THE MINERAL INDUSTRY OF

JAPAN

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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 sector. Japan also relied on imports to meet some of its requirements for base and rare metals, industrial mineral products, and refined petroleum products.

In 1994, Japan was 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 high-purity gallium metal, pig iron, titanium sponge, and zinc metal. Japan remained the third largest producer of cement, copper metal, limestone, and nickel metal.

Japan was a major world market for minerals and metals. It was one of the world's top 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, 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.

The mining sector of Japan's mineral industry was small. The value of output by the mining sector was about $9 billion,[2] accounting for less than 0.3% of Japan's gross domestic product in 1994. However, the mineral processing sector played a very important role in providing the basic materials for Japan's world-class manufacturing sector. Japan's mineral processing sector also was one of the important supplier of ferrous and nonferrous metals, especially refined copper, refined lead, steel products, and slab zinc, to the growing economies of China, South Korea, Taiwan, and southeast Asian countries.

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, and titanium sponge, scrap; and powder to the United States.

Government Policies and Programs

The Ministry of International Trade and Industry (MITI), through its affiliated Metal Mining Agency of Japan (MMAJ), decided in February 1994 to set up an MMAJ Technology Research Center mainly to develop new technologies for mine drainage treatment, prevention of mine related pollution, and mineral exploration. The Government planned to provide $4.5 million for the capital costs of the Center. In mid-1994, MMAJ started construction of the new research center in Kosaka, Akita Prefecture, and was scheduled to complete construction by March 1995.[3]

According to MMAJ, the center planned to conduct research on environmental technology, exploration technology, and environmentally friendly production technology, and to promote international cooperation. On environmental technology, it planned to develop new economical biotechnology and other neutralization systems for mine drainage treatment, to investigate and test new recycling technology for recovery of metals from waste materials, and to develop mine-related pollution control strategies. On exploration technology, it planned to develop new exploration techniques, to improve technologies for satellite image analysis and geophysical exploration, and to develop exploration strategies. On production technology, it planned to develop economically viable and environment-friendly metal extracting techniques.

In September, MMAJ and the Japan International Cooperation Agency jointly announced that the country signed separate agreements with Kazakhstan and Kyrgyzstan to jointly explore for mineral resources in both countries for 3 years beginning in fiscal year 1994. The joint exploration would focus on copper in two areas, one about 700 kilometers (km) and the other about 1,000 km northwest of Almaty in Kazakhstan; and on copper, gold, lead, and silver

in the Talas area, about 350 km west of Bishkek in Kyrgyzstan. To facilitate its activities in Central Asia, MMAJ planned to open a new overseas branch office in Almaty, Kazakhstan, in March 1995.

After a cooperation agreement was reached in late 1994 between Japan's New Energy Development Organization (NEDO) and VNIITSVETMET of Kazakhstan, MMAJ, as a subcontractor to NEDO, was expected to sign a joint-research agreement with VNIITSVETMET in early 1995 for extraction of copper, gold, and silver from tailings. According to MMAJ, the 5-year joint-research project will focus on using solvent-extraction and electrowinning (SX-EW) to recover copper, gold, and silver from tailings at a polymetallic deposit in East Kazakhstan.

In October, MITI made a cooperative agreement with Australia, Indonesia, and Saudi Arabia to develop a new satellite analysis system with a new radar system jointly developed by MITI, Fujitsu Corp., Mitsubishi Electric Corp., NEC Corp., National Oil Corp., and Toshiba Corp. According to the agreement, the project, which was scheduled to start in April 1995 and be completed by 2000, was intended to develop new radar prospecting equipment and a data analysis system. With this new technology, the satellite would be able to locate and estimate reserves of oil, natural gas, and other minerals resources.[4]

According to the Ministry of Finance, Japan's Tariff Council approved in December 1994 cutting the tariff on primary aluminum ingots from 1% to 0.8% by March 31, 1995, and reducing the tariff to zero beginning on April 1, 1995. The Tariff Council also agreed to remove completely the existing 5.2% tariff on primary magnesium on April 1, 1995.

In June 1994, MITI's Natural Resources and Energy Agency announced that it decided to abolish Law No. 95 of 1985 concerning provisional measures for importing specified petroleum refined products, such as gasoline, kerosene, and diesel fuel. Under this law, importers of these products were limited to those major oil companies with petroleum refining facilities in Japan. Beginning in April 1996, after the law expires in March 1996, importers of petroleum refined products would not be limited to those oil companies with refining facilities, but to allow newcomers, such as trading companies, to freely import gasoline and other petroleum refined products.

Environmental Issues

To help solve the problem of growing volumes of industrial waste and to control mine-related pollution, the Mine Safety Division of MITI's Environmental Protection and Industrial Location Bureau decided in 1994 to promote its Recycle Mine Parks plan. According to the Recycle Mine Parks plan, industrial waste would be dumped into existing closed mines and use these closed mine sites as metals recycling and processing bases. According to MITI, about 80 such closed mine sites have an existing infrastructure and full drainage treatment facilities. These sites could be used to extract recoverable metals from industrial waste and facilitate other recycling efforts. Utilization of these closed mine sites also would spur the economic activity of local communities and reduce the risk of subsidence.[5]

Production

Mine production of most nonferrous minerals, except gold, decreased considerably from that of 1993 resulting from the higher yen value and increased low-priced imports of nonferrous metal ore and concentrate. Mine production of most industrial minerals and construction-related materials, except limestone and silica sand, decreased from that of 1993 owing to the continued weakness in the general economic condition in 1994.

In the mineral fuels sector, coal output dropped to a record low in 1994 because of mine closures in Hokkaido. Production of natural gas continued the 1993 upward trend, while production of crude petroleum decreased in 1994.

In the mineral processing sector, production of most metals and industrial minerals was at a lower level than that of 1993 because of reduced demand for basic materials by the manufacturing and construction industries in 1994. However, metal production of gold, indium, molybdenum, nickel, high-purity silicon, titanium sponge, and tungsten rose slightly owing to the short supply and higher prices of these metals in 1994. Cement production reached a record high in 1994 owing to increased exports to southeast Asia. *(See table 1.)*

Trade

Japan was a large net importer of mineral commodities in 1994. It was a major world importer of mineral fuels, nonfuel minerals, and nonferrous metals. It was also a major world exporter of processed minerals in 1994. According to the Ministry of Finance, its mineral trade deficit was smaller than that of 1993 because of higher export earnings that in 1994 were due to increased exports of iron and steel and nonferrous metal products, as well as a higher yen value.

The import bills of both mineral fuels and nonferrous metal ores were higher than that of 1993 because of the larger quantities of mineral fuels imports and the higher prices of nonfuel minerals imports in 1994. Despite an increase in the import quantity of mineral fuels, import bills of coal, crude and partially refined petroleum, LNG, and refined petroleum products declined from $48.8 billion in 1993 to $47.8 billion in 1994 owing to the stronger value of the Japanese yen. However, import bills for nonfuel minerals and metals rose from $16.8 billion in 1993 to $18.3 billion in 1994 owing to higher prices of nonferrous minerals and metals. Imports of mineral fuels and nonfuel minerals and metal accounted for 17.4% and 6.7%, respectively, of Japan's total import bills in 1994.

Total exports of minerals commodities, including iron and steel, nonferrous metals, and industrial minerals, increased from $27 billion in 1993 to $29 billion, accounting for 7.3% of Japan's total exports. Exports of iron and steel increased

slightly to $14.8 billion from $14.5 billion in 1993. Exports of nonferrous metals, fabricated metal products, and industrial minerals also increased to $14.1 billion from $12.5 billion in 1993.

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 States rose from $105.4 billion in 1993 to $117.6 billion, accounting for 29.7% of Japan's total exports in 1994. Imports from the United States also rose from $55.2 billion in 1993 to $62.7 billion, accounting for 22.8% of Japan's total imports. In 1994, Japan's overall merchandise trade surplus with the United States rose to $54.9 billion from $50.2 billion in 1993.

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. The Government extended financial and technical assistance to the mineral industry, which followed Government policy guidelines during depressed market conditions.

Because of the continuing restructuring program resulting from the high value of the Japanese yen and economic recession during the first half of the 1990's, industry output capacity and employment had been reduced substantially. Contraction in coal and nonferrous metal mining was more drastic than in other sectors because of the higher yen value, lower costs of imports, and higher domestic production costs.

According to MITI, coal was produced from 4 major mines and about 10 small-scale mines in the Hokkaido and Kyushu areas with a total capacity of about 7 million metric tons per year (Mmt/a) and a work force of 3,200 in 1994. The number of operating nonferrous metal mines was reduced from 24 in 1993 to 20 in 1994, and employment declined from 1,863 in 1993 to 1,427 in 1994. The number of operating industrial minerals mines and employment both declined from 577 and 12,951 in 1993 to 565 and 12,810, respectively, in 1994.

In line with the overall restructuring program, the steel industry, with an excess of workers, cut its work force from 287,068 in 1993 to 271,906 in 1994. The iron and steel industry also reduced its pig iron production capacity from 97.6 Mmt/a in 1993 to 93.6 Mmt/a in 1994, but raised its steelmaking capacity from 137.9 Mmt/a in 1993 to 147.5 Mmt/a in 1994. Because of a slight improvement in domestic demand for nonferrous metals, the nonferrous metal smelting and refining industry remained steady.

Japan's copper refining capacity stood at 1.25 Mmt/a, lead refining capacity was at 278,000 metric tons per year (mt/a), and zinc refining capacity was at 874,800 mt/a in 1994. *(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 1994 remained at about 60,000, accounting for 0.09% of the Japanese labor force of 66.5 million, compared with 70,000 persons accounting for 0.11% of 62.7 million in 1989.

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 1994. 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 about 23% of the primary aluminum traded in the world market, and was the world's second largest consumer of primary aluminum in 1994.

According to MITI, because of increased demand by the rolling and wire and cable sectors, imports of primary aluminum increased from 2.27 million metric tons (Mmt) to 2.33 Mmt (in metal content of primary aluminum and alloy ingots) in 1994. The yearend overall stocks of primary aluminum by producer, dealer, and consumer increased from 382,332 metric tons (mt) in 1993 to 385,955 mt in 1994.

According to the Ministry of Finance, imports of primary aluminum were 2,639,436 mt in 1994, of which 119,845 mt was high-grade ingot, 1,864,781 mt was regular-grade ingot, and 654,810 mt was alloy ingot. Because of its heavy reliance on imports, Japan had widely diversified its overseas sources of primary aluminum from more than 50 countries. About 64% of Japan's primary aluminum imports in 1994 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. However, since 1993, Russia, Bahrain, and the United Arab Emirates had emerged among the major suppliers of primary aluminum to Japan. Among the major suppliers of primary aluminum to Japan, Australia accounted for 16.4% of Japan's total primary aluminum imports in 1994, followed by Brazil, 15.3%; Russia, 13.5%; Canada and the United States, 7.1% each; New Zealand, 6.4%; Venezuela, 6.0%; Indonesia, 5.6%; Bahrain, 4.6%; and the United Arab Emirates, 4%.

Consumption of primary aluminum rose by 9.7% to 2.32 Mmt in 1994 because of a mild economic recovery in the second half of 1994. Increased demand by the aluminum rolling and aluminum casting sectors was owing to improvements in production of automobiles, aluminum cans, building materials, and home electric appliances. According to MITI, consumption of primary aluminum, by sector, in 1994 was as follows: 1,872,897 mt by aluminum rolling;

125,758 mt by aluminum casting; 125,158 mt by secondary smelting; 86,041 mt by wire and cable; 39,373 mt by aluminum die-casting; 27,471 mt by steel deoxidization; and 41,648 mt by other.

Chromium.—Domestic mine production of chromium ore concentrate was by Nippon Chrome Industries Ltd. from the Wakamatsu Mine in Tottori Prefecture. The small-scale mining operation, using less than 50 workers, produced about 7,000 mt in 1994. Japan relied on imports to meet about 99% of its chromium requirements in 1994.

Imports of metallurgical- and refractory-grade chromite rose by 10.5% to 664,545 mt in 1993. South Africa and Kazakhstan were two dominant suppliers of chromite, providing 363,603 mt and 83,668 mt, respectively, in 1994. Other important suppliers of chromite were Madagascar, 57,941 mt; Iran, 62,840 mt; India, 37,065 mt; Brazil, 16,291 mt; and Sudan, 15,163 mt.

According to MITI, consumption of chromite by the ferroalloy industry decreased from 428,026 mt in 1993 to 394,605 mt in 1994. Ferrochromium was produced by four companies in 1994. Japan Metal and Chemical Co. Ltd. operated a 62,800-mt/a-capacity plant at Kita Kyushu in Fukuoka Prefecture and a 21,000-mt/a-capacity plant at Oguni in Yamagata Prefecture. NKK Corp. operated a 61,000-mt/a-capacity plant at Toyama in Toyama Prefecture. Nippon Denko K.K., which cut its capacity by 81,000 mt/a in 1994, operated a 18,600-mt/a-capacity plant at Hokuriku in Toyama Prefecture. Showa Denko K.K. operated a 20,700-mt/a-capacity plant at Chichibu in Saitama Prefecture and a 70,000-mt/a-capacity plant at Shunan in Yamaguchi Prefecture. During 1994, Pacific Metals Co. Ltd. idled its 27,000-mt/a-capacity plant at Hachinohe in Aomori Prefecture.

In 1994, imports of ferrochromium increased to 610,163 mt from 548,917 mt in 1993 because of reduced domestic production of ferrochromium and increased consumption for the production of stainless steel. In 1994, South Africa remained the dominant supplier of ferrochromium, providing 289,218 mt or 47% of the 1994 ferrochromium imports. Other major suppliers in 1994 were India, 84,378 mt; China, 82,688 mt; Zimbabwe, 48,855 mt; Russia, 32,915 mt; the Philippines, 18,668 mt; Finland, 13,453 mt; and Kazakhstan, 13,296 mt.

Because of decreasing competitiveness of domestically produced ferrochromium, Showa Dendo and Marubeni Corp., a major trading company, were expected to reach an agreement with Samancor Ltd. of South Africa to establish a joint-venture firm to produce low-carbon ferrochromium and ferrochromium-silicon in Middelburg, South Africa, for export to Japan and other overseas markets. According to the agreement, a feasibility study for a joint-venture production of low-carbon ferrochromium using Showa Denko's technology at Samancor's Middelburg plant was scheduled to be completed by March 1995.[6] Nippon Denko and Samancor, through NST Ferrochrome Pty. Ltd., had established a 50-50 joint-venture firm in 1993 to produce 60,000 mt/a of ferrochromium at Samancor's Tubatse plant in October 1993. Most of the Tubatse's output was exported to Japan for distribution by Nippon Denko.

Japan was the world's leading producer of chromium metal in 1994. Production of chromium metal with 99.95% purity declined to about 3,000 mt in 1994 from 3,150 mt in 1993. Nippon Denko K.K. operated a 700-mt/a plant using an 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. About 90% of chromium metal production in 1993 was by Tosoh. Because of the yen appreciation and the redevelopment program of Yamagata City, where the Tosoh chromium metal plant is located, the company had decided to close the metal plant in 1995. In 1992, Tosoh conducted a joint feasibility study with Samancor for construction of a 3,600-mt/a chromium metal plant in South Africa using Tosoh's technology. However, the two companies were unable to reach an agreement and decided to terminate negotiations in September.

As a result of reduced domestic production, imports of chromium metal rose by 39% to 2,046 mt. Principal suppliers of chromium metal in 1994 were China, 855 mt; Russia, 464 mt; the United Kingdom, 309 mt; the United States, 266 mt; and France 120 mt. Exports of chromium metal rose slight from 1,336 mt in 1993 to 1,484 mt in 1994. The United States and South Korea were the two major buyers of the Japanese high-purity chromium metal, accounting for 65% and 15%, respectively, of the total exports in 1994.

Cobalt.—Japan relied on imports to meet all of its cobalt requirements. Cobalt metal production declined in 1994. Since 1987, Sumitomo Metal Mining Co. Ltd., the only cobalt metal producer with a rated capacity of 500 mt/a, had recovered cobalt from the precipitate of its nickel refinery in Niihama, Ehime Prefecture, using cobalt-bearing nickel sulfide from Australia and Indonesia. Nippon Mining's Nikko cobalt-nickel refinery with a rated capacity of 1,200 mt/a in Hitachi, Ibaraki Prefecture, reportedly remained shut down in 1994 owing to a lack of raw material.

Imports of cobalt metal increased by about 28% to 5,650 mt in 1994, while cobalt prices in the world market remained at the high level. Imports of cobalt metal, including powders, flakes, and waste and scrap, totaled 5,776 mt in 1994. Zambia and Zaire were the two dominant suppliers, providing 1,299 mt and 1,091 mt, respectively, in 1994. Other important cobalt metal suppliers in 1994 were Canada, 843 mt; Norway, 744 mt; Belgium, 563 mt; the United States, 307 mt; the United Kingdom, 228 mt; Russia, 221 mt; and Finland 131 mt. In 1994, Japan's exports of cobalt, including matte, intermediate products, and scrap were 401 mt, compared with 269 mt in 1993.

According to MITI, demand for cobalt by the manufacturers of catalysts, magnetic materials, and specialty steel declined, while demand by the manufacturers of pipe, plate, and rods; and cemented carbides; and other end uses

increased in 1994. Consumption of cobalt by end use in 1994 was as follows: catalysts, 371 mt; cemented carbides, 299 mt; magnetic materials, 486 mt; pipe, plate, rod, and wire, 275 mt; specialty steels, 591 mt; and other, 501 mt.

Copper, Lead, and Zinc.—In 1994, domestic mine production of copper, lead, and zinc decreased to a record low in 1994 because of mine closures by Dowa Mining Co. Ltd. The amount of domestic mine production of copper, lead, and zinc was equivalent to about 0.4%, 3.5%, and 14.6%, respectively, of Japan's apparent consumption of copper, lead, and zinc metals in 1994. According to MITI, Kamioka Mining and Smelting Co. Ltd. and Toyoha Mining Co. Ltd. were the two major nonferrous metal mining companies operating with more than 100 workers in 1994.

Because of the Japanese yen appreciation and sluggish domestic metal prices, Dowa Mining, through its wholly owned subsidiary, Hanaoka Mining Co. Ltd., closed the Matsumine and Fukazawa Mines in Akita Prefecture; and through another wholly owned subsidiary, Shin-Uchinotai Mining Co. Ltd., closed the Nurukawa Mine in Aomori Prefecture at the end of March 1994. As a result, Dowa Mining had ceased all of its nonferrous mining operations in Japan in 1994.

Mitsui Mining and Smelting Co. Ltd., through its wholly owned subsidiary, Kamioka Mining and Smelting Co. Ltd., reportedly closed one of its underground mining operations at the Kamioka-Mozumi deposit in June 1994 because of decreasing ore grade and depleting ore reserves. However, it continued to mine lead and zinc at the Tochibora deposit of the Kamioka Mine in Gifu Prefecture.

To extend mining life of the Kamioka Mine, Mitsui Mining and Smelting and MMAJ planned to jointly conduct a 4-year detailed geological survey in the Sakonishi district of the Hida area near the Kamioka-Mozumi deposit in Gifu Prefecture beginning in 1995. According to previous drilling surveys by MMAJ, two high-grade zinc mineralizations were discovered in 1992 and 1993. MMAJ planned to conduct exploratory tunneling beginning in 1995 to identify the size and quality of the deposit.[7]

Toyoha Mining Co. Ltd., a wholly owned subsidiary of Nippon Mining and Metals Co. Ltd., operated Japan's largest lead-silver-zinc mine at Toyoha, near Sapporo in Hokkaido. The 1994 ore output of lead and zinc reportedly was less than that of 1993 because of lower ore grade. In 1994, MMAJ and Toyoha Mining jointly continued their exploration for lead, silver, and zinc in the Jozankei area, west of Sapporo, near the Toyoha Mine.

Because of dwindling supply of domestic nonferrous metal ores, Japan's major nonferrous metal mining companies were actively involved in overseas development of copper, lead, and zinc mines with foreign partners in Australia, Chile, Mexico, and the United States in 1994. Among the major nonferrous metal mining companies, Dowa Mining Co. Ltd., Mitsubishi Materials Corp., Sumitomo Metal Mining Co. Ltd., Nippon Mining and Metals Co. Ltd., and affiliated trading companies, had heavily invested in overseas mine development projects to secure their smelters' nonferrous metal ores requirements since 1993.

According to Nikkan Kogyo Shimbun, a local press report, in October 1994, Sumitomo Metal Mining and Sumitomo Corp. began joint development of the La Candelaria copper project, near Copiapo in Chile, with Phelps Dodge Corp. of the United States in April 1993. The $559 million project was jointly owned by Phelps Dodge, 80%; Sumitomo Metal Mining, 15%; and Sumitomo Corp., 5%. Development of the copper mine was completed ahead of schedule and started mine production in October 1994. La Candelaria Mine planned to produce 400,000 mt/a of copper concentrate containing 120,000 mt/a of copper, of which 200,000 mt/a of copper concentrate containing 60,000 mt/a of copper wwas scheduled to be shipped to Japan beginning in late 1994.

Sumitomo Metal Mining Co. Ltd. and Sumitomo Corp. also began joint development of the Northparkes copper-gold project in New South Wales, Australia, with North Broken Hill Peko Ltd. in April 1993. The $175 million project was jointly owned by North Broken Hill Peko, 80% and Sumitomo Metal Mining and Sumitomo Corp., 20%. Construction of mine and milling facilities was scheduled for completion in September 1995. The ores would be produced from two open pits and one underground mine. The milling capacity, 3.7 Mmt/a for producing 100,000 mt/a of copper concentrate containing 45,000 mt/a of copper, of which 60,000 mt/a of copper concentrate containing 27,000 mt/a of copper, would be shipped to Japan beginning in October 1995.[8]

Nippon Mining & Metal Co. Ltd., Mitsui & Co. Ltd., Mitsubishi Materials Corp., and Marubeni Corp. began joint development of the McArthur River zinc-lead-silver project with Mount Isa Mines Ltd. of Australia's Northern Territory in 1993. The $180 million project was jointly owned by MIM, the parent company of Mount Isa Mine, 70%; Nippon Mining and Metal, 15%; and Mitsui, Mitsubishi Materials, and Marubeni, 5% each. Construction of mine and milling facilities was scheduled for completion in 1995 with an annual capacity of 1.5 Mmt of ore and 350,000 mt/a of mixed concentrate containing 160,000 mt of zinc, 45,000 mt of lead, and 49,800 kilograms (kg) of silver.

Dowa Mining Co. Ltd. and Sumitomo Corp. began joint development of a complex (copper, lead, and zinc) sulfide ore deposit with Industria Penoles of Mexico at Tizapa in the Arceris district in Mexico in June 1992. The $38.2 million project was owned by Industria Penoles, 51%; Dowa Mining, 39%; and Sumitomo Corp., 10%. According to Nikkan Kogyo Shimbun, the mine started production in August 1994 at the rate of 240,000 mt/a. The mine was to ship 30,000 mt/a of zinc concentrate containing 12,600 mt/a of zinc and 1,400 kilograms per year of silver to Japan.

Other important overseas investments made during the 1980's by major nonferrous metal mining companies in copper, lead, and zinc mines were as follows:

- A Japanese consortium, led by Mitsubishi Materials, Mitsubishi Corp., and Nippon Mining and Metals, which

had acquired a 10% interest in the La Escondida copper Mine in Chile in 1985, reportedly planned to participate in a major expansion project with its partners to increase mine production capacity to 800,000 mt/a of ore from 480,000 mt/a in 1994.

- Sumitomo Metal Mining and Sumitomo Corp., which jointly held a 15% interest in the Morenci copper mine in Arizona since 1986, reportedly were planning to make an additional $200 million investment for exploration and development of a new copper deposit and for upgrading the SX-EW equipment in cooperation with Phelps Dodge at the Morenci Mine.
- Mitsubishi Materials and Mitsubishi Corp. acquired one-third interest in copper mining, milling, and smelting complex at Chino, New Mexico, in 1981. Mitsubishi Materials had the right to take one-third of the copper production.

Japan remained the world's largest importer of copper ore and concentrate, accounting for more than 50% of the world total imports in 1994. Imports of copper concentrate and refined copper decreased slightly from that of 1993, while imports of blister and unalloyed copper scrap increased in 1994. *(See table 3).*

Because of reduced smelter production, imports of lead ore and concentrate decreased by 19.5% to 234,085 mt in 1994, of which 100,641 mt came from Australia, 68,116 mt from Peru, 22,754 mt from China, 19,837 mt from South Africa, 12,350 mt from Russia, 10,306 mt from the United States, and 81 mt from other countries.

For the same reason, imports of zinc ore and concentrate dropped by 16% to 992,025 mt in 1994, of which 580,832 mt came from Australia, 140,552 mt from Peru, 107,642 mt from the United States, 37,003 mt from China, 33,979 mt from Russia, 30,001 mt from Chile, 21,866 mt from Mexico, 20,696 mt from Canada, and 19,454 mt from other countries. The United States was the third largest overseas supplier, accounting for 10.9% of Japan's zinc concentrate imports in 1994.

Imports of refined lead rose by 24.3% to 52,369 mt, while imports of slab zinc also dropped by 23.8% to 64,156 mt in 1994. The overseas suppliers of refined lead in 1994 were China, 22,966 mt; Peru, 9,108; Australia, 7,849 mt; Mexico, 6,013 mt; the United States, 2,882 mt; South Korea, 2,534 mt, and other countries, 1,017 mt. The overseas suppliers of slab zinc were China, 22,824 mt; North Korea, 18,709 mt; Canada, 5,078 mt; Kazakhstan, 4,040 mt; Australia, 3,733 mt; South Korea, 2,724 mt; Russia, 2,569 mt; Peru, 1,387 mt; Mexico, 1,096 mt; and other countries, 1,996 mt.

Despite a slight increase in domestic demand, metal production of copper declined by 5.9% owing mainly to a tight supply of copper ores and concentrates in the world market in 1994. Metal production of lead and zinc decreased owing mainly to a weaker domestic demand by the storage batteries and inorganic chemicals industries for lead and by the galvanizing industry for slab zinc in 1994. *(See table 4).*

To increase efficiency and to remain competitive, Nippon Mining and Metals was to spend between $60 million and $70 million for renovating one of the two existing flash furnaces for copper smelting at its Saganoseki smelting and refining complex in Oita Prefecture starting in mid-1994. The renovation project involved modifications of the furnace for injection of high-density oxygen into the furnace, loading of copper ore and concentrate into the furnace from the top, and raising the recovery rate of sulfuric acid. According to the company, when the project is completed in 1996, the newly renovated furnace would be able to produce the same amount as the two old furnaces combined and would enable the company to make a profit at the 99-yen-to-US$1 exchange rate level. The other furnace, which was not renovated, was expected to be mothballed.[9]

According to a report by the Tokyo-based Japan Metal Review, Mitsubishi Materials had agreed in late 1994 to supply its continuous smelting technology to the privately owned the United Kingdom-based Medist Group to build a 150,000 mt/a copper smelting, refining, and rolling complex at Pipavav in Gujarat, India. Mitsubishi Materials also agreed to take an 18% interest in the $500 million project, which was scheduled to start construction in September 1995 and to begin commercial operation in January 1998. This will be the third copper smelter using Mitsubishi's continuous smelting technology in the world, following two successful operations at its own Noashima complex and the Falconbridge complex in Canada.

As a result of the poor outlook for domestic demand for lead by the storage battery industry, the appreciation of the Japanese yen, a lower lead price, and a Government plan to cut tariffs on imports of refined copper, lead, and zinc, two major nonferrous metals mining companies had withdrawn from the primary lead refining business and another firm converted its facilities to recycling lead in 1994.

According to the Japan Mining Industry Association, Mitsubishi Materials had closed its 14,000 mt/a lead refinery on Naoshima Island, Kagawa Prefecture, in April 1994. The Japan Metal Review reported that Nippon Mining and Metals stopped production of primary lead at its 15,000 mt/a lead refinery at Saganoseki, Oita Prefecture, in May 1994. However, according to Nippon Mining and Metals, the move merely suspended production, but did not close the plant. Kamioka Mining Co. Ltd., a wholly owned subsidiary of Mitsui Mining and Smelting, reportedly also ceased production of primary lead at its 33,600 mt/a lead refinery at Kamioka, Gifu Prefecture, at yearend 1994. However, the lead refinery at Kamioka was to become a secondary lead producer by recycling auto batteries in 1995.

MIM Holdings of Australia, in partnership with Nippon Mining and Metals and Mitsui Mining and Smelting, reportedly abandoned its plan to build a $375 million lead-zinc smelting and refining complex in Hachinohe, Aomori Prefecture, in August 1994.[10] Construction had been scheduled to begin in early 1994, but in August 1993, MIM decided to postpone the project indefinitely because of the appreciation of the Japanese yen and lower world metals prices.

According to MITI, domestic consumption of refined

copper increased by 1.5% to 1,502,666 mt in 1994 because of increased demand for production of brass mill products and copper alloy castings. Demand for copper by the wire and cable sector, which accounted for 65.8% of copper consumption in 1994, dropped 0.8% to 989,341 mt. Demand for copper by the brass mill sector, which accounted for 32.8% of copper consumption in 1994, increased by 6.6% to 493,080 mt owing to the stronger demand by the electrical machinery and metal products industries. Exports of refined copper decreased by 28% to 114,436 mt in 1994. The major overseas buyers were Taiwan, accounting for 59.6% of total exports; South Korea, 14.2%; Thailand, 11.2%; and the United States, 6.8%. Overall stocks of refined copper dropped by 9.7% to 143,252 mt at yearend 1994.

Domestic demand for refined lead decreased by 5.8% to 273,206 mt in 1994, of which 65.6% was for storage batteries; 18.4%, for inorganic chemicals; 3.6%, for solders; 3.3%, for lead pipe and sheet; and 9.1%, for other. Exports of primary lead dropped by 93.5% from 7,175 mt in 1993 to only 467 mt in 1994. Overall stocks of primary lead decreased by 25.3% to 28,272 mt at yearend 1994.

Domestic demand for zinc slab decreased by 2.8% to 703,460 mt in 1994, of which 49% was for sheet galvanizing; 14% each, for other plating and brass mill products; 12%, for zinc die-cast products; 5%, for inorganic chemicals; and 6%, for other. Exports of zinc metal increased by 19% to 38,635 mt in 1994. Overall stocks of zinc slab dropped by 21% to 117,374 mt at yearend 1994.

Gold and Silver.—Mine production of gold reached its highest level in 7 years, while silver continued its 1993 downward trend in 1994. Gold mine production by Sumitomo Metal Mining from the Hishikari Mine, Kagoshima Prefecture of southern Kyushu, was about 150,000 metric tons per month of ore and averaged more than 50 grams per metric ton of gold in 1994. To improve efficiency, Sumitomo Metal Mining reportedly invested about $6 million in 1994 to enlarge the drift of the Hishikari Mine. Because of closings of the Hanaoka Mine, Akita Prefecture, and the Mozumi deposit of the Kamioka Mine, Gifu Prefecture, silver mine production declined in 1994.

Japan's metal production of gold and silver decreased in 1994. There were five metal producers of gold and silver in 1994. 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 Niihama, Ehime Prefecture.

In 1994, the National Institute of Materials and Chemical Research under the Agency of Science and Technology reportedly had developed an environmentally friendly gold refining technology. The new technique used iodine tincture to dissolve gold from gold-bearing materials at a high temperature, then extract gold at a low temperature. Iodine and potassium iodide were the two principal elements of iodine tincture, which react with gold. The technique reportedly could be used to extract gold from ore or from gold-bearing electronic parts waste. The Institute had a contract with a Japanese iodine producer to conduct further studies for practical applications.[11]

In 1994, Japan relied on imports to meet about 55% of its gold metal demand and 28% of its silver metal demand. Imports of gold metal rose to 197,349 kg in 1994 from 176,351 kg in 1993. The major overseas gold suppliers in 1994 were Australia, 43.5%; the United Kingdom, 19.5%; Switzerland, 13.4%; South Africa, 9.3%; South Korea, 2.8%; Russia and Canada, 2.3% each; Belgium, 2.0%; the United States, 1.4%; and from other countries, 3.5%. Imports of silver metal jumped by 62.5% to 949 mt in 1994. The principal silver metal suppliers in 1994 were Mexico, providing 401 mt; the United States, 254 mt; Peru, 117 mt; Australia, 61 mt; and the United Kingdom, 51 mt.

Domestic gold demand, according to an estimate by Sumitomo Corp., totaled 345 mt in 1994, of which 100 mt was for jewelry; 50 mt, electronics; 15 mt, dentistry; 20 mt, gold plating, pottery and porcelain, watches, fountain pens, and other industrial uses; and 160 mt, private investments and other. Domestic silver demand, according to MITI, totaled 3,368 mt in 1994, of which 1,713 mt was for silver nitrate for photography; 284 mt, silver nitrate for other uses; 268 mt, electrical contacts; 248 mt, rolled products; 147 mt, brazing alloy; 111 mt, electroplating; 69 mt, jewelry and silverware; and 528 mt, 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. Imports of iron ore, including iron sand, pellet, and sinter, increased slightly to 116.1 Mmt in 1994 from 114.5 Mmt in 1993. Australia, Brazil, and India remained the three dominant sources of iron ore, providing 47.7%, 24.0%, and 13.5%, respectively, in 1994. Imports of pig iron, including direct-reduced iron, also increased to 1.8 Mmt in 1994 from 1.6 Mmt in 1993. The three major suppliers of pig iron in 1994 were China, 38.3%; Russia, 24.4%; and Brazil, 13.2%; and other countries, 24.1%. According to the Ministry of Finance, Japan's import c.i.f. price per metric ton of iron ore dropped $23.75 in 1994 from $26.56 in 1993, and its import c.i.f. price per metric ton of pig iron dropped to $151.73 in 1994 from $168.50 in 1993.

Consumption of iron ore, including iron sand, pellet, and sinter by blast furnaces, increased slightly to 121.48 Mmt in 1994 from 121.34 Mmt in 1993. Of the total pig iron produced in 1993, 98.8% was for steelmaking and 1.2% was for foundry uses. By the end of 1994, the total number of furnaces, including blast furnaces, electric furnaces, and other furnaces for pig iron production, remained at 47, but pig iron production capacity dropped to 93.6 Mmt/a from 97.6 Mmt/a

in 1993.

According to the Japan Iron and Steel Federation (JISF), to cut fuel costs, to ensure stabilizing blast furnace operation, and to prolong the service life of coke ovens, the iron and steel industry was actively using pulverized coal injection (PCI) with blast furnaces in making pig iron in 1994. Of 30 blast furnaces operating in 1994, 27 units used PCI. The average pulverized coal rate rose to 97.9 kilograms per metric ton (kg/mt) in 1994 from 84.5 kg/mt in 1993.

Japan remained the world's largest pig iron and crude steel producer, accounting for 14.5% and 13.6%, respectively, of the world production in 1994. In 1994, Nippon Steel Corp., which produced 25.5 Mmt of crude steel, remained the largest steelmaker in the world; NNK Corp., which produced 10.9 Mmt, ranked 5th; Sumitomo Metal Industries, which produced 10.1 Mmt, ranked 9th; Kawasaki Steel Corp., which produced 10 Mmt, ranked 10th; and Kobe Steel Ltd., which produced 5.6 Mmt, ranked 26th.[12]

Crude steel output declined slightly from that of 1993, but was better than the industry expected. Of the crude steel produced in 1994, 68.4% was processed by basic oxygen furnaces and 31.6% by electric furnaces. For the steelmaking sector, according to MITI, the number of basic oxygen furnaces remained at 71, while the number of electric arc furnaces increased by 6 to 480 by yearend 1994. As a result, the overall crude steel production capacity increased by 9.53 Mmt/a to 147.48 Mmt/a in 1994. However, the industry's labor force was cut by 15,162 to 271,906 workers at yearend 1994.

JISF's Direct Iron Ore Smelting technology development project reportedly produced consistently good results from tests using a 500-metric-ton-per-day pilot plant at NKK's Keihin Steel Works on Ogishima, offshore Kawasaki, Kanagawa Prefecture. A project test run was scheduled for completion in fiscal year 1995, ending March 1996. To develop a next-generation coke oven, according to JISF, a new joint research project, called the Super Coke Oven for Productivity and Environment Enhancement Toward the 21st Century, was launched in April 1994.

Despite a moderate recovery in the Japanese economy, domestic demand for ordinary steel products remained unchanged in 1994, while domestic demand for specialty steel increased considerably in 1994. According to JISF, domestic demand for ordinary steel products and specialty steel products was 55.89 Mmt and 9.75 Mmt, respectively, in 1994, compared with 55.91 Mmt and 9.23 Mmt, respectively, in 1993.

In 1994, domestic demand for ordinary and specialty steel products, respectively, was steel dealers, 19.79 Mmt and 1.21 Mmt; construction, 13.74 Mmt and 0.65 Mmt; automobile, 9.45 Mmt and 2.62 Mmt; conversion and processing, 3.22 Mmt and 3.50 Mmt; shipbuilding and marine equipment, 2.62 Mmt and 0.11 Mmt; electric machinery and equipment, 2.32 Mmt and 0.10 Mmt; tanks and containers, 2.20 Mmt and 0.03 Mmt; industrial machinery and equipment, 1.53 Mmt and 1.23 Mmt; and home and office appliances and other, 1.01 Mmt and 0.30 Mmt.

Exports of ordinary steel products decreased to 15.6 Mmt in 1994 from 16.8 Mmt in 1993, while exports of specialty steel products rose slightly to 3.5 Mmt in 1994 from 3.4 Mmt in 1993. Exports of iron and steel products, which included pig iron, ferroalloys, ordinary steels, specialty steels, semifinished steel, steel slab, and other iron and steel products, increased to 23.96 Mmt in 1994 from 23.51 Mmt in 1993, despite a sharp drop in exports to China.

The overall increase in exports of iron and steel products was attributed mainly to increased exports in 1994 to the United States and South Korea. In 1994, exports of iron and steel products to the United States jumped 99% to 3.64 Mmt and to South Korea by 75% to 2.94 Mmt, while exports to China dropped by 36% to 4.41 Mmt in 1994. Other major buyers of Japan's iron and steel products in 1994 were Taiwan, 2.57 Mmt and Thailand, 1.9 Mmt. Of the total exports in 1994, 16.59 Mmt was ordinary steel products; 3.94 Mmt, specialty steel products; and 3.43 Mmt, pig iron semifinished steel, ferroalloys, and other steel products.

Imports of iron and steel products dropped by 1.3% to 9.06 Mmt in 1994. Of the total imports, 5.19 Mmt was ordinary steel products; 1.81 Mmt, pig iron; 1.47 Mmt, ferroalloys; and the remaining 0.59 Mmt was steel slab, semimanufactured, wire, and specialty steel products. Hot-rolled heavy and medium plates, hot-rolled wide strip, hot-rolled wire rods, cold-rolled coils and sheets, and zinc-coated steel sheets were the major import steel products in 1994. South Korea remained the dominant overseas supplier of iron and steel products in 1994 providing 2.90 Mmt. Other overseas suppliers were China, 1.30 Mmt; Taiwan, 0.82 Mmt; and Brazil and Russia, 0.75 Mmt each.

According to the Ministry of Finance, average export prices for iron and steel products rose to $674.02 per metric ton (/mt) in 1994 from $659.94/mt in 1993. However, average import prices for iron and steel products declined to $454.53/mt in 1994 from $448.46/ mt in 1993.

Magnesium.—Production of primary magnesium dropped sharply in 1994 because of Ube Industries Ltd.'s decision to discontinue magnesium refining operation in Ube, Yamaguchi Prefecture, in October 1994. Japan Metals and Chemicals Ltd. discontinued magnesium refining operation in Takaoka, Toyama Prefecture, in 1992. However, both companies continued to process (remelting and casting) and sell magnesium ingots using imported materials mainly from Canada, China, Norway, the United States, and Russia. High energy costs, yen appreciation, and cheap imports were cited as the main reasons for the two companies ending their primary magnesium refining operations in Japan.[13]

To meet the growing demand, Japan imported a record amount of primary magnesium in 1994. Primary magnesium imports totaled 22,926 mt in 1994, of which China provided 35%; the United States, 30%; Canada, 16%; Norway, 11%; Russia, 5%; and 3%, other countries. Japan's secondary magnesium production by Japan's titanium sponge and zirconium production facilities amounted to 19,000 mt in

1994.

According to MITI, domestic demand for primary magnesium rose from 25,056 mt in 1993 to 27,511 mt in 1994, of which 20,775 mt were consumed by the manufacturers of aluminum nodular alloys; 2,898 mt by cast iron; 1,538 mt by die-castings; and 2,300 mt by others. Consumption of secondary magnesium by the titanium sponge and zirconium totaled 14,311 mt in 1994.

Manganese.—Japan's only operating manganese mine, the Nodatamagawa Mine in Iwate Prefecture, was a small-scale mining operation with fewer than 10 regular workers in 1994. Japan relied on imports for virtually all of its manganese ore requirements in 1994. Imports of manganese ore decreased by 6.5% to 1,131,521 mt in 1994, of which 8,445 mt was manganese dioxide and 1,123,076 mt was metallurgical-grade manganese ore. Australia, China, and Gabon were the three principal suppliers of manganese dioxide, providing 56%, 24%, and 14%, respectively, in 1994. The major suppliers of metallurgical-grade manganese were South Africa, Australia, and India, providing 43%, 36%, and 9%, respectively, in 1994. Japan also imported 67,877 mt of manganiferous iron ore, almost all of it from India.

To secure stable supplies of manganese ore from South Africa, Sumitomo Corp., a Tokyo-based major trading company, reportedly had invested $3 million in Associated Manganese Mines of South Africa Ltd. Sumitomo planned to make more investments or to extend loans for exploration and development of mines producing chromite, iron ore, and manganese ore in South Africa.[14]

According to MITI, consumption of metallurgical-grade manganese ore totaled 731,335 mt in 1994, of which 574,766 mt was for production of ferroalloys; 122,014 mt, for steelmaking; 10,156 mt, for production of pig iron; and 4,399 mt for other uses. Consumption of ferruginous manganese totaled 323,655 mt in 1994, of which 130,696 mt was for production of ferroalloys; 108,617 mt for steelmaking; 49,730 mt for production of pig iron; and 34,612 mt for production of sinter.

Japan was the world's leading producer of electrolytic manganese dioxide (EMD). In 1994, the total EMD production capacity controlled by three Japanese producers accounted for more than 40% of the world's total. Tosoh Corp., Japan's top producer of EMD, operated a 24,000-mt/a plant in Hyuga, Miyazaki Prefecture. Tosoh also has a 12,000-mt/a plant, which was operated with Mitsubishi Corp. as a joint-venture firm called Tosoh Hellas A.I.C. in Salonika, Greece. This plant was capable of producing high-grade EMD for the manufacture of dry cell batteries.

Mitsui Mining & Smelting Co., Japan's second largest producer, operated a 24,000 mt/a plant in Takehara, Hiroshima Prefecture. Production of EMD at the Takehara plant was interrupted by a fire. As a result, the plant was only partially operable for about 2 months in mid-1994. The company also has a 12,500 mt/a plant, which was operated by its subsidiary, Mitsui Denman (Ireland) Ltd. in County Cork, Ireland. Japan Metal and Chemicals Co. Ltd., Japan's third producer of EMD, operated a 18,000 mt/a plant in Takaoka, Toyama Prefecture.

According to MITI, total shipments of EMD decreased from 58,512 mt in 1993 to 56,616 mt in 1994. Stocks at yearend 1993 decreased from 9,998 mt in 1993 to 8,237 mt in 1994. According to the Ministry of Finance, exports of EMD totaled 32,574 mt in 1994, while imports of EMD amounted to only 4,375 mt in 1994. Japan exported most of its EMD to east Asian and southeast Asian countries, such as South Korea, Taiwan, Hong Kong, Indonesia, Malaysia, Thailand, Singapore, and the Philippines. France, Germany, and Switzerland were other major European buyers EMD in 1994.

Nickel.—Japan was the world's largest consumer and the second largest producer of nickel metal, including ferronickel, nickel oxide, and refined nickel, in 1994. However, all of its raw material requirements for nickel, including nickel ore, ferronickel, and refined nickel, were met by imports. In 1994, imports of nickel ore were 2.9 Mmt. According to the Ministry of Finance, New Caledonia, Indonesia, and the Philippines remained the three suppliers, providing 1,309,178 mt, 939,557 mt, and 652,825 mt, respectively, in 1994.

According to MITI, consumption of nickel ore by the ferroalloy industry for ferronickel production dropped 5.5% to 2 Mmt in 1994. However, imports of ferronickel rose by 9% to 48,394 mt in 1994. The major suppliers of ferronickel in 1994 were New Caledonia, 34,580 mt; the Dominican Republic, 6,555 mt; Colombia, 4,279 mt; and Indonesia, 1,776 mt.

Production of ferronickel in 1994 was by Pacific Metals Co. Ltd. with a 42,000 mt/a plant in Hachinohe, Aomori Prefecture; by Nippon Yakin Kogyo Co. Ltd. with a 14,400 mt/a plant in Oeyama, Kyoto Prefecture; and by Sumitomo Metal Mining Co. Ltd., through its subsidiary, Hyuga Smelting Co. Ltd., with a 18,000 mt/a plant in Hyuga, Miyazaki Prefecture. The plant capacity for each company was not in gross weight of ferronickel but nickel content of ferronickel, ferronickel shot, and ferronickel granules. The average nickel content of ferronickel produced by Pacific Metal and Sumitomo Metal Mining was 20%; and by Nippon Yakin Kogyo, 22.5%. According to MITI, consumption of ferronickel increased by 11.4% to 341,019 mt in 1994 from 306,325 mt in 1993 owing to increased production of nickel-based stainless steel in 1994.

Imports of nickel matte for the production of refined nickel and nickel oxide rose from 63,622 mt in 1993 to 82,242 mt in 1994, of which 56,707 mt was from Indonesia and 25,535 mt was from Australia. Western Mining Corp. Ltd. of Australia and P.T. Inco of Indonesia remained the two suppliers of nickel matte to Japan. Imports of nickel oxide and oxide sinter decreased from 2,396 mt in 1993 to 2,256 mt in 1994. Australia remained the sole supplier of nickel oxide and oxide sinter in 1994.

Production of refined nickel by Sumitomo Metal Mining,

which had a 27,900 mt/a plant in Niihama, Ehime Prefecture, increased considerably in 1994 owing to stronger demand for refined nickel by stainless steel producers. Production of nickel oxide sinter in 1994 was by Tokyo Nickel Co. Ltd., operating a 36,000 mt/a nickel in oxide sinter plant in Matsuzaka, Mie Prefecture.

Japan relied on imports to meet 73.8% of its domestic requirement for refined nickel. In 1994, imports of refined nickel were 47,560 mt, imports of nickel powder and flakes were 6,803 mt, and nickel waste and scrap were 6,305 mt. The major suppliers of refined nickel in 1994 were Russia, 9,961 mt; Zimbabwe, 9,277 mt; Norway, 9,141 mt; China, 7,379 mt; Canada, 4,324 mt; Australia, 2,178 mt; and the United Kingdom, 2,076 mt. The major suppliers of nickel powders and flakes in 1994 were the United Kingdom, 3,932 mt and Canada, 2,671 mt. In 1994, Japan exported 1,448 mt of ferronickel, of which 1,431 mt went to Taiwan. Exports of refined nickel were 64 mt, all of which went to Indonesia.

According to MITI, domestic demand for refined nickel rose by 17.2% to 73,641 mt in 1994, of which 50,891 mt were consumed by the manufacturers of specialty steel; 5,809 mt by galvanized sheet; 3,836 mt by batteries; 3,751 mt by nonferrous alloy; 3,615 mt by magnetic material; 439 mt by catalyst; and 5,300 mt by other, including coinage and rolled sheet.

Titanium.—In 1994, Japan remained the second largest producer of titanium sponge metal 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 1994, Japan imported 68,000 mt of rutile, principally from Australia (52,000 mt) and India (14,600 mt), and 331,794 mt of ilmenite, mainly from Australia, 118,229 mt; Malaysia, 85,764 mt; Vietnam, 65,451 mt; Canada, 28,341 mt; and Sri Lanka, 25,122 mt. The average import c.i.f. price of rutile was $397.02/mt in 1994, compared with $394.78/mt in 1993. The average import c.i.f. price of ilmenite was $95.94/mt in 1994, compared with $88.13/mt in 1993.

All of the rutile was consumed by the producers of titanium sponge metal. Ilmenite was consumed mainly by the manufacturers of titanium dioxide of 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 1994 was by Sumitomo Sitix Corp. (formerly Osaka Titanium Co. Ltd.) at Amagasaki, near Osaka, Hyogo Prefecture, with a capacity of 15,000 mt/a; Toho Titanium Co. Ltd. at Chigasaki, about 20 km south of Yokohama, Kanagawa Prefecture, with a capacity of 10,900 mt/a; and Showa Titanium Co. Ltd., in Toyama, Toyama Prefecture, with a capacity of 3,200 mt/a. With decreased worldwide demand for titanium sponge metal, lower metal prices, and yen appreciation, Showa Titanium decided to cease production of titanium sponge by yearend 1994. Showa Titanium reportedly suffered a loss of about $39 million in 1994 because of undercapacity utilization and lower metal prices on the world market.

According to the Japan Titanium Society (JTS), domestic demand for titanium sponge decreased to 11,235 mt in 1994 from 12,132 mt in 1993, while overseas shipments of titanium sponge rose to 4,516 mt in 1994 from 2,962 mt in 1993. According to the Ministry of Finance, titanium sponge exports rose from 2,897 mt in 1993 to 4,634 mt in 1994, of which 3,244 mt went to the United Kingdom, 1,232 mt, the United States; 116 mt, France; and the remainder, other countries. Exports of titanium waste, scrap, and powder were 2,154 mt, of which 1,249 mt went to the United States and 765 mt went to the United Kingdom in 1994.

Production of titanium dioxide pigment continued the 1993 downward trend to a 6-year low because of lower market prices in 1994. However, according to MITI, domestic shipments of titanium dioxide were slightly higher than that of 1993. The 1994 output was equivalent to 77.3% of the industry's capacity of 307,800 mt/a.

Because of lower prices and weak demand by the automobile, electrical, and construction industries, most titanium dioxide pigment producers were operating at a loss. The industry's leader, Ishihara Sangyo Co. Ltd. reportedly had suffered heavy losses in 1993-94. Ishihara Sangyo, although planning to expand capacity 1995, reportedly was restructuring its operations and cutting back its number of employees in 1994. Ishihara Sangyo and Tohkem Products Corp. both had implemented temporary layoffs for the first time since the first oil crisis in 1972.

According to MITI, total shipments of titanium dioxide increased from 241,257 mt in 1993 to 244,360 mt in 1994. Overall stocks at yearend 1994 were 19,550 mt, compared with 24,726 mt in 1993.

According to the Ministry of Finance, exports of titanium dioxide decreased from 59,067 mt in 1993 to 40,735 mt in 1994, while imports of titanium dioxide increased from 66,000 mt in 1993 to 75,000 mt in 1994. The major buyers in 1994 were China, 10,220 mt; South Korea 6,250 mt; the United States, 5,311 mt; Taiwan, 4,991 mt; Hong Kong, 3,934 mt; Indonesia, 3,227 mt; Sweden, 2,563 mt; and Thailand, 1,639 mt. The major suppliers in 1994 were the United States, 28,833 mt; the United Kingdom, 11,513 mt; Australia, 8,666 mt; France, 7,440 mt; Malaysia, 7,296 mt; the South Korea, 4,355 mt; Italy, 3,422 mt; Singapore, 2,767 mt; and Germany, 2,729 mt.

Industrial Minerals

Cement.—Japan remained the world's third largest cement producer after China and Russia in 1994. Cement production increased in 1994 because of higher domestic demand and increased exports. Overall construction activity had increased slightly, especially in the private housing sector. However, local governments were still cautious about letting new public works contracts following an upsurge in arrests of construction companies' executives and public officials. As a result, attempts to increase public works projects by implementing a series of Government spending packages had little impact on the overall construction activity

in 1993-94.

According to MITI, Japan's total cement clinker operating capacity increased to 93.5 Mmt/a in 1994 from 91.3 Mmt/a in 1993. Production of cement clinker in 1994 was 99.5 Mmt, about 6.5% higher than operating capacity. In 1994, Sumitomo Cement Co. Ltd., Ube Industries Ltd., and Daiichi Cement Co. Ltd. reportedly had completed replacements of their old clinker coolers with units manufactured by INK in 1994. In 1994, the industry consumed about 100.5 Mmt of limestone, 19.1 Mmt of clay, 5.7 Mmt of silica stone, 4.2 Mmt of ore slag, and 3.4 Mmt of gypsum. Total energy consumption by the industry included about 9.2 Mmt of coal, 1.1 Mmt of petroleum coke, 390,900 kiloliters of heavy fuel oil, 2,900 tons of coke, and 9,900 megawatt hours of electricity in 1994. The industry's work force at yearend 1994 decreased to 6,127 from 6,482 in 1993.

Because of lower domestic cement prices and intensified competition with the low-priced foreign cement, several major cement companies had consolidated their operations or merged with another company in 1994. Following merger of Onoda Cement Co. Ltd. and Chichibu Cement Co. Ltd. in October, Sumitomo Cement Co. Ltd., Japan's fourth largest cement producer, absorbed Osaka Cement Co. in late 1994 and became Japan's second largest cementmaker. The newly merged company, called Sumitomo Osaka Cement K.K., was capitalized at about $392.4 million with sales of about $2 billion and 18% of the domestic market.[15] According to a local press report, the market shares of the newly merged cement companies were 23.7% for Chichibu Onoda Cement Corp. and 18.1% for Sumitomo Osaka Cement K.K. in 1994.

Mitsubishi Materials Corp. and Nihon Cement Co. reached an agreement in November 1994 on joint cement marketing to cut distribution costs. The two companies operated a total of 13 cement plants and 176 outlets in Japan. According to the agreement, the companies were to supply cement to their customers from their nearby plants and service outlets and to jointly produce special types of cement beginning in 1995.[16]

According to the Cement Association of Japan, domestic consumption of cement increased by 1.9% to 79.6 Mmt in 1994. Exports of cement rose by 12.6% to 14.8 Mmt 1994. Of the total domestic demand for cement in 1994, 70.2% was for ready-mixed concrete; 14.8% for cement products; 5.2% for civil engineering works; 2.0% for public and private buildings; 1.2% for construction of roads, railroads, bridges, powerplants, and ports; and 6.6% for other uses.

According to the Ministry of Finance, exports of cement clinker dropped by 4.6% to 5.8 Mmt and were valued at $196.2 million in 1994. Exports of portland cement increased from 7.1 Mmt to 8.9 Mmt in 1994 and were valued at $343.3 million. Malaysia, Singapore, Taiwan, and the Philippines were the major buyers of cement clinker. The major buyers of portland cement were Taiwan, 4 Mmt; South Korea, 2 Mmt; Vietnam, 1.4 Mmt; Singapore, 474,135 mt; and China, 344,832 mt in 1994. The average export f.o.b. price per metric ton of portland cement increased slightly to $37.76 in 1994 from $37.06 in 1993. Imports of cement clinker dropped by 76.2% to only 442 mt in 1994. Imports of portland cement decreased from 1 Mmt in 1993 to 698,053 mt and were valued at $30 million in 1994. The principal supplier of portland cement in 1993 was South Korea, which accounted for more than 91% of the total imports. The average import c.i.f. price per ton of portland cement decreased to $42.88 in 1994 from $46.61 in 1993.

With limited domestic growth potential, Japanese cementmakers were moving aggressively into overseas markets, especially in Asia, to take advantage of lower labor costs and greater market potential in China and the Southeast Asian countries. In China, Mitsubishi Materials was to bring on-stream a 900,000-mt/a cement plant in Yantai, China, in 1996. The Yantai plant, which was designed by Mitsubishi Materials, was equipped with F. L. Smidth's precalciner kiln, clinker coller, and two cement mills. Nihon Cement Co. and Onoda Cement Co. had two separate joint-venture projects with the Chinese and were to bring on-stream a 1.4-Mmt cement plant in Chinwang Tao, China, and a 1.28-Mmt/a cement plant in Nanjing, China, respectively, in 1996.

In southeast Asia, Sumitomo Cement Co. Ltd. and Tokuyama Corp. had two separate joint-venture projects with the Philippines and planned to bring on-stream a 1.2-Mmt/a cement plant, in Davao, the Philippines, in 1996. Mitsubishi Materials and Nihon Cement signed an agreement with the Vietnamese Government to establish a joint-venture project for construction of a 2.3-Mmt/a cement plant in the Province of Thanh Hoa, about 200 km south of Hanoi, Vietnam.

Limestone.—Japan was self-sufficient in limestone, its annual output ranking the third largest in the world in 1994. Production of limestone increased by about 2 Mmt in 1994, but the overall domestic demand remained relatively unchanged at 203 Mmt in 1994. As a result, the stock at yearend 1994 rose to about 11.2 Mmt in 1994 from 10.4 Mmt in 1993. 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 $1.3 billion. In 1994, 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, shipments of limestone remained at 203 Mmt in 1994, of which 141 Mmt was consumed by the manufacturing sector, 57 Mmt by the construction sector, and 5 Mmt by other. Of the 141 Mmt consumed by the manufacturing sector, 100 Mmt was by the cement industry; 21 Mmt, by the iron and steel industry; 10 Mmt, by the lime industry; and 10 Mmt, by other manufacturing industries. Of the 57 Mmt consumed by the construction sector, 30.3 Mmt was for concrete-making; 20.2 Mmt, for road construction; and 6.8 Mmt, for other construction.

Coal.—Japan's coal production continued to shrink and reached a new 92-year record low. The 1994 output was in line with the rationalization plan recommended by MITI's Coal Mining Industry Council in 1992. Japan had not produced metallurgical-grade bituminous coal (coking coal) since April 1990.

In February, Sumitomo Akabira Coal Co. Ltd. permanently closed its 670,000 mt/a coal mine in Akabira, Hokkaido, the second coal mine to close under the rationalization plan recommended by MITI's Coal Mining Industry Council in 1992. According to the rationalization plan, Hokutan Sorachi Coal Mining was scheduled to close its mine at Sorachi in Utashinai, Hokkaido, in March 1995.

In 1994, the remaining four major coal mines and their output were Mitsui Coal Mining Co. Ltd., 2.3 Mmt; Taiheiyo (Pacific) Coal Mining Co. Ltd., 2.2 Mmt; Matsushima Coal Mining Co. Ltd., 1.2 Mmt; and Hokutan Sorachi Coal Mining Co. Ltd., 600,000 mt. Of the total coal produced in 1994, 49% was from the Hokkaido area and 51% was from the Kyushu and Honshu areas. The industry's employment declined by 474 to 3,202 at the end of 1994. However, the industry's labor productivity, as measured by metric tons per month per miner, rose to 171.8 in 1994 from 159.1 in 1993.

To improve efficiency, the Taiheiyo (Pacific) Coal Mining reportedly completed a $25 million upgrading project involving digging a 6,700-meter (m)-long inclined shaft in Kushiro, Hokkaido Prefecture, in mid-1994. The company's 2,000 workers in 1985 had been reduced to 1,300 worker in 1994.[17]

In 1994, Japan remained the world's largest coal importer. As a result of reduced domestic production, coal imports increased by 4.3% to 116.2 Mmt in 1994. In 1994, Japan relied on imports to meet 94.2% of its coal requirement in 1994. According to MITI, imports of coking coal declined 65.0 Mmt in 1993 to 63.2 Mmt in 1994. The major suppliers of coking coal in 1994 were Australia, 31.2 Mmt; Canada, 15.3 Mmt; the United States, 6.8 Mmt; South Africa, 3.1 Mmt; Russia, 2.9 Mmt; Indonesia, 1.8 Mmt; and China, 1.7 Mmt. Imports of anthracite rose to 3.1 Mmt in 1994 from 2.8 Mmt in 1993. The major suppliers of anthracite in 1994 were China, 1.9 Mmt; Vietnam, 579,200 mt; and North Korea, 493,300 mt. Imports of steam coal increased to 49.9 Mmt in 1994 from 43.7 Mmt in 1993. The major suppliers of steam coal in 1994 were Australia, 31.6 Mmt; Indonesia, 6.1 Mmt; China, 4.3 Mmt; the United States, 2.4 Mmt; South Africa, 2.5 Mmt; Canada, 1.4 Mmt; and Russia, 1.5 Mmt.

According to MITI, overall consumption of coal increased by 3.6% to 123 Mmt in 1994 owing mainly to the continued growth in demand for steam coal by the utility industry in 1994. Demand for steam coal by the utility industry grew from 28.2 Mmt in 1991 to 32.8 Mmt in 1993 and 37.2 Mmt in 1994. In 1994, demand for coal by the cement, ceramics, and other manufacturing industries was 19.7 Mmt; by the coke industry, 4.6 Mmt; by the iron and steel industry, 61.2 Mmt; by the electric power industry, 37.2 Mmt; by the gas industry, 259,000 mt; and other industries, 70,000 mt. Of the total coal consumed in 1994, 115.9 Mmt was imported coal, while only 7.2 Mmt were domestic coal.

Petroleum and Natural Gas.—Japan remained the world's largest importer of natural gas and crude petroleum in 1994. 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 decreased, while production of natural gas increased slightly in 1994. Consumption of crude petroleum and natural gas rose by 4.6% to 1,528 million barrels (Mbbl) and by 7.3% to 65.5 billion cubic meters (m^3), respectively, in 1994.

To meet the 1994 demand, according to MITI, imports of crude petroleum rose by 6.2% to 1,703.4 Mbbl, the highest since 1980. Imports of natural gas, in the form of LNG, broke the previous year's record and reached 63.1 billion m^3 in 1994. Imports of refined petroleum products, which included diesel, gasoline, heavy fuel oil, jet fuel, kerosene, and naphtha, also rose by 12.1% to 200.6 Mbbl because of increased domestic demand for all of these refined petroleum products, except kerosene, in 1994.

Crude petroleum imports in 1994 came mainly from the Middle East region, accounting for 77.1%, compared with 76.3% in 1993; and Asia, including China, accounting for 19.2% compared with 19.7% in 1993. The major suppliers of crude petroleum in 1994 were the United Arab Emirates, 26.1%; Saudi Arabia, 19.3%; Iran, 9.7%; Indonesia, 9.0%; Oman, 6.7%; Qatar, 6.2%; China, 5.3%; and Kuwait, 4.1%.

Imports of LNG totaled 42.2 Mmt in 1994, of which Indonesia supplied 18.5 Mmt; Malaysia, 7.8 Mmt; Australia, 6.1 Mmt; Brunei, 5.5 Mmt; Australia, 6.2%; the United Arab Emirates, 3.1 Mmt; and the United States, 1.2 Mmt. Because of an ongoing expansion of LNG production capacity in Indonesia and Malaysia, imports of LNG from these two countries were expected to continue to increase in the next 2 to 3 years. According to the Ministry of Finance, the average import c.i.f. price per metric ton of LNG decreased from $181.86 in 1993 to $164.12 in 1994. The average import c.i.f. price per metric ton of LNG among supplying countries were $157.76 from United Arab Emirates; $158.74 from Malaysia; $159.03 from the United States; $160.63 from Brunei; $167.25 from Australia; and $167.84 from Indonesia in 1994.

Overall demand for refined petroleum products increased in 1994, except for asphalt and liquefied petroleum gas. Demand for fuel oil, which included gasoline, naphtha, jet fuel, kerosene, diesel, and heavy fuel oil, increased by 5.3% to 1,493.3 Mbbl in 1994. In 1994, gasoline consumption rose by 5.0% to 315.7 Mbbl; naphtha increased by 8.2% to 245.7 Mbbl; jet fuel rose 2.6% to 27.0 Mbbl; kerosene remained unchanged at 176.3 Mbbl; diesel rose by 6.0% to 276.0 Mbbl; heavy fuel oil, including types A, B, and C, rose

by 5.8% to 452.5 Mbbl; and lubricants rose by 3.0% to 14.7 Mbbl.

In 1994, consumption of domestically produced natural gas totaled 2.7 billion m^3, of which 40% was consumed by the gas industry, 27% by the utility industry, 16% by the chemical industry, 13% by the oil and gas industries, and 4% by other manufacturing and service industries. Additionally, Japan consumed 42.2 Mmt or 63.1 billion m^3 of imported natural gas in the form of LNG in 1994, of which 72.4% was consumed by the utilities industry for power generation, 26.1% by the city gas industry for household use, and 1.5% by the iron and steel industry for steelmaking.

To reduce dependence on the Middle East for sources of crude petroleum and natural gas, several major Japanese oil and trading companies were actively participating in oil and gas exploration and development and acquisition of exploration and development rights for oilfields worldwide. According to Japan Petroleum Development Association, as of March 1994, 140 Japanese oil companies were engaged in oil and gas exploration and development projects overseas. Of these companies, 47 were newly established during 1992-94, 27 were in Asia; 8 in Oceania; 4 in the United Kingdom; 3 in the United States; 2 each in Canada and Venezuela; and 1 in the Middle East.

Among these companies, Dai-Hung Oil Development (Japan) Ltd., a joint-venture firm of Sumitomo Corp., Japan Energy Corp., Sumitomo Petroleum Development Co.; and Japan Vietnam Petroleum Co. Ltd., a joint-venture firm of Mitsubishi Oil Corp., Mitsubishi Corp., and Mitsubishi Petroleum Development Co. Ltd., were operating in Vietnam.

Dai-Hung Oil development and its partners, BHP Petroleum of Australia, Petronas of Malaysia, and Total of France, jointly signed a production-sharing agreement with Petrovietnam of Vietnam to develop the Dai Hung (Big Bear) Oilfield with an estimated reserves of 1 billion barrels (bbl) of crude oil in Block 05-1, about 260 km southeast of Vung Tau. Oil production began in October at an initial rate of 25,000 barrels per day (bbl/d) to 35,000 bbl/d. Dai Hung Oil Development owned 10.625% stake in the oilfield.[18]

Japan Vietnam Petroleum, exploring oil and gas in Block 15-2, announced in June 1994 that its first exploratory well tested for oil production of 10,346 bbl/d of light crude. The company plan to drill two to three appraisal wells to determine the size of the oilfield. According to Japan's oil industry analysts, the oilfield has the potential to produce more than 100,000 bbl/d of crude oil. Mitsubishi Oil has an 86% stake in the Japan Vietnam Petroleum.

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 5)*.

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 70% 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 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 had 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.

Construction of a new 250-km natural gas pipeline across northern Honshu (Japan's main island) from Niigata, Niigata Prefecture, to Sendai, Miyagi Prefecture, had begun in early 1994. The project was scheduled for completion in mid-1996. This new 51-centimeter (cm) pipeline will transport gas from an LNG regasification plant at Niigata to Sendai.[19] According to a report by Nikkan Koggyo Shimbun, construction of another new 75-km natural gas pipeline in Hokkaido from the Yufutsu Gasfields to Sapporo had begun in June 1994. This 36-cm pipeline will supply natural gas from the gasfields to the Sapporo area. This project was scheduled for completion in March 1996. Construction work on the two pipelines reportedly was carried out by Japan Petroleum Exploration Co.

Japan has 18 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 major seaports of major mineral processing centers were Chiba, Fushiki-Toyama, Himeji, Hiroshima, Kawasaki, Kobe, Osaka, Nagoya, Niigata, Tokuyama-Shimomatsu, Shimizu, Shimonoseki, Tokyo, Wakayama-Shimotsu, Yokkaichi, and Yokohama in Honshu; Fukuoka, Kita Kyushu, and Oita in Kyushu; and Muroran and Tomakomai in Hokkaido.

Japan has 165 airports, of which 137 were with permanent-surface runways. The major international airports

were Fukuoka, Haneda (Tokyo), Nagoya, Narita (New Tokyo), and Osaka. In September 1994, Japan's first round-the-clock Kansai International Airport was officially opened on a reclaimed land in Osaka Bay, about 5 km offshore the coast of Osaka Prefecture. The construction of the airport took 8 years to complete at a total cost of about $14.7 billion.

Outlook

The nonferrous metal mining and coal mining sectors were expected to continue the 1994 downward trend because of the ongoing restructuring programs proposed by the Government and mine closures. Mining activities of industrial minerals, such as limestone and silica stone and sand, were expected to remain steady as the Japanese economy and construction activity continued its slow recovery in 1995. Mine production of copper, lead, and zinc was expected to decline further or remain at the 1994 level, if the value of the Japanese yen and imports of ore remain at the high level. The remaining three major nonferrous mines in the Prefectures of Gifu, Hokkaido, and Kagoshima were expected to continue operating in 1995. Coal output was expected to decline further, after Hokutan Sorachi Coal Mine closed its mine in Utashinai, Hokkaido, in February 1995.

The outlook for the mineral processing sector was expected to be as gloomy as that of the mining sector, mainly because of the expected slower economic recovery in 1995. Most of the ferrous and nonferrous mineral processing plants should operate at slightly lower capacity than that of 1994. Metal production of lead and zinc should decline further because of plant closures due to the high value of the Japanese yen, and a Government plan to reduce import tariffs on nonferrous metals. Production of crude steel should remain at the same level as that of 1995 or higher because of an anticipated upward trend in the activities of the automobile and construction industries in 1995.

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, when the value of the Japanese yen remained at the 1994 level with a mild economic recovery in 1995. 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 likely to actively continue to participate in joint exploration and development of minerals in both developed and developing countries, especially in Australia, Brazil, Canada, Chile, China, Peru, Mexico, and the United States. The targeted minerals were expected to include coal, crude petroleum, base metals, antimony, chromium, columbium, lithium, molybdenum, natural gas, nickel, rare earths, strontium, tantalum, titanium, tungsten, and vanadium.

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[1]Text prepared Aug. 1995.

[2]Where appropriate, values have been converted from Japanese yen (Y) to U.S. dollars ($) at the rate of Y111.2=US$1.00 in 1993 and Y102.2=US$1.00 in 1994.

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1990	1991	1992	1993	1994
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	481	438	316	327	322
Metal:						
Primary:						
Regular grades	do.	34	32	19	18	17
High-purity	do.	16	20	20	20	24
Secondary 3/	do.	1,090 r/	1,100 r/	1,070 r/	1,010 r/	1,170
Antimony:						
Oxide		11,000	11,900	11,200	10,500	10,400
Metal		216	262	175	225	207
Arsenic (equivalent of arsenic acid) e/		500	500	500	500	500
Bismuth		442	461	530	497	505
Cadmium, refined		2,450	2,890	2,990	2,830	2,630
Chromium:						
Chromite, gross weight		8,080	8,000 e/	8,000 e/	7,000 e/	7,000 e/
Metal		4,130	4,020	3,720	3,150	3,000 e/
Cobalt metal		199	185	105	191	161
Columbium and tantalum: Tantalum metal e/		90	85	80	80	80
Copper:						
Mine output, Cu content		12,900	12,400	12,100	10,300	6,040
Metal:						
Blister and anode:						
Primary		893,000	968,000	1,050,000	1,100,000 r/	1,030,000
Secondary		147,000	118,000	129,000	85,700 r/	96,500
Total		1,040,000	1,090,000	1,170,000	1,180,000 r/	1,120,000
Refined:						
Primary		893,000	968,000	1,050,000	1,100,000 r/	1,030,000
Secondary		115,000	109,000	115,000	89,700 r/	93,700
Total		1,010,000	1,080,000	1,160,000	1,190,000 r/	1,120,000
Gallium metal:						
Primary e/		6	6	6	6	6
Secondary e/		37	41	38	39	40
Germanium:						
Oxide		12	11	11 e/	11 e/	10 e/
Metal		3	3	3	3	2
Gold:						
Mine output, Au content	kilograms	7,300	8,300	8,890	9,350	9,550
Metal:						
Primary	do.	108,000	103,000	108,000	109,000	103,000
Secondary 4/	do.	148,000	109,000	93,700 r/	105,000 r/	100,000 e/
Total	do.	256,000	212,000	202,000 r/	214,000 r/	203,000 e/
Indium metal	do.	48,100	51,600	59,900	56,200	58,500
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight	thousand tons	34	31	40	11	3
Fe content	do.	21	19	25	6	2
Roasted pyrite concentrate (50% or more Fe):						
Gross weight	do.	210	224	244	92	90 e/
Fe content	do.	131	140	153	57	55 e/
Metal:						
Pig iron and blast furnace ferroalloys	do.	80,200	80,000	73,100	73,700	73,800
Electric-furnace ferroalloys:						
Ferrochrome		293,000	271,000	268,000	205,000	192,000
Ferromanganese		452,000	464,000	362,000	383,000	340,000
Ferronickel		234,000	295,000	237,000	257,000	242,000
Ferrosilicon		62,600	62,400	37,700	29,100	13,100
Silicomanganese		77,500	87,200	96,400	64,800	68,900
Other:						
Ferrocolumbium		984	710	919	1,090	868
Ferromolybdenum		3,370	3,730	3,260	3,660	3,930
Ferrotungsten		46	61	71	80	68
Electric-furnace ferroalloys:						
Ferrovanadium		3,710	3,850	3,010	3,670	3,420
Unspecified		3,980 r/	3,970 r/	4,930 r/	5,170 r/	6,360
Total		1,130,000	1,190,000	1,010,000	952,000	871,000
Steel, crude	thousand tons	110,000	110,000	98,100	99,600	98,300
Semimanufactures, hot-rolled:						
Of ordinary steels	do.	88,900	88,000	78,500	79,100	76,600
Of special steels	do.	16,300	16,800	14,800	14,800	15,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1990	1991	1992	1 993	1994
METALS--Continued:						
Lead:						
Mine output, Pb content		18,700	18,300	18,800	16,500	9,950
Metal, refined:						
Primary		205,000	220,000	219,000	212,000	183,000
Secondary		122,000	112,000	111,000	97,300	87,200
Total		327,000	332,000	330,000	309,000	270,000
Magnesium metal:						
Primary		12,800	11,600	7,120	7,470	3,410
Secondary		23,300	17,200	13,000	13,200	19,000
Manganese:						
Ore and concentrate:						
Gross weight e/		100	100	100	80	60
Mn content e/		21	21	21	16	12
Oxide		51,500	58,500	54,300	56,100	54,600
Metal		4,570	4,060 r/	3,730 r/	3,170 r/	2,600 e/
Molybdenum metal		686	661	564	619	651
Nickel metal:						
Refined		22,300	23,700	22,000	22,600 r/	25,300
Ni content of nickel oxide sinter		21,500	22,500	27,500	27,000	27,000 e/
Ni content of ferronickel		56,500	68,000	57,400	51,100	58,200 e/
Total		100,000	114,000	107,000	101,000	111,000 e/
Platinum-group metals:						
Palladium metal	kilograms	1,050	1,050	986	1,180	1,280
Platinum metal	do.	1,430	988	629	661	691
Rare-earth oxide 5/		4,260 r/	4,200 r/	3,950 r/	3,830 r/	4,410
Selenium, elemental		495	537	573	541	614
Silicon, high-purity		2,160	2,380	2,360	2,520	3,030
Silver:						
Mine output, Ag content	kilograms	150,000	171,000	178,000	137,000	133,000
Metal:	do.					
Primary	do.	2,090,000	2,150,000	2,180,000	2,160,000	2,020,000
Secondary 4/	do.	229,000	126,000	131,000	144,000	162,000
Total	do.	2,320,000	2,280,000	2,310,000	2,300,000	2,180,000
Tellurium, elemental		50	57	57	47	47
Tin:						
Metal, smelter		816	716	821	804	706
Titanium:						
Metal		25,600	18,900	14,500	14,400	14,800
Oxide		286,000	279,000	252,000	246,000	238,000
Tungsten:						
Mine output, W content		260	279	347	66	--
Metal		4,180	4,150	3,310	3,480	3,830
Vanadium metal e/ 6/		700	404 r/	245 r/	252 r/	300 r/
Zinc:						
Mine output, Zn content		127,000	133,000	135,000	119,000	101,000
Oxide		83,200	84,900	82,300	75,200	734,000
Metal:						
Primary		606,000	641,000	645,000	609,000	572,000
Secondary		126,000	138,000	136,000	135,000 r/	141,000
Total		732,000	779,000	781,000	745,000 r/	713,000
Zirconium:						
Oxide e/		6,820	6,750	6,380	6,200	6,000
INDUSTRIAL MINERALS						
Asbestos e/		5,000	25,000	29,500	24,900	21,000
Bromine, elemental e/		15,000	15,000	15,000	15,000	15,000
Cement, hydraulic	thousand tons	84,400	89,600	88,300	88,000	91,500
Clays:						
Bentonite		549,000 r/	554,000 r/	534,000 r/	517,000 r/	484,000
Fire clay		936,000	846,000	752,000	737,000 r/	685,000
Kaolin		165,000 r/	130,000	123,000 r/	110,000 r/	134,000
Feldspar and related materials:						
Feldspar		57,900	88,500	72,300	71,600	56,000
Aplite		523,000	500,000	416,000	404,000	381,000
Gypsum e/	thousand tons	6,400	5,400	5,400	5,500	5,300
Iodine, elemental		7,580	7,490	6,760	6,490	5,590
Lime: Quicklime	thousand tons	8,980	9,050	8,050	7,960	7,710
Nitrogen: N content of ammonia	do.	1,530	1,550	1,600	1,450	1,450 e/
Perlite e/		203,000	203,000	203,000	200,000 r/	200,000
Salt, all types	thousand tons	1,380	1,380	1,410	1,380	1,390
Silica sand		4,440,000	4,340,000	3,840,000	3,880,000	3,940,000
Silica stone	thousand tons	17,900	18,500	19,300	18,800	18,500

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1990	1991	1992	1993	1994
INDUSTRIAL MINERALS--Continued:						
Sodium compounds, n.e.s.:						
Soda ash		1,130,000	1,100,000	1,060,000	1,060,000	1,050,000
Sulfate		253,000	250,000	243,000	229,000	211,000
Stone, crushed and broken:						
Dolomite	thousand tons	5,370	5,320	4,850	4,760 r/	3,830
Limestone	do.	198,000	207,000	204,000	200,000 r/	202,000
Sulfur:						
S content of pyrite	do.	53	30	31	29	4
Byproduct:						
Of metallurgy	do.	1,310	1,350	1,370	1,380	1,350 e/
Of petroleum	do.	1,270	1,240	1,340	1,510	1,550 e/
Talc and related materials:						
Talc		61,600	65,600	61,100 r/	57,200	63,100
Pyrophyllite		1,210,000	1,230,000	1,060,000	1,030,000 r/	936,000
Vermiculite e/		15,000	15,000	15,000	15,000	15,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand tons	788	793	771	709	704
Coal:						
Anthracite	do.	7	7 r/	--	--	1
Bituminous 7/	do.	8,260	8,050 r/	7,600	7,220	6,930
Total	do.	8,260	8,050	7,600	7,220	6,930
Coke including breeze:						
Metallurgical	do.	46,100	45,500	42,300	39,300	41,300
Gashouse including breeze	do.	1,410	1,240	1,100	1,020	705
Fuel briquets, all grades	do.	128	115	110	108 r/	94
Gas, natural:						
Gross 8/	million cubic meters	2,040	2,130	2,160	2,200	2,270
Marketed	do.	2,190	2,270	2,300	2,310	2,340
Natural gas liquids:						
Natural gasoline e/	thousand 42-gallon barrels	55	55	55	55	56
Liquefied petroleum gas from natural gas (field plants only) e/	do.	250	300	300	300	300
Peat e/		60	60	60	60	60
Petroleum:						
Crude	thousand 42-gallon barrels	3,980	5,520	6,300	5,730	5,470
Refinery products:						
Gasoline:						
Aviation	do.	78	72	78	72 r/	82
Other	do.	265,000	279,000	291,000	302,000 r/	314,000
Asphalt and bitumen	do.	37,900	36,700	37,600	36,900	38,300
Distillate fuel oil	do.	201,000	237,000	251,000	259,000	276,000
Jet fuel	do.	27,900	32,700	37,800	40,600	45,000
Kerosene	do.	145,000	154,000	164,000	170,000	171,000
Liquefied petroleum gas	do.	51,200	52,600	54,500	53,400	52,800
Lubricants	do.	15,800	15,600	15,600	16,000	17,100
Naphtha	do.	68,300	88,600	101,000	109,000	110,000
Paraffin e/	do.	1,200	1,200	1,200	1,000	1,100
Petroleum coke e/	do.	900	950	900	900	950
Refinery fuel and losses e/ 9/	do.	150,000	150,000	155,000	150,000	160,000
Residual fuel oil	do.	451,000	456,000	477,000	480,000	509,000
Unfinished oils e/	do.	57,000	57,000	58,000	58,000	60,000
Total e/	do.	1,470,000	1,560,000	1,640,000	1,680,000 r/	1,750,000

e/ Estimated. r/ Revised.
1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.
2/ Table includes data available through Aug. 25, 1995.
3/ Includes unalloyed ingot and alloyed ingot.
4/ Recovered from scrap, waste, and returned by end users.
5/ Includes oxide of cerium, eruopium, gadolinium, lanthanum, neodymim, praseodymim, samarium, terbium, and yttrium.
6/ Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.
7/ Includes coking coal and steam coal. Includes steam coal only beginning in 1991.
8/ Includes output from gas wells and coal mines.
9/ May include some additional unfinished oils.

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Non-ferrous Metals Statistics, 1994; Yearbook of Iron and Steel Statistics, 1994; Yearbook of Chemical Industry Statistics, 1994; Yearbook of Ceramics and Building Materials Statistics, 1994; Yearbook of Production, Supply and Demand of Petroleum, Coal and Coke, 1994.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(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, Hokkido 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.		Sumitomo Akabira Coal Co. Ltd. 2/	Akabira in Akabira, Hokkaido Prefecture	670
Do.		Taiheiyo (Pacific) Coal Mining Co. Ltd.	Kushiro, Hokkaido Prefecture	2,200
Copper:				
In concentrate		Hanaoka Mining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.) 3/	Hanaoka, Akita Prefecture	5
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 Saganoseki, Oita Prefecture	132,000 198,000
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 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	8,500
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 Corps.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture, Onoda-Tsukumi and Nitteltsu-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		Hanaoka Mining Co. Ltd. 3/	Hanaoka, Akita Prefecture	5
Do.		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. 4/	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsubishi Materials Corp. 5/	Naoshima, Kagawa Prefecture	14,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Nippon Mining and Metals Co. Ltd. 6/	Saganoseki, Oita Prefecture	15,000
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.) 7/	Hosokura, Miyagi Prefecture	21,600
Manganese:				
In electrolytic dioxide		Mitsui Mining and SmeltingCo. 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	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	14,400
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	42,000
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	36,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	27,900

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
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
Steel, crude		Kawasaki Steel Corp.	Mizushima, Okayama Prefecture and Chiba, Chiba Prefecture	16,880
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture Keihin, Tokyo Prefecture	8,300
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 and 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 refecture	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		Hanaoka Mining Co. Ltd. 3/	Hanaoka, Akita Prefecture	30
Do.		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. (majority Dowa Mining Co. Ltd., and minority ownership by Mitsui Mining and Smelting Co. Ltd., Mitsubishi Materials Corp., Nippon Mining and Metals, Co. Ltd, Toho Zinc Co. Ltd., and Sumitomo Metal Mining Co. Ltd.)	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, 20% 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 and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Mitsubishi Materials Corp.	Akita, Akita Prefecture	105,600
Do.	do.	Nikko Zinc. Co. Ltd.	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/ To be closed in Mar. 1995.
2/ Closed in Feb. 1994.
3/ Closed in Mar. 1994.
4/ Closed in Dec. 1994. The plant was renovated to a secondary lead smelter recycling batteries
5/ Closed in Mar. 1994.
6/ Stopped production in May 1994.
7/ The plant would become a secondary smelter recycling batteries in 1995.

TABLE 3
JAPAN: IMPORTS OF COPPER IN 1994, BY FORM AND ORIGIN

(Metric tons)

Source	Copper concentrate (gross weight)	Copper scrap	Unwrought	
			Unrefined	Refined
Australia	278,640	4,213	--	30,491
Canada	585,518	473	--	2,139
Chile	849,147	51	20,231	126,664
Indonesia	514,733	501	--	--
Malaysia	119,564	8,587	--	--
Mongolia	38,820	--	--	--
Papua New Guinea	308,574	--	--	--
Peru	45,510	--	27,074	24,683
Philippines	280,478	5,693	--	44,143
Portugal	68,120	--	--	--
Russia	36,277	--	--	293
South Africa, Republic of	24,735	223	--	13,017
United States	265,121	23,115	16	43,187
Zambia	--	--	--	56,708
Other	41,817	50,226	534	9,356
Total	3,457,054	93,082	47,855	350,681

Source: Ministry of Finance (Tokyo). Japan Imports and Exports, Commodity by Country, Dec. 1994.

TABLE 4
JAPAN: SOURCE OF MATERIALS USED IN PRODUCTION OF COPPER, LEAD, AND ZINC

(Metric tons)

Commodity and/ or source	1991	1992	1993	1994
Copper, refined:				
Domestic ore	6,412	7,866	5,603	2,443
Imported ore 1/	961,309	1,038,289	1,093,480	1,023,069
Scrap	70,873	73,840	62,455	54,441
Other	37,689	40,864	27,238	39,215
Total	1,076,283	1,160,859	1,188,776	1,119,168
Lead, refined:				
Domestic ore	33,967	29,093	28,382	19,257
Imported ore	186,364	189,694	183,763	163,467
Scrap	9,124	10,560	11,071	10,221
Other	52,261	40,949	34,912	41,552
Secondary recovery	50,715	59,865	51,324	35,436
Total	332,431	330,161	309,452	269,933
Zinc, slab:				
Domestic ore	138,684	140,609	133,728	98,349
Imported ore	501,965	504,470	475,544	473,571
Scrap	28,077	32,591	29,259	8,048
Other	62,103	51,784	57,156	85,534
Secondary recovery	47,909	51,272	48,882	47,824
Total	778,738	780,726	744,569	713,326

1/ Includes blister.

Source: Ministry of International Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistics, 1991-94, annual.

TABLE 5
JAPAN: RESERVES OF MAJOR MINERAL
COMMODITIES FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity		Reserves	
Coal 1/		844,000	
Copper ore, content		151	
Dolomite 2/		1,200,000	
Gold ore, content	kilograms	550,000	e/
Iodine		1,800	e/
Lead ore, content		623	
Limestone 3/		57,800,000	
Pyrophyllite		206,000	
Silica sand 4/		357,000	
Silica stone 5/		1,330,000	
Zinc ore, content		3,250	

e/ Estimated.
1/ Recoverable reserves, including 17 Mmt 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.