THE MINERAL INDUSTRY OF

JAPAN

By John C. Wu

Japan is a mineral-poor country. Its reserves of crude petroleum, natural gas, and most nonfuel minerals are very small. However, its reserves of iodine, limestone, silica stone and sand, and pyrophyllite are quite large and of world significance. Japan relied on imports to meet most of its raw material requirements for energy and most nonfuel minerals for its world-class mineral processing and manufacturing sectors. Japan also relied on imports to meet some of its requirements for base and rare metals, industrial mineral products, and refined petroleum products.

On January 17, 1995, a powerful earthquake (7.2 on the Richter scale) struck Kobe and the surrounding cities in the Kinki Region of western Japan. The devastating quake, with a horizontal swing of 18 centimeters, took 4,319 lives and caused extensive damages to the buildings, schools and medical facilities, houses, railroads, highways, bridges, port facilities, power lines, supply net works of gas and water, industrial materials production facilities, including several major mineral-processing and metal-fabricating facilities in the Amagasaki, Ashiya, Kobe, Nishinomiya, and Osaka areas.

After the earthquake, several major metal-production facilities in those areas were shut down or were temporarily put out of commission. Severely damaged ferrous and nonferrous metals- production facilities were the wharf, blast furnace, converter, rolling mill, and utilities system of the Kobe Steel Works of Kobe Steel Ltd. in Kobe; east and south wharfs, power supply and control cable system, and power station of the Kakogawa Steel Works of Kobe Steel in Kakogawa, Hyogo Prefecture; and the lead and zinc smelter and refinery of Sumitomo Metal Mining Co. Ltd. in Harima, Hyogo Prefecture. Other minor damaged metal-production facilities were Nishinomiya Steel Mill of Kawasaki Steel Corp., Sakai Steel Works of Nippon Steel Corp., Amagasaki Steel Works of Sumitomo Metal Industries Ltd., and the titanium sponge metal and high-purity silicon plants of Sumitomo Sitix Corp. However, according to the officials of MITI's Kinki Bureau and Kobe Steel, all ferrous and nonferrous metals production plants and facilities had returned to their normal operations by the end of August 1995.

Despite the devastating effects of the Hanshin (Osaka-Kobe) earthquake in 1995, Japan remained the world's largest producer of cadmium metal, indium metal, iodine, electrolytic manganese dioxide, pyrophyllite, selenium metal, steel, and tellurium metal. It was the world's second largest producer of cement, high-purity gallium metal, pig iron, nickel metal, and titanium sponge. Japan was the world's third largest producer of copper metal, limestone, and zinc metal.

In 1995, Japan was one of the world's top consumers and importers 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 ore and metal, liquefied natural gas (LNG), manganese ore, nickel ore and metal, crude petroleum, potash, phosphate rock, precious metals, rare earths, silicon, steel, zinc ore and metal, and zircon. On the other hand, Japan was one of the world's major exporters of cement, fertilizer materials, iodine, electrolytic manganese dioxide, high-purity rare metal products, steel products, and titanium sponge metal and mill products.

In 1995, the value of output by the mining sector was about $10 billion[1] at current prices, accounting for about 0.21% of Japan's gross domestic product in 1995. However, the mineral processing sector, which contributed about 5% to Japan's GDP, played a very important role in providing the primary materials for the world-class manufacturing sector of the Japanese economy and played a significant role in providing ferrous and nonferrous metals, and industrial mineral products to the growing economies of China, the Republic of Korea, Malaysia, Singapore, Taiwan, and Thailand.

Japan was an important market for U.S. exports of primary aluminum, beryllium metal, boron oxide and acid, chromium oxide and hydroxide, coal, copper (concentrate and refined 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, 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 was an important supplier of fabricated aluminum mill and copper mill products, cement, iodine, iron oxide, high-purity rare metals, high-quality steel products, titanium sponge, titanium scrap, and titanium powder to the United States.

Government Policies and Programs

The underlying mineral policy of Japan was to secure a stable supply of raw material requirements for its national security and growing economy. However, to achieve that overall policy objective for the next 10 years, the Ministry of International Trade and Industry (MITI) had set three additional objectives for the non-ferrous minerals sector. These objectives were (1) to improve competitiveness of domestic nonferrous metal smelters in the world market, (2) to encourage and support Japanese trading and mining companies to participate in overseas nonferrous minerals exploration and development projects, and (3) to encourage and support Japanese trading and mining companies to establish and invest in nonferrous metal smelting business overseas.

To achieve these policy objectives, the Government had designated the nonferrous metal-smelting industry as one of the depressed industries and provided financial assistance for restructuring of the industry and for development of a more competitive technology for nonferrous metal smelting and recycling. The Government also had provided technical and financial assistance with low-interest loans to support Japanese companies to develop overseas nonferrous metal mines.[2]

In 1995, the Government, through MITI's affiliated Metal Mining Agency of Japan (MMAJ),signed several cooperation agreements with mineral-rich countries to transfer mineral processing and pollution prevention technologies, as well as to participate in joint exploration for nonferrous minerals. In March 1995, MMAJ acted as a subcontractor to Japan's New EnergyIndustrial Technology Development Organization and signed a research cooperation agreement with Kazakstan's Eastern Research Mining and Metallurgical Institute for Nonferrous Metals for transferring leaching technology. The 7-year project involved construction and management of a pilot plant by MMAJ. The pilot plant will use the solvent extraction-electrowinning (SX-EW) technology to recover copper, gold, lead, silver, and zinc from residue (polymetallic slag) in eastern Kazakstan.[3]

In July 1995, MMAJ and the Japan International Cooperation Agency (JICA) agreed to provide development assistance to Albania at the request of Albanian Government in February 1995. The development aid involved a 3-year full-scale survey of chromium resources in central Albania. In September 1995, a group of geologists and mining specialist from MMAJ and JICA arrived in the Shebenik area, about 80 kilometers (km) southeast of Tirana (the national capital of Albania), to investigate chromium reserves in a 600-square-kilometer (km^2) area. According to MMAJ, the Shebenik area is known for having large-scale ultra-basic rock formations and about 300 sites show the existence of chromium reserves. Japan planned to invest about $1 million in the next 3 years for boring, sampling, and other activities.[4]

In August 1995, MMAJ and JICA agreed to provide assistance to Zimbabwe for exploring platinum resources in a 150-km^2 area of the Snake-Head region, about 150 km north of Harare (the national capital of Zimbabwe) at the northern tip of Great Dyke. The Great Dyke has composite layers of basic to ultra-basic rock with chromium and platinum group metals. The 3-year joint exploration with Zimbabwe's Ministry of Mines began in late 1995.[5]

In October 1995, a team of technical experts from MMAJ and JICA arrived in Oman to carry out exploration for copper, chromium, gold, silver, and other metals in a 3,300-km^2 area located in the Batinah region between the Gulf of Oman and the Hajar Mountains. The $2-million joint exploration project, which involved minerals exploration and training of Omanis in the evaluation of mineral deposits, was undertaken under an agreement signed between MMAJ, JICA, and Oman's Ministry of Petroleum and Minerals in February 1995.

In October 1995, MMAJ and JICA also signed an agreement with Tanzania's Ministry of Water, Energy and Minerals to jointly explore for gold in the Igengi area (60 km^2), the Mhunze area (150 km^2), and the Ibologero area (270 km^2), south of Lake Victoria, about 400 km northwest of Dodoma (the national capital of Tanzania). The 3-year exploration project began in December 1995.[6]

Environmental Issues

For the implementation of mining-related pollution prevention program in fiscal year 1994 ending March 31, 1995, MMAJ spent about 17% of its annual budget, or $62.7 million. According to the MMAJ annual report, by the end of the fiscal year, MMAJ had investigated 167 abandoned mines and had reported to the regional government the results of its investigation. MMAJ planned to carry out 43 pollution prevention construction projects out of 167 abandoned mines and planned to manage 41 sites out of the 43 projects. In fiscal year 1995, about $64 million was appropriated through MITI's annual budget for mining-related pollution prevention program. This fund was again implemented through MMAJ.

Production

Mine production of all nonferrous minerals continued the 1994 downward trend resulting from the fast depleting domestic ore reserves and further appreciation of the Japanese yen. Mine production of almost all industrial minerals and construction-related materials was at a lower level than that of 1994 owing to the continued weakness in the general economic condition in 1995.

In the mineral fuels sector, with only three major coal mines operating, coal output dropped to a record low in 1995. The Sorachi coal mine in Utashinai, Hokkaido Prefecture, was closed on March 3, 1995. Output of both

natural gas and crude petroleum was also at a lower level than that of 1994.

In the mineral-processing sector, metal production of bismuth, cadmium, copper, cobalt, ferroalloys, gold, indium, manganese dioxide, molybdenum, nickel, rare-earth oxide, steel, titanium sponge, and zinc increased from that of 1994 because of the short supply and higher prices. Production of most industrial mineral products decreased in 1995. Cement production declined slightly in 1995 resulting from general market contraction and restructuring of the industry. Production of most refined petroleum products rose slightly in 1995 owing to a higher demand for gasoline, naphtha, and distillate fuel oil. *(See table 1.)*

Trade

Japan was a major world importer of mineral fuels, nonfuel minerals, and nonferrous metals. It was also a major world exporter of processed minerals in 1995. According to the Ministry of Finance, import bills of coal, crude and partially refined petroleum, LNG, and refined petroleum products, rose from $47.8 billion in 1994 to 53.4 billion in 1995 owing to increased imports of coal and refined petroleum products. Import bills for nonfuel minerals and metals also rose from $18.3 billion in 1994 to $24.7 billion owing to increased quantity of imports and higher prices of ferrous and nonferrous minerals and metals. Imports of mineral fuels and nonfuel minerals and metals accounted for 15.9% and 7.3%, respectively, of Japan's total import bills in 1995.

Total exports of minerals commodities, including iron and steel, nonferrous metals, and industrial minerals, rose sharply from $28.9 billion in 1994 to 34.3 billion, accounting for 7.7% of Japan's total exports in 1995. Exports of iron and steel increased to $17.5 billion in 1995 from $14.8 billion in 1994. Exports of nonferrous metals and fabricated metal products rose to $11.3 billion in 1995 from $9.4 billion in 1994. Exports of industrial minerals also increased to $5.5 billion in 1995 from $4.7 billion in 1994. The increased export earnings from mineral commodities in 1995 was attributed mainly to higher export prices.

The United States remained Japan's most important trade partner 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 to $120.9 billion in 1995 from $117.6 billion in 1994, accounting for 27.3% of Japan's total exports in 1995. Imports from the United States also rose to $75.4 billion in 1995 from $62.7 billion in 1994, accounting for 22.4% of Japan's total imports in 1995. However, Japan's overall merchandise trade surplus with the United States shrank from $54.9 billion in 1994 to $45.4 billion in 1995 as a result of a substantial increase in imports from the United States.

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 coal-mining sector, a large industrial-minerals mining sector, and a large world-class ferrous and nonferrous-minerals processing sector. Mining- and mineral- processing businesses were owned and operated by private companies incorporated in Japan.

Because of the high value of the Japanese yen and economic recession during the first one-half of the 1990's, the minerals industry continued to cut its work force and output capacity in 1995. Contraction in the coal- and nonferrous-metal-mining sectors in the first one half of 1990's had extended to the nonferrous metals processing sector mainly because of higher value of the Japanese yen and high power cost. In 1995, two lead smelters closed down, and two lead smelters converted to a secondary lead smelter by recycling batteries. One major magnesium refinery, one major chromium metal refinery, one electrolytic manganese dioxide refinery, and one zinc refinery were permanently closed. One major zinc refinery was expected to be closed in June 1996.

According to MITI, coal was produced from three major mines and several small-scale mines in the Hokkaido and Kyushu areas with a total capacity of about 6.7 million metric tons per year (Mt/yr) and a work force of 2,700 in 1995. The number of operating nonferrous metal mines was reduced from 20 in 1994 to 19 in 1995, and employment declined from 1,427 in 1994 to 1,279 in 1995. The number of operating industrial minerals mines declined from 565 in 1994 to 557 in 1995, and employment declined from 12,810 in 1994 to 12,515 in 1995.

In line with the overall mineral industry's restructuring program, the steel industry, with an excess of workers, cut its employment from 271,905 in 1994 to 255,875 in 1995. However, the iron and steel industry increased its pig iron production capacity from 95.2 Mt/yr in 1994 to 95.5 Mt/yr in 1995 and raised its steelmaking capacity from 147.5 Mt/yr in 1994 to 149.8 Mt/yr in 1995. Despite a higher value of the Japanese yen and lower tariff on imports of nonferrous metals, Japan's refining capacity of copper remained unchanged at 1.3 Mt/yr because of strong domestic demand. However, the zinc-refining capacity was reduced to 754,800 metric tons per year (t/yr). Lead refining capacity was also reduced to 249,000 t/yr in 1995, but the two primary lead smelters had converted to a secondary smelter to recycle batteries in 1995. *(See table 2.)*

According to the Statistics Bureau of Japan's Management and Coordination Agency, the number of persons employed by the mining industry in 1995 declined to 50,000, accounting for 0.075% of the Japanese labor force of 66.7 million, compared with 60,000 persons, accounting for 0.094% of 63.8 million in 1990.

Commodity Review

Metals

Aluminum.—Production of primary aluminum by Nippon Light Metal Co. Ltd. at its Kanbara plant in Shizuoka Prefecture increased slightly, but remained insignificant in 1995. Since the mid-1980's, Japan had been dependent on primary aluminum imports to meet virtually all of its annual primary aluminum requirements. Japan was the world's largest importer of primary aluminum, accounting for 25% of the primary aluminum traded in the world market, and was the world's second largest consumer of primary aluminum in 1995.

According to MITI, imports of primary aluminum increased from 2.33 million metric tons (Mt) in 1994 to 2.43 Mt (in metal content of primary aluminum and alloy ingots) in 1995. The yearend overall stocks of primary aluminum by producer, dealer, and consumer increased from 385,940 metric tons (t) in 1994 to 405,216 t in 1995.

According to the Ministry of Finance, imports of primary aluminum totaled 2,802,781 t in 1995, of which 145,316 t was high-grade ingot, 1,901,106 t was regular-grade ingots, and 756,359 t was alloy ingot. Because of its heavy reliance on imports, Japan widely diversified its overseas sources of primary aluminum into more than 50 countries. However, about 66% of Japan's primary aluminum imports in 1995 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. Russia had moved up to the second largest suppliers of primary aluminum to Japan providing 443,439 t in 1995. The other major suppliers of primary aluminum in 1995 were Brazil, providing 500,548 t; Australia, 383,852 t; the United States, 226,002 t; Canada, 224,574 t; Venezuela, 194,287 t; and New Zealand, 176,464 t.

Domestic demand for primary aluminum totaled 2,259,541 t in 1995. According to MITI, consumption of primary aluminum by the aluminum rolling and aluminum casting sectors increased in 1995 owing to the continued improvement in the manufacture of automobiles, aluminum cans, building materials, and home electric appliances. In 1995, consumption of primary aluminum by sector was as follows: 1,874,789 t by aluminum rolling; 106,596 t by aluminum casting; 93,250 t by secondary smelting; 89,220 t by wire and cable; and 95,686 t by aluminum diecasting, steel deoxidization, and other.

Chromium.—Domestic mine production of chromium ore concentrate was by Nippon Chrome Industries Ltd. from the Wakamatsu Mine in Tottori Prefecture. The mines was operating with only 38 workers in 1995. Japan relied on imports to meet almost all of its chromium requirements in 1995.

Imports of metallurgical- and refractory-grade chromite totaled 607,268 t in 1995. South Africa and Iran were two dominant suppliers of chromite, providing 342,599 t and 100,100 t, respectively, in 1995. Other important suppliers of chromite were India, 70,375 t; Madagascar, 42,255 t; and Kazakstan, 29,636 t.

According to MITI, consumption of chromite by the ferroalloy industry increased to 437,343 t in 1995 from 394,742 t in 1994. Ferrochromium was produced by four companies in 1995. Japan Metal and Chemical Co. Ltd. operated a 62,800-t/yr plant at Kita Kyushu in Fukuoka Prefecture and a 21,000-t/yr plant at Oguni in Yamagata Prefecture. NKK Corp. operated two plants with combined capacity of 62,100-t/yr at Toyama in Toyama Prefecture. Nippon Denko K.K. operated a 18,600-t/yr plant at Hokuriku in Toyama Prefecture. Showa Denko K.K. operated a 20,700-t/yr plant at Chichibu in Saitama Prefecture and a 70,000-t/yr plant at Shunan in Yamaguchi Prefecture.

Imports of ferrochromium increased to 825,718 t in 1995 from 610,163 t in 1994 because of an increase in domestic demand for ferrochromium by the producers of chromium-base stainless steel. In 1995, South Africa remained the dominant supplier of ferrochromium, providing 393,774 t, or 48% of the 1995 ferrochromium imports. Other major suppliers in 1995 were China, 164,100 t; India, 80,798 t; Zimbabwe, 73,680 t; Russia, 38,015 t; and the Philippines, 22,807 t.

Following the joint-venture project of Nippon Denko with Samancor Ltd. of South Africa in 1993, Showa Denko K.K. and Marubeni Corp., a major trading company, signed an agreement with Samancor Ltd. of South Africa in June 1995 for the establishment of a joint-venture firm in Johannesburg, South Africa, in July 1995 to produce and market the low-carbon ferrochromium and silicochromium in Middelburg, South Africa. According to the agreement, the joint-venture firm, called Middelburg Technochrome Pty. Ltd., was 65.5% owned by Samancor, 20.7% by Showa Denko, and 13.8% by Marubeni. The plant's capacity in Middelburg was 36,000 t/yr of low-carbon ferrochromium and 24,000 t/yr of ferro silicochromium. Production had started in July 1995 using Showa Denko technology. Marubeni Corp. was to market the products in Japan.[7]

According to a Japanese industry source, in late 1995, the Japan Metal and Chemicals Co., Japan's second largest ferrochromium producer, and Mitsui & Co., a major Japanese trading company, established a joint-venture firm with Zimbabwe Alloys Ltd. of Zimbabwe to produce low-carbon ferrochromium beginning in April 1996. The joint-venture firm was 50% owned by Zimbabwe Alloys and 25% owned each by the Japan Metal and Chemicals and Mitsui & Co. The two Japanese companies will have the rights to take delivery of 14,000 t/yr of ferrochromium from Zimbabwe Alloys.

In 1995, Japan remained the world's leading producer of

chromium metal. Production of chromium metal with 99.95% purity declined to about 900 t in 1995 from 3,300 t in 1993. Nippon Denko K.K. operated a 700-t/yr plant using an aluminothermic process at Tokushima in Tokushima Prefecture. Tosoh Corp. operated a 3,600-t/yr plant using the electrolytic process at Yamagata in Yamagata Prefecture. However, Tosho closed down its plant and ceased production in March 1995 because of the high value of the Japanese yen and a redevelopment program around Japan Rail Yamagata station, where the Tosoh chromium metal plant is located. In 1992, Tosoh conducted a joint feasibility study with Samancor for construction of a 3,600-t/yr chromium metal plant in South Africa using Tosoh's technology. However, because of the market conditions, it was decided in 1995 not to construct the metal plant in South Africa.[8]

Copper, Lead, and Zinc.—In 1995, domestic mine production of copper, lead, and zinc decreased to a record low. The amount of domestic mine production of copper, lead, and zinc was equivalent to about 0.17%, 3.22%, and 12.66%, respectively, of Japan's apparent consumption of copper, lead, and zinc metals in 1995.

According to MITI's Mining Division, Kamioka Mining and Smelting Co. Ltd. and Toyoha Mining Co. Ltd. were the two major nonferrous metal mining companies operating in 1995. Kamioka Mining and Smelting mined lead and zinc at its Tochibora deposit of the Kamioka Mine in Gifu Prefecture; while Toyoha Mining mined lead and zinc at its Soya, Izumo, and Shinano deposits of the Toyoha Mine in Hokkaido in 1995.

In 1995, crude ore production at the Kamioka Mine was about 897,000 t, averaging 0.3% lead and 4.1% zinc plus 18 grams per metric ton (g/t) of silver. The Kamioka's Shikama concentrator produced about 3,000 t of lead concentrate, averaging 65.5% lead and 8.0% zinc plus 3,600 g/t of silver; and 58,500 t of zinc concentrate, averaging 59.7% zinc and 0.4% lead plus 58 g/t of silver.

Crude ore production at the Toyoha Mine was about 480,000 t, averaging 0.3% copper, 2.1% lead, and 13.0% zinc plus 210 g/t of silver in 1995. The Toyoha concentrator produced about 7,200 t of copper concentrate, averaging 20.6% copper and 2,300 g/t of silver; 12,500 t of lead concentrate, averaging 57.4% lead and 1,700 g/t of silver; 104,000 t of zinc concentrate, averaging 55.0% of zinc and 420 g/t of silver; and 36,300 t of pyrite concentrate, averaging 43.0% sulfur and 100 g/t of silver.

To extend the mining life of the Kamioka Mine and Toyoha Mine, MMAJ and the two companies were jointly conducting a 4-year (fiscal year 1994-98) detailed geological survey involving underground drilling and exploratory tunneling programs in the Sakonishi district of the Hida area near the Kamioka-Mozumi deposit in Gifu Prefecture and in the southern district of the Jozankei-Toyoha area near the Toyoha Mine in Hokkaido. MMAJ discovered mineralization of zinc in the Hida area and copper, gold, indium, lead, silver, and zinc in the Jozankei area in 1992 and in 1993.

Because of the depleted domestic nonferrous metals ore reserves and small crude ore production, Japan's ore and concentrate requirements for its nonferrous metals production sector had been met mostly by imports since mid-1980's. To secure a steady supply of its raw materials requirements, Japan's major nonferrous metals mining and trading companies had been jointly involved in negotiating with overseas suppliers to import nonferrous metal ore and concentrate by signing short- and long-term contracts or by financing agreements through loans. These companies had also been actively seeking a long-tern supply of nonferrous minerals from overseas by directly investing in the exploration and development of a major mining property as a partner.

Japan's major overseas investment projects through equity participation in the past years for copper, in alphabetic order of country, were the Northparkes in Australia, La Escondida and La Candelaria in Chile, El Roble in Columbia, the Morenci and Chino in the United States. Japan's major overseas investment projects through equity participation for lead, silver, and zinc, in alphabetic order of country, were the McArthur River in Australia, the Tizapa in Mexico, and the Huanzala in Peru.

The major nonferrous metals mining companies involved in overseas investment projects through equity participation in exploration and development of nonferrous metals mines in the past years were Dowa Mining Co. Ltd., Mitsui Mining and Smelting Co. Ltd., Mitsubishi Materials Corp., Nippon Mining and Metals Co. Ltd., Nittetsu Mining Co. Ltd., and Sumitomo Metal Mining Co. Ltd. The major participating trading companies were Itochu Corp., Marubeni Corp. Mitsubishi Corp., Mitsui & Co., and Sumitomo Corp.

To raise the percentage share of importing through direct equity participation in overseas mineral exploration and development projects, Japan's major nonferrous metal mining companies had increased their overseas investment in exploration for and development of copper, lead, silver, and zinc in 1995.

In March 1995, Sumitomo Corp. and Newmont Gold Co. of the United States announced that they will jointly develop a large copper and gold deposit at the Batu Hijau on Sumbawa Island in Indonesia. The $1.5 billion project involved development of an open pit mine, a mill, and related infrastructure in 3 years. Under the project plan, the mill will have a capacity to produce 245,000 t/yr of copper and 15,600 kilograms per year of gold in concentrate for more than 20 years. The project will be 45% owned by Newmont Gold, 35% by Sumitomo, and 20% by P.T. Pukuafu Indah of Indonesia.[9] However, information on the project financing and the date of actual construction work was not available.

In April 1995, Sumitomo Corp. agreed to help finance a $72.4- million Mount Polley copper and gold project in

central British Columbia, Canada, by paying $60.3 million to Imperial Metals Corp. of Vancouver. In return, Sumitomo Corp. was to have a 35% equity interest in the project and the rights to market the products. Ore reserves at the Mount Polley deposit were estimated at 231 Mt, averaging 0.26% copper and 0.35 g/t of gold. Mine development was scheduled to start in 1997.[10]

In December 1995, a consortium of Mitsui Mining and Smelting, Mitsui & Co., and Nippon Mining and Metals reached an agreement to acquire 12% equity interest in Compania Minera Dona Ines de Collahuasi S.A. in Chile from Falconbridge Ltd. of Canada and Minorco S.A. of Luxembourg for $195 million. The Japanese consortium agreed to buy, under a long-term contract with a $6.8-million premium, 250,000 t/yr of copper concentrate, or about one-third of the output from the Collahuasi copper project in northern Chile. Additionally, Mitsui & Co. agreed to provide $200 million in customer financing for the project. Ore reserves at the Collahuasi deposit were estimated at 1,400 Mt, averaging more than 1% copper within a resource of 3,200 Mt, averaging 0.82% copper. The $1.75-billion project was scheduled to come on-stream in late 1998 with an initial capacity to produce 330,000 t/yr of concentrate and 50,000 t/yr of refined copper using the SX-EX technology.[11]

In 1995, Dowa Mining, which has a 39% equity interest in the Tizapa lead-silver-zinc project in Mexico, planned to double the mining capacity of lead and zinc after spending $1 million for exploration to confirm additional ore reserves in the surrounding areas of the Tizapa Mine. Dowa Mining also signed a long-term contract with Prime Resources Inc. of Canada to import zinc concentrate from the KS Creek Mine in British Columbia. The mine came on-stream in August 1995.

The McArthur River project in Australia, in which Nippon Mining and Metals, Mitsui, Mitsubishi Materials, and Marubeni jointly had a minority interest, came on-stream in September 1995 and began shipping the lead and zinc concentrates to Japan. The Northparkes project in Australia, in which Sumitomo Metal Mining and Sumitomo Corp. had a minority interest, came on-stream in late 1995 and was expected to ship its copper concentrate to Japan beginning in 1996.

Nittetsu Mining launched a project feasibility study in June 1995 to develop a copper mine in the Los Bronces area south of Copiapo in Chile. According to MMAJ, the 1994 preliminary survey by MMAJ showed that all 10 drilling in the Los Bronces area intersected mineralization of over 3 meters (m) in length, averaging 1.6% copper. Ore reserves in the Los Bronces area were estimated at 15 Mt.

In late 1994, MMAJ and Mitsui Mining and Smelting jointly began exploring for lead and zinc in the Pallca area north of Lima near the Huanzala Mine in Peru. Over the past 2 years, it was expected to spend about $2 million for the exploration. In June 1995, Mitsui Mining and Smelting signed a contract with a local owner to purchase 100% ownership of the Pallca property for $1.4 million following 3-year annual payment of $300,000.

In 1995, MMAJ and Mitsui Mining and Smelting were jointly exploring for copper in the Quechua area of Cuzco Province in Peru. In late 1995, MMAJ announced that it had discovered a promising mineralized zone of copper in the northern part of Quechua, where Mitsui Mining and Smelting had held mining rights. According to MMAJ, a significant copper mineralization was discovered from 17 m below surface stretching 230 m long, averaging 0.44% copper including a 29.3-m wide high-grade zone, averaging 0.91%. This new discovery is near the southern part of Quechua, where about 100 Mt of resources, averaging 0.84% copper had been estimated by MMAJ following its exploration in the 1970's. Mitsui Mining and Smelting, which had mining rights to both areas, planned to conduct a feasibility study to develop an open pit mine by year 2000.[12]

Japan remained the world's largest importer of copper ore and concentrate, accounting for 56% of the total copper concentrate traded in the world market in 1995. Japan's imports of copper concentrate increased 10.6% to 3,825,212 t in 1995. The top seven overseas suppliers of copper concentrate to Japan were Chile, 28%; Indonesia, 18%; Canada, 17%; Papua New Guinea, 10%; the Philippines, 7%; Australia, 6%; and the United States, 5%. Because of reduced smelter production, imports of lead ore and concentrate dropped by 29.6% to 164,819 t in 1995. The top three overseas suppliers were Australia, 36%; Peru, 25%; and the United States, 13%. Imports of zinc ore and concentrate rose by 8.1% to 1,072,653 t in 1995. The top three overseas suppliers were Australia, 56%; Peru, 14%; the United States, 11%.

Production of refined copper rose slightly in 1995 reflecting the continued upward trend in domestic demand and strong demand for refined copper in the Asian market. Production of refined lead decreased resulting from the shutdown of the Naoshima lead smelter by Mitsubishi Materials and the Saganoseki lead smelter by Nippon Mining and Metals in 1994. The Kamioka and the Hosokura smelters had successfully converted their facilities to secondary lead smelter by recycling batteries, and Dowa Mining also converted part of its facilities for recycling waste batteries and reduced its electrolytic lead refining operation in 1995. As a result of these changes, utilization of scrap materials (waste batteries) as raw material in the lead smelting and refining industry had increased; while use of imported ore and concentrate had decreased in 1995. Production of refined zinc declined slightly despite a higher demand by the domestic galvanizing plants.

The higher value of the Japanese yen, lower tariffs for nonferrous metals, and higher cost of production had negatively affected the profitability of lead and zinc production in Japan for the past 2 years. Because of these reasons, according to a local press report and the Tokyo-based Japan Metal Review, Nippon Mining and Metals, the

parent company of Nikko Zinc Co. Ltd., had closed its 120,000-t/yr zinc plant in Mikkaichi, Toyama Prefecture, in October 1995.[13] For the same reasons, Mitsubishi Materials, Japan's third largest zinc metal producers, had decided to phase out zinc smelting and refining operations beginning in October 1995 and planned to close down its 105,600-t/yr Akita zinc smelter in Iijima, Akita Prefecture, in June 1996. The 42-year-old plant produced about 95,000 t of slab zinc, accounting for about 14% of domestic refined zinc production in 1995.[14]

To shift part of its copper smelting and refining operations overseas, Mitsubishi Materials reached an agreement in early 1995 with Freeport McMoRan Copper and Gold Inc. (FMCG) and Fluor Daniel Inc. (FD) of the United States to jointly build a $550-million copper smelting and refining complex at Gresik in East Java, Indonesia. According to the agreement, construction of the 200,000-t/yr smelter and refinery was scheduled to start in 1995 and to be completed by the second half of 1998. The smelter, which will use Mitsubishi Materials' continuous copper smelting technology, will be fed by 600,000 t/yr of copper concentrate from the Grasberg Mine in Irian Jaya. The smelting and refining complex will be run by a joint venture of Mitsubishi Materials (70%), FMCG (20%), and FD (10%).[15]

In late 1995, Sumitomo Metal Mining, Sumitomo Corp., and Itochu Corp. reached an agreement with two subsidiaries of China National Nonferrous Metals Industry Corp., Tonling Nonferrous Metals Corp. and Hong Kong based-Sharpling International Ltd. of China, to build a $200-million copper smelter in Tonling, Anhui Province. The copper smelter was scheduled to come on-stream in 1997. The copper smelter, which will be the largest in China, will have a capacity of 100,000 t/yr of copper anode and 360,000 t/yr of sulfuric acid. The joint-venture firm is 52% owned by Tonling Nonferrous Metals, 20% by Sumitomo Metal Mining, 13% by Sharpling International, and 7.5% each by Itochu and Sumitomo.[16]

Imports of refined copper increased by 9.8% to 389,760 t in 1995. The top five overseas suppliers were Chile, 35%; the United States and Zambia, 15% each; Peru, 12%; and the Philippines, 8%. Imports of refined lead rose by 40.5% to 73,560 t, and imports of slab zinc also rose sharply by 82.3% in 1995 because of the cutback in domestic metal production of lead and zinc. The top three overseas suppliers of refined lead in 1995 were China, 46,357 t; Peru, 10,701 t; and Australia, 7,995 t. The top three suppliers of zinc slab in 1995 were China, 80,790 t; North Korea, 10,650 t; and the Republic of Korea, 9,118 t.

According to MITI, domestic consumption of refined copper increased by 0.95% to 1,520,908 t in 1995 because of increased demand for production of both wire and cable and brass mill products. Demand for copper by the wire and cable sector, which accounted for 65.6% of copper consumption in 1995, rose 0.9% to 997,649 t. Demand for copper by the brass mill sector, which accounted for 33% of copper consumption in 1995, increased by 1% to 502,103 t. Exports of refined copper increased by 38.7% to 158,727 t in 1995. The major overseas buyers of refined copper were Taiwan, accounting for 43.6% of total exports, followed by the Republic of Korea and Thailand. Overall stocks of refined copper rose by 2.9% to 147,452 t at yearend 1995.

Domestic demand for refined lead increased by 0.7% to 274,866 t in 1995, of which 68.1% was for storage batteries, 16.7% for inorganic chemicals, and the remaining 15.2% was for solders and other uses. Exports of primary lead increased by 156% from 467 t in 1994 to 1,196 t in 1995. Overall stocks of primary lead increased by 70.4% to 48,183 t at the end of 1995.

Domestic demand for zinc slab increased from 609,434 t in 1994 to 638,625 t in 1995, of which 46.5% was for sheet galvanizing, 15.9% for other plating, 14.5% for brass mill products, 10.3% for zinc die-cast products, and the remaining 12.8% for inorganic chemicals and other uses. Exports of zinc slab dropped by 27.6% to 27,970 t in 1995. Overall stocks of zinc slab remained almost unchanged at 117,721 t at the end of 1995, compared with 117,374 t in 1994.

Gold and Silver.—Mine production of gold remained steady at the 9-t/yr level, while mine production of silver continued the 1994 downward trend because of reduced mine output from the Kamioka and Toyoha Mines. Gold mine production was mainly by Sumitomo Metal Mining from the Hishikari Mine in Kagoshima Prefecture of southern Kyushu. The company was working on its Yamada, Motoyama, and Yamagumi deposits in the Hishikari area and was producing about 122,000 t per month (t/m) of ore during fiscal year 1995. Silver mine production declined in 1995 mainly owing to reduced output as a co-product from the two remaining major lead and zinc mines at Kamioka in Gifu Prefecture and at Toyoha in Hokkaido Prefecture.

In domestic exploration, MMAJ announced in November 1995 that its exploration team had discovered two mineralized zones with high gold content in the Seta area of northern Hokkaido. According to MMAJ, the newly discovered zones, a lower extension of the gold-bearing quartz veins discovered in 1993, were at a vertical depth of 230 m. Sampling with a core length of 19 m taken from the two zones averaged 5 g/t of gold and 63.4 g/t of silver.

In overseas exploration, Sumitomo Corp. signed an agreement with the Government of Niger in September 1995 to conduct a 5-year feasibility study on development of gold deposits in Niger. According to the agreement, Sumitomo was given 30-year exploration and mining rights in a 750-km^2 area in Sirba, southwestern Niger. Sumitomo was expected to spend about $6 million in the next 5 years on detailed exploration and feasibility study. According to the results of a preliminary survey conducted by MMAJ in the Mbanga area of Sirba during 1992 to 1995, ore reserves in the area were estimated at 4.1 Mt, averaging 1.45 g/t of gold.

In August 1995, Sumitomo Metal Mining, through its wholly owned subsidiary, Sumitomo Metal Mining Arizona Inc., acquired the remaining 42.9% equity in Stone Boy Inc. for $2 million and became a 100% owner of the gold, lead, and zinc project in Alaska. The Stone Boy gold exploration project had been started in 1991 in the Tanana Upland region of Alaska. MMAJ had assisted Sumitomo Metal Mining to conduct geologic, geochemical, geophysical survey, and drilling in the Pogo district of the Stone Boy area, about 32 km east of Fairbanks. According to MMAJ, 9 out of 13 drilled holes intersected gold including one 200-m vein, averaging 1.1 g/t at 3 m below surface. Other holes intersected high-grade gold ranging from a 1.7-m vein 183 m below surface with an average of 221 g/t to a 6.9-m vein with 63 g/t at about 180 m below surface. Further exploration will be continued for development of a new gold mine.[17]

Because of higher yen value and increased private investment in gold, Japan's imports of gold rose by 38% to 278 t in 1995. Imports of silver also rose by 30% to 1,238 t in 1995 owing to increased domestic demand for silver by the producers of silver nitrates and electrical contacts. Japan relied on imports to meet about 60% of its gold metal demand and 35% of its silver metal demand. The major overseas gold suppliers in 1995 in decreasing order were Australia, the United Kingdom, Switzerland, South Africa, Russia, and Canada. The principal silver metal suppliers in 1995 in decreasing order were Mexico, the United States, and Peru.

Iron and Steel.—Mine production of iron sand and roasted pyrite was small and insignificant in 1995. Japan's iron and steel industry relied on imports to meet virtually all of its iron ore requirements. Imports of iron ore, including iron sand, pellet, and sinter, increased to 120.4 Mt in 1995 from 116.1 Mt in 1994. Australia, Brazil, and India remained the three dominant suppliers, accounting for 48.8%, 22.9%, and 15.2%, respectively, of total iron ore imports in 1995. Imports of pig iron, including direct-reduced iron, also increased to 2.8 Mt in 1995 from 1.8 Mt in 1994. China alone accounted for 75.5% of total pig iron imports in 1995. According to the Ministry of Finance, Japan's average import price per metric ton of iron ore increased to $25.98 in 1995 from $24.96 in 1994, and the average import price per metric ton of pig iron increased to $200.29 in 1995 from $185.46 in 1994.

To secure long-term supply of iron ore requirements from overseas, Mitsubishi Corp. reached an agreement with Cia de Acero del Pacifico S.A. de Inversiones of Chile in September 1995 to establish a 50-50 joint-venture firm to develop an iron ore mine called Los Colorados East Iron Mine, about 110 km northeast of the Algarrobo pellet plant in Huasco, Chile. According to the agreement, Mitsubishi will invest $21 million for its equity share and will provide $65 million loan to the $107-million project. According to the Tokyo-based Tex Report, ore reserves of Los Colorados Mine were estimated at 245 Mt, averaging 30% iron. Under the development plan, the iron ore mine, with a capacity of 4 Mt/yr, was expected to come on-stream in 1998. The iron ore output will feed a pellet plant at an annual rate of 4 Mt for 20 years.

Consumption of iron ore, including iron sand, pellet, and sinter by blast furnaces, increased to 123.4 Mt in 1995 from 121.5 Mt in 1994. Of the total pig iron produced in 1995, 98.9% was for steelmaking, and 1.1% was for foundry use. By the end of 1995, the total number of furnaces, including blast furnaces, electric furnaces, and other furnaces for pig iron production, was 47; however, pig iron production capacity rose slightly to 95.5 Mt/yr in 1995 from 95.2 Mt/yr in 1994.

Japan was the world's largest producer of pig iron and crude steel. Its output of pig iron and crude steel accounted for 15% and 14%, respectively, of the world total in 1995. According to the London-based Metal Bulletin, Nippon Steel Corp., which produced 26.84 Mt of crude steel in 1995, ranked the largest steelmaker in the world; NNK Corp., which produced 11.28 Mt, ranked 7th; Sumitomo Metal Industries and Kawasaki Steel Corp. each produced 10.44 Mt and equally ranked 9th; and Kobe Steel Ltd., which produced 5.53 Mt, ranked 27th in 1995.[18]

Crude steel output increased 3.4% in 1995. Of the crude steel produced in 1995, 67.7% was processed by basic oxygen furnaces and 32.3% by electric furnaces. For the steelmaking sector, according to MITI, the number of basic oxygen furnaces was reduced by 2 to 69; while the number of electric arc furnaces was reduced by 1 to 479 by yearend 1995. However, the overall crude steel production capacity increased by 2.35 Mt/yr to 149.83 Mt/yr in 1995. The industry cut its labor force by 16,030 to 255,875 workers in 1995.

In new technology development, NKK had successfully developed a top and bottom blowing converter stainless steel refining furnace at its Fukuyama Works to reduce consumption of ferrochromium in stainless steelmaking. The newly improved furnace would reduce per-unit consumption of ferrochromium (with 61% of chromium content) from the average of 40 kilograms per metric ton (kg/t) of stainless steel produced to 7.7 kg/t by using ferrochromium only in the ladle refining process for the final adjustment of the steel's chemistry. Kawasaki Steel had developed a new technology to recover valuable metals from dust generated in specialty steel mills using direct smelting reduction at its Chiba Works. According to the company, this new process would increase the metal yield from dust by 6% and enable the recycling of iron from rolling facilities.

To reduce the cost of ironmaking, Nippon Steel purchased a new iron smelting technology called Romelt from Moscow Institute of Steel and Alloys of Russia. Nippon Steel planned to build an experimental plant in Japan in 1995. According to the company, the Romelt process would reduce

capital cost by 40% and production cost of hot metal by up to 20%. The process had been undergoing testing and evaluation at Novalipetsk Steel Works in Russia.[19]

Because of a moderate economy recovery, Japan's domestic demand for both ordinary steel products and specialty steel products by all end use except tanks and container makers increased considerably in 1995. According to the Japan Iron and Steel Federation, domestic demand for ordinary steel products and specialty steel products was 58.0 Mt and 10.1 Mt, respectively, in 1995, compared with 55.9 Mt and 9.8 Mt, respectively, in 1994.

Domestic demand for ordinary and specialty steel products by steel dealers was 20.8 Mt and 1.3 Mt, respectively; by construction, 14.3 Mt and 0.68 Mt, respectively; by automobile, 9.5 Mt and 2.6 Mt, respectively; by conversion and processing, 3.3 Mt and 3.6 Mt, respectively; by shipbuilding and marine equipment, 2.8 Mt and 0.1 Mt, respectively; by electric machinery and equipment, 2.4 Mt and 0.1 Mt, respectively; by tanks and containers, 2.1 Mt and 0.03 Mt, respectively; by industrial machinery and equipment, 1.8 Mt and 1.3 Mt, respectively; and by home and office appliance and other, 1.0 Mt and 0.3 Mt, respectively, in 1995.

According to the Ministry of Finance, exports of iron and steel totaled 22,988,343 t in 1995, of which pig iron was 525,744 t; ferroalloys, 70,476 t; steel ingots, 2,885 t; semifinished ordinary steel, 561,903 t; semifinished specialty steel, 68,688 t; ordinary steel products, 17,148,797 t; and specialty steel products, 4,027,039 t. Exports of iron and steel products to Asian markets totaled 17,894,026 t, accounting for 77.8% of total exports in 1995. The major buyers in Asia were China, 3,843,492 t; South Korea, 3,127,972 t; Thailand, 2,629,080 t; Taiwan, 2,585,392 t; Malaysia, 1,357,786 t; Hong Kong, 1,254,124 t; and Singapore, 1,111,255 t in 1995. Exports of iron and steel products to the United State dropped 35.8% to 2,334,209 t in 1995.

Imports of iron and steel products rose by 30.4% to 11,723,342 t in 1995. Of the total imports, pig iron was 2,775,854 t; ferroalloys, 1,869,476 t; steel ingots, 4,809 t; semifinished steels, 562,759 t; ordinary steel products, 6,143,240 t; specialty steel products, 94,942 t; and process steels and other, 272,263 t. Hot-finished hoop, hot-rolled heavy and medium plates, cold-rolled coils and sheets, and galvanized sheets were the major import ordinary steel items in 1995. In 1995, the major suppliers of ordinary steel products to Japan were South Korea, 47.7%; China, 12.6%; Taiwan, 9.9%; Brazil, 4.2%; and the United States, 3.9%.

Manganese.—Japan's only operating manganese mine, the Nodatamagawa Mine in Iwate Prefecture, was a small-scale mining operation produced only about 100 t/yr of manganese concentrate. In 1995, virtually all of its manganese ore requirements were met by imports. Imports of manganese ore increased by 5% to 1,187,025 t in 1995, of which 10,143 t was high-grade manganese dioxide ore and 1,176,882 t, metallurgical-grade manganese ore. The major suppliers of high-grade manganese dioxide ore were China, Australia, Gabon, and South Africa, providing 29%, 28%, 18%, and 10%, respectively, in 1995. The major suppliers of metallurgical-grade manganese ore were South Africa, Australia, India, and Brazil, providing 46%, 35%, 11%, and 6%, respectively, in 1995. Japan also imported 85,952 t of manganiferous iron ore, almost all of it from India. According to MITI, consumption of metallurgical-grade manganese ore by the ferroalloys industry totaled 601,632 t in 1995.

Japan was the world's leading producer of electrolytic manganese dioxide (EMD). In 1995, Japan Metals and Chemicals Co. Ltd. shut down its Takaoka plant in Toyama Prefecture. As a result, Japan's total production capacity of EMD was reduced by 18,000 t/yr to 49,000 t/yr in 1995. Tosoh Corp., Japan's top producer of EMD, operated a 24,000-t/yr plant in Hyuga, Miyazaki Prefecture. Tosoh also had a 12,000-t/yr plant, which was operated by a joint-venture firm called Tosoh Hellas A.I.C. with Mitsubishi Corp. in Salonika, Greece. This plant was capable of producing high-grade EMD for the manufacture of dry cell batteries. Mitsui Mining and Smelting Co., Japan's second largest producer, operated a 25,000-t/yr plant in Takehara, Hiroshima Prefecture. The company also had a 12,500- t/yr plant, which was operated by its subsidiary, Mitsui Denman (Ireland) Ltd. in County Cork, Ireland.

According to the Japan Association of Dry Battery Industries, domestic demand for EMD increased to 24,090 t in 1995 from 22,253 t in 1994. According to the Ministry of Finance, Japan exported 34,948 t of EMD and imported only 711 t of EMD in 1995.

Nickel.—Japan was the world's largest consumer and the second largest producer of nickel metal, including ferronickel, nickel oxide, and refined nickel in 1995. However, all of its raw material requirements for nickel metal production were met by imports. According to the Ministry of Finance, imports of nickel ore rose by 31% to 3.8 Mt in 1995. New Caledonia, Indonesia, and the Philippines were the three suppliers, providing 1,864,282 t, 1,058,995 t, and 898,077 t, respectively.

According to MITI, consumption of nickel ore by the ferroalloy industry for ferronickel production increased by 41% to 2.9 Mt in 1995. According to the Ministry of Finance, imports of ferronickel rose by 38% to 66,771 t in 1995. The major suppliers of ferronickel were New Caledonia, 36,614 t; Indonesia, 11,037 t; the Dominican Republic, 7,852 t; Russia 6,700 t; and Colombia, 2,854 t, in 1995. Imports of nickel matte rose from 82,242 t in 1994 to 88,852 t in 1995. Western Mining Corp. Ltd. of Australia and P.T. Inco of Indonesia were the two suppliers of nickel matte to Japan. Imports of nickel oxide and nickel oxide sinter were 540 t and 1,601 t, respectively, in 1995.

Australia was the dominant supplier of nickel oxide and oxide sinter to Japan.

Production of refined nickel by Sumitomo Metal Mining increased in 1995 owing to a strong demand for refined nickel by stainless steel producers. Production of nickel oxide sinter by Tokyo Nickel Co. Ltd. was at full capacity in 1995. According to a local press report, Tokyo Nickel planned to spend about $5 million to expand the capacity of its Matsuzaka plant by 18,000 t/yr to 54,000 t/yr by late 1998.[20] Additional raw material will be fed by P.T. Inco of Indonesia, which was undertaking a $580 million expansion program to increase smelting capacity by 50% at its Soroako smelter in Sulawesi, Indonesia in 1995.

Japan relied on imports to meet 79.7% of its domestic requirements for nickel metal, including cathode, powder, and flakes in 1995. Imports of nickel cathode were 61,698 t, imports of nickel powder and flakes were 4,882 t, and nickel waste and scrap were 6,444 t in 1995. The major suppliers of nickel cathode in 1995 were Russia, 23,471 t; Zimbabwe, 7,351 t; Norway, 6,952 t; Canada, 5,434 t; China, 5,092 t; Australia, 3,412 t; South Africa, 2,741 t; the United Kingdom, 2,621 t; and Brazil, 2,164 t. The major suppliers of nickel powders and flakes in 1995 were Canada, 2,804 t, and the United Kingdom, 1,465 t. In 1995, Japan exported 9,938 t of ferronickel, of which 6,295 t went to Taiwan. Exports of refined nickel rose sharply to 262 t in 1995 from 64 t in 1994.

According to MITI, domestic demand for refined nickel increased 13.5% to 83,554 t in 1995, of which 59,363 t were consumed by the manufacturers of specialty steel; 6,461 t by galvanized sheet; 4,325 t by batteries; 4,107 t by nonferrous alloys; 3,478 t by magnetic materials; 493 t by catalysts; and 5,327 t by other, including coinage and rolled sheet.

Titanium.—Japan was the world's second largest producer of titanium sponge metal and one of the world's top producers of titanium dioxide pigment in 1995. However, all of Japan's raw material requirements for production of titanium metal and dioxide pigment were met by imports. In 1995, Japan imported about 438,000 t of titanium ore, including rutile and ilmenite, and 108,000 t of titanium slag. Australia was the principal supplier of rutile; while Australia, Canada, Malaysia, and Vietnam were the major suppliers of ilmenite. Titanium slag was imported mainly from Canada and South Africa.

All of the rutile was consumed by the producers of titanium sponge metal. Ilmenite was consumed mainly by the manufacturers of titanium dioxide pigment and synthetic rutile. A small amount of rutile and ilmenite was consumed as a blast furnace additive in the steel industry. Production of titanium sponge in 1995 was by Sumitomo Sitix Corp. at Amagasaki, near Osaka in Hyogo Prefecture, and Toho Titanium Co. Ltd. at Chigasaki, about 20 km south of Yokohama in Kanagawa Prefecture. The higher level of titanium production in 1995 resulted mainly from a strong overseas demand for high-grade Japanese titanium sponge metal from Europe and the United States.

According to the Japan Titanium Society, domestic demand for titanium sponge decreased to 10,562 t in 1995 from 11,235 t in 1994; while overseas shipments of titanium sponge rose to 5,153 t in 1995 from 4,516 t in 1994. According to the Ministry of Finance, the titanium sponge exports rose from 4,634 t in 1994 to 5,370 t in 1995. In 1995, the major buyers of titanium sponge were the United Kingdom and the United States.

Production of titanium dioxide pigment increased considerably owing to higher market prices and increased demand in 1995. The 1995 output was equivalent to 81% of the industry's capacity. According to MITI, domestic shipments of titanium dioxide pigment were at about the same level as that of 1994. However, exports of titanium dioxide pigment increased by 11% to 74,480 t in 1995. The major buyers of titanium dioxide pigment in 1995 were China, the Republic of Korea, and Taiwan.

Industrial Minerals

Cement.—Japan was the world's second largest cement producer after China in 1995. Cement production decreased in 1995 owing to the low level domestic demand and reduced exports. The slowdown in building construction starts and new housing starts had resulted in a weaker domestic demand, while the high value of the Japanese yen had a negative impact on cement exports in 1995.

Japan's cement clinker capacity in 1995 was 97.6 Mt/yr with 41 plants having a total of 81 operating kilns. Production of cement clinker in 1995 was about 96 Mt. According to a report by MITI, several distribution terminals (service stations) of Sumitomo Osaka Cement and Nihon Cement in the Kobe area suffered substantial damages from the Hanshin Earthquake. However, all quake damaged distribution terminals reportedly were quickly repaired.

Because of lower cement prices in the domestic market, several major cement producers had suffered from losses. Nihon Cement Co. Ltd. was ranked Japan's largest before the mergers of Chichibu-Onoda Cement Corp. and Sumitomo-Osaka Cement K.K. in late 1994. To improve earnings, Nihon Cement planned to reduce its distribution cost by sharing distribution facilities with Mitsubishi Materials Corp. and Ube Industries to market its cement.

According to the Cement Association of Japan, domestic consumption of cement decreased to 79.6 Mt in 1995. Of the total domestic demand in 1995, 71% was for ready-mixed concrete; 14% for cement products; 5% for civil engineering works; 2% for public and private buildings; 1% for construction of roads, railroads, bridges, powerplants, and ports; and 7% for other uses.

According to the Ministry of Finance, cement clinker exports remained unchanged at 5.8 Mt in 1995; while exports of portland cement dropped to 8.0 Mt in 1995 from

8.9 Mt in 1994. In decreasing order, Malaysia, Singapore, Taiwan, and the Philippines were the major buyers of cement clinker; while, in decreasing order, Taiwan, Singapore, the Republic of Korea, and China were the major buyers of portland cement in 1995. Imports of cement was about 0.7 Mt, of which about 90% was provided by the Republic of Korea in 1995.

Limestone.—Japan was self-sufficient in limestone. Its annual output ranked the world's third largest in 1995. Production of limestone decreased in 1995, but the overall domestic demand remained relatively unchanged at 203 Mt in 1995. However, the yearend overall stocks rose to about 12.5 Mt in 1995 from 11.2 Mt in 1994.

According to the Limestone Association of Japan, the industry consisted of about 240 limestone mining companies with most of the major quarries being controlled by cement and steel companies. The gross value of limestone was estimated at more than $1.3 billion. In 1995, the leading seven limestone mining companies, in decreasing order, were 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, domestic shipments of limestone declined slightly from 203 Mt in 1994 to 201.6 Mt in 1995, of which 141 Mt was consumed by the manufacturing sector; 55.2 Mt, by the construction sector; and 5.4 Mt, by other. Of the 141 Mt consumed by the manufacturing sector, 99.6 Mt was by the cement industry; 22.4 Mt, by the iron and steel industry; 9.6 Mt, by the lime industry; and 9.4 Mt, by other manufacturing industries. Of the 55.2 Mt consumed by the construction sector, 33 Mt was for concretemaking; 15.7 Mt, for road construction; and 6.5 Mt, for other construction.

Mineral Fuels

Coal.—Japan's coal production continued to fall and reached a new 93-year record low in 1995. In March 1995, after 105 years of operation, Hokutan Sorachi Coal Mining Co. Ltd., permanently closed its 800,000-t/yr coal mine at Utashinai in central Hokkaido, and laid off all of its 562 employees.[21] In 1995, the three remaining major coal mines were Mitsui Coal Mining Co. Ltd. at Miike in Fukuoka Prefecture, Taiheiyo (Pacific) Coal Mining Co. Ltd. at Kushiro in eastern Hokkaido, and Matsushima Coal Mining Co. Ltd. at Ikeshima in Nagasaki Prefecture. According to MITI, of the total coal produced in 1995, 46% was from the Hokkaido area and 54% was from the Kyushu and Honshu areas. The industry's employment declined by 507 to 2,695 workers at the end of 1995.

Japan was the world's largest coal importer in 1995. Because of reduced domestic production and increased consumption by the iron and steel and electric power industries, coal imports increased by 5.3% to 122.4 Mt in 1995. In 1995, Japan relied on imports to meet 95% of its coal requirements. According to MITI, imports of coking coal increased from 63.2 Mt in 1994 to 65.3 Mt in 1995. The major suppliers of coking coal in 1995 were Australia, 31.5 Mt; Canada, 15.1 Mt; the United States, 7.6 Mt; and Russia, 3.0 Mt. Imports of anthracite rose from 3.1 Mt in 1994 to 3.4 Mt in 1995. The major suppliers of anthracite in 1995 were China, 1.9 Mt; and Vietnam, 1.1 Mt. Imports of steam coal increased from 49.9 Mt in 1994 to 53.7 Mt in 1995. The major suppliers of steam coal in 1995 were Australia, 32.4 Mt; China, 5.6 Mt; Indonesia, 3.4 Mt; the United States, 3.1 Mt; and South Africa, 2.9 Mt.

According to MITI, overall consumption of coal increased by 4.7% to 129 Mt in 1995 owing to the continued growth in demand for steam coal by the electric power industry in 1995. Demand for steam coal by the electric power industry grew by 9.8% in 1995. In 1995, demand for coal by the iron and steel industry was 62.9 mt; by the electric power industry, 40.8 Mt; by the coke industry, 4.7 Mt; by the cement and ceramics industries, 9.7 Mt; by other manufacturing industries, 10.4 Mt; by the gas industry, 278,000 t; and by other industries, 71,000 t. Of the total coal consumed in 1995, 122.4 Mt was imported coal, and only 6.4 Mt was domestically produced coal.

Petroleum and Natural Gas.—Japan was the world's largest importer of natural gas and crude petroleum. Its domestic production of natural gas and crude petroleum was very small when compared to its huge requirements for crude petroleum including refined petroleum products and natural gas in the form of LNG. Domestic production of both crude petroleum and natural gas declined in 1995. Consumption of crude petroleum and natural gas remained steady at 1,528 million barrels (Mbbl) and at 67 billion cubic meters (m^3), respectively, in 1995.

To meet the domestic demand, according to MITI, Japan imported 1,678.3 Mbbl of crude petroleum in 1995. Imports of natural gas, in the form of LNG, reached a record high at 64 billion m^3 in 1995. Imports of refined petroleum products, which included diesel, gasoline, heavy fuel oil, jet fuel, kerosene, and naphtha, also rose by 11.8% to 224.5 Mbbl because of increased domestic demand for all refined petroleum products, except heavy fuel oil types B and C, in 1995.

Crude petroleum imports in 1995 were mainly from the Middle East region, accounting for 78.6%, compared with 77.1% in 1994; and Asia, including China, accounting for 18.1%, compared with 19.2% in 1994. The major suppliers of crude petroleum in 1995 were the United Arab Emirates, 26.9%; Saudi Arabia, 19.4%; Iran, 8.6%; Indonesia, 7.9%; Qatar, 6.4%; Oman, 6.3%; Neutral Zone, 5.3%; China, 5.1%; and Kuwait, 4.8%. Imports of LNG totaled 42.2 Mt in 1995, of which Indonesia supplied 17.3 Mt; Malaysia, 7.9 Mt; Australia, 6.7 Mt; Brunei, 5.6 Mt; the United Arab Emirates, 3.9 Mt; and the United States, 1.3 Mt.

Demand for refined petroleum products increased by 2.4% to 1,529.7 Mbbl in 1995. Japan's net import reliance of refined petroleum products was 14.7% in 1995. In 1995, gasoline consumption rose by 2.0% to 321.6 Mbbl; naphtha increased by 13.7% to 279.2 Mbbl; jet fuel rose 12.2% to 30.3 Mbbl; kerosene increased by 4.6% to 184.3 Mbbl; and diesel rose by 2.5% to 282.9 Mbbl; however, heavy fuel oil, including types A, B, and C, dropped by 4.8% to 431.1 Mbbl. In 1995, consumption of domestically produced natural gas totaled 2.7 billion m^3, of which 41% was consumed by the gas industry, 25% by the electric power industry, 16% by the chemical industry, 15% by the oil and gas industries, and 3% by other manufacturing and service industries. Additionally, Japan consumed 42.8 Mt, or 64.1 billion m^3, of imported natural gas in the form of LNG in 1995, of which 72% was consumed by the electric power industry for power generation, 27% by the city gas industry for household use, and 1% by the iron and steel industry for steelmaking.

In overseas oil and gas exploration, Japan Vietnam Petroleum, a joint-venture firm of Mitsubishi Oil Corp., Mitsubishi Corp., and Mitsubishi Petroleum Development Co. Ltd., in partnership with Vietnam National Petroleum Corp., announced in July 1995 that it had discovered a second oil and gas field called Phuong Dong Field, about 19 km northeast of the Rang Dong Field discovered in 1994 in Block 15-2. The second exploratory well tested for oil and gas output of 1,100 barrels per day (bbl/d) of crude petroleum and about 227,000 m^3 of natural gas. The company and its Vietnamese partner were assessing the two fields for possible commercial production.

In July 1995, Mitsui & Co., Mitsui Oil Development, and Indonesia Oil, a Japanese oil development company in which Japan National Oil Corp. had 50% equity, jointly acquired 40% equity interest in an offshore oilfield from Anporex of Australia. The acquisition was the first for Mitsui & Co. to directly participate in crude oil production overseas. The oilfield, about 65 km off Dampier in Western Australia, was producing 16,000 bbl/d of oil and was expected to reach 36,000 bbl/d at the peak time. The three Japanese companies were expected to participate in development of additional oilfields near the acquired oilfield with additional cost. Japan was expected to import most of the output from the oilfields.[22]

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 very small. *(See table 3.)*

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 million km, of which 68% is paved, and a railroad network of 27,327 km, of which 25,315 km 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 and tunnels.

Japan's domestic and international telecommunication services are among the best in the world with five satellite earth stations as well as submarine cables to China, the Philippines, Russia, and the United States. For electric power transmission, Japan has a route length of 87,500 km and a circuit length of 152,000 km. For power distribution, Japan's total length of line distances, including high- and low-voltage, was 1,130,100 km concentrating in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. 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 25 major ports and more than 2,000 minor ports to receive raw materials from overseas and export 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 important seaports of the major mineral-processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Hamrima, Himeji, Hiroshima, Kawasaki, Kinuura, Kobe, Kushiro, Mizushima, Moji, Nagoya, Osaka, Sakai, Sakaide, Shimizu, Tokyo, and Yokohama in Honshu; Fukuoka, Kita Kyushu, and Oita in Kyushu; and Muroran and Tomakomai in Hokkaido.

The Kobe port, the world's fourth largest, its facilities, such as berths and warehouses, along with eight-lane superhighway (Route 43), bridges, railroads, powerlines, and communication system in the surrounding areas had been severely damaged by the Hanshin earthquake in January 1995. However, the City of Kobe, with financial assistance of the Central Government, had quickly repaired most of the damages. By the end of 1995, the Port of Kobe was 80% operational. However, restoration of superhighway Route 43, which connects highways from north to the south, was expected to take 2 to 3 more years.

Japan has 175 airports, of which 173 were with permanent-surface runways. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita

(New Tokyo), and Osaka. Japan's first round-the-clock Kansai International Airport opened in September 1994 on an offshore reclaimed land in Osaka Bay and was operating smoothly in 1995.

Outlook

The nonferrous-metal-mining and coal-mining sectors were expected to hold steady in 1996, as the industry was about to complete its restructuring program. Mining activities of industrial minerals, such as limestone and silica stone and sand, were expected to increase in 1996 as the Japanese economy begins to recover and the construction activity moves into a higher gear. Mine production of copper, lead, and zinc was expected to remain at the 1996 level. The remaining two major nonferrous metal mines and one major gold mine in the Prefectures of Gifu, Hokkaido, and Kagoshima were expected to continue operating in 1996. Coal output was expected to be between 5.5 Mt and 6 Mt after Hokutan Sorachi Coal Mine stopped production at Utashinai, Hokkaido, in March 1995.

The outlook for the mineral-processing sector was not bright because of the high value of the Japanese yen, the high cost of production, and the reduced tariff on import metals. Metal production of lead and zinc was expected to decline further because of shrinking production capacity and lower import tariffs on nonferrous metals. However, production of crude steel was expected to remain steady at about 100 Mt in 1996 because of an anticipated upward trend in the automobile and construction industries in 1996.

As a result of decreasing domestic mine production of nonfuel minerals and mineral fuels, imports of coal, nonferrous minerals, and metals are expected to increase with the continuing recovery of the Japanese economy in 1996. In line with its mineral policy to secure and diversify its long-term supply of raw materials to ensure a steady economic growth, Japan was expected to continue its active search for direct investment in joint exploration and development of minerals in both developed and developing countries, especially in Australia, Canada, Chile, China, Peru, Mexico, and the United States. The targeted minerals were coal, crude petroleum, base metals, antimony, chromium, columbium (niobium), gold, lithium, manganese, molybdenum, natural gas, nickel, rare earths, silver, 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 Y99.8=US$1.00 in 1994 and Y102.9=US$1.00 in 1995.

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Research and Statistics Department
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Metal Mining Agency of Japan
Tokiwa Building, 1-24-14
Toranomon, Minato-ku, Tokyo 105, Japan
Telephone: 81-3-3503-2801, Fax: 81-3-3503-0570
Geological Survey of Japan
1-1-3 Higashi, Yatabe, Ibaraki 305, Japan
Telephone: 81-298-54-3513, Fax: 81-298-54-3533

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1991	1992	1993	1994	1995 p/
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	438	316	327	326 r/	320 e/
Metal:						
Primary:						
Regular grades	do.	32	19	18	17	18
High-purity	do.	20	20	20	24	28
Secondary 2/	do.	1,096	1,074	1,006	1,175 r/	1,181
Antimony:						
Oxide		11,908	11,227	10,485	10,395	10,393
Metal		262	175	225	207	93
Arsenic (equivalent of arsenic acid) e/		500	50 r/	40 r/	40 r/	40
Bismuth		461	530	497	505	591
Cadmium, refined		2,889	2,986	2,832	2,629	2,652
Chromium:						
Chromite, gross weight e/		8,000	8,000	7,000	7,000	7,000
Metal		4,020	3,730 r/	3,297 r/	2,200 r/	900 e/
Cobalt metal		185	105	191	161	227
Columbium (niobium) and tantalum, tantalum metal e/		85	80	80	80	80 e/
Copper:						
Mine output, Cu content		12,414	12,074	10,277	6,043	2,376
Metal:						
Blister and anode:						
Primary		967,700	1,046,200	1,099,100	1,025,500	1,040,300
Secondary		117,700	128,700	85,700	96,500	128,200
Total		1,085,400	1,174,900	1,184,800	1,122,000	1,168,500
Refined:						
Primary		967,721	1,046,155	1,099,083	1,025,510	1,040,314
Secondary		108,562	114,704	89,693	93,658	147,645
Total		1,076,283	1,160,859	1,188,776	1,119,168	1,187,959
Gallium metal:						
Primary e/		6	6	6	6	6
Secondary e/		41	38	39	40	40
Germanium:						
Oxide		11	11 e/	11 e/	10	10 e/
Metal		3	3	3	2	2
Gold:						
Mine output, Au content	kilograms	8,299	8,893	9,352	9,551	9,185
Metal:						
Primary	do.	103,017	107,957	108,769	102,778	113,148
Secondary 3/	do.	109,000	93,700	105,000	100,000	110,000 e/
Total	do.	212,017	201,657	213,769	202,778	223,148 e/
Indium metal	do.	51,576	59,906	56,161	58,546	61,222
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight	thousand tons	31	40	11	3	3
Fe content	do.	19	25	6	2	2
Roasted pyrite concentrate (50% or more Fe):						
Gross weight	do.	224	244	92	90	86
Fe content	do.	140	153	57	55	57
Metal:						
Pig iron and blast furnace ferroalloys	thousand tons	79,985	73,144	73,738	73,776	74,905
Electric-furnace ferroalloys:						
Ferrochrome		270,786	267,857	204,719	192,989 r/	210,445
Ferromanganese		463,722	361,941	382,912	345,153 r/	346,977
Ferronickel		295,422	237,350	257,316	242,447	351,337
Ferrosilicon		62,362	37,656	29,084	12,208 r/	3,650
Silicomanganese		87,229	96,360	64,758	69,183 r/	64,870
Other:						
Ferrocolumbium		710	919	1,086	868	37
Ferromolybdenum		3,729	3,261	3,656	3,930	4,109
Ferrotungsten		61	71	80	68	120

See footnotes at the end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1991	1992	1993	1994	1995 p/
METALS--Continued						
Iron and steel--Continued:						
Metal--Continued:						
Electric-furnace ferroalloys--Continued:						
Ferrovanadium		3,847	3,005	3,670	3,418	3,418
Unspecified		3,970	4,933	5,174	6,363	4,669
Total		1,191,838	1,013,353	952,455	876,627 r/	989,632
Steel, crude	thousand tons	109,649	98,132	99,623	98,295 r/	101,640
Semimanufactures, hot-rolled:						
Of ordinary steels	do.	87,982	78,487	79,078 r/	76,631	79,449
Of special steels	do.	16,808	14,842	14,767	15,014	16,171
Lead:						
Mine output, Pb content		18,329	18,839	16,470	9,946	9,659
Metal, refined:						
Primary		220,331	218,787	212,145	182,621	149,523
Secondary		112,100	111,374	97,307	109,641 r/	137,011
Total		332,431	330,161	309,452	292,262 r/	286,534
Magnesium metal:						
Primary		11,559	7,119	7,471	3,412	--
Secondary		17,158	12,978	13,215	19,009	16,760
Manganese:						
Ore and concentrate:						
Gross weight e/		100	100	80	100 r/	100
Mn content e/		21	21	16	20 r/	20
Oxide		58,526	54,294	56,106	54,560	60,366
Metal		4,056	3,734	3,169	2,555 r/	2,700 e/
Molybdenum metal		661	564	619	651	689
Nickel metal:						
Refined		23,658	22,038	23,108 r/	25,311	26,824
Ni content of nickel oxide sinter		22,473 r/	27,520 r/	28,812 r/	34,711 r/	36,800
Ni content of ferronickel		68,045	57,447	51,120	50,186 r/	63,600
Total		114,176 r/	107,005 r/	103,040 r/	110,208 r/	127,224
Platinum-group metals:						
Palladium metal	kilograms	1,053	986	1,183	1,277	2,174
Platinum metal	do.	988	629	661	691	730
Rare-earth oxide 4/		4,203	3,948	3,830	4,397 r/	4,615
Selenium, elemental		537	573	541	614	548
Silicon, high-purity		2,384	2,364	2,523	3,031	3,328
Silver:						
Mine output, Ag content	kilograms	170,676	178,330	136,886	133,713 r/	100,078
Metal:	do.					
Primary	do.	2,148,708	2,181,130	2,159,517	2,020,223	2,056,657
Secondary 3/	do.	126,308	130,711	143,605	162,025	150,000 e/
Total	do.	2,275,016	2,311,841	2,303,122	2,182,248	2,206,657 e/
Tellurium, elemental		57	57	47	47	43
Tin, metal, smelter		716	821	804	706	630
Titanium:						
Metal		18,945	14,554 r/	14,426	14,847	16,702
Oxide		279,054	252,479	245,992	237,956	249,290
Tungsten:						
Mine output, W content		279	347	66	--	--
Metal		4,147	3,307	3,477	3,825	4,468
Vanadium metal e/ 5/		404	245	252	300	250
Zinc:						
Mine output, Zn content		133,004	134,510	118,599	100,653	95,274
Oxide		84,932	82,334	75,203	73,888 r/	75,973
Metal:						
Primary		640,649	645,079	609,272	571,880 r/	573,912
Secondary		138,089	135,647	135,297	141,406	143,042
Total		778,738	780,726	744,569	713,326	716,954
Zirconium:						
Oxide e/		6,750	6,380	6,200	6,000	6,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1991	1992	1993	1994	1995 p/
INDUSTRIAL MINERALS						
Asbestos e/		25,000	29,500	24,900	21,000	20,000
Bromine, elemental e/		15,000	15,000	15,000	15,000	15,000
Cement, hydraulic	thousand tons	89,564	88,253	88,046	91,624 r/	90,474
Clays:						
Bentonite		554,325	534,472	517,389	484,115	478,058
Fire clay		845,867	751,661	736,503	685,390 r/	567,620
Kaolin		129,942	122,948	110,318	138,412 r/	166,338
Feldspar and related materials:						
Feldspar		88,471	72,285	71,568	56,003	65,085
Aplite		500,272	416,304	403,724	381,160	388,000
Gypsum	thousand tons	4,508 r/	4,322 r/	3,953 r/	3,873 r/	3,900 e/
Iodine, elemental		7,492	6,764	6,489	5,592	6,200 e/
Lime, quicklime	thousand tons	9,045	8,049	7,958	7,712 r/	7,871
Nitrogen, N content of ammonia	do.	1,553	1,602	1,447	1,450	1,500 e/
Perlite e/		203,000	203,000	200,000	200,000	200,000
Salt, all types	thousand tons	1,374 r/	1,405	1,378 r/	1,387	1,400 e/
Silica sand		4,343,413	3,842,984	3,882,719	3,942,368 r/	3,737,007
Silica stone	thousand tons	18,477	19,275	18,849	18,479	18,334
Sodium compounds, n.e.s.:						
Soda ash		1,103,455	1,056,803	1,055,959	1,049,676	1,049,017
Sulfate		249,817	242,771	229,346	210,950	210,000 e/
Stone, crushed and broken:						
Dolomite	thousand tons	5,318	4,854	4,755	3,831	3,773
Limestone	do.	206,839 r/	203,854	200,455	202,481 r/	201,089
Sulfur:						
S content of pyrite	do.	30	31	29	4	2 e/
Byproduct:						
Of metallurgy	do.	1,352	1,374	1,383	1,269 r/	1,360 e/
Of petroleum	do.	1,244	1,340	1,510	1,550 e/	1,500 e/
Talc and related materials:						
Talc		65,633	61,120	57,229	56,120 r/	57,269
Pyrophyllite		1,228,896	1,055,897	1,028,399	934,007 r/	946,894
Vermiculite e/		15,000	15,000	15,000	15,000	15,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand tons	793	771	702 r/	704	757
Coal:						
Anthracite	do.	7	--	--	1	--
Bituminous 6/	do.	8,046	7,598	7,217	6,931	6,263
Total	do.	8,053	7,598	7,217	6,932	6,263
Coke including breeze:						
Metallurgical	do.	45,458	42,308	41,767 r/	41,287	42,010
Gashouse including breeze	do.	1,243	1,096	1,024	705	593
Gas, natural:						
Gross 7/	million cubic meters	2,134	2,159	2,204	2,274	2,209
Marketed	do.	2,273	2,295	2,308	2,334 r/	2,315
Petroleum:						
Crude	thousand 42-gallon barrels	5,523	6,302	5,730	5,472	5,415
Refinery products:						
Gasoline:						
Aviation	do.	72	78	72	70 r/	74
Other	do.	278,883	290,913	301,782	313,523 r/	320,322
Asphalt and bitumen	do.	41,925 r/	37,273 r/	36,878	36,837 r/	36,124
Distillate fuel oil	do.	236,833	250,724	259,442	276,392	287,500
Jet fuel	do.	32,722	37,795	40,569	45,010	49,287
Kerosene	do.	153,908	163,560	169,573	171,010	171,969
Liquefied petroleum gas	do.	53,082 r/	54,798 r/	53,372	53,174 r/	57,084
Lubricants	do.	15,618	15,583	15,951	17,080	17,247
Naphtha	do.	88,636	100,649	109,178	109,821 r/	111,921
Paraffin	do.	918 r/	918 r/	804 r/	793 r/	800 e/
Petroleum coke e/	do.	950	900	900	950	950 e/
Refinery fuel and losses e/ 8/	do.	150,000	155,000	150,000	160,000	160,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specidied)

Commodity		1991	1992	1993	1994	1995 p/
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Refinery products:						
Residual fuel oil	thousand 42-gallon barrels	456,102	476,875	479,799	508,505	489,598
Unfinished oils e/	do.	57,000	58,000	58,000	60,000	60,000
Total e/	do.	1,566,699 r/	1,643,066	1,676,320	1,753,165	1,762,876

e/ Estimated. p/ Preliminary. r/ Revised.
1/ Table includes data available through July 9, 1996.
2/ Includes unalloyed ingot and alloyed ingot.
3/ Recovered from scrap, waste, and returned by end users.
4/ Includes oxide of cerium, eruopium, gadolinium, lanthanum, neodymim, praseodymim, samarium, terbium, and yttrium.
5/ Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.
6/ All steam coal.
7/ Includes output from gas wells and coal mines.
8/ May include some additional unfinished oils.

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistics, 1995; Yearbook of Iron and Steel Statistics, 1995; Yearbook of Chemical Industries Statisitics, 1995; Yearbook of Ceramics and Building Materials Statistics, 1995; and Yearbook of Production, Supply and Demand of Petroleum, Coal and Coke, 1995.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal		Hokutan Sorachi Coal Mining Co. Ltd. 1/	Sorachi in Utashinai, Hokkaido Prefecture	800
Do.		Mitsui Coal Mining Co. Ltd.	Miike in Omuta, Fukuoka Prefecture	2,500
Do.		Matsushima Coal Mining Co. Ltd.	Ikeshima in Sotome, Nagasaki Prefecture	1,400
Do.		Taiheiyo (Pacific) Coal Mining Co. Ltd.	Kushiro, Hokkaido Prefecture	2,200
Copper:				
Refined	metric tons	Hibi Kyodo Smelting Co. Ltd. (64% owned by Mitsui Mining and Smelting Co. Ltd., with minority ownership by Nittetsu Mining Co. Ltd. and Furukawa Co. Ltd.)	Tamano, Okayama Prefecture	174,700
Do.	do.	Mitsubishi Materials Crop.	Naoshima, Kagawa Prefecture	187,200
Do.	do.	Nippon Mining and Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture	132,000
			Saganoseki, Oita Prefecture	198,000
Do.	do.	Onahama Smelting and Refining Co. Ltd. (30% owned by Dowa Mining Co. Ltd., 12% by Furukawa Group Co., 49% by Mitsubishi Materials Corp., 4% by Mitsui Mining and Smelting Co. Ltd., and 5% by others)	Onahama, Fukushima Prefecture	247,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi, Ehime Prefecture	210,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	60,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	38,400
Gold:	kilograms			
In concentrate		Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined		Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.		Nippon Mining and Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	15,000
Do.		Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	30,000
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka 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 Otia Prefecture	14,000
Do.		Ube Industries Ltd.	Isa, Yamaguchi Prefecture	11,000
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (wholly owned subsidiary of Asahi Glass Co. Ltd.)	Oami-Shirasato, Ichinomya, Misaki, and Hikari,Chiba Prefecture; Kurosaki, Niigata Prefecture; and Sadowara, Miyazaki Prefecture	4,300
Do.	do.	Nippon Natural Gas Industry Co. Ltd.	Minamihinato-Shirako, Koji-Shirake, Yokoshiba, and Narashino, Chiba Prefecture	1,300
Do.	do.	United Resources Industry Co. Ltd.	Chosei and Otaki, Chiba Prefecture	1,800
Lead:				
In concentrate		Kamioka Mining and Smelting Co. Ltd. (wholly owned subsidiary of Mitsui Mining and Smelting Co. Ltd.)	Kamioka, Gifu Prefecture	4
Do.		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.)	Toyoha, Hokkaido Prefecture	8
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd. 2/	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	94,800
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.) 3/	Hosokura, Miyagi Prefecture	21,600
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. 4/	Takaoka, Yoyama Prefecture	18
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	18,000
Do.	do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	13,000
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	56,000
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	36,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	27,900
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

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel, crude		Kawasaki Steel Corp.	Mizushima, Okayama Prefecture and Chiba, Chiba Prefecture	16,880
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,300
Do.		NKK Corp.	Fukuyama, Hiroshima Prefecture and Keihin, Tokyo Prefecture	22,130
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	48,800
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	22,140
Titanium:				
In sponge metal		Sumitomo Sitix Corp. (92.4% owned by Sumitomo Metal Industries, Ltd. and 7.6% owned by Kobe Steel Ltd.)	Amagasaki, Hyogo Prefecture	15
Do.		Toho Titanium Co. Ltd. (47% owned by Nippon Mining and Metals Co. Ltd., 20% by Mitsui & Co. Ltd., and 33% by others)	Chigasaki, Kanagawa Prefecture	11
In oxide	metric tons	Fuji Titanium Industry Co. Ltd. (24.8% owned by Ishihara Sangyo Co. Ltd.)	Kobe, Hyogo Prefecture	16,200
Do.	do.	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	23,400
Do.	do.	Ishihara Sangyo Co. Ltd.	Yokkaichi, Mie Prefecture	154,000
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	43,200
Do.	do.	Teika Co. Ltd.	Saidaiji, Okayama Prefecture	48,600
Do.	do.	Titan Kogyo Co. Ltd.	Ube, Yamaguchi Prefecture	16,800
Do.	do.	Tohken Products Corp.	Akita, Akita Prefecture	30,000
Zinc:				
In concentrate		Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	50
Do.		Toyoha Mining Co. Ltd.	Toyoha, Hokkaido Prefecture	60
Refined	metric tons	Akita Smelting Co. Ltd. (52% owned by Dowa Mining Co. Ltd., 24% by Nippon Mining and Metals Co. Ltd., 14% by Sumitomo Metal Mining Co. Ltd., and 5% each by Mitsubushi Materials Corp. and Toho Zinc Co. Ltd.) 5/	Iijima, Akita Prefecture	156,000
Do.	do.	Hachinohe Smelting Co. Ltd. (20% owned by Dowa Mining Co. Ltd., 50% by Mitsui Mining and Smelting Co. Ltd., 10% each by Nippon Mining and Metals Co. Ltd. and Mitsubishi Materials Corp., and 5% each by Toho Zinc Co. and Nisso Smelting Co.)	Hachonohe, Aomori Prefecture	108,000
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining ans Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Mitsubishi Materials Corp.	Akita, Akita Prefecture	105,600
Do.	do.	Nikko Zinc. Co. Ltd. (wholly-owned subsidiary of Nippon Mining and Metals Co. Ltd.) 6/	Mikkaichi, Toyama Prefecture	120,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

1/ Closed in Mar. 1995.
2/ The plant was renovated to a secondary lead smelter recycling batteries in 1995.
3/ The plant became a secondary smelter recycling batteries in 1995.
4/ Closed in Oct. 1995.
5/ Nippon Mining and Metals Co. Ltd. acquired 10% equity ownership from Mitsui Mining and Smelting Co. Ltd. in Mar. 1995. The plant was scheduled to close in June 1996.
6/ Closed in Oct. 1995.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal 1/		844,000
Copper ore, Cu content		151
Dolomite 2/		1,200,000
Gold ore, Au content	kilograms	550,000 e/
Iodine		1,800 e/
Lead ore, Pb content		623
Limestone 3/		57,430,000
Pyrophyllite		205,000
Silica sand 4/		357,000
Silica stone 5/		1,327,000
Zinc ore, Zn content		3,245

e/ Estimated.
1/ Recoverable reserves, including 17 Mt of lignite.
2/ Average ore grade is 17.9% MgO.
3/ Average ore grade is 54.2% CaO.
4/ Average ore grade is 73.1% SiO.
5/ Average ore grade is 87.9% SiO.

Sources: Ministry of International Trade and Industry (Tokyo). Agency of Natural Resources and Energy.