,763	5,500
Total	do.	223,538	226,835	231,095	243,062	239,800

[e]Estimated. [r]Revised.

[1]Includes data available through Sept. 24, 1993.

[2]Reported figure.

[3]Data are for years ending Nov. 30 of that stated for plants owned by the Broken Hill Pty. Co. Ltd.

[4]Excludes tin content of copper-tin and tin-tungsten concentrates.

[5]Excludes production from Western Australia.

[6]In addition, about 7,000 ton of sillimanite clay, also known as kaolinized sillimanite, is produced, containing 40% to 48% Al_2O_3.

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

[8]Excludes data from some States.

TABLE 2

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	4	12	—	Singapore 9; Hong Kong 1.
Aluminum:				
Oxides and hydroxides	159,957	218,599	9,586	Singapore 52,432; Republic of Korea 45,750.
Metal including alloys:				
Scrap	53,440	59,681	31	Japan 43,148; New Zealand 5,920.
Unwrought	937,183	929,275	6,898	Japan 496,592; Republic of Korea 166,739.
Semimanufactures	29,381	28,743	39	New Zealand 6,935; Hong Kong 6,093.
Antimony: Metal including alloys, all forms	—	5	—	All to New Zealand.

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS—Continued				
Bismuth: Metal including alloys, all forms	397	47	—	All to Japan.
Cadmium: Metal including alloys, all forms	537	485	155	Japan 182; Israel 42.
Chromium:				
Ore and concentrate	74	142	—	All to New Zealand.
Oxides and hydroxides	195	513	—	Sri Lanka 323; Indonesia 42.
Metal including alloys, all forms	1	1	—	Mainly to Fiji.
Cobalt:				
Ore and concentrate	—	3	—	All to New Zealand.
Oxides and hydroxides value, thousands	$1	$6	—	Indonesia $3; New Zealand $3.
Metal including alloys, all forms	—	103	—	All to Netherlands.
Columbium and tantalum: Ore and concentrate[2]	322	330	52	Netherlands 136; West Germany 62.
Copper:				
Ore and concentrate	207,189	283,276	1,829	Japan 260,663; Philippines 11,023.
Matte and speiss including cement copper	40	6,177	—	All to West Germany.
Metal including alloys:				
Scrap	1,264	12,429	—	Republic of Korea 5,038; Japan 4,907.
Unwrought	127,221	177,777	7	Japan 67,368; United Kingdom 38,660.
Semimanufactures	21,079	21,320	1,564	New Zealand 9,319; Singapore 2,831.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	57,881	78,781	—	Japan 53,547; Republic of Korea 4,720; West Germany 3,644.
Pyrite, roasted	56,644	45,662	—	All to Japan.
Metal:				
Scrap	54,971	220,414	—	Malaysia 71,631; Japan 47,893; Indonesia 15,000.
Pig iron, cast iron, related materials	24,058	946	—	Republic of Korea 716; New Zealand 144.
Ferroalloys:				
Ferrochromium	254	1	—	All to New Zealand.
Ferromanganese	28,655	43,093	15,200	Qatar 9,885; Indonesia 9,000.
Ferrosilicomanganese	45,785	49,999	41,900	Indonesia 4,950; New Zealand 1,330.
Ferrosilicon	82	7,508	1,530	Japan 3,200; New Zealand 1,854.
Unspecified	194	7	—	New Zealand 4; Hong Kong 3.
Steel, primary forms	381,940	705,020	126,491	Iran 239,367; Indonesia 124,986.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	159,599	533,859	24,521	Republic of Korea 198,980; Indonesia 58,440.
Clad, plated, coated	316,534	353,048	138,807	Singapore 32,052; Malaysia 27,691.
Of alloy steel	5,434	10,276	1,453	Papua New Guinea 4,501; Hong Kong 1,282.
Bars, rods, angles, shapes, sections	64,954	122,055	13,633	Thailand 16,043; New Zealand 16,033.
Rails and accessories	12,037	15,875	1,162	Canada 8,960; Malaysia 2,143.
Wire	12,985	16,110	4,428	New Zealand 3,665; Malaysia 2,520.
Tubes, pipes, fittings	12,296	14,428	1,364	Papua New Guinea 3,949; Fiji 3,363.
Lead:				
Ore and concentrate	134,508	133,003	6,400	Japan 68,698; Belgium-Luxembourg 18,500.
Oxides	1,205	353	—	Thailand 82; Indonesia 71; Philippines 25.

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued:					
Lead—Continued:					
Metal including alloys:					
Scrap		29,398	30,153	—	Philippines 7,285; Indonesia 7,212; Republic of Korea 5,164.
Unwrought		278,426	293,701	6,992	United Kingdom 162,586; Republic of Korea 25,561.
Semimanufactures		562	826	—	Philippines 487; Thailand 218.
Magnesium: Metal including alloys, all forms		169	13	9	Singapore 3.
Manganese:					
Oxides		1,260	1,439	3	United Kingdom 280; Thailand 260.
Metal including alloys, all forms		118	115	—	Japan 92; Malaysia 22.
Mercury	value, thousands	$11	$18	—	Singapore $11; United Arab Emirates $4.
Molybdenum:					
Ore and concentrate		99	—		
Metal including alloys, all forms	value, thousands	—	$2	—	All to Malaysia.
Nickel:					
Ore and concentrate		1,344	—		
Matte and speiss		38,585	25,982	3,450	Netherlands 9,782; West Germany 4,015.
Metal including alloys:					
Scrap		297	410	2	United Kingdom 203; Japan 105.
Semimanufactures		118	214	57	Netherlands 109; United Kingdom 18.
Platinum-group metals:					
Ore and concentrate[3]		27,981	1,520	—	Japan 1,519.
Waste and sweepings	value, thousands	$1,828	$43	—	All to United Kingdom.
Metals including alloys, unwrought and partly wrought	do.	$3,702	$4,382	$11	United Kingdom $3,251; West Germany $880.
Silicon, high-purity		4,386	18,941	43	Japan 6,976; West Germany 4,413.
Silver:					
Ore and concentrate		NA	23	23	
Waste and sweepings[4]	value, thousands	$2,322	$4,800	$345	United Kingdom $3,409; Belgium-Luxembourg $396.
Metal including alloys, unwrought and partly wrought	do.	$16,739	$38,288	$543	Singapore $14,442; Japan $11,669.
Tin:					
Ore and concentrate		16,771	17,241	—	Malaysia 17,137; Singapore 104.
Metal including alloys:					
Scrap		186	455	—	Sri Lanka 364; United Kingdom 43.
Unwrought		312	187	101	United Kingdom 58; Netherlands 19.
Semimanufactures		441	1,048	(5)	New Zealand 619; Vietnam 391.
Titanium:					
Ore and concentrate		1,028,563	1,061,942	398,922	United Kingdom 193,465; Japan 160,618.
Oxides		143	28	—	Indonesia 23; Fiji 5.
Metal including alloys, all forms		35	23	12	United Kingdom 11.
Tungsten:					
Ore and concentrate		2,028	1,945	22	Japan 707; Republic of Korea 663.
Metal including alloys, all forms		171	1	1	

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS—Continued				
Uranium and thorium: Ores and concentrates value, thousands	$115,594	$7,133	—	All to France.
Zinc:				
Ore and concentrate	1,069,231	1,271,201	7,000	Japan 569,143; Republic of Korea 261,672.
Oxides	1,676	777	21	Japan 252; New Zealand 181.
Blue powder	879	1,760	190	India 551; Malaysia 296.
Metal including alloys:				
Scrap	3,829	4,445	—	India 1,362; Republic of Korea 441; unspecified Asia 2,441.
Unwrought	185,450	178,417	26,480	Indonesia 25,702; Japan 19,256.
Semimanufactures	120	47	—	Papua New Guinea 14; Thailand 13.
Zirconium:				
Ore and concentrate	382,498	231,551	3,005	Japan 90,165; Netherlands 52,386.
Metal including alloys, all forms	527	82	1	Iraq 80.
Other:				
Ores and concentrates	2,774	2,412	—	France 1,310; Japan 660; Netherlands 384.
Ashes and residues	35,133	23,143	—	West Germany 8,097; Japan 6,235; India 5,927.
Metalloids[6]	435	19,945	—	New Zealand 19,701; Papua New Guinea 115.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	4,386	5,395	2,377	Netherlands 1,154; United Kingdom 477.
Artificial: Corundum	—	4	—	All to Republic of South Africa.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$126	$170	$6	Canada $82; France $33.
Grinding and polishing wheels and stones	177	185	(3)	New Zealand 117; Singapore 32.
Barite and witherite	1,177	52	—	Republic of South Africa 20; New Zealand 13.
Boron materials:				
Crude natural borates	1	—		
Oxides and acids	7	—		
Cement	16,861	21,284	—	Singapore 15,476; Papua New Guinea 4,463.
Clays, crude:				
Bentonite	7,706	8,799	—	Japan 1,841; Thailand 954; unspecified Asia 4,160.
Kaolin	107,159	141,519	—	Japan 104,869; Finland 12,750.
Unspecified	88,713	2,755	—	New Zealand 1,504; Japan 1,025.
Cryolite and chiolite	3	3,009	—	All to Japan.
Diamond, natural:				
Gem, not set or strung value, thousands	$61,148	$62,192	$746	United Kingdom $22,707; Belgium-Luxembourg $17,562.
Industrial stones do.	$2,475	$162	$20	Thailand $40; New Zealand $37.
Diatomite and other infusorial earth	249	216	(3)	New Zealand 107; Philippines 55.
Feldspar	1,030	24,021	—	Japan 5,515; Indonesia 5,220; Malaysia 1,969.
Fertilizer materials:				
Crude, n.e.s.	779	7,970	6	Hong Kong 2,412; Malaysia 363.
Manufactured:				
Ammonia	40	120	—	Thailand 45; Papua New Guinea 36; Hong Kong 17.
Nitrogenous	45,145	69,001	—	China 32,959; Philippines 14,819; New Zealand 9,234.
Phosphatic	814	132	—	Papua New Guinea 29; Singapore 24.

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued:				
Manufactured—Continued:				
Potassic	123	63	—	Vanuatu 27; New Zealand 21; Fiji 15.
Unspecified and mixed	3,100	4,674	(5)	Papua New Guinea 2,215; New Zealand 725.
Fluorspar	10	43	—	All to New Zealand.
Graphite, natural	52	272	—	Japan 211; West Germany 23.
Gypsum and plaster	30,326	23,038	18,000	Singapore 3,292; Indonesia 1,030.
Lime	2,077	759	—	Papua New Guinea 447; Vanuatu 150; Indonesia 51.
Magnesium compounds:				
Magnesite, crude	4,538	3,262	4	New Zealand 2,888; Philippines 216.
Oxides and hydroxides	140	744	—	Japan 690; Indonesia 34.
Mica:				
Crude including splittings and waste	120	120	—	New Zealand 85; Japan 17; Singapore 14.
Worked including agglomerated splittings	282	298	—	Mainly to New Zealand.
Nitrates, crude	29	3	—	All to Philippines.
Phosphates, crude	23	16	—	Fiji 15.
Pigments, mineral: Iron oxides and hydroxides, processed	1,412	1,082	18	United Kingdom 364; Thailand 252.
Potassium salts, crude	8	—		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$91,618	$87,303	$3,914	Japan $26,585; Hong Kong $22,909; Thailand $15,414.
Synthetic do.	$243	$338	$1	Hong Kong $317; Thailand $11.
Pyrite, unroasted	1	—		
Quartz crystal, piezoelectric value, thousands	$1,155	$645	$231	Thailand $216; Switzerland $138.
Salt and brine thousand tons	6,198	6,469	18	Japan 4,915; Republic of Korea 423.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	9,738	50,053	—	Thailand 23,000; New Zealand 11,093.
Sulfate, manufactured	329	15	—	Papua New Guinea 5; Fiji 3.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,613	2,627	6	Japan 797; Italy 647.
Worked	644	2,293	114	Japan 559; New Zealand 184.
Dolomite, chiefly refractory-grade	190,494	270,200	—	Japan 268,200; New Zealand 2,000.
Gravel and crushed rock	9,363	11,133	—	Hong Kong 3,760; Philippines 3,313; New Zealand 1,073.
Limestone other than dimension	26	50	—	Japan 35; Fiji 10.
Quartz and quartzite	3,613	2,612	—	Japan 2,601; Republic of Korea 6.
Sand other than metal-bearing	34,990	33,844	33,400	Nauru 122; New Zealand 52.
Sulfur:				
Elemental:				
Crude including native and byproduct	725	1,467	—	Indonesia 942; Philippines 305; Thailand 102.
Colloidal, precipitated, sublimed value, thousands	$1	$4	—	All to New Zealand.
Sulfuric acid	639	191	—	Papua New Guinea 101; Fiji 41.
Talc, steatite, soapstone, pyrophyllite	169,000	146,034	5,510	Japan 112,720; Belgium-Luxembourg 14,404.
Vermiculite[7]	15	3	—	All to New Zealand.

See footnotes at end of table.

TABLE 2—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		18,954	45,175	2,604	Netherlands 26,674; Japan 7,319.
Slag and dross, not metal-bearing		11,113	10,002	9,958	Papua New Guinea 25.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		5	156	—	Papua New Guinea 99; New Zealand 30.
Carbon black		26,114	27,916	—	Indonesia 11,924; Thailand 3,531; New Zealand 3,261.
Coal:					
Anthracite		217,708	305,262	—	Japan 227,051; Republic of Korea 78,211.
Bituminous	thousand tons	93,808	103,417	22	Japan 57,178; Republic of Korea 9,084; Netherlands 5,338.
Briquets of anthracite and bituminous coal		36	120	—	Japan 106; New Zealand 14.
Lignite including briquets		36,562	38,465	—	Republic of Korea 34,717; Japan 3,586.
Coke and semicoke[8]		910,966	604,703	164,914	Brazil 139,384; Japan 100,048.
Gas, natural: Gaseous		—	4		Christmas Island 3; Indonesia 1.
Peat including briquets and litter		—	5	—	Mainly to Spain.
Petroleum:					
Crude	thousand 42-gallon barrels	22,964	57,344	20,586	Singapore 15,155; Japan 7,490.
Refinery products:					
Liquefied petroleum gas	do.	4,483	2	—	NA.
Gasoline:					
Aviation	do.	2,008	1,788	—	Papua New Guinea 477; French Polynesia 330.
Motor	do.	46	146	(5)	Singapore 102; New Zealand 30.
Mineral jelly and wax	do.	41	27	(5)	New Zealand 12; Malaysia 6.
Kerosene and jet fuel	do.	8,466	9,338	—	Japan 598; French Polynesia 485; ships 6,230.
Distillate fuel oil	do.	6,413	5,898	1	Papua New Guinea 1,737; Fiji 919.
Lubricants	do.	1,360	1,850	169	Singapore 368; New Zealand 303.
Residual fuel oil	do.	11,148	10,177	1,244	Singapore 3,451; New Zealand 444; ships 4,690.
Bitumen and other residues	do.	(5)	2	—	Papua New Guinea 1.
Bituminous mixtures	do.	3	3	—	Vanuatu 1.

[1]Table prepared by Audrey D. Wilkes.
[2]Includes vanadium.
[3]May include other precious metal ores and concentrates.
[4]May include other precious metals.
[5]Less than 1/2 unit.
[6]Reported under SITC item number as "selenium, phosphorus, etc."
[7]Includes perlite.
[8]Includes retort carbon.

TABLE 3

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	12	8	—	Denmark 5; Papua New Guinea 2.
Alkaline-earth metals	9	188	142	United Kingdom 40; New Zealand 3; Philippines 2.
Aluminum:				
Oxides and hydroxides	218,599	280,935	13,650	Singapore 94,212; Japan 70,646; Republic of Korea 31,913.
Metal including alloys:				
Scrap	59,681	68,732	392	Japan 44,497; New Zealand 4,117; unspecified 12,989.
Unwrought	929,275	958,600	1,546	Japan 484,298; Republic of Korea 157,446; unspecified 145,421.
Semimanufactures	28,743	32,346	12	New Zealand 8,312; Hong Kong 5,137; Japan 3,511.
Antimony: Metal including alloys, all forms	5	—		
Bismuth: Metal including alloys, all forms	47	46	—	Mainly to Japan.
Cadmium: Metal including alloys, all forms	485	879	162	Japan 580; Hong Kong 47; Singapore 22.
Chromium:				
Ore and concentrate	142	(2)	—	All from Indonesia.
Oxides and hydroxides	513	320	(2)	Indonesia 142; Sri Lanka 65; unspecified 57.
Metal including alloys, all forms	1	2	—	Mainly to New Zealand.
Cobalt:				
Ore and concentrate	3	—		
Oxides and hydroxides value, thousands	$6	$59	—	Netherlands $50; Philippines $8; New Zealand $1.
Metal including alloys, all forms	103	14	—	New Zealand 12; Fiji 1; France 1.
Columbium and tantalum:				
Ore and concentrate[3]	330	488	101	Germany 156; Netherlands 66; Austria 56.
Tantalum metal including alloys, all forms	1,124	91	—	All to Germany.
Copper:				
Ore and concentrate	283,276	204,786	—	Japan 163,975; China 22,600; Republic of Korea 7,700.
Matte and speiss including cement copper	6,177	1,696	—	Germany 1,490; Republic of Korea 200; New Zealand 6.
Metal including alloys:				
Scrap	12,429	14,741	48	Japan 6,437; Republic of Korea 1,936; Hong Kong 1,228.
Unwrought	177,777	179,489	97	Japan 61,083; United Kingdom 33,986; Germany 28,258.
Semimanufactures	21,320	32,963	1,222	New Zealand 6,844; Japan 6,013; Republic of Korea 4,853.
Gold:				
Waste and sweepings value, thouands	$16	$99	—	All to Hong Kong.
Metal including alloys, unwrought and partly wrought kilograms	257,948	268,844	272	Singapore 84,497; Japan 78,232; Switzerland 19,333.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	78,781	107,584	119	Japan 60,690; China 14,594; Republic of Korea 12,744.
Pyrite, roasted	45,662	79,868	—	All to Japan.
Metal:				
Scrap	220,414	277,600	—	Japan 123,747; Republic of Korea 53,268; unspecified 43,550.
Pig iron, cast iron, related materials	946	401	—	Singapore 300; New Zealand 49; United Arab Emirates 28.
Ferroalloys:				
Ferrochromium	1	61	—	All to New Zealand.
Ferromanganese	43,093	24,918	9,400	Qatar 5,225; Malaysia 3,437; Indonesia 3,101.
Ferronickel	—	10	—	All to Thailand.

See footnotes at end of table.

TABLE 3—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Ferroalloys—Continued:				
Ferrosilicomanganese	49,999	53,725	37,940	Saudi Arabia 10,600; Indonesia 2,000; Malaysia 1,372.
Ferrosilicon	7,508	7,820	—	Japan 4,000; New Zealand 2,647; Indonesia 460.
Unspecified	7	42	—	Singapore 40; New Zealand 2.
Steel, primary forms	705,020	730,228	160,139	Iran 208,325; Indonesia 67,118; unspecified 147,358.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	533,859	472,545	23,845	Japan 99,876; Republic of Korea 93,902; Philippines 89,932.
Clad, plated, coated	353,048	425,340	142,190	Singapore 61,751; New Zealand 32,078; Belgium-Luxembourg 32,016.
Of alloy steel	10,276	3,629	22	Hong Kong 1,171; Papua New Guinea 795; New Zealand 380.
Bars, rods, angles, shapes, sections	122,055	258,552	13,676	Republic of Korea 64,466; Thailand 39,771; unspecified 60,180.
Rails and accessories	15,875	14,456	1,350	Canada 3,259; Malaysia 2,266; unspecified 2,984.
Wire	16,110	16,762	4,456	New Zealand 4,515; Malaysia 1,960; Singapore 973.
Tubes, pipes, fittings	14,428	17,921	329	Papua New Guinea 6,965; Indonesia 4,160; Singapore 2,476.
Lead:				
Ore and concentrate	133,003	151,822	—	Japan 79,354; Italy 21,250; United Kingdom 18,500.
Oxides	353	102	32	Papua New Guinea 43; New Zealand 10; Indonesia 6.
Metal including alloys:				
Scrap	30,153	32,181	2	Indonesia 13,847; Belgium-Luxembourg 4,737; Republic of Korea 3,736.
Unwrought	293,701	335,042	8,000	United Kingdom 156,629; Republic of Korea 51,108; unspecified 28,478.
Semimanufactures	826	1,367	—	Philippines 504; Singapore 356; Republic of Korea 209.
Magnesium: Metal including alloys, all forms	13	116	30	New Zealand 47; Singapore 17; Malaysia 10.
Manganese:				
Oxides	1,439	12,873	9,242	Thailand 520; Mexico 380; unspecified 698.
Metal including alloys, all forms	115	537	—	Japan 464; Hong Kong 40; Indonesia 20.
Mercury value, thousands	$18	$6	—	Indonesia $2; Philippines $2.
Molybdenum:				
Ore and concentrate	—	57	—	All to Germany.
Metal including alloys, all forms value, thousands	$2	$15	$1	Japan $10; New Zealand $2; Papua New Guinea $1.
Nickel:				
Ore and concentrate	—	40	—	All to Belgium-Luxembourg.
Matte and speiss	25,982	30,954	4,802	Netherlands 15,140; Japan 2,712; unspecified 4,154.
Metal including alloys:				
Scrap	410	403	18	United Kingdom 117; Japan 107; Netherlands 106.
Semimanufactures	214	154	43	France 65; New Zealand 10; unspecified 13.
Platinum-group metals:				
Ore and concentrate[4]	1,520	81	5	United Kingdom 76.
Waste and sweepings value, thousands	$43	$5,179	$257	United Kingdom $3,743; Italy $776; France $318.

See footnotes at end of table.

TABLE 3—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals—Continued:					
Metals including alloys, unwrought and partly wrought	value, thousand	$4,382	$5,317	$4,309	United Kingdom $483; Hong Kong $216; Republic of Korea $177.
Silicon, high-purity		18,941	5,433	1,739	Japan 1,179; Netherlands 887; Republic of Korea 742.
Silver:					
Ore and concentrate		23	39	—	All to Germany.
Waste and sweepings[5]	value, thousands	$4,800	$3,176	$931	United Kingdom $1,901; Germany $109; Canada $93.
Metal including alloys, unwrought and partly wrought	do.	$38,288	$29,009	$3	Germany $5,430; Singapore $3,003; United Kingdom $2,614.
Tin:					
Ore and concentrate		17,241	10,538	—	Malaysia 10,517; Thailand 21.
Metal including alloys:					
Scrap		455	744	—	Sri Lanka 624; Hong Kong 46; Pakistan 6.
Unwrought		187	473	281	Malaysia 167; United Kingdom 19; New Zealand 6.
Semimanufactures		1,048	7,457	3	Singapore 4,210; New Zealand 899; India 748.
Titanium:					
Ore and concentrate	thousand tons	1,062	1,000	295	United Kingdom 204; Japan 173; Mexico 137.
Oxides		28	51,288	22,383	Canada 10,005; United Kingdom 8,000; Saudi Arabia 5,022.
Metal including alloys, all forms		23	867	189	United Kingdom 67; Hong Kong 49; unspecified 174.
Tungsten:					
Ore and concentrate		1,945	1,577	282	Republic of Korea 713; Germany 401; Japan 181.
Metal including alloys, all forms		1	12	6	Norway 3; Republic of South Africa 2; New Zealand 1.
Uranium and thorium:					
Ores and concentrates	value, thousands	$7,133	$2,547	—	France $2,540; Malaysia $6.
Oxides and other compounds	do.	$2	$2		All to Papua New Guinea.
Vanadium: Metal including alloys, all forms		—	124	—	All to Japan.
Zinc:					
Ore and concentrate	thousand tons	1,271	1,467	10	Japan 664; Republic of Korea 294; Belgium-Luxembourg 186.
Oxides		777	1,620	—	Japan 566; New Zealand 129; unspecified 803.
Blue powder		1,760	2,038	80	India 1047; New Zealand 102; unspecified 474.
Metal including alloys:					
Scrap		4,445	3,075	—	India 489; Republic of Korea 65; unspecified 2,438.
Unwrought		178,417	217,016	19,408	Indonesia 35,143; Hong Kong 23,168; unspecified 34,154.
Semimanufactures		47	108	—	Papua New Guinea 82; New Zealand 12; Christmas Islands 6.
Zirconium:					
Ore and concentrate		231,551	217,784	14,851	Japan 120,938; Netherlands 17,734; Italy 14,324.
Metal including alloys, all forms		82	338		China 210; Singapore 5; unspecified 122.
Other:					
Ores and concentrates		2,412	2,141	—	Japan 1,075; France 816; United Kingdom 134.
Oxides and hydroxides		2,107	5,337	2,599	United Kingdom 701; Belgium-Luxembourg 432; Japan 340.
Ashes and residues		23,143	19,122	44	Japan 12,020; India 5,473; unspecified 785.
Metalloids[6]		19,945	226	—	Hong Kong 74; Papua New Guinea 69; Finland 35.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		5,395	10,392	6,176	Netherlands 1,525; Germany 500; unspecified 1,026.

See footnotes at end of table.

TABLE 3—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued:				
Artificial: Corundum	4	674	—	Japan 530; Republic of South Africa 40; unspecified 101.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$170	$80	—	Japan $34; New Zealand $13; unspecified $25.
Grinding and polishing wheels and stones	185	205	18	New Zealand 102; Singapore 30; Japan 18.
Barite and witherite	52	1,577	1,364	Papua New Guinea 47; Italy 40; Malaysia 36.
Boron materials:				
Crude natural borates	—	(2)	—	All to Papua New Guinea.
Oxides and acids	—	1	—	All to Fiji.
Cement	21,284	72,265	—	Philippines 45,741; Singapore 15,577; Papua New Guinea 8,030.
Chalk	—	1	—	All to New Zealand.
Clays, crude:				
Bentonite	8,799	13,188	305	Hong Kong 4,253; Thailand 1,744; unspecified 3,754.
Kaolin	141,519	146,718	—	Japan 117,655; Finland 7,500; Indonesia 5,193.
Unspecified	2,755	2,042	—	Japan 805; New Zealand 735; unspecified 282.
Cryolite and chiolite	3,009	—		
Diamond, natural:				
Gem, not set or strung value, thousands	$62,192	$122,339	$8,716	Japan $27,970; Belgium-Luxembourg $26,331; United Kingdom $21,287.
Industrial stones do.	$162	$1,435	$260	Switzerland $463; Ireland $244; Hong Kong $185.
Diatomite and other infusorial earth	216	231	—	New Zealand 144; Philippines 58; Papua New Guinea 15.
Feldspar	24,021	17,454	—	Malaysia 5,250; Indonesia 4,951; unspecified 6,014.
Fertilizer materials:				
Crude, n.e.s.	7,970	992	—	Indonesia 430; Malaysia 220; unspecified 152.
Manufactured:				
Ammonia	120	48,100	—	India 15,754; Papua New Guinea 34; unspecified 32,296.
Nitrogenous	69,001	78,015	—	China 32,911; Philippines 17,102; Papua New Guinea 11,497.
Phosphatic	132	95	—	Papua New Guinea 32; Canada 20; Greece 20.
Potassic	63	123	—	New Zealand 62; Indonesia 34; New Caledonia 20.
Unspecified and mixed	4,674	5,922	—	Papua New Guinea 2,031; New Caledonia 1,515; Philippines 808.
Fluorspar	43	41	—	All to New Zealand.
Graphite, natural	272	40	—	Singapore 21; Germany 15; New Zealand 4.
Gypsum and plaster	23,038	117,224	30,610	New Zealand 63,675; Japan 13,000; Fiji 4,002.
Lime	759	4,793	—	Papua New Guinea 3,869; Thailand 500; New Zealand 203.
Magnesium compounds:				
Magnesite, crude	3,262	1,771	—	New Zealand 1,614; Philippines 72; unspecified 49.
Oxides and hydroxides	744	2,116	60	Japan 678; New Zealand 634; Netherlands 324.
Mica:				
Crude including splittings and waste	120	244	—	New Zealand 191; Singapore 38; Malaysia 8.
Worked including agglomerated splittings	298	215	1	Mainly to New Zealand.
Nitrates, crude	3	67	—	United Kingdom 36; Republic of South Africa 17; Fiji 4.
Phosphates, crude	16	7	—	Solomon Islands 4; New Zealand 2; Fiji 1.
Pigments, mineral: Iron oxides and hydroxides, processed	1,082	1,380	—	Germany 360; Thailand 351; unspecified 286.

See footnotes at end of table.

TABLE 3—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$87,303	$89,107	$3,802	Hong Kong $29,128; Thailand $9,780; Singapore $5,618.
Synthetic	do.	$338	$621	—	Hong Kong $437; Republic of Korea $68; United Kingdom $52.
Quartz crystal, piezoelectric	do.	$645	$1,000	$165	Thailand $344; Hong Kong $171; Singapore $140.
Salt and brine	thousand tons	6,469	7,199	26	Japan 4,852; Republic of Korea 719; unspecified 739.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		50,053	62,629	—	Philippines 10,625; Hong Kong 9,912; New Zealand 8,372.
Sulfate, manufactured		15	67	14	Republic of South Africa 43; Papua New Guinea 6; Indonesia 2.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		2,627	4,226	141	Japan 1,317; Italy 380; unspecified 1,811.
Worked		2,293	3,756	431	New Zealand 967; Republic of Korea 786; Singapore 308.
Dolomite, chiefly refractory-grade		270,200	302,366	—	All to Japan.
Gravel and crushed rock		11,133	22,903	—	Guam 12,722; Hong Kong 3,580; Philippines 2,804.
Limestone other than dimension		50	141	40	Papua New Guinea 83; Fiji 10; Indonesia 6.
Quartz and quartzite		2,612	1,050	—	Japan 1,030; Thailand 15; Singapore 5.
Sand other than metal-bearing		33,844	56,692	33,528	Saudi Arabia 10,001; Japan 6,042; Hong Kong 2,926.
Sulfur:					
Elemental:					
Crude including native and byproduct		1,467	30,580	—	Republic of South Africa 28,400; Indonesia 1,406; Philippines 425.
Colloidal, precipitated, sublimed	value, thousands	$4	—		
Dioxide		—	6	—	All to New Zealand.
Sulfuric acid		191	361	—	Papua New Guinea 207; New Caledonia 42; Fiji 40.
Talc, steatite, soapstone, pyrophyllite		146,034	182,748	6,003	Japan 111,021; Netherlands 52,167; Belgium-Luxembourg 11,255.
Vermiculite[7]		3	65	—	New Zealand 40; unspecified 25.
Other:					
Crude		45,175	35,072	5	Netherlands 16,010; Italy 8,514; Japan 6,139.
Slag and dross, not metal-bearing		10,002	77,052	17	Philippines 70,993; Malaysia 5,047; New Zealand 535.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		156	912	—	Papua New Guinea 689; Norfolk Islands 89; New Zealand 69.
Carbon black		27,916	31,938	—	Indonesia 12,324; New Zealand 4,692; unspecified 3,826.
Coal:					
Anthracite		305,262	346,598	—	France 141,696; Japan 113,733; Republic of Korea 91,077.
Bituminous	thousand tons	103,417	113,474	28	Japan 60,718; Republic of Korea 11,238; Netherlands 5,853.
Briquets of anthracite and bituminous coal		120	—		
Lignite including briquets		38,465	98,543	—	Germany 61,458; Republic of Korea 37,000; United Kingdom 40.
Coke and semicoke[8]		604,703	887,793	211,622	Brazil 227,991; Japan 144,764; Malaysia 70,604.
Gas, natural: Gaseous	value, thousands	$7	$4	—	All to Indonesia.
Peat including briquets and litter		5	23	1	Hong Kong 20; Spain 1; Syria 1.
Petroleum:					
Crude	thousand 42-gallon barrels	57,344	51,288	8,997	Indonesia 10,538; Japan 2,343; Singapore 1,472.
Refinery products:					
Liquefied petroleum gas	do.	2	2	—	Mainly to Philippines.

See footnotes at end of table.

TABLE 3—Continued

AUSTRALIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued:					
Refinery products—Continued:					
Gasoline:					
Aviation	thoussand 42-gallon barrels	1,788	—		
Motor	do.	146	5,087	—	Papua New Guinea 937; Fiji 445; unspecified 526.
Mineral jelly and wax	do.	27	32	—	Indonesia 8; New Zealand 6; Papua New Guinea 3.
Kerosene and jet fuel	do.	9,338	8,759	—	India 819; French Polynesia 308; bunkers 6,415.
Distillate fuel oil	do.	5,898	7,657	74	Papua New Guinea 1,752; Fiji 941; bunkers 1,540.
Lubricants	do.	1,850	2,063	(2)	Singapore 542; Hong Kong 354; United Arab Emirates 239.
Residual fuel oil	do.	10,177	11,497	334	Singapore 4,764; New Zealand 492; bunkers 4,693.
Bitumen and other residues	do.	2	1	—	Mainly to Vanuatu.
Bituminous mixtures	do.	3	5	—	Guam 2; Vanuatu 1; Fiji 1.

[1]Table prepared by Douglas Rhoten, International Data Section. Import data are not reported quantitatively.
[2]Less than 1/2 unit.
[3]Includes vanadium.
[4]May include other precious metal ores and concentrates.
[5]May include other precious metals.
[6]Reported under SITC item number as "selenium, phosphorus, etc."
[7]Includes perlite.
[8]Includes retort carbon.

TABLE 4

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Alumina	Alcoa of Australia Ltd., 100%	Kwinana refinery, WA	1,660
Do.	do.	Pinjarra refinery, WA	2,800
Do.	do.	Wagerup refinery, WA	1,500
Do.	Nabalco Pty. Ltd., manager. (Swiss Aluminium Australia Ltd., 70%; and Gove Aluminium Ltd., 30%)	Gove refinery, NT	1,600
Do.	Queensland Alumina Ltd., operator. (Comalco Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan Australia Ltd., 21.4%; and Pechiney Australia Pty. Ltd., 20%)	Gladstone refinery, QLD	3,000
Do.	Worsley Alumina Pty. Ltd., manager. (Reynolds Australia Alumina Ltd., 50%; The Shell Co. of Australia Ltd., 37.5%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho Iwai Alumina, 2.5%)	Worsley refinery, WA	1,400
Aluminum	Alcan Australia Ltd., 100%	Kurri Kurri smelter, NSW	150
Do.	do.	Point Henry smelter, VIC	180
Do.	do.	Portland Island smelter, VIC	327
Do.	Boyne Island Smelters Ltd., manager. (Comalco Ltd., 30%; Australia Metallgesellschaft AG, 20%; Sumitomo Light Metal Industries, 17%; Kobe Steel Ltd., 9.5%; Mitsubishi Corp., 9.5%; Yoshida Kogyo KK, 9.5%; and Sumitomo Aluminium Smelting Co. Ltd., 4.5%)	Boyne Island smelter, QLD	230
Do.	Comalco Aluminium (Bell Bay) Ltd., 100%	Bell Bay smelter, TAS	117
Do.	Tomago Aluminium Co. Pty. Ltd., manager. (Gove Aluminium Finance Ltd., 35%; Pechiney Australia Pty. Ltd., 35%; Australian Mutual Provident Society, 15%; VAW Australia Pty. Ltd., 12%; and Hunter Douglas Ltd., 3%)	Tomago smelter, NSW	[2]380

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Bauxite[3]	Alcoa of Australia Ltd., 100%	Huntly, Jarrahdale, and Willowdale Mines, WA	22,000
Do.	Comalco Aluminium Ltd., 100%	Weipa operations, QLD	11,000
Do.	Nabalco Pty. Ltd., manager. (Swiss Aluminium Australia Ltd., 70%; and Gove Aluminium Ltd., 30%)	Gove Mine, NT	6,100
Do.	Worsley Alumina Pty. Ltd., manager. (Reynolds Australia Alumina Ltd., 50%; The Shell Co. of Australia Ltd., 37.5%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho-Iwai Alumina Ltd., 2.5%)	Mount Saddleback (Worsley) Mine, WA	3,850
Cement	Adelaide Brighton Cement Ltd., 100%	Birkenhead Plant, SA	1,000
Do.	do.	Geelong Plant, VIC	800
Do.	Blue Circle Southern Cement Ltd., 100%	Berrima Plant, NSW	1,200
Do.	Cockburn Cement Ltd., 100%	South Coogee Plant, WA	1,000
Do.	Goliath Cement Holdings Ltd., 100%	Railton Plant, TAS	1,000
Do.	Queensland Cement Ltd., 100%	Darra Plant, QLD	700
Coal, black	Arco Coal Australia Inc., 80% and manager; Mitsui and Co. Ltd., 20%	Gordonstone underground mine, QLD	[4]2,500
Do.	Austen and Butta Ltd., 100%	South Bulli underground mine, NSW	3,000
Do.	BHP Steel Collieries Division	Appin underground mine, NSW	2,250
Do.	do.	Cordeaux underground mine, NSW	2,800
Do.	do.	Tower underground mine, NSW	1,200
Do.	Camberwell Coal Pty. Ltd., operator. (Navidale Pty. Ltd., 50%; Toyota Tsusho Corp., 40%; and Dia Coal Ltd., 10%)	Camberwell open cut, NSW	2,400
Do.	Capricorn Coal Management Pty. Ltd., operator. (Shell Co. of Australia Ltd., 38.08%; Minproc Energy Pty. Ltd., 26.06%; Jena Pty. Ltd., 13.03%; Coal Developments (German Creek) Pty. Ltd., 12.06%; and Ruhrkohle Australia Pty. Ltd., 10.77%)	German Creek open cut and underground mine, QLD	6,000
Do.	Central Queensland Coal Associates, 100%. (BHP Australia Coal Ltd., 44.72% and operator; QCT Resources, 27.78%; Mitsubishi Development Pty. Ltd., 13.33%; AMP Society, 8.61%; and Pancontinental Mining Ltd., 5.56%)	Blackwater open cut, QLD	5,000
Do.	do.	Goonyella open cut, QLD	5,500
Do.	do.	Norwich Park open cut, QLD	4,500
Do.	do.	Peak Downs open cut, QLD	5,500
Do.	do.	Saraji open cut, QLD	4,700
Do.	Coal and Allied Industries Ltd., 100%	Hunter Valley No. 1 open cut, NSW	5,300
Do.	do.	Hunter Valley No. 2 open cut, NSW	5,200
Do.	Coal and Allied Industries Ltd., 80% and manager; and Pahong Iron and Steel Co. Ltd., 20%	Mount Thorley open cut, NSW	6,500
Do.	Clutha, Ltd., 100%	Brimestone No. 1 underground mine, NSW	2,400
Do.	Curragh Queensland Mining Ltd., operator. [ARCO Coal Australia Inc., 60%; R.W. Miller Ltd., 30%; and Mitsui Coal Development (Australia) Ltd., 10%]	Curragh open cut, QLD	5,300
Do.	Pacific Power	Angus Place underground mine, NSW	1,300
Do.	do.	Awaba State underground mine, NSW	1,000
Do.	do.	Cooranbong underground mine, NSW	1,200
Do.	do.	Munmorah State underground mine, NSW	1,200
Do.	do.	Myuna underground mine, NSW	1,500
Do.	do.	Newstan State underground mine, NSW	2,200
Do.	do.	Wyee State underground mine, NSW	1,750
Do.	Electricity Trust of South Australia, 100%	Leigh Creek open cut mine, SA	3,000

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Coal, black—Continued:	FAI Mining Ltd., 70% and manager; and Macquarie Resources Ltd., 30%	Teralba underground mine, NSW	1,200
Do.	do.	West Wallsend underground mine, NSW	2,400
Do.	Kembla Coal and Coke Pty. Ltd., 100%	Tahmoor underground mine, NSW	1,800
Do.	do.	West Cliff underground mine, NSW	3,000
Do.	MIM Holdings Ltd., 75%; and AGIP Australia Pty. Ltd., 25%	Newlands open cut, QLD	5,000
Do.	Oakbridge Ltd., 100%	Gretley underground mine, NSW	1,000
Do.	do.	Ellalong underground mine, NSW	2,000
Do.	Oakbridge Ltd., 80%, manager. Sumitomo Coal Mining Co. Ltd., 20% (Japan)	Baal Bone underground mine, NSW	2,500
Do.	Oakbridge Ltd., 80%, manager. Kyodo Oil 10% (Japan); and Yukong Oil Ltd., 10% (Republic of Korea)	Clarence underground mine, NSW	1,700
Do.	Pacific Coal Pty. Ltd., 57.195%, operator; ARCO Coal Australia Inc., 17.527%; ARCO Resources Ltd., 13.889%; and Electric Power Development Co.-Japan Coal Development, 11.389%	Blair Athol open cut, QLD	8,000
Do.	Ulan Coal Mines Ltd., 100%	Ulan No. 2 underground mine, NSW	4,600
Do.	Wambo Mining Corp. Pty. Ltd., 100%	Wambo underground mine, NSW	3,000
Coal, brown	The State Electricity Commision of Victoria, 100%	Latrobe Valley open cut mines (Loy Yang, Morwell, Yallourn), VIC	48,000
Copper	Copper Refineries Pty. Ltd., 100%	Townsville refinery, QLD	[5]155
Copper, gold	Poseidon Gold Ltd., 100%	Gecko Mine, NT	[6]16,000 [7]800
Copper, gold, palladium, platinum, selenium	Southern Copper Ltd., manager. (Enterprise Metals Ltd., 60%; Furukawa Co. Ltd., 30%; and Nissho-Iwai Corp., 10%)	Port Kembla smelter-refinery, NSW	[5]80
Copper, gold, silver	Renison Goldfields Consolidated Ltd., 100%	Mount Lyell Mine, TAS	[3]1,500
Copper, gold, silver, uranium	Roxby Mining Corp. Pty. Ltd., 51%; and BP Australia Ltd., 49%	Oympic Dam Mine, smelter, and refinery, SA	[3]2,200
Copper, lead, zinc	Cobar Mines Pty. Ltd., 100%	Cobar (CSA) Mine, NSW	[3]2,200
Copper, lead, zinc silver	MIM Holdings Ltd., 100%	Hilton Mine, QLD	[3]1,200
Copper, nickel	AGIP Australia Pty. Ltd., 100%	Radio Hill Mine, WA	[8]11
Copper, zinc	Denehurst Ltd., 50% and manager; and Macquarie Resources Ltd., 50%	Benambra Mine, VIC	[3]200
Diamond	Argyle Diamond Mines Pty. Ltd., manager. (CRA Ltd., 59.7%; and Ashton Mining Ltd., 40.3%)	Argyle Mine (AK-1 pipe and alluvial deposits), WA	[9]35,000
Do.	Poseidon Ltd., 100%.	Bow River Mine, WA	[9]1,000
Gas, natural and gas condensate	Woodside Petroleum Pty. Ltd., manager; (BP Developments Australia Ltd.; Chevron Asiatic Oil Co.; Shell Development (Australia) Pty. Ltd.; BHP Petroleum (North West Shelf Pty.) Ltd.; and Japan Australia Oil (MiMi) Pty. Ltd., each with 16.67%)	North West Shelf Gas Project, 140 km offshore of Dampier, WA	[10]20 [11]60
Gold[7]	ACM Gold Ltd., 100%	Golden Crown Mine, WA	1,150
Do.	do.	Wirralie Mine, QLD	3,200
Do.	do.	Big Bell Mine, WA	5,500
Do.	Alcoa of Australia Ltd., 100%	Hedges Mine, WA	4,900
Do.	Asarco Australia Ltd., 100%	Wiluna Mine, WA	4,225
Do.	Australian Gold Refineries, 100% (State of Western Australia agency)	Kalgoorie refinery, WA	[12]46,000
Do.	do.	Perth refinery (Newburn), WA	[12]95,000

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Gold[7]—Continued:	Aztec Mining Co. Ltd., operator, 62%; and Forrestania Gold NL, 38%	Bounty Mine, WA	2,500
Do.	Carpentaria Gold Pty. Ltd., 100%	Tick Hill Mine, QLD	5,500
Do.	Central Coast Exploration NL, manager, 66.67%; and Pancontinental Mining Ltd., 33.33%	Croydon Mine, QLD	4,700
Do.	Dominion Mining Ltd., 100%	Cosmo Howley Mine, NT	1,700
Do.	do.	Gabanintha Mine, WA	2,300
Do.	Forsayth NL, operator, 50%; and Reynolds Australia Mines Ltd., 50%	Mount Gibson Mine, WA	3,450
Do.	Golden Kilometre Mines Joint Venture, Manager. (Southern Resources Ltd., 55%; Square Gold and Minerals Ltd., 25%; and Black Flag Consolidated, 20%)	Golden Kilometre Mine, WA	1,750
Do.	Golden Valley Joint Venture, manager. Delta Gold NL, 50%; and Peko Gold Ltd., 50%	Kanowna Belle, WA	5,600
Do.	Hampton Areas Australia Ltd., 100%	Jubilee Mine, WA	2,300
Do.	Homestake Gold of Australia, 100%	Fortnum Mine, WA	1,500
Do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager. (Gold Mines of Kalgoorlie Ltd., 50%; and Homestake Gold of Australia Ltd., 50%)	Kalgoorlie Super Pit, WA	16,000
Do.	do.	Mount Charlotte Mine, QLD	4,300
Do.	Kidston Gold Mines Ltd., 100%	Kidston Mine, QLD	6,000
Do.	Mount Leyshon Gold Mines Ltd., 100%	Mount Leyshon Mine, QLD	7,000
Do.	Newcrest Mining Ltd., 100%	Ora Banada Mine, WA	2,650
Do.	do.	Telfer Mine, WA	12,000
Do.	do.	Tuckabianna Mine, WA	1,700
Do.	Newmont Australia Ltd., manager, 80%; and Mount Martin Gold Mines NL, 20%	New Celebration Mine, WA	4,750
Do.	Niugini Mining Ltd., 100%	Red Dome Mine, QLD	2,000
Do.	North Flinders Mines Ltd., 100%	The Granites Mine, NT	4,750
Do.	Pajingo Gold Mine Pty. Ltd., 100%	Pajingo Mine, QLD	1,900
Do.	Perserverance Corp. Ltd., 100%	Nagambie Mine, VIC	1,250
Do.	Placer Pacific Ltd., manager, 60%; and Delta Gold NL, 40%	Granny Smith Mine, WA	4,800
Do.	Plutonic Resources Ltd., 100%	Plutonic Mine, WA	5,000
Do.	Renison Goldfields Consolidated Ltd., 100%	Lucky Draw Mine, NSW	1,500
Do.	do.	Pine Creek Mine, NT	3,100
Do.	Sons of Gwalia NL, 100%	Leonora Mine, WA	2,800
Do.	Western Mining Corp. Ltd., 50%; and Central Norseman Gold Corp., 50%	Stawell Mine, VIC	1,100
Do.	Western Mining Corp. Ltd., 100%	Kambalda (St. Ives) Mines, WA	7,500
Do.	do.	Mount Magnet Mine, WA	5,000
Do.	Zappan NL, 100%	Tanami Mine, NT	1,900
Gold, copper	Cyprus Gold Australia, Corp., 50 % and manager; Arimco NL, 25%; and Elders Mining Pty. Ltd., 25%	Selwyn (Starra) Mine, QLD	3,600
Do.	Worsley Alumina Pty. Ltd., manager. (Reynolds Australia Metals Ltd., 40%; Billiton Australia Gold Pty. Ltd., 30%; Newcrest Mining Ltd., 20%; and Kobe Alumina Associates (Australia) Pty. Ltd., 10%)	Boddington Mine, WA	[6]10,000 11,000 [13]10,000

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Gold, copper, lead, zinc	Enterprise Metals Ltd., 100%	Peak Mine, NSW	3,100 [6]2,250 [14]4,850 [15]3,600
Gold, silver	MIM Holdings Ltd., 100%	Pacific precious metals refinery, NSW	[12]1,900 [16]500
Do.	Paragon Resources NL, 100%	Temora Mine, NSW	2,250
Iron ore	BHP Iron Ore Pty. Ltd., 55%; BHP Australia Coal Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; and Mitsui and Iron Ore Corp. Ltd., 7%	Kennedy Gap, Nimingarra, Shay Gap, Sunrise Hill, and Yarrie deposits, WA	6,500
Do.	BHP Iron Ore Pty. Ltd., 55%; Pilbarra Iron Ltd., 30%; Mitsui-C. Itoh Pty. Ltd., 10%; CI Minerals Australia Pty. Ltd., 5%	Mount Whaleback (Mount Newman) Mine, WA	30,000
Do.	do.	Orebody 29, WA	5,000
Do.	BHP Iron Pty. Ltd., 85%; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corp. Pty. Ltd., 7%	Yandi Mine, WA	5,000
Do.	Channar Management Services, manager. (Hamersley Iron Pty. Ltd., 60%; and CMIEC (Channar) Pty. Ltd., 40%, a People's Republic of China Government Agency)	Channar Mine, WA	3,000
Do.	Hamersley Iron Pty. Ltd., 100%	Mount Tom Price and Paraburdoo Mines, WA	42,000
Do.	Robe River Iron Associates, manager. (North Broken Hill-Peko Ltd., 53%; Robe River Mining Co. Pty. Ltd., 20%; Pannawonica Iron Associates, 10%; and Cape Lambert Iron Associates, 5%)	Pannawonica-Deepdale Mines, WA	27,000
Do.	Savage River Mines, operator. (Pickands Mather and Co. International, 5%)	Savage River Mine, TAS	1,300
Lead	MIM Holdings Ltd., 100%	Mount Isa smelter, QLD	210
Do.	Pasminco Ltd., 100%	Port Pirie refinery-smelter, SA	235
Lthium	Gwalia Consolidated. Ltd., 100%	Greenbushes Mine, WA	[17]84
Manganese	Groote Eylandt Mining Co. Pty. Ltd., 100%	Groote Eylandt Mine, NT	[3]2,300
Do.	Portman Mining Ltd., 50% and manager; and Gayna Park Pty. Ltd., 50%	Woodie Woodie Mine, WA	[3]400
Manganese alloys	Tasmanian Electro Metallurgical Co. Pty. Ltd., 100%	Bell Bay smelter, TAS	[18]190
Mineral sands	Cable Sands (WA) Pty. Ltd., 100%	Busselton East and Waroona Mines and associated Bunbury dry processing plant, WA	[19]200 [23]1 [22]15 [24]5
Do.	Consolidated Rutile Ltd., 100%	Amity, Bayside, and Gordon Mines on North Stradbroke Island and associated Pinkenba dry processing plant, QLD	[19]280 [22]85 [20]100 [23]1
Do.	Mineral Deposits Ltd., 100%	Stockton and Viney Creek Mines and associated Hawks Nest dry processing plant, NSW	[20]30 [22]25 [19]10
Do.	Minproc Chemical Co. Pty. Ltd., manager, 50%; and Kerr-McGee Chemical Corp., 50% (Tiwest Joint Venture)	Cooljarloo Mine and associated Chandala dry processing and synthetic rutile plants; and Kwinana titanium pigment plant, WA	[19]180 [24]9 [23]1 [20]35 [21]68 [22]60 [25]54

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Mineral sands—Continued:	Newcrest Mining Ltd., 100%	Woodburn Mine (includes Newrybar, Richmond River, Lennox Head, Hastings Point, and Byron Bay) and associated Woodburn dry processing plant, NSW	[20]10 [22]10
Do.	RGC Mineral Sands Ltd., 100%	Capel Mine and associated Capel dry processing and synthetic rutile plants, WA; Eneabba and Eneabba West Mines and associated Eneabba dry processing and Narngulu dry processing and synthetic rutile plants, WA	[19]360 [20]100 [21]170 [22]300 [23]15
Do.	RZM Pty. Ltd., 100%	Nabiac Mine and associated Harrington dry processing plant; 4 mines in Tomago area and associated Tomago dry processing plant, NSW	[20]35 [22]35 [19]10
Do.	Westralian Sands Pty. Ltd., 100%	North Capel,[26] Yoganup Extended,[26] and Yoganup North Mines and associated Capel dry processing and synthetic rutile and North Capel dry processing plants, WA	[19]540 [22]50 [23]2 [21]100
Do.	Wimmera Industrial Minerals Pty. Ltd., 100%	WIM 150 (Horsham) Mine, VIC	[19]250 [20]100 [22]120
Nickel	Outokumpu Australia Pty. Ltd. and Outokumpu Western Australia Pty. Ltd., 50% each and both wholly owned subsidiaries of Outokumpu Oy of Finland.	Forrestania deposits, 375 km southeast of Perth, WA	[27] [28]8,000
Do.	Queensland Nickel Joint Venture, manager. (Queensland Nickel Pty. Ltd., 80; and Resources North Queensland Pty. Ltd., a subsidiary of the Queensland Government, 20%)	Yabulu refinery, QLD	[29]26
Do.	Western Mining Corp. Ltd., 100%	Kalgoorlie smelter, WA	[31]80
Do.	do.	Kambalda Nickel Operations, WA	[31]1,600
Do.	do.	Kwinana refinery, WA	[32]42
Do.	do.	Leinster Nickel Operations, WA	[32]2,000
Do.	Western Mining Corp., 50% and manager; and Outokumpu Metals and Resources Oy, 50%	Mount Keith Mine,[30] WA	[27]28,000
Opal	Many small producers	Andamooka and Coober Pedy areas, SA; Lightening Ridge area, NSW	NA
Petroleum[33]	Ampol Refineries Ltd., 100%	Lytton refinery, QLD	74
Do.	BP Refinery (Bulwer Island) Pty. Ltd., 100%	Bulwer Island refinery, QLD	53
Do.	BP Refinery (Kwinana) Pty. Ltd., 100%	Kwinana refinery, WA	120
Do.	Caltex Refining Co. Pty. Ltd., 100%	Kurnell refinery, NSW	108
Do.	Petroleum Refineries (Australia) Pty. Ltd., manager. (Mobil Oil Australia Ltd., 100%)	Altona refinery, VIC	108
Do.	Ampol Refineries Ltd., 100%	Port Stanvac refinery, SA	72
Do.	Shell Refining (Australia) Pty. Ltd., 100%	Clyde refinery, NSW	91
Do.	do.	Geelong refinery, NSW	132
Salt	Dampier Salt (Operations) Pty. Ltd., 100%	Dampier and Lake McCleod Fields, WA	4,500
Do.	Cargill Australia Ltd., 100%	Leslie Salt operations, WA	2,250
Steel	BHP Steel Ltd., 100%	Newcastle steelworks, NSW	1,800
Do.	do.	Port Kembla steelworks, NSW	3,800

See footnotes at end of table.

TABLE 4—Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Steel—Continued:	BHP Steel Ltd., 100%	Whyalla steelworks, SA	1,100
Do.	do.	Sydney (Rooty Hill) Minimill, NSW	250
Talc	Three Springs Talc Pty. Ltd., 100%	Three Springs Mines, WA	200
Tin	Renison Goldfields Consolidated Ltd., 100%	Renison Bell Mine, TAS	[3]825
Tin, tantalum	Gwalia Consolidated Ltd., 100%	Greenbushes Mine, WA	[3]2,200
Uranium	Energy Resources of Australia Ltd., 100%	Ranger Mine, NT	[34]4,500
Zinc	Pasminco Ltd., 100%	Ridson refinery, TAS	212
Do.	do.	Cockle Creek refinery-smelter, NSW	80
Zinc, copper, gold, silver	Australian Consolidated Ltd., operator. (Normandy Metals Ltd., 45%; Esso Australia Resources, 35%; and Aztec Mining Co. Ltd., 20%)	Scuddles (Golden Grove) Mine, WA	[3]800
Zinc, lead	BHP Minerals Ltd., 100%	Cadjebut Mine, WA	[3]550
Zinc, lead, copper, silver, gold	Aberfoyle Ltd., 100%	Hellyer Mine, TAS	[3]1,250
Do.	Denehurst Ltd., 100%	Woodlawn Mine, NSW	[3]750
Do.	Pasminco Ltd., 100%	Rosebery Mine, TAS	[3]500
Zinc, lead, silver	MIM Holdings Ltd., 100%	Mount Isa Mine, QLD	[3]11,000
Do.	Nicron Resources Ltd., 100%	Woodcutters Mine, NT	[3]500
Zinc, lead, silver, copper	Pasminco Ltd., 100%	Pasminco's South Operation (Broken Hill South Mine), NSW	[3]2,500
Zinc, lead, silver, copper, gold	do.	Elura Mine, NSW	[3]1,250
Do.	Pancontinental Mining Ltd., manager, 50%; Outokumpu Australia Pty. Ltd., 25%; and Agip Australia Pty. Ltd., 25%	Thalanga Mine, QLD	[3]550
Zirconia	Z-Tech Pty. Ltd., 100%	Rockingham, WA	[35]450

NA Not available.
[1]NSW New South Wales; NT Northern Territory; QLD Queensland; SA South Australia; TAS Tasmania; VIC Victoria; WA Western Australia.
[2]Capacity scheduled for early 1993. 1992 capacity was 240,000 tons of aluminum.
[3]Ore.
[4]Initial capacity, expected to increase to 4.2 million tons black coal by 1995.
[5]Refined copper.
[6]Tons copper-in-concentrates.
[7]Kilograms gold.
[8]Copper-nickel matte.
[9]Thousand carats.
[10]20 million cubic meters per day natural gas.
[11]Thousand 42-gallon barrels per day gas condensate.
[12]Kilograms refined gold.
[13]Tons copper concentrate.
[14]Tons zinc-in-concentrates.
[15]Tons crude lead containing silver.
[16]Tons zinc concentrate.
[17]Spodumene concentrate.
[18]Ferromanganese and/or silicomanganese.
[19]Ilmenite.
[20]Rutile.
[21]Synthetic rutile.
[22]Zircon.
[23]Monazite.
[24]Leucoxene.
[25]Titanium dioxide pigment.
[26]Closed temporarily.
[27]Tons nickel-in-concentrates.
[28]Scheduled to begin production in early 1993.
[29]Nickel in oxides.
[30]Scheduled to begin production in 1995.
[31]Nickel matte.
[32]Refined nickel with copper sulfide and mixed nickel-cobalt sulfides.
[33]Thousand 42-gallon barrels per day.
[34]Tons triuranium octoxide.
[35]Tons high-purity zirconia powder.

TABLE 5

AUSTRALIA: LARGEST AUSTRALIAN GOLD MINDS IN 1992

Mine and State or Territory	Production (kilograms)
1. Kalgoorlie Super Pit, Western Australia	16,192
2. Telfer, Western Australia	11,822
3. Boddington, Western Australia	10,937
4. Kambalda (St. Ives), Western Australia	7,338
5. Mount Leyshon, Queensland	7,202
6. Kidston, Queensland	5,890
7. Big Bell, Western Australia	5,681
8. Tick Hill, Queensland	5,518
9. Mount Magnet, Western Australia	5,242
10. Plutonic, Western Australia	5,181
11. Hedges, Western Australia	4,871
12. Granny Smith, Western Australia	4,799
13. New Celebration, Western Australia	4,754
14. The Granites, Northern Territory	4,751
15. Mount Charlotte, Western Australia	4,364

Source: Metallica 2000.

TABLE 6

AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES[1] FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Antimony		63.5
Bauxite	million metric tons	2,379
Black coal:		
In situ	billion metric tons	72
Recoverable	do.	52
Brown coal:		
In situ	do.	46
Recoverable	do.	41
Cadmium		50.2
Cobalt		53
Columbium		3.4
Copper	million metric tons	
Diamond:		
Gem and near gem	million carats	366
Industrial	do.	458
Gold	metric tons	2,466
Iron ore	billion metric tons	17.9
Lead	million metric tons	8.9
Lithium		160
Manganese ore	million metric tons	108
Mineral sands:		
Ilmenite	do.	111.8
Rutile	do.	13.5
Zircon	do.	20.3

See footnotes at end of table.

TABLE 6—Continued

AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES[1] FOR 1992

(Thousand metric tons unless otherwise specified)

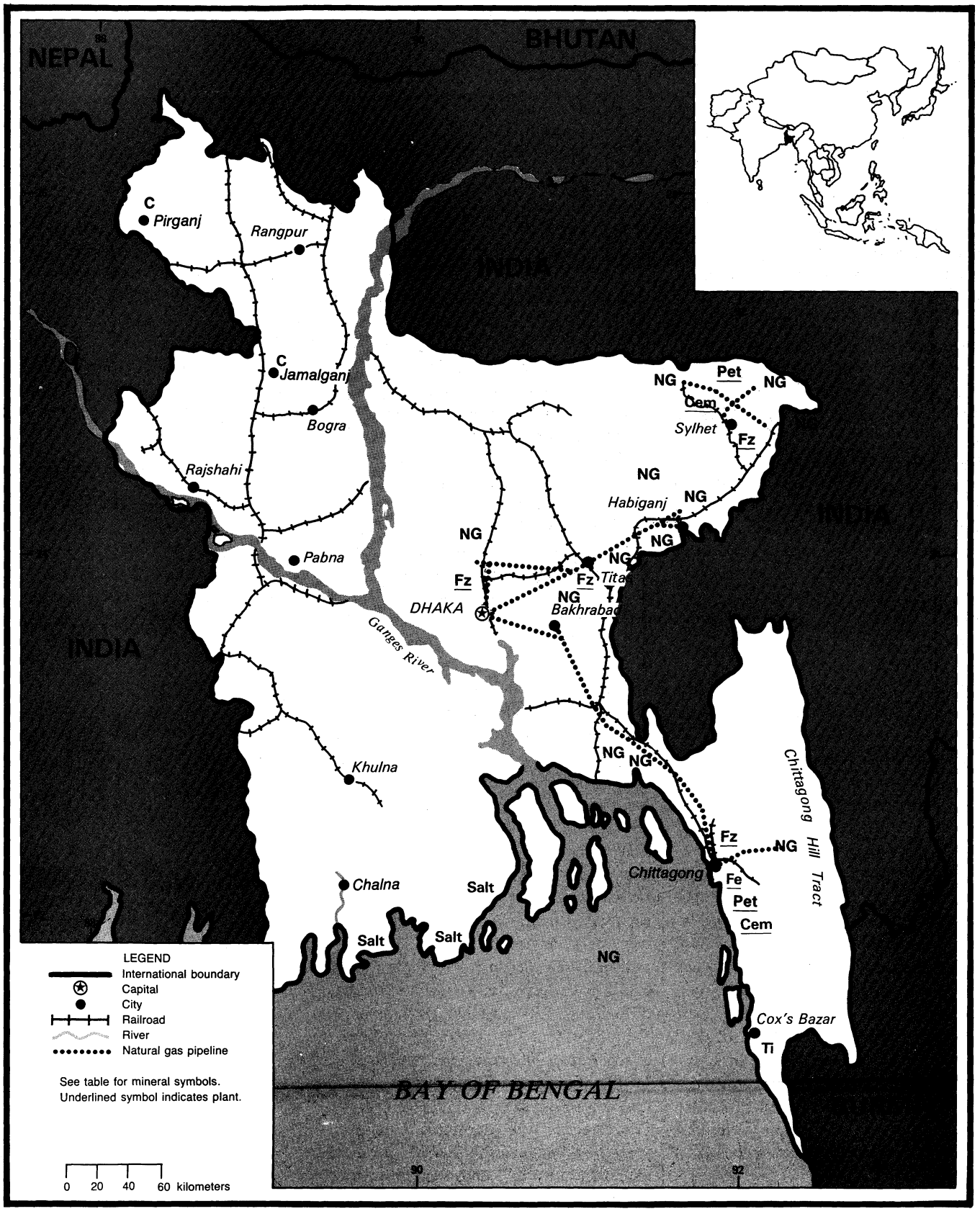
Commodity		Reserves
Nickel	million metric tons	2.7
Petroleum, recoverable:		
Condensate	billion liters	118
Crude	do.	285
Liquid petroleum gas	do.	129
Natural gas	billion cubic meters	888
Platinum-group metals (Pd, Pt)	metric tons	17
Rare earths (REO plus Y_2O_3)		300
Silver		17.0
Tantalum		5.9
Tin		99.7
Tungsten		1.1
Uranium, recoverable		462
Vanadium		24
Zinc	million metric tons	15.0

[1]As of Dec. 31, 1992.

Source: Bureau of Resource Sciences.

BANGLADESH

AREA 144,000 km² **POPULATION 119 million**



THE MINERAL INDUSTRY OF

BANGLADESH

By Chin S. Kuo

Despite healthy signs, the Bangladeshi economy was not in good shape in 1992. Although inflation stayed well under control and the foreign exchange reserves rose to record levels, the economic growth was 3.8%, slightly below the 4.5% rate registered in the previous year, owing to a decline in disbursements of foreign assistance. Foreign assistance contributed the equivalent of 7% of the gross domestic product (GDP).

Public enterprises that were state-run and state-financed were large, inefficient, and insufferable; they were a drag on the economy. The Government made little progress in privatizing inefficient state-owned industries or reducing the public payroll. A new generation of home-grown entrepreneurs was beginning to make its mark. However, they were frustrated by corruption and the bureaucracy's traditional distaste for business. As a result, much of the private sector grew soft from a diet of protectionism. The country had difficulty in creating a free-market economy in the Third World, where entrenched interests stood in the way of market reform.

The Government liberalized foreign exchange controls and allowed foreign-owned and joint-venture companies to borrow unlimited loans in takas, the local currency, and short-term foreign currency loans without central bank permission. The Government established a new industrial policy that streamlined standard procedures and allowed foreign investors to repatriate profits without its approval. It also planned to cut import duties, to lower the top income tax rate from 45% to 30%, and to eliminate taxes on capital gains.

Industrial development was hampered by a strong Government commitment to intervention in trade and industry policies. Stagnant industrial growth was only 4%, even after including the export garment industry. Industry contributed approximately a 16% share of GDP. The public sector accounted for only one-fourth of the country's industrial output. Without increases in private and foreign investment, an upsurge in the industrial growth rate was unlikely.

The Government invited foreign and local investors to buy interests in its five state-controlled fertilizer companies and participate in a $170 million[1] revamping of its natural gas-based fertilizer complex at Fenchuganj, Khulna District. The upgrade was expected to boost urea production to 180,000 mt/a. About 30% of funding was to come from international loans.

The U.S. aid-financed Bangladeshi tender for 30,000 tons of diammonium phosphate was closed in October. However, offers totaling 240,000 tons were made. Japan agreed to grant Bangladesh $54 million for debt relief and $8.7 million to control soil erosion near Meghna, outside Dhaka. The Government planned to use the funds saved from debt servicing to import essential industrial raw materials, machinery, and parts.

The China National Machinery Import and Export Corp. was awarded a contract to build a $200 million coal mine at Barapukuria in the northwestern district of Dinajpur. The mine was to produce 1 Mmt/a of coal, and China was to provide loans to cover most of the capital costs. Construction was expected to take 3 years. Bangladesh signed a draft memorandum of understanding with North Korea for Maddyapara hard-rock mining for an undisclosed commodity.

Bangladesh's proven reserves of oil were estimated at 7.6 Mbbl. Average production rate of crude oil was 200 bbl/d. Crude oil totaling 1 Mmt/a was imported from Iran, Saudi Arabia, and the United Arab Emirates. The country's Eastern Oil Refinery processed 1 Mmt/a of crude oil in 1992. The World Bank and the Asian Development Bank agreed to finance a secondary conversion unit, which was expected to process an additional 500,000 mt/a.

Natural gas remained the country's most abundant energy resource. The official estimates of its recoverable reserves were put at 303 billion m^3. Cumulative national production for 1992 was 48 billion m^3 from 17 wells.

[1]When necessary, values have been converted from Bangladesh taka to U.S. dollars at the rate of Taka39.13=US$1.00 for 1992.

TABLE 1

BANGLADESH: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992e
Cement, hydraulic[3]		310,077	343,990	337,359	274,551	290,000
Clays: Kaolin[3]		10,097	7,092	7,223	7,338	7,300
Gas, natural, marketed[3 4]	million cubic meters	4,113	4,413	4,754	4,893	4,900
Iron and steel: Metal:[3]						
Steel, crude (ingot only)		70,036	86,274	75,029	57,520	44,000
Steel products		114,420	109,161	87,422	95,016	90,000
Nitrogen: N content of urea, ammonia, and ammonium sulfate		673,400	775,000	700,500	667,300	[5]769,900
Petroleum:						
Crude	thousand 42-gallon barrels	1,687	1,287	1,191	e1,200	1,100
Refinery products	do.	7,411	7,688	e7,500	e7,600	7,700
Salt, marine[e 3]		409,000	415,000	350,000	300,000	320,000
Stone: Limestone[3]		32,933	29,457	38,008	42,484	47,000

eEstimated.

[1]Table includes data available through Aug. 31, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel and other varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

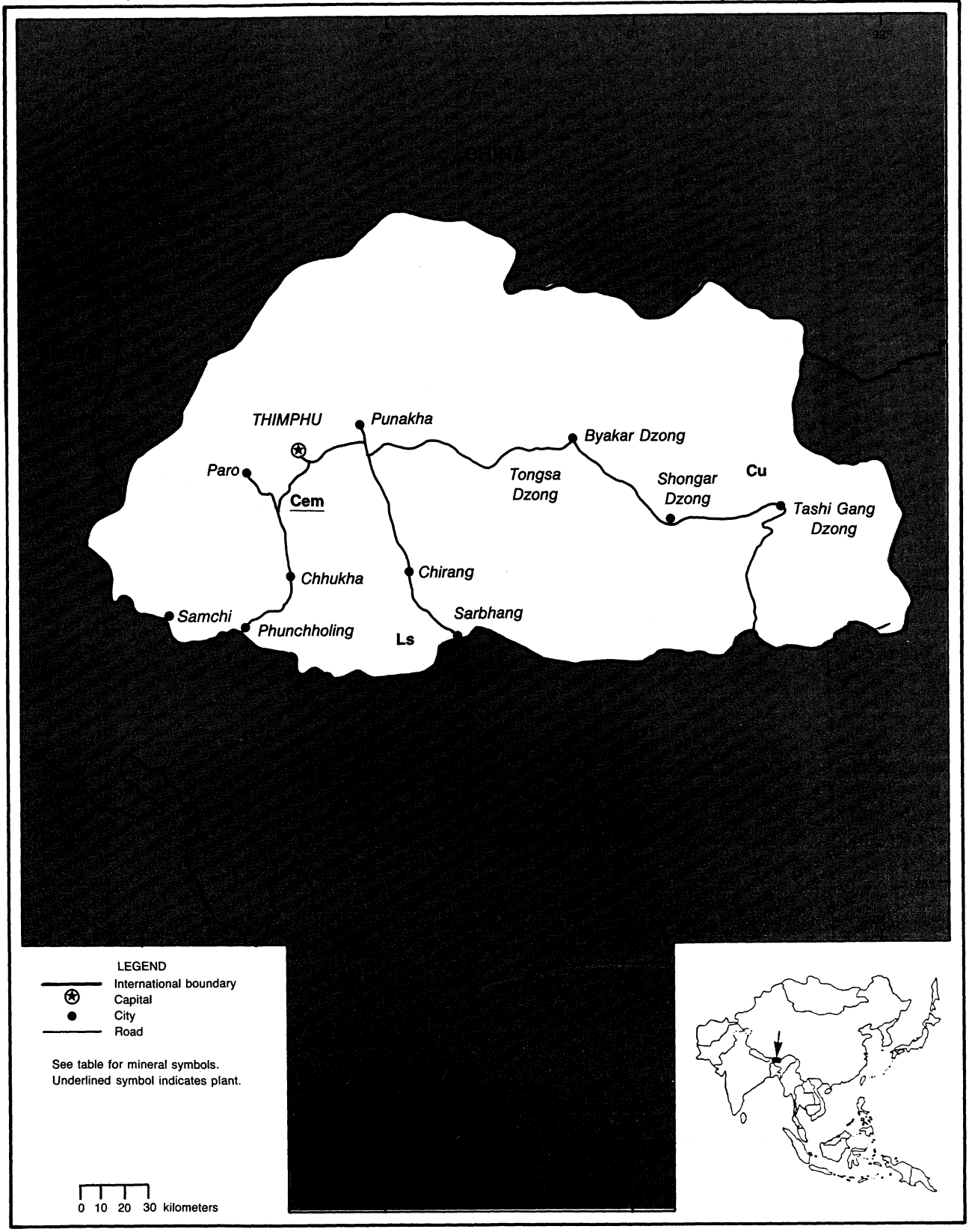
[3]Data are for years ending June 30 of that stated.

[4]Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

[5]Reported figure.

BHUTAN

AREA 47,000 km² **POPULATION 1.7 million**



THE MINERAL INDUSTRY OF

BHUTAN

By John C. Wu

The Kingdom of Bhutan, a landlocked mountainous country with a land area slightly larger than Switzerland, is situated on the southeast slope of the Himalayas, bordered on the north and east by Tibet of China and on the south and west by the Assam-Bengal Plain of India. The mineral resources of Bhutan have not been fully surveyed. However, mineral deposits of beryl, coal, copper, dolomite, graphite, gypsum, iron, lead, limestone, marble, mica, pyrite, slate, silver, talc, tin, tungsten, and zinc reportedly have been discovered by the Bhutan authorities in various parts of the country. Currently, dolomite, gypsum, limestone, sand and gravel, and slate were being mined for the manufacture of cement, calcium carbide, and construction materials. Small quantities of copper, iron, and silver reportedly have long been mined for craftsmen. Coal and graphite also have been mined in past years.

Bhutan's mining sector, composed of several small-scale industrial minerals mining firms, is the smallest sector of Bhutan's economy. The output of the mining and quarrying industries, according to the latest United Nations' statistics, accounted for only 0.9% of the country's GDP. The total value of minerals output was estimated at $3 million,[1] while Bhutan's GDP was estimated at $330 million in 1992. Bhutan also has a small mineral processing industry, which is composed of a cement plant, a calcium carbide plant, a salt iodization plant, and a ferroalloys plant, which was expected to come on-stream in 1993.

Most dolomite, gypsum, and limestone, produced in the mining districts of Paro and Samchi in western Bhutan, were for the manufacture of cement. The 155,000-mt/a cement plant at Gomptu, about 50 km south of Thimphu (national capital), is owned and operated by Penden Cement Authority Ltd. Cement production was operating at near capacity in 1991 and 1992, but was 17% below capacity in 1990 owing to electrical power disruption caused by militants. In past years, some cement has been exported to neighboring states.[2]

Limestone produced from the Pasakha area of the Sarbhang mining district in southern Bhutan was used for the manufacture of calcium carbide. The 22,000-mt/a calcium carbide plant, at Pasakha near Phunchholing in southern Bhutan, is operated by Bhutan Carbide & Chemicals Ltd. (BCCL). BCCL is 36% owned by the Government of Bhutan, 20% by Tashi Commercial Corp. (TCC), and 44% by public shareholders. The plant was operating near capacity, and all calcium carbide production was for export.

Under an agreement signed in October 1990, a joint-venture company, Bhutan Ferro Alloys Ltd. (BFAL), was established for building and operating a 15,000-mt/a ferroalloys plant at Pasakha near a hydroelectric powerplant, about 179 km southwest of Thimphu. In 1991, a $17 million contract had been awarded to Elkem Technology A/S of Norway and Elkem Engineering of India to supply a 28-MV•A furnace and pollution control equipment.[3]

The total cost of the ferroalloy complex was estimated at $26 million. Construction of the ferroalloys plant was expected to be completed in mid-1993. The raw material of the plant will be supplied from a quartzite mine with proven reserves of about 3.5 Mmt in the Samchi mining district. In 1992, a 12-year sales contract was signed with Marubeni Corp. of Japan for exporting 5,700 mt/a of ferrosilicon and 3,000 mt/a of microsilica to Japan and other countries. BFAL is owned 25% each by the Government and BCCL, 20% each by TCC and Marubeni Corp., and 10% by public shareholders.

Reserves of most Bhutan's minerals were unknown largely due to the difficulty of access to much of the country with its high relief and lack of roads. Systematic exploration and geologic mapping are still in an incipient stage. However, the Himalayas are known to include thick sequences of carbonate rocks and Bhutan's mineral reserves of dolomite and limestone were considered to be large. Likewise, quartzite reserves were considered to be large. Reserves of quartzite recently have been estimated at 5.5 Mmt in the Samchi mining district of western Bhutan.

Bhutan has 1,304 km of roads, of which 418 km is paved, 515 km improved, and 371 km unimproved. There are two airports, but no rail network in Bhutan. Telecommunication, linking only with India, is inadequate with other parts of the world. Bhutan's main power source was from its 336-MW giant Chukha hydroelectric power stations on the Wangchu River of southwestern Bhutan. The power stations not only provided electricity to central and southern Bhutan, where several mineral processing plants are located, but also sold a substantial part of the output to India. With two to three other small powerplants, Bhutan's total installed capacity was estimated at more than 350 MW.

Bhutan's economy is one of the least developed in the world. Its development is largely dependent on foreign financial and technical aid from India, Japan, and international organizations. Cooperation

between Bhutan and India in the power sector is expected to continue, and mineral trade is expected to expand into countries other than India when the ferroalloys plant comes on-stream in 1993 and cement production increases in the next few years. However, Bhutan's economic development will require upgrading of its infrastructure, such as highway network expansion, telephone system modernization, and hydroelectric power generation capacity expansion. Further mineral exploration is a prerequisite to growth in Bhutan's small mining sector.

[1]Where appropriate, values have been converted from Bhutanese ngultum (Nu) to U.S. dollars at the rate of Nu25.45=US$1.00 in 1992.

[2]Far Eastern Economic Review (Hong Kong). Bhutan in Asia 1992 Yearbook, Dec. 1991, p. 85.

[3]Metal Bulletin (London). No. 7509, Aug. 20, 1990, p. 1; No. 7601, July 25, 1991, p. 9.

TABLE 1

BHUTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

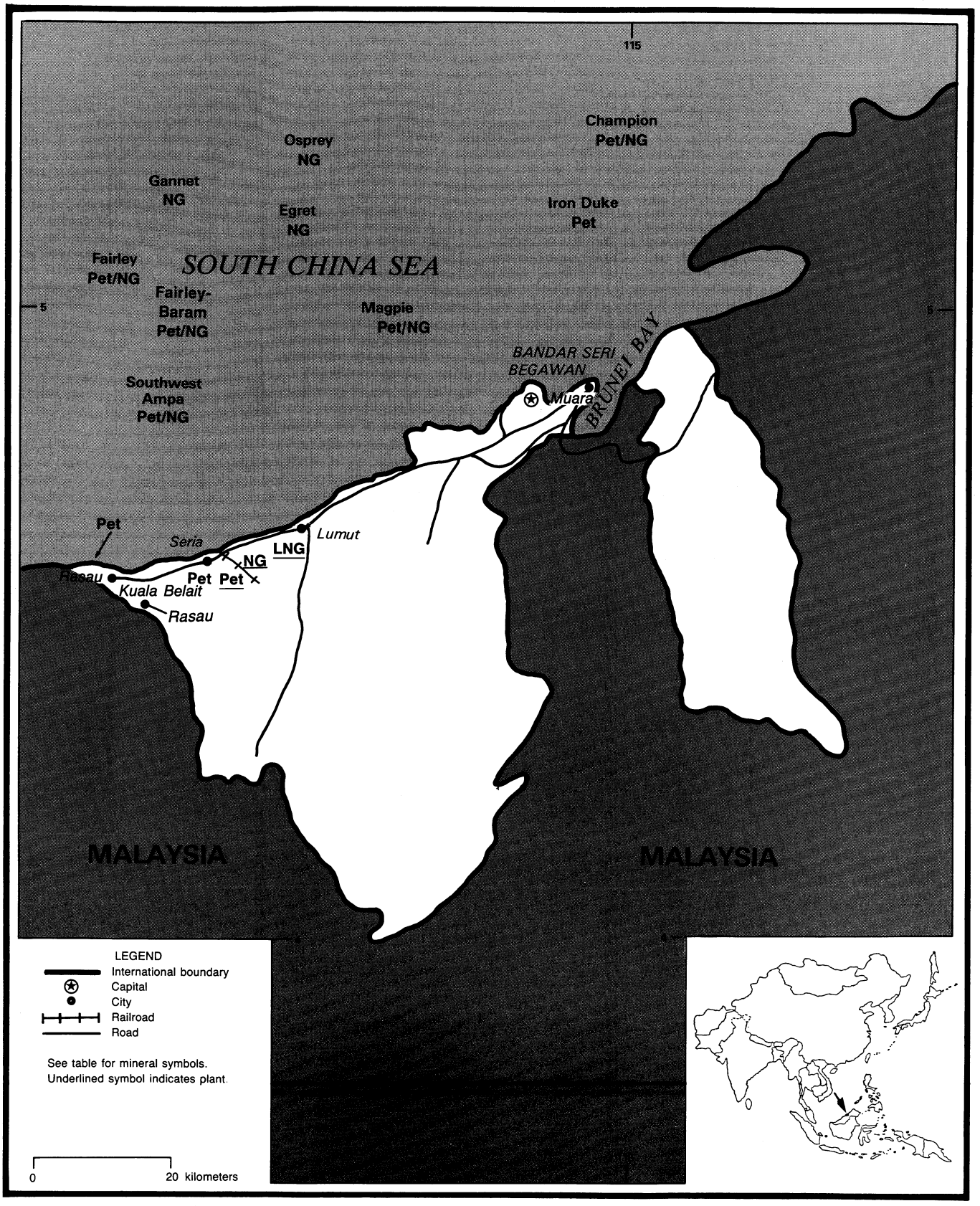
Commodity[2]	1988	1989	1990	1991	1992
Cement	147,692	151,676	153,000	153,000	127,000
Dolomite	80,000	90,000	100,000	90,000	90,000
Gypsum	20,000	22,000	22,000	22,000	20,000
Limestone	200,000	200,000	220,000	220,000	190,000

[1]Table includes data available through Mar. 26, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

BRUNEI

AREA 5,770 km² **POPULATION 270,000**



THE MINERAL INDUSTRY OF

BRUNEI

By John C. Wu

Brunei, on the northwest coast of Borneo Island, has extensive reserves of petroleum and natural gas. Brunei, despite its small land area, was the world's fourth largest producer of LNG. In 1992, it ranked the sixth largest producer of crude petroleum and the seventh largest producer of natural gas in the Asia and Pacific region. Mining activity in Brunei involved only production and processing of crude petroleum and natural gas. The oil and gas industry, which employed about 6,000 workers or 7% of the total work force, contributed more than 65% of Brunei's GDP and provided about 55% of Government revenues.

Brunei's GDP was estimated to have grown by 1% to $3.8 billion.[1] The economic growth of this small Sultanate is almost entirely dependent on increased production and exports of crude petroleum and natural gas. Exports of crude petroleum, natural gas (in the form of LNG), and refined petroleum products accounted for about 96% of Brunei's export earnings. In 1992, Brunei's export earnings were estimated at $2.6 billion, of which about 46% was from exports of LNG, 43% from exports of crude petroleum, and 7% from exports of refined petroleum products. Japan remained the dominant importer of Brunei's crude petroleum and LNG in 1992. The Republic of Korea, Singapore, and Thailand were other important crude petroleum importers.

Production of oil and gas in 1992 was from six offshore fields—Southwest Ampa, Champion, Magpie, Fairley, Fairley-Baram, and Gannet—and from two onshore fields in Serai and Rasau. Brunei Shell Petroleum Co. Sdn. Bhd., a 50-50 joint venture of Royal Dutch Shell Group Co. and the Government of Brunei, was the country's only producer of crude petroleum and natural gas. To meet domestic demand for refined petroleum products, Brunei Shell operated a 8,500-bbl/d petroleum refinery at Serai. Major refined petroleum products included gasoline and distillate fuel oil.

In 1992, production of crude petroleum rose by 10.3% to an average of 161,000 bbl/d, of which about 70% was from the Southwest Ampa and Champion Fields. Crude petroleum output was more than the 150,000-bbl/d limit in 1992. During the Gulf war, the Government lifted its own restricted production under the 1988 conservation policy. According to an industry analyst, the high output level achieved in 1992 was partially due to successful pressure by Brunei Shell on the Government for an increase in oil production so as to recoup it heavy investment in high-technology exploration, such as its three-dimensional seismic exploration technique.

Production of natural gas increased by 3.7% to about 9.5 billion m^3, of which more than 95% was from the Southwest Ampa, Champion, and Fairley Fields. Brunei LNG Sdn. Bhd. purchased natural gas from Brunei Shell and produced LNG at the Lumut LNG plant with a capacity of 5 Mmt/a. Exports of LNG were 5.4 Mmt valued at about $1.2 billion in 1992. Virtually all LNG output was exported to Japan under a 20-year contract.

The existing 20-year contract will expire at the end of March 1993. Negotiations on a new 20-year contract between Brunei LNG and the Japanese buyers continued, but no agreement had been reached by yearend because of disagreements over price. Brunei LNG was owned 50% by the Government of Brunei and 25% each by Brunei Shell and Mitsubishi Corp. of Japan. The three Japanese buyers are Tokyo Electric Power Co. Inc., Tokyo Gas Co. Ltd., and Osaka Gas Co. Ltd.

In June, Brunei LNG awarded a $59 million turnkey contract to Hollandsche Beton Group NV of the Netherlands to build additional LNG loading facilities at its Lumut LNG complex. The turnkey project involves design, engineering, procurement, and the construction of a 426-m trestle and loading platform and the installation of three LNG loading arms. The loading facilities, capable of handling LNG carriers of 75,000 to 135,000 m^3, were expected to be completed by early 1994.[2]

In February, Brunei Shell announced that it had made a significant discovery in the South China Sea. The new discovery, near the Iron Duke Field, flowed at more than 500,000 m^3 of gas and 140 m^3 of condensate per day. Future development of oilfields and gasfields by Brunei Shell includes the Egret, Iron Duke, and Champion West Fields near the existing infrastructure.[3]

According to oil and gas industry sources, Brunei's estimated proven reserves of crude petroleum and natural gas, as of January 1992, were 1.35 billion bbl and 317.15 billion m^3, respectively. Most of the proven oil and gas reserves were in the Southwest Ampa and Champion Fields.

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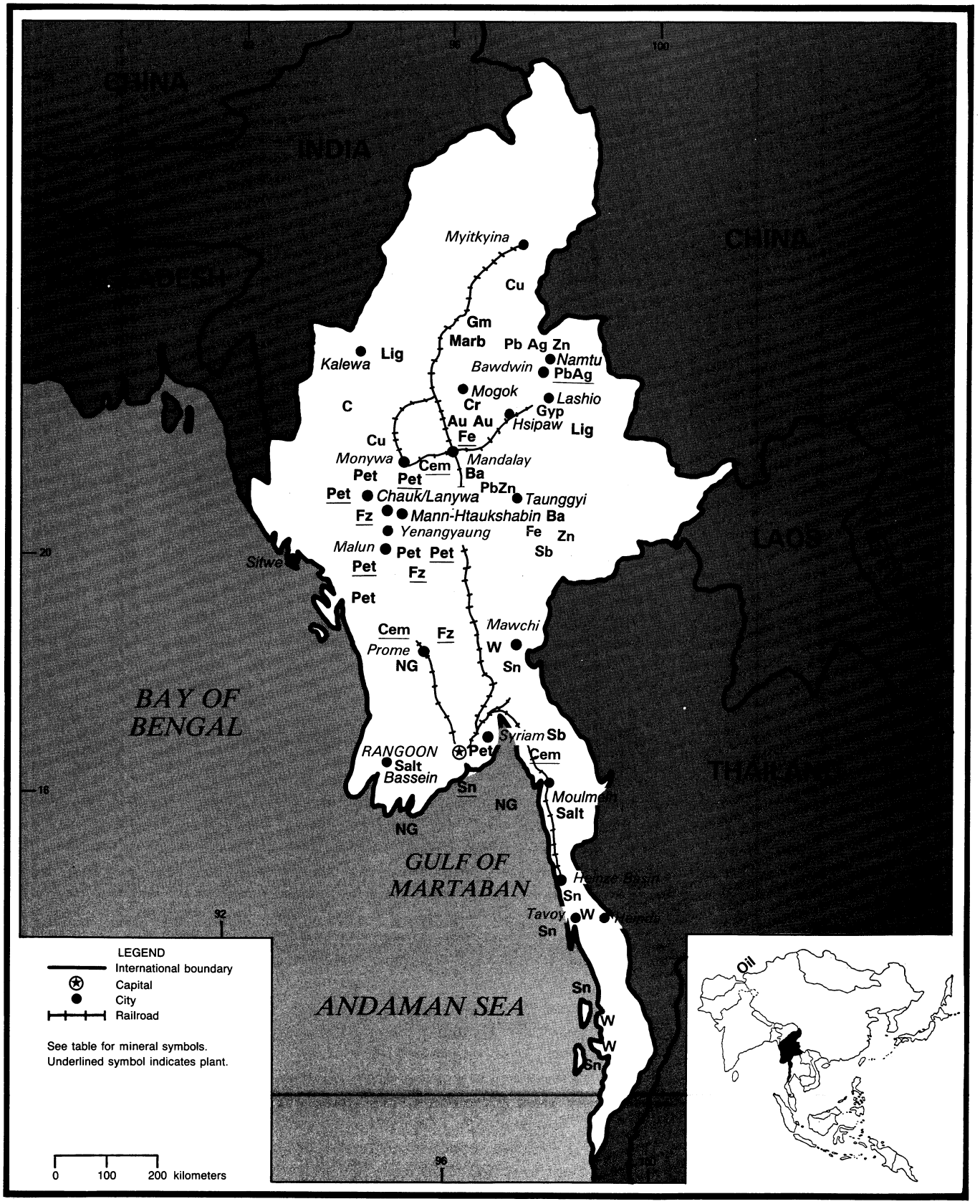
[1]Where appropriate, values have been converted from Brunei dollars (B$) to U.S. dollars at the rate of B$1.62=US$1.00 in 1992. Brunei dollars are convertible at a par with Singapore dollars.

[2]Oil & Gas Journal. V. 90, No. 22, 1992, p. 44.

[3]South-East Asia Mining Letter (London). Brunei Deepest Drilling Discovery. V. 4, No. 4, Feb. 28, 1992, p. 8.

BURMA

AREA 678,600 km² **POPULATION 42.6 million**



THE MINERAL INDUSTRY OF

BURMA (MYANMAR)

By John C. Wu

Burma, once an important producer and exporter of crude petroleum, lead, silver, and zinc in Asia during the 1950's, produced only modest amounts of metallic minerals, such as chromium, copper, gold, lead, silver, tin, tungsten, and zinc; industrial minerals, such as barite, clays, dolomite, feldspar, gypsum, limestone, precious stones, and salt; and mineral fuels, such as coal, natural gas, and crude petroleum. Most of the production was for its own consumption. However, most of the jade and precious stones production, such as diamond, rubies, sapphires, and other gems, and certain amounts of copper, tin, and zinc were exported. Burma, with only 57% of its land geologically mapped, has potential for a wide variety of uncharted minerals. These minerals include antimony, chromium, copper, diamond, gems, gold, lead, natural gas, nickel, crude petroleum, platinum-group metals, silver, and zinc.

Burma's mineral industry is composed of three State-owned metals mining enterprises, a State-owned petroleum and gas enterprise, and many small-scale private and local enterprises. The total work force of the mining sector was estimated at 83,000 or about 0.5% of Burma's labor force in 1992. According to the Burmese Ministry of National Planning and Economic Development, the total output of the mining sector, in 1986 constant producers' prices, was valued at $76 million[1] or 0.89% of Burma's gross domestic product (the total value of net output and services), which was valued at $8.5 billion for fiscal year 1992. Of the total output of the mining sector, about 73% was produced by the State-owned enterprises, 26% by the private enterprises, and 1% by cooperatives.[2]

Minerals production in Burma had been declining since the 1960's. In 1989, the Government adopted an open-door policy and a liberal foreign investment law to encourage participation of foreign mining companies in exploration and development of Burma's mineral resources. According to the Burmese Department of Geological Survey and Mineral Exploration, since 1989 no substantial foreign capital had been invested in the Burmese mining industry, especially in the nonfuel minerals sector.

Burma's mining industry suffered a steady decline because no new mines were developed while many of the old mines were left to deteriorate without the much needed renovation in the past years. However, in fiscal year 1992, progress reportedly was made in production of gems, gold, tin, and tungsten because of the Government all-out efforts in encouraging small-scale mining by the private and joint government-private enterprises.

Burma's mineral trade involved mainly exporting jade, gems, and certain amounts of base metals and importing certain amounts of ferrous and nonferrous metals and a modest amount of crude petroleum. Burma holds gem emporium annually in Yangon (Rangoon, the national capital), mainly for selling and exporting jade, gems, and jewelry. In fiscal year 1992, export earnings from jade and gems alone amounted to about $23.5 million and accounted for more than 60% of Burma's minerals exports. Additionally, a considerable amount of high-quality jade and gems reportedly are smuggled annually to China and Thailand. Exports of copper concentrate in 1992 were estimated at $3.5 million and accounted for 10% of total minerals exports. Burma, once a net exporter of crude oil, was importing about 3,200 bbl of crude petroleum annually to meet its domestic demand.

Production of copper, lead, silver, and zinc was by the State-owned Mining Enterprise No. 1. Production of gold, tin, and tungsten was by the State-owned Mining Enterprise No. 2 and other small-scale private and joint government-private mining enterprises. Production of iron, nickel, steel, and other minerals, including industrial minerals, was by the State-owned Mining Enterprise No. 3 and other small-scale private and joint government-private mining enterprises. Production of jade and gems was by the State-owned Myanmar Gems Enterprise and other private small-scale miners.

Copper was produced from the Monywa Mine, about 100 km west of Mandalay. The designed capacity of the mine and mill is 2.4 Mmt/a of ore and 60,000 mt/a of concentrate, respectively. For fiscal year 1992, the output of copper concentrate from the mine was estimated at 15,000 tons compared with 18,300 tons in 1991. In past years, Burma has been exporting about 20,000 mt/a of copper concentrate, principally to Japan.

In 1992, Mining Enterprise No. 1 was negotiating with Ivanhoe Capital Corp. of Canada to upgrade the Monywa Mine and to develop a new porphyry copper deposit at Letpadaung, about 11 km from the Monywa Mine. Ivanhoe Capital planned to conduct further exploration to ascertain ore reserves of the deposit. Ivanhoe Capital reportedly proposed to the Burmese Government to use solvent extraction and electrowinning for extracting copper instead of the conventional concentrating and smelting.[3]

Mine production of lead, silver, and zinc was from the Bawdwin (open pit) and the Namtu (underground) mines in the Shan State of northern Burma. In

fiscal year 1992, the mine output of lead and zinc increased considerably, while the mine output of silver decreased. Mining Enterprise No. 1 also operated a concentrator at Bawdwin and a lead smelter at Namtu. Mining Enterprise No. 1 reportedly reached an agreement with International Minerals Co. of Singapore to form a joint venture for extracting zinc from tailings at the Namtu silver mine.

Gold production reportedly increased substantially in 1992. Most of the increase in the 1992 gold production came from primary gold deposits, operated by the State-owned Mining Enterprise No. 2. These primary gold deposits were commissioned recently at the Phayaung Taung Mine in Pathein near Mandalay, at the Thayet Kkone Mine in Pyinmana, and at the Shwegyin and the Kyaukpahtoe Mines, both in central Burma. However, the small-scale private miners operating in the northern and eastern parts of Burma contributed most to the country's total gold output. These private gold miners, according to the Department of Geological Survey and Mineral Exploration, must sell their gold to the Burmese Government. The Ministry of Trade, which maintains a gold purchasing committee at the township level, purchases gold from private gold miners.

For the first time, in 1992, the Government reportedly invited private investors to participate in joint exploration and development of gold in the Lepyin Shweminbo and Kawin Thone Se regions. According to a model joint-venture agreement, the private partner must process the gold to 22 karats with a quality guarantee and the proceeds from the sale of the gold would be distributed according to a 60:40 ratio between the private partner and the Government.

Despite low metal prices, production of tin and tungsten rose considerably in 1992 owing to the Government's all-out efforts in promoting participation of the private sector in setting up joint-venture firms with the Government. A joint-venture agreement normally was based on a production-sharing contract having 65% private and 35% Government ownership. Most tin and tungsten were produced from the Mawchi, Heinda, and Tavoy areas. In 1992, two joint-venture firms were established for mining tin and tungsten in the Pyinmana east area of the central-eastern part and in the Dawei area of the southern part of the country. Additionally, the State-owned Mining Enterprise No. 2 reached an agreement with China's Shweli Co. of Yunnan Province in November for joint exploration and development of a new tin mine in the Namkham area of the Shan State, about 300 km north of Mandalay, near the Sino-Burma border. The State-owned Mining Enterprise No. 2 also operated a 1,000-mt/a tin smelter in Thanlyin, near Rangoon. Owing to lack of raw material, the smelter had been operated far below its capacity. Production of refined tin mainly for domestic consumption was estimated at 200 tons in 1992.

According to Government statistics, Burma also produced certain amounts of chromite, nickel speiss, and manganese dioxide. However, the annual output was small, and the producing areas are unknown. Exploration for chromium and nickel continued at the Mwetaung area of the Chin State in northeastern Burma near the Indian border. Exploration was conducted with technical assistance provided by Germany under a 5-year agreement.

Burma produced a variety of industrial minerals in small quantities but significant amounts of precious and semiprecious stones. Production of industrial minerals, such as barite, bentonite, clays, dolomite, feldspar, gypsum, limestone, and salt, was for domestic consumption. Production of precious stones and semiprecious stones, such as diamond, jade, rubies, sapphires, and other gems, was for exports.

Mining Enterprise No. 3, which had a joint venture with ECI of Singapore to produce barite powder for oil drilling, produced barite from the Kyaukse Mine, south of Mandalay; from the Heho Mine in Shan State; and from the Anisakan Mine near Maymyo. The joint-venture barite processing plant at Thazi, which began operation in 1991, is capable of producing 60,000 mt/a of barite powder. ECI reportedly planned to mine and process other industrial minerals, such as feldspar, manganese, and talc, in Burma. In 1992, Mining Enterprise No. 3 also signed a joint-venture agreement with Watana Co. of the United States to mine granite in Burma for export to Japan. As part of the rationalization of the State-owned industry, Mining Enterprise No. 3 took control of the Ywama Steel Mill from the Ministry of Industry.

The State-owned Myanmar Ceramic Industries operated three cement plants. The Kyangin plant, near Mandalay, is capable of producing 270,000 mt/a of cement. The Pa-An plant, about 160 km east of Yangon, is capable of producing 280,000 mt/a. The Thayetmyo plant, 300 km northeast of Yangon, is capable of producing 270,000 mt/a. According to Government statistics, Burma's cement output totaled 465,000 tons, or about 57% of its installed capacity in 1992. A modest amount of portland cement had been imported to meet the cement shortage in some parts of the country.

The State-owned Myanmar Gems Enterprise operated gem mines at the Mogok Stone Tract for mining rubies and sapphire, and at the Jade Mines area for jade. It also held the gems emporium twice per year. One was held in February and another one in October. According to the Department of Geological Survey and Mineral Exploration, gem production rose significantly in 1992, especially for diamond and jade. Participation of wealthy private enterprises in gem mining with Government support had resulted in a 127% increase in diamond production and a 45% increase in jade production in 1992.

In the past years, there had been an active search for rubies and sapphires in northern Burma. As a result of intensive exploration, several new gemstone tracts had been found in northern Burma. The Pyinlon and the Namsa deposits (the Nawarat Stone Tract), discovered near the Chinese border in the Shan State in 1990, began production of high-quality rubies and sapphires in 1991. In 1992, a new gemstone tract for rubies reportedly was discovered near Mongshu in the

eastern part of the country and an occurrence of fine quality jadeite also was discovered near Khami in the northwestern part of Burma.

Production of crude petroleum and natural gas was by Myanmar Oil and Gas Enterprise (formerly Myanmar Oil Corp.). According to the Minister of Energy, Burma was unable to increase its output of crude petroleum and natural gas because it lacks experience and skilled technicians in oil and gas exploration and development. Production of oil and gas from seven oilfields and gasfields averaged 16,000 bbl/d of crude petroleum and 2.3 Mm^3 of natural gas, respectively, in 1992. Burma's top four oilfields were at Chauk/Lanywa, Mann-Htaukshabin, Prome, and Yenangyaung.

In 1989-90, the Government attracted 10 major foreign oil companies into Burma and signed production-sharing contracts with them to undertake a 3-year oil and gas exploration program. By the end of 1992, a total of 12 exploratory well were drilled by foreign oil companies but only 1 well was successful. As a result, six foreign oil companies reportedly either had relinquished their concession acreage or announced plans to withdraw citing disappointing results and high exploration costs. These six major oil companies were Petro-Canada, Australia's Broken Hill Proprietary Ltd., Unocal, Amoco Corp., Shell Oil Co., and Yukong Oil Co. of the Republic of Korea.

A consortium of Texaco Exploration Myanmar Inc. (50%) of the United States, Premier Petroleum Myanmar Ltd. (30%) of the United Kingdom, and Nippon Oil (Myanmar) Exploration Ltd. (20%) of Japan was the only successful foreign contractor, which discovered an offshore gas/condensate well in their concession area block M-13. The consortium spudded the 1 Yetagun wildcat in 105 m of water in the southwestern corner of block M-13, off peninsular Myanmar in October. The wildcat well, which flowed at a combined rate of 2.1 Mm^3 of natural gas and 1,800 bbl/d of 47.5° API condensate, was the first discovery in the Tenasserim shelf area. The consortium, which signed a production-sharing contract with Myanmar Oil and Gas Enterprise in 1990 for oil and gas exploration for blocks M-13 and M-14, signed another production-sharing contract for block M-12 adjacent to their blocks M-13 and M-14 in September.[4]

In July, Total Oil Co. of France signed a production-sharing contract with the State-owned Myanmar Oil and Gas Enterprise for exploration and development of oil and gas offshore blocks M-5 and M-6 in the Gulf of Mataban. The potential gas reserves in the concession, according to an industry estimate, were between 99 Mm^3 and 142 Mm^3. Under the agreement, about 75% of the future natural gas output from the area would be marketed in Thailand. The contract also called for spudding the first test well using the Maersk Vanguard drilling platform for commercial production from the offshore area in the Gulf of Martaban (Mottama) in early 1993.

The State-owned Myanmar Petrochemical Enterprise operated a small oil refinery at Chauk with a 6,000-bbl/d capacity and a larger one at Thanlyn with a 26,000-bbl/d capacity. To meet the domestic demand for refined petroleum products, Burma reportedly imported 3,150 bbl of crude petroleum in 1992.

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[1]Where necessary, values have been converted from Burmese Kyats (K) to U.S. dollars at the rate of Ks6.5=US$1.00 in 1992.

[2]Ministry of National Planning and Economic Development. Review of the Financial, Economic and Social Conditions for 1993-94, p. 259.

[3]U.S. Embassy, Rangoon, Burma. State Dep. Telegram 00969, Feb. 18, 1993, p. 4.

[4]Oil and Gas Journal. V. 90, No. 52, Dec. 28, 1992, p. 32.

TABLE 1

BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991[p]	1992[e]
METALS						
Chromium: Chromite, gross weight		5,000	e5,000	e1,000	e1,000	e6,200
Copper:						
Mine output, Cu content		4,700	5,080	r4,399	5,670	4,800
Matte, gross weight		224	200	r53	150	150
Gold, mine output[e]	kilograms	100	126	150	130	140
Iron and steel: Pig iron		688	2,946	r406	e1,000	500
Lead:						
Mine output, Pb content		6,000	5,200	4,400	4,700	4,800
Metal:						
Refined		4,402	3,443	r2,750	2,177	2,112
Antimonial lead (93% Pb)		160	300	88	e100	100
Manganese mine output, Mn content[e]		34	47	55	50	50
Nickel						
Mine output, Ni content[e]		26	20	r50	20	20
Speiss, gross weight		104	184	r163	50	100
Silver, mine output	kilograms	9,207	r5,910	r5,816	r5,256	4,790
Tin, mine output, Sn content:						
Of tin concentrate		102	172	r190	r114	130
Of tin-tungsten concentrate		427	329	r463	r404	580
Total		529	501	r653	r518	710
Metal: Refined		110	171	r275	157	189
Tungsten, mine output, W content:						
Of tungsten concentrate		14	8	r9	r5	25
Of tin-tungsten concentrate		293	225	r342	270	350
Total		307	233	r351	r275	375
Zinc, mine output, Zn content		1,600	1,400	r1,559	r1,750	1,880
INDUSTRIAL MINERALS						
Barite[3]		12,678	11,278	9,468	e9,000	10,000
Cement, hydraulic		348,981	394,000	r420,000	r435,189	465,125
Clays:[3]						
Ball clay		247	203	100	200	150
Bentonite		418	711	416	600	200
Fire clay[4]		3,473	3,150	1,404	2,540	2,500
Industrial white clay		600	—	779	—	—
Feldspar[3]		4,938	4,257	2,476	e2,500	2,600
Graphite[3]		—	—	45	36	—
Gypsum[3]		31,716	31,534	32,952	r33,630	36,070
Nitrogen: N content of fertilizer		112,178	120,000	e125,000	e130,000	130,000
Precious and semiprecious stones: Jade[3]	kilograms	e131,777	660,200	242,200	r177,900	145,800
Salt, all types:[5]	thousand tons	246	262	—	260	260
Stone:[3]						
Dolomite		938	1,930	r3,505	r2,792	1,016
Limestone, crushed and broken	thousand tons	1,118	1,219	1,320	1,860	1,700
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		30,258	37,594	30,815	56,690	56,000

See footnotes at end of table.

TABLE 1—Continued

BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991[p]	1992[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Gas, natural:						
Gross[e]	million cubic meters	1,108	1,133	[r]1,015	934	1,000
Marketed[3]	do.	1,064	1,088	993	817	950
Petroleum:						
Crude (gross wellhead)[3]	thousand 42-gallon barrels	4,800	5,600	[r]5,800	5,372	5,800
Refinery products[e 3]	do.	3,137	3,287	3,200	3,800	3,500

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

[1]Tables includes data available through Mar. 26, 1993.

[2]In addition to the commodities listed, pottery clay, common sand, glass sand, other varieties of crude construction stone, and other varieties of gemstones are produced, but available information is inadequate to make reliable estimates of output levels.

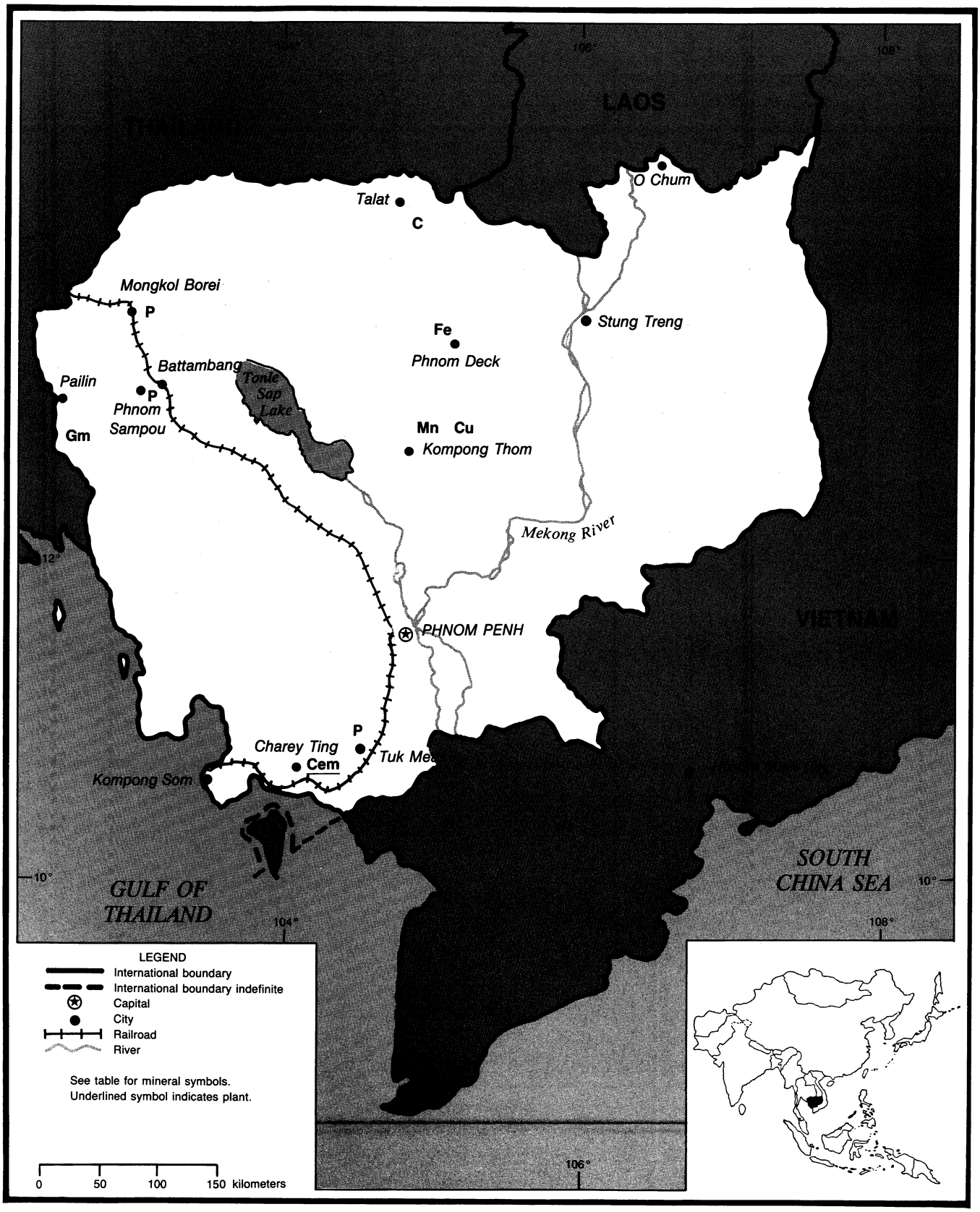
[3]Data are for fiscal years beginning Apr. 1 of that stated.

[4]Includes fireclay powder.

[5]Brine salt production (in metric tons) as reported by the Burmese Government was as follows: 1988—59,768; 1989—60,229; 1990—49,670; 1991—46,835; and 1992—43,488.

CAMBODIA

AREA 181,040 km² **POPULATION 7.3 million**



THE MINERAL INDUSTRY OF

CAMBODIA

By Travis Q. Lyday

Although the peace accord that took effect toward the end of 1991 maintained a fragile peace, the country continued in 1992 to suffer serious economic difficulties. Inflation was rampant, exceeding 200% by yearend. The minerals industry, as most other sectors of the economy, remained stagnant. Essentially, construction materials (brick clays, gravel, and stone), phosphate rock, and salt were the only mineral commodities produced and consumed domestically. No Cambodian mineral commodities were known to have been exported legally. However, gemstones may have been smuggled out of the country. Singapore was the major trading partner with the country. Mineral imports included petroleum products and clinker for cement manufacture.

Cambodia's mineral industry is distributed erratically and operated irregularly. One small plant of unknown capacity was thought to produce cement intermittently at Charey Ting, about 70 km southwest of Phnom Penh. Highly localized utilization of clays for brickmaking represented an industry of sorts. The technology used was simple and widely applied in many districts and Provinces.

Cambodia has gem-quality corundum mineralization in several parts of the country, ranging from Pailin near the western border with Thailand to the eastern border area between Stung Treng in Cambodia and Pleiku in Vietnam. High-quality rubies have been found, but true cornflower-blue sapphire of high quality has been the most valuable gemstone produced in Cambodia.

A phosphate plant at Tuk Meas, Kampot Province, was essentially a grinding and roasting operation for locally dug phosphate rock. The treatment enhanced the solubility of the phosphate for application as fertilizer. Little information was available on salt production, which was from numerous small operations. Estimated production for the past several years was about 40,000 mt/a.

Information on mineral reserves in Cambodia is scant. The country is known to have coal, copper, iron, and manganese deposits, but their quality and quantity have not been determined. Reportedly, the country also has deposits of gold, lead, and zinc to the east and northeast of Stung Treng, but the prospects discovered years ago never have been evaluated.

Essential elements of the communications-transportation infrastructure include 13,351 km of roads, including 2,622 km with bituminous pavement; 7,105 km of crushed stone, gravel, or other loose surface; and 3,624 km of unimproved earth or dirt track. Many of the roads are in disrepair, both from neglect and the results of 22 years of war. Inland waterways included 3,700 km navigable all year to craft drawing 0.6 m and 282 km navigable to craft drawing 0.6 m. The Government-owned railway consists of 612 km of 1-m-gauge track. Its operating condition is uncertain. There were five principal airports with permanent-surface runways out of an aggregate of eight in operating condition in the country. Two had runways 2,440 to 3,659 m in length, and four had runways 1,220 to 2,439 m long. Principal ports were Kompong Som on the coast of the Gulf of Thailand, and Phnom Penh, inland on the Mekong River.

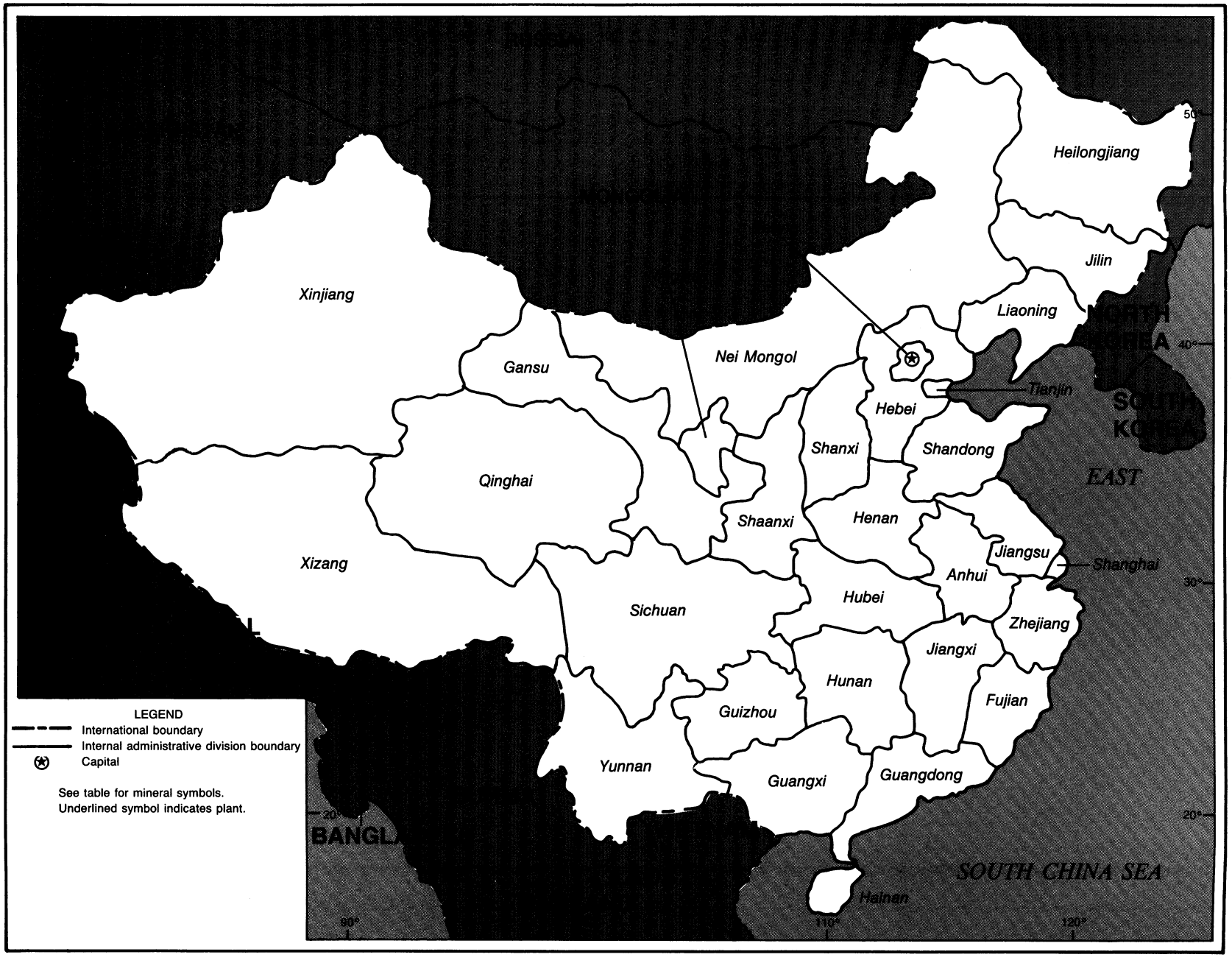
Cambodia had an electric-power generating capacity of 140 MW and produced power at the approximate level of 30 kW•h per capita. There is a hydroelectric power generation project in northeastern Cambodia at O Chum where a 1,000-kW plant is in construction with assistance from Vietnam.

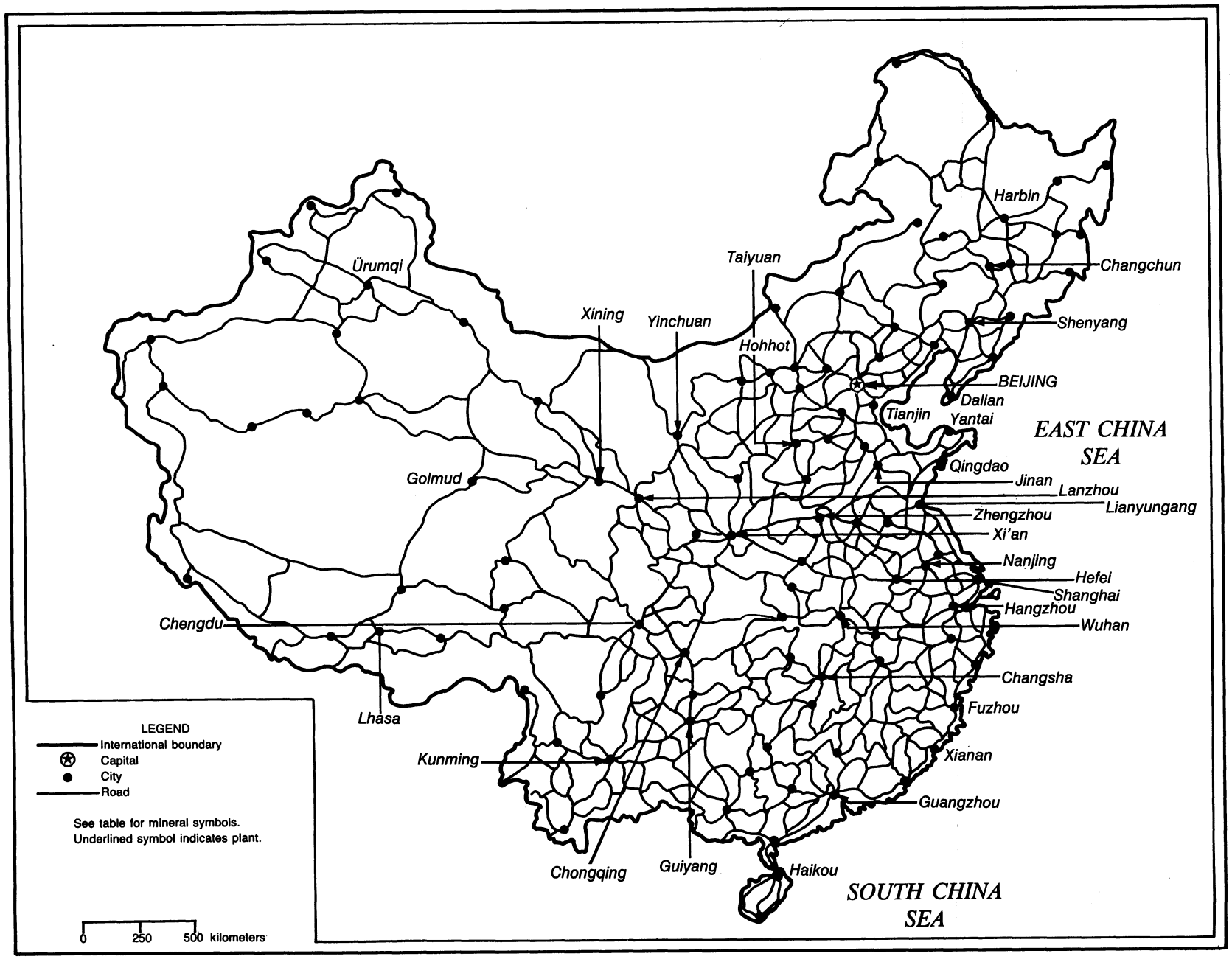
Cambodia will remain one of the poorest and most demoralized countries in the world until political stability is achieved. The immediate need for any modernization of the country is fuels and power generation, accompanied by improvement of the national infrastructure. Construction of roads, railroads, and a power grid could then support industrial development.

Because of its location, Cambodia has the potential to develop agricultural production, fisheries, and mining. The Southeast Asian peninsula is endowed with minerals. Hence, Cambodia could have the potential to develop and benefit accordingly in the production of mineral commodities. Coal, petroleum, metals, and industrial minerals are prospects that could help to make the country economically self-sufficient and perhaps even an exporter of mineral commodities. However, any development will require political stability and removal of explosive mines planted throughout the country.

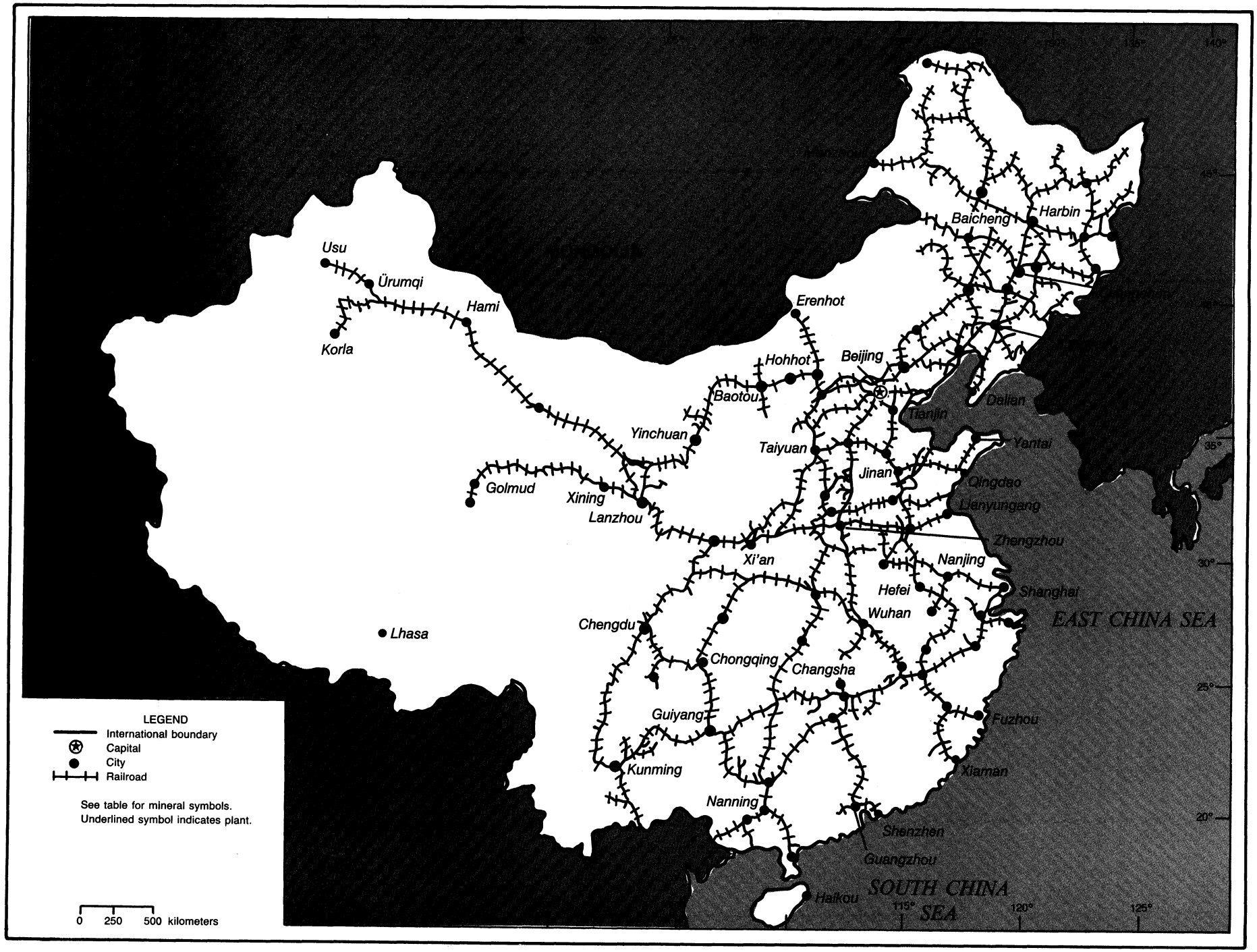
CHINA

AREA 9,596,960 km² **POPULATION 1.19 billion**

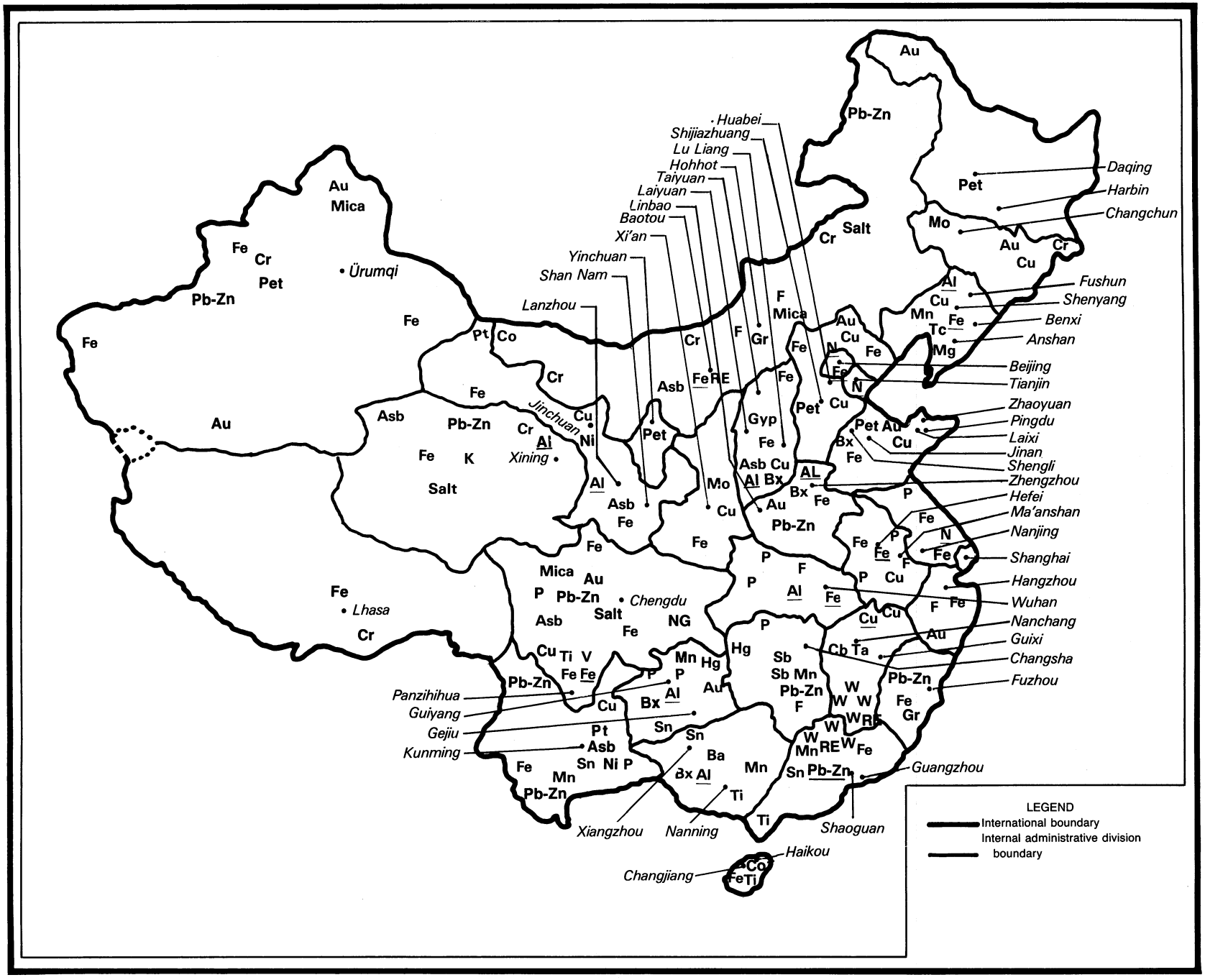




PRINCIPAL ROADS IN CHINA



PRINCIPAL RAILWAYS IN CHINA


Au
Pb-Zn
Huabei
Shijiazhuang
Lu Liang
Hohhot
Taiyuan
Laiyuan
Linbao
Baotou
Xi'an
Yinchuan
Shan Nam
Lanzhou
Daqing
Harbin
Changchun
Fushun
Shenyang
Benxi
Anshan
Beijing
Tianjin
Zhaoyuan
Pingdu
Laixi
Jinan
Shengli
Zhengzhou
Hefei
Ma'anshan
Nanjing
Shanghai
Hangzhou
Wuhan
Nanchang
Guixi
Changsha
Fuzhou
Guangzhou
Shaoguan
Haikou
Nanning
Xiangzhou
Panzihihua
Guiyang
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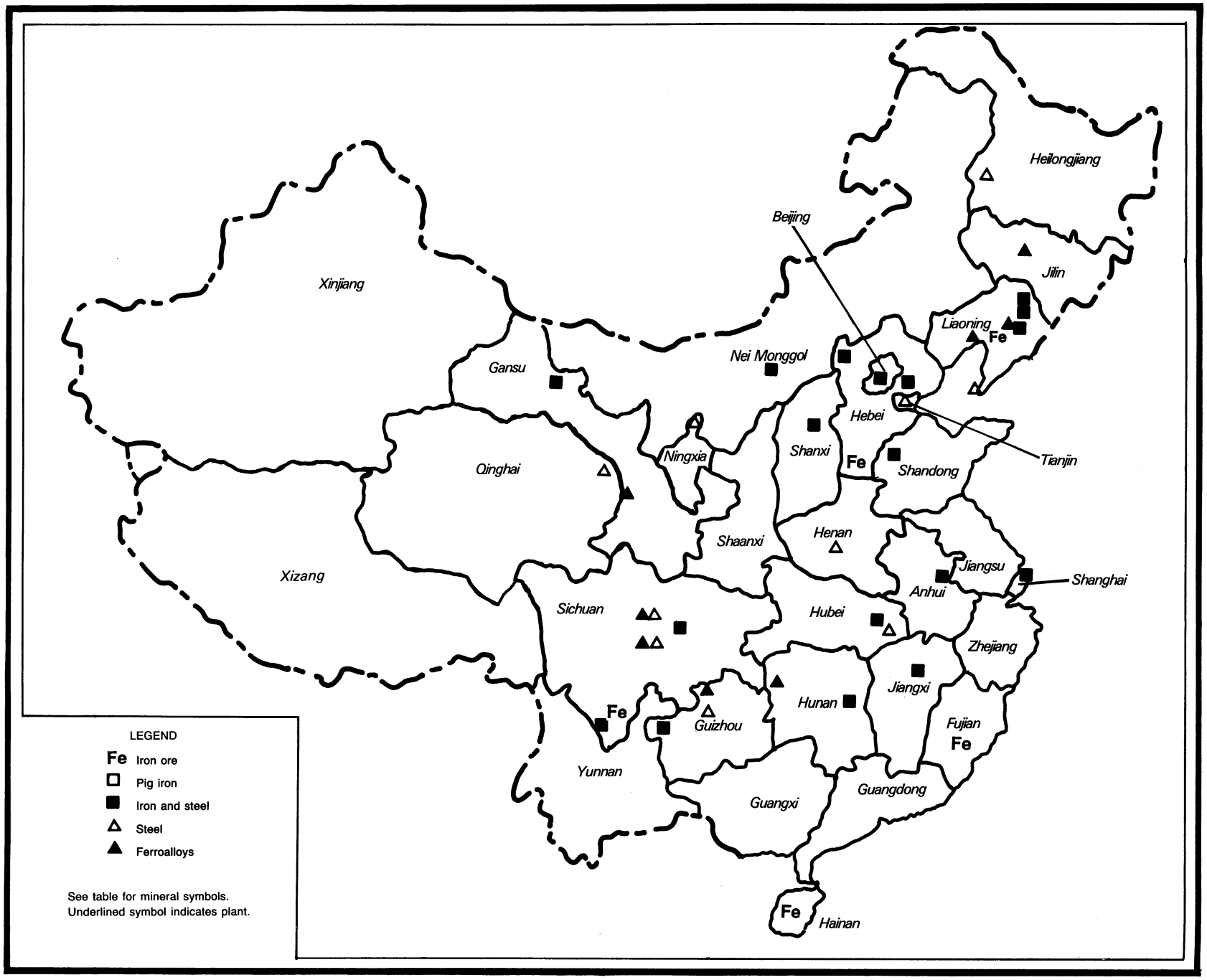
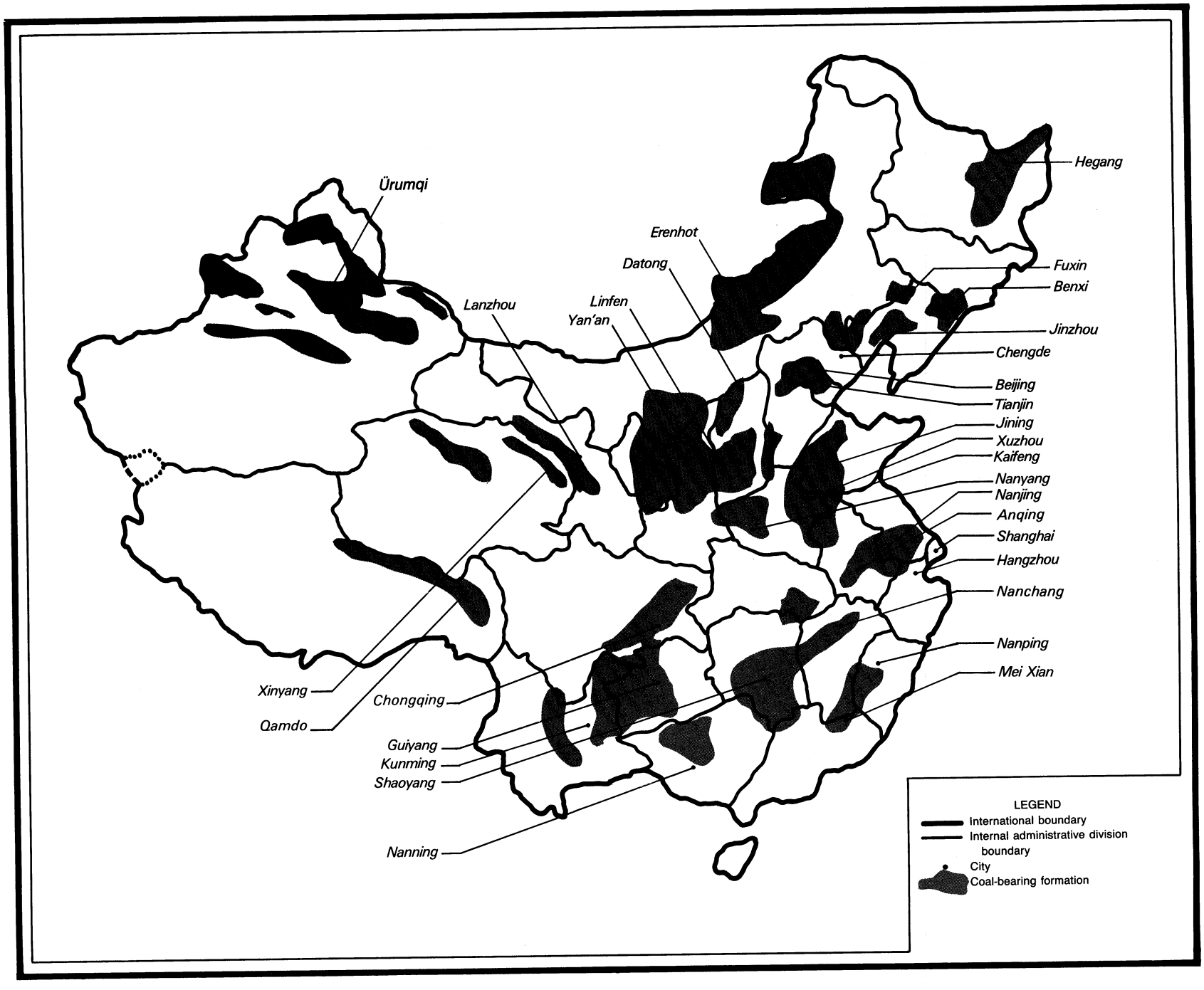
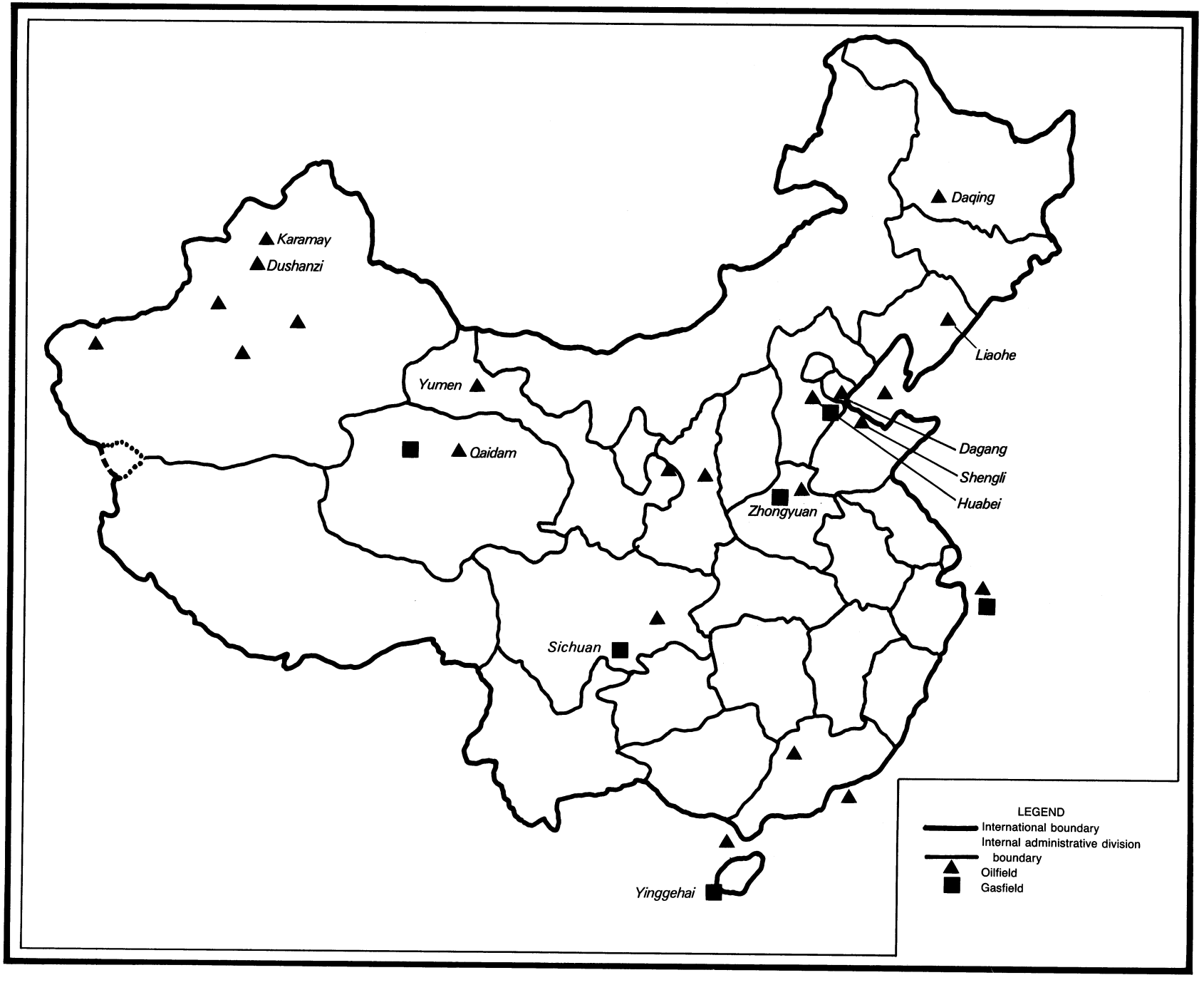
Jinchuan
Changjiang
Mica
Salt
LEGEND
International boundary
Internal administrative division boundary



LOCATION OF MAJOR ORE DEPOSITS AND IRON AND STEEL WORKS IN CHINA



COAL RESOURCES IN CHINA



OIL AND NATURAL GAS RESOURCES IN CHINA

THE MINERAL INDUSTRY OF

CHINA

By Pui-Kwan Tse

The most important change in China's economy in 1992 was that the slow growth that had persisted since June 1989 finally gave way to a new phase of strong economic activity. In 1992, the gross national product increased by 12.8% over that of 1991 and industry output grew more than 20% over that of the previous year. Inflation was officially reported at 5% nationwide, but it ran more than twice or more than that in the largest 35 cities. The most dramatic price increases came from industrial and construction raw materials.

For almost an entire year after the June 4, 1989, Tiananmen crackdown, the Government tried to constrain the development of the private sector, including village and township enterprises (VTE). The VTE were considered the locomotive of growth in the coastal provinces. They were blamed for the increase in inflation and for runaway capital construction because they drew raw materials and other resources away from state enterprises. By late 1991, the state formally declared an end to restrictive and discriminatory measures against private-sector practitioners. Private entrepreneurs would no longer be subjected to political discrimination. The capitalists were recognized as management workers and as such, entitled to the full rights accorded citizens in a socialist state. From 1993 to 2000, the State Council planned to arrange an additional $900 million in loans through the People's Bank of China each year to support the development of township enterprises in the central and western regions of the country.

During the meeting of the 14th Central Committee of the Communist Party of China (CPC) of the National Congress in October 1992, it was declared that China was to change from a planned economy to a socialist market economy. The action will be submitted to the 8th National People's Congress (NPC) in late March 1993 to rectify the change. The socialist market economy being proposed is connected with the ownership system of the country. China has a predominant public ownership and work ethic system for according to work wealth distribution. In the future, China will employ a market mechanism in directing the flow of social resources, regulating production in response to changes in the market, rationalizing the economic structure, improving product quality, and raising efficiency. This was to ensure that its economy develop in the direction of socialism.

China continues to be identified as a Communist country. However, in practice it is increasingly resembling a market economy country. The economic restructuring started when China adopted its open door policy in 1978. Currently, the state sector accounts for only about one-third of economic output. Farming is now mostly quasi-private. Retailing and other service sectors are increasingly privatizing. Even in the industrial sector, state-owned enterprises accounted for only 53% of the output in 1992, compared with about 36% for collectives and 11% for private-owned enterprises. It is expected that the output of state-owned enterprises will decrease to 27% in the year 2000, while that of the collectives and private-owned will increase to 48% and 25%, respectively.

After more than a decade of open door policy, the differences in relations between the state and Provincial government became particularly pronounced after 1989. During the past several years, the debates on the Eighth Five-Year Plan and the Ten-Year Programme provided ample evidence of the tension created between the state and the provinces. One clear example is the transfer of Guangdong's Governor to a state Government position in 1991. This was interpreted as a demotion. The state wanted to control Guangdong. However, the Guangdong Provincial Communist Committee objected to the state appointing an outsider as its Provincial Governor. In recent elections in coastal provinces, Communist party members rejected the state nominated candidates as governors and city managers. Further evidence may be found in the planning process, which was inherently political, with various participants making ambitious claims. There was clearly some hard bargaining on a wide range of issues, but at the end, an agreement was reached, and it was an agreement that does not at present threaten the political system.

China is a large country with poor communications. Regionalization becomes more pronounced when the state government is weak. In the 1980's, the relationship between the state and the Provincial government has been altered significantly by the introduction of new arrangements for revenue sharing. Reforms to the budgetary relationship between state and Provincial government in 1982 and the introduction of a system of revenue-sharing based on taxation in 1988, are generally acknowledged to increase Provincial autonomy in economic development. In recent years, the state has increasingly faced budgetary deficits. The state sector's declining share of output and its poorer economic performance have clearly concerned the central Government in increasing Provincial autonomy. In addition, the

competition between provinces has become fierce. It has become common for provinces to ban imports from other provinces, to levy high taxes on goods whose internal production is seen as important to the domestic Provincial economy, and to create nontariff barriers. Local authorities provided finance assistance to promote a variety of local products. Enterprises from other provinces have difficulty in finding office space, accommodation, or land for their activity. Evidence of both economic protectionism and Provincial automony are apparent in the increased ability of the provinces to resist the state attempts to control their economic activities. In 1991, the state officials emphasized national economic unity, regional economic cooperation, and assistance to poor areas. These three short-term goals were incorporated as guiding principles of the Eighth Five-Year Plan and the Ten-Year Programme.

In 1992, China's open door policy had opened further. China had set the scene for further expansion in contact with the West. At the same time, the country continued its attempt to deepen reform. When Deng Xiaoping visited south China in January 1992, he said "stability without reform is a false stability. Only reform can bring true stability and economic development needs to be hurried up." China wants to ensure that changes take place in a stable environment. There was a deep-rooted economic foundation for the change of direction in 1991 that had resulted in readjustments being made to China's economic policies in 1992. The worsening efficiency of state enterprises and the high waste of energy and raw materials are constraints to improving economic conditions in China. Because of this, China could not expect to sustain a high growth rate over a long period of time even with increasing input of more resources into the economy.

Worsening financial difficulties were another factor to force China into a major policy change. In 1992, the country's official budget deficit was $4.10 billion,[1] excluding a $7.91 billion domestic debt and a $3.68 billion foreign debt. However, the actual deficit was higher due to an ingenuous accounting method. Expenditure items such as the money pumped into failing state enterprises are curiously accounted as revenue. In 1993, the projected deficit was $3.63 billion, excluding a projected $6.43 billion domestic debt and $4.68 billion foreign debt. The Government's financial position could not be improved unless the production value of the enterprises improved their profitability. In addition, conflicts between the state and local governments and between the coastal provinces and the inner provinces were forcing the Government to change policy. If not, this would exacerbate the gap between regions and increase the potential for conflict. When the state was practising austerity, the local government was bent on expansion. There was clearly a divergence of views between the state cadres and local government cadres reflected by economic indicators in the past 3 years.

The speed of China's economic development depends upon the reform of policy breakthrough in state-owned enterprises. State-owned enterprises, especially large and medium enterprises, have to make giant strides toward the end of becoming independent commodity producers and traders. There is inordinate administrative intervention in enterprise management. The enterprises' self-management right exists in name only. Enterprises do not have the power to set prices for their products. Without price-setting power, state-owned enterprises are seriously hampered from fulfilling their production and operation targets. Furthermore, unequal price policies are implemented for different enterprises. Currently, price control on certain commodities applies only to large and medium enterprises. The Government also exercises stricter management control on large- and medium-size enterprises than that on small enterprises. Small enterprises have preferential tax liability. Statistical figures showed that large and medium enterprises' profit rates on capital have continuously declined, and their amount of loss has increased in the past 3 years.

Large- and medium-size state-owned enterprises also bear the burden of providing housing, medical treatment, pensions, employment, and training, as well as building public facilities. Development funds are insufficient and staff wages are relatively low, resulting in a serious drop in quality. Changing the operation mechanism between the Government and enterprises would be necessary to move into a market economy structure.

GOVERNMENT POLICIES AND PROGRAMS

In July 1992, the Government published regulations on the management of state-owned enterprises. According to the regulations, managers of enterprises have the full power to manage the enterprises freely in decisionmaking for production, setting product prices, purchasing raw material, and hiring and firing employees. They have the right to set salaries and distribute bonuses. Enterprises could make their own investment in domestic and international enterprises. In addition, enterprises could engage in direct import for their raw materials, as well as export their products. The enterprises must assume sole responsibilities for their profits and losses. The Government will coordinate, supervise, manage, and offer services to enterprises. If the Government violates the regulations, the enterprise could register a complaint or file a law suit.

China planned to overhaul the Government structure by cutting 8 million of a total of 34 million Government employees and 9.2 million party employees and bureaucrats. The plan includes abolishing a number of ministries, bureaus, and departments and creating new institutions to replace them. The most important aim of the restructuring, apart from reducing the number of employees, was to strengthen policymaking departments at the center.

It will remove those sections of the bureaucracy engaged in commercial activities into decentralized corporations. According to the Minister of Personnel,

the mass layoff would not spawn unemployment. Redundant staff would find work in other "independent companies" such as the service sector that was created by ministries, bureaus, and departments to absorb overstaffing. The Government will strictly enforce mandatory age retirement. The Government planned to use committed funds to increase wages to stop the loss of talented management and technically skilled personnel to the private sector. Beginning in 1993, the start of reform of the personal income system, enterprises and institutions could tailor the wage system according to their needs. The Government indicated that an appropriate income gap is needed to stimulate competition.

Quality control management remains poor in China. The State Technical Supervision Bureau officials inspected 1,900 kinds of products and found more than 30% did not meet a satisfactory grade. Many managers were found to have ignored or were not aware of state quality standards. Factories continued to produce substandard products.

Reforming the current pension system has been proposed by the 14th CPC meeting. Under the current system, the Government is responsible for supporting all retired Government employees. The proposed new pension program requires all Government employees to contribute a share of their salary into a pension fund. However, the current pension distribution system for employees that are retired will not be affected by the new program. The Government believed that the new program will help to improve the national economic development and cut down the budget deficit. The total number of retired Government exployees is expected to exceed 10 million by the year 2000.

In addition, the Government is pressing employment reform, breaking the "iron rice bowl" of guaranteed jobs and benefits and maintaining the unemployment rate at 3.5% in the urban areas. It will require extraordinary Government efforts to hold the 3.5% jobless rate over the coming years. China had an unprecedented surge of urban jobseekers and an unavoidable reduction in current jobs in state-owned enterprises reform. During the next several years, about 36 million urban youths will be looking for jobs. Another 100 million farmers will be freed from rural areas either because of losing land to urban expansion or improved farming technology.

The State Tax Bureau of China announced a reform on the taxation system in the country. Income tax for state-owned, collective-owned, and private enterprises would be merged into a single tax bracket (33%) for all domestic enterprises. Value added tax would be applied universally in industrial and commodity wholesale and retail sectors. A tax would be imposed selectively on a limited number of products and on businesses in the service sector, excluding commodity trade. Taxes also would be levied on the recovery of petroleum, metallic, and nonmetallic minerals. At the same time, a new system would be introduced to enlarge the scope of local taxes and strengthen revenues to promote development of local economies.

China planned to divide the 30 provinces, municipalities, and autonomous regions into 10 major economic areas. Each economic area will launch key projects for development suited to the needs of each region. The northeast area is made up of Heilongjiang, Jilin, Liaoning, and the eastern part of Nei Mongol. It will become the largest heavy industry base and the most important production center for agriculture, forestry, and animal husbandry.

The north China Bo Hai area comprises the cities of Beijing and Tianjin and the Provinces of Hebei and Shandong. It will focus on the development of technology-intensive industry. It also will become a key production base for sea farming and cotton planting.

Chang Jiang (Yangtze River) Delta Area consists of Shanghai and the Provinces of Jiangsu and Zhejiang. It will become a high-technology development area. It will be China's banking, trading, and information service center.

The Chang Jiang Mid-Reaches Area is composed of the four Provinces of Anhui, Hubei, Hunan, and Jiangxi. These provinces will turn the river into an economic corridor with heavy-duty transport and key agricultural production base.

The Chang Jiang Upper-Reaches Area is made up of Guizhou, Sichuan, and Yunnan Provinces. These will build a base for energy-intensive industries. Efforts also will be made to promote the development of agriculture and forestry.

The south China coastal area includes the Provinces of Fujian, Guangdong, Guangxi, and Hainan. It will focus on the development of an export-oriented economy base.

The Huang He (Yellow River) Mid-Reaches Area is composed of the Provinces of Henan, Shaanxi, Shanxi, and the central and western parts of Nei Mongol. It will become China's largest development base for coal and mineral resources.

The Huang He Upper-Reaches Area consists of Gansu, Qinghai, and Ningxia. It will be developed into a production base of hydroelectric power and raw materials. Food and animalfeed industries will be expanded there.

The Xinjiang Development Area will tap the resources of agriculture and animal husbandry. It also will become a center for a petroleum industry.

The Xizang Special Area will need support from the state to speed up infrastructure construction to become an economic development zone.

PRODUCTION

The growth in demand for consumer products was slower compared with industry growth, although the growth rate in the retail sales volume was 14.3% in the first 8 months of 1992. After adjusting for the inflation rate of 6%, the actual growth rate was less than 10%, which was far slower than the industrial growth rate of 20% in the same period. Also within the same time, investment in fixed assets within the state-owned sector

soared 36.4%, which pushed industrial growth into double digits. The consumption of durable electrical appliances has approached the saturated point in most urban areas, especially in the coastal regions. Houses and cars will be the next sought after items in these regions. However, these commodities cannot be easily purchased by ordinary households because of the limitation in household income. Therefore, people deposited their money into bank saving accounts. Even though the People's Bank of China cut its interest rates several times, it failed to lure more money into the market. People in Guangzhou, Shenzhen, and Shanghai deposited their money in bank foreign currency accounts in the bank because they feared the devaluation of renminbi (RMB).

Currently, China's industrial growth exceeded what was anticipated. The construction sector was expanding rapidly. Steel products used for construction purposes are in great demand, and prices have gone up by a large margin. In addition, the promotion of housing reform in various localities, recontruction in the disaster areas that occurred in 1991, and the building of water conservancy work are also added to the growing demand of steel products for construction. Because the prices of iron ore, coal, petroleum, and railway fare have increased, the production cost for steel has increased correspondingly. According to a survey of mechanical and electronic, light industry, coal, railway, and petroleum departments, which consumes more than 40% of the country's total steel production, demand for steel products for these five departments increased by 7% in 1992. The total domestic steel products consumption was estimated at 65 million tons in 1992.

In 1992, China produced 3 million tons of cold-rolled steel plates. Of this, the Baoshan Iron and Steel Work (Baogang) turned out 1.3 million tons, the Wuhan Iron and Steel Co. (Wugang) produced 600,000 tons, the Anshan Iron and Steel Co. (Angang) produced 700,000 tons, and the Yichang Co. in Shanghai produced 120,000 tons. However, China required 3.5 million tons of cold-rolled steel plates. Domestic producers mainly produce cold-rolled steel plates more than 1 mm thick. China can only produce less than 200,000 tons of less than 0.5- to 0.6-mm-thick cold-rolled steel plates. More than 500,000 tons of this specification must be imported, mainly from Japan. Currently, the domestic market price for 0.5- to 0.6-mm cold-rolled steel plates is $520 per ton, which is much higher than that of the imported price of $420 per ton and the state price of $245.

China planned to produce 381,000 tons of galvanized plate in 1992. Because of the innovation of its equipment, the output of Wugang was reduced from 188,000 tons in 1991 to 170,000 tons in 1992. Baogang and the Shanghai Metallurgical Bureau produced 200,000 tons and 11,000 tons, respectively. However, the estimated consumption of galvanized plate was 550,000 tons in 1992. The balance came from imports from Brazil, Japan, the Republic of South Korea, and European countries.

Wugang is the sole producer of cold-rolled silicon steel sheet in China. It produced 120,000 tons in 1992. Consumption was about 240,000 tons of cold-rolled silicon steel sheet in 1992. China continued to import cold-rolled silicon steel plate to meet its demand.

The Ministry of Metallurgical Industry (MMI) planned to advance its iron and steel enterprises into a self-sufficiency stage to meet the demand of iron and steel by the late 1990's. First, two new factories will be under construction in Shangdong Province in the 1990's. Second, the Ministry will continue to organize and develop enterprise groups. The Ministry will support and promote the development of Angang, Baogang, Shoudou Iron and Steel Corp. (Shougang), and Wugang enterprises into a stock sharing system held by legal persons and workers within the enterprises. Third, under the guidance of a unified state plan, the Ministry intends to coordinate with related departments and/or ministries to adopt the method of integrating the adjustment of price, merge the two price tracks, and decontrol the price and management within the enterprises. It gradually will reduce the number of iron and steel products produced under the mandatory plan and develop into a full market economy.

In 1992, China's supply of copper continuously fell short of demand; therefore, China has banned exporting copper metal and its alloys beginning in 1993. The booming industry demand for copper led to the import of more than 200,000 tons of copper ore in 1992. In addition, the country also imported more than 400,000 tons of copper and its alloys during the year. In the second half of 1992, the demand of copper became very tight because the price hike in the world market restrained the import of copper to a certain degree. In addition, the expansion of automotive, machine building, and electronic sectors increased copper use.

After lifting the restriction of aluminum use for doors and windows, the volume of aluminum consumption increased dramatically. In 1992, the target for aluminum output was set at 950,000 tons. In the first half of 1992, even though the output of aluminum was up 28% compared to that of 1991, the supply still fell short of demand. By the end of June 1992, the stock held in major aluminum plants had been depleted. The domestic market price of aluminum was up as high as $2,500 per ton in July 1992 and maintained at about $2,200 per ton the remainder of the year. The rapid growth of the real estate industry in the coastal areas and newly open inland regions expanded the use of aluminum.

The production of lead exceeds domestic demand. The lead market was sluggish in China. Zinc consumption rose markedly and the zinc market price was rising in 1992. The supply of zinc remained balanced throughout the year. The domestic zinc market price maintained at $1,400 to $1,550 per ton.

Nickel used by the metallurgical, light, and machine-building sectors rose slightly. The stocks held in Jinchuan decreased. However, the domestic market price of nickel remained constant at about $12,000 per ton throughout the year because China imported nickel to

remedy the gap between supply and demand.

TRADE

Beginning in 1992, China has adopted plans to bring its foreign trade policy into closer compliance with international standards and to reduce import restriction. On January 1, 1992, China adopted the Harmonized Commodity Description Coding System, which is used by the United State and 60 other countries in reporting exports and imports. On April 1, China eliminated its import regulatory tax, a separate surcharge imposed over and above applicable tariffs. At the same time, it lowered tariffs on 225 commodities. The Government indicated it was to eliminate import licensing, a highly restrictive system. It also indicated that it will publish trade regulations on both existing and new laws on trade and investment.

Chinese officials repeatedly have stated their objective in moving ahead with trade reforms to gain admission to the GATT. The reforms were also steps toward meeting the U.S. demands under a market-access investigation intitated in October 1991 under section 301 of the Trade Act of 1974. China's total foreign trade amounted to $165.5 billion in 1992, an increase of 22.1% over the record $135.7 billion in 1991. Exports expanded by 18.2% to $85.0 billion, and imports grew by 26.3% to $80.6 billion. As a result of the large increase in imports relative to exports, China trade surplus declined from $8.1 billion in 1991 to $4.4 billion in 1992. Another factor for the decline in the trade surplus was that the official renminbi (RMB) exchange rate was gradually depressed in 1992. According to the exchange quotations published by the State Administration of Foreign Exchange Control, the RMB-US$ rate was 5.85 in December 1992, compared with 5.42 in August 1992. In the foreign exchange centers, where buying and selling hard currencies are under Government supervision, the rates fluctuated between 7.2 to 7.4. The trading of the U.S. dollar and the Hong Kong dollar has been very active, and the rate of US$ vs RMB was 1:8 to 9 in the black markets of Shenzhen, Guangzhou, Shanghai, and Beijing.

Hong Kong continued to be China's largest trading partner in 1992, in part because Chinese statistics do not take into account its entrepot role. China considers transshipment through Hong Kong as part of its total trade with Hong Kong. On the other hand, the United States counts these transshipments through Hong Kong as trade with China, resulting in a wide discrepancy between United States and Chinese statistics. China reported exports of $8.6 billion to the United States in 1992 and imports of $8.9 billion from the United States, resulting in a bilateral trade deficit for China of $0.3 billion. The United States reported exports to China of $7.3 billion and imports of $25.5 billion from China for a U.S. trade deficit with China of $18.2 billion.

As the result of gradual reforms, China's foreign trade is largely decentralized with most operations handled by more than 4,000 trading companies scattered throughout the country. With the exception of 16 commodities that are handled by state-owned companies, state controls on exports have been largely eliminated. All state subsidies to promote exports were discontinued in 1991. But some Provincial and local governments continue to provide incentives to encourage production for export, such as tax preferences and access to raw materials at lower cost.

STRUCTURE OF THE MINERAL INDUSTRY

All Chinese large minerals and metals enterprises are stated-owned. However, there is considerable overlapping of authority over various mineral and metals commodities. MMI is responsible for barite, iron, iron ore, manganese, and steel production, as well as some magnesite and dolomite mines and plants. The China National Nonferrous Metals Industry Corp. (CNNC) is in charge of nonferrous metals and byproduct output of bismuth, gold, and silver. Gold production is under the supervision of the China National Gold Corp. The Ministry of Chemical Industry has responsibility for boron, chemical fertilizers, phosphate, potassium, salt, various inorganic salts, and sulfur. The China Nonmetallic Mineral Industry Corp. is responsible for mines and processing facilities operation for a wide array of industrial minerals and its subordinate processing enterprises. The State Administration of Building Materials is responsible for cement, dolomite, limestone, sand and gravel, and stone aggregates used for construction. For the energy sector, Ministry of Coal Industry (coal), China Oil and Natural Gas Corp. (onshore oil and natural gas), China National Offshore Oil Corp. (oil and natural gas), and China National Nuclear Corp. (uranium) are responsible for all aspects of energy exploration, production, or mining.

COMMODITY REVIEW

Metals

China's nonferrous metals industry plans expansion in the next several years. It is expected that national laws would be changed to allow foreign investors in the exploration and development of China's minerals. Chinese officials hoped that foreign aid would provide the additional resources needed to support a booming economy. The existing mining regulations adopted in 1986 are strongly nationalistic and not incentive to investment. Chinese authorities planned to change the regulations to link development with exploration and to shift to international outlook because China had neither the funds nor the advanced minerals treatment technology required. The priority minerals included those for coal, copper, diamond, possibly gold, iron, lead, rare earths, uranium, and zinc. Under the current regulations, gold information is considered a state secret. Chinese Government does not reveal its geological reserves of gold nor statistical data on gold production. However, this may change if certain gold deposits need high technology and funds for

development. In the past two decades, China devoted more than 50% of its mineral exploration and development funds to search for gold.

In the revoke of the change, Broken Hill Proprietary of Australia signed an agreement with Chinese officials to investigate a lead-zinc deposit in Sichuan Province.

China opened a second metals exchange in Shanghai in May 1992. The Shanghai metal exchange is under the supervision of both the Ministry of Materials and Equipment and the Shanghai People's Government. The deputy mayor of Shanghai holds the post of chairman of the management committee of the exchange. It is expected that the exchange will be used mainly as a market for sales and purchases between China's domestic producers and consumers, at least in the initial stage. The Shanghai metal exchange lists seven metals for trade—aluminum, copper, lead, nickel, pig iron, tin, and zinc. The unit measurement is "shou," which is 5 tons of aluminum, copper, lead, or zinc, 2 tons of nickel or tin, or 25 tons of pig iron.

The State Council and Ministry of Foreign Economic Relations and Trade approved the formation of a joint-venture company, China National Tungsten and Antimony Import Export Corp., by China National Nonferrous Metals Import and Export Corp. (CNIEC) and China National Metals and Minerals Import and Export Corp. (Minmetals) in 1993. Tungsten will be controlled from the ore stage to hard alloys, and antimony will include ore, metal trioxide, and sulfide. The joint venture was to clamp down on illegal exports.

Aluminum.—In June 1992, CNNC merged Zhengzhou Aluminum Plant, Zhengzhou Light Metals Research Institute, Zhongzhou Aluminum Plant, and Mining Co. to form China Great Wall Aluminum Corp. One large aluminum corporation would strengthen the coordination of the Henan Provinces's aluminum industry and would eliminate the intraprovincial and interprovincial competition for raw materials between the two large aluminum plants, Zhengzhou and Zhongzhou.

The first phase of construction of the Zhongzhou Aluminum Plant in Jiaozuo, Henan Province, was completed in 1992. Trial runs of the plant began, and the plant was expected to be in full operation in early 1993 with a capacity of 200,000 mt/a of alumina using a sintering process. The second phase was in the planning stage. It will use the Bayer process to output 400,000 mt/a of alumina. The ultimate goal was to output 1.2 Mmt/a of alumina in the year 2000.

In 1991, Guizhou Aluminum Plant produced a total of 79,000 tons of aluminum. In 1992, Guizhou Aluminum Plant completed the construction of its combination-mixing process plant and its second 160,000-ampere potline using prebaked anodes with an annual capacity of 80,000 tons of aluminum. Output was expected to be 100,000 tons of aluminum in 1992. The first potline using Soderberg anodes was retired because of excess fluoride emissions. It will be replaced by a 180,000-ampere potline using prebaked anodes with an annual capacity of 120,000 tons of aluminum.

Copper.—China North Industries Corp. signed an agreement with Philcopper Gold Mining Co., Philippines, that would guarantee the purchase of part of Philcopper's future copper production. Under the agreement, China will buy 30% of the future copper concentrate with contained gold, silver, pyrites, and rare metals for a period of 30 years. The two sides also are negiotiating a loan package to finance a joint venture for a copper and gold beneficiation plant. An agreement was being based on the exchange of Chinese mining and milling equipment for copper concentrate for a period of time.

Japan agreed to spend $16 million during the next 6 years for China to look for copper deposits along the Chang Jiang. It includes geological studies and drilling. The study will cover two regions, each about 1,000 km^2, one near Kunming in Yunnan Province and the other in Xian in Shaanxi. The project is expected to start in June 1993.

The third stage of construction of Jiangxi Copper Corp.'s Dexing copper mine is under way. After completion, the mine would have a daily capacity of 90,000 tons of ore by 1996. Also, the extension of the Guixi smelter is under construction. After the completion, smelter capacity will increase from the current annual level of 110,000 tons to 200,000 tons in 1996.

CNNC reached an agreement with Udokan Mining Co. (UMC) of Russia with Chita Minerals Co. (Hong Kong-based company) owned 45%; Andrei Chuguyevsdy's Arter Group, 35%; the Chita Geological Committee, 15%; and the Chita government, 5%, on the construction of a large copper mine in the Chita region of Russia. Copper content of the ore is more than 1% and ore reserves are estimated at least 1.2 billion tons. Under the agreement, UMC will sell no less than 260,000 tons of 400,000 tons of refined copper yearly for 25 years to CNNC when it comes on-stream in 1997. The concentrate will be shipped by the Baikul-Amur railway from Udokan to China. A smelter will be built specifically to treat the high sulfur concentrates. The $1.74 billion project will be financed by the Bank of China, Outokumpu of Finland, and General Electric of the United States.

Iron and Steel.—The iron and steel industry produced 72 Mmt of pig iron and 80 Mmt of crude steel in 1992. China plans to speed up the construction of large- and medium-size iron and steel projects and to continue the expansion of iron ore mining capacity to meet demand because of increased output and the variety of ferrous products. MMI is investing a large sum in iron ore mining. MMI is looking for foreign partners in the next several years to maintain a stable growth in the iron and steel industry. MMI planned to spend $1 to $1.2 billion or 20% of the total capital investment in the iron and steel industry to renovate old mines with latent production capacity and build new mines such as the Nanfen Mine in Benxi, Jian Chan in Taiyuan, Shuichang in Beijing, Bayanobo in Nei Mongol, and Qidashan in Anshan in

1995.

In 1992, China imported about 25 Mmt tons of iron ore, mainly from Australia, Brazil, and India. The total output of iron ore was 197 Mmt, which accounted for only 70% of the country's need in 1992. Most of the iron ore used by Baogang, Chongqing Iron and Steel Works, and Wugang is imported. Even after the completion of the new mines, the output of iron ore still would not be able to meet the rising demand by the steel industry. China expected to import annually more than 50 Mmt tons of iron ore in the Ninth Five-Year Plan (1996-2000). At the same time, China is focusing efforts on developing mines overseas. Delegations and research teams have been sent to Brazil, India, Peru, Russia, and Vietnam to pursue the possibility of setting up a joint venture to mine iron ore in these countries. Average iron content in ores produced from mines of these countries is about double those in China, which averages only about 30% iron content.

China's four largest steel producers have set their target of producing 10 Mmt/a of crude steel: Angang and Shougang by 1994, Baogang by 1998, and Wugang by 2000. The Ministry planned two 10-Mmt/a greenfield construction projects. One is Qilu Iron and Steel Corp. at Jining, Shangdong Province. The investment will come mainly from Shougang, while the state and Shangdong Provincial government will contribute some money. The output capacity of the complex was to be 5 Mmt/a of steel in 1997 and reach 10 Mmt/a in the year 2000. Jining is about 323 km west of Shijiusuo, which has two 100,000-ton berths. Reserves of iron ore deposits in Zhangjiawa, Hanwang, Changzhe in Shangdong Province and Huoqiu in Anhui Province are about 1.7 billion tons. Jining is a major coal production center. The second is a joint venture between China and Japan at Shijiusuo in Shangdong Province that has been on hold since its the announcement in 1991.

Guangdong Provincial Planning Commission is seeking foreign cooperation to build the 10 Mmt/a Zhanjiang Steel complex at Donghai Dao in Zhanjiang Shi by 2010. The joint venture will have the Guangdong Provincial government and Baogang as partners. Foreign investment will be at least 49% of the total investment. Contruction of the project will be in three phases, and the first phase construction was to get under way in 1995. Ore used by the complex will come from Australia, Brazil, India, and local mines.

In 1979, Shougang signed a contract of responsibility agreement with the state Government. According to the agreement, the corporation will increase profits delivered to the Government by 7.2% annually and overall profits by 20% each year. Of the profits the corporation retained, 60% will be used in expanding production, 20% in increasing employees' wages and bonuses, and the rest for collective welfare. In 1992, the corporation used the expanding production fund to acquire domestic and overseas enterprises.

Shougang ranked fourth in sales volume of China's biggest industrial enterprises in 1991. In 1992, the corporation had received approval from the State Council to set up joint equity and cooperative projects, each with an investment of less than $100 million abroad and $200 million in the country. It also received approval to set up a bank with its financial system and business as the same as those of the China Trust Industrial bank and to establish an international trade and engineering corporation. It also empowers sending personnel of the corporation abroad and invitating foreigners to work in China.

In October 1992, Shougang agreed to pay $312 million to purchase the Hierro Peru Iron Mine in Peru. Under the contract, Shougang agreed to pay $120 million in cash, invest $150 million over the next 3 years, and assume $42 million of Hierro Peru's debt. The corporation also has discussed the possibility of increasing the investment to $300 million, which would include building a steel plant at the port of San Nicolas. Shougang planned to increase the current mine annual output level of 2 Mmt to 10 Mmt and possibly to 15 Mmt. The mine has estimated iron reserves of 1.4 billion tons with an iron content of 51% to 57%. The corporation considered the investment in the Hierro Peru Iron Mine would be cheaper than importing the same amount of ore from Australia. In 1992, China purchased more than 300,000 tons of iron from the Hierro Peru mine.

In November 1992, Shougang purchased a U.S. steel mill owned by California Steel Co. The corporation will dismantle the plant and ship it to China for reassembly in Jining, Shangdong Province, as part of the first phase of construction of the Qilu Iron and Steel Corp.

Shougang also invested $20 million to buy 51% of the stock of Tung Wing Steel (Holdings) Ltd. in Hong Kong. Tung Wing is a steel products dealer that is involved in trading, warehousing, and transport. The company's steel trading accounts for more than one-third of Hong Kong's total. Tung Wing would act as an arm for Shougang's import and export of steel products in and out of China.

Besides acquiring international enterprises, Shougang also added two domestic firms under its aegis. Shougang acquired No. 4 Metallurgical Construction Co. in Guixi, Jiangxi Province, and No. 10 Metallurgical Construction Co. in Huayin, Shaanxi Province, which were formerly under China National Nonferrous Metals Industry Corp. Shougang will be responsible for paying debts while accepting all 16,000 employees into Shougang's staff. In December 1992, Shougang opened its own bank, Hua Xia Bank, in Beijing. The bank was registered a capital of $174 million. The bank will conduct all the business as approved by the People's Bank of China and the State Administration of Exchange Control, as with other banks in China.

To improve productivity, Wugang planned to cut two-thirds of its 120,000 workers. If the targets are reached, the per capital output of iron and steel will be raised from 40 to 200 tons. This will enable the company to compete in the worldwide market. In the beginning of 1992, the company formed four

subsidiary companies specializing in mining, equipment, manufacturing, and services. These companies absorbed 50,000 of the laid off workers. The service company is expanding its business into real estate, fast-food machinery, and hotel management, and hopes to hire another 20,000 workers at the end of 1993.

Nippon Steel of Japan agreed to assist Wugang to build another electrical silicon sheet mill by doubling its silicon sheet production capacity from its current 100,000-mt/a level. Nippon Steel helped Wugang to build an electrical silicon sheet mill in 1979. An international bank group, including banks from Spain, France, and the United Kingdom, signed a contract for a $160 million syndicated loan to support the construction of the No. 3 steel plant for Wugang. The company will use export credit to purchase advanced equipment and technology from these countries.

Baogang and the Shanghai Iron and Steel Co., a steel products enterprise, merged in 1992. Baogang now has the capacity to produce 11.71 Mmt of steel. Coupled with the completion of a third phase construction project in 1998, steel output by Baogang will reach 15 Mmt/a. The major reason for the merger was to unify overall planning in the development of the steel industry in Shanghai. Baogang will be responsible for the overall planning and production by Shanghai Iron and Steel Co.

Kaiser Engineers completed a prefeasibility study on a gas-based direct-reduced-iron plant in Western Australia's Pilbara region for a Sino-Australia joint-venture project. The project intends to produce 2 Mmt/a of direct-reduced iron; 50% of the output will be shipped to China. The project was estimated to cost about $1.1 billion.

Lead and Zinc.—Asia Minerals, a private company in Vancouver, Canada, signed an agreement with Chinese authorities to acquire up to a 60% equity in the Qiandongshen lead and zinc project in Shaanxi Province. Asia Minerals retained Cominco Engineering Services to complete a feasibility study on the project. The deposit is believed to have a total reserve of 12 Mmt, including 6.4 Mmt grading 1.6% lead, 8.3% zinc, and 23 g silver per ton. Drilling indicated that there was a potential for a further 5 to 6 Mmt of similar grade reserves. Capital costs were estimated at $28 million, allowing for a capital payback of 2.5 years from startup. The mine will have an output of 1,200 mt/d of ore. Mine life was estimated at 17 years.

Construction of the opencast Lanping lead and zinc mine, Yunnan Province, began in 1992. The mine has verified reserves of 14.3 Mmt of lead and zinc. Ore content is 85% zinc, grading 9.63%. Apart from lead and zinc, the ore also contains cadmium, silver, and thallium.

Other Metals and Minerals.—Sichuan Rare Nonferrous Metal Corp. discovered a primary tellurium deposit in Anshun, Shimian Xian, Sichuan Province. According to laboratory results, the tellurium content ranges from 1% to 12%, reaching as high as 36%. The ore also contains 3% to 20% bismuth. Exploitation of the deposit, which covers about 50 km, began in April 1992 and is expected to produce 8 to 10 tons of refined tellurium per year.

After 3 years of construction, Shouguang Xian of Shandong Province became China's largest bromine production base. There are nine bromine plants with an annual production capacity of 7,000 tons in Shouguang Xian. The Xian accounts for about 80% of the country's total bromine production.

China discovered a strontium sulfate deposit in Qaidan basin in northwest Qinghai Province. The main lode is more than 10 km long, 100 to 600 m wide, and 1 to 11 m deep. The verified reserves of strontium sulfate are more than 5 Mmt. The ore body is amenable to opencast mining.

Du Pont signed an agreement with the Ministry of Chemical Industry in October 1992 to conduct joint research, developing new products and marketing, management trading, and setting up joint ventures. The major co-operative fields include chemical fertilizers and polymer products.

Mineral Fuels

In 1992, the total energy output, in terms of standard fuel equivalence,[2] was up 1.8% from that of 1991. By sector, coal accounted for 1.11 billion tons, up 2.1%; crude oil, 142 Mmt, up 0.5%; and natural gas, 15.7 billion m^3, up 0.2%. China's first nuclear powerplant with a capacity of 300 MW, at Qinshan, Zhejiang Province, began trial operation in December 1991. It was expected to reach full capacity and begin commercial operation in 1992. However, since startup, the plant has run into many technical problems and has operated at about 50% of its capacity.

The state government planned to invest $12.5 billion in the energy industry in 1993, up 44.4% over that in 1992. Provincial governments are expected to invest an additional $6.5 billion into the energy sector. Of the total investment, $2.8 billion will be used in coal mines to increase the country's output by an additional 30 Mmt in 1993 over that of 1992. About $9.2 billion will be channeled into electricity production and transmission, including $5.5 billion for hydropower, $2 billion for thermal power, and the remainder for the electrical transformation projects. The petroleum and natural gas sectors will receive about $7.2 billion for their respected projects to increase the production of oil by 16.5 Mmt and gas by 500 Mm^3.

Because of the low selling prices for power, backward production technology, and high cost of energy production, coal enterprises alone lost $2.1 billion. Oil enterprises also recorded an overall loss of $1.75 billion in 1992. To help these enterprises to survive, the state government gave $1.9 billion to subsidize them. To recoup some of the losses, these enterprises are looking for co-operative projects, including mining and prospecting in Southeast Asian countries and the former U.S.S.R.

China planned to open two petroleum trade centers in Nanjing, Jiangsu Province, and Shanghai in 1993. The Nanjing trade center will have 49 members, including domestic and foreign

firms, and will go into operation in March 1993. The Nanjing trade center was jointly established by China Offshore Oil Co., China Oil and Natural Gas Trading Co., China Petrochemical Trading Co., and a Hong Kong company. The center will be managed by two Hong Kong-based companies—Hong Kong Futures Exchange Ltd. and Standard Capital International (Holdings) Ltd.

Coal.—In 1992, mine accidents killed more than 1,000 coal miners in 51 major disasters in China, an increase of 24.9% over that in 1991. The Ministry of Labor and its local bureaux have vowed to strengthen mine safety supervision and inspection. The Ministry is drafting detailed regulations to help implement China's first law on mining safety. The law was approved by the Standing Committee of the National People's Congress in 1992 and will be implemented in May 1993.

China is the world's largest coal producer, but its coal is being used inefficiently and with no environmental controls. The British Government's Overseas Development Administration awarded a contract worth $1.7 million to a British Coal consortium to investigate coal used in power generation, industry, and in homes; coal carbonization to produce gas; wastewater treatment and reuse; computer modeling of energy use; and investment finance and training in Taiyan Shi, Shanxi Province. This project has the potential to be of enormous benefit to the environment. Recommendations will be put forward in Taiyuan, and they will be used as guidelines in 30 other cities in China.

China National Coal Corp. (CNCC), China Northeast and Nei Mongol Coal Corp. (East Coal), and China National Local Mines Corp. (CGCC) are three major corporations involved with coal production in China and are administrated by the Ministry of Energy. In the restructuring ministries and commission of the State Council during the eighth NPC conference, the Ministry of Energy was abolished and replaced by the Ministry of Coal Industry and the Ministry of Power Industry. The general manager of CNCC became the Minister of the Ministry of Coal Industry.

In China, coal enterprises employed a total of 7.6 million people to produce 1.1 billion tons of coal in 1992. With such a massive work force, it is difficult to cut production costs and raise efficiency. Therefore, CNCC planned to close 30 inefficient mines in 1993 and was expected to lay off more than 30,000 workers and shift 70,000 people to its noncoal subsidiary companies. The corporation employed more than 3 million people and produced more than 370 Mmt of coal in state-owned mines in 1992. The corporation hopes to move a total of 400,000 workers out of coal mining by the end of 1995. CGCC also was to tranfer about 400,000 redundant coal miners to other industries in the next 3 years to improve efficiency. It will build 100 coal mines that can produce 30% of its existing total output. The corporation also is trying to develop an international coal market. CGCC produced 365 Mmt of coal in 1992 and vowed to shut down inefficient and unprofitable coal mines. East Coal also is planning a massive layoff to increase efficiency.

China has completed its prospecting study on the large Dabaodang Coalfield, near Yulin Shi and Shenmu Xian, in the northern part of Shaanxi Province. The field has a proven reserve of 24.8 billion tons of high-grade coal, and about 80% of the reserves were buried less than 600 m below the surface. It is suitable for large-scale mechanized mining. The overall development plan is under draft. The Shaanxi Provincial government invested more than $12.5 million in the construction of a methanol plant, with a designed annual output of 300,000 tons, to utilize its rich natural gas resources in the Yulin area. The new coalfield, the Shenfu Coalfield, and the natural gas project are expected to help in developing the region's economy.

Shanxi Province, the leading coal producer in China, planned to exploit coal deposits in the Luliang Shan area. The plan calls for the completion of the Liliu Mine in the year 2005. The mine is expected to have an annual production capacity of 15 Mmt of coking coal. The Liliu Mine covers five xians in Luliang Prefecture. There is a coal-bearing area of 4,842.5 m^2 with an estimated coal reserve of 50 billion tons with low ash and sulfur content. Construction of the 116-km Liliu railway began in 1986 and was completed in November 1992. Other infrastructual facilities being built include an expressway, a powerplant with a capacity of 1.2 MkW, a fiber-optic cable between Taiyuan, capital of the Province, to Lishi, and a coal dressing plant.

CNCC and the Shanghai government are preparing to set up a coal trading center in the Pudong area. In the first stage, only spot trading will be permitted. Future trading is expected to start later. Trading policies include contract trade, market prices, and commissions, allowed by market members.

Petroleum.—China's oil sector is eager to raise output and tap potential reserves. With the approval of the Government, China National Petroleum Corp. (CNCP) announced it is opening inland areas to foreign oil companies for exploitation. China opened the Nan Hai (South China Sea) and Bo Hai to foreign oil exploration and development 14 years ago, followed by the opening of 11 provinces in south China 5 years ago and the Dong Hai (East China Sea) in 1992.

The newly opening areas include nine provinces and autonomous regions and one muncipality in northern China—Hebei, Henan, Hubei, Gansu, Nei Mongol, Ningxia, Qinghai, Shandong, Xinjiang, and Tianjin Shi. The area covers about 420,000 km^2, and the untapped resources in those areas are estimated to be 8.2 billion tons of oil and 2.5 trillion m^3 of natural gas. The bidding areas for enhancement of oil recovery include 14 blocks in 10 oilfields of Daqing, Dagang, Henan, Huabei, Jianghan, Jiangsu, Jilin, Liaohe, Shengli, and Zhongyuan. The bidding on the southeastern part of Tarim Basin, Xinjiang Uygur Zizhiqu, is expected to begin in March 1993. This section divided into five blocks covering 72,730 km^2. Construction of roads through the deserts of Tarim Basin is expected to be completed within years. Foreign

companies that are to undertake risk exploration will share oil reserves. CNCP stressed that contracting on joint oil development between China and foreign companies will comply with international conventional standards. Other areas are expected to be open for bidding in early 1994.

Chinese geologists estimated total oil reserves in the Tarim Basin at 10 billion tons. CNPC spent more than $20 million drilling discovery wells in the past 2 years. In 1991, CNPC signed an agreement with Japan National Oil Corp. to explore an area of 30,000 km^2 in the southwestern part of Tarim Basin. In 1992, the corporation signed an agreement with Exxon of the United States to act as technical contractor for exploration work in Xinjiang. The Chinese Government also is putting a considerable effort into developing infrastructure in the area. Getting the oil from Tarim Basin to the marketplace requires the construction of a pipeline to the eastern part of China.

China Offshore Oil Nan Hai East Corp., a subsidiary of China National Offshore Oil Corp. (CNOOC), planned to develop nine offshore oilfields in the next 5 years to achieve annual production of 7 Mmt/a by 1997. In 1992, the two offshore oilfields, Huizhou 21-1 and Huizhou 26-1, produced 2.58 Mmt of oil, accounting for two-thirds of China's offshore output. About 40% of the crude oil was exported. Lufeng 13-1 is expected to be put into production in August 1993. The oilfield is a joint venture between CNOOC and the JHN (Japan Petroleum Exploration Co., Huanan Oil Development Co., and Nippon Mining Co.) oil group of Japan. Xijiang 24-2 and Xijiang 302 are scheduled to be in operation in 1994. These two oilfields are a joint development among CNOOC, Philips Petroleum International Corp., Asia, and Pecton Orient Co. of the United States. Other wells that are under development are Huizhou 32-2 and Huizhou 32-3 by ACT [Agip (Overseas) Ltd. of Italy, Chevron Overseas Petroleum, and Texaco Petroleum Maatshappij (Netherland) B.V. Co.] and CNOOC.

In 1992, CNPC also has expanded its international activities. The corporation has negotiated either buying or forming joint ventures in Canada, India, Indonesia, Papua New Guinea, Peru, Russia, Turkmenistan, and Venezuela. CNPC also will extend its business from merely developing oilfields to downstream industries such as oil refining and petroleum products.

Currently, China exports more than 23 Mmt of crude oil while importing 10 Mmt of oil, including the reimport of oil products processed abroad. Because of booming economic growth, the country will become a net importer in 1995. During the past several years, the rate of oil output could not keep up with the rate of growth in demand. The main oilfields that went into operation in the 1960's and 1970's have entered the late stages of their stable yield. Output by the main oilfields is progressively decreasing. Local economic boom has caused a decentralization in state control over oil trade. Local businesses have greater freedom in buying foreign oil to meet their needs.

Reserves

China is the world leader in proven reserves of antimony, barite, molybdenum, rare earths, titanium, tungsten, and vanadium. China has 55 billion tons of iron ore, albeit with an average grade of only 30% to 35% elemental content. Moreover, only 5% of the ore reserves contain 35% to 50% iron. Major deposits occur in Anhui, Hebei, Liaoning, and Nei Mongol. Major gold deposits are in Hebei, Heilongjiang, Henan, Hunan, Jilin, Nei Mongol, and Shandong. Bauxite deposits occur in Guangxi, Guizhou, Henan, and Shandong. Lead and zinc deposits are in Fujian, Gansu, Guangdong, and Guangxi.

With the exception of some commodities such as chromium, copper, and potash, China produces significant quantities of a wide array of minerals and metals, based on its production and/or export capability for these commodities.

INFRASTRUCTURE

An inadequate transportation sector and telecommunications system are majors factors hindering economic growth in China. The total capacity of its telephone network is targeted for 48 million units in 1995 and 65 million units in the year 2000. China is preparing a series of flexible policies to attract foreign investors in post and telecommunications, but it will not allow foreigners to be involved in management decisions.

In the next 3 years, the Ministry of Railways will spend $15.9 billion on capital construction of new railways to meet the demands of China's economic development. In a new development program, China will build 6,600 km of new lines, double-track 4,100 km, and electrify 5,600 km of old lines. China will gradually cut the mandatory plans for railway transportation. China will develop large containers, cold storage, and bulk freight in cargo transportation.

China will build 29 new airports in southwest China in the 1990's. Airports to be built include Ganzi, Guangyuan, Jiangbe, Jiuzaigou, Mianyang, Neijiang, Qiangjiang, and Wanxian in Sichuan Province; Bijie, Tongren, Xingyi, and Zunyi in Guizhou Province; and Diqing, Lincan, Tengchong, and Wenshan in Yunnan.

OUTLOOK

China is one of the world's leading producers of industrial minerals, metals, and fuels. It plans to increase output capacity of cement, copper, fertilzer, iron and steel, lead, nickel, salt, soda ash, and zinc. Despite an extensive minerals base, constraints based on a lack of both hard currency and advanced technology have forced the Chinese Government to delay capital investments in mine and plant construction and plant expansion. China also has opened the interior of the country for foreign exploration and development in an effort to increase the production of its fuel and nonfuel minerals sectors. China is expected to

continue to be a major force in the world market for such commodities such as antimony, barite, flurospar, magnesite, rare earths, and tungsten. As the result of industrial development being achieved under its ambitious modernization program, China's industry will be technologically better suited to the production of value added manufactures and advanced materials, meeting international quality specifications. By the end of this century, China hopes to become a newly industrialized country.

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[1]Where necessary, values have been converted from renminbi (RMB) to U.S. dollars at the rate of RMB5.85=$US1.00 for 1992.

[2]Standard coal equivalent (SCE) with thermal equivalent of 7,000 kilocalories per kilogram. The conversion is as follows (figures in bracket refer to thermal equivalent): 1 kg of coal (5,000 kcal) = 0.71 kg of SCE; 1 kg of crude oil (10,000 kcal) = 1.43 kg of SCE; and 1 cubic meter of natural gas (9,310 kcal) = 1.33 kg of SCE.

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TABLE 1

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992
METALS						
Aluminum:						
Bauxite, gross weight		2,300,000	2,388,000	2,400,000	2,600,000	2,700,000
Alumina, gross weight		1,300,000	1,350,000	1,460,000	1,600,000	1,600,000
Metal, refined, primary		710,000	750,000	850,000	r963,000	1,100,000
Antimony, mine output, Sb content		46,000	r61,000	r54,800	45,000	45,000
Bismuth, mine output, Bi content		750	850	1,000	1,100	1,200
Cadmium, smelter		750	800	1,100	1,200	1,200
Cobalt		306	255	325	300	400
Copper:						
Mine output, Cu content		282,000	276,000	r285,000	300,000	300,000
Metal:						
Smelter, primary and secondary		400,000	450,000	559,000	600,000	630,000
Refined, primary and secondary		510,000	540,000	560,000	560,000	560,000
Gold, mine output, Au content		80	90	100	120	140
Iron and steel:						
Iron ore, gross weight	thousand tons	167,700	171,850	168,300	176,070	197,600
Pig iron	do.	57,040	58,200	62,380	67,200	72,000
Ferroalloys	do.	1,804	2,382	2,400	r2,460	2,650
Steel, crude	do.	59,430	61,200	66,100	70,570	80,000
Steel, rolled	do.	47,000	48,700	51,200	r56,380	65,340
Lead:						
Mine output, Pb content		312,000	308,000	r315,000	r352,000	385,000
Metal, refined, primary and secondary		245,000	260,000	296,000	330,000	330,000
Magnesium metal, primary		3,200	3,500	5,900	r8,600	10,000
Manganese ore, gross weight	thousand tons	3,200	3,200	3,300	3,400	3,500
Mercury, mine output, Hg content		940	r1,200	r1,000	r700	800
Molybdenum, mine output, Mo content		14,400	15,700	15,700	16,000	16,000
Nickel:						
Mine		32,743	34,250	33,000	36,000	37,000
Smelter		24,700	25,600	r27,500	r28,900	29,000
Silver, mine output, Ag content		110	125	130	150	170
Tin:						
Mine output, Sn content		38,000	40,000	42,000	43,000	43,000
Metal, smelter		29,500	29,500	35,000	38,000	38,000
Tungsten, mine output, W content		30,000	30,200	32,000	25,000	17,000
Zinc:						
Mine output, Zn content		528,000	538,000	619,000	650,000	670,000
Refined, primary and secondary		420,000	451,000	550,000	r612,000	630,000
INDUSTRIAL MINERALS						
Asbestos		150,000	r181,000	r221,000	r230,000	240,000
Barite	thousand tons	1,500	1,750	1,750	1,800	1,800
Boron, mine, B_2O_3 equivalent		95,000	74,000	75,000	76,000	77,000
Bromine		6,800	8,000	8,080	8,000	8,000
Cement, hydraulic	thousand tons	210,140	207,000	203,000	r252,610	304,000
Fluorspar		1,100,000	1,750,000	1,700,000	1,600,000	1,600,000
Graphite		r400,000	r490,000	r455,000	r289,000	300,000
Gypsum	thousand tons	8,100	r9,020	r10,180	r10,500	11,000

See footnotes at end of table.

TABLE 1—Continued

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992
METALS—Continued						
Kyanite and related materials		2,500	2,500	2,500	2,500	2,500
Lithium minerals, all types		15,000	15,000	15,000	15,500	15,500
Magnesite	thousand tons	2,610	2,600	2,600	2,600	2,600
Nitrogen: N content of ammonia	do.	16,500	17,000	17,500	18,000	18,000
Phosphate rock and apatite, P_2O_5 equivalent	do.	5,470	6,000	r6,400	6,500	6,800
Potash, marketable, K_2O equivalent	do.	r36	r42	r29	r40	40
Salt	do.	22,000	28,000	20,000	r24,100	28,100
Sodium compounds: Soda ash, natural and synthetic	do.	2,609	2,983	3,750	r3,940	4,500
Sulfur:						
Native	do.	300	300	320	320	320
Content of pyrite	do.	3,900	4,270	4,400	4,500	4,500
Byproduct, all sources	do.	550	600	650	650	650
Total	do.	4,750	5,170	5,370	5,470	5,470
Talc and related materials		1,900,000	2,100,000	r2,545,000	r2,600,000	2,650,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	175,000	190,000	170,000	190,000	190,000
Bituminous and lignite	do.	770,000	850,000	883,460	900,000	920,000
Total	do.	945,000	1,040,000	1,053,460	1,090,000	1,110,000
Coke, all types	do.	47,000	66,200	73,280	r73,520	75,000
Gas, natural:						
Gross	billion cubic meters	14	15	15	r16	16
Marketed	do.	13	13	13	13	14
Petroleum:						
Crude (including crude from oil shale)	thousand 42-gallon barrels	999,200	1,004,000	1,008,000	1,014,700	1,050,000
Refinery products	do.	725,000	725,000	730,000	800,000	830,000

rRevised.

[1]Table includes data available through Apr. 20, 1993.

TABLE 2

CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN JANUARY-SEPTEMBER 1992

(Metric tons)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Bauxite	680,000	$35,110
Metal and alloys:		
Unwrought	44,364	55,650
Semimanufacturers	24,438	41,220
Antimony metal, unwrought	13,179	20,360

See footnotes at end of table.

TABLE 2—Continued

CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN JANUARY-SEPTEMBER 1992

(Metric tons)

	Quantity	Value (thousands)
METALS—Continued		
Barium sulfate	460,000	$14,050
Copper:		
Metal and alloys, unwrought	9,542	21,120
Semimanufacturers	29,358	90,840
Iron and steel:		
Ferrosilicon	190,000	89,980
Pig iron and cast iron	410,000	62,240
Steel:		
Bars and rods	580,000	155,510
Shapes and sections	400,000	105,610
Sheets and plates	280,000	93,540
Tube and pipe	130,000	101,260
Magnessium carbonate and oxide	1,430,000	112,690
Manganese, unwrought	19,661	21,520
Tin:		
Metal and alloys, unwrought	19,967	101,930
Tungsten:		
Tungstates	4,199	24,550
Ore	1,107	1,870
Zinc:		
Metal and alloys, unwrought	48,048	50,910
INDUSTRIAL MINERALS		
Cement	5,660,000	228,240
Fluorspar	750,000	51,600
Talc	710,000	36,990
MINERAL FUELS		
Coal	14,030,000	535,580
Coke, semicoke	810,000	57,880
Petroleum:		
Crude oil	15,700,000	1,991,630
Refinery products	3,980,000	632,140

Source: China's Customs Statistics (1992.4).

TABLE 3

CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN JANUARY-SEPTEMBER 1992

(Metric tons)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Alumina	450,000	$82,540
Metal and alloys, unwrought	83,678	97,460
Semimanufactures	73,989	216,440
Chromium: Chromite	590,000	69,000
Copper:		
Ore	200,000	83,420
Metal and alloys, unwrought	219,504	476,180
Semimanufactures	103,732	272,380
Iron and steel:		
Iron ore	16,710,000	521,000
Pig iron and cast iron	60,000	4,480
Steel:		
Bars and rods	300,000	110,900
Billets and forgings	130,000	60,950
Seamless pipe	820,000	769,120
Shapes and sections	130,000	60,950
Sheets and plates	2,650,000	1,604,260
Manganese ore	200,000	83,420
INDUSTRIAL MINERALS		
Compound fertilizers	5,000,000	977,340
Potassium chloride	1,960,000	225,100
Sodium carbonate	49,249	8,810
Titanium dioxide	21,763	37,430
Urea	7,240,000	958,720
MINERAL FUELS		
Coal	890,000	33,720
Petroleum:		
Crude oil	5,730,000	844,630
Refinery products	5,080,000	881,260

Source: China's Customs Statistics (1992.4).

TABLE 4

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals		1,408	1,077	496	Japan 239; France 102; Norway 47.
Aluminum:					
Ore and concentrate	thousand tons	680	542	241	Netherlands 85; Japan 54; U.S.S.R. 35.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued:				
Oxides and hydroxides	566,148	646,294	88,470	Japan 111,592; Germany 95,279; Netherlands 82,193.
Metal including alloys:				
Scrap	1,715	2,706	—	Japan 2,690; Taiwan 10.
Unwrought	65,125	68,556	(2)	Japan 22,878; Hong Kong 21,595; Republic of Korea 19,978.
Semimanufactures	17,764	27,300	168	Hong Kong 17,622; Japan 1,993; Singapore 1,590.
Antimony:				
Ore and concentrate	10,241	5,087	709	Japan 2,383; Italy 407; Hong Kong 323.
Oxides and hydroxides	13,014	14,429	5,730	Hong Kong 3,061; Japan 2,289; Netherlands 2,142.
Metal including alloys, all forms	33,368	29,373	13,740	Japan 4,937; Netherlands 3,899; Hong Kong 2,559.
Arsenic:				
Ore and concentrate	1,570	186	—	Hong Kong 78; Pakistan 54; Egypt 36.
Oxides and acids	2,704	12,316	5,805	Hong Kong 5,467; United Kingdom 274; Thailand 261.
Bismuth: Metal including alloys, all forms	609	961	73	Hong Kong 393; Netherlands 288; United Kingdom 71.
Cadmium: Metal including alloys, all forms	568	475	—	Japan 321; Hong Kong 78; Netherlands 77.
Chromium:				
Ore and concentrate	2,448	2,042	—	All to Japan.
Oxides and hydroxides	2,622	3,074	265	Netherlands 1,406; Hong Kong 427; Germany 172.
Cobalt:				
Oxides and hydroxides	170	143	—	Netherlands 48; Belgium-Luxembourg 26; United Kingdom 15.
Metal including alloys, all forms	32	100	22	Hong Kong 59; Netherlands 19.
Columbium and tantalum: Tantalum metal including alloys, unwrought	10	4	1	Germany 3.
Copper:				
Sulfate	4,296	920	—	Canada 368; Hong Kong 238; Republic of Korea 120.
Metal including alloys:				
Scrap	248	665	44	Taiwan 500; Hong Kong 121.
Unwrought	18,003	8,711	5	Hong Kong 3,874; Japan 3,491.
Semimanufactures	25,229	33,655	615	Hong Kong 29,092; Japan 1,034.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	561	658	—	Japan 468; Hong Kong 150; Australia 40.
Pyrite, roasted	—	21	—	All to Hong Kong.
Metal:				
Scrap	112,469	71,325	—	Hong Kong 40,548; Japan 17,276; Indonesia 7,950.
Pig iron, cast iron, related materials thousand tons	378	628	(2)	Japan 422; Republic of Korea 104; Taiwan 43.
Ferroalloys:				
Ferrochromium	11,463	29,768	8,447	Japan 14,299; Republic of Korea 3,691.
Ferromanganese	70,497	73,722	4,520	Japan 11,742; Hong Kong 10,454; Indonesia 10,351.
Ferromolybdenum	6,629	4,957	857	Netherlands 2,248; Hong Kong 415; Republic of Korea 316.
Ferrosilicomanganese	97,303	165,847	3,460	Japan 105,139; Hong Kong 35,999; Indonesia 9,402.
Ferrosilicon	244,286	319,997	4,302	Japan 218,378; Hong Kong 29,248; Republic of Korea 18,155.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Ferroalloys—Continued:				
Unspecified	18,150	28,123	811	Japan 11,222; Republic of Korea 8,128; Hong Kong 4,105.
Steel, primary forms	521,032	853,086	52	Thailand 272,405; Taiwan 243,564; Republic of Korea 132,739.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,183,682	1,718,643	1,014	Hong Kong 592,556; Republic of Korea 303,967; Japan 123,155.
Universals, plates, sheets	515,007	456,775	140	Japan 175,902; Thailand 94,511; Republic of Korea 72,261.
Hoop and strip	20,109	133,229	—	Japan 75,093; Republic of Korea 35,194; Thailand 5,524.
Rails and accessories	13,330	12,194	54	Singapore 5,664; North Korea 4,620.
Wire	169,237	231,439	7,298	Hong Kong 81,847; Singapore 25,518; United Arab Emirates 16,442.
Tubes, pipes, fittings	291,580	306,479	58,339	Hong Kong 74,042; Japan 22,473; Singapore 18,786.
Castings and forgings, rough	46,434	67,607	15,786	Japan 17,729; Taiwan 11,065; Malaysia 5,577.
Lead:				
Ore and concentrate	1,978	5,451	—	Japan 3,281; North Korea 2,169.
Oxides	5,106	5,483	—	Japan 3,139; Hong Kong 1,154; Iran 200.
Metal including alloys:				
Scrap	177	255	180	Hong Kong 72; Japan 3.
Unwrought	37,981	15,936	418	Japan 7,346; Singapore 2,704; Hong Kong 1,973.
Semimanufactures	3,093	1,110	—	Japan 942; Singapore 103; Hong Kong 28.
Magnesium: Metal including alloys, all forms	523	18	—	Taiwan 15; Australia 3.
Manganese:				
Ore and concentrate	27,998	19,498	—	North Korea 12,186; Japan 3,740; Thailand 1,858.
Oxides and hydroxides	5,867	6,486	—	Hong Kong 3,827; Thailand 626; Japan 471.
Metal including alloys, all forms	42,524	34,600	475	Japan 13,652; Netherlands 8,430; Hong Kong 3,176.
Mercury	330	63	—	Pakistan 27; Hong Kong 12; Burma 8.
Molybdenum:				
Ore and concentrate	370	1,311	20	Belgium-Luxembourg 708; Hong Kong 297; Netherlands 252.
Oxides and hydroxides	381	895	—	Netherlands 632; Hong Kong 200; United Kingdom 50.
Metal including alloys, all forms	178	232	135	Netherlands 88; Japan 3.
Nickel:				
Matte and speiss	—	35	—	Japan 17; Thailand 17.
Metal including alloys:				
Unwrought kilograms	10	100	—	All to Japan.
Semimanufactures	326	19	5	Japan 10; Taiwan 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought grams	1,129,602	159,504	85,756	Hong Kong 72,588; Macau 1,160.
Rare-earth metals:				
Ores and concentrates	327	660	183	Japan 294; Hong Kong 64; Macau 43.
Oxides and other compounds	2,530	2,792	420	Japan 1,718; France 200; Hong Kong 196.
Metals including alloys, all forms	1,327	2,393	217	Japan 1,355; Netherlands 308; Austria 274.
Selenium: Elemental	5	17	—	All to Hong Kong.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Silver:					
Ore and concentrate[3]	kilograms	1,055	7,555	2,555	Japan 5,000.
Waste and sweepings[4]	do.	177,488	308	—	Japan 300; Singapore 8.
Metal including alloys, unwrought and partly wrought	kilograms	7,153	11,721	554	Hong Kong 11,149; Singapore 18.
Tin:					
Ore and concentrate		9,583	11,295	106	Hong Kong 4,866; Singapore 2,457; Japan 1,694.
Metal including alloys:					
Scrap					
Unwrought		10,135	15,692	5,322	Japan 4,179; Hong Kong 3,660; Taiwan 1,358.
Semimanufactures		4,904	5,567	230	Japan 3,233; Hong Kong 1,996.
Titanium:					
Oxides		630	1,489	911	U.S.S.R. 420; Japan 60; Iran 52.
Metal including alloys, all forms		634	115	96	Hong Kong 11; North Korea 7.
Tungsten:					
Ore and concentrate		16,450	6,071	3,328	Republic of Korea 885; Germany 620.
Oxides and hydroxides		2,111	4,278	1,556	Japan 1,229; Netherlands 1,052.
Metal including alloys, all forms		335	420	159	Hong Kong 103; Netherlands 79.
Uranium and thorium:					
Ore and concentrate	kilograms	17,000	2,820	—	Iran 1,800; Japan 1,020.
Oxides and other compounds	value, thousands	$21,806	$12,233	—	France $10,273; Pakistan $1,907.
Zinc:					
Ore and concentrate		76,228	76,960	—	Japan 47,971; Republic of Korea 11,449; North Korea 9,117.
Oxides and hydroxides		44,431	29,333	657	Hong Kong 9,999; Netherlands 4,236; Japan 2,392.
Metal including alloys:					
Scrap		75	13	—	All to Hong Kong.
Unwrought		16,711	6,284	—	Hong Kong 3,840; Republic of Korea 1,108; Pakistan 835.
Semimanufactures		6,003	7,177	70	Hong Kong 4,183; Japan 1,382.
Other:					
Ores and concentrates		38,189	43,945	—	Japan 38,197; Philippines 2,039; Republic of Korea 1,398.
Ashes and residues		16,690	12,079	—	Hong Kong 9,798; Japan 2,281.
Base metals: Unwrought and semimanufactures		20,351	20,237	2,546	Japan 10,858; Hong Kong 2,810; Germany 1,536.
Metalloids, unspecified[5]		129,897	145,329	3,904	Japan 81,448; Hong Kong 26,854; Netherlands 6,593.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$7,646	$3,774	$62	Japan $1,315; Hong Kong $732; Thailand $586.
Artificial:					
Corundum		71,812	89,904	—	Japan 45,339; Hong Kong 26,856; Republic of Korea 5,823.
Silicon carbide[6]		55,073	69,464	13,723	Japan 22,814; Netherlands 15,013; Germany 4,532.
Dust and powder of precious and semi-precious stones including diamond	value, thousands	$227	$317	$20	Japan $107; Thailand $97; Hong Kong $72.
Grinding and polishing wheels and stones	do.	$10,794	$13,804	$702	Hong Kong $4,974; Japan $2,423; Singapore $1,133.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Asbestos, crude		7,135	612	—	Iran 310; Singapore 144; Thailand 108.
Barite and witherite	thousand tons	1,443	1,125	686	Netherlands 98,724; Japan 86,823.
Boron materials:					
Crude natural borates		18	20	—	Switzerland 15; Macau 5.
Oxides and acids		6,554	3,422	—	Hong Kong 695; Taiwan 630; Japan 544.
Cement		6,829,558	10,735,945	1,000	Republic of Korea 5,689,192; Hong Kong 1,228,436; Bangladesh 1,082,459.
Clays, crude:					
Chamotte earth		161,736	191,184	1,195	Japan 62,256; Netherlands 27,307; Turkey 19,174.
Unspecified		814,497	880,525	237	Hong Kong 582,480; Macau 143,990; Japan 66,957.
Cryolite and chiolite		69	84	—	North Korea 64; Hong Kong 15; Malaysia 5.
Diamond: Natural:					
Gem, not set or strung	value, thousands	$81,650	$52,468	$2,226	Hong Kong $37,669; Belgium-Luxembourg $8,780.
Industrial stones	do.	$6,444	$3,515	—	Hong Kong $2,468; France $760; Belgium-Luxembourg $282.
Diatomite and other infusorial earth		19,528	37,659	—	Japan 16,675; Hong Kong 10,095; Netherlands 4,293.
Feldspar, fluorspar, related materials:					
Feldspar		222,945	381,804	—	Hong Kong 292,234; Taiwan 16,092; Singapore 2,595.
Fluorspar		1,094,047	933,694	173,997	Japan 443,434; Netherlands 67,650; India 43,696.
Unspecified		154	211	—	Japan 126; Malaysia 50; Taiwan 20.
Fertilizer materials:					
Crude, n.e.s.		1,878	875	—	Japan 824; Hong Kong 20; Taiwan 20.
Manufactured:					
Ammonia		3,801	3,869	—	Hong Kong 3,530; Japan 310; Macau 28.
Nitrogenous		76,713	87,194	—	Malaysia 39,750; Australia 16,983; Philippines 11,720.
Phosphatic		168,359	152,278	60	Japan 82,700; Sri Lanka 25,617; Malaysia 24,153.
Potassic		28	24	—	Pakistan 20; Macau 3.
Unspecified and mixed		2,643	4,184	—	Japan 3,906; Hong Kong 202.
Graphite, natural		141,234	153,061	8,278	Japan 92,974; Republic of Korea 12,969; Netherlands 10,371.
Gypsum and plaster		130,798	153,879	—	North Korea 131,127; Macau 12,500; Hong Kong 4,964.
Iodine including bromine and fluorine	value, thousands	$62	$41	—	All to Hong Kong.
Lime		71,325	74,880	—	Hong Kong 61,306; Macau 11,627; Singapore 1,400.
Magnesium compounds: Magnesite, including calcined	thousand tons	1,306	1,540	181	Japan 393; U.S.S.R. 206; Netherlands 158.
Meerschaum, amber, jet		4,869	5,014	—	Japan 4,832; Republic of Korea 138.
Mica:					
Crude including splittings and waste		24,879	23,020	322	Japan 13,035; United Kingdom 4,917; Netherlands 2,524.
Worked including agglomerated splittings	value, thousands	$444	$1,565	$324	Hong Kong $890; Japan $91; Netherlands $90.
Phosphates, crude		344,648	533,866	—	Malaysia 168,475; North Korea 141,752; Republic of Korea 100,979.
Pigments, mineral:					
Natural, crude		2,217	1,512	—	Japan 630; Pakistan 460; Syria 200.
Iron oxides and hydroxides, processed		26,796	36,891	4,897	United Kingdom 6,271; Hong Kong 5,787; Netherlands 3,977.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$84,437	$43,004	$754	Hong Kong $38,588; Japan $1,689; Thailand $1,236.
Synthetic	do.	$5,669	$11,102	$1,206	Hong Kong $3,994; Indonesia $2,840; Thailand $1,127.
Pyrite, unroasted		207,078	195,388	—	Japan 195,066; Hong Kong 301.
Salt and brine	thousand tons	481	212	—	Hong Kong 116; North Korea 65; Singapore 10.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		86,775	197,737	—	Indonesia 37,135; Japan 32,691; Thailand 23,848.
Sulfate, manufactured		342,763	302,015	—	Republic of Korea 82,795; Hong Kong 49,628; Malaysia 35,244.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value, thousands	$30,704	$39,277	$370	Japan $25,262; Hong Kong $7,455.
Worked	do.	$105,369	$143,687	$12,354	Japan $78,081; Hong Kong $26,136; Singapore $7,053.
Dolomite, chiefly refractory-grade		5,293	86,566	—	Japan 86,450; Hong Kong 82.
Gravel and crushed rock	thousand tons	5,875	8,330	14	Hong Kong 7,524; Macau 685.
Limestone flux and calcareous stone		8,890	8,849	—	Hong Kong 8,382; Japan 207; Thailand 200.
Quartz and quartzite		34,686	14,992	(2)	Japan 10,246; Hong Kong 3,871; Malaysia 698.
Sand other than metal-bearing	thousand tons	3,970	7,186	18	Macau 5,237; Hong Kong 1,416; Japan 488.
Sulfur:					
Elemental:					
Crude including native and byproduct		85	486	—	North Korea 292; Japan 80; Singapore 51.
Colloidal, precipitated, sublimed		6	316	—	North Korea 300; Japan 16.
Sulfuric acid		7,486	6,400	—	Hong Kong 6,199; Republic of Korea 90; Macau 68.
Talc, steatite, soapstone, pyrophyllite		869,855	948,296	17,793	Japan 558,211; Republic of Korea 161,930.
Other:					
Crude		66,467	112,067	21	Hong Kong 74,906; Japan 31,591.
Slag and dross, not metal-bearing		17,784	11,941	1,272	Japan 8,037; Hong Kong 1,023.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, matural		—	10	—	All to Hong Kong.
Carbon:					
Carbon black		28,863	25,461	50	Thailand 6,732; Hong Kong 4,386; Indonesia 2,882.
Gas carbon		424	325	—	Hong Kong 152; Taiwan 93.
Coal:					
Anthracite	thousand tons	1,527	2,093	—	Republic of Korea 944; Japan 641; France 238.
Bituminous	do.	15,766	17,908	—	Japan 5,158; Hong Kong 2,618; Republic of Korea 2,254.
Briquets of anthracite and bituminous coal		2,752	660	126	Taiwan 480; Hong Kong 43.
Lignite including briquets		—	190	—	Singapore 100; Burma 90.
Coke and semicoke	thousand tons	1,303	1,082	17	Japan 220; Peru 135; France 112.
Peat including briquets and litter		86	32	—	All to Hong Kong.
Petroleum:					
Crude	thousand 42-gallon barrels	175,044	162,334	32,440	Japan 86,881; Singapore 21,420; Republic of Korea 8,348.
Refinery products:					
Liquefied petroleum gas	value, thousands	$2,610	$3,583	—	Republic of Korea $1,340; Hong Kong $1,183; Macau $808.

See footnotes at end of table.

TABLE 4—Continued

CHINA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued:					
Refinery products—Continued:					
Gasoline:					
Aviation	thousand 42-gallon barrels	1,352	493	—	Singapore 481; North Korea 9.
Motor	do.	13,916	17,483	1,732	Singapore 15,040; Japan 639.
Naptha including white spirit	do.	4,745	3,316	(2)	Japan 2,857; Republic of Korea 309.
Mineral jelly and wax	do.	1,509	1,501	49	Singapore 211; Burma 162; Hong Kong 145.
Kerosene and jet fuel	do.	3,420	2,484	—	Japan 1,555; Hong Kong 812; Singapore 62.
Distillate fuel oil	do.	11,946	9,024	—	Singapore 3,583; Hong Kong 3,411; Japan 1,318.
Lubricants	do.	2,077	2,142	179	Japan 493; Thailand 439.
Residual fuel oil	do.	3,839	3,167	—	Japan 1,731; Hong Kong 1,414.
Bitumen and other residues	do.	192	353	—	Japan 344; Hong Kong 6.
Bituminous mixtures	do.	203	413	—	Japan 407; Australia 3.
Petroleum coke	do.	899	1,009	—	Japan 979; Republic of Korea 24.

[1]Data presented in this table are from China's Customs Statistics Yearbook. Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]May include other precious ores and concentrates.
[4]May include platinum-group metals.
[5]Elemental arsenic, phosphorus, and tellurium.
[6]Includes boron carbide.

TABLE 5

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals		2,650	3,087	(2)	U.S.S.R. 2,181; Germany 538; Taiwan 60.
Aluminum:					
Ore and concentrate		57	—		
Oxides and hydroxides		583,012	686,177	5	Australia 625,304; India 56,365; Taiwan 3,648.
Metal including alloys:					
Scrap		5,490	6,149	425	Mongolia 2,170; Hong Kong 1,797; U.S.S.R. 1,237.
Unwrought		71,771	43,710	334	U.S.S.R. 16,759; Canada 9,584; Australia 5,040.
Semimanufactures		43,858	65,028	15,072	Australia 12,939; Hong Kong 9,339; Japan 7,322.
Antimony:					
Ore and concentrate		53	—		
Oxides		9	15	—	Hong Kong 7; Japan 6.
Metal including alloys, all forms		50	84	—	Mainly from Hong Kong.
Arsenic: Oxides and acids	kilograms	4,340	450	80	Hong Kong 370.
Beryllium: Metal including alloys, all forms		3	7	—	All from Japan.
Bismuth: Metal including alloys, all forms		72	45	19	Mexico 23; Spain 2.
Cadmium: Metal including alloys all forms		9	108	32	Belgium-Luxembourg 60; Japan 12.

See footnotes at end of page.

TABLE 5—Continued

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Chromium:				
Ore and concentrate	641,267	544,648	—	India 251,218; Turkey 54,800; Iran 42,687.
Oxides and hydroxides	234	1,714	51	U.S.S.R. 879; Germany 378; Hong Kong 186.
Cobalt:				
Oxides and hydroxides	5	6	—	Japan 3; Hong Kong 2.
Metal including alloys, all forms	498	437	11	Zaire 220; Zambia 56; U.S.S.R. 55.
Columbium and tantalum: Tantalum metal including alloys, all forms kilograms	867	840	210	Germany 630.
Copper:				
Ore and concentrate	242,197	309,786	87,103	U.S.S.R. 39,214; Chile 27,314; Portugal 30,618.
Matte and speiss including cement copper	—	6,020	791	Republic of Korea 5,229.
Sulfate	4,219	2,320	—	U.S.S.R. 2,138; Hong Kong 45.
Metal including alloys:				
Scrap	21,729	78,358	48,298	Hong Kong 9,721; Canada 5,691; Japan 4,366.
Unwrought	40,251	113,966	13,053	U.S.S.R. 19,144; Netherlands 12,703; United Kingdom 9,530.
Semimanufactures	37,761	52,167	1,448	Hong Kong 17,576; Taiwan 8,639; Japan 8,626.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite-thousand tons	14,343	18,458	48	Australia 12,073; Brazil 3,137.
Pyrite, roasted	—	91,287	—	All from Australia.
Metal:				
Scrap	183,354	238,923	45,420	U.S.S.R. 89,344; Hong Kong 40,184; Japan 23,160.
Pig iron, cast iron, related materials	1,309,484	365,999	213	U.S.S.R. 182,689; Brazil 179,632; Japan 1,177.
Ferroalloys:				
Ferrochomium	201	1,204	(2)	U.S.S.R. 1,178; Taiwan 23.
Ferrosilicon	39	507	(2)	Switzerland 500; Japan 5.
Unspecified	r133	5,180	21	U.S.S.R. 4,937; Brazil 66.
Steel, primary forms	454,841	329,576	10,305	U.S.S.R. 267,245; Poland 24,153.
Semimanufactures:				
Bars, rods, angles, shapes, sections	991,782	238,249	246	Japan 117,533; U.S.S.R. 62,325; Brazil 12,971.
Universals, plates, sheets	2,379,525	2,040,948	40,293	Japan 1,383,953; Republic of Korea 172,117; U.S.S.R. 109,756.
Hoop and strip	83,621	97,114	340	Japan 63,883; Brazil 7,555; Republic of Korea 6,031.
Rails and accessories	14,015	15,177	—	United Kingdom 10,324; U.S.S.R. 4,569.
Wire	42,925	21,749	43	Hong Kong 8,921; Japan 3,228.
Tubes, pipes, fittings	733,217	1,173,329	58,364	Japan 690,142; Argentina 153,198; Germany 146,454.
Castings and forgings, rough	1,433	3,106	12	U.S.S.R. 762; Taiwan 714.
Lead:				
Ore and concentrate	470	1,334	—	Burma 1,289; Malaysia 45.
Oxides kilograms	821	22,274	19	Japan 15,000; Taiwan 7,180.
Metal including alloys:				
Scrap	665	511	418	Mongolia 60; Hong Kong 20.
Unwrought	1,773	167	(2)	U.S.S.R. 121; Hong Kong 46.
Semimanufactures	793	1,170	18	U.S.S.R. 482; Japan 452.

See footnotes at end of table.

TABLE 5—Continued

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Magnesium: Metal including alloys, all forms		374	5,237	—	U.S.S.R. 4,591; North Korea 365; Norway 199.
Manganese:					
Ore and concentrate		357,021	560,947	—	Gabon 221,403; Australia 147,451; Burma 59,246.
Oxides		462	593	1	Hong Kong 365; Singapore 70; Japan 60.
Metal including alloys, all forms		468	303	—	Hong Kong 157; Singapore 105.
Mercury	kilograms	28	200,119	87,665	Spain 64,515; U.S.S.R. 47,886.
Molybdenum:					
Ore and concentrate		—	800	686	U.S.S.R. 100.
Oxides and hydroxides		—	201	101	Hong Kong 100.
Metal including alloys, all forms		6	3	—	Mainly from Macau.
Nickel:					
Matte and speiss	kilograms	—	540	—	All from Hong Kong.
Metal including alloys:					
Scrap		9	141	—	Do.
Unwrought		35	4,568	128	U.S.S.R. 3,275; Japan 290; Hong Kong 226.
Semimanufactures		418	1,159	23	U.S.S.R. 246; Japan 196; Germany 184.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	kilograms	7,561	9,619	194	Hong Kong 8,291; United Kingdom 461.
Rare-earth metals:					
Ores and concentrates		59	—		
Oxides and other compounds	kilograms	10,630	8,769	3,704	United Kingdom 3,210; Germany 1,200.
Metals including alloys, all forms	do.	251	25,606	600	Hong Kong 25,000.
Selenium, elemental		151	316	18	Japan 140; Australia 48; Canada 33.
Silver:					
Ore and concentrate[3]	kilograms	9	61,410	—	Australia 59,990; Taiwan 1,395.
Waste and sweepings	do.	—	57,503	—	U.S.S.R. 40,000; Hong Kong 17,500.
Metal including alloys, unwrought and partly wrought	do.	7,955	16,602	123	Japan 7,525; Germany 3,095; North Korea 2,002.
Tin:					
Ore and concentrate		109	221	—	All from Burma.
Metal including alloys:					
Unwrought		116	68	—	Hong Kong 25; U.S.S.R. 18; Singapore 15.
Semimanufactures		251	754	4	Hong Kong 392; Japan 107.
Titanium:					
Ore and concentrate[4]		60,524	35,742	166	Australia 12,383; Mozambique 11,221; Singapore 7,508.
Oxides		3,812	2,444	789	Japan 1,051; United Kingdom 201.
Metal including alloys, all forms		80	399	17	U.S.S.R. 321; Japan 60.
Tungsten:					
Oxides and hydroxides	kilograms	230	2,813	—	All from Japan.
Metal including alloys, all forms	do.	821	1,168	—	Taiwan 828; Japan 197; Hong Kong 143.
Uranium and thorium:					
Oxides and other compounds	value, thousands	$598	$70	—	France $64; Belgium-Luxembourg $6.
Metal including alloys, all forms	kilograms	10	—		
Zinc:					
Ore and concentrate		21	214	—	All from Burma.

See footnotes at end of table.

TABLE 5—Continued

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Zinc—Continued:					
Oxides		2,332	428	22	Taiwan 232; Japan 57; Thailand 54.
Metal including alloys:					
Scrap		4	581	59	North Korea 300; Hong Kong 222.
Unwrought		4,141	11,705	599	Hong Kong 3,135; North Korea 2,616.
Semimanufactures		737	1,787	—	Japan 1,079; Republic of Korea 296.
Other:					
Ores and concentrates		2,151	2,647	(2)	Morocco 2,070; United Kingdom 303; Malaysia 216.
Oxides and hydroxides		1,106	1,344	310	Hong Kong 365; Japan 335.
Ashes and residues		1,337	9,111	2,722	Mozambique 2,996; New Zealand 2,200.
Metalloids, unspecified[5]		332	128	5	Hong Kong 94; Japan 11; Singapore 10.
Base metals including alloys, all forms		3,070	6,616	5,214	Japan 655; Germany 291.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$3,079	$5,237	$680	Hong Kong $1,848; Indonesia $713; Italy $461.
Artificial:					
Corundum		71	43	—	Italy 21; Japan 10; Hong Kong 6.
Silicon carbide[6]	kilograms	1,761	4,274	300	Japan 3,550; Hong Kong 420.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$1,579	$220	—	Hong Kong $138; Taiwan $36; Germany $10.
Grinding and polishing wheels and stones	do.	$9,189	$12,685	$2,145	Japan $4,897; Taiwan $1,775; Hong Kong $1,765.
Asbestos, crude		1,083	2,249	—	Canada 1,346; Zimbabwe 619; Mozambique 108.
Barite and witherite		29	6	—	Hong Kong 5; Japan 1.
Boron materials:					
Crude natural borates		231	1,670	84	U.S.S.R. 1,200; Turkey 272; Japan 93.
Oxides and acids		1,537	6,431	17	U.S.S.R. 6,189; Germany 198.
Cement	thousand tons	397	158	(2)	Hong Kong 82; North Korea 38; U.S.S.R. 27.
Chalk		17	(2)	—	All from Hong Kong.
Clays, crude:					
Chamotte earth		31	60	—	Taiwan 41; Denmark 15.
Unspecified		18,585	10,902	4,380	Taiwan 2,717; United Kingdom 1,498.
Cryolite and chiolite	kilograms	950	45,094	—	Hong Kong 40,730; Taiwan 2,364.
Diamond:					
Natural:					
Gem, not set or strung	value, thousands	$89,421	$41,097	$837	Hong Kong $31,299; Belgium-Luxembourg $5,681.
Industrial stones	do.	$1,546	$3,932	$153	Belgium-Luxembourg $2,441; Hong Kong $760; Ireland $457.
Synthetic: Gem, not set or strung	do.	$1,291	$1,375	$446	Ireland $623; Hong Kong $116.
Diatomite and other infusorial earth		765	1,847	1,534	France 155; Hong Kong 106.
Feldspar, fluorspar, related materials:					
Feldspar		111	174	—	Taiwan 73; France 65.
Fluorspar		421	110	—	Hong Kong 109.
Unspecified		44	18	—	All from Canada.

See footnotes at end of table.

TABLE 5—Continued

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials:					
Crude, n.e.s.		10,158	9,835	3	Hong Kong 9,545; U.S.S.R. 260.
Manufactured:					
Ammonia		29	364	43	Japan 247; Hong Kong 65.
Nitrogenous	thousand tons	8,634	7,771	437	U.S.S.R. 3,625; Indonesia 433; Norway 404.
Phosphatic	do.	202	294	3	U.S.S.R. 176; Tunisia 75; Morocco 20.
Potassic	do.	2,793	2,936	172	Canada 1,303; U.S.S.R. 563; North Korea 424.
Unspecified and mixed	do.	3,610	7,175	4,112	U.S.S.R. 1,019; Norway 431; Philippines 249.
Graphite, natural		12	31	1	Netherlands 13; Hong Kong 7; Japan 3.
Gypsum and plaster		1,362	2,471	44	Taiwan 1,748; Hong Kong 314.
Iodine including bromine and fluorine	value, thousands	$8,408	$18,518	$2,327	Germany $5,496; Japan $2,895; Italy $2,593.
Lime		254	84	2	Hong Kong 49; Taiwan 27.
Magnesium compounds: Magnesite, crude including calcined		658	295	—	Hong Kong 205; Japan 63.
Meerschaum, amber, jet		—	34	—	All From Hong Kong.
Mica:					
Crude including splittings and waste		10	59	(2)	Japan 42; Taiwan 14.
Worked including agglomerated splittings	value, thousands	$60	$108	$8	Hong Kong $65; Italy $13; Japan $9.
Nitrates, crude		18,818	100	—	All from U.S.S.R.
Phosphates, crude		203,882	354,545	—	Morocco 206,356; U.S.S.R. 55,250; Syria 49,899.
Pigments, mineral: Iron oxides and hydroxides, processed		1,104	2,372	41	Singapore 1,439; Japan 551; Taiwan 142.
Potassium salts, crude		9	37	37	
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$83,169	$55,494	$175	Burma $27,370; Hong Kong $23,884.
Synthetic	do.	$796	$1,605	$94	Hong Kong $548; Ireland $278; Japan $250.
Salt and brine		11,257	8,656	103	U.S.S.R. 5,100; Hong Kong 3,024.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		210,520	54,220	50,928	U.S.S.R. 1,760; Hong Kong 1,294.
Sulfate, manufactured		294	2,784	—	U.S.S.R. 2,308; Hong Kong 220.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value, thousands	$208	$100	—	Hong Kong $11; Italy $11; unspecified $66.
Worked	do.	$18,797	$15,939	$144	Italy $10,342; Hong Kong $2,199; Germany $1,116.
Dolomite, chiefly refractory-grade		47	123	—	Taiwan 111; Italy 9.
Gravel and crushed rock		360	642	—	Hong Kong 164; Taiwan 148; Indonesia 124.
Limestone other than dimension		41	11	—	Taiwan 7; Italy 3.
Quartz and quartzite		57	96	—	Burma 87; Hong Kong 7.
Sand other than metal-bearing		330	698	311	Taiwan 198; Japan 151; Hong Kong 19.
Sulfur:					
Elemental:					
Crude including native and byproduct		92	26,290	3	Canada 26,086; Singapore 120; Taiwan 56.

See footnotes at end of table.

TABLE 5—Continued

CHINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued:					
Elemental—Continued:					
Colloidal, precipitated, sublimed		37,863	24,655	—	Canada 24,601; Taiwan 29; Singapore 20.
Dioxide		61	6	[2]	Mainly from Japan.
Sulfuric acid		345	326	51	Hong Kong 220; Japan 34.
Talc, steatite, soapstone, pyrophyllite		207	289	26	Hong Kong 135; Taiwan 43; Japan 30.
Other:					
Crude		631	210	4	Malaysia 58; Philippines 44; Taiwan 29.
Slag and dross, not metal-bearing		64,893	31,834	—	North Korea 30,299; Mozambique 1,013.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		6	11,030	11	Singapore 11,000.
Carbon black		1,299	3,853	2,206	U.S.S.R. 507; Taiwan 441; Italy 288.
Coal:					
Anthracite	thousand tons	1,202	968	—	Mainly from North Korea.
Bituminous	do.	784	376	—	Australia 139; Canada 91; Indonesia 86.
Lignite including briquets	do.	17	23	[2]	Mainly from U.S.S.R.
Coke and semicoke		50	101	1	Japan 100.
Gas, natural: Gaseous	cubic meters	5,104	2,717	—	Hong Kong 2,056; North Korea 624.
Peat including briquets and litter		—	20	—	All from U.S.S.R.
Petroleum:					
Crude	thousand 42-gallon barrels	21,658	44,084	1	Indonesia 20,318; Oman 19,614; Malaysia 1,692.
Refinery products:					
Liquefied petroleum gas	value, thousands	$27,094	$48,411	$1,195	Singapore $12,441; Japan $11,680; Hong Kong $7,981.
Gasoline	thousand 42-gallon barrels	1,437	955	16	Singapore 609; Philippines 139.
Mineral jelly and wax	do.	5	24	1	Japan 16; Hong Kong 4.
Kerosene and jet fuel	do.	5	173	1	Singapore 171; Hong Kong 1.
Distillate fuel oil	do.	16,791	23,844	2,836	Singapore 14,939; U.S.S.R. 3,101.
Lubricants	do.	688	759	184	Singapore 226; Hong Kong 170; Japan 110.
Residual fuel oil	do.	4,242	7,750	250	Singapore 6,714; U.S.S.R. 307; Japan 230.
Bitumen and other residues	do.	235	70	[2]	Singapore 67; Hong Kong 2.
Bituminous mixtures	do.	65	7	—	Mainly from Japan.
Petroleum coke	do.	161	19	[2]	Singapore 18.

[1]Data presented in this table are from China's Custom Statistics Yearbook. Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]May include other precious ores and concentrates.
[4]May include vanadium and niobium.
[5]Elemental arsenic, phosphorus, and tellurium.
[6]Includes boron carbide.

TABLE 6

CHINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum:			
Bauxite	China National Nonferrous Metals Industry Corp.	Guangxi, Pingguo	650
Do.	do.	Guizhou, Guiyang	400
Do.	do.	Henan, Zhongzhou	200
Do.	do.	Hunan, Zhengzhou	620
Do.	do.	Shandong, Zibo	500
Do.	do.	Shanxi, Hejin	1,000
Metal	do.	Anhui, Hefei	25
Do.	do.	Gansu, Baiyin	50
Do.	do.	Gansu, Lanzhou	50
Do.	do.	Guangxi, Pingguo	40
Do.	do.	Guizhou, Guiyang	160
Do.	do.	Henan, Jiaozuo	30
Do.	do.	Henan, Sanmenxia	30
Do.	do.	Hebei, Wuhan	35
Do.	do.	Hunan, Changsa	15
Do.	do.	Jilin, Changchun	15
Do.	do.	Liaoning, Fushun	100
Do.	do.	Nei Monggol, Baotou	70
Do.	do.	Ningxia, Qingtongxia	80
Do.	do.	Ningxia, Yinchuan	30
Do.	do.	Qinghai, Xining	100
Do.	do.	Shaanix, Tongchuan	10
Do.	do.	Shandong, Qingdao	15
Do.	do.	Shangdong, Zibo	35
Do.	do.	Shanxi, Taiyuan	25
Do.	do.	Yunnan, Kunming	15
Do.	do.	Gansu, ShanNam	
Asbestos	China National Nonmetallic Minerals Industry Corp.		
Do.	do.	Nei Monggol, Baotou	
Do.	do.	Shanxi, Lai Yuan	130
Do.	do.	Shanxi, Lu Liang	
Barite	do.	Guizhou, Xiangshou	NA
Coal	China National Coal Corp.	Hebei	70,000
Do.	do.	Heilongjiang	70,000
Do.	do.	Henan	85,000
Do.	do.	Liaoning	50,000
Do.	do.	Shandong	60,000
Do.	do.	Shanxi	240,000
Do.	do.	Sichuan	60,000
Cobalt	China National Nonferrous Metals Industry Corp.	Hainan, Changjiang	5
Copper, refined		Anhui:	
Do.	do.	Tongling No. 1	30
Do.	do.	Tongling No. 2	30

See footnotes at end of table.

TABLE 6—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Copper, refined—Continued:		China National Nonferrous Metals Industry Corp.	Gansu:	
Do.		do.	Baiyin	110
Do.		do.	Hezheng Xian	35
Do.		do.	Wu Wei	35
Do.		do.	Henan, Zhuzhou	10
Do.		do.	Hubei, Daye	30
Do.		do.	Jiangxi, Guixi	90
Do.		do.	Liaoning, Shenyang	50
Do.		do.	Shanghai	65
Do.		do.	Shanxi, Taiyuan	35
Do.		do.	Tianjin	100
Do.		do.	Yunnan, Kunming	45
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Gold, refined	thousand kilograms	China National Gold Corp.	Henan, Kingbao	3
Do.		do.	Shandong, Laizhou	15
Do.		do.	Shandong, Zhaoyuan	6
Graphite		China National Nonmetallic	Shandong, Laixi	190
Do.		Minerals Industry Corp.	Shandong, Pingdu	
Iron and steel:				
Iron ore		Maanshan Iron and Steel Co.	Anhui, Maanshan	8,000
Do.		Shoudu Iron and Steel Co.	Beijing	18,000
Do.		Meishan Metallurgical Co.	Shanghai	1,700
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	2,700
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan-Xingtai Metallurgical Bureau	Hebei, Handan	3,200
Do.		Tangshan Iron and Steel Co.	Hebei, Tangshan	1,800
Do.		Wuhan Iron and Steel Co.	Hubei, Wuhan	5,100
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Iron and Steel Co.	Liaoning, Anshan	26,800
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel Co.	Nei Monggol, Boatou	7,800
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	3,400
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhihua Mining Co.	Sichuan, Panzhihua	8,260
Do.		Kuming Iron and Steel Co.	Yunnan, Kuming	1,400
Ferroalloy		Maanshan Iron and Steel Co.	Anhui, Maanshan	30
Do.		Shoudu Iron and Steel Co.	Beijing	30
Do.		Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.		Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.		Hunan Ferroalloy Co.	Hunan, Xiangxiang	70
Do.		Jilin Ferroalloy Co.	Jilin, Jilin	190
Do.		Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	50
Do.		Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	50

See footnotes at end of table.

TABLE 6—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Iron and steel—Continued:			
Ferroalloy—Continued:	Jilin Ferroalloy Co.	Jilin, Jilin	190
Do.	Shanghai Steel Co.	Shanghai	180
Do.	Emi Ferroalloy Co.	Sichuan, Emei	40
Crude steel	Maanshan Iron and Steel Co.	Anhui, Maanshan	1,900
Do.	Shoudu Iron and Steel Co.	Beijing	4,000
Do.	Tangshan Iron and Steel Co.	Hebei, Tangshan	1,600
Do.	Wuhan Iron and Steel Co.	Hubei, Wuhan	4,700
Do.	Anshan Iron an Steel Co.	Liaoning, Anshan	8,100
Do.	Benxi Iron and Steel Co.	Liaoning, Benxi	2,500
Do.	Baotou Iron and Steel Co.	Nei Monggol, Baotou	2,300
Do.	Baoshan Iron and Steel Co.	Shanghai	6,800
Do.	Shanghai Steel Co.	Shanghai	5,700
Do.	Taiyuan Iron and Steel Co. No. 2	Shanxi, Taiyuan	1,800
Do.	Panzhihua Iron and Steel Co.	Sichuan, Panzhihua	1,850
Do.	Tianjin Iron and Steel Co.	Tianjin	1,500
Lead	China National Nonferrous Metals Industry Corp.	Fujian, Lianchang	10
Do.	do.	Gansu, Baiyan	50
Do.	do.	Guangdong, Shaoquan	15
Do.	do.	Guangxi, Changpo	5
Do.	do.	Hunan, Songbai	20
Do.	do.	Hunan, Zhuzhou	50
Do.	do.	Liaoning, Shenyang	50
Do.	do.	Shanghai	5
Do.	do.	Yunnan, Lanping	20
Nickel, refined	do.	Gansu, Jinchuan	40
Petroleum, crude	China National Petroleum Corp.	Hebei, Shengli	33,350
Do.	do.	Heilongjiang, daqing	55,000
Do.	do.	Liaoning, Liaohe	15,000
Do.	China National Offshore Oil Corp.	Bohai, Wan	1,300
Do.	do.	Nanhai	
Potash	Ministry of Chemical Industry	Qinghai	40
Rare earths	Ministry of Metallurgical Industry	Nei Monggol, Baiyunebo	12
Do.	China National Nonferrous Metals Industry Corp.	Jiangxi, Ganan	1
Do.	do.	Guangdong, Nanshanhai	5
Do.	do.	Shandong, Weishan	2
Salt	Ministry of Chemical Industry	Anhui	200
Do.	do.	Qinghai	320
Talc	China National Nonmetallic Mineral Industry Co.	Guangxi, Longshen	130
Do.	do.	Liaoning, Haicheng	50
Do.	do.	Shandong, Qixia	5

See footnotes at end of table.

TABLE 6—Continued

CHINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Tungsten, concentrate	China National Nonmetallic Mineral Industry Co.	Guangdong:	
Do.	do.	Guangxi	
Do.	do.	Hunan	30
Do.	do.	Jiangxi	
Do.	do.	Zhejiang	
Zinc	do.	Fujian, Liancheng	15
Do.	do.	Gansu, Baiyan	100
Do.	do.	Guangdong, Shaoquan	30
Do.	do.	Guangxi, Changpo	20
Do.	do.	Hunan, Zhuzhou	135
Do.	do.	Liaoning, Huludao	60
Do.	do.	Liaoning, Shenyang	20
Do.	do.	Yunnan, Lanping	40

NA Not available

TABLE 7

CHINA: MINE OUTPUT OF SELECTED METAL ORES IN 1990

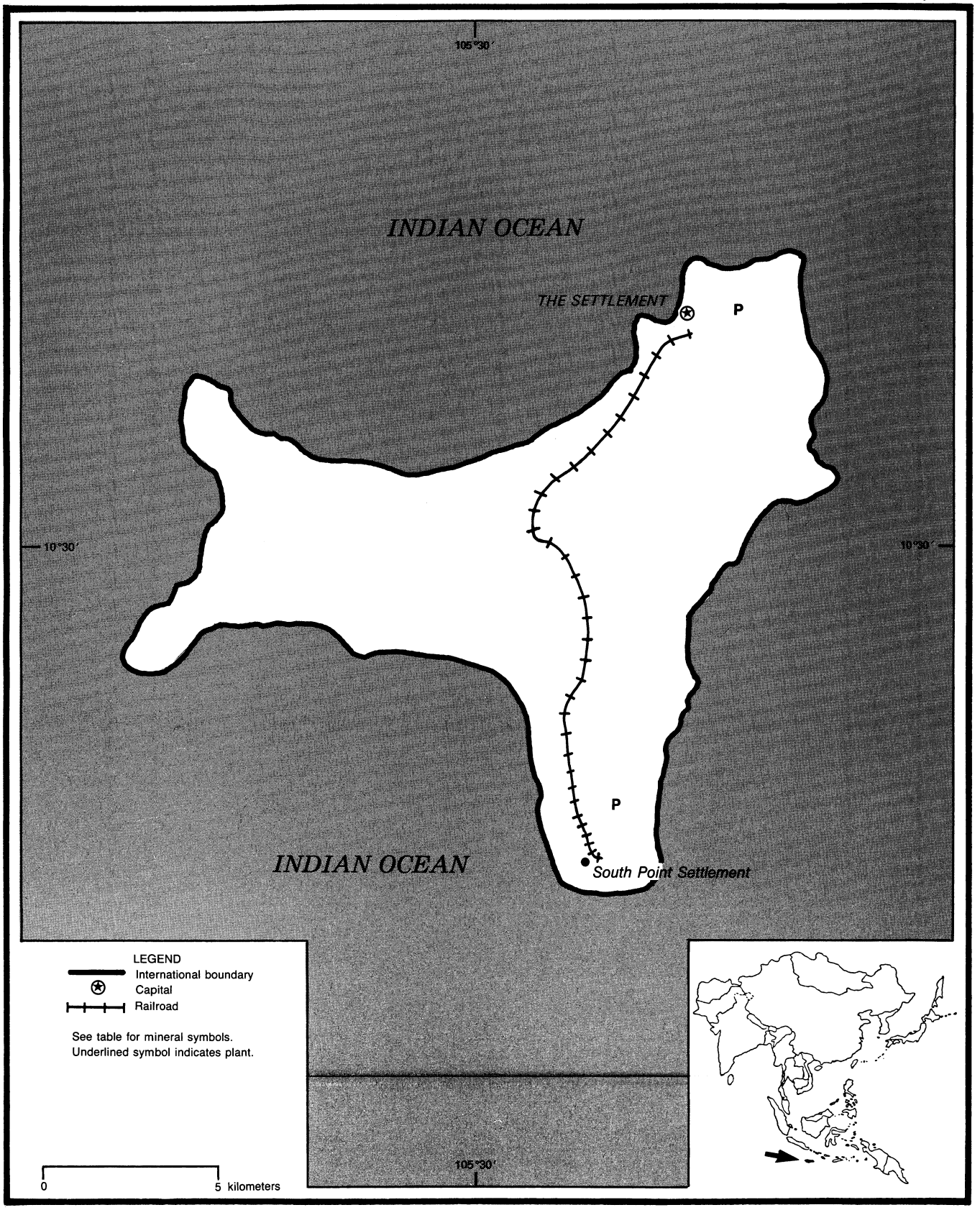
	State-owned (metric tons)	Urban collective-owned (metric tons)	Total (metric tons)	Mine ore grade (percent)	Concentrate grade (percent)	Metal recovery ratio in ore dressing (percent)
Antimony (Sb content)	11,000	30,000	41,000	NA	NA	NA
Copper (Cu content)	227,000	58,000	285,000	0.83	21.61	85.17
Lead (Pb content)	170,000	145,000	315,000	2.50	62.01	83.97
Mercury (Hg content)	NA	NA	1,000	NA	NA	NA
Molybdenum (MoS_2 content)	NA	NA	25,500	.13	46.65	83.59
Nickel (Ni content)	32,000	1,000	33,000	1.39	6.02	83.61
Tin (Sn content)	24,000	13,000	37,000	.35	43.21	58.21
Tungsten (WO_3 content)	30,000	23,000	53,000	.26	68.92	85.53
Zinc (Zn content)	368,000	251,000	619,000	4.97	48.97	87.14

NA Not available.

TERRITORY OF CHRISTMAS ISLAND

(Australia)

AREA 135 km² **POPULATION 1,000**



THE MINERAL INDUSTRY OF

CHRISTMAS ISLAND

By Travis Q. Lyday

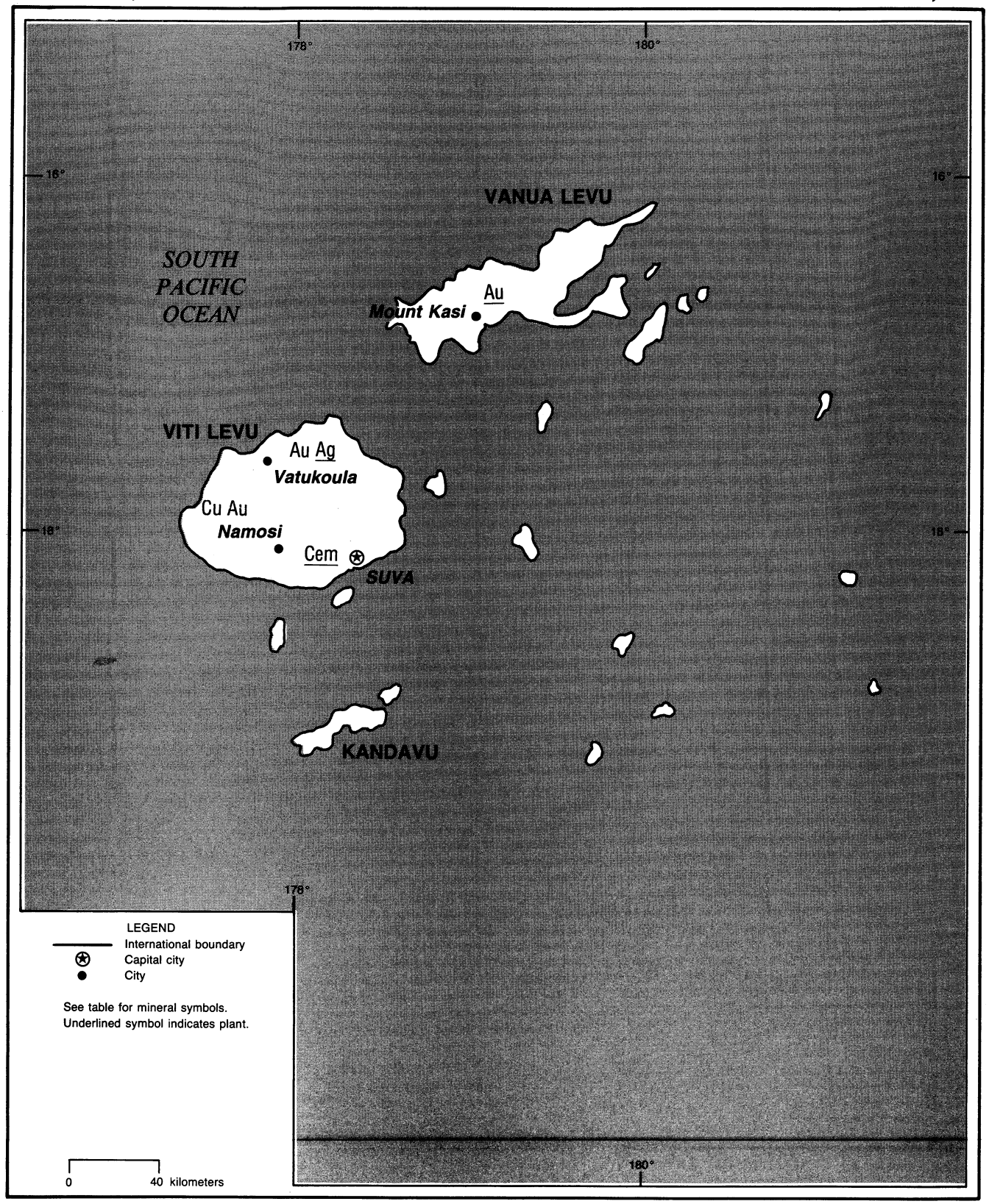
From 1897 until mining ceased in 1987, guano-base phosphate rock was the mainstay of the economy of the Territory of Christmas Island, an island territory of Australia in the Indian Ocean. The mining operation, owned by the Phosphate Mining Co. of Christmas Island, a wholly Australian Government-owned firm headquartered in Perth, was closed primarily because of the exhaustion of high-grade phosphate reserves. The area where high-grade phosphate reserves remain has been classified as a national park to preserve the few remaining tall trees in the rain forest and, therefore, the natural habitat for the rare bird species on the island. Resources of lower grade phosphate rock containing 74% to 76% bone phosphate of lime are minable in less sensitive parts of the island.

In 1991, the Australian Government contracted Phosphate Resources NL to renew phosphate mining on the island, but no mining has occurred since December 1987. Phosphate Resources was owned by Clough Engineering Ltd., 51%; the citizens of Christmas Island, 40%; and Saley Investments Pty., 9%.

There is one permanent-surface airport on the island and one shipping port, Flying Fish Cove. Electric generating capacity in 1991 was 11,000 kW.

FIJI

AREA 18,270 km² **POPULATION 750,000**



THE MINERAL INDUSTRY OF

FIJI

By Travis Q. Lyday

Fiji's economy continued to be basically agrarian, depending mainly on the sugar industry. Moreover, it has a large subsistence sector. The mineral industry remained small, contributing less than 1% to the GDP of the country. The economy continued to be hampered by recession in the major foreign markets, a long-running mine workers' strike at the Emperor Mine, and a sugarcane farmers' boycott. Fiji's mineral industry consisted of two operating gold-silver mines, the Emperor at Vatukoula and the Tavua Basin Mine in the Tavua goldfield, operating in close proximity to each other on the main island of Viti Levu; a cement plant near Suva; and several quarries for the production of stone and crushed gravel, limestone, and coral and river sands.

GOVERNMENT POLICIES AND PROGRAMS

The Government closed in midyear the Fiji National Petroleum Co. (FINAPECO), which was established in late 1990 to become the sole importer of petroleum products into the country. The company was dissolved without ever importing any petroleum products.

PRODUCTION

Gold production continued to be the dominant minerals industry business, but only accounted for less than 1% of the country's GDP. Historically, gold mining has been carried out only at the Emperor Mine at Vatukoula in the northern part of Viti Levu. Since 1987, an ever-increasing amount has been produced from the Tavua Basin Mine, about 2.5 km south of the main Emperor workings. Both mines were also producers of silver. *(See table 1.)*

TRADE

The unrefined gold and silver produced in Fiji was the country's third largest foreign exchange earner, after sugar and tourism, but represented less than 15% of the total.

STRUCTURE OF THE MINERAL INDUSTRY

The main mineral operations of Fiji are the underground/opencut gold operations at the Emperor and Tavua Basin Mines at Vatukoula, about 100 km northwest of the capital at Suva on Viti Levu Island. Both mines produce silver as a byproduct and, until 1980, the Emperor Mine also recovered significant amounts of selenium and tellurium oxide from the telluride ore. Fiji has one cement plant at Lami, just outside Suva. Other mineral industry operations in Fiji include quarries for stone and crushed gravel, limestone for the cement and lime industry, and coral and river sand dredging, all exclusively for domestic use. *(See table 2.)*

COMMODITY REVIEW

Metals

Gold has been mined continuously since 1935 from the Emperor Mine at Vatukoula on Viti Levu. Beginning in 1987, gold output from the Emperor Mine was supplemented by production from the nearby Tavua Basin Mine. Emperor Gold Mining Co. Ltd. (EGM), a subsidiary of the United Kingdom-registered Emperor Mines Ltd., owned both mines. EGM purchased in January 1991 the equity shares previously held by its former joint-venture partner in both operations, Western Mining Corp. (Fiji) Ltd. (WMCF), a wholly owned subsidiary of Australia's Melbourne-based Western Mining Corp. Holdings Ltd. WMCF continued to provide technical and managerial services at the mines.

Australia's Sydney-based Placer Pacific Ltd. continued to assess its porphyry copper-gold prospect at Namosi, about 40 km northwest of Suva in southern Viti Levu. The investigation included a major diamond drilling program to confirm ore grades, extend the size of the resource, and collect samples for metallurgical testing. Preliminary mine design, infrastructure, and environmental studies also were initiated. The project became a 50-50 joint venture in May between Placer Pacific and its parent company, Placer Dome Inc. of Vancouver, Canada. Placer Dome was funding all of the work through to completion of a feasibility study.

The Namosi area previously had been explored without success by several companies from the late 1960's to the early 1980's. The Namosi prospect is thought to have the potential to become a world-class size copper-gold mine.

Pacific Sovereign Mint Ltd., owned 80% by EGM with the Government-owned Fiji Development Bank holding the remaining 20% interest, minted legal-tender gold coins from gold mined at the Emperor Mine. Minting consisted of a maximum of 5,000 coins in each of three denominations, F$100, F$50, and F$25, containing 1 ounce, one-half ounce, and one-quarter ounce of unrefined gold, respectively. The coins, primarily sold to buyers in Europe and the United States, bore unique aspects of Fijian culture.

Mineral Fuels

FINAPECO, established by the Government in late 1990, was abolished in midyear without ever distributing any fuel in Fiji. The company was created ostensibly to establish a Fijian-based petroleum product industry that eventually was to include a refinery, shipping terminals, and tanker farms. Initially, FINAPECO was to purchase crude oil from Malaysia's PETCO, a subsidiary of the Malaysian Government-owned Petroleum National Bhd., for refining by Esso Singapore Pte. Ltd. in Singapore. The imported refined petroleum then was to have been distributed through Fiji's previous petroleum suppliers, British Petroleum (BP), Mobil Oil, and Shell Fiji Ltd., for both internal use and for transshipment to smaller countries of the region, including the Cook Islands, Kiribati, Niue, Tonga, and Tuvalu. These companies also were to have been prohibited from importing any oil on their own, enabling FINAPECO to be the sole supplier of petroleum products in Fiji and neighboring nations. The dissolution of FINAPECO enabled the BP, Mobil, and Shell subsidiaries to resume their traditional roles as petroleum product suppliers for Fiji and the region.

Reserves

Metallic mineralization is widespread in Fiji, occurring as polymetallic base metal sulfide deposits, disseminated porphyry copper deposits, epithermal precious-metal deposits, residual bauxite deposits, and manganese and heavy-mineral sand deposits. However, gold, and associated silver, is the only mineralization being mined at present.

Proven recoverable reserves at the Emperor Mine are 1.2 Mmt of ore grading 6.4 g/mt of gold. The Tavua Basin deposit in the Tavua goldfield has proven recoverable reserves of 300,000 tons of ore grading 14 g/mt of gold.

Australian-based Climax Mining Ltd. reported an indicated resource of 500,000 tons of ore grading 7 g/mt of gold at its Faddys gold prospect in western Viti Levu, and Newmont Pty. Ltd. and Range Resources Ltd. reported a geological resource of 2.5 Mmt of ore grading 2.5 g/mt of gold at the Mount Kasi prospect in southwestern Vanua Levu.

The Namosi copper-gold prospect area was reported to have copper deposits containing about 600 Mmt of ore averaging 0.47% copper and containing about 0.15 g/mt of gold.

INFRASTRUCTURE

Essential elements of the islands' infrastructure include 644 km of narrow-gauge railroad belonging to the Government-owned Fiji Sugar Corp.; 3,300 km of roads, including 1,590 km paved; 1,290 km gravel, crushed stone, or stabilized-soil surface; and 420 km unimproved earth. Inland waterways consist of 203 km, of which 122 km is navigable by motorized craft and 200-ton barges. There are 4 ports for international shipping and 25 airports in the country, 2 with permanent-surface runways. Electric generating capacity in 1991 was 215,000 kW, about 430 kW • h per capita.

Generally, infrastructure for mineral industry operations are regarded as adequate.

OUTLOOK

Although there was a severe industrial dispute throughout 1991 and early 1992 at the Emperor Mine that caused a substantial reduction in gold and silver production, there had not been any other adverse impact on exploration and mining in the country since the military coups in 1987. Normal mining operations at the EGM facilities were expected to be maintained in the future. Exploration programs, especially for gold and silver mineralization, were expected to continue. About 45% of the country's land area of 18,000 km^2 was under active exploration.

OTHER SOURCES OF INFORMATION

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TABLE 1

FIJI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[e]
Cement, hydraulic		44,200	58,000	[r]72,000	[r]84,000	90,000
Gold, mine output, Au content	kilograms	4,273	4,221	4,115	[r]2,817	[2]3,090
Lime[e 3]		—	2,000	—	—	—
Silver, mine output, Ag content	kilograms	995	1,055	775	[r]493	[2]866
Stone, sand and gravel:						
Coral sand for cement manufacture		38,529	48,809	64,997	71,664	[2]61,465
River sand for cement manufacture		8,377	15,009	8,393	19,386	20,000
River sand for gravel, n.e.s.	cubic meters	210,000	230,780	838,756	[e]800,000	800,000
Quarried stone	do.	49,711	65,849	152,455	73,771	[2]63,412

[e]Estimated. [r]Revised.

[1]Table includes data available through June 2, 1993.

[2]Reported figure.

[3]Produced from an unreported amount of domestically quarried limestone.

TABLE 2

FIJI: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

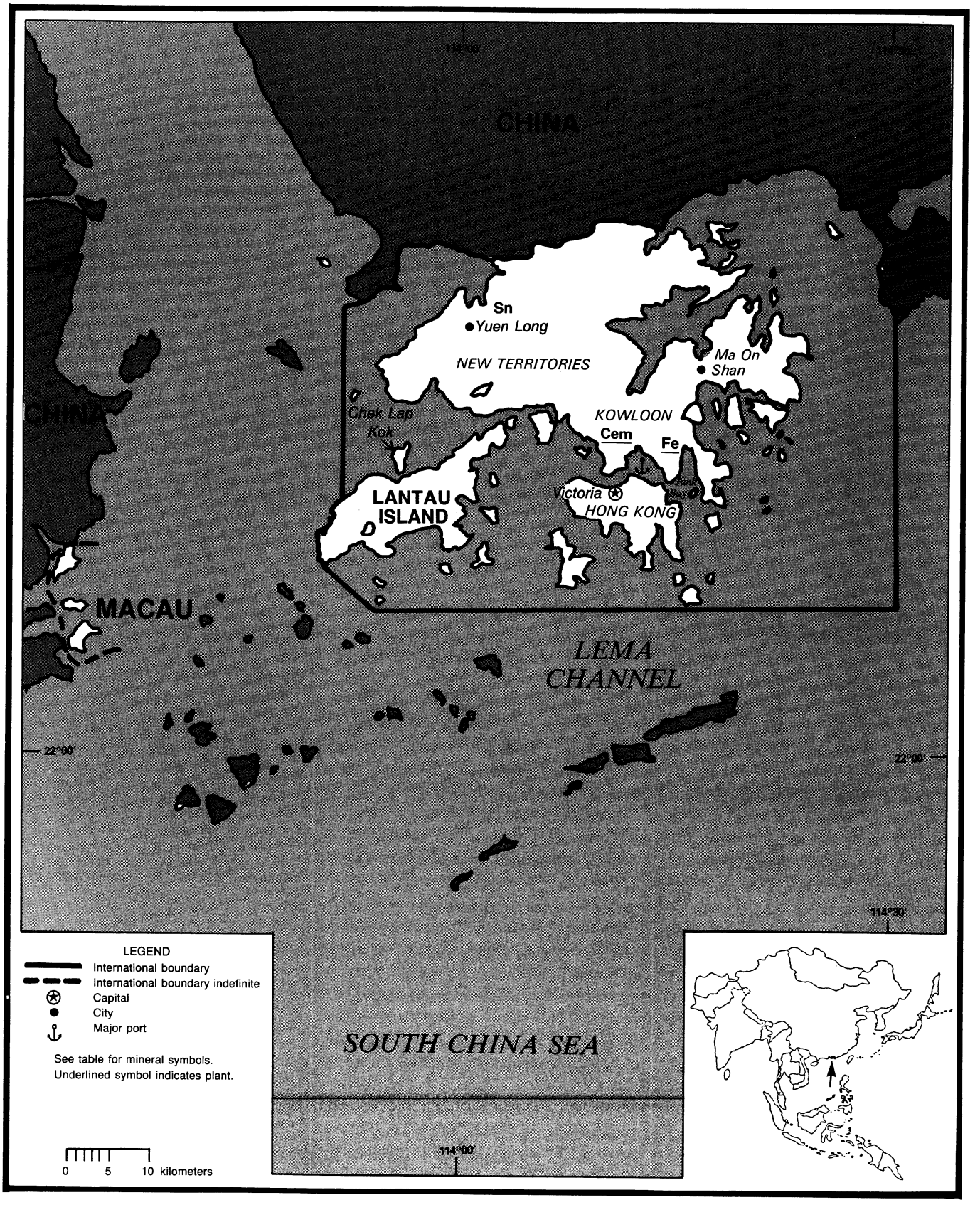
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Fiji Industries Ltd., 100%, operator and manager	Suva, Viti Levu Island	105
Gold	Emperor Gold Mining Co. Ltd., 100%, operator and manager	Emperor Mine, Viti Levu Island	[1]600
Do.	do.	Tavua Basin Mine, Viti Levu Island	1,710

[1]Throughput to the mill.

HONG KONG AND MACAU

AREA 1,040 km² **POPULATION 6.4 million**



THE MINERAL INDUSTRY OF

HONG KONG AND MACAU

By Pui-Kwan Tse

In 1992, Hong Kong and Macau rebounded from their economic downfall in 1991. The economic development of Hong Kong and Macau witnessed a smooth rising momentum, with an annual growth rate of 5% in 1992. However, inflation continued to be a problem for Hong Kong and Macau. The consumer price index increased by 9.5% in 1992, down from 12% in 1991. Macau registered a trade deficit of $162.5 million[1] of its total trade of $3.06 billion in the first 10 months of 1992. Hong Kong also registered a trade deficit of $3.34 billion of its total trade of $218.47 billion in the first 11 months of 1992. Both Hong Kong and Macau have limited natural resources; therefore, more than 80% of the consumer goods, raw materials, and semifinished products are imported.

In the 1980's Hong Kong's manufacturing base moved to southern China in pursuit of cheap labor and land. Now its service industry is trying the same route. The underlying factor is to escape Hong Kong's persistently high inflation rate of the past several years. In the past 10 years, the Hong Kong dollar was linked with the U.S. dollar at a fixed rate that hindered Hong Kong from running a monetary policy independent of the United States. The aim of this fixed rate was to stimulate the growth in a mature economy. However, in a high-growth Hong Kong, low interest rates have fueled stock and property market speculation, thus promoting asset price inflation. Inflation has forced Hong Kong business managers to rethink the way they do things. Either capital moves to labor or labor moves to capital.

For reasons of geography, language, and family ties, Hong Kong and Macau investments have been directed into southern China, especially in Guangdong Province. The crucial contribution from Hong Kong and Macau to wealthy southern China has been in low-cost, low-technology products. China recognizes that its economy must move away from this sort of production. Foreign investors also are recognizing that there is a limited amount of turnkey advanced equipment that they can sell to China. Chinese industry increasingly is capable of producing adequate equipment that can substitute for imports. Foreign investors also have come to realize that the way to enter the Chinese market is through a combination of technology transfer and foreign investment. Hong Kong and Macau are weak in science and technology. But both, especially Hong Kong, are remarkably strong in financial service and knowledge of the Chinese market. Hong Kong and Macau often act as intermediaries between China and foreign investors.

China's state-owned enterprises continue to penetrate the Hong Kong stock market. In the 1960's, the Bank of China, China Merchants, China Resources, and China Travel Service had a major role in Hong Kong's economy. China Merchants and China Travel Service have subsidiaries on the Hong Kong stock market. In the 1980's, China International Trust and Investment Corp. began an extensive investment in Hong Kong. In 1992, China officially reported that it had invested $20 billion in Hong Kong and Macau. The actual figure is believed to be much higher. The leading Hong Kong business tycoons, Chinese State Council agencies, and Singaporean Government-backed investors formed a new business venture, New China Hong Kong Group, in Hong Kong in 1992. The company plans to invest in the Hong Kong financial market and bid for projects in China. In 1993, 10 more of China's state-owned enterprises will be listed in Hong Kong's stock market. The Hong Kong community is concerned that Chinese Government agencies may be attempting to make a financial profit from Hong Kong's volatile political and business environment before 1997.

[1]Where necessary, values have been converted from Hong Kong dollars (HK$) to U.S. dollars at the rate of HK$7.8=US$1.00 and Macau pataca to U.S. dollars at the rate of Pataca 8.0=US$1.00 for 1992.

TABLE 1

HONG KONG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	71	133	—	Taiwan 35; Japan 34; China 32.
Aluminum:				
Ore and concentrate	14,461	10,561	—	Taiwan 10,260; Indonesia 250; Philippines 51.
Oxides and hydroxides	38	17	—	Republic of Korea 9; China 5; Brazil 2.
Metal including alloys:				
Scrap	32,999	31,895	—	Japan 16,025; China 11,801; Taiwan 3,615.
Unwrought	17,381	21,955	—	China 15,535; Taiwan 2,219; Indonesia 1,826.
Semimanufactures	44,197	48,180	1,855	China 31,732; France 1,883; Mexico 1,003.
Arsenic: Oxides and acids	765	4,264	2,409	Israel 600; Malaysia 289; Republic of South Africa 257.
Chromium:				
Ore and concentrate	2,260	—		
Oxides and hydroxides	1,038	12	—	Republic of South Africa 7; Vietnam 4.
Cobalt: Oxides and hydroxides	50	42	—	China 33; Singapore 6; Philippines 2.
Columbium and tantalum: Tantalum metal including alloys, all forms	14	(2)	—	NA.
Copper:				
Oxides and hydroxides	226	262	—	China 257; Indonesia 5.
Sulfate	585	420	—	China 297; Taiwan 60; Australia 20.
Metal including alloys:				
Scrap	80,878	111,755	—	China 78,337; Japan 23,079; Taiwan 6,247.
Unwrought	5,483	14,382	—	China 10,660; Vietnam 2,409; Taiwan 841.
Semimanufactures	49,564	80,617	211	China 74,064; Taiwan 2,107; Philippines 766.
Gold:				
Waste and sweepings value, thousands	$25,076	$16,850	$12	Switzerland $13,794; Australia $2,636; Singapore $229.
Metal including alloys, unwrought and partly wrought kilograms	15,874	5,826	1	Taiwan 2,456; Republic of Korea 1,299; China 1,095.
Iron and steel: Metal:				
Scrap	479,971	489,404	175	Taiwan 231,620; China 88,973; Indonesia 80,565.
Pig iron, cast iron, related materials	3,413	2,425	—	China 1,365; Taiwan 980; Indonesia 40.
Ferroalloys:				
Ferromanganese	10,340	14,791	—	North Korea 4,787; Taiwan 3,090; Republic of Korea 1,201.
Ferrosilicon	42,066	64,630	—	Taiwan 21,676; Republic of Korea 17,116; Japan 11,560.
Unspecified	33,079	47,787	110	Japan 15,268; Indonesia 11,049; Taiwan 9,461.
Steel, primary forms	1,643	3,123	—	Taiwan 3,077; China 26; Pakistan 20.
Semimanufactures:				
Bars, rods, angles, shapes, sections	147,029	171,187	46	Macau 60,732; China 58,316; Indonesia 13,818.
Universals, plates, sheets	354,119	488,351	2	China 474,251; Taiwan 3,887; Vietnam 1,623.
Hoop and strip	124,128	185,180	169	China 181,492; Thailand 955; Indonesia 662.
Rails and accessories	1,181	475	—	Thailand 464; China 11.
Wire	33,304	36,152	74	China 28,567; Indonesia 1,807; Taiwan 1,164.
Tubes, pipes, fittings	56,451	50,276	2,053	China 24,508; Taiwan 10,548; Japan 3,737.
Castings and forgings, rough	7,713	8,188	1,419	Republic of Korea 2,679; Taiwan 1,668; Japan 825.
Lead:				
Ore and concentrate	47	—		
Oxides	947	1,297	—	Indonesia 595; Australia 360; Taiwan 160.

See footnotes at end of table.

TABLE 1—Continued

HONG KONG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Lead—Continued:					
Metal including alloys:					
Scrap		2,737	6,740	—	China 4,908; Republic of Korea 644; Thailand 537.
Unwrought		17,380	2,135	—	Taiwan 891; China 599; Malaysia 183.
Semimanufactures		224	56	—	China 36; Taiwan 20.
Magnesium: Metal including alloys:					
Scrap		17	—		
Unwrought		11	170	—	China 166; North Korea 4.
Manganese:					
Ore and concentrate		1,190	710	—	All to Republic of Korea.
Oxides		2,801	3,943	—	China 1,200; Indonesia 633; Republic of Korea 391.
Mercury		116	124	—	China 90; Indonesia 16; Australia 13.
Molybdenum: Metal including alloys:					
Unwrought		10	1	—	All to Singapore,
Nickel:					
Oxides and hydroxides		101	63	—	China 49; Argentina 5; Kenya 3.
Metal including alloys:					
Scrap		56	55	—	Japan 27; Taiwan 15; India 13.
Unwrought		2,509	4,980	(e)	China 2,954; Taiwan 1,297; Thailand 302.
Semimanufactures		163	386	—	China 331; Taiwan 20; Netherlands 19.
Platinum-group metals:					
Waste and sweepings	value, thousands	$8,538	$5,188	$2,671	United Kingdom $2,104; Switzerland $312; Germany $18.
Metals including alloys, unwrought and partly wrought	kilograms	1,131	2,075	9	Taiwan 774; Singapore 570; China 492.
Silver:					
Ore and concentrate	do.	75,505	—		
Waste and sweepings	value, thousands	$5,226	$158	—	United Kingdom $91; Taiwan $28; Australia $26.
Metal including alloys, unwrought and partly wrought	kilograms	31,126	55,009	66	Republic of Korea 15,157; Taiwan 14,862; Thailand 11,205.
Tin:					
Ore and concentrate		9,088	9,907	—	Malaysia 7,536; Republic of Korea 918; China 459.
Oxides	kilograms	6,400	22,470	—	Taiwan 15,000; China 7,470.
Metal including alloys:					
Scrap		45	40	—	Taiwan 27; China 9; Japan 4.
Unwrought		4,511	7,105	2,673	Japan 1,746; Taiwan 1,070; Republic of Korea 914.
Semimanufactures		1,247	1,062	—	China 548; Singapore 159; Taiwan 128.
Titanium: Oxides		8,698	9,030	363	China 6,639; India 283; Netherlands 241.
Tungsten:					
Ore and concentrate		2,516	1,836	363	Republic of Korea 986; Singapore 328; Sweden 95.
Metal including alloys:					
Scrap		1	—		
Semimanufactures		—	8	—	China 4; Taiwan 2.
Uranium and thorium: Oxides and other compounds		228	451	13	Japan 304; China 66; Taiwan 34.

See footnotes at end of table.

TABLE 1—Continued

HONG KONG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Zinc:					
Oxides		17,819	8,303	741	Taiwan 2,724; China 914; Netherlands 598.
Blue powder		291	822	—	Taiwan 716; China 105.
Metal including alloys:					
Scrap		9,537	9,333	—	China 8,457; Taiwan 798; Japan 78.
Unwrought		57,606	57,816	—	China 44,181; Republic of Korea 5,576; Taiwan 3,375.
Semimanufactures		3,037	1,954	31	China 446; Indonesia 23; Taiwan 16.
Other:					
Ores and concentrates		10,034	8,395	—	China 7,392; Taiwan 604; Yugoslavia 213.
Metalloids, unspecified[6]		26,096	25,195	2,335	Taiwan 10,228; Republic of Korea 2,950; Indonesia 1,607.
Ashes and residues		5,431	3,208	—	China 2,123; Japan 966; Republic of Korea 59.
Base metals including alloys, all forms		15,986	14,012	2,654	Republic of Korea 3,173; Netherlands 1,753; India 1,697.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		32,453	37,765	—	China 27,976; Macau 6,428; Mauritius 1,590.
Artificial:					
Corundum		27,498	27,341	—	Taiwan 11,771; Republic of Korea 7,571; Japan 4,332.
Silicon carbide		3,711	4,044	268	Taiwan 1,559; Indonesia 1,249; Republic of Korea 759.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$6,124	$12,849	$1,151	Taiwan $11,362; Canada $85; China $77.
Grinding and polishing wheels and stones		2,915	2,153	33	Indonesia 781; China 693; Taiwan 220.
Asbestos, crude		5	—		
Barite and witherite		4,150	1,967	—	Indonesia 658; Republic of South Africa 341; Taiwan 203.
Boron materials:					
Crude natural borates		294	378	—	All to China.
Oxides and acids		588	347	—	China 249; Malaysia 40; Macau 21.
Bromine including fluorine	kilograms	1,158	197,946	—	All to China.
Cement	thousand tons	504	351	—	Macau 226; China 79; Taiwan 36.
Clays, crude:					
Kaolin		213,896	323,580	—	Taiwan 262,258; Republic of Korea 26,445; Philippines 13,728.
Unspecified		118,246	123,851	—	Taiwan 83,133; Republic of Korea 22,441; Japan 9,811.
Diamond: Natural:					
Gem, not set or strung	carats	1,895,397	1,822,695	464,160	Belgium-Luxembourg 396,035; Japan 277,956; Thailand 248,293.
Industrial stones	do.	193,154	215,606	23,844	Taiwan 105,000; Italy 77,000; Netherlands 6,383.
Diatomite and other infusorial earth		1,403	1,837	—	China 1,723; Taiwan 44; Sri Lanka 40.
Feldspar, fluorspar, related materials		146,487	177,932	—	Taiwan 162,809; Indonesia 9,922; Republic of Korea 2,860.
Fertilizer materials:					
Crude, n.e.s.		30	212	—	China 112; Japan 100.
Manufactured:					
Ammonia		179	298	—	China 228; Macau 70.
Nitrogenous		4,506	4,489	—	Philippines 1,680; Australia 1,205; Vietnam 1,100.
Potassic		45	—		
Unspecified and mixed		802	245	1	China 153; Taiwan 57; Japan 18.

See footnotes at end of table.

TABLE 1—Continued

HONG KONG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Graphite, natural		1,576	2,410	—	Indonesia 1,260; Taiwan 1,080; Philippines 32.
Gypsum and plaster		7,736	16,205	—	Macau 10,882; China 3,324; Indonesia 780.
Iodine	kilograms	2,076	31,241	—	China 31,201; Burma 40.
Lime		949	4	—	All to China.
Magnesium compounds:					
Magnesite, crude		9,973	2,046	—	Nigeria 1,534; Taiwan 400; China 91.
Oxides and hydroxides		3,170	6,003	—	Taiwan 3,819; China 1,214; Philippines 761.
Mica:					
Crude including splittings and waste		552	834	—	Indonesia 777; Taiwan 49; China 8.
Worked including agglomerated splittings		382	442	—	China 435; Egypt 4; Vietnam 1.
Nitrates, crude		287	232	—	China 156; Japan 40; Philippines 36.
Phosphates, crude		114	—		
Pigments, mineral:					
Natural, crude		152	2	—	All to Philippines.
Iron oxides and hydroxides, processed		7,811	9,521	202	China 2,798; Indonesia 2,275; United Kingdom 1,318.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$400,528	$362,663	$35,252	Thailand $157,117; Japan $86,225; Switzerland $24,400.
Synthetic	do.	$3,669	$8,482	$2,063	China $1,109; Germany $776; Singapore $437.
Pyrite, unroasted		—	1	—	All to China.
Salt and brine		6,150	7,009	—	China 6,466; Philippines 332; Malaysia 112.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		77,822	5,315	—	China 4,922; Macau 168; Philippines 82.
Sulfate, manufactured		17,689	8,406	—	Vietnam 2,349; Indonesia 1,808; China 1,121.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		94,699	22,799	69	Taiwan 17,287; Republic of Korea 3,524; China 2,086.
Worked		24,223	33,552	1,821	China 11,499; Taiwan 11,381; Macau 2,048.
Dolomite, chiefly refractory-grade		32	43	—	All to China.
Gravel and crushed rock		4,183	16,470	—	China 16,180; Japan 170; Taiwan 120.
Limestone other than dimension		1,786	3,260	—	China 1,218; Indonesia 726; Philippines 430.
Sand other than metal-bearing		7,061	15,234	—	China 11,870; Taiwan 3,164; Republic of Korea 160.
Quartz and quartzite		2,018	605	8	Singapore 384; Taiwan 120; Republic of Korea 20.
Sulfur:					
Elemental:					
Crude including native and byproduct		823	84	—	Indonesia 56; Philippines 26; China 2.
Colloidal, precipitated, sublimed		62	96	—	China 63; Kenya 20; Philippines 13.
Dioxide		—	10		All to China.
Sulfuric acid		311	370	—	China 365; Malaysia 2; Indonesia 2.
Talc, steatite, soapstone, pyrophyllite		42,137	41,623	—	Taiwan 36,761; Philippines 1,410; China 1,345.
Other:					
Crude		4,087	3,271	—	Taiwan 2,453; Indonesia 300; China 277.
Slag and dross, not metal-bearing		18	289	—	Republic of South Africa 200; China 70; Taiwan 19.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		17	14	—	All to China.

See footnotes at end of table.

TABLE 1—Continued
HONG KONG: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Carbon black		3,283	2,317	—	Indonesia 924; Sri Lanka 761; China 332.
Coal, all grades including briquets		130	18	—	All to Taiwan.
Coke and semicoke		109	191	—	All to Kenya.
Peat including briquets and litter		6,406	38	—	Taiwan 34; Japan 4.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	494	442	—	China 341; Macau 101.
Gasoline	do.	624	292	—	China 165; Macau 127.
Mineral jelly and wax	do.	334	283	—	Republic of South Africa 115; Taiwan 74; China 18.
Kerosene and jet fuel including white spirit	do.	42	138	—	Singapore 93; Macau 28; China 17.
Distillate fuel oil	do.	6,441	9,345	—	China 9,185; Macau 160.
Lubricants	do.	716	718	(4)	China 514; Taiwan 105; Macau 18.
Nonlubricating oils	do.	55	104	—	China 88; Indonesia 8; Taiwan 4.
Residual fuel oil	do.	7,162	8,050	—	China 6,956; Macau 1,094.
Bitumen and other residues	do.	13	4	—	Mainly to Macau.
Bituminous mixtures	do.	1	3	—	China 2; Macau 1.

[1]Table prepared by Jeremy H. Tidwell.
[2]Excludes unreported quantity valued at $3,500.
[3]Excludes unreported quantity valued at $701,000.
[4]Less than 1/2 unit.
[5]Excludes unreported quantity valued at $111,000.
[6]Reported under SITC item 522.120 as "selenium, tellurium, phosphorus, arsenic, etc."

TABLE 2
HONG KONG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals[2]		44	57	—	China 56; United Kingdom 1.
Aluminum:					
Ore and concentrate		12,497	9,850	—	All from China.
Oxides and hydroxides		60	60	3	Japan 31; China 16; Netherlands 5.
Metal including alloys:					
Scrap		5,693	8,460	2,022	China 4,657; Taiwan 277; Australia 230.
Unwrought		46,208	58,666	6,020	China 23,050; Australia 11,015; Japan 3,231.
Semimanufactures		65,716	80,799	16,433	Taiwan 11,043; China 11,016; Republic of Korea 10,193.
Arsenic: Oxides and acids		660	4,696	—	Mainly from China.
Beryllium: Metal including alloys, all forms	value, thousands	—	$103	—	All from Japan.
Chromium:					
Ore and concentrate		2,270	—		
Oxides and hydroxides		1,376	5	—	India 2; China 2; Netherlands 1.

See footnotes at end of table.

TABLE 2—Continued

HONG KONG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Cobalt: Oxides and hydroxides		62	46	—	China 37; Netherlands 6; United Kingdom 1.
Columbium and tantalum: Tantalum metal including alloys all forms		13	(3)		
Copper:					
Oxides and hydroxides		297	398	54	Germany 152; Norway 90; United Kingdom 45.
Sulfate		1,044	1,011	53	France 320; United Kingdom 291; China 98.
Metal including alloys:					
Scrap		46,640	92,467	41,603	China 23,460; Australia 5,025; Japan 4,767.
Unwrought		7,096	20,338	2,985	Chile 4,338; China 4,053; Netherlands 2,411.
Semimanufactures		125,882	163,022	2,341	Taiwan 41,642; China 36,880; Japan 31,070.
Gold:					
Waste and sweepings	value, thousands	$2,761	$1,214	—	Philippines $1,072; Taiwan $66; Switzerland $51.
Metal including alloys, unwrought and partly wrought	kilograms	180,780	301,559	83,824	Switzerland 78,176; Australia 38,151; Canada 30,066.
Iron and steel: Metal:					
Scrap		81,961	140,587	43,818	China 83,035; Japan 4,917; Republic of Korea 4,383.
Pig iron, cast iron, related materials		4,999	10,056	1,193	China 6,786; North Korea 902; Italy 576.
Ferroalloys:					
Ferromanganese		12,189	14,089	—	Mainly from China.
Ferrosilicon		39,514	60,641	—	Do.
Unspecified		36,455	49,435	—	Do.
Steel, primary forms		139,318	143,112	—	Turkey 66,500; China 26,725; Brazil 15,470.
Semimanufactures:					
Bars, rods, angles, shapes, sections		1,425,775	1,546,301	2,230	China 589,713; Brazil 149,090; Mexico 107,714.
Universals, plates, sheets		804,561	1,027,661	57,614	Japan 479,698; Republic of Korea 122,133; Taiwan 67,737.
Hoop and strip		87,253	105,350	3,941	Japan 58,814; China 14,705; Taiwan 8,194.
Rails and accessories[4]		2,619	4,178	(3)	United Kingdom 2,825; Germany 456; Italy 385.
Wire		69,371	74,927	331	China 43,820; Japan 7,560; United Kingdom 4,336.
Tubes, pipes, fittings		201,768	215,061	1,140	China 74,061; Japan 48,032; Mozambique 24,922.
Castings and forgings, rough		27,425	31,519	25	China 29,589; Australia 764; United Kingdom 640.
Lead:					
Oxides		1,552	635	—	China 623; Germany 6; Australia 6.
Metal including alloys:					
Scrap		3,949	4,923	1,807	Japan 1,555; China 1,147; Germany 106.
Unwrought		18,327	2,583	175	China 1,664; Australia 414; Canada 238.
Semimanufactures		904	139	—	Republic of South Africa 94; Netherlands 14; Taiwan 11.
Magnesium: Metal including alloys:					
Unwrought		46	419	374	Canada 41; Taiwan 4.
Semimanufactures	value, thousands	—	$41	$38	Taiwan $3.
Manganese:					
Ore and concentrate		959	762	—	All from China.
Oxides		3,650	5,167	91	China 3,782; Japan 806; Singapore 359.
Mercury		129	116	69	Netherlands 28; China 16; United Kingdom 2.
Molybdenum: Metal including alloys, all forms		12	1	(3)	Mainly from China.
Nickel:					
Oxides and hydroxides		123	239	147	China 71; Japan 20; Taiwan 2.

See footnotes at end of table.

TABLE 2—Continued

HONG KONG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Nickel—Continued:					
Metal including alloys:					
Scrap		41	—		
Unwrought		3,836	8,068	—	Netherlands 3,106; Norway 2,474; Canada 694.
Semimanufactures		314	721	27	France 229; China 209; Canada 151.
Platinum-group metals:					
Waste and sweepings	value, thousands	$1,768	$61	—	Republic of Korea $50; Australia $11.
Metals including alloys, unwrought and partly wrought	kilograms	2,595	5,048	316	United Kingdom 1,600; Canada 1,234; Japan 809.
Silver:					
Waste and sweepings	value, thousands	$3	$158	—	China $95; Taiwan $63.
Metal including alloys, unwrought and partly wrought	kilograms	132,490	242,822	51,621	United Kingdom 43,845; Australia 24,236; Taiwan 17,912.
Tin:					
Ore and concentrate		8,710	8,367	—	All from China.
Oxides		25	22	—	China 15; United Kingdom 4; Netherlands 2.
Metal including alloys:					
Scrap		87	99	54	China 41; Philippines 4.
Unwrought		7,022	9,425	19	China 8,963; Malaysia 212; Singapore 160.
Semimanufactures		1,378	1,159	21	Singapore 496; China 323; Taiwan 161.
Titanium: Oxides		16,046	18,233	2,020	Australia 4,855; China 3,936; Japan 1,717.
Tungsten: Ore and concentrate		2,031	516	—	China 496; Thailand 20.
Uranium and thorium: Oxides and other compounds		807	581	112	China 400; Japan 38; France 25.
Zinc:					
Ore and concentrate		1,107	3	—	All from Republic of South Africa.
Oxides		19,287	10,233	6	China 8,956; Taiwan 435; Republic of Korea 280.
Blue powder		330	204	—	All from China.
Metal including alloys:					
Scrap		6,407	6,592	510	China 2,005; United Kingdom 1,550; Japan 994.
Unwrought		74,818	87,798	—	Australia 22,677; Belgium-Luxembourg 20,573; Peru 14,807.
Semimanufactures		4,235	3,539	—	China 2,792; Germany 305; Japan 271.
Other:					
Ores and concentrates		16,496	7,524	36	Republic of South Africa 5,105; China 1,251; Singapore 883.
Metalloids, unspecified[7]		36,732	27,962	8	China 26,827; Germany 586; Taiwan 190.
Ashes and residues		11,860	7,928	212	China 6,875; Belgium-Luxembourg 433; Singapore 380.
Base metals including alloys, all forms		18,115	16,259	102	China 15,259; Netherlands 558; Belgium-Luxembourg 150.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		76,239	85,601	407	Indonesia 81,668; Turkey 1,460; China 1,344.
Artificial:					
Corundum		26,531	25,747	490	China 23,356; Japan 1,081; Republic of Korea 260.
Silicon carbide		2,615	2,853	(5)	China 2,821; Germany 9; Taiwan 9.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$2,277	$1,629	$377	Ireland $490; Japan $282; China $184.
Grinding and polishing wheels and stones		4,547	4,442	256	China 2,368; Japan 681; Taiwan 630.
Asbestos, crude		200	—		

See footnotes at end of table.

TABLE 2—Continued

HONG KONG: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Barite and witherite		4,783	1,939	—	China 1,778; Thailand 144; Japan 9.
Boron materials:					
Crude natural borates		378	462	168	Japan 294.
Oxides and acids		812	656	213	Italy 270; China 170; Taiwan 2.
Bromine including fluorine	kilograms	19	223,496	114,386	Germany 89,100; China 20,000.
Cement	thousand tons	4,270	3,263	(5)	Japan 1,597; China 1,030; Taiwan 306.
Clays, crude:					
Kaolin		208,669	274,369	2,445	China 268,649; Taiwan 1,618; United Kingdom 650.
Unspecified		192,984	206,309	1,895	China 201,805; Australia 1,361; France 436.
Diamond: Natural:					
Gem, not set or strung	thousand carats	2,930	3,612	182	Belgium-Luxembourg 1,802; India 1,349; Israel 561.
Industrial stones	do.	88	217	27	United Kingdom 53; India 50; Belgium-Luxembourg 47.
Diatomite and other infusorial earth		2,149	2,855	2,636	China 165; Singapore 41; United Kingdom 9.
Feldspar, fluorspar, related materials		178,243	185,599	—	China 185,165; Taiwan 434.
Fertilizer materials:					
Crude, n.e.s.		103	21	4	Australia 17.
Manufactured:					
Ammonia		2,953	2,726	2	China 2,620; United Kingdom 39; Taiwan 35.
Nitrogenous		10,404	12,949	—	China 8,765; New Zealand 1,076; Singapore 640.
Unspecified and mixed		5,724	6,323	53	Germany 4,229; Malaysia 592; Vietnam 382.
Graphite, natural		1,394	2,546	—	China 2,483; Switzerland 54; Taiwan 6.
Gypsum and plaster		77,441	90,446	7,803	Thailand 73,537; China 3,648; United Kingdom 1,886
Iodine	kilograms	2,780	29,600	—	Japan 23,500; China 3,000; Taiwan 3,000.
Lime		43,472	42,717	37	China 42,680.
Magnesium compounds:					
Magnesite, crude		7,120	2,047	—	China 1,960; United Kingdom 44; Japan 42.
Oxides and hydroxides		7,688	8,545	191	China 7,432; France 632; Japan 151.
Mica:					
Crude including splittings and waste		904	315	—	China 305; United Kingdom 10.
Worked including agglomerated splittings		1,644	1,690	4	Belgium-Luxembourg 651; Japan 557; China 231.
Nitrates, crude		553	652	—	China 530; Belgium-Luxembourg 122.
Pigments, mineral:					
Natural, crude		91	40	—	All from China.
Iron oxides and hydroxides, processed		11,200	13,076	1,771	China 6,258; Japan 2,189; Germany 2,136.
Potassium salts, crude		—	30	—	All from China.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$177,704	$186,561	$28,615	Thailand $34,840; Japan $21,769; China $14,819.
Synthetic	do.	$6,327	$11,767	$447	China $4,071; Japan $3,907; Taiwan $664.
Salt and brine		148,674	143,579	48	China 122,412; Taiwan 8,600; Germany 5,983.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		92,572	51,582	2,525	China 23,779; Australia 9,046; Poland 4,752.
Sulfate, manufactured		59,452	54,529	—	China 53,072; Taiwan 1,396; Germany 41.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		78,515	25,699	—	China 24,300; Taiwan 505; Republic of South Africa 438.

See footnotes at end of table.

TABLE 2—Continued

HONG KONG: IMPORTS OF MINERAL COMMODITIES[1]

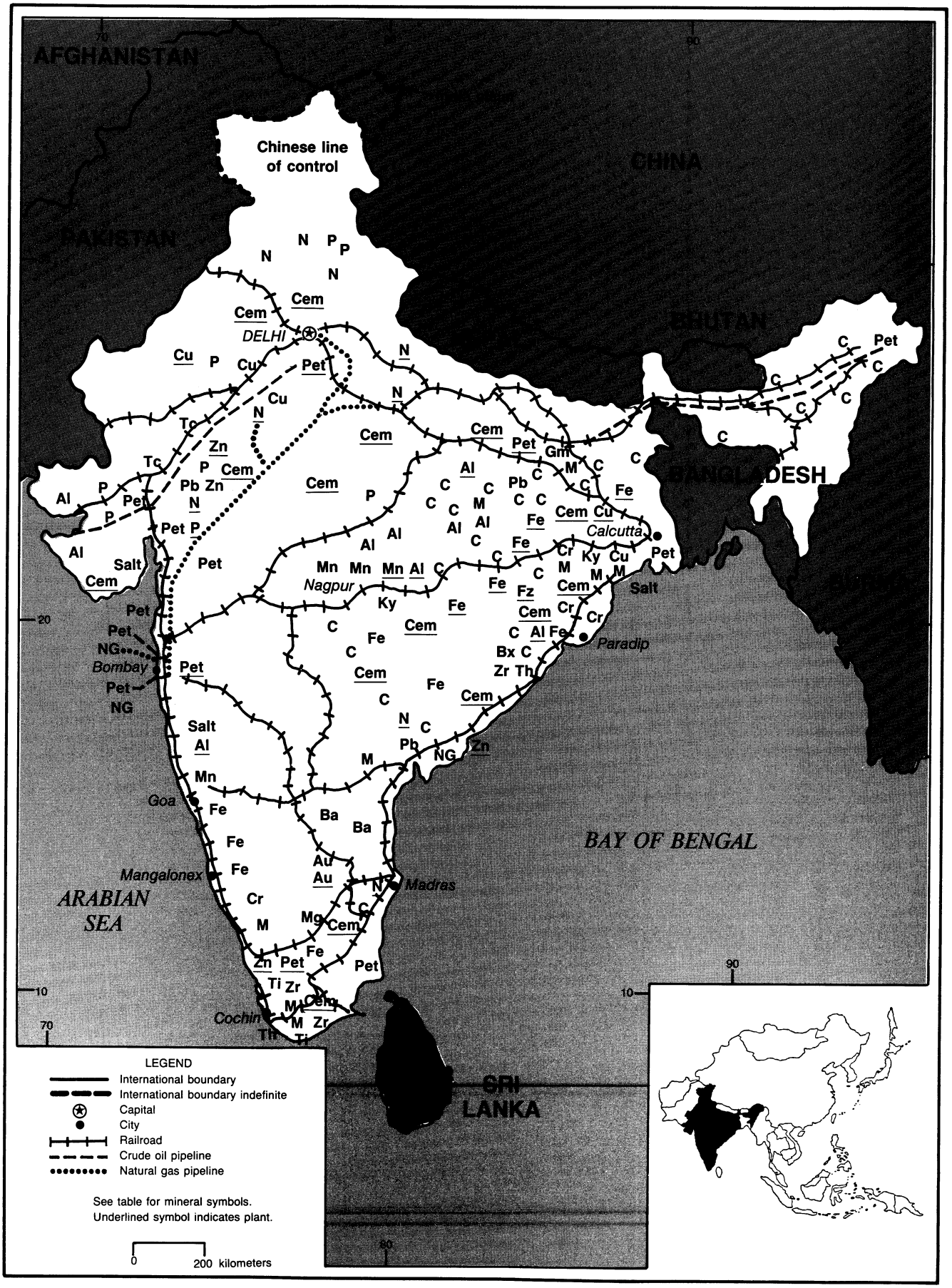
(Metric tons unless otherwise specified)

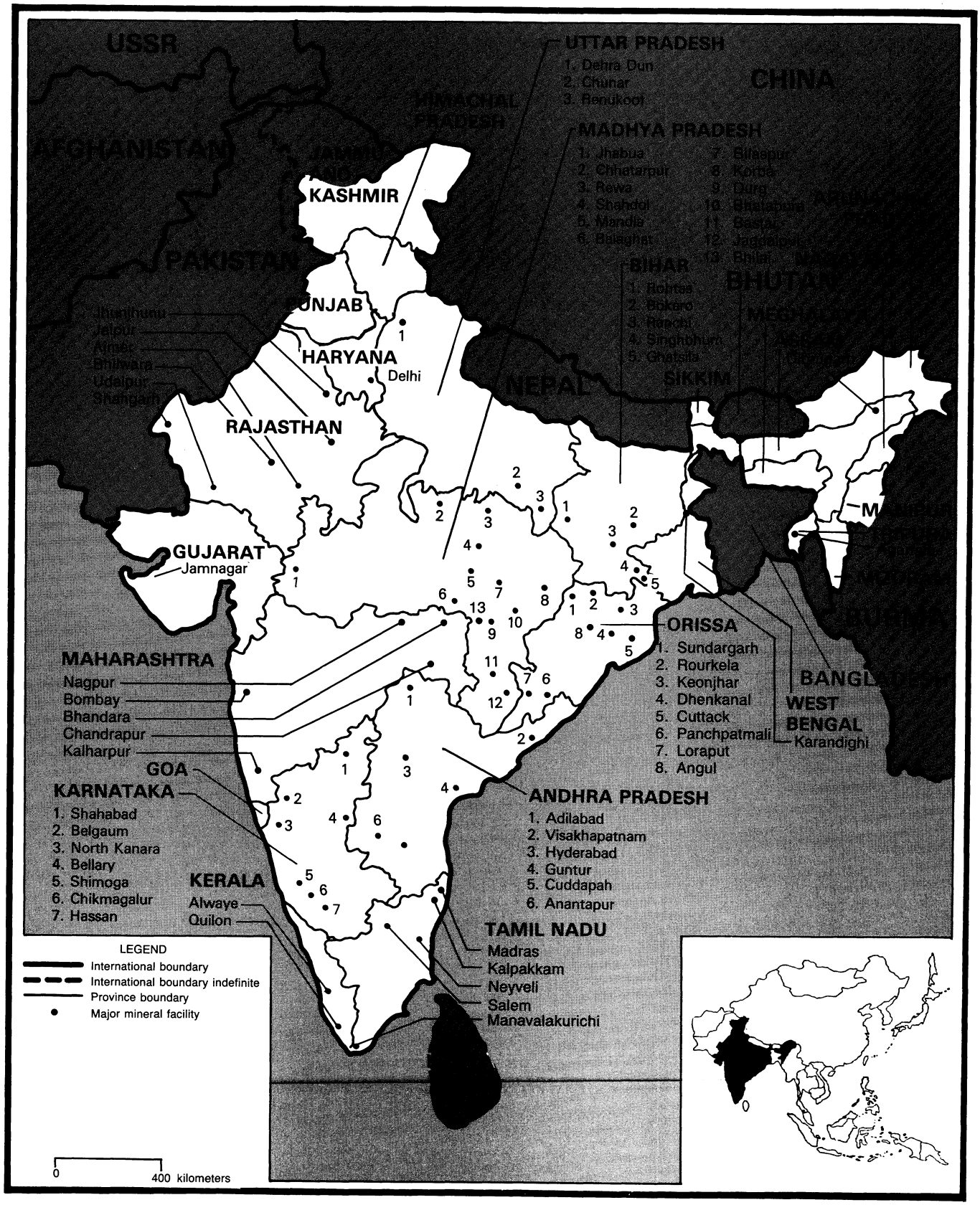
Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Dimension stone—Continued:					
Worked		89,870	113,160	291	Italy 57,175; China 32,313; Spain 7,910.
Dolomite, chiefly refractory-grade		22	—		
Gravel and crushed rock	thousand tons	8,459	8,402	—	China 8,395; Philippines 4; Taiwan 2.
Limestone other than dimension		416,818	1,451,986	1,223	Japan 1,412,344; China 38,252; France 127.
Quartz and quartzite		1,790	1,235	—	China 1,176; Germany 54; Brazil 5.
Sand other than metal-bearing	thousand tons	1,396	1,200	(5)	China 1,195; Australia 2; Taiwan 1.
Sulfur:					
Elemental:					
Crude including native and byproduct		623	881	—	Germany 719; United Kingdom 98; Thailand 36.
Colloidal, precipitated, sublimed		574	572	18	Republic of Korea 310; Germany 167; Taiwan 37.
Dioxide	kilograms	4,246	264	—	Taiwan 234; Singapore 30.
Sulfuric acid		5,182	3,300	44	China 3,129; Germany 81; United Kingdom 41.
Talc, steatite, soapstone, pyrophyllite		52,127	40,782	150	China 39,560; Taiwan 440; United Kingdom 247.
Other:					
Crude		12,215	4,646	13	China 4,430; Republic of South Africa 80; Japan 45.
Slag and dross, not metal-bearing		7,768	6,498	—	Japan 6,000; China 425; Thailand 38.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		859	120	8	Trinidad and Tobago 72; Malaysia 25; China 12.
Carbon black		3,544	4,782	1,703	China 1,598; Germany 662; United Kingdom 332.
Coal:					
Anthracite and bituminous	thousand tons	8,931	9,634	440	Australia 3,230; Republic of South Africa 3,056; China 1,599.
Briquets of anthracite and bituminous coal		130	—		
Coke and semicoke		1,513	484	—	Japan 306; Taiwan 142; Republic of Korea 36.
Peat including briquets and litter		1,597	726	—	Netherlands 602; Canada 76; Germany 48.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	2,457	2,337	—	Philippines 1,775; Singapore 302; China 106.
Gasoline:					
Aviation	do.	1	1	—	All from Australia.
Motor	do.	3,068	2,490	17	Singapore 2,424; China 49.
Naphtha including white spirit	do.	3,267	3,091	(5)	Singapore 3,068; Australia 8; Republic of Korea 6.
Mineral jelly and wax	do.	406	300	5	China 288; Japan 3.
Kerosene and jet fuel	do.	14,523	13,405	—	Singapore 12,323; China 765; Japan 317.
Distillate fuel oil	do.	20,027	24,368	244	Singapore 14,670; China 5,459; Japan 1,560.
Lubricants	do.	1,229	1,067	104	Australia 334; Singapore 324; China 154.
Nonlubricating oils	do.	70	110	3	China 72; France 14; Japan 7.
Residual fuel oil	do.	15,818	15,452	1,477	Singapore 9,226; Republic of Korea 2,653; China 1,332.
Bitumen and other residues	do.	278	297	—	Singapore 167; Taiwan 88; Japan 20.
Bituminous mixtures	do.	5	7	(5)	Taiwan 2; United Kingdom 2.

[1]Table prepared by Jeremy H. Tidwell.
[2]May include rare-earth metals.
[3]Unreported quantity valued at $679.
[4]Excludes unreported quantities valued at $1,868,000 in 1990 and $3,802,000 in 1991.
[5]Less than 1/2 unit.
[6]Excludes unreported quantity valued at $89,000.
[7]Reported under SITC item 522.120 as "selenium, tellurium, phosphorus, arsenic, etc."

INDIA

AREA 3.29 million km² **POPULATION 886 million**





LOCATION OF MAJOR MINERAL FACILITIES

THE MINERAL INDUSTRY OF

INDIA

By Pui-Kwan Tse

The P.V. Narasimha Rao government inherited an economic crisis when it came into power in 1991. The central Government fiscal deficit reached 8.4% of gross domestic product (GDP) in 1990-91. The inflation rate reached an alltime high of 17% in August 1991. India historically had a low inflation rate. In mid-1991, because of a severe shortage of foreign exchange, the Government was on the verge of defaulting on its external debt. The Rao government overcame the balance-of-payments crisis and reduced fiscal imbalances. Foreign reserves were increased from $1.2 billion[1] in 1991 to $6.5 billion by mid-1992 by a drastic import reduction on nonfuel raw materials and emergency borrowing from international agencies. Since the Government launched an economic reform in 1991, the inflation rate was 7% in the early 1993, down from 17% in August 1991. Overall economic growth, which had dipped to 1.2% in 1991-92, recovered to 4% in 1992-93. Industry growth showed significant recovery in the last three quarters of 1992. The Government budget deficit reduced from 8.4% of GDP in the year ending March 1991 to 5% in the year ending March 1993. The Government continued efforts to reduce the budget deficit to 4% in fiscal year 1993-94.

India's economy continued flat in 1992. Industrial recession reduced tax revenues. Import duties generated about 20% of the country's total revenue, but restriction on imports significantly reduced the receipt of revenue compared with that in the corresponding period of the previous year. Continuous and excessive subsidies on State-owned enterprises, which exceeded 1.1% of GDP in 1992, tended to hinder the country's economic reform and also exacerbate the situation by restricting the ability of State-owned enterprises to raise funds in the capital market. India's strained infrastructure may well limit economic growth potential for the next several years.

Following the destruction of a mosque in Ayodhya, Uttar Pradesh, on December 6, 1992, by Hindu nationalists, violent ethnic clashes flared up across the country for 2 weeks. Similar scenes were repeated in Bombay and Ahmedabad in January 1993. These events disrupted economic activity, shutting down ports and sharply curbing banking transactions. A month-long Indian Airlines strike at the same time also depressed the tourism market.

A favorable monsoon in 1992 prompted real GDP growth of 4.5% in 1992-93 and composed 5.3% growth in agriculture and 4% in industry. Population increased by 2% in 1992 compared with 1991, which restrained per capita real income growth. Recent IMF estimates using purchasing-power parity suggested fairly large disposable incomes for some sectors of the economy and ranked India as the world's sixth largest world economy.

GOVERNMENT POLICIES AND PROGRAMS

The Government owns and operates most major mines, processing plants, and most of the mineral-based industries. The fundamental operating rules and procedures for the mineral industries are the Mines and Minerals (Regulation and Development) Act of 1953 and its amendments, the Minimum Wages Act of 1948 and its amendments, the Mineral Concession Rules of 1960, the Mines Labor Welfare Fund Act of 1976, and the Oil and Mines Regulations of 1983.

The national mineral policy for metals and nonnuclear fuel was formulated by a balance between conservation and mineral development. The guiding principle in its strategy to develop any mineral and mineral deposit at any location ordinarily would be the economic cost. However, under the conservation measure, recycling of metallic scrap and the utilization of low-grade minerals, mineral wastes, and rejects are encouraged.

India issued the National Mineral Policy (NMP) in March 1993 to withdraw the ban on foreign and private investment in the mining of 13 mineral commodities—chromium, copper, diamond, gold, iron ore, lead, manganese, molybdenum, nickel, platinum-group metals, sulfur, tungsten, and zinc. The NMP allows foreign equity of up to 50% in mining joint-venture projects if promoted by Indian companies. Enhanced equity holdings of more than 50% will be considered on a case-by-case basis. The policy permits development of other minor minerals through private sector efforts; however, the state will continue to play an active role in mining and processing. The introduction of foreign technology and participation in exploration for high-value and rare minerals would be pursued. The Government introduced a stringent budget and a new industrial policy affecting the minerals enterprise. The subsidies on public enterprises were reduced, and defense spending was restrained. The Government increased petroleum and liquefied gas prices and required a steeper holding tax and levy rates. The Government began to privatizate its public enterprises. In the case of joint ventures, the Government allowed an increase in foreign investments from the

previous 40% ceiling to an automatic approval to 51%. The Government will permit the foreign equity ceiling to reach 75% to 100% for selected high-technology, export-oriented, and tourism industries.

New mining leases will not be granted without proper mining plans, including environmental issues. This condition will apply to both public- and private-sector parties. The environmental safeguards will be approved and enforced by statutory authorities.

The policy also emphasizes certain new aspects such as mineral exploitation in the seabed and the development of an appropriate inventory for mineral resources. The Geological Survey of India has been designated the principal agency for geological mapping and identification of mineral resources, and the Department of Ocean Development is responsible for seabed exploration and mining operations.

PRODUCTION

The overall industrial production growth rate increased by 4% in 1992 over the same period of 1991. India's steel industry is in a transitional phase. In January 1992, as part of the liberalization measures, the Government abolished steel prices and distribution regulations of the Joint Plant Committee that have been imposed since 1964. The steel supply to defense, railways, small-scale industries sector, exporters of engineered goods, and the Northeastern Region will continue to be on the priority list. An inappropriate product mix, power shortages, and imbalances were responsible for low profitability and idle capacity in the industry. The nonferrous sector is not as well positioned as its ferrous counterpart. With the exception of aluminum, nonferrous metals suffer from supply problems. The shortage of copper is likely to persist because of delays in stepping up domestic production. Lead and zinc are not much better off than copper. A more pronounced rise in lead production is being done from imported concentrates. The main handicap of the nonferrous metal industry is the shortage of power. The industry is attempting to install captive generating capacity wherever feasible. (*See table 1.*)

TRADE

The Government of India made significant reforms to its trade policy as part of an overall effort to integrate India more closely into the world economy. The new Government party has made efforts to shift India away from its self-reliant economic strategies toward more liberal trade relations and to introduce regimes to increase foreign exchange. In early 1992, India's Minister of Commerce announced a new trade policy that would run concurrently with the eighth 5-year economic plan, beginning on April 1, 1992. The new policy sought to raise the share of trade in India's GDP from 13% to 20% and to remove unnecessary restrictions to the flow of goods and services. Although the Government will continue to restrict imports of consumer goods, the new policy will restrict only 5% of nonconsumer products—down from 40% from the previous trade policy. Furthermore, the number of items that previously were channeled through public-sector import agencies will be reduced from 28 to 8 under the new policy. On the export side, 62 items will be restricted, 7 banned, and 10 channeled by the Government. India imposed a ceiling of 110% on the basic tariff rate in 1992-93—down from 150% under the 1991-92 trade policy. India also has committed itself to further tariff reductions and binding tariffs as part of the General Agreement on Tariff and Trade (GATT) Uruguay Round market access negotiations. Despite the newly lowered tariff ceiling, India's tariffs remain high, especially for goods that can be produced domestically.

Another aspect of the new policy is reform of the foreign exchange system. In February 1992, the Government replaced the "exim scrip" system introduced in July 1991, by which exporters kept 30% of their foreign earnings as tradable entitlements to foreign exchange at the official rate. The scrip could be used to import any product from the restricted, limited permissible, and open general import license lists. The Government also allowed the scrip to trade openly in secondary markets at market rates. Banks and other financial institutions in India were quite active in exim scrip, trading at premiums of 20% to 40% of face value. The new system established a two-tiered exchange rate. Foreign exchange earners will be allowed to sell 60% of their earnings at market-determined exchange rates. The remaining 40% of foreign exchange earnings must be sold to India's central bank at an official rate. It will be used to finance the Government's purchases of essential commodities or for other official trade transactions.

India's trade deficit was $3.9 billion for fiscal year 1992-93. Exports were at $18.4 billion and imports were at $22.3 billion. Exports to the former U.S.S.R. continued to decline from $3 billion in 1989-90 to $1.8 billion in 1991-92 and $600 million in 1992-93. Social unrest in the last quarter of the fiscal year disrupted what had been a relatively strong recovery of exports. (*See tables 2 and 3.*)

STRUCTURE OF THE MINERAL INDUSTRY

The India mining industry produces more than 70 mineral commodities, representing various ores, metals, industrial minerals, and fuels. The entire industry is expanding, and the rate of growth depends on several factors: location of resources; capital investment; and the accessibility of advanced technologies in mining, processing, and production.

There were more than 4,200 operating mines in India. However, the majority of these mines were small, manually operated surface pits with relatively low output and accounted for approximately 70% industrial minerals, 18% of metallic minerals, and 12% of mineral fuels.

In the nonfuel sector, more than 300 underground mines were in production of such minerals as chromite, copper, gold,

lead-zinc, and manganese in the metals sector and apatite, barite, fluorspar, graphite, mica, and steatite in the industrial minerals section. Most of these are manual operations. The coal sector has been gradually undergoing a transition from manual to semimechanized operations.

Total employment in the mining and quarrying sector exceeds 1 million, or 4.5% of the employed labor force. The public sector employs about 90% of the total. Employment in the private sector has been increasing in the past several years. (*See table 4.*)

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Despite a large bauxite resource, high power costs and heavy import duties have forced the production cost of aluminum to be high in India. The Indian Government approved the Aluminium Association of India's request to reduce the heavy excise duty on aluminum and aluminum products. Duties on aluminum and aluminum products, which ranged from 23% to 40%, were replaced by a uniform rate of 25%.

Indian Aluminium Co. (INDAL) suspended operations at its Belgaum plant in Karnataka because of a steep increase in the cost of power in 1992. Bharat Aluminium Co. (BALCO) and INDAL were plagued by power shortages. The Public Investment Board approved National Aluminium Co.'s (NALCO) $370 million plan to expand its bauxite mines and alumina refinery at Damanjodi in District Koraput of Orissa. The mining capacity will be doubled to 4.8 Mmt/a and the refinery capacity expanded from 860,000 mt/a to 1.35 Mmt/a. It will take more than 4 years to complete the expansion. The Government of India scrubbed plans for a 600,000-mt/a bauxite mine at Gandhmardan in Orissa in the wake of local agitation against its environmental impact.

Domestic sales of aluminum were slow because the demand in the electric cable, extrusion, and automobile sectors was sluggish. High prices for and taxes on aluminum metal also cut consumption by other industries. Since aluminum prices were decontrolled in 1989, aluminum prices were raised six times and went from $1,136/mt in 1989 to $1,718/mt in 1992, which was much higher than international market prices. In 1992, India produced 490,000 tons aluminum from its five aluminum companies, which was lower than the targeted production. This was mainly due to power shortage facing INDAL, which has resulted in closure of its Belgaum smelter in Karnataka. The domestic demand for aluminum was about 400,000 tons during 1992.

NALCO, India's largest aluminum producer, exported 432,000 tons of alumina and 85,496 tons of aluminum of its output of 800,000 tons and 192,000 tons, respectively, in fiscal 1992-93. The Government estimated that the demand of aluminum would be 575,000 tons in 1994-95 and 855,000 tons in the year 2000. BALCO and NALCO have plans to raise their respective capacities by 50,000 tons and 115,000 tons to 150,000 tons and 333,000 tons in 1995, respectively.

Chromium.—India produced 995,000 Mmt of chromite from Cuttack District in Orissa in 1991. Chromite was mostly mined by Tata Iron and Steel Co. (TISCO), Indian Metals and Ferroalloys (IMFA), and Orissa Mining Corp. TISCO's operations in the Sukinda area were hit by labor unrest protesting the start of mechanized mining. India consumed 800,000 tons of chromite in 1991, for which the metallurgical industry was the main consumer. Indian Charge Chrome Ltd., a subsidiary of IMFA, began commercial production of its 50,000-mt/a-capacity plant in Orissa. Japan and China are India's main customers, but limited supplies forced the Government to restrict the export of high-grade chromite ore.

Copper.—India has 35 known deposits and prospects that are confined to three States—Bihar, Madhya Pradesh, and Rajasthan, with total reserves of 724 Mmt. Out of the 17 working mines, 10 are being operated by Hindustan Copper Ltd. (HCL). Others are operated by Sikkim Mining Corp. (SMC) at Rangpo, Sikkim, and Hutti Gold Mines Ltd. (HGML) at Chitradurga and Kalyadi in Karnataka.

HCL, a sole copper producer, improved performance at its Khetri Copper Complex (KCC) in Rajasthan. Following modernization in 1987 and 1990, the Outokumpu flash furnace is capable of increasing the output from 31,000 tons to 45,000 tons. The estimated production of ore, concentrates, blister copper, and refined copper at KCC is 19 Mmt, 16,000 tons, 33,000 tons, and 32,000 tons, respectively, at KCC in fiscal year 1992-93.

Indian Copper Complex of HCL consists of a smelter and refinery of 16,500 mt/a, with supporting mines at Mosaboni, Pathargora, Surda, Kendadih, and Rakha in District Singhbhum in Bihar, a 84,000-mt/a wirebar casting plant, and a 54,000-mt/a sulfuric acid plant. Depletion of reserves and a power shortage at Ghatsila, Bihar, have affected the output of copper ore and concentrates. It produced 12,000 tons of concentrates, 13,500 tons of blister copper, and 13,150 mt of cathode in 1992-93.

In 1992-93, HCL copper output was 45,000 tons while domestic consumption was 160,000 tons. India relied heavily on imports. Effective April 1992, the Government lifted import controls and allowed users to import directly. India will continue to rely on imports to meet growing demand. In 1994-95, imports are projected at 115,000 tons and domestic output will be at 77,000 tons.

Gold.—Limited gold reserves and difficult mining conditions have led annual gold production to be maintained at a 2-tons level. Almost one-half of the gold output comes from the Karnataka State-owned HGML, about one-third from Government-owned Bharat Gold Mine Ltd. (BGML), and the rest recovered as a byproduct of copper refining.

Iron and Steel.—The recoverable reserves of iron ore, hematite and magnetite, are at 9.58 billion tons and 3.14 billion tons, respectively. Hematite was mainly found in Bihar, Goa, Karnataka, and Madhya Pradesh, while magnetite was in Andhra Pradesh, Goa, Karnataka, and Kerala. Iron ore is produced through a combination of large mechanized mines in the State-owned and smaller mines operated on a manual or semimanual basis in private-owned. India has an annual output capacity of 67 Mmt/a. In 1992-93, the country produced 57.5 Mmt compared with 57.1 Mmt the previous year. Madhya Pradesh was the leading producing State, with 23.9%; followed by Goa, 22.2%; Karnataka, 21.0%; Bihar, 17.6%; and Orissa, 14.6%. Domestic iron ore consumption was about 24 Mmt/a. The remainder was exported.

Kudremukh Iron Ore Co. Ltd. (KIOCL), a Government-owned enterprise that is 100% export-oriented, was expected to produce 6.2 Mmt of concentrate and 2.15 Mmt of iron ore pellets in 1992-93. During July 1992, the plant in Kudremukh was shut down. Landslides from heavy rainfall caused damage to the diversion channel of the Lakhya Dam, a reservoir used to store tailings generated by the Kudremukh plant. In addition, power supply restrictions and interruptions by the Karnataka State Electricity Board and the unanticipated breakdown of equipment resulted in lower production.

With the liberalization of trade policy and commencement of the export and import policy for 5 years from April 1, 1992, to March 31, 1997, imports of iron and steel materials and ferrous scrap have been dechanneled. The Development Commissioner for Iron and Steel is not required to clear requests for imports.

The Visakaptnam Steel Plant (VSP) was the first to be implemented by Steel Authority of India Ltd. (SAIL). In 1982, Rashtriya Ispat Nigam Ltd. was incorporated in the public sector and became a sole correspondent for the establishing VSP. The plant design adopted the most modern technology, including a 3,200-m^3 blast furnace, dry quenching of coke with auxiliary power generation facilities, torpedo ladle for steel melt shop, in addition to conventional mixer, cast house slag granulation for blast furnace, and 100% continuous casting of liquid steel. VSP was dedicated on August 1, 1992.

Domestic production of pig iron has not kept pace with demand. The major producers are the integrated steel plants. During 1992-93, the demand of pig iron was estimated at 210,000 tons, while domestic production would likely be about 179,000 tons; about 148,200 tons was used by the integrated steel plants. Because of financial considerations, integrated steel plants concentrated on production of finished steel products rather than on pig iron. The Government encouraged the creation of pig iron manufacturing facilities in the secondary sector. The shortage of coking coal reserves in the country has discouraged some entrepreneurs from setting up pig iron facilities. India imported 6 Mmt of coking coal, mainly from Australia, in 1991-92. In 1992-93, this was expected to increase to 7 Mmt. Under the New Industrial Policy of July 1991, manufacturing of coke has been delicensed. This encouraged the private sector to set up merchant cokemaking facilities.

In 1991-92, India produced 1.2 Mmt of sponge iron and was expected to produce 1.4 Mmt, about 78% of its capacity, from nine companies in 1992. Essar Gujarat Ltd. was scheduled to add another 400,000 mt/a of capacity in its plant in Hazira, District Surat, Gujarat in March 1993. By 1995, India's sponge iron capacity is expected to rise to 6 Mmt/a.

Lead and Zinc.—After the completion of the Rampura-Agucha Mine and Chanderiya Lead-Zinc Smelter in Rajasthan in May 1991, India moved a step closer to self-sufficiency in lead and zinc. The project cost to Hindustan Zinc Ltd. (HZL) was $270 million. The design capacity called for 3,000 mt/d of ore with 13.48% of Zn and 1.93% of Pb content. It would be integrated with the Chanderiya smelter to have an annual output of 70,000 tons of Zn, 35,000 tons of Pb, 74 tons of Ag, and 375 tons of Cd. With the commission of this project, HZL raised its production capacity of 10,740 mt/d of Pb-Zn ore in eight mining pits to 149,000 mt/a of Zn and 65,000 mt/a of Pb in four smelting plants. The new smelter produced 12,202 tons of Zn and 4,388 tons of Pb in 1991-92 and would produce 32,000 tons of Zn and 13,000 tons of Pb during 1992-93. From April to December 1992, HZL produced 76,674 tons of Zn and 25,945 tons of Pb.

In the private sector, Binani Zinc Ltd. produced zinc from imported concentrates at the Alwaye plant in Kerala. The company modernized and expanded the plant to increase its capacity to 20,000 mt/a. Indian Lead Ltd., which has two plants at Phane in Maharashtra and at Kalipara in West Bengal with a total installed capacity of 24,500 mt/a, produced secondary lead from indigenous and imported lead scrap and lead concentrates.

Manganese.—The reserves of manganese ore are estimated at 176 Mmt. The majority of the reserves are in Karnataka (36%), Orissa (23%), Goa (13%), Maharahstra (11%), and Madhya Pradesh (9%). Most of the manganese ore is blast furnace grade. In 1991, India produced 1.4 Mmt of manganese ore. The Government-owned Manganese Ore India Ltd. (MOIL), which was the leading producer, produced 56,560 tons in 1991-92 and 60,540 tons from April 1992 to February 1993 from its mines in Maharahstra and Madhya Pradesh. TISCO has six leased mines at Bamebari, Joda West, Khandbond, Malda, Manmora, and Tiringpahar in Orissa that produced a total 79,091 tons of manganese ore in 1991-92. India consumed about 1.3 Mmt of manganese ore in 1991.

Uranium.—The Department of Atomic Energy (DEA) plans to set up a mine and a mill to produce uranium concentrate at Domiasat in West Khasi Hills of Meghalaya. The uranium deposits at Domiasat were estimated at 10,000 tons

that accounted for about one-seventh of the country's identified reserves. The proposed mine and mill would be operated by Uranium Corp. of India. The uranium concentrates will be shipped to the nuclear fuel complex at Moula Ali near Hyderabad for fuel fabrication for use in nuclear power reactors.

Industrial Minerals

Diamond.—In 1991, India produced 19,200 carats of diamond, which was mainly from the Government-owned National Mineral Development Corp. (NMDC) mines at Wajrakurur in Andhra Pradesh. NMDC planned to upgrade exploration and mining technology to expand its diamond production from 17,500 carats/a to 100,000 carat/a. There are more than 400 diamond processing/exporting firms that depend on imported rough diamond. In 1992, India imported rough diamonds valued at about $2 billion and exported polished diamonds valued at $60 billion. India's diamond industry is now the world's largest in terms of value, pieces, carats, and employment. Most of the diamond processing plants are at Bombay and Surat in Gujarat. In the wake of civil unrest in Bombay and Surat in late 1992 and early 1993, many skilled diamond workers were forced to move away from these areas and buyers shifted to other sources.

Financing of diamond processing and exporting became a major problem for the industry. Exporters were concerned about the cost of postshipment credit charged, 15.5% for 90 days and 19% to 20% for more than 90 days, which was about twice the amount foreign firms paid. Exporters often sold stones at reduced profit levels because the Reserve Bank of India would not permit financing of inventory for more than 90 days. As a result, more exporters are tying up with foreign firms.

Granite.—Pooja Granite and Marble Ltd. (PGML) completed the first phase of construction of its Abu Road Plant in Sirohi District, Rajasthan. The new plant has an annual capacity of 45,000 m^2 of polished granite slabs. The second phase of construction was expected to be completed in the second quarter of 1993, doubling its current capacity. PGML imported the plant machinery and technology from B. Barsanti and Co. of Italy and established agreements with Italian customers to supply them with polished granite over the next 5 years.

Gypsum.—Kashmir Gypsum Ltd. invested $5.6 million to set up a mechanized opencast gypsum mine in the Parlanka area of Jammu's Doda District in Kashmir. The mine will produce 60,000 mt/a of 95%-pure gypsum. It will reduce the gap between demand and supply in the country.

Mineral Fuels

Coal.—About 70% of electricity generated comes from coal in India. Indian coal reserves are estimated at 192,300 Mmt. India produced 234 Mmt of coal in 1992. Distribution of coal was controlled statutorily under the Colliery Control Order of 1945. Distribution is done by the Coal Controller. If for any reason the Coal Controller is not able to do so, coal companies have been allowed to distribute coal on the basis of linkages and/or sponsorship. Short-term linkages for important sectors of economy, such as power and cement, are decided by the Standing Linkage Committee set up under the Ministry of Coal. Linkages to other consumers, except steel, are within the purview of coal companies, which allot coal to actual users in accordance with advice received by them from the various sponsoring authorities. New allotments by coal companies are on the order of 5,000 mt/month.

Indian coal has a high ash content of more than 30%, which makes it less fuel efficient. Metallurgical-grade coal production is well below demand, and about 5 Mmt/a is imported, mainly from Australia. For 1993-94, the production target was set at 220 Mmt and was expected to reach 308 Mmt in 1996-97. Therefore, Coal India Ltd. (CIL) planned to improve the efficiency of old mines whose capacity utilization is less than 65%. New technologies, such as long-wall mining, semimechanized drilling, and blasting operation, were introduced.

Because of the low degree of mechanization in underground mines, the output per manshift (OMS) was only 0.53 tons while the average OMS for mechanized and semimechanized in an opencast mine was 3.08 tons. The OMS in the Northern Coalfield operated by CIL reached 8.03 tons in 1991-92.

Coal prices are set by the Government, based on recommendations from the Bureau of International Cost and Prices. Coal prices are revised by the Bureau of Industrial Costs and Prices, based on the cost of inputs. However, most input data used to set prices typically are out of date. Production costs are high in India, with wages alone accounting for more than one-half of the cost per tons of coal. In 1992, 600,000 miners were required to produce 210 Mmt/a (i.e., 350 mt/miner /a.)

As part of liberalization, the first private-owned coal mining company, Eastern Mining Ltd., has been allowed to set up an operation in Meghalaya. The Government has added amendments into the Coal Mine Nationalization Act and Mines and Minerals Regulation Act to govern the privatization of coal mines. Privatization is limited to virgin mine blocks for setting up captive power projects. Private companies and the public coal consuming sectors will be allowed to open new coal mines, coal-fired thermal powerplants, and coal washeries.

Oil and Gas.—Oil imports costed about $6.5 billion, approximately 27% of the Indian total import value, in 1992-93. The demand for petroleum products is expected to grow about 7% annually in the next several years, and crude oil production from the existing oilfields is on a decline. Following disappointing results in its most recent exploration bidding, the Government offered joint ventures with private foreign and domestic companies involving development of 43% of the country's

oilfields and gasfields. The Government was expected to attract a total investment of $1.3 to $1.9 billion in the next 5 years.

India also faces another serious problem—current refining capacity is not keeping pace with the demand. Twelve refineries had a combined annual output capacity of 53.35 Mmt in 1992. An additional 7.15 Mmt of refinery capacity is under construction and is expected to be commissioned in 1995. Finally, India opened its refinery sector to full private investment in 1992. The Government approved a proposed joint venture by Japan's C. Itoh & Co. and India's privately held Reliance Industries, based in Bombay, to build a 120,000-bbl/d refinery at Salaya Gujarat, north of Bombay, at a cost of $1.2 billion. Other major companies, including the Birlas, Ruias, and Hindujas from India, and Chevron, Caltex, Shell, Mobil, and Gulf Oil from the United States and Europe, started exploring ways to enter the Indian refinery business. The most important inducement for the private sector is the retention price scheme announced by the Government, under which 12% posttax return on net worth is ensured, subject to a certain efficiency criteria. A 12% post-tax return on net worth translated into about 25% pretax return in India, where the existing corporate tax rate was 51.75%. The price is based on a cost computed at a 60% capacity utilization in the first year of operation and a 90% utilization subsequently.

India and Oman signed a Memorandum of Understanding, providing that Oman would help India set up two refineries as a joint venture and supply natural gas through an undewater pipeline. An oil pipeline from Oman to India will be constructed after the completion of a natural gas pipeline.

Reserves

The country's mineral resources have not been fully delineated, and in many areas large deposits of oil, gas, coal, limestone, bauxite, and iron ore are still likely to be found. Iron ore deposits, mainly in the form of hematite or magnetite, occur in Bihar, eastern Madhya Pradesh, Orissa, Karnataka, and Tamil Nadu. Bauxite deposits are mainly in Orissa and Andra Pradesh, and also occur in Matharashtra, Tamil Nadu, Bihar, and Gujarat. Low-grade copper deposits are in Rajasthan, Madhya Pradesh, Bihar, and Andra Pradesh. Lead and zinc deposits are in Rajasthan and Bihar. Nickel and chromium ore reserves exist in Orissa. Gold is produced only in small amounts in Karnataka, and diamond is mined in Madhya Pradesh. Ilmenite sands in Kerala and Tamil Nadu contain a large amount of thorium. (*See table 5.*)

INFRASTRUCTURE

India's road network includes 515,000 km of hard-surface two-lane roads and approximately 1.12 Mkm of gravel, loose-surface, or prepared-earth routes having at least one lane and, in many stretches, two lanes. This secondary system is not well drained in all places, but generally can accommodate passing of vehicles headed in opposite directions. As in many Asian countries, access to some remote areas is by cart tracks, current or abandoned.

The railroad system comprises 33,600 km of broad-gauge 1.676-m track, 24,000 km of meter-gauge (1.00-m) track, and 4,250 km of narrow-gauge, 0.762-m and 0.610-m, track. The total track length of all gauges is approximately 61,850 km, of which 12,617 is double track and 6,500 km is electrified. The mixed-gauge trackage introduces complexities, such as loss of time in transshipment and multiple stockage of spare parts. The rail system has considerable old equipment that is unreliable and expensive to maintain. At yearend 1992, detailed plans were revealed to upgrade the railroads through the use of heavier rails of higher tensile strength, welded rails, and prestressed concrete sleepers to improve track structure. Modern electronic devices were expected to improve reliability of signals and telecommunications. In addition, locomotives were to be upgraded to higher horsepower and greater fuel efficiency, coaches would be built of lighter weight and greater speed potential, and freight cars would be constructed of better payload-to-weight ratio.

The country has about 16,200 km of inland waterways, with 3,630 km navigable by large vessels. Principal seaports are Bombay, Calcutta, Cochin, Kandla, Madras, New Mangalore, and Port Blair in the Andaman Islands. A newer port at Visakhapatnam is growing rapidly and likely will become India's most active port in the next 5 to 10 years. Cochin Port has endured labor problems and suffered losses of traffic to other ports. Madras Port has recently earned a reputation as the cleanest and most efficient port in India. India has a total of 345 airports, 292 of which are presently usable. Of these, 203 have paved runways, 2 of them with runways more than 3,659 m long, 59 of them with runways 2,440 to 3,659 mines, and 87 of them with runways 1,220 to 2,439 m in length. Air service utilizes about 93 large transport aircrafts.

The electric-power system has a present capacity of about 80,000 MW. Some of its major industrial on-site capacity is dedicated to specific plants, particularly in the copper and aluminum sectors. By the year 2000, India plans to have an installed capacity of 10,000 MW of nuclear power. Total production of public-sector power in 1991 was 290 billion kW • h.

Pipelines, relatively new to India, consist of 3,497 km for petroleum crude, 1,703 km for refined products, and 902 km for natural gas, in all totaling 6,102 km. Pipelines are undergoing further development and expansion as new routes and terminals are being proposed with increasing urgency.

OUTLOOK

India entered what showed signs of becoming a period of political instability as various ideological entities vied for election, mostly to earn only pluralities rather than commanding majorities. The socialist mindset of the Nehru era contended with proponents of free enterprise wanting fewer restrictions on entrepreneurial venturing and

development, all with a rich mixture of religious and caste distinctions that made for what the world has come to know as the Indian style of Government. Meanwhile, the country has steadily grown in population, expectations of social progress, and the desire for an improved quality of life. Against this background, India was short of electric power and increasingly short of petroleum products. Demand for virtually all mineral commodities increased steadily and, for some, greatly exceeded supply. The country has benefited from widespread mineral exploration within a very complex variety of geological terranes. The promise of additional mineral wealth awaits further, and increasingly sophisticated, search. Shortfalls in the supply of mineral commodities such as in ores of copper, gold, nickel, industrial fertilizer minerals such as phosphate and potash, and petroleum can be paid for with the production of minerals with which India is endowed, such as bauxite, chromite, iron ore, and manganese among the metals; gemstones, granite, graphite, mica, and talc among the industrial minerals; and coal, to name a few. But India's formidable and confusing plexus of trade regulations and restrictions, including virtually senseless tariff schedules, will defeat the kind of trade relations that the country would need increasingly if it is to survive and progress.

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[1]Where necessary, values have been converted from Indian rupees (Rs) to U.S. dollars at the rate of Rs26.20=US$1.00 in 1992.

OTHER SOURCES OF INFORMATION

Agencies

Geological Survey of India
Ministry of Steel and Mines
27 Jawaharlal Nehru
Calcutta 700 016, India

Indian Bureau of Mines
New Secretariat Building
Nagpur 440 001, India

National Mineral Development Corp.
Hyderabad 500 004, India

Oil and Natural Gas Commission (ONGC)
Bombay Offshore Project
12 Floor, Express Towers, Nariman Point
Bombay 400 021, India

Oil India Limited (OIL)
Allabad Bank Building
17 Parliament Street
New Delhi 110 001, India

Publications

Ministry of Steel and Mines, Indian Bureau of Mines, Nagpur:
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The Indian Mining and Engineering Journal, monthly.

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TABLE 1

INDIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	3,961	r4,471	4,852	r4,735	4,850
Alumina, Al_2O_3 equivalent	do.	776	1,947	1,601	1,700	1,700
Metal, primary		375,000	423,400	433,270	r504,000	490,000
Cadmium metal		237	275	277	207	210
Chromium: Chromite, gross weight		820,863	1,002,659	939,000	994,674	1,000,000
Copper:						
Mine output, Cu content		55,429	57,376	e58,200	55,380	55,000
Metal, primary:						
Smelter		44,284	42,456	40,667	47,000	50,000
Refinery:						
Electrolytic (cathode)		38,914	41,041	40,598	45,000	45,000
Fire refined		1,186	802	e1,000	e1,000	1,000
Total		40,100	41,843	e41,598	46,000	46,000
Gold metal, smelter	kilograms	1,942	1,827	1,983	r1,973	2,000
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	49,961	53,418	54,579	r57,638	54,000
Iron content	do.	31,226	33,440	34,200	35,600	33,800
Metal:						
Pig iron	do.	11,735	12,080	r12,645	r14,176	15,000
Ferroalloys:						
Ferrochromium (including charge chrome)		140,262	135,000	122,000	r96,007	95,000
Ferromanganese		138,331	157,776	201,194	r148,000	145,000
Ferrochromium-silicon		2,769	11,384	7,000	8,800	9,000
Ferrosilicon		46,721	74,472	64,035	r39,099	39,000
Silicomanganese		52,895	72,229	57,361	r46,172	45,000
Silicon metal		686	—	—	—	—
Other		445	386	e400	r6,767	6,500
Steel, crude:						
Steel ingots	thousand tons	12,682	12,452	r14,963	r17,100	18,000
Steel castings	do.	340	330	e350	e400	450
Total	do.	13,022	12,782	r e15,313	r e17,500	18,450
Semimanufactures[3]	do.	9,501	9,241	e10,500	e11,600	12,000
Lead:						
Mine output, Pb content		21,677	24,300	23,220	r25,068	25,000
Metal, refined:						
Primary		18,833	21,260	r29,919	33,140	30,000
Secondary		9,889	13,469	r16,808	20,260	20,000
Total		28,722	34,729	r46,727	53,400	50,000

See footnotes at end of table.

TABLE 1—Continued

INDIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992e
METALS—Continued						
Manganese:						
Ore and concentrate, gross weight	thousand tons	1,333	1,334	1,385	1,401	1,400
Mn content		493,058	496,861	512,000	r532,000	530,000
Rare-earth metals: Monazite concentrate, gross weighte		4,000	4,300	4,500	4,000	4,000
Selenium	kilograms	5,103	4,261	3,840	r4,000	4,000
Silver, mine and smelter output	do.	40,958	35,499	33,206	r31,758	32,000
Titanium concentrates, gross weight:						
Ilmenite		229,693	240,656	e280,000	311,537	300,000
Rutile		9,584	9,931	e11,000	13,635	10,000
Tungsten, mine output, W content		19	12	e10	11	11
Zinc:						
Mine output, concentrate:						
Gross weight		118,056	127,043	137,649	163,474	170,000
Zn content		61,389	65,384	73,970	r75,000	75,000
Metal:						
Primary		68,940	71,572	79,093	r85,800	80,000
Secondarye		200	200	200	200	200
Totale		69,140	71,772	79,293	r86,000	80,200
Zirconium concentrate: Zircon, gross weighte		16,000	17,200	17,500	r18,200	18,000
INDUSTRIAL MINERALS						
Abrasives, natural, n.e.s.:						
Corundum, natural		669	254	410	64	70
Garnet		4,311	5,652	4,422	8,984	9,000
Jasper		3,915	r5,297	e4,650	5,013	5,000
Asbestos		31,123	r36,502	26,053	r24,094	25,000
Barite		445,604	r548,103	633,000	615,000	620,000
Bromine, elemental		1,242	1,272	e1,300	e1,300	1,300
Cement, hydraulic	thousand tons	40,700	r46,000	49,000	51,000	50,000
Chalk		109,782	119,000	128,000	128,424	129,000
Clays:						
Ball clay		330,126	266,000	245,000	316,522	320,000
Diaspore		10,901	15,301	7,701	9,248	9,300
Fire clay		596,835	618,000	r522,000	r403,000	410,000
Kaolin:						
Direct salable, crude	thousand tons	471	520	r631	r628	625
Processed	do.	107	110	104	113	110
Total	do.	578	630	r735	r741	735
Othere	do.	100	100	100	14	15
Diamond:e						
Gem	thousand carats	11	12	15	r15	15
Industrial	do.	3	3	3	3	3
Total	do.	14	15	18	r18	18

See footnotes at end of table.

TABLE 1—Continued

INDIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
INDUSTRIAL MINERALS—Continued						
Feldspar		57,656	r59,690	54,135	65,089	65,000
Fluorspar:						
Concentrates:						
Acid-grade		8,823	10,300	10,399	9,700	10,000
Metallurgical-grade		6,772	12,589	13,042	14,439	15,000
Total		15,595	22,889	23,441	24,139	25,000
Other fluorspar materials, graded		4,797	5,176	r5,715	r8,218	9,000
Gemstones excluding diamond:						
Agate including chalcedony pebble		812	788	631	549	600
Garnet	kilograms	1,390	2,483	2,005	1,187	1,400
Graphite[4]		57,325	58,000	61,000	69,922	70,000
Gypsum		1,424,674	1,564,000	r1,661,000	r1,553,000	1,550,000
Kyanite and related materials:						
Kyanite		35,773	40,009	r38,851	r30,020	31,000
Sillimanite		15,377	17,398	r18,240	11,600	12,000
Lime[e]		750,000	790,000	800,000	820,000	850,000
Magnesite		507,873	491,000	544,000	r539,000	550,000
Mica:[5]						
Crude		3,839	4,195	3,860	3,607	3,500
Scrap and waste		3,694	3,108	2,822	1,922	2,000
Total		7,533	7,303	6,682	5,529	5,500
Nitrogen: N content of ammonia[6]	thousand tons	6,205	6,661	7,022	r7,044	7,000
Phosphate rock including apatite		739,000	703,716	r674,000	562,771	600,000
Pigments, mineral: Natural: Ocher		151,781	173,366	126,387	155,563	160,000
Pyrites, gross weight		29,656	38,867	r94,000	r128,000	100,000
Salt:						
Rock salt	thousand tons	4	3	e3	3	3
Other[e]	do.	9,200	9,600	9,500	9,500	9,500
Total[e]	do.	9,204	9,603	9,503	9,503	9,503
Sodium carbonate		1,098,200	1,343,500	e1,400,000	e1,500,000	1,500,000
Stone, sand and gravel:[7]						
Calcite		32,951	40,326	55,000	r98,236	100,000
Dolomite	thousand tons	2,211	2,417	r2,621	r2,568	2,500
Limestone	do.	62,998	64,032	r67,236	r71,021	70,000
Quartz and quartzite	do.	305	326	285	251	250
Sand:						
Calcareous	do.	63	106	r218	r117	120
Silica	do.	1,606	1,239	1,139	1,924	2,000
Other	do.	1,195	1,242	e1,300	1,652	1,700
Slate		7,732	25,963	r30,563	23,578	24,000
Sulfur:						
Content of pyrites		29,656	38,867	r94,000	r128,000	100,000

See footnotes at end of table.

TABLE 1—Continued

INDIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
INDUSTRIAL MINERALS—Continued						
Sulfur—Continued:						
Byproduct:						
From metallurgical plants[e]		125,000	125,000	125,000	130,000	130,000
From oil refineries		10,420	10,200	10,315	12,261	13,000
Total[e]		165,076	174,067	r229,315	r270,261	243,000
Talc and related materials:						
Pyrophyllite		64,923	93,000	80,000	84,557	85,000
Steatite (soapstone)		417,493	414,286	r406,000	r424,000	425,000
Vermiculite		4,052	3,075	1,769	1,768	2,000
Wollastonite		34,286	44,042	61,386	61,358	62,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	r194,600	r200,890	r211,730	r229,280	210,000
Lignite	do.	r12,580	r12,640	r14,110	r15,970	15,000
Total	do.	r207,180	r213,530	r225,840	r245,250	225,000
Coke:[e]						
Coke oven and beehive	do.	13,000	13,000	13,000	13,000	13,000
Gashouse	do.	100	10	100	100	100
Other, soft	do.	200	200	200	200	200
Total	do.	13,300	13,300	13,300	13,300	13,300
Gas, natural:						
Gross	million cubic meters	8,813	10,493	10,245	r11,532	11,600
Marketable[8]	do.	7,457	6,700	e6,560	e7,500	7,500
Petroleum:						
Crude	thousand 42-gallon barrels	230,680	250,700	22,7800	23,2900	235,000
Refinery products:						
Liquefied petroleum gas	do.	19,905	e20,500	e20,000	e20,000	20,000
Gasoline	do.	22,950	e23,200	e23,000	e23,000	23,000
Kerosene and jet fuel	do.	53,697	e54,000	e53,000	e53,000	53,000
Distillate fuel oil	do.	12,2337	e123,000	e122,000	e122,000	122,000
Residual fuel oil	do.	56,803	e57,200	e56,000	e56,000	56,000
Lubricants	do.	4,039	e4,100	e4,000	e4,000	4,000
Other	do.	67,286	e68,000	e67,000	e67,000	67,000
Total	do.	34,7017	e350,000	e345,000	e345,000	345,000

[e]Estimated. [r]Revised.

[1]Table includes data available through Sept. 30, 1993.

[2]In addition to commodities listed, other clays (bentonite, common clays, and fuller's earth), other gemstones (aquamarine, emerald, ruby, and spinel), and uranium are produced but output is not reported, and available information is inadequate to make reliable estimates of output levels. Reported production of sand and gravel and stone are clearly only partial figures and exclude a number of types of stone; the amounts reported are inadequate to provide sufficient aggregate for production of concrete from domestically produced and consumed cement, nor do they provide for other supplies of aggregate for road metal and other construction uses.

[3]Excludes production from steel miniplants.

[4]India's marketable production is 10% to 20% of mine production.

[5]The disparity between amounts of mica produced versus amounts exported is based on (a) stockpile, (b) illicit mines, and (c) occasional mining by others seeking additions to income nominally derived from other sources.

[6]Data are fiscal year beginning Apr. 1 of that stated.

[7]Partial figures; for details, see footnote 2.

[8]Includes reinjected gas.

TABLE 2

INDIA: EXPORTS OF MINERAL COMMODITIES[1] [2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Destinations, 1988-89	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	147,402	93,547	—	United Arab Emirates 83,428; Jordan 9,631.
Oxides and hydroxides	7,014	400,362	99,399	Brazil 123,533; China 55,217; Saudi Arabia 35,000.
Metal including alloys, all forms	4,594	20,584	350	Republic of Korea 5,086; Taiwan 1,864; Singapore 1,698.
Arsenic: Sulfide, natural	162	—		
Chromium:				
Ore and concentrate	185,196	588,700	—	Japan 240,865; China 222,664; Philippines 88,736.
Metal including alloys, all forms	1	13,319	—	Japan 7,719; Netherlands 3,000; Germany 2,600.
Copper:				
Ore and concentrate	18,000	14,000	—	Republic of Korea 9,000; Taiwan 5,000.
Metal including alloys, all forms	r1,864	547	19	Hong Kong 141; Sri Lanka 104; United Kingdom 74.
Iron and steel:				
Iron ore and concentrate including roasted pyrite thousand tons	r29,408	33,041	—	Japan 21,637; Republic of Korea 3,104; Romania 2,173.
Metal:				
Scrap	33,577	35,483	16,398	Philippines 16,445; U.S.S.R. 2,500.
Pig iron, cast iron, related materials	606	871	604	Saudi Arabia 96; Sudan 40; U.S.S.R. 31.
Ferroalloys:				
Ferrochromium	2	7,999	—	France 5,755; Sweden 1,044; Republic of Korea 800.
Ferromanganese	1,614	3,400	—	Japan 1,500; Malaysia 1,500; Indonesia 300.
Ferrosilicomanganese	—	7,600	—	Japan 6,500; Malaysia 1,050.
Ferrosilicon	—	28	—	All to Republic of Korea.
Silicon metal	8	—		
Unspecified	76,011	87,490	2,057	Japan 50,908; Netherlands 18,312; France 3,300.
Steel, primary forms	77,434	136,681	53,624	Bangladesh 8,467; Yemen 5,378; Australia 5,054.
Lead: Metal including alloys, all forms	r95	69	—	United Arab Emirates 41; Netherlands 20.
Manganese:				
Ore and concentrate, metallurgical-grade	225,781	307,656	—	Japan 97,364; North Korea 74,200; Republic of Korea 52,382.
Oxides	582	234	—	Taiwan 169; Bangladesh 50; Nepal 10.
Nickel: Metal including alloys, all forms	r247	67	1	Sri Lanka 22; United Arab Emirates 18; Nigeria 15.
Silicon, high-purity	8	13	13	
Silver: Metal including alloys, unwrought and partly wrought kilograms	7,545	2,629	—	U.S.S.R. 2,508; United Arab Emirates 45.
Tin: Metal including alloys, all forms	561	134	—	United Arab Emirates 121; Thailand 6; Canada 3.
Titanium: Ore and concentrate	r63,522	119,108	4,002	Japan 61,081; Netherlands 24,965; U.S.S.R. 14,730.
Tungsten: Metal including alloys, all forms kilograms	19,741	248	23	Singapore 100; Bangladesh 25; unspecified 100.
Vanadium: Ore and concentrate[3]	25,200	243	40	Japan 101; Republic of Korea 72.
Zinc: Metal including alloys, all forms	231	83	46	Malawi 20; Sri Lanka 11.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	1,046	2,579	48	Japan 670; Republic of Korea 372; Bangladesh 322.
Silicon carbide	118	13	—	All to Bangladesh.

See footnotes at end of table.

TABLE 2—Continued

INDIA: EXPORTS OF MINERAL COMMODITIES[1 2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Destinations, 1988-89	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Asbestos, crude	12	118	—	Japan 50; Australia 40; United Kingdom 16.
Barite and witherite	123,454	433,000	277,281	United Arab Emirates 61,424; Netherlands 38,500; Italy 18,034.
Boron materials:				
Sodium borate	494	124	—	Sri Lanka 48; Egypt 45; United Kingdom 20.
Oxides and acids	26	30	—	Sri Lanka 17; Bangladesh 5; Zambia 4.
Cement	962	30,197	—	Nepal 25,850; Bangladesh 4,290.
Chalk	r138	295	—	Bangladesh 292; Mauritius 2.
Clays, crude:				
Bentonite	39,312	68,472	—	Malaysia 17,467; Australia 11,750; Kuwait 9,696.
Fire clay	2,076	906	—	Kenya 462; Bangladesh 419.
Fuller's earth	148	382	—	Malaysia 114; Kenya 80; United Arab Emirates 65.
Kaolin	16,638	9,069	50	Bangladesh 8,797; Egypt 100.
Ball clay	488	856	NA	NA.
Unspecified	1	1	NA	NA.
Cryolite and chiolite	r81	18	NA	NA.
Diamond: Natural:				
Gem, not set or strung value, thousands	$1,895,904	$2,650,056	$1,047,308	Japan $543,179; Belgium-Luxembourg $516,950.
Industrial stones do.	$274	$8	$8	
Feldspar	44,811	28,573	—	Malaysia 10,470; Bangladesh 7,802; Singapore 3,271.
Graphite, natural	r311	246	40	Japan 60; Taiwan 60; Bangladesh 42.
Gypsum and plaster	5,879	5,785	—	Nepal 5,137; Japan 470; Sri Lanka 178.
Kyanite and related materials: Sillimanite	9,054	1,153	NA	NA.
Magnesium compounds: Oxides and hydroxides	1,832	4,753	395	United Kingdom 1,894; Netherlands 949; Japan 805.
Mica:				
Crude including splittings and waste	13,532	19,320	3,273	Belgium-Luxembourg 7,146; Japan 4,131; France 1,192.
Worked including agglomerated splittings	24,562	28,474	3,288	Germany 6,817; United Kingdom 6,555; Japan 3,583.
Phosphorus, elemental	165	119	62	Egypt 35; Mexico 21.
Pigments, mineral:				
Natural, crude	429	352	—	Kenya 176; Bangladesh 72; Tanzania 50.
Iron oxides and hydroxides, processed	r5,573	3,406	—	Philippines 922; United Kingdom 617; Italy 353.
Potassium salts, crude	—	17	—	All to Singapore.
Precious and semiprecious stones other than diamond: Natural:				
Emerald value, thousands	r$25,980	$39,925	$13,103	Hong Kong $11,076; Switzerland $3,368.
Other do.	$17,922	$27,778	$9,688	Hong Kong $4,294; Japan $3,410.
Salt and brine	43,932	26,839	—	Nepal 8,274; Nigeria 8,000; Malaysia 7,584.
Sodium compounds, n.e.s.: Soda ash, manufactured	319	401	NA	NA.
Stone, sand and gravel:				
Dimension stone, all forms	610,106	771,978	85,515	Italy 252,000; Japan 184,935; Australia 51,906.
Dolomite, chiefly refractory-grade	3,175	2,722	—	Bangladesh 2,647; Kenya 40; Tanzania 18.
Limestone other than dimension	258,326	151,205	—	Bangladesh 145,843; Nepal 3,512; Sri Lanka 1,349.

See footnotes at end of table.

TABLE 2—Continued

INDIA: EXPORTS OF MINERAL COMMODITIES[1 2]

(Metric tons unless otherwise specified)

Commodity		1987-88	1988-89	Destinations, 1988-89	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Quartz and quartzite		69,136	62,778	—	Japan 59,677; Bangladesh 1,326.
Sand:					
Other than metal-bearing		r13,751	12,967	—	Japan 8,733; Maldives 3,431; United Arab Emirates 214.
Silica sand		2,926	1,402	—	United Arab Emirates 1,148; Japan 204; Saudi Arabia 50.
Sulfur: Elemental: Crude including native and byproduct		94	178	NA	NA.
Talc, steatite, soapstone, pyrophyllite		r23,330	15,630	—	Austria 5,805; Kenya 4,002; Bangladesh 1,821.
Vermiculite		r1,048	204	—	Saudi Arabia 78; Japan 54; Taiwan 50.
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades including briquets	thousand tons	150	167	—	Bangladesh 102; Nepal 65.
Coke and semicoke		6,549	9,601	—	Nepal 9,595; unspecified 6.
Petroleum refinery products:[4]					
Light distillates:					
Naphtha	do.	22,253	16,830	NA	NA.
Other	do.	162	706	NA	NA.
Middle distillates	do.	1,313	1,604	NA	NA.
Heavy ends	do.	3,989	87	NA	NA.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Data are for Indian fiscal years Apr. 1 through Mar. 31 and have been compiled from the Indian Minerals Yearbook 1992.
[3]May include other unspecified ores.
[4]Defined as provided in data source.

TABLE 3

INDIA: IMPORTS OF MINERAL COMMODITIES[1 2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Sources, 1988-89	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	57	113	—	Italy 65; Hong Kong 48.
Oxides and hydroxides	2,585	4,031	266	Germany 1,250; Netherlands 652; United Kingdom 636.
Metal including alloys, all forms	r78,503	21,417	—	Bahrain 4,047; Italy 1,980; Singapore 1,761.
Antimony:				
Ore and concentrate	252	258	NA	NA.
Metal including alloys, all forms	820	959	NA	NA.
Beryllium including bismuth	r175	337	—	Australia 324; Singapore 13.
Cadmium: Metal including alloys, all forms	106	2	—	Australia 1; Japan 1.

See footnotes at end of table.

TABLE 3—Continued

INDIA: IMPORTS OF MINERAL COMMODITIES[1 2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Sources, 1988-89	
			United States	Other (principal)
METALS—Continued				
Chromium:				
Ore and concentrate	15	29,800	—	Madagascar 11,000; Albania 10,150; Turkey 8,600.
Metal including alloys, all forms	34	—		
Cobalt: Metal including alloys, all forms	135	250	—	Zambia 97; Zaire 61; Germany 32.
Columbium and tantalum: Tantalum metal including alloys, all forms	1	1	1	
Copper:				
Ore and concentrate	12	44	NA	NA.
Matte including cement copper	1	—		
Metal including alloys, all forms	136,358	159,981	20,156	Zambia 41,806; Zaire 20,086; Singapore 14,904.
Iron and steel:				
Ore and concentrate	26,000	8,000	NA	NA.
Metal:				
Scrap	1,870,497	2,120,305	903,341	Netherlands 258,474; U.S.S.R. 220,694; United Kingdom 162,727.
Pig iron, cast iron, related materials	87,322	164,771	—	Brazil 81,357; Taiwan 53,613; China 25,246.
Ferroalloys:				
Ferrochromium	828	48	—	Germany 35; Sweden 12.
Ferromanganese	157	22	—	Spain 20; Belgium-Luxembourg 2.
Ferromolybdenum	106	79	18	United Kingdom 22; Austria 22; Chile 10.
Ferronickel	55,370	20,545	—	New Caledonia 4,830; Colombia 4,275; France 3,164.
Ferrosilicomanganese	84	73	—	Norway 40; France 20; United Kingdom 8.
Ferrosilicon	442	858	—	Taiwan 170; Brazil 158; Germany 143.
Silicon metal	2,837	2,770	—	Taiwan 610; Hong Kong 526; Norway 280.
Unspecified	r372	1,216	177	Germany 564; Japan 100; Australia 95.
Steel, primary forms	2,142,730	2,016,825	73,364	Germany 445,509; Japan 389,914; United Kingdom 160,053.
Lead:				
Ore and concentrate	8,607	20,530	—	Iran 6,208; Canada 5,201; Spain 4,284.
Metal including alloys, all forms	40,458	47,277	1,383	Australia 26,568; U.S.S.R. 3,327; United Arab Emirates 2,882.
Magnesium: Metal including alloys, all forms	r1,542	916	199	Norway 438; Germany 111.
Manganese:				
Ore and concentrate	1,152	4,860	20	Brazil 3,690; Singapore 900; Gabon 250.
Oxides	r649	173	9	Belgium-Luxembourg 72; Japan 58; Italy 30.
Metal including alloys, all forms	r519	1,082	20	Taiwan 481; Hong Kong 336; China 130.
Mercury	r236	299	8	Taiwan 97; Algeria 58; Spain 51.
Molybdenum: Metal including alloys, all forms	2	5	4	Austria 1.
Nickel:				
Ore and concentrate	r3,937	3,265	—	Austria 1,059; Canada 819; Cuba 638.
Metal including alloys, all forms	r7,173	7,386	—	U.S.S.R. 3,004; Australia 754; Norway 736.
Platinum-group metals: Metals including alloys, unwrought and partly wrought kilograms	151	51	—	U.S.S.R. 38; United Kingdom 14.
Selenium, elemental	r24	35	3	Japan 22; Italy 4; Germany 2.

See footnotes at end of table.

TABLE 3—Continued

INDIA: IMPORTS OF MINERAL COMMODITIES[1] [2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Sources, 1988-89	
			United States	Other (principal)
METALS—Continued				
Silver: Metal including alloys, unwrought and partly wrought kilograms	r3,507	4,230	626	United Kingdom 3,182; Switzerland 250; France 102.
Tellurium, elemental	(4)	7	—	Mainly from United Kingdom.
Tin:				
Ore and concentrate	221	287	—	China 248; Taiwan 39.
Metal including alloys, all forms	r5,729	6,344	—	Malaysia 2,278; Spain 1,018; United Kingdom 581.
Titanium:				
Ore and concentrate	309	2,950	NA	NA.
Oxides	r2,243	2,082	350	United Kingdom 846; Germany 314; Japan 127.
Tungsten:				
Ore and concentrate	343	468	—	Burma 136; Sweden 102; Taiwan 77.
Metal including alloys, all forms	68	24	14	Japan 4; United Kingdom 2.
Vanadium: Ore and concentrate[3]	2,784	1,740	294	Chile 401; United Kingdom 224; Canada 214.
Zinc:				
Ore and concentrate	10,935	22,537	—	Peru 22,501; unspecified 36.
Metal including alloys, all forms	r95,615	80,145	—	U.S.S.R. 24,520; Republic of Korea 9,751; Zambia 7,256.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	56	852	15	Hong Kong 662; Indonesia 117; Italy 36.
Silicon carbide	r65	37	2	United Kingdom 18; Germany 14.
Asbestos, crude	r75,701	101,345	—	Canada 42,920; U.S.S.R. 24,531; Brazil 17,970.
Boron materials:				
Crude natural borates[5]	18,065	19,323	3,271	Turkey 16,018.
Oxides and acids	1	25	NA	NA.
Cement	19,861	21,672	—	United Arab Emirates 21,519; United Kingdom 102.
Chalk	1	125	NA	NA.
Clays, crude:				
Bentonite	53	26	11	United Kingdom 12; Germany 3.
Fire clay	155	—		
Fuller's earth	299	231	20	Germany 211.
Kaolin	99	207	40	United Kingdom 145; Germany 22.
Ball clay	r1,952	4,009	283	United Kingdom 3,064; Germany 348; Japan 257.
Cryolite and chiolite	—	2,001	—	Denmark 2,000.
Diamond:				
Gem, not set or strung value, thousands	$1,510,229	$2,230,692	—	Belgium-Luxembourg $1,257,886; United Kingdom $806,652; Israel $127,250.
Industrial stones do.	$245	$75	$52	Belgium-Luxembourg $22.
Diatomite and other infusorial earth	534	452	381	Spain 64; France 5.
Feldspar	181	42,275	2	United Kingdom 42,063; Thailand 199.
Fertilizer materials: Manufactured:				
Potassic	1,045,908	1,255,510	—	Germany 628,288; Jordan 296,505; Canada 230,922.

See footnotes at end of table.

TABLE 3—Continued

INDIA: IMPORTS OF MINERAL COMMODITIES[1] [2]

(Metric tons unless otherwise specified)

Commodity	1987-88	1988-89	Sources, 1988-89	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fluorspar	19,431	23,346	—	Taiwan 9,167; Kenya 7,480; China 5,987.
Graphite, natural	422	457	10	Japan 205; Sri Lanka 124; Germany 66.
Gypsum and plaster	42	18	11	United Kingdom 7.
Kyanite and related material	87	47	NA	NA.
Magnesium compounds:				
Magnesite, crude, including calcined	r6,534	911	—	Japan 876; United Kingdom 20.
Oxides and hydroxides	r30,270	68,229	6	Japan 14,349; China 11,193; Turkey 10,100.
Mica:				
Crude including splittings and waste	4	6	2	Austria 2; Switzerland 2.
Worked including agglomerated splittings	r55	30	2	Germany 10; Switzerland 9; Austria 7.
Phosphates, crude thousand tons	1,819	2,017	346	Jordan 962; Morocco 313; Senegal 164.
Phosphorus, elemental	r233	983	114	Netherlands 382; Taiwan 281; China 147.
Pigments, mineral:				
Natural, crude	1	—		
Iron oxides and hydroxides, processed	1	7	NA	NA.
Precious and semiprecious stones other than diamond: Natural:				
Emerald value, thousands	$32,920	$35,470	$21,151	Germany $3,747; Switzerland $2,795; United Kingdom $2,268.
Other do.	$5,468	$8,123	$3,473	Germany $1,228; Brazil $895; Switzerland $611.
Salt and brine	11,081	10,645	—	All from Pakistan.
Sodium compounds, n.e.s.: Soda ash	21,672	2,265	—	U.S.S.R. 1,494; Poland 490; Pakistan 260.
Stone, sand and gravel:				
Dimension stone, all forms	2,315	2,629	144	Italy 2,002; Nepal 452.
Limestone other than dimension	108,590	271,822	—	United Arab Emirates 271,772; unspecified 50.
Quartz and quartzitevalue, thousands	$24	$26	—	Italy $24; Belgium-Luxembourg $1.
Sand:				
Other than metal-bearing	1,588	1,667	198	Australia 1,335; United Kingdom 46.
Silica sand	98	414	389	Belgium-Luxembourg 20; Germany 5.
Sulfur: Elemental:				
Crude including native and byproduct	1,148,785	1,298,963	76,396	Saudi Arabia 613,588; Canada 126,839; Kuwait 96,683.
Colloidal, precipitated, sublimed	501	105	1	Germany 104.
Talc, steatite, soapstone, pyrophyllite	r455	294	—	All from Nepal.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including briquets thousand tons	r2,862	4,488	—	Australia 3,929; Poland 213; Taiwan 155.
Coke and semicoke	107,773	131,652	—	Japan 54,537; China 33,417; Australia 27,130.
Petroleum, crude thousand 42-gallon barrels	132,737	131,688	—	Saudi Arabia 66,966; United Arab Emirates 35,992; Kuwait 7,253.

rRevised. NA Not available.

[1]Table prepared by Audrey D. Wilkes.

[2]Data are for Indian fiscal years Apr. 1 through Mar. 31 and have been compiled from the Indian Minerals Yearbook 1992.

[3]May include other unspecified ores.

[4]Less than 1/2 unit.

[5]Includes "sodium borate" and "other borates."

TABLE 4

INDIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annaul capacity
Aluminum:			
Bauxite	Bharat Aluminium Co. Ltd.	Manla, Madhya Pradesh	200
Do.	do.	Bilaspur, Madhya Pradesh	600
Do.	Bombay Mineral Supply Co. (Pvt.) Ltd.	Jamnagar, Gujarat	150
Do.	Hindustan Aluminium Co. Ltd.	Ranchi, Bihar	300
Do.	do.	Shandol, Madhya Pradesh	300
Do.	Indian Aluminium Co. Ltd.	Kalharpur, Maharashtra	250
Do.	do.	Ranchi, Bihar	250
Do.	Madras Aluminium Co. Ltd.	Salem, Tamil Nadu	150
Do.	Minerals & Minerals Ltd.	Ranchi, Bihar	200
Do.	National Aluminium Co. Ltd.	Panchpatmali, Orissa	2,400
Metal	Bharat Aluminium Co. Ltd.	Korba, Madhya Pradesh	100
Do.	Hindalco Aluminium Co. Ltd.	Renukoot, Uttar Pradesh	150
Do.	Indian Aluminium Co. Ltd.	Alipuram, Kerala	20
Do.	do.	Belgaum, Karnataka	73
Do.	do.	Hirakud, Orissa	24
Do.	Madras Aluminium Co. Ltd.	Metturdam, Tamil Nadu	25
Do.	National Aluminium Co. Ltd.	Angul, Dhenkanal District, Orissa	218
Barite	Andhra Pradesh Mining Corp. Ltd.	Mangampet, Cuddapah District, Andhra Pradesh	350
Do.	C.M. Ramanatha Reddy	Kodur, Anantapur District, Andhra Pradesh	75
Do.	K. Obul Reddy (Pvt.) Ltd.	Cuddapah District, Andhra Pradesh	25
Do.	Pragathi Minerals (Pvt.) Ltd.	Kodur, Anantapur District, Andhra Pradesh	50
Do.	Vijayalaxmi Minerals Trading Co.	do.	50
Cement:			
Public sector	Bihar State Industrial Development Corp.	Rohtas-Palaman, Bihar	760
Do.	Cement Corp. of India Ltd.	Jagdalpur, Madhya Pradesh	1,000
Do.	do.	Tandur, Hyderabad District, Andhra Pradesh	1,000
Do.	do.	Yerraguntia, Cuddapah District, Andhra Pradesh	1,120
Do.	Hindustan Steel Ltd.	Rourkela, Orissa	2,140
Do.	Uttar Pradesh State Cement Corp.	Chunar, Uttar Pradesh	840
Private sector	Associated Cement Co. Ltd.	Shahabad, Karnataka	1,076
Do.	Century Spring & Manufacturing Co.	Chandrapur, Maharashtra	1,000
Do.	Coromandel Fertilizers	Kalamalla, Cuddapah District, Andhra Pradesh	1,000
Do.	Jaypee Rewa Cement Ltd.	Rewa, Madhya Pradesh	1,000
Do.	Larsen & Toubro Ltd.	Chandrapur, Maharashtra	1,109
Do.	Modi Cement Ltd.	Bhatapure, Madhya Pradesh	1,000
Do.	Rajasthan Manufacturing & Weaving Mills Ltd.	Bhilwara, Rajasthan	1,042
Do.	Shree Cement Ltd.	Bewar, Ajmer District, Rajasthan	1,200
Chromite	Ferro Alloys Corp. Ltd.	Keonjhar District, Orissa	*75
Do.	do.	Dhenkanal District, Orissa	*75
Do.	Mysore Minerals Ltd.	Hassan District, Karnataka	*125
Do.	Orissa Mining Corp.	Cuttack District, Orissa	*200
Do.	do.	Dhenkanal District, Orissa	*200
Do.	do.	Keonjhar District, Orissa	*100
Do.	Tata Iron & Steel Co. Ltd.	Cuttack District, Orissa	*100

See footnotes at end of table.

TABLE 4—Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal:			
Bituminous	Coal India Ltd:		
Do.	Bharat Coking Coal Ltd.	105 mines in Bihar, Orissa, and Uttar Pradesh	
Do.	Eastern Coalfields Ltd.	187 mines in Bihar and West Bengal	
Do.	Northern Coalfields Ltd.	61 mines in Madhya Pradesh and Uttar Pradesh	160,000
Do.	Southeastern Coalfields Ltd.	44 mines in Andhra Pradesh and Orissa	
Do.	Western Coalfields Ltd.	55 mines in Madhya Pradesh, Maharashtra, and Orissa	
Lignite	Neyveli Lignite Corp.	Neyveli, Tamil Nadu	8,000
Copper:			
Ore:	Hindustan Copper Ltd.	Khetri copper complex, Jhunjhunu District, Rajasthan:	
Do.	do.	Khetri Mine	825
Do.	do.	Kolihan Mine	825
Do.	do.	Chandmari Mine	330
Do.	do.	Indian copper complex, Singhbhum District, Bihar:	
Do.	do.	Mosabani Mine	
Do.	do.	Pathargora Mine	1,800
Do.	do.	Surda Mine	
Do.	do.	Kendadih Mine	
Do.	do.	Rakha Mine	
Do.	do.	Malanjkhand, Balaghar District, Madhya Pradesh	2,000
Metal	do.	Khetri smelter, Rajasthan	31
Do.	do.	Maubhandar smelter, Ghatsila District, Bihar	20
Iron:			
Ore and concentrate	Chowgule & Co. Pvt. Ltd.	Goa	e7,000
Do.	Dempo Mining Corp. Ltd.	do.	
Do.	V.M. Salgaocar & Bros. Pvt. Ltd.	do.	
Do.	Indian Iron & Steel Co. Ltd.	Singhbhum District, Bihar	e2,500
Do.	Kudremukh Iron Ore Co. Ltd.	Chikmagalur District, Karnataka	7,500
Do.	National Mineral Development Corp. Ltd.	Bellary District, Karnataka	3,000
Do.	Steel Authority of India Ltd.	Singhbhum District, Bihar	e3,500
Do.	do.	Bastar and Durg District, Madhya Pradesh	e7,000
Do.	do.	Keonjhar District, Orissa	e3,000
Do.	Tata Iron & Steel Co. Ltd.	Singhbhum District, Bihar	e3,500
Do.	do.	Keonjhar District, Orissa	e2,000
Steel, primary	Steel Authority of India, Ltd.	Bhilai, Durg District, Madhya Pradesh	2,680
Do.	do.	Bokaro, Bihar	2,230
Do.	Tata Iron & Steel Co. Ltd.	Jamshedpur, Singhbhum District, Bihar	1,740
Do.	159 private ministeel plants	Countrywide	4,700
Kyanite	Hindustan Copper Ltd.	Lapso, Singhbhum District, Bihar	e22
Do.	Maharashtra Mineral Corp. Ltd.	Bahegaon, Bhandara District, Maharashtra	e28
Do.	Maharashtra State Mining Corp. Ltd.	Bhandara, Maharashtra	
Do.	S.M. Khola	do.	
Lead:			
Concentrate	Hindustan Zinc Ltd.	Gunter District, Andhra Pradesh	10
Do.	do.	Udaipur District, Rajasthan	20
Metal, primary	do.	Visakhapatnam, Andhra Pradesh	22
Do.	do.	Tundoo, near Ghatsila, Bihar	8

See footnotes at end of table.

TABLE 4—Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Magnesite	Burn Standard Co. Ltd.	Salem, Tamil Nadu	
Do.	Dalmia Magnesite Corp.	do.	400
Do.	Tamil Nadu Magnesite Ltd.	do.	
Manganese ore[2]	Aryan Mining & Trading Corp.	Sundargarh, Orissa	
Do.	Eastern Mining Co.	North Kanara, Karnataka	
Do.	J.A. Trivedi Bros.	Balaghat, Madhya Pradesh	
Do.	Manganese ore (India) Ltd.	Adilabad, Andhra Pradesh	
Do.	do.	Balaghat, Madhya Pradesh	
Do.	do.	Bhandara, Maharashtra	
Do.	do.	Keonjhar, Orissa	
Do.	Mangilah, Rungta (Pvt.) Ltd.	do.	
Do.	Mysore Minerals Ltd.	North Kanara, Karnataka	
Do.	do.	Shimoga, Karnataka	
Do.	Orissa Manganese & Minerals (Pvt.) Ltd.	Sundargarh, Orissa	1,500
Do.	Orissa Mineral Development Co. Ltd.	Koraput, Orissa	
Do.	Orissa Mining Corp. Ltd.	Keonjhar, Orissa	
Do.	do.	Koraput, Orissa	
Do.	R.B.S. Shreeram Durga Prasad & Falechand Marsingdas	Vizianagaram, Visakhapatnam District, Andhra Pradesh	
Do.	Rungta Mines (Pvt.) Ltd.	Keonjhar, Orissa	
Do.	Sandur Manganese & Iron Ores Ltd.	Bellary, Karnataka	
Do.	Serajuddin & Co.	Keonjhar, Orissa	
Do.	S. Lall & Co.	do.	
Do.	Tata Iron & Steel Co. Ltd.	Keonjhar, Orissa	
Do.	do.	Sundargarh, Orissa	
Phosphate rock	Hindustan Zinc Ltd.	Udaipur District, Rajasthan	
Do.	Madhya Pradesh State Mining Corp. Ltd.	Jhabua, Madhya Pradesh	
Do.	do.	Chhatarpur, Madhya Pradesh	800
Do.	Pyrites Phosphates & Chemicals Ltd.	Dehra Dun, Uttar Pradesh	
Do.	Rajasthan State Mineral Development Corp. Ltd.	Udaipur District, Rajasthan	
Do.	Rajasthan State Mines & Minerals Ltd.	do.	
Titanium, ilmenite concentrate	Kerala Minerals & Metals Ltd.	Chavara, Quilon District, Kerala	100
Do.	Indian Rare Earths Ltd.	do.	200
Do.	do.	Ganjam, Orissa, 100 km south of Dhenkanal	220
Do.	do.	Manavalakurichi, Tamil Nadu	65
Zinc:			
Concentrate	Hindustan Zinc Ltd.	Zawar, Udaipur District Rajasthan	34
Do.	do.	Rajpura-Dariba, Udaipur District, Rajasthan	42
Metal	Comindo Binani Zinc Ltd.	Binanipuram, near Alwaye, Kerala	17
Do.	Hindustan Zinc Ltd.	Debari, Udaipur District, Rajasthan	49
Do.	do.	Visakhapatnam, Andhra Pradesh	30

[e]Estimated.

[1]The annual capacity of the five major Coal India subsidiaries was as follows: 14 mines, more than 1.0 Mmt, for 17% of capacity; 32 mines, 0.5 to 1.0 Mmt, for 17%; 80 mines, 0.3 to 0.5 Mmt, for 24%; 254 mines, 0.1 to 0.3 Mmt, for 39%; and the remaining mines, less than 0.1 Mmt.

[2]Capacity of clusters of surface mines varies extremely, depending on demand.

TABLE 5

INDIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Bauxite	2,333,000
Barite	35,000
Chromite	108,000
Coal:	
Bituminous	186,044,000
Lignite	5,813,000
Copper, in ore	4,000
Gold kilograms	55,000
Graphite	4,648
Iron, in ore	11,000,000
Kyanite group	15,000
Lead, in ore	160,000
Limestone	60,000,000
Magnesite	222,000
Manganese in ore	154,000
Natural gas billion cubic meters	648
Petroleum, crude million metric tons	726
Phosphate rock	102,000
Salt	(1)
Talc and related minerals	15,000
Titanium	62,000
Zinc	7,488
Zircon	1,420

[1]Essentially all from seawater.

INDONESIA

AREA 1,919,440 km² **POPULATION 195.7 million**

THE MINERAL INDUSTRY OF

INDONESIA

By Chin S. Kuo

Indonesia continued its strong economic growth, aided by the Government's deregulation policies. Real gross domestic product (GDP) growth was in the 6% range. Investment by the private sector and non-oil and gas exports were increased. The 1992 consumer price index increase was down to 5% from 9.5% in the previous year.

The oil and gas sector accounted for 12% of GDP, 30% of export earnings, and 32% of domestic revenues. Fast growing non-oil manufacturing contributed its GDP share of 17%. Non-oil mineral production and exports, particularly for coal, copper, gold, nickel, and silver, rose moderately in 1992.

Foreign investment in Indonesia was $8.8 billion,[1] lower than that of 1991. The shortage of infrastructural facilities, especially electricity, was one of the causes of the decline of foreign investment. Another cause was the Government's tight money policy aimed at cooling the country's overheated economy. Total Australian investment in Indonesia was more than $765 million, mostly in the mining sector. Construction projects were of growing value too.

P.T. Gunawan Dianjaya planned to build a 2-Mmt/a slab plant in Malaysia and signed a lease with Malaysian authorities on a 200-ha site near Kemaman. The project was currently 100% Indonesian with a minority equity participation from unknown Hong Kong sources; eventually Gunawan Dianjaya wanted to have 30% Malaysian participation.

Indonesian mining companies were to invest a total of $27 million in a project to mine 500,000 mt/a of high-quality anthracite in Quang Ninh Province, northeast of Hanoi. The province has the most abundant coal reserves in Vietnam.

P.T. Astra Petronusa signed a 25-year production-sharing contract to explore for oil and gas in a 3,200-km^2 block near the Dai Hung Field off Vietnam's southern coast. The field has the largest known reserves on Vietnam's continental shelf.

GOVERNMENT POLICIES AND PROGRAMS

The Government's efforts to encourage foreign investment in eastern provinces provide favorable tax incentives, including the deductibility of fringe benefits and acceleration of asset depreciation, as well as the adoption of a more favorable debt/equity ratio. Other suggested improvements for foreign investment include allowing unrestricted imports of industrial minerals not available in Indonesia, permitting 100% foreign ownership, and improving the legal system.

Foreign investors will be able to start up new projects with initial 100% ownership if the projects have paid capital of at least $50 million or are outside the main population areas of Java and the developed provinces of Sumatra. Companies can retain 100% ownership until 5 years into production when 5% equity must be sold to Indonesian partners. Within 20 years, 20% must be in Indonesian hands. Foreign companies also have been allowed 95% ownership of joint ventures that exported at least 65% of production, but their equity has to be reduced to 49% within 20 years.

New incentives were introduced for oil production in remote areas where exploration costs were high. Explorers now may keep 20% whatever the production level is. The normal 85-15 division is unchanged outside the frontier regions. New incentives were also introduced for gas production. The previous division after costs are deducted has been changed to 65-35 in all areas, with a 60-40 split in frontier areas. For gas found in water deeper than 1,500 m, a 55-45 share will be permitted.

The Government is to relax the rules to encourage private-sector investment in the power industry. It is to free import tax on capital goods such as power generators and to ease tax rules. However, the Government will not guarantee any capital investment or debt repayments made by the private sector. Furthermore, powerplants should use energy sources other than oil. Privately generated electricity can be sold to the state-owned electricity company, Perusahaan Umum Listrik Negara (PLN), or another party.

PRODUCTION

Although Indonesia is a major producer of bauxite and tin, the country also produces coal, copper, nickel, and silver, most of which is exported. In 1992, coal production increased 40% over that of 1991 to 20 Mmt, owing to contribution from new coal mines in Kalimantan. Output of oil and condensate averaged 1.5 Mbbl/d. Most companies operated in the upstream oil sector through production-sharing contracts. More than 100 contractors were actively exploring for oil and gas in the country. Liquefied natural gas (LNG) production increased to 23 Mmt, maintaining Indonesia as the world's largest exporter of LNG. (*See table 1.*)

TRADE

Total exports for 1992 were estimated to be $30 billion, of which non-oil and gas exports were the source of earning growth. These included textiles, garments, handicrafts, timber, rubber, and coffee, in order of descending values. The country's leading export minerals were copper and nickel. Imports rose by 5% to 6% in 1992 with capital equipment and intermediate goods accounting for more than 90%. Petroleum and chemical products, base metals, food, beverages, and tobacco were major import items. (*See tables 2 and 3.*)

STRUCTURE OF THE MINERAL INDUSTRY

Mine and plant operations are conducted by either state-owned companies or local and foreign firms that are awarded contracts of work or operate under production-sharing contracts from the Government. The labor force was reported to be growing at 2.8% annually. The overall number of job seekers exceeds the number of positions available. However, there are shortages of skilled labor and managerial personnel, particularly for foreign-owned mining companies such as P.T. International Nickel Co. (Inco) and P.T. Freeport Indonesia Co. The oil and gas sector has the largest number of workers, followed by the industrial minerals and tin industries. (*See table 4.*)

COMMODITY REVIEW

Metals

Copper.—The P.T. Freeport Indonesia mill operated at a rate of 57,000 mt/d and produced 400,000 tons of copper concentrate in 1992. An output of 286,000 tons of copper and 18,662 kg of gold was achieved. Recovery rates were 90% for copper and 80% for gold. A production capacity of 66,000 mt/d could begin during the second half of 1993 at a cost of $90 million. This would yield 327,000 mt/a of copper, 21,026 kg/a of gold, and 65,317 kg/a of silver. An additional expansion to 95,000 to 100,000 mt/d by the end of 1995 was being studied. It was approved in August that the expansion to 90,000 mt/d of ore would be completed by mid-1996. The new expansion plan was to cost $545 million, excluding infrastructure works that would cost $175 million. This was to enable the company to achieve production of 454,000 mt/a copper and 37,324 to 46,655 kg/a gold. The company's Grasberg deposit is known to contain the largest single gold mine reserve and one of the five largest open pit copper reserves in the world.

Surface drilling at the company's Big Gossan prospect in Irian Jaya outlined a reserve in excess of 6 Mmt with an average grade of 5% copper and 2.9 g/mt gold.

The financing of the $590 million copper smelter and refinery project at Gresik in eastern Java, which was to produce 150,000 mt/a of refined copper, was being arranged by an international banking consortium. Rheinische Zinc, Metallgesellschaft's local subsidiary, has a 55% stake in the project with both Nippon Mining and Freeport McMoRan holding 20% each. The rest is held by the Government and Indonesian business interests, including Petrokimia Gresik, a local fertilizer company that uses sulfuric acid. Lurgi of Germany was likely to be involved in the construction of the smelter in August 1993, and the startup date could be in 1996 using local copper concentrates. Magma Copper Co. of the United States had been taking a small tonnage of Freeport Indonesia's copper concentrates in the spot market for its Arizona-based smelter. Most copper concentrates were shipped to Japan.

Gold.—The construction of P.T. Kelian Equatorial Mining's $230 million Kelian gold mine at Sangatta in east Kalimantan, 90% owned by CRA, Ltd. and 10% by P.T. Harita Jayaraya, was completed, and the first gold doré was poured and shipped in January. About 2,200 kg of gold was produced in the first quarter and 4,035 kg in the second quarter. The mine was expected to process 6 Mmt/a of ore and produce 8 mt/a of gold and 9.3 tons of silver until the year 2000. The Kelian deposit is the largest epithermal deposit with a geological resource of more than 85 Mmt at 1.7 g/mt gold. Proven ore reserves amount to 37.6 Mmt grading 2.0 g/mt with probable reserves of 14.6 Mmt at 1.87 g/mt. At least 617 drums of toxic chemicals (hydrochloric acid and sodium nitrate) were washed into the Kelian River by floods earlier in April. Indonesia's gold production was predicted to be 30 tons in 1992 and could rise to 40 tons in 1994 and 55 tons in the year 2000.

P.T. Prima Lirang Mining, a joint-venture company between Billiton Indonesia (90%) and P.T. Prima Maluka, operates a gold-silver-barite mine at Lerokis on Wetar Island with an annual production capacity of 2.5 tons gold, 30 tons silver, and 120,000 tons barite. The company planned to become a major supplier of barite to the local oil exploration industry and to increase capacity to 160,000 mt/a. A copper sulfide resource was found beneath the gold ore body. New deposits of copper, gold, mercury, and silver were also discovered near the current mining area.

Ashton Mining of Australia planned to buy 90% of P.T. Indo Muro Kencana, which owns the Mount Muro gold project in central Kalimantan, from Duval Corp. of Indonesia at yearend. The current resource was estimated at about 31,104 kg of gold. Construction was to start in 1993, with production projected at 4,666 kg/a of gold and 77,759 kg/a of silver in 1994. The total startup capital cost was estimated at $76.5 million, including $16 million for mining equipment. Ashton Mining also has gold reserves at the Tewah and Kapuas alluvial deposits, owning 50% and 75%, respectively. Indicated and inferred resource at Tewah was 35 Mm^3 at a grade of 0.26 g/m^3 gold. Gold exploration was being conducted on Sangihe Island and at the Alpha West-Rumabar Ridge prospect in Irian Jaya.

Highlands Gold of Australia, the MIM Holdings subsidiary, acquired from P.T. Marhauma Subur a 90% interest in the

Miwah copper-gold project near Takengon in Aceh Province, north Sumatra. The company was to spend $1.2 million on exploration for a number of copper and gold targets over the next 12 months beginning in October. Meanwhile, Newmont Mining Corp. of the United States began definition drilling at its Minahasa prospect on Sulawesi and indicated resources at 13.5 Mmt of mineralization grading 5.2 g/mt of gold. Contained gold was estimated to be 62,207 kg, of which 40,435 kg was contained in refractory ore. The drilling program at its Batu Hijau prospect on the island of Sumbawa suggested resources of 370 Mmt grading 0.8% copper and 6.86 g/mt of gold. Newmont owns 80% of both prospects.

The Government approved the new agreement that Montague Gold of Australia, as manager with a 10% free carried interest, signed with Setdco Mining Corp. Ltd. of Indonesia to explore the Gunung Bijih contract of work area. Setdco was to be responsible for the funding of exploration and development costs. Recent exploration of the Lebong Donok Mine on Sumatra Island has indicated a gold resource of 4 Mmt at 2 g/mt of gold.

Iron and Steel.—State-owned P.T. Krakatau Steel bought $8 million worth of steel slabs from Broken Hill Pty. of Australia for the company's West Java plant. Krakatau Steel won Japan Industrial Standards' certification covering three types of hot-rolled sheet and strip for welding and construction applications. The certification would better position the company in the Japanese market in preparation for the commissioning in 1993 of new hot-rolling facilities, which were to double capacity to 2 Mmt/a.

P.T. Hokuriku United Forging Industry, a joint-venture company of P.T. United Tractors (30%), Komatsu Ltd. (30%), and Hokuriku Kogyo Co. (40%), set up a $5.4 million steel forging plant at the Cikarang Industrial Estate, west Java, to produce forged steel goods, including track links and hooks. The plant was to have a capacity of 3,000 mt/a and begin production in September.

The Asian Development Bank approved a loan of $30 million and an equity investment of $7.5 million in P.T. Ispat Steel to set up a hot-rolled coil plant in Surabaya, east Kalimantan, with a production capacity of 1.2 Mmt/a. The project was to employ 500 workers and be completed in 1994. A $270 million integrated plan was to add facilities later to manufacture sponge iron and steel slabs for the input requirement of the hot-rolled coil plant. Other investors were Mitsubishi Corp. of Japan and institutional investors.

Nickel.—P.T. Inco's 1992 output rose slightly above last year's 27,400 tons of nickel matte. One of its three electric furnaces underwent major rebuilding and upgrading during the first quarter. Another electric furnace was shut down for a major overhaul and upgrade in late December. During shutdown, a new, modernized electrode system and an advanced suspended roof were installed. A production target of 45,000 mt/a was set for 1995 when all three furnaces were to run at full capacity.

P.T. Aneka Tambang awarded Mitsui & Co. of Japan a contract to construct a 5,500-mt/a ferronickel smelter at Tambea on Sulawesi. The plant was to be commissioned by late 1994. Output was to be exported to Japan and Europe. Other companies participating in the project were Chiyoda Engineering and Taisei Construction of Japan, L'Air Liquide of France, and Kone of Finland.

P.T. Aneka Tambang was considering proposals for the construction of a hydroelectric powerplant and in turn a nickel smelter in Buli. Rich nickel ore reserves in Buli and on Fakai Island would justify building a smelter. The company currently operates a nickel mine on Gebe Island.

Tin.—P.T. Tambang Timah, accounting for 80% of Indonesia's total tin production, was the world's largest tin-producing company with an annual output of 23,600 tons in 1992. Exports were 22,800 tons in the same year. The export quota for 1993 was raised to 30,500 tons. The reduction of the number of dredgers by 5 to 20 by 1994 was planned to contain production costs. Low-cost production was largely to maintain output.

Industrial Minerals

Diamond.—Indonesia Diamond Corp. suspended all operations on April 30 at the Danau Serun diamond project in southeast Kalimantan due to suspension of mining because of relicensing procedures, wet weather, and equipment delivery delays. Sufficient gravel feed was unavailable, and neither the primary nor the secondary plants operated at full capacity. Its primary plant only achieved a throughput of between 40 and 90 m^3/h during the first quarter. The project is held 65% by Acorn Diamonds Indonesia, 20% by P.T. Aneka Tambang, and 15% by Keymead. Acorn is in turn 63.4% owned by Indonesia Diamond Corp.

Zeolite.—Paragon Resources of Australia was expected to sign a contract of work with the Government in 1993 for the development of a zeolite project, of which it owns 70%. Samples were being tested, and trial shipments were to be sent. Paragon held discussions with potential large users of zeolite both in Australia and elsewhere.

Mineral Fuels

The country was experiencing a lack of needed energy supplies, including oil. Some of the domestic oil consumption had to be imported, especially diesel fuel. The Government planned to control energy consumption by improving production methods and transportation systems and using other energy sources such as hydropower, geothermal energy, and coal.

Coal.—Coal production continued to increase by 48% to 17 Mmt, of which 11 Mmt was exported. With growing demand in European and Asian markets, exports were forecast to grow to 14.5

Mmt by 1995. Output level was expected to reach 50 Mmt and exports to rise to 25 Mmt by the year 2000. Currently, 11 foreign companies operate coal mines under old cooperation agreements with P.T. Tambang Batubara Bukit Asam (PTBA), the Government-owned coal firm. PTBA also worked with 10 local firms to develop coal mines in Aceh Province in north Sumatra, Kalimantan, and Irian Jaya. Coal deposits were reported to total 30 billion tons of bituminous and subbituminous steam coal, the second largest in Asia.

P.T. Kaltim Prima Coal's production reached 5.8 Mmt in 1992. Its large-scale operation is based on the Pinang deposit where minable reserves have been estimated to be 154 Mmt. The new Kaltim Prima Mine came on-stream in February. Coal production for the first half was 2.7 Mmt. It was expected to produce 7 Mmt/a of high-quality, low-ash steam coal by 1995. The company has contracted with Japan's Hokuriku Electric Power Co. to export 420,000 mt/a of coal from 1992 to 2001. P.T. Kaltim Prima and P.T. Arutmin accounted for 60% of the country's exports.

British Petroleum was considering disposing the 50% share worth $50 million of the Sangatta coal mining project in East Kalimantan it held jointly with CRA of Australia. The coal mining operation began in 1991, and production for 1992 was about 7 Mmt. The size of the coal deposit was estimated to be more than 150 Mmt.

Mitsui Mining of Japan was to buy a 20% share of the subsidiary of Broken Hill Pty. of Australia that held development rights to a coalfield in Kalimantan. Korea Indonesia Resources Development Co. began to mine coal in Pasir with an investment of $140 million. The coal deposit was estimated to be capable of producing 2 Mmt/a. Indo-Thai Coal Co., a joint-venture company between Banpu Coal Co. of Thailand and P.T. Tambang Batubara Bukit Kassam of Indonesia, planned to explore coal in Sumatra.

Liquefied Natural Gas (LNG).—Union Texas Petroleum (UTP) allocated $58 million for LNG sales from the Bontang Bay plant in which the company holds a 38% working interest. UTP also was to spend $17 million on gas exploration activities and $58 million on development work.

The Arun gasfield in Aceh is one of the largest natural gas fields in the world. It feeds the six-train LNG facilities at Lhokseumanwe. Pertamina signed long-term LNG supply contracts with Japan's Hiroshima Gas Co., Nippon Gas Co., and Osaka Gas Co. The contract called for Pertamina to supply 200,000 mt/a to the three utility companies during 1996-2000. Shipments were to increase to 400,000 mt/a from the year 2000 until the contracts were to expire in 2015.

LASMO, Ltd. of the United Kingdom took over Ultramar's 37.81% interest in the Sanga Sanga production-sharing contract in east Kalimantan and is the joint operator. It planned to upgrade the existing five processing units and add a sixth at the LNG plant at Bontang Bay. When the work was completed in 1994, the Bontang plant would be the largest LNG facility in the world. LNG production from Bontang reached an alltime high in 1992. Proven gas reserves were increased by 8% to 454.7 Mbbl of oil equivalent. The Sanga Sanga area supplied 60% of all gas to the Bontang LNG plant, which in turn supplied 60% of Indonesian LNG exports. The country supplied 50% of the Pacific markets' LNG requirements. Exploration efforts also took place in the Runtu block nearby. New oil zones were found in the Malacca Strait and Kakap production-sharing contract areas.

Pertamina might sell 40% of its shareholding in the large Natuna gasfield, reducing to 10%. Companies showing interest included Nissho Iwai, Mitsui, and Mitsubishi, all of Japan, and Mobil of the United States. Esso Indonesia owns the other 50% and seeks a 50-50 profit split from the normal 30-70 to compensate for the high costs and risks of the project. The Natuna field has reserves estimated at 1.27 trillion m^3 with 72% carbon dioxide in an area northeast of Natuna Island and could supply 40% of Japan's annual LNG needs. Development costs were to amount to $17 billion, and development of the field was to take 8 years. Pertamina set a deadline of 1994 to develop the field.

British Gas was awarded a production-sharing contract covering an onshore and offshore area in the Kepala Burung region, Irian Jaya. British Gas has 95% interest and its Indonesian partner Sapta Patra Wisesa has the remainder.

New reserves of 127 billion m^3 of gas have been discovered by Asamera Indonesia off northern Sumatra, close to the existing Arun field. Asamera recently sold 50% of its shares in block A, where the newly found reserves lie, to a Japanese-led consortium, Aceh Gas and Oil, that was to fund the first $70 million of the present exploration and drilling program.

Total, Ltd. of France confirmed its North West Peciko field, offshore east Kalimantan, as a major new gasfield with reserves at 57 to 71 billion m^3 of gas and 30 to 50 Mbbl of liquids. The partners were Total (50% and operator) and Inpex (50%).

The Government was to go ahead with the expansion of the northwest Java gas pipeline network for using gas to generate electricity. Pertamina reached agreement with gas producers Arco and Maxus for the supply of 17.27 Mm^3/d to fire 2.8 GW of generating capacity.

Petroleum.—Beginning in 1992, Indonesia reduced oil production by 25,000 bbl/d from 1.4 Mbbl/d in accordance with OPEC's output cutback. The country's fast-developing economy and its plans to boost petrochemical production meant much more Indonesian oil was needed at home; consequently, exports were to drop.

C. Itoh & Co. (50%) of Japan and British Petroleum Co. (50%) planned to jointly build an oil refinery at Tanjung Uban on the island of Bintan near Singapore with a processing capacity of 120,000 bbl/d. The export-oriented $1.5 billion refinery was expected to be completed about 1995 and was to process Mideast crude oil. The first phase for the primary processing facility was to cost $600 million while the second phase for

additional processing units to boost output of gasoline and middle distillates was to cost $900 million. Itoh also bought LASMO's 3.72% share of southeast Sumatra's production-sharing contract for $19.5 million.

British Petroleum was also a partner in another refinery project being built by Foster Wheeler Corp. in conjunction with JGC Corp. of Japan. The 125,000-bbl/d refinery was to process Indonesian crudes, 80% Duri and 20% Minas, and was to be completed in September 1994. The project was financed by the Java Petroleum Investment Consortium, a Japanese concern.

Caltex Pacific Indonesia reached an agreement with the Government to extend a production-sharing oil contract on the Kangaroo block in central Sumatra for 20 years from the year 2001 with a 10-90 split. Caltex produced 720,000 bbl/d of oil from the Minas oilfield, at 220,000 bbl/d; Duri oilfield, at 210,000 bbl/d; and from central Sumatra. These accounted for 40% of Indonesia's total. The Duri oilfield is the world's largest steam flood project to recover oil, and Caltex was aiming for production of 300,000 bbl/d by 1994.

Total expenditure on oil exploration and production in 1992 by foreign and domestic companies was estimated to be $4.5 billion, an 18% increase over that of 1991. The number of exploration wells expected to be drilled was up by 34% to 217, mostly in western Indonesia. Pertamina and its production-sharing contractors planned to drill 730 new production wells, an increase of 21%. Eleven foreign companies started oil exploration, which included a seismic survey and the drilling of 45 exploratory wells, in the Timor Gap, and were to invest a minimum of $362 million over 6 years.

P.T. Risjad Salim Resources International was to explore the 2,070-km^2 Bontang block in east Kalimantan with a spending of $36 million during the first 10 years. Enterprises Oil of Britain was to explore the 5,675-km^2 Laut Natuna block offshore Natuna, Riau with a minimum spending of $47 million. Maxus Southeast Sumatra of the United States amended its blocks and agreement with a 14,734-km^2 area in Sumatra and was to spend $75 million between 1991 and 1998.

Repsol Exploration Indonesia was to buy Sunda Shell's 5% interest in the offshore southeast Sumatra concession and Shell Fifi Zaitun's 2.5% stake in the adjacent Fifi and nearby Zaitun concessions. Repsol also has a 12.5% interest in the northwest Java concession. Indonesia Petroleum, a Japanese-owned concern, bought 25% interest in the 8,920-km^2 block in a West Natuna oil exploration area from Total of France.

Reserves

Indonesia is one of the most mineral resource-rich countries in Southeast Asia. The major mineral commodities are bauxite, coal, copper, natural gas, nickel, petroleum, and tin. Crude oil and natural gas are the most abundant and occur onshore and offshore Sumatra, offshore north Java, and onshore and offshore east Kalimantan. Bauxite reserves are significant and concentrated on Bintan Island and west Kalimantan. Coal is found in west and south Sumatra. Copper reserves are in the Ertsberg and Grasberg areas of Irian Jaya. Nickel reserves are large and mainly in south Sulawesi, on Gebe Island, and on Gag Island. Tin reserves also are abundant and found onshore and offshore Bangka Island and around nearby islands of Belitung, Karimum, Kundur, and Singkep. (*See table 5.*)

INFRASTRUCTURE

The country was to build a $700 million power station at Tanjung Priok near Jakarta. The 1,170-MW combined cycle oil/gas-fired station equipped with GT 13 E gas turbines was to be completed by 1994. The overall thermal efficiency of the plant would be 50%. Total installed capacity in Indonesia was 9,275 MW.

The Mission Energy consortium, which included Mitsui of Japan, General Electric of the United States, and local coal producer Batu Hitam Perkasa, was to take on the $2 billion project setting up two 600-MW coal-powered units at Paiton in east Java. The consortium was trying to obtain sovereign guarantees on matters such as force majeure, payment guarantees, and dispute settlement rules, which the Government was reluctant to offer.

OUTLOOK

The Government planners forecast a rise in bauxite production and export in 1993 as a result of a renewed 5-year supply contract with Reynolds Aluminum Co. of the United States. The outlook for nickel demand is encouraging for markets around the Pacific Rim. Stainless steel accounts for 60% of nickel consumption, and its production has prospects for substantial growth in use.

Although much of the increased coal production over the remaining years of the decade will be needed to satisfy the new coal-fired powerplants in Indonesia, export potential to the world market will also grow, including small tonnages, particularly Envirocoal, to export to the United States.

The oil and gas sector will require a $54 billion investment during the next 10 years: $17 billion for the development of the Natuna gas project, $4 billion for two refineries with a total capacity of 240,000 bbl/d, $1.5 billion for LNG trains, $2.5 billion for nationwide gas pipelines, and $150 million for LPG plants.

[1]Where necessary, values have been converted from Indonesian rupiahs (Rp) to U.S. dollars at the rate of Rp2,040=US$1.00 for 1992.

OTHER SOURCES OF INFORMATION

Agencies

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Jakarta Pusat, Indonesia

Publications

Department of Mines and Energy, Jakarta: Indonesian Mining Yearbook, annually.
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TABLE 1

INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	513	862	1,206	r1,406	804
Metal, primary		184,859	196,869	185,863	r187,000	173,000
Chromite sand, dry basis		7,636	7,635	e8,000	1,950	e2,000
Copper, mine output, Cu content		121,472	143,970	r164,110	r211,692	280,819
Gold, mine output, Au content[2]	kilograms	4,738	6,155	11,158	16,879	37,983
Iron and steel:						
Iron sand, dry basis		202,748	142,654	145,401	173,242	287,821
Metal:						
Ferroalloys: Ferronickel		26,852	26,058	25,025	r e25,000	e26,000
Steel, crude		2,050,000	r2,383,000	r2,892,000	3,250,000	3,171,072
Manganese ore		10,957	9,364	9,417	13,253	e13,000
Nickel:						
Mine output, Ni content[3]		57,982	62,987	68,308	71,681	e77,600
Metallurgical products:						
Matte: Ni content		28,864	29,030	24,949	27,433	39,307
Ferronickel: Ni content		4,905	4,964	5,005	5,318	5,506
Silver, mine output, Ag content	kilograms	58,336	73,884	67,315	80,294	99,941
Tin:						
Mine output, Sn content		29,590	31,263	30,200	30,061	e29,400
Metal		28,365	29,916	30,389	30,415	31,915
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	12,242	14,099	13,762	16,153	17,280
Clays:						
Bentonite		8,266	3,863	5,914	21,512	17,960
Fire clay		2,222,420	1,730,834	e1,800,000	e1,850,000	e1,900,000
Kaolin powder		147,109	157,122	160,098	139,915	230,550
Diamond:[e]						
Industrial stones	thousand carats	22	25	23	24	21
Gem	do.	7	7	7	r8	6
Total	do.	29	32	30	r32	27
Feldspar		11,388	13,025	19,779	13,674	16,719
Gypsum		894	449	58	404,310	e400,000
Iodine	kilograms	9,753	14,275	59,820	36,353	e35,000
Nitrogen: N content of ammonia		2,366,700	2,526,400	r2,789,000	2,706,268	2,687,818
Phosphate rock		411	10,549	1,600	6,384	e8,000
Salt, all types[e]	thousand tons	600	600	600	r610	630
Stone:						
Dolomite		70,043	68,731	10,537	e10,000	11,414
Granite	thousand tons	1,122	1,195	e1,200	e1,200	2,907
Limestone	do.	13,430	10,199	9,510	2,573	3,796
Marble	square meters	2,369	1,112	1,013	378	1,989
Quartz sand and silica stone		421,126	301,706	165,198	429,251	e400,000
Sulfur, elemental		4,321	3,890	3,628	e3,600	e3,600
Zeolite		626	640	e600	r e600	70
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand tons	4,095	8,812	10,769	13,688	22,357

See footnotes at end of table.

TABLE 1—Continued

INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Gas, natural:						
Gross	million cubic feet	1,846,861	1,975,421	2,158,921	2,035,058	2,582,641
Marketed	do.	1,312,090	1,397,873	e1,500,000	e1,400,000	e1,600,000
Petroleum:						
Crude including field condensate	thousand 42-gallon barrels	491,509	514,184	533,666	581,232	550,668
Refinery products:						
Liquefied petroleum gas	do.	3,130	3,245	3,467	3,453	e3,500
Gasoline	do.	32,026	36,580	39,003	42,137	e44,000
Jet fuel	do.	5,795	7,223	5,439	6,580	e6,200
Naphtha	do.	17,471	12,696	18,471	14,078	e19,000
Paraffin wax	do.	192	143	121	183	200
Kerosene	do.	41,413	43,500	45,630	47,326	e49,000
Distillate fuel oil	do.	79,628	84,307	72,418	76,592	e75,000
Lubricants	do.	1,462	1,504	1,641	1,462	e1,500
Residual fuel oil	do.	47,241	40,565	26,864	26,975	e25,000
Unfinished oil requiring further processing	do.	1,565	e1,600	41,813	44,251	e45,000
Refinery fuel and losses	do.	13,677	13,409	15,262	12,490	e13,000
Unspecified	do.	4,790	2,046	1,074	2,936	e3,000
Total	do.	248,390	e246,818	271,203	278,463	e284,400

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through July 8, 1993.

[2]Includes Au content of copper ore and output by Government-controlled foreign contractors' operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available but may be as much as 18 tons per year.

[3]Includes a small amount of cobalt that is not recovered separately.

TABLE 2

INDONESIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	813,637	1,077,036	409,120	Japan 636,281; United Arab Emirates 31,635.
Oxides and hydroxides	—	91	—	Japan 88; Philippines 3.
Metal including alloys:				
Scrap	307	—		
Unwrought	126,163	123,016	—	Japan 115,664; Singapore 5,853; Thailand 1,200.
Semimanufactures	587,999	523,110	2	Singapore 477,044; Hong Kong 43,706.
Chromium: Ore and concentrate	1,400	2,052	—	All to Australia.
Cobalt: Oxides and hydroxides	37	673	—	Singapore 316; Taiwan 275; Vietnam 82.
Copper:				
Ore and concentrate	397,648	600,571	31,155	Japan 415,200; Republic of Korea 46,005; Philippines 30,000.
Metal including alloys, all forms	16,642	18,153	101	Thailand 4,888; Republic of Korea 4,347; Japan 2,018.

See footnotes at end of table.

TABLE 2—Continued

INDONESIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Iron and steel: Metal:					
Scrap		847	2,166	—	Republic of Korea 1,291; Japan 847; Singapore 19.
Pig iron, cast iron, related materials		67,990	84,614	(2)	China 42,495; Japan 42,110.
Ferroalloys:					
Ferromanganese		7	—		
Ferrosilicon		2,646	180	—	All to Japan.
Ferronickel		27,709	20,846	—	Netherlands 11,591; Japan 9,254.
Steel, primary forms		55,531	229,374	—	Japan 113,122; Republic of Korea 41,626; Malaysia 41,309.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		225,636	232,515	(2)	Japan 95,207; Republic of Korea 68,129; Malaysia 34,527.
Clad, plated, coated		19,154	32,522	—	Singapore 29,798; Saudi Arabia 1,848; Burma 346.
Of alloy steel		165	779	—	Malaysia 730; Singapore 39; Senegal 8.
Bars, rods, angles, shapes, sections		149,412	197,870	—	Thailand 77,390; Singapore 35,512; Republic of Korea 35,071.
Rails and accessories		77	10	—	Japan 6; Malaysia 3; Germany 1.
Wire		1,562	1,262	306	Japan 846; Republic of Korea 50; Singapore 37.
Tubes, pipes, fittings		9,223	14,621	11	Singapore 6,825; Japan 2,458; Brunei 2,208.
Lead:					
Ore and concentrate		306	5,694	—	All to Italy.
Metal including alloys, all forms		16,706	17,280	(2)	Taiwan 4,381; Republic of Korea 3,665; Japan 3,535.
Manganese: Ore and concentrate:					
Metallurgical-grade[3]		67,027	3,004	—	Singapore 3,000; China 4.
Nickel:					
Ore and concentrate		1,364,752	1,697,110	—	Australia 943,254; Japan 744,056.
Matte and speiss		35,069	42,284	—	All to Japan.
Metal including alloys, all forms		—	50	—	Japan 30; Republic of Korea 20.
Platinum-group metals:					
Ores and concentrates[4]	kilograms	50	—		
Silver:					
Ore and concentrate	do.	120	—		
Metal including alloys, unwrought and partly wrought	value, thousands	$6	$25	$5	Denmark $6; Hong Kong $6; Canada $5.
Tin:					
Ore and concentrate		368	339	—	All to Malaysia.
Metal including alloys:					
Scrap		—	20	—	All to Republic of Korea.
Unwrought		28,995	27,704	—	Singapore 22,361; Netherlands 4,605; United Kingdom 580.
Semimanufactures		—	40	(2)	Mainly to Republic of Korea.

See footnotes at end of table.

TABLE 2—Continued

INDONESIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Titanium: Oxides	41	—		
Tungsten: Metal including alloys, all forms kilograms	—	729	—	Netherlands 603; Japan 126.
Zinc:				
Ore and concentrate	503	—		
Oxide	—	308	—	Japan 200; Singapore 108.
Metal including alloys:				
Scrap	271	—		
Unwrought and semimanufactures	127	269	—	Singapore 208; Taiwan 61.
Other:				
Ores and concentrates	47,150	—		
Ashes and residues	100	7	—	All to Japan.
Precious metals, n.e.s.:				
Ores and concentrates kilograms	—	4	—	All to Singapore.
Waste and sweepings do.	9,600	—		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	104,473	101,966	740	Hong Kong 67,408; Thailand 14,025; Malaysia 2,481.
Grinding and polishing wheels and stones	51	793	3	Taiwan 568; Republic of Korea 132; Singapore 35.
Barite and witherite	5,246	1,902	—	All to Singapore.
Cement thousand tons	2,564	1,034	6	Singapore 334; Bangladesh 245; Malaysia 112.
Chalk	53	725	346	Papua New Guinea 330; Australia 38; Canada 11.
Clays, crude:				
Bentonite	7,708	14,453	—	Singapore 7,387; Malaysia 5,895; Thailand 914.
Fuller's earth	—	576	—	All to Philippines.
Kaolin	129,660	125,125	(2)	Japan 59,661; Taiwan 34,940; Malaysia 15,608.
Unspecified	26,396	74,935	(2)	Taiwan 74,874; Malaysia 60.
Cryolite and chiolite	95	18	—	All to Thailand.
Diamond, natural: Gem, not set or strung value, thousands	$39	$180	—	Singapore $147; Thailand $33.
Diatomite and other infusorial earth	122	109	—	Taiwan 50; Malaysia 48; Japan 11.
Feldspar, fluorspar, related materials	—	1	—	Mainly to Italy.
Fertilizer materials:				
Crude, n.e.s.	4,725	3,008	(2)	Japan 2,277; Taiwan 719.
Manufactured:				
Ammonia	195,870	185,623	—	Philippines 112,144; India 21,797; Malaysia 17,840.
Nitrogenous	1,546,894	1,552,773	3,510	Vietnam 632,019; China 373,275; Taiwan 119,572.
Phosphatic	6,826	166,230	—	Bangladesh 78,500; Vietnam 46,795; Philippines 22,025.
Unspecified and mixed	89	116,274	—	Vietnam 55,358; Philippines 35,063; Singapore 13,240.
Gypsum and plaster	81,639	89,300	—	Mainly to Philippines.
Iodine	19	37	—	India 22; Germany 8; Mexico 3.
Magnesium compounds: Oxides and hydroxides	180	6,000	—	Mainly to Malaysia.
Mica: Crude including splittings and waste	13	—		

See footnotes at end of table.

TABLE 2—Continued

INDONESIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphates, crude		3,563	5,249	20	Taiwan 2,202; Singapore 2,185; Malaysia 399.
Precious and semiprecious stones other than diamond: Natural	kilograms	(2)	—		
Salt and brine		501	14,594	—	North Korea 14,000; Hong Kong 199; Australia 167.
Sodium compounds, n.e.s.:					
Sulfate, manufactured		4,513	7,571	—	Singapore 3,271; Thailand 2,680; Philippines 520.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	1,396	2,841	—	Mainly to Singapore.
Worked		5,126	19,814	1,312	Singapore 11,099; Taiwan 2,984; Republic of Korea 1,013.
Dolomite, chiefly refractory-grade		—	1	—	All to Hong Kong.
Gravel and crushed rock		6,259	9,830	63	Hong Kong 6,850; Japan 2,203; Taiwan 364.
Limestone other than dimension		500	5,540	40	Malaysia 5,500.
Quartz and quartzite		—	14,601	—	Taiwan 12,600; Singapore 2,001.
Sand other than metal-bearing	thousand tons	7,916	6,289	(2)	Singapore 6,230; Taiwan 48; Australia 9.
Sulfur:					
Elemental: Crude including native and byproduct		80	1,000	—	All to Bangladesh.
Talc, steatite, soapstone, pyrophyllite		941	238	—	Taiwan 218; Philippines 20.
Other: Crude		—	1,814	—	Japan 1,711; Malaysia 76; Pakistan 27.
MINERAL FUELS AND RELATED MATERIALS					
Carbon black		—	5,423	—	Singapore 5,262; Japan 90; Thailand 38.
Coal:					
Anthracite and bituminous	thousand tons	4,351	5,420	22	Japan 1,889; Hong Kong 907; Taiwan 741.
Briquets of anthracite and bituminous coal		96,769	434,562	—	Denmark 118,641; Japan 104,200; Philippines 68,700.
Coke and semicoke[5]		1,065	—		
Gas, natural: Liquefied	thousand tons	21,332	23,172	—	Japan 18,797; Republic of Korea 2,843; Taiwan 1,533.
Petroleum:					
Crude	thousand 42-gallon barrels	278,159	289,904	38,105	Japan 151,664; Republic of Korea 32,610; China 25,784.
Refinery products:					
Liquefied petroleum gas	do.	29,585	28,129	—	Japan 26,090; Republic of Korea 33,411; Taiwan 17,831.
Gasoline	do.	64,446	8,750	477	Japan 7,544; Republic of Korea 500; Singapore 298.
Mineral jelly and wax	do.	NA	2	—	Mainly to Thailand.
Lubricants	do.	196	94	—	Singapore 49; Taiwan 22; Thailand 16.
Residual fuel oil	do.	—	43,931	5,097	Japan 33,390; Republic of Korea 4,554; Netherlands 436.
Petroleum coke	do.	678	662	33	Japan 321; Australia 141; Belgium-Luxembourg 90.

NA Not available.
[1]Table prepared by Jeremy H. Tidwell.
[2]Less than 1/2 unit.
[3]Includes manganiferous iron ore and concentrate.
[4]May include other precious metals.
[5]Includes gas carbon.

TABLE 3

INDONESIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	14	66	1	China 36; Singapore 21; Hong Kong 8.
Aluminum:				
Ore and concentrate	60	909	—	All from China.
Oxides and hydroxides	358,063	289,238	216	Australia 223,971; India 40,932.
Metal including alloys:				
Scrap	185	2,323	1,279	Australia 440; Singapore 285; Japan 239.
Unwrought	24,778	55,637	4,127	Australia 31,163; China 5,833; India 3,075.
Semimanufactures	16,074	32,319	921	Australia 4,660; Singapore 3,877; China 2,928.
Antimony: Metal including alloys, all forms	230	216	—	Hong Kong 148; China 37; Thailand 31.
Arsenic: Metal including alloys, all forms	—	50	—	Hong Kong 28; China 12; Taiwan 8.
Beryllium: Metal including alloys, all forms	16	—		
Bismuth: Metal including alloys, all forms	1	2	(2)	United Kingdom 1.
Cadmium: Metal including alloys, all forms	1	1	(2)	Mainly from Australia.
Chromium:				
Ore and concentrate	395	444	—	Germany 202; Japan 139; Australia 83.
Oxides and hydroxides	2,707	440	83	United Kingdom 128; Germany 95; Japan 92.
Metal including alloys, all forms	8	4	—	United Kingdom 2; Japan 2.
Cobalt:				
Ore and concentrate	—	5	—	All from United Kingdom.
Oxides and hydroxides	41	157	—	Taiwan 71; Germany 42; Japan 15.
Metal including alloys, all forms	4	4	—	Mainly from United Kingdom.
Columbium and tantalum: Tantalum metal including alloys, all forms kilograms	26	9	—	Japan 7; Taiwan 2.
Copper:				
Ore and concentrate	3	(2)	—	All from Taiwan.
Metal including alloys:				
Scrap	1,806	3,232	1,409	Japan 792; Singapore 247; Taiwan 139.
Unwrought	50,414	49,848	849	Chile 30,713; Zambia 7,003; Australia 5,146.
Semimanufactures	13,316	13,089	269	Japan 4,269; Republic of Korea 1,590; Germany 890.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	158,996	158,277	1,010	India 117,551; North Korea 39,521.
Pyrite, roasted thousand tons	1,779	1,613	—	Brazil 666; Sweden 610; Norway 337.
Metal:				
Scrap	1,177,669	1,187,092	106,874	Australia 359,746; Netherlands 296,825; United Kingdom 130,592.
Pig iron, cast iron, related materials	328,325	293,103	107	Malaysia 128,800; U.S.S.R. 76,373; Iran 35,500.
Ferroalloys:				
Ferromanganese	17,719	17,531	1	Taiwan 8,077; China 4,650; Australia 3,142.
Ferrosilicomanganese	13,841	21,403	—	China 15,237; Taiwan 2,506; Australia 2,000.
Ferrosilicon	7,880	8,992	—	China 7,221; Hong Kong 540; Australia 500.
Unspecified	809	1,291	39	Japan 429; Australia 210; France 190.
Steel, primary forms	756,621	517,136	63,193	Republic of Korea 99,208; Mexico 84,719; Australia 73,877.

See footnotes at end of table.

TABLE 3—Continued

INDONESIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	562,644	756,756	41,581	Japan 365,426; Brazil 167,838; Republic of Korea 53,709.
Clad, plated, coated	96,699	97,480	3,508	Japan 61,352; Australia 13,364; Republic of Korea 6,698.
Of alloy steel	45,992	50,611	954	Japan 28,016; Republic of Korea 7,683; Spain 4,730.
Bars, rods, angles, shapes, sections	296,072	199,870	3,660	Japan 77,659; Republic of Korea 25,993; Poland 11,233.
Rails and accessories	8,955	31,485	32	United Kingdom 12,621; Canada 8,649; Japan 3,810.
Wire	30,258	38,796	108	Taiwan 11,000; Republic of Korea 7,938; Japan 5,901.
Tubes, pipes, fittings	233,595	247,042	20,396	Japan 130,840; Mexico 14,591; Belgium-Luxembourg 11,547.
Lead:				
Oxides	1,489	2,012	149	China 711; Mexico 702; Germany 198.
Metal including alloys:				
Scrap	35,822	46,424	6,360	Japan 17,924; Australia 10,007; Saudi Arabia 3,809.
Unwrought	15,494	22,703	3,214	Australia 15,396; Canada 1,101; China 639.
Semimanufactures	673	302	1	Germany 200; Japan 32; Republic of Korea 16.
Magnesium: Metal including alloys, all forms	363	271	85	Norway 105; Germany 22; U.S.S.R. 20.
Manganese:				
Ore and concentrate:[3] Metallurgical grade	2,803	2,705	(2)	Singapore 2,610; Ghana 80; Netherlands 14.
Oxides	19,821	21,189	2	Singapore 12,451; Japan 5,857; Mexico 1,000.
Metal including alloys, all forms	112	80	—	United Kingdom 70; Japan 10.
Mercury	42	86	(2)	Taiwan 50; China 23; Japan 4.
Molybdenum:				
Ore and concentrate	2	—		
Metal including alloys, all forms value, thousands	r$228	$385	$1	Austria $72; Japan $66; Hungary $56.
Nickel:				
Matte and speiss	271	121	101	Australia 20.
Metal including alloys:				
Scrap	4	12	—	All from China.
Unwrought	214	194	(2)	Finland 110; Japan 63; Singapore 13.
Semimanufactures	2,738	206	4	Japan 68; Germany 48; China 31.
Platinum-group metals:				
Waste and sweepings value, thousands	$3	$10	$10	
Metal including alloys, unwrought and partly wrought do.	$52	$25	—	Germany $21; Australia $3.
Selenium, elemental	—	3	—	Australia 2; Chile 1.
Silicon, high-purity[4]	332	1	—	Mainly from Malaysia.
Silver:				
Ore and concentrate	—	1,000	(2)	Finland 695; India 305.

See footnotes at end of table.

TABLE 3—Continued

INDONESIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Silver—Continued:				
Waste and sweepings[5] value, thousands	$5	$1	—	Mainly from Singapore.
Metal including alloys, unwrought and partly wrought do.	$1,511	$877	—	Taiwan $204; United Kingdom $195; Germany $141.
Tellurium, elemental	—	6	3	Brazil 3.
Tin:				
Ore and concentrate	99	1	(2)	Mainly from Hong Kong.
Metal including alloys, all forms	781	1,874	(2)	United Kingdom 815; Australia 519; Singapore 360.
Titanium:				
Ore and concentrate	1,391	1,143	—	All from Australia.
Oxides	5,912	4,747	24	Republic of Korea 1,086; Japan 918; Germany 797.
Metal including alloys, all forms	24	17	4	Japan 7; Taiwan 2; Singapore 2.
Tungsten:				
Metal including alloys, all forms value, thousands	r$2,662	$2,313	$3	Belgium-Luxembourg $1,823; Republic of Korea $126; Taiwan $115.
Uranium and thorium: Oxides and other compounds do.	$1,959	$1,955	$121	France $1,615; Germany $186; China $24.
Zinc:				
Oxides	1,865	1,556	14	China 835; Republic of Korea 349; Japan 125.
Metal including alloys:				
Scrap	195	326	48	Thailand 276; Singapore 2.
Unwrought	55,314	56,721	5	Australia 43,451; Canada 10,331.
Semimanufactures	996	2,259	9	China 1,132; Australia 467; Japan 236.
Zirconium:				
Ore and concentrate	329	985	108	United Kingdom 750; Taiwan 60; Singapore 35.
Metal including alloys, all forms	(6)	10	(2)	Taiwan 5; Singapore 2; Japan 2.
Other:				
Ores and concentrates	1,092	883	(2)	Japan 500; Australia 305; Netherlands 40.
Ashes and residues	2,674	4,273	(2)	United Kingdom 2,818; Singapore 930; Japan 340.
Base metals including alloys, all forms	(2)	6	1	Japan 3; Singapore 2.
Metalloids[7]	177	—		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	1,308	1,206	172	Japan 358; Netherlands 223; Italy 130.
Artificial: Corundum	769	948	(2)	China 354; Singapore 287; Japan 232.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$157	$412	—	Japan $405; Sweden $4; Singapore $3.
Grinding and polishing wheels and stones	3,991	4,665	39	China 2,283; Japan 411; Taiwan 362.
Asbestos, crude	28,599	32,213	18	Canada 14,650; Zimbabwe 9,522; Brazil 5,798.
Barite and witherite	82,394	67,580	465	India 30,973; Bhutan 16,574; Singapore 9,914.
Boron materials:				
Crude natural borates	431	346	326	Turkey 20.
Oxides and acids	902	785	238	Chile 209; Turkey 120; Italy 116.

See footnotes at end of table.

TABLE 3—Continued

INDONESIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Cement	34,619	25,554	26	Japan 15,173; China 10,000.
Chalk	3,551	2,330	(2)	Taiwan 1,720; United Kingdom 609.
Clays, crude	106,941	84,164	29,159	China 12,363; United Kingdom 7,982; Australia 5,885.
Cryolite and chiolite	100	—		
Diamond, natural:				
Gem, not set or strung value, thousands	$5,113	$6	(2)	Mainly from Germany.
Industrial stones do.	$38	$33	—	Singapore $32; Japan $1.
Diatomite and other infusorial earth	2,071	1,591	1,142	Japan 242; Republic of Korea 180.
Feldspar, fluorspar, related materials	20,982	28,098	1	China 11,718; Australia 4,448; Norway 4,312.
Fertilizer materials:				
Crude, n.e.s.	9,035	1,263	25	Chile 817; Malaysia 300; Japan 43.
Manufactured:				
Ammonia	4,957	121	(2)	Poland 100; India 13; Singapore 5.
Nitrogenous	7,466	9,558	246	Norway 5,000; Philippines 3,704.
Phosphatic	152,235	10,539	9,303	Belgium-Luxembourg 1,200.
Potassic	443,960	284,210	544	Canada 111,195; U.S.S.R. 67,710; Jordan 51,308.
Unspecified and mixed	56,043	54,806	97	Germany 23,224; Belgium-Luxembourg 13,752; Malaysia 6,698.
Graphite, natural	1,688	1,761	2	China 1,382; Republic of Korea 134.
Gypsum and plaster	248,630	234,464	255	Thailand 220,927; Germany 3,127; Japan 3,102.
Iodine[e]	5	5	(2)	Germany 2; Netherlands 1; Japan 1.
Lime	2,849	418	148	Singapore 177; Denmark 20.
Magnesium compounds:				
Magnesite, crude	466	1,372	—	Germany 749; China 510; Australia 107.
Oxides and hydroxides	19,150	15,156	—	China 11,438; Germany 1,434; Singapore 765.
Mica:				
Crude including splittings and waste	817	543	135	Singapore 178; India 84; Japan 40.
Worked including agglomerated splittings	46	37	(2)	Belgium-Luxembourg 13; Japan 9; Taiwan 8.
Nitrates, crude	4,408	4,299	1	Chile 3,233; United Kingdom 411; Belgium-Luxembourg 409.
Phosphates, crude thousand tons	899	1,586	—	Jordan 743; Morocco 672; Tunisia 98.
Phosphorus, elemental	—	187	—	Germany 77; Italy 65; Taiwan 24.
Pigments, mineral: Iron oxides and hydroxides, processed	7,295	7,449	436	China 3,178; Germany 2,384; Japan 590.
Potassium salts, crude	151,633	46,194	—	All from U.S.S.R.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$98	$22	—	Belgium-Luxembourg $17; Pakistan $5.
Synthetic do.	$34	$6	$2	Hong Kong $2; Republic of Korea $2.
Salt and brine	349,042	330,107	194	Australia 329,375; Germany 259.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	275,692	301,790	203,735	China 29,362; Poland 28,822; India 13,202.
Sulfate, manufactured	62,928	27,431	110	China 23,529; Taiwan 1,141; Japan 1,118.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	48,230	73,170	2,350	Italy 32,815; China 13,743; Taiwan 5,538.
Worked	1,521	3,251	(2)	Argentina 1,196; China 695; Taiwan 378.

See footnotes at end of table.

TABLE 3—Continued

INDONESIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued:				
Dolomite, chiefly refractory-grade	5,091	3,586	9	United Kingdom 1,993; Japan 1,190; Germany 311.
Gravel and crushed rock	4,299	28,556	42	Malaysia 25,715; France 2,240.
Limestone other than dimension	5,682	3,349	(2)	Taiwan 2,187; Hong Kong 604; Republic of Korea 306.
Quartz and quartzite	651	4,174	(2)	India 3,852; Sweden 212; France 64.
Sand other than metal-bearing	14,472	10,899	7,219	Taiwan 2,253; Japan 533.
Sulfur:				
Elemental:				
Crude including native and byproduct	143,193	320,052	38,074	Canada 225,395; Singapore 51,976.
Colloidal, precipitated, sublimed	117,131	22,653	21,159	Singapore 1,147; Republic of Korea 227.
Dioxide	9	7	—	Netherlands 5; Malaysia 2.
Sulfuric acid	78	314	101	United Kingdom 132; Australia 54; Singapore 10.
Talc, steatite, soapstone, pyrophyllite	43,770	28,891	247	China 24,820; Republic of Korea 2,176; Thailand 490.
Vermiculite including perlite[9]	408	673	—	Philippines 583; Japan 46; Singapore 18.
Other:				
Crude	63,960	53,005	661	Germany 32,118; China 12,351; Taiwan 5,842.
Slag and dross, not metal-bearing	32,270	72,108	108	Japan 67,616; United Kingdom 2,857; Singapore 1,382.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	18,803	4,808	297	Taiwan 3,153; Singapore 723; United Kingdom 196.
Carbon:				
Carbon black	55,030	62,517	12,099	Australia 14,281; Republic of Korea 8,462; Thailand 8,022.
Gas carbon	NA	60	—	All from Japan.
Coal:				
Anthracite and bituminous	620,717	672,864	176	China 348,632; Australia 321,657; India 2,200.
Lignite including briquets	1,684	2,542	1,827	Singapore 632; United Kingdom 31; Japan 19.
Coke and semicoke	[10]47,362	38,331	5	Australia 15,421; China 13,428; Japan 7,261.
Peat including briquets and litter	6	18	—	Mainly from Canada.
Petroleum:				
Crude thousand 42-gallon barrels	49,171	54,754	—	Saudi Arabia 30,771; Malaysia 10,003; Australia 8,430.
Refinery products:				
Liquefied petroleum gas do.	(2)	(2)	(2)	Mainly from Germany.
Gasoline do.	24,300	4,293	(2)	Singapore 3,347; Saudi Arabia 724; Australia 221.
Mineral jelly and wax do.	110	122	4	Singapore 32; China 31; Germany 14.
Kerosene and jet fuel including white spirit do.	NA	22	(2)	Singapore 20; Belgium-Luxembourg 1.
Distillate fuel oil do.	NA	19,075	1,508	Singapore 13,360; Saudi Arabia 1,941; Republic of Korea 799.
Lubricants do.	NA	1,378	389	Singapore 417; France 133; China 114.
Residual fuel oil do.	NA	5,333	—	Singapore 5,233; Hong Kong 99.
Bitumen and other residues do.	1,129	1,434	1	Singapore 1,417; Taiwan 13; Japan 3.
Bituminous mixtures do.	17	15	2	Singapore 9; Sweden 2; Malaysia 1.
Petroleum coke do.	200	174	173	Mainly from Japan.

[r]Revised. NA Not available.
[1]Table prepared by Jeremy H. Tidwell.
[2]Less than 1/2 unit.
[3]Includes manganiferous iron ore and concentrate.
[4]May include silicon metal.
[5]May include other precious metals.
[6]Unreported quantity valued at $20,000.
[7]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[8]Includes bromine and fluorine.
[9]Includes chlorites.
[10]May include gas carbon.

TABLE 4

INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum:			
Bauxite	P.T. Aneka Tambang (Government)	Kijang, Bintan Island	1,300
Metal	P.T. Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. of Japan, 59%; and Government, 41%)	Kual Tanjun, north Sumatra	225
Cement	P.T. Indocement	Citeureup, west Java	8,000
Do.	P.T. Semen Cibinong	Narogong, east Java	1,400
Do.	P.T. Semen Gresik	Gresik, east Java	1,500
Do.	P.T. Semen Padang	Indarung, west Java	2,200
Coal	P.T. Allied Indo Coal (Allied Indonesia Coalfields Pty. Ltd. of Australia, 60%; and P.T. Mitra Abadi Sakti of Indonesia, 20%)	Parambahan, west Sumatra	500
Do.	P.T. Tambang Batubara Bukit Asam (Government)	Bukit Asam, south Sumtra	4,000
Do.	Perum Tambang Batubara (Government)	Ombilin, west Sumtra	1,000
Copper, concentrate	P.T. Freeport Indonesia Co. (Freeport McMoRan Copper and Gold Inc. of the United States, 80%; Government, 10%; and others, 10%)	Ertsberg and Grasberg, Irian Jaya	350
Granite	P.T. Karium Granite (subsidiary of P.T. Pandawa Sempurna of Indonesia)	Karium Island	2,000
Petroluem, crude thousand barrels per day	Atlantic Richfield Indonesia, Inc. (subsidiary of ARCO of the United States)	Arjuna and Arimbi, offshore west Java	170
Do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy of the United States)	Cinta and Rama, offshore southeast Sumatra	95
Do.	PERTAMINA (Government)	Jatibarang, west Java, and Bunyu, offshore east Kalimantan	80
Do.	P.T. Caltex Pacific Indonesia (Texaco Inc., 50%; and Chevron, 50%, both of the United States)	Minas, Duri, and Bangko, central Sumatra	700
Do.	Total Indonesia (subsidiary of Compagnie Francaise des Petroles of France)	Handi and Bakapai onshore and offshore east Kalimantan	180
Gas:			
Natural million cubic feet per day	Mobil Oil Indonesia, Inc. (subsidiary of Mobil Corp. of the United States)	Arun, Aceh in north Sumatra	1,700
Do.	Roy M. Huffington (subsidiary of HUFFCO of the United States)	Badak, east Kalimantan	1,000
Liquefied	P.T. Arun LNG Co. Ltd. (Government, 55%; Mobil Oil, 30%; and the Japan Indonesia LNG Co., 15%)	Balang Lancang, Aceh in north Sumatra	10,000
Do.	P.T. Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; and the Japan Indonesia LNG Co., 15%)	Bontang, east Kalimantan	7,900
Nickel:			
In ore	P.T. Aneka Tambang (Government)	Pomalaa, south Sulawesi and on Gebe Island, Moluccas	34
In matte	P.T. International Nickel Indonesia (Inco Ltd. of Canada, 78%; Sumitomo Metal Mining Co. Ltd. of Japan, 20%; other, 2%)	Soroako, south Sulawesi	48
Nitrogen	P.T. Aseah-Aech Fertilizer (Government, 60%; other members of Asean, 40%)	Lhokseumawe, north Sumatra	506
Do.	P.T. Pupuk Iskandar Muda (Government)	do.	506
Do.	P.T. Pupuk Kalimantan Timur (Government)	Bontang, east Kalimantan	1,012
Do.	P.T. Pupuk Sriwijawa (Government)	Palembang, south Sumatra	1,438
Steel, crude	P.T. Krakatau Steel (Government)	Cilegon, west Java	2,000

See footnotes at end of table.

TABLE 4—Continued
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Tin:			
In ore	P.T. Koba Tin (Government, 25%; Renison Goldfields Consolidated Ltd. of Australia, 75%)	Koba, Bangka Island	6
Do.	P.T. Tambang Timah (Government)	Onshore and offshore islands of Bangka, Belitung, and Singkep	32
Metal, refined	Peleburan Timah Indonesia (Government)	Mentok, Bangka Island	32

TABLE 5
INDONESIA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Bauxite	[1]396,000
Coal	[2]3,000,000
Copper	[3]676,000
Gas, natural billion cubic feet	87,015
Nickel	[4]367,000
Petroleum, crude million barrels	8,200
Tin	[5]740

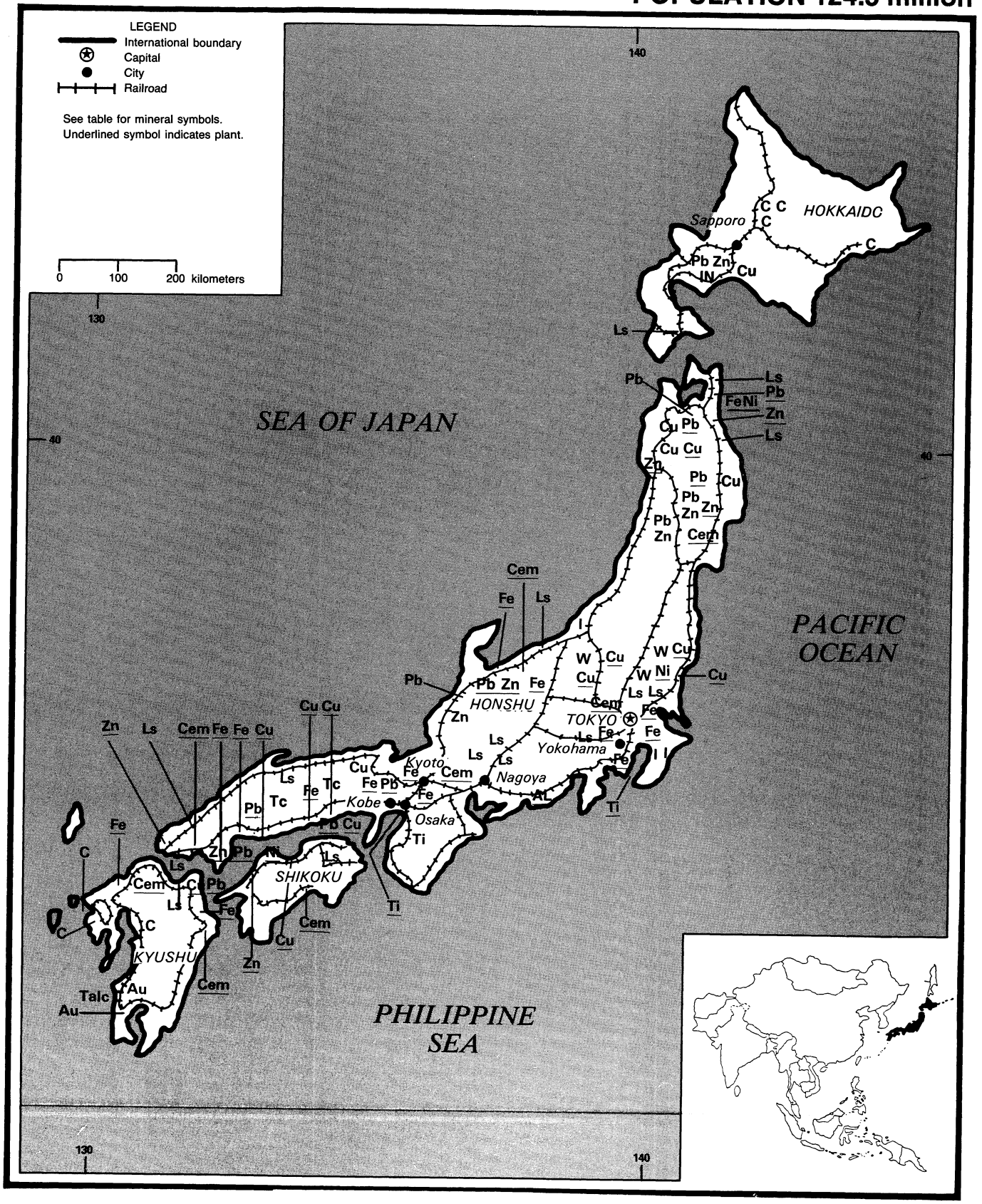
[1]Includes proven reserves on Bintan Island and west Kalimantan, grading no less than 40% Al_2O_3.
[2]Includes proven and probable reserves.
[3]Represents proven and probable reserves, grading 1.4% Cu, in the Ertsberg and Grasberg areas of Irian Jaya.
[4]Represents proven and probable reserves on Gag Island, Gebe Island, in the Polmalaa and Soroako areas of south Sulawesi, grading between 1.5% to 2% Ni.
[5]Official proven reserves.

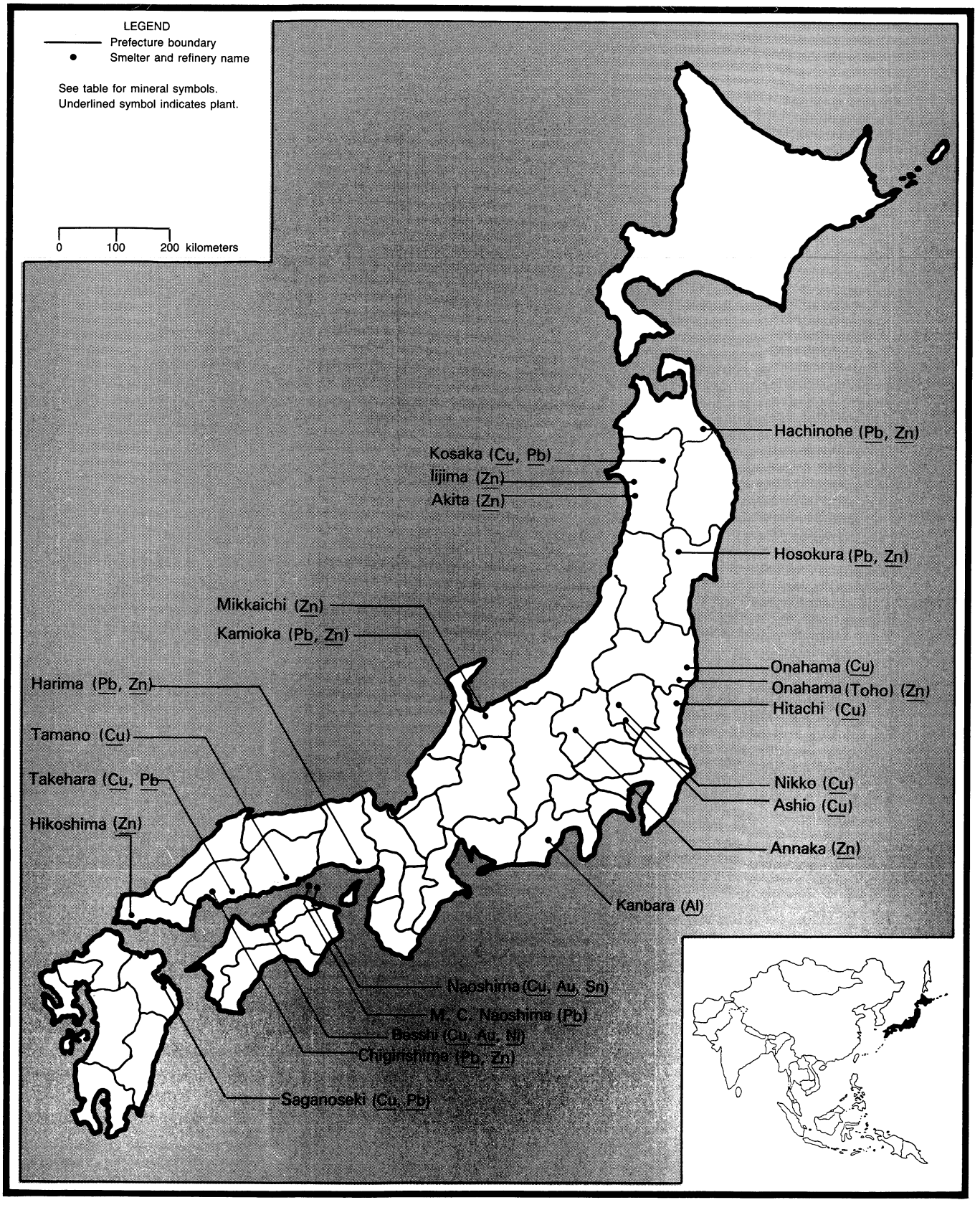
Sources: The Indonesian Department of Mines and Energy, the Indonesian Mining Association, P.T. Freeport Indonesia Co., P.T. Inco., and Oil and Gas Journal. Inonesia Co., P.T. Inco., and Oil and Gas Journal.

JAPAN

AREA 377,835 km²

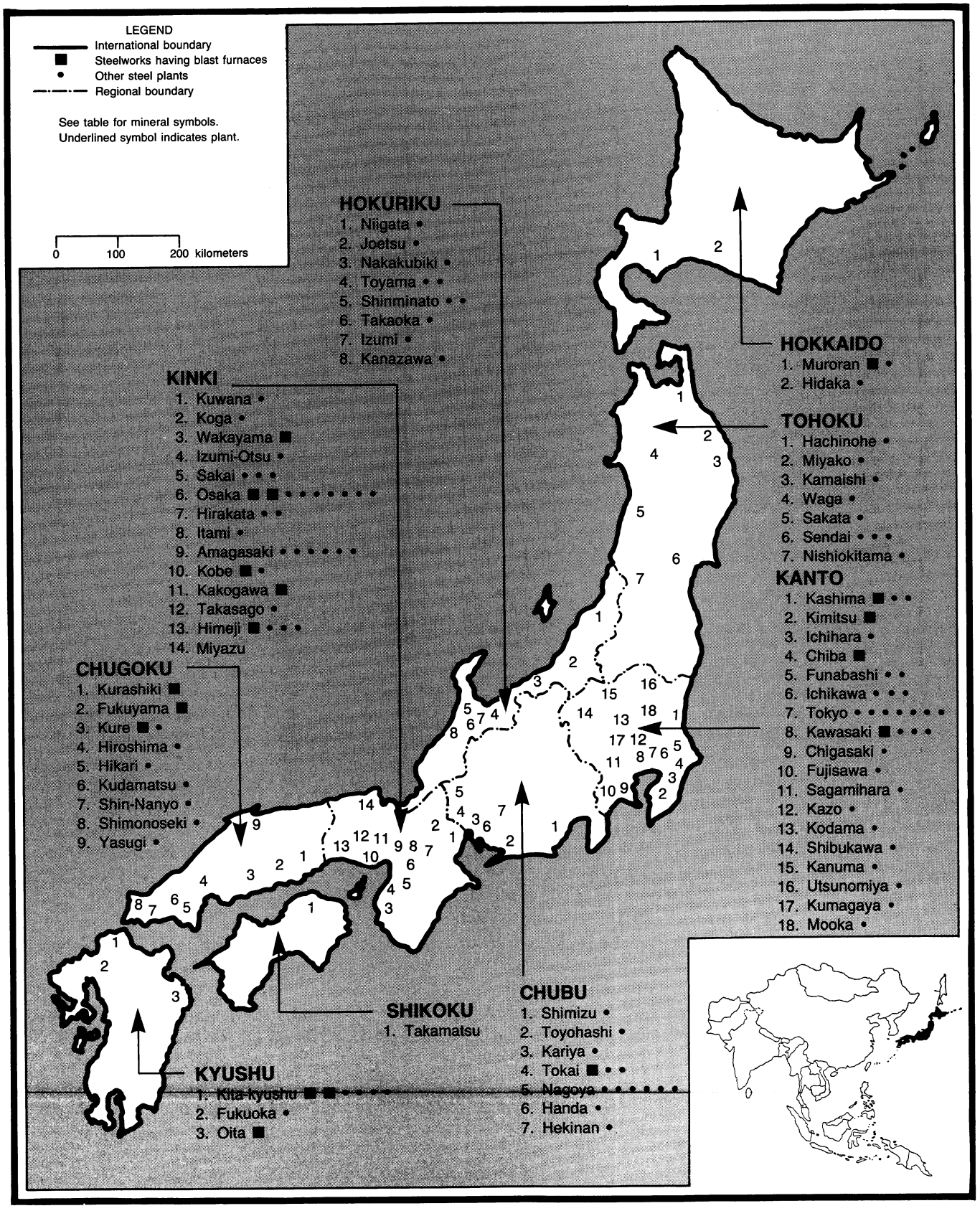
POPULATION 124.5 million





Metal Mining Agency of Japan (Tokyo) publication adapted from *Mining Activities of Japan, 1990.*

JAPAN: LOCATION OF MAJOR NONFERROUS SMELTING AND REFINING PLANTS



The Japan Iron and Steel Federation (Tokyo) publication adapted from *The Steel Industry of Japan, 1992.*

JAPAN: LOCATION OF MAJOR STEELWORKS

THE MINERAL INDUSTRY OF

JAPAN

By John C. Wu

In 1992, Japan was the world's largest producer of cadmium metal, indium metal, iodine, electrolytic manganese dioxide, pyrophyllite, selenium metal, and tellurium metal. It was the world's second largest producer of high-purity gallium metal, pig iron, steel, titanium sponge, and zinc metal. Japan remained the third largest producer of cement, copper metal, limestone, and nickel metal. Japan was one of the world's top six producers of bismuth metal, bromine, gypsum, lime, primary magnesium, sand and gravel, silica sand, and sulfur. Reserves of crude petroleum, natural gas, and most nonfuel minerals in Japan are very small. However, Japan's reserves of iodine, limestone, silica stone and sand, and pyrophyllite are large and of world significance.

Japan is a major world market for metals and minerals. It is one of the world's three largest consumers of primary aluminum, cadmium metal, chromite, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, fluorspar, gallium metal, iron ore, ilmenite and rutile, industrial salt, lead metal, LNG, manganese ore, nickel ore and metal, crude petroleum, potash, phosphate rock, precious metals, rare earths, silicon, zinc ore and metal, and zircon. On the other hand, Japan is one of the world's top exporters of cement, fertilizer materials, iodine, electrolytic manganese dioxide, high-purity rare metal products, iron and steel products, and titanium sponge and mill products.

The mining sector of Japan's mineral industry remained small. The value of output by the mining sector was estimated at $8.2 billion,[1] accounting for 0.26% of Japan's GDP in 1992. According to Japan's Economic Planning Agency, Japan's GDP, in 1985 constant dollars, was estimated at $3.3 trillion in 1992, compared with $3.1 trillion in 1991. The mineral processing sector, which expanded further the capacity of nonferrous metal smelting and refining in 1992, continued to play an important role in providing the basic materials for its large world-class manufacturing sector. In 1992, Japan's mineral processing sector became an important supplier of refined copper, lead, and zinc as well as other high-purity rare metals to neighboring countries, such as China, Hong Kong, the Republic of Korea, and Taiwan.

Japan remained an important market for U.S. exports of primary aluminum, beryllium metal, boron oxide and acid, chromium oxide and hydroxide, coal, copper (concentrate and metal), ferrous and nonferrous scrap metals, lead ore and concentrate, lithium oxide and hydroxide, dust and powder of precious stones (abrasive), primary magnesium, molybdenum (concentrate and metal), phosphate rock, rare-earth compounds, high-purity silicon, soda ash, tantalum metal and powder products, refined petroleum products, especially petroleum coke, uranium oxide and other compounds, and zinc ore and concentrate. On the other hand, Japan continued to be an important supplier of fabricated aluminum mill and copper mill products, cement, iodine, iron oxide, high-purity rare metals, high-quality steel products, and titanium sponge and mill products to the United States.

Japan remained a large net importer of mineral commodities in 1992. According to the Ministry of Finance, mineral commodities imports, which included metallic ore and scrap, coal, crude and refined petroleum, LNG, iron and steel products, and nonferrous metals, decreased by 9.5% to $71.1 billion in 1992. Japan's mineral commodity exports, which included metallic and industrial mineral products, increased by 2.4% to $25.2 billion in 1992. As a result, Japan's mineral trade deficit declined from $55 billion in 1991 to $46 billion in 1992 owing to a lower import bill for every major category of mineral and metal commodities and higher export earnings from every category of mineral and metal commodities except iron and steel products.

In 1992, imports of mineral fuels were $52.7 billion, of which $30.1 billion was for crude and partially refined petroleum, $6.3 billion for refined petroleum products, $7.3 billion for LNG, $6.1 billion for anthracite and bituminous coal, and $2.9 billion for other fuels. Imports of metallic ore and scrap totaled $7.6 billion, of which $3.2 billion was for iron ore and $4.4 billion for nonferrous ore and ferrous and nonferrous scrap. Japan's imports of iron and steel products and nonferrous metals totaled $10.8 billion, while exports of iron and steel, nonferrous metals, and other metal products totaled $21.3 billion. Exports of industrial mineral products totaled $3.9 billion in 1992.

GOVERNMENT POLICIES AND PROGRAMS

An amendment to the laws related to mine wastewater treatment was made in May to solve the problems of water pollution caused by wastewater effluent (acidic drainage) from 68 closed mines. Of that total, 25 are abandoned mines without owners. According to the amended legislation, the Ministry of International Trade and Industry (MITI) is to implement a 10-year plan with a

total capital expenditure budget of $197 million for construction of pollution prevention facilities and an annual operating budget of $36 million for cleaning up water pollution caused by closed mines, beginning in fiscal year 1993. The cleanup cost for those abandoned mines without owners is to be shared 75% by the central Government and 25% by the local governments, when the local government initiate an antiwater pollution project.

In past years, for those closed mines with mining right holders, the cleanup cost had been borne by the owners and operators of the mines. To prevent pollution caused by mining activities and to assist the mining right holders of the closed mines for carrying out their antipollution projects, under the amended laws, a permanent organization called the Center for Eco-Mining was established in Tokyo in December 1992. The center is to operate on behalf of the closed mine owners to secure lowinterest loans from MITI through the Metal Mining Agency of Japan (MMAJ) for undertaking the mining-pollution prevention projects. Other activities of the center include conducting research and development for reducing costs of wastewater treatment and new environmental protection technology, preparing textbook and teaching materials for educating the public, and sponsoring symposiums and seminars related to mining-pollution prevention. The center is also to cooperate with developing countries on developing environmental protection technology with financial assistance from the Official Development Assistance Program and technical assistance from Japan's Environmental Protection Agency.

In February, a geological observation satellite, named Fuyo No. 1, was successfully launched by the National Space Development Agency of Japan via an H-1 rocket from the agency's space center on Tanegashima, an island off southern Kyushu in the western Pacific, to spot natural resources, including copper, iron, lead, gold, silver, zinc, and other valuable metals, worldwide. According to the Nikkei Weekly, Fuyo No. 1 was claimed by the Japanese Government to have the world's most advanced resources exploration satellite. It is equipped with a sensor to detect infrared light from the Earth's surface and a synthetic aperture radar to produce an image of the surface regardless of time or weather conditions.

The satellite was expected to transmit data and pictures covering 10 portions of the Earth's surface during fiscal year 1993 and to be functional until 1994. The 10 target areas are Yerington and Bulfrog, Nevada, in the United States; Imiter Bou in Morocco; Ariquemes in Brazil; Bid-bid in Malaysia; Hishikari, Kyushu, in Japan; Tizapa in Mexico; Escondida in Chile; Ih-Sanhai in Mongolia; and Semlyachik in Russian. MMAJ was commissioned by MITI to conduct detailed data analysis and to negotiate with involved countries over exploration rights and joint exploration programs.[2]

In 1992, the Government of Japan, through MMAJ, reached three separate agreements with the Governments of Argentina, China, and Mongolia to provide technical and financial assistance to jointly explore for minerals. In Argentina, MMAJ is to spend about $2.4 million in the next 3 years beginning in October to explore for gold, lead, and silver in the Provinces of Salta and La Rioja. In China, MMAJ is to spend about $15.8 million in the next 6 years beginning in June 1993 to explore for copper in the Provinces of Yunnan and Shaanxi. In Mongolia, MMAJ is to spend about $8 million in the next 3 years beginning in July to explore for lead, silver, and zinc in Tsav of Dornod Aymag. MMAJ had more than a dozen ongoing joint exploration projects mainly for nonferrous and precious metals with about 16 countries in Africa, North and South America, and Asia.

In April, MITI announced that the Government was planning to boost its rare-metals stockpile of chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium in fiscal year 1993. According to MMAJ's Stockpile Department, an annual budget of about $7.9 million had been appropriated for the Government stockpile of the seven metals in 1991 and 1992. During fiscal years 1991 and 1992, a total of 2.1 days had been added to the Government stockpile, while the private stockpile had added a 0.9-day supply. By the end of fiscal year 1992, the stockpile of the seven metals by the Government program was 32.7 days of supply and the private program was 14.0 days of supply. These new cumulative amounts of stockpile, in terms of day of supply, had been recalculated by MMAJ using the average daily consumption of the seven metals during 1986 to 1989. Because the Government stockpile was lagging behind schedule, MITI is expected to allot $31.6 million, about four times the value as that of fiscal year 1992, for stockpile acquisitions in fiscal year 1993. The 60-day stockpile goal of the seven metals was scheduled to be achieved by the end of fiscal year 1995.

According to local press reports, in late 1992, the Government of Japan was considering eliminating its tariffs on nonferrous metals on a reciprocal basis through negotiations on market access under the Uruguay Round of multilateral trade talks of the General Agreement on Tariffs and Trade (GATT). However, the negotiations on GATT collapsed by yearend. According to Government sources, the proposed nonferrous metals for which tariffs were to be eliminated were aluminum, copper, lead, manganese, nickel, and zinc.

PRODUCTION

Despite lower domestic prices of nonferrous metals, mine production of most nonferrous minerals, except copper, increased slightly from that of 1991. Increased gold production was mainly due to increased ore output from the Hishikari Mine and from the nearby Yamada gold deposit in Kagoshima Prefecture of southern Kyushu. Increased ore output from the Toyoha Mine near Sapporo in southern Hokkaido had resulted in a slight increase in production of lead, silver, and zinc in 1992. Mine production of most industrial minerals and construction-related materials, such

as limestone, decreased slightly from that of 1991 owing to a slowdown in construction activity because of a weak economy in 1992.

In the mineral fuels sector, coal output dropped to a record low in 1992 resulting from the permanent shutdown of the Ashibetsu coal mine in Hokkaido and the further cutback in production of other coal mines. Production of natural gas and crude petroleum continued the 1991 upward trend owing to increased output from the newly developed Iwafune Oilfield, offshore Niigata Prefecture in the Japan Sea.

In the mineral processing sector, the overall production of metals and industrial minerals was at a lower level because of reduced demand for basic materials by the automobile and construction industries in 1992. However, production of some nonferrous metals, such as bismuth, cadmium, copper, gold, indium, selenium, silver, and zinc, was at a slightly higher level due to steady domestic and overseas demand for these metals in 1992. *(See table 1.)*

TRADE

Japan remained a major world importer of energy, nonfuel minerals, and nonferrous metals and was a major world exporter of processed minerals in 1992. As a result of lower import bills and higher export earnings, Japan's mineral trade deficit was smaller than that of 1991. The lower import bills of mineral fuels were due to lower world prices of coal and oil, while higher export earnings were due to increased export volume of iron and steel products and nonferrous metals in 1992.

Despite increased imports of mineral fuels, including coal, crude and partially refined petroleum, LNG, and refined petroleum products, the total import bills of mineral fuels declined from $54.7 billion in 1991 to $52.7 billion, accounting for 22.6% of total imports in 1992. Because of the reduced import volume of minerals ores, iron and steel products, nonferrous metals, and metal scrap, total import bills of nonfuel minerals dropped from $23.9 billion in 1991 to $18.4 billion, accounting for 7.9% of total imports in 1992.

Total exports of minerals commodities, including iron and steel, nonferrous metals, and industrial minerals, increased from $24.6 billion in 1991 to $25.2 billion, accounting for 7.4% of total exports in 1992. Exports of iron and steel dropped slightly to $13.3 billion from $13.6 billion in 1991. Exports of nonferrous metals and industrial minerals rose to $11.9 billion in 1992 from $11.1 billion in 1991.

The United States remained the most important trade partner of Japan because of its significant role in supplying Japan with a wide variety of raw materials, foodstuffs, and manufactured products. In overall merchandise trade, Japan's exports to the United State rose from $91.5 billion in 1991 to $95.8 billion, accounting for 28% of Japan's total exports in 1992. Imports from the United States declined from $53.3 billion in 1991 to $52.2 billion, accounting for 22% of Japan's total imports in 1992. In 1992, Japan's overall merchandise trade surplus with the United States rose from $38.2 billion in 1991 to $43.6 billion in 1992. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

In terms of the number of establishments, employment, and gross value of production, Japan's mineral industry consisted of a small nonferrous metal mining sector, a small-size coal mining sector, a large industrial mineral mining sector, and a large world-class ferrous and nonferrous minerals processing sector. Mining and mineral processing businesses are owned and operated by private companies incorporated in Japan. The Government extends financial and technical assistance to the mineral industry, which follows Government policy guidelines during depressed market conditions. Because of the restructuring program resulting from the depressed market conditions domestically and internationally in the 1980's, industry output capacity and employment had been reduced considerably. Contraction in coal, nonferrous metal mining, iron and steel, fertilizer materials, and cement was more drastic than other sectors because of the appreciation of the yen, higher domestic production costs, and lower import mineral prices.

According to MITI, coal was produced from 5 large-scale major mines and 11 small-scale mines mainly in the Hokkaido and Kyushu areas with a total capacity of 8 Mmt/a and a work force of 4,000 in 1992. The number of operating nonferrous metal mines remained unchanged at 26, but employment declined from 2,404 in 1991 to 2,198 in 1992. The number of operating industrial minerals mines and employment both declined from 592 and 13,247 in 1991 to 578 and 13,235, respectively, in 1992.

In line with the overall industrial restructuring program, the steel industry continued implementing a reduction in employment by cutting its work force by 1,703 workers to 291,624 in 1992. However, three new electric furnaces had been added to the industry's steelmaking capacity in 1992. As a result, Japan's steelmaking capacity was raised by about 2.9 Mmt/a to 140,283,110 mt/a in 1992. Because of the continued growth in demand for copper and zinc in the Far East region, the nonferrous metal smelting and refining industry continued expanding its capacity of copper and zinc in 1992.

According to MITI, Japan's copper smelting and refining capacities were raised to 1,489,200 mt/a and 1,222,800 mt/a in 1992 from 1,388,400 mt/a and 1,204,800 mt/a, respectively, in 1991. Japan's lead refining capacity remained at 327,000 mt/a in 1992, while zinc refining capacity was raised to 874,800 mt/a in 1992 from 864,000 mt/a in 1991. *(See table 4.)*

According to the Statistics Bureau of Japan's Management and Coordination Agency, the number of persons employed by the mining industry in 1992 was about 60,000, accounting for 0.09% of the Japanese labor force of 65.8 million compared with 80,000 persons,

accounting for 0.14% of 59.1 million in 1987.

COMMODITY REVIEW

Metals

Aluminum.—Production of primary aluminum by Nippon Light Metal Co. Ltd. at its Kanbara plant in Shizuoka Prefecture declined to a record low and remained insignificant in 1992. Since the mid-1980's, Japan had been dependent on primary aluminum imports to meet virtually all of its annual primary aluminum requirement. Japan remained the world's largest importer of primary aluminum, accounting for 32% of the primary aluminum traded in the world market, and was the world's second largest consumer of primary aluminum in 1992. Because of reduced demand caused by a sluggish economy, imports of primary aluminum reversed its 5-year upward trend and declined by 10.4% to 2.25 Mmt (in metal content of primary aluminum and alloy ingots).

According to the Ministry of Finance, imports of primary aluminum were 2.5 Mmt in 1992, of which 1.9 Mmt was high-grade and regular-grade ingot and 650,000 tons was alloy ingot. Because of its heavy reliance on imports, Japan had widely diversified its overseas sources of primary aluminum into more than 50 countries. However, about 76% of Japan's primary aluminum imports in 1992 was from seven major primary aluminum-producing countries, including Australia, Brazil, Canada, Indonesia, New Zealand, the United States, and Venezuela, where Japan's overseas aluminum smelting operations are located. In 1992, the United States was the top supplier, accounting for 18.5% of Japan's total primary aluminum imports, followed by Australia, 17.2%; Brazil, 14.8%; Venezuela, 8.3%; Canada, 6.5%; New Zealand, 6.4%; United Arab Emirates, 5.4%; Russia, 5.0%; and Indonesia, 4.7%.

To secure a long-term stable supply of primary aluminum, Marubeni Corp., a major trading company and an aluminum importer, acquired from Aluminum Smelter Victoria Pty. Ltd., a Victoria State Government-owned agency, a 10% equity interest in Portland Smelter for about $144 million in September. The Portland Smelter, in the southeastern Australian State of Victoria with a capacity of 350,000 mt/a, was expected to ship 32,000 mt/a of primary aluminum to Japan beginning in late 1992.[3]

Consumption of primary aluminum declined by 5.5% to 2.2 Mmt in 1992 because of reduced consumption for aluminum rolling and secondary smelting. The 1992 sluggish economy had resulted in a considerable decline in demand for primary aluminum by the manufacturers of automobiles, building materials, and home appliances. According to the Japan Aluminium Federation, consumption of primary aluminum, by sector, in 1990-92 is shown in table 5. *(See table 5.)*

Cadmium.—Japan was the world's largest cadmium producer and consumer. Production of cadmium reached a 19-year high in 1992. Despite a sharp drop in the world market price of cadmium, Japan's imports of cadmium metal declined considerably because of increased secondary recovery in 1992 and excessive imports in 1991.

Cadmium was recovered as a byproduct of zinc refineries. Japan's raw material requirements for production of cadmium was 78% dependent on imported zinc ore from Australia, Canada, Peru, and the United States. According to the Japan Mining Industry Association, production of cadmium was by Dowa Mining Co. Ltd., Mitsubishi Materials Corp., Mitsui Mining and Smelting Co. Ltd., Nippon Mining Co. Ltd., Sumitomo Metal Mining Co. Ltd., and Toho Zinc Co. Ltd. These companies owned and operated zinc refineries, which produced cadmium as a byproduct.

In 1992, imports of cadmium declined by 19.2% to 2,766 tons, of which 678 tons was from the Republic of Korea, 543 tons from Canada, 420 tons from Australia, 400 tons from Belgium, 226 tons from Peru, 112 tons from China, and the remaining 387 tons from other countries. The average import c.i.f. price of unwrought cadmium was $1.10 per pound compared with $1.78 per pound in 1991 and $3.80 per pound in 1990. Exports of cadmium increased slightly from 13 tons in 1991 to 22 tons in 1992, of which 21 tons went to the Republic of Korea.

Domestic demand for cadmium dropped by 1% to 2,776 tons in 1992. Of the total demand, 84.8% was consumed for cadmium-nickel batteries, 4.4% for pigment, 2.5% for nonferrous alloys, 0.9% for stabilizer of plastics, and the remaining 7.4% for other uses. Consumption of cadmium for the manufacture of nickel-cadmium batteries had increased from 1,760 tons in 1987 to 2,354 tons in 1992. In past years, most of the nickel-cadmium batteries in Japan was used for railroad crossing signals, toys, video cassette recorders, cordless telephones, and more recently for portable personal computers and cellular car telephones. The batteries industry was expecting an upsurge in applications of nickel-cadmium batteries for electric cars in the next few years.

In June, MITI announced that it plans to promote recycling of cadmium-nickel batteries beginning in 1993 to mitigate the possible adverse environmental effects of the batteries. The recycling promotion may include mail-back of the batteries and installation of special collection boxes at the sales stores. Currently, the large industrial rechargeable cadmium-nickel batteries were recycled by Toho Zinc at its Annaka zinc refinery in Gumma Prefecture. Hikoshima Smelting Co. Ltd. also operated a 240-mt/a recycling plant at its zinc refining complex at Hikoshima near Shimonoseki in Yamaguchi Prefecture. The recycling plant reportedly recovered about 150 mt/a of cadmium. However, all of the scrap materials feeding the plant were imported from the United States.

Chromium.—Chromium ore concentrate produced by Nippon Chrome Industries Ltd. from the Wakamatsu Mine in Tottori Prefecture was estimated to remain at about 8,000 tons in 1992. Japan relied on imports to meet almost all of its chromium requirements in 1992.

Imports of metallurgical- and refractory-grade chromite declined slightly from 755,059 tons in 1991 to 724,983 tons in 1992. The Republic of South Africa remained the dominant supplier of chromite, providing 420,889 tons in 1992. Other important suppliers of chromite were Russia, 68,819 tons; India, 64,584 tons; Brazil, 40,407 tons; the Republic of Kazakhstan, 26,694 tons; the Philippines, 22,953 tons; and Albania, 10,410 tons.

According to MITI, consumption of chromite by the ferroalloy industry decreased from 580,734 tons in 1991 to 548,236 tons in 1992. Ferrochromium was produced by five companies in 1992. Japan Metal and Chemical Co. Ltd. operated a 62,800-mt/a-capacity plant at Kita Kyushu in Fukuoka Prefecture and a 39,600-mt/a-capacity plant at Oguni in Yamagata Prefecture. NKK Corp. operated a 96,100-mt/a-capacity plant at Toyama in Toyama Prefecture. Nippon Denko K.K. operated a 77,990-mt/a-capacity plant at Hokuriku in Toyama Prefecture. Pacific Metals Co. Ltd. operated a 49,000-mt/a-capacity plant at Hachinohe in Aomori Prefecture. Showa Denko K.K. operated a 20,700-mt/a-capacity plant at Chichibu in Saitama Prefecture and a 55,000-mt/a-capacity plant at Shunan in Yamaguchi Prefecture.

In 1992, imports of ferrochromium declined from 578,073 tons in 1991 to 459,608 tons because of reduced demand by stainless steel producers. The Republic of South Africa remained the dominant supplier of ferrochromium, providing 252,391 tons or 55% of the 1992 ferrochromium imports. Other important suppliers in 1992 were India, 56,376 tons; Zimbabwe, 40,464 tons; China, 23,452 tons; Norway, 17,805 tons; Finland, 12,991 tons; and Brazil 12,481 tons. Of the 1992 ferrochromium imports, 28,100 tons was imported from developing countries duty free under the Preferential Tariff Basis.

In an effort to secure a long-term supply of chromium, Nippon Steel Corp. and Mitsui & Co. Ltd. jointly conducted a feasibility study in 1992 with Consolidated Metallurgical Industries (CMI) of the Republic of South Africa for development of the Thorncliff chromium mine in Eastern Transvaal. The Thorncliff Mine, if developed, will export chromium ore to Japan and supply a portion of the ore output to the existing CMI's Lydenburg ferrochromium plant, about 100 km away from the mine.

Japan remained the world's leading producer of chromium metal in 1992. Production of chromium metal with 99.95% purity was by two companies. Nippon Denko K.K. operated a 700-mt/a plant using the aluminothermic process at Tokushima in Tokushima Prefecture. Tosoh Corp. operated a 3,600-mt/a plant using the electrolytic process at Yamagata in Yamagata Prefecture.

According to a Japanese industry source, domestic demand for chromium metal increased slightly from 1,360 tons in 1991 to 1,390 tons in 1992, of which 59% was for super alloys, 21% for nonferrous alloys, 16% for welding rods, and 4% for other uses. Exports of chromium metal rose from 2,100 tons in 1991 to 2,315 tons in 1992, of which 1,652 tons went to the United States, 197 tons to the United Kingdom, and 114 tons to Canada. Imports of chromium metal also increased from 794 tons in 1991 to 991 tons in 1992, of which China provided 566 tons; France, 165 tons; the United States, 127 tons; and the United Kingdom, 126 tons.

Because of the redevelopment program of Yamagata City, where the Tosoh chromium metal plant is located, the company had decided to close the plant in March 1995. In early 1992, Tosoh reportedly was conducting a joint feasibility study with Sammancor of the Republic of South Africa for construction of an integrated chromium metal plant in South Africa. Higher yen value, increased power cost, and high cost of slag disposal in Japan were cited as the main reasons for Tosoh to relocate its chromium metal plant overseas.[4]

Cobalt.—Japan relied on imports to meet all of its cobalt requirements. Cobalt metal production declined to the normal level of between 100 tons and 110 tons. Since 1987, Sumitomo Metal Mining Co. Ltd., the sole cobalt metal producer with a rated capacity of 1,600 mt/a, recovered cobalt from the precipitate of its nickel refinery in Niihama, Ehime Prefecture, using cobalt-bearing nickel sulfide from Indonesia and Australia. Nippon Mining's Nikko cobalt-nickel refinery, with a rated capacity of 1,200 mt/a, in Hitachi, Ibaraki Prefecture, remained shut down owing to the lack of raw material.

Imports of cobalt metal dropped sharply by 36% to about 4,300 tons in 1992, largely due to the excessive inventory buildup in 1991 and reduced demand resulting from the slowdown in the Japanese economy and higher cobalt prices. Imports of cobalt metal, including powders, flakes, and waste and scrap, were 4,288 tons in 1992, compared with 6,716 tons in 1991. In 1992, Zaire and Zambia remained the two dominant suppliers, providing 1,368 tons and 906 tons, respectively. Other important cobalt metal suppliers in 1992 were Belgium, 575 tons (mostly in cobalt powder); Norway, 499 tons; Canada, 186 tons; and the United Kingdom, 143 tons. In 1992, Japan's exports of cobalt, including matte and other intermediate products, were 264 tons, compared with 336 tons in 1991.

According to Japan's Metal Economics Research Institute, demand by the specialty steel manufacturers, the largest consumer of cobalt, dropped by 27% because of reduced production of high-speed tool steel. Demand by the manufacturers of magnetic materials experienced the sharpest drop in 1992 because of the high prices and increased substitution of samarium-cobalt magnets by a less expensive neodymium-iron-boron magnet. Demand by producers of catalyst, pipe, plate, rod, and wire also was down substantially because of reduced demand by the automobile and petrochemical industries. Consumption of cobalt by end use is shown in table 6. *(See table 6.)*

Copper, Lead, and Zinc.—In 1992, domestic mine production of lead and zinc was slightly higher and that of copper was lower. Japan continued to use more imported ore and concentrate in

metal production of copper, lead, and zinc. Domestic mine production of copper, lead, and zinc supplied 1%, 7%, and 18%, respectively, of Japan's ore requirements for metal production of copper, lead, and zinc in 1992. According to MITI, there were 4 major nonferrous metal mining companies in 1992 operating with more than 100 workers each and 3 small-scale nonferrous metal mining companies operating with less than 100 workers.

Hanaoka Mining Co. Ltd., which operated three underground mines at Ezuri, Fukasawa, and Matsumine in Akita Prefecture with 334 workers, produced 5,927 tons of lead and 28,066 tons of zinc (metal content of the concentrate) in 1991. Kamaishi Mining Co. Ltd., which operated the Kamaishi Mine in Iwate Prefecture with 102 workers, produced 1,697 tons of copper and 17,714 tons of iron in 1991. The Kamioka Mining Co. Ltd., which operated two underground mines at Kamioka-Mozumi and Kamioka-Tochibora in Gifu Prefecture with 855 workers, produced 3,458 tons of lead and 49,308 tons of zinc in 1991. Toyoha Mining Co. Ltd., which operated an underground mine at Toyoha in Hokkaido Prefecture with 360 workers, produced 7,558 tons of lead and 51,869 tons of zinc in 1991. Shin-Uchinotai Mining Co. Ltd., a lead and zinc producer, operated an underground mine at Nurukawa in Aomori Prefecture with 46 workers. Kosaka Smelting and Refining Co. Ltd. resumed lead mining at the Kosaka Mine in Akita Prefecture with 21 workers. Furukawa Co. Ltd. operated an old Ashio copper mine in Tochigi Prefecture with 20 workers.

In domestic exploration, MMAJ continued its exploration at the Jozankei area, west of Sapporo, Hokkaido, where a promising lead-zinc-silver deposit had been discovered. According to MMAJ, six deposit belts, ranging from 0.5 m to 4.7 m wide, were discovered about 400 m below surface. The results indicated that the ore contained up to 35.93% zinc, 8.9% lead, and up to 404 g/mt silver. Ore reserves of the area had not been estimated.

In overseas exploration, four Japanese nonferrous metal mining companies were involved in joint development of copper, lead, and zinc mines with foreign partners in Australia, Chile, and Mexico in 1992. In April, Furukawa Co. Ltd. completed a feasibility study for development of the Benambra copper mine in northeastern Victoria of Australia. Development of the mine was expected to begin in late 1992 at an estimated cost of $11 million. The rich Benambra copper mine is equally owned by Macquarie Resources Ltd. and Denehurst Ltd. of Australia. The partnership of Furukawa in the Benambra Mine is through its 16% ownership of Denehurst. Ore reserves of the Benambra Mine were estimated at 10.65 Mmt grading 8% to 10% copper.[5]

In May, Dowa Mining Co. Ltd. established its first overseas joint-venture firm with Industria Penoles S.A. de C.V., Mexico's largest nonferrous metal company, for development of a complex (copper, lead, zinc) sulfide ore deposit at Tizapa in the Arceris district, about 260 km west of Mexico City. The ore deposit, discovered by the Metal Mining Agency of Japan in 1987, has proven reserves of more than 4.1 Mmt averaging 7.9% zinc, 1.6% lead, and 0.7% copper plus 2 g/mt of gold and 300 g/mt of silver. According to Dowa Mining, mine development was expected to be completed in 2 years with an estimated cost of $32 million. Ore production will begin in 1994 at the rate of 240,000 mt/a. The mill output will be 27,600 mt/a of zinc concentrate and 10,800 mt/a of copper concentrate. The joint-venture firm, Minera Tizapa S.A. de C.V., is owned 51% by Industria Penoles, 39% by Dowa Mining, and 10% by Sumitomo Corp.

Following an agreement with Phelps Dodge Corp. of the United States in June 1991 to jointly develop the La Candelaria copper mine in northern Chile, Sumitomo Metal Mining Co. Ltd. and Phelps Dodge established a joint-venture firm, Compania Contractual Minera Candelaria (CCMC), in May. Sumitomo Metal Mining paid Phelps Dodge $40 million for a 20% equity participation in CCMC. Sumitomo Corp. participated in the joint venture later by acquiring 25% of the 20% interest held by Sumitomo Metal Mining in CCMC. The $530 million development project was started in mid-1992 and was expected to be completed in early 1995. The mine is expected to produce 400,000 mt/a of copper concentrate, of which 200,000 tons will be shipped annually to Japan for smelting and refining. Recoverable reserves of the La Candelaria Mine were estimated at 354 Mmt averaging 1.14% copper plus 26 g/mt of gold.[6]

In April, Nippon Mining Co. Ltd. announced that it agreed to jointly conduct a feasibility study with MIM Holdings of Australia for developing the McArthur River zinc-lead-silver project in Australia's Northern Territory. The McArthur River deposit, owned by Mount Isa Mines Ltd., a wholly owned subsidiary of MIM Holdings, reportedly contains about 227 Mmt of ore reserves averaging 13% combined lead and zinc. Of these total reserves, about 47 Mmt was proven with an average ore grade of 15.7% zinc and 6.5% lead plus 66 g/mt of silver.

In November, following a detailed feasibility study by ANT Minerals Pty. Ltd., a Nippon Mining's wholly owned subsidiary in Australia, Nippon Mining, Toyoha Mining Co., Mitsui & Co., Mitsubishi Materials Corp., and Marubeni Corp. agreed to jointly participate with MIM Holdings Ltd. of Australia in the McArthur River project. The $183 million project, which was scheduled to begin in 1993, calls for development of the world's largest underground lead-silver-zinc mine with an annual capacity of 1.5 Mmt/a of ore and a milling capacity of 350,000 mt/a of concentrate containing about 160,000 tons of zinc, 45,000 tons of lead, and 50,000 kg of silver.[7]

To secure a long-term stable supply of copper ore and concentrate, Nippon Mining signed a 9-year purchase contract with Marcopper Mining Corp. of the Philippines for importing copper concentrate from Marcopper's San Antonio Mine on the island of Marinduque beginning in April 1992. According to the contract, Nippon Mining

would take 45,000 tons of copper concentrate in 1992 then increase to 60,000 mt/a for the next 2 years with an option to take only 55,000 mt/a for each of the remaining 6 years, if the copper concentrate contains more than 10 parts per million of mercury.[8]

Japan remained the world's largest importer of copper in 1992. As a result of an economic downturn and slackened domestic demand for copper, imports of copper ore and concentrate, blister and refined copper, and copper scrap all declined in 1992. *(See table 7 and figure 1.)*

In 1992, imports of lead ore and concentrate dropped by 11% to 270,197 tons, of which 93,594 tons came from Australia, 54,117 tons from Peru, 53,203 tons from Canada, 28,593 tons from the Republic of South Africa, 22,069 tons from the United States, 10,480 tons from China, and 8,141 tons from other countries. Imports of zinc ore and concentrate rose 6.7% to 1,233,112 tons, of which 698,103 tons came from Australia, 204,427 tons from the United States, 189,855 tons from Peru, 62,181 tons from Canada, 27,413 tons from Chile, 26,425 tons from China, and 24,708 tons from other countries. The United States, the second largest supplier, increased its percentage share of Japan's zinc concentrate imports to 16.6% in 1992 from 9.6% in 1991 because of increased shipments in 1992 from the Red Dog zinc mine in Alaska. *(See table 8.)*

Imports of refined lead dropped sharply by 26% to 51,164 tons, while imports of slab zinc also dropped by 26% to 105,831 tons in 1992. The suppliers of refined lead in 1992 were Mexico, 14,402 tons; Peru, 13,864 tons; Australia, 9,318 tons; the United States, 6,604 tons; Canada, 2,923 tons; China, 2,731 tons; and other countries, 1,322 tons. The major suppliers of slab zinc were North Korea, 28,980 tons; the Republic of Korea, 19,605 tons; Australia, 14,482 tons; Canada, 13,695 tons; China, 9,464 tons; Russia, 7,947 tons; Peru, 2,733 tons; and Mexico, 2,713 tons.

Despite a weak domestic demand, metal production of copper and zinc continued to increase in 1992 because of a sharp drop in imports of refined copper and zinc and increased exports of copper and zinc to the Far East market. However, metal production of lead decreased slightly owing to reduced domestic demand for production of storage batteries, inorganic chemicals, and solders.

In 1992, the nonferrous minerals processing sector expanded its refining capacity of copper and zinc. Sumitomo Metal Mining raised the capacity of copper smelting and refining at its Besshi complex in Ehime Prefecture to 276,000 mt/a and 210,000 mt/a in 1992 from 216,000 mt/a and 192,000 mt/a, respectively, in 1991. Sumitomo Metal Mining also expanded the capacity of zinc refining at its Harima complex in Hyogo Prefecture to 90,000 mt/a in 1992 from 79,200 mt/a in 1991.

Mitsubishi Materials Corp. expanded the capacity of copper refining at its Naoshima complex in Kagawa Prefecture to 187,200 mt/a in 1992 from 179,500 mt/a in 1991. Kosaka Smelting and Refining Co. Ltd., a wholly owned subsidiary of Dowa Mining Co. Ltd., expanded the capacity of copper refining at its Kosaka complex in Akita Prefecture to 108,000 mt/a in 1992 from 67,200 mt/a in 1991. As a result, Japan's copper smelting capacity rose to 1,489,200 mt/a in 1992 from 1,388,400 in 1991 and copper refining capacities rose to 1,222,800 mt/a in 1992 from 1,204,800 mt/a in 1991. Japan's refining capacity of lead remained at 327,000 mt/a in 1992, while refining capacity of zinc increased to 874,800 mt/a in 1992 from 864,000 mt/a in 1991.

After 3 years of planning and an investment of more than $10 million, Mitsubishi Materials announced in March that it was withdrawing its plan to build a 182,000-mt/a copper smelter in Texas City, Texas. The long delay in getting required permits and opposition from residents and environmentalists were cited as the reasons for making that decision. According to the company officials, Mitsubishi Materials decided in January 1989 to build the $260 million smelter and planned to use the pollution-free continuous smelting process (CSP) developed by Mitsubishi Materials. However, only the permit for using Galveston Bay water and discharging water into the bay had been approved by the Texas Water Commission by yearend 1991. Repeated delays in approving the air and general permits by the local and Federal authorities and opposition from area environmentalists had prevented the company from starting construction. To carry out the company's plan to expand its copper smelting capacity overseas, Mitsubishi reportedly was considering building a copper smelter using CSP in Thailand.[9]

In connection with the McArthur River lead-silver-zinc development project, Nippon Mining, Mitsui Mining & Smelting Co., and Australia's MIM Holdings established a joint-venture firm called Pacific Zinc Corp. (PZC) in August. The joint-venture firm is to build and operate a $375 million lead-zinc smelting and refining plant using the Imperial Smelting process by September 1994 at the site of the existing zinc refinery operated by Hachinohe Smelting Co. Ltd. in Hachinohe, Aomori Prefecture. The proposed lead-zinc smelting and refining facilities will have an annual production capacity of 120,000 tons of zinc and 60,000 tons of lead.

Under the original agreement, PZC is owned 48.5% by Nippon Mining, 30% by MIM holdings, 18.5% by Mitsui Mining & Smelting, and 3% by Mitsubishi Materials. However, in November, the Japan Fair Trade Commission asked the owners of PZC to change their share of ownership to avoid a possible violation of Japan's Anti-Monopoly Act. As a result, Mitsubishi Materials was forced to withdraw from the joint venture, and the ownership of PZC was changed to 50% owned by Nippon Mining, 40% by MIM Holdings, and 10% by Mitsui Mining & Smelting.[10]

Domestic consumption for refined copper reversed a 5-year upward trend and dropped by 11.4% to 1,515,655 tons in 1992 because of a slowdown in activity of all major copper end users. Demand for copper by the wire and cable sector, which accounted for 69% of copper

consumption in 1992, dropped 10.3% owing to reduced demand by the construction, electrical machinery, and electric power industries. Demand for copper by the brass mill sector, which accounted for 30% of copper consumption, declined by 14.1% owing to a sharp drop in demand by the electrical and general machinery and equipment, and metal products producers. Exports of refined copper continued the 1991 upward trend and reached 99,979 tons in 1992. The major overseas buyers were Taiwan, accounting for 42% of total exports; the Republic of Korea, 20%; China, 16%; and Thailand, 11%. Overall stocks of refined copper increased by 15% to 150,322 tons at the end of 1992.

Domestic demand for refined lead decreased by 3.4% to 307,282 tons in 1992, of which 65% was for storage batteries, 20% for inorganic chemicals, 4% for solders, 3% for lead pipe and sheet, and 8% for other. Exports of primary lead rose sharply from 8 tons in 1991 to 3,557 tons in 1992. Overall stocks of primary lead rose by 33% to 40,765 tons at the end of 1992.

Domestic demand for zinc slab also reversed a 5-year upward trend and dropped by 4.5% to 781,190 tons in 1992, of which 51% was for sheet galvanizing; 13% for tube, wire, and general galvanizing; 12% each for zinc diecastings and for brass mill products; 4% for inorganic chemicals; and 8% for other. Exports of zinc metal increased by 66% to 30,124 tons in 1992. Overall stocks of zinc slab rose by 22% to 118,820 tons at the end of 1992.

Gold and Silver.—Mine production of gold reached its highest level in 5 years and that of silver reached a 4-year high in 1992. A 20% increase in ore production by Sumitomo Metal Mining from the Hishikari Mine and the nearby Yamada deposit in Kagoshima Prefecture of southern Kyushu was the main factor for the overall increase in mine production of gold and silver in 1992. The Hishikari Mine, the largest and richest gold mine, contributed about 80% of Japan's total gold mine output, while the Toyoha Mine, a major lead-zinc-silver mine in Hokkaido, contributed about 45% of Japan's total silver mine output in 1992.

Following the discovery of new ore bodies at Yamada and at Sanjin in the vicinity of the Hishikari Mine, Sumitomo Metal Mining began its mine expansion program in 1991 and ore output reached 130,000 tons averaging 54 g/mt of gold or 7 tons of gold. According to MITI, mine production of gold from the Hishikari Mine by Sumitomo Metal Mining rose to 7,246 kg in 1991 from 6,038 kg and 3,159 kg in 1990 and mine production of silver rose to 3,927 kg in 1991 from 3,159 kg in 1990.

In January, Sumitomo Metal Mining announced that it had discovered gold and silver at the Ohtohge potter's clay mine, which is operated by its subsidiary, Ohtohge Tohseki Co. in Yamagata Prefecture, near the border of Fukushima Prefecture. According to Sumitomo Metal Mining, a total of 10 exploratory holes had been drilled during 1990-91, of which 6 had hit gold and silver. One deposit, about 5 m wide and about 704 m below surface, was estimated to contain between 175.7 g/mt and 50.4 g/mt of gold. The size and composition of the deposits were unknown. However, the company planned to invest about $1.6 million for further exploration in 1992. In August, Sumitomo Metal Mining reportedly reached an agreement, through its U.S. subsidiary, Sumitomo Metal Mining Arizona, with Watts, Griffis and McQuat Inc. and the Noranda/Hemlo Group of Canada, and Conroy Petroleum and Natural Resources Plc. of Ireland to jointly participate in a $4 million Stone Boy project to explore and develop gold, lead, silver, and zinc near Fairbanks, Alaska.

In April, MMAJ announced that it had discovered one promising gold deposit in the Yagen area of Aomori Prefecture and another one in Hokkaido Prefecture. According to MMAJ's preliminary investigation, the gold content in both areas is about 16 g/mt. The agency planned to continue its investigation in both areas for the next 7 to 10 years. In September, MMAJ announced that it had discovered another rich gold deposit during the exploratory boring about 150 to 200 m below surface at Kokonoe, Oita Prefecture, in northeastern Kyushu. According to MMAJ, two of three holes sunk between June and August had struck gold. In one bore, the ore contained 402 g/mt of gold and 50.4 g/mt of silver. In another, the ore contained 457.2 g/mt of gold and 158.4 g/mt of silver. The mining rights to the areas are held by Mitsui Mining and Smelting, which planned to conduct feasibility studies following further drilling in 1993.

Japan's production of gold metal increased, while that of silver metal reached another record high in 1992. There were five metal producers of gold and silver in 1992. Dowa Mining's metal production was at its Kosaka precious-metals refinery in Akita Prefecture. Mitsubishi Materials' metal production was at its Naoshima precious-metals refinery in Kagawa Prefecture. Mitsui Mining and Smelting's metal production was at its Takehara precious-metals refinery in Hiroshima Prefecture. Nippon Mining's metal production was at its Saganoseki precious-metals refinery in Oita Prefecture. Sumitomo Metal Mining's metal production was at its Toyo smelting and refining facilities in Ehime Prefecture. Sludge from domestic copper refineries and foreign sources was used as raw materials for gold and silver refining.

In 1992, Japan relied on imports to meet 53% of its gold metal demand and 19% of its silver metal demand. Because of a weaker demand, imports of gold metal dropped 23.9% to 194,699 kg. Of the total gold imported in 1992, 29% was from Australia, 28% from Switzerland, 15% from the United Kingdom, 7% each from the Republic of South Africa and the United States, 4% from New Zealand, 3% from Russia, 2% from Canada, 1% from Mongolia, and 4% from other countries. Imports of silver metal declined by 27.3% to 622 tons because of reduced demand in electrical contacts, brazing alloys, electroplating, and other categories except silver nitrate for photography. The principal silver metal suppliers in 1992 were Mexico, providing 267 tons; the United States, 194 tons; Australia, 78 tons; and Chile,

49 tons. *(See table 9.)*

Indium.—Japan remained the world's top producer and consumer of indium metal in 1992. Indium metal extracted from zinc residue and from indium content of scrap reached another record high in 1992, largely due to the continued strong demand by the manufacturers of indium-tin oxide (ITO) for making liquid crystal displays (LCD's). The raw materials, such as indium content of zinc ore and semiconductors scrap, were obtained from both domestic and overseas sources.

According to the Japanese industry sources, Nippon Mining and Metals Co. Ltd. (a subsidiary of Nippon Mining Co. Ltd., which had merged with Kyodo Oil Co. Ltd. in November 1992) produced indium metal at the indium plants of its Saganoseki complex in Oita Prefecture and its Hitachi refinery in Ibaraki Prefecture using zinc residue with a total capacity of 30 mt/a. The zinc residue was generated mainly from its Mikkaichi zinc refinery in Toyama Prefecture. The indium content of zinc concentrate feeding the Mikkaichi refinery originated principally from Nippon Mining's Toyoha lead-silver-zinc mine near Sapporo in Hokkaido.

Sumitomo Metal Mining recovered indium as a byproduct of its Harima zinc refinery near Kobe in Hyogo Prefecture using both imported ore and scrap with a capacity of about 12 mt/a. Mitsui Mining & Smelting Co. Ltd. produced indium metal at its Takehara plant in Hiroshima Prefecture using zinc residue supplied by its affiliate Hachinohe zinc refinery in Aomori Prefecture with a capacity of 10 mt/a. Dowa Mining Co. Ltd. produced indium metal as a byproduct of its Kosaka copper-lead refinery in Akita Prefecture using local black ore containing indium with an estimated capacity of about 2 to 3 mt/a.

To meet domestic demand for indium, Japan also imported a record amount of indium metal, including powder and scrap that totaled 59,662 kg in 1992. The major suppliers were France, 26,219 kg; China, 7,815 kg; the United States, 7,165 kg; Belgium, 6,797 kg; Canada, 5,001 kg; and Italy, 4,863 kg.

According to Japan's Rare Metals News, demand for indium in 1992 was estimated at 69 tons, slightly higher than that of 1991. Of the total demand, 28 tons was by producers of ITO for making LCD, 10 tons by producers of indium-boron oxide for making fluorescent materials, 6 tons by producers of high-purity compound for making semiconductors, 5.8 tons by producers of bonding alloy for targets, 4.5 tons by producers of low-melting-point alloys, 2.9 tons by producers of dental alloys, and 11.8 tons for batteries, bearings, videcom tubes, and other uses.

Iron and Steel.—Mine production of iron sand and roasted pyrite was small and insignificant. Japan's iron and steel industry relied on imports to meet virtually all of its iron ore requirements. Because of reduced consumption by the iron and steel industry, imports of iron ore, including iron sand, pellet, and sinter, dropped 10.6% to 113.7 Mmt in 1992. Australia, Brazil, and India remained the three dominant sources of iron ore, providing 46%, 24%, and 15%, respectively, in 1992. Imports of pig iron dropped sharply to 1.4 Mmt from 3.4 Mmt in 1991 because of higher import prices of pig iron in 1992. Russia, Brazil, and China remained the three major suppliers of pig iron in 1992. In 1992, Japan imported about 310,000 tons of iron and steel scrap principally from the United States, Australia, and Russia.

Kawasaki Steel Corp., Japan's third largest steelmaker, began receiving iron ore from the newly developed Yandi Mine in Western Australia in mid-1992. Kawasaki Steel and three other major Japanese steel producers reportedly have a long-term purchase contract with the owner of the mine, BHP Iron Ltd. of Australia. The Yandi Mine, having an annual capacity of 5 Mmt that can be expanded to 10 Mmt/a with reserves of 1,800 Mmt, was expected to ship 3.5 Mmt/a of iron ore to Japan, of which about 1.5 Mmt/a is for Kawasaki, 1.1 Mmt for Nippon Steel Corp., 0.6 Mmt/a for Kobe Steel Ltd., and 0.3 Mmt/a for Sumitomo Metal Industries Ltd. beginning in 1992. The Yandi Mine is owned 8% by Mitsui & Co. and 7% by C. Itoh & Co. of Japan and the remainder by BHP Iron.

For the first time in 17 years, Japan resumed importing iron ore from North Korea. In 1992, 13,915 tons of iron ore, valued at $301,000, was imported by Meiwa Trading Co. from North Korea. In October, Nissho Iwai Corp., a major trading company, reportedly was negotiating with the Government of North Korea on a multimillion project to redevelop North Korea's largest iron ore mine for doubling the production in the northwest part of North Korea near the China border.

According to the Ministry of Finance, Japan's import c.i.f. price per ton of iron ore declined from $28.62 in 1991 to $27.97 in 1992, and its import c.i.f. price per ton of pig iron rose from $159.57 in 1991 to $168.70. However, import c.i.f. price per ton of iron and steel scrap rose sharply again to $586.76 in 1992 from $354.56 in 1991. Because of an increase in domestic iron and steel scrap and higher world prices of iron and steel scrap, Japan became a net exporter of iron and steel scrap in 1992, for the first time in its history, exporting 1.7 Mmt, compared with 361,704 tons in 1991 and 396,403 tons in 1990.

Consumption of iron ore, including iron sand, pellet, and sinter by blast furnaces, dropped to 120.54 Mmt from 131.99 Mmt in 1991. Of the total pig iron produced in 1991, 99% was for steelmaking and 1% was for foundry uses. Production of crude steel fell for the second year in a row to a 10-year low owing to slack demand resulting from further economic slowdown in 1992. By the end of 1992, the total number of furnaces, including blast furnaces, electric furnaces, and other furnaces for pig iron production, remained at 47 with a pig iron production capacity of 99 Mmt/a.

Japan remained the world's second largest pig iron and crude steel producer, accounting for 14.8% and 13.6%, respectively, of the world production in 1992. Nippon Steel Corp., the largest steelmaker in the Western World, along with four other major steelmakers,

continued to maintain its leading position in the Western World in 1992. *(See table 10 and figure 2.)*

Because of the continued economic slowdown in 1992, domestic demand for steel by the automobile, construction, industrial machinery, and all other industries, except the shipbuilding industry, fell in 1992. As a result, crude steel output fell by 10.5% to less than 100 Mmt for the first time since 1987. Of the crude steel produced in 1992, 68.4% was processed by the basic oxygen furnaces and 31.6% by the electric furnaces. The steelmaking sector, according to MITI, maintained its 72 basic oxygen furnaces and added 3 new electric arc furnaces to 480 units by the end of 1992. As a result, the overall crude steel production capacity was raised from 137.4 Mmt/a to 140.3 Mmt/a in 1992. However, the industry's labor force was reduced by 1,703 to 291,624 workers at the end of 1992.

In October, The Japan Iron and Steel Federation (JISF) and the American Iron and Steel Institute (AISI) held their third meeting in Tokyo to discuss, report, and exchange information on their research achievements in the next-generation technology of JISF's Direct Iron Ore Smelting (DIOS) and AISI's Direct Steelmaking Program. DIOS is a joint research project of JISF, Japan's Coal Mining Research Center, and eight Japanese integrated steelmakers. Construction of a 500-mt/d pilot plant, which was started in May of 1991 at NKK's Keihin Steel Work on Ogishima, off Kawasaki in Kanagawa Prefecture, is scheduled for completion in September 1993. Usinor-Sacilor, the largest steelmaker in France and two other Japanese steelmakers reportedly joined the next-generation steelmaking research project in August. Usinor-Sacilor, the first foreign company to join the research project, will own the technology jointly with the other members and will be able to use the technology at no cost.

Despite increased public works investment, provided by the Government's economic stimulus package, private housing starts, as well as private plant and equipment investment, remained sluggish in 1992. As a result, steel demand by the construction and most manufacturing industries declined. However, demand from the shipbuilding industry continued to increase because of large order backlogs. According to JISF, Japan's apparent steel consumption, in crude steel equivalent, reversed the 5-year upward trend and declined from 99.1 Mmt in 1991 to 83.4 Mmt in 1992. Exports of steel, in crude steel equivalent, increased slightly from the 1991's 20 Mmt level.

Overall domestic demand for steel declined in 1992 owing to a stagnant private investment in plant and equipment by the manufacturing sector, especially the automobile, electrical and industrial machinery industries. *(See table 11.)*

Exports of iron and steel products continued the 1991 upward trend and rose by 5.3% to 19 Mmt in 1992. Increased exports were a direct result of increased exports to Southeast Asian countries. Exports to Taiwan rose to 2.5 Mmt from 2.2 Mmt in 1991. Exports to China also rose substantially to 2.4 Mmt from 2.1 Mmt in 1992. Exports to Thailand rose slightly to 1.9 Mmt in 1992. Of the total exports in 1992, 14.7 Mmt was ordinary steel products; 3.1 Mmt, specialty steel products; and 1.2 Mmt, other. Export earnings from iron and steel products decreased slightly to $13.3 billion in 1992 because of a lower average export price in 1992.

Imports of iron and steel products fell by 35.9% to 8.9 Mmt in 1992. Of the total imports, 5.4 Mmt was ordinary steel products and 3.5 Mmt was pig iron, ferroalloy, steel slab, semimanufactured, wire, and specialty steel products. Hot-rolled wide coil, cold-rolled coil, tinplate, and galvanized steel sheet were the major import steel products in 1992. The Republic of Korea remained the dominant supplier, providing 2.9 Mmt in 1992.

Magnesium.—Primary magnesium production dropped sharply to an 8-year low in 1992 owing mainly to the withdrawal of Japan Metals and Chemical Co. (JMCC) from primary magnesium production in 1992. The 1992 production was equivalent to about 26% of domestic demand for primary magnesium. JMCC, which operated a 5,000-mt/a plant at Takaoka in Toyama Prefecture using the magnetherm process, was not cost-competitive with imports, especially from China. Ube Industries Ltd., which operated a 9,000-mt/a plant at Ube in Yamaguchi using the pidgeon process to extract magnesium from dolomite, is also not cost-competitive with imports from China, Norway, Russia, and the United States.

In an effort to develop a low-cost technology for production of primary magnesium, Ube Industries signed an agreement in early 1992 with the Australian national research organization, CSIRO, and MIM Holdings Ltd. of Australia to jointly conduct a 5-year research project beginning in 1992. The $37 million project will be funded 50% by the Commonwealth and Queensland Governments, and the remaining 50% by MIM Holdings, Queensland Metal Corp., and Ube Industries.

In 1992, Japan imported 20,089 tons of primary magnesium, principally from the United States, 10,777 tons; Norway, 3,032 tons; Russia, 1,971 tons; China, 1,573 tons, and Canada, 1,552 tons. In the past 3 years, imports from Canada, China, and Russia had risen significantly, while imports from Norway and the United States had dropped considerably.

Demand for primary magnesium remained steady at 26,972 tons, of which 20,548 tons was for aluminum mill and alloys, 2,718 tons was for nodular cast iron, 1,405 tons was for magnesium diecastings and other magnesium castings, and 2,301 tons was for other uses.

Manganese.—Japan's only operating manganese mine, the Nodatamagawa Mine in Iwate Prefecture, was a small-scale mining operation with seven regular workers. Japan relied on imports for virtually all of its manganese ore requirements in 1992.

Imports of manganese ore dropped 35% to 962,575 tons in 1992, of which 4,244 tons was manganese dioxide and 958,331 tons, metallurgical-grade manganese ore. China and Mexico were the two suppliers of manganese dioxide,

providing 53% and 38%, respectively, in 1992. The major suppliers of metallurgical-grade manganese were the Republic of South Africa, Australia, Brazil, providing 42%, 35%, and 10%, respectively, in 1992. Japan also imported 91,875 tons of ferruginous manganese ore from the Republic of South Africa, 82%, and India, 18%.

The overall consumption of metallurgical-grade manganese ore and ferruginous manganese dropped by 12.5% to 1,289,127 tons in 1992 mainly because of reduced consumption for the production of ferroalloys and pig iron in 1992. *(See table 12.)*

Japan was the world's leading producer of electrolytic manganese dioxide (EMD). The total capacity of three companies operating three plants in Japan and two plants overseas (Ireland and Greece) was 94,000 tons, accounting for more than 40% of the world's total capacity. The 1992 EMD output was equivalent to 81% of its domestic capacity.

In 1992, both domestic demand and exports of EMD declined because of the sluggish economy at home and overseas. Domestic demand for EMD dropped to about 24,000 tons from 26,000 tons in 1991. Exports of EMD decreased to 30,400 tons in 1992 from 33,200 tons in 1991. The principal buyers of EMD in 1992 were Indonesia, 6,274 tons; Germany, 4,380 tons; Singapore, 3,125 tons; France, 1,920 tons; Switzerland, 1,629 tons; Spain, 1,598 tons; and the Republic of Korea, 1,517 tons. Japan's exports of EMD to the United States dropped to only 39 tons in 1992 from 14,657 tons in 1987, resulting from the imposition of a U.S. antidumping duty of up to 77.43% against the Japanese producers in 1989.

Nickel.—Japan remained the world's third largest producer of nickel metal in 1992, but all of its raw material requirements for the production of nickel products were met by imports. In 1992, imports of nickel ore dropped by 13.8% to 3.5 Mmt. New Caledonia, Indonesia, and the Philippines remained the three suppliers, providing 1,656,855 tons, 1,037,699 tons, and 756,062 tons, respectively, in 1992. According to Japan's trade statistics, the average water and nickel content of the nickel ore from New Caledonia were 25% and 2.5%, respectively; from Indonesia, 33% and 2.5%, respectively; and from the Philippines, 30% and 2.4%, respectively.

Consumption of nickel ore by the iron and steel industry, mainly for the production of ferronickel, dropped 16.5% to 2.4 Mmt in 1992. Imports of ferronickel dropped sharply by 29% to 32,626 tons with an average nickel content of 27.3% in 1992. The major suppliers of ferronickel in 1992 were New Caledonia, 18,798 tons with an average nickel content of 25%; Indonesia, 5,909 tons with an average nickel content of 19%; the Dominican Republic, 5,695 tons with an average nickel content of 38%; and Colombia, 2,066 tons with an average nickel content of 40%. Consumption of ferronickel decreased by 22.7% to 247,362 tons from 319,975 tons in 1991 because of reduced production of stainless steel and other specialty steel in 1992.

Imports of nickel matte for the production of refined nickel and nickel oxide rose slightly to 65,809 tons in 1992, of which 43,955 tons was from Indonesia and 21,854 tons from Australia. Imports of nickel oxide and oxide sinters declined from 3,190 tons in 1991 to 1,894 tons in 1992. Australia was the sole supplier of nickel oxide and oxide sinters in 1992. In March, Sumitomo Metal Mining renewed its 10-year purchase contract with Western Mining Corp. Ltd. of Australia for importing annually about 20,000 tons of nickel matte from Australia. The new 10-year contract became effective April 1, 1992, and will expire at the end of March 2002.

Production of nickel oxide by Tokyo Nickel Co. Ltd. at its Matsusake plant in Mie Prefecture rose sharply to another record high in 1992. Production of refined nickel by Sumitomo Metal Mining at its Niihama plant in Ehime Prefecture decreased slightly in 1992. Imports of refined nickel, including powder and flake, dropped sharply by 42% to 33,466 tons in 1992 because of the high level of inventory and a substantial reduction in demand for refined nickel. The major suppliers of refined nickel, including powder and flake, in 1992 were Canada, 8,302 tons; Norway, 6,649 tons; Zimbabwe, 5,628 tons; Russia, 3,301 tons; Australia, 2,340 tons; and the United Kingdom, 2,081 tons. Exports of refined nickel, including powders and flakes, totaled 88 tons, of which 57 tons of refined nickel went to Indonesia and 29 tons of nickel powder and flakes went to the Republic of Korea.

Consumption of refined nickel dropped by 12.7% owing mainly to a sharp decline in demand by the producers of stainless steel, magnetic materials, and rolled sheet because of the economic slowdown. *(See table 13.)*

Rare Earths.—Japan remained a major world consumer of rare earths. All of Japan's rare-earth requirements were met by imports. Japan imported rare-earth chlorides and compounds for further processing into rare-earth products. Japan also imported a wide variety of rare-earth products to meet its domestic demand.

Imports of both crude rare earths and seven rare-earth products were at a lower level than those in 1991 except cerium oxide, reflecting a lower level of overall demand for rare earths. *(See table 14.)* In 1992, imports of rare-earth chlorides were mainly from China, 790 tons; Malaysia, 685 tons; India, 499 tons; the United States, 70 tons; and Brazil, 49 tons. Imports of cerium oxide were from the United States, 1,077 tons; Estonia, 755 tons; Taiwan, 245 tons; and France, 202 tons. China, France, and the United States remained the three dominant suppliers of rare earths in 1992.

Domestic production of rare-earth products continued the 1991 downward trend owing to a further slowdown in the Japanese economy in 1992. In 1992, production of rare-earth products was by Santoku Metal Industry Co. Ltd. in Hyogo, Nippon Yttrium Co. Lt. in Tokyo, Seimi Chemical Co. Ltd. in Kanagwa, Shin-Etsu Chemical Co. Ltd. in Fukui, Tohoku Metal & Chemical Co.

Ltd. in Fukushima, Shin Nihon Metal & Chemicals Co. Ltd. in Saitama, Mitsui Metal & Mining Co. Ltd. in Fukuoka, and Dowa Mining Co. in Akita. Mitsubishi Kasei Corp. and Nippon Mining reportedly also produced rare-earth products in 1992.

Applications of rare earths in the 1950's and the 1960's were limited to the use of rare-earth fluorides for arc carbon; misch metal for pyrophoric alloys; and cerium and lanthanum oxides for use as a glass polishing agent, an additive to optical lens, and phosphors in television (TV) manufacturing. Application of rare earths in magnetic materials began in the 1970's and greatly expanded in the 1980's. According to MMAJ, cerium oxide was used mainly as a polishing agent for TV tube glass, plate glass, and optical glass; decoloring of TV tube glass; and as a catalyst for automobile exhaust control, when used with lanthanum. Lanthanum oxide was used as an additive to optical lens and ceramic condensers. Samarium and neodymium oxides were used for the manufacture of magnetic materials for computer printers and monitors. Europium oxide and yttrium oxide were used as a red phosphor in the manufacture of color TV phosphors and tricolor fluorescent lamps. Misch metal was used for the manufacture of auto parts and pyrophoric alloys for cigarette lighters. *(See table 15.)*

Titanium.—Japan remained the second largest producer of titanium sponge and one of the major producers of titanium dioxide pigment in the world. However, all of Japan's raw material requirements were met by imports. In 1992, Japan imported 40,374 tons of rutile mainly from Australia, 33,147 tons; India, 3,960 tons; and the Republic of South Africa, 2,405 tons. Imports of ilmenite totaled 444,228 tons. The principal suppliers were Australia, 159,461 tons; Malaysia, 97,478 tons; India, 79,378 tons; Canada, 36,044 tons; and Vietnam, 34,005 tons. Japan also imported 106,091 tons of titanium slag mainly from the Republic of South Africa, 85,004 tons, and Canada, 21,066 tons in 1992. The average import c.i.f. price of rutile dropped by 29% to $468.78 per ton and the average import c.i.f. price of ilmenite also decreased by 34% to $110.63 per ton in 1992.

All of the rutile was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed mainly by the titanium dioxide producers for the production of pigment and synthetic rutile. A small amount of ilmenite was consumed as a blast furnace additive in the steel industry. Production of titanium sponge continued the 1991 downward trend, when domestic demand for titanium metal decreased and exports to overseas markets remained low.

Production of titanium sponge was by Osaka Titanium Co. Ltd. at Amagasaki, near Osaka, in Hyogo Prefecture with a capacity of 13,200 mt/a; Toho Titanium Co. Ltd. at Chigasaki, about 20 km south of Yokohama, in Kanagawa Prefecture with a capacity of 10,560 mt/a; and Showa Titanium Co. Ltd., in Toyama in Toyama Prefecture with a capacity of 3,000 mt/a. In 1992, Toho Titanium spent about $37 million for renovation of its sponge production facilities to increase efficiency and reduce production cost. However, the overall sponge production capacity will remain unchanged at 10,560 mt/a, when the renovation work is completed in 1993.

According to the Japan Titanium Society, domestic demand for titanium sponge decreased by 21.8% to 10,881 tons, while the overseas shipments of titanium sponge increased by 15.4% to 3,895 tons in 1992. According to the Ministry of Finance, the titanium sponge exports totaled 4,044 tons, of which 1,739 tons went to the United Kingdom, 1,090 tons went to the United States, 385 tons went to the Republic of Korea, 384 tons went to France, 195 tons went to Germany, 161 tons went to India, and 90 tons went to other countries. Japan also exported 1,792 tons of titanium waste, scrap, and powder, principally to the United States, 1,460 tons; the United Kingdom, 142 tons; and Germany, 130 tons in 1992.

Production of titanium dioxide pigment continued the 1991 downward trend to a 4-year low in 1992 because of reduced demand by the paint, printing ink, pigment, and paper industries. Japan's titanium dioxide industry consisted of seven companies operating nine plants with a capacity of 344,400 mt/a in 1992. Ishihara Sangyo Co. Ltd. operated two plants in Yokkaichi, Mie Prefecture, with a capacity of 154,800 mt/a. Teika Co. Ltd. operated a plant in Saidaiji, Okayama Prefecture, with a capacity of 60,000 mt/a. Sakai Chemical Industries Co. Ltd. operated a plant in Onahama, Fukushima Prefecture, with a capacity of 43,200 mt/a. Tohkem Products Corp. operated two plants in Akita, Akita Prefecture, with a capacity of 30,000 mt/a. Furukawa Co. Ltd. operated a plant in Osaka, Osaka Prefecture, with a capacity of 23,400 mt/a. Titan Kogyo Co. Ltd. operated a plant in Ube, Yamaguchi Prefecture, with a capacity of 16,800 mt/a. Fuji Titanium Industry Co. Ltd. operated a plant in Kobe, Hyogo Prefecture, with a capacity of 16,200 mt/a.

According to the Japan Titanium Dioxide Industry Association, the total shipment of titanium dioxide decreased from 278,579 tons in 1991 to 265,635 tons in 1992, of which 63,839 tons was exported. Producers stocks at the end of 1992 declined to 19,771 tons from 27,925 ton in 1991. The domestic demand for titanium dioxide dropped by 5.6% to 202,391 tons in 1992. Among the major consumers, the paint industry, which accounted for 48% of total demand, declined by 6.9% to 97,617 tons; the ink and pigment industry, which accounted for 19% of total demand, declined by 3.4% to 37,795 tons; and the paper manufacturing industry, which accounted for 9% of total demand, declined by 10.4% to 17,632 tons in 1992. However, a small increase in consumption of titanium dioxide was reported in the plastic and rubber industries. According to Japan industry sources, the export market, especially to Southeast Asian countries, such as Indonesia, Malaysia, the Philippines, and Thailand, may be depressed because of the rising Japanese yen value and competition from new regional producers in Australia and Malaysia as well as other producers from

Saudi Arabia and the United States.

Industrial Minerals

Cement.—Japan remained the world's third largest cement producer after China and Russia in 1992. Cement production reversed the 4-year upward trend and declined slightly in 1992 because of a slowdown in the domestic construction industry. According to MITI, in 1992, Japan's total cement clinker capacity was 90.4 Mmt/a and capacity utilization rate averaged about 90%. No new capacity had been added in 1992, but Nihon Cement Co. Ltd., one of Japan's top cement producer, resumed operation of the No. 5 kiln at its Saitama plant in November. The kiln was shut down when the cement industry underwent its restructuring program in 1990 because of excess capacity.

The industry's work force at the end of 1992 was 6,677 persons, compared with 6,846 persons in 1991. In 1992, the industry consumed about 98 Mmt of limestone, 20 Mmt of clays, 5 Mmt of silica stone, 5 Mmt of ore slag, and 4 Mmt of gypsum. Total energy consumption by the industry included about 9.4 Mmt of coal, 0.8 Mmt of petroleum coke, 307,000 kiloliters of heavy fuel oil, 20,000 tons of coke, and 9,800 MkW • h of electricity in 1992.

Domestic consumption of cement dropped by 3.6% to 81.7 Mmt in 1992, while exports of cement, including clinker, rose sharply to 11.5 Mmt in 1992 from 7.3 Mmt in 1991. Of the total domestic demand for cement in 1992, 69% was for ready-mixed concrete; 15% for cement products; 5% for civil engineering works; 2% for public and private buildings; 2% for construction of roads, powerplants, and ports; and 7% for other uses.

In 1992, exports of clinker rose from 3 Mmt in 1991 to 5 Mmt and were valued at $172 million in 1992. Exports of portland cement increased from 4.4 Mmt in 1991 to 6.5 Mmt and were valued at $260 million. The major buyers of clinker in 1992 were Singapore, 1.6 Mmt; Malaysia and Thailand, 0.9 Mmt each; and Taiwan, 0.7 Mmt. The major buyers of portland cement in 1992 were Taiwan, 2 Mmt; the Republic of Korea, 1.5 Mmt; Hong Kong, 1.1 Mmt; Thailand, 0.6 Mmt; and Singapore, 0.5 Mmt. Exports of portland cement to the United States totaled 292,742 tons and were valued at $9.9 million in 1992.

Imports of portland cement were 1.1 Mmt valued at $54.7 million in 1992, compared with 1.8 Mmt valued at $90.4 million in 1991. The major suppliers of portland cement in 1992 were the Republic of Korea, accounting for 80%, and Taiwan, 18%. Imports of cement clinker totaled only 1,282 tons. France provided 1,160 tons in 1992. The average export f.o.b. price per ton of portland cement increased to $39.46 in 1992 from $37.78 in 1991, while average import c.i.f. price per ton of portland cement dropped to $47.17 in 1992 from $49.31 in 1991.

In overseas development, Onoda Cement Co. Ltd., Japan's second largest cement producer, reportedly completed construction of the $154 million joint-venture cement plant with Huaneng Raw Material Corp. of China in June. The 1.4-Mmt/a cement plant, near a limestone deposit in Dalian, Liaoning Province, is expected to export 70% of the output to Southeast Asian and Japanese markets and to distribute the remainder to the local market.[11]

Mitsubishi Materials, Japan's largest cement producer, signed a joint-venture agreement in July with Yantai Building Materials Corp. in Yantai, Shangdong Province, for construction of a 900,000-mt/a cement plant. According to the agreement, the cement plant was scheduled to come on-stream in 1994, and 70% of the plant output will be exported.

In an effort to create an environmentally friendly image, the Cement Association of Japan reportedly had set up a special committee in 1992 to deal with environmental issues, such as the carbon dioxide matter, and to under take public-relations campaign programs through television commercials on how the industry is dealing with the environment to keep it clean. According to the association, the cement industry has been using industrial waste materials, such as 60% of the blast furnace slag and 27% of the fly ash in Japan, as raw materials and 18% of the waste tires in Japan as fuel substitutes.

Limestone.—Japan is self-sufficient in limestone. Its annual output ranks as the third largest in the world. Because of the reduced demand by the iron and steel and other nonconstruction-related industries, production of limestone declined only slightly owing to the high level of demand by the cement and construction industries. According to the Limestone Association of Japan, the industry consists of about 250 limestone mining companies with most of the major quarries being controlled by cement and steel companies. In 1991, the leading seven limestone mining companies and their output were, in decreasing order, Nittetsu Mining Co. Ltd., Todaka Mining Co. Ltd., Onoda Cement Co. Ltd., Ube Industries Ltd., Mitsubishi Materials Corp., Sumitomo Cement Co. Ltd., and Sumimetal Mining Co. Ltd.

According to MITI, consumption of limestone declined slightly to 211 Mmt in 1992 from 213 Mmt in 1991. Of the 1992 total demand for limestone, 48% was for cement production, 28% for construction materials and aggregate, 10% for ironmaking and steelmaking, 5% for production of lime, 3% for fillers, and 6% for other uses.

Marble.—In 1992, a large marble deposit reportedly had been discovered by Hiryu Mining Industry Inc. in the Nyukawa area of Gifu Prefecture. According to industry sources, reserves at the 2.1-Mm^2 area of Nyukawa were estimated at 48.5 Mmt. Hiryu Mining Industry, which has the mining right, planned to begin quarrying marble in 1995 at an annual rate of 1,200 mt/a. In past years, almost all of Japan's marble requirements were met by imports, mostly from Italy. In 1992, Japan's imports of marble totaled 73,711 tons and were valued at $37 million. Italy alone provided 47,733 tons worth $25.2 million.

According to Hiryu Mining, the marbles discovered in the Nyukawa area, with color ranging from red to gold, are harder than most imported marbles and are suitable to be used as flooring materials.[12] According to the Limestone Association of Japan, many marble deposits had been identified in the Prefectures of Gifu, Iwate, Okayama, and Yamaguchi on Honshu and in Kochi Prefecture on Shikoku. However, most deposits are difficult to exploit. During the 1950's, marble had been produced in the Prefectures of Gifu and Yamaguchi to meet about 50% of Japan's marble requirements.

Mineral Fuels

Coal.—Japan's coal production continued to shrink and reached its lowest level since 1902. There were five major coal mines still operating in 1992. According to a report submitted by the Coal Mining Council to MITI, four more coal mines are expected to be closed during the final stage of a restructuring program by the year 2000. According to industry analysts, only the Taiheiyo colliery, owned and operated by Taiheiyo Coal Mining Co. Ltd. in Kushiro, Hokkaido, is likely to survive at the end of the restructuring program.

In September, Mitsui Coal Mining shut down its Ashibetsu coal mine for good, after 53 years of operations in Ashibetsu, Hokkaido. The mine capacity was rated at 1 Mmt/a in the late 1980's and was reduced to about 500,000 mt/a in the early 1990's, before it was closed in September. The other four major coal mines, which were still operating at yearend, were the Akabira Mine operated by Sumitomo Coal Mining Co. Ltd. in Akabira, Hokkaido; the Ikeshima Mine operated by Mitsui-Matsushima Coal Mining Co. Ltd. in Sotome, Nagasaki Prefecture; the Miike Mine operated by Mitsui Coal Mining Co. Ltd. in Omuta, Fukuoka Prefecture; and the Sorachi Mine operated by Hokkaido Colliery & Steam Co. in Utashinai, Hokkaido.

Japan had stopped production of metallurgical-grade bituminous coal (coking coal) since April 1990 and stopped production of anthracite since April 1991. In 1992, the industry produced about 7.6 Mmt of steam coal. Of the total coal produced in 1992, 54% was from the Hokkaido area and 46% from the Kyushu and Honshu areas. The average heating value declined to 5,760 kcal/kg in 1992 from 5,810 kcal/kg in 1991. The industry's employment declined by 537 to 3,918 at the end of 1992, and its labor productivity, as measured by metric tons per month per miner, rose to 149.6 in 1992 from 146.0 in 1991.

Japan remained the world's largest coal importer. Coal imports decreased slightly to 109.1 Mmt in 1992, compared with 109.4 Mmt in 1991. In 1992, a 7% decline in imports of coking coal and anthracite mainly for consumption by the iron and steel industry was offset by a 12% increase in imports of steam coal mainly for consumption by the cement and utilities industries. The 1992 coal imports included 64.5 Mmt of coking coal, 42.3 Mmt of steam coal, and 2.4 Mmt of anthracite. Japan relied on imports to meet 93.3% of its coal requirement in 1992, compared with 92.2% in 1991, the last year of the Eighth National Coal Policy. *(See table 16.)*

Overall consumption of coal decreased by 1.5% to 116.8 Mmt in 1992 owing to reduced demand for coking coal by the iron and steel industry, despite a stronger demand for steam coal by the cement and utility industries in 1992. The upward trend in steam coal demand by the utility industry is expected to continue. According to a forecast by the Central Electric Power Council in 1991, Japan's steam coal requirements for the utility industry are expected to increase to 38.7 Mmt in 1995 and 58.8 Mmt in the year 2000, as more new coal-fired powerplants come on-stream in the next 7 years. *(See table 17.)*

To meet the growing coal requirements and the declining domestic coal industry, Japan had been actively seeking additional sources of coal overseas. In the United States, following a review of a feasibility study in September, Mitsui Mining & Smelting and Sumitomo Corp. agreed to set up a joint-venture firm with Arch Mineral Corp. and Meridian Minerals Co. of the United States for development of the Bull Mountain coal deposit in Montana. The joint-venture firm will be 50% owned by Arch Mineral, 25% by Meridian Minerals, and 25% by Mitsui Mining & Smelting and Sumitomo Corp.

The Bull Mountain deposit was estimated to have 130 Mmt of workable coal reserves. The joint-venture project planned to start mine development in the spring of 1993 and to begin coal production in 1994 at an initial rate of between 700,000 mt/a and 800,000 mt/a and gradually increase to the full capacity level of 5 Mmt/a by 1997. About 60% to 70% of the coal production from the mine will be exported to Japan for consumption by electric powerplants.[13]

In Indonesia, Mitsui Coal Mining planned to acquire a 20% stake in P.T. Utah Indonesia, which holds development and mining rights to the Pentagis coal deposit in East Kalimantan, Indonesia. Mitsui Coal Mining planned to invest about $4 million in the coal mine, which is expected to begin production in mid-1993 at an annual rate of 1 Mmt/a. Most of the coal production will be exported to Japan for consumption by electric powerplants. Coal reserves of the Pentagis Mine were estimated at between 25 Mmt and 33 Mmt.[14]

Petroleum and Natural Gas.—Japan remained the world's largest importer of natural gas and crude petroleum in 1992. Its domestic production of natural gas and crude petroleum was negligible when compared to its huge requirements for crude petroleum, refined petroleum products, and LNG. Domestic production of crude petroleum and natural gas both continued to increase in 1992 because of increased output from the new offshore oilfield, called Off-Iwafune Oilfield, off Niigata Prefecture in the Sea of Japan. Peak oil and gas production of Off-Iwafune Oilfield was expected to reach 6,920 bbl/d and 300,158 m^3/d, respectively.

Consumption of crude petroleum and natural gas rose by 6.5% to 1,429.1 Mbbl and by 2.4% to 60.7 billion m^3,

respectively, in 1992. To meet the 1992 demand, according to MITI, imports of crude petroleum rose by 3.5% to 1,580.2 Mbbl, the highest since 1980. Imports of natural gas, in the form of LNG, broke the previous year's record and reached 58.4 billion m^3 in 1992. Imports of refined petroleum products, which included diesel, gasoline, heavy fuel oil, jet fuel, kerosene, and naphtha, declined by 3% to 206.8 Mbbl and continued the 1991 downward trend because of increased domestic production and a slower growth in demand for these refined petroleum products in 1992. Imports of residual (heavy) fuel oil were also lower than those of 1991 because of increased domestic production and reduced consumption by the manufacturing and utility industries.

Crude petroleum imports in 1992 came mainly from the Middle East region, accounting for 75.4%, compared with 72.8% in 1991; and Asia, accounting for 20.6%, compared with 22.3% in 1991. In 1992, the main supplying countries of crude petroleum were the United Arab Emirates, 24.3%; Saudi Arabia, 22.3%; Indonesia, 10.1%; Iran, 8.6%; Oman, 6.5%; Qatar, 5.9%, and China, 5.8%. Kuwait, which provided 3.3% of Japan's crude petroleum imports in 1990, supplied 3.4% in 1992, 2 years after the Persian Gulf War.

Imports of LNG totaled 58.4 billion m^3 in 1992, of which 47.5% was from Indonesia, 17.3% from Malaysia, 13.9% from Brunei, 11.6% from Australia, 6.3% from the United Arab Emirates, and 3.3% from the United States. Australia, which began delivery of LNG from its Northwest Shelf LAG production facility in August 1989, raised its share of Japan's LNG imports to 11.6% from 10.3% in 1991. Because of a major expansion in Malaysia's LNG production capacity at the Bintulu plant of Sarawak, Malaysia's share of Japan's LNG imports is expected to increase in the next 2 years.

Demand for overall refined petroleum products increased 3.3% to 1,432.2 Mbbl, mainly because of increased consumption of gasoline owing to the increased number of gasoline-powered vehicles. In 1992, gasoline consumption rose by 2.8% to 296 Mbbl, naphtha jumped 10% to 226.2 Mbbl, jet fuel rose 4% to 24.8 Mbbl, kerosene increased by 1.7% to 173.1 Mbbl, diesel rose by 3% to 255.5 Mbbl, heavy fuel oil increased by 2.8% to 456.7 Mbbl, and lubricants decreased by 1% to 14.9 Mbbl in 1992.

In 1992, consumption of domestically produced natural gas totaled 2.6 billion m^3, of which 39% was consumed by the gas industry, 26% by the utility industry, 17% by the chemical industry, 13% by the oil and gas industries, and 5% by other manufacturing and service industries. Additionally, Japan consumed 39.1 Mmt or 58.5 billion m^3 of imported natural gas in the form of LNG in 1992, of which 73.7% was consumed by the utilities industry for power generation, 24.7% by the city gas industry for household use, and 1.6% by the iron and steel industry for steelmaking.

In overseas exploration, a consortium of Mitsui & Co. and Marathon Oil Co. and McDermott International Inc. of the United States was awarded by the Russian Government in January the rights to explore and develop oil and gas offshore Sakhalin Island. Following participation of the Royal Dutch Shell Group in October, Mitsubishi Corp. announced in December that it also will participate in the consortium promoting a feasibility study of an oil and gas development offshore Sakhalin. The cost of the feasibility study was estimated at $30 million, of which 30% will be provided by Marathon Oil; 20% each by McDermott, the Shell Group, and Mitsui; and 10% by Mitsubishi. According to the Russian Government, the estimated natural gas and oil reserves of the offshore concession area, which was allocated to the consortium, were 400 billion m^3 and 730 Mbbls, respectively.[15]

In June, Mitsubishi Oil Co. was awarded the oil-drilling rights by Petro Vietnam, the state-owned oil and gas company in an offshore concession area of 3,370 km^2. Mitsubishi planned to spend about $80 million for prospecting beginning in early 1993. In August, C. Itoh Energy Development Co., a subsidiary of C. Itoh & Co., and Lasmo PLC of the United Kingdom jointly signed a contract with Petro Vietnam to explore for oil off southern Vietnam. The two companies planned to begin trial drilling in 1993 and share the exploration costs. C. Itoh announced in August that it agreed jointly with Marubeni Corp. and Petroleos de Venezuela S.A. to develop, refine, and market oil. The two Japanese companies planned to conduct a feasibility study for development of oilfields along the Orinoco River Belt in eastern Venezuela.

Mitsubishi Corp., which owned 17.5% of the existing LNG plant of Malaysia LNG Sdn. Bhd. in Bintulu, Sarawak, Malaysia, had entered into another joint venture with PETRONAS, the Malaysian state-owned oil and gas company, and two other partners for a second LNG plant at the same location under an expansion program. The new company, called Malaysia LNG Dua Sdn. Bhd., has an authorized capital of $395 million, of which Mitsubishi is to hold 15%. The new LNG plants in Bintulu, Sarawak, will have three LNG trains and is expected to begin LNG production in 1995.

In August, Nippon Oil Corp., Japan Petroleum Exploration Corp., and Nishho Iwai Corp. agreed to join Mobil Corp. of the United States and four other companies from Australia, Canada, and the United Kingdom to develop and produce natural gas for LNG production in Papua New Guinea. According to industry sources, the consortium is expected to spend about $20 billion for development of gasfields and construction of the LNG plant by 1998. Most LNG production will be shipped to Japan for power generation.[16]

Reserves

Japan's ore reserves for limestone and other industrial minerals, such as iodine, pyrophyllite, and silica stone, are large and of world significance. With the exception of gold and zinc, its ore reserves for other minerals, especially oil and gas, and metallic minerals are negligible. *(See table 18.)*

INFRASTRUCTURE

Japan has one of the world's most modern and complete infrastructures for its mining and mineral processing industry. Despite its small land area, Japan has a highway system of 1.1 Mkm, of which 68% is paved, and a railroad network of 27,327 km, of which 93% is 1.067-m narrow gauge. Both highway and railroad networks link not only all major seaports and coastal cities on four major islands, but also connect Honshu (the main island) to the islands of Shikoku and Kyushu in the south and Hokkaido in the north via bridges or tunnels.

Japan's domestic and international telecommunication services are among the best in the world with four satellite earth stations as well as submarine cables to China, the Philippines, the former U.S.S.R., and the United States. For electric power transmission and distribution, Japan has a route length of 86,100 km and a circuit length of 149,000 km concentrating in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Toyama, and Tokyo. Japan also has an extensive pipeline system composed of 1,800 km for natural gas, 84 km for crude petroleum, and 322 km for refined petroleum products.

Japan has 18 major ports and more than 2,000 minor ports for receiving raw materials from overseas and exporting manufactured products. The major port facilities, including the terminals and warehouses, are among the most indispensable infrastructure for the mineral industry because of their role in receiving imported raw materials, such as coal, iron ore, nonferrous ore, phosphate rock, crude petroleum, and LNG for mineral processing plants and powerplants as well as exporting value-added mineral and metal products. The major seaports of major mineral processing centers are Chiba, Hachinohe, Himeji, Hiroshima, Kawasaki, Kobe, Osaka, Nagoya, Niigata, Shimizu, Shimonoseki, Tokyo, Toyama, Yokkaichi, and Yokohama in Honshu; Fukuoka, Kita Kyushu, and Oita in Kyushu; and Muroran and Tomakomai in Hokkaido.

OUTLOOK

The nonferrous metal mining and coal mining sectors are expected to continue the 1992 downward trend because of the onward going restructuring programs proposed by the Government. Mining activities of industrial minerals, such as limestone and silica stone and sand, are to remain steady when the Japanese economy and construction activity begins to recover in the second half of 1993. Mine production of copper, lead, and zinc is expected to decrease, when metal prices in the world market turn down and imported ore moves higher. The remaining five major nonferrous mines in the Prefectures of Akita, Gifu, Hokkaido, Iwate, and Kagoshima are expected to continue operating. Coal output is expected to drop to 7 Mmt in 1993, when one to two of the remaining five major coal mines in Hokkaido prepared for closure by the mid-1990's.

Outlook for the mineral processing sector is as equally depressed as that of the mining sector. Because of a slow recovery in the Japanese economy, most ferrous and nonferrous mineral processing plants are expected to operate at about the same level as that of 1992. According to the Japan Iron and Steel Federation, production of crude steel is expected to remain at the 98-Mmt level in 1993, despite the Government stimulus package. Because of the sluggish economy, production of most nonferrous metals, such as cadmium, copper, gold, nickel, rare-earth oxide, and zinc, as well as industrial minerals and cement, are expected to remain at the 1992 level or increase only slightly in an anticipated slow economic recovery in the second half of 1993.

Because of decreasing domestic mine production of nonfuel minerals and mineral fuels, imports of nonferrous minerals and metals as well as coal are expected to move higher in 1993. In line with its mineral policy to secure and diversify its long-term supply of raw materials for a steady economic growth, Japan is expected to continue active participation in joint exploration and development of minerals in both developed and developing countries. The targeted countries are Australia, Brazil, Canada, Chile, China, Peru, Mexico, Mongolia, and the United States. The targeted minerals include coal, crude petroleum, base metals, antimony, columbium, lithium, molybdenum, nickel, rare earths, strontium, tantalum, titanium, tungsten, and vanadium.

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[1]Where appropriate, values have been converted from Japanese yen (Y) to U.S. dollars ($) at the rate of Y134.7=US$1.00 in 1991 and Y126.7=US$1.00 in 1992.

[2]The Nikkei Weekly (Tokyo). V. 30, No. 1539, Oct. 12, 1992, p. 4.

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TABLE 1

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	415	r466	481	438	316
Metal:						
Primary:						
Regular grades	do.	35	35	34	32	19
High-purity	do.	14	16	16	20	20
Secondary[2]	do.	1,309	1,353	1,458	1,461	e1,400
Antimony:						
Oxide		10,661	10,327	10,994	11,908	11,227
Metal		185	173	216	262	175
Arsenic, white (equivalent of arsenic acid)[e]		500	500	500	500	500
Bismuth		524	502	442	461	530
Cadmium, refined		2,614	2,694	2,451	2,889	2,986
Chromium:						
Chromite, gross weight		9,508	11,674	8,075	e8,000	e8000
Metal		3,045	3,620	r4,131	4,020	e4,000
Cobalt metal		109	99	199	185	105
Columbium and tantalum: Tantalum metal[e]		123	90	90	85	80
Copper:						
Mine output, Cu content		16,666	14,650	12,927	r12,414	12,074
Metal:						
Blister and anode:						
Primary		854,600	882,300	893,200	967,700	1,046,200
Secondary		139,400	123,200	147,400	r117,700	128,700
Total		994,000	1,005,500	1,040,600	r1,085,400	1,174,900
Refined:						
Primary		854,608	882,263	893,133	967,721	1,046,555
Secondary		100,500	107,303	114,843	108,562	114,704
Total		955,108	989,566	1,007,976	1,076,283	1,160,859
Gallium metal:						
Primary		6	6	6	e6	e6
Secondary		28	32	37	e40	e37
Germanium:						
Oxide		14	13	12	11	11
Metal		4	4	3	3	3
Gold:						
Mine output, Au content	kilograms	7,308	6,097	7,303	r8,299	8,893
Metal:						
Primary	do.	92,029	110,330	108,152	103,017	107,957
Secondary[3]		166,121	190,586	r148,000	r109,000	118,000
Total	do.	258,150	300,916	r256,152	r212,017	225,957
Indium metal	do.	48,388	49,465	48,077	51,646	59,906
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight	thousand tons	97	41	34	31	40
Fe content	do.	61	25	21	19	24

See footnotes at end of table.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS—Continued						
Iron and steel—Continued:						
Roasted pyrite concentrate (50% or more Fe):						
Gross weight	thousand tons	214	211	210	224	244
Fe content	do.	136	132	131	140	153
Metal:						
Pig iron and blast-furnace ferroalloys	thousand tons	79,295	80,197	80,229	79,985	73,144
Electric-furnace ferroalloys:						
Ferrochrome		295,406	324,371	293,345	270,786	267,857
Ferromanganese		378,351	394,055	452,434	463,722	361,941
Ferronickel		242,276	275,341	234,311	295,422	237,350
Ferrosilicon		73,767	74,936	62,599	62,362	37,656
Silicomanganese		106,970	122,192	77,465	87,229	96,360
Other:						
Calcium silicon		1,360	808	514	410	426
Ferrocolumbium		649	737	984	710	919
Ferromolybdenum		2,656	2,784	3,366	3,729	3,261
Ferrotungsten		91	77	46	61	71
Ferrovanadium		3,776	3,127	3,706	3,847	2,995
Unspecified		1,761	3,578	3,462	3,560	4,507
Total		1,107,063	1,202,006	1,132,232	1,191,838	1,013,343
Steel, crude	thousand tons	105,681	107,909	110,339	109,649	98,131
Semimanufactures, hot-rolled:						
Of ordinary steels	do.	84,100	86,687	88,911	87,982	78,487
Of special steels	do.	16,396	15,875	16,311	16,808	14,842
Lead:						
Mine output, Pb content		22,899	18,595	18,727	18,329	18,839
Metal, refined:						
Primary		217,711	207,735	204,881	r220,331	218,787
Secondary		r122,260	r124,639	r122,300	r112,100	111,374
Total		339,971	r332,374	r327,181	r332,431	330,161
Magnesium metal:						
Primary		9,012	8,381	12,843	11,559	7,119
Secondary		15,099	20,270	23,308	17,158	12,978
Manganese:						
Ore and concentrate:						
Gross weight		80	e100	e100	e100	e100
Mn content		17	e21	e21	e21	e21
Oxide		67,460	55,628	51,473	58,526	54,294
Metal		3,933	4,498	4,571	r4,439	e3,900
Molybdenum metal		652	707	686	661	564
Nickel metal:						
Refined		19,961	21,938	22,274	23,658	22,038
Ni content of nickel oxide sinter		24,744	21,444	21,500	25,000	e22,000
Ni content of ferronickel		57,556	62,834	56,474	68,045	57,447
Total		102,261	106,216	100,248	116,703	e101,485

See footnotes at end of table.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS—Continued						
Platinum-group metals:						
Palladium metal	kilograms	1,170	821	1,047	1,053	986
Platinum metal	do.	647	1,031	1,425	988	629
Rare-earth oxide:						
Cerium	do.	2,677,462	2,933,170	e3,100,000	e3,100,000	e2,900,000
Europium	do.	6,234	7,673	e8,000	e7,000	e7,000
Gadolinium	do.	48,835	49,887	e50,000	e50,000	e50,000
Lanthanum	do.	362,694	308,804	e310,000	e300,000	e300,000
Neodymium	do.	207,009	247,337	e250,000	e240,000	e225,000
Praseodymium	do.	18,815	28,073	e30,000	e30,000	e25,000
Samarium	do.	115,330	114,490	e115,000	e116,000	e116,000
Terbium	do.	7,644	8,483	e8,000	e7,000	e7,000
Yttrium	do.	316,586	353,842	e350,000	e350,000	e320,000
Total	do.	3,760,609	4,051,759	e4,221,000	e4,200,000	3,950,000
Selenium, elemental		471	470	495	537	573
Silicon, high-purity		1,545	1,759	2,155	2,384	2,364
Silver:						
Mine output, Ag content	kilograms	251,971	155,792	149,920	170,676	178,330
Metal:						
Primary	do.	1,837,277	1,986,928	2,089,033	2,148,708	2,181,130
Secondary[3]	do.	161,991	166,564	229,319	r126,308	130,711
Total	do.	1,999,268	2,153,492	2,318,352	r2,275,016	2,311,841
Tellurium, elemental		55	51	50	57	57
Tin, metal		846	808	816	r716	821
Titanium:						
Metal		16,408	21,341	25,630	r18,945	14,554
Oxide		259,875	283,184	285,851	279,054	252,479
Tungsten:						
Mine output, W content		266	296	260	279	347
Metal		3,481	3,758	4,176	4,147	3,307
Vanadium metal[4]		728	868	e700	889	r870
Zinc:						
Mine output, Zn content		147,217	131,794	127,273	133,004	134,510
Oxide		r82,909	84,034	r83,190	r84,932	82,334
Metal:						
Primary		601,082	591,142	605,718	640,649	645,079
Secondary		124,702	123,536	125,884	r138,089	135,647
Total		725,784	714,678	731,602	r778,738	780,726
Zirconium:						
Metal[e]		r—	r—	r—	r—	r—
Oxide		7,345	7,100	r6,820	r6,750	e6,500
INDUSTRIAL MINERALS						
Asbestos		e5,000	e5,000	e5,000	e5,000	29,503
Bromine, elemental[e]		15,000	15,000	15,000	15,000	15,000
Cement, hydraulic	thousand tons	77,554	79,717	84,445	r89,564	88,253

See footnotes at end of table.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
INDUSTRIAL MINERALS—Continued						
Clays:						
Bentonite		455,137	526,131	549,414	554,145	534,445
Fire clay		961,354	942,199	r935,878	845,867	751,661
Kaolin		157,771	165,696	165,532	129,942	123,154
Feldspar and related materials:						
Feldspar		29,465	43,137	57,877	r88,471	69,715
Aplite		526,285	562,823	r522,744	r500,272	416,304
Gypsum[e]	thousand tons	6,300	6,300	6,400	5,400	5,400
Iodine, elemental		7,451	7,592	7,581	r7,492	6,764
Lime: Quicklime	thousand tons	7,726	8,486	8,983	9,045	8,049
Nitrogen: N content of ammonia	do.	1,524	1,539	1,531	1,553	1,602
Perlite[e]		200,000	202,000	203,000	203,000	203,000
Salt, all types	thousand tons	1,363	1,367	1,377	1,380	1,405
Silica sand		4,200,410	4,377,941	r4,438,708	r4,343,413	3,864,000
Silica stone	thousand tons	16,215	17,230	r17,925	r18,477	19,319
Sodium compounds, n.e.s.:						
Soda ash		1,083,121	1,105,308	1,134,825	1,103,455	1,056,803
Sulfate		246,541	256,393	253,131	249,807	e240,000
Stone, crushed and broken:						
Dolomite	thousand tons	5,423	5,465	5,371	5,318	4,854
Limestone	do.	182,468	190,854	198,224	206,780	203,854
Sulfur:						
S content of pyrite	do.	71	62	53	30	35
Byproduct:						
Of metallurgy	do.	1,268	1,320	1,336	r1,382	e1,350
Of petroleum	do.	1,093	1,176	1,268	r1,244	e1,250
Talc and related materials:						
Talc		49,797	55,665	61,550	r65,633	61,045
Pyrophyllite		1,244,491	1,233,600	1,213,036	r1,228,896	1,055,897
Vermiculite[e]		15,000	15,000	15,000	15,000	15,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand tons	720	779	783	793	771
Coal:						
Anthracite	do.	9	8	7	r1	—
Bituminous[5]	do.	11,214	10,179	8,256	r8,052	7,598
Total	do.	11,223	10,187	8,263	8,053	7,598
Coke including breeze:						
Metallurgical	do.	47,727	46,899	46,067	45,458	42,308
Gashouse including breeze	do.	2,907	2,896	1,414	1,243	1,096
Fuel briquets, all grades	do.	185	159	128	115	e110
Gas, natural:						
Gross[6]	million cubic meters	2,097	2,009	2,044	2,134	2,159
Marketed	do.	2,294	2,155	2,189	2,273	2,295

See footnotes at end of table.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	56	55	e55	e55	e55
Liquefied petroleum gas from natural gas field plants only)e	do.	300	250	250	300	e300
Peate		60	60	60	60	60
Petroleum:						
Crude	thousand 42-gallon barrels	4,353	4,032	3,975	5,523	6,302
Refinery products:						
Gasoline:						
Aviation	do.	57	80	78	r72	75
Other	do.	222,904	241,723	265,137	r78,883	290,916
Asphalt and bitumen	do.	35,758	36,085	r37,920	r36,743	37,588
Distillate fuel oil	do.	160,730	174,705	201,150	r236,833	244,434
Jet fuel	do.	24,272	26,335	27,933	r32,722	37,795
Kerosene	do.	132,300	128,488	145,415	r153,908	163,560
Liquefied petroleum gas	do.	46,784	46,809	51,233	r52,584	54,463
Lubricants	do.	12,743	12,561	r15,759	15,618	15,580
Naphtha	do.	55,061	56,287	68,310	r88,636	100,649
Paraffine	do.	1,000	1,000	1,200	1,200	1,200
Petroleum coke	do.	r940	r800	900	950	e900
Refinery fuel and losses[7]	do.	r134,000	140,000	e150,000	e150,000	e155,000
Residual fuel oil	do.	399,899	422,159	451,118	r456,102	476,943
Unfinished oils	do.	r47,700	r53,200	e57,000	e57,000	e58,000
Total	do.	r1,274,148	r1,340,232	r1,473,153	r1,561,251	e1,637,103

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through Sept. 20, 1993.

[2]Includes unalloyed ingot, alloyed ingot, billet, and mother alloys.

[3]Recovered from scrap, waste, and returned by end users.

[4]Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[5]Includes coking coal and steam coal.

[6]Includes output from gas wells and coal mines.

[7]May include some additional unfinished oils.

TABLE 2

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	200	189	18	Republic of Korea 89; Taiwan 45.
Aluminum:				
Ore and concentrate	843	1,143	—	Mainly to Republic of Korea.
Oxides and hydroxides	278,641	252,096	6,575	Republic of Korea 85,777; Canada 68,030; Taiwan 30,199.
Metal including alloys:				
Scrap	7,751	6,874	84	Taiwan 3,503; Philippines 1,450; Republic of Korea 1,101.
Unwrought	4,814	4,649	110	Thailand 2,432; Singapore 637; Malaysia 399.
Semimanufactures	193,603	158,725	41,046	Republic of Korea 26,088; Singapore 11,358; Hong Kong 9,268.
Antimony:				
Oxides and hydroxides	958	1,189	10	Singapore 218; Taiwan 207; Republic of Korea 142.
Metal including alloys, all forms	22	21	7	Singapore 4; Republic of Korea 3; Philippines 2.
Arsenic: Elemental	13	5	4	United Kingdom 1.
Beryllium: Metal including alloys, all forms kilograms	388	4,428	(2)	Taiwan 3,318; Republic of Korea 774.
Bismuth: Metal including alloys, all forms	35	13	—	Netherlands 5; Taiwan 2; Hong Kong 2.
Cadmium: Metal including alloys, all forms	202	12	(2)	Mainly to Republic of Korea.
Chromium:				
Ore and concentrate	495	356	1	Singapore 258; Indonesia 40.
Oxides and hydroxides	5,236	4,696	730	Republic of Korea 1,908; Taiwan 1,342.
Metal including alloys, all forms	2,822	2,020	1,144	United Kingdom 205; Germany 157; Netherlands 148.
Cobalt:				
Oxides and hydroxides	99	50	(2)	Taiwan 23; Republic of Korea 5; Indonesia 4.
Metal including alloys, all forms	287	336	106	Germany 60; Netherlands 47; Republic of Korea 36.
Columbium and tantalum: Tantalum metal including alloys, all forms	26	33	3	Germany 18; Republic of Korea 4.
Copper:				
Oxides and hydroxides	1,137	1,698	51	Singapore 607; Taiwan 336; Republic of Korea 249.
Sulfate	872	1,452	42	Taiwan 1,028; Republic of Korea 169.
Metal including alloys:				
Scrap	12,003	9,186	54	China 2,151; Republic of Korea 2,134; Taiwan 2,127.
Unwrought	81,710	87,267	8,009	Taiwan 30,491; Republic of Korea 26,524.
Semimanufactures	189,419	195,956	20,619	Taiwan 39,190; Hong Kong 32,581; Singapore 30,779.
Germanium: Metal including alloys, all forms kilograms	106	58	35	Singapore 13; Portugal 10.
Gold:				
Waste and sweepings do.	316	1,029	—	All to Hong Kong.
Metal including alloys, unwrought and partly wrought do.	30,994	12,354	622	Singapore 5,941; Taiwan 1,873; Republic of Korea 955.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	45	47	—	All to Republic of Korea.
Metal:				
Scrap	396,403	361,704	164	Republic of Korea 204,495; Taiwan 76,686.

See footnotes at end of table.

TABLE 2—Continued

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued:					
Metal—Continued:					
Pig iron, cast iron, related materials		24,745	21,960	5,245	Taiwan 6,252; Republic of Korea 3,581; Singapore 1,651.
Ferroalloys:					
Ferrochromium		2,811	1,928	1,308	Germany 181; Republic of Korea 97.
Ferromanganese		5,631	5,025	1,214	Taiwan 2,216; Thailand 775; New Zealand 414.
Ferrosilicon		3,780	4,676	22	Republic of Korea 2,439; Taiwan 1,279.
Silicon metal		224	171	(e)	Republic of Korea 92; Hong Kong 30; Taiwan 18.
Unspecified		5,819	5,251	2,109	Republic of Korea 2,179; Belgium-Luxembourg 400.
Steel, primary forms	thousand tons	43	65	4	Republic of Korea 27; Singapore 3.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated[3]	do.	5,735	5,664	406	Thailand 1,013; Republic of Korea 843; Malaysia 514.
Clad, plated, coated	do.	3,166	3,476	916	China 339; Thailand 221; Hong Kong 199.
Of alloy steel[4]	do.	937	1,312	216	Republic of Korea 268; Hong Kong 103.
Bars, rods, angles, shapes, sections	do.	2,175	r2,278	315	Republic of Korea 346; Thailand 296.
Rails and accessories	do.	173	122	79	Canada 13; Brazil 8.
Wire[6]	do.	131	105	29	Hong Kong 5; Republic of Korea 2.
Tubes, pipes, fittings	do.	3,258	3,724	522	China 706; U.S.S.R. 402; Republic of Korea 155.
Lead:					
Oxides		70	61	4	Taiwan 22; China 11; North Korea 10.
Metal including alloys:					
Scrap		25,528	25,261	—	Indonesia 13,319; Thailand 4,330; China 3,204.
Unwrought		1,425	906	4	Taiwan 692; Republic of Korea 166.
Semimanufactures		454	248	27	Taiwan 104; Indonesia 17.
Lithium: Oxides and hydroxides		14	7	—	Pakistan 3; Republic of Korea 2.
Magnesium: Metal including alloys, all forms		19	74	—	Indonesia 38; Thailand 20.
Manganese:					
Ore and concentrate, metallurgical-grade		80	49	—	Taiwan 40; Malaysia 9.
Oxides		30,606	31,557	134	Indonesia 6,912; Germany 3,716; U.S.S.R. 3,294.
Metal including alloys, all forms		64	74	—	Taiwan 21; Indonesia 13; Thailand 11.
Mercury		104	9	—	Republic of Korea 6; Indonesia 2.
Molybdenum:					
Oxides and hydroxides		8	19	—	Mainly to India.
Metal including alloys, all forms		17	73	3	Republic of Korea 30; Taiwan 15.
Nickel:					
Matte and speiss		167	—	—	—
Oxides and hydroxides		245	1,102	35	Republic of Korea 955; Taiwan 33.
Metal including alloys:					
Scrap		222	312	21	Republic of Korea 158; Netherlands 106.
Unwrought		147	81	4	Indonesia 56; United Kingdom 7.

See footnotes at end of table.

TABLE 2—Continued

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Nickel—Continued:				
Metal including alloys—Continued:				
Semimanufactures	3,301	4,301	1,651	U.S.S.R. 659; United Arab Emirates 314.
Platinum-group metals:				
Waste and sweepings value, thousands	390	2,423	—	United Kingdom $1,924; Switzerland $246.
Metals including alloys, unwrought and partly wrought kilograms	7,201	5,917	1,852	Taiwan 2,072; Hong Kong 1,006.
Rare earths:				
Compounds	801	595	188	Republic of Korea 99; Germnany 59; China 51.
Metal including alloys, all forms	11	75	71	Republic of Korea 2; United Kingdom 1.
Selenium, elemental	368	351	38	China 141; United Kingdom 53; Hong Kong 43.
Silicon, high-purity	492	773	313	Malaysia 176; Republic of Korea 45;
Silver:				
Waste and sweepings value, thousands	$2,710	$1,952	$286	Germany $938; United Kingdom $508.
Metal including alloys, unwrought and partly wrought kilograms	153,659	205,794	6,058	Singapore 115,590; Republic of Korea 24,854.
Tin: Metal including alloys:				
Scrap	42	247	161	India 49; China 19.
Unwrought	311	276	33	Republic of Korea 183; Taiwan 39.
Semimanufactures	570	378	20	Singapore 81; Indonesia 77.
Titanium:				
Ore and concentrate	67	(2)	—	All to Republic of Korea.
Oxides	47,335	52,745	434	Taiwan 17,299; Singapore 15,590; China 6,138.
Metal including alloys, all forms	8,177	8,551	1,256	United Kingdom 2,897; France 933; Republic of Korea 898.
Tungsten: Metal including alloys, all forms	586	1,280	645	Germany 503.
Uranium and thorium: Oxides and other compounds	35	23	(2)	Mainly to United Kingdom.
Vanadium:				
Oxides and hydroxides	46	66	—	Republic of Korea 31; Indonesia 11; Malaysia 8.
Metal including alloys, all forms	6	(2)	—	Mainly to Republic of Korea.
Zinc:				
Oxides	1,290	1,159	243	Taiwan 208; Republic of Korea 171; Indonesia 139.
Metal including alloys:				
Scrap	8,519	8,141	—	Taiwan 5,835; Hong Kong 1,041.
Unwrought	25,654	22,389	(2)	Taiwan 10,516; Philippines 7,071.
Semimanufactures	2,261	2,527	66	Taiwan 819; Canada 692.
Zirconium:				
Ore and concentrate	265	1,494	—	Taiwan 670; Singapore 573.
Metal including alloys, all forms	37	82	40	France 35; Republic of Korea 5.
Other:				
Ores and concentrates	2	(2)	—	All to Taiwan.
Oxides and hydroxides[7]	—	718	164	Republic of Korea 404; Taiwan 94.
Ashes and residues	8,156	8,057	72	Taiwan 4,818; Republic of Korea 1,402.
Base metals including alloys, all forms	11	13	—	Republic of Korea 5; Germany 3.

See footnotes at end of table.

TABLE 2—Continued

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	13,946	13,295	—	Republic of Korea 9,251; Taiwan 2,189.
Artificial:				
Corundum	31,774	35,701	3,450	Republic of Korea 17,707; Australia 4,302.
Silicon carbide	7,413	9,576	322	Republic of Korea 7,016; Taiwan 1,245.
Dust and powder of precious and semi-precious stones including diamond kilograms	3,925	94,087	558	Republic of Korea 90,269; Taiwan 397.
Grinding and polishing wheels and stones	8,753	8,841	1,746	Republic of Korea 1,141; Thailand 735; Singapore 719.
Asbestos, crude	142	147	—	Indonesia 63; Taiwan 36; Tunisia 30.
Barite and witherite	74	14	14	
Boron materials:				
Crude natural borates	2,016	2,680	—	Taiwan 2,260; Hong Kong 420.
Elemental[8]	10	4	2	Netherlands 1.
Oxides and acids	178	113	(2)	Republic of Korea 62; Taiwan 17; Thailand 15.
Bromine[9]	6	(2)	—	All to Republic of Korea.
Cement thousand tons	6,369	7,383	297	Hong Kong 1,770; Singapore 1,648; Thailand 1,840.
Chalk	156	7	—	Taiwan 4; Pakistan 3.
Clays, crude:				
Bentonite	1,277	885	4	Sri Lanka 480; Indonesia 256.
Chamotte or dinas earth	364	401	—	Republic of Korea 179; Taiwan 71; Thailand 70.
Fire clay	4,945	5,066	19	Republic of Korea 3,412; Bangladesh 384; Taiwan 360.
Kaolin	7,377	11,353	—	Taiwan 7,921; Republic of Korea 1,121; Indonesia 1,120.
Unspecified	43,084	45,707	(2)	Taiwan 20,379; Republic of Korea 6,111.
Cryolite and chiolite	15	19	—	Republic of Korea 10; Taiwan 9.
Diamond: Natural:				
Gem, not set or strung carats	2,973	2,905	111	Taiwan 1,410; Philippines 557; Thailand 343.
Industrial stones do.	120,509	598,841	95,450	Thailand 238,842; Republic of Korea 200,239.
Diatomite and other infusorial earth	1,863	2,374	(2)	Taiwan 925; Malaysia 434; Thailand 376.
Feldspar, fluorspar, related materials:				
Feldspar	31,331	40,412	—	Taiwan 28,096; Singapore 5,900.
Fluorspar	338	582	—	Mainly to Taiwan.
Fertilizer materials:				
Crude, n.e.s.	653	1,593	1	Do.
Manufactured:				
Ammonia	270	787	27	Republic of Korea 558; Hong Kong 194.
Nitrogenous	755,577	935,638	1,607	Philippines 340,783; Malaysia 220,955; Thailand 191,882.
Phosphatic	2,337	943	—	Yemen 450; Taiwan 182; Guinea 150.
Potassic	1,074	1,022	214	Philippines 342; Republic of Korea 173; Guinea 150.
Unspecified and mixed	107,601	123,137	5,101	Pakistan 18,264; Sri Lanka 12,000; Kenya 11,146.
Graphite, natural	1,314	1,484	196	Taiwan 485; Republic of Korea 310.
Gypsum and plaster	5,806	7,573	20	Indonesia 2,871; Taiwan 1,452.

See footnotes at end of table.

TABLE 2—Continued

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Iodine	5,192	4,793	1,735	United Kingdom 881; Italy 583; France 440.
Kyanite and related materials	5,159	5,512	144	Republic of Korea 3,722; Taiwan 577.
Lime	4,694	1,343	—	Taiwan 606; Singapore 305; Republic of South Africa 300.
Magnesium compounds:				
Magnesite, crude	791	309	—	Mainly to Taiwan.
Oxides and hydroxides	94,665	88,705	14,225	Republic of Korea 23,536; Netherlands 10,281; Iran 9,072.
Mica:				
Crude including splittings and waste	683	711	50	Republic of Korea 314; Taiwan 144; Germany 80.
Worked including agglomerated splittings	1,095	1,154	86	Hong Kong 536; Taiwan 172.
Phosphorus, elemental	152	56	(2)	United Kingdom 16; Malaysia 14; Indonesia 10.
Pigments, mineral:				
Natural, crude	280	176	—	Taiwan 99; China 37.
Iron oxides and hydroxides, processed	32,653	38,825	4,872	Taiwan 13,493; Republic of Korea 11,577; Singapore 4,304.
Precious and semiprecious stones other than diamond:				
Natural kilograms	18,462	15,793	4	China 5,444; Republic of Korea 4,487; Hong Kong 3,508.
Synthetic do.	88,311	140,126	6,586	Indonesia 60,082; Thailand 30,444; Malaysia 17,370.
Pyrite, unroasted	200	25	—	All to Taiwan.
Quartz crystal, piezoelectric	62	52	1	Thailand 15; Philippines 11; Taiwan 7.
Salt and brine	1,320	1,509	20	Republic of Korea 726; U.S.S.R. 406; China 102.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	40,357	13,824	—	Indonesia 8,221; Philippines 3,858.
Sulfate, manufactured	8,306	4,539	54	Republic of Korea 3,359; Indonesia 1,024.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,073	705	—	Mainly to Republic of Korea.
Worked	2,162	1,977	236	Republic of Korea 1,027; Hong Kong 188.
Dolomite, chiefly refractory-grade	2,111	1,891	—	Indonesia 1,640; Taiwan 109.
Gravel and crushed rock	62,785	64,193	26	Australia 61,850; Republic of Korea 920.
Limestone other than dimension	1,945,099	3,049,306	444	Hong Kong 1,385,976; Australia 997,855; Taiwan 468,860.
Quartz and quartzite	1,358	4,284	5	Malaysia 2,524; Singapore 482.
Sand other than metal-bearing	5,009	5,834	6	Taiwan 2,666; Singapore 817.
Sulfur:				
Elemental:				
Crude including native and byproduct	385,385	358,370	32	Republic of Korea 287,096; Tunisia 26,306.
Colloidal, precipitated, sublimed	1,532	1,579	2	India 417; Malaysia 279; Taiwan 240.
Sulfuric acid	731,543	846,442	109,013	Taiwan 195,104; Republic of Korea 162,780; Philippines 131,748.
Talc, steatite, soapstone, pyrophyllite	3,160	3,547	635	Republic of Korea 886; Taiwan 629; Philippines 336.
Vermiculite[10]	24,611	28,000	9	Republic of Korea 25,478; Taiwan 2,193.

See footnotes at end of table.

TABLE 2—Continued

JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		8,360	18,781	42	Republic of Korea 6,711; Taiwan 5,724; Indonesia 2,317.
Slag and dross, not metal-bearing		1,241,701	1,301,304	—	Republic of Korea 394,645; Singapore 383,931; Phillippines 258,441.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		10	18	—	Yemen 13; Taiwan 3.
Carbon black		8,943	12,833	1,364	Republic of Korea 2,997; Indonesia 2,235; Taiwan 2,042.
Coal, all grades including briquets		2,183	1,132	—	Thailand 711; Indonesia 223.
Coke and semicoke	thousand tons	1,731	2,531	835	Brazil 846; Romania 260; Taiwan 135.
Peat including briquets and litter		102	50	—	Taiwan 42; Indonesia 5.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	27	74	50	China 23; Republic of Korea 1.
Gasoline	do.	3,462	2,866	(2)	Republic of Korea 1,814; Taiwan 869.
Mineral jelly and wax	do.	392	407	41	Colombia 69; Taiwan 46; India 45.
Kerosene and jet fuel	do.	3,899	4,414	20	Republic of Korea 3,171; Hong Kong 944.
Distillate fuel oil	do.	7,661	9,723	—	Hong Kong 3,079; Republic of Korea 2,548; China 2,303.
Lubricants	do.	1,951	1,558	8	Republic of Korea 758; Singapore 265; Thailand 204.
Nonlubricating oils	do.	112	78	1	Taiwan 42; Republic of Korea 7.
Residual fuel oil	do.	12,300	11,992	(2)	Taiwan 5,206; Republic of Korea 3,436; Singapore 1,843.
Bitumen and other residues	do.	86	163	(2)	Republic of Korea 85; Thailand 40; Hong Kong 24.
Bituminous mixtures	do.	2	1	(2)	Taiwan.[2]
Petroleum coke	do.	471	388	23	India 122; U.S.S.R. 101; Netherlands 56.

[1]Excludes exports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Jeremy H. Tidwell.
[2]Less than 1/2 unit.
[3]Excludes unreported quantity valued at $130,071,000 in 1991 and $112,935,000 in 1990.
[4]Excludes unreported quantity valued at $520,515,000 in 1991 and $451,172,000 in 1990.
[5]Excludes unreported quantity valued at $2,825,000.
[6]Excludes unreported quantity valued at $66,491,000 in 1991 and $63,127,000 in 1990.
[7]Includes germanium oxides and zirconium dioxide.
[8]Includes tellurium.
[9]Includes fluorine.
[10]Includes perlite and chlorites.

TABLE 3

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	46	2,470	48	France 2,074; China 186.
Aluminum:				
Ore and concentrate thousand tons	2,302	2,049	—	Australia 1,328; Indonesia 619.
Oxides and hydroxides	73,456	104,363	22,701	Australia 70,015; New Zealand 5,584.
Metal including alloys:				
Scrap	352,699	291,742	157,846	Australia 29,580; Hong Kong 16,110; United Kingdom 13,550.
Unwrought thousand tons	2,724	2,831	715	Australia 450; Brazil 362; New Zealand 198.
Semimanufactures	70,866	88,841	22,807	France 13,688; Bahrain 9,149; Hungary 6,479.
Antimony:				
Ore and concentrate	5,997	6,051	—	China 2,979; Bolivia 1,860; Australia 1,153.
Oxides	6,299	8,646	185	China 5,210; United Kingdom 1,799.
Metal including alloys, all forms	6,316	6,172	(2)	China 5,851; Thailand 160.
Arsenic:				
Elemental	95	336	—	Mainly from China.
Oxides and acids	362	234	—	France 183; Republic of Korea 51.
Beryllium:				
Oxides and hydroxides	60	51	51	
Metal including alloys, all forms kilograms	1,172	301	301	
Bismuth: Metal including alloys, all forms	180	181	—	Republic of Korea 88; China 50; Peru 19.
Cadmium: Metal including alloys, all forms	2,199	3,567	(2)	Belgium-Luxembourg 679; Australia 665; Republic of Korea 647.
Chromium:				
Ore and concentrate	789,225	755,059	—	Republic of South Africa 455,798; Brazil 67,995; Madagascar 66,227.
Oxides and hydroxides	2,659	3,016	1,020	Germany 958, United Kingdom 436; China 347.
Metal including alloys, all forms	571	811	174	United Kingdom 257; France 178; China 140.
Cobalt:				
Oxides and hydroxides	224	571	57	Belgium-Luxembourg 376; Finland 94.
Metal including alloys, all forms	4,807	6,185	184	Zaire 3,464; Zambia 1,154; Belgium-Luxembourg 832.
Columbium and tantalum:				
Ore and concentrate[3]	1,503	1,651	—	Canada 1,185; Malaysia 247.
Tantalum metal including alloys, all forms	56	77	50	Taiwan 16; Germany 4.
Copper:				
Ore and concentrate thousand tons	3,523	3,787	310	Canada 983; Chile 537; Indonesia 428.
Matte and speiss including cement copper	3,110	438	—	Portugal 303; Taiwan 135.
Oxides and hydroxides	970	2,000	1,431	Australia 340; Norway 180.
Sulfate	136	159	54	Thailand 85; Peru 15.
Metal including alloys:				
Scrap	126,662	153,426	63,291	Hong Kong 22,393; Singapore 16,828; Australia 7,651.
Unwrought	653,051	669,615	132,988	Chile 204,700; Zambia 126,387; Australia 50,384.
Semimanufactures	37,703	40,815	9,673	Republic of Korea 7,894; Indonesia 2,000; Sweden 1,785.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Germanium:				
Oxides[4]	1,010	930	108	United Kingdom 773; Australia 29.
Metal including alloys, all forms kilograms	1,713	2,279	224	China 1,242; France 360.
Gold:				
Waste and sweepings do.	1,926	1,369	—	Mainly from Singapore.
Metal including alloys, unwrought and partly wrought do.	302,938	257,912	9,280	Switzerland 78,603; Australia 73,573; United Kingdom 32,210.
Indium: Metal including alloys, all forms	36	40	3	France 20; China 8; Belgium-Luxembourg 3.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite thousand tons	125,290	127,186	—	Australia 58,354; Brazil 28,470; India 20,973.
Metal:				
Scrap do.	1,048	821	320	Vietnam 100; Australia 77; Hong Kong 55.
Pig iron, cast iron, related materials do.	3,283	3,375	29	U.S.S.R. 1,638; Brazil 692; China 535.
Ferroalloys:				
Ferrochromium	441,672	578,073	—	Republic of South Africa 363,529; India 60,653; Zimbabwe 43,746.
Ferromanganese	43,268	32,563	—	Brazil 11,894; China 4,791; Republic of South Africa 4,099.
Ferromolybdenum	1,600	1,975	33	Chile 1,255; Austria 477.
Ferronickel	41,941	45,925	797	New Caledonia 22,475; Indonesia 11,717; Dominican Republic 6,241.
Ferrosilicochromium	6,690	10,622	—	China 6,694, Zimbabwe 1,995.
Ferrosilicomanganese	195,282	241,271	—	China 135,385; Republic of South Africa 34,905; U.S.S.R. 33,741.
Ferrosilicon	476,482	484,772	1,619	China 234,232; Brazil 93,452; Norway 73,320.
Silicon metal	129,763	136,103	442	China 68,914; Brazil 30,900; Norway 11,460.
Unspecified	25,763	31,540	418	China 11,833; Brazil 11,246; France 2,044.
Steel, primary forms	1,082,972	[5]1,399,323	138,623	Brazil 257,619; Republic of Korea 195,584; Turkey 177,894.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	4,477,679	5,746,841	646,311	Republic of Korea 2,151,285; Brazil 542,499; China 331,856.
Clad, plated, coated	292,436	370,423	3,174	Republic of Korea 343,200; Germany 10,435.
Of alloy steel[6]	19,936	34,458	474	Republic of Korea 15,046; Finland 5,237; Germany 2,134.
Bars, rods, angles, shapes, sections	884,270	1,088,314	39,500	Republic of Korea 334,255; Brazil 122,560; Belgium-Luxembourg 69,388.
Rails and accessories	9,848	6,243	18	Republic of Korea 3,949; United Kingdom 1,221; Belgium-Luxembourg 270.
Wire	61,388	82,805	2,006	Republic of Korea 54,129; Thailand 6,111.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Semimanufactures—Continued:				
Tubes, pipes, fittings	360,077	361,272	3,542	Republic of Korea 273,475; Thailand 15,572.
Lead:				
Ore and concentrate	279,535	304,054	29,422	Australia 88,804;Canada 78,180; Peru 50,231.
Oxides	31,090	37,424	9	Mexico 14,960; Taiwan 12,543; China 4,388.
Metal including alloys:				
Scrap	1,126	1,843	34	China 1,440; Australia 332.
Unwrought	99,041	78,206	6,647	Mexico 19,497; Australia 19,381; Peru 16,736.
Semimanufactures	1,675	1,424	36	United Kingdom 1,062; China 278.
Lithium: Oxides and hydroxides	1,036	1,025	802	U.S.S.R. 160; China 63.
Magnesium: Metal including alloys:				
Scrap	888	747	90	Taiwan 299; Germany 89; Republic of Korea 86.
Unwrought	16,517	21,262	13,275	Norway 4,559; U.S.S.R. 1,926.
Semimanufactures	621	762	498	Republic of Korea 206; Taiwan 30.
Manganese:				
Ore and concentrate, metallurgical-grade thousand tons	1,647	1,664	—	Australia 595; India 93; Brazil 71.
Oxides	4,323	1,964	34	Belgium-Luxembourg 1,102; China 362; Republic of South Africa 230.
Metal including alloys, all forms	13,689	17,931	723	Republic of South Africa 9,308; China 7,533.
Mercury	34	45	(2)	Algeria 38; United Kingdom 3.
Molybdenum:				
Ore and concentrate	24,408	25,298	7,185	Chile 9,083; Canada 6,956.
Oxides and hydroxides	335	567	423	Chile 137; Germany 7.
Metal including alloys, all forms	348	530	233	Germany 158; Austria 50.
Nickel:				
Ore and concentrate thousand tons	3,338	4,002	—	New Caledonia 2,114; Indonesia 1,041.
Matte and speiss	62,291	67,267	—	Indonesia 42,181; Australia 24,595.
Oxides and hydroxides	270	272	3	Canada 261.
Metal including alloys:				
Scrap	3,843	4,155	1,549	Taiwan 1,404; Hong Kong 265; Republic of Korea 238.
Unwrought	44,383	51,198	163	U.S.S.R. 23,369; Zimbabwe 7,501; Norway 6,652.
Semimanufactures	6,698	8,965	1,300	United Kingdom 3,900; Canada 2,684.
Platinum-group metals:				
Ores and concentrates[7]	38,804	34,195	25,545	Canada 6,357; Saudi Arabia 2,397.
Waste and sweepings kilograms	5,295	24,775	712	New Zealand 17,970; Taiwan 5,346.
Metals including alloys, unwrought and partly wrought do.	125,885	143,336	7,529	U.S.S.R. 74,257; United Kingdom 20,774; Republic of South Africa 17,249.
Rare earths:				
Compounds	8,894	10,470	2,261	China 3,282; Malaysia 2,000; France 1,156.
Metals including alloys, all forms	180	436	24	China 378; Brazil 30.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Selenium, elemental	44	69	18	Philippines 30; Republic of Korea 14.
Silicon, high-purity	1,547	2,103	1,094	Germany 857; Denmark 38.
Silver:				
Ore and concentrate	6,390	8,998	—	Peru 7,264; Australia 1,734.
Waste and sweepings	112	264	18	Singapore 213; Thailand 12.
Metal including alloys, unwrought and partly wrought	1,548	1,050	304	Mexico 469; Australia 92; Republic of Korea 42.
Tin:				
Oxides	7	15	1	Brazil 8; United Kingdom 6.
Metal including alloys:				
Scrap	65	23	—	Malaysia 17; Hong Kong 3.
Unwrought	36,297	38,678	917	Malaysia 12,992; Indonesia 9,718; China 7,776.
Semimanufactures	54	149	2	Malaysia 70; Singapore 47; Republic of Korea 24.
Titanium:				
Ore and concentrate	757,595	576,003	5,023	Australia 233,888; Malaysia 132,486; India 96,597.
Oxides	17,196	8,849	55	Republic of Korea 3,109; Australia 1,758; China 1,244.
Metal including alloys, all forms	577	1,084	437	U.S.S.R. 491; Belgium-Luxembourg 50.
Tungsten:				
Ore and concentrate	2,589	1,200	—	China 466; Portugal 350; Australia 200.
Metal including alloys, all forms	292	591	64	Republic of Korea 204; China 137; Germany 72.
Uranium and thorium:				
Ore and concentrate	(2)	(2)	—	All from Central African Republic.
Oxides and other compounds kilograms	1,149	1,494	486	United Kingdom 1,000; Germany 8.
Vanadium:				
Oxides and hydroxides	4,796	4,613	256	Republic of South Africa 3,285; China 1,109.
Metal including alloys, all forms	104	136	38	Germany 98.
Zinc:				
Ore and concentrate thousand tons	1,186	1,156	111	Australia 677; Peru 173.
Oxides	13,267	13,391	26	Republic of Korea 6,090; China 2,676; Taiwan 2,618.
Metal including alloys:				
Scrap	409	338	38	Singapore 239; China 49.
Unwrought	154,803	154,536	147	North Korea 45,721; Canada 22,565; Australia 21,061.
Semimanufactures	5,390	3,931	48	China 2,499; France 1,328.
Zirconium:				
Ore and concentrate	119,008	148,343	940	Australia 119,474; Republic of South Africa 26,686.
Metal including alloys, all forms	683	676	413	France 239; U.S.S.R. 18.
Other:				
Ores and concentrates	94	60	—	Australia 41; China 17.
Ashes and residues	76,754	50,918	9,088	Republic of Korea 9,143; Taiwan 6,502; Singapore 5.053.
Base metals including alloys, all forms	106	154	25	Brazil 68; Germany 19; France 11.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	9,386	13,936	2,288	India 9,692; China 1,758.
Artificial:				
Corundum	75,290	80,177	232	China 55,256; Hungary 10,565.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s—Continued:				
Artificial—Continued:				
Silicon carbide	51,003	50,938	254	China 29,463; Germany 5,722; Brazil 4,143.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	685,364	684,632	684,632	
Grinding and polishing wheels and stones	1,972	2,270	332	Thailand 384; China 339; Italy 334.
Asbestos, crude	287,659	272,088	14,462	Canada 99,536; Republic of South Africa 75,518; U.S.S.R. 37,258.
Barite and witherite	115,684	106,038	118	China 94,235; India 11,631.
Boron materials:				
Crude natural borates	66,096	75,288	—	Mainly from Turkey.
Elemental[8]	6	24	3	Belgium-Luxembourg 10; U.S.S.R. 5.
Oxides and acids	26,581	28,562	19,058	Italy 5,201; Turkey 2,162.
Bromine[9]	5,490	6,097	1,321	Israel 4,776.
Cement	2,543,903	1,841,149	2,575	Republic of Korea 1,205,455; Taiwan 436,234.
Chalk	1	—	—	
Clays, crude thousand tons	1,627	1,822	1,037	China 264; Australia 112; Indonesia 63.
Cryolite and chiolite	391	119	—	Denmark 85; Greenland 34.
Diamond:				
Natural:				
Gem, not set or strung thousand carats	3,304	3,079	106	India 1,633; Belgium-Luxembourg 586; Israel 475.
Industrial stones do.	691	710	225	Ireland 72; Belgium-Luxembourg 99; Netherlands 81.
Dust and powder do.	1,884	2,158	399	Ireland 1,156; United Kingdom 200.
Synthetic: Dust and powder do.	59,447	66,486	32,268	Ireland 32,695; United Kingdom 298.
Diatomite and other infusorial earth	4,501	5,517	5,490	Iceland 27.
Feldspar, fluorspar, related materials:				
Feldspar	22,471	4,440	—	China 2,127; India 1,413; North Korea 800.
Fluorspar	567,023	565,831	(r)	China 476,877; Thailand 51,405.
Unspecified	9,835	7,335	—	Norway 5,900; Canada 1,435; Indonesia 4,094.
Fertilizer materials:				
Crude, n.e.s.	28,652	25,358	19	China 9,523; Republic of Korea 7,499; Indonesia 4,094.
Manufactured:				
Ammonia kilograms	1,960	1,027	—	All from Germany.
Nitrogenous	262,077	246,805	30,125	Qatar 117,017; Indonesia 33,375; Germany 21,937.
Phosphatic	158,580	137,667	45,471	China 79,457; Republic of Korea 10,589.
Potassic	1,199,402	1,339,983	240,910	Canada 560,699; U.S.S.R. 212,556; Germany 160,335.
Unspecified and mixed	688,728	632,725	545,927	Republic of Korea 56,767; Norway 5,021.
Graphite, natural	126,527	122,650	362	China 87,914; Republic of Korea 21,519.
Gypsum and plaster	3,637,273	3,954,419	722	Thailand 3,469,151; Mexico 412,693.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Iodine	289	394	358	Chile 36.
Kyanite and related materials	34,825	39,687	5,663	China 10,641; Republic of South Africa 21,605.
Lime	18	10	—	Netherlands 8; Singapore 2.
Magnesium compounds:				
Magnesite, crude	1,381	2,270	—	All from China.
Oxides and hydroxides	372,014	421,934	7,417	China 381,091; Israel 13,457.
Other	4,139	3,758	—	Mainly from Germany.
Mica:				
Crude including splittings and waste	27,393	34,365	537	China 18,893; India 6,711; Finland 3,196.
Worked including agglomerated splittings	730	467	1	India 185; Belgium-Luxembourg 177; Republic of Korea 97.
Nitrates, crude	19,309	19,700	—	Mainly from Chile.
Phosphates, crude thousand tons	1,543	1,456	652	Republic of South Africa 226; Jordan 218; Morrocco 186.
Phosphorus, elemental	20,427	21,141	10,190	China 5,016; Republic of South Africa 3,156.
Pigments, mineral:				
Natural, crude	675	867	9	China 750; Austria 53.
Iron oxides and hydroxides, processed	15,506	16,555	6,023	Germany 6,661; China 1,600.
Precious and semiprecious stones other than diamond:				
Natural kilograms	1,085,156	1,307,016	100,982	Brazil 567,265; Indonesia 276,000; Republic of South Africa 126,274.
Synthetic do.	65,710	88,624	80,555	France 5,506; Switzerland 1,332.
Pyrite, unroasted	317,550	321,293	—	China 195,036; Australia 79,506.
Quartz crystal, piezoelectric	110	71	35	Germany 18; Brazil 11.
Salt and brine thousand tons	7,920	7,855	(2)	Australia 4,131; Mexico 3,387.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	294,893	307,842	307,718	Canada 80; Netherlands 38.
Sulfate, manufactured	18,812	17,462	4,660	China 10,822; Taiwan 1,800.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,436,167	1,420,053	42,932	China 389,130; Republic of Korea 257,370; India 227,645.
Worked	618,842	705,533	3,149	China 299,491; Republic of Korea 162,294; Italy 142,102.
Dolomite, chiefly refractory-grade	1,386,481	1,466,635	5,220	Republic of Korea 331,126; Thailand 320,336; Philippines 294,592.
Gravel and crushed rock	480,440	563,789	198	Taiwan 453,837; Philippines 31,132.
Limestone other than dimension	900	4,388	—	Taiwan 3,170; France 1,080.
Quartz and quartzite	119,623	121,127	1,611	India 68,298; Sri Lanka 16,898; Thailand 15,938.
Sand other than metal-bearing	2,627,688	2,652,730	3,782	Australia 1,630,989; China 409,140; Taiwan 327,871.
Sulfur:				
Elemental:				
Crude including native and byproduct	939	453	72	Republic of Korea 317; China 64.

See footnotes at end of table.

TABLE 3—Continued

JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued:					
Elemental—Continued:					
Colloidal, precipitated, sublimed		61	68	3	China 32; France 27.
Sulfuric acid		—	17	1	Republic of Korea 16.
Talc, steatite, soapstone, pyrophyllite		666,040	698,683	17,280	China 552,941; Australia 126,553.
Vermiculite[10]		36,974	34,513	264	Republic of South Africa 18,786; China 14,903.
Other:					
Crude		445,880	419,410	16,983	Republic of Korea 193,679; China 69,465; U.S.S.R. 34,940.
Slag and dross, not metal-bearing		490,428	449,762	1,481	Republic of South Africa 100,035; Republic of Korea 93,805; U.S.S.R. 34,940.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		3,964	3,461	3,187	Trinidad and Tobago 274.
Carbon black		22,282	27,051	13,081	Republic of Korea 8,543; Canada 1,579.
Coal:					
Anthracite and bituminous	thousand tons	107,517	111,954	12,023	Australia 59,637; Canada 18,820.
Lignite including briquets		14,326	24,586	1,090	U.S.S.R. 22,773; China 698.
Coke and semicoke		326,751	362,176	197	China 201,309; Australia 153,850.
Gas, natural: Liquefied	thousand tons	35,465	37,515	982	Indonesia 17,910; Malaysia 7,018; Brunei 5,186.
Peat including briquets and litter		79,289	81,972	546	Canada 69,192; Germany 7,911.
Petroleum:					
Crude	thousand 42-gallon barrels	1,404,214	1,458,513	—	United Arab Emirates 383,968; Saudi Arabia 338,936; Indonesia 178,175.
Refinery products:					
Liquefied petroleum gas	do.	168,618	170,020	(2)	Saudi Arabia 83,091; United Arab Emirates 41,914; Indonesia 2,342.
Gasoline	do.	169,892	163,027	1,639	Saudi Arabia 64,618; United Arab Emirates 22,116; Singapore 21,229.
Mineral jelly and wax	do.	91	97	58	Republic of South Africa 29; China 2.
Kerosene and jet fuel	do.	64,309	44,067	5,165	Singapore 15,295; United Arab Emirates 7,726; Saudi Arabia 6,141.
Distillate fuel oil	do.	42,013	18,402	1,440	Republic of Korea 4,238; Saudi Arabia 4,230; Algeria 2,875.
Lubricants	do.	1,772	982	244	Singapore 317; Republic of Korea 218; Germany 105.
Nonlubricants	do.	420	750	267	Republic of Korea 242; France 124.
Residual fuel oil	do.	101,308	80,609	3,138	Indonesia 32,907; Republic of Korea 9,776; Oman 8,860.
Bitumen and other residues	do.	1,106	1,241	730	China 534; Germany 12.
Bituminous mixtures	do.	12	528	3	Venezuela 516; United Kingdom 4.
Petroleum coke	do.	22,424	23,896	21,160	China 989; Republic of Korea 774.

[1]Excludes imports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Jeremy H. Tidwell.
[2]Less than 1/2 unit.
[3]Includes vanadium ore and concentrate.
[4]Includes zirconium dioxide.
[5]Excludes unreported quantity valued at $1,965,000.
[6]Excludes unreported quantity valued at $3,966,000 in 1991 and $3,194,000 in 1990.
[7]May include other precious metal ores and concentrates.
[8]Includes tellurium.
[9]Includes fluorine.
[10]Includes perlite and chlorites.

TABLE 4

JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Coal	Hokutan Sorachi Coal Mining Co. Ltd.	Sorachi, Hokkaido Prefecture	800
Do.	Mitsui Coal Mining Co. Ltd.	Ashibetsu, Hokkaido Prefecture, and Miike, Kyushu	3,500
Do.	Matsushima Coal Mining Co. Ltd.	Ikeshima, Kyushu	1,300
Do.	Sumitomo Akabira Coal Co. Ltd.	Akabira, Hokkaido Prefecture	670
Do.	Taiheiyo Coal Mining Co. Ltd.	Kushiro, Hokkaido Prefecture	2,000
Cooper:			
In concentrate	Hanaoka Mining Co. Ltd. (subsidiary of Dowa Mining Co. Ltd.)	Hanaka, Akita Prefecture	7
Do.	Shin Kamaishi Mining Co. Ltd. (subsidiary of Nittetsu Mining Co. Ltd.)	Kamaishi, Iwate Prefecture	2
Refined	Hibi Kyodo Smelting Co., Ltd.	Tamano, Okayama Prefecture	163.2
Do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	187.2
Do.	Nippon Mining Co. Ltd.	Hitachi, Ibaraki Prefecture, and Saganoseki, Oita Prefecture	330
Do.	Onahama Smelting and Refining Co. Ltd.	Onahama, Fukushima Prefecture	234
Do.	Sumitomo Metal Mining Co. Ltd.	Besshi, Ehime Prefecture	210
Gold:			
In concentrate kilograms	Mitsui Kushikino Mining Co. Ltd	Kushikino, Kagoshima Prefecture	200
Do.	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	Nippon Mining Co. Ltd.	Hitachi, Ibaraki Prefecture	15,000
Do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	30,000
Limestone	Mitsubishi Materials Corp.	Higashitani, Fukuika Prefecture	10,000
Do.	Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture, Onoda- Tsukumi and Nittetsu-Tsukumi, Oita Prefecture	28,000
Do.	Sumitomo Cement Co. Ltd.	Shuho, Yamaguchi Prefecture	8,000
Do.	Todaka Mining Co. Ltd.	Todaka-Tsukumi Oita Prefecture	14,000
Do.	Ube Industries Ltd.	Isa, Yamaguchi Prefecture	11,000
Iodine, crude	Ise Chemical Industries Co. Ltd.	Oami-Shirasato, Ichinomya, Misaki, and Hikari, Chiba Prefecture; Kurosaki, Niigata Prefecture; and Sadowara, Miyazaki Prefecture	4.3
Do.	Nippon Natural Gas Industry Co. Ltd.	Minamihinato-Shirako, Koji-Shirako, Yokoshiba, and Narashino, Chiba Prefecture	1.3
Do.	United Resources Industry Co. Ltd.	Chosei and Otaki, Chiba Prefecture	1.8
Lead			7
In concentrate	Hanaoka Mining Co. Ltd.	Hanaoka, Akita Prefecture	
Do.	Kamioka Mining and Smelting Co. Ltd. (subsidiary of Mitsui Mining and Smelting Co. Ltd.)	Kamioka, Gifu Prefecture	2
Do.	Toyoha Mining Co. Ltd. (subsidiary of Nippon Mining Co. Ltd.)	Toyoha, Hokkaido Prefecture	10
Refined	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33.6
Do.	Mitsbishi Cominco Smelting Co. Ltd.	Naoshima, Kagawa Prefecture	42
Do.	Mitsui Mining And Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43.8
Do.	Nippon Mining Co. Ltd.	Saganoseki, Oita Prefecture	36
Do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	94.8

TABLE 4—Continued

JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Manganese:			
In electrolytic dioxide	Mitsui Mining and Smelting Co. Ltd.	Takehara, Toyama Prefecture	25
Do.	Tosoh Corp.	Hyuga, Miyazaki Prefecture	24
Do.	Japan Metals and Chemical Co. Ltd.	Takaoka, Yoyama Prefecture	18
Nickel:			
In ferronickel	Hyuga Smelting Co. Ltd. (subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	18
Do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	14.4
Do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	42
In oxide	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	36
Refined	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	27.9
Steel, crude	Kawasaki Steel Corp.	Mizushima, Okayama Prefecture, and Chiba, Chiba, Prefecture	16,880
Do.	Kobe Steel Ltd.	Kakogawa Kobe, Hyogo Prefecture	8,300
Do.	NKK Corp.	Fukuyama, Hiroshima Prefecture, and Keihin, Tokyo Prefecture	22,130
Do.	Nippon Steel Corp.	Oita, Oita Prefecture; Yawata, Fukuoka Chiba Prefecture; and Nagoya, Aichi Prefecture	48,800
Do.	Sumitomo Metal Industries	Kashima, Ibaraki Prefecture, and Kokura, Fukuoka Prefecture	22,140
Pyrophyllite	Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.	Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.	Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.	Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.	Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.	Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Titanium, sponge metal	Osaka Titanium Co. Ltd.	Amagasaki, Hyogo Prefecture	13.2
Do.	Showa Titanium Co. Ltd.	Toyama, Toyama Prefecture	3
Do.	Toho Titanium Co. Ltd.	Chigasaki, Kanagawa Prefecture	10.8
Zinc:			
In concentrate	Hanaoka Mining Co. Ltd.	Hanaoka, Akita Prefecture	30
Do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	50
Do.	Toyoha Mining Co. Ltd.	Toyoha, Hokkaio Prefecture	60
Refined	Akita Smelting Co. Ltd.	Iijima, Akita Prefecture	156
Do.	Mitsubishi Materials Corp.	Akita, Akita Prefecture	105.6
Do.	Nikko Zinc Co. Ltd	Mikkaichi, Toyama Prefecture	120
Do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139.2
Do.	Hachinohe Smmelting Co. Ltd.	Hachinohe, Aomori Prefecture	108
Do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90
Do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamauchi Prefecture	84

TABLE 5
JAPAN: DEMAND FOR PRIMARY ALUMINUM, BY SECTOR

(Thousand metric tons)

Sector	1990	1991	1992
Aluminum rolling	1,875	1,916	1,817
Aluminum casting	126	126	126
Aluminum diecasting	38	37	31
Other casting and diecasting	5	6	5
Wire and cable	72	85	87
Steel deoxidization	39	40	35
Tubes	11	11	11
Secondary smelting	370	128	106
Other	3	24	25
Total	2,589	2,373	2,243

Source: Japan Alumnum Federation (Tokyo).

TABLE 6
JAPAN: CONSUMPTION OF COBALT, BY END USE

(Metric tons)

End use	1990	1991	1992
Catalysts	417	416	358
Cemented carbides	345	365	294
Magnetic materials	647	632	473
Pipe, plate, and rod wire	405	415	204
Specialty steels	890	896	654
Other	290	291	247
Total	2,994	3,015	2,223

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistic 1992, p. 175.

TABLE 7

JAPAN: IMPORTS OF COPPER IN 1992, BY FORM AND ORIGIN

(Metric tons)

Source	Copper concentrate, gross weight	Copper scrap	Unwrought	
			Unrefined	Refined
Australia	142,833	3,154	—	25,745
Canada	857,489	265	—	823
Chile	619,865	—	1	126,001
Indonesia	502,501	380	—	—
Malaysia	124,654	4,218	—	—
Mexico	14,621	40	—	—
Papua New Guinea	286,964	—	—	—
Peru	45,734	—	29,599	22,843
Philippines	365,032	3,426	—	38,877
Portugal	87,639	—	—	—
South Africa, Republic of	12,799	274	—	13,023
Russia	13,412	238	—	2,853
United States	305,667	20,386	—	52,366
Zambia	—	—		84,714
Other	90,401	27,999	512	3,300
Total	3,469,611	60,380	30,112	370,545

Source: Ministry of Finance (Tokyo). Japan Import and Exports, Commodity by Country, Dec. 1992.

TABLE 8

JAPAN: SOURCE OF MATERIALS USED IN THE PRODUCTION OF COPPER, LEAD, AND ZINC

(Metric tons)

Commodity and/or source	1990	1991	1992
Copper, refined:			
Domestic ore	5,881	6,412	7,866
Imported ore[1]	887,252	961,309	1,038,289
Scrap	60,289	70,873	73,840
Other	54,554	37,689	40,864
Total	1,007,976	1,076,283	1,160,859
Lead, refined:			
Domestic ore	39,041	33,967	29,093
Imported ore	165,840	186,364	189,694
Scrap	7,877	9,124	10,560
Other	48,258	52,261	40,949
Secondary recovery	67,971	50,715	59,865
Total	328,987	332,431	330,161
Zinc, slab:			
Domestic ore	129, 294	138,684	140,609
Imported ore	476,424	501,965	504,470
Scrap	23,283	28,077	32,591
Other	58,460	62,103	51,784
Secondary recovery	44,141	47,909	51,272
Total	731,602	778,738	780,726

[1]Includes blister.

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistics, 1990-92 annual.

TABLE 9

JAPAN: SUPPLY AND DEMAND FOR GOLD AND SILVER

(Gold in kilograms, silver in metric tons)

Item	1991	1992
Gold:		
Supply:		
Domestic production	103,017	107,957
Imports	255,863	194,699
Secondary recovery	108,593	e118,000
Total supply	467,472	e420,656
Demand:		
Demand for industrial use		
Dental and medical	15,499	15,872
Electrical, electronic, and communications apparatus	55,849	45,431
Gold plating	18,249	16,425
Gilding	310	243
Jewelry	106,441	103,979
Decorations and badges	694	429
Pottery porcelain	3,398	3,323
Fountain pens	796	624
Watches	1,614	1,105
Subtotal	202,850	187,431
Demand for industrial arts and crafts	4,111	3,221
Demand for investment and other:		
Private investment	112,651	e106,000
Other	101,131	e105,000
Total domestic demand	420,743	e401,652
Exports	46,729	e49,000
Total demand	467,472	e450,652
Silver:		
Supply:		
Beginning stock	1,396	1,396
Primary metal production	2,149	2,181
Metal imports	855	622
Secondary recovery	126	131
Total supply	4,526	4,330
Demand:		
Silver nitrate for photography	1,796	1,805
Silver nitrate for other uses	260	246
Electric contacts	303	261
Brazing alloy	148	130
Electroplating	127	105
Rolled products	234	225
Jewelry and silverware	109	87
Other	406	403
Total domestic demand	3,382	3,263
Exports	40	225
Total demand	3,422	3,488
Ending stock	1,396	1,180

eEstimated.

Sources: Arumu Publishing Co. Ltd. (Tokyo). Industrial Rare Metals, Annual Review. No. 105, 1992, p. 140-41; Japan Metal Journal (Kobe). V. 23, No. 19, May 10, 1993, p. 9; and Bulletin of Japan Mining Industry Association (Tokyo). Aug. 1993, p. 24.

TABLE 10

JAPAN: CRUDE STEEL PRODUCTION AND RANKING OF THE TOP SEVEN COMPANIES

	Output (million metric tons)		Company ranking in market economy countries	
	1991	1992	1991	1992
Nippon Steel Corp.	28.63	25.10	1	1
NKK Corp.	12.45	10.89	5	5
Kawasaki Steel Corp.	10.91	10.00	8	8
Sumitomo Metal Industries Ltd.	10.90	9.97	9	9
Kobe Steel Ltd.	6.50	5.75	15	17
Tokyo Steel Manfacturing Co. Ltd.	3.66	3.95	33	29
Nisshin Steel Co. Ltd.	3.47	3.37	37	36
Total	76.52	69.03	XX	XX

XX Not applicable.

Source: Metal Bulletin (London). No. 7755, Feb. 11, 1993, p. 21.

TABLE 11

JAPAN: DOMESTIC ORDERS FOR ORDINARY STEEL AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	Ordinary		Specialty	
	1991	1992	1991	1992
Automobiles	11,880	10,887	2,861	2,705
Construction	17,964	15,044	714	605
Conversion and processing	3,720	3,059	3,888	3,493
Electric machinery	3,254	2,505	124	106
Home and office equipment	906	718	244	214
Industrial machinery	2,321	1,809	1,296	1,067
Rolling stock	51	36	26	17
Shipbuilding	2,614	2,750	132	120
Steel dealers	23,070	20,735	1,342	1,135
Tanks and containers	2,371	2,187	35	28
Other	319	282	75	68
Total	68,470	60,012	10,737	9,558

Source: Ministry of International Trade and Industry (Tokyo). Iron and Steel Statistics, monthly, Dec. 1993, pp. 68-69.

TABLE 12
JAPAN: CONSUMPTION OF MANGANESE ORE, BY END USE

(Metric tons)

End Use	1990	1991	1992
Metallurgical-grade manganese:			
Iron and steel sector:			
Ferroalloys	804,547	799,486	665,958
Pig iron	20,916	27,897	19,841
Sinter	22,273	18,146	34,320
Steel	258,711	194,864	215,959
Subtotal	1,106,507	1,040,393	936,078
Other uses	45,194	80,764	62,088
Total	1,151,701	1,121,157	998,166
Ferruginous manganese:			
Iron and steel sector:			
Ferroalloys	138,635	135,065	122,796
Other	1	1	1
Pig iron	80,085	61,921	45,369
Sinter	47,430	49,093	30,284
Steel	126,796	105,865	92,511
Total	392,946	351,945	290,961

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Iron and Steel Statistics, 1991-1992, annual.

TABLE 13
JAPAN: SUPPLY AND DEMAND FOR REFINED NICKEL

(Metric tons)

Item	1990	1991	1992
Supply:			
Beginning stock	12,315	12,123	17,882
Production	22,275	23,659	22,037
Imports[1]	49,125	57,625	33,466
Total supply	83,715	93,407	73,385
Demand:			
Batteries	2,919	3,367	3,334
Catalyst	499	497	546
Coinage	172	371	311
Exports	68	73	88
Galvanized sheet	6,085	5,878	5,682
Magnetic material	3,252	3,226	2,274
Nonferrous alloy	4,912	3,634	3,398
Other	3,695	4,001	3,942
Rolled sheet	958	1,030	648
Specialty steel	43,022	45,494	38,803
Total demand	65,582	67,571	59,026
Ending stock	12,123	17,882	16,055

[1]Included refined nickel ingots, powder, and flakes.

Source: The Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistics, 1992, p. 173.

TABLE 14
JAPAN: IMPORTS OF RARE-EARTH METALS AND COMPOUNDS

(Metric tons)

Item	1990	1991	1992
Rare-earth chlorides	2,003	3,084	2,102
Rare-earth products:			
Cerium oxide	790	2,239	2,454
Lanthanum oxide	249	313	249
Rare-earth metals	180	436	414
Rare-earth compounds	3,774	3,812	3,085
Pyrophoric alloys	383	501	499
Cerium compounds	1,559	593	345
Yttrium oxide	518	428	408

Source: Ministry of Finance (Tokyo). Japan Exports and Imports Commodity by Country, Dec. 1992.

TABLE 15
JAPAN: CONSUMPTION OF RARE-EARTH PRODUCTS AND YTTRIUM OXIDE

(Metric tons)

Products	1990	1991	1992
Cerium oxide	3,350	3,500	3,500
Europium oxide	12	12	12
Lanthanum oxide	440	500	440
Misch metal	230	230	260
Neodymium oxide	650	770	840
Samarium oxide[1]	340	340	250
Other rare earths[2]	120	120	120
Yttrium oxide	290	300	300
Total	5,432	5,772	5,722

[1]Included in other rare earths.
[2]Includes gadolinium oxide, praseodymium rare-earth fluoride, and terbium oxide.

Source: Japan Society of Newer Metals (Tokyo). Newer Metal Industry Quarterly, No. 352, July 15, 1992, p. 29.

TABLE 16
JAPAN: COAL IMPORTS, BY SOURCE

(Thousand metric tons)

	Anthracite		Bituminous			
			Coking		Steam	
	1991	1992	1991	1992	1991	1992
Australia	381	250	33,087	32,206	25,170	26,968
Canada	—	—	16,962	14,081	1,325	1,407
China	1,094	1,336	1,595	1,581	2,808	3,317
Colombia	—	—	152	147	152	119
Indonesia	—	—	493	885	2,026	4,246
Korea, North	481	297	—	—	—	—
New Zealand	—	—	416	417	—	28
South Africa, Republic of	62	119	3,345	3,340	1,802	2,453
United States	—	—	9,765	9,061	2,079	2,165
Russia	145	56	3,539	2,693	2,264	1,552
Vietnam	239	340	—	—	—	—
Other	—	—	—	57	—	—
Total	2,402	2,398	69,354	64,468	37,626	42,255

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Production, Supply and Demand of Petroleum, Coal, and Coke, 1992, pp. 152-155.

TABLE 17
JAPAN: COAL CONSUMPTION, BY SECTOR

(Thousand metric tons)

Sector	1990	1991	1992
Manufacturing:			
Cement, ceramics, other	18,196	19,004	19,142
Of which:			
Domestic	472	166	22
Imported	17,724	18,838	19,120
Coke	5,133	5,006	5,035
Of which:			
Domestic	127	100	—
Imported	5,006	4,906	5,035
Iron and steel	63,875	65,126	60,266
Of which:			
Domestic	292	135	—
Imported	63,582	64,992	60,266
Utilities:			
Electric power	25,472	28,239	31,577
Of which:			
Domestic	8,780	8,313	7,629
Imported	16,691	19,926	23,950
Gas	725	556	554
Of which:			
Domestic	163	3	—
Imported	562	553	554
Other	565	575	203
Of which:			
Domestic	520	481	170
Imported	45	94	33
Total consumption	113,966	118,506	116,777
Of which:			
Domestic	10,354	9,197	7,819
Imported	103,611	109,309	108,958

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Production, Supply Demand of Petroleum, Coal, Coke, 1992, pp. 146-147 and pp.156-157.

TABLE 18
JAPAN: RESERVES OF MAJOR MINERALS, 1992

(Thousand metric tons unless otherwise specified)

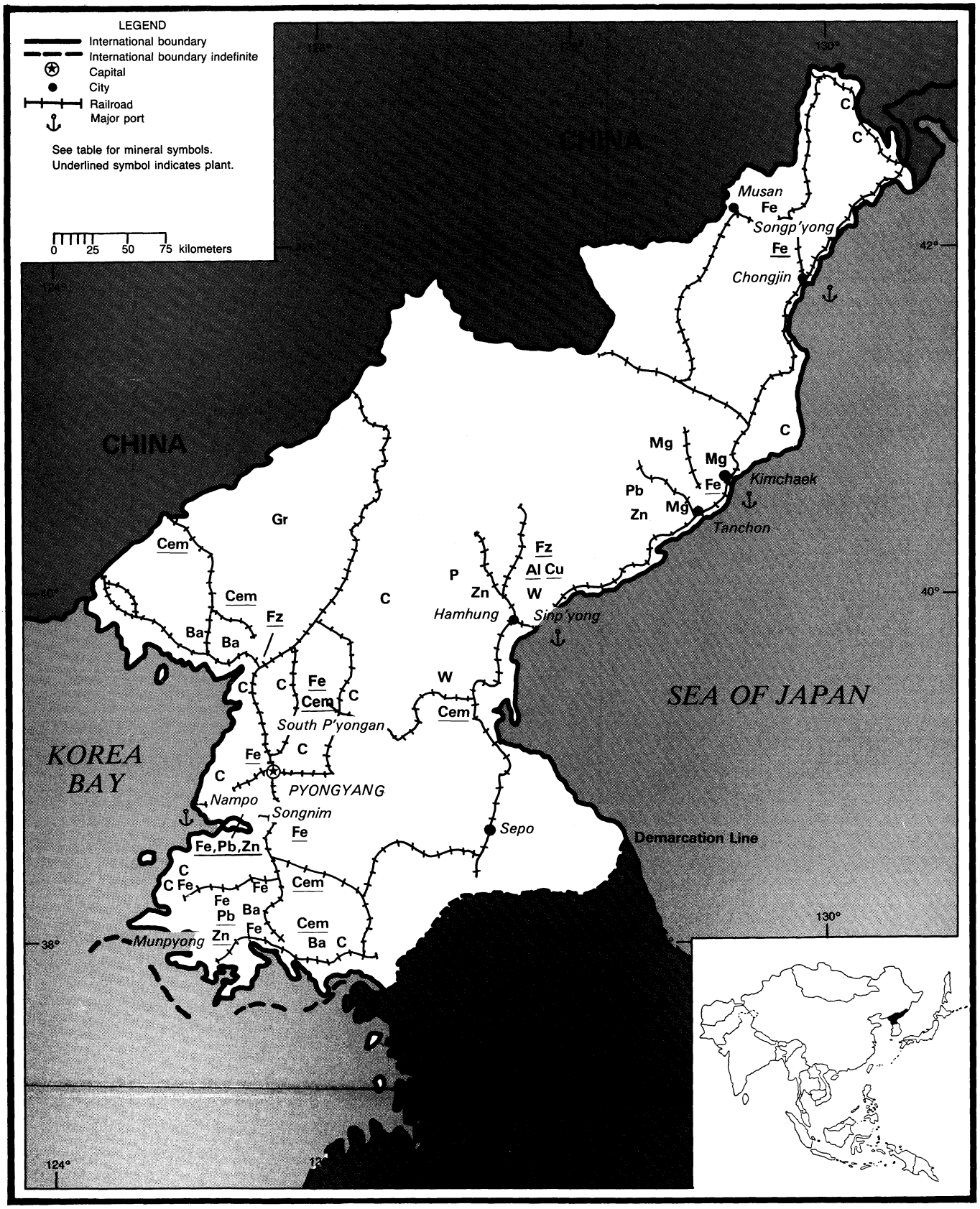
Commodity	Reserves
Coal	7,000,000
Copper ore, content	211
Dolomite[1]	1,197,662
Gold ore, content kilogram	558,000
Iodine	e1,800
Lead ore, content	649
Limestone[2]	57,814,046
Pyrophyllite	205,552
Silica stone[3]	1,327,192
Silica sand[4]	357,292
Zinc ore, content	3,351

eEstimated.
[1]Average ore grade is 17.9% MgO.
[2]Average ore grade 54.2% CaO.
[3]Average ore grade is 87.9% SiO_2.
[4]Average ore grade is 73.1% SiO_2.

Sources: Ministry of International Trade and Industry: Agency of Natural Resources and Energy.

NORTH KOREA

AREA 120,540 km² **POPULATION 22.2 million**



THE MINERAL INDUSTRY OF

NORTH KOREA

By Chin S. Kuo

North Korea suffered a severe economic crisis in 1992 and had to depend on neighboring countries for oil and other goods. The country had no hard currency for purchases and already was in arrears on its $4 billion[1] foreign debt. GNP shrank 7.6% in 1992 to $21 billion, its third straight year of contraction, compared with 5.2% in 1991 and 3.7% in 1990.

Trade also fell 43% to $2.7 billion, due mainly to the demise of the former U.S.S.R. The country's imports outpaced its exports, resulting in an increasing trade deficit of $6 billion during the third 7-year economic plan (1987-93). China was North Korea's largest trading partner, followed by Japan, the former U.S.S.R., and Iran. Because of a sharp decrease in oil imports from Russia, North Korea experienced a severe fuel shortage. Meanwhile, China demanded cash payments for petroleum products that North Korea imported, beginning in 1993. Bilateral trade between North Korea and Japan totaled $500 million per year in 1992. The trade between North Korea and the Republic of Korea amounted to $169 million for 9 months in 1992: North Korea imported $10.2 million worth of goods from and exported $158.6 million worth to the south.

North Korea invited foreign companies to invest in 18 projects with an estimated total cost of $100 million. Free special economic zones were expected to be set up as a major industrial and trade complex in Rajin and Sonbong, along the northeastern coast in North Hamgyang Province, as part of the Tumen River basin project under the United Nations Development Program. Foreign-owned companies were to be permitted to trade in the special zones. As an incentive for foreign investors, corporate tax in the zones was to be reduced by 10% to 15%. As part of the program to develop the infrastructure in the zones, a port was to be constructed at Sonbong with a handling capacity of up to 50 Mmt/a.

Considerable geologic work resulted in the discovery of more than 20 new mineral deposits. A magnesite deposit was prospected in Hochon, South Hamgyong Province. A phosphate rock deposit with a thickness of 10 to 20 m and a resource of 1 Mmt was found at Sinhung on the east coast. Anthracite of good quality and large quantity was discovered in Chagang Province. Other mineral deposits, such as rare earths and precious metals, also were found in the Provinces of North Hamgyong, Kangwon, South Hwanghae, Yanggang, and North Pyongan. Projects were being formulated to develop these deposits.

North Korea's mineral industry produced 7 Mmt/a of steel, 85 Mmt/a of coal, 13.5 Mmt/a of cement, and 5.6 Mmt/a of chemical fertilizers. In addition, the country generated 28,000 MW of electricity in 1992, compared with 50,000 MW the year before. However, industrial productivity was only 40% to 50% of capacity for most plant operations because of the power shortage. Steel mills were often idle due to frequent power cuts.

The Musan mining complex is the country's largest iron ore producer. Construction of its Mine No. 5 was near completion for the production of iron ore. The Chollima steel complex was maintaining a high and steady rate of production in pig iron and steel for the year. The Kimchaek iron complex greatly increased its output, whereas the Hwanghae iron complex and the Songjin steel complex slightly increased production.

North Korea resumed iron ore exports to Japan after a break of 17 years. Sumitomo Metal Industries Ltd. purchased 14,000 tons of iron ore through Meiwa Trading Co. and an intermediary. Before 1975, the country had exported about 500,000 mt/a to Japan.

In April, North Korean silicomanganese was exported to Japan for the first time. It is likely that North Korean silicomanganese will continue to be shipped to Japan. However, Japanese ferroalloymakers met to work out a counterplan to the North Korean imports. During the year, the Ministry of Mining and ethnic Korean Japanese set up two joint-venture companies engaged in mining. These were the Unsan Joint Venture Youth Mine Sagok Gallery and Chisong Gold Mine Joint Venture Co.

A mine with a large deposit of high-grade nonferrous metal ore was developed in Samsu. The mine was reported to have a dressing capacity of 100,000 mt/a of ore and several pits that were equipped with modern mining equipment. At the Komdok mining complex, a belt conveyer of 12 km, a dressing plant with a capacity of 10 Mmt/a, and a crushing ground with a capacity of 1 Mmt were built during the year.

The cement complexes and plants under the Ministry of Building Materials Industry increased production. The Chonnaeri cement complex was operating at full capacity, and the Haeju cement plant increased output drastically.

Salt output grew gradually on the east and west coasts over the past 5 years. Hundreds of hectares of salt fields was established, and a modern automated salt plant with an area of 24,000 m^2 was

being built in Hamhung on the east coast.

Coalfields of South Pyongan Province produced more than 60% of the country's coal output. They included the Anju, Kaechon, Pukchang, Sunchon, and Tokchon coal mining complexes. The Anju coal mining complex is in an area having an estimated coal reserve of 2,260 Mmt. Two large cutting areas were developed to produce 650,000 mt/a of coal and two cutting faces to yield 300,000 mt/a. The Sunchon and Pukchang coal mining complexes increased coal production as a result of the introduction of new conveyor systems. In 1992, the 8th February Chikdong Youth Coal Mine was commissioned; it has a production capacity of 250,000 mt/a.

In Hamhung's Hungnam District, soot briquets were produced as an alternative fuel that was as good as high-caloric anthracite. Soot briquets were made by adding a small amount of mud and sawdust to coal dust.

North Korea expressed its willingness to consider a plan for a trans-Siberian project to build a gas pipeline through North Korea that would link Russian Siberia with the Republic of Korea.

The Government was increasing its investment in power-generating capacity. Ten large thermal and hydropower plants were under construction in Pyongyang, Haeju, Sariwon, Nyongwon, and other areas. Numerous small hydropower stations were being built in areas with rivers and streams, including Yanggang, Chagang, and South Hamgyong Provinces. To meet increased demand for electricity, some powerplants were operated at full capacity. However, chronic power shortages still existed for the industries in the country.

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[1]Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W2.13 = US$1.00 for 1992.

TABLE 1

NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992
METALS						
Aluminum metal ingot, primary		10,000	10,000	—	—	—
Cadmium metal, smelter		100	100	100	100	100
Copper:						
Mine output, Cu content		12,000	12,000	15,000	15,000	16,000
Metal:						
Smelter:						
Primary		24,000	25,000	25,000	20,000	21,000
Secondary		5,000	5,000	5,000	5,000	5,000
Total		29,000	30,000	30,000	25,000	26,000
Refined:						
Primary		24,000	25,000	25,000	19,000	20,000
Secondary		10,000	10,000	10,000	5,000	5,000
Total		34,000	35,000	35,000	24,000	25,000
Gold, mine output, Au content	kilograms	5,000	5,000	5,000	5,000	5,000
Iron and steel:						
Iron ore and concentrate, marketable:						
Gross weight	thousand tons	9,000	9,500	10,000	10,000	10,500
Fe content	do.	4,200	4,400	4,700	4,700	4,900
Metal:						
Pig iron	do.	6,500	6,500	6,500	6,500	6,600
Ferroalloys, furnace type unspecified	do.	120	120	120	120	120
Steel, crude	do.	6,800	7,300	8,000	8,000	8,100
Lead:						
Mine output, Pb content		90,000	80,000	80,000	80,000	75,000
Metal:						
Smelter, primary only		64,000	65,000	65,000	70,000	65,000
Refined:						
Primary		64,000	70,000	70,000	75,000	70,000
Secondary		6,000	5,000	6,000	5,000	5,000
Total		70,000	75,000	76,000	80,000	75,000
Silver, mine output, Ag content	kilograms	50	50	50	50	50
Tungsten, mine output, W content		500	500	1,000	1,000	1,000
Zinc:						
Mine output, Zn content		225,000	230,000	230,000	200,000	200,000
Metal, primary		210,000	210,000	200,000	175,000	175,000
INDUSTRIAL MINERALS						
Barite		100,000	100,000	100,000	100,000	100,000
Cement, hydraulic	thousand tons	12,000	16,000	16,000	16,000	17,000
Fluorspar		40,000	40,000	40,000	41,000	41,000
Graphite		25,000	35,000	35,000	35,000	38,000
Magnesite, crude	thousand tons	1,500	1,500	1,500	1,600	1,600
Nitrogen, N content of ammonia	do.	500	500	500	550	550

See footnotes at end of table.

TABLE 1—Continued

NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

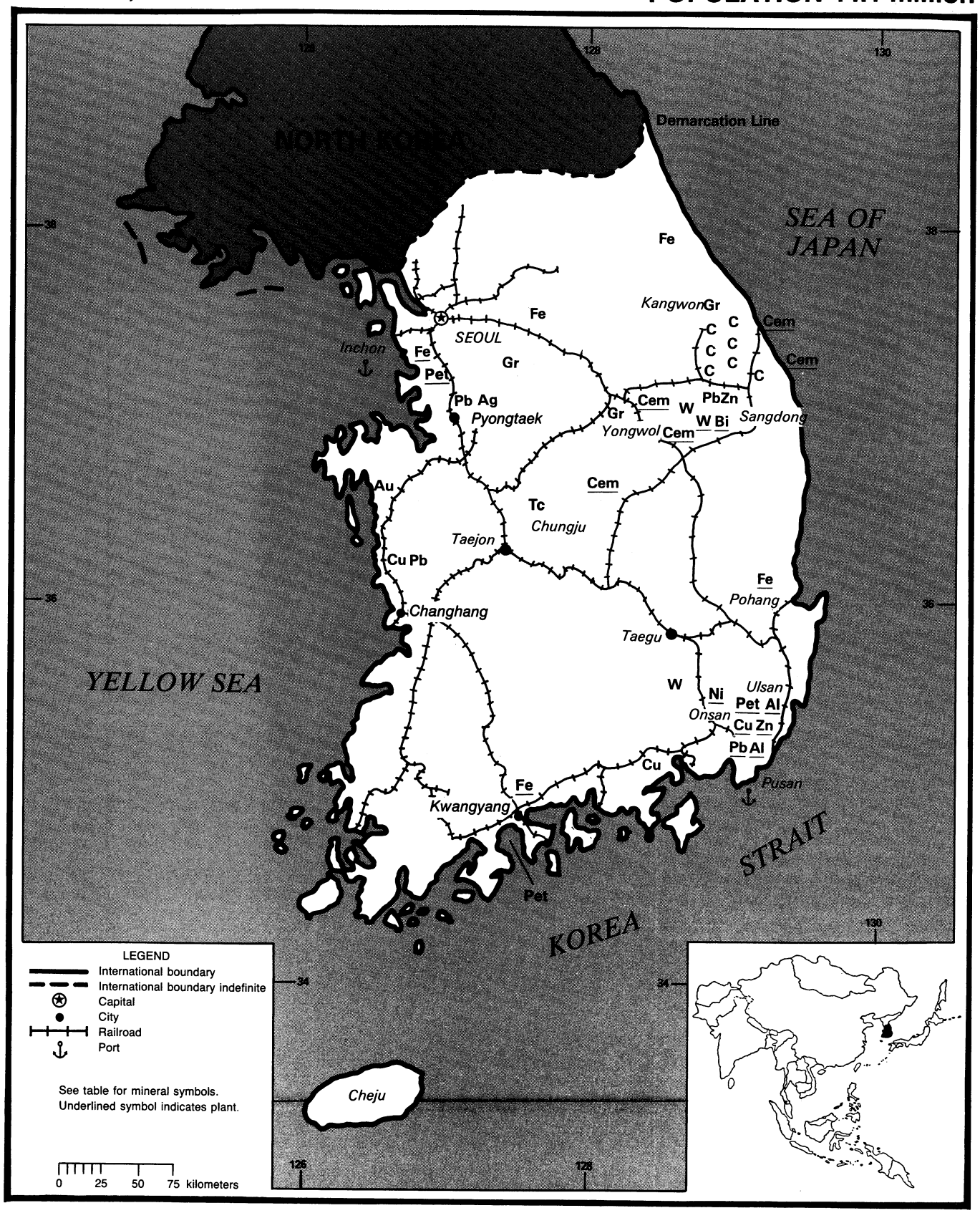
Commodity[2]		1988	1989	1990	1991	1992
INDUSTRIAL MINERALS—Continued						
Phosphate rock		500,000	500,000	500,000	500,000	500,000
Salt, all types		570,000	570,000	580,000	580,000	590,000
Sulfur	thousand tons	230	230	230	240	240
Talc, soapstone, pyrophyllite		100,000	100,000	170,000	170,000	170,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	62,000	65,000	68,000	70,000	70,000
Lignite	do.	18,000	20,000	22,000	20,000	21,000
Total	do.	80,000	85,000	90,000	90,000	91,000
Coke	do.	3,000	3,000	3,000	3,000	3,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	8,000	8,300	8,500	8,400	8,500
Jet fuel and kerosene	do.	1,700	1,800	1,800	1,700	1,800
Distillate fuel oil	do.	7,400	7,700	7,800	7,6001	7,800
Residual fuel oil	do.	4,100	4,200	4,200	4,100	4,200
Refinery fuel and other products	do.	2,100	2,200	2,200	2,200	2,300
Total	do.	23,300	24,200	24,500	24,000	24,600

[1]Table includes data available through Aug. 31, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel and other varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

REPUBLIC OF KOREA

AREA 98,480 km² **POPULATION 44.1 million**



THE MINERAL INDUSTRY OF THE

REPUBLIC OF KOREA

By Chin S. Kuo

The country's gross national product grew at 4.7% in 1992, the lowest in a decade, down from 8.4% in the previous year. Because of credit tightening to cool the economy, interest rates and inflation had been cut by more than one-half. Per capita income rose to $7,135.[1] Manufacturing and service sectors continued to grow at rates in line with the overall growth. However, the construction industry recorded 1% growth because of new restrictions on building and limited funds for property development. Mine development and plant construction were at a standstill.

The major mineral industry in the Republic of Korea is steelmaking and oil refining. In the mining sector, anthracite coal mining was most active during the year, followed by iron ore mining and limestone quarrying.

Korean companies continued to invest heavily abroad, particularly in Southeast Asian countries, for raw material requirements. Korean and Japanese firms were to take a majority stake in Haneda Corp., a Philippine aluminum and zinc diecaster. Haneda Diecast Corp. of the Republic of Korea was to have a 32% stake, while Japan Asean Investment was to buy a 11% stake.

Poongsan Corp. (39%), Hyosung Corp. (10%), and P.T. Continental (51%) formed a joint-venture company, P.T. Continental Poongsan Hyosung Metal, to construct a plant in Cibinong, Indonesia, and to produce brass rod antennae for electric appliances and automobiles. The plant was to have a production capacity of 12 million units annually and receive brass strip from Poongsan's Onsan plant at an initial demand of 1,000 mt/a.

Korean International Cooperation Agency was to help set up a gold exploration project on the 250-ha Panaon Island, southern Leyte, in the central Philippines. Geological and geochemical exploration was due to start in September.

Pohang Iron and Steel Co. Ltd. (Posco), Kangwon Industries, and Pusan Steel Pipe signed agreement with Vietnam Steel Corp. (VSC) to set up two joint ventures. Posco (25%) and Kangwon (25%) teamed with VSC to form a 50-50 joint venture to construct a 200,000-mt/a, $100 million electric furnace mill near Haiphong, Vietnam, for the production of rebars, wire rods, and other products. Construction work was to begin by September 1994, and commissioning was expected to be in October 1996. Posco (15%) and Pusan Steel Pipe (35%) agreed with VSC (50%) to form another joint venture to construct a 45,000-mt/a, $8 million welded pipe plant near Hanoi. Posco also agreed with VSC to triple the production capacity of Posvina, a joint-venture galvanized sheet plant near Ho Chi Minh City, to 30,000 mt/a.

In Myanmar, Posco formed a joint venture with Myanmar Metal Industries to renovate a steel plant. Posco was to supply rod for wire drawing and cold-rolled sheet for galvanizing.

Korea Petroleum Development Corp. signed a new 25-year production-sharing contract with PetroVietnam for the Korean company to take one-half of the output of an offshore block in southeast Vietnam. The block was estimated to contain 620 Mbbl of oil.

GOVERNMENT POLICIES AND PROGRAMS

Effective April 1, foreign firms will not need a permit for investments in projects valued at less than $20 million and foreign financial institutions, including banks and insurance companies, may invest directly in domestic venture-capital companies.

The Ministry of Trade and Industry planned to earmark $6.6 million in financial support for research and development projects for the country's iron and steel industry. The Ministry also was to accord tax favors for research and development projects in a move to help strengthen the international competitiveness of the Korean steel industry. A 60% tariff reduction was to be granted for the import of plant automation equipment by steelmakers for introduction to their works.

To stimulate greater competition with foreign suppliers, the tariff rate on lead and zinc ingot imports is to be gradually reduced from 9% in 1992 to 7% in 1993 and to 5% thereafter.

PRODUCTION

Crude steel production continued to grow at 8%, while pig iron output grew more moderately at 4.4%. Domestic iron ore production remained about 0.25 Mmt. Cement production for 1992 was estimated to be 42.7 Mmt. Limestone output reached 60 Mmt, surpassing previous levels of production.

TRADE

The country and North Korea agreed in principle that inter-Korean trade should be exempted from tariffs and that direct air, land, and sea transportation channels should be used for trade instead of intermediaries in China and Hong Kong.

The initial direct barter deal was made between the country's Lucky-Goldstar International Corp. and North Korea's Yongnam Chemical Co. Lucky-Goldstar delivered 2,100 color television receivers and 200 tons of polyethylene film to the

North's port of Nampo, while about 20,000 tons of North Korean anthracite arrived at the South's port of Inchon.

Commodity trade between the two countries included polyester textiles and polystyrene resin to the North and cement, frozen conch, gold ingots, and zinc ingots to the South.

STRUCTURE OF THE MINERAL INDUSTRY

The Government, through its Ministries of Trade and Industry and Energy and Resources, owns and controls most of the country's large, mineral-related enterprises. Some state-owned companies have gradually gone public, and part of the Government interest has been transferred to private investors' hands. Right now, Posco is only 35% owned by the Government.

Because of mine shutdowns, the number of persons employed in the mining sector decreased considerably. Coal miners were still the largest group, accounting for 75% of mine employees, followed by persons in other areas of mining at 19% and metal ore miners at 6%. The mining sector is dominated by male miners who accounted for 93% of the workers in 1992.

COMMODITY REVIEW

Metals

Aluminum.—Sam Yang Metal Co. awarded a contract, valued at $20 million, to Tippins of the United States for the design and manufacture of a new rolling mill complex to be located north of Taegu and to produce aluminum coils in a variety of alloys. The contract work was scheduled to be completed in late 1992.

Aluminium of Korea (Koralu) reached an agreement with Nippon Light Metal (NLM) for the latter to import and market in Japan cold-rolled aluminum sheet produced at Koralu's new rolling mill in Ulsan. The mill, with a capacity of 100,000 mt/a, was expected to be commissioned by yearend. Most of the sheet was to be sold primarily to Japanese foil producers with NLM acting as import agent because NLM does not produce foil itself.

Korea General Chemical Corp. awarded a $225 million contract to Kaiser Engineers Australia to build a 215,000-mt/a aluminum hydroxide plant in Mokpo, 350 km south of Seoul. It was expected that the plant would come on-stream by mid-1995. Comalco Ltd. was to supply all the bauxite feed stock from its Weipa Mine in north Queensland at between 400,000 and 500,000 mt/a.

Copper.—Poongsan Corp., the largest copper and copper alloys producer with a domestic market share of 80%, was increasing production capacity for sheets and strips at its Onsan plant from 120,000 to 180,000 mt/a. The company also was boosting capacities for bronze sheets and strips from 20,000 to 36,000 mt/a and for copper pipe from 30,000 to 60,000 mt/a. Poongsan has no smelting capacity and buys copper cathode from domestic suppliers, such as Lucky Metals, and imports the rest.

Meanwhile, PMX Industries, Poongsan's U.S. subsidiary, opened a 120,000-mt/a copper and copper alloy sheets and strips plant in Cedar Rapids, Iowa. The plant was expected to be fully operational in 1994. Poongsan's (49%) and Padaeng Industry Co.'s (51%) joint-venture company, Padaeng Poongsan Metals, began test operations on a new 15,000-mt/a brass plant in Chon Buri, Thailand in August.

Hyosung Corp., a Seoul-based trading company, was finalizing a deal with North Korea's Nampo Smelter to toll smelt 10,000 tons of copper concentrates bought from suppliers in Chile and elsewhere. In return, Hyosung was to receive 3,000 tons of standard-grade cathode for use by alloymakers such as Poongsan Corp. The country imported about 130,000 tons of copper cathode from the North.

Iron and Steel.—Posco, a 35% state-owned company, completed construction of the fourth blast furnace at Kwangyang in October, adding another 3.3 Mmt/a to its capacity. This final phase of expansion boosted Posco's raw steel production capacity to 21 Mmt/a and its share of the country's total steel output to 70%. The new 3,800-m^3 furnace was built by Davy McKee and Korea Heavy Industries. Other components in the expansion program include a new conticaster to supply slab for the 3.5-Mmt/a No. 3 hot-strip mill, a third 250-ton LD converter from Voest Alpine and Hyundai Heavy Industries, and a new 1.22-Mmt/a cold-rolling mill, which raises the company's total cold-rolling capacity to 5.9 Mmt/a. The country's total raw steel output in 1992 reached 27.1 Mmt against an estimated demand of 35.4 Mmt leading to a shortfall of 8.3 Mmt.

In line with the expansion program, Posco planned to buy more Latin American iron ore. Currently, the company bought 10 Mmt/a of ore from the region, representing 38% of its total requirements. In 1993, the purchases were to increase to 11.2 Mmt/a, coming from Brazil, Chile, and Peru.

Posco promoted a plan to expand semifinished steel imports from North Korea, which were to be bartered for its finished steel products. North Korea could ship hot coils, chrome, and scrap to the South, while Posco could ship galvanized sheet, tinplate, stainless bars, and steel wire ropes to the North. In addition, Posco was considering a steel joint venture inside North Korea and a joint iron and steel research institute between Pohang Engineering College and Kim Chaek Steel Works' engineering school.

Posco reached an agreement to form a 50-50 joint venture with Shanghai No. 10 Iron and Steel Co. to build a 120,000-mt/a electrolytic tinning mill in the Pudong Industrial Complex outside Shanghai. Construction was to start in 1993 with commissioning set for 1995. Posco was to supply 90% of the 123,000 mt/a of blackplate that the $97 million tinplate mill would require. Posco planned to ship 1 Mmt of hot-rolled, cold-rolled, and galvanized steel products to China in 1992 to expand the export market.

Posco also was sought by Shougang Corp. of China to participate on a 50-50 basis in the construction of a 0.5-1 Mmt/a

cold-rolling mill in Qinhuangdao to produce carbon steel. Hot coils from Kwangyang could be shipped to Qinhuangdao within days. Posco had been in need of Chinese coking coal and ferroalloys and China in need of steel processing facilities.

Posco decided to reduce its heavy plate exports in 1992 by 10% as the strong demand from the country's shipbuilders rose to 1.2 Mmt compared with 1.07 Mmt in 1991. Production level of plates was kept at the same as last year's 2.3 Mmt. Exports in 1991 reached 370,000 tons whereas those for 1992 were down to 330,000 tons.

Dongkuk Steel Mill commissioned a new 700,000-mt/a plate mill at Pohang in November 1991. However, output had been cut by 20% in May owing to the continuing slump in the construction industry. The company also operates a 300,000-mt/a plate mill at Pusan. Dongkuk has a total capacity of 1 Mmt/a, of which commercial plate accounts for 70% and heavy plate 30%.

Posco was fighting the U.S. antidumping and subsidy charges made against its exports of hot-rolled coil to the USS-Posco Industries (UPI) rerolling plant at Pittsburg, California. UPI, with a capacity for 1.3 Mmt/a of cold-rolled galvanized and tinplate products, has a hot-rolled raw material requirement of 1.4 Mmt/a. Posco's hot-rolled coil supplies to UPI were currently 900,000 mt/a because of the voluntary restraint agreement. After completion of an expansion program, its availability of hot-rolled coil for sale was to rise to 9 Mmt/a.

Posco expected to ship about 8,000 tons of cold-rolled sheet and coil to Volkswagen de Mexico, accounting for 10% of the plant's need. About 80% of the total shipment was for sheets with the balance being coils. The company was expected to increase its share to 30% in 1994.

Another cold-rolled and coated sheet producer, Union Steel Manufacturing Co., was planning to double color-coated sheet capacity to 200,000 mt/a at its Pusan works. The new line was to begin commercial production by late September 1993. About 40% of the existing line's total output was being exported. The country's total capacity at present is put at 470,000 mt/a.

In 1992, production of small bars climbed by more than 1 Mmt to 6.2 Mmt because mills such as Kangwon Industries, Inchon Iron and Steel, and Dongkuk Steel boosted their output. Meanwhile, domestic small bar demand rose by 7% to about 6 Mmt, leaving a small tonnage for exports. The Government's Office of Supply purchased 1.77 Mmt of steel bars from local minimills, a 16% increase over that of 1991.

Total imports of reinforcing bars for 1992 reached 1 Mmt, while the demand for these products increased to 6.23 Mmt, of which 6 Mmt was covered by domestic production.

Kangwon Industries planned to construct a new beam mill with a capacity of 700,000 mt/a, rising subsequently to 1.2 Mmt/a, through a German plantmaker, Schloemann Siemag. The mill was to produce sheet piling sections; special sections; and heavy sections, including beams, channels, and angles; along with bars and wide flats.

Sammi Steel, a stainless and alloy steelmaker, planned to expand and modernize its Atlas Stainless Steel Div. in Tracy, Quebec, to increase output of sheet, strip, and plate from 80,000 mt/a to 300,000 mt/a by 1995, making it one of the largest stainless steel producers in North America. However, the length of the recession may cause the company to scale back the expansion program.

Sammi Steel's Changwon works was struck by 1,000 trade unionists over claims for an 8.7% wage hike in September. The plant had been producing 250,000 mt/a of cold-rolled stainless steel before the strike. The company had temporarily curbed its imports of stainless hot band from its Atlas subsidiary in Canada. Sammi Steel's Ulsan plant workers had a short strike and decided to return to work. The Ulsan plant's production capacity of 50,000 mt/a was little affected.

Kia Steel Co., a specialty steelmaker, was building a new $500 million plant near Kunsan in southwestern Korea with a capacity of 720,000 mt/a when completed in 1996. Kia Steel has a 22% share of the domestic market, after Sammi Steel, and intends to supply special steel products to Kia Motor Co.

The country's combined special steel capacity after expansion of the four major mills—Kia Steel, Posco, Sammi Steel, and Seoul Steel—was to rise to 1.55 Mmt/a by 1995. Yet the planned output was expected to be 774,000 tons, or 50% of the capacity. In addition, Kangwon Industries was expected to expand its 50,000-mt/a Pohang plant, which produced high-carbon round bars.

Lead and Zinc.—Korea Zinc Co. Ltd. commissioned its lead smelter and refinery with a production capacity of 80,000 mt/a at Onsan in September. The plant uses the QSL process provided by Lurgi of Germany and is designed to handle a variety of raw materials ranging from low-grade residues, mixed concentrates, to high-quality lead concentrates. The country's total capacity of lead was to reach 150,000 mt/a after the completion of the new smelter. The lead production level was increased by 43.5% to 89,000 tons in 1992. Lead demand remained at the same level as that of 1991, about 161,000 tons.

The country's zinc refineries required about 540,000 tons of zinc concentrates in 1992, of which 92% had been imported from Australia, Canada, and Peru. Output of zinc ingot grew by 16.4% to 270,000 tons. However, the growth rate of zinc consumption fell 3% to 261,000 tons, owing to a slowdown in overall activity in construction. Local production was able to meet domestic demand.

Dongbu Corp. teamed up with an Australian partner to explore for lead and zinc deposits in the Canning Basin in Western Australia. The company planned to spend $300,000 over 3 years in any mine development project that resulted from the exploration program. It is to provide zinc ingot for Dongbu Steel's galvanizing lines.

Samsung Group, Hyungdai Corp., and another Korean partner were negotiating with China National Nonferrous Metals Industry Corp. on a $60 million project to

exploit zinc resources in China's Gansu Province. Feasibility studies were currently being conducted on the construction of a new lead and zinc mine.

Tin.—Lucky Metals ceased operations at its 1,000-mt/a Changhang tin smelter near Kunsan owing to low market prices, falling tariffs, and depressed domestic demand. The company also had difficulties in obtaining tin concentrate from countries such as China and Malaysia. The output at Changhang met about 16% of the country's annual tin demand. On the other hand, Alpha Korea, a subsidiary of Alpha Metal of the United States, planned to build a new plant in the country to produce cream solders beginning in October.

Hyundai Resources Development formed a 50-50 joint venture with Dalgeologia Co. of Khabarovsk, Russia, to develop a tin deposit of the Pravourmy Mine near this far eastern city. Estimated ore reserves at the mine were put at 50 Mmt and the tin grade at 0.5% with some copper. Annual mine output was to be 1 Mmt of ore, or 5,000 tons of metal. The ore was to be transported to the Solnechny copper smelter near Komsomolsk, which also had tin concentrating facilities. Much of the tin concentrate could be exported to the Republic of Korea and countries in Southeast Asia, and some could also be sent to the tin smelter at Novosibirsk in south-central Russia.

Tungsten.—Korea Tungsten Mining Co. Ltd. shut down its Sangdong Mine in May because of fierce competition from China, depressed demand, and low market prices. The company reduced output to 800 tons of metal in 1991. Although the mine was on care and maintenance, Korea Tungsten continued to source its feed from imports and inventory to produce ammonium paratungstate and other tungsten products. Domestic consumption had been about 2,000 mt/a.

Industrial Minerals

Cement.—Tongyang Cement Corp. was to have a second kiln line installed at its Samchok works with a capacity of 7,200 mt/d, increasing total production to 5 Mmt/a of portland cement. Meanwhile, a new kiln line at the Dangyang works of Sung Shin Cement Co. Ltd. was to go into operation in early 1993. Both were installed by Krupp Polysius of Germany.

The combined production capacity of slag cement was expected to range between 3.4 and 3.6 Mmt/a because of expansions and new plants. Slag cement comprises ordinary cement and waste slag from the ironmaking process. Cement companies producing this product have all opted to build their plants at Kwangyang.

Talc.—The country has about 37 Mmt of talc reserves and was expected to be a consuming market rather than a major exporter. Domestic production remained at the level of 160,000 mt/a. Talc consumption was projected to be 430,000 tons in 1996, requiring an import of 270,000 tons.

Titanium Dioxide.—A 60,000-mt/a titanium dioxide facility was being built under a joint venture between Hanyang Chemical Corp. and E.I. du Pont de Nemours & Co. Inc. of the United States. The new plant, at Ulsan, was expected to be completed in 1996.

Mineral Fuels

Dependency of imported energy increased to 92.9% of total consumption. Consumption reached 114.15 Mmt of oil equivalent, of which 106 Mmt of oil equivalent was imported.

Liquefied Natural Gas (LNG).—Korea Gas Co. signed a memorandum of understanding with Indonesia's Pertamina to buy 500,000 tons of LNG in 1992 and 800,000 tons in 1993. Under an agreement signed in 1991, Korea Gas was to buy 4 Mmt of LNG beginning in 1994.

Petroleum.—The country's total oil refining capacity was 1.075 Mbbl/d. There were plans to add 100,000 bbl/d of new capacity. For future expansion of capacity, Honam Oil Refinery Co. Ltd. received Government approval to build another refinery with a capacity of 220,000 bbl/d.

Honam Oil Refinery Co. Ltd. was to use Stone and Webster technology for a 50,000-bbl/d residue refining unit at Yeochun. The largest unit of its kind in the Republic of Korea was due to start up late in 1994.

The country's petroleum reserves were to be boosted to the equivalent of 90 days of consumption while buffer stock was to be lifted from 34 days of consumption to 60 days. The Government was to spend $730 million on building seven oil storage tanks, starting in 1993, to boost reserves from 40 to 87 Mbbl by 1998.

In the first stockpile of its kind in Asia, Saudi Arabia might be allowed to store 40 Mbbl of crude oil in the Republic of Korea and the stockpile could be built to be operational in 1997.

Reserves

The Republic of Korea is a mineral resource-poor country. Anthracite coal is the most important mineral commodity. Indigenous metallic minerals include ores of lead and zinc and tungsten. The mining of the latter has ceased because of market competition and world prices. Several industrial minerals with a large share of world production include diatomaceous earth, feldspar, graphite, mica, pyrophyllite, and talc.

INFRASTRUCTURE

The country's current power generating capacity stood at 21.2 MkW. The transport system is well developed and very efficient. The Government runs the railroads, which have a total length of 3,110 km. National highways measure 13,400 km, while provincial and local roads total 49,500 km. Expanded road and rail links around Seoul and Pusan were planned. The country's port facilities are adequate for raw material

shipment as well as product export. Kwangyang Port serves to handle iron ore for Posco, whereas Pyongtack Port is used as an LNG import terminal. Pusan is the largest port among a total of 11, and Inchon is the largest on the west coast. Infrastructure development is important to future export competitiveness of the country's economy.

OUTLOOK

Domestic demand for steel products is likely to decrease and exports of steel products are expected to increase. Steel-consuming industries except automobile and construction are expected to show an decrease in demand for long products and plate because of recession. However, increased demand from China for reinforcing bars, cold-rolled sheets, and galvanized sheets is expected to continue in 1993.

Completion of Kwangyang expansion and additional capacity brought to the minimills will push the country's crude steel production to 32 Mmt in 1993. The 1993 capital investment in the steel industry is likely to fall by 30% owing to the gloomy prospects for the steelmakers and the rising costs of those investments. Steel producers will face the task for survival by improving quality and customer services, developing new products, bringing down production costs, and finding solution to the steel trade issue.

[1]Where necessary, values have been converted from Korean won(W) to U.S. dollars at the rate of W783 = $1.00 for 1992.

OTHER SOURCES OF INFORMATION

Agencies

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TABLE 1

REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Aluminum, primary		17,500	17,500	2,000	e2,000	e2,000
Bismuth metal		132	96	79	42	9
Cadmium, smelter[e]		490	e500	e500	e450	620
Copper:						
Mine output, Cu content		36	4	53	5	e4
Metal:						
Smelter		169,000	179,890	185,563	e202,000	e210,000
Refined, primary		168,334	178,665	e183,000	201,911	209,000
Gold metal	kilograms	11,121	14,270	20,760	20,809	23,263
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	390	334	298	222	222
Fe content	do.	218	187	180	134	134
Metal:						
Pig iron	do.	12,577	14,846	15,339	18,510	[2]19,323
Ferroalloys:						
Ferromanganese		75,924	85,329	84,000	94,893	102,000
Ferrosilicon		8,909	4,582	2,000	18,912	84,000
Other		89,966	101,818	99,000	74,173	e74,000
Total		174,799	191,729	185,000	187,978	e260,000
Steel, crude	thousand tons	19,117	21,873	23,125	26,001	[2]28,054
Lead:						
Mine output, Pb content		14,457	16,535	14,857	12,633	13,628
Metal, smelter		60,799	e60,000	e61,000	40,554	63,000
Molybdenum, mine output, Mo content		144	132	103	144	5
Silver metal	kilograms	226,687	239,214	238,236	264,746	332,791
Tungsten, mine output, W content		2,029	1,701	1,361	780	247
Zinc:						
Mine output, Zn content		21,820	23,202	22,792	22,039	21,883
Metal, primary		223,000	240,184	248,244	254,050	253,000
INDUSTRIAL MINERALS						
Asbestos		2,428	2,361	1,534	e1,500	2,308
Barite		2,573	3,735	r2,923	1,014	40
Cement, hydraulic	thousand tons	28,995	30,474	33,600	34,999	42,650
Clays: Kaolin		832,110	1,219,174	1,446,598	1,755,225	1,856,157
Diatomaceous earth		71,952	75,019	55,445	91,126	76,775
Feldspar		241,511	232,607	237,447	247,969	281,553
Fluorspar, metallurgical-grade		261	856	560	290	70
Graphite:						
Crystalline		678	1,186	r703	1,552	8,412
Amorphous		107,767	100,282	98,987	75,239	e75,000
Total		108,445	101,468	r99,690	76,791	e83,412
Kyanite and related materials: Andalusite		112	19	r—	14	38
Mica: All grades		18,848	7,888	r4,765	5,127	7,732
Nitrogen: N content of ammonia		506,471	480,310	411,287	407,297	442,482
Salt		1,020,000	830,000	616,681	695,804	771,937
Soda ash, manufactured[e]		280,000	280,000	280,000	300,000	300,000

See footnotes at end of table.

TABLE 1—Continued

REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
INDUSTRIAL MINERALS—Continued						
Stone, sand and gravel:						
Limestone	thousand tons	46,377	48,011	48,851	59,221	65,446
Quartzite	do.	1,379	1,554	1,452	1,627	1,870
Sand including glass sand	do.	1,488	1,358	1,408	1,354	1,266
Talc and related materials:						
Pyrophyllite		673,776	770,298	657,611	573,208	602,580
Talc		146,478	162,098	181,600	170,563	149,862
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		183,346	193,358	215,300	231,000	246,000
Coal: Anthracite	thousand tons	24,295	20,785	17,217	14,850	11,970
Coke[e]	do.	5,200	5,500	5,500	5,600	5,600
Fuel briquets: Anthracite briquets		22,926	18,700	18,779	14,996	11,069
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	13,618	18,309	23,984	28,917	30,000
Jet fuel[e]	do.	9,500	9,600	9,600	9,700	9,700
Kerosene	do.	10,619	13,161	13,873	14,523	15,000
Distillate fuel oil	do.	73,504	88,577	94,814	128,379	130,000
Residual fuel oil	do.	r75,000	100,320	98,634	142,443	145,000
Lubricants[e]	do.	7,300	7,400	7,400	7,500	7,500
Other[e]	do.	15,000	16,000	17,000	18,000	19,000
Refinery fuel and losses[e]	do.	4,000	4,000	4,000	4,000	4,000
Total[e]	do.	208,541	257,367	269,305	353,462	360,200

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through June 15, 1993.
[2]Reported figure.

TABLE 2

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkaline-earth metals	—	5	—	
Aluminum:				
Oxides and hydroxides	287	386	—	Nigeria 105; Netherlands 89; Bangladesh 63.
Ash and residue containing aluminum	—	20	—	All to Thailand.
Metal including alloys:				
Scrap	137	409	5	Japan 403; Bangladesh 1.
Unwrought	6,308	1,810	67	Japan 1,529; Indonesia 123.
Semimanufactures	25,392	29,129	307	Hong Kong 10,695; Japan 4,193; Philippines 3,873.
Antimony:				
Oxides	170	176	—	Japan 170; Pakistan 6.
Metal including alloys, all forms	—	21	—	All to Japan.
Arsenic:				
Ore and concentrate, kilograms	—	859	—	All to Taiwan.
Oxides and acids	188	34	—	All to Japan.
Metal including alloys, all forms	—	(2)	—	All to Belgium-Luxembourg.

See footnotes at end of table.

TABLE 2—Continued

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Bismuth: Metal including alloys, all forms		129	90	—	Japan 88; Taiwan 2.
Cadmium: Metal including alloys, all forms		874	669	—	Japan 647; Netherlands 22.
Chromium:					
Oxides and hydroxides		3	3	—	Mainly to Indonesia.
Metal including alloys, all forms	kilograms	—	507	—	All to Indonesia.
Cobalt:					
Oxides and hydroxides		—	1	1	
Metal including alloys, all forms	kilograms	46,000	790	—	Thailand 395; Japan 186; United Kingdom 152.
Columbium and tantalum: Tantalum metal including alloys, all forms	kilograms	69	8	3	Japan 5.
Copper:					
Matte and speiss including cement copper		11,325	5,058	—	China 5,007; Japan 51.
Oxides and hydroxides		—	6	—	All to Japan.
Sulfate		566	191	—	Hong Kong 87; Australia 60; Indonesia 44.
Ash and residue containing copper		—	97	—	All to Japan.
Metal including alloys:					
Scrap		1,919	2,819	14	Japan 2,266; United Kingdom 236; Hong Kong 121.
Unwrought		1,129	151	6	Japan 59; Indonesia 33; China 26.
Semimanufactures		45,063	60,458	300	Hong Kong 21,463; Japan 8,187; India 5,806.
Gallium: Metal including alloys, all forms	kilograms	—	100	—	All to Japan.
Gold:					
Ores and concentrates		—	1,772	—	All to Belgium-Luxembourg.
Waste and sweepings	value, thousands	$172	$211	$30	Japan $180; France $1.
Metal including alloys, unwrought and partly wrought	kilograms	14,374	16,866	34	Hong Kong 9,865; Taiwan 5,850; Singapore 950.
Iron and steel:					
Metal:					
Scrap		39,576	20,328	973	Hong Kong 8,300; Japan 5,525; Taiwan 3,980.
Pig iron, cast iron, related materials		2,981	7,941	—	Japan 7,406; Indonesia 232; India 79.
Ferroalloys:					
Ferromanganese		1,429	6	6	
Ferrosilicomanganese		940	—		
Ferrochromium		250	—		
Silicon metal		—	107	—	Hong Kong 106.
Unspecified		502	—		
Steel, primary forms	thousand tons	331	436	(2)	Japan 195; Indonesia 74; Taiwan 42.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated	do.	3,964	4,282	850	Japan 2,173; Thailand 156.
Clad, plated, coated	do.	1,009	1,081	117	Japan 349; Taiwan 75; Thailand 73.
Of alloy steel	do.	132	161	9	Hong Kong 32; Taiwan 19; Japan 18.
Bars, rods, angles, shapes, sections	do.	779	657	22	Japan 282; Thailand 58; Indonesia 29.
Rails and accessories	do.	311	25	4	Taiwan 8; Japan 5.

See footnotes at end of table.

TABLE 2—Continued

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued:					
Metal—Continued:					
Semimanufactures—Continued:					
Wire	thousand tons	164	198	5	Japan 61; Iran 35; Singapore 21.
Tubes, pipes, fittings	do.	890	879	335	Japan 277; Saudi Arabia 64.
Lead:					
Ore and concentrate		12,350	750	—	All to Japan.
Oxides		2,678	3,727	2	Japan 3,514; Australia 79; Indonesia 72.
Ash and residue containing lead		—	320	—	All to Japan.
Metal including alloys:					
Scrap		2,433	4,067	—	Indonesia 3,537; Japan 380; India 150.
Unwrought		4,635	5,968	—	Japan 4,122; Taiwan 1,367; Indonesia 270.
Semimanufactures		149	221	2	Saudi Arabia 176; Pakistan 17; Philippines 15.
Magnesium: Metal including alloys:					
Scrap		81	93	—	All to Japan.
Unwrought		11	—		
Semimanufactures		175	263	32	Japan 214; Philippines 16.
Manganese:					
Oxides		60	271	—	Japan 230; Sri Lanka 36; Indonesia 5.
Metal including alloys, all forms		2	—		
Mercury	kilograms	—	138	—	All to Bangladesh.
Molybdenum:					
Metal including alloys:					
Scrap		1	—		
Semimanufactures		1	10	—	China 6; Indonesia 3.
Nickel:					
Oxides and hydroxides	kilograms	—	25	—	All to Malaysia.
Metal including alloys:					
Scrap		2,221	7,567	—	All to Japan.
Unwrought		1,330	836	—	Japan 320; Taiwan 309; Australia 149.
Semimanufactures		5	16	4	Hong Kong 8; Taiwan 2.
Platinum-group metals:					
Waste and sweepings	value, thousands	$5,721	$726	—	United Kingdom $576; Japan $100; Hong Kong $49.
Metals including alloys, unwrought and partly wrought, unspecified	kilograms	77	16	14	Japan 2.
Selenium, elemental		—	20	(2)	Japan 15; Hong Kong 2; China 2.
Silicon, high-purity		37	25	14	Japan 6.
Silver:					
Waste and sweepings[3]	value, thousands	$687	$609	—	Japan $515; United Kingdom $82; Hong Kong $12.
Metal including alloys, unwrought and partly wrought	kilograms	100,411	79,700	136	Japan 38,500; Taiwan 16,955; Australia 9,624.
Tin: Metal including alloys:					
Scrap		483	435	—	Japan 348; United Kingdom 83; Libya 4.
Unwrought		170	416	—	All to Japan.
Semimanufactures		116	230	5	Fiji 84; Singapore 68; Iran 47.

See footnotes at end of table.

TABLE 2—Continued

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Titanium:					
Ore and concentrate		136,440	111,135	—	All to Japan.
Oxides		5,563	5,600	144	Japan 3,050; Indonesia 1,088; Bangladesh 290.
Metal including alloys, all forms		25	98	68	Japan 29; Indonesia 1.
Tungsten:					
Ore and concentrate		—	46	34	Netherlands 12.
Oxides and hydroxides		18	34	—	Germany 17; Netherlands 17.
Metal including alloys:					
Scrap		93	340	261	Japan 60; United Kingdom 18.
Unwrought		166	198	—	Japan 194; Germany 5; United Kingdom 5.
Semimanufactures		6	10	(2)	China 6; Indonesia 3.
Vanadium: Metal including alloys, all forms		166	187	—	All to Japan.
Zinc:					
Ore and concentrate		1,456	83	—	All to Malaysia.
Oxides		8,903	12,492	61	Japan 6,074; U.S.S.R. 4,573; Indonesia 632.
Blue powder		1,179	1,201	—	Singapore 460; Hong Kong 241; Japan 125.
Ash and residue containing zinc		280	1,896	—	Japan 1,816; Indonesia 80.
Metal including alloys:					
Scrap		—	20	—	All to Japan.
Unwrought		56,310	27,626	4	Japan 21,000; Taiwan 4,749; Pakistan 1,049.
Semimanufactures		234	202	8	Japan 49; Canada 15; Philippines 13.
Zirconium: Metal including alloys:		—			
Semimanufactures	kilograms	—	581	—	All to Taiwan.
Other:					
Oxides and hydroxides		85	14	—	Australia 6; Taiwan 6.
Ashes and residues		12,119	2,078	—	Japan 1,998; Indonesia 80.
Base metals including alloys, all forms	kilograms	281	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		42	14	3	Taiwan 4; Indonesia 3.
Artificial: Corundum		10	—		
Dust and powder of precious and semi-precious stones including diamond	kilograms	352	1,180	2	Hong Kong 1,178.
Grinding and polishing wheels and stones		2,601	2,088	312	Canada 276; Japan 213.
Asbestos, crude		—	157	—	All to Indonesia.
Boron materials:					
Crude natural borates		—	9	—	All to China.
Oxides and acids		28	4	(2)	Bangladesh 3.
Bromine		2	2	—	All to Taiwan.
Cement	thousand tons	1,740	1,651	29	Japan 1,186; Hong Kong 137; Malaysia 67.
Chalk		29	7	—	Guatemala 6; Philippines 1.
Clays, crude:					
Bentonite		6,119	5,660	—	Thailand 4,725; Japan 572; Taiwan 229.

See footnotes at end of table.

TABLE 2—Continued

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued:					
Chamotte earth		15,104	17,070	—	All to Japan.
Kaolin		37,776	37,660	—	Japan 34,948; Taiwan 1,718; Indonesia 566.
Unspecified		1,491	1,241	12	Taiwan 501; Singapore 376; Sri Lanka 342.
Cryolite and chiolite		6	—		
Diamond:					
Natural: Gem, not set or strung	carats	2,400	2,845	110	India 1,035; Belgium-Luxembourg 700; China 385.
Synthetic	do.	5	7,220	—	All to Thailand.
Diatomite and other infusorial earth		673	183	—	Indonesia 180; Japan 3.
Feldspar		24,571	20,805	—	Taiwan 20,080; Indonesia 5.
Fertilizer materials:					
Crude, n.e.s.		514	1,086	—	All to Japan.
Manufactured:					
Ammonia		16	9	5	Malaysia 1.
Nitrogenous		239,351	296,764	—	Thailand 97,205; Vietnam 78,300; Philippines 68,305.
Phosphatic		11,717	11,200	—	Japan 7,254; Thailand 2,050; Philippines 1,800.
Potassic		89,283	30,517	—	Japan 21,135; Philippines 6,500; Australia 2,702.
Unspecified and mixed	thousand tons	856	776	—	Thailand 423; China 138; Vietnam 117.
Fluorspar		93	47	—	Indonesia 36; Nigeria 11.
Graphite, natural		48,697	29,925	—	Japan 17,224; Taiwan 8,147; Thailand 258.
Gypsum and plaster		11,497	1,387	—	Sri Lanka 1,080; Indonesia 184; Japan 50.
Lime		14	—		
Magnesium compounds: Oxides and hydroxides		133	55	—	Singapore 54; Indonesia 1.
Mica:					
Crude including splittings and waste		5	9	—	Japan 7; Sri Lanka 2.
Worked including agglomerated splittings		309	318	64	Japan 82; Hong Kong 56.
Nitrates, crude		5	—		
Phosphates, crude		—	2	—	All to Malaysia.
Pigments, mineral: Iron oxides and hydroxides, processed		80	959	(2)	Japan 630; Ireland 310; Philippines 18.
Potassium salts, crude		—	1	—	NA.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	64,442	29,154	1,420	Hong Kong 14,353; Japan 12,670.
Synthetic	do.	65,512	70,098	3,365	Thailand 50,635; Japan 5,694.
Quartz crystal, piezoelectric	grams	51,492	233,285	14,220	Ireland 214,365; Japan 4,700.
Salt and brine		40,568	59,621	14,927	Japan 44,523; Macau 100.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		247	22,814	—	Thailand 14,478; Philippines 3,841; Hong Kong 3,428.
Sulfate, manufactured		4	501	—	Dominica 334; Bangladesh 150.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		296,950	266,033	(2)	Japan 258,182; Taiwan 6,720; Indonesia 1,112.
Worked		184,030	171,452	187	Japan 170,040; Singapore 722; Guam 220.
Dolomite, chiefly refractory-grade		348,947	335,617	—	Japan 332,384; Sudan 3,000; Indonesia 233.

See footnotes at end of table.

TABLE 2—Continued

REPUBLIC OF KOREA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Gravel and crushed rock		347	40	—	All to Taiwan.
Limestone other than dimension		1,203	226	—	Indonesia 126; Bangladesh 100.
Quartz and quartzite		3,019	2,323	—	All to Japan.
Sand other than metal-bearing		1,431	413	—	Iran 397.
Sulfur:					
Elemental:					
Crude including native and byproduct		6,402	5,589	—	Indonesia 1,580; Malaysia 1,055; Vietnam 500.
Colloidal, precipitated, sublimed		605	374	—	Japan 240; Indonesia 107; Philippines 18.
Sulfuric acid		90,793	222,232	—	Taiwan 118,807; Philippines 94,572; Australia 5,924.
Talc, steatite, soapstone, pyrophyllite		289,113	278,713	479	Japan 152,205; Taiwan 100,390; Thailand 8,224.
Other:					
Crude		79,118	78,392	—	Japan 48,531; Taiwan 28,315; Costa Rica 2,000.
Slag and dross, not metal-bearing		87,154	89,680	—	All to Japan.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	2	—	All to Indonesia.
Carbon black		43,848	31,291	—	Japan 8,840; Indonesia 8,547; Iran 3,186.
Coal:					
Anthracite		50	7	—	All to Japan.
Bituminous		258	176	—	Thailand 144; Taiwan 32.
Coke and semicoke		7,252	5,199	—	Japan 3,000; Singapore 1,000; Indonesia 600.
Petroleum:					
Refinery products:					
Liquefied petroleum gas	thousand-42-gallon barrels	1,094	1,340	(2)	Japan 958; Hong Kong 255; Indonesia 35.
Gasoline: Motor	do.	733	1,057	(2)	Japan 1,056.
Naphtha	do.	2,466	5,497	241	Japan 5,255.
Mineral jelly and wax	do.	9	25	—	Indonesia 7; Sri Lanka 5; Japan 2.
Kerosene and jet fuel	do.	233	3,464	319	Japan 2,877; India 108; Hong Kong 99.
Distillate fuel oil	do.	10,687	20,969	111	Japan 7,113; Thailand 3,882; Singapore 3,510.
Lubricants	do.	531	471	(2)	Iran 309; Thailand 26; Japan 19.
Residual fuel oil	do.	12,379	39,030	1,018	Japan 12,465; Singapore 11,903; Thailand 4,334.
Bitumen and other residues	do.	28	46	—	Japan 24; Hong Kong 16; Malaysia 3.
Bituminous mixtures	do.	4	5	—	Malaysia 2; Japan 2; Thailand 1.
Petroleum coke	do.	919	1,228	—	Japan 713; Philippines 304; Netherlands 210.

NA Not available.

[1]Table prepared by Amy M. Burk, International Data Section.

[2]Less than 1/2 unit.

[3]May include other precious metals.

TABLE 3

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	101	92	—	Japan 56; France 22; Germany 13.
Alkaline-earth metals	66	78	—	Belgium 39; Ireland 22; Japan 11.
Aluminum:				
Ore and concentrate	34,538	37,396	—	China 16,061; Hong Kong 13,789; Guyana 4,998.
Oxides and hydroxides	115,093	133,454	889	Japan 88,827; Australia 36,150; Germany 6,227.
Ash and residue containing aluminum	142	118	37	Japan 68; Australia 13.
Metal including alloys:				
Scrap	39,577	57,805	38,481	Saudi Arabia 3,910; U.A.E. 2,689; Canada 2,545.
Unwrought	361,926	391,794	32,005	Australia 166,298; Canada 52,667.
Semimanufactures	72,084	93,148	16,226	Japan 26,308; Bahrain 16,333.
Antimony:				
Ore and concentrate	2,326	100	—	All from Hong Kong.
Oxides	505	958	25	Taiwan 382; United Kingdom 260; Japan 143.
Metal including alloys, all forms	2,178	2,976	(2)	China 2,858; Hong Kong 60; Thailand 40.
Arsenic:				
Ore and concentrate	217	105	—	All from Australia.
Elemental	24	31	(2)	China 26; Hong Kong 5.
Oxides and acids	40	—		
Beryllium: Metal including alloys, all forms kilograms	149	172	72	Japan 100.
Bismuth: Metal including alloys, all forms do.	20,755	18,312	9	China 16,253; United Kingdom 2,000; Japan 50.
Cadmium: Metal including alloys, all forms	60	97	34	Hong Kong 41; Japan 22.
Chromium:				
Ore and concentrate	528	501	19	Japan 52.
Oxides and hydroxides	2,799	2,847	629	Japan 1,839; Germany 159.
Metal including alloys, all forms	108	143	5	Japan 123; United Kingdom 7; China 6.
Cobalt:				
Oxides and hydroxides	147	169	59	Belgium 66; Finland 29.
Metal including alloys, all forms	355	654	30	Belgium 286; Zaire 249; Zambia 139.
Columbium and tantalum:				
Ore and concentrate value, thousands	—	r$3	r$3	
Metal including alloys, all forms:				
Columbium kilograms	112	142	57	Japan 85.
Tantalum	2	6	(2)	Japan 5; Austria 1.
Copper:				
Ore and concentrate	368,402	429,317	36,707	Chile 160,506; Papua New Guinea 104,615; Indonesia 40,870.
Matte and speiss including cement copper	8,487	3,530	890	Norway 1,715; Mexico 633.
Oxides and hydroxides	1,379	1,850	1,272	Japan 296; Australia 240.
Sulfate	413	223	(2)	Japan 163; Taiwan 60.
Metal including alloys:				
Scrap	287,313	220,544	77,106	Malaysia 62,626; United Kingdom 16,109.
Unwrought	176,006	199,674	16,485	Chile 65,469; U.S.S.R. 26,659; Chile 24,732.
Semimanufactures	47,729	50,186	1,223	Taiwan 16,638; Japan 2,147.

See footnotes at end of table.

TABLE 3—Continued

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Gallium: Metal including alloys, all forms	kilograms	254	151	1	Japan 150.
Germanium:					
Oxides	do.	117	184	—	Germany 150; Japan 34.
Metal including alloys, all forms	do.	10	15	13	Germany 2.
Gold:					
Ore and concentrate		355	594	—	Peru 368; Colombia 226.
Waste and sweepings	value, thousands	$25	—		
Metal including alloys, unwrought and partly wrought	kilograms	20,407	22,428	841	Australia 17,173; Switzerland 2,404.
Hafnium: Metal including alloys, all forms	do.	56	16	16	
Indium: Metal including alloys, all forms	do.	434	403	101	Japan 127; Peru 124.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	21,154	28,939	(e)	Australia 12,879; Brazil 8,246; India 3,783.
Pyrite, roasted		29,167	9,927	—	All from Philippines.
Metal:					
Scrap	thousand tons	3,876	3,261	2,644	Japan 192; Australia 154.
Pig iron, cast iron, related materials	do.	1,084	1,022	1	U.S.S.R. 364; Malaysia 199; China 160.
Ferroalloys:					
Ferrocolumbium		102	339	—	Brazil 244; Japan 72; France 18.
Ferrochromium		76,931	90,148	8,206	India 15,439; China 8,121; U.S.S.R. 2,559.
Ferromanganese		7,868	9,046	—	China 6,429; Norway 1,103; Costa Rica 660.
Ferromolybdenum		919	879	172	China 337; Chile 101.
Ferronickel		18,541	23,617	209	New Caledonia 14,129; Dominica 9,279.
Ferrosilicochromium		1,820	6,060	—	China 4,926; Taiwan 930; Costa Rica 204.
Ferrosilicomanganese		4,420	9,424	—	China 7,402; Costa Rica 660; Italy 336.
Ferrosilicon		167,781	82,534	2,558	China 35,576; Brazil 12,416; Yugoslavia 8,870.
Ferrovanadium		377	444	—	Belgium 142; Netherlands 116; Germany 65.
Silicon metal		6,829	7,190	14	China 4,863; Australia 1,441; Taiwan 291.
Unspecified		3,432	4,460	359	China 1,957; France 746; Japan 401.
Steel, primary forms	thousand tons	1,136	2,163	97	Brazil 694; China 326; Poland 196.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		2,375,154	2,988,208	640,738	Japan 831,369; Canada 271,416.
Clad, plated, coated		324,580	165,291	1,506	Japan 162,276; Germany 1,282.
Of alloy steel		460,666	515,016	37,077	Japan 391,075; France 23,865.
Bars, rods, angles, shapes, sections		1,414,872	2,448,078	94,606	Turkey 691,905; Japan 351,170; China 216,014.
Rails and accessories		3,291	4,992	166	Japan 4,025; Germany 362.
Wire		21,689	16,974	1,085	Japan 10,138; China 974.
Tubes, pipes, fittings		231,935	208,553	10,911	Japan 165,869; Germany 11,076.
Lead:					
Ore and concentrate		—	9,456	—	All from Canada.
Oxides		83	1,091	58	Taiwan 980; Japan 21.
Ash and residue containing lead		624	303	—	All from Japan.

See footnotes at end of table.

TABLE 3—Continued

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Lead—Continued:					
Metal including alloys:					
Scrap		47,711	17,434	3,208	Saudi Arabia 4,889; Australia 4,426.
Unwrought		107,380	138,064	41,238	Australia 50,395; Mexico 26,430.
Semimanufactures		44	108	39	Japan 44; France 21.
Lithium:					
Oxides and hydroxides		149	194	184	Japan 10.
Metal including alloys, all forms	kilograms	285	99	99	
Magnesium: Metal including alloys:					
Scrap		4	3	3	
Unwrought		1,544	1,690	870	Norway 420; U.S.S.R. 364.
Semimanufactures		362	345	291	Canada 40; Japan 7.
Manganese:					
Ore and concentrate:					
Battery-grade		5,294	4,751	—	Singapore 3,162; China 1,316; Japan 126.
Metallurgical-grade		387,824	438,034	119	Australia 234,352; India 146,466; Brazil 14,409.
Oxides		4,101	4,125	—	Japan 1,762; Belgium 708; Germany 459.
Metal including alloys, all forms		891	1,158	186	China 474; Taiwan 97; Costa Rica 80.
Mercury		27	30	5	Japan 8; U.S.S.R. 8.
Molybdenum:					
Ore and concentrate		745	1,450	261	Canada 1,082; Chile 34.
Oxides and hydroxides		460	118	97	United Kingdom 20; Canada 1.
Metal including alloys:					
Unwrought		5	5	(2)	Japan 5.
Semimanufactures		354	73	20	Japan 40; Austria 8.
Nickel:					
Matte and speiss		10,479	16,163	(2)	Canada 14,721; Japan 1,046; Australia 396.
Oxides and hydroxides		105	108	20	Canada 47; Japan 35.
Metal including alloys:					
Scrap		2,439	2,366	671	Japan 1,147; France 228.
Unwrought		6,571	13,280	135	U.S.S.R. 7,185; Canada 1,412; Netherlands 964.
Semimanufactures		1,547	1,772	200	Japan 687; Australia 313; Germany 222.
Platinum-group metals:					
Waste and sweepings	value, thousands	—	r$2	r$2	
Metals including alloys, unwrought and partly wrought:					
Platinum	kilograms	395	957	633	Germany 213; United Kingdom 49.
Unspecified	do.	1,353	1,752	813	Germany 428; Japan 263.
Rare-earth metals including alloys, all forms		122	10	1	Brazil 7; China 2.
Rhenium: Metal including alloys, all forms	kilograms	—	3	3	
Selenium, elemental		7	7	4	Japan 2; Germany 1.
Silicon, high-purity		92	130	94	Japan 36.
Silver:					
Waste and sweepings[3]	value, thousands	$2	$2	$2	

See footnotes at end of table.

TABLE 3—Continued

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Silver—Continued:					
Metal including alloys, unwrought and partly wrought	kilograms	122,949	287,487	116,115	Germany 20,962; Japan 18,164.
Tellurium, elemental	do.	712	650	50	Japan 560; Belgium 40.
Thallium: Metal including alloys, all forms	kilograms	—	1	—	All to Japan.
Tin:					
Ore and concentrate		4,228	2,535	—	China 1,868; Nigeria 299; Chile 251.
Oxides		3	2	—	Japan 1.
Metal including alloys:					
Scrap		4	16	16	
Unwrought		6,050	6,606	(2)	Malaysia 4,185; Hong Kong 797; Indonesia 770.
Semimanufactures		608	408	15	Japan 236; Ecuador 65; Malaysia 22.
Titanium:					
Ore and concentrate		39,872	99,485	—	Canada 35,065; Malaysia 31,363; Australia 26,087.
Oxides		5,160	5,464	149	Japan 3,618; Germany 1,420.
Metal including alloys:					
Scrap		34	3	3	
Unwrought		730	902	124	U.S.S.R. 447; Japan 156.
Semimanufactures		869	691	71	Japan 613; United Kingdom 3.
Tungsten:					
Ore and concentrate		3,007	3,412	—	China 2,683; Australia 559; Peru 72.
Oxides and hydroxides	kilograms	15,397	178	101	Japan 77.
Metal including alloys:					
Unwrought including scrap		2	3	1	Japan 2.
Semimanufactures		63	61	13	Japan 38; Italy 5.
Uranium and thorium:					
Oxides and other compounds		—	111	83	France 28.
Uranium metal including alloys, all forms	value, thousands	$2	$3,220	—	All to Australia.
Vanadium:					
Oxides and hydroxides		113	151	24	China 65; Taiwan 32; Japan 24.
Metal including alloys, all forms	kilograms	911	2,729	39	Japan 2,690.
Zinc:					
Ore and concentrate		485,327	468,242	9,377	Australia 304,191; Canada 90,309; Peru 19,201.
Oxides		2,110	2,384	121	China 1,583; Taiwan 216; Japan 172.
Blue powder	kilograms	400	600	—	All from Japan.
Matte		13,003	—		
Ash and residue containing zinc		3,683	11,587	1,656	Japan 5,074; Norway 1,594.
Metal including alloys:					
Scrap		543	327	211	Denmark 116.
Unwrought		25,283	22,353	1,113	China 5,195; Peru 4,926; Mexico 4,554.
Semimanufactures		951	1,458	13	Peru 1,274; Japan 97; Vietnam 40.
Zirconium:					
Ore and concentrate		24,515	21,445	112	Australia 15,451; Malaysia 918; Japan 174.
Oxides		117	183	37	Japan 109; United Kingdom 33.

See footnotes at end of table.

TABLE 3—Continued

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Zirconium—Continued:					
Metal including alloys:					
Unwrought	kilograms	220	2,996	231	Japan 1,763; Germany 1,002.
Semimanufactures		68	71	53	France 7; Japan 5.
Other:					
Oxides and hydroxides		94	217	2	Belgium 74; Australia 60; United Kingdom 43.
Ashes and residues		127	69	69	
Base metals including alloys, all forms	kilograms	2,000	448	307	Japan 72; United Kingdom 50.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		21,132	22,298	264	India 10,172; Japan 8,733; Indonesia 2,319.
Artificial:					
Corundum		43,578	48,114	3,113	Japan 16,384; China 13,519; Brazil 4,206.
Silicon carbide		14,900	16,039	66	Japan 7,263; China 3,225; Norway 1,466.
Dust and powder of precious and semi-precious stones including diamond		203	737	3	Japan 660; Ireland 3.
Grinding and polishing wheels and stones		1,885	1,889	201	Japan 1,095; China 206.
Asbestos, crude		74,549	88,753	1,057	Canada 47,528; Zambia 1,856; Swaziland 1,638.
Barite and witherite		47,839	39,104	2	India 28,064; China 5,745; Thailand 4,611.
Boron materials:					
Crude natural borates		2,675	2,796	2,666	Germany 80; China 50.
Elemental	kilograms	293	684	661	Japan 20; Germany 3.
Oxides and acids		3,345	3,403	1,499	Italy 972; Chile 595.
Bromine		196	472	(2)	Italy 106; unspecified 366.
Cement	thousand tons	3,778	7,215	1	China 6,471; Japan 590; Mexico 55.
Chalk		23,493	21,115	—	France 20, 543; Switzerland 347; Belgium 162.
Clays, crude:					
Bentonite		11,549	15,102	5,829	China 7,218; Australia 1,575.
Chamotte earth		14,008	8,316	2,110	Hong Kong 3,220; China 611.
Fire clay		315	762	89	China 642; Japan 31.
Fuller's earth		—	29	29	
Kaolin		171,320	222,853	136,991	China 33,523; Hong Kong 17,024.
Unspecified		5,343	3,770	1,589	China 551; Japan 187.
Cryolite and chiolite		28	61	11	Japan 30; Denmark 20.
Diamond:					
Natural:					
Gem, not set or strung	carats	36,005	35,540	1,445	India 13,320; Belgium 11,310; Taiwan 4,410.
Industrial stones	do.	63,640	15,439,110	15,383,020	Japan 32,370; Ireland 3,150.
Synthetic: Gem, not set or strung	do.	26,065	821,240	13,655	Japan 750,750; Germany 6,830.
Diatomite and other infusorial earth		414	159	4	China 75; Thailand 50; Japan 30.
Feldspar, fluorspar, related materials:					
Feldspar		r8,728	6,206	25	Japan 2,463; China 2,402; Hong Kong 395.
Fluorspar		r52,936	72,030	30	China 47,755; Thailand 16,041; Costa Rico 4,977.
Unspecified		r135	3,465	—	Canada 3,316; Norway 144; Netherlands 5.

See footnotes at end of table.

TABLE 3—Continued
REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials: Manufactured:					
Ammonia		508,091	490,938	307,975	Bahrain 81,840; Qatar 46,263; U.S.S.R. 20,952.
Nitrogenous		190,974	174,341	—	U.S.S.R. 91,570; Indonesia 45,106; Qatar 16,437.
Phosphatic		2,000	19,627	929	U.S.S.R. 15,589; China 3,110.
Potassic		570,901	602,218	2,249	Canada 412,013; Jordan 86,125; U.S.S.R. 74,565.
Unspecified and mixed		5,911	24,642	8,357	U.S.S.R. 15,474; Japan 221.
Graphite, natural		23,692	11,917	9	China 11,173; Hong Kong 374; Japan 219.
Gypsum and plaster		234,445	402,282	1,000	Thailand 395,300; Morroco 5,700.
Iodine		14	14	(2)	Chile 1; Japan (2).
Kyanite and related materials:					
Andalusite		10,877	8,917	—	Saudi Arabia 63; France 20; unspecified 8,834.
Kyanite		2,036	2,829	2,598	Sweden 220; Japan 11.
Sillimanite		81	22	—	
Mullite		4,919	5,944	2,259	Japan 3,665; Germany 2.
Lime		35	361	—	China 291; Japan 70.
Magnesium compounds:					
Magnesite, crude		2,384	365	—	Japan 342; China 20; United Kingdom 3.
Oxides and hydroxides		80,495	97,192	1,117	China 65,538; Japan 24,377; Costa Rica 4,095.
Other		580	400	—	All to Germany.
Mica:					
Crude including splittings and waste		2,508	3,094	328	Malaysia 1,174; India 719.
Worked including agglomerated splittings		190	254	(2)	Japan 89; China 84; Belgium 61.
Nitrates, crude		13,030	12,531	558	Chile 6,560; Germany 4,805.
Phosphates, crude	thousand tons	1,560	1,310	1,000	Jordan 124; China 80; Morroco 34.
Phosphorus, elemental		3,090	3,431	49	China 2,720; Netherlands 190; Pacific Islands 147.
Pigments, mineral:					
Natural, crude		312	188	3	Austria 78; United Kingdom 37; Japan 12.
Iron oxides and hydroxides, processed		19,126	21,634	4,280	Japan 10,271; Belgium 2,363.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	307,010	335,481	50,886	Brazil 99,742; Australia 44,874.
Synthetic	do.	303,616	2,184,733	1,863,653	Japan 285,839; Taiwan 3,169.
Pyrites, unroasted		—	5	—	All from Italy.
Quartz crystal, piezoelectric	kilograms	5,806	14,801	1	Belgium 14,200; Japan 557; China 43.
Salt and brine	thousand tons	1,081	1,275	(2)	Australia 917; Mexico 245; Yemen 96.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		219,845	236,685	228,190	China 4,417; U.S.S.R. 3,750.
Sulfate, manufactured		110,622	131,012	20,073	China 94,293; Taiwan 7,200; Japan 4,403.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		100,255	129,650	2,637	China 64,112; Belgium 19,150; Saudi Arabia 18,510.
Worked		46,836	63,276	1,893	Italy 38,439; China 6,533; Brazil 2,098.
Dolomite, chiefly refractory-grade		1,398	22,082	—	United Kingdom 21,652; Norway 420; Japan 10.

See footnotes at end of table.

TABLE 3—Continued

REPUBLIC OF KOREA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Gravel and crushed rock		8,036	8,582	67	France 3,760; China 2,383; Philippines 1,176.
Limestone other than dimension		5,897	167,580	(2)	Japan 162,873; Costa Rico 2,700; China 2,007.
Quartz and quartzite		3,594	5,270	1,092	China 2,557; Sweden 655.
Sand other than metal-bearing		520,130	649,345	1,569	Australia 471,158; Malaysia 132,604; China 21,100.
Sulfur:					
Elemental:					
Crude including native and byproduct		517,345	472,320	1,313	Japan 300,881; Canada 170,064.
Colloidal, precipitated, sublimed		1,766	1,253	1,064	Japan 163; Germany 26.
Dioxide	kilograms	54	127	127	
Sulfuric acid		171,497	159,100	814	Japan 158,285.
Talc, steatite, soapstone, pyrophyllite		r1,721,902	178,348	5,469	China 162,554; Pacific Islands 7,034.
Vermiculite		5,646	4,045	264	China 3,273; Pacific Islands 98; Philippines 36.
Other:					
Crude		r100,391	85,412	404	Turkey 35,353; Japan 23,844; Philippines 4,177.
Slag and dross, not metal-bearing		387,209	469,768	(2)	Japan 407,769; Australia 59,482; United Kingdom 1,282.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		302	318	266	Japan 38; Taiwan 14.
Carbon black		8,396	9,236	3,636	Japan 2,833; Germany 993.
Coal:					
Anthracite	thousand tons	1,072	1,410	—	China 941; Vietnam 237; U.S.S.R. 66.
Bituminous	do.	22,846	27,849	3,544	Australia 11,029; Canada 6,716; China 3,229.
Briquets of anthracite and bituminous coal		—	6	—	All from Japan.
Lignite including briquets		34,717	19,352	—	All from Australia.
Coke and semicoke		144,819	151,021	1,654	Japan 112,459; China 35,601.
Gas, natural: Liquefied	thousand tons	2,237	2,494	—	Indonesia 2,436; Malaysia 58.
Peat including briquets and litter		20,751	4,223	—	China 1,157; Canada 894; Netherlands 881.
Petroleum:					
Crude	thousand 42-gallon barrels	289,550	405,718	593	Saudi Arabia 136,777; Oman 58,681; Iran 54,756.
Refinery products:					
Liquefied petroleum gas	do.	26,075	29,075	(2)	Saudi Arabia 22,464; U.A.E. 4,481; Indonesia 1,170.
Gasoline	do.	4,030	8,989	291	Japan 6,848; Singapore 721.
Naphtha	do.	13,906	24,797	649	Singapore 6,649; Saudi Arabia 5,210; India 3,829.
Mineral jelly and wax	do.	153	130	19	China 53; Japan 46.
Kerosene and jet fuel	do.	17,843	10,107	1,026	Japan 3,442; Suadi Arabia 2,184; Singapore 1,650.
Distillate fuel oil	do.	13,762	9,984	4,409	Japan 1,655; Canada 940.
Lubricants	do.	191	2,036	47	Japan 1,965; Singapore 8.
Residual fuel oil	do.	29,566	43,482	18,520	Japan 5,444; Singapore 3,283.
Bitumen and other residues	do.	(2)	84	—	All from Japan.
Bituminous mixtures	do.	—	12	5	United Kingdom 5; Netherlands 1.
Petroleum coke	do.	682	475	412	China 36; Germany 20.

rRevised. NA Not available.

[1]Table prepared by Amy M. Burk, International Data Section.

[2]Less than 1/2 unit.

[3]May include other precious metals.

TABLE 4
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons per year)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum, primary	Aluminum of Korea Ltd.	Ulsan	17.5
Bismuth, metal	Korea Tungsten Mining Co. Ltd.	Sangdong	.135
Cement	Ssangyong Cement Industrial Co. Ltd.	Yongwol	11,500
Copper, metal	Lucky Metals Co. Ltd.	Changhang	50
Do.	do.	Onsan	150
Graphite	Kaerion Graphite Ltd.	Kangwon	25
Do.	Wolmyong Mining Co.	do.	26
Lead, metal	Lucky Metals Co. Ltd.	Changhang	15
Do.	Korea Zinc Co. Ltd.	Onsan	80
Nickel, metal	Korea Nickel Corp.	do.	12
Steel	Pohang Iron and Steel Co. Ltd. (Mostly government owned)	Kwangyang	11,400
Do.	do.	Pohang	9,400
Talc	Dongyang Talc Mining Co.	Chungju	NA
Tungsten, in ore	Korea Tungsten Mining Co. Ltd.	Sangdong	3
Zinc, metal	Korea Zinc Co. Ltd.	Onsan	165
Do.	Young Poong Copr.	Sukpo	75

NA Not available.

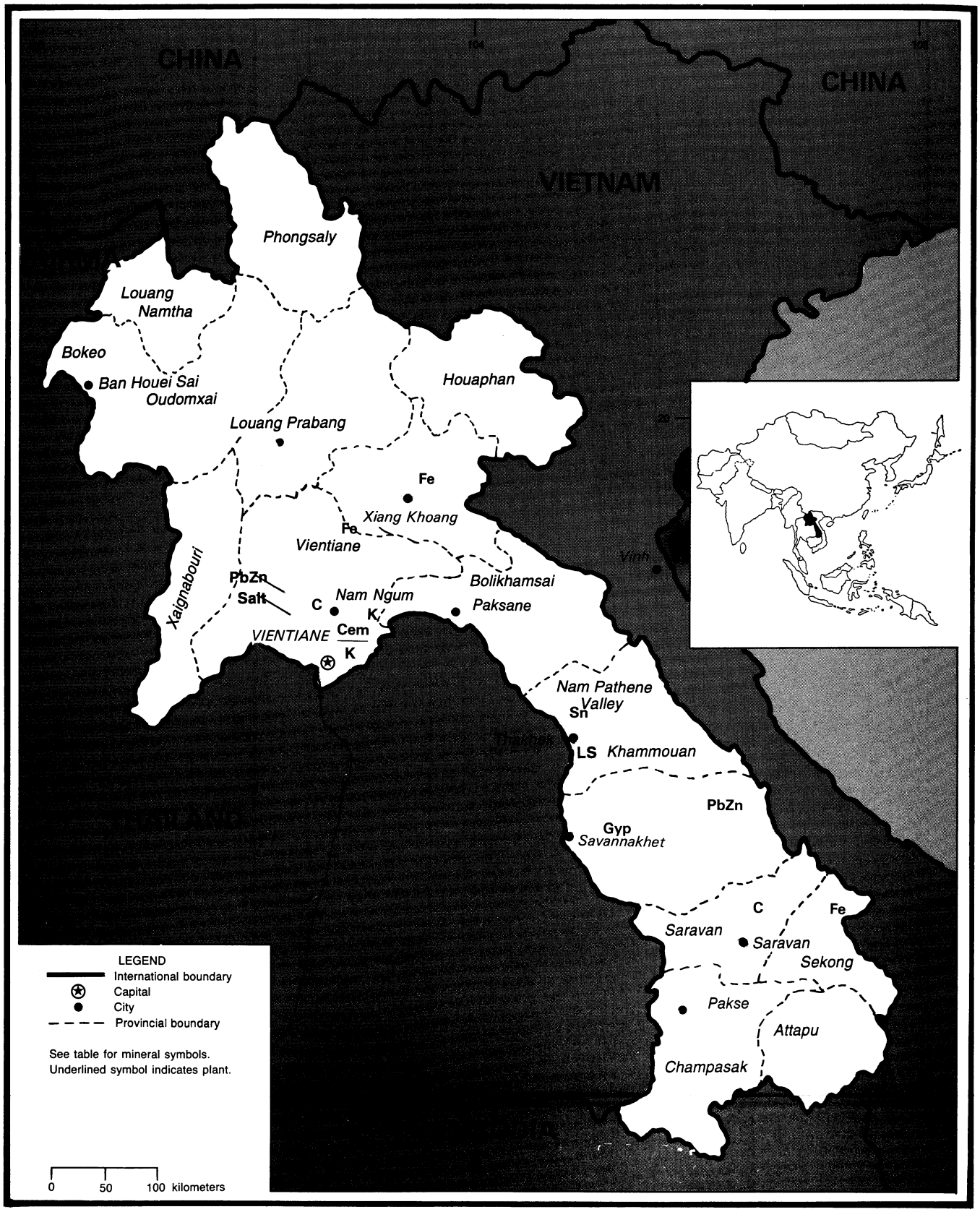
TABLE 5
REPUBLIC OF KOREA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand tons)

Commodity	Reserves
Bismuth	4
Coal, anthracite	1,450,600
Graphite	39,500
Pyrophyllite and talc	15,000
Tungsten	60
Zinc, in ore	10,800

LAOS

AREA 236,800 km² **POPULATION 4 million**



THE MINERAL INDUSTRY OF

LAOS

By Travis Q. Lyday

The Lao People's Democratic Republic is a small, landlocked country on the Indochinese Peninsula. Its economy is agrarian, based primarily on wet rice farming and slash-and-burn cultivation. The mining and quarrying sector contributes less than 0.5% to the economy.

The mineral resources of Laos include copper, gold, iron ore, lead and zinc, tin, gypsum, rock salt, sapphire, coal, and, probably, petroleum. The only significant mineral production in the country until recently has been tin ore. Some of the other mineral resources have been extracted, but only by using primitive and unsystematic methods. In addition, limestone is quarried near Thakhek in Khammouan Province and is used locally for highway construction and export to Thailand. Other construction materials such as sand and gravel also are extracted on a small scale, mainly from the renewable deposits of the Mekong River, which constitutes most of the country's western boundary with Thailand. Essentially, the mineral industry that is extant in the country is unstructured and sporadic.

Gold is found throughout Laos in deposits occurring in primary quartz veins, in association with base metals, and in placers. Current production is obtained by panning at numerous sites in both the north and the south. Investment in gold exploration is being considered by some foreign firms.

Laos' iron ore deposits are in Xiang Khoang Province, in the north-central part of the country. The principal deposits are Pha Lek and Phou Nhouan, both of which are deemed to have economic potential. However, they remain basically undisturbed owing to inaccessibility, lack of infrastructure, and the high capital cost required for development. Any development of the deposits probably would depend on the growth of the steel industries in the adjacent countries of Thailand or Vietnam.

Tin mining continues to be a cottage industry from a group of small mines in the Nam (River) Pathene Valley about 60 (km) north of Thakhek. The principal ore is a surface enrichment of cassiterite, an oxide of tin.

Production of gypsum comes from near Dong Hene in Savannakhet Province and is marketed to customers across the border in Vietnam. The mine and plant originally were developed in the late 1970's by the Vietnamese. Production characteristically is suspended during the rainy season, which typically occurs from June to October. Stockpiled material sometimes is processed during this period. The gypsum underlies potash and rock salt horizons in a thick and extensive evaporite sequence.

High-grade rock salt is mined from the same evaporite deposits in the Vientiane plain from which gypsum is mined. However, mining methods and marketing patterns of product are unknown.

Sapphire is mined, or collected, on an artisanal scale by the local population from placer deposits near Ban Houei Sai, Bokeo Province, in the northwest and from streambeds throughout the southern part of the country.

Coal reportedly has been mined since about 1985 at the rate of about 1,500 (mt/a) from deposits at Bochan, northwest of Vientiane in Vientiane Province. No production is known to have occurred during 1992. Coal also occurs in the south of the country in Saravan Province and in the north of the country in Phongsaly Province.

Laos has a centrally planned economy; the Government owns and controls all productive enterprises, regardless of size or activity. However, with increasing recognition that systematic production of minerals would probably be beneficial to the country's economy, measures have been enacted in recent years by the Government to encourage exploration and development in the mineral sector. These measures include sanctioning activity by the private sector, including foreign interests.

Any presentation on the mineral reserves of Laos merely would be crude estimates as well as premature. Efforts are continuing through Government initiatives to attract and organize mineral exploration and development in the country.

Laos is one of the world's poorest countries. Its infrastructure is primitive at best, having no railroads (although a Thai railroad reaches Nong Khai, across the Mekong from Vientiane, which serves as a main trade artery for the country) and only a rudimentary transportation system. There are almost 27,530 km of roads, of which 1,856 km is paved. Another 7,450 km consists of gravel, crushed stone, or other type of improved surface. The remaining 18,224 km is unimproved, loose surface, and often impassable during the rainy season.

There are 57 airports in the country, 47 of which are considered usable. There are only eight airports with paved runways. There are no airports with runways more than 3,659 (m) in length and only one airport with a runway longer than 2,440 m. Only one airport, the Wattay International in Vientiane, has regularly scheduled flights.

The country has about 4,587 km of inland waterways, primarily the Mekong

and its tributaries. An additional 2,897 km is sectionally navigable by craft drawing less than 0.5 m.

The country has one 136-km pipeline for refinery products, thought to be in the process of being extended from Vientiane to Vinh, Vietnam.

Power is generated by a 150-MW hydroelectric plant about 70 km north of Vientiane on the Nam Ngum, an effluent of the Mekong, and a 45-MW plant on the Nam Seset. Other than what is consumed in the Vientiane area, most of the output, about 80%, is exported to Thailand. An additional 3 MW of capacity is distributed among several smaller hydroelectric plants, and about 14 MW of capacity is provided by a number of diesel units in various parts of the country.

Laos is only on the verge of social, political, and industrial development. The country ostensibly has possibilities for mineral development with consequent benefits to the economy. The principal problem is a lack of capital to develop infrastructure and industry, although legislation has been enacted to attract foreign capital.

TABLE 1

LAOS: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[p]
Cement (from imported clinker)		4,500	[3]6,875	6,500	7,000	7,000
Gemstones (sapphires)	carats	15,000	[3]37,925	30,000	35,000	35,000
Gypsum		[3]80,000	[3]104,000	[r] [3]53,034	[r] [3]76,776	[3]79,863
Salt, roc		30,000	[3]7,950	8,000	8,000	8,000
Tin, mine output, Sn content		[3]300	[3]127	[3]500	300	300

[p]Preliminary. [r]Revised.

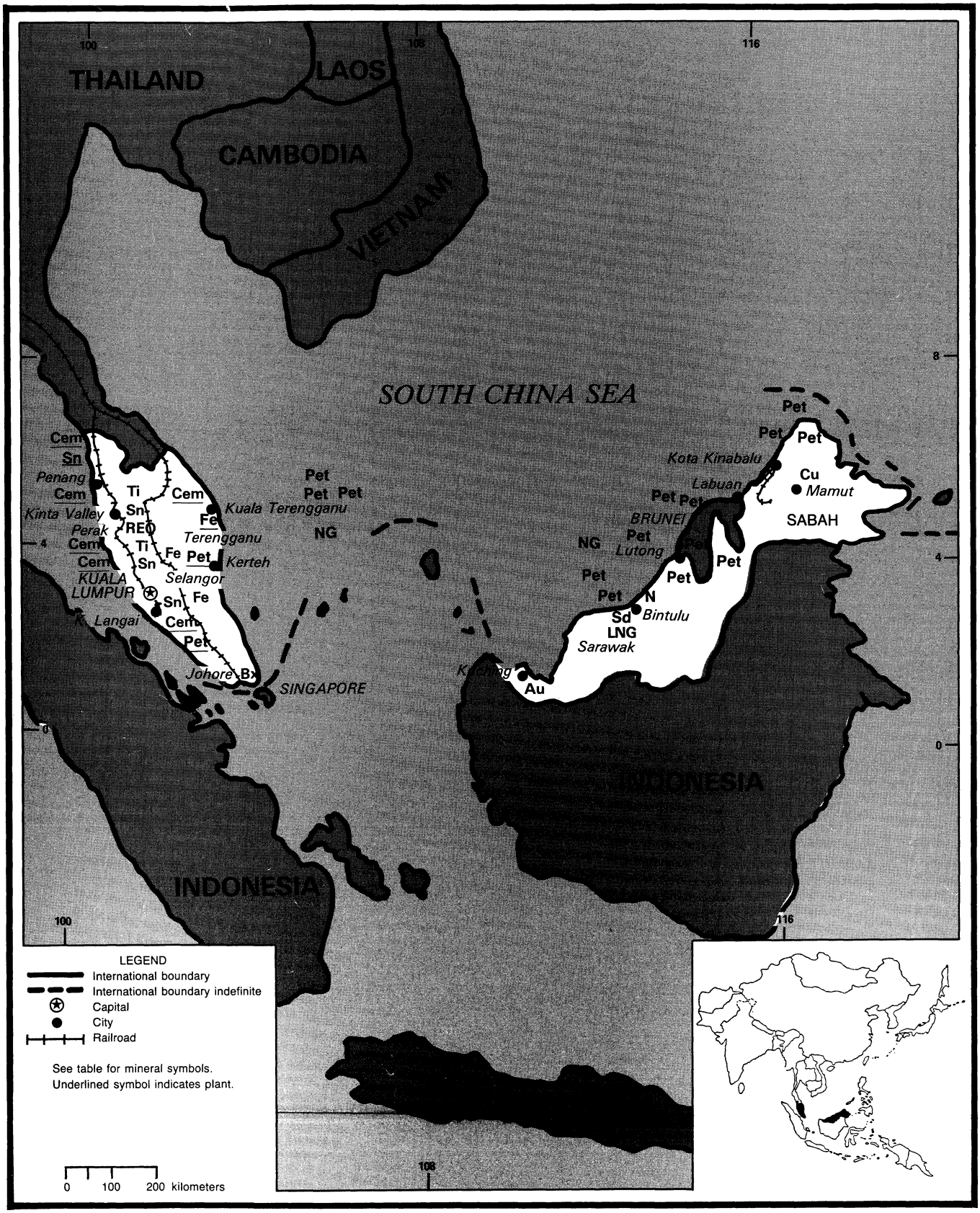
[1]Table includes data available through June 2, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

MALAYSIA

AREA 329,750 km² **POPULATION 18.4 million**



THE MINERAL INDUSTRY OF

MALAYSIA

By John C. Wu

Malaysia's important mineral resources include bauxite, clay, copper, ilmenite, iron ore, natural gas, petroleum, rare earths, and tin. Of these minerals, only its tin reserves are large and are ranked the world's third largest after China and Brazil. In past years, deposits of copper, lead, and zinc as well as gold and silver had been discovered in the central belt of Peninsular Malaysia extending from Kelantan to Johore. According to the Geological Survey of Malaysia, mineralization of copper, lead, and zinc associated with considerable amounts of gold and silver was discovered in the Ulu Sokor area of northern Kelantan, in the Sungai Lebir, and Gua Setir areas of Kelantan, and around the areas of Kuala Lipis, Raub, Sungai Lepar, and Chini in Pahang. In 1992, mineralization of gold was also found in the Penjon area of central Pahang by Avocent Venture of the United States. However, development activity in nonferrous minerals was practically at a standstill in 1992 because of the low metal prices and problems with the land.

Malaysia, once the world's largest tin producer, was ranked fifth in 1992. Malaysia became the world's third largest LNG producer in 1992 and remained an important producer of bauxite, copper, crude petroleum, ilmenite, kaolin, monazite, natural gas, and zircon in Southeast Asia. The mining industry, which contributed 8.7% to Malaysia's GDP in 1992, remained an important sector of the economy. Malaysia's mining industry continued to grow at about 3% in 1992, fueled mainly by continued increased output of crude petroleum and natural gas.

According to Malaysia's Department of Statistics, the output of the mining industry grew 2.7% in 1992 compared with 5.1% in 1991, while Malaysia's GDP grew 8.5% in 1992 compared with 8.7% in 1991. Malaysia's GDP in 1978 constant dollars was estimated at $36.8 billion,[1] of which about $3.2 billion was contributed by the mining industry in 1992. Malaysia exported most of its mineral products to Japan and neighboring Southeast Asian countries. Malaysia was an important supplier of bauxite, ilmenite, natural gas, crude petroleum, rare earths, and refined tin to Japan. The relative importance of Malaysia for supplying crude petroleum, rare earths, and refined tin to the United States had diminished, as U.S. imports of these commodities from Malaysia decreased considerably since 1991.

Malaysia remained a net exporter of mineral products in 1992. Malaysia exported all of its coal, copper concentrate, ilmenite, rare earths, and zircon concentrate production; between 80% and 85% production of its smelted tin, silica sand, and natural gas production; and about 50% of its bauxite and crude petroleum production in 1992. Export earnings were estimated at $40.6 billion in 1992, of which $3.5 billion was from exports of crude petroleum and about $915 million from exports of natural gas (in the form of LNG). Malaysia's imports of nonfuel minerals, such as iron ore and tin concentrate, were mostly reexported after smelting. However, a considerable quantity of coal, heavy crude petroleum, and industrial minerals including gypsum, phosphate rock, potash, and salt were imported annually for domestic consumption.

In 1992, the focus of Malaysia's mineral industry's major investment remained on the mineral fuels sector. In 1992, the oil and gas industry was to invest about $3.2 billion, of which about $1.4 billion was for development of production facilities, about $670 million for exploration, and about $1.1 billion for operation improvements.

GOVERNMENT POLICIES AND PROGRAMS

In late 1992, the Federal Government and National Council had approved the draft National Mineral Policy, tax revisions, and other related mining legislation including Mineral Tax and Investment, Mineral Title Management, Mineral Sector Development Plan, Model State Mineral Enactment, Model State Standard Mineral Agreement, and Model Federal Mineral Development Act. The entire package reportedly was sent to the Office of the Attorney General for final drafting of revisions before ratification and final approval by the respective State governments and the Parliament.

The primary goal of the National Mineral Development Policy is to provide Malaysia with a modern and internationally competitive regulatory system, which will allow the mineral sector to expand, diversify, and contribute to Malaysia's economic development. Under this new policy, local and foreign investors will be encouraged to explore for bauxite, clay, coal, copper, gold, rare metals, and silica in Malaysia; miners will be ensured security of tenure, paying lower royalty, and enjoying tax incentives, such as income tax allowances on exploration expenditures and lower import duties on mining equipment. Under this new policy, foreign investors also will be allowed to raise their ownership in Malaysia venture to 100% from 30% in the past years.[2]

To maintain Malaysia as an attractive

and favorable investment center in Asia, the Government is to implement policies to strengthen the domestic sources of growth by maintaining macroeconomic stability, to promote efficiency and productivity of the private sector, to encourage high levels of private investment, and to diversify the industrial base and expand exports. In addition, the Government is to develop the necessary human resources to meet the growing demand for skilled labor, to develop industrial technology, and to improve the country infrastructure.

In line with the New Development Policy (1991-2000), the Government announced two measures for its 1993 Government budget in late 1992. First, to rely on the private sector to stimulate economic growth, the Government will reduce the income tax rate for a company by 1% to 34% and will abolish a 2% development tax. The Government also will reduce individual income taxes by 1% to 2%. Second, to establish a Human Resources Development Fund for encouraging direct private participation in skill development programs, the Government will spend $6.4 million annually beginning in 1993 for the next 3 years.

PRODUCTION

The oil and gas industry continued to dominate the mineral industry of Malaysia in 1992. The output of both crude petroleum and natural gas reached a record high in 1992. The country's tin industry continued to suffer from low tin prices on the Kuala Lumpur tin market (KLTM), and the industry's employment reached a record low in 1992. As a result of reduced tin production, the output of byproducts such as monazite and zircon decreased considerably. The output of washed bauxite and iron ore also declined in 1992. However, the production of copper, gold, and silver increased in 1992 mainly because of increased output of copper ore and improved recovery rate at the Mamut Mine in Sabah. Production of barite and silica sand decreased, while production of cement, kaoline, and mica reached a record high in 1992 because of stronger demand in the domestic market. *(See table 1.)*

TRADE

Malaysia remained a minerals net exporting country. In 1992, Malaysia's export earnings of crude petroleum and natural gas in the form of LNG totaled $4.6 billion, accounting for more than 95.6% of the total mineral export earnings and 10.1% of the country's total merchandise exports. Export earnings from crude petroleum and LNG decreased in 1992 because of lower oil and gas prices in the world market. World prices of crude petroleum ranged between $17 and $18 per barrel in 1992 compared with between $20 and $21 per barrel in 1991. However, export earnings from refined tin increased in 1992 mainly because of increased volume of exports, which amounted to 45,150 tons and were valued at $270 million in 1992.

Malaysia continued to import about 22,000 bbl/d of heavy crude petroleum from the Middle East to meet the requirement for domestic refineries. Other important minerals imports in 1992 were iron ore, tin concentrate (for reexport after smelting), cement, gypsum, phosphate rock, potash, sodium carbonate, and sulfur for domestic consumption.

STRUCTURE OF THE MINERAL INDUSTRY

The structure of Malaysia's mineral industry remained unchanged in 1992. However, the output capacity of the oil and gas industry continued to expand, while capacity of the tin industry contracted further in 1992. In the industrial minerals sector, the cement industry was expected to have more than a 9-Mmt/a capacity by 1993. Associated Pan Malaysia Cement Sdn. Bhd. had upgraded its plants and expanded its capacity by 500,000 mt/a in 1992, while Tasek Cement Bhd. was expected to complete the 2,000-mt/d-capacity expansion program in Ipoh, Perak, by 1993.

According to an estimate by the Malaysian Ministry of Human Resources, the total number of persons employed by the mining and quarrying industry rose to 40,200 from 39,400 in 1991, despite the further decline of employment in the tin industry. According to the Malaysian Department of Mines, the number of workers employed by the major nonfuel minerals at the end of 1992 was 84 in barite, 208 in bauxite, 1,125 in copper, 505 in gold, 175 in iron ore, 428 in kaolin, 204 in silica sand, and 4,672 in tin. Additionally, there were more than 1,000 workers involved in limestone quarrying and 164 coal miners in 1992. Malaysia's total labor force rose from 7.3 million in 1991 to 7.5 million in 1992, while the unemployment rate decreased from 5.6% in 1991 to 5.3% in 1992 owing mainly to increased employment in the construction, manufacturing, and service industries. *(See table 2.)*

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Mine production of bauxite declined in 1992 due to a sharp drop in exports. Exports of bauxite declined from 301,975 tons in 1991 to 166,040 tons in 1992. Export earnings from bauxite were valued at $3.2 million in 1992 compared with $4.7 million in 1991. Johore Mining and Stevedoring Co. Sdn. Bhd., Malaysia's sole bauxite producer, operated a multiple-bench, open pit mine and a washing plant with a work force of 205 at Bukit Raja around Pengerang Highway north of Sungai Rengit, east of Johore Bahru. The washing plant, capable of milling 1 Mmt/a of ore, produced a monthly average of about 27,550 tons of washed bauxite with 10% water content in 1992. The company produced three grades of bauxite: refractory-grade, metallurgical-grade, and cement-grade.

In July, a group of foreign investors led by Finland's Kuusakoski Oy (KO) and Johore State Economic Development Corp. (JSEDC) reached an agreement to

build a 7,500-mt/a secondary aluminum smelter in the State of Johore. A joint-venture firm called Johore Aluminium Processing Sdn. Bhd. was established to manage the project and run the plant when the construction work is completed. Construction of the $11 million smelter was scheduled to begin in early 1993 and was expected to be completed in July 1993. KO will supply the technology and equipment including a 6-ton converter and a 16-ton holding furnace. About 50% of the aluminum scrap feed for the smelter will be obtained locally and 50% will be met by imports mainly from Japan and Singapore. The joint venture is 35% owned by JSEDC; 27.5% each by KO and Finfund (the Finnish Government's Industrial Development Corp.); and 5% each by Nakadaya Co. of Japan and Celtrad Metal Industries of Singapore.[3]

Copper.—Production of copper concentrate from the Mamut Mine in Sabah increased by 13.5% to 111,593 tons, when more ore was mined and milled in 1992. Copper recovery rate averaged about 86% in 1992. Exports of copper concentrate, all to Japan, totaled 101,532 tons and were valued at $65.2 million in 1992. The average content of copper in the concentrate was 25.6% in 1992 compared with 26.0% in 1991. The content of gold and silver in the concentrate was 19.85 g/mt and 135.10 g/mt, respectively, in 1992 compared with 16.4 grams per ton and 134.98 grams per ton, respectively, in 1991. The metal content of copper, gold, and silver in the concentrate was 28,556 tons, 2,214.9 kg, and 15,075.7 kg, respectively, in 1992. In 1992, the Government of Sabah reportedly ordered the Mamut Mine to pay $4.7 million in compensation for crop damages caused by mine effluent.

An application for development of the porphyry-type copper deposits at the West-Sualog and at the Kiabau deposits in the Bidu-Bidu Hill area reportedly was submitted to the Department of the Environment in 1992. According to the Geological Survey of Malaysia, the indicated ore reserves based on drilling by Leadstar Co. in the late 1980's were: at the West-Sualog deposit about 2 Mmt, averaging 3.6% copper plus gold and silver averaging 2.5 g/mt of ore and 8 g/mt of ore, respectively; and at the Kiabau deposit about 2.5 Mmt, averaging 1.6% copper.[4]

Gold.—Gold production increased considerably in 1992 due mainly to increased production as a byproduct from the Mamut copper mine in Sabah and increased production from the Bukit Young gold mine in Sarawak. Of the total gold produced in 1992, 63% was from the Mamut copper mine in Sabah; 20% was from 10 to 20 small-scale mines in the States of Kelantan, Pahang, and Negeri Sembilan; and 17% from 2 to 5 primary gold mines in Sarawak.

In mid-1992, Avocet Ventures of the United States announced that its British subsidiary, Luckfrost Ltd., had located gold mineralization in the Punjom concession area in Pahang State of central peninsular Malaysia. Drilling had resulted in finding a visible gold-bearing cross cutting quartz tension vein averaging 67.4 g/mt of ore in its Hole 12. Ore grade tests for the gold mineralization area reportedly ranged from 0.8 g/mt to 145.7 g/mt.[5]

PKB-MMC Sdn. Bhd., a joint venture of Malaysia Mining Corp. (MMC) and Permodalan Kelantan Bhd., temporarily shut down its gold mining at Pulai in southern Kelantan because of low recovery rates and depleting ore reserves. Tronoh Mines Malaysia Bhd., a 52.3%-owned subsidiary of MMC, had deferred development of its gold mine at Pergau in northwestern Kelantan because of low metal prices. Equatorial Gold Ltd. of Australia reportedly also abandoned its gold prospecting at Ulu Sokor in Kelantan due to low metal prices.

Iron and Steel.—Iron ore production decreased; however, exports of iron ore rose sharply in 1992. According to the Malaysian Department of Mines, exports of iron ore totaled 248,580 tons and were valued at $3.8 million in 1992. In 1992, most iron ore was produced from seven to eight small deposits located in the States of Perak, Kedah, Pahang, Johore, and Terengganu. About 5,000 tons of iron ore was produced as a byproduct of tin mining in 1992.

Perwaja Terengganu Sbn. Bhd. (PTSB), the State-owned steel company, was renovating the direct-reduced-iron (DRI) plant by building two HYL-III-process modules at its Telok Kalong site of the failed Japanese-designed DRI plant in Kemaman, Terengganu. Construction work of the 1.2 Mmt DRI plant was expected to be completed by the spring of 1993, and the startup date was set for mid-1993. MAN Gutehoffnungshutte AG of Germany and Ferrostaal AG of Mexico were in charge of plant supply and construction.

In October, three Malaysian major steel producers, Amalgamated Steel Mills Bhd. (ASM), Malayawata Steel Bhd. (MS), and Southern Iron and Steel Works (SISW), jointly acquired from the Ministry of Finance the DRI plant operated by Sabah Gas Industries Bhd. (SGI) for $33 million. In April, the Ministry of Finance took over from the Sabah State Government the financially troubled Sabah Gas Utilization Project, including a small powerplant, a methanol plant, and a DRI plant on Labuan Island, off Sabah.[6] To operate SGI's DRI plant, a new firm called Steelcorp Sdn. Bhd. was established jointly by ASM holding 75% of SGI equity, MS, 15%; and SISW, 10%. Production of hot-briquetted iron by the DRI plant averaged about 620,000 tons annually. According to Steelcorp, SGI planned to sell 20% of its output to the three steelmakers and export the remainder mainly to Southeast Asia.[7]

Rare Earths.—Crude rare earths had been produced by Asian Rare Earth Ltd. (ARE) near Bukit Merah, about 6 km southwest of Ipoh in Perak, since 1982. The plant processed monazite for the production of rare-earth chloride and rare-earth carbonate for export mainly to Japan and EC. In processing monazite to produce crude rare earths, the plant also produced a low-level radioactive thorium hydroxide as byproduct. In October 1985, nearby Bukit Merah residents filed

a civil suit to stop ARE from operating until proper safety measures were taken to prevent escape of the radioactive gases from the plant. The plant was shut down for more than a year, but ARE resumed operation in February 1987 claiming that it had complied with the safety measures, while storing the low-level waste at a nearby site in Mukim Belanja.

In July 1992, Malaysia's high court ordered a complete shutdown of the plant on the grounds that the plant was producing and storing radioactive waste and was endangering the health of nearby residents. However, ARE contended that it was operating the plant and storing radioactive waste in accordance with Malaysian laws. ARE appealed to Malaysia's Supreme Court in late July to reverse the ruling. In August, Malaysia's Supreme Court ruled that ARE can remain in operation while it appeals against a plant closure ordered by a lower court.[8]

Tin.—Malaysia's tin industry contracted further in 1992 because of the continued low level of tin prices on the KLTM and the decision by the major mining companies to close down tin mines and shift part of their mining business to produce construction materials or industrial minerals. By the end of 1992, the total number of operating mines declined to 63 from 92 in 1991, and the total number of tin miners dropped to 4,672 in 1992 from 6,594 in 1991. As a result, the 1992 mine output of tin dropped to the lowest level in Malaysia's post-World War II tin mining history. Of the tin produced in 1992, 43% was by dredging, 27% by gravel pumping, 11% each by open pits and panning, and 8% by others.

According to Malaysia's Department of Mines, the 1992 monthly output of tin decreased to 1,201 tons in December from 1,621 tons in January. The total number of operating mines decreased to 63 in December from 89 in January. In 1992, the total number of tin miners declined to 4,672 in December from 6,115 in January. The dredging sector shut down 6 dredges and laid off 1,213 workers, while the gravel-pumping sector closed 14 mines and laid off 456 miners in 1992. During 1992, the tin industry, as a whole, shut down 14 gravel-pumping mines, 6 dredges, 2 open pit mines, and 7 underground mines and incurred the loss of 1,922 jobs. However, many of the laid-off tin miners reportedly were able to find jobs in the growing manufacturing and construction industries.

Production of tin metal by Datuk Keramat Smelter Bhd. and Malaysia Smelting Corp. Bhd. increased slightly in 1992. To fully utilize its tin smelting capacity, Malaysia continued to import record amounts of tin concentrate at 58,638 tons containing 33,147 tons of tin in 1992 mainly from Australia, Bolivia, and China to supplement the declining supply of domestic concentrate.

Malaysia exported 45,150 tons of refined tin in 1992 compared with 42,425 tons in 1991. The major buyer of Malaysia's refined tin in 1992 was Japan, followed by the Netherlands, the Republic of Korea, and the United States. In 1992, export earnings from tin rose 8.4% to $270 million. According to the Malaysian Department of Mines, domestic demand for refined tin rose 20.4% to 4,101 tons in 1992. Of the total domestic tin consumption, 1,918 tons was consumed by the solder industry, 810 tons by the tinplating industry, 578 tons by the pewter industry, and 795 tons by other.

Industrial Minerals

Cement.—Because of a steady growth in demand for cement by the construction industry, Malaysia's cement production reached a record of 8.3 Mmt in 1992. Malaysia has nine cement plants, of which seven were in peninsular Malaysia and two (grinding plants) in east Malaysia. The industry's total clinker capacity expanded to 8.5 Mmt/a, and grinding capacity was about 9 Mmt/a in 1992.

Because of growing domestic demand, four major cement producers announced expansion plans to be completed in the next 3 years. Cement Industries Malaysia Sdn. Bhd. planned to modernize its Kangar works at Bukit Ketri for increasing capacity from 1.2 Mmt/a to 2.7 Mmt/a by February 1994. Tasek Cement Bhd. planned to raise its capacity to 1.4 Mmt/a by mid-1993. Perak-Hanjong Cement Sdn. Bhd. planned to expand its capacity to 1.8 Mmt/a in 1993 and to 2.4 Mmt/a by 1995. Kedah Cement Sdn. Bhd., Malaysia's second largest cement producer, was doubling clinker capacity at its Langkawi plant to 3 Mmt/a by 1993.

Titanium.—Most ilmenite concentrate was recovered as a byproduct from tin tailing treatment plants operating in the States of Perak and Selangor. Production of ilmenite concentrate remained steady in 1992. However, exports of ilmenite concentrate dropped to 140,878 in 1992 from 202,833 tons in 1991. Export earnings of ilmenite concentrate were valued at $12.2 million in 1992.

Malaysia Titanium Corp. Sdn. Bhd. (MTC) commissioned a 50,000-mt/a synthetic rutile plant in Ipoh, Perak, in 1991. The plant was refurbished in 1990 at a cost of $11.6 million. Texas-based Hitox Corp. of America, the majority owner of MTC, raised its equity ownership to 78.27% by injecting additional capital in March 1991 and in June 1992. The remaining 21.73% is owned by Airtrust International Corp. of Singapore.

The rehabilitated chloride-process synthetic rutile plant reportedly began commercial operation in September 1991 following 8 months of test operation. In 1991, about 12,000 tons of synthetic rutile was shipped to Hitox's milling facilities in Corpus Christi, Texas, and 500 tons was exported to Spain. After 5 months of operation in 1992, the plant was shut down for the installation of an afterburner and boiler. The plant will resume operation in 1993. To operate the synthetic rutile plant, MTC was required to apply for a license from the Malaysia Atomic Energy Licensing Board (MAELB) because the Malaysian ilmenite, which was recovered from tin tailings, contains small amounts of radioactive compounds. Since 1991, MTC's plant had been operating under a

temporary 2-year license. During the 2-year period, MTC was required to conduct an operational monitoring program. At the end of 1992, a report on the operational monitoring results was submitted to MAELB. A permanent license would be granted if results of the operational monitoring program were found satisfactory. According to Hitox Corp., MTC also was granted permission to operate the plant by the Malaysia Department of Environment following submission of a detailed environmental impact assessment by MTC in December 1990.[9]

Mineral Fuels

Coal.—In 1992, coal production was by Global Minerals Sarawak at the Beradai deposit in the Merit-Pila area near Kapit in Sarawak. According to the Geological Survey of Malaysia, coal resources of the Merit-Pila coalfield were estimated at 387 Mmt, of which 88 Mmt were measured reserves, 76 Mmt indicated reserves, and 223 Mmt inferred reserves. Most of the coal output from the area was exported to Japan, the Republic of Korea, and Taiwan. In 1991, Sarawak exported 64,859 tons of coal and earned about $2 million. Coal exports in 1992 were estimated at 74,000 tons and valued at about $2.5 million.

Natural Gas.—Overall natural gas production from offshore Sabah, Sarawak, and Terengganu averaged about 63 Mm^3/d. In 1992, about 60% of the natural gas was produced by Sarawak Shell Bhd. (SSB) from the Central Luconia gasfields offshore Sarawak. The remaining natural gas was produced by Sabah Shell Petroleum Co. (SSP) from the Samarang Oilfield offshore Sabah and by Esso Production Malaysia Inc. (EPMI) from the Duyong Gasfield, and the Gungtong, Kepong, and Bekok Oilfields offshore Terengganu.

In September, EPMI brought on-stream its Jerneh Gasfield in the South China Sea off northern Terengganu coast, containing about 85 billion m^3 of gas reserves, equivalent to one-half billion barrels of oil. The initial cost of developing the Jerneh field was estimated at $550 million. The initial capacity of the gasfield was 12.7 Mm^3/d and will be gradually increased to 21.2 Mm^3/d when demand grows in the 1990's.

The natural gas produced from three Central Luconia gasfields (E11, F6, and F23) at the rate of 38 Mm^3/d was delivered as feedstock to the LNG and nitrogen fertilizer plants in Bintulu, Sarawak. The natural gas produced from the Samarang Oilfield at the rate of 2 Mm^3/d was delivered as feedstock to a methanol plant and as a power source for a 79-MW powerplant and a sponge iron plant on Labuan Island off Sabah. The natural gas produced from the Duyong Gasfield and Guntong, Kepong, and Bekok Oilfields at the rate of 23 Mm^3/d was delivered as the power source for a 900-MW powerplant in Paka, the PTSB iron and steel complex in Telok Kalong, Terengganu, and as a feedstock to a gas processing plant and a liquefied petroleum gas production plant in Kerteh, Terengganu.

LNG production in Bintulu, Sarawak, rose to 7.8 Mmt in 1992. To carry out further expansion of LNG production capacity in Bintulu, Sarawak, PETRONAS, the State-owned oil and gas company, entered into an agreement with Shell Gas B.V. of the Netherlands, Mitsubishi Corp. of Japan, and Sarawak State government for the establishment of a joint-venture firm called Malaysia Liquefied Natural Gas Dua Sdn. Bhd. (MLNGD) for managing the LNG expansion project in May. MLNGD has an authorized capital of $392.6 million, of which 60% is owned by PETRONAS, 15% each by Shell Gas B.V. and Mitsubishi Corp., and 10% by the Sarawak State government.[10] The partners of MLNGD were the same as those of Malaysis Liquifid Natural Gas Sdn. Bhd. (MLNG), which began operation in 1983 and had produced and exported about 50 Mmt of LNG to Japan since 1983.

In mid-1992, PETRONAS awarded a $1.6 billion contract to a consortium of M.W. Kellogg Co. of the United States, JGC Corp. of Japan, and Sime Engineering Sdn. Bhd. of Malaysia for expanding the Bintulu LNG plant in Sarawak. The contract called for engineering, procuring, and building three new LNG trains to double the production capacity of the Bintulu LNG plant to 15.8 Mmt/a by 1995.[11] To accommodate the expanding LNG output capacity, the company will also build a fifth 65,000-m^3-capacity storage tank, bringing the total LNG storage capacity to 325,000 m^3 at the Bintulu LNG complex.

Exports of LNG by MLNG to Japan totaled about 7.1 Mmt and were valued at about $1 billion in 1992. Most of the LNG produced in 1992 was exported to three Japanese utility companies, Tokyo Electric Power Co. Tokyo Gas Co., and Saibu Gas Co., under two 20-year supply contracts signed separately in 1983 and in 1990. MLNG began shipping about 58,500 tons of LNG to Korea Gas Corp. of the Republic of Korea in 1992 under a 3-year supply contract signed in 1991. In September, MLNG signed another 20-year contract to supply 500,000 mt/a of LNG to Tohoku Electric Power Co. of Japan beginning in 1996.

As part of the second phase of the Peninsular Gas Utilization (PGU-II) project, the second and the third 7-Mm^3/d gas processing plants at Telok Kalong near Kertek in Terengganu, the upgrading and expanding of the Kertek export terminal facilities, and the ethane extraction facilities had been completed in 1992. The entire construction project was awarded in 1990 to a consortium composed of SWES Zainal Sdn. Bhd. of Malaysia, Hyundai Engineering and Construction Co. of the Republic of Korea, and Sumitomo Corp. of Japan.

The Government of Malaysia announced in February that it planned to complete the third phase of the Peninsular Gas Utilization project (PGU-III) by 1995. The $1 billion PGU-III project, under design and engineering studies, involved construction of a 530-km pipeline network for extending the existing 730-km gas pipeline (PGU-II) northward from Meru in Klang to Bukit Keteri in Perlis on the west coast near the border with Thailand. Studies were also

under way to extend the gas pipeline northward from Kertek on the east coast. The fourth 7-Mm^3/d gas processing plant under PGU-III was under construction by Stone and Webster of the United States in 1992.

In August, PETRONAS awarded a $240 million contract to a consortium composed of Pernas Construction Sdn. Bhd. of Malaysia, Sumitomo Corp. of Japan, Stone and Webster of the United States, and Hyundai Engineering and Construction Co. of the Republic of Korea. The contract was for construction of a 2.8-Mm^3/d gas processing plant in Bintulu, Sarawak, to be completed by 1995.

Petroleum.—Malaysia's crude oil production rose to an average of 661,000 bbl/d in 1992 from 652,100 bbl/d in 1991. Malaysia's crude oil production capacity including condensate stood at an average of 690,000 bbl/d in 1992. Production of crude oil in 1992 was from 32 oilfields with 43 offshore platforms operated by PETRONAS Carigali Sdn. Bhd., the upstream arm of PETRONAS, and three foreign contractors, EPMI, SSB, and SSP.

In 1992, export earnings from crude petroleum dropped by 5.4% to $3.5 billion resulting from lower oil prices and decreased exports. Singapore, the Republic of Korea, Japan, and the United States remained the major buyers of the Malaysia crude petroleum in 1992. Malaysia continued to import about 22,000 bbl/d of heavy crude oil in 1992 to meet the requirement of the domestic oil refineries.

The second stage of the Dulang development project involving installation of the Dulang satellite was completed in 1992. The third stage involving development of PETRONAS' western area will begin in 1993 and be completed in 1994. Crude oil production from the Dulang waxy oilfield reached an average of 40,000 bbl/d in September. In April EPMI announced that it planned to spend $490 million for installing three platforms in the Guntong Field offshore Terengganu in 1993 and 1994.

During the past 2 years, several significant new oil and gas discoveries were made by foreign production-sharing contractors. These significant discoveries included EPMI's Abu-1, Lukut North-1, Lawang-1 and Serudon-1 and Hamilton Oil Corp.'s Bunga Orkid-1, Bunga Pakma-1, and Bunga Raya-1, all offshore Terengganu in South China Sea; Occidental Petroleum Corp.'s Jintan-1 and Jintan-2, Taiwan's Chinese Petroleum Corp.'s Acis-2, Nippon Oil Co. Ltd.'s Layany-1, and Elf Aquitaine Malaysia's Jamalulalam 1 and 2, all offshore Sarawak. As a result of new oil and gas discoveries, Malaysia's estimated proven reserves of crude petroleum and natural gas increased to 3.7 billion barrels and 1.92 trillion m^3, respectively, from 3 billion barrels and 1.67 trillion m^3, respectively, in 1991.[12]

PETRONAS' plan to build a 100,000-bbl/d sour crude refinery in Malacca suffered another setback when Idemitsu Kosan Co. Ltd. of Japan withdrew from the $1.9 billion project because of disputes with PETRONAS in September. In July, Idemitsu Kosan Co. Ltd. of Japan and Samsung Trading Co. Ltd. of the Republic of Korea reportedly reached an agreement with PETRONAS for Idemitsu Kosan and Samsung Trading to take 40% and 15% stakes in the project.[13]

Reserves

Malaysia is estimated to have more than 15% of known world tin reserves. The estimated ilmenite and monazite reserves associated with tin reserves are substantial. Ore reserves of bauxite, copper, natural gas, petroleum, and other industrial minerals are small but considered significant for the area. Malaysia was ranked 22d in worldwide oil reserves and 14th in natural gas reserves. Reserves of major mineral commodities are shown in table 3, according to the Malaysian Government and industry sources. *(See table 3).*

INFRASTRUCTURE

Malaysia's existing highways, railroad system, and port facilities are adequate to transport most of the nonferrous mineral products to the domestic and overseas markets. As part of PGU-II, construction of two new gas processing plants and upgrading of export terminals at Kerteh were completed in 1992. A consortium formed by PETRONAS, two local companies, and two Japanese firms began construction of a gas-reticulation system covering the States of Selangor and Johore. The Government began design and engineering studies on construction of a 530-km gas pipeline network for extending the 730-km gas pipeline northward from Meru in Klang to Bukit Keteri in Perlis on the west coast of peninsular Malaysia and northward from Kertek on the east coast under the PGU-III project in 1992. Under the Government plan, the PGU-III project, which also included building one more new gas processing plant, was scheduled for completion in 1995 at an estimated cost of more than $1 billion.

To accommodate the transportation needs of the new growing industrial areas and in the southern Johore State, the 924-km North-South Expressway along the west coast of peninsular Malaysia connecting Thailand in the north and Singapore in the south was expected to be completed by 1993. According to the Malaysian Highway Authority, Federal route No. 2 connecting Kuala Lumpur on the west coast to Kuantan on the east coast was being expanded and another new East-West Expressway was under planning. In Johore, construction of a new second bridge for crossing to Singapore and a 43-km highway linking the North-South Expressway to western Singapore was expected to begin in 1993.

Malaysia's installed electricity capacity was 5,400 MW, and total demand was about 4,200 MW in 1991. Demand for electricity had been increasing at an average annual rate of about 11% as a result of the growing manufacturing sector over the past 5 years. To cope with the increasing demand for electricity, Tenaga Nasional, the semiprivate national electrical power company, announced in early 1991 that it plans to invest $365 million for purchasing seven gas-powered turbines to raise Malaysia's total electricity-

generating capacity by 800 MW to 6,200 MW by 1995. Under the company plan, Malaysia's electricity-generating capacity will be expanded to 10,000 MW by the year 2000.

OUTLOOK

The oil and gas industry will continue to dominate the mineral industry of Malaysia because of its contribution to the Malaysian economy. The crude petroleum production capacity will be raised to 750,000 bbl/d when EPMI and PETRONAS complete their three-stage development of the Dulang Oilfield offshore Terengganu in 1994. Production of natural gas should also increase to more than 65 Mm^3/d in the next 2 to 3 years because of the growing demand for natural gas by the manufacturers of LNG and nitrogen fertilizer materials in the Bintulu area of Sarawak as well as by the manufacturing and utility industries in western and southern peninsular Malaysia.

The tin industry is expected to remain depressed in 1993, unless the market prices of tin recover substantially from the continued low prices in 1992. Production of copper concentrate at the Mamut Mine in Sabah is expected to operate at the rate of 120,000 mt/a until 1997. Production capacity of the cement industry will expand by 2.2 Mmt/a to 9.5 Mmt/a in the next 3 years as the growing demand for cement by the construction industry continues. Malaysia should emerge as an important producer of LNG, nitrogen fertilizer materials, and petrochemical products in Southeast Asia when all of the announced investment plans are successfully implemented in the next 3 years.

According to the Finance Ministry's Economic Report 1992/1993, Malaysia economy was projected to grow at 8% in 1993. The manufacturing and construction sectors will grow at 14% and 11%, respectively, while the mining sector will suffer a negative growth rate of 1.1% in 1993. Malaysia's foreign debt, which stood at $17 billion in 1992 compared with $16 billion in 1991, will continue to mount because of increased borrowing from abroad for upgrading the country's major ports, Federal highways in peninsular Malaysia, and other economic development projects in various parts of the country. However, the Finance Ministry expected the national debt service ratio will continue its steady decline from 6.2% in 1991 to 5.6% in 1992 because of a steady increase in Malaysia's trade surplus.

[1]Where appropriate, values have been converted from Malaysia ringgits (M$) to U.S. dollars at the rate of M$2.75=US$1.00 in 1991 and M$2.55=US$1.00 in 1992.

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[3]Metal Bulletin (London). Malaysia Gets a New Aluminum Smelter. No. 7713, Sept. 10, 1992, p. 11.

[4]Geological Survey of Malaysia. Annual Report 1991, pp. 122-23.

[5]South-East Asia Mining Letter (London). Malaysia, Punjom Gold Presence Confirmed. V. 4, No. 11, June 26, 1992, p. 3.

[6]Far Eastern Economic Review (Hong Kong). Briefing, Kuala Lumpur Agrees To Take Over Sabah Project. V. 155, No. 15, Apr. 15, 1992, p. 71.

[7]Metal Bulletin (London). Malaysia Mills Buy Sabah DR Plant. No. 7731, Nov. 12, 1992, p. 25.

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[9]Hitox Corp. of America. 10-K Report 1991, pp. 3-4; and 10-K Report 1992, pp. 3-5.

[10]Japan Metal Bulletin (Tokyo). Mitsubishi To Enter Into a Joint Venture of LNG in Malaysia. No. 5650, June 2, 1992, p. 1.

[11]Petroleum Economist (London). Malaysia. V. 59, No. 7, July 1992, p. 34.

[12]Oil and Gas Journal. Worldwide Look at Reserves and Production. V. 90, No. 52, Dec. 28, 1992, p. 44.

[13]Far Eastern Economic Review (Hong Kong). Idemitsu Pull Out. V. 155, No. 38, Sept. 24, 1992, p. 109.

OTHER SOURCES OF INFORMATION

Agencies

The Ministry of Primary Industry:
Department of Mines
11th Floor, West Block
Wisma Selangor Dredging
142 C, Jalan Ampang,
50656 Kuala Lumpur, Malaysia
Geological Survey of Malaysia
20th Floor, Tabung Haji Building
Jalan Tun Razak, P.O. Box 11110
50736 Kuala Lumpur, Malaysia
Tin Industry (Research and Development) Board
8th Floor, West Block
Wisma Selangor Dredging
142 C, Jalan Ampang, P.O. Box 12560
50782 Kuala Lumpur, Malaysia

Publications

Ministry of Primary Industry, Kuala Lumpur:
Department of Mines: Statistics on Mining Industry in Malaysia, monthly; Bulletin on Mining Statistics, quarterly; and Bulletin of Statistics Relating to the Mining Industry of Malaysia, annually.
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Malaysian Chamber of Mines, Kuala Lumpur: Year Book.
Malaysian Industrial Development Authority, Kuala Lumpur:
Malaysia Industrial Digest, quarterly.

TABLE 1

MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[p]
METALS						
Aluminum: Bauxite, gross weight	thousand tons	361	355	398	376	331
Columbium and tantalum concentrate, gross weight		—	—	4	—	—
Cb content of columbium[e]		—	—	1	—	—
Ta content of tantalum[e]		—	—	—	—	—
Copper, mine output, Cu content (Sabah)		22,097	23,805	24,327	r25,605	28,556
Gold, mine output, Au content:						
Malaya	kilograms	717	678	869	r871	708
Sabah	do.	1,773	1,951	1,586	1,615	2,215
Sarawak	do.	439	255	139	r291	590
Total	do.	2,929	2,884	2,594	r2,777	3,513
Iron and steel:						
Iron ore and concentrate	thousand tons	202	193	344	r376	320
Steel, crude[e]	do.	r925	r1,125	r1,200	e1,200	1,250
Rare-earth metals: Monazite, gross weight		2,920	2,948	3,323	1,981	777
Silver, mine output, Ag content						
Sabah	kilograms	10,490	12,808	12,455	r13,262	15,076
Sarawak[3]	do.	285	199	103	r169	250
Total	do.	10,775	13,007	12,558	r13,431	15,326
Tin:						
Mine output, Sn content		28,866	32,034	28,468	20,710	14,339
Metal, smelter		49,945	50,874	r49,067	r42,722	45,598
Titanium: Ilmenite concentrate, gross weight		486,305	r533,657	530,237	336,347	337,744
Tungsten, mine output, W content		—	—	—	2	3
Zirconium: Zircon concentrate, gross weight		25,671	18,704	4,279	5,579	2,608
INDUSTRIAL MINERALS						
Barite		38,766	36,526	48,291	16,600	10,525
Cement, hydraulic	thousand tons	3,775	4,794	5,881	7,451	8,300
Clays: Kaolin		116,869	108,347	152,972	186,699	244,573
Limestone[e]	thousand tons	84,000	85,000	85,000	87,000	100,000
Mica		1,065	2,251	3,341	3,517	4,754
Nitrogen: N content of ammonia		300,600	278,900	228,800	286,200	331,100
Silica sand (Malaya and Sarawak)		418,818	452,025	686,604	668,244	579,491
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand tons	28	112	99	64	74
Gas, natural:[4]						
Gross	million cubic meters	16,730	18,683	e18,900	e22,900	e23,000
Net[5]	do.	13,123	13,964	14,230	e16,260	e17,800
Petroleum:[4]						
Crude	thousand 42-gallon barrels	198,343	214,938	r227,288	238,293	240,541
Refinery products:						
Gasoline	do.	9,804	10,979	r11,854	e13,400	e14,000
Jet fuel[e]	do.	3,000	2,766	3,000	3,000	e3,000
Kerosene	do.	4,041	4,580	r6,655	e6,900	e7,000
Distillate fuel oil	do.	10,753	15,619	r17,933	e19,600	e1,900

See footnotes at end of table.

TABLE 1—Continued

MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Refinery products—Continued:						
Residual fuel oil	thousand 42-gallon barrels	9,107	10,802	[r]14,307	[e]14,000	[e]14,000
Other[e 6]	do.	12,500	9,596	[r]12,000	12,500	[e]13,000
Total[e]	do.	49,205	54,342	[r]65,749	69,400	[e]70,000

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

[1]All production is from Malaya unless otherwise specified. Table includes data available through June 23, 1993.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone), fertilizers, and salt is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Byproduct from gold mines in Sarawak.

[4]Includes production from Malaya, Sabah, and Sarawak.

[5]Gross less volume of reinjected and flared.

[6]Includes LPG, naphthas, and lubricants.

TABLE 2

MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating company and major equity owners	Location of main facilities	Annual capacity
Bauxite	Johore Mining and Stevedoring Co. Sdn. Bhd. (61% owned by Alcan Aluminium Ltd. of Canada, 30% by local investors, and 9% by other)	Bukit Raja-Penberang, Johore	500
Cement	Associated Pan Malaysia Cement Sdn. Bhd.	Rawang, Selangor and Kanthan, Perak	2,800
Do.	Cement Industries Malaysia Sdn. Bhd.	Kangar, Perlis	1,200
Do.	Kedah Cement Sdn. Bhd. (Government-owned)	Langkawi, Kedah	1,500
Do.	Perak-Hanjong Cement Sdn. Bhd. (60% owned by Hyundai Cement Co. Ltd. of Republic of Korea and 40% by Perak State Government)	Padang Rengas, Perak	1,500
Do.	Tasek Cement Bhd.	Ipoh, Perak	1,100
Copper, concentrate	Mamut Copper Mining Sdn. Bhd. (A wholly owned subsidiary of Mega First Corp. Bhd.)	Mamut, Sabah	120
Gas: Natural million cubic meters[3]	Esso Production Malaysia Inc.	Offshore Terengganu	22.7
Do. do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	2.8
Do. do.	Sarawak Shell Bhd.	Offshore Sarawak	38.5
Liquefied	Malaysia LNG Sdn. Bhd. (60% owned by PETRONAS, 17.5% each by Shell Gas N.V. and Mitsubishi Corp. and 5% by Sarawk State Government)	Tanjung Kidurong, Bintulu, Sarawak	7,900
Petroleum, crude millon 42-gallon barrels	Esso Production Malaysia, Inc.	Offshore Terengganu	390
Do. do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100
Do. do.	Sarawak Shell Bhd.	Offshore Sarawak	184
Do. do.	PETRONAS Carigali Sdn. Bhd.	Offshore Terengganu	22

TABLE 2—Continued

MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating company and major equity owners	Location of main facilities	Annual capacity
Tin:			
Concentrate	Malaysia Mining Corp. Bhd. (51.7% owned by Government, 9.5% by Hong Kong & Shanghai Bank Nominees Pte. Ltd. of Singapore, and 38.8% by others)	Concentrated in States of Perak and Selangor	9
Refined	Datuk Keramat Smelting Bhd. (50.5% owned by Amalgamated Metal Corp., 29% by Consolidated Tin Smelters Ltd., and 20.5% by Malaysia Mining Corp. Bhd.)	George Town, Penang	40
Do.	Malaysia Smelting Corp. Bhd. (58% owned by Straits Trading Co. and 42% by Malaysia Mining Corp. Bhd.)	Butterworth, Penang	60

TABLE 3

MALAYSIA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons unless otherwise specified)

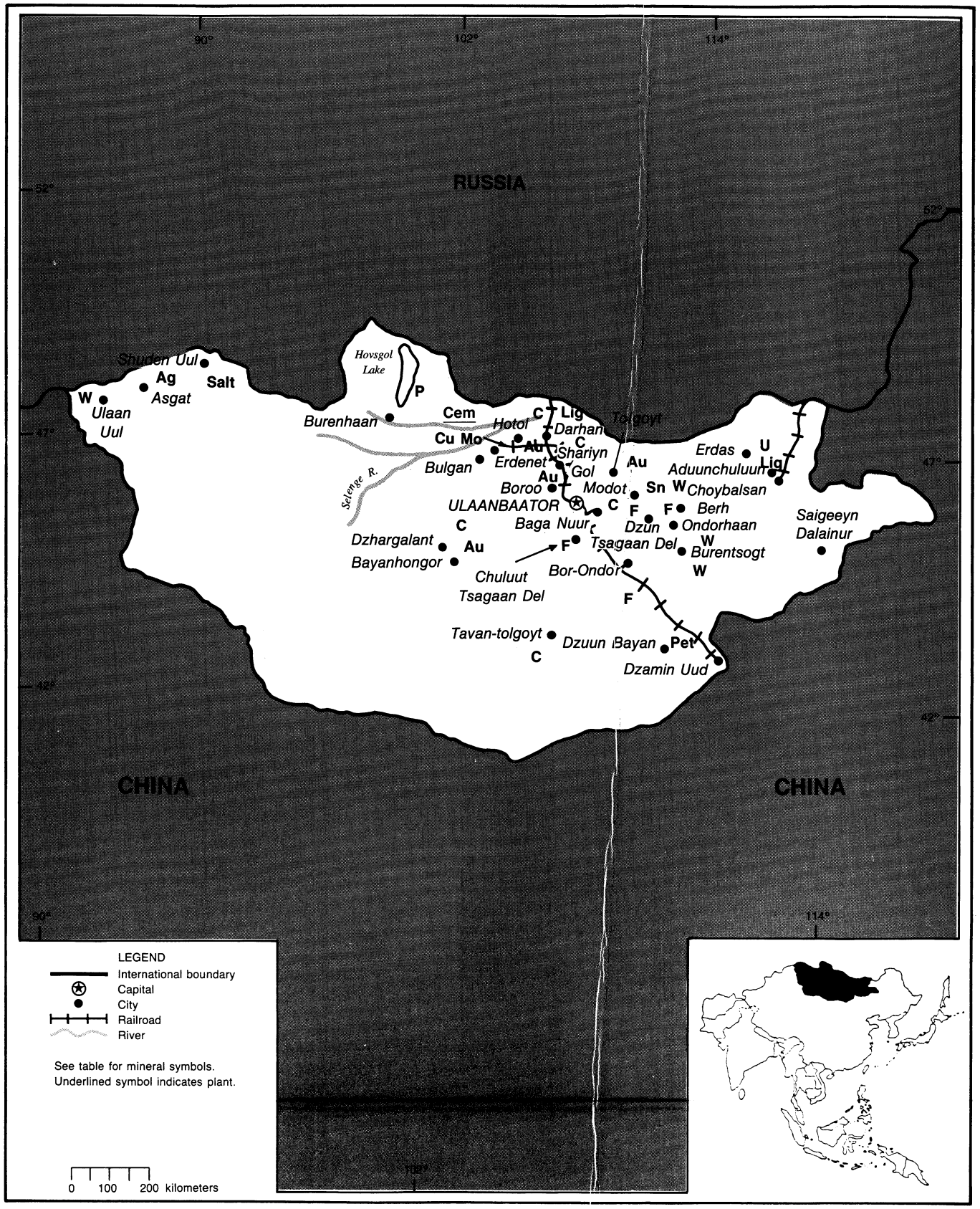
Commodity	Reserves
Bauxite	14,000
Clays[1]	25,600
Copper	e260
Gas, natural billion cubic meters	1,920
Petroleum, crude million 42-gallon barrels	3,700
Marble	68,000
Tin, in concentrate	1,100
Titanium	e896

eEstimated.
[1]Includes kaolin and ball clay.

Sources: PETRONAS, and Oil and Gas Journal, Geological Survey of Malaysia, Malaysia Mining Corp. Bhd.

MONGOLIA

AREA 1,565,000 km² **POPULATION 2.3 million**



THE MINERAL INDUSTRY OF

MONGOLIA

By John C. Wu

Mongolia is a mineral-rich country. According to the Ministry of Geology and Mineral Resources (MGMR) of Mongolia, more than 6,000 occurrences of about 80 different minerals had been found in Mongolia. Of these findings, about 500 deposits of 40 different minerals had been evaluated and about 150 deposits were being worked. Currently, coal, copper, fluorspar, and molybdenum are mined by large-scale operations, while other ore deposits, such as clay, gold, gypsum, limestone, silver, precious stones, tin, and tungsten, were mined by medium- and small-scale operations. Most of these mining operations were in the north-central and eastern parts of the country.

In the 1980's, uranium reportedly had been mined in the northeastern part of the country by Russia. Recently, a wide variety of minerals, including placer and hard-rock gold, petroleum, polymetallic minerals, and uranium, and industrial minerals, such as clay, magnesite, silica sand, and zeolite, in central and eastern Mongolia reportedly were ready for joint exploration and development with foreign investors.

Mongolia's minerals output was estimated to account for 18% of its gross industrial production, and its minerals exports accounted for about 75% of the country's export earnings in 1992. Mongolia's gross domestic product (GDP) and export earnings were estimated at $1.3 billion[1] and $368.0 million, respectively, in 1992. During the ongoing economic transformation period, the Mongolian economy had experienced negative growth and a high rate of inflation in 1991 and 1992. According to a joint estimate by the Government, the World Bank, and the International Monetary Fund, Mongolia's real GDP growth in 1990, 1991, and 1992, was estimated at -2.0%, -9.9%, and -7.6%, respectively, and the rate of inflation in 1991 and 1992 was 209% and 321%, respectively.

In 1992, Mongolia continued to rely heavily on Russia for capital goods and industrial raw materials to meet its domestic requirements. Because of continued economic difficulties in Russia, shipments of fuels, capital goods, and industrial raw materials from Russia to Mongolia had been cut back substantially. As a result, according to the Mongolian State Statistical Office, Mongolian industrial production continued its 2-year downward trend and decreased by 15% in 1992. Production of most minerals (except copper) and building materials also declined owing to the lack of spare parts, fuels, and industrial raw materials.

In May 1992, an additional $320 million in financial aid had been pledged by eight major donor nations and four international organizations over an 18-month period starting June 1992 at the Tokyo international aid conference following the Prime Minister's appeal for helping Mongolia overcome the shortages of fuel, food, and medicine; stabilize its energy sector; and upgrade its manufacturing machinery and transport equipment. The major donors included Japan, the United States, Germany, Asian Development Bank, and International Monetary Fund.[2] Of the $320 million, only $75 million was expected to be disbursed in 1992 for offsetting the Mongolian current account deficit. According to a local press report, the United States pledged a total of $23 million, of which $12 million was for improving the country's coal and electric power production capacity and efficiency.

Following approval by the Small People's Hural (standing legislature), the People's Great Hural (national assembly) passed a new constitution on January 13. The new Constitution became effective on February 12, 1992. Under the new Constitution, the 430 deputies of the People's Great Hural and the 50-member Small People's Hural were replaced by a single-chamber Mongolian Great Hural with only 76 members. The country's official name also was changed to Mongolia from the Mongolian People's Republic in February 1992.

GOVERNMENT POLICIES AND PROGRAMS

In 1992, numerous laws reportedly were adopted and enacted by the Mongolian Great Hural. These laws included an Anti-Monopoly Law, Immigration Law, Law on Non-Government Organizations, Land Law, Religion Law, Budget Law, Constitution Law, Statistical Office Law, Securities Operation Law, State Border Law, General Law on Taxes, Law on Protection of Intellectual Property Rights, and Tax Laws on Economic Units and Organization, on Population, Trade, and Transportation.

To manage and administer the country's mineral resources more efficiently, the central Government established the MGMR by consolidating the Mining Bureau and the State Geological Center in August. Under this new Ministry, there are three departments: Geological Research, Mining, and Administrative; two divisions: Mineral Policy and Planning, and State Geological and Mining; and one bureau for administering oil and gas resources. The Mining Department has the jurisdiction over exploration and

development of all minerals except coal and construction materials. The Geological Research Department controls most of the functions of the former State Geological Center (Geological Survey of Mongolia).

The National Geoinformation Center of Mongolia, under MGMR's Geological Survey of Mongolia, began building Mongolia's first modern data bank for national mineral resources in July 1992 with a $206,000 grant from the United Nations Department of Economic and Social Development. The project was to provide the skills and equipment for establishing a fully integrated and automated computer-based geodata center, which is capable of providing adequate services to other government agencies and all interested authorized users. By the end of the project, a data base of a single 1:1,000,000 map sheet and four 1:500,000 map sheets for the Orhon-Tuul area with high gold potential in north-central Mongolia will be completed. The data bank will have remote sensing, topographic, geological, geophysical, geochemical, hydrogeological, agricultural, and archaeological information as well as information on mineral title, mineral deposit, mineral occurrences, mine production, forestry, and environmental data.

MONMAP Engineering Services Co. Ltd., formerly a part of the National Center of Geological Information and Remote Sensing under MGMR's Geological Survey of Mongolia, was partially privatized with 50% equity owned by local investors in December 1992. Scope of the company's services included mapping, remote sensing, geophysical, geological, geochemical, and other geoscientific surveys. It also provides geological information on mining districts, exploration areas, and access routes as well as drilling services.

To attract foreign investors to participate in exploration and development of Mongolian mineral resources, the Ministry of Geology and Mineral Resources reportedly had completed drafting a new mining law in August with the World Bank's assistance. In late 1992, the draft reportedly was being reviewed and revised by related Government agencies. The revised final draft was expected to be adopted and passed by the Mongolia Great Hural by the end of 1993. A new foreign investment law, which would allow 100% equity ownership by foreign investor and lower income tax, also was expected to be passed by the Mongolian Great Hural in 1993.

According to a local press report, the main obstacle to foreign investment in Mongolia is its geographical location, small domestic market, poor infrastructure, and political factor. Since the declaration of an open-door policy and implementation of the 1990 foreign investment law 2 years ago, a total of 84 joint ventures involving $22 million investment were established with 17 countries participating. Of the total number of joint ventures, about 50% were for food production, 27% were for tourism, and 25% were with partners from the former U.S.S.R.

Since 1991, two U.S. companies had participated in the joint venture with Mongolia for exploration of gold in north-central Mongolia and petroleum resources in eastern Mongolia. The Metal Mining Agency of Japan also had a joint-venture agreement with Mongolia to explore for lead-zinc-silver in northeast Mongolia.

In 1992, a preliminary investigation for construction of the country's first hydroelectric powerplant at the River Egiin-Gol, about 60 km northwest of Erdenet, in Bulgan Aymag, was completed. Topographic survey and other preliminary investigations for the proposed $100 million powerplant were financed by the Asian Development Bank. Electrowatt Co. Ltd. of Switzerland and MONMAP Engineering Services Co. Ltd. of Ulaanbaatar reportedly were involved in the preliminary investigation.

PRODUCTION

Mongolia was the world's fourth largest fluorspar producer in 1992. Mongolia remained an important producer of copper and molybdenum in the region. The activity of the mining industry in 1992 was severely affected by the shortage of electric power, fuels, and supplies, such as diesel fuel for power generation, spare parts for mining equipment, and tires for trucks. The shortage was caused mainly by a lack of hard currency for trade and reduced financial aid from Russia. As a result, the overall output of the mining industry dropped substantially in 1992.

Mongolia's overall mineral production in 1992 was estimated to be about 15% lower than that of 1991. In 1992, production of copper concentrate at the Erdenet Mine increased by 17%, while production of molybdenum decreased by 11%. The output of coal, limestone, and other metallic and industrial minerals was at a lower level than that of 1991. The decline in coal production was due to a lack of spare parts and diesel oils for mining equipment and truck. The sharp drop in production of cement and limestone was caused by the curtailed construction industry caused by the withdrawal of most Russian construction companies from Mongolia in 1992. The lower output of fluorspar was owing to reduced exports to Russia. *(See table 1.)*

TRADE

In 1992, Mongolia continued to conduct a significant portion of its merchandise trade with the former U.S.S.R. and other Council for Mutual Economic Assistance (CMEA) block countries. Under a protocol agreement on trade with Russia signed in June 1992, Russia agreed to supply 800,000 tons of refined petroleum products and granted Mongolia a credit of $38.7 million. According to a local press report, Mongolia's merchandise exports rose to $368 million in 1992 from $350 million in 1991, while Mongolia's imports also increased to $400 million in 1992 from $357 million in 1991.

Exports of mineral commodities (mainly concentrates of copper, molybdenum, and fluorspar) were estimated at more than $270 million, accounting for more than 75% of Mongolia's export earnings in 1992. According to the Ministry of Trade and

Industry, exports of mineral commodities in 1992 were as follows: copper concentrate, 346,000 tons; fluorspar, 166,000 tons; fluorspar concentrate, 97,000 tons; coal, 78,000 tons; cement, 16,000 tons; metal scrap, 24,000 tons; and molybdenum concentrate, 3,000 tons.

Because of a lack of mineral processing facilities, Mongolia continued to rely on the former U.S.S.R. for processed mineral products to meet its domestic demand. In 1992, petroleum products, ferrous and nonferrous metal products, and fertilizer materials remained the major import components, accounting for about 40% of Mongolia's imports in 1992. According to the Ministry of Trade and Industry, imports of petroleum products in 1992 were as follows: gasoline, 209,800 tons; diesel oil, 146,800 tons; mazut (a fuel used to prime the boilers), 46,100 tons; jet fuel, 15,000 tons; and lubricants, 12,200 tons.

COMMODITY REVIEW

Metals

Copper and Molybdenum.—Production of copper concentrate and molybdenum concentrate from the Erdenet Mine in Bulgan Aymag of northern Mongolia increased to 300,200 tons and 3,238 tons, respectively, in 1992, compared with 258,000 tons and 2,846 tons, respectively, in 1991. According to an official of the Mongolian-Russian joint venture of the Erdenet Combine, in the past 2 years the average ore grade of the Erdenet Mine had decreased to about 0.76% copper and the copper concentrate contained between 28% and 35% of copper, no more than 0.35% of arsenic and 0.05% of bismuth, plus 0.2 g/mt of gold, 50 g/mt to 55 g/mt of silver, 60 g/mt of selenium, and 7 g/mt to 8 g/mt of tellurium. The molybdenum concentrate at the mine contained 50% to 53% molybdenum, 0.8% to 1.2% of copper, plus 350 g/mt to 450 g/mt of rhenium, 90 g/mt of selenium, and 15 g/mt of tellurium.

In 1992, the output of copper and molybdenum was below the planned production level mainly because of a shortage of electric power. Most of the combine's requirement for electric power was supplied by the No. 4 powerplant in Ulaanbaatar. The shortage of electric power reportedly was caused by a shortage of steam coal for power generation at the No. 4 powerplant and partially due to a dispute between the combine and the No. 4 powerplant on the price of electricity.

According to the first Deputy General Director of the combine, the loss of the copper concentrate production due to power shortage amounted to 65,000 tons in 1991 and 50,000 tons or about $37 million in export earnings loss in 1992. To solve the power shortage problems, a feasibility study had been conducted for building a coal-fired powerplant at the combine to meet about 50% of its annual electric power requirement. According to the general manager of C. Itoh & Co. in Ulaanbaatar, the feasibility study for building the powerplant involved renovation of the heating plant at the combine by installing two new 30-MW-capacity steam turbines for the existing boilers. The cost of building the powerplant was estimated at between $42 million and $50 million. The Mongolian Government reportedly approached the Imports and Exports Bank of Japan to finance the project.

In April, C. Itoh & Co. of Japan extended a $20 million loan to Mongolia for improving the mining operation and rehabilitating the milling facilities at the Erdenet copper-molybdenum complex. However, most of the borrowed money reportedly had been spent for the purchase of mining equipment, spare parts, fuels, explosives, and tires from Russian and China to keep the operation going. To repay the loan, Mongolia was to export about 35,000 mt/a of copper concentrate to Japan.[3]

According to the Ministry of Trade and Industry, exports of copper concentrate totaled 346,000 tons in 1992 compared with 245,000 tons in 1991. Mongolia continued to export a large portion of its copper concentrate to Russia and Kazakhstan. Exports of copper concentrate to Japan, according to Japanese trade statistics, declined to 30,877 tons in 1992 from 32,791 tons in 1991. Exports of concentrate to Japan reportedly were shipped through Siberia via Nakhoda Port on the far eastern coast of Russia. Some quantities of the copper concentrate were exported to China, Finland, and Switzerland. Mongolia continued to export all of its molybdenum concentrate to Krasno Uralsk of Russia.

The structure of the Erdenet copper and molybdenum combine is composed of a 25-Mmt/a open pit mine, an ore storage yard, a 430,000-mt/a concentrator, a workshop for repair and maintenance, a heating plant, a food processing plant, and a construction company. The combine operated a school, hospital, and shopping center inside the complex and a farm with more than 10,000 cattle and sheep nearby. In 1992, the Mongolia-Russian joint-venture copper and molybdenum complex employed about 6,500 workers; of those, about 1,200 are Russian, including managers, technical advisers, medical personnel, and teachers.

Gold and Silver.—Official statistics on production and trade of gold and silver remained classified as a state secret. Gold production in 1992 was estimated to be between 850 kg and 1,000 kg, including gold recovered as a byproduct of the Erdenet copper operation. Silver recovered as a byproduct of copper was estimated to be about 16,000 kg in 1992. Mongolbank, the Mongolian state bank, controls all buying and trading of gold in Mongolia. To promote gold and silver mine production in Mongolia, Mongolbank raised its purchasing prices of gold and silver per gram to $12.86 and $0.24 in December 1992.

According to the Ministry of Geology and Mineral Resources, gold was produced mainly from the alluvial deposits at Tolgoyt and at Shariyn Gol in Selenge Aymag; at Khailaast (Hailaast) in Tov Aymag; and at Mukhar Ereg and Duvuntiin in Bayanhongor Aymag. Gold mining at Tolgoyt was by Mongolsovtsvetmet, a Mongolia-Russia joint venture; at Shariyn Gol, by Shariyn Gol Coal Co.; at Duvunt, by Duvunt Gold Enterprise; and at Mukhar Ereg and Duvuntiin, by Zhargalant (Gargalant) Enterprise. The

newly developed Khailaast (Hailaast) gold mine, with a capacity of about 250 kg/a, was operated by Khailaast Gold Enterprise. Two new gold projects expected to be undertaken by joint venture with foreign investors or Mongolian enterprises were the Bumbat and Bayan Gol projects in Zaamar district of Tov Aymag.

In May 1992, Morrison Knudsen Corp. (MK) signed an agreement through its subsidiary, Morrison Knudsen Gold company, with Mongol Erdene, a Mongolian state-owned trading and mining company, to jointly explore, develop, and produce gold from the Boroo deposit in Tov Aymag. The Boroo project, about 130 km northwest of Ulaanbaatar, was the first major U.S. investment in the Mongolian mining sector. According to MK, the joint-venture firm had obtained a license from the Mining Department to explore a 7,770-km^2 area in 1992. The drilling program, which was conducted in the second half of 1992, had proven the previously estimated ore reserves of 20 Mmt, with an average ore grade of 0.0018 gram/mt of ore. MK estimated that about 31.1 tons (1 million troy ounces) of gold was recoverable from the Boroo deposit. MK was expected to plan and design the mine, process facilities, and infrastructure as well as to prepare and submit a bankable feasibility study for securing a loan for the project.[4]

Lead and Zinc.—In July, the Ministry of Geology and Mineral Resources reached a 3-year joint exploration agreement with the Metal Mining Agency of Japan (MMAJ) to conduct a detail drilling program for a subsequent mine development of the Tsav (Tsaviin) lead-zinc deposit beginning in 1992. The Tsav deposit, about 130 km northeast of Choybalsan, the capital of Dornod Aymag, had been explored by the Russian survey team. According to MMAJ, the latest Russian exploration conducted in 1991 showed that ore reserves at Tsav were about 4.4 Mmt averaging 6.4% lead and 3.3% zinc, plus 253 g/mt silver. Under the 3-year agreement, MMAJ was to conduct a drilling program at the No. 4 ore body, to analyze the data from the latest exploration, and to conduct sample tests beginning in the second half of 1992.

The Tumurtiin Ovoo zinc deposit, about 16 km north of Baruun-Urt, the capital of Suhbaatar Aymag, was still under study by the prospective investors for subsequent development. In 1992, C. Itoh Co. of Japan reportedly was investigating the property. The ore reserves at the deposit were previously estimated by the Mongolian-Russian survey team at 7.8 Mmt averaging 13% zinc.

Tin and Tungsten.—Production of both tin and tungsten concentrate continued the 1991 downward trend in 1992 owing to the lack of fuel and spare parts as well as reduced exports. The Tsagaan-Davaa tungsten mine in Tov Aymag remained shut down in 1992. According to MGMR's Mining Department, production of tin concentrate from the Bain-Mot (Modot) and Khujikhan Mines in Henity Ayamg was only 62.9 tons, a sharp drop from 140.9 tons in 1991 and 317.4 tons in 1990. The Khujikhan Mine also produced tungsten concentrate as a byproduct of tin mining. The average metal content of tin concentrate produced from the Modot area was about 50% SnO_2.

Production of tungsten concentrate was by a state-owned enterprise at the Ulaan Uul and Khovd Gol Mines both in Bayan Olgiy Aymag. According to the Mining Department, the Ulaan Uul Mine was not operating in 1992. Production of tungsten concentrate, which accounted only the state-owned mining operations, was only 25 tons in 1992, compared with 30 tons in 1991 and 45 tons in 1990. The average metal content of tungsten concentrate from the state-owned mines was about 60% WO_3. Most joint-venture operations with East European countries for the production of tin and tungsten had been closed since 1990.

Industrial Minerals

Cement.—Cement production dropped sharply in 1992 because of a curtailment in construction of plants, office buildings, and apartments in Ulaanbaatar and other industrial areas due to the withdrawal of Russian construction companies and Mongolia's financial and economic difficulties. Production of cement was by Hutol Cement and Lime Combine in Hutol (Khutul) and Darhan Cement Co. in Darhan, both in Selenge Aymag of northern Mongolia.

Hutol Cement and Lime Combine, which operated a 500,000-mt/a cement plant and 65,000-mt/a hydrated lime plant using Russian technology and equipment, produced only 40,000 tons of cement in 1992, compared with 200,000 tons in 1991; and 50,000 tons of lime compared with 76,000 tons in 1991. The combine, about 65 km southwest of Darhan, also operated a 750,000-mt/a limestone quarry, about 7 km north of the cement plant. Limestone reserves at the Hutol Mine were estimated at more than 20 Mmt. Other raw materials, such as gypsum, zeolite, basalt, and high-grade coal for cement manufacturing, were imported from Russia. The work force at the combine was about 1,000; of those, about 52% were female workers. Darhan Cement, which operated a 150,000-mt/a-capacity plant using Czechoslovakian technology and equipment, produced about 70,000 tons in 1992. Mongolia exported 16,000 tons of cement in 1992.

Fluorspar.—Production of direct shipping metallurgical-grade fluorspar ranging between 45% CaF_2 and 95% CaF_2 for exports mainly to Russia was estimated at 180,000 tons. Production of fluorspar, which averaged about 32% CaF_2 for concentrating into acid-grade calcium fluoride, was estimated at 360,000 tons. The sharp decline in the 1992 overall production of fluorspar was due mainly to the closure of the Chuluut Tsagaan Del Mine in Tov Aymag in early 1992 and reduced exports of acid-grade calcium fluorite (fluorspar concentrate) to Russia in 1992.

In 1992, fluorspar was produced by Mongolsovtsvetmet, a joint venture of Mongolia (51%) and Russia (49%). Mongolsovtsvetmet operated an

underground mine and an open pit mine as well as a fluorspar concentrator at Bor Ondor in Hentiy Aymag. It also operated open pit mines at Khar-Airag, Khajuu (Khazhu) Ulaan, and Urgon (Orgon) in Dorngovi Aymag and an underground mine at Berh in Henity Aymag. Output of fluorspar from all mines except from the Berh and Urgon Mines was delivered to Bor Ondor for concentration.

In an effort to expand its product market into the Western World, Mongolsovtsvetmet was upgrading the existing concentrating facilities to raise the content of calcium fluorite in the concentrate from 94% to between 96% and 98%. Metallurgical-grade fluorspar produced from the Berh Mine and the Urgon Mine was exported to Russia. Fluorspar produced from the Berh Mine is of a higher grade than that of all other mines in Mongolia.

Mongol-Czechoslovakmetal, which operated an open pit mine with a capacity of 45,000 mt/a at Chuluut Tsagaan Del in Tov Aymag, shut down its operation in Mongolia in early 1992.

Zeolite.—In March, the Three River Geological Co. of Mongolia had enter into an agreement with Russia to establish the joint venture called Gurvan Gol Co. for development of natural zeolite deposits in the Tsagaan Tsav area of Dornogovi Aymag, about 30 km south of the Sainshand railroad station. The zeolite mine, located near Zuun Bayan, was expected to produce 15,000 mt/a of clinoptilolite. Clinoptilolite reserves at the Tsagaan Tsav area were estimated at 4.8 Mmt. There is a railroad branch line connecting Zuun Bayan with Sainshand station of the Tran-Mongolian Railroad.

Mineral Fuels

Coal.—Coal production dropped to the lowest level since 1986 owing to the continued shortage of explosives, fuel, and spare parts for mining equipment, batteries, lubricants, and tires for dump trucks as well as the temporary shutdown of the Shariyn Gol Mine in Selenge Aymag and the Nalaikh Mine in Tov Aymag because of flooding. According to the Ministry of Fuel and Energy, 17 coal mines were operating in 1992; of those, only the Baga Nuur Mine, the Shariyn Gol Mine, and the Shivee Ovvo Mine produced substantial amounts of coal. Coal production in 1992 was about 21% below the average annual production in the past 6 years.

In 1992, the Baga Nuur Mine, the country's largest coal mine, produced about 65% of total coal production and the Shariyn Gol Mine produced about 20%. The coal output from Nalaikh Mine, an underground mine about 35 km southeast of Ulaanbaatar, was down 40% from that of 1991 because of a mine fire and flooding problems. However, a new open pit coal mine at Shivee Ovvo, 15 km east of the Choyr railroad station in the northwestern part of Dornogovi Aymag, was brought on-stream in March. The initial monthly production at the Shivee Ovvo Mine reportedly was about 9,000 tons, then increased to about 23,300 tons by yearend.

In September, the Ministry of Fuel and Energy organized and held a 2-day international seminar in Ulaanbaatar on the development of Tavan Tolgoi in southern Govi. The Tavan Tolgoi coal mine, about 400 km west of the nearest railroad station at Tsimog, is composed of 16 coal seams with thicknesses ranging from 3 m to 30 m each. According to the latest estimate by a Russian survey team, coal reserves were estimated at 5,000 Mmt, of which 1,500 Mmt is metallurgical (coking) coal. Recoverable coal was estimated at 1,030 Mmt, of which 730 Mmt is coking coal. The coking coal reportedly has low sulfur and phosphorus content, but has a relatively high ash content and poor washability.[5] The Government was seeking foreign investors to jointly develop an open pit mine with a capacity of 20 Mmt/a. Currently, the mine was producing about 100,000 mt/a of coal for local consumption. Infrastructure, such as railroad, powerplant, water sources, and communication network, is prerequisite to development of a large-scale coal mining operation.

Petroleum.—Mongolia had not produced oil and gas from its Zuun Bayan Oilfield in Donogovi Aymag since 1970. Mongolia has relied on imports from Russia to meet the requirement for most of its refined petroleum products. In 1992, a limited amount of refined petroleum products were imported from China and other Asian countries under barter trade agreements, but Russia remained the dominant supplier of refined petroleum products, especially gasoline, aviation fuel, and diesel, in 1992.

According to the Ministry of Trade and Industry, imports of refined petroleum products in 1992 were as follows: 209,800 tons of gasoline, 146,800 tons of diesel, 15,000 tons of aviation fuel, 46,100 tons of mazut (fuel for priming the boiler), and 12,200 tons of lubricants. In Mongolia, all refined petroleum product imports are handled by the state-owned Mongolian Petroleum Import and Supply Organization. The organization also controls distribution of petroleum products through 10 storage and transshipment points to deliver the products to 25 regional distribution centers. The regional centers, in turn, supply consumers in their respective areas.[6]

The Houston-based Western Geophysical of the United States reportedly had completed a 1,500-km speculative seismic survey covering the East Govi, Tamsag, and Choybalsan basins in 1992. According to Western Geophysical, the seismic program, which began in the fall of 1991, was based on an exclusive agreement signed between Mongol Gazyn Tos (MGT), the Mongolian state-owned petroleum company, and Western Geophysical in 1991. In June 1992, MGT announced opening about 12 blocks of contract areas mainly in the previous oil-producing East Govi basin and the Tamsag, Choybalsan, and Nyalga basins for joint-venture oil and gas exploration with foreign exploration companies.

In early 1992, MGT signed an agreement with Amgol Inc. of the United States to rehabilitate and restore oil production facilities in the Zuun Bayan and Tsagaan Els areas in southeastern Mongolia beginning in 1993. Under the

agreement, Amgol also was to help the Mongolian Government to secure financing of the project. Amgol is a equal partnership of Exploration Associates International of Texas Inc.; SOCO International, a wholly owned subsidiary of the Fort Worth-based Snyder Oil Corp.; and CP&G, a Houston oilfield equipment supplier.[7]

[1]Where necessary, values have been converted from Mongolian tugriks (Tug) to U.S. dollars at the rate of Tug/150.00=US$1.00 in 1992 and Tug/40.00=US$1.00 in 1991.

[2]Far Eastern Economic Review (Hong Kong). Asian Yearbook, 1993, p. 170.

[3]Journal of Commerce. Japan Firm To Finance Mongolian Mine Upgrade. V. 392, No. 27,700, Apr. 6, 1992, p. 9A.

Metal Bulletin. No. 7673, Apr. 13, 1992, p. 9.

[4]Morrison Knudsen Corp. News Release, MK Signs Joint-Venture Agreement To Develop Gold Mining Property in Mongolia. May 11, 1992.

[5]U.S. Embassy, Ulaanbaatar, Mongolia. State Dep. Telegram 000954, Mar. 27, 1992, p. 1.

[6]———. State Dep. Telegram 003853, Nov. 25, 1992, p. 1.

[7]Oil & Gas Journal. OGJ Newsletter. V. 90, No. 5, Feb. 3, 1992, 1.

OGJ Special—Newly Democratic Mongolia Offering Exploration Contracts. V. 90, No. 49. Dec. 7, 1992, pp. 39-43.

TABLE 1
MONGOLIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
Cement, hydraulic[3]	thousand tons	502	513	441	227	110
Coal:[3]						
Anthracite and bituminous	do.	692	645	r591	r588	580
Lignite and brown	do.	r7,903	7,400	6,557	6,450	5,400
Total	do.	r8,595	8,045	r7,148	r7,038	5,988
Copper, mine output, Cu content[3]		121,800	123,550	123,900	90,100	105,100
Fluorspar:[3]						
Acid grade	thousand tons	115	115	119	120	97
Metallurgical grade	do.	584	586	495	250	180
Total	do.	699	701	614	370	277
Gold, mine output, Au content	kilograms	1,000	1,200	1,000	800	900
Gypsum	thousand tons	30	30	30	25	25
Lime, hydrated and quicklime	do.	122	95	103	76	50
Molybdenum, mine output, Mo content[3]		1,536	1,580	r1,578	1,716	1,522
Salt		16,000	16,000	17,000	17,000	17,000
Silver, mine output, Ag content	kilograms	20,900	21,200	21,200	15,500	18,000
Tin, mine output, Sn content		1,200	1,200	320	250	190
Tungsten, mine output, W content		600	600	500	300	260

[e]Estimated. [r]Revised.

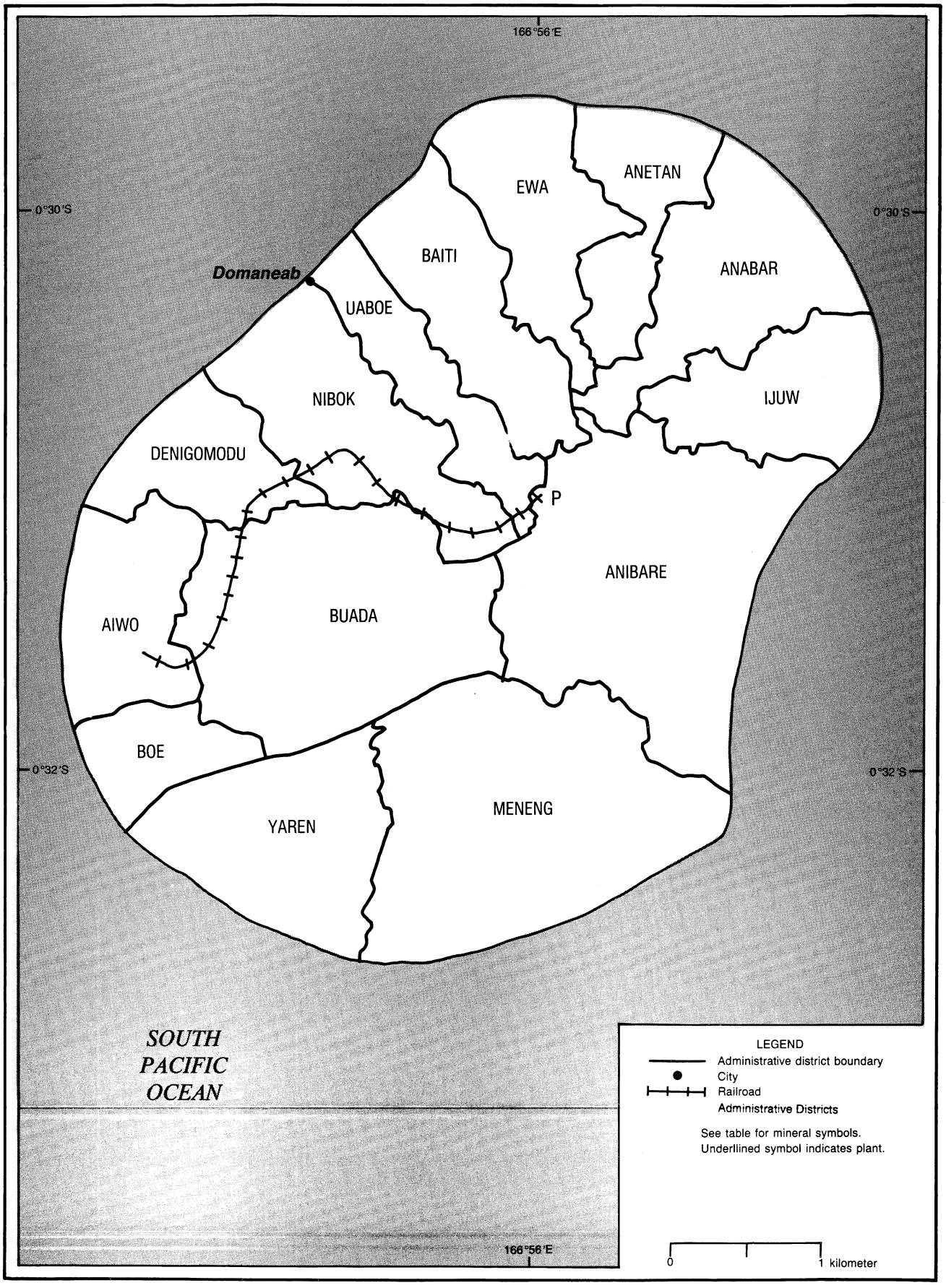
[1]Table includes data available through Mar. 26, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel, varieties of stone such as limestone, silica sand, and uranium presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported.

NAURU

AREA 21 km² **POPULATION 9,500**



THE MINERAL INDUSTRY OF

NAURU

By Travis Q. Lyday

The 21-km^2 island of Nauru is one of three historic phosphate-producing islands of the Pacific. The other two are Banaba (or Ocean Island) in the Gilbert Islands Group of Kiribati and Makatea, part of French Polynesia; however, Nauru is the only remaining producer.

Nauru is the world's smallest nation. It also has one of the highest per capita incomes in the world. The economy continued to be based on the mining of extensive high-grade phosphate rock deposits on the central plateau of the island by the Government-owned Nauru Phosphate Corp. (NPC). The deposits are among the richest in the world, having a consistent content of 84% bone phosphate of lime (BPL) or tricalcium phosphate, equivalent to 38.5% phosphorus pentoxide (P_2O_5). Rock treated in the calcination plant averaged about 89% BPL (40.7% P_2O_5) and may be as high as 91% BPL (41.7% P_2O_5).

Phosphate rock is mined from deposits interdigitated with evenly spaced dolomitized coral limestone pillars using mechanical extractors with clamshell buckets, leaving the coral as a "forest" of very hard-rock pinnacles. The associated coral is cobbed for domestic use as road aggregate.

After overburden is removed by bulldozing, the alluvial phosphate rock is removed from around the coral pinnacles, trucked to a railhead for primary crushing, and reduced to minus 50 mm. A narrow-gauge railway using diesel locomotives transports the crushed material to a treatment plant where it is dried before further crushing to minus 12 mm and sold as run-of-mine product. A proportion of the fine material is upgraded by high-temperature calcination to remove organic carbon and marketed as Nauru Calcined Rock.

There is 3.9 km of NPC-owned railroad track, which is used to transport phosphate from the central plateau of the island to processing facilities in Aiwo District on the southwestern coast.

All phosphate rock mined on Nauru was exported by NPC. Phosphate remained Nauru's sole export. Exports of phosphate rock, by destination, for 1990-92 are given in table 2. Phosphate rock reserves on Nauru are expected to be sufficient for only a few more years of mining at current production levels.

The International Court of Justice (ICJ) at The Hague, Netherlands, delivered in June its judgement on the preliminary phase of Nauru's claim for entitlement to compensation from the former partners of the British Phosphate Commission (BPC). The BPC was composed of Australia, New Zealand, and the United Kingdom. The decision affirmed that the ICJ does indeed have jurisdiction to hear and determine Nauru's claim, filed in May 1989 against Australia after Australia had rejected the compensation claim, concerning certain phosphate lands in Nauru. Australia rejected the proceedings in a counterclaim filed in early 1991 on several issues, perhaps foremost of which was based on the fact that both New Zealand and the United Kingdom were not joined as parties to the proceedings. Australia contended that because the administering authority comprised three states, any finding of breach on the part of Australia would mean the other two states would be discharged of their respective obligations.

The crux of the dispute is the assertion that Australia, as the administering authority in control of the phosphate industry on behalf of the other partners of the BPC, had failed to rehabilitate the environmental damage to the land caused by phosphate mining during the period from 1919 until 1968. The NPC assumed control of the island's phosphate industry in 1968, shortly after the island country's independence.

OTHER SOURCES OF INFORMATION

Nauru Phosphate Corp.
Republic of Nauru
Central Pacific
Telephone: +674 4180 or +674 4198

TABLE 1
NAURU: PRODUCTION OF PHOSPHATE ROCK[1]

(Thousand metric tons)

Commodity[2]	1988	1989	1990	1991	1992
Phosphate rock	1,541	1,181	926	530	747

[1]Includes data available through Mar. 26, 1993.
[2]In addition to the commodity listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates of output levels.

TABLE 2
NAURU: EXPORTS OF PHOSPHATE ROCK, BY DESTINATION

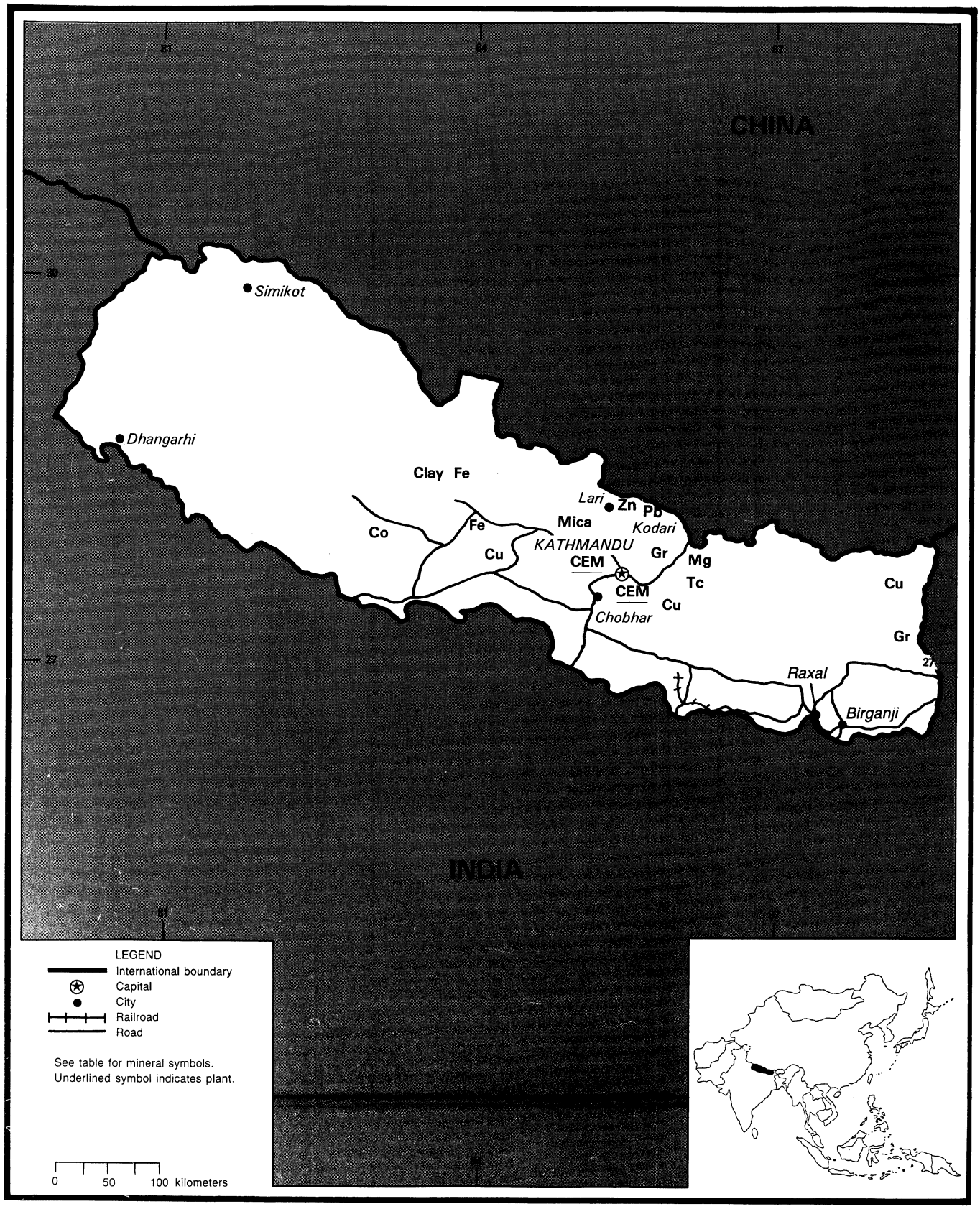
(Thousand metric tons)

Destination	1990	1991	1992
Australia	593.9	186.6	373.4
Korea, Republic of	153.0	59.2	43.4
New Zealand	179.3	190.9	330.5
Philippines	—	93.4	—
Total	926.2	530.1	747.3

Source: Phosphate Rock Statistics 1992, International Fertilizer Association Ltd.

NEPAL

AREA 140,800 km² **POPULATION 20.1 million**



THE MINERAL INDUSTRY OF

NEPAL

By John C. Wu

The Kingdom of Nepal, a small landlocked country with an area about the size of Arkansas, is bordered on the north by Tibet of China, on the east by Sikkim and West Bengal of India, and on the south and west by Bihar and Uttar Pradesh of India. Nepal's per capita GNP in 1992, according to the Asia Development Bank, amounted to only $170[1] and was the poorest nation in south Asia. Nepal's mineral resources, identified by its Department of Mines and Geology under the Ministry of Industry, include beryl, clays, coal, copper, dolomite, gemstones, gold, iron ore, lead, limestone, magnesite, mica, silica sand, construction stone, talc, tin, and zinc. Among these minerals only clays, coal, gemstones, limestone, marble, magnesite, and talc were currently being mined.

Nepal's mining sector, comprised mainly of several small-scale industrial minerals mining companies, is the smallest sector of the Nepalese economy. Nepal's GDP was estimated at $3 billion in 1992. The output of the mining and quarrying industry, according to the latest United Nations' statistics, was estimated at $6 million,[2] or 0.2% of Nepal's GDP. Nepal mineral processing consisted of three cement plants, a dead-burned magnesite processing plant, and a talc processing plant.

Mining operations of various industrial minerals by privately owned small mining firms are sparsely distributed throughout the country. Limestone was being mined for the production of cement and lime and for construction materials. Boulders, clays, marble, and sand were being mined for domestic consumption as well as for export to India. In early 1992, gold and uranium particles reportedly had been found in the sand and boulders in the Chaulani-Gad and Panchmane areas of the Baitadi District. As a result, exports to India of sand and boulders from these areas were suspended. In environmental restoration, the Ministry of Forest and Environment and the Nepal Mining Industry Association initiated planting in September of 4,000 saplings at Lele Bhanjyany, Lalitpur, on 4 ha of land to help maintain the balance between development and environment.[3]

Nepal produced a small amount of coal, but most of the coal requirements for cement production and other uses were met by imports from India. Because of financial and technical problems, a major coal producer, Abhidhara Pataghar Coal Industry, which had suspended mining operations since 1991, reportedly was expected to resume production in the near future. The Nepal Coal Co., which had a purchase agreement with India for importing 125,000 tons of coal in 1992, signed another agreement for importing an additional 10,000 tons in 1992.

Mining of crude magnesite was by Nepal Orind Magnesite Ltd. at Kharidhunga and Lamusangu, to the northeast of Kathmandu (national capital) in the Dolkha mining district. Nepal Orind Magnesite, which is 50% owned by the Government and 50% by Orissa Industries Ltd. of India, completed construction of a crushing plant at Kharidhunga as well as a 50,000-mt/a dead-burned magnesite processing plant (shaft kiln) and a 10,000-mt/a talc processing plant at Lamusangu in 1988. Processing technology was supplied under a licensing agreement between Orissa Industries and Harbison-Walker Refractories of the United States. According to the Finance Ministry, although large investments had been made in Nepal Orind Magnesite, the company had not yet been able to start trial production in late 1991.

Production of cement was estimated to be at a higher level than that of 1991 as a result of the commissioning of a new cement plant in July 1992. The Himal Cement Co. Ltd., which was commissioned in 1976 at Chobhar, produced about 60,000 tons with an annual capacity of about 100,000 mt/a. Hetauda Cement Ltd., which was commissioned in 1985 at Hetauda, produced about 150,000 tons with an annual capacity of 260,000 mt/a. The plant of Udayapur Cement Industry Ltd. at Jaljale, newly commissioned in July 1992, was estimated to have produced 60,000 tons with an annual capacity of 277,200 mt/a.[4]

Following a prefeasibility study conducted by a four-person UN team in 1988, the United Nations Development Program provided a $1.6 million budget to conduct a feasibility study for developing the Ganesh Himal lead-zinc-silver deposit, about 60 km northwest of Kathmandu in 1991. The final report was scheduled for the first quarter of 1993. The ongoing 2-year feasibility study included an extensive underground drilling program, additional metallurgical tests, rock mechanics, geotechnical work, and environmental impact studies.

According to a preliminary report, the drilling results were not as promising as originally expected. The deposit is at a 4,100-m elevation above sea level, the area is remote, and the topography rugged. Hence, access and transportation costs would be high. The capital cost of developing the deposit was estimated at between $18 million and $20 million.

Diluted ore reserves of the Ganesh Himal deposit, based on the 1988 prefeasibility study, were estimated at 915,000 tons grading 12.1% zinc, 1.66% lead, and 24.6 g of silver per ton of ore.[5]

According to information released by the Government in 1992, major limestone deposits are in Okhara, with 10 Mmt of reserves; in Udaipur, with 51.4 Mmt; and in Surkhet, with 48.6 Mmt. Additionally, sizable limestone reserves are found in Panaute and Dhankuta. Substantial mineral resources, including clay, dolomite, magnesite, quartz, silica sand, and talc, had been found in Nepal. However, no definitive geological work and systematic delineation for estimating reserves have been accomplished.

Nepal has 7,080 km of roads, of which 2,898 km is paved, 1,660 km gravel or crushed stone, and 2,522 km of seasonally motorable tracks. It also has 52 km of 0.762-m-gauge railroad, all in Terai close to the India border. The 10 km from Raxal to Birganji is Government owned. The country has five major airports with permanent-surface runways. Telephone and telegraph services are poor. Nepal has 280,000 kW of electricity generating capacity and produced about 540 MkW•h of electricity for consumption by Kathmandu and several larger cities, but there is no national power distribution and transmission system.

Nepal's enormous hydroelectric potential remains largely untapped. To develop its hydroelectric power, the Nepalese Government announced a new hydropower development policy in 1992. Under the new policy, small hydropower projects will be constructed in the hilly and Himalayan regions; a rural electrification system will be adequately extended; and private local and foreign investment will be encouraged.

The outlook for development of Nepalese economy relies very much on foreign financial and technical assistance. Japan is currently a leading aid donor, followed by the United States, the European Community, China, and India. Various UN-affiliated international organizations were among the important donors. Infrastructure projects in progress were several small hydroelectric power stations, bridge construction, installation of a high-power transmission line between Nepal and India, and construction of a highway in western Nepal. The potential for mineral development remains largely untapped.

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[1]Nepal Press Digest (Kathmandu). Part II, The Economy. V. 36, No. 17, p. 1.

[2]Where appropriate, values have been converted from Nepalese rupees to U.S. dollars at the rate of NRs44.5=US$1.00 in 1992.

[3]The Rising Nepal (Kathmandu). Mining Industries Plant Saplings. Sept. 8, 1992, p. 3.

[4]Nepal Press Digest (Kathmandu). Cement Production. V. 36, No. 32, Aug. 10, 1992, p. 300; No. 50, Dec. 14, 1992, p. 463; and No. 51, Dec. 21, 1992, p. 476.

[5]Labonne, B., J. G. Bray, and H. Maire. Lead/Zinc Exploration Update. A paper presented at the 37th Session of the International Lead Zinc Study Group, Vienna, Oct. 16, 1992, pp. 7-11.

TABLE 1

NEPAL: PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		1988	1989	1990	1991[p]	1992[e]
Beryl	kilograms	400	900	e1,000	(4)	(4)
Cement, hydraulic		215,010	217,666	107,179	135,897	196,005
Clays for cement manufacture		8,033	7,206	824	8,850	8,850
Coal: Lignite		8,311	9,639	7,808	10,150	10,350
Copper ore:						
Gross weight		9	20	18	22	20
Cu content		3	7	6	4	7
Gem stones:[e]						
Garnet	kilograms	25,000	25,000	20,000	e22,000	25,000
Tourmaline	do.	5r22	20	20	5	20
Lime, agricultural		21,200	40,500	e45,000	24,500	24,500
Magnesite, crude		45,000	27,978	e25,000	e25,000	25,000
Salt		6	7,200	6,900	7,300	7,000
Stone:						
Limestone		323,584	289,743	e295,000	221,920	221,920
Marble:						
Chips		1,164	57	945	778	281
Cut	square meters	15,855	23,448	46,892	34,306	35,000
Craggy	do.	6,171	68,954	5,318	e6,000	6,000
Talc		4,430	6,728	1,798	3,500	3,170

eEstimated. pPreliminary.

[1]Table includes data available through Mar. 26, 1993.

[2]Data are for the fiscal year ending mid-July of that stated.

[3]In addition to the commodities listed, construction materials such as sand and gravel and other arieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

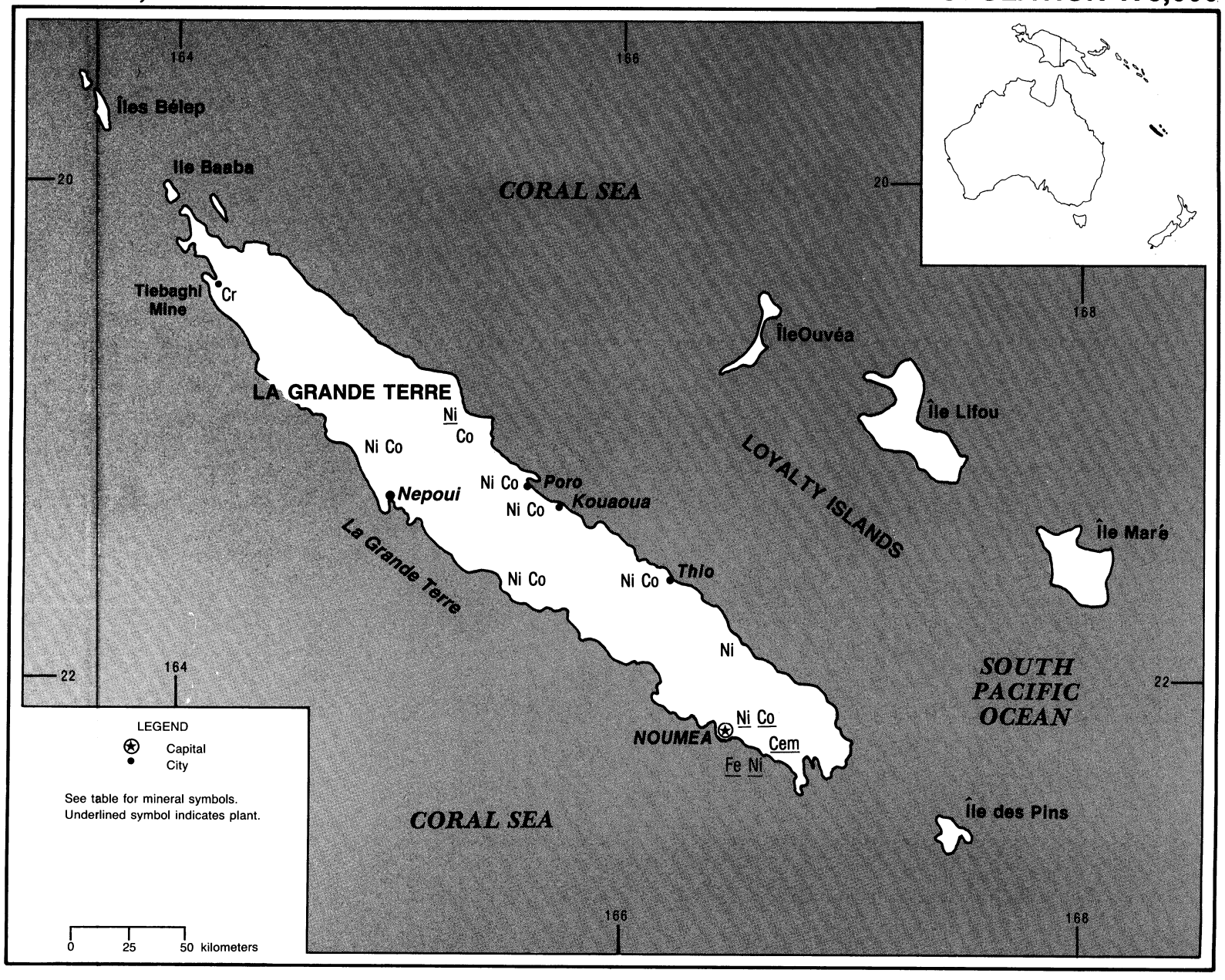
[4]Beryl may have been produced but quantities were not reported.

[5]Reported figure.

NEW CALEDONIA

(France)

AREA 19,060 km² **POPULATION 175,000**



THE MINERAL INDUSTRY OF

NEW CALEDONIA

By Travis Q. Lyday

The mineral industry in the French Territory of New Caledonia and Dependencies continued to be dominated by the mining of nickeliferous laterite-saprolite ore, which was used for the subsequent production of ferronickel of various grades and of nickel matte at the Doniambo smelter at Nouméa, the capital. Minor amounts of cobalt were recovered as a component of nickel matte exports from refining operations at Sandouville, near Le Havre, northern France. Minor amounts of pit and quarry construction materials also were produced.

New Caledonia remained the third largest producer of mined nickel in the world after Canada and the former U.S.S.R. and was the largest producer of ferronickel, with about 40% of the world's output. Nickel mining and smelting is the territory's largest foreign exchange earner, estimated to be $736 million.[1]

Nickel was produced at mines owned by Société Métallurgique le Nickel-SLN (SLN), a 95%-owned subsidiary of Metropolitan France's Eramet-SLN, and from smaller, independent producers. SLN produced about 65% of the territory's nickel ore at the two mining centers of Kouaoua and Thio on the east coast and at contractor-operated mines on the west coast of La Grande Terre, the main island. The remaining 35% came from smaller, independent operators, including Nickel Mining Corp., Nouméa Nickel, Société des Mines de la Toutouta, and Société des Minière du Sud Pacifique.

Mine output from the independently operated mines was mainly for export to Australia's Yabulu nickel refinery near Townsville, Queensland, Japanese nickel smelters and refiners, and the Glenbrook ferronickel smelter near Riddle, Oregon. SLN's nickel ore was used as feed for its Doniambo smelter at Nouméa for the production of ferronickel ingots and shot and nickel matte. Most of the ferronickel production was shipped to consumers in Australia, and all production of nickel matte was shipped to Eramet-SLN's refinery at Sandouville-Le Havre for further processing into high-purity electrolytic nickel and nickel salts.

Output of nickel in 1992 at the Doniambo smelter again was below targeted levels. Production fell because of the scheduled renovation of one of the three Demag electric furnaces. Although the shutdown was planned, unlike the accidental fire that curtailed production in 1991, it continued longer than expected.

New Caledonia's nickel reserves, estimated to be 30% of world reserves, are second only to those of Cuba. Several small-scale chromite ore deposits have been identified in the vicinity of the Tiébaghi chromite mine, both to the east and to the west of the present site. Chromical S.A., the owner-operator of the now closed Tiébaghi Mine, appears optimistic that sufficient chromite reserves will be identified for the company to recommence operations at the mine site.

In addition to abundant reserves of nickel ores, the island territory is well endowed with other mineral resources. Significant prospects have been reported for antimony, copper, gold, iron ore, lead-zinc, manganese, and phosphate rock. However, none of these has been mined commercially.

The transportation infrastructure includes 6,340 km of roads, of which only about 10% is paved, with the remaining improved earth. There are 29 airports serving the country, 6 with permanent-surface runways. International shipping ports include the port at the capital city of Nouméa and the ports at Népoui, Poro, and Thio. Electricity generating capacity was 400,000 kW. Generally, infrastructure for the mining of nickel ore is regarded as adequate.

[1]Where necessary, values have been converted from the Comptoirs Français du Pacifique Franc (CFPF), or French Pacific Franc, to U.S. dollars at the rate of CFPF97.81=US$1.00. The CFPF is linked to the French franc (F) at the rate of CFPF18.18=F1.0.

OTHER SOURCES OF INFORMATION

Agency

Le Service des Mines et L'Energie
Nouméa, New Caledonia

Publications

Service de la Statistique (Paris). Annuaire Statistique, annual.
Annales des Mines (Paris). Productions et Exportations Minères & Métallurgiques de la Nouvelle Calédonie, monthly.

TABLE 1
NEW CALEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
Cement e		60,000	2 67,232	65,000	2 89,739	65,000
Chromite, gross weight		70,341	60,281	6,223	—	2 7
Cobalt, mine output: e						
Co content		6,000	6,000	6,000	6,000	6,000
Recovered		800	800	800	800	800
Nickel:						
Ore:						
Gross weight	thousand tons	3,385	4,919	4,486	r 5,690	2 5,596
Ni content		r 71,200	r 96,200	r 85,100	r 114,492	113,100
Metallurgical products:						
Ferronickel:						
Gross weight e		146,300	142,500	126,500	r 137,600	127,600
Metal content (nickel plus cobalt)		37,352	36,285	32,278	r 34,411	2 31,895
Nickel matte:						
Gross weight e		14,300	14,500	13,000	10,800	10,150
Metal content (nickel plus cobalt)		10,470	10,650	9,683	r 9,041	2 7,475
Stone, sand and gravel: e						
Stone:						
Crude (unspecified)	cubic meters	20,000	20,000	25,000	25,000	25,000
Crushed	do.	100,000	100,000	125,000	125,000	125,000
Sand	do.	75,000	75,000	100,000	100,000	100,000
Silica (for metallurgical use)	do.	15,000	15,000	20,000	20,000	20,000

eEstimated. rRevised.
[1]Table includes data available through June 2, 1993.
[2]Reported figure.

TABLE 2
NEW CALEDONIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

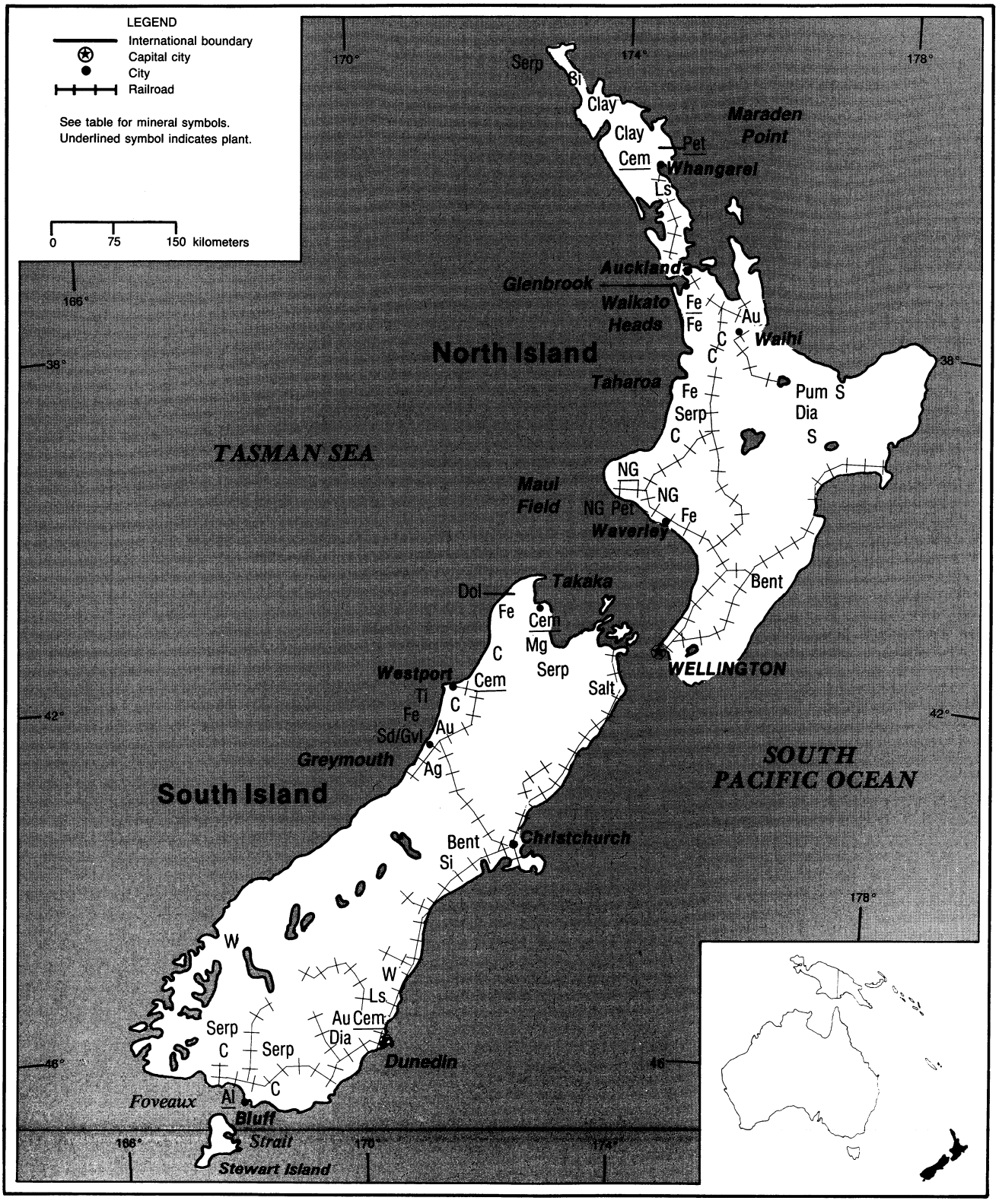
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	S.A. Ciments de Numbo, operator and owner, 100%	Noumea, La Grande Terre	180
Nickel, ore	Societe Metallurgique le Nickel-SLN, operator and owner, 100%	Kouaoua mining center, east coast of La Grande Terre	1,000
Do.	do.	Thio mining center, east coast of La Grande Terre	700
Do.	Small, independent producers	Several mines on west coast of La Grande Terre	1,100
Ferronickel, matte	Societe Metallurgique le Nickel-SLN, operator and owner, 100%	Doniambo smelter, Noumea, La Grande Terre	1 48

[1]Contained nickel.

NEW ZEALAND

AREA 268,680 km² **POPULATION 3.3 million**



THE MINERAL INDUSTRY OF THE

NEW ZEALAND

By Travis Q. Lyday

The New Zealand mining industry is centered primarily on coal and gold, mineral commodities with long traditions in the country. The mineral industry in New Zealand began with the discovery of gold on the Coromandel Peninsula, North Island, in 1852. Coal mining also began in the 1850's and, early in this century, its production value exceeded that of gold for the first time. During the 1960's, building aggregates replaced coal as the country's most valuable mineral product. In the early 1980's, aggregates were, in turn, replaced by natural gas as New Zealand's most valuable mineral product.

The existence of extensive iron sand deposits on the west coast of North Island has been known for more than a century, but not until the late 1960's was a steelmaking industry in New Zealand able to use successfully the iron sands and coal from an area near Waikato North Head. Construction of the Glenbrook steelworks was completed in 1970. Its capacity was expanded to 750,000 mt/a in 1988, but was operated far below this level throughout 1992.

Serious exploration for oil and gas began in the late 1950's, resulting in the discovery of several natural gas fields to date. The Kapuni Field was discovered in 1959 and began production in 1970, supplying gas to North Island Government distribution centers and industrial customers. The much larger Maui offshore gasfield, New Zealand's largest, was discovered in 1969. Production has been used primarily for electricity generation and as a premium fuel.

Today's extractive mineral industry in New Zealand constitutes only a small segment of the economy, contributing on the order of 1% to 2% to the GDP of the country. The mineral processing sector provided an estimated 4% to 5% to the GDP, based to a significant extent on imported alumina, crude oil, and fertilizer, increasing the value of the mineral industry output to about 5% to 6% of GDP.

As a result of the continuing policies of deregulation, there are currently no limits on the equity participation of foreign companies in the exploration and development of New Zealand's mineral resources.

Because of its geological setting on an active plate boundary, New Zealand's geology is varied and complex. In addition to being a gold province, the country has significant coal and heavy mineral sands deposits and the potential for other significant minerals deposits, including petroleum. Titanomagnetite sands form the basis of the country's steel industry. A wide variety of nonmetallic minerals for construction and industrial uses are currently being mined. Many other minerals have been mined, including ores for aluminum (bauxite), antimony, arsenic, chromium, copper, lead-zinc, manganese, mercury, molybdenum, nickel, platinum, tin, and tungsten, although generally only in small quantities.

GOVERNMENT POLICIES AND PROGRAMS

Mining in New Zealand is regulated by the Crown Minerals Act and the Resource Management Act, both promulgated in 1991. Permits to mine Crown-owned (Government) minerals are only issued under the Crown Minerals Act, while the effects of all industrial activity, including mining, are controlled through resource permits granted by regional and local authorities under the Resource Management Act.

The Government was planning to develop draft policies detailing licensing methods and royalty rates for minerals and petroleum during 1993. The present system levies no royalties on gold or silver, and specific rates for most other mineral commodities are low.

PRODUCTION

Because reliable statistical information on current production is unavailable for most commodities, production levels were estimated.

Mining activities in New Zealand during the year continued to be composed of coal extraction, both by underground and open pit methods; quarrying of raw materials for use primarily in domestic construction (clays, sand and gravel, and stone) and agricultural industries (limestone and marble); and gold and titaniferous magnetite sand (iron sand) mining. Hard-rock gold mining continued at the Golden Cross and Martha Hill Mines near Waihi at the base of the Coromandel Peninsula on North Island and at the Macraes Mine in the Eastern Otago region of South Island; alluvial mining occurred at several sites, especially on South Island. Gold mining began in December 1991 at the Golden Cross Mine, 13 km from the Martha Hill Mine, and is the first underground gold mine to operate in New Zealand since 1952. Mineral production also included natural gas, natural gas liquids, and petroleum condensate.

The mineral processing sector consisted chiefly of the production of primary aluminum, manufactured fertilizers, petroleum refinery products, and crude steel produced mostly from imported raw materials. *(See table 1.)*

TRADE

Among mineral commodity imports, crude petroleum, partly refined petroleum, and petroleum refinery products dominated. Other mineral commodity imports were alumina, fertilizer materials, and steel semimanufactures. Aluminum ingots continued to be the dominant mineral commodity export, followed closely by gold, steel semimanufactures and other products, and iron ore (iron sand). *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

A significant part of the mineral industry was controlled by the Government until 1984, including a considerable share of coal production capacity; oil and gas production facilities; the Glenbrook Steelworks; and the nation's sole oil refinery at Marsden Point. Since 1984, the Government has been reducing its attachment and control of these enterprises in a privatization program through deregulation and sale of its equity to the private sector. Major facilities in private hands during 1992 included the aluminum smelter at Bluff; the gold operations at Golden Cross, Macraes, and Martha Hill; the steel plants of New Zealand Steel Ltd. and Pacific Steel Ltd.; the two cement plants at Portland and Westport; and most of the mines and quarries for industrial minerals. State-owned entities that still exist, such as coal mining operations (Coal Corp. of New Zealand), have been incorporated—meaning they are required to operate as private-sector companies. *(See table 4.)*

COMMODITY REVIEW

Metals

Gold.—New Zealand's recorded gold production for 1992 increased more than 55% over that of 1991, reaching its highest level since 1915. The largest contribution, 3,219 kg, came from Macraes Mining Co.'s open pit in the Eastern Otago region of South Island. Cyprus Gold (NZ) Ltd.'s majority-owned Golden Cross combined underground-open pit system produced 2,715 kg of gold in its first full year of operation, having commenced operations in December 1991. The mine, officially opened in January, became the first underground gold mine to operate in New Zealand since 1952. Cyprus was trying to find a buyer for its 80% share of the mine at yearend. The Martha Hill open pit mine at Waihi on the Coromandel Peninsula of North Island produced in October its 10th mt of gold since recommencing mining in 1988. Production in 1992 was 2,307 kg. Remaining production was obtained from about 150 alluvial gold mining operations mining placer deposits in the Otago-Southland and West Coast areas of South Island.

Macraes Mining completed during the year its geological assessment of the Globe-Progress hard-rock gold prospect at Reefton near the northwest coast of South Island. A feasibility study was expected to be completed by the second quarter of 1993. Macraes Mining initially is planning for an open pit operation, converting it into an underground operation as depth increases. The mine also has potential for the recovery of antimony and arsenic as byproducts.

Iron and Steel.—Titanomagnetite-bearing iron sand is mined and concentrated along the western coast of North Island by New Zealand Steel Ltd. (NZ Steel), a wholly owned subsidiary of Australia's BHP Steel. Titanomagnetite concentrate is produced by dry-mining (bulldozing) methods at Waikato North Head, about 50 km south of Auckland and 18 km from NZ Steel's integrated Glenbrook Steelworks. At Taharoa, about 100 km farther south, NZ Steel uses both wet- (suction dredging) and dry-mining methods to produce iron sand concentrate for export to Japanese steel mills for use as a steelmaking additive and for lining blast furnaces. NZ Steel marked 20 years of operation at the Taharoa site on October 23, producing more than 29 Mmt of titanomagnetite iron sand for export during the period.

Pacific Steel Ltd., utilizing the electric arc furnace method, remained New Zealand's second steelmaker, producing exclusively long products (rod and bar).

Mineral Sands.—Feasibility investigations of two mineral sands deposits continued on the western coast of South Island. Australia's Austpac Gold NL with a 70% interest and Nissho Iwai Corp. of Japan with the remaining 30% share were able to process successfully the ilmenite-bearing sands at the Westport prospect to produce synthetic, or beneficiated, rutile with a grade exceeding 99% titanium dioxide, TiO_2. North Broken Hill-Peko Ltd. of Australia was investigating the Barrytown ilmenite-zircon sands in the Westland area.

Mineral Fuels

Coal.—The sale of the country's largest coal producer, the Government-owned Coal Corp. of New Zealand, continued to be delayed pending the resolution of legal challenges arising from Maori land disputes against the Crown under the Treaty of Waitangi.

The Greymouth Coal Corp. joint venture, composed of Coal Corp., 33%; the Todd Group, 18%; and Japanese interests with 49%, was conducting a feasibility study into producing high-rank coal from the West Coast of South Island for export to Japan.

Natural Gas.—The installation of the second production platform in the Maui Gasfield, 35 km off the coast of North Island, continued. The $0.5 billion[1] project was scheduled to begin producing in April 1993.

The Maui gasfield is the country's most productive, with all production coming from the existing Maui A platform. The new platform was being constructed to maintain current output levels of natural gas and gas condensate, both of which have been forecast to begin declining within the next few years.

Reserves

Coal in New Zealand has been mined only in certain well-defined areas, and no significant quantities of coal are known outside these areas. New Zealand mined bituminous, subbituminous, and lignite coals. New Zealand has 15.7 billion tons of in situ coal resources, of which 8.6 billion tons is considered recoverable by mining techniques presently employed in New Zealand. Most of the lignite resources, if mined, would require large-scale mining techniques not currently used in the country.

New Zealand's reserves of iron ore are contained in black sands of the western beaches from Westport southward in South Island and from Wanganui to Muriwai in North Island. These sands are estimated to contain a total of 850 Mmt of combined titaniferous magnetite and ilmenite.

Although New Zealand is rich in epithermal gold deposits, large-scale exploration, prospecting, and development projects continued to face public opposition because of the potential for environmental degradation. The estimated gold reserves in the Buller, Grey, and Hokitika River valleys on the Coromandel Peninsula are 311 mt. Additional alluvial reserves contain an estimated 93 mt of gold. *(See table 5.)*

INFRASTRUCTURE

New Zealand's downstream mineral industry had two steel mills; an aluminum smelter; aluminum, copper, and brass extrusion plants; and an oil refinery. Most of these operations were established and prospered under a mantle of Government protection, subsidies, or incentives until privatization was introduced in 1984.

The communications and transportation infrastructure of New Zealand is well developed. There are 4,716 km of Government-owned railroads, of which 113 km is electrified; 92,648 km of roads, including 49,547 km paved and 43,101 km gravel or crushed stone; and 1,000 km of pipeline for natural gas, 160 km for refined oil products, and 150 km for condensate. There are 34 principal airports with permanent-surface runways out of an aggregate of 118 serving the country. Inland waterways, of which there is 1,609 km, are of little importance to the transportation industry. International shipping ports include Auckland, Christchurch, Dunedin, Tauranga, and Wellington.[2] Electric generating capacity in 1990, the latest year for which data were available, was reportedly 7.8 MW, of which about 75% was generated from hydroelectric power stations, 7% from geothermal stations, and 18% from fossil fuels (14% natural gas- and 4% coal-fired thermal plants).

Generally, infrastructure for mineral industry operations is regarded as adequate.

OUTLOOK

Coal production in New Zealand, produced predominantly by operations of the wholly Government-owned Coal Corp. of New Zealand Ltd., is expected to remain stable. The commercial commitment for gold mining is becoming more encouraging as mining companies complete exploration in one of the last countries in the Pacific Rim with a potential for a modern-day gold rush. Regulatory constraints and environmental concerns are becoming less intrusive, especially for the larger corporations, as companies learn to cooperate effectively with environmental regulations.

[1]Where necessary, the values have been converted from New Zealand dollars (NZ$) to U.S. dollars at the rate of NZ$1.87=US$1.00.

[2]U.S. Central Intelligence Agency, Washington, DC: The World Factbook 1992, p. 249.

OTHER SOURCES OF INFORMATION

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TABLE 1

NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
METALS						
Aluminum metal, smelter:						
Primary		264,398	259,671	r259,584	r258,500	2241,935
Secondary		e3,100	r4,500	r4,800	r4,700	4,800
Total		e267,498	r264,171	r264,384	r263,200	246,735
Gold, mine output, Au content	kilograms	2,404	4,766	r4,626	r6,758	210,544
Iron and steel:						
Iron ore, gross weight e 3		290	—	—	2,060	2,000
Iron sand (titaniferous magnetite):						
Gross weight	thousand tons	2,351	2,367	2,296	r2,265	2,300
Fe content e	do.	1,300	1,300	1,300	1,300	1,300
Direct-reduced iron	do.	418	493	549	594	2384
Steel, crude	do.	460	608	e765	e700	600
Lead, refinery output, secondary e		3,600	25,000	5,000	5,000	5,000
Silver, mine output, Ag content	kilograms	1,845	4,837	4,914	r11,370	19,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	812	729	e750	r576	2579
Clays:						
Bentonite		1,255	1,342	1,393	(4)	—
Kaolin (pottery)		24,020	26,324	r25,435	r21,338	25,000
For brick and tile		87,892	60,438	r65,644	r121,030	65,000
Lime e		150,000	100,000	100,000	90,000	100,000
Nitrogen: N content of ammonia		73,000	70,000	70,000	70,000	268,200
Perlite		2,938	2,500	1,972	r1,674	2,000
Pumice		25,003	40,974	r100,584	r52,644	50,000
Salt e		45,000	76,000	80,000	80,000	80,000
Sand and gravel:						
Silica sand (glass sand)		55,201	102,131	r100,280	r99,132	100,000
Other industrial sand		330,042	316,930	r444,986	r494,428	500,000
For roads and ballast	thousand tons	12,455	12,577	r12,090	r10,460	10,000
For building aggregate	do.	5,806	5,172	r4,121	r3,486	5,000
Stone:						
Dolomite		r20,061	14,581	13,756	r11,636	14,000
Greenstone e	kilograms	1,000	1,000	1,000	1,000	1,000
Limestone and marl:						
For agriculture	thousand tons	708	967	r1,049	r946	1,000
For cement	do.	1,256	1,408	1,360	r1,390	1,400
For other industrial uses	do.	281	314	353	r364	350
For roads	do.	190	377	411	r407	400
Serpentine	do.	16,042	21,495	20,157	r13,647	15,000
Unspecified:						
Dimension		17,543	20,297	r29,719	r17,898	20,000
Rock for harbor work	thousand tons	1,359	1,543	r2,163	r5,238	3,000
Sulfur		4,323	1,206	2,689	r451	1,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon dioxide, liquefied e		10,000	10,000	10,000	10,000	10,000
Coal: e						
Bituminous	thousand tons	600	2763	700	700	800

See footnotes at end of table.

TABLE 1—Continued

NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES1

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992e
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal e—Continued:						
Subbituminous	thousand tons	1,600	1,700	1,600	1,600	1,700
Lignite	do.	200	250	r 2284	r 2384	250
Total	do.	2,400	2,713	r 2,584	r 2,684	2,750
Coke:e						
Coke oven		2,000	2,000	2,000	2,000	1,000
Gashouse		6,000	6,000	7,000	7,000	7,000
Total		8,000	8,000	9,000	9,000	8,000
Fuel briquets e		5,000	5,000	(4)	(4)	—
Gas:e						
Manufactured (from gasworks)	thousand cubic meters	9,900	11,350	11,350	11,350	11,350
Natural:						
Gross production	do.	5,375	25,925	r 24,850	5,000	5,000
Marketed production	do.	4,675	24,950	r 23,750	4,000	4,000
Natural gas liquids:e						
Liquefied petroleum gas	thousand 42-gallon barrels	r1,150	r1,150	r1,150	r1,400	1,400
Natural gasoline	do.	r300	2250	r300	r400	400
Total	do.	r1,450	r1,400	r1,450	r1,800	1,800
Petroleum:						
Crude	do.	r12,483	r13,848	r14,140	r15,311	13,800
Refinery products:e						
Gasoline	do.	14,000	26,429	r 214,965	r15,000	15,000
Distillate fuel oil	do.	5,000	28,892	r 210,220	r10,000	10,000
Residual fuel oil	do.	2,000	21,863	r 22,555	r2,500	3,000
Other	do.	1,000	21,058	r 22,920	r2,900	3,000
Refinery fuel and losses	do.	1,000	1,000	r 21,825	r1,800	2,000
Total	do.	23,000	219,242	r 232,485	r32,200	33,000

eEstimate. rRevised.

1Table includes data available through Aug. 15, 1993.

2Reported figure.

3Not used for manufacture of iron; reportedly consumed for gas purification, preparation of stock licks, and manufacture of brick. Because of these uses, iron content is not reported.

4Revised to zero.

TABLE 2

NEW ZEALAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES1

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals	value, thousands	$278	$2,894	—	Belgium-Luxembourg $2,037; France $773; Australia $84.
Aluminum:					
Oxides and hydroxides		—	50	—	All to Indonesia.
Metal including alloys:					
Scrap		9,280	9,566	—	Japan 7,110; Australia 1,791; Republic of Korea 164.

See footnotes at end of table.

TABLE 2—Continued

NEW ZEALAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued				
Metal including alloys—Continued				
Unwrought	235,837	240,942	—	Japan 205,749; Republic of Korea 18,352; unspecified 6,937.
Semimanufactures	15,171	15,125	489	Australia 10,959; Canada 511; Thailand 471.
Chromium: Oxides and hydroxides	1	4	—	Australia 3.
Cobalt: Oxides and hydroxides	12	—		
Copper:				
Matte and speiss including cement copper	—	2	—	All to Australia.
Metal including alloys:				
Scrap	4,278	3,579	19	Australia 2,519; India 340; Belgium-Luxembourg 299.
Unwrought	284	118	20	Australia 64; Malaysia 24.
Semimanufactures	8,713	[2]9,007	762	Australia 5,077; Malaysia 628.
Gold:				
Waste and sweepings value, thousands	—	$20	—	All to United Kingdom.
Metal including alloys, unwrought and partly wrought kilograms	—	4,628	11	Australia 4,222; Italy 386.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	895	1,003	—	Mainly to Japan.
Pyrite, roasted	—	21	—	NA.
Metal:				
Scrap	61,097	1,558	20	Hong Kong 804; Indonesia 388; Pakistan 204.
Pig iron, cast iron, related materials	—	5	—	Australia 4; Fiji 1.
Steel, primary forms	12,140	4,362	—	Thailand 797; Japan 462; unspecified 3,096.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	249,211	353,649	24,111	Japan 125,305; Australia 57,034; Republic of Korea 46,088.
Clad, plated, coated	83,592	81,037	25,383	Australia 36,012; Malaysia 2,444.
Of alloy steel	110	160	—	Australia 90; Malaysia 8; Singapore 8.
Bars, rods, angles, sections	11,824	35,164	16	Guam 16,897; Fiji 4,974; Singapore 3,370.
Rails and accessories	—	20	—	Fiji 19; Australia 1.
Wire	6,677	10,249	574	Australia 6,043; Indonesia 1,120; Hong Kong 683.
Tubes, pipes, fittings	14,253	4,522	468	Australia 2,843; Papua New Guinea 249.
Lead: Metal including alloys:				
Scrap	[3]1,272	388	—	Indonesia 336; Australia 52.
Unwrought	1,224	863	—	Mainly to Australia.
Semimanufactures	NA	29	—	Australia 16; Fiji 9; Cook Islands 2.
Mercury value, thousands	—	$5	—	Malaysia $4; Fiji $1.
Nickel: Metal including alloys:				
Scrap	—	484	—	Japan 367; Republic of Korea 63; Hong Kong 43.
Unwrought	18	—		
Semimanufactures	1	18	—	All to United Kingdom.

See footnotes at end of table.

TABLE 2—Continued

NEW ZEALAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	$295	$10	—	All to Australia.
Silicon, high-purity[4]		2	2	—	Australia 1; Fiji 1.
Silver:					
Ore and concentrate	kilograms	—	10,059	—	Japan 5,053; Hong Kong 5,006.
Waste and sweepings[5]	value, thousands	$409	$269	—	Australia $159; United Kingdom $110.
Metal including alloys, unwrought and partly wrought	do.	$2,010	$580	—	Australia $366; Japan $196; United Kingdom $13.
Tin: Metal including alloys:					
Waste and scrap	value, thousands	—	$5	—	All to Singapore.
Unwrought		—	1	—	All to Fiji.
Semimanufactures		85	89	—	Samoa 6; unspecified 79.
Titanium: Oxides		2	10	—	Australia 9; Fiji 1.
Tungsten: Metal including alloys, all forms	value, thousands	$265	$12	—	All to Germany.
Vanadium[6]		—	3,104	—	All to China.
Zinc:					
Oxides		454	221	—	Japan 160; Australia 60.
Metal including alloys:					
Scrap		712	629	—	Australia 521; unspecified 108.
Unwrought and semimanufactures		14	12	—	Fiji 5; Solomon Islands 3; New Caledonia 1.
Zirconium: Ore and concentrate		500	—		
Other:					
Waste and scrap of precious metals, n.e.s.	value, thousands	$161	—		
Ashes and residues		1,611	2,614	—	China 2,101; India 279; Australia 86.
Metalloids[7]		—	1	—	All to Fiji.
Oxides and hydroxides		—	2	—	Do.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		[8]124	66	—	Indonesia 21; New Caledonia 13; unspecified 31.
Artificial: Corundum		19	1	—	All to Australia.
Grinding and polishing wheels and stones	value, thousands	$322	$174	—	Fiji $97; Australia $25; French Polynesia $12.
Dust and powder of precious and semiprecious stones	do.	$79	—		
Cement		158,921	245,915	94,774	Singapore 76,705; Papua New Guinea 22,783.
Chalk		5	15	—	Samoa 9; Fiji 6.
Clays, crude:					
Bentonite		NA	71	—	Australia 24; Fiji 6; unspecified 36.
Kaolin		NA	24,035	38	Japan 11,450; Republic of Korea 3,233; unspecified 5,388.
Unspecified		22,299	28	—	Australia 22; Fiji 2; Norfolk Islands 2.

See footnotes at end of table.

TABLE 2—Continued

NEW ZEALAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diamond:					
Natural:					
Gem, not set or strung	value, thousands	$1,091	$222	—	Australia $146; Japan $72; Germany $3.
Industrial stones	do.	—	$4	—	United Kingdom $3; Australia $1.
Diatomite and other infusorial earth		4	2	—	Papua New Guinea 1; Samoa 1.
Fertilizer materials:					
Crude, n.e.s.		237	301	32	Malaysia 106; Singapore 70; French Polynesia 40.
Manufactured:					
Ammonia		1	10	—	Fiji 9; Samoa 1.
Nitrogenous		90,446	82,335	—	Australia 79,638; Hong Kong 1,180; French Polynesia 652.
Phosphatic		47	95	14	French Polynesia 40; Cook Islands 25; Vanuatu 10.
Potassic		82	57	—	Australia 30; Norfolk Islands 15; Niue 10.
Unspecified and mixed		309	837	—	Tonga 609; Cook Islands 201; French Polynesia 14.
Gypsum and plaster		3	241	—	Fiji 149; Samoa 51; Australia 27.
Iodine including fluorine and bromine		—	(e)	—	All to French Polynesia.
Lime		—	12,542	—	Papua New Guinea 12,205; Fiji 257; New Caledonia 42.
Phosphates, crude		11	—		
Pigments, mineral: Iron oxides and hydroxides, processed		155	11	—	Fiji 9; Samoa 1.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$828	$523	$9	Australia $306; Japan $52; Sweden $91.
Synthetic	do.	$2	—		
Salt and brine		3,720	5,229	4	Australia 2,702; American Samoa 593; Solomon Islands 439.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		7	7	—	Fiji 5; French Polynesia 2.
Sulfate, manufactured		22	5	—	All to Australia.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value, thousands	$49	$15	—	Australia $10; Cook Islands $2; Japan $2.
Worked	do.	$148	$210	—	Samoa $74; Cook Islands $70; Australia $27.
Dolomite, chiefly refractory-grade		1,098	—		
Gravel and crushed rock		1,227	681	—	Malaysia 419; Indonesia 114; Fiji 42.
Limestone other than dimension		16,338	16,631	—	Papua New Guinea 16,358; Polynesia 147; New Caledonia 122.
Sand other than metal-bearing		198	302	—	Australia 267; Fiji 20; Nauru 6.
Sulfur:					
Elemental: Colloidal, precipitated, sublimed		1	—		
Sulfuric acid		99	65	—	Fiji 16; Solomon Islands 13; Papua New Guinea 11.
Talc, steatite, soapstone, pyrophyllite		7	3	—	Fiji 2; Australia 1.
Vermiculite including perlite	value, thousands	$55	$212	—	Australia $152; Indonesia $60.
Other:					
Slag and dross, not metal-bearing		2,277	1,067	—	China 1,000; Papua New Guinea 40; Australia 27.

See footnotes at end of table.

TABLE 2—Continued

NEW ZEALAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	5,047	—	Australia 4,981; Tonga 32; Kiribati 18.
Carbon black		1	12	—	Australia 8; French Polynesia 3; Fiji 1.
Coal, all grades including briquets		335,717	609,426	—	Japan 356,942; China 113,616; India 91,368.
Gas, natural: Liquefied	cubic meters	7,035	28,832	—	Australia 25,623; Hong Kong 2,344; French Polynesia 866.
Peat including briquets and litter		3,399	3,899	—	Australia 3,313; French Polynesia 412; New Caledonia 51.
Petroleum:					
Crude	thousand 42-gallon barrels	6,199	8,078	119	Australia 7,719; Japan 240.
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	r52,589	27,260	—	French Polynesia 20,027; Australia 7,232.
Mineral jelly and wax	do.	1,022	78	—	Fiji 37; Samoa 8.
Bitumen and other residues	do.	72	7,266	—	Norfolk Islands 7,023; Cook Islands 242.
Bituminous mixtures	do.	116,812	7,017	—	Samoa 3,666; Fiji 1,370; Niue 764.

rRevised figure. NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Excludes unreported quantity valued at $26,000.
[3]Includes semimanufactures.
[4]May include silicon metal.
[5]May include other precious metals.
[6]May include niobium and tantalum.
[7]Reported under SITC item number 522.12 as "selenium, phosphorus, etc."
[8]Excludes unreported quantity valued at $59,000.
[9]Less than 1/2 unit.

TABLE 3

NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS					
Alkali, alkaline-earth metals	value, thousands	$20	$6	—	United Kingdom $3; Australia $1.
Aluminum:					
Ore and concentrate		4,448	6,796	—	Guyana 4,410; China 2,374; United Kingdom 10.
Oxides and hydroxides		490,395	532,100	123	Australia 531,534; Japan 227.
Metal including alloys:					
Scrap		1,221	2,999	—	Australia 2,974; Cook Islands 19.
Unwrought		9,068	2,931	497	Australia 2,070; United Kingdom 130.
Semimanufactures		12,740	14,086	421	Australia 9,629; Germany 1,076; Switzerland 733.
Antimony: Metal including alloys, all forms	value, thousands	$37	$52	—	Hong Kong $46; Australia $6.
Beryllium: Metal including alloys, all forms	do.	—	$24	$10	Japan $10; Thailand $4.
Bismuth: Metal including alloys, all forms	do.	—	$8	$5	Australia $3.

See footnotes at end of table.

TABLE 3—Continued

NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Cadmium: Metal including alloys, all forms value, thousands	$5	$6	—	All from Australia.
Chromium:				
Ore and concentrate	426	343	—	Republic of South Africa 231; Australia 112.
Oxides and hydroxides	219	105	27	Germany 46; Japan 22.
Metal including alloys, all forms value, thousands	$18	$29	$1	United Kingdom $27; Australia $1.
Cobalt:				
Ore and concentrate do.	—	$5	—	Germany $4; Japan $1.
Oxides	4	5	—	United Kingdom 3; Finland 2.
Metal including alloys, all forms value, thousands	$35	$85	$6	Switzerland $51; Germany $21; United Kingdom $7.
Copper:				
Ore and concentrate	40	—		
Metal including alloys:				
Scrap	818	430	—	Australia 336; Papua New Guinea 14; Cook Islands 11.
Unwrought	5,231	4,488	62	Australia 1,321; United Kingdom 115; Brazil 81.
Semimanufactures	10,794	[2]8,641	179	Australia 6,616; Japan 607; United Kingdom 306.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	60	20	—	Australia 19; United Kingdom 1.
Metal:				
Scrap	203	128	—	Fiji 126; Sweden 1.
Pig iron, cast iron, related materials	6,113	1,132	38	Australia 687; United Kingdom 194; Sweden 83.
Ferroalloys:				
Ferrochromium	80	175	—	Japan 63; Hong Kong 40; Republic of South Africa 20.
Ferromanganese	2,131	2,008	—	Australia 1,599; Japan 372; Belgium-Luxembourg 23.
Ferrosilicon	2,772	3,311	39	Australia 2,762; China 450; Brazil 40.
Ferrosilicomanganese	1,204	1,429	—	All from Australia.
Unspecified	73	107	(3)	Australia 76; Belgium-Luxembourg 8; United Kingdom 7.
Steel, primary forms	1,660	5,182	5	Australia 5,153; United Kingdom 23.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	25,637	21,794	2,747	Australia 7,708; Japan 6,060; Republic of Korea 3,044.
Clad, plated, coated	61,121	62,243	389	Australia 31,898; Japan 19,041; Republic of Korea 7,579.
Of alloy steel	13,247	12,509	122	Japan 6,734; United Kingdom 1,671; Canada 1,096.
Bars, rods, angles, shapes, sections	61,509	43,156	526	Australia 29,530; Japan 6,170; Republic of Korea 2,130.
Rails and accessories	9,210	411	(3)	Australia 261; United Kingdom 148; Belgium-Luxembourg 1.
Wire	15,992	11,633	60	Australia 4,165; United Kingdom 2,295; Republic of Korea 1,644.
Tubes, pipes, fittings	22,838	38,384	1,285	Japan 21,255; Australia 10,182; Germany 2,896.
Lead:				
Oxides	53	61	—	Australia 30; United Kingdom 25; Hong Kong 3.
Metal including alloys:				
Scrap	1,723	392	—	Australia 382; Papua New Guinea 10.

See footnotes at end of table.

TABLE 3—Continued

NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Lead—Continued:				
Metal including alloys—Continued:				
Unwrought	2,143	1,751	—	All from Australia.
Semimanufactures	58	48	2	Australia 35; Japan 2.
Magnesium: Metal including alloys, all forms	258	58	(3)	Australia 45; United Kingdom 6.
Manganese:				
Ore and concentrate: Metallurgical-grade	75	71	—	Singapore 53; Australia 17; Switzerland 1.
Oxides	488	416	1	Australia 195; China 120; Japan 46.
Metal including alloys, all forms value, thousands	$351	$144	$7	Australia $69; Germany $25; Hong Kong $21.
Mercury do.	$5	$2	—	Australia $1; United Kingdom $1.
Molybdenum: Metal including alloys, all forms do.	$8	$128	$3	France $87; Belgium-Luxembourg $28.
Nickel: Metal including alloys:				
Scrap	4	1	—	All from Australia.
Unwrought	53	44	—	Norway 36; Canada 8.
Semimanufactures	54	60	7	Canada 24; Australia 12.
Platinum-group metals: Metal including alloys, unwrought and partly wrought value, thousands	$97	$45	$1	Australia $22; Switzerland $9; Germany $6.
Silicon, high-purity	1,484	512	90	Australia 255; Republic of South Africa 143.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$1,205	$1,135	$147	Australia $847; Brazil $62.
Tin: Metal including alloys:				
Unwrought	86	133	(3)	Malaysia 77; Australia 20; Japan 12.
Semimanufactures	161	62	(3)	Malaysia 38; Australia 11.
Titanium:				
Ore and concentrate	11	2	—	All from Australia.
Oxides	3,298	3,536	58	Australia 3,092; Finland 240; Germany 64.
Metal including alloys, all forms value, thousands	$31	$82	—	Germany $68; United Kingdom $14.
Tungsten: Metal including alloys, all forms do.	$51	840	46	Belgium-Luxembourg $440; Austria $217; United Kingdom $92.
Uranium: Oxides and other compounds do.	$6	$2	$2	
Vanadium: Metal including alloys, all forms do.	—	$22	$22	
Zinc:				
Ore and concentrate	7	4	—	Australia 2; Thailand 2.
Oxides	620	396	(3)	Australia 140; Thailand 108; China 80.
Metal including alloys:				
Unwrought	20,991	19,250	(3)	Australia 11,690; Canada 7,122; Republic of Korea 438.
Semimanufactures	543	319	26	Australia 155; Republic of Korea 76; Germany 33.
Zirconium:				
Ore and concentrate	131	167	58	Belgium-Luxembourg 47; Australia 43.
Metal including alloys, all forms value, thousands	$9	$3	$3	
Other:				
Ores and concentrates	211	144	—	Australia 141; China 3.

See footnotes at end of table.

TABLE 3—Continued
NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]
(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Other—Continued:					
Oxides and hydroxides		—	471	48	Finland 121; Japan 67; China 60.
Waste and scrap of precious metals, n.e.s.	value, thousands	$13	$12	—	All from Australia.
Ashes and residues		—	42	—	Do.
Base metals including alloys, all forms	value, thousands	$4	$7	$3	United Kingdom $4.
Metalloids[4]		90	5	—	Hong Kong 4.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		126	213	27	Australia 84; Turkey 77.
Artificial: Corundum		85	108	26	China 36; Australia 22.
Grinding and polishing wheels and stones	value, thousands	$3,417	$2,739	$295	Republic of Korea $556; Australia $422; Japan $304.
Dust and powder of precious and semi-precious stones including diamond	do.	$322	$205	$96	Ireland $103; Iran $4.
Asbestos, crude		2	2	—	All from Canada.
Barite and witherite		1,448	761	20	Thailand 646; Singapore 40; Australia 33.
Boron materials:					
Crude natural borates	value, thousands	$247	$163	—	Netherlands $159; Chile $4.
Oxides and acids		1,454	875	470	Argentina 187; Chile 126.
Cement		4,376	2,556	318	Malaysia 477; Singapore 414.
Chalk		1,332	938	2	Australia 550; France 120; Switzerland 117.
Clays, crude:					
Bentonite		878	753	326	Australia 350; Singapore 68.
Kaolin		8,539	6,240	1,988	Australia 3,681; United Kingdom 353.
Unspecified		5,951	4,815	3,006	Australia 1,250; United Kingdom 282.
Cryolite and chiolite		37	1	—	All from Germany.
Diamond:					
Gem, not set or strung	value, thousands	$8,009	$6,001	$157	Australia $2,002; India $1,979; Israel $769.
Industrial stones	do.	$14	$20	$10	Ireland $4; Australia $2.
Diatomite and other infusorial earth		1,023	2,213	1,719	Australia 451; Philippines 43.
Feldspar		274	289	—	China 158; Australia 49; Canada 41.
Fertilizer materials:					
Crude, n.e.s.		29	34	—	All from United Kingdom .
Manufactured:					
Ammonia		—	17	—	Mainly from Australia.
Nitrogenous		57,569	77,096	33,236	Germany 22,233; Netherlands 6,962.
Phosphatic		37,304	20,869	18,980	Israel 1,801; China 35.
Potassic		163,781	146,298	17,375	Canada 94,907; Israel 24,451.
Unspecified and mixed		20,998	[5]44,424	28,797	Netherlands 6,475; Germany 4,526.
Fluorspar		115	61	—	Australia 46; United Kingdom 15.
Graphite, natural		140	127	—	Republic of Korea 105; China 18; Germany 3.
Gypsum and plaster		145,533	92,018	2,830	Australia 81,026; Mexico 8,000.
Iodine including fluorine and bromine		20	11	(3)	Belgium-Luxembourg 10.
Lime		26	32	—	Australia 27; United Kingdom 5.

See footnotes at end of table.

TABLE 3—Continued

NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Magnesium compounds:					
Magnesite, crude		1,160	445	—	China 383; Japan 40; Australia 21.
Oxides and hydroxides		5,343	10,088	289	China 6,962; Australia 2,754; United Kingdom 61.
Mica:					
Crude including splittings and waste	value, thousands	$213	$208	$86	Australia $60; India $23.
Worked including agglomerated splittings	do.	$84	$60	$1	United Kingdom $43; Australia $12; Switzerland $2.
Nitrates, crude		42	6	5	Italy 1.
Phosphates, crude		615,445	554,772	130,067	Nauru 192,667; Israel 70,067.
Pigments, mineral: Iron oxides and hydroxides, processed		1,426	1,183	442	Germany 665; United Kingdom 21.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$3,553	$3,749	$38	Australia $1,858; Thailand $763; Hong Kong $323.
Synthetic	do.	$90	$70	$1	Japan $27; Australia $12; India $10.
Pyrite, unroasted		4	6	5	Italy 1.
Quartz, piezoelectric units	value, thousands	$3	$29	—	Japan $27; Singapore $2.
Salt and brine		26,933	13,504	5	Mexico 13,200; Pakistan 220.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		2,564	8,439	—	Australia 7,843; Germany 472; Japan 63.
Sulfate, manufactured		8,580	16,222	15,647	China 376; Austria 60.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		2,550	553	—	Republic of South Africa 277; Australia 93; China 65.
Worked	value, thousands	$5,768	$2,629	$58	Italy $1,144; India $363; China $269.
Dolomite, chiefly refractory-grade		2,546	637	—	All from Germany.
Gravel and crushed rock		131	26	3	Germany 21.
Quartz and quartzite		122	58	—	Australia 51; United Kingdom 6.
Sand other than metal-bearing		566	824	109	Australia 612; Japan 32.
Sulfur:					
Elemental:					
Crude including native and byproduct		139,878	79,650	105	Canada 74,172; China 4,966; Saudi Arabia 300.
Colloidal, precipitated, sublimed		116	142	2	Poland 80; Australia 60.
Sulfuric acid		70	27	2	United Kingdom 16; Australia 7.
Talc, steatite, soapstone, pyrophyllite		1,587	1,580	3	China 1,094; Australia 468; United Kingdom 13.
Vermiculite, perlite, chlorite	value, thousands	—	$94	—	China $36; Australia $22; Kenya $18.
Other:					
Crude	do.	$586	$3,298	$2,761	Germany $314; Austria $122.
Slag and dross, not metal-bearing		357	214	2	Australia 212.
Asphalt and bitumen, natural		138	160	69	Trinidad and Tobago 90; Australia 2.
Carbon black		5,449	5,671	432	Australia 4,239; Japan 739.
Coal, all grades including briquets		625	588	—	United Kingdom 560; Australia 28.
Coke and semicoke		7,006	7,429	1	Australia 7,411; United Kingdom 17.
Gas, natural: Gaseous	value, thousands	$3	—		
Peat including briquets and litter		—	20	—	Mainly from Germany.

See footnotes at end of table.

TABLE 3—Continued

NEW ZEALAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Petroleum:					
Crude	thousand 42-gallon barrels	26,461	22,791	—	Saudi Arabia 14,936; United Arab Emirates 5,307; Australia 1,161.
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	475	383	23	Italy 313; France 46.
Mineral jelly and wax	do.	41,144	43,356	4,210	China 23,319; Australia 5,163.
Bitumen and other residues	do.	94,087	[3]	[3]	
Bituminous mixtures	do.	1,254	1,400	376	Australia 642; United Kingdom 321.
Petroleum coke	do.	576,774	584,958	584,282	China 484; United Kingdom 198.
Unspecified	do.	3,597,510	3,132,080	407,099	Australia 2,335,382; Singapore 378,784.

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]Excludes unreported quantity valued at $153,000.
[3]Less than 1/2 unit.
[4]Reported under SITC item number 522.12 as "selenium, phosphorus, etc."
[5]Excludes unreported quantity valued at $279,000.

TABLE 4

NEW ZEALAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	New Zealand Aluminium Smelters Ltd., operator. Comalco NZ Ltd., 79.36%; Sumitomo Aluminium Smelting Co. Ltd., 20.64%	Bluff, Tiwai Point, South Island	259
Cement	Golden Bay Cement Co. Ltd., operator. International Cement Ltd., 75%; and public shares, 25%	Portland plant, North Island	450
Do.	Milburn New Zealand Ltd., 100%	Westport plant, South Island	425
Coal	Coal Corp. of New Zealand Ltd. (State-owned), 100%	Huntly District, North Island	920
Gold, silver	Cyprus Gold (NZ) Ltd., manager, 80%; and Viking Minerals Co. Ltd., 20%	Golden Cross Mine, 8 kilometers northwest of Waihi, North Island	[1]350 [2]450
Do.	Macraes Mining Co. Ltd., 100%	Macraes Mine, 60 kilometers north of Dunedin, South Island. (Also known as Golden Point, Macraes Flat, and Round Hill.)	[3]2,100
Do.	Waihi Gold Mining Co. Ltd., manager. Welcome Gold Mines Ltd., 33.53%; Amax Gold Mines New Zealand Ltd., 33.53%; and AUAG Resources Ltd., (Mineral Resources Ltd.), 32.94%	Martha Hill Mine, Waihi, North Island	[3]800
Steel, crude	New Zealand Steel Ltd., manager. Helenus Corp. Ltd., owner. BHP Steel Ltd., 31%; Fisher and Paykel Industries Ltd., 25%; Steel and Tube Holdings Ltd., 25%; and Australia and New Zealand Banking Group Ltd., 19%	Glenbrook Steel Works, North Island	750
Do.	Pacific Steel Ltd., 100%	Otahuhu Mini-Steel Works, near Auckland, North Island	190
Petroleum	Fletcher Challenge Ltd., 100%	Maui offshore field, northwest of Waverly, North Island	[4]10

See footnotes at end of table.

TABLE 4—Continued

NEW ZEALAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	Fletcher Challenge Ltd., 100%	Maui offshore field, northwest of Waverly, North Island	[5]15
Do.	New Zealand Refining Co. Ltd., operator. Consortium of Shell Oil New Zealand Ltd.; Europa Oil (NZ) Ltd.; Mobile Oil New Zealand Ltd.; Caltex Oil (NZ) Ltd.; and the State of New Zealand	Marsden Point Refinery, near Whangarei, North Island	[6]950

[1]Underground ore throughput to plant. Milled on a campaign basis, alternating with surface ore.
[2]Open pit ore throughput to plant. Milled on a campaign basis, alternating with underground ore.
[3]Ore throughput to plant.
[4]Million cubic meters per day natural gas.
[5]Thousand 42-gallon barrels per day gas condensate.
[6]Thousand 42-gallon barrels per day refined petroleum products.

TABLE 5

NEW ZEALAND: RESERVES OF MAJOR MINERAL COMMODITIES[1]

(Million metric tons unless otherwise specified)

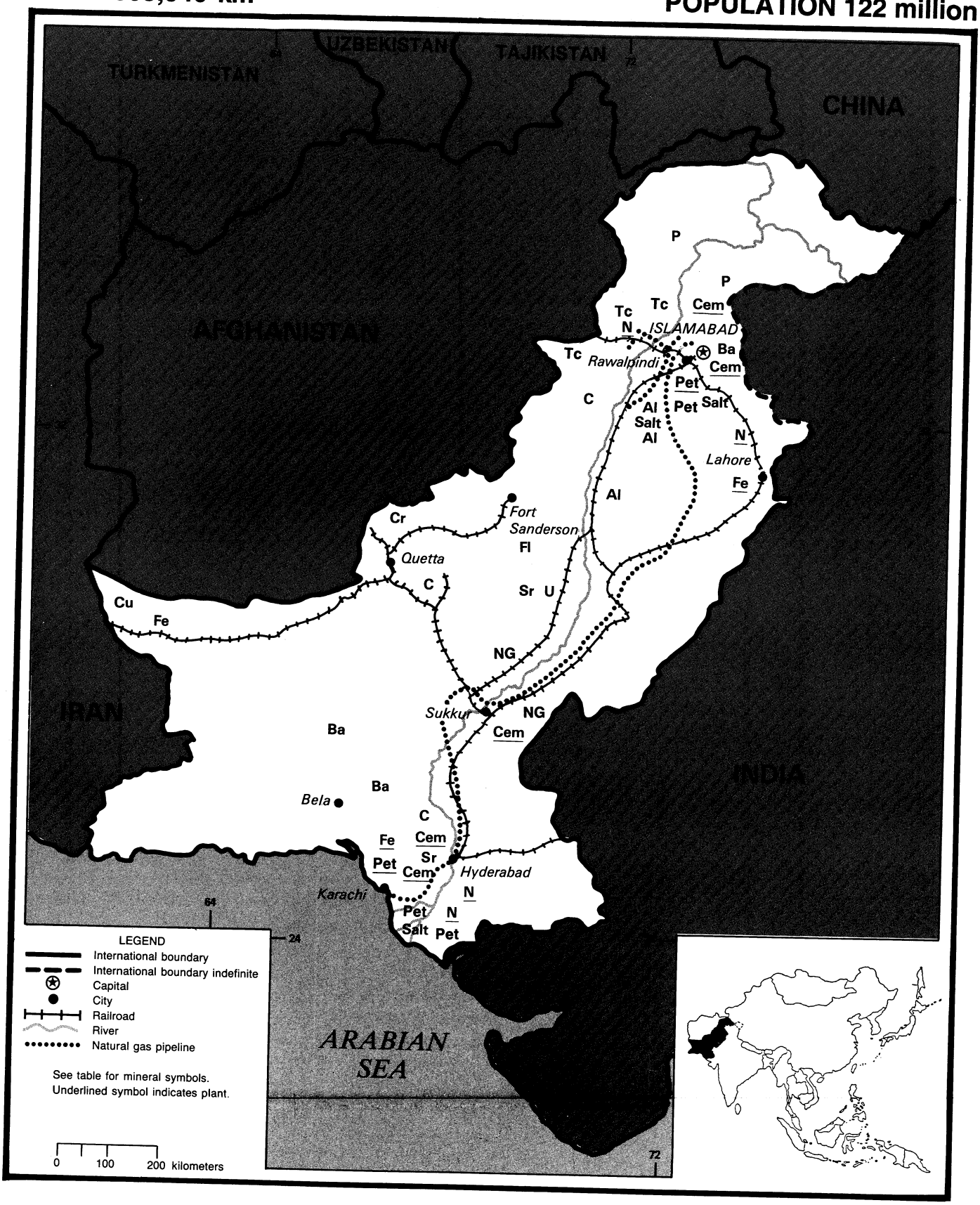
Commodity		Reserves
Coal:		
Bituminous		315
Lignite		7,055
Subbituminous		1,230
Gold, alluvial	metric tons	404
Iron sand		850
Petroleum:		
Condensate	million 42-gallon barrels	157.2
Crude	do.	39.4
Natural gas	million cubic meters	137

[1]As of Dec. 31, 1989.

Source: U.S. Embassy, Canberra, Australia.

PAKISTAN

AREA 803,940 km² **POPULATION 122 million**



THE MINERAL INDUSTRY OF

PAKISTAN

By Chin S. Kuo

During the 1991-92 fiscal year, the Pakistan economy showed improvement with a growth rate of 6.4% as compared with 5.6% in 1990-91. The growth in the agricultural sector was also 6.4%, while large-scale manufacturing grew by 7.4% and small-scale manufacturing by 8.4%. The mining and quarrying sector contributed only less than 1% to the country's gross domestic product. Exports increased by 13% and imports by 21.3% over those of 1990-91. A new trade policy emphasized enhancing export of nontraditional items, finding new export markets, and allowing more import items to accelerate the process of industrialization.

Foreign investment in Pakistan increased by 48% in 1992 as a result of the Government's liberal economic policies. A draft of the country's first-ever national mineral policy was prepared in consultation with all four Provincial governments. The new mineral policy is to activate ongoing projects, associate more foreign and local investors in the mineral sector, accelerate the pace of exploration and exploitation of local mineral resources, and develop the mineral sector by adopting modern technology. The policy was expected to encourage private foreign and local investment in the development of known mineral deposits.

The Geological Survey of Pakistan awarded a $385,000[1] contract to Grundstofftechnik GmbH of Germany to help formulate a 10-year national mineral exploration program. The consultants were to conduct a study of the different geological areas and metallogenic zones to be mapped, prospected, and explored in detail for an assessment of mineral potential. The Survey was required to complete geological mapping of the whole country on a given scale and expected to reassess the known mineral deposits that had been considered uneconomic.

An exploration and appraisal project for gold, lead, and zinc in the Chitral-Gilgit region, North West Frontier Province, was funded by the Australian Government. The Pakistani Government approved a scheme for the detailed investigation of iron ore occurrences in the Kirana Hills near Sargodha in Punjab Province.

About 500 Chinese and 200 Resource Development Corp. personnel were currently working at the Saindak copper project in Balochistan Province's Chagai District. Premine stripping of 500,000 tons of rock was undertaken by the Chinese. Project machinery was transported to the site, and plant construction was to start soon. However, because of delays in planning and execution of the project, cost overrun and financial problems had forced the Government to reconsider its merits.

New iron ore deposits were discovered in an area stretching from Khanpur in Haripur District to Kalabagh in Abbottabad District, North West Frontier Province. The geological resource was estimated at 53 Mmt grading 45% iron. Two other iron ore deposits were also found in this Province: one in Chitral District containing 3 Mmt at 70% iron and the second at Pezu in Dera Ismail Khan District containing 28 Mmt at 33% iron. The Provincial government offered incentives for mineral exploration and development, including exemption from custom duty, import surcharge, and sale tax on the import of mining machinery and many tax holidays.

Pakistan Steel Mills Corp., the state integrated steelmaker in Karachi, cut at least 4,000 jobs since February to improve efficiency and work practices. The company produced 850,000 to 900,000 tons of raw steel in 1991 while employing more than 27,000 people. It also undertook a rehabilitation and an expansion program designed to increase its capacity to 1.5 Mmt/a. Russia agreed to give a credit of $95 million for the expansion program. The mill's annual capacities were 215,000 tons of coke and 135,000 tons of pig iron. It imported all its raw materials, including 1 Mmt/a of coal. The company was interested in bids from U.S. coal producers and exporters on the tender to supply coal for the next 5 years.

Because of continuing financial losses and other problems, including mismanagement, excess employees, labor dispute, and the uncertain law-and-order situation, the Government decided to privatize Pakistan Steel Mills. Privatization was the only answer to slowing industrial growth and utilizing scarce resources. Total demand for steel in Pakistan was 2.5 Mmt, growing at 6% to 8% annually. Pakistan Steel Mills supplied 35% of the total.

Several new cement plants were planned for 1993 and beyond. Among them were the 3,000-mt/d ACC Wah plant scheduled to be commissioned by early 1994, the 2,000-mt/d Fauji Welfare Trust plant to be completed by 1995, and the 2,700-mt/d plant by Cherat Cement Co. State Cement Corp. continued rehabilitation work on its Zeal Park and Maple Leaf plants. Pioneer Cement's planned 2,000-mt/d plant in Punjab Province moved into construction stage. Cherat Cement Co.'s expansion plans to increase plant capacity to 2,000 mt/d proceeded according to schedule.

North West Frontier Province was seeking foreign investment to exploit

mineral commodities after the discovery of a number of mineral deposits. Among the ore bodies awaiting exploitation were large tonnages of phosphate in Abbottabad, chromite in Malakland and Kohistan, nepheline syenite in Koga, and gypsum in Kobat. Other minerals discovered were lead-zinc in Kohistan; boulangerite, gold, silver, and sheelite in Chitral; and rock salt, marble, and granite in undisclosed areas.

The Geological Survey of Pakistan found a new coalfield at Dhakla in the Tharparkar District, Sind Province, which contains 5 coal seams of 13 m thick cumulatively at a depth of 146 m to 193 m. Another coalfield was also found near Thara-e-jo-Goth in the Thar desert, Sind Province, with the coal having low sulfur and ash contents. Coal reserves were estimated to be 10 billion tons. A coal seam measuring 30 m thick was discovered at a depth of 148 m. Before the discoveries, the country's coal reserves were estimated at 9 billion tons. Current production was 2.7 Mmt/a of lignite and bituminous coal. About 1 Mmt/a of coal was being imported for metallurgical uses.

Pakistan Mineral Development Corp. (PMDC) planned to spend $45 million on coal mine development in Sind Province to supply 750,000 mt/a to power stations. The mines currently operated by PMDC produced 240,000 mt/a. PMDC also planned to establish a coal briquet plant at Lakhra in Dadu District with a capacity of 50,000 mt/a. The Provincial government of Sind set up Sind Coal Authority to undertake all the activities relating to coal development in the Province and implement the Sind coal policy to harness its coal resources. Lakhra Coal Development Co. Ltd. was formed as a joint-venture company for this purpose. Sind Province has huge coal reserves, accounting for 98% of the country's total.

Oil and gas reserves were discovered near Fatehjang in Attock District and were expected to yield 3,311 bbl/d of oil and 538,000 m^3/d of gas. The Government awarded a group of companies a fifth exploration block in the Riwat area of Potwar basin, southeast of Islamabad, for a 400-line-km seismic program and a three-well drilling program. This group is led by OMV Exploration GmbH of Germany and includes Hardy Oil and Gas Ltd. of the United Kingdom and Oil and Gas Development Corp. of Pakistan.

The Government was also involved with Pakistan Oilfields and Occidental Petroleum of the United States in a 20-year development and production lease for an enhanced recovery scheme in the Balkassar oilfield, Potwar District. A gas and water injection scheme was to raise production from 250 to 10,000 bbl/d. Shell Exploration Pakistan acquired a farmout covering 47.5% of Lasmo Oil Pakistan's 95% interest in Block 36 in the Dera Ismail Khan area, North West Frontier Province.

About 10,000 employees of Oil and Gas Development Corp. working in the Pirkoh gasfields in Balochistan Province staged a 1-day strike that shut off about 25% of the country's oil and gas supplies but resumed work on March 1. The strikers demanded the release of two workers who were kidnapped on February 22.

Union Texas Pakistan began gas production from two new fields in the Badin block in Sind Province. The Nari gasfield produced 566,000 m^3/d and the Bukhari gasfield 1.42 million m^3/d of gas. Their combined output was 1.98 million m^3/d of gas, raising total production to 5.66 million m^3/d, or about 10% of Pakistan's total output.

Sui Southern Gas Co. Ltd. planned a $600 million expansion and upgrade of its gas processing, transmission, and distribution facilities in Sind and Baluchistan Provinces for the next 4 years. It planned to lay a 408-km high-pressure line from the recently discovered Kandanwari gasfield near Khairpur, Sind Province, to Karachi.

A consortium of mainly Arab investors was negotiating to purchase Burmah Castrol's 63.9% interest in Pakistan Petroleum Ltd. Pakistan Petroleum produces gas from the Sui gasfield, Kandhkot gasfield, and Adhi gasfield. Burmah Castrol also holds 8.5% of the Qadirpur gasfield, which is near Sui and is due to be in operation in 1994. Oil and Gas Development Corp. is the major holder of Qadirpur with 75%, and Pakistan Petroleum holds only 7.5%.

The local Schon Group awarded Hobbs Bannerman Engineering a turnkey contract for the construction of a $100 million, 30,000-bbl/d refinery at Port Qasim near Karachi. The refinery was scheduled to be operational by January 1994. Meanwhile, the Government and Abu Dhabi National Oil Co. of the United Arab Emirates planned to build an 80,000-bbl/d joint-venture refinery at Multan. The Government also agreed with Iran to set up a $900 million joint-venture refinery in Baluchistan Province on 50-50 equity basis. The project was to be completed by 1997. Currently the country has three refineries in operation, and fuel oil continued to be the single largest product with more than 36% of the total production. Pakistan State Oil Co. and National Iranian Gas Co. reached an agreement for shipments by road of 50 mt/d of liquefied petroleum gas to Pakistan with shipments to increase gradually to 2,000 mt/d.

Pakistan's quantities of mineral commodities are of local importance. The Geological Survey of Pakistan reported reserves of coal at 580 Mmt, copper ore at 412 Mmt, iron ore at 430 Mmt, and bauxite/laterite at 74 Mmt.

Thermal power stations are generally oil-fired, but there are two 7.5-MW coal-fired plants at Quetta and three 50-MW coal-fired plants being installed near Hyderabad in Sind Province. The country's power generation capacity was less than 9,000 MW. A further 2,400 MW was to be added beginning in July.

A contract was awarded to China for the construction of a powerplant at Lakhra at a cost of $70.5 million. Meanwhile, the Water and Power Development Authority (WPDA) was implementing a comprehensive program to replace all feeders throughout the country to solve the problems of low voltage and power losses.

The Government and WPDA signed a $1.7 billion contract with a foreign consortium, led by Mitsui of Japan, for the construction of a 1,292-MW oil-fired

powerplant near the Hub River in Sind Province. Pakistan State Oil Co. signed an agreement for a supply of 1.8 Mmt/a of fuel oil.

[1]When necessary, values have been converted from Pakistani rupees (R) to U.S. dollars at the rate of R25.4=US$1.00 for 1992.

TABLE 1

PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Aluminum: Bauxite, gross weight		2,452	1,967	2,581	4,324	3,461
Antimony ore:						
Gross weight		—	51	59	75	83
Sb content[e]		—	8	9	11	12
Chromium: Chromite:						
Gross weight		3,327	27,105	18,191	31,474	22,852
Cr content[e]		1,090	8,900	6,000	10,380	7,500
Iron and steel:[e]						
Pig iron	thousand tons	[2]933	1,000	1,000	1,100	1,100
Steel, crude	do.	1,000	1,000	1,000	1,000	1,000
Lead, refined, secondary[e]		2,000	2,000	2,500	2,500	3,000
INDUSTRIAL MINERALS						
Abrasives, natural: Emery		2,005	1,360	54,961	10,819	298
Barite		22,198	29,718	23,329	28,751	32,432
Cement, hydraulic	thousand tons	7,041	6,936	7,488	7,762	7,793
Chalk		5,035	4,165	3,175	5,428	4,280
Clays:						
Bentonite		4,880	5,466	3,235	5,106	6,057
Fire clay		124,581	130,627	81,856	136,184	123,034
Fuller's earth		12,395	15,436	16,489	22,075	22,042
Kaolin (china clay)		41,968	39,907	61,630	44,738	37,444
Other		924,237	880,382	1,012,083	1,855,013	1,268,968
Feldspar		9,026	7,703	10,249	10,210	19,166
Fluorspar		284	4,741	5,312	[e]5,300	[e]5,000
Gypsum, crude		374,258	466,969	477,671	521,891	462,002
Magnesite, crude		3,081	8,750	4,274	5,191	6,484
Nitrogen: N content of ammonia		1,173,000	[e]1,175,000	[r]1,214,100	[r]1,153,600	1,144,200
Phosphate rock:						
Gross weight		[e]35,000	[e]40,000	[e]42,000	18,985	19,828
P_2O_5 content		[e]11,000	[e]12,800	[e]13,000	5,930	[e]6,000
Pigments, mineral, natural: Ocher		1,040	2,394	1,382	1,889	5,126
Salt:						
Rock	thousand tons	406	721	763	769	853
Marine	do.	266	250	14	12	10
Total	do.	672	971	777	781	863
Sand:						
Bajri and common[e]		210,000	210,000	220,000	220,000	237,676
Glass		133,991	181,187	131,042	151,070	135,101
Sodium compounds, n.e.s.:						
Caustic soda		61,344	[e]60,000	[e]61,000	78,500	60,000
Soda ash, manufactured		134,106	[e]135,000	[e]135,000	147,000	146,000
Stone:						
Aragonite and marble		211,896	260,178	254,305	331,820	330,570
Dolomite		69,131	59,228	82,642	213,117	153,324
Limestone	thousand tons	6,428	7,897	7,810	8,432	8,759
Other (reported as "ordinary stone")	do.	[e]580	[e]600	[e]600	46	50
Strontium minerals: Celestite		488	956	1,799	1,472	1,448

See footnotes at end of table.

TABLE 1—Conyinued

PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
INDUSTRIAL MINERALS—Continued						
Sulfur:						
Native		690	—	175	255	140
Byproduct, all sources[e]		25,000	25,000	25,000	26,000	26,000
Total[e]		25,690	25,000	25,175	26,255	26,140
Talc and related materials: Soapstone		37,429	38,290	30,177	33,643	23,676
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	3,199	2,642	2,733	3,040	2,751
Coke[e]	do.	600	600	620	650	650
Gas, natural:						
Gross production	million cubic feet	437,300	[r]450,000	499,685	518,483	550,715
Marketed production (sales)[e]	do.	413,000	425,000	425,000	450,000	450,000
Natural gas liquids[e]	thousand 42-gallon barrels	75	75	80	80	85
Petroleum:						
Crude	do.	16,310	[r]16,500	19,033	23,027	22,500
Refinery products:[e]						
Gasoline	do.	7,000	7,000	7,200	7,200	7,300
Jet fuel	do.	3,700	4,000	4,000	4,200	4,200
Kerosene	do.	3,000	3,000	3,200	3,200	3,200
Distillate fuel oil	do.	13,000	13,000	13,200	13,500	13,600
Residual fuel oil	do.	12,000	12,000	12,100	12,200	12,300
Lubricants	do.	1,000	1,000	1,000	1,200	1,200
Other	do.	4,000	4,000	4,100	4,100	4,200
Total	do.	43,700	44,000	44,800	45,600	46,000

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

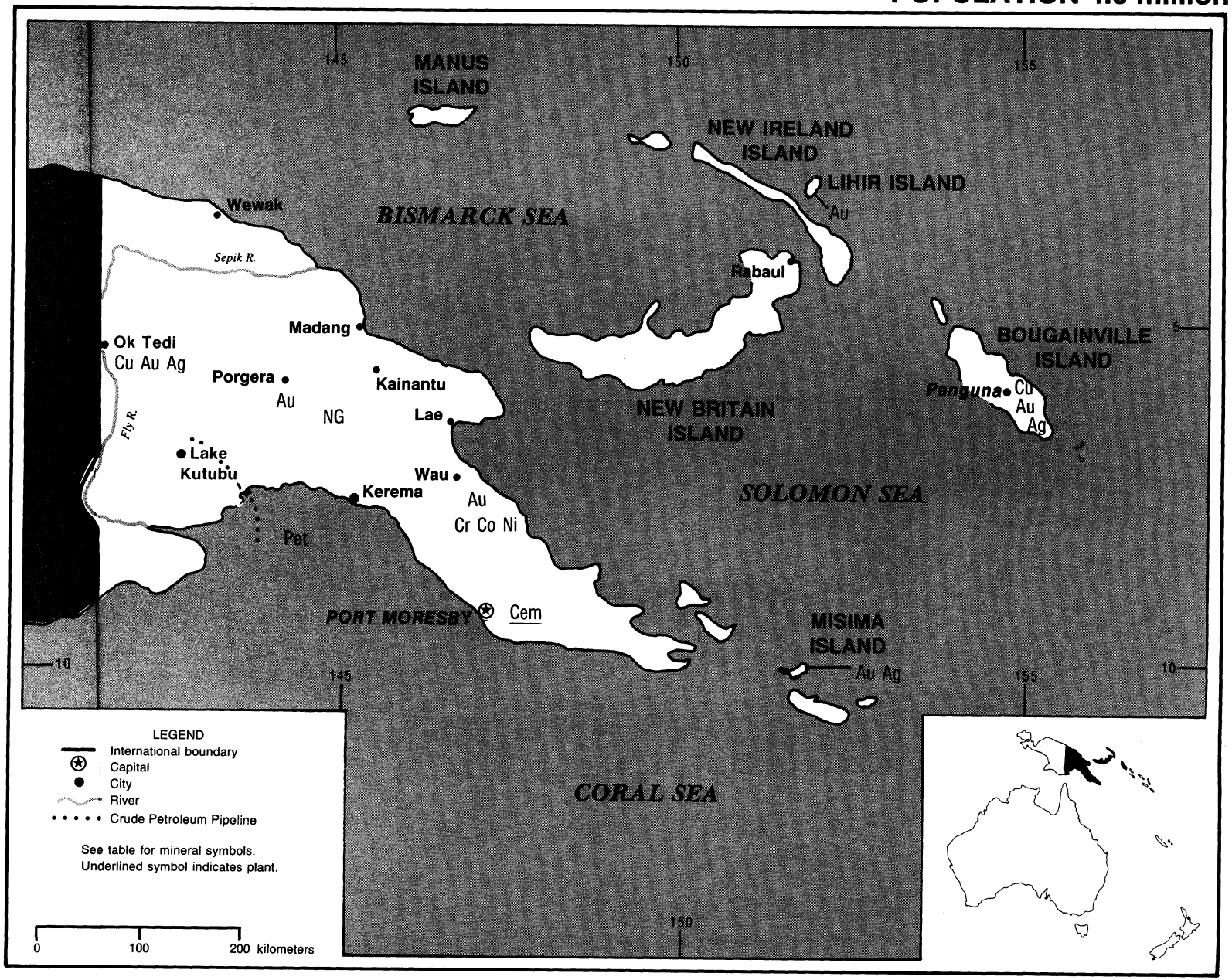
[1]Table includes data available through July 21, 1993.

[2]Reported figure.

PAPUA NEW GUINEA

AREA 461,690 km²

POPULATION 4.0 million



THE MINERAL INDUSTRY OF

PAPUA NEW GUINEA

By Travis Q. Lyday

Mining in Papua New Guinea during the year consisted of modern, mechanized copper (Ok Tedi Mine, Western Province) and gold (Misima opencast, Milne Bay Province, and Porgera underground-open pit mine, Enga Province) operations, as well as panning and crude sluicing activity from individual and small-scale miners.

The mineral industry has been the cornerstone of the country's economy since 1972 when the world-class Panguna porphyry copper-gold deposit on Bougainville Island, North Solomons Province, was developed. Revenues from mining projects contribute about 30% to the Government's total revenue and minerals, including petroleum, and constitute about 80% of the country's total exports. Papua New Guinea's 1992 gross domestic product increased at a 9% rate, mainly due to the remarkable growth of the minerals sector, including exploration programs, mining, and associated construction and development such as that at the Porgera Mine and the Kutubu Oilfield.

The mining industry in Papua New Guinea paid more than $13 million[1] in mineral royalty payments to Provincial governments and landowners in 1992. The owners of the Porgera Mine had the largest payout, more than $6.3 million, followed by the Ok Tedi Mine with more than $4.9 million. The Misima Mine paid an estimated $1.8 million, and the Mount Kare alluvial gold operation in Enga Province paid more than $12,000.

GOVERNMENT POLICIES AND PROGRAMS

Following the closure of the Mount Kare alluvial gold mine in January because of an armed attack, the Government announced the formation of a rapid deployment police unit to provide 24-hour protection for the country's resource projects, including mines, oilfields, and gas projects and their associated equipment and infrastructure, such as pipelines, transmission lines, buildings, and helicopters. The unit is based at Goroka, Eastern Highlands Province, and consists of 300 personnel.

Early in the year, the Government considered and then abandoned the idea of establishing a state-owned national oil and gas company. However, the Government was considering in midyear to build a small oil refinery as part of its plans to develop downstream operations for its mining and petroleum projects. The refinery, estimated to cost about $100 million, would be built on Motukea Island in Port Moresby Harbor and have a capacity of 40,000 bbl/d of oil. Although the refinery is envisioned to be fed largely by production from the Kutubu Oilfield, other light, sweet (low in nitrogen and sulfur) crudes from Australia and Indonesia may be blended in. Domestic demand for oil is about 20,000 bbl/d.

A new Mining Act was passed by the Parliament in March. The new act allows for the introduction of a new alluvial mining lease, which would restrict ownership of small alluvial gold mines to Papua New Guineans and enable local landowners to mine their own lands by mechanical methods, providing no other lease had previously been issued for the same area. Formerly, landowners could mine their own lands only by using hand tools. The act provides that Papua New Guineans will have at least a 51% controlling interest in any medium to large alluvial gold operation and up to a 35% share in any mining project.

The act formalized for the first time the Government's right to acquire, at cost, up to a 30% equity share in any mineral resource project on behalf of the citizens of Papua New Guinea. The previous policy of the Government was to be able to acquire up to a limit of 30% equity in new mining developments. The Government accordingly acquired a 20% equity each in the Misima, Panguna, and Ok Tedi Mines, and a 10% share in the Porgera Mine at the mine development approval stage.

The Government announced in November its intention to negotiate the acquisition of an additional 20% of the Porgera Mine from the three non-Government joint-venture partners, namely Placer (P.N.G.) Pty. Ltd., Highlands Gold Properties Pty. Ltd., and RGC (Papua New Guinea) Pty. Ltd., under the precepts of the new Mining Act. The Government previously had negotiated an equity agreement in 1979 with the partners in which Government participation was set at a maximum of 10% in the Porgera project. In May 1989, the Government exercised its option and acquired, equally from the other partners, its maximum permissible interest under this agreement of 10% in the project.

PRODUCTION

Four mines (Misima, Mount Kare, Ok Tedi, and Porgera), one gas project (Hides), and one petroleum field (Kutubu) were in operation at the end of the year. These produced virtually all of the country's mineral production, excluding minor amounts of alluvial gold by

individual panners, and clays, sand and gravel, and stone for construction purposes. A fifth mine, the Panguna Mine on Bougainville Island, North Solomons Province, remained closed throughout the year owing to civil unrest by Bougainville Revolutionary Army militants. *(See table 1.)*

TRADE

Papua New Guinea has developed from a country dominated by subsistence agriculture and the export of the unrivaled cash crops of cocoa, coffee, and copra and palm oils in the early 1980's to one in which minerals (61.1%) and petroleum (19.6%) represent more than 80% of the country's labor force.

The Porgera Mine has replaced the role of the closed Panguna Mine in the national economy by becoming the nation's largest single income earner. Porgera accounts for about 40% of all export revenues and 10% of the Government's income.

Virtually all nonfuel mineral production was exported in the form of doré, bullion, and copper-gold-silver concentrates. All petroleum production was exported from the newly constructed offshore terminal in the Gulf of Papua. *(See table 2.)*

STRUCTURE OF THE MINERAL INDUSTRY

Papua New Guinea is a mineral-rich country with a modern mining industry. Mining is the only large-scale industry in the country, directly accounting for more than 30% of the GDP, estimated at $39 billion. In addition to several large, world-class mining operations, there are numerous small-scale mining activities. The country has a long history of mining, beginning in 1888 with the discovery of gold on what is now Misima Island, and is a world-class producer of both copper and gold, ranking 10th in copper and 6th in gold in 1992.

Workers in the country's mining and petroleum sectors formed their own national union, the Papua New Guinea Mining and Energy Workers' Federation. The union was established during the first quarter of the year at a meeting at Mount Hagan, the capital of Enga Province and the logistical base of operations for the huge Porgera Mine. Executive officers in the union were to be divided equally among workers from the Misima, Ok Tedi, and Porgera Mines. *(See table 3.)*

COMMODITY REVIEW

Metals

Copper.—With the closure of the Panguna Mine in May 1989, all copper production in the country is being mined at the Ok Tedi Mine on Mount Fubilan in the Star Mountains of Western Province, 18 km from the Indonesian Province of Irian Jaya.

Pacific Minerals Pty. Ltd., a wholly owned subsidiary of CRA Ltd., continued prospecting its Wafi copper-gold prospect about 60 km southwest of Lae in Morobe Province. At yearend, Pacific Minerals was working with the Government to determine landowner status in the area. Competing claims by landowners have caused minor problems at the Wafi prospect.

Force Majeure on shipments of copper concentrate from the Ok Tedi Mine was in effect from November 26 to the end of the year. Water levels in the Fly River were too low to transport the concentrate 850 km by barge from the river port at Kiunga to a storage and transshipment facility at Umuda Island in the Gulf of Papua at the river's mouth. The concentrate is transported 160 km from the mine to Kiunga by slurry pipeline. Mining operations at the mine were not affected, and the ore was stockpiled. Ok Tedi supplies concentrates under long-term contract to smelters in Finland, Germany, Japan, the Philippines, and the Republic of Korea.

Gold.—Escalation in landowner violence at the Mount Kare alluvial-colluvial gold mine in Enga Province in the central highlands, 18 km southwest of the huge Porgera Mine, continued to disrupt operations at the site into 1992. The most serious attack was an armed raid in January that cost the project more than $3.6 million in damage and forced an 8-month shutdown of the mine. Mount Kare resumed gold production in August.

The Mount Kare project was the first joint-venture undertaking between a major international mining company and Papua New Guinea's landowners. After the violence at the Panguna Mine on Bougainville Island, with what initially was a dispute with local landowners, it was hoped that such an approach would be the model for future mining endeavors in the country. However, even substantial landowner involvement in mining apparently does not ensure deliverance from landowner-led violence.

A $767 million mine development proposal for the Lihir prospect on Lihir Island, New Ireland Province, was submitted in March by the joint-venture partners Kennecott Explorations (Australia) Ltd. and Niugini Mining Ltd. to the Government's Mining Advisory Board and the Department of Minerals and Energy. The report proposes to process 2.825 Mmt/a of ore to produce almost 19,300 kg/a of gold for the 31-year life of the mine. The Government responded by renewing the Prospecting Authority for a further 2 years and requiring that the partners enter into sincere negotiations with both the Provincial and national Governments, local landowners, and financial institutions that will ultimately lead to the granting of a Mining Development Contract and a Special Mining Lease permitting construction of the mine. In addition, negotiations between the partners proceeded throughout the second semester of the year with the aim of increasing Niugini Mining's equity interest in the Lihir project. The Government, through Mineral Resources Development Co., was expected to take at least a 20% stake in the project.

The last of the Stage 3 plant expansions at the Porgera Mine was completed in August with the installation underground of a jaw crusher and an associated conveying system, while

capacity was increased at the surface with the installation of a new gyratory crusher, a semiautogenous grinding mill, and a ball mill. Associated underground development for expansion to a rate of 3,500 mt/d was completed as was the development of the open pit to furnish 1,000 mt/d to the mill. The additional mining and milling capacity enabled the mine to maintain gold production despite falling ore grades, from an average of 64.5 g/mt of gold in 1991 to 36 g/mt of gold in 1992, by increasing ore production from 1,950 to 4,500 mt/d. The next stage of development will be the installation of a second ball mill and a fourth autoclave that will lift the processing capacity to 8,500 mt/d. These improvements are expected to cost almost $34 million.

Gold production, in kg by mine, is shown in table 4.

Mineral Fuels

Natural Gas.—Natural gas from the Hides Gasfield production facility in Southern Highlands Province was used in an adjacent 36-MW gas turbine generating station to produce electricity to supply the Porgera Mine in Enga Province. The power was transmitted 70 km through Porgera's transmission lines to the mine site. A small quantity of diesel fuel also was being produced to supply local markets.

The Hides Project became Papua New Guinea's first commercial gasfield when commissioning was completed in December 1991. The Porgera Mine has signed a 20-year contract with the Hides project for the supply of power.

Reportedly, three Japanese companies, Japan Petroleum Exploration Corp., Nippon Oil Co., and Nissho Iwai Corp., will join Mobil Corp. of the United States in a joint venture to develop offshore natural gas resources and build a liquefied natural gas processing plant in Papua New Guinea. The plant is envisioned to begin production by 1995 at a cost of $20 billion. Australian, British, and Canadian companies are expected to join the consortium.

Petroleum.—The Kutubu joint-venture petroleum project in Gulf and Southern Highlands Provinces of the Papuan Basin came on-stream in June, 2 months ahead of schedule, with an initial production of 20,000 bbl/d. Daily output, produced from the closely spaced Agogo, Hedinia, Iagifu, and Usano Oilfields, was planned to increase to about 140,000 bbl from the 130,000 bbl at yearend. Total capital costs for the project were more than $1 billion and included the construction of a large airstrip near Lake Kutubu, roads, storage tanks, a 266.5-km pipeline, and an offshore terminal 40 km out in the Gulf of Papua. The Kumul Marine Terminal was used to load tankers for transshipment of the crude oil to refineries in Australia, Japan, Singapore, and the United Kingdom.

Reserves

Papua New Guinea, part of the largest of the islands of Oceania, also has the greatest share of Oceania's mineral resources. However, only three major nonfuel mineral commodities—copper, gold, and silver—are produced. Although there is no immediate prospect of other major commodities being produced on a large scale, subeconomic resources of chromium, cobalt, and nickel are known. Mineral sands containing magnetite and titanomagnetite occur at many locations around the coasts of Papua New Guinea. Minor quantities of platinum-group metals have been recovered from alluvial gold workings. Resources of bauxite are known on Manus Island in the Admiralty Islands and on New Ireland Island. In addition, lead, manganese, molybdenum, and zinc mineralization, as well as occurrences of industrial minerals such as limestone, phosphate guano, and phosphate rock, are widely known.

Natural gas and petroleum potential is thought to be large, but proven reserves are only now being delineated. *(See table 5.)*

INFRASTRUCTURE

Essential elements of the transportation infrastructure include 19,200 km of roads, including 640 km paved; 10,960 km gravel, crushed stone, or stabilized-soil surface; and 7,600 km unimproved earth. The length of inland waterways totals about 10,940 km and is of little importance to the transportation industry. There are 18 principal airports with permanent-surface runways out of an aggregate of 503 in the country. International shipping ports include Lae, Madang, Port Moresby, and Rabaul. There are no railroads. Electric generating capacity in 1991 was 397 MW.[2]

The vast majority of the in-place infrastructure in the country is concentrated in the provincial capitals; therefore, the lack of infrastructure for most of the country is a distinct hinderance for the minerals industry, including exploration, mine construction and development, and transportation of mined products.

OUTLOOK

The terrorist activity that forced the closure of the Panguna Mine in May 1989, coupled with other unrest, for example, proliferous urban street crime, is continuing to make financiers edgy and, thus, will almost certainly make project financing for new projects, such as the Lihir gold deposit on Lihir Island, much more difficult. Although most of the secessionist factions on Bougainville Island reportedly have surrendured to Government forces, there are still some militants remaining and therefore no plans are iminent to reopen the Panguna Mine.

However, Papua New Guinea in 1992 was entering a phase of unprecedented mineral and petroleum development. New mining developments have replaced the losses that resulted following the closure of the Panguna Mine, which had become the mainstay of the country's economy, accounting for 10% of the gorss national product, 36% of export earnings, and 18% of the Government's internally generated revenues. Annual gold production in the country is appraised to remain at more than 70 mt/a through 1994, staying in excess of 40 mt/a well into the 21st century.

Production from small-scale mining operations will continue to expand. Petroleum production, which only began in midyear, will become the biggest single source of revenue for the Government in a few years, possibly as early as 1994.

Since Panguna's shutdown, the Porgera and Misima Mines have come on-stream; the Ok Tedi Mine, the country's largest and oldest active mine, has become more profitable and is producing consistently; natural gas from the Hides Gasfield began fueling the electricity generation plant that supplies power to Porgera, replacing the costly diesel generation plant previously used; and the Kutubu Oilfield began producing crude oil for export, providing another major boost to the country's economy.

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[1]Where necessary, the values have been converted from the Papua New Guinean kina (K) to U.S. dollars at the 1992 average rate of K0.97=US$1.00.

[2]U.S. Central Intelligence Agency, Washington, DC: The World Factbook 1992, p. 268.

OTHER SOURCES OF INFORMATION

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TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1988	1989	1990	1991	1992
Copper, mine output, Cu content	metric tons	218,634	204,025	170,210	204,459	193,359
Gold, mine output, Au content	kilograms	38,129	27,538	31,938	60,780	71,190
Petroleum, crude	thousand 42-gallon barrels	—	—	—	—	19,400
Silver, mine output, Ag content	kilograms	70,408	93,672	r106,300	124,880	95,498

rRevised.
[1]Table includes data available through June 7, 1993.
[2]In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates.

TABLE 2
PAPUA NEW GUINEA: EXPORTS OF COPPER CONCENTRATES, BY DESTINATION

(Thousand metric tons)

Destination	1991	1992
Germany	17,338	22,913
Japan	35,415	67,739
Korea, Republic of	11,819	23,190
Unspecified	31,712	31,195
Total	96,284	[1]145,037

[1]Jan. to Sept.

Source: World Metal Statistics, Apr. 1993.

TABLE 3
PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper, gold silver	Ok Tedi Mining Ltd., operator. [BHP Minerals Holdings Pty. Ltd., managing shareholder, 30%; Amoco Minerals (PNG) Co., 30%; Mineral Resources Development Co. (State of Papua New Guinea), 20%; Metallgesellschaft AG, 7.5%; Degussa AG, 7.5%; and Deutsche Finanzierungsgesellschaft Fuer Beteiligungen in Entwicklungs-laendern GmbH. (West German Development Co.), 5%]	Ok Tedi Mine, Mount Fubilan, Western Province	145[1] Cu, 15 Au, 30 Ag.
Copper, gold	Bougainville Copper Ltd., operator and manager. [CRA Ltd., 53.6%; public shareholders, 27.3%; and Mineral Resources Development Co. (State of Papua New Guinea), 19.1%]	Panguna Mine, Bougainville Island, North Solomons Province[2]	180[1] Cu,. 10 Au.
Gold	Kennecott Explorations (Australia) Ltd., 80%; and Niugini Mining Ltd., 20%	Lihir project, Lihir Island, New Ireland Province	18.[3]

See footnotes at end of table.

TABLE 3—Continued

PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	Mount Kare Alluvial Mining Co. Pty. Ltd., operator. [CRA Minerals (PNG) Pty. Ltd., 51%; and Kare-Puga Development Corp. (local landowners), 49%]	Mount Kare deposit, 18 kilometers southwest of Porgera, in Southern Highlands Province	4.7.
Gold, silver	Misima Mines Pty. Ltd., operator and manager. [Placer Niugini Pty. Ltd., 80%, and Mineral Resources Development Co. (State of Papua New Guinea), 20%]	Misima Mine, Misima Island, Milne Bay Province	6 Au, 100 Ag.
Do.	Placer (P.N.G.) Pty. Ltd., manager, 30%; Highlands Gold Properties Pty. Ltd., 30%; RGC (Papua New Guinea) Pty. Ltd., 30%; and Mineral Resources Development Co. (State of Papua New Guinea), 10%	Porgera Mine, 130 kilometers west of Mount Hagen, in Enga Province	30 Au.
Natural gas	BP Petroleum Development Ltd., operator manager, 95%; and Oil Search Ltd., 5%	Hides Gasfield, Southern Highlands Province	425.[4]
Petroleum	Chevron Niugini Pty. Ltd., manager, 19.375%; BP Petroleum Development, 19.375%; Ampol Exploration Ltd., 16.46%; BHP Petroleum (PNG) Inc., 9.69%; Oil Search Ltd., 7.76%; Merlin Pacific Petroleum Co., 4.84%; and Petroleum Resources Kutubu Pty. Ltd. (State of Papua New Guinea), 22.5%	Kutubu Oilfield, Gulf and Southern Highlands Provinces	140.[5]
Do.	Barracuda Pty. Ltd., 20%, operator. (Southern Highlands Petroleum, 50%; Oil Search Ltd., 20%; Nomenco PNG Oil Co., 7%; and Mountains West Exploration Inc., 3%)	South East Gobe Oilfield, Gulf Province	40.[5]

[1]Thousand metric tons.
[2]Closed since May 1989 because of civil unrest.
[3]Initial tunneling and construction work scheduled to begin last quarter 1993, with mining planned to begin midyear 1996.
[4]Thousand cubic meters per day.
[5]Thousand barrels per day.

TABLE 4

PAPUA NEW GUINEA: PRODUCTION OF GOLD, BY MINE

(Kilograms)

Mine	1991	1992
Misima Mine	10,050	11,642
Ok Tedi Mine	12,407	10,494
Porgera Mine	37,825	46,191
Mount Kare Mine and other alluvial	498	2,863
Total	60,780	71,190

TABLE 5

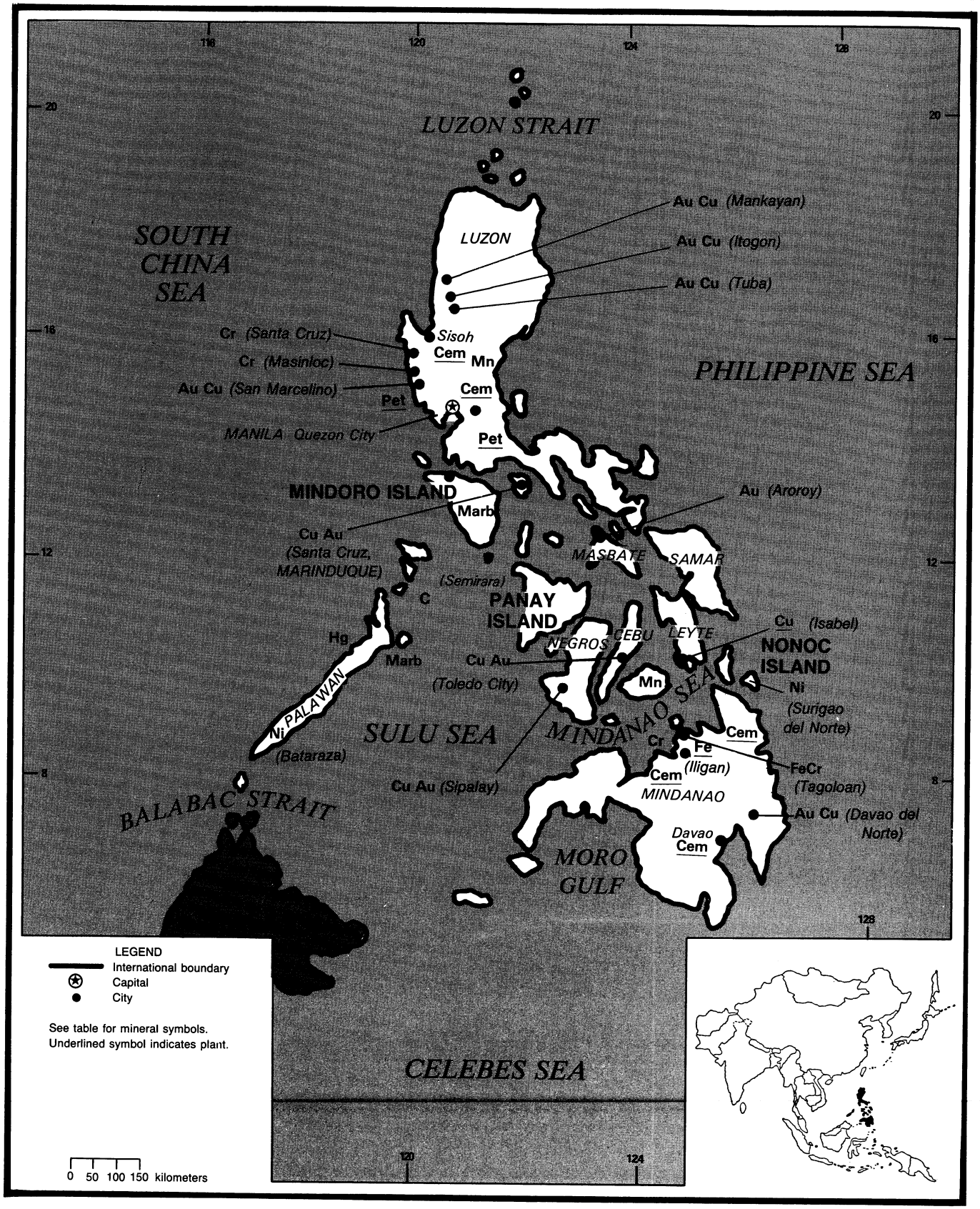
PAPUA NEW GUINEA: RESERVES OF MAJOR MINERAL COMMODITIES, BY DEPOSIT, FOR 1992

Commodity, deposit, and location	Reserves[e]
Copper:	
Ok Tedi, Western Province	470 million tons ore grading 0.64% copper.
Panguna, North Solomons Province	530 million tons ore grading 0.4% copper.
Gold:	
Hidden Valley, Morobe Province	65 tons recoverable gold.
Lihir, New Ireland Province	613 tons recoverable gold.
Misima, Milne Bay Province	77 tons recoverable gold.
Mount Kare, Enga Province	3 million cubic meters alluvium grading 5 grams gold per cubic meter.
Ok Tedi, Western Province	470 million tons ore grading 0.5 gram gold per ton.
Panguna, North Solomons Province	530 million tons ore grading 0.49 gram gold per ton.
Porgera, Enga Province	342 tons recoverable gold.
Wafi, Morobe Province	18 million tons ore grading 2.5 grams gold per ton, with associated copper.
Petroleum:	
Kutubu Oilfield, Southern Highlands Province	258 million barrels recoverable petroleum.
Silver:	
Hidden Valley, Morobe Province	1,100 tons recoverable silver.
Misima, Milne Bay Province	1,175 tons recoverable silver.
Panguna, North Solomons Province	530 million tons ore grading 1.18 grams silver per ton.
Porgera, Enga Province	585 tons recoverable silver.

[e]Estimated.

PHILIPPINES

AREA 300,000 km² **POPULATION 67.1 million**



THE MINERAL INDUSTRY OF

THE PHILIPPINES

By Travis Q. Lyday

The Philippines' gross domestic product (GDP) remained stagnant at less than $50 billion[1] in 1992, primarily because of a prolonged drought, severe power shortages, and weak demand in world markets. Agriculture is most important to the country's economy; rice, fruit, and coconuts are the major cash crops. The mining and quarrying sector of the minerals industry contributed less than 1.5% to the country's GDP in 1992, marking the sixth successive year of its descent. Although copper and gold remained the backbone of the country's minerals, production continued to be thwarted by the effects of the 1991 volcanic activity surrounding Mount Pinatubo, localized flooding caused by several tropical cyclones, and low international prices.

The Philippines, however, was among the 10 largest producers of chromite, copper, and gold in the world in 1992 and was a world force in the output of other commodities as well, including ferroalloys, mined nickel, and refined copper.

GOVERNMENT POLICIES AND PROGRAMS

Laws to implement the much-needed mining code were still waiting passage by the new Philippine Congress at yearend. The code was favorably received by the preceding Congress, but had not been enacted. The mining code will be the enabling act that will implement Section 2, Article XII, of the 1987 Constitution. This will repeal the leasehold system, replacing it with coproduction, joint-venture, and production-sharing agreements, as well as introducing technical and financial assistance agreements for large-scale mining projects (more than $50 million). It also will allow foreign companies to own 100% equity in large-scale projects engaged in mineral exploration, development, and production, providing they divest down to not more than 40% equity once their initial investment is recovered. The constitutional requirement that Philippine operations must have a minimum 60% Filipino ownership remains.

In an effort to attract foreign exploration and mining companies to invest in the Philippines, the Chamber of Mines of the Philippines and the Philippine Mines and Geosciences Bureau held three seminars on current Philippine mining activities, investment prospects, and the legal framework under which mineral exploration in the country is conducted, including laws and regulatory policies. The seminars, sponsored by the United Nations Department of Technical Cooperation for Development under a mineral investment promotion project of the United Nations Development Program, were given in London, Manila, and Vancouver early in the year by senior representatives from both Government and industry. A separately available prospectus delineated the Philippines' geography, economic activity, mining geology, mining laws, and the regulatory policies governing mineral exploration and production. The handbook also included a listing of current mining and quarrying activity by major companies, focusing on each mineral and area in turn.[2]

The Government-owned National Development Co. was in various stages of selling to private interests several mineral industry companies under the auspices of the Asset Privatization Trust (APT), including the following: National Steel Corp. (NSC), the country's leading manufacturer and supplier of steel products; Philippine Associated Smelting and Refining Corp. (PASAR), the country's only copper smelter-refinery; Philippine Phosphate Fertilizer Corp. (Philphos), the largest phosphatic fertilizer plant in Asia; and Semirara Coal Corp. (SCC), the country's largest coal mining company.

PRODUCTION

The minerals industry of the Philippines employed an estimated 420,000 people, including almost 300,000 engaged in small-scale mining and panning activities, chiefly in artisanal gold workings. Over the years, the metallic sector has consistently accounted for 75% of the industry's production value and nearly 100% of export earnings. Of the more than 20 mining companies producing metallic minerals in the country, 8 were mining primary gold, while 7 were involved in production of copper concentrates. Several of the copper miners also produced gold and silver as byproducts. Other companies produced other metals, including chromite, manganese, nickel ore, and zinc concentrates. The industrial minerals sector is dominated by the production of limestone for the manufacture of cement and marble and sand and gravel for construction uses.

Mineral production in 1992 decreased as the industry was hampered by generally low prices, high operating costs, and dwindling access to capital. The value of mineral production was $825 million in 1992, a decrease of 14% from the 1991 value of $960. A 6% increase in the value of industrial mineral production was inadequate to counter the

more than 20% decline in value of production in the metals sector.

Refined gold and copper remained the country's most important mineral products, each representing more than 30% of total mineral value.

TRADE

The main market for the country's mineral products was Japan. Japan imported almost all of the Philippine production of chromite and nickel and more than 60% of its copper concentrates. The remaining copper concentrates were smelted by PASAR into copper cathodes at Isabel, Leyte Province, primarily for export to Japan. Although all primary and byproduct gold recovered domestically must be sold to the Central Bank, the gold contained in the copper concentrates that were exported to Japan was sold to the smelter along with the copper. However, some gold production from small-scale miners, estimated to be at least 7 to 8 mt/a, frequently bypasses official Central Bank purchasing stations.

Mining contributes about 10% to the Philippines' total exports.

STRUCTURE OF THE MINERAL INDUSTRY

The Philippines has one of the oldest and most active mining industries of Southeast Asia. It has a strong, established mining structure. Mining in the Philippines operated on a leasehold system until 1987, when this system was abolished in favor of a new system of joint-venture or production-sharing agreements under policies governed by interim regulations until a new mining law and enabling regulations could be passed. The proposed mining code drafted in 1988 has been passed but not implemented by the Philippine Congress. The new mining code will promote the involvement of foreign investors in large-scale exploration, development, and utilization of mineral resources while retaining small-scale development by Filipinos. State control over mineral resources gives the flexibility to undertake mining as a Government activity or to enter into coproduction, joint-venture, or production-sharing agreements with the domestic private sector or with corporations and associations whose capital is owned 60% by Filipinos. In addition, the code will recognize the importance of foreign investment in the Philippine minerals industry by enabling investors to undertake minerals operations for their own account, instead of acting as service companies for Filipino clients. For large-scale projects (with a capital value in excess of $50 million), the requirement for a minimum 60% Filipino ownership of the project may be waived for a specific period, allowing 100% foreign equity in prospecting for and the processing of minerals.

The mining industry of the Philippines was dominated by a few large-scale private local companies mining chromite, copper, and gold. Coal was mined by numerous private companies and three subsidiaries of the state-owned Philippine National Oil Corp. (PNOC). One of the large Government-owned companies produced more than one-half of the country's coal. Copper, ferroalloys, and phosphate fertilizer were produced by three joint-venture firms. Cement was produced by at least 18 private companies. Most were Filipino owned, with only minor foreign interests.

COMMODITY REVIEW

Metals

Chromium.—Chromite production is centered in the Province of Zambales in northern Luzon. Metallurgical- and refractory-grade chromite has been produced from two principal deposits mined by Acoje Mining Co. and Benguet Corp., respectively. Production in 1992 was dominated by Benguet from its Coto Mine, based on the world's largest single refractory chromite deposit. The principal supplier of metallurgical chromite has been Acoje from its Santa Cruz operations, but the mine was dormant during the year. Additionally, small-scale operations in the vicinity provided feed ore to the major producers' plants. There was also significant output of metallurgical- and chemical-grade chromite from alluvial and lateritic deposits on eastern Samar Island, Samar Province, and on Dinagat Island, Surigao del Norte Province.

China and the Government, as part of an agreement to improve the balance of trade between the two countries, announced they would enter into a joint venture to explore and develop the chromite deposits in Surigao del Sur Province in northeastern Mindanao.

Copper.—Five large operations supplied most of the country's copper output in 1992: Atlas Consolidated Mining and Development Corp.'s open pit (Biga and Carmen) and underground (Lutopan) mines in the Toledo district of central Cebu; Benguet Corp.'s Dizon Mine, Lepanto Consolidated Mining Co.'s Mankayan Mine, and Philex Mining Corp.'s Padcal Mine, all in Benguet Province, northern Luzon; and Maricalum Mining Corp.'s Sipalay Mine in the southern part of Negros Island. Other copper producers included Marcopper Mining Corp. on the Island of Marinduque and North Davao Mining Corp.'s Amacan Mine in Davao del Norte Province, Mindanao.

To avoid continued dependence on toll smelting in foreign countries, the Philippine copper industry, in conjunction with the Government and Japanese investors, formed PASAR and brought into operation in 1983 the country's only copper smelter-refinery at the Leyte Industrial Development Authority site at Isabel, Leyte Province, in central Philippines. An expansion and modernization program increasing the capacity from 138,000 mt/a of copper cathode to 172,500 mt/a was completed at yearend, making the PASAR plant the fourth largest in the Asia-Pacific region. In addition to taking feed from Philippine mines, the plant also toll smelted concentrates from overseas.

Ferroalloys.—A 3-year drought and the arrival of new power-consuming industries continued to adversely affect the Philippine ferroalloy industry centered on the island of Mindanao. Severe daily power outages of up to 12 hours,

precipitated by low water levels in Lake Lanao, which drives the Agus-1 hydroelectric powerplant, caused the plants to shut down for extended periods throughout most of the year. The situation also was exacerbated by the Government's solution of the power crisis through fast-tracking power sources in the form of diesel power and gas turbine units operating as base loads, increasing power costs prohibitively. The affected plants included Christina Chemical, Ferrochrome Philippines Inc., Integrated Chrome, Mindanao Ferro-Alloy Corp., Metro Alloy, and Philippine Mineral and Alloys.

Gold.—The principal gold-producing districts of the Philippines are Baguio, northern Luzon; Masara, southeastern Mindanao; Masbate Island; Paracale, southern Luzon; and Surigao, northeastern Mindanao. Primary gold production in 1992 was dominated by two companies, Atlas Consolidated and Benguet Corp., which between them accounted for more than one-half of the officially recorded Philippine primary production. Six additional companies produced most of the remainder. In addition, small-scale mining operations, primarily in Mindanao, produced an undeclared (and unknown, but estimated as 7 to 8 mt/a) amount for a thriving parallel, or black, market.

Texaphil Mining Corp. commissioned in April the country's first nontoxic, nonchemical gold-processing plant in Bukidnon Province, Mindanao. The operation serves the more than 3,500 small-scale miners and panners in the province.

Iron and Steel.—The Philippines does not have a fully integrated steel sector, although several rod and bar mills and galvanizing plants have been established, all since the end of World War II. The National Steel Corp. (NSC), owned by the Government, was planning the construction of a $1.9 billion, 2.3-Mmt/a integrated iron and steel plant at its billet works at Iligan, Lanao del Norte Province, on the Island of Mindanao.

Steelmaking in the Philippines presently involves scrap-based electric furnace steel melting operations, of which there were 17 facilities in 1992—13 in the National Capital Region; 3 in Pampanga Province to the northwest of Manila, the capital; and NSC's plant at Iligan. NSC is the single largest steel company in the country, producing about one-third of total production. Power outages due to the ongoing drought continued to interrupt the Philippine steel melting industry in 1992.

The Philippine Sinter Corp., owned by Kawasaki Steel Corp. of Japan, imports iron fines from various overseas sources, primarily Australia, and exports iron ore sinter and pellets to Japan. The plant was opened in 1977 and has a capacity of 5 Mmt/a.

Manganese.—Manganese output was centered on the islands of Bohol, Busuanga, Marinduque, Masbate, and Siquijor, as well as in the Provinces of Zamboanga del Sur and Agusan del Norte on Mindanao. Many of the deposits, however, are small and unsuitable for large-scale mining operations.

Portman Mining Ltd. of Australia confirmed through reconnaissance exploration the existence of a soil-hosted manganese resource on its property on Bohol Island. Previous metallurgical testing by the Government's Mines and Geosciences Bureau had indicated a deposit capable of being beneficiated to more than 300,000 mt of salable manganese. Portman was planning to continue exploration in 1993 to confirm the economics of developing a 50,000- to 100,000-mt/a mine.

Nickel.—The mainstay of Philippine nickel production in 1992 was Rio Tuba Nickel Mining Corp.'s Rio Tuba Mine in the far south of Palawan Island, Palawan Province. Hinatuan Mining Corp. and Taganito Mining Corp. both operated smaller mines in Surigao del Norte Province. All three worked lateritic nickel deposits, exporting all ore production to Japan.

Philnico Mining and Industrial Corp.'s lateritic nickel mine on Nonoc Island in Surigao del Norte Province, off the coast of northeastern Mindanao, and its associated refinery on nearby Marinduque Island remained mothballed throughout 1992. However, Philnico was reportedly still planning a rehabilitation program for mining the ore and producing refined nickel and nickel-cobalt sulfides. Until the closure in 1986 of this nickel mine-refinery complex, the Philippines was the world's fifth largest producer of nickel.

Mineral Fuels

Coal.—Philippine coal production was dominated by SCC and PNOC, both of which were Government-owned companies, producing almost 70% of the country's output. SCC operated the Unong open pit on the island of Semirara in Antique Province, while PNOC worked three underground mines in Cebu, eastern Mindanao, and at Malangas in western Mindanao. The remainder of production came from 30 to 35 small-scale private producers operating near-surface mines.

Much of the coal mined in the Philippines is low grade and is often blended with higher grade imported coals. Cement production remained the leading consumer, closely followed by power generation. All of SCC's production is used to fuel coal-fired powerplants of the state-owned National Power Corp., although the company was considering supplying coal to the cement industry. The high moisture content of SCC's production may, however, make SCC's coal uncompetitive.

Petroleum.—Pilipinas Shell Petroleum Corp. announced at yearend plans to build a second refinery adjacent to its existing plant at Batangas, Batangas Province, on Luzon. The 70,000-bbl/d refinery is scheduled to be expanded to 110,000 bbl/d by mid-1994. Shell is one of two multinational oil firms operating and competing with the state-owned PNOC in the Philippines—the other being Caltex (Philippines) Inc.

Reserves

Mineralization in the Philippines, although usually not rich, nonetheless is extensive. The Chamber of Mines of the

Philippines ranks the mineral reserves of the country at the top in Southeast Asia and seventh worldwide. There are abundant deposits of gold, especially in eastern Mindanao and in Benguet and Camarines Norte Provinces, Luzon Island; copper in Zambales Province on Luzon and in the Visayan Islands; zinc at Zamboanga on Mindanao; high-grade chromium in Zambales and Camarines Sur Provinces on Luzon, near Surigao on Mindanao, and near Puerto Princesa on Palawan Island; and nickel in Surigao del Norte Province, especially on Hinatuan and Nonoc Islands, Mindanao. Ores of iron, manganese, and mercury also occur in the country. Lead and silver, as well as less common cadmium and molybdenum, mineralization occurs in association with other ores. Deposits of industrial minerals include limestone on Cebu, Luzon, and Romblon Islands; salt and asbestos on Luzon; marble on Romblon and Panay Islands; gypsum on Luzon; sulfur on Luzon, Leyte, and Mindanao Islands; and phosphate rock on Cebu and Bohol Islands. Asphalt occurs on Leyte, and coal deposits are found on Cebu and Mindoro Islands.

INFRASTRUCTURE

The more than 300,000 km^2 of land area in the Philippines is distributed over more than 7,100 islands. This, coupled with the fact that virtually any point on even the largest of the islands is within 100 km of the coast, dictates that sea and air transport are essential elements of the communications-transportation infrastructure. Railroads (378 km in length, all on Luzon) and pipelines (357 km for refined oil products) play only a modest role, but there is more than 156,000 km of roads, including 29,000 km paved, 77,000 km loose-surface improved (gravel, crushed stone, or stabilized soil surface), and 50,000 km unimproved earth. Inland waterways, of which there is 3,219 km, are relatively unimportant because of their shallowness. None can accommodate vessels with a draft greater than 1.5 m.

There are 244 usable airports in the country, 72 with permanent-surface runways, and most are on the larger islands such as Luzon and Mindanao. Two, those at Cebu and Manila, are international airports. Many of the smaller islands can only be reached by interisland ferries or small chartered vessels.

International shipping uses 18 major ports, including Bacolod (Negros Occidental Province), Bago (Negros Occidental Province), Batangas (Batangas Province), Cagayan de Oro (Misamis Oriental Province), Cebu (Cebu Province), Davao (Davao del Sur Province), Dumaguete (Negros Oriental Province), General Santos (South Cotabato Province), Iligan (Lanao del Norte Province), Iloilo (Iloilo Province), Legaspi (Albay Province), Manila (National Capital Region), Ozamis (Misamis Occidental Province), Puerto Princesa (Palawan Province), Subic Bay (Zambales Province), Surigao (Surigao del Norte Province), Toledo (Cebu Province), and Zamboanga (Zamboanga del Sur Province), out of more than 450 seaports in the country.

The Philippines has a considerable excess of power-generating capacity relative to present actual production levels, but power costs are relatively high. Generating capacity in 1991 was reportedly 7.5 GW, of which about 50% was from imported crude oil-, natural gas-, and/or coal-fired thermal plants; 30% from hydroelectric plants; and 20% from geothermal plants. The Philippines was the world's second largest producer, after the United States, of geothermal energy. Total power production in the same year was 31 billion Kw • h.[3]

Generally, the infrastructure for mineral industry operations is regarded as adequate on the Islands of Cebu, Luzon, Marinduque, Negros, and Palawan. Elsewhere, infrastructural development is less than ideal.

OUTLOOK

The slowdown of economic activity in the industrialized countries, particularly in the United States, the Philippines' biggest export market, was expected to have a continuing effect on the Philippine economy. However, the Philippine mining sector was expected to sustain a steady, albeit small, growth in the near term.

Aside from this external factor, the country must continue to manage a number of domestic issues, including a large foreign debt, a widening budget deficit, a shortfall in foreign exchange, and inflation.

Inflation continued to be a major preoccupation of the Government as year-to-year increases in the consumer price index remained in the double-digit range. However, trade and currency reforms introduced by the Government should put the country's economy on a sounder base. Near yearend, inflation was down to less than 10%, international reserves had been strengthened, and real interest rates were falling. The country's external debt, estimated to be $30 billion, remained at a high level. The annual debt-service ratio of goods and services exports was estimated to have increased slightly. Economic growth of about 3% was expected for 1993. Increased exploration and investment, especially for gold, was expected to help keep the Philippine economy stable.

[1]Where necessary, values have been converted from the Philippine peso (P) to U.S. dollars at the rate of P25.512=US$1.00, the average for 1992.

[2]Mining Journal Research Services. The Philippines: Investment Opportunities for International Mining Companies. Jan. 1992, 226 pp.

[3]U.S. Central Intelligence Agency, Washington, DC: The World Factbook 1992, p. 275.

OTHER SOURCES OF INFORMATION

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Chamber of Mines of the Philippines, Manila: Newsletter and Annual Report.
Mines and Geosciences Bureau, Manila: Mineral News Service and Annual Report.

TABLE 1

PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992e
METALS						
Arsenic: White (equivalent of arsenic acid)		5,046	4,652	5,092	e5,000	5,000
Chromium: Chromite, gross weight:						
Metallurgical-grade		26,168	105,153	61,792	79,000	55,000
Chemical-grade		15,211	18,424	20,240	19,997	17,000
Refractory-grade		87,879	92,985	103,563	85,013	60,000
Total		r129,258	216,562	185,595	184,010	132,000
Copper:						
Mine output, Cu content		218,089	192,991	182,139	r148,300	3123,300
Metal:						
Smelter		e159,200	r156,300	r153,500	r167,500	168,000
Refined		132,183	132,200	125,938	116,666	122,000
Gold, mine output, Au content	kilograms	30,482	29,992	24,591	24,938	24,000
Iron and steel:e						
Ferroalloys, electric-furnace:						
Ferrochromium		r73,000	r82,000	r56,000	323,730	27,400
Ferromanganese		—	—	—	5,000	5,000
Ferrosilicon		—	9,000	10,000	10,000	10,000
Steel, crude	thousand tons	3331	300	300	250	250
Lead: Metal, secondary refined		r11,400	r13,600	r12,100	r17,500	316,800
Manganese ore and concentrate, gross weight		2,251	3,002	14,583	r3,101	33,224
Nickel: Mine output, Ni content		10,349	15,380	15,818	r13,658	15,400
Silver, mine output, Ag content	kilograms	54,634	50,630	47,110	38,414	331,100
Zinc, mine output, Zn content		1,435	1,200	53	(4)	—
INDUSTRIAL MINERALS						
Barite		349	348	e500	e500	500
Cement, hydraulic	thousand tons	r4,092	r3,624	r6,360	r6,900	36,500
Clays:						
Bentonite		2,030	5,961	16,484	r39,529	331,896
Red[e]		300	350	3140	r 3552	500
White		4,730	e5,000	25,849	r51,528	45,000
Other		860,012	e500,000	e500,000	r 3765,514	700,000
Feldspar		9,199	36,803	46,102	r47,979	45,000
Gypsum and anhydrite:						
Natural		2,250	e2,000	e2,000	r30,000	30,000
Synthetic[e]		115,000	115,000	115,000	(4)	—
Lime		3,924	e4,000	12,470	r7,458	10,000
Magnesite		—	4,796	e700	e700	700
Perlite		e6,900	e1,100	3,150	r2,894	2,800
Phosphate:						
Guano		1,470	48,347	888	r11,689	10,000
Phosphate rock		8,103	4,139	2,963	r20,633	20,000
Pyrite and pyrrhotite (including cuprous), gross weight		379,328	359,155	429,604	r359,607	350,000
Salt, marine		492,080	488,674	490,407	r492,859	450,000
Sand and gravel:						
Silica sand	thousand tons	308	185	292	r562	3500
Other[5]	thousand cubic meters	14,842	15,140	15,673	r15,677	15,000

See footnotes at end of table.

TABLE 1—Continued

PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
INDUSTRIAL MINERALS—Continued						
Stone:						
Dolomite		585,744	e500,000	320,424	r608,779	600,000
Limestone[6]	thousand tons	4,775	3,831	3,837	r2,995	3,000
Marble (dimension), unfinished	cubic meters	e5,000	e5,000	6,391	r21,699	20,000
Volcanic cinder[e]	do.	1,500	2,000	2,000	2,000	2,000
Tuff		47,515	e40,000	79,133	r51,756	50,000
Quartz[e]		3e58,603	60,000	60,000	60,000	50,000
Crushed, broken, other[e 7]	thousand cubic meters	1,000	1,000	1,000	1,000	1,000
Sulfur: S content of pyrite[e]		160,000	195,000	3134,316	150,000	150,000
Talc		27	—	—	—	—
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades		1,335,687	1,334,676	1,186,531	1,267,102	3e1,510,000
Petroleum:						
Crude	thousand 42-gallon barrels	2,170	1,876	1,727	r1,091	3e3,260
Refinery products:						
Liquefied petroleum gas	do.	e2,500	e2,500	r2,920	r2,777	3,000
Gasoline	do.	e12,800	e12,600	14,261	r15,321	15,000
Jet fuel	do.	e4,500	4,420	3,421	e3,400	3,500
Kerosene	do.	e2,500	3,415	3,897	r3,299	3,300
Distillate fuel oil	do.	e19,900	20,806	23,729	r24,157	24,000
Residual fuel oil	do.	e21,800	22,160	26,428	r24,131	25,000
Other[e]	do.	4,000	5,282	3e5,647	5,500	6,000
Refinery fuel and losses	do.	e3,100	3,052	3e3,071	r2,839	3,000
Total[e]	do.	71,000	74,235	r 3e83,374	r81,424	82,800

[e]Estimated. [r]Revised.

[1]Table includes data available through June 25, 1993.

[2]In addition to the commodities listed, the Philippines produces platinum-group metals as byproducts of other metals, but output is not reported quantitatively, and no basis is available to make reliable estimates.

[3]Reported figure.

[4]Revised to zero.

[5]Includes "pebbles" and "soil" not further described.

[6]Excludes limestone for road construction.

[7]Includes materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

TABLE 2

PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Davao Union Cement Corp., 100%	Davao City plant, Mindanao Island	648
Do.	Floro Cement Corp., 100%	Higait plant, Mindanao Island	450
Do.	Iligan Cement Corp., 100%	Iligan City plant, Mindanao Island	420
Do.	Northern Cement Co. Inc., 100%	Sison plant, Luzon Island	640
Do.	Republic Cement Corp., 100%	Norzagaray plant, Luzon Island	950
Do.	Rizal Cement Co. Inc., 100%	Binangonan plant, Luzon Island	964
Chromite	Acoje Mining Co. Inc., operator. Voest Alpine AG of Austria, 75.6%, and Merlin Mining NL of Australia, 24.4%	Santa Cruz Mine, Zambales Province, Luzon Island	1100

See footnotes at end of table.

TABLE 2—Continued

PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Chromite—Continued	Alamag Processing Corp., operator. Pacific Shore Mining Co., 50%, and Rio Chico Mining Corp., 50%	Llorente, Eastern Samar Province, Samar Island	[2]20
Do.	Benguet Corp., 70%, operator. Consolidated Mines Inc., 30%	Masinloc Chromite Operations, Zambales Province, Luzon Island	[3]105
Coal	Semirara Coal Corp. (Government), manager. Voest Alpine AG of Austria, 60%; National Development Corp., 56%; and Development Bank of the Philippines, 4%	Unong Mine, Antique Province, Semirara Island	1,000
Copper, gold	Far Southeast Resources Inc., manager. Lepanto Consolidated Mining Co. Inc., 60%, and CRA Ltd. of Australia, 40%	Far South East Project, Benguet Province, Luzon Island	[4]4,000
Do.	Marcopper Mining Corp., 60%, and Placer Dome Inc. of Canada, 40%	San Antonio Mine, Marinduque Province, Marinduque Island	[4 5]1,300
Do.	North Davao Mining Corp., manager. Asset Privatization Trust (Government), 100%	Amacan Mine, Davao del Norte Province, Mindanao Island	[4]3,900
Do.	Philex Mining, 100%	Padcal Mine, Benguet Province, Luzon Island	[4]10,200
Copper, gold, silver	Atlas Consolidated Mining and Development Corp., 100%	Cebu Copper Operations, Cebu Province, Cebu Island	[4]24,250
Do.	Benguet Corp., 50%, operator, and Dizon Copper-Silver Mines Inc., 50%	Dizon Copper-Gold Operation, Zambales Province, Luzon Island	[4]6,000
Do.	Lepanto Consolidated Mining Co. Inc., 100%	Mankayan Mine, Benguet Province, Luzon Island	[6]172
Copper, gold, molybdenum, silver	Maricalum Mining Corp., manager. Asset Privatization Trust (Government), 100%	Sipalay Mine, Negros Occidental Province, Negros Island	[4]6,250
Copper, refined	Philippine Associated Smelting and Refining Corp., operator. National Development Corp. (Government), 42%; Japanese consortium of companies led by Marubeni Corp., 32%; domestic copper producers led by Atlas Consolidated Mining and Development Corp., 21%; and International Finance Corp. (United Nations agency), 5%	Isabel, Leyte Province, Leyte Island	[7]138
Ferrochromium	Ferrochrome Philippines Inc., operator. Voest Alpine AG of Austria, 100%	Tagoloan plant, Lanao del Norte, Mindanao Island	[8]60
Do.	Ferro-Chemicals Inc., 100%	Manticao plant, Misamis Oriental Province, Mindanao Island	[8]30
Do.	Integrated Chrome Corp., 100%	Cagayan de Oro plant, Misamis Oriental Province, Mindanao Island	[8]26
Gold, silver	Atlas Consolidated Mining and Development Corp., 100%	Masbate Gold Operations, Masbate Province, Masbate Island	[4]1,275
Do.	Benguet Corp., 100%	Benguet Gold Operations, Benguet Province, Luzon Island	[4]1,100
Do.	Benguet Corp., 70%. Santa Rosa Mining Co. Ltd., La Suete Mining Corp., et. al., 30%	Paracale Gold Operations, Camarines Norte Province, Luzon Island	205
Do.	Manila Mining, 75%; Lepanto Consolidated Mining Co. Inc., 25%	Placer mine, Surigao del Norte Province, Mindanao Island	[4]350
Do.	United Paragon Mining Corp., operator. Paragon Resources of Australia, 12.5%; and public shares, 87.5%	Longos Mine, Camarines Norte Province, Luzon Island	[4]2,200

See footnotes at end of table.

TABLE 2—Continued

PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	Benguet Corp., 100%	Benguet Antamok Gold Operation, Benguet Province, Luzon Island	[4]1,275
Do.	Banahaw Mining and Development Corp., operator, 68%; and Muswellbrook Gold Exploration and Mining Ltd. of Australia, 32%	Co-O Mine, Agusan del Sur Province, Mindanao Island	[4]210
Do.	Gold Fields Philippines Corp., operator. Renison Goldfields Consolidated of Australia, 100%	Nalesbitan Mine, Camarines Norte Province, Luzon Island	[4]250
Do.	Itogon-Suyoc Mines Inc., operator, 46%; and Benguet Corp., 54%	Itogon Mill, Benguet Province, Luzon Island	[9]146
Do.	Philex Mining, 100%	Tubao Mine, Benguet Province, Luzon Island	[10]6,220
Do.	do.	Bulawan Mine, Negros Occidental, Province, Negros Island	[4]1,300
Iron ore, sinter	Philippine Sinter Corp., operator. Kawasaki Steel Corp. of Japan, 100%	Cagayan de Oro, Misamis Oriental Province, Mindanao Island	[11]5,000
Nickel	Rio Tuba Nickel Mining Corp., operator, 60%; and Japanese interests, 40%	Rio Tuba Mine, Palawan Province, Palawan Island	[4]500
Do.	Taganito Mining Corp., 100%	Near Surigao City, Surigao del Norte, Mindanao Island	[4]150
Nickel, cobalt	Hinatuan Mining Corp., 100%	do.	[4]100
Do.	Philnico Mining and Industrial Corp., 100%	Nonoc Mine, Surigao del Norte Province, Nonoc Island	[4] [12]2,000
Nickel, cobalt, refined	do.	Nonoc Refinery, Surigao del Norte Province, Marinduque Island	[12] [13]31 [14]1
Petroleum	Caltex (Philippines) Inc., 100%	Caltex Batangas Refinery, Batangas Province, Luzon Island	[15]68
Do.	Petron Corp., operator. Philippine National Oil Co. (Government), 100%	Petron Bataan Refinery, Bataan Province, Luzon Island	[15]156
Do.	Pilipinas Shell Petroleum Corp., 100%	Shell Batangas Refinery, Batangas Province, Luzon Island	[15]70
Steel	National Steel Corp., operator. National Development Corp. (Government), 100%	Iligan, Lanao del Norte, Mindanao Island	350

[1]Metallurgical-grade concentrates.
[2]Chemical-grade concentrates.
[3]Refractory-grade concentrates.
[4]Ore.
[5]Scheduled to expand to 1.5 Mmt/a of ore in 1993.
[6]Thousand metric tons of copper cathode.
[7]High-carbon ferrochromium.
[8]Scheduled to replace the nearby Mankayan Mine about 1995. Planned production was being revised upward to 7 to 8 Mmt/a of ore.
[9]Mill throughput.
[10]Kilograms gold.
[11]Self-fluxing sinter.
[12]Operation was suspended in March 1986; undergoing rehabilitation.
[13]Refined nickel (powder, briquettes, and mixed nickel-cobalt sulfides).
[14]Refined cobalt.
[15]Thousand 42-gallon barrels per day.

TABLE 3

PHILIPPINES: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992[1]

(Thousand metric tons)

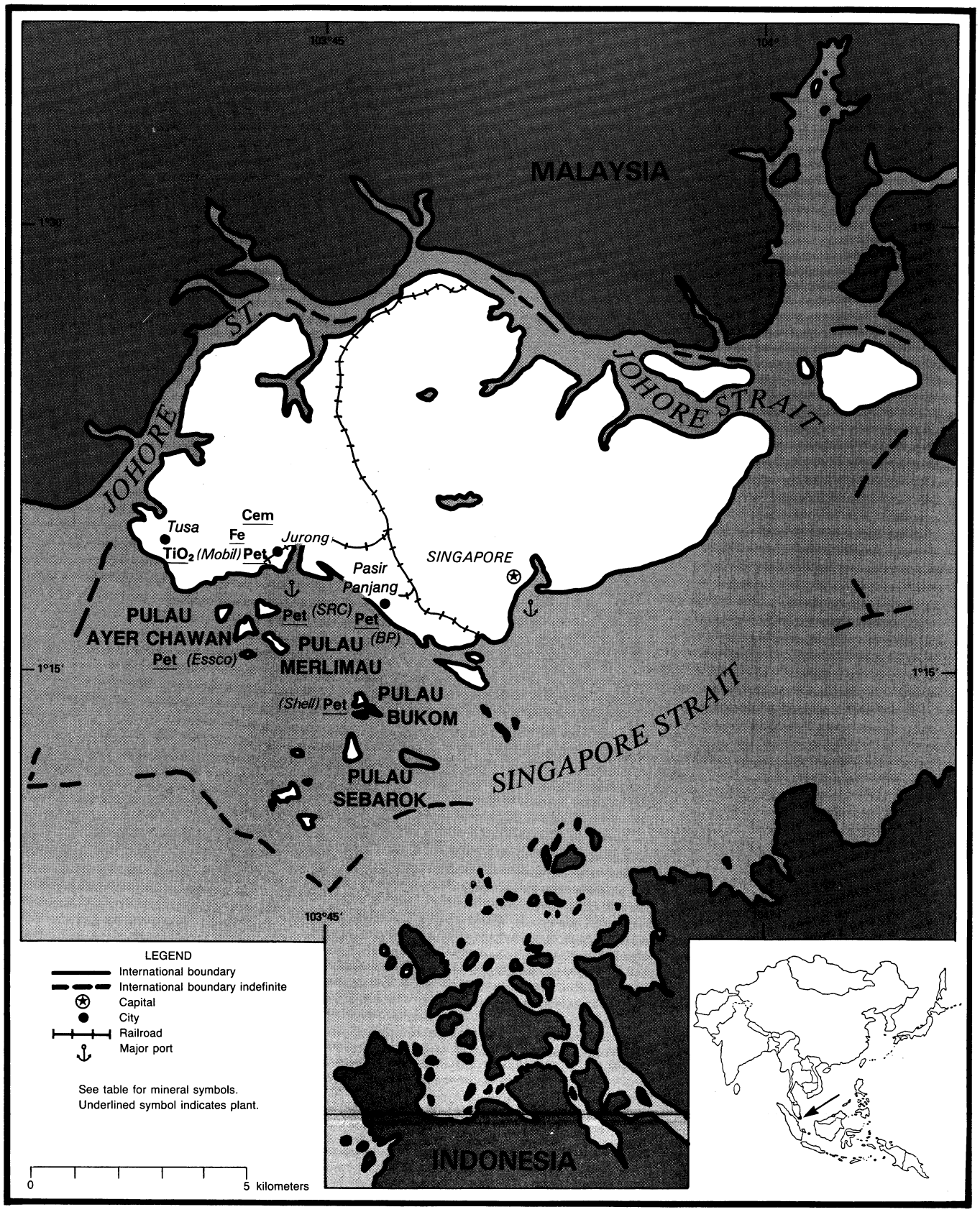
Commodity	Reserves[e]
METALS	
Chromite:	31,725
Chemical	3,710
Metallurgical	16,860
Refractory	11,154
Copper	4,180,219
Gold	129,796
Iron:	490,762
Aluminum laterite	292,010
Lump ore	80,732
Magnetic sand	118,020
Lead	6,313
Manganese	1,955
Mercury	16,243
Molybdenum	30,608
Nickel	1,586,928
Zinc	6,163
INDUSTRIAL MINERALS	
Asbestos	24,498
Barite	163
Bauxite	82,650
Clays:	1,126,965
Bentonite	1,385
Diatomaceous earth	3,903
Dolomitic limestone	486,431
Feldspar	29,380
Guano	1,014
Gypsum	1,883
Limestone:	9,556,168
Agricultural	312,949
Magnesite	26,534
Marble	4,058,472
Perlite	18,509
Phosphate rock	2,407
Pumice and pumicite	21,878
Pyrite	983,402
Silica pebbles/cobbles	6,804
Silica rock form	1,750,561
Silica sand	213,873
Sulfur	44,011
Talc	503

[e]Estimated.
[1]As of Dec. 31, 1990.

Source: Mines and Geosciences Bureau.

SINGAPORE

AREA 623 km² **POPULATION 2.8 million**



THE MINERAL INDUSTRY OF

SINGAPORE

By Pui-Kwan Tse

Singapore has limited natural resources. Therefore, the country's strategy is to market itself as a regional service hub focusing on advanced electronics, aerospace, and other high-technology industries. After nearly three decades of almost uninterrupted rapid expansion, Singapore's economy showed a slowdown in the past 2 years, with a growth rate of 5.8% in 1992 and 6.7% in 1991. Singapore's Government has traditionally attempted to keep the inflation rate low, about 3%. The Singaporean Financial Minister proposed a 3% consumption tax beginning in April 1994. In the same proposal, the Government will reduce both the corporate and top personal tax rates by 3% each, to 27% and 30%, respectively, starting in July 1993. To accommodate the new consumption tax, the Government also will abolish or cut a number of small, indirect taxes such as for hotel, food, utility, and domestic telephone service.

Singapore's total value of trade increased to $138.1 billion[1] in 1992. The value of exports and imports were $64.6 billion and $73.5 billion, respectively. The United States continued to be Singapore's largest trade partner, followed by Japan, Malaysia, Hong Kong, Thailand, and Taiwan, in descending order.

Singapore also has limited land and labor force. Unemployment remains minimal in Singapore. Real wage increased by 7.8%, while labor productivity grew by only 1.5% in 1991. Singapore authorities worry about losing its competitive edge in the region. At the same time, most of the labor intensive work is being transfered to neighboring countries such as Indonesia, Malaysia, and Thailand. In 1992, the Singaporean electronics sector produced 18 million units of disk drive, which accounted for 50% of the world total output. The electronics sector also accounts for 40% of the value of the country's total manufacturing output. Currently, the Singaporean electronics sector is facing various challenges from its neighboring countries, particularly Malaysia and Thailand, which have successfully developed their own electronics sector and threatened to compete with Singapore for the export market.

Because of its geographical location, at the center of the supply chain from the Middle East to Asia, Singapore is the world's third largest refining center after Rotterdam and Houston. The total capacity of Singapore's refineries is slightly more than 1 million barrels per day. The petroleum sector accounts for about 10% of Singapore's manufacturing output, and refined goods continue to be one of the largest items in the country's trade activity. To meet the fast expanding regional demand for petrochemical products in the years ahead, the Singaporean authorities have the ability to attract domestic and foreign investors to invest in new plants, despite constraints on demand of petrochemical products worldwide. It is expected that Singapore's petrochemical sector will grow at an annual rate of 5% through 1996.

Singapore's economic propects depend on the success of its strategy to globalize and make the transition from a production-driven economy to an innovation-driven one. Singapore also is required to strengthen its global links through foreign investment, not just in the immediate region, but also in distant regions such as in northern Asia and Europe.

[1]Where nescessary, values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$1.6=US$1.0 in 1992.

TABLE 1

SINGAPORE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	—	10	—	Mainly to Malaysia.
Aluminum:				
Ore and concentrate	224	82	—	Malaysia 64; Republic of Korea 18.
Oxides and hydroxides	20,581	11,788	—	Malaysia 4,908; Republic of Korea 2,500; Sri Lanka 1,020.
Metal including alloys:				
Scrap	20,576	19,067	—	Japan 9,747; Malaysia 4,191; Republic of Korea 1,913.
Unwrought	21,819	43,205	—	Malaysia 18,905; Bangladesh 6,418; Japan 3,617.
Semimanufactures	24,163	11,993	10	Malaysia 3,083; Australia 2,058; Hong Kong 1,512.
Cadmium: Metal including alloys, all forms	6	55	—	India 54.
Chromium:				
Ore and concentrate	3,359	636	—	Malaysia 373; Thailand 262.
Oxides and hydroxides	94	109	—	Malaysia 61; North Korea 25.
Cobalt:				
Oxides and hydroxides	26	22	—	Thailand 9; Malaysia 3.
Metal including alloys, all forms	(2)	11	1	Japan 5; Republic of Korea 5.
Columbium and tantalum: Tantalum metal including alloys, all forms, kilograms	—	150	—	All to Italy.
Copper:				
Ore and concentrate	54	208	—	Malaysia 148; Thailand 60.
Matte and speiss including cement copper	64	259	—	Malaysia 131; Thailand 102.
Metal including alloys:				
Scrap	38,734	41,847	13	Japan 18,969; India 11,884; Republic of Korea 4,679.
Unwrought	41,881	65,648	4	Malaysia 35,867; Thailand 12,626.
Semimanufactures	24,051	16,726	89	Malaysia 12,057; Hong Kong 2,019.
Gold:				
Waste and sweepings kilograms	1,319	22,234	11	Japan 21,958; Germany 262.
Metal including alloys, unwrought and partly wrought do.	20,099	8,258	191	Malaysia 2,123; India 1,803; Germany 1,326.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	167	323	—	Burma 294; Netherlands 22.
Metal:				
Scrap	299,835	237,813	233	Malaysia 152,423; India 27,711; Japan 20,526.
Pig iron, cast iron, related materials	6,796	6,042	8	Malaysia 5,065; Thailand 659.
Ferroalloys:				
Ferromanganese	2,868	6,347	—	Malaysia 6,337; Thailand 10.
Ferrosilicon	6,328	2,780	—	Malaysia 2,446; India 313.
Unspecified	155	351	—	Malaysia 311; Thailand 33.
Steel, primary forms	3,070	3,420	—	Taiwan 2,215; Malaysia 892.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	114,810	118,026	—	Malaysia 102,488; Brunei 2,847; Thailand 2,282.
Clad, plated, coated	72,549	73,465	—	Burma 26,484; Malaysia 17,483; Yemen 5,292.
Of alloy steel	12,536	16,175	217	Malaysia 8,781; Hong Kong 2,265.
Bars, rods, angles, shapes, sections	289,208	181,984	1,110	Malaysia 77,748; Thailand 34,989; Brunei 21,037.

See footnotes at end of table.

TABLE 1—Continued

SINGAPORE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Semimanufactures—Continued:				
Rails and accessories	4,514	3,377	—	Malaysia 3,053; Philippines 98.
Wire	12,334	8,209	1	Malaysia 3,984; Brunei 1,257.
Tubes, pipes, fittings	133,074	369,139	13,834	Netherlands 208,446; Malaysia 50,308.
Lead:				
Ore and concentrate	76	101	—	All to Malaysia.
Oxides	288	293	—	Malaysia 110; Sri Lanka 80; Bangladesh 40.
Metal including alloys:				
Scrap	5,202	7,429	—	Thailand 3,246; Philippines 3,033; India 606.
Unwrought	16,863	11,936	—	Malaysia 5,388; Taiwan 2,796; India 2,545.
Semimanufactures	2,636	6,881	1	Malaysia 6,601; Thailand 102.
Magnesium: Metal including alloys, all forms	38	28	—	Japan 9; Malaysia 8; Thailand 8.
Manganese:				
Ore and concentrate, metallurgical	9,696	10,412	—	Kenya 3,544; Philippines 2,897; India 1,479.
Oxides	11,239	13,996	1	Republic of Korea 3,524; India 2,126; Pakistan 2,055.
Mercury	7	6	—	North Korea 3; Burma 2.
Molybdenum: Metal including alloys, all forms	(3)	14	—	Taiwan 13; Malaysia 1.
Nickel:				
Ore and concentrate	51	31	—	All to Malaysia.
Matte and speiss	1,667	1,114	—	India 1,055; Malaysia 58.
Metal including alloys:				
Scrap	174	69	17	Japan 46.
Unwrought	633	1,220	—	Taiwan 419; India 243; Republic of Korea 161.
Semimanufactures	1,457	982	1	Malaysia 553; France 92; Hong Kong 58.
Platium-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$675	$716	$21	Malaysia $451; Hong Kong $72; France $58.
Selenium: Elemental[4]	671	395	60	Malaysia 132; India 120.
Silver:				
Ore and concentrate[5]	105	29	—	Japan 24; Malaysia 4.
Metal including alloys, unwrought and partly wrought value, thousands	$23,436	$17,819	$1	Thailand $8,210; India $4,088; Bruma $1,674.
Tin:				
Ore and concentrate	1,297	1,359	—	Malaysia 1,158; United Arab Emirates 180.
Ash and residue containing tin	NA	424	—	Taiwan 240; Malaysia 87; Republic of Korea 40.
Metal including alloys:				
Scrap	277	275	—	Taiwan 249; Malaysia 24.
Unwrought	26,826	26,917	5,468	Japan 10,968; Netherlands 2,748.
Semimanufactures	907	704	—	Hong Kong 299; Malaysia 124.
Titanium:				
Oxides	1,542	18,595	2,750	Japan 4,323; Thailand 2,473; Taiwan 1,795.
Metal including alloys, all forms	61	99	60	Italy 26; Australia 4.

See footnotes at end of table.

TABLE 1—Continued

SINGAPORE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Tungsten:				
Ore and concentrate	707	1,401	961	India 209; North Korea 70.
Metal including alloys, all forms	23	5	3	Malaysia 1.
Uranium and thorium: Ore and concentrate value, thousands	$641	—		
Zinc:				
Ore and concentrate	283	146	—	Malaysia 78; India 68.
Oxides	1,439	789	—	Japan 260; Egypt 110; Malaysia 93.
Blue powder	NA	697	—	Malaysia 583; Thailand 93.
Metal including alloys:				
Scrap	1,360	1,001	—	Taiwan 420; Malaysia 214; India 200.
Unwrought	22,542	12,920	20	Malaysia 4,870; India 3,493; Thailand 2,497.
Semimanufactures	[6]1,706	545	—	Mauritania 167; Malaysia 78.
Zirconium: Metal including alloys all	26	—		
Other:				
Ashes and residues	65,099	113,375	—	Malaysia 48,770; India 18,589; Japan 17,599.
Base metals including alloys, all forms	338	71	—	India 24; Philippines 20; Thailand 17.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum kilograms	75,000	460	—	All to Malaysia.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$268	$281	—	Brazil $61; Republic of Korea $39; Sri Lanka $32.
Grinding and polishing wheels and stones	1,396	1,619	1	Malaysia 1,137; Thailand 269.
Asbestos, crude	2,177	700	—	Thailand 488; Malaysia 155.
Barite and witherite	18,555	19,033	—	Burma 6,659; Papua New Guinea 5,061; Australia 3,754.
Boron materials:				
Crude natural borates	204	380	—	Malaysia 364.
Oxides and acids	82	45	—	Malaysia 36; India 7.
Cement	270,822	134,324	5	Papua New Guinea 50,298; Malaysia 39,015; Brunei 14,113.
Chalk	1,533	3,949	—	Brunei 3,216; Malaysia 297; Bangladesh 184.
Clays, crude	34,746	34,424	—	Malaysia 12,545; Thailand 6,885; Republic of Korea 3,154.
Cryolite and chiolite	—	17	—	NA.
Diamond:				
Gem, not set or strung value, thousands	$54,471	$98,510	$8,649	Thailand $22,558; Hong Kong $17,809; Australia $14,859.
Industrial stones do.	$999	$1,276	$26	Belgium-Luxembourg $597; Thailand $298.
Diatomite and other infusorial earth	765	412	—	Malaysia 191; Thailand 101; Saudi Arabia 39.
Feldspar, fluorspar, related materials	7,515	15,173	—	Malaysia 9,402; Thailand 5,013.
Fertilizer materials:				
Crude, n.e.s.	15,476	14,166	—	Malaysia 14,020; Sri Lanka 66.
Manufactured:				
Ammonia	83	165	--	Malaysia 100; Hong Kong 17; Thailand 17.
Nitrogenous	24,906	16,936	—	Tanzania 5,999; Malaysia 4,564; Papua New Guinea 3,131.
Phosphatic	2,791	2,325	—	Malaysia 1,533; Papua New Guinea 471; Thailand 300.
Potassic	118,975	74,632	—	Sri Lanka 22,210; Papua New Guinea 7,377; Burma 7,030.
Unspecified and mixed	26,181	30,873	—	Malaysia 27,463; Papua New Guinea 1,658.
Graphite, natural	221	240	—	Malaysia 219; Philippines 6.

See footnotes at end of table.

TABLE 1—Continued

SINGAPORE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Gypsum and plaster	4,934	7,216	—	Malaysia 5,536; Brunei 560.
Iodine including bromine and fluorine kilograms	8,000	43,176	—	India 17,032; Republic of Korea 11,100; Hong Kong 4,730.
Lime	26,846	13,771	—	Papua New Guinea 12,709; Brunei 634.
Magnesium compounds: Magnesite, crude including calcined	1,002	590	—	Qatar 300; Malaysia 226.
Mica:				
Crude including splittings and waste	282	306	—	Malaysia 129; Australia 36; Burma 33.
Worked including agglomerated splittings	19	7	(2)	North Korea 5.
Nitrates, crude	266	118	—	Philippines 38; Malaysia 23; Sri Lanka 15.
Phosphates, crude	5,347	595	—	Malaysia 538; Philippines 54.
Pigments, mineral: Iron oxides and hydroxides, processed	1,484	1,523	—	Malaysia 1,401; Papua New Guinea 20.
Potassium salts, crude	—	162	—	Solomon Islands 100; Malaysia 62.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$33,751	$29,819	$7,044	Thailand $19,032; United Kingdom $829; Hong Kong $816.
Synthetic do.	$1,195	$3,146	$2,012	Sri Lanka $256; Thailand $225.
Salt and brine	r18,157	13,628	(2)	Brunei 6,487; Malaysia 5,589.
Sodium compounds, n.e.s.: Sulfate, manufactured	10,777	6,195	—	Malaysia 4,274; Taiwan 163.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,160	2,422	17	Malaysia 985; Brunei 738.
Worked	8,087	NA		
Dolomite, chiefly refractory-grade	122	341	—	Papua New Guinea 286; Malaysia 40.
Gravel and crushed rock	3,876	3,215	—	Malaysia 2,760; Hong Kong 102.
Limestone other than dimension	134	162	—	Malaysia 103; Thailand 38.
Quartz and quartzite	2	2	—	NA.
Sand other than metal-bearing	9,232	12,554	—	Japan 8,100; Malaysia 4,045.
Sulfur:				
Elemental:				
Crude including native and byproduct	35,720	18,839	—	Malaysia 10,900; Thailand 4,352.
Colloidal, precipitated, sublimed	19,981	11,626	—	Thailand 3,828; Malaysia 3,430; Sri Lanka 862.
Sulfuric acid	1,063	967	—	Malaysia 487; Sri Lanka 146; Papua New Guinea 144.
Talc, steatite, soapstone, pyrophyllite	1,345	895	—	Malaysia 789; Taiwan 53; Sri Lanka 36.
Other:				
Crude	14,782	9,843	—	Sri Lanka 6,750; Thailand 1,670; Malaysia 432.
Slag and dross, not metal-bearing	26,052	44,010	—	Malaysia 28,688; Philippines 15,074.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	13,876	14,412	—	Malaysia 13,102; Papua New Guinea 468.
Carbon:				
Carbon black	7,209	5,574	—	Australia 815; Malaysia 755; Saudi Arabia 605.
Gas carbon	NA	26	NA	NA.
Coal, all grades including briquets	13,446	185,911	—	Philippines 91,047; Thailand 54,486; Malaysia 39,454.
Coke and semicoke	21,702	29,369	—	Malaysia 22,559; Thailand 3,024; Sandi Arabia 2,294.
Gas, natural: Liquefied	s418,085	10,205	—	Malaysia 7,705; Hong Kong 2,489.
Peat including briquets and litter	15	818	—	Taiwan 785; Malaysia 25.

See footnotes at end of table.

TABLE 1—Continued

SINGAPORE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum:					
Crude	42-gallon barrels	r36	562	—	Malaysia 401; Australia 116.
Partly refined	do.	NA	4,263	—	All to Malaysia.
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	rNA	3,616	—	Malaysia 2,649; Hong Kong 506.
Gasoline:					
Aviation	do.	52,694	51,404	391	Japan 18,013; Hong Kong 11,037; Thailand 4,396.
Motor	do.	60,596	39,733	—	Malaysia 11,717; Taiwan 8,949; Thailand 5,443.
Naphtha (including white spirits)	do.	NA	29,181	—	Japan 19,868; Republic of Korea 5,250; Hong Kong 3,104.
Kerosene and jet fuel	do.	8,782	10,797	—	India 4,101; Hong Kong 2,843; Republic of Korea 1,090.
Mineral jelly and wax	do.	171	127	(7)	India 66; Malaysia 5.
Distillate fuel oil	do.	81,358	83,685	872	Thailand 28,611; Hong Kong 14,640; Malaysia 13,930.
Lubricants	do.	5,697	4,962	(7)	India 941; Thailand 979; Malaysia 941.
Residual fuel oil	do.	126	[9]141,989	6,664	Malaysia 16,993; Panama 13,291; Liberia 10,906.
Bitumen and other residues	do.	2,759	1,966	—	Malaysia 502; China 273; Hong Kong 201.
Bituminous mixtures	do.	22	16	—	Malaysia 8; Burma 2.
Petroleum coke	do.	6	10	—	Australia 3; Saudi Arabia 2.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Unreported quantity valued at $2,000.
[3]Unreported quantity valued at $4,000.
[4]Includes tellurium and phosphorus.
[5]May include other precious metals.
[6]Includes blue powder.
[7]Less than 1/2 unit.
[8]Includes liquefied petroleum gas
[9]Includes fuel oil for aircraft and ships.

TABLE 2

SINGAPORE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	r47	88	41	France 18; Netherlands 18.
Aluminum:	—	10	—	Mainly to Malaysia.
Ore and concentrate	224	12	—	Malaysia 5; United Kingdom 4.
Oxides and hydroxides	63,684	78,849	261	Australia 76,706; China 754; Japan 717.
Metal including alloys:	20,581	11,788	—	Malaysia 4,908; Republic of Korea 2,500;
Scrap	3,347	3,989	391	Malaysia 1,750; Thailand 820.
Unwrought	46,123	55,067	2,328	India 20,145; Australia 14,664; United Kingdom 4,341.
Semimanufactures	50,464	55,701	3,054	Japan 10,988; Malaysia 9,465.
Cadmium: Metal including alloys, all forms	25	58	(2)	Australia 57.
Chromium:				
Ore and concentrate	1,072	673	—	Mozambique 357; Japan 263; Netherlands 20.
Oxides and hydroxides	396	468	255	United Kingdom 95; China 40.
Cobalt:				
Ore and concentrate	19	149	149	
Oxides and hydroxides	28	42	—	Finland 19; China 10; United Kingdom 8.
Metal including alloys, all forms	25	216	1	Hong Kong 55; Netherlands 11; unspecified Africa 141.
Cobalt:				
Columbium and tantalum: Tantalum metal including alloys, all forms	44	1	NA	NA.
Copper:				
Ore and concentrate	—	8	—	All from United Kingdom.
Matte and speiss including cement copper	60	(2)	NA	NA.
Metal including alloys:				
Scrap	45,826	14,748	2,527	Malaysia 6,937; United Kingdom 1,122.
Unwrought	65,984	84,053	4,948	Zambia 36,784; Chile 19,187; Australia 7,119.
Semimanufactures	72,374	74,054	1,143	Japan 23,531; Taiwan 16,694; Malaysia 15,902.
Gold:				
Waste and sweepings value, thousands	$5,236	$3,860	$134	Thailand $1,239; Malaysia $528; Japan $501.
Metal including alloys, unwrought and partly wrought kilograms	11,857	10,083	1,084	Japan 5,803; Germany 1,021; Republic of Korea 950.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	4,565	1,631	50	Malaysia 1,409; India 171.
Metal:				
Scrap	220,865	148,592	530	Malaysia 63,989; United Kingdom 44,068.
Pig iron, cast iron, related materials	95,762	142,800	226	U.S.S.R. 60,000; Brazil 47,625; Algeria 22,016.
Ferroalloys:				
Ferromanganese	2,401	3,135	—	China 931; Hong Kong 810; unspecified Africa 1,050.
Ferrosilicon	9,611	11,181	166	China 8,137; Australia 906; Norway 739.
Unspecified	375	458	63	Malaysia 97; Japan 87; United Kingdom 71.
Steel, primary forms	164,922	244,218	3,513	Turkey 83,322; Canada 31,472; Netherlands 14,771.

See footnotes at end of table.

TABLE 2—Continued

SINGAPORE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued:					
Metal—Continued:					
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated	thousand tons	932	957	8	Japan 352; Brazil 154; Republic of Korea 105.
Clad, plated, coated	do.	180	232	5	Japan 115; Australia 59.
Of alloy steel	do.	118	80	—	Japan 53; Germany 5.
Bars, rods, angles, shapes, sections		634	870	36	Japan 148; China 120; Turkey 89.
Rails and accessories	do.	8	11	(2)	China 6; Republic of Korea 2.
Wire	do.	40	42	(2)	China 15; Japan 7.
Tubes, pipes, fittings	do.	550	562	19	Japan 306; Republic of Korea 33; France 23.
Lead:					
Ore and concentrate		—	20	(2)	NA.
Oxides		471	818	3	United Kingdom 252; Germany 198; China 170.
Metal including alloys:					
Scrap		3,038	5,005	648	Malaysia 3,660; Brunei 345.
Unwrought		37,169	12,953	2,218	China 3,271; Australia 2,781; Canada 1,681.
Semimanufactures		1,557	2,475	945	Canada 356; Malaysia 274; Australia 245.
Magnesium: Metal including alloys:					
Scrap		3	5	—	All from Australia.
Unwrought		59	75	47	Australia 11; Germany 11.
Manganese:					
Ore and concentrate		80,014	46,630	—	Gabon 41,260; Ghana 5,009; Netherlands 320.
Oxides		7,287	7,107	21	Brazil 3,100; Japan 3,081.
Mercury		19	86	1	Taiwan 50; Spain 18; Germany 7.
Molybdenum: Metal including alloys, all forms		(3)	2	(2)	Mainly from China.
Nickel:					
Matte and speiss		1,423	1,040	—	Canada 938; U.S.S.R. 100.
Metal including alloys:					
Scrap		277	223	—	Malaysia 108; Thailand 55; United Kingdom 39.
Unwrought		672	706	1	U.S.S.R. 282; Canada 189; Finland 76.
Semimanufactures		2,304	1,461	479	Japan 322; Germany 172; Malaysia 171.
Platinum-group metals:					
Waste and sweepings[4]	kilograms	3,182	1,326	1	Malaysia 1,191; Japan 110.
Metals including alloys, unwrought and partly wrought	value, thousands	$5,996	$4,546	$293	Germany $748; United Kingdom $589; Canada $462.
Selenium: Elemental[5]		1,885	1,717	52	China 1,122; Malaysia 149; Australia 125.
Silver:					
Ore and concentrate		1	(2)	(2)	
Metal including alloys, unwrought and partly wrought	value, thousands	$167,947	$87,212	$14,466	Belgium-Luxembourg $20,729; France $13,682; Canada $13,650.
Tin:					
Ore and concentrate		4,210	1,350	—	Burma 601; China 264; unspecified Africa 321.
Metal including alloys:					
Scrap		365	376	—	Netherlands 203; Malaysia 107.

See footnotes at end of table.

TABLE 2—Continued

SINGAPORE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Tin—Continued:				
Metal including alloys—Continued:				
Unwrought	3,835	5,272	10	Malaysia 1,610; Thailand 506; U.S.S.R. 304.
Semimanufactures	2,537	1,396	92	Italy 659; Hong Kong 232; Japan 165.
Titanium:				
Oxides	5,784	14,726	6,134	Australia 3,129; Germany 1,593; United Kingdom 1,447.
Metal including alloys, all forms	2	3	—	Mainly from Japan.
Tungsten:				
Ore and concentrate	976	1,334	—	China 553; Burma 358; Thailand 132.
Metal including alloys, all forms	41	68	48	China 13; Germany 3.
Uranium and thorium: Ores and concentrates value, thousands	$6	—		
Zinc:				
Ore and concentrate	59	162	—	France 101; Australia 61.
Oxides	2,186	2,071	165	China 719; Republic of Korea 367; Thailand 314.
Blue powder	NA	2,815	282	Norway 1,216; Republic of Korea 476; Canada 410.
Metal including alloys:				
Scrap	547	1,042	—	Malaysia 962; Australia 19.
Unwrought	56,188	36,039	169	Australia 13,758; Canada 6,167; North Korea 2,067.
Semimanufactures	[e]2,824	882	(2)	Brazil 201; China 123; Australia 117.
Zirconium: Metal including alloys, all forms	170	—		
Other:				
Ores and concentrates	28,181	42,633	125	Japan 24,273; Australia 17,226.
Ashes and residues	373,197	399,556	51	Japan 313,334; Philippines 84,036.
Base metals including alloys, all forms	883	191	1	China 75; France 56; Hong Kong 22.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc. value, thousands	$2,048	$91	—	Germany $57; United Kingdom $27.
Artificial: Corundum	81	37	—	Germany 20; United Kingdom 17.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$518	$572	$87	United Kingdom $228; Ireland $202.
Grinding and polishing wheels and stones	4,989	5,495	273	China 1,733; Italy 838; Taiwan 802.
Asbestos, crude	4,737	2,035	—	Canada 327; China 268; unspecified Africa 968.
Barite and witherite	30,830	30,998	11	China 11,910; Thailand 8,866; India 5,500.
Boron materials:				
Crude natural borates	182	353	114	Chile 230.
Oxides and acids	583	674	349	Italy 324.
Cement thousand tons	2,121	2,585	(2)	Japan 1,664; Saudi Arabia 367.
Chalk	4,408	3,855	—	Taiwan 2,258; Australia 587; United Kingdom 442.
INDUSTRIAL MINERALS				
Clays, crude:				
Bentonite	54,713	31,113	20,811	India 6,341; China 2,932.
Fuller's earth	NA	4,744	4,477	United Kingdom 92; Netherlands 90.
Unspecified	36,984	18,116	1,549	Malaysia 6,591; Australia 3,957.

See footnotes at end of table.

TABLE 2—Continued

SINGAPORE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cryolite and chiolite		—	22	—	Mainly from China.
Diamond: Natural:					
Gem, not set or strung	value, thousands	$132,740	$209,238	$25,871	Belgium-Luxembourg $40,677; India $33,614; Thailand $28,145.
Industrial stones	do.	$12,814	$2,986	$956	Ireland $1,109; Belgium-Luxembourg $146; Switzerland $119.
Diatomite and other infusorial earth		1,937	2,090	1,870	Malaysia 86; Philippines 46; Denmark 41.
Feldspar, fluorspar, related materials		20,885	33,780	—	Norway 21,101; Japan 6,059; China 3,811.
Fertilizer materials:					
Crude, n.e.s.		686	1,159	(2)	Malaysia 1,007; Australia 113; New Zealand 35.
Manufactured:					
Ammonia		2,318	2,694	10	Malaysia 2,365; Thailand 130.
Nitrogenous		19,763	7,063	34	Malaysia 3,791; Germany 1,007; Japan 510.
Phosphatic		1,323	70	—	Malaysia 51; United Kingdom 6.
Potassic		119,565	97,905	(2)	Germany 42,317; Canada 30,968; Jordan 24,100.
Unspecified and mixed		47,114	41,947	229	Norway 18,754; Germany 11,113; Malaysia 5,757.
Graphite, natural		994	1,240	(2)	Japan 374; Germany 348; China 258.
Gypsum and plaster		67,932	74,316	842	Thailand 66,610; Germany 1,806.
Iodine including bromine and fluorine		37	70	—	Chile 54; Japan 15.
Lime		18,929	11,603	—	Malaysia 8,772; China 1,379; United Kingdom
Magnesium compounds: Magnesite, crude including calcined		16,000	21,035	188	China 19,908; Norway 422.
Mica:					
Crude including splittings and waste		1,347	1,443	25	India 776; China 450.
Worked including agglomerated splittings		743	95	4	India 67; Japan 16.
Nitrates, crude		2,546	3,296	(2)	Belgium-Luxembourg 1,844; Germany 706; China
Phosphates, crude		10,197	611	—	Malaysia 431; Netherlands 60.
Pigments, mineral: Iron oxides and hydroxides, processed		9,602	11,613	1,348	Japan 5,263; Germany 1,557; Sweden 936.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$10,952	$12,748	$3,071	Switzerland $1,752; Austria $1,629; Sri Lanka
Synthetic	do.	$2,770	$2,692	$54	Japan $1,511; Austria $417; Malaysia $309.
Salt and brine		87,354	70,482	512	Australia 34,388; Israel 11,369; China 8,421.
Sodium compounds, n.e.s.: Sulfate manufactured		30,146	15,975	148	China 14,655; United Kingdom 678.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		20,190	30,526	3	China 6,116; Malaysia 5,741.
Worked		67,918	72,188	59	Italy 36,094; China 14,566.
Dolomite, chiefly refractory-grade		740	985	—	Taiwan 760; France 140.
Gravel and crushed rock		125,459	593,419	15	Malaysia 588,705; Philippines 1,850.
Limestone other than dimension		20,109	23,866	23	Malaysia 23,842.
Quartz and quartzite		460	409	(2)	India 220; Germany 107.
Sand other than metal-bearing	thousand tons	1,049	946	11	Malaysia 883; Australia 41.

See footnotes at end of table.

TABLE 2—Continued

SINGAPORE: IMPORTS OF MINERAL COMMODITIES[1]

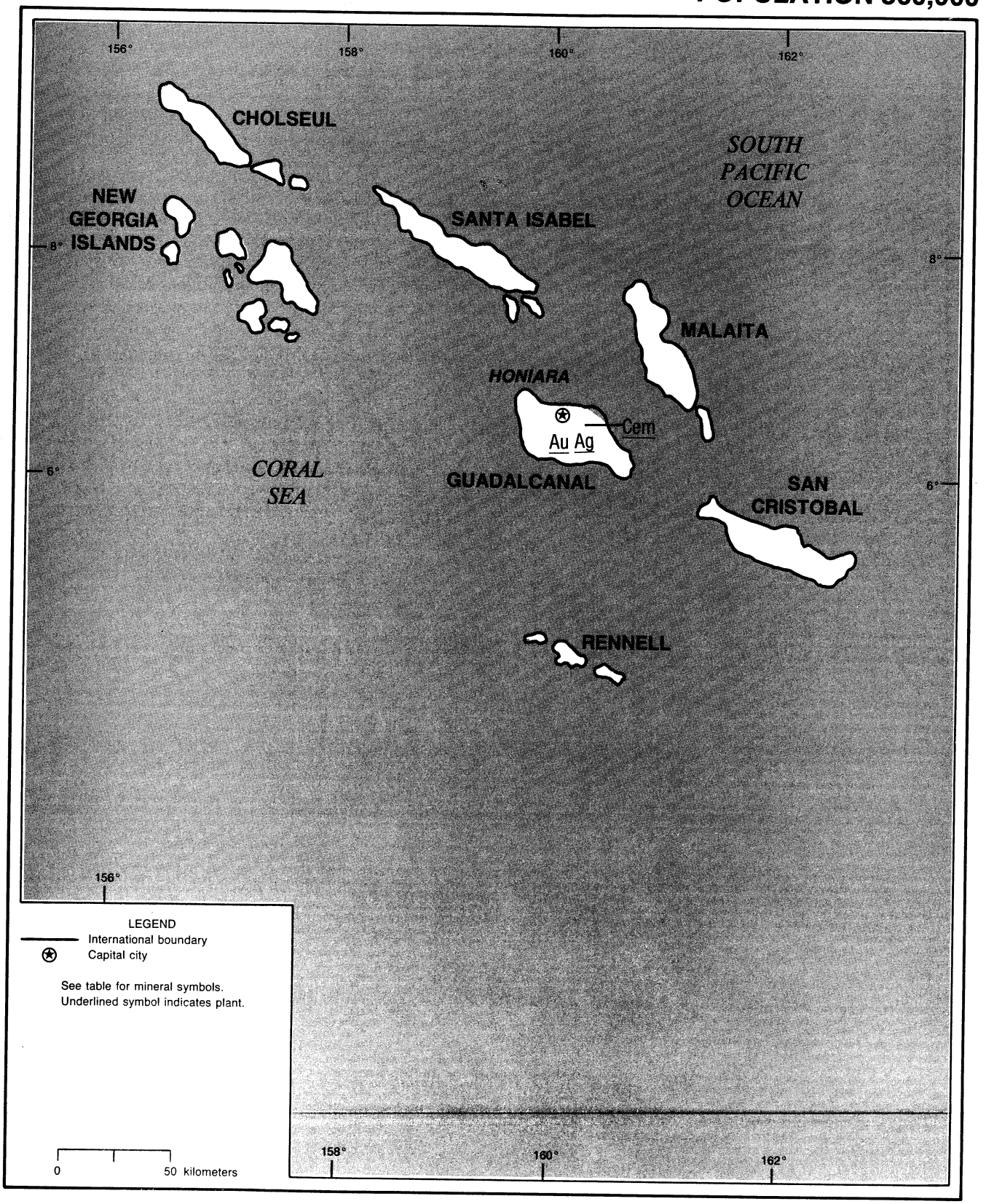
(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental:					
Crude including native and byproduct		233	919	3	Republic of Korea 374; China 273; Saudi Arabia 200.
Colloidal, precipitated, sublimed		195	101	8	Poland 54; China 24.
Sulfuric acid		1,266	1,152	145	Malaysia 596; Germany 350.
Talc, steatite, soapstone, pyrophyllite		6,108	7,164	1,497	China 3,479; Norway 800.
Other:					
Crude		51,919	—		
Slag and dross, not metal-bearing		37,733	52,481	—	Japan 51,067; Malaysia 1,136.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		2,192	2,188	903	United Kingdom 535; Japan 287.
Carbon black		4,573	3,296	331	Malaysia 1,039; Australia 773; China 426.
Coal, all grades including briquets		2,736	2,111	1,826	China 51; Japan 44.
Coke and semicoke		52,747	25,111	—	China 13,390; Australia 6,174; Malaysia 4,498.
Peat including briquets and litter		110	102	—	Malaysia 40; United Kingdom 24; Canada 23.
Petroleum:					
Crude	thousand 42-gallon barrels	317,350	333,337	—	Saudi Arabia 146,778; United Arab Emirates 62,001; Malaysia 35,899.
Partly refined	do.	NA	3,005	—	All from Malaysia.
Refinery products:					
Liquefied petroleum gas	do.	33	59	(2)	Mainly from Philippines.
Gasoline:					
Aviation	do.	1,915	2,273	—	Saudi Arabia 1,223; Japan 264; Hong Kong 197.
Motor	do.	[6]3,522	18,323	853	China 12,277; Malaysia 1,284.
Naphtha (including white spirits)	do.	NA	2,441	1	Malaysia 1,307; Pakistan 363; Thailand 287.
Kerosene and jet fuel	do.	713	1,233	10	Malaysia 891; Saudi Arabia 255.
Mineral jelly and wax	do.	224	313	6	China 289; Japan 7.
Distillate fuel oil	do.	6,180	5,025	452	U.S.S.R. 1,119; Saudi Arabia 1,030; Malaysia 1,012.
Lubricants	do.	272	1,649	146	Australia 439; Japan 295; China 276.
Residual fuel oil	do.	rNA	66,994	11,249	Saudi Arabia 15,786; Bahrain 11,391.
Bitumen and other residues	do.	3	2	(2)	Japan 1.
Bituminous mixtures	do.	21	16	(2)	United Kingdom 7.
Petroleum coke	do.	77	48	45	Germany 3.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $7,000; imported from the United States.
[4]May include other precious metals.
[5]Includes tellurium and phosphorus.
[6]Includes blue powder.

SOLOMON ISLANDS

AREA 28,450 km² **POPULATION 360,000**



THE MINERAL INDUSTRY OF

SOLOMON ISLANDS

By Travis Q. Lyday

Mineral production in the Solomons remained restricted to minor amounts of construction materials used domestically and small quantities of alluvial gold with contained silver, which was exported.

Although the Solomon Archipelago was named in the 16th century for the legendary gold mines of King Solomon, the Melanesian state has had only minor gold production. The operation at Mavu, on the Chovohio River 30 km southeast of the capital city of Honiara on Guadalcanal Island, was granted a mining lease by the Government in 1985 to the Australian firm Zanex Ltd. (70%) in joint venture with the local firm Mavu Gold Development Ltd. (30%). Mining began in November of that year, with a recovery plant opening in early 1986. The operation was closed in 1987 owing to destruction caused by a tropical cyclone and internal company problems. The joint venture produced a total of 40 kg of gold.

Arimco (Solomon Islands) Ltd., a 50-50 joint venture of Australia's Arimco NL and Cyprus Minerals Ltd. of the United States, applied for a mining lease to develop an opencut gold mine near Gold Ridge, 25 km from Honiara, following a feasibility study that was completed early in the year. Gold production was expected to be at a rate of 350,000 mt/a of ore, producing about 1,000 kg/a of gold. Identified reserves were 1.34 Mmt of ore grading 3.86 g/mt.

Although the mine at Gold Ridge will be small by world standards, it will have a significant role in the economic development of the Solomon Islands. Currently, the mining sector contributes less than 1% to the country's export earnings. Export earnings from gold produced at the Gold Ridge Mine are expected to increase the sector's share to become the country's third largest, after fishing and forestry, and accounting for about 15% of the total.

Most of the country's land mass was covered by applications for prospecting licenses or by issued licenses. However, with the development of Gold Ridge, exploration interest and expenditures were expected to increase substantially, boosting chances of new gold discoveries.

Essential elements of the transportation infrastructure include about 2,100 km of roads, including 30 km of sealed, 290 km of gravel, 980 km of earth, and 800 km of private logging and plantation roads of varied construction. There are 2 permanent-surface airports, out of 30 total in the country, and 2 shipping ports, Honiara and Ringi Cove. Electric generating capacity in 1992 was 21,000 kW. Generally, infrastructure for mining is not in place, and each potential site must be upgraded with respect to access and logistics.

TABLE 1
SOLOMON ISLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Kilograms)

Commodity[2]	1988	1989	1990	1991	1992
Gold, mine output, Au content[e]	[3]47	[3]33	35	30	25
Silver, mine output, Ag content[e]	[3]8	[3]7	5	2	2

[e]Estimated.
[1]Table includes data available through June 2, 1993.
[2]In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

TABLE 2
SOLOMON ISLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

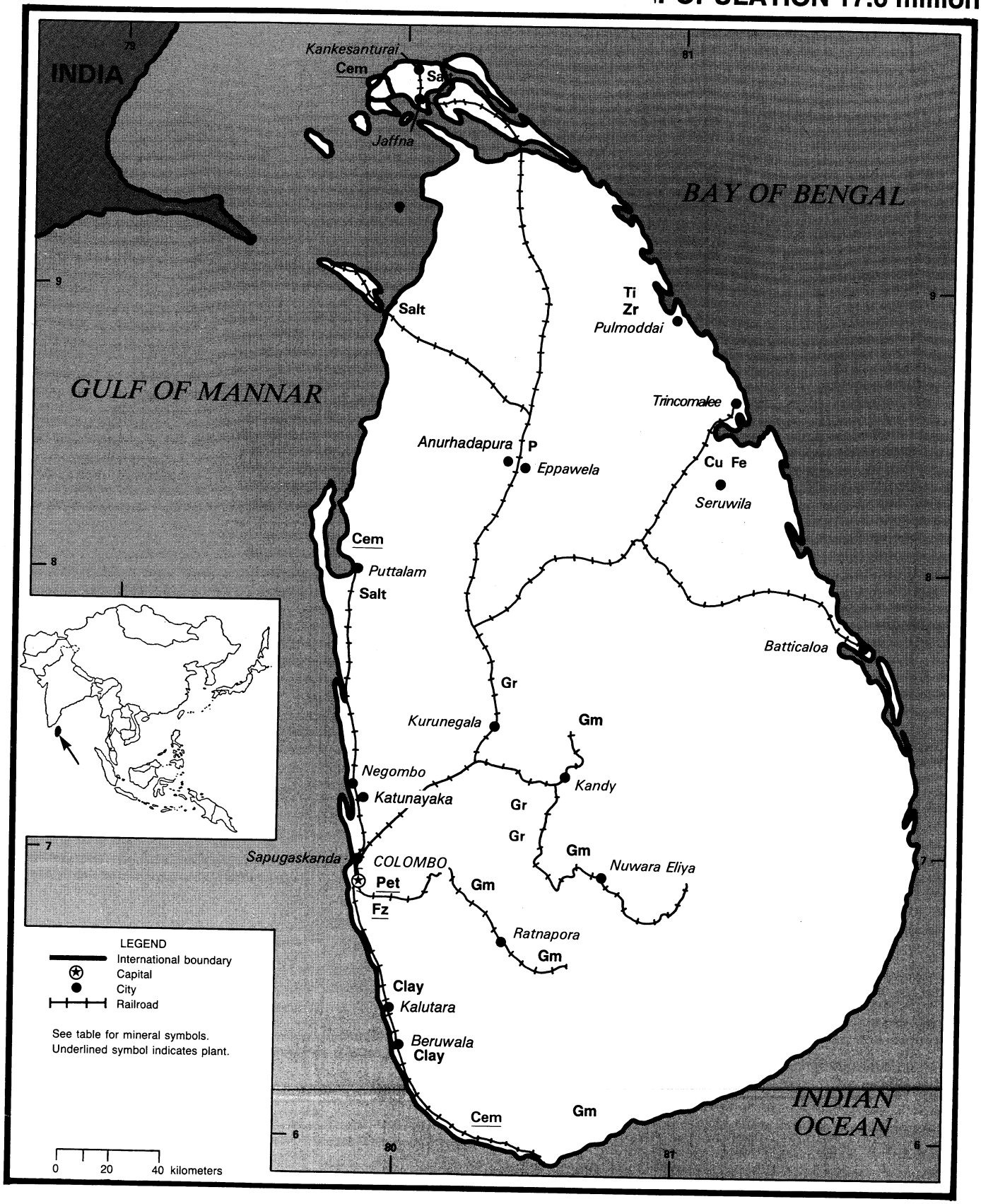
(Kilograms)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	Arimco (Solomon Islands) Ltd., manager. Arimco NL, 50%; and Cyprus Minerals Ltd., 50%.	Near Honiara, Guadalcanal	1,000

[1]Mining expected to begin in early 1992.

SRI LANKA

AREA 65,610 km² **POPULATION 17.6 million**



THE MINERAL INDUSTRY OF

SRI LANKA

By Chin S. Kuo

The country's economy continued to be dominated by agriculture in terms of employment, which was less than one-half of the work force and major export categories. The prolonged drought that prevailed during the early part of the year caused agricultural production to decline. Economic growth for 1992 was 4.3% while the annual average increase in consumer prices was 11.4%. Industry's share of gross domestic product grew rapidly. The state-owned sector was substantial and included cement, chemicals, petroleum products, and steel. Indigenous mineral production formed the base of the cement industry, and precious and semiprecious stones were extensively mined. However, the mining sector recorded negative growth.

The Government's reform program consisted of measures to liberalize the economy, including cuts in subsidies; the progressive lifting of restrictions on foreign equity participation; and the privatization of nonviable public ventures. The reform policy had won the support of the International Monetary Fund and aid donors.

The Government offered incentives for private and foreign investors. For large investments of more than $225,000,[1] the incentives include a 5-year tax holiday; partial tax credit for 5 years; duty-free import of project-related grants, machinery, equipment, and vehicles; the right to maintain a foreign currency bank account; and eligibility to repatriate profits. The Government adopted a new law, the Mines and Minerals Act No. 33 of 1992, that lays down the ground rules for mineral exploration in the country.

Production from industry was up by 12% in 1992 due to increased output in the private sector. The garment sector contributed the largest share of increase. Output of timber and timber products, paper, food, tobacco, and minerals also rose.

Industrial export earnings increased by 20% in 1992, amounting to $1.7 billion. Textile and garment exports had been the fastest growing component. Mineral exports included crude oil, diamond, and gemstones. The United States was the largest trade partner, followed by Japan. Graphite exports to the United States in 1992 totaled 405 tons and were valued at $395,000.

Bogala Graphite Lanka Ltd. and Kahatagaha Graphite Mines Ltd., both state-owned, were the two major graphite producers that took over the mining operations of the State Mining and Mineral Development Corp. in 1992. Bogala operates the largest mine that is located at Aruggammana in the Kegalle District. Its production capacity was rated at 5,000 mt/a of graphite consisting of 80% to 99% carbon. Bogala planned to install a new plant to upgrade the low-grade graphite using froth flotation and hoisting equipment for deeper mining. Bogala is currently 51% state-owned, with the remaining held by the public.

Kahatagaha operates the Kahatagaha/-Kolongaha Mines located at Dodangaslanda in the Kurunegala District. It produced 3,600 to 4,000 mt/a of high-grade graphite containing 90% to 99% carbon. The company planned to install a grinding facility in early 1994 and increase production capacity to 6,000 mt/a by the end of 1995. Ceylon Graphite Mining Co. Ltd. bought 90% of Kahatagaha in September, and the remaining 10% was sold to the workers.

Lanka Refractories Ltd. dominates the country's refractories market. Its plant at Meepe, Padukka is capable of producing a wide range of acidic and basic refractories. Currently, the company concentrated on alumina, mag chrome, and fire clays. Initial design capacity of the plant was 9,600 mt/a, and present output was only 3,500 mt/a, enough to fulfill production of a full range of types and sizes. Most of the raw material requirements for china clay and ball clay were supplied by Lanka Ceramics Ltd. Carbon, graphite, and zircon were bought locally. Bauxite, high-alumina cement, chrome, and magnesite were imported from China, France, and Greece. Products were supplied domestically to the cement (40%), iron and steel (20%), ceramic, and textile industries. Future exports to Southeast Asian countries such as Indonesia, Myanmar, and Singapore are likely.

Lanka Ceramics Ltd. mined ball clay at Waskaduwa near Kalutara and produced 20,000 mt/a of crude material. Output was supplied to a variety of markets, including sanitaryware, crockery, insulators, and clay porcelain. The company also mined china clay at Boralasgamuwa and Meetiyagoda. Other well known china clay deposits are at Dediyawela, where more than 500,000 tons has been found.

The Ministry of Industries, Science and Technology invited proposals to set up a joint venture for a phosphate fertilizer plant with products for domestic and export markets. A large apatite deposit is near Eppawela in the North Central Province. The proven and inferred reserves were estimated on the order of 60 Mmt of phosphate rock, with an average grade of 37% P_2O_5. State-owned Lanka Phosphate Ltd. currently owns the mining rights to the deposit and is engaged in extracting and processing 30,000 mt/a of phosphate rock for domestic market. Present demand for phosphate fertilizer in the country was about 120,000 mt/a.

[1]Where necessary, values have been converted from Sri Lankan rupees (SLR) to U.S. dollars at the rate of SLR44.36=US$1.00 in 1992.

TABLE 1

SRI LANKA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[p]
Cement, hydraulic[e]	thousand tons	400	400	400	400	[3]817
Clays:						
Ball clay		17,330	20,866	27,695	[e]25,000	18,558
Kaolin		7,100	7,761	7,731	7,737	6,759
Brick and tile clay[e]		60,000	60,000	60,000	75,000	75,000
Clays for cement manufacture		12,487	[e]12,500	[e]12,500	320	[e]300
Feldspar, crude and ground		6,345	6,656	9,698	9,908	7,524
Gemstones, precious and semiprecious, other than diamond [e]	value, thousands	$14,000	$14,000	$14,000	$57,000	$58,000
Graphite, all grades		8,547	4,163	5,469	6,381	3,307
Iron and steel: Metal: Semimanufactures		[e]35,000	[e]35,000	33,422	47,659	53,811
Mica, scrap[e]		200	200	200	200	200
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	[e]2,040	3,128	5,460	1,168	[e]1,200
Jet fuel	do.	[e]420	384	805	722	[e]700
Kerosene	do.	[e]1,010	961	1,325	1,173	[e]1,200
Distillate fuel oil	do.	[e]3,580	3,327	4,345	3,450	[e]3,500
Residual fuel oil	do.	[e]2,000	—	—	3,801	[e]3,800
Other	do.	[e]1,500	1,166	620	1,030	[e]1,000
Refinery fuel and losses	do.	[e]440	553	630	464	[e]600
Total		[e]10,990	9,519	13,185	11,808	[e]12,000
Phosphate rock		22,995	24,440	32,564	19,693	26,010
Rare-earth metals: Monazite concentrate, gross weight[e]		200	200	200	200	200
Salt		106,794	150,223	53,031	52,888	121,875
Stone:						
Limestone	thousand tons	733	608	642	621	[e]600
Quartz, massive		953	961	1,300	978	1,130
Titanium concentrate, gross weight:						
Ilmenite		74,305	[r]101,354	66,413	60,861	33,283
Rutile		5,255	[r]5,589	5,460	3,085	2,741
Zirconium: Zircon concentrate, gross weight		[e]4,000	[r]21,983	19,727	26,123	13,368

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

[1]Table includes data available through Aug. 12, 1993.

[2]In addition to the commodities listed, crude construction materials such as sand and gravel and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TABLE 2

SRI LANKA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Aluminum: Metal:				
Scrap metric tons	20	—		
Semimanufactures	$154	$364	—	United Arab Emirates $180; Kenya $80; Bangladesh $46.
Copper: Metal:				
Scrap	$1,834	$1,385	—	India $841; Singapore $342; Belgium-Luxembourg $81.
Unwrought and semimanufactures	$23	$31	—	Germany $17; Maldives $3; unspecified $10.
Gold: Metal including alloys, unwrought and partly wrought	$4,451	—		
Iron and steel: Metal:				
Scrap	$9,892	$3,866	—	India $3,853; Japan $13.
Steel, primary forms	—	$8	—	Japan $7; Maldives $1.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	$485	$1,235	—	United Arab Emirates $1,174; Saudi Arabia $52.
Clad, plated, coated metric tons	230	[2]177	—	United Arab Emirates 20; unspecified 157.
Of alloy steel	$17	—		
Bars, rods, angles, sections	$215	$638	—	Singapore $210; Germany $12; unspecified $410.
Rails and accessories metric tons	50	—		
Wire do.	242	—		
Tubes, pipes, fittings do.	[3]92	[4]175	—	Mainly to India.
Lead: Scrap do.	—	88	—	All to Philippines.
Mercury	$3	—		
Molybdenum: Ore and concentrate	$2,014	$1	—	All to Australia.
Silicon, high-purity[5]	—	$1	—	All to Maldives.
Silver: Waste and sweepings[6]	$65	$47	$47	
Tin: Metal including alloys, all forms, semimanufactures metric tons	18	40	—	Mainly to United Arab Emirates.
Titanium: Ore and concentrate do.	6,965	160	—	All to Japan.
Vanadium: Ore and concentrate[7] do.	—	25	—	Japan 20; Australia 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	$2	—		
Dust and powder of precious and semi-precious stones including diamond	—	$3	—	All to Belgium-Luxembourg.
Asbestos	—	$5	—	All to Maldives.
Cement	$1	$9	—	Do.
Chalk	$9	—		
Clays, crude:				
Kaolin	—	$2	—	All to Hong Kong.
Unspecified	$10	$22	$3	Germany $12; Pakistan $7.
Diamond:				
Gem, not set or strung	$89,201	$93,080	$1	Belgium-Luxembourg $81,653; Thailand $3,915; Hong Kong $2,743.
Industrial stones	$2,730	$3,340	$22	Belgium-Luxembourg $1,794; Israel $1,096; Japan $304.

See footnotes at end of table.

TABLE 2—Continued

SRI LANKA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diatomite	metric tons	20	—		
Feldspar	do.	104	785	—	Sweden 420; Japan 200; unspecified 165.
Fertilizer materials:					
Crude, n.e.s.		$40	$128	—	Japan $109; Maldives $19.
Manufactured:					
Nitrogenous		$10	$5	—	All to Maldives.
Phosphatic		$9	$1	—	Do.
Unspecified and mixed		$13	$36	—	Seychelles $24; Maldives $11; Oman $1.
Graphite, natural		$4,281	$3,383	$786	Japan $1,162; United Kingdom $856.
Mica: Crude including splittings and waste	metric tons	1,288	1,090	—	Mainly to Japan.
Precious and semiprecious stones other than diamond:					
Natural		$73,226	$77,227	$5,405	Japan $38,415; Thailand $15,510.
Synthetic		$4	$6	—	Hong Kong $4; Japan $2.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		$459	$1,093	$2	Italy $689; Japan $211; Canada $170.
Worked		$1	$215	$1	Germany $95; Italy $46; United Kingdom $34.
Quartz and quartzite	metric tons	7,534	21,259	16	Japan 20,243; Germany 1,000.
Sand other than metal-bearing		—	$8	—	Maldives $5; Germany $3.
Sulfur: Elemental: Crude including native and byproduct	metric tons	—	5	—	All to Maldives.
Talc, steatite, soapstone, pyrophyllite	do.	143	1,100	—	Belgium-Luxembourg 520; Japan 421; Republic of Korea 160.
Other: Crude	do.	15,028	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		$1	—		
Petroleum refinery products:					
Mineral jelly and wax		$2	—		
Bituminous mixtures		$13	$2	—	All to Maldives.
Unspecified		$13,180	$12,740	—	Singapore $12,736; Maldives $3.

[1]Table prepared by Theodore T. Spittal.
[2]Excludes unreported quantity valued at $4,000.
[3]Excludes unreported quantity valued at $100,000.
[4]Excludes unreported quantity valued at $153,000.
[5]May include silicon metal.
[6]May include other precious metals.
[7]May include tantalum and niobium.

TABLE 3

SRI LANKA: IMPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS					
Alkali and alkaline earth metals		$10	$14	—	United Kingdom $10; Hong Kong $4.
Aluminum:					
Ore and concentrate	metric tons	72	—		
Oxides and hydroxides		$748	$1,121	$18	Germany $547; Australia $267; Japan $174.
Metal:					
Scrap		$34	$29	—	Australia $27; Hong Kong $2.
Unwrought		$1,621	$2,647	—	Republic of South Africa $1,710; United Arab Emirates $452; India $160.
Semimanufactures		$9,321	$27,901	$165	Australia $7,993; Republic of South Africa $6,483; Venezuela $3,190.
Antimony: Metal including alloys, all forms	metric tons	22	2	—	All from China.
Cadmium: Metal including alloys, all forms		—	$1	—	NA.
Chromium:					
Ore and concentrate	metric tons	—	72	—	All from Greece.
Oxides and hydroxides		$24	$23	$1	Germany $13; United Kingdom $9.
Cobalt:					
Oxides and hydroxides		$1	$5	—	All from U.S.S.R.
Metal including alloys, all forms		$1	—		
Columbium and tantalum:[2] Ore and concentrate	metric tons	14	10	—	All from Japan.
Copper:					
Ore and concentrate	do.	40	—		
Metal:					
Scrap		$8	$44	—	Japan $22; Australia $19; Singapore $3.
Unwrought		$36	$251	—	Japan $63; Australia $50; unspecified $93.
Semimanufactures		$7,521	$9,049	$36	Netherlands $1,837; Japan $1,553; Austria $1,309.
Gold: Metal including alloys, unwrought and partly wrought		$1,233	$4,641	—	Switzerland $4,579; Sweden $57; Germany $3.
Iron and steel:					
Iron ore and concentrate including roasted pyrite		$4	$4	—	All from Belgium-Luxembourg.
Metal:					
Scrap		$258	$233	—	Bahrain $89; United Arab Emirates $56; United Kingdom $13.
Pig iron, cast iron, related materials	metric tons	[3]71	[4]507	(5)	Republic of South Africa 444; Italy 21; China 14.
Ferroalloys:					
Ferrochromium	do.	—	2	—	All from United Kingdom.
Ferromanganese	do.	5	23	—	Pakistan 12; Norway 10; India 1.
Ferrosilicon		$9	$86	—	Bahrain $47; Norway $16; India $14.
Ferrosilicochromium	metric tons	5	—		
Unspecified		$1	$1	—	All from China.
Steel, primary forms	metric tons	[6]37,705	[7]56,554	—	Republic of South Africa 15,067; China 1,562; Bahrain 427.

See footnotes at end of table.

TABLE 3—Continued

SRI LANKA: IMPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	$19,142	$20,266	$6	Republic of South Africa $10,139; Japan $1,763; Germany $1,499.
Clad, plated, coated	$9,435	$16,256	$42	Japan $5,400; Australia $2,041; unspecified $2,988.
Of alloy steel	$2,055	$2,876	—	Japan $835; United Kingdom $758; Singapore $417.
Bars, rods, angles, shapes, sections	$19,949	$27,800	$8	Republic of South Africa $10,266; India $6,252; China $3,295.
Rails and accessories	$863	$3,578	—	United Kingdom $2,651; Australia $764; China $66.
Wire	$6,759	$7,929	—	China $2,696; Republic of South Africa $2,662; India $867.
Tubes, pipes, fittings	$8,506	$18,013	$33	United Kingdom $5,872; Japan $3,497; Thailand $2,863.
Lead:				
Ore and concentrate metric tons	—	2	—	All from Republic of South Africa.
Oxides	$115	$165	—	Singapore $151; Republic of South Africa $5; United Kingdom $5.
Metal:				
Unwrought	$793	$1,084	—	Australia $1,035; United Kingdom $18; Malaysia $12.
Semimanufactures	$143	$240	$4	Singapore $81; United Kingdom $48; Japan $32.
Magnesium: Metal including alloys, all forms	$22	$14	—	All from Singapore.
Manganese: Oxides	$1,658	$1,759	—	Belgium-Luxembourg $970; Singapore $562; Japan $178.
Mercury	$14	$16	—	Germany $6; France $5; United Kingdom $5.
Molybdenum: Ore and concentrate	—	$1	—	All from Germany.
Nickel:				
Ore and concentrate	$2	—		
Metal including alloys:				
Waste and scrap metric tons	—	19	—	All from Australia.
Unwrought	$11	$7	—	Norway $4; Germany $3.
Semimanufactures	$95	$108	—	Switzerland $34; Sweden $19; United Kingdom $18.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	$9	$64	—	Hong Kong $48; Germany $13; Sweden $2.
Selenium, elemental[8]	—	$83	—	All from Italy.
Silicon, high-purity	$20	$35	—	Republic of Korea $10; Singapore $7; unspecified $14.
Silver:				
Ore and concentrates[9] kilograms	—	75	—	All from India.
Waste and sweepings[9]	$9	—		
Metal including alloys, unwrought and partly wrought	$64	$91	$1	Germany $84; Japan $2; United Kingdom $2.
Tin:				
Ore and concentrate	—	$1	—	NA.
Metal including alloys:				
Scrap	$17	—		
Unwrought	$103	$74	—	United Kingdom $48; Singapore $22; Indonesia $4.
Semimanufactures	$42	$36	—	Singapore $15; United Kingdom $12; Japan $2.
Titanium: Oxides	$586	$356	—	United Kingdom $217; Germany $46; Belgium-Luxembourg $42.

See footnotes at end of table.

TABLE 3—Continued

SRI LANKA: IMPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Tungsten: Metal including alloys, all forms		$15	—		
Zinc:					
Oxides		$1,451	$1,337	$8	China $623; Hong Kong $159; Republic of Korea $146.
Metal including alloys:					
Scrap		$2	$25	—	All to Australia.
Unwrought		$2,285	$2,673	—	Canada $1,422; Australia $795; Belgium-Luxembourg $117.
Semimanufactures		$229	$45	—	Singapore $30; Japan $11; United Kingdom $4.
Zirconium: Ore and concentrate	metric tons	38	52	—	All from Japan.
Other:					
Ores and concentrates of precious metals	kilograms	75	75	—	All from India
Ashes and residues		$2	$7	—	Germany $6.
Oxides and hydroxides		—	$40	$1	India $21; Singapore $10; Belgium-Luxembourg $5.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		$130	$280	$7	Indonesia $206; Hong Kong $35.
Artificial: Corundum	metric tons	24	21	—	All from Italy.
Dust and powder of precious and semi-precious stones including diamond		$878	$231	$34	Belgium-Luxembourg $136; Australia $15.
Grinding and polishing wheels and stones		$600	$1,076	$6	United Kingdom $250; Italy $141; Republic of Korea $117.
Asbestos, crude		$4,173	$624	—	Zimbabwe $442; Canada $175; China $5.
Barite and witherite	metric tons	10	63	—	All from India.
Boron materials:					
Crude natural borates		$16	—		
Oxides and acids		$70	$179	—	China $81; India $25; Turkey $19.
Cement		$35,790	$53,122	$67	Romania $12,142; Jordan $11,155; United Arab Emirates $9,932.
Chalk		$168	$94	$2	United Kingdom $66; Australia $19; Thailand $4.
Clays, crude:					
Bentonite		$27	$214	$2	Japan $143; India $49; United Kingdom $10.
Kaolin		$212	$504	—	Japan $361; Malaysia $106; New Zealand $15.
Unspecified		$859	$1,571	$5	Japan $742; United Kingdom $399; New Zealand $207.
Cryolite and chiolite	metric tons	82	—		
Diamond:					
Gem, not set or strung		$73,471	$75,636	—	Belgium-Luxembourg $37,979; United Kingdom $24,114; Thailand $3,001.
Industrial stones		$4,998	$2,998	—	Belgium-Luxembourg $1,447; Israel $909; Thailand $214.
Diatomite and other infusorial earth		$69	$59	$27	Germany $22; India $3.
Fertilizer materials:					
Crude, n.e.s.	metric tons	—	105	(3)	Netherlands 62; Denmark 41; Singapore 1.
Manufactured:					
Ammonia		$241	$279	—	Malaysia $206; Netherlands $20; United Kingdom $18.
Nitrogenous		$36,337	$51,838	—	Indonesia $15,478; Japan $6,622; United Arab Emirates $5,754.
Phosphatic		$8,304	$9,956	—	China $4,982; Turkey $2,793; Tunisia $1,964.

See footnotes at end of table.

TABLE 3—Continued

SRI LANKA: IMPORTS OF MINERAL COMMODITIES[1]

(Thousand U.S. dollars unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued:				
Manufactured—Continued:				
Potassic	$17,796	$9,072	—	U.S.S.R. $3,389; Canada $2,702; Germany $2,365.
Unspecified and mixed	$2,267	$5,122	$137	Japan $1,949; Republic of South Africa $1,515; Malaysia $1,129.
Fluorspar	—	$1	—	All from Japan.
Graphite	$5	—		
Gypsum and plaster	$1,084	$1,528	—	Republic of Korea $488; Thailand $371; Germany $287.
Iodine[10]	$21	$14	—	Netherlands $7; Japan $2; Pakistan $2.
Lime metric tons	7	10	—	Singapore 9; United Kingdom 1.
Magnesium compounds:				
Magnesite, crude do.	15	25	—	All from China.
Oxides and hydroxides	$13	$43	—	Japan $16; Republic of Korea $12; Germany $8.
Mica:				
Crude including splittings and waste	$4	$14	—	India $7; Republic of Korea $7.
Worked including agglomerated splittings	$4	$4	$1	United Kingdom $2; China $1.
Nitrates, crude metric tons	—	15	—	Mainly from Singapore.
Phosphates, crude	$1,473	$404	—	Mainly to Egypt.
Pigments, mineral: Iron oxides and hydroxides, processed	$1,339	$1,557	$11	Germany $787; Netherlands $576; United Kingdom $139.
Precious and semiprecious stones other than diamond:				
Natural	$762	$6,108	$232	Japan $2,579; Israel $2,117; Belgium-Luxembourg $445.
Synthetic	$33	$95	$1	Hong Kong $57; Belgium-Luxembourg $23; Republic of Korea $8.
Salt and brine	$84	$92	—	United Kingdom $67; Germany $15; India $4.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured	$682	$1,183	—	India $438; Kenya $427; Republic of South Africa $142.
Sulfate, manufactured	$61	$152	—	Netherlands $57; Indonesia $53; China $17.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	$46	$113	—	Belgium-Luxembourg $63; Italy $28; India $13.
Worked	$79	$130	—	Italy $58; Belgium-Luxembourg $34; Republic of Korea $8.
Dolomite, chiefly refractory-grademetric tons	—	21	—	Mainly from Norway.
Gravel and crushed rock	$134	$197	—	India $70; China $45; France $42.
Limestone other than dimension	$1	$6	—	Mainly from United Kingdom.
Quartz and quartzite metric tons	9	80	—	India 76; Italy 4.
Sand other than metal-bearing	$14	$17	—	Germany $13; Singapore $2; United Kingdom $2.
Sulfur:				
Elemental:				
Crude including native and byproduct metric tons	[11]42	1,609	1	Singapore 911; Republic of Korea 452; Thailand 185.
Colloidal, precipitated, sublimed	$189	$232	—	Singapore $182; Thailand $27; Germany $9.
Sulfuric acid	$207	$315	—	Malaysia $216; Singapore $52; Netherlands $40.
Talc, steatite, soapstone, pyrophyllite	$362	$321	$6	China $140; India $112; Norway $21.

See footnotes at end of table.

TABLE 3—Continued

SRI LANKA: IMPORTS OF MINERAL COMMODITIES[1]

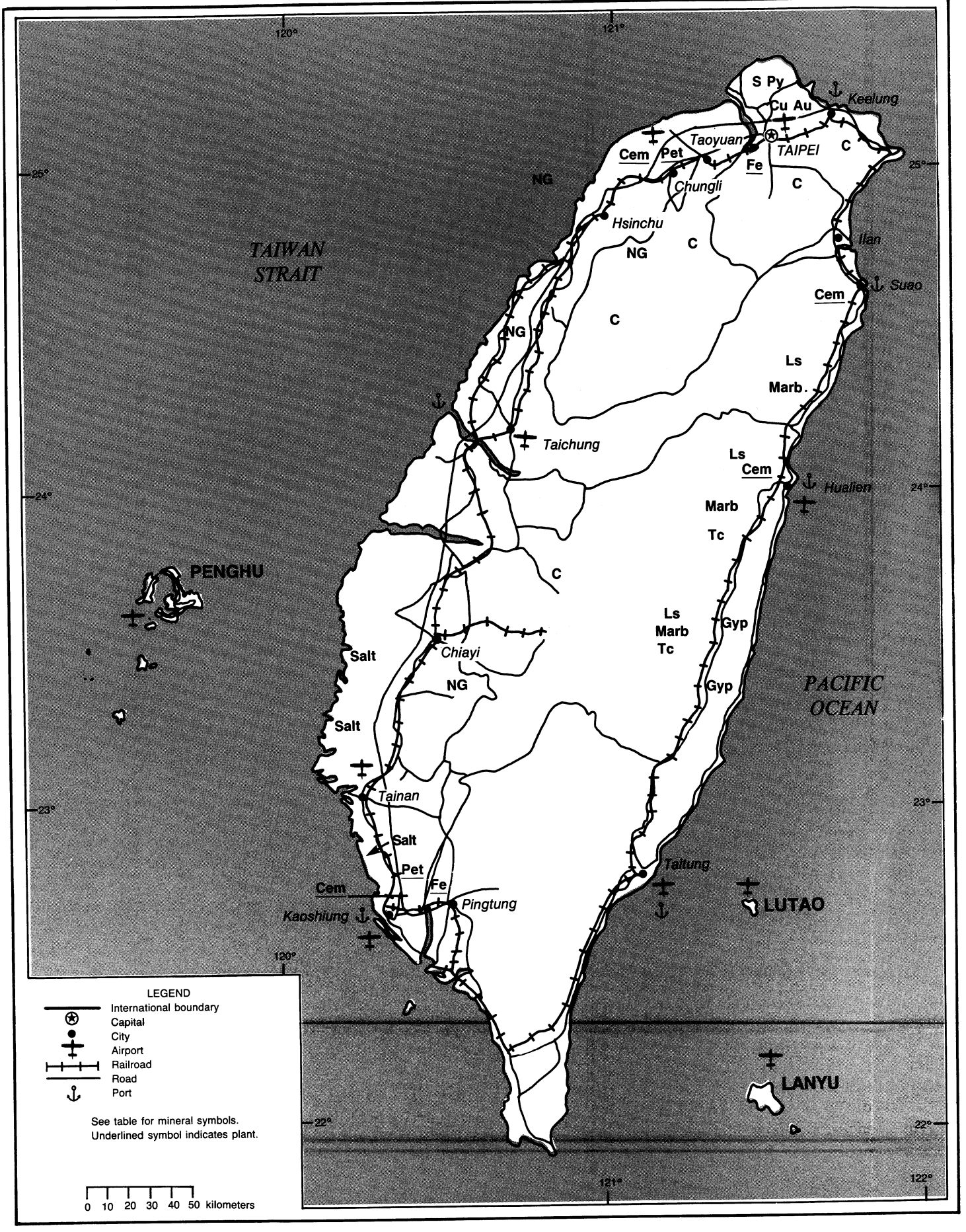
(Thousand U.S. dollars unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Other:				
Crude	$702	$1,815	—	Germany $1,510; Singapore $294; Kenya $9.
Slag and dross, not metal-bearing	$626	$590	—	Singapore $542; Japan $48.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	$13	$2	$1	Singapore $1.
Carbon black	$3,624	$4,702	$35	Republic of Korea $2,076; China $767; Singapore $405.
Coal: Anthracite	$145	$229	—	United Kingdom $141; Thailand $88.
Coke and semicoke	$496	$796	—	Australia $482; Belgium-Luxembourg $278; Japan $22.
Petroleum:				
Crude	$282,273	$324,804	—	Iran $173,732; Malaysia $88,769; Egypt $31,208.
Refinery products:				
Liquefied petroleum gas	$4,063	$4,965	$4	Singapore $1,886; Japan $1,507; Hong Kong $506.
Mineral jelly and wax	$1,577	$3,046	$114	Japan $1,221; China $872; Republic of Korea $487.
Bitumen and other residues	$65	$10	—	All from Singapore.
Bituminous mixtures	$25	$3	—	All from United Kingdom.
Unspecified	$43,238	$98,835	$139	Singapore $32,894; Spain $22,678; Cyprus $7,401.

NA Not available.
[1]Table prepared by Theodore T. Spittal.
[2]May include vanadium.
[3]Excludes unreported quantity valued at $64,000.
[4]Excludes unreported quantity valued at $49,000.
[5]Less than 1/2 unit.
[6]Excludes unreported quantity valued at $681,000.
[7]Excludes unreported quantity valued at $21,000.
[8]May include phosphorus, elemental.
[9]May include other precious metals.
[10]May include bromine and fluorine.
[11]Excludes unreported quantity valued at $229,000.

TAIWAN

AREA 35,980 km² **POPULATION 20.7 million**



THE MINERAL INDUSTRY OF

TAIWAN

By Pui-Kwan Tse

Despite the recession and a weak recovery affecting much of the world, Taiwan's economy continued to grow in the 1990's. Even though the gross national product (GNP) growth slowed from 7.2 in 1991 to 6.1 in 1992, the economic growth is a remarkable achievement by the standards of an industrialized country. It was also the best performance of the four little dragons—Hong Kong, Singapore, South Korea, and Taiwan—in 1992.

Taiwan's manufacturing sector was the country's economic backbone in the 1980's. It lost its competitive edge to its neighboring countries owing to rising land and labor costs and stringent environmental protection regulations. An increasing number of small- and medium-sized labor-intensive enterprises have moved their production to China to survive competition. Taiwan ranked behind Hong Kong as the second largest investor in China. To make up losses, the Ministry of Economic Affairs revised regulations to attract investment in high-technology and capital-intensive industries in Taiwan.

After three decades of uninterrupted rapid expansion, Taiwan became an industrial power in Asia. But environmental degradation became one of the most serious problems in Taiwan. Taiwan's waterways have suffered serious pollution from inadequate sewage and wastewater treatment facilities. Taiwan's Environment Protection Agency (EPA) found 30.6% of 21 major rivers in the inland either moderately or heavily polluted by industrial wastes and household and livestock effluent. Air quality was unhealthy in most of the country. In 1992, Taiwan's Legistrative Yuan passed the Air Pollution Control Act and strengthened the noise pollution regulations to enforce a higher living standard in the country. Environmentalists believed that the Government authorities intended to keep the EPA weak in authority so that the higher environmental standard could not inhibit economic growth.

Taiwan's population grew from 20.5 million in 1991 to 20.7 million in 1992, and per capita GNP increased from $8,815 in 1991 to $10,196 in 1992. The total labor force increased by 1% to 8.8 million, and the unemployment rate remains minimal in Taiwan. Employment in the mining and quarrying industry decreased to 18,000 in 1992. The output value of the mining sector was 0.4% of the GNP, which is insignificant compared with other sectors.

The consumer price index was up by 4.5% in 1992 from that of 1991. Wholesale prices were down by 3.1% in 1992 from that of 1991. The food prices increased sharply because storms in the spring and again in September caused crop damage. Other than that, domestic prices remained stable in 1992.

GOVERNMENT POLICIES AND PROGRAMS

Taiwan authorities decided to open Taiwan's financial securities sector to more foreign firms. The market liberation will bring the local market into alignment with the policies of the General Agreement on Tariffs and Trade. The Government thought that the growing competition will improve the domestic financial management and upgrade the operational technology of local securities houses.

The Government developed a set of programs to attack major problems in the areas of land, environment, labor, tariff rates, and financing to improve domestic investment conditions. The Government urged the local business community to "keep their roots in Taiwan" and to stop the exodus. The plan indicated that those who make large, substantial investments will be given the opportunity to arrange for favorable financing, through the issuance of corporate convertible bonds. Imports of essential raw materials and equipment will be given preferential tariffs or quota rates. The EPA will develop more flexible regulations for less polluting industry.

Taiwan's Legistrative Yuan passed a revised copyright law in April 1993. The law strengthened the protection of foreign patents and copyrights in a bid to avert U.S. trade sanctions after the United States placed Taiwan on a "priority watch list" of countries failing to prevent piracy of U.S. copyrights. The new law gave explicit legal protection to a wide range of products.

The Ministry of Economic Affairs (MOEA) planned to privatize nine state-owned enterprises in two phases within 5 years. According to the plan, BES Engineering Corp., China Petroleum Development Corp., China Steel Corp. (CSC), China Shipbuilding Corp., and Taiwan Machinery Manufacturing Corp. will be listed on the Taiwan Stock Exchange or sold by auction in the first phase. Chinese Petroleum Corp. (CPC), Taiwan Power Co., Taiwan Salt Works, and Taiwan Fertilizer Co. Ltd. will be sold in the second phase. The Taiwan Sugar Corp. is not included in the plan because it is complicated by the involvement use of land issues. The MOEA welcomes foreign investors to participate in the bidding process.

PRODUCTION

Rapid industrialization over the past three decades has changed Taiwan's production structure. The share industry production changed from 17% of gross domestic product (GDP) in 1953 to 43% of GDP in 1992. The private sector accounted for 89% of the net production value in 1991. The production value of heavy industry accounted for 56% in 1991.

During the past decade, the Government inaugurated an economic development plan to promote strategic industries such as semiconductors, electronics, precision machinery, and industrial automation. The development of technology-intensive, high value added, and energy efficient products was encouraged. In 1992, heavy, chemical, and technology-intensive products accounted for 54% of the country's export values, while another 40% was represented by the electronics, information, and machinery industries.

Marble and limestone dominated the minerals output of the hard-rock mining sector; most of the operations are in the eastern part of the country. Natural gas and coal are mined in the western part of the country. Most of the large minerals-producing and metals-producing companies in Taiwan are state-owned enterprises. The production of major mineral commodities is listed in table 1.

TRADE

Because of the demand for both consumer and capital goods, imports rose 14.5% to $72.0 billion[1] in 1992. Because of the sluggish world economy, exports rose only by 7.0% to $81.5 billion. The trade surplus fell 29% to $9.5 billion. The United States continued to be Taiwan's largest export destination, followed by Hong Kong, Japan, the Federal Republic of Germany, and Singapore. The Government continues to ban direct trade with China. Most of the $7 billion worth of goods were exported to China via Hong Kong. The largest supplier of Taiwan's imports remained Japan, followed by the United States, the Federal Republic of Germany, the Republic of Korea, Australia, and Malaysia.

The industrial upgrading from labor-intensive products to technology- and capital-intensive goods has brought a substantial increase in metal products and machinery equipment for export. These two categories' combined share value of Taiwan's total exports increased to 44.3% in 1992, compared with that of 42.1% in 1991 and 33.3% in 1985. It also reflected the demand for imported quality consumer goods and capital- and technology-intensive machineries and equipment. Export and import mineral trades are listed in tables 2 and 3.

STRUCTURE OF THE MINERAL INDUSTRY

The growth of the industrial sector was very impressive in the past decade, but the mineral industry continued to decline. Coal, oil, and natural gas are the country's most valuable mine products. Carbonate minerals, such as dolomite, limestone, and marble, composed the most important nonfuel mining sector. In addition to the aggregates, clays, feldspar, salt, and talc make up the remaining mine production. In the metals production sector, the country produces iron and steel and processes aluminum, copper, lead, nickel, tin, and zinc from imported raw materials. Major nonfuel and fuel producers are listed in table 4.

COMMODITY REVIEW

Metals and Industrial Minerals

Cement.—Asia Cement Corp.'s 1.6 Mmt Hualien plant and Taiwan Cement Corp.'s 1.6 Mmt Suao plant were put in operation in 1992. Humboldt Wedag supplied the major equipment for both plants.

Copper.—The China National Nonferrous Metals Import and Export Corp. discussed with Taiwan's Pacific Wire and Cable Co. setting up a warehouse in Taiwan and selling cable and wire to Taiwan's manufacturers at average London prices. In return for guaranteed, uninterrupted supplies of copper, China would import high-quality copper products from Taiwan. This arrangement requires an approval from Taiwan's authorities. Under current regulations, Taiwanese companies are only permitted to do business with Chinese counterparts via a third country.

Iron and Steel.—CSC suspended plans to invest $360 million in building a steel plant in Malaysia because of the absence of investment incentives and an investment guarantee treaty by the Malaysian Government. However, Malaysia's International Trade Minister said that Malaysia will sign an investment guarantee treaty with Taiwan in 1993.

CSC produced 6.25 Mmt of crude steel in 1992 compared with 5.86 Mmt in 1991. The improvement of output was attributed to the addition of two "torpedo" ladle cars. Because of worldwide recession and the surge of low-priced imported steel in the domestic market, CSC slashed its prices in three consecutive quarters in 1992. Without any iron ore resources in Taiwan, CSC imported iron ore from Australia (62.8%), Brazil (34.4%), and Republic of South Africa (2.8%). Coking coal was imported from Australia (66.6%), Canada (24.4%), and the United States (9%).

Nickel.—Taiwan Nickel Refining Corp., a subsidiary of Inco Pacific, will suspend its production for 6 weeks starting January 20, 1993 owing to low prices in the nickel market. The company produced about 14,000 mt of nickel metal yearly, which is mainly for domestic consumption. Deliveries to customers will be maintained and inventories reduced during the shutdown.

Tin.—Ton Yin Industrial Corp., owned by President Enterprises Corp. (88.2%), Toyo Menka (9.6%), and Kawasaki Steel (2.2%), will invest $360 million to build a 60,000-mt/a-capacity halogen-type electrolytic tin mill that

would incorporate Kawasaki's technology in its Tainan plant. The addition of a new mill would only meet one-third of the Ton Yin blackplate requirement. The rest of the demand still continues to be imported from three Japanese tinplate producers—Kawasaki Steel, Nippon Steel, and NKK.

Uranium.—Canada signed an agreement with the United States that allowed Canadian uranium to be shipped to the United States for conversion into nuclear fuel for shipment to Taiwan. The enriched fuel will be under the U.S. nuclear nonproliferation regulations and is regulated by the International Atomic Energy Agency.

Mineral Fuels

In 1992, Taiwan's coal production dropped 17% from that of 1991 to 334,821 mt and accounted for only 0.4% of the total supply of energy. This was attributed mainly to reduced domestic coal resources and the strict environmental controls in the country. Its coal reserves amount to only 170 Mmt. Most of them are distributed throughout the northern part of the island. In 1992, Taiwan's coal imports increased by 25% to 23.2 Mmt. The major coal suppliers were Australia, China, Indonesia, the Republic of South Africa, and the United States. Taiwan agreed to import an additional 450,000 mt/a of Indonesian coal, from the current import level of 3 Mmt. In return, Taiwan will participate in joint exploration for oil on the Indonesian island of Sumatra and build a refinery and hydroelectric powerplants. In 1992, Taiwan imported 2.4 Mmt of coal from China via a third country.

In 1992, Overseas Petroleum and Investment Corp., a subsidiary of CPC, acquired the Coke and Tyler concession in Texas from Edge Petroleum Corp. The Lay No. 1 well in the Tyler concession has proven natural gas potential and was under production. CPC; Pacific Resources Inc., a subsidiary of Hill PTY Co. of Australia; and Petronas of Malaysia with shares of 45%-45%-10%, respectively, agreed to invest $1.26 billion to build a refinery in Malaysia. The refinery was expected to produce 150,000 bbl/d of oil after its completion before the end of the century.

Formosa Plastics Group (FPG), after 6 years of delay caused by the protests of environmentalists, finally received an approval from EPA in May 1992 for construction of its first naphtha cracker. However, FPG faced another problem in acquiring land in the Mailiao area of Yunlin County. Land regulations require both that at least 30% of the land must be set aside for public use and that the Government have a 30% share of the project land. FPG requested the Government to build an industrial port exclusively for petrochemicals use. Construction of an industrial port at Mailiao required Executive Yuan approval.

Reserves

Taiwan has a very weak mineral resource base, and output is limited to mostly carbonate minerals, small amounts of other industrial minerals, and negligible amounts of fossil fuels, the overall value of which is significant only to the local economy. Reserves of major minerals are listed in table 5.

INFRASTRUCTURE

The railroad system comprises 4,600 km of common carrier lines and 3,525 km of industrial carrier lines of 1.075-m gauge and 1,075 km of 1.067-m gauge. Common carrier lines are owned by the Government and operated by the Railway Administration under the Ministry of Communications. Industrial carrier lines are owned and operated by Government enterprises. Taiwan has a total of 20,041 km of highway, including 17,095 km of bituminous or concrete pavement, 2,371 km of crushed stone or gravel, and 575 km of graded earth.

Taiwan has four international harbors--Keelung, Kaoshiung, Hualien, and Taitung. Suao harbor on the northeastern coast is used as a supplementary port to Keelung. There are two international airports--Chiang Kai-shek International Airport in Taoyuan and Hsiaokang International Airport in Kaoshiung. In addition, there are a number of domestic airports on the east and west coasts of the island.

OUTLOOK

Because Taiwan lacks a strong and varied mineral resource base, the domestic mining sector will never contribute significantly to the output of downstream manufacturing. Rising wages and a strong international currency exchange rate have affected export competitiveness and have forced domestic businesses to establish operations in lower cost neighboring countries such as China, Indonesia, Malaysia, Thailand, and Vietnam. Taiwan is a top investor in Malaysia and Vietnam. The future for Taiwan-based industry seems to lie in high-technology-intensive manufacturing.

[1]Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$25.3 = US$1.00 in 1992.

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Taipei, Taiwan
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Department of Reconstruction
2 Chenkiang Street
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TABLE 1

TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Copper: Metal, refined		43,333	43,237	16,090	—	—
Gold, primary	kilograms	237	269	72	—	—
Iron and steel: Metal:						
Pig iron	thousand tons	5,675	5,780	5,474	5,561	5,292
Ferroalloys:						
Ferromanganese		25,822	30,623	43,631	40,110	37,802
Ferrosilicomanganese		30,745	25,510	20,587	12,801	3,991
Ferrosilicon		19,601	19,277	15,501	6,252	2,606
Steel, crude	thousand tons	8,313	9,047	9,747	10,957	10,705
Nickel, refined[e]		8,200	8,200	8,200	7,000	7,000
Silver, primary	kilograms	8,388	6,491	3,926	—	—
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	17,281	18,043	18,459	19,389	21,464
Clays:						
Fire clay		131,370	85,803	99,389	79,497	55,008
Kaolin		81,879	98,115	105,084	92,970	e100,000
Feldspar		19,101	9,806	7,321	1,339	2,216
Gypsum: Precipitated		2,438	3,904	1,743	3,723	e3,700
Lime		105,701	615,047	553,517	613,942	e600,000
Mica		4,387	4,290	4,946	8,596	e8,000
Nitrogen: N content of ammonia		278,928	202,916	216,306	243,389	223,719
Salt, marine		111,341	169,982	82,820	195,319	25,732
Sodium compounds, n.e.s.:						
Caustic soda		144,800	86,100	110,600	119,600	131,223
Soda ash		126,828	115,572	e120,000	109,320	e110,000
Stone:						
Dolomite	thousand tons	448	419	339	363	254
Limestone	do.	13,653	14,069	13,924	15,352	16,885
Marble	do.	11,213	12,231	11,349	11,352	14,604
Serpentine	do.	328	469	388	414	405
Sulfur		86,541	76,060	95,533	125,819	118,621
Talc		21,603	22,559	22,123	18,518	e18,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		52,982	57,632	62,230	60,330	65,409
Coal, bituminous	thousand tons	1,225	784	473	403	335
Coke	do.	97	88	70	14	15
Gas, natural:						
Gross[e]	million cubic meters	1,158	1,158	1,129	776	630
Marketed	do.	1,100	1,094	e1,100	e700	580
Petroleum:						
Crude	thousand 42-gallon barrels	880	850	1,148	r694	e450
Refinery products:						
Gasoline	do.	26,640	27,084	32,610	37,070	40,740
Kerosene	do.	1,201	2,032	e2,200	r2,350	e2,000
Distillate fuel oil	do.	23,131	27,015	29,260	30,240	30,800
Residual fuel oil	do.	60,538	71,207	76,470	83,580	81,870
Lubricants fuel oil	do.	969	1,038	e1,000	e1,000	e1,000

See footnotes at end of table.

TABLE 1—Continued

TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products—Continued:						
Asphalt	thousand 42-gallon barrels	2,567	2,901	e3,000	e3,000	e3,000
Other[2]	do.	6,408	14,531	13,560	12,960	e13,000
Refinery fuel, losses and not reported[3]	do.	11,176	8,695	e10,000	e10,000	e10,000
Total[e]	do.	132,630	154,503	168,100	r180,200	182,410

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through May 6, 1993.
[2]Naphtha, solvent oil, and base oil.
[3]Includes liquefied petroleum gas and jet fuel.

TABLE 2

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	25	13	—	Hong Kong 6; Philippines 4.
Aluminum:				
Ore and concentrate	43	9	—	All to Philippines.
Oxides and hydroxides	3,833	959	—	Japan 644; Thailand 201.
Metal including alloys:				
Scrap	5,577	5,275	(2)	Japan 4,611; Republic of Korea 318; Hong Kong 237.
Unwrought	47,686	52,866	89	Japan 45,474; Thailand 2,623.
Semimanufactures	34,076	38,279	309	Hong Kong 12,003; Japan 8,982.
Antimony:				
Oxides	555	1,041	—	Japan 406; Republic of Korea 400; Netherlands 160.
Metal including alloys, all forms	2	224	—	All to Hong Kong.
Beryllium: Metal including alloys, all forms kilograms	3,462	3,386	—	Australia 3,366.
Bismuth: Metal including alloys, all forms do.	—	350	—	All to Hong Kong.
Cadmium: Metal including alloys, all forms do.	100,716	417	142	Nigeria 275.
Chromium:				
Ore and concentrate	21	—		
Oxides and hydroxides	27	29	—	Hong Kong 15; Netherlands 10.
Metal including alloys, all forms	66	88	52	Hong Kong 7; Japan 7; Switzerland 5.
Cobalt:				
Oxides and hydroxides	17	4	—	Philippines 2; Indonesia 1.
Metal including alloys, all forms	14	45	—	Hong Kong 39; Japan 6.
Columbium and tantalum: Tantalum metal including alloys, all forms	21	16	1	Japan 14.
Copper:				
Ore and concentrate	—	80	—	All to Hong Kong.
Matte and speiss including cement copper	2	13	(2)	Malaysia 12.
Oxides and hydroxides	49	167	—	Malaysia 166; Thailand 1.
Sulfate	5,367	5,767	—	New Zealand 959; Malaysia 743; Singapore 697.

See footnotes at end of table.

TABLE 2—Continued

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Copper—Continued:				
Metal including alloys:				
Scrap	30,497	15,991	192	Republic of Korea 5,846; Japan 5,237; Hong Kong 3,638.
Unwrought	7,439	3,990	19	Hong Kong 1,060; Japan 498; Thailand 490.
Semimanufactures	118,941	132,393	2,757	Hong Kong 46,808; Japan 23,954; Singapore 23,614.
Gold:				
Waste and sweepings kilograms	42,946	22,361	12,119	Hong Kong 8,301; Japan 1,690.
Metal including alloys, unwrought and partly wrought do.	2,048	36	10	Japan 19; Singapore 7.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	(3)	—		
Metal:				
Scrap	68,731	68,745	91	Japan 58,724; India 3,796.
Pig iron, cast iron, related materials	1,689	833	11	Malaysia 218; Japan 181; Hong Kong 147.
Ferroalloys:				
Ferrochromium	2,460	67	—	Republic of Korea 41; Hong Kong 23.
Ferromanganese	62	9	(2)	Mainly to Nigeria.
Ferronickel	(2)	1	—	Mainly to Indonesia.
Ferrosilicon	751	1,756	—	Hong Kong 1,515; Japan 202.
Silicon metal	4	70	—	Singapore 42; Philippines 18.
Unspecified	56	756	12	Japan 382; Republic of Korea 131; Hong Kong 76.
Steel, primary forms	204,667	46,069	2	Australia 20,237; Philippines 10,323; Finland 8,972.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	1,024,811	1,000,152	21,516	Japan 619,145; Malaysia 93,455; Hong Kong 65,075.
Clad, plated, coated	92,704	126,436	19,979	Japan 59,043; Hong Kong 16,204.
Of alloy steel	6,762	19,787	75	Hong Kong 4,247; Thailand 2,412.
Bars, rods, angles, shapes, sections	225,124	231,841	1,044	Hong Kong 34,055; Japan 22,080; Malaysia 21,006.
Rails and accessories	527	1,349	20	Japan 1,003; Malaysia 127.
Wire	31,047	55,442	10,521	Japan 10,814; Indonesia 8,534; Hong Kong 7,219.
Tubes, pipes, fittings	186,438	178,315	60,953	Japan 28,799; Saudi Arabia 19,462; Hong Kong 15,441.
Lead:				
Oxides	12,226	18,559	—	Japan 13,164; Thailand 4,200; Republic of Korea 980.
Metal including alloys:				
Scrap	317	217	—	Hong Kong 103; Indonesia 100.
Unwrought	16,690	7,956	—	Japan 4,214; Republic of Korea 2,219.
Semimanufactures	361	249	9	Singapore 85; Hong Kong 49.
Magnesium: Metal including alloys:				
Scrap	500	253	—	Japan 252.
Unwrought	3	15	—	Thailand 10; Hong Kong 2; Indonesia 2.
Semimanufactures	25	29	14	Hong Kong 12.
Manganese:				
Ore and concentrate, metallurgical-grade	89	31	—	Indonesia 18; Hong Kong 13.
Oxides	16	19	—	Mainly to Hong Kong.
Metal including alloys, all forms	6	2	(2)	Hong Kong 1.

See footnotes at end of table.

TABLE 2—Continued

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Mercury		4	50	—	Mainly to Singapore.
Molybdenum:					
Oxides		108	55	—	Netherlands 54.
Metal including alloys:					
Scrap	kilograms	1,449	4,980	—	Netherlands 3,890; Japan 1,090.
Semimanufactures	do.	33,100	9,315	4,182	Thailand 2,113; Japan 1,226.
Nickel:					
Ore and concentrate		—	1	—	All to Hong Kong.
Matte and speiss		16	—		
Oxides and hydroxides	kilograms	500	18,030	—	Do.
Metal including alloys:					
Scrap		3,041	2,346	5	Japan 2,314; Republic of Korea 21.
Unwrought		1,421	105	—	Australia 90; Hong Kong 13.
Semimanufactures		139	149	14	Hong Kong 79; Malaysia 21.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	kilograms	11,524	9,315	183	Japan 8,953; Sri Lanka 107.
Rare-earth metals	do.	13,567	18,593	211	Hong Kong 13,345; Malaysia 2,771.
Selenium, elemental	do.	1,000	—		
Silicon, high-purity	do.	41,394	120,654	—	Hong Kong 24,401; Republic of South Africa 17,210; Japan 14,468.
Silver:					
Waste and sweepings[4]	do.	358,105	194,411	150,977	Japan 20,440; Canada 8,598.
Metal including alloys, unwrought and partly wrought	do.	740	941	149	Hong Kong 710; Netherlands 70.
Tin:					
Oxides	do.	8	83,370	—	Singapore 79,900; Thailand 2,000.
Metal including alloys:					
Scrap		41	1	—	All to Hong Kong.
Unwrought		18	18	—	Japan 14; Indonesia 2.
Semimanufactures		1,151	1,520	105	Hong Kong 825; Singapore 79.
Titanium:					
Ore and concentrate		84	—		
Oxides		3,840	407	(2)	Hong Kong 367; Thailand 21.
Metal including alloys, all forms		108	117	54	Japan 32; Hong Kong 17.
Tungsten: Metal including alloys:					
Scrap		18	19	—	Japan 10; Netherlands 7.
Unwrought		—	3	1	Germany 1.
Semimanufactures		195	35	(2)	Philippines 12; Malaysia 8; Hong Kong 5.
Uranium and thorium:					
Oxides and other compounds		17	14	14	
Metal including alloys, all forms		—	2	—	All to Singapore.
Vanadium:					
Oxides		225	18	—	All to Netherlands.
Metal including alloys, all forms	kilograms	—	300	172	France 128.
Zinc:					
Oxides		4,060	4,338	105	Japan 2,460; Malaysia 497; Hong Kong 446.

See footnotes at end of table.

TABLE 2—Continued

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Zinc—Continued:					
Blue powder	kilograms	24,160	6,898	—	Malaysia 4,000; Hong Kong 2,898.
Metal including alloys:					
Scrap		357	266	—	Malaysia 111; Hong Kong 91; Philippines 28.
Unwrought		2,410	1,080	49	Hong Kong 391; Malaysia 161; Thailand 154.
Semimanufactures		1,689	983	228	Hong Kong 247; Canada 85; Spain 75.
Zirconium:					
Ore and concentrate		129	109	—	Malaysia 40; Thailand 39; Hong Kong 30.
Oxides		10	30	—	Switzerland 26.
Metal including alloys, all forms		6	33	—	All to Hong Kong.
Other:					
Ores and concentrates		724	323	—	Hong Kong 164; Indonesia 138.
Oxides and hydroxides		251	248	—	Japan 159; Singapore 80.
Ashes and residues		1,692	641	—	Japan 569; Canada 30.
Base metals including alloys, all forms		123	94	7	Hong Kong 63; Thailand 7.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		1,169	513	—	Lesotho 230; Vietnam 138; Republic of South Africa 30.
Artificial:					
Corundum		(2)	(2)		
Silicon carbide		583	675	—	Japan 612; Thailand 56.
Dust and powder of precious and semi-precious stones including diamond	kilograms	2,280	480	—	Malaysia 300; Hong Kong 106.
Grinding and polishing wheels and stones		8,378	8,650	2,414	Thailand 1,936; Singapore 844; Hong Kong 635.
Barite		2	30	—	Malaysia 20; Singapore 10.
Boron materials:					
Crude natural borates		—	40	40	
Oxides and acids		55	44	—	Hong Kong 12; Sri Lanka 9; Republic of Korea 8.
Cement	thousand tons	893	917	—	Japan 397; Hong Kong 330.
Chalk		56	61	1	Hong Kong 40; Saudi Arabia 16.
Clays, crude:					
Bentonite		—	51	—	Malaysia 50.
Fire clay		176	342	—	Hong Kong 163; Philippines 58; Indonesia 56.
Fuller's earth		—	156	—	All to Hong Kong.
Kaolin		3,423	8,779	—	Indonesia 3,620; Philippines 2,435; Hong Kong 1,735.
Unspecified		3,392	5,829	4	Philippines 2,936; Hong Kong 1,290; Thailand 822.
Diamond:					
Natural:					
Gem, not set or strung	thousand carats	85	15,395	(5)	Hong Kong 5,530; Thailand 4,875; Belgium-Luxembourg 3,230.
Industrial stones	do.	—	1,610	—	Japan 1,110; Hong Kong 500.
Synthetic:					
Gem, not set or strung	do.	15	16,240	—	Thailand 15,950; Switzerland 250; Hong Kong 40.
Industrial stones	do.	59,835	46,325	—	Japan 45,375; Malaysia 560; Hong Kong 390.
Diatomite and other infusorial earth		195	528	(2)	Thailand 402; Philippines 87.
Feldspar, fluorspar, related materials		268	553	—	Philippines 230; Singapore 90; Hong Kong 81.

See footnotes at end of table.

TABLE 2—Continued

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials:					
Crude, n.e.s.		156	171	—	Hong Kong 74; Italy 20; Malaysia 18.
Manufactured:					
Ammonia		41	62	—	Hong Kong 60.
Nitrogenous		30,551	12,965	461	Thailand 5,961; Philippines 5,518.
Phosphatic		7,299	—		
Potassic		80,895	71,744	183	Hong Kong 26,548; Japan 26,036.
Unspecified and mixed		679	348	—	Hong Kong 284; Japan 20.
Graphite, natural		16	27	—	Indonesia 24; Hong Kong 3.
Gypsum and plaster		3,299	6,367	19	Philippines 2,242; Hong Kong 1,834; Thailand 895.
Iodine	kilograms	—	3,000	—	All to Hong Kong.
Kyanite and related materials		2	—		
Lime		31	48	—	Hong Kong 29; Malaysia 19.
Magnesium compounds:					
Magnesite, crude		—	172	—	Australia 80; Venezuela 42; New Zealand 20.
Oxides and hydroxides		949	292	(2)	Hong Kong 128; Philippines 60; Republic of Korea 60.
Other		—	2	—	All to Hong Kong.
Meerschaum, amber, jet		36	126	52	Philippines 60; Germany 7.
Mica:					
Crude including splittings and waste		273	189	—	Japan 112; Philippines 23.
Worked including agglomerated splittings		95	52	(2)	Hong Kong 35; Japan 17.
Phosphates, crude		134	152	—	Indonesia 70; Hong Kong 36; Philippines 30.
Phosphorus, elemental		(2)	16	—	Mainly to Belgium-Luxembourg.
Pigments, mineral:					
Crude		50	100	—	All to Hong Kong.
Iron oxides and hydroxides, processed		201	705	—	Malaysia 444; Hong Kong 229.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	404,425	701,637	—	Hong Kong 493,345; Australia 41,638.
Synthetic	do.	130,612	289,023	35,531	Hong Kong 87,974; Thailand 66,062.
Quartz crystal, piezoelectric	do.	295	348	34	Hong Kong 170; Greece 117.
Salt and brine		8,000	9,000	—	All to Hong Kong.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		10,804	12,150	—	Indonesia 10,250; Thailand 1,004; Hong Kong 678.
Sulfate, manufactured		26,075	18,443	—	Republic of Korea 7,620; Malaysia 4,100; Philippines 2,980.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		5,899	5,499	356	Japan 4,551; Hong Kong 194.
Worked		52,117	60,608	17,119	Japan 18,271; Hong Kong 4,679.
Dolomite, chiefly refractory-grade		105,197	131,298	—	Japan 130,500; Singapore 560.
Gravel and crushed rock		382,700	480,073	3,025	Japan 466,512; Indonesia 5,727; Republic of Korea 3,352.
Limestone other than dimension		118	234	—	Indonesia 100; Hong Kong 60; Thailand 38.
Quartz and quartzite		115	492	—	Singapore 440; Republic of South Africa 20.
Sand other than metal-bearing		407,992	352,854	(2)	Japan 349,425; Indonesia 1,745.

See footnotes at end of table.

TABLE 2—Continued

TAIWAN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued:					
Elemental:					
Crude including native and byproduct		94	350	—	Malaysia 79; Vietnam 77; Thailand 68.
Colloidal, precipitated, sublimed		26	134	—	Hong Kong 52; Indonesia 46.
Sulfuric acid		194	286	7	Hong Kong 158; Thailand 101.
Talc, steatite, soapstone, pyrophyllite		1,741	1,033	(2)	Philippines 621; Hong Kong 307.
Other:					
Crude		8,277	5,853	—	Indonesia 3,192; Thailand 1,045.
Slag and dross, not metal-bearing		92,888	67,530	(2)	Japan 62,440; Philippines 4,000.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		(2)	—		
Carbon:					
Carbon black		10,822	8,543	—	Indonesia 4,271; Thailand 1,133; Malaysia 1,130.
Gas carbon		137	253	—	Malaysia 85; Indonesia 81; Hong Kong 51.
Coal, all grades including briquets		9	12	—	All to Hong Kong.
Coke and semicoke		24,527	1,314	646	Hong Kong 419; Japan 144; Indonesia 100.
Peat including briquets and litter		—	119	—	Japan 108; Vietnam 11.
Petroleum refinery products:					
Gasoline, motor	thousand 42-gallon barrels	3,085	1,608	NA	NA.
Mineral jelly and wax	do.	12	9	—	Thailand 3; Indonesia 2; Philippines 2.
Kerosene and jet fuel	do.	1,013	1,782	NA	NA.
Distillate fuel oil	do.	2,813	3,535	—	Panama 831; Hong Kong 429; unspecified 1,615.
Lubricants	do.	756	772	1	Republic of Korea 157; France 155; Indonesia 139.
Residual fuel oil	do.	8,094	10,266	—	Japan 1,268; Singapore 858; unspecified 8,118.
Bitumen and other residues	do.	278	196	—	Indonesia 94; Hong Kong 83; Japan 18.
Bituminous mixtures	do.	1	1	—	NA.
Petroleum coke	do.	104	16		Mainly to Japan.

NA Not available.

[1]Table prepared by Audrey D. Wilkes.

[2]Less than 1/2 unit.

[3]Unreported quantity valued at $5,000 exported to United States ($3,000) and Austria ($2,000).

[4]Includes other precious metals.

[5]Unreported quantity valued at $96,000.

TABLE 3

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	64	90	(2)	Japan 44; France 32; Germany 14.
Aluminum:				
Ore and concentrate	48,025	45,321	4	Malaysia 39,030; Japan 2,628; China 1,155.
Oxides and hydroxides	55,276	50,979	657	Japan 30,261; Australia 10,311.

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Aluminum—Continued:					
Metal including alloys:					
Scrap		70,265	128,649	79,036	Australia 10,598; United Kingdom 8,573; Netherlands 5,186.
Unwrought		245,356	315,604	35,423	Australia 154,209; United Arab Emirates 23,421; Saudi Arabia 16,557.
Semimanufactures		63,801	86,074	20,770	Japan 27,715; Australia 8,488; Belgium-Luxembourg 4,214.
Antimony:					
Oxides		1,075	1,753	69	Republic of South Africa 349; France 280; Japan 213.
Metal including alloys, all forms		1,954	2,443	(2)	China 1,186; Thailand 33; unspecified 1,218.
Arsenic:					
Elemental	kilograms	250	336	130	Japan 201; United Kingdom 5.
Oxides and acids		479	169	(2)	Mainly from France.
Beryllium: Metal including alloys, all forms	kilograms	7	51	46	Japan 5.
Bismuth: Metal including alloys, all forms		13	10	1	Japan 4; Republic of Korea 2.
Cadmium:					
Oxides and hydroxides		254	258	30	Belgium-Luxembourg 211; Republic of Korea 11.
Metal including alloys, all forms	kilograms	25,640	36,246	19	Australia 11,100; Belgium-Luxembourg 10,000; United Kingdom 5.
Chromium:					
Ore and concentrate		4,492	5,595	—	Republic of South Africa 1,324; Philippines 900; unspecified 3,248.
Oxides and hydroxides		3,009	3,069	239	Japan 1,323; Germany 951.
Metal including alloys, all forms		27	37	8	United Kingdom 16; Japan 9.
Cobalt:					
Oxides and hydroxides		148	133	20	Belgium-Luxembourg 67; Japan 23.
Metal including alloys, all forms		101	180	40	Zaire 38; Germany 32; Belgium-Luxembourg 19.
Columbium and tantalum: Tantalum metal including alloys, all forms	kilograms	411	377	47	Japan 329.
Copper:					
Ore and concentrate		10,625	301	—	Singapore 300.
Matte and speiss including cement copper		19	11	1	Singapore 6; China 1.
Oxides and hydroxides		362	686	120	Japan 314; Belgium-Luxembourg 73; Australia 56.
Sulfate		872	1,274	88	Japan 980; United Kingdom 139; Thailand 60.
Metal including alloys:					
Scrap		15,333	39,596	14,240	United Kingdom 6,674; Hong Kong 5,856.
Unwrought		256,168	404,984	144,359	Chile 151,989; Japan 32,765; Philippines 24,252.
Semimanufactures		56,490	74,335	5,367	Japan 40,292; Germany 7,064; Republic of Korea 5,910.
Germanium:					
Oxides	kilograms	145	100	(2)	Germany 70; Japan 30.
Metal including alloys, all forms	do.	34	2	2	
Gold:					
Bullion	kilograms	98,767	106,366	5,952	Switzerland 31,050; Hong Kong 20,882; Australia 13,579.
Metal including alloys, unwrought and partly wrought	do.	2,400	2,787	700	Japan 1,306; Singapore 617.

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	7,762	8,433	1	Australia 5,028; Brazil 2,916.
Pyrite, roasted		2	1	(e)	Mainly from Philippines.
Metal:					
Scrap		1,286,723	2,262,211	776,655	Netherlands 694,122; Hong Kong 278,967.
Pig iron, cast iron, related materials		708,700	926,512	6,527	Brazil 684,170; Japan 24,634.
Ferroalloys:					
Ferrochromium		35,182	57,246	13	Republic of South Africa 24,006; unspecified Africa 32,505.
Ferromanganese		21,120	19,348	—	Republic of South Africa 5,752; Japan 4,534; Philippines 3,514.
Ferromolybdenum		434	433	60	United Kingdom 154; Chile 75; Germany 72.
Ferronickel		(e)	—		
Ferrosilicomanganese		12,430	31,272	18	Republic of South Africa 8,325; Japan 6,387; Philippines 6,218.
Ferrosilicon		36,207	41,412	551	Philippines 13,753; Japan 11,410.
Silicon metal		11,037	17,613	13	China 10,736; Germany 1,061.
Unspecified		1,820	2,882	709	United Kingdom 753; Japan 416.
Steel, primary forms		2,461,379	3,837,135	187,462	Brazil 642,654; Poland 482,286; U.S.S.R. 326,838.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		991,933	1,807,477	190,927	Japan 574,694; Brazil 387,200.
Clad, plated, coated		618,948	879,953	21,313	Japan 366,863; Republic of Korea 93,979; Republic of South Africa 30,435.
Of alloy steel		212,165	277,758	5,629	Japan 168,321; Finland 15,716; Republic of Korea 15,164.
Bars, rods, angles, shapes, sections		1,271,979	1,573,152	17,519	Japan 598,138; Brazil 217,560.
Rails and accessories		24,372	23,581	2,432	Japan 9,921; Republic of Korea 6,056.
Wire		27,493	29,505	2,063	Japan 15,568; Republic of Korea 4,533.
Tubes, pipes, fittings		178,227	220,510	1,583	Japan 136,309; Republic of South Africa 16,912; Hong Kong 13,719.
Lead:					
Oxides		2,073	1,074	16	Germany 387; United Kingdom 280; France 208.
Metal including alloys:					
Scrap		34,251	11,350	523	Australia 2,479; United Arab Emirates 2,452.
Unwrought		64,031	81,718	31,435	Australia 30,122; Indonesia 4,182.
Semimanufactures		112	160	10	Japan 111; Australia 20.
Lithium: Oxides and hydroxides	kilograms	24,338	31,956	20,999	Canada 6,000; Japan 1,912.
Magnesium: Metal including alloys:					
Scrap		17	—		
Unwrought		1,022	1,743	750	Norway 604; U.S.S.R. 270.
Semimanufactures		148	121	114	Germany 3.
Manganese:					
Ore and concentrate, metallurgical-grade		141,392	125,004	—	Australia 25,652; Gabon 17,551; India 15,050.
Oxides		3,893	5,160	—	India 3,345; Japan 748; Australia 400.
Metal including alloys, all forms		89	167	2	Germany 51; Republic of South Africa 46; Japan 35.

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Mercury:				
Cinnabar and vermillion	15	21	—	China 3; unspecified Asia 16.
Metal	11	14	4	Spain 8; Japan 1.
Molybdenum:				
Oxides	10	65	53	Belgium-Luxembourg 12.
Metal including alloys:				
Scrap kilograms	—	1,924	424	Japan 1,500.
Unwrought	109	97	68	Germany 21; Japan 6.
Semimanufactures	30	31	17	Japan 11.
Nickel:				
Matte and speiss	6,035	7,280	—	Australia 4,174; Canada 3,106.
Oxides and hydroxides	398	431	(2)	Canada 372; Japan 33.
Metal including alloys:				
Scrap	14	82	—	Thailand 37; Canada 19; Indonesia 15.
Unwrought	11,153	13,145	37	Belgium-Luxembourg 5,222; Canada 4,732.
Semimanufactures	952	1,083	197	Japan 463; Australia 101; United Kingdom 70.
Platinum-group metals: Metals including alloys, unwrought and partly wrought kilograms	1,712	2,254	637	Canada 578; Japan 576.
Rare-earth:				
Ores and concentrates	332	548	527	Japan 10; Indonesia 6.
Oxides and other compounds	340	442	299	Japan 89; France 20.
Metals including alloys, all forms	56	52	6	Japan 42; Germany 3.
Selenium, elemental	24	42	(2)	Japan 31; Australia 10.
Silicon, high-purity	229	403	44	Australia 79; Japan 27; unspecified Africa 100.
Silver:				
Ore and concentrate[3] value, thousands	$2	$3	—	All from Indonesia.
Waste and sweepings[3] kilograms	8	1,105	—	Japan 720; Hong Kong 385.
Metal including alloys, unwrought and partly wrought	121	143	47	Australia 29; Japan 21.
Tellurium: Elemental kilograms	249	460	201	Peru 259.
Tin:				
Ore and concentrate	—	20	—	All from Singapore.
Oxides	24	44	(2)	China 20; Germany 9; United Kingdom 7.
Metal including alloys:				
Scrap	332	491	—	Singapore 410; Hong Kong 44; Malaysia 37.
Unwrought	5,164	7,349	5	Malaysia 4,114; Indonesia 1,499; Hong Kong 629.
Semimanufactures	338	509	65	Hong Kong 204; Japan 88.
Titanium:				
Ore and concentrate	18,617	20,014	—	Malaysia 16,788; Australia 2,271.
Oxides	24,217	27,011	271	Japan 15,702; Germany 6,458; United Kingdom 1,208.
Metal including alloys, unwrought and semimanufactures	254	629	83	United Kingdom 204; Japan 173; Germany 102.
Tungsten:				
Ore and concentrate	(2)	—		
Metal including alloys:				
Scrap	29	38	—	All from Japan.

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Tungsten—Continued:					
Metal including alloys—Continued:					
Unwrought	kilograms	11,273	21,571	15,604	Japan 2,837; United Kingdom 950.
Semimanufactures		584	73	38	Japan 24; Singapore 3.
Vanadium:					
Oxides and hydroxides		31	37	31	Japan 5.
Metal including alloys, all forms		38	19	(e)	Republic of South Africa 11; unspecified 8.
Zinc:					
Oxides		2,870	4,979	327	Thailand 1,302; Australia 743; Portugal 520.
Blue powder		652	824	—	Australia 269; Thailand 218; Republic of Korea 98.
Metal including alloys:					
Scrap		155,345	134,190	65,058	United Kingdom 14,215; Germany 11,343; Netherlands 9,243.
Unwrought		85,728	156,736	1,167	Canada 50,040; Australia 34,922; Peru 15,735.
Semimanufactures		1,507	2,933	288	Thailand 1,414; Japan 835; Germany 148.
Zirconium:					
Ore and concentrate		7,064	8,004	2	Australia 6,521; Malaysia 845.
Oxides		203	685	28	Germany 380; United Kingdom 136; Japan 99.
Metal including alloys, all forms		1	6	5	Germany 1.
Other:					
Ores and concentrates		3,097	2,368	204	Canada 940; Australia 522.
Oxides and hydroxides		1,416	1,975	7	Japan 1,745; Germany 148.
Ashes and residues		47,818	69,698	4,021	Japan 55,639; Singapore 2,819.
Base metals including alloys, all forms		9	24	2	Netherlands 20.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		13,637	11,975	269	Indonesia 4,559; Japan 1,294; France 701.
Artificial:					
Corundum		4,128	7,139	10	China 2,560; Japan 1,681; India 715.
Silicon carbide		5,948	7,211	55	China 1,553; Italy 1,486; Germany 828.
Dust and powder of precious and semi-precious stones including diamond	kilograms	13,423	21,939	699	Japan 18,951; Ireland 1,352; Hong Kong 582.
Grinding and polishing wheels and stones		3,727	4,536	408	Italy 2,043; Japan 1,032.
Asbestos, crude		15,165	8,080	96	Canada 4,766; Republic of South Africa 2,226.
Barite and witherite		11,960	5,832	—	Thailand 2,298; China 1,500.
Boron materials:					
Crude natural borates		3,649	5,644	3,923	Japan 1,680; Netherlands 40.
Elemental	kilograms	382	2,925	2,923	Germany 2.
Oxides and acids		4,668	4,819	1,977	Chile 1,022; China 525; Italy 436.
Bromine	kilograms	20,517	112,647	6,350	Israel 106,260; Japan 23.
Cement		930,024	1,186,497	72	Japan 502,588; Mexico 237,824; China 138,404.
Chalk		—	2	—	All from France.
Clays, crude:					
Bentonite		49,133	34,227	30,726	Australia 2,535; Republic of South Africa 235.
Fire clay		4,691	6,032	793	China 1,467; Japan 418.

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued:					
Kaolin		568,628	844,865	107,632	China 276,111; Indonesia 99,027; Malaysia 92,787.
Unspecified		115,594	31,183	7,073	Japan 9,110; Malaysia 8,758.
Cryolite and chiolite		4	13	—	Japan 10; Indonesia 3.
Diamond:					
Natural:					
Gem, not set or strung	thousand carats	4,940	1,850	25	Hong Kong 1,360; Belgium-Luxembourg 415.
Industrial stones	do.	25	290	(2)	United Kingdom 120; Belgium-Luxembourg 100; Japan 65.
Synthetic:					
Gem, not set or strung	do.	1,570	15,055	(4)	Germany 14,800; unspecified 250.
Industrial stones	do.	2,115	460	40	Italy 210; Japan 170; Hong Kong 40.
Diatomite and other infusorial earth		6,117	6,920	5,401	Japan 801; China 447.
Feldspar, fluorspar, related materials		571,520	630,614	1,044	Thailand 213,073; China 135,442; Philippines 73,612.
Fertilizer materials:					
Crude, n.e.s.		1,034	2,229	103	Japan 1,447; Indonesia 188.
Manufactured:					
Ammonia		201,356	183,866	3	Bahrain 59,951; Australia 32,282; U.S.S.R. 29,728.
Nitrogenous		80,167	220,108	64	Saudi Arabia 142,334; Indonesia 58,238.
Phosphatic		197	318	—	Japan 220; Indonesia 98.
Potassic		257,412	329,747	72	Canada 170,952; U.S.S.R. 71,352; Israel 53,701.
Unspecified and mixed		19,208	23,751	6,145	Japan 9,666; Germany 2,396.
Graphite, natural		7,393	13,429	47	Republic of Korea 8,152; China 2,747.
Gypsum and plaster		462,635	539,369	763	Thailand 535,937; Japan 1,407.
Iodine		25	26	9	Japan 8; Belgium-Luxembourg 4.
Kyanite and related materials		4,229	20,695	1,058	India 11,948; Republic of South Africa 2,492; Japan 2,099.
Lime		42	111	—	Japan 71; Austria 40.
Magnesium compounds:					
Magnesite		123	237	—	Philippines 100; Japan 97; Thailand 40.
Oxides and hydroxides		60,921	79,350	805	China 24,657; Japan 12,819; Malaysia 5,452.
Meerschaum, amber, jet		382	303	(2)	Japan 97; Netherlands 96; Philippines 55.
Mica:					
Crude including splittings and waste		1,116	1,177	164	Malaysia 449; India 254.
Worked including agglomerated splittings		280	300	19	Japan 103; Belgium-Luxembourg 92; India 39.
Phosphates, crude		420,425	348,656	—	Jordan 250,677; Morocco 52,200; Israel 42,587.
Phosphorus, elemental		1,752	4,956	1	China 2,411; U.S.S.R. 1,695.
Pigments, mineral:					
Natural, crude		706	365	—	France 239; Austria 81.
Iron oxides and hydroxides, processed		31,066	27,277	140	Japan 18,365; Germany 2,394.
Potassium salts, crude		44	66	—	All from Germany.
Precious and semiprecious stones other than diamond:					
Natural		2,847	3,943	49	Brazil 1,955; Republic of South Africa 258.
Synthetic		48	55	30	Japan 8; Belgium-Luxembourg 6; Italy 5.
Pyrite, unroasted		14	40	—	All from Japan.
Quartz, piezoelectric:					
Natural	kilograms	29	—		

See footnotes at end of table.

TABLE 3—Continued

TAIWAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Quartz, piezoelectric—Continued:					
Synthetic	do.	105	1,349	—	Brazil 1,000; Japan 205; Republic of South Africa 93.
Salt and brine		942,384	855,840	150	Australia 855,285; Austria 200.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		121,182	129,332	8,912	Poland 8,912; Australia 5,116; Kenya 3,000.
Sulfate, manufactured		371	3,789	22	Japan 2,102; India 720.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		424,017	578,317	21,290	China 94,494; Spain 81,918; India 63,768.
Worked		26,046	30,685	218	Italy 13,661; Hong Kong 9,425.
Dolomite, chiefly refractory-grade		40,412	35,581	—	Philippines 32,365; United Kingdom 2,175.
Gravel and crushed rock		16,920	18,939	6,296	France 7,785; Philippines 4,320.
Limestone other than dimension		462,217	429,760	1	Japan 429,459; Thailand 300.
Quartz and quartzite		2,154	236	5	Japan 103; Hong Kong 40; Philippines 30.
Sand other than metal-bearing		216,081	240,169	2,620	Australia 117,793; Indonesia 62,857.
Sulfur:					
Elemental:					
Crude including native and byproduct		114,827	129,775	3,113	Canada 117,793; Japan 8,440.
Colloidal, precipitated, sublimed		116,400	96,207	612	Canada 67,277; Japan 27,732.
Dioxide		29	40	(2)	Germany 26; Japan 14.
Sulfuric acid		306,728	319,259	442	Japan 225,046; Republic of Korea 93,546.
Talc, steatite, soapstone, pyrophyllite		62,663	81,256	4,152	China 11,062; Republic of Korea 4,586.
Vermiculite, perlite, chlorites		8,840	9,228	63	Philippines 4,169; Japan 2,216.
Other:					
Crude		135,536	155,679	865	Republic of Korea 129,338; Japan 7,849.
Slag and dross, not metal-bearing		110,286	156,623	263	Japan 155,837; Norway 199.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		6	32	20	Japan 12.
Carbon:					
Carbon black		18,506	20,758	5,122	Australia 4,206; Japan 2,126.
Gas carbon		2,295	3,050	36	U.S.S.R. 3,014.
Coal, all grades including briquets	thousand tons	19,012	18,487	4,082	Australia 6,686; Republic of South Africa 2,441.
Coke and semicoke		164,379	262,804	(2)	Japan 153,494; China 27,719.
Peat including briquets and litter		2,530	14,213	47	Indonesia 9,658; Netherlands 1,076.
Petroleum:					
Crude	thousand 42-gallon barrels	151,431	182,144	—	Saudi Arabia 71,115; Indonesia 16,861; Oman 16,110.
Refinery products:					
Liquefied petroleum gas	do.	17,990	28,890	355	Indonesia 18,066; Saudi Arabia 7,288.
Gasoline	do.	377	—		
Mineral jelly and wax	do.	211	191	9	China 53; Japan 45.
Kerosene and jet fuel	do.	16,676	14,646	2,051	Singapore 9,643; Republic of Korea 1,096; Japan 968.
Distillate fuel oil	do.	5,035	1,670	154	Japan 338; Australia 182.
Lubricants	do.	1,284	1,611	381	Singapore 301; Japan 281.
Residual fuel oil	do.	16,400	16,967	11,022	Japan 5,131; United Kingdom 292.
Bituminous mixtures	do.	3	3	3	
Petroleum coke	do.	105	19	13	Germany 5.

[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Unreported quantity valued at $29,000.

TABLE 4
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Asia Cement Corp.	Hsinchu	1,800
Do.	do.	Hualien	11,150
Do.	Chia Hsin Cement Corp.	Kaoshiung	2,200
Do.	Lucky Cement Corp.	Tungao	1,800
Do.	Chien Tai Cement Co. Ltd.	Kaoshiung	1,758
Do.	Hsing Tai Cement Co. Ltd.	Taipei	1,300
Do.	Taiwan Cement Corp.	Chutung	1,400
Do.	do.	Hualien	280
Do.	do.	Kaoshiung	1,900
Do.	do.	Suao	2,230
Do.	Universal Cement Corp.	Kaoshiung	1,400
Coal, bituminous	Numerous independent operators	Taipei Prefecture (74 pits)	1,200
Marble	Taiwan Marble Co., Ltd.	Panchiao	10
Nickel	Taiwan Nickel Refinery	Kaoshiung	8
Petroleum:			
Crude thousand barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	do.	Kaoshiung	150,000
Do.	do.	Taoyuan	33,000
Steel	China Steel Corp.	Kaoshiung	6,400
Do.	Tung Eng Iron Work Co. Ltd.	do.	90
Sulfur	China Petrochemical Development Corp.	Taipei	50

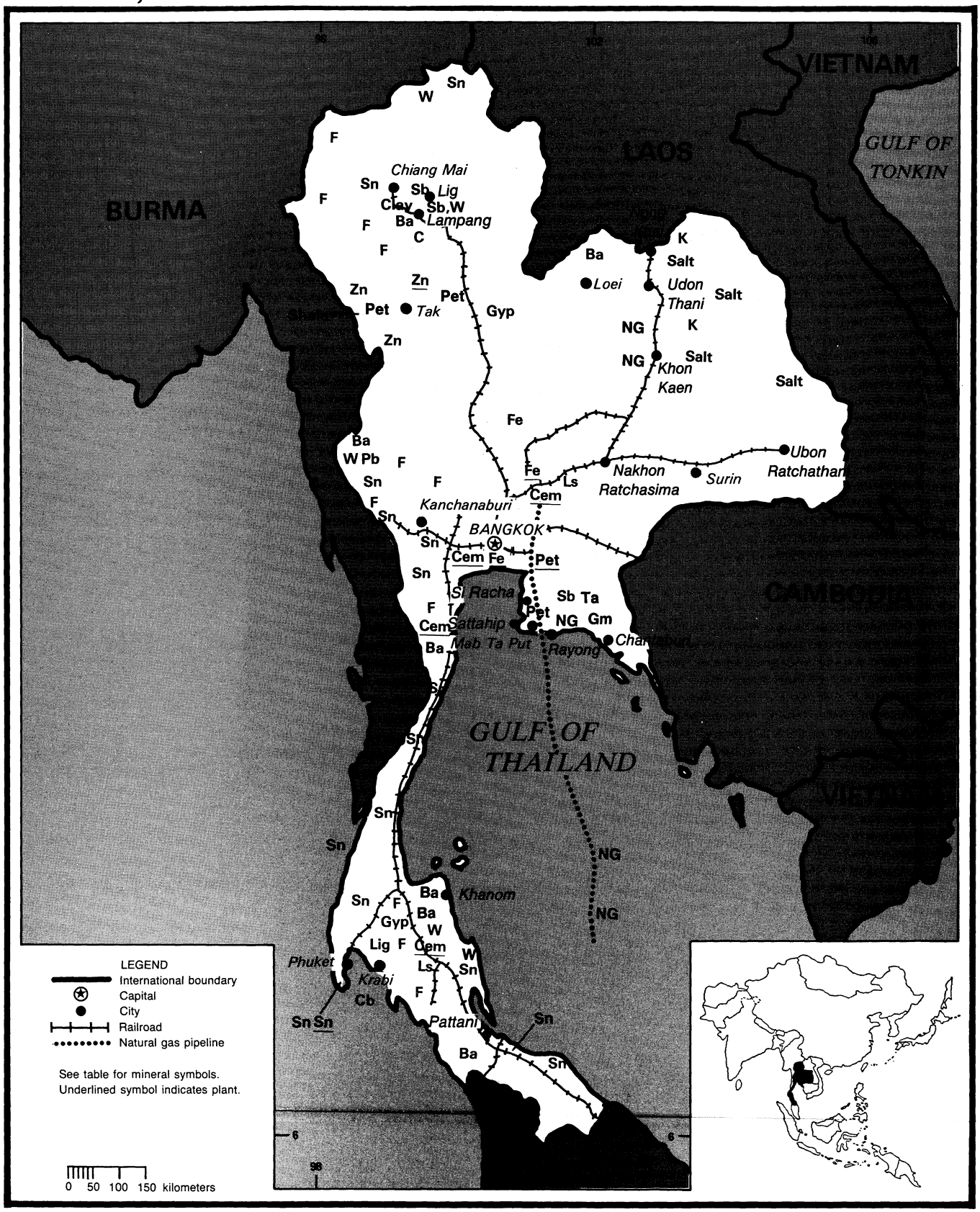
TABLE 5
TAIWAN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Metric tons unless otherwise specified)

Commodity	Reserves
Coal	170,000
Dolomite	110,000
Limestone	395,000
Marble	280,000,000
Natural gas thousand cubic meters	20,000,000
Talc	2,000

THAILAND

AREA 514,000 km² **POPULATION 57.6 million**



THE MINERAL INDUSTRY OF

THAILAND

By Pui-Kwan Tse

A year marked by political turmoils, the bloodshed forced the military rulers to revert their power to a democratically elected civilian government in September 1992. The global economy continued its slowdown. However, the Thai economy remained strong in 1992. The GDP expanded a healthy 7.5% from a year earlier. The Government made special efforts to lure back worried foreign investors and convinced them that the country's troubles had been revolved. Although the effort did not bring a flow of new foreign investment that was slowed with recession in the region, it did succeed in preventing investors from cancelling existing plans.

The new Government emphasized the development of rural areas. In the past several years, the differences in incomes and living standards between Bangkok and rural Thailand have grown more pronounced. The Government believed that developing rural areas will eliminate the country's horrendous communications and human congestion problems. Building better infrasturcture will attract people and job-creating business away from the capital. The Government also designed to build up infrastructure for the Eastern Seaboard and for the largely plantation- and tourism-based economy in southern Thailand.

Because of the rapid growth of the Thai economy in recent years, the consumption of energy also increased sharply. It placed severe pressure on the energy sector to meet the demand. Electricity consumption had outpaced the growth of capacity. Environmental concerns on the polluting of thermal powerplants are making it more difficult to meet future needs. The Government postponed construction of a coal-fired electricity generating plant because of fears of pollution.

Agricultural production, which accounted for 12% of GDP, grew only 3.6% in 1992, compared with 3.8% in 1991. However, the falling price on farm products could be trouble for farmers, who make up about 60% of the Thai work force.

The Government's private-investment index, which measures construction indicators, private-equity inflows, and machinery imports, fell below 100 through the year 1992. The drop indicated a less-than-healthy level of investment. It reflects that the three changes of Government affects the confidence of private investors. The Government also delayed public investment in infrastructure projects, resulting in a combined public-private investment increase of 1% in 1992, compared with that of 9.7% in 1991.

GOVERNMENT POLICIES AND PROGRAMS

Thailand's economic development policies are based on a competitive, export-oriented, free market philosophy. Building from a base of strong agricultural production, the Thai Government has pursued a policy of encouraging diversification toward export-oriented light industries and increased reliance on earnings from tourism. The monetary policy was to ensure sufficient credit expansion and that its distribution was beneficial to further economic growth and further development. A number of deregulations were undertaken to promote efficient management of financial institutions, such as relaxing branch openings, reducing commercial banks' Government bond holding from 9.5% to 8% of total deposit, and redefining "rural credit" to encompass enterprises related to rural job creation. The second phase of foreign exchange deregulation also was implemented to promote flexible capital movement. The authorities amended the revenue code to eliminate double taxation, setting a uniform rate of income tax at 15%. The Government planned to reduce the tariff on steel products from 30% to 15% in January 1993 and further reduce that to 10% in January 1995.

The Government introduced a 7% value added tax and inaugurated a new Securities and Exchange Commission in 1992. The new Securities Exchange Act designed to spur development of capital markets. The change also was intended to encourage companies to go public and promote the issue and trading of debt securities.

Increased public awareness of the environmental impact of mining, abetted by numerous inadequate reclamations of mined-out areas, has seriously constrained the expansion of the mining sector. Under the pressure from environmental groups and the general public, the Government was reluctant to open up national forest reserves, the last areas in Thailand with high potential for exploration and mining large mineral deposits. The Thai Development Research Institute, an influential private think tank, has proposed that the mining industry finance a bulk of $30 million for the reclamation. Miners would pay a set fee or "bond" per ton to extract ores. The set fee depends on the value of the mineral and on relevant environmental factors. The proposal remains under study.

PRODUCTION

The mineral industry in Thailand was an important economic force. In recent years, the mining sector has diminished

greatly in relative importance with the rapid rise of the manufacturing and service sectors. The new regulations under the umbrella of the National Environment Act also constrained the mining sector for expansion. The value of mineral exports has fallen from 15% to less than 1% of Thailand's total exports. The number of individuals employed in the mining sector has dropped from a peak of nearly 100,000 in 1980 to less than 40,000 in 1992.

There are more than 40 minerals produced in Thailand. However, only about 20 of them are considered to be economically significant. The major minerals produced were feldspar, kaolin, lignite, limestone, tin, and zinc. Zinc has replaced tin as the major metallic mineral produced and consumed domestically. The production of major mineral commodities is listed in table 1.

TRADE

In 1992, Thailand's balance of trade registered a deficit of $8.5 billion, down $1.5 billion from last year. This reflected a 15% rise in exports to $32.5 billion while imports were $41 billion, an increase of 10%.

The United States remained the most important export market for Thailand, climbing 20% in the first 10 months of the year compared with the same period as that of 1991. The second largest market was the European Community (EC), whose share declined to 21% of the total export value. Exports to Japan increased 12% in the period.

In 1992, imports from Japan continued to account for the largest share of the total imports, 30.3%, followed by the EC, with 14.5%. The Association of Southeast Nations (ASEAN) and the United States each accounted for a share of 12.6%. Exports and imports are listed in tables 2 and 3.

STRUCTURE OF THE MINERAL INDUSTRY

Minerals are counted as state-owned properties. All activities regarding mineral development are supervised by the Government to ensure that benefits will be maximized for the country. All mining companies are privately owned, except the lignite mine at Mae Moh in Lampang Province, which is owned by the Electricity Generating Authority of Thailand (EGAT), a state enterprise designated to mine lignite for power generation. Most mining companies in Thailand conduct small-scale operations. There are several large-scale mines in Thailand such as the zinc mine owned by Pa Daeng Co.; lignite mines operated by EGAT Lanna Lignite Co., and Ban Pu Co.; and a lead mine operated by Kanchanaburi Exploration and Mining Co. (KEMCO).

The country's mineral resources are distributed throughout the country. Petroleum occurrences are in the Gulf of Thailand, in a northern offshoot of the central plain, and in the central part of the Khorat basin in northeast Thailand. Principal companies and operating locations are shown in table 4.

COMMODITY REVIEW

Metals and Industry Minerals

Aluminum.—Nikkei Thai Aluminum, a subsidiary of Nippon Light Metal, Japan, commissioned its new alloy plant in Bangpoo near Bangkok. The new plant has the capacity of 12,000 mt/a. Even with the new plant, it would not meet Thai demand on aluminum alloy. The company began to plan for the construction of a second plant at Bangpakong, west of Bangkok. The plant would have a designed annual capacity of 24,000 tons.

Tone Kinzoku of Japan and JTS Engineering and Metal established a 49-51 equity to construct a 200-mt/month-capacity secondary aluminum plant at Patum Thani, 25 km northwest of Bangkok. The company plans to supply secondary ingot to Nikkei Thai Aluminum and other local Japanese-Thai joint-venture companies.

Copper.—Padaeng Poongsan Metal, a joint venture of Padaeng Industry and Poongsan Corp. Republic of Korea, began trial runs on its 15,000-mt/a copper fabricator plant, in the Laem Chabang Industry Estate on Thailand's east coast in August 1992. The company intended to sell 7,000 tons in the domestic market and 2,000 tons in the international market. Thailand's annual demand for copper alloys was expected to reach 13,000 tons in 1993; therefore, the company planned to expand its annual capacity to 20,000 or even 30,000 tons.

Padaeng Industry reached an agreement with the Vietnamese authorities for exploring mineral resources in Vietnam. According to the agreement, Padaeng Industry will provide the technology while the Vietnamese Government will provide information, including copper, lead, and zinc, and facilitate field work. The first phase of the program would take between 6 months and 1 year. If viable reserves are located, a joint-venture company would be formed to begin mine development work.

Iron and Steel.—In 1992, the demand for steel was about 7 Mmt; however, Thailand's total steel production was less than 1 Mmt—most of the balance came from imports. The Government has been actively promoting new steelmaking capacity by including incentives of 7-year tax reduction as well as cheap land and services in new industrial areas outside of Bangkok. The output capacity of finished products from minimills is expected to reach 1.6 Mmt/a in 1995.

The primary feasibility study on the construction of a 750,000-mt/a direct-reduced iron (DRI) plant has been completed. The DRI study is backed by eight EAF-based rolling mills, which hold a total 60% of the shareholding in the project; the Government agencies Industrial Finance Corp. of Thailand and the Crown Property Bureau hold the balance. The study indicated that it would be feasible if it can negotigate a reasonable price for gas. The state-owned Petroleum Authority of Thailand agreed in principle to supply natural gas at a discount rate. The study also indicated that the demand for iron ore was about 1 Mmt/a. The study group has identified and investigated a potential supply from an undeveloped magnetite deposit at 60 km south of Hanoi in

Vietnam. The ore has an iron content of 67% and has a minable reserve in excess of 300 Mmt. The deposit site is owned by the Vietnamese Government. A joint development of the iron ore mine between the Thai and the Vietnamese Government was proposed.

Siam Yamato, a joint venture between Siam Construction Steel, a subsidiary of Siam Cement Group of Thailand, and the Japanese Yamato Steel and Mitsui, is constructing a 600,000-mt/a H-beam plant at Matapu in Rayong Province. The plant is expected to be in commission in late 1994. Together with the newly constructed 300,000-mt/a minimill in the same location plus the upgrading of its Ta Luang plant at Ban Krusa, the Siam Cement Group has a total steel products capacity of 1.3 Mmt/a in the region. The H-beam plant will be equipped with a 130-mt/h electric arc furnace and matching ladle furnace from Danieli, the continuous caster from Mitsubishi Heavy Industries, and the rolling mills from Nippon Steel. The new facility will produce beams ranging from 200 mm to 600 mm. The scrap used for the mill will be imported from Australia and the United States.

Potash.—Japan's Fukuda Fund received a contract from ASEAN Potash Mining for studying the $289 million ASEAN potash project in the Bamnet Narong district of Chaiyaphum. ASEAN Potash Mining was established with shareholders of the Thai Government (20%), Charoen Pokphand Group (13.67%), the Malaysian and Indonesian Governments (13% each), Asahi Glass (11%), Padaeng Industry (10%), Industrial Finace Corp. of Thailand (10%), National Fertilizer Co., Asia Chemical Fertilizer Industry (1.33%), and Brunei, Singapore, and the Philippines (1% each). After mine construction is completed in 1996, the mine will have the capacity to produce 1 Mmt/a of potash. Most of the output will be sold in ASEAN countries. Potash reserves in the district are estimated at 570 Mmt.

Tantalum.—Thai Tantalum Co. Ltd., the new name for Thailand Tantalum Industry Co. Ltd., commenced its $36 million plant in the Map Ta Phut industrial estates, Rayong, in 1992. The plant in Rayong was built to replace the plant in Phuket that was burned down in 1986 by local protesters about the environmental problems on the resort area. The plant is owned by the Ministry of Finance Corp. (19.45%), Industrial Finance Corp. of Thailand (9.63%), commerical banks (33.41%), individual miners in Phuket (31.33%), and the rest from individual investors. The plant has an annual capacity of 450 tons of K_2TaF_7 and 45 tons tantalum pentoxide powder and niobium pentoxide powder.

Tin.—The tin concentrates and ingot productions dropped by 23% and 5% to 11,484 tons and 10,679 tons, respectively, in 1992. However, local demand for ingots rose 9% in 1992. The increase in domestic consumption was due to increasing demand from tinplate and solder industries, which represent 90% of demand. Thai Pioneer Enterprise, which is owned by Van Waaden and Associates of the Netherlands (60%) and local Thai business groups, including Universal Mining (12%) and Chavarat (8%), planned to increase annual tin production from 6,000 tons to 12,000 tons at its Pathum Thani plant in 1993. The expansion project will depend upon the recovery of the tin price, which dropped by 20% in 1992.

Mineral Fuels

Thailand lacks large mineral fuels reserves. The country relied on imports to meet its petroleum and other energy demands. Thailand's energy policy has concentrated on reducing the country's dependence on imported energy by developing indigenous energy resources and promoting energy efficiency. Thailand's Seventh Five-Year Plan (1992-96) continued to stress securing stable sources of energy supply at a reasonable price. Thailand was accelerating indigenous energy resource development and was participating in the development of energy resources in neighboring countries. In 1992, the production of crude oil and natural gas rose 10.3% to the equivalent 196,500 bbl/d of petroleum or 32% of Thailand's energy needs for petroleum. Currently, there are nine fields producing gas and condensate. Baanpot, Erawan, Funan, Kaphong, Platong, Satun, South Satun, and Surat of Unocal in the Gulf of Thailand and Shell Sirikit in central Thailand produce gas and condensate. Esso's Nam Phong Field in the northeast of Thailand produces gas only. There are five fields in central Thailand that produce crude oil: Shell's Pru Krathiam and Pratu Tao; BP's Neung and Sawng; and North Central International's Bung Ya.

Coal.—In 1992, Thailand produced 15.6 Mmt of lignite from the mine of the Electricity Generating Authority of Thailand (EGAT) and by two private companies, Ban Pu Coal and Lanna Lignite. Most of the output went into the generation of electricity at EGAT's Mae Moh plant in northern Thailand, next to an EGAT owned and operated mine. Anthracite production increased to 22,000 tons. Thai coal is of a low rank, with high ash and high moisture content with a heating value of 2,500 to 3,000 kcal/kg. Lignite production has grown rapidly from 1.5 Mmt in 1980 as a result of burgeoning demand for power generation. Demand is larger than domestic supply.

EGAT planned to build a $2.8 billion powerplant at Ao Phai near Chonburi, east of Bangkok. The plant, scheduled for completion in January 1997, would have produced 700 MW of electricity. Annually, the plant would consume 3.53 Mmt of imported coal. Three additional units will be installed between July 1997 and October 1998 and the Ao Phai plant would produce 2,800 MW, nearly one-half of the additional capacity that EGAT planned to install during Thailand's 1996-2001 Eighth Five-Year Plan. However, in September 1992, by the recommendation of the National Energy Policy Committee, the Government ordered the project to be suspended pending a further study on the plant's environment impact. The concerns about the effect of coal smoke on the environment had led EGAT to consider adding a scrubber to the plant. The

Government also ordered EGAT to form a working committee to look for alternate sites. The study will take about a year to complete. The delay in the startup of the Ao Phai powerplant will seriously disrupt the power supply planning.

Natural Gas.—Thailand's output of natural gas rose to 8.6 billion m^3 in 1992, an increase of 7.0% over that of 1991. Natural gas accounted for about 40% of Thailand's electricity.

The Petroleum Authority of Thailand (PTT), a state-owned enterprise, planned to construct a new power station to substitute for the new coal powerplant in Ao Phai. However, this would require a supply of 8.5 Mm^3/d of gas to generate 700 MW. But Unocal Thailand Ltd., which produces nearly 90% of Thailand's natural gas, was unable to make a firm commitment for supplying that extra amount of natural gas in 1997. Unocal delivers 22.6 Mm^3/d to PTT for use by EGAT. In the absence of a commitment from Unocal, PTT is trying to accelerate the development of its own discovered Bongkot Field. This field was scheduled to go on-stream in mid-1993. The initial production rate will be 4.25 Mm^3/d and will rise to 9.9 Mm^3/d in later years. PTT also is considering piping gas from Malaysia Peninsular. The Malaysian National Oil Co. agreed that the company would supply gas to PTT as early as 1995.

Since March 1991, British Gas had invested $21 million of its designed $110 million to make a seismic survey of its 15,544 km^2 in the Gulf of Thailand. The company expects to bring on-stream in 1995 the Bongkot Field, which will be linked by pipeline with the Erawan Field. The field has estimated gas reserves of 139 billion m^3 and will produce 4.2 Mm^3/d of gas and 2,500 bbl/d of condensate initially and 7 Mm^3/d of gas and 4,000 bbl/d of condensate within 3 years.

In 1992, Thailand and Malaysia overcame difficulties for the establishment of a joint authority to decide on the terms for management, exploration, production, and profit sharing in the 7,300-km^2 Thai-Malaysian Joint Development Area, farther south in the Gulf of Thailand. U.S. Triton Oil Co. holds the right for development activity in the area, which may have up to 100 Mm^3 of gas reserves. PTT expects the area to begin producing gas in 1998.

Petroleum, Crude.—Output of crude increased 4% to a total of 9.63 Mbbl in 1992. More than 90% of oil output comes from Royal Dutch Shell's Sirkit Field in Kampaeng Phet Province in central Thailand. In addition, Shell produced crude from the Pru Krathiam Field and Pratu Tao Field in nearby Phitsanulok Province. Oil experts have estimated that these fields will be exhausted by 1998.

In February 1992, the National Energy Policy Office agreed to allow the free establishment of oil refineries. Thailand had three refineries with a total capacity of 249,000 bbl/d. The Thai Government hopes that this will help Thailand become a regional export center for refined oil.

Reserves

Thailand is endowed with diverse mineral resources. There are extensive deposits of salt-type minerals such as rock salt and potash. Barites, diatomite, dolomite, feldspar, glass sand, gypsum, kaolin, and limestone also are present in a substantial amount. Exploration in Thailand has been aggressive and well organized, utilizing high-technology methods. Land use conflicts between mineral resources development and other sectors have become a major source of difficulty for the mining industry in Thailand. The conflicts have become so serious that emerging from the exploration activities will become more complex. Reserves of major mineral commodities are shown in table 3.

INFRASTRUCTURE

Thailand has 3,940 km of 1-m-gauge railroad, extending to most parts of the country, and 99 km of double track. The country has a total 44,534 km of highways, including 28,016 km of paved, 5,132 km of earth surface, and 11,386 km of under development. Thailand has 4,000 km of inland waterway, with 3,700 km navigable depth of 0.9 m or more throughout the year and others with minor waterways navigable by shallow-draft native craft.

Bangkok, Pattani, Phuket, Sattahip, and Si Racha are Thailand's major seaports. At least 15 other minor seaports are elsewhere along the Thai coast. The country has a total of 129 airfields. Among them, 103 are usable. Permanent, paved runways are utilized at 56 of these fields, 1 with runways more than 3,659 m; 12 with runways 2,440 to 3,659 m; and 28 with runways 1,220 to 2439 m. Navigation aids are modern and sophisticated.

OUTLOOK

The Thai Government is promoting the development of the petrochemicals industry on a priority basis to help fully exploit natural gas from the Gulf of Thailand. The Government sees such an industry as a means to add value to the gas, to provide raw materials at internationally competitive prices for downstream industries, to boost Thailand's exports, to develop the manufacturing industry, and to promote employment through the growth of labor-intensive downstream industries such as textiles.

The Thai Government recognizes the importance of energy conservation as a means of coping with rapidly increasing demand for both electricity and refined petroleum products. However, it has so far implemented only a few concrete measures. In a major step to combat Bangkok's severe air pollution by motor car emission, the Government will require that all refineries produce unleaded gasoline by September 1993.

On the whole, Thailand bids well to grow into a major economic and industrial nation through tax reforms to stimulate production, investment, and export. Thailand's economic policy will continue to emphasize production efficiency and competitiveness of its export.

[1]Where appropriate, values have been converted from Thai baht (B) to U.S. dollars at the rate of B25.00=US$1.00 in 1992.

OTHER SOURCES OF INFORMATION

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Bangkok 10400, Thailand
National Statistical Office
Office of the Prime Minister
Bangkok, Thailand
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132 Sinthorn Building
Room 11, Wireless Road
Bangkok 10500, Thailand

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185 Soi Putta-O-Soth New Road, Bangkok 10500, Thailand.

TABLE 1

THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS						
Antimony:						
Ore and concentrate:						
Gross weight		1,048	1,166	767	141	632
Sb content[e]		445	495	326	60	269
Metal, smelter		1,769	2,275	2,833	2,256	1,847
Chromium: Chromite, gross weight		776	416	—	—	—
Columbium and tantalum ores and concentrates, gross weight:[2]						
Columbite and tantalite:						
Gross weight	kilograms	124,000	109,000	9,000	3,000	e3000
Cb content	do.	21,080	18,530	1,530	e510	e500
Ta content	do.	33,480	29,430	2,430	e810	e800
Stuverite:						
Gross weight	do.	788,000	99,000	122,000	e100,000	e100,000
Cb content	do.	63,343	7,958	9,807	e8,040	e8,000
Ta content	do.	61,310	7,703	9,492	e7,780	e7,800
Iron and steel:						
Iron ore:						
Gross weight		99,257	177,373	128,626	240,075	427,242
Fe content		54,591	97,555	70,744	132,040	234,980
Metal: Steel:						
Crude		552,000	689,421	684,678	711,134	779,156
Semimanufactures (selected):						
Bars		356,000	498,986	597,899	620,438	1,019,689
Galvanized iron sheets		189,996	200,616	208,483	210,953	217,332
Tinned plates		147,337	149,478	173,110	190,386	226,368
Lead:						
Mine output, Pb content of 42.5% Pb concentrate		29,474	25,075	22,231	16,680	27,946
Metal: Ingot, secondary		15,614	18,711	15,861	12,843	18,906
Manganese ore:						
Battery- and chemical-grade, 75% MnO_2		3,530	3,115	2,405	2,539	1,676
Metallurgical-grade, 46% to 50% MnO_2		4,417	7,390	14,247	8,493	6,151
Total, gross weight		7,947	10,505	16,652	11,032	7,827
Total Mn content		3,815	5,301	7,993	5,300	3,800
Rare-earth minerals:						
Monazite concentrate, gross weight		590	631	377	400	89
Xenotime		101	35	14	15	e15
Tin:						
Mine output, Sn content		14,225	14,922	14,635	14,937	11,484
Metal, smelter, primary		14,675	14,571	15,512	11,255	10,679
Titanium:						
Ilmenite concentrate, gross weight		16,455	16,955	10,554	17,071	2,922
Leucoxene concentrate, gross weight		1,799	30	120	4	5
Rutile concentrate, gross weight		128	—	—	76	281

See footnotes at end of table.

TABLE 1—Continued

THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
METALS—Continued						
Tungsten concentrate:						
Mine output, gross weight		1,173	1,086	552	440	125
Mine output, W content		651	603	290	230	70
Zinc:						
Mine output, gross weight		420,102	412,620	404,100	496,006	407,180
Mine output, Zn content		78,000	62,831	61,534	87,000	e62,000
Metal, smelter, primary		68,600	68,376	63,257	62,152	60,557
Zirconium concentrate, gross weight		5,098	1,496	490	2,573	1,723
INDUSTRIAL MINERALS						
Barite		40,587	87,052	107,707	e100,000	46,328
Cement, hydraulic	thousand tons	11,514	15,024	18,054	18,054	21,832
Clays:						
Ball clay		86,890	134,921	183,313	178,192	224,254
Kaolin, marketable:						
Beneficiated		222,964	176,281	208,029	255,543	301,035
Nonbeneficiated		46,724	152,266	139,342	125,563	182,255
Filler[3]		288	277	319	733	3,445
Diatomite		470	1,412	4,593	7,328	10,425
Feldspar		293,678	515,206	311,249	702,603	559,806
Fluorspar:						
Crude mine output:						
High-grade		76,321	98,375	94,757	60,617	51,597
Low-grade		573	—	—	1,450	4,863
Total		76,894	98,375	94,757	62,067	56,460
Salable product:						
Acid-grade (beneficiated low-grade)		—	—	—	1,450	4,863
Metallurgical-grade		76,321	98,375	94,757	60,617	51,597
Total		76,321	98,375	94,757	62,067	56,460
Gemstones	carats	933,985	e2,000,000	3,577,000	4,351,641	4,765,820
Gypsum		4,549,011	5,477,237	5,753,351	7,196,390	7,111,109
Phosphate rock, crude		8,348	6,584	9,547	5,936	7,981
Salt:						
Rock		5,670	15,384	119,179	124,500	212,750
Other[e]		165,000	165,000	100,000	100,000	100,000
Sand, silica		242,385	296,130	421,508	157,464	e170,000
Stone:						
Calcite		171	2,400	40,160	18,000	17,215
Dolomite		140,455	257,576	379,548	481,866	331,819
Limestone for cement manufacture only	thousand tons	14,101	15,966	19,521	19,517	25,272
Marble		42,553	54,459	55,337	74,984	86,995
Marl for cement manufacture only	thousand tons	136	535	367	718	675
Quartz, not further described		28,449	33,850	22,074	20,312	18,051
Shale for cement manufacture only	thousand tons	2,283	2,452	2,686	2,448	2,860
Talc and related materials:						
Pyrophyllite		37,285	39,799	29,290	42,960	34,638
Talc		4,843	7,242	4,360	5,575	4,786

See footnotes at end of table.

TABLE 1—Continued

THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	1990	1991	1992[p]
MINERAL FUELS AND RELATED MATERIALS						
Anthracite		15,330	8,740	20,600	14,300	22,000
Coal: Lignite	thousand tons	7,274	8,899	12,421	14,689	15,618
Natural gas (gross production)-million cubic meters		5,997	5,990	6,525	8,079	8,643
Petroleum:						
Crude	thousand 42-gallon barrels	7,437	7,793	8,748	8,938	9,632
Natural gas condensate	do.	5,433	6,731	7,208	7,938	9,676
Refinery products:						
Liquefied petroleum gas	do.	1,931	2,189	e2,300	e2,350	e2,400
Gasoline	do.	15,781	16,980	e18,000	e18,200	e19,000
Jet fuel	do.	8,183	10,380	e12,000	e12,000	e12,500
Kerosene	do.	811	811	e900	e900	e900
Distillate fuel oil	do.	22,021	26,493	e28,000	e28,400	e28,500
Residual fuel oil	do.	15,907	21,933	e22,000	e22,300	e22,500
Unspecified[4]	do.	2,447	3,000	e3,300	e3,400	e3,400
Total	do.	67,081	81,786	e86,500	e87,650	e89,200

eEstimated. pPreliminary.

[1]Includes data available through Aug. 4, 1993.

[2]Excludes columbium- and tantalum-bearing tin slags.

[3]Kaolin for use as filler was not reported before 1988.

[4]Includes refinery fuel plus refinery gains or losses.

TABLE 2

THAILAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	1	4	—	All to Laos.
Aluminum:				
Oxides and hydroxides	65	207	—	Laos 206; Malaysia 1.
Metal including alloys:				
Scrap	38	802	—	Singapore 765; Japan 37.
Unwrought	41	247	—	Singapore 243; Japan 2; Malaysia 2.
Semimanufactures	4,843	3,236	1	Singapore 705; United Arab Emirates 570; Hong Kong 446.
Antimony: Metal including alloys, all forms	1,132	—		
Bismuth: Metal including alloys, all forms-	18	—		
Chromium: Ore and concentrate	—	27	—	All to Malaysia.
Columbium and tantalum:[2] Ores and concentrates	726	861	—	Germany 561; Hong Kong 183; Singapore 72.
Copper: Metal including alloys:				
Scrap	NA	6	—	All to Japan.

See footnotes at end of table.

TABLE 2—Continued

THAILAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
METALS—Continued				
Copper: Metal including alloys—Continued:				
Unwrought	500	12	1	Singapore 4; United Kingdom 4.
Semimanufactures	1,342	2,457	991	Hong Kong 464; Japan 232; Philippines 198.
Gold:				
Waste and sweepings kilograms	NA	1,987	1,958	Germany 28.
Metal including alloys, unwrought and partly wrought do.	NA	119	94	Germany 4; Israel 4.
Iron and steel:				
Metal:				
Scrap	9,763	10,434	14	Japan 8,824; United Kingdom 450; Singapore 160.
Pig iron, cast iron, related materials	1,365	1,451	—	Australia 356; Malaysia 185; Japan 80.
Ferroalloys: Ferromanganese value, thousands	—	$3	—	All to Germany.
Steel, primary forms	6	7	—	Malaysia 2; Hong Kong 1; unspecified 3.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	20,398	13,084	—	Singapore 7,723; Malaysia 2,578; United Arab Emirates 1,361.
Clad, plated, coated	4,139	3,679	—	Fiji 2,270; Laos 909; Burma 442.
Of alloy steel	159	255	—	Hong Kong 104; Japan 37; Singapore 32.
Bars, rods, angles, sections	10,099	5,056	1	Laos 2,196; Singapore 1,417; Burma 379.
Rails and accessories	10	5	—	Mainly to Laos.
Wire	1,904	3,098	96	Japan 1,045; Malaysia 1,030; Hong Kong 200.
Tubes, pipes, fittings	137,523	197,880	20,583	Iran 33,382; United Arab Emirates 31,027; Yemen 21,517.
Lead:				
Ore and concentrate	34,379	34,586	—	Japan 15,723; Belgium-Luxembourg 12,233; Netherlands 2,535.
Oxides	NA	20	—	All to Singapore.
Metal including alloys:				
Scrap	21	7	—	All to Laos.
Unwrought	1	100	—	All to Indonesia.
Semimanufactures	2	29	—	Philippines 18; Malaysia 7; Hong Kong 2.
Manganese:				
Ore and concentrate: Metallurgical-grade	120	—		
Oxides	60	9	—	All to Indonesia.
Nickel: Metal including alloys:				
Scrap	—	197	—	Singapore 142; Japan 18; unspecified 37.
Unwrought value, thousands	$11	—		
Semimanufactures do.	$1	$4	—	United Kingdom $3; Italy $1.

See footnotes at end of table.

TABLE 2—Continued

THAILAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	$93	$587	$2	Japan $561; Israel $15; India $7.
Silver:					
Waste and sweepings[3]	kilograms	349,727	183	62	Israel 69; France 27.
Metal including alloys, unwrought and partly wrought	value, thousands	$153	$49	—	Israel $17; Hong Kong $15; Australia $10.
Tin: Metal including alloys:					
Unwrought		11,881	6,255	—	Japan 5,035; Netherlands 520; Singapore 350.
Semimanufactures		8	—		
Titanium: Ore and concentrate		13,033	14,168	—	All to Malaysia.
Tungsten: Ore and concentrate		590	840	487	India 94; Singapore 94.
Uranium and thorium: Oxides and other compounds	value, thousands	NA	$4	—	All to Netherlands.
Zinc:					
Ore and concentrate		—	4,095	—	Belgium-Luxembourg 3,003; Germany 1,092.
Oxides		824	780	—	Singapore 298; Japan 172; New Zealand 90.
Metal including alloys:					
Unwrought		6,059	10	—	All to Japan.
Semimanufactures		7,417	5,280	—	Burma 4,419; Laos 422; Indonesia 229.
Zirconium: Ore and concentrate		23	2	—	NA.
Other:					
Ores and concentrates		—	18	18	
Oxides and hydroxides		—	27	18	France 6; Australia 1; Canada 1.
Ashes and residues		4,046	2,179	—	India 1,641; Indonesia 160; Belgium-Luxembourg 102.
Metalloids, n.e.s.[4]		2	—		
Base metals including alloys, all forms		1,151	1,324	220	India 261; Japan 240.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		7	(5)		
Artificial: Silicon carbide		NA	1	—	All to Japan.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$71	$93	—	India $64; Republic of Korea $13; Hong Kong $8.
Grinding and polishing wheels and stones		923	1,312	203	Singapore 229; Pakistan 93.
Asbestos, crude		—	5	—	All to Malaysia.
Barite and witherite		105,232	44,542	20	Indonesia 11,760; Singapore 9,264; Brunei 5,100.
Cement		43,599	23,282	—	Hong Kong 6,969; Laos 6,203; Australia 1,597.
Chalk		—	42	—	Malaysia 28; Greece 1; unspecified 13.
Clays, crude:					
Bentonite		NA	155	—	Malaysia 72; Indonesia 20; unspecified 63.
Kaolin		NA	13,117	4	Bangladesh 220; Singapore 43; unspecified 12,854.
Unspecified		16,302	8,739	6	Malaysia 3,408; Philippines 2,440; Indonesia 1,360.
Diamond: Natural:					
Gem, not set or strung	value, thousands	$304,342	$406,739	$42,228	Belgium-Luxembourg $140,941; Hong Kong $69,718; Japan $49,248.

See footnotes at end of table.

TABLE 2—Continued

THAILAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Destinations, 1991	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Diamond: Natural—Continued:				
Industrial stones value, thousands	$8,698	$9,633	$295	Belgium-Luxembourg $5,723; Australia $885; Sri Lanka $709.
Diatomite and other infusorial earth	50	—		
Feldspar	333,739	255,423	320	Malaysia 56,441; Singapore 649; unspecified 198,013.
Fertilizer materials:				
Crude, n.e.s.	51	42	—	All to Brunei.
Manufactured:				
Ammonia	7	124	—	Singapore 115; China 7; Laos 1.
Nitrogenous	4,530	NA		
Unspecified and mixed	2,583	360	(5)	Mainly to Cambodia.
Fluorspar	79,695	84,210	—	Japan 57,200; Republic of Korea 16,370; Philippines 1,100.
Gypsum and plaster	32,501	11,194,147	3,825	Singapore 5,606,385; Japan 3,565,604; Republic of Korea 465,700.
Lime	1,023	478	—	Malaysia 450; Laos 28.
Mica: Worked including agglomerated splittings	(6)	—		
Phosphates, crude	1	—		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$549,489	$501,852	$134,607	Japan $179,398; Hong Kong $48,850.
Synthetic do.	$24,746	$29,921	$12,943	Switzerland $4,831; Italy $3,718.
Salt and brine	31,091	55,375	2,022	Malaysia 38,683; Singapore 12,071; Brunei 746.
Selenium, elemental[7]	—	2	—	All to Indonesia.
Sodium compounds, n.e.s.:				
Soda ash, natural	NA	75	—	Malaysia 50; Singapore 25.
Sulfate, manufactured	3,965	400	—	All to Philippines.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	14,822	4,544	—	Japan 881; Netherlands 113; unspecified 3,550.
Worked	740	427	3	Japan 291; Australia 27; Laos 23.
Dolomite, chiefly refractory-grade	280,639	191,279	—	Japan 190,968; Saudi Arabia 220; Republic of Korea 50.
Gravel and crushed rock	103	558	—	Laos 203; Burma 173; Singapore 140.
Limestone other than dimension	3,759	2,818	—	Malaysia 1,490; Bangladesh 1,250; Laos 62.
Quartz and quartzite	16,800	8,002	—	Mainly to Japan.
Sand other than metal-bearing	1,949	2,181	—	Philippines 1,998; Singapore 139; Japan 40.
Sulfur:				
Elemental:				
Crude including native and byproduct	1,824	766	—	Bangladesh 500; Sri Lanka 180; Japan 50.
Colloidal, precipitated, sublimed	35	16	—	Sri Lanka 15; Indonesia 1.

See footnotes at end of table.

TABLE 2—Continued

THAILAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Destinations, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued:					
Sulfuric acid		344	703	—	All to Laos.
Talc, steatite, soapstone, pyrophyllite		1,074	1,735	24	Malaysia 1,073; Indonesia 501; United Arab Emirates 105.
Other:					
Crude		—	5,487	—	Philippines 5,400; Singapore 40; Laos 5.
Slag and dross, not metal-bearing		15,346	12,652	—	Germany 6,846; Saudi Arabia 1,807; Belgium-Luxembourg 1,372.
MINERAL FUELS AND RELATED MATERIALS					
Carbon black		6,527	17,235	—	Indonesia 8,147; India 6,683; Philippines 535.
Coal, all grades including briquets		108	338	46	Sri Lanka 216; Pakistan 54.
Gas, natural:					
Gaseous		—	12,264	—	All to Australia.
Liquefied		625,402	864,579	609,104	Australia 118,427; North Korea 84,684.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	10,231	468,304	—	Singapore 467,051; Laos 1,253.
Gasoline	do.	163,616	285,651	—	Laos 120,046; Singapore 34,723; unspecified 130,882.
Mineral jelly and wax	do.	6	16	—	All to Malaysia.
Kerosene and jet fuel	thousand 42-gallon barrels	1,920	2,417	—	Singapore 13; Malaysia 9; unspecified 2,393.
Distillate fuel oil	42-gallon barrels	150,356	129,841	—	Laos 121,508; Cambodia 7,632; Burma 701.
Lubricants	do.	24,437	92,302	—	Indonesia 39,095; Singapore 30,954; Laos 12,726.
Residual fuel oil	do.	—	168,678	—	Laos 573; unspecified 168,105.
Bitumen and other residues	do.	103	97	—	Laos 91; Nepal 6.
Bituminous mixtures	do.	—	18	—	Mainly to Laos.

NA Not available.

[1]Table prepared by Amy M. Burk.

[2]May include vanadium.

[3]May include other precious metals.

[4]Reported under SITC item number as "selenium, tellurium, phosphorus, etc."

[5]Less than 1/2 unit.

[6]Unreported quantity valued at $3,000.

[7]May include elemental phosphorus.

TABLE 3

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	23	4	—	All from Japan.
Aluminum:				
Ore and concentrate	25,102	32,076	—	China 22,176; Malaysia 9,900.
Oxides and hydroxides	27,800	8,339	187	Japan 5,216; China 2,457; Italy 236.
Metal including alloys:				
Scrap	2,012	709	57	Laos 332; Singapore 126; Australia 104.
Unwrought	128,135	146,747	17,563	Australia 72,244; Brazil 22,715; United Arab Emirates 11,301.
Semimanufactures	16,853	22,903	4,628	Japan 8,978; France 1,662.
Antimony: Metal including alloys, all forms	1	10	—	All from China.
Beryllium: Metal including alloys, all forms	—	1	(2)	Mainly from France.
Bismuth: Metal including alloys, all forms	8	5	—	Japan 2; United Kingdom 2; Germany 1.
Cadmium: Metal including alloys, all forms	2	2	—	Australia 1; Japan 1.
Chromium:				
Ore and concentrate	5,872	2,944	47	Philippines 1,650; Poland 500; Netherlands 395.
Oxides and hydroxides	1,047	887	136	Germany 423; United Kingdom 184.
Metal including alloys, all forms	9	7	1	Japan 3; United Kingdom 3.
Cobalt:				
Oxides and hydroxides	18	22	3	Belgium-Luxembourg 6; Canada 6; United Kingdom 5.
Metal including alloys, all forms value, thousands	$229	$416	—	Belgium-Luxembourg $234; Germany $157; United Kingdom $15.
Columbium and tantalum: Ores and concentrates[3]	420	847	—	Australia 562; Malaysia 180; Vietnam 105.
Copper:				
Ore and conentrate	—	278	81	Singapore 197.
Matte and speiss including cement copper	514	779	—	Singapore 778; Japan 1.
Metal including alloys:				
Scrap	2,450	1,331	392	Japan 431; Laos 292.
Unwrought	53,725	68,953	6,422	Zambia 42,843; Japan 8,967.
Semimanufactures	43,510	104,196	2	Saudi Arabia 43,077; United Arab Emirates 23,028; Bahrain 11,025.
Gold:				
Metal including alloys, unwrought and partly wrought kilograms	NA	42,277	43	Singapore 20,207; Switzerland 7,068; United Kingdom 6,302.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	NA	21	—	All from United Kingdom.
Pyrite, roasted	NA	5	—	Germany 3; Belgium-Luxembourg 1; France 1.
Metal:				
Scrap thousand tons	1,101	501	64	U.S.S.R. 71; Germany 63.
Pig iron, cast iron, related materials	110,475	81,528	(2)	China 70,220; Vietnam 7,522; Italy 2,487.
Ferroalloys:				
Ferrochromium	234	472	9	Spain 258; Italy 80; Germany 57.
Ferromanganese	6,783	5,484	23	China 2,751; Japan 775; France 748.

See footnotes at end of table.

TABLE 3—Continued

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Sources, 1991	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Ferroalloys—Continued:				
Ferronickel	86	NA		
Ferrosilicochromium	—	17	—	All from China.
Ferrosilicomanganese	1,171	1,411	—	China 1,373; Germany 21; Yugoslavia 11.
Ferrosilicon	6,452	NA		
Unspecified	9,011	287	—	China 171; Belgium-Luxembourg 29; Germany 21.
Steel, primary forms	979,645	891,557	17	China 477,771; Poland 117,223; U.S.S.R. 91,820.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	2,381,740	2,942,040	69,825	Japan 1,079,390; Brazil 318,936; U.S.S.R. 256,890.
Clad, plated, coated	260,512	370,930	15,818	Japan 240,822; Republic of Korea 79,450.
Of alloy steel	142,819	185,968	509	Japan 142,174; Germany 10,213; Republic of Korea 8,793.
Bars, rods, angles, shapes, sections	1,648,700	1,423,211	10,348	Japan 302,718; Brazil 164,635; China 158,563.
Rails and accessories	2,734	3,575	—	Japan 1,887; China 726; Austria 524.
Wire	39,433	38,496	57	Japan 11,759; China 9,292; Republic of Korea 4,138.
Tubes, pipes, fittings	86,556	92,212	1,586	Japan 61,459; Republic of Korea 9,485; China 4,930.
Lead:				
Ore and concentrate	—	45	—	All from Malaysia.
Oxides	1,611	8,854	—	France 2,652; Mexico 798; Germany 300.
Metal including alloys:				
Scrap	7,592	16,293	418	Japan 5,225; Singapore 3,449; Australia 2,438.
Unwrought	14,338	25,528	784	Australia 16,066; Canada 2,758; Indonesia 2,405.
Semimanufactures	182	337	4	Australia 133; Belgium-Luxembourg 80; Japan 74.
Magnesium: Metal including alloys, all forms	201	205	87	Japan 46; Yugoslavia 16.
Manganese:				
Oxides	1,616	2,010	—	China 842; Australia 500; Singapore 141.
Metal including alloys, all forms	34	39	(2)	Japan 21; United Kingdom 12; Germany 6.
Mercury	10	11	3	Germany 4; China 2.
Molybdenum: Metal including alloys, all forms	2	6	3	Unspecified 3.
Nickel:				
Matte and speiss value, thousands	$2	—		
Metal including alloys:				
Scrap	1	—		
Unwrought	928	812	7	Canada 338; Norway 235; China 94.
Semimanufactures	145	120	55	Japan 57; Germany 7.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$8,485	$10,223	$1	Japan $9,949; Germany $164; Hong Kong $97.
Rare-earth metals including alloys, all forms do.	NA	$4	—	Mainly from Japan.

See footnotes at end of table.

TABLE 3—Continued

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
METALS—Continued					
Silicon, high-purity		77	367	21	China 187; Australia 145.
Silver:					
Waste and sweepings[4]	kilograms	NA	145	1	France 144.
Metal including alloys, unwrought and partly wrought	value, thousands	$5,843	$7,553	$1,082	Philippines $1,841; Germany $803.
Tin:					
Ore and concentrate		118	330	—	Peru 195; Laos 114; Australia 21.
Metal including alloys:					
Unwrought		NA	98	—	Vietnam 97; Sweden 1.
Semimanufactures		115	163	(2)	Japan 156; Germany 5; unspecified 2.
Titanium:					
Ore and concentrate		5,796	9,073	—	Australia 6,914; Vietnam 1,830; Mozambique 200.
Oxides		2,288	2,182	6	Japan 478; Germany 388; France 320.
Metal including alloys, all forms	value, thousands	(3)	$983	$65	Japan $756; United Kingdom $27.
Tungsten: Metal including alloys, all forms		1	1	(2)	Germany 1.
Uranium and thorium: Metals including alloys, uranium	value, thousands	—	$83	—	Netherlands $54; Germany $25; Japan $3.
Zinc:					
Ore and concentrate		1,000	33,865	—	Vietnam 19,254; Australia 14,612.
Oxides		2,965	1,543	(2)	China 852; Vietnam 110; Japan 70.
Blue powder		NA	462	117	Norway 169; Singapore 112.
Metal including alloys:					
Scrap		84	107	—	Japan 99; unspecified 8.
Unwrought		4,737	11,247	(2)	Australia 6,527; Belgium-Luxembourg 1,982; Spain 456.
Semimanufactures		1,068	1,494	3	Belgium-Luxembourg 468; Canada 399; Indonesia 298.
Zirconium:					
Ore and concentrate		1,108	1,904	—	Vietnam 1,902; unspecified 2.
Metal including alloys, all forms	value, thousands	NA	$7	—	Japan $3; United Kingdom $3; Netherlands $1.
Other:					
Ores and concentrates		8,172	2,695	(2)	Burma 1,866; China 799; Malaysia 30.
Oxides and hydroxides		—	850	128	Japan 233; Norway 139; China 109.
Ashes and residues		208	448	73	Singapore 88; United Kingdom 79.
Metalloids, n.e.s.[6]		84	54	(2)	China 34; Germany 6; India 6.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		14,232	17,628	16	Indonesia 14,224; Netherlands 1,923; India 1,054.
Artificial:					
Corundum		742	1,847	4	China 996; Italy 379; Japan 209.
Silicon carbide		2,110	1,941	9	China 892; Germany 461; Brazil 280.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$732	$1,083	$317	Japan $363; China $183.
Grinding and polishing wheels and stones		4,070	5,272	19	Italy 1,654; Japan 931; Spain 415.

See footnotes at end of table.

TABLE 3—Continued

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Asbestos, crude		116,652	271,011	1,752	Mozambique 132,588; Canada 94,206; Brazil 18,270.
Barite and witherite		1,037	4,136	—	Switzerland 2,028; Laos 1,500; China 599.
Boron materials: Oxides and acids		663	1,199	973	Italy 180; Germany 24.
Cement		3,057,832	6,328,645	1,296	Japan 1,514,056; China 1,064,884; Saudi Arabia 921,399.
Chalk		111	307	1	Belgium-Luxembourg 282; United Kingdom 10; Italy 3.
Clays, crude:					
Bentonite		NA	22,407	8,442	Republic of Korea 5,201; United Kingdom 2,779.
Kaolin		NA	40,742	12,804	Indonesia 10,086; Malaysia 8,327.
Unspecified		82,080	30,088	363	China 18,086; United Kingdom 4,709; Hong Kong 3,100.
Cryolite and chiolite		26	19	—	All from Japan.
Diamond: Natural:					
Gem, not set or strung	value, thousands	$689,708	$784,432	$62,556	Belgium-Luxembourg $292,444; India $169,558; Hong Kong $73,209.
Industrial stones	do.	$37,035	$31,041	$1,596	United Kingdom $16,499; Netherlands $11,568.
Diatomite and other infusorial earth		275	243	219	Malaysia 24.
Feldspar, fluorspar, related materials:					
Feldspar		NA	8,154	14	Norway 4,451; Japan 1,150; Australia 959.
Fluorspar		NA	127	—	China 104; Japan 23.
Unspecified		3,116	—		
Fertilizer materials:					
Crude, n.e.s.		27	203	52	Laos 127; Canada 24.
Manufactured:					
Ammonia		18,289	29,755	—	Indonesia 17,286; Malaysia 11,955; Singapore 275.
Nitrogenous		1,039,270	855,495	32,687	Japan 186,365; Malaysia 135,752; Germany 89,249.
Phosphatic		6,233	7,365	(2)	Republic of Korea 2,050; Switzerland 1,954; Netherlands 1,000.
Potassic		122,382	111,162	5,000	Canada 50,680; U.S.S.R. 27,884; Germany 15,714.
Unspecified and mixed		1,652,456	1,397,684	62,811	Republic of Korea 421,833; Norway 212,252; Tunisia 119,991.
Graphite, natural		984	838	27	China 477; Republic of Korea 238; Japan 61.
Gypsum and plaster		3,230	11,135	17	United Kingdom 5,000; Germany 2,033; France 1,727.
Iodine[7]		6	20	(2)	Singapore 12; Japan 6; Germany 2.
Lime		114	107	—	United Kingdom 90; Malayasia 12; Singapore 5.
Magnesium compounds:					
Magnesite, crude		20,563	18,852	2,516	China 11,848; Japan 4,015.
Oxides and hydroxides		4,515	6,817	74	China 4,514; Japan 1,819; United Kingdom 211.
Mica:					
Crude including splittings and waste		596	510	8	Malaysia 218; India 187; China 42.
Worked including agglomerated splittings		132	147	(2)	Japan 89; Belgium-Luxembourg 30; India 6.
Nitrates, crude		1,580	2,396	—	Chile 1,784; Belgium-Luxembourg 274; China 243.
Phosphates, crude		1	(2)		

See footnotes at end of table.

TABLE 3—Continued

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Pigments, mineral:					
Natural, crude		11,145	13,556	—	China 4,636; Germany 1,967; Malaysia 1,537.
Iron oxides and hydroxides, processed		5,385	5,213	1,088	Germany 1,364; China 990.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$387,273	$1,023,165	$90,178	India $562,280; Hong Kong $260,034.
Synthetic	do.	$12,626	$17,171	$1,823	Switzerland $4,099; Republic of Korea $2,161.
Pyrite, unroasted		25	69	—	Japan 22; Germany 20; Sweden 20.
Quartz crystal, piezoelectric	value, thousands	NA	$799	$16	Japan $389; China $77; Hong Kong $58.
Salt and brine		828	934	85	Israel 248; United Kingdom 248; Germany 128.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		240,454	239,135	107,723	Kenya 42,750; Australia 20,638; Poland 19,450.
Sulfate, manufactured		56,497	33,025	3	China 29,944; Indonesia 2,140; India 600.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		2,537	8,231	(e)	China 3,391; Zimbabwe 1,330; India 714.
Worked		978	886	3	Italy 833; Japan 21; India 17.
Dolomite, chiefly refractory-grade		1,339	1,140	—	United Kingdom 754; Norway 383; France 3.
Gravel and crushed rock		3,017	4,087	4	France 3,177; Laos 250; China 235.
Limestone other than dimension		19	61	2	Japan 21; unspecified 38.
Quartz and quartzite		218	293	—	Italy 240; Netherlands 17; Japan 12.
Sand other than metal-bearing		982	1,483	96	Japan 540; Australia 526; Germany 119.
Sulfur:					
Elemental:					
Crude including native and byproduct		84,429	96,874	1	Canada 80,345; Singapore 15,793; Germany 320.
Colloidal, precipitated, sublimed		255	198	13	Germany 162; Japan 11.
Dioxide		21	41	—	United Kingdom 38; Australia 3.
Sulfuric acid		17,681	17,776	50	Japan 17,518; Germany 113.
Talc, steatite, soapstone, pyrophyllite		36,611	37,078	310	China 28,139; Republic of Korea 8,183.
Vermiculite[6]		261	95	—	All from China.
Other: Slag and dross, not metal-bearing		17,183	2,699	—	United Kingdom 1,360; Singapore 1,098; Japan 200.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		36	70	50	Republic of Korea 14; Belgium-Luxembourg 3; Japan 3.
Carbon black		13,162	13,475	476	China 6,701; Australia 3,274.
Coal:					
Anthracite		12,894	18,780	1	China 9,514; Vietnam 9,265.
Bituminous		191,886	423,532	—	Indonesia 193,686; China 186,474; India 43,104.
Briquets of anthracite and bituminous coal		33	3,664	—	Indonesia 3,600; Republic of Korea 64.
Lignite including briquets		—	5	5	
Coke and semicoke[9]		91,250	84,422	32	China 56,524; Japan 27,318; Switzerland 285.
Gas, natural: Liquefied	value, thousands	$12	$10	$10	

See footnotes at end of table.

TABLE 3—Continued

THAILAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Sources, 1991	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum:					
Crude	thousand 42-gallon barrels	69,254	73,767	—	Malaysia 21,704; United Arab Emirates 14,025; Saudi Arabia 10,932.
Refinery products:					
Liquefied petroleum gas	do.	1,162	415	27	Japan 82; Republic of Korea 66; Indonesia 39.
Gasoline	do.	3,870	4,588	—	Singapore 4,538; Republic of Korea 43; Saudi Arabia 6.
Mineral jelly and wax	do.	121	128	7	China 97; Japan 9.
Kerosene and jet fuel	do.	2,925	3,614	—	Singapore 3,347; China 34.
Distillate fuel oil	do.	32,661	37,087	—	Singapore 29,016; Republic of Korea 5,571; China 843.
Lubricants	do.	9,386	2,325	57	Singapore 1,241; China 481; Japan 237.
Residual fuel oil	do.	8,136	24,464	1,805	Singapore 9,511; Republic of Korea 6,806; Saudi Arabia 3,824.
Bitumen and other residues	do.	215	214	—	Singapore 203; Japan 9; Republic of Korea 2.
Bituminous mixtures	do.	21	19	(2)	Mainly to United Kingdom.
Petroleum coke	do.	—	27	2	Burma 20; United Kingdom 1.

NA Not available.
[1]Table prepared by Amy M. Burk.
[2]Less than 1/2 unit.
[3]May include vanadium.
[4]May include other precious metals.
[5]Unreported quantity valued at $3,000.
[6]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[7]May include bromine and fluorine.
[8]May include perlite.
[9]May include gas carbon.

TABLE 4

THAILAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony, concentrate	Associated Minerals Co. Ltd.	Bo Thang, 130 kilometers southeast of Bangkok (temporarily inactive)	6
Do.	Parasit Mining Co.	Doi Ngoem, 100 kilometers southeast of Chiang Mai	2
Barite	American Thai Barite Co. Ltd.	Siam Mine, 200 kilometers southeast of Phuket	25
Do.	P&S Mining Co. Ltd.	Loei Mine, 10 kilometers northwest of Loei	70
Do.	STA Mining Co. Ltd.	STA Mine, 105 kilometers southeast of Chiang Mai	100
Cement	Siam Cement Co. Ltd.	Kaeng Khoi, 90 kilometers north of Bangkok	3,300
Do.	do.	Tambol Tabkwang, Kaeng Khoi District, 90 kilometers northeast of Bangkok	2,800
Do.	do.	Tha Luang, 90 kilometers northeast of Phuket	3,200
Do.	do.	Thung Song, 130 kilometers east of Phuket	900
Fluorspar, concentrate	Phanom Thuan Mining Co. Ltd.	Phanom Thuan, 45 kilometers north of Kanchanaburi	60
Do.	Skt Minerals Co. Ltd.	Mine is 47 kilometers southeast of Krabi	65
Do.	Thai Fluorite Processing Co. Ltd.	Ban Lad, Phet Buri	120
Do.	United Fluorite Co. Ltd.	Salak Pra, 80 kilometers northwest of Kanchanaburi	26
Do.	Universal Mining Co. Ltd.	Mae la Luang, 120 kilometers west of Chiang Mai	35
Lead, concentrate	Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, 250 kilometers northwest of Bangkok	45
Steel, rolled	Bangkok Iron & Steel Co. Ltd.	Bangkok	160
Do.	Bangkok Steel Industry Co. Ltd.	Samut Prakan Province, south of Bangkok	210
Do.	Siam Iron & Steel Co. Ltd.	Saraburi Province, 100 kilometers north of Bangkok	220
Tantalum and niobium, in tin slag	Thai Tantalum Co. Ltd.	Rayong	500
Tin:			
Concentrate	Numerous small companies	Offshore Andaman Sea from southern tip of Burma to south of Phuket	NA
Do.	do.	Mostly south Thailand and along southern Burma border	NA
Refined	Thailand Smelting and Refining Co. Ltd.	Phuket	38
Tungsten, concentrate	Parasit Mining Co.	Doi Ngeom, 100 kilometers east	.1
Do.	Siamerican Mining Enterprise Co. Ltd.	Khao Soon, 185 kilometers east of Phuket (temporarily inactive)	1.2
Do.	Sirithai Scheelite Thailand Co. Ltd.	Doi Mok, 120 kilometers northeast of Chiang Mai (temporarily inactive)	.4
Zinc:			
Ore	Padaeng Industry Co. Ltd.	Mae Sot, 64 kilometers west of Tak	350
Refined	Do.	Tak	60

NA Not available.

TABLE 5

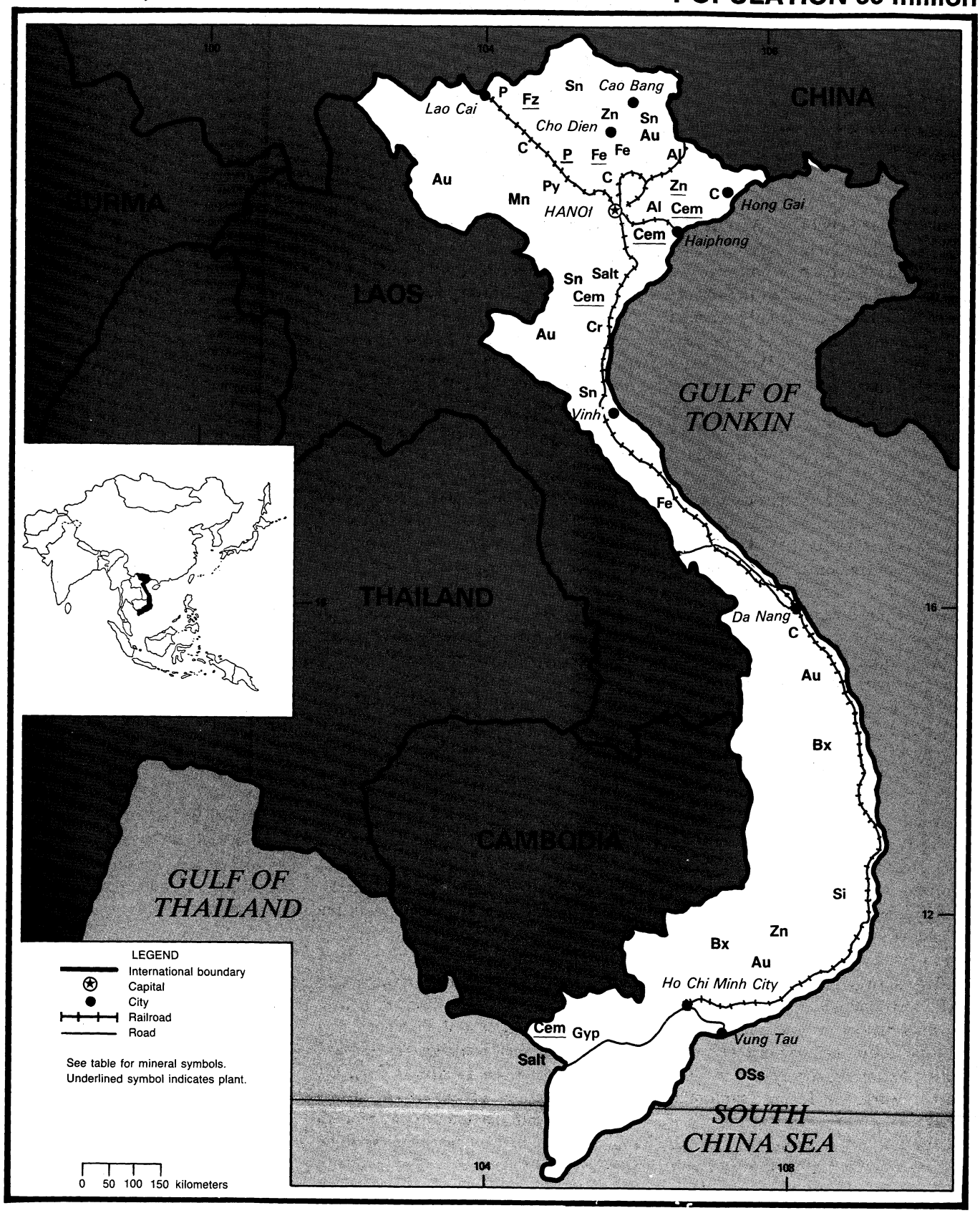
THAILAND: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Antimony	300
Barite	14,000
Clay, kaolin	500
Feldspar	43,000
Fluorspar	1,000
Gas, natural billion cubic meters	455
Gypsum	42,300
Lead	1,500
Lignite	2,100,000
Limestone	5,500,000
Petroleum, crude million barrels	325
Potash	570,000
Tantalum (including tantalum-bearing tin slags)	3,000
Tin	270
Tungsten	3
Zinc	3,800

VIETNAM

AREA 330,000 km² **POPULATION 69 million**



THE MINERAL INDUSTRY OF

VIETNAM

By Travis Q. Lyday

The Socialist Republic of Vietnam has had a centrally planned economy since 1976, when the former northern and southern areas partitioned in 1954 by the Geneva accords were officially reunited. Its economy has been one of devastation since 1945, when Japan's World War II occupation ended and the country first proclaimed independence. However, the economy in 1992 grew an estimated 5.3% over that of 1991, in part as a result of the Government's policy of "doi moi," or renovation, intended to introduce a free market to Vietnam without ejecting the authoritarian Government. Under "doi moi," the Government encourages private enterprise and trade to stimulate the transition from a centrally planned to a market economy.

The economy basically is agrarian, providing more than one-half of the country's gross domestic product and employing about 70% of the labor force. The cultivation of rice predominates. Inflation during 1992 was brought down to under 20%, after having been as high as several hundred percent just a few years ago.

In December, the United States authorized American firms to negotiate and sign joint-venture contracts with the Vietnamese. However, the contracts can go into effect only after the end of the U.S.-led embargo on trade with Vietnam, which was imposed in 1975. U.S. companies may open offices in Vietnam; hire local staff; and conduct feasibility studies, technical surveys, and other advance work, including exploration drilling.

Vietnam is rich in numerous minerals, including bauxite, chromite, coal, gold, iron ore, manganese, petroleum, phosphate rock, tin, and zinc. With the exception of petroleum, the mineral resources are predominantly in the northern region of the country. The major petroleum fields occur on the wide continental shelf off the southern coast in the South China Sea.

Exports of crude petroleum in 1992 continued to be the country's leading foreign exchange earner from the mineral sector and, coupled with rice, enabled the country to have a yearly trade surplus for the first time. Coal also was an important mineral export.

Despite the Government's policy of "doi moi," the mineral resources in Vietnam remain under state ownership and, with the exception of the petroleum sector, all mines and mineral processing plants are owned and operated solely by the Government. Petroleum exploration, development, and production projects are joint ventures between Petro Vietnam, the state oil company, and foreign companies. In addition, some mining, primarily for gold, is being done by individuals. The state-owned National Gold, Silver, and Precious Metals Corp. in Hanoi refines all the gold mined in the country.

Vietnam has a variety of coals, ranking from lignite to anthracite. Anthracite has been for many years the chief mineral commodity produced in Vietnam. The principal coal mines are in Quang Ninh Province, near Haiphong in the north, and in Quang Nam Province, near Da Nang in central Vietnam. The Government was planning to increase production to about 15 Mmt/a from the present capacity of about 9 Mmt/a through the introduction of new, modern mines, although these plans appear to be somewhat formidable. The industry currently is constrained by frequent failure with equipment and shortages with supplies, so that existing mines only operate at about 60% of design capacity. The state-owned Vietnam National Coal Import-Export and Materials Supply Corp. exported 1.6 Mmt in 1992, a 33% increase over that of 1991.

With the successful discovery in 1986 of hydrocarbons, petroleum increasingly is becoming more important to Vietnam's economy. Production in 1992 almost trebled that of 1991, and crude oil export earnings led over all other mineral commodities. The state-owned Oil and Natural Gas Import-Export Co. managed all crude oil exports, valued at more than $1 billion.[1] All production was from the Bach Ho (White Tiger) offshore oilfield by the Vietnam-Soviet Oil and Gas Joint Enterprise (Vietsovpetro), the operating company jointly owned by the Russian and Vietnamese Governments.

Since enacting in 1987 the law on foreign investment, 23 product-sharing oil and natural gas projects have been licensed, —10 alone in 1992—including a major project for the construction of a $300 million gas pipeline from the Bach Ho Oilfield to the coast involving Petro Vietnam and its Canadian partners. The gas will be used for power generation in the shortage-plagued southern region of the country.

Essential elements of the transportation infrastructure comprise about 85,000 km of roads, including 9,400 km bituminous, 48,700 km gravel or improved earth, and 26,900 km unimproved earth. The length of navigable inland waterways totals about 17,702 km, with more than 5,100 km navigable at all times by vessels up to 1.8-m draft. The rail system consists of 3,059 km of track, including 2,454 km of 1.000-m narrow gauge, 151 km of 1.435-m standard gauge, 230 km of dual gauge having three rails, and 224 km of unserviceable track. There are 50

principal airports with permanent-surface runways out of an aggregate of 100 in the country. International shipping ports include Da Nang, Haiphong, and Ho Chi Minh City. The merchant marine fleet includes eight petroleum-oils-lubricants tankers and three bulk ore freighters. There is about 150 km of pipeline for refined oil products. Electric generating capacity in 1991 was 3,300 MW.

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[1]Where necessary, the Vietnamese dong (D) has been converted into U.S. dollars at the rate of D10,600=US$1.00, the rate at yearend 1992.

OTHER SOURCES OF INFORMATION

Agencies

General Department of Chemicals
Hanoi, Vietnam
Ministry of Construction
Hanoi, Vietnam
Ministry of Energy
Hanoi, Vietnam
Ministry of Heavy Industry
Hanoi, Vietnam
Ministry of Power and Coal
Hanoi, Vietnam

TABLE 1
VIETNAM: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1988	1989	1990	1991	1992[e]
Bauxite: Gross weight		6,000	6,000	6,500	6,000	6,000
Cement, hydraulic	thousand tons	[3]1,954	2,000	2,500	3,000	3,000
Chromium: Chromite		4,000	3,500	3,500	35,000	3,500
Clays: Kaolin		700	750	750	800	800
Coal: Anthracite	thousand tons	[3]6,900	5,500	[3]4,022	4,000	[3]5,470
Gold	kilograms	1,000	1,200	1,200	1,300	10,000
Gypsum		25,000	25,000	25,000	r30,000	30,000
Iron and steel: Metal:						
Steel, ingot	thousand tons	115	115	r120	r120	120
Steel, rolled	do.	50	50	50	50	50
Nitrogen: N content of ammonia		36,000	36,000	36,000	36,000	35,000
Petroleum: Crude	thousand 42-gallon barrels	[3]5,475	[3]10,850	[3]19,700	[3]13,670	[3]38,950
Phosphate rock:						
Gross weight	thousand tons	330	500	[3]274	274	275
P_2O_5 content	do.	115	175	96	96	95
Salt	do.	300	320	340	350	350
Tin:						
Mine output, Sn content		700	850	850	r800	800
Metal, smelter		600	800	800	r500	500
Zinc:						
Mine output, Zn content		5,500	5,500	5,500	r15,000	15,000
Metal, smelter, primary		4,200	4,200	4,200	r10,000	10,000

rRevised.
[1]Table includes data available through June 2, 1993.
[2]In addition to the commodities listed, iron ore was mined in the past and pig iron was produced at industrial facilities, but the status of these industries under prevailing conditions is not sufficiently clear to allow formulation of reliable estimates of output levels. Similarly, data on output of crude construction materials are not available, and no basis is available to make reliable estimates of output levels.
[3]Reported figure.

TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Bauxite	Basic Chemical Corp.	Lo Son, believed to be in Hai Hung Province	NA
Do.	do.	Mieu, believed to be in Hai Hung Province	NA
Cement	Ministry of Construction	Bim Son, Thanh Hoa Province, 100 kilometers south of Hanoi	1,200
Do.	do.	Huang Thach, Hai Hung Province, 50 kilometers east of Hanoi	1,000
Do.	do.	Ha Tien, Kien Giang Province, 245 kilometers west of Ho Chi Minh City	1,300
Chromite	Basic Chemical Corp	Co Dinh, 100 kiometers north of Vinh, Thanh Hoa Province	4
Coal, anthracite	Ministry of Mines and Coal	Coc Sau, Deo Nai, Ha Tu, and Thong Nhat in the Hon Gai coalfield, north of Haiphong	6,000
Fertilizer:			
Apatite	General Department of Chemicals	Lao Cai, Hoang Lien Son Province, 250 kilometers northwest of Hanoi	300

See footnotes at end of table.

TABLE 2—Continued

VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1992

(Thousand metric tons)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Fertilizer—Continued:			
Phosphate, single superphosphate	General Department of Chemicals	Lam Thao, Vinh Phu Province, 70 kilometers north of Hanoi	[1]300
Iron:			
Ore	Ministry of Mines and Coal	Thach Khe, coast of Thach Ha District, Nghe Tinh Province, 175 kilometers southeast of Vinh	NA
Steel	do.	Thai Nguyen, 60 kilometers north of Hanoi	200
Tin:			
Ore	Ministry of Heavy Industry	Tinh Tuc mining area near Cao Bang	NA
Do	do.	Son Duong mining area, Ha Tuyen Province, 75 kilometers west of Hanoi	NA
Do	do.	Qui Hop, Nghe Tinh Province, 25 kilometers north-northwest of Vinh	NA
Metal	do.	Tinh Tuc, Cao Bang Province	1
Zinc:			
Ore	Ministry of Heavy Industry	Cho Dien, Bac Thai Province	10
Do	do.	Trang Da Mine, location unknown	NA
Metal	do.	Quang Yen, near Haiphong	6,000

NA Not available.
[1]Plant produced single superphosphate (SSP) fertilizer but it is not clear whether capacity is in P_2O_5 content or gross weight of SSP at 16% P_2O_5.

TABLE 3

VIETNAM: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES FOR 1992

(Thousand metric tons)

Commodity	Reserves[e]
Apatite	1,700,000
Chromite	750,000
Coal	200,000
Gold	1.5
Graphite	100
Iron ore	250,000
Kaolinite	50
Manganese	2,500
Petroleum crude thousand barrels	800,000
Tin	2,000
Zinc	200

[e]Estimated.

MAP SYMBOLS

Commodity	Symbol
Alunite	Alu
Alumina	Al
Aluminum	AL
Andalusite	And
Antimony	Sb
Arsenic	As
Asbestos	Asb
Asphalt	Asp
Barite	Ba
Bauxite	Bx
Bentonite	Bent
Beryllium/beryl	Be
Bismuth	Bi
Bitumen (natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium/calcite	Ca
Carbon black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium (niobium)	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Ds
Emerald	Em
Emery	E
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fz
Fluorspar	F
Gallium	Ga
Garnet	Gt
Gemstones	Gm
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Indium	In
Iron and steel	Fe
Iron ore	Fe
Jade	Jade
Kaolin	Kao
Kyanite	Ky
Lapis lazuli	Laz
Lead	Pb
Lignite	Lig
Lime	Lime
Limestone	Ls
Liquefied natural gas	LNG
Liquefied petroleum gas	LPG
Lithium	Li
Magnesite	Mag
Magnesium	Mg
Manganese	Mn
Marble and alabaster	Marb
Marl	Ma
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural gas	NG
Natural gas liquids	NGL
Nepheline syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (ammonia plants)	N
Ochre	Oc
Oil sands	OSs
Oil shale	OSh
Olivine	Ol
Opal	Opal
Peat	Peat
Perlite	Per
Petroleum, crude	Pet
Petroleum refinery products	Pet
Phosphate	P
Pig iron	Pig
Pigments, iron	Pigm
Platinum-group metals	PGM
Potash	K
Pozzolana	Pz
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or quartzite	Qtz
Rare earths	RE
Rhenium	Re
Salt	Salt
Sand and gravel	S/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	So
Soda ash, trona	NaAsh
Sodium sulfate	$NaSO_4$
Stone	St
Strontium	Sr
Sulfur	S
Talc	Tc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium (rutile or ilmenite)	Ti
Titanium dioxide (processed)	TiO_2
Tungsten	W
Umber	Um
Uranium	U
Vanadium	V
Vermiculite	Vm
Wollastonite	Wo
Yttrium	Y
Zinc	Zn
Zircon	Zr

MAP LEGEND

Symbol =	Mine, including beneficiation plants, wells
Circled Symbol =	Group of producing mines or wells
Underlined Symbol =	Processing plant or oil refinery, including smelters and metal refineries
(Symbol) =	Undeveloped significant resource

UNITS OF MEASURE AND ABBREVIATIONS

Unit of Measure

a =	year
° API =	American Petroleum Institute gravity
bbl =	barrel(s)
cal =	calorie(s)
c =	centi (prefix)
cm =	centimeter(s)
m^3 =	cubic meter(s)
d =	day(s)
dwt =	ton(s), deadweight
G =	giga (prefix)
GW =	gigawatt(s)
GW•h =	gigawatt hour(s)
g =	gram(s)
g/mt =	gram(s) per metric ton
ha =	hectare(s)
k =	thousand
kcal =	kilocalorie(s)
kg =	kilogram(s)
kL =	kiloliter(s)
km =	kilometer(s)
km^2 =	square kilometer(s)
kmt =	thousand metric ton(s)
kV =	kilovolt(s)
kW =	kilowatt(s)
kW•h =	kilowatt hour(s)
L =	liter(s)
M =	mega (prefix)
MW =	megawatt(s)
MW•h =	megawatt hour(s)
m =	meter(s)
M =	million
Mmt =	million metric ton(s)
m^2 =	square meter(s)
mt =	ton(s), metric
SCE =	standard coal equivalent
V =	volt
W =	watt
W•h =	watt hour

Abbreviation

APEC =	Asia and Pacific Economic Cooperation
API =	American Petroleum Institute
ASEAN =	Association of Southeast Asian Nations
EC =	European Community
EFTA =	European Free Trade Association
FTA =	Free Trade Agreement
GATT =	General Agreement on Tariffs and Trade
GDP =	gross domestic product
GNP =	gross national product
LNG =	liquefied natural gas (methane)
LPG =	liquefied petroleum gas (propane-butane)
NAFTA =	North American Free Trade Agreement
OECD =	Organization for Economic Cooperation and Development
OPEC =	Organization of Petroleum Exporting Countries
UN =	United Nations
UNDP =	United Nations Development Program