

JAPAN

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Japan's resources of coal and nonferrous metals are limited. Its resources of carbonate rocks, iodine, pyrophyllite, and silica, however, are substantial (table 3). Japan relied heavily on imports of mineral fuels, which included coal, crude petroleum, liquefied natural gas (LNG), and uranium, and a wide variety of crude ore and concentrates of nonfuel minerals to meet the raw material requirements for the large manufacturing and utility (electricity and gas) sectors of its economy.

In Japan's manufacturing and utility sectors, the production capacity of cement, chemicals, electricity, and ferrous and nonferrous metals industries was among the world's largest. These industries processed imported raw materials and produced a broad category of mineral products, which included inorganic chemicals and compounds, ferrous metals, industrial minerals, nonferrous metals, petrochemicals, and refined petroleum products, for domestic consumption and exports. The electricity industry used imported coal, LNG, petroleum, and uranium and other nuclear fuel materials to produce electricity to meet the electric power requirements for the mining and manufacturing sector as well as other sectors of the economy.

In 2001, Japan was one of the world's major importers and consumers of primary aluminum, cadmium metal, chromite, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, iron ore, ilmenite and rutile, indium metal, industrial salt, lead ore and metal, LNG, lithium metal, manganese ore, magnesium, nickel ore and metal, crude petroleum, potash, phosphate rock, precious metals, rare earths, silicon metal, zinc ore and metal, and zircon. Japan was one of the world's major exporters of cement, refined copper, mineral-related chemicals and fertilizers, iodine, electrolytic manganese dioxide, high-purity rare metals, iron and steel, and titanium sponge metal and mill products.

The mining sector was the smallest sector of Japan's industrial-based economy. According to the Government statistics on national accounts, the percentage contribution of the mining sector to Japan's gross domestic product (GDP) was only 0.17% in 2000 (the last year for which data are available). The percentage contribution to Japan's GDP by the mineral industry as a whole, which included the mining sector and the mineral processing industries of chemicals, petroleum, industrial minerals, iron and steel, nonferrous metals, and fabricated metal products in the manufacturing sector, however, was 6.35% in 2000 (Economic and Social Research Institute, 2001§¹).

The mineral industry was important to the Japanese economy because of its contribution to the GDP and its vital role in

supplying primary materials not only to its own construction and manufacturing sectors, but also to those sectors of neighboring China, the Republic of Korea, and Taiwan in northeastern Asia and Indonesia, Malaysia, Singapore, and Thailand in southeastern Asia.

In 2001, the Japanese economy slipped into its second recession in the past 5 years following a 2-year positive growth path during 1999 and 2000. Japan's real GDP (in 1995 constant prices) registered a 0.5% negative growth in 2001 compared with a 2.4% positive growth in 2000 and a 0.7% positive growth in 1999; this was largely the result of a 0.1% decline in private demand, a 7.9% decline in residential investment, a 3.4% decline in public investment, and a 6.6% decline in exports of goods and services despite a 0.2% increase in overall domestic demand. Japan's real GDP was estimated to be \$4,314 billion in 2001 (Economic and Social Research Institute, 2002a, b§).

Because of the economic recession in 2001, Japan's industrial production, as measured by the indices of mining and manufacturing, decreased by 7.8%. The number of Japan's unemployed workers increased to 3.4 million from 3.2 million in 2000, and its total labor force decreased to 67.52 million from 67.66 million in 2000. As a result, Japan's unemployment rate rose to 5.0%, which was a record high, from 4.7% in 2000. Japan's merchandise trade surplus shrank to \$54.0 billion compared with \$99.4 billion in 2000, and the Japanese yen (¥) depreciated by 11.3% to ¥121.5 against US\$1.00 in 2001. As measured by the consumer price index, Japan's rate of deflation was 0.7%, which was the same as that of 2000 (Japan Institute of Labor, 2002§).

Government Policies and Programs

As part of the ongoing Government restructuring program to save money and to promote greater efficiency in Government services, the Government and the ruling three-party coalition submitted a bill to the Diet (Japan's Parliament) in mid-2001 to dissolve the Government-run Japan National Oil Corp. (JNOC). The bill also covered privatization of the national oil reserves operations of JNOC-affiliated companies. According to the proposed plan, JNOC was to be shut down in three steps—dissolution, transfer of assets to a new Government-owned company, and gradual unloading of JNOC's shares on the market (Nikkei Weekly, 2001a).

In November 2001, an agreement reportedly was reached between the Ministry of Economy, Trade and Industry (METI) and the General Council of the Liberal Democratic Party to keep the oil corporation's role as provider of the risk capital for oil and gas exploration; to maintain the national oil reserves under existing Government-run corporations; to liquidate most assets of the corporation, which included equity interests in oil

¹References with a section twist (§) are found in the Internet References Cited section.

developers, through sales and other means and to transfer the rest of the assets to a new entity; and to eliminate the eight companies that maintain the national oil reserves and to turn over the operations to the private sector. Issues related to liquidation of JNOC's equity interests in oil developers and the transfer of the rest of JNOC's asset and management of national oil reserves to another Government-affiliated organization, such as the Metal Mining Agency of Japan (MMAJ), were to be clarified in 2002 (Asahi Shimbun, 2001§).

The MMAJ, in cooperation with the Japan International Cooperation Agency (JICA), continued to undertake overseas mineral exploration projects as part of the Official Development Assistance Program (ODA) of the Japanese Government in 2001. In response to requests from the Governments of developing countries, the MMAJ provided technical assistance, which included the transfer of advanced exploration technology to these Governments, and carried out a broad range of basic exploration for further exploration and development of their mineral resources. The MMAJ also provided loans and exploration assistance to support private Japanese companies and their foreign partners that were involved in joint-exploration works overseas.

The MMAJ's ongoing ODA projects in 2001 included two 2-year reconnaissance survey projects, eight 3-year mineral exploration projects, a regional development planning project, and a deep-sea mineral exploration project. In 2001, the MMAJ completed three 3-year (1999-2001) mineral exploration projects that targeted copper, gold, and molybdenum in porphyry copper and vein-type deposits in the Oruro-Uyuni area of Bolivia, in the Bicol North area of the Philippines, and in Region I of Chile and a 3-year (1999-2001) regional development planning project that targeted lead and zinc in Mississippi Valley-type lead-zinc deposits in El Krib and the Mejez El Bab areas of Tunisia (Metal Mining Agency of Japan, 2001).

In 2001, the purpose of the ongoing two 2-year reconnaissance surveys was to explore for copper, gold, lead, and zinc in massive sulfide, porphyry copper, and vein-type deposits in the northwestern area of Argentina and copper, nickel, and platinum-group metals in magmatic deposits in the Parana Basin of Brazil. The purpose of the ongoing eight 3-year mineral exploration projects was to explore for copper, gold, lead, nickel, and zinc in massive sulfide and porphyry copper deposits in the Altai area of China; copper, gold, lead, silver, and zinc in porphyry copper, skarn, and vein-type deposits in the southwestern and central areas of Honduras; copper and gold in porphyry copper and vein-type deposits in the East Java area of Indonesia; titanium in placer deposits in the Kokpetinskaya area of Kazakhstan; gold in greenstone-type deposits in the Baoule-Banifing area of Mali; gold, lead, silver, and zinc in massive sulfide deposits in the Zacualpan area of Mexico; copper, gold, and molybdenum in porphyry copper and vein-type deposits in the Western Erdenet area of Mongolia; and gold in greenstone-type deposits in the San Jose and the Arroyo Grande areas of Uruguay. The purpose of the ongoing regional development planning project was to explore for copper and gold in massive sulfide deposits in the Ghuzain and the Yanqul areas of Oman. The purpose of the ongoing deep-sea mineral exploration project was to explore for cobalt,

manganese, nickel, and platinum in the cobalt-rich manganese crust offshore Marshall Island (Metal Mining Agency of Japan, 2002a).

The MMAJ continued to provide financial and technical support, which included geologic and geophysical surveys and drilling, to five private Japanese companies in 2001. These overseas exploration projects were for copper and gold by Mitsubishi Materials Corp. in the Los Dos Buhos Cateo area of Argentina; lead and zinc by Mitsui Metal Mining Co. Ltd. in the Ciquian East area of Peru; nickel by Sumitomo Metal Mining Co. Ltd. in the Zambales area of the Philippines; copper, gold, and platinum-group metals by Sumitomo Metal Mining in the Tropico area of Mexico; and copper by Nittetsu Mining Co. Ltd. in the Namosi area of Fiji (Metal Mining Agency of Japan, 2002b).

Environmental Issues

To implement the Government 3R (reduce, reuse, and recycle) policy to achieve the goals of sustainable development in the 21st century and to create a recycling-oriented economy, the Japanese Government enacted the Designated Household Appliance Law on April 1, 2001. The law governs the recycling of household appliances, which included air conditioners, television sets that use cathode-ray tubes, electric refrigerators, and electric washing machines.

To ensure that these electric appliances are properly recycled, the law made the manufacturers and importers responsible for recycling; the retailers, for collecting and transporting the appliances for recycling; and the consumers, for paying recycling fees that ranged from \$19.75 (¥2,400) for a washing machine and \$22.22 (¥2,700) for a television set to \$28.81 (¥3,500) for an air conditioner and \$37.86 (¥4,600) for a refrigerator. The law also requires manufacturers or their designated recycling companies to achieve recycling ratios of 50% for refrigerators and washing machines, 55% for television sets, and 60% for air conditioners. By April 2001, 190 pick-up centers and 24 recycling plants were in place nationwide for the manufacturers of electric home appliances to comply with the new recycling law (Nikkei Weekly, 2001c).

Production

Mine production of all nonferrous metals and most industrial minerals (except iodine) declined in 2001 because of the economic recession and weaker domestic demand for mineral products. Mine production of copper, lead, silver, and zinc dropped sharply because the Kamioka Mine in Gifu Prefecture ceased its lead-silver-zinc mining operations in June 2001. Japan's coal mine output was slightly higher in 2001, but all coal production was expected to cease in early 2002 because of the permanent closures of the Ikeshima Mine in Nagasaki Prefecture in December 2001 and the Kusbiro Mine in Hokkaido Prefecture in January 2002. The output of crude petroleum and natural gas continued to increase in 2001, but the production remained very small.

In the mineral processing industry, production of most metals (except bismuth, ferromanganese, gold, and titanium) decreased because of lower demand for metals by the manufacturing

sector and reduced exports in 2001. Production of iron and steel, refined copper, refined lead, refined zinc, and most minor and rare metals decreased owing mainly to decreased domestic demand in 2001. Production of cement and other construction-related materials was also lower because of the continued slowdown in the construction sector in 2001. Production of most refined petroleum products, however, remained steady in 2001 (table 1).

Trade

Japan was a net importer of minerals mainly because of its large import bill for mineral fuels. Japan's mineral trade deficit decreased to \$71.7 billion in 2001 from \$80.7 billion in 2000. This was largely a result of a smaller trade deficit in mineral fuels and ferrous and nonferrous metal ores in 2001.

Total imports of minerals were valued at \$102.9 billion and accounted for 29.5% of the total imports, which were valued at \$349.1 billion in 2001 (Ministry of Finance, 2001b, p. 9-13, 15-16, 33-41). Of the total minerals imports, \$70.4 billion was for such mineral fuels as coal, LNG, crude and partially refined petroleum, refined petroleum products, and other mineral fuels; \$6.5 billion, for ores and concentrates of ferrous and nonferrous minerals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and \$1.3 billion, for such industrial minerals as salt, sulfur, earths and stone, plastering materials, lime, and cement. Imports of processed minerals, mineral-related chemicals, and metals totaled \$24.7 billion, of which \$3.4 billion was for mineral-related chemicals and fertilizers; \$12.5 billion, for products of iron and steel and nonferrous, rare, and other base metals; \$5.9 billion, for precious and semiprecious stones and precious metals; and \$2.9 billion, for products of asbestos, cement, ceramics, glass, mica, and stone.

Total exports of minerals, mineral-related chemicals, and processed minerals products were valued at \$31.2 billion and accounted for 7.7% of Japan's total exports, which were valued at \$403.1 billion in 2001 (Ministry of Finance, 2001a, p. 9-13, 15-16, 33-41). Exports of iron and steel products and nonferrous, rare, and other base metals totaled \$21.5 billion. Exports of processed mineral products of asbestos, cement, ceramics, glass, mica, and stone amounted to \$4.3 billion. Exports of salt, sulfur, earths and stone, plastering materials, lime, cement, mineral fuels, and nonferrous minerals were \$1.8 billion. Exports of mineral-related chemicals and fertilizer were \$1.9 billion. Exports of precious and semiprecious stones and precious metals were \$1.7 billion (table 4). Physical measures of the exports and imports of mineral commodities in 1999 and 2000 are listed in tables 5 and 6.

Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining sector of industrial minerals, and a large mineral processing sector of ferrous and nonferrous metals and industrial minerals (table 2). Mining and mineral processing businesses were owned and operated by private companies incorporated in Japan.

In the mining sector, the major nonferrous metal mines had reduced to two from three after the closure of the Kamioka

Mine in Gifu Prefecture in June 2001. The major industrial mineral mines, however, remained steady. The major coal mines had reduced to one from two after the closure of the Ikeshima Mine in Nagasaki Prefecture in December 2001 and then to none after the closure of the Kushiro Mine in Hokkaido Prefecture in January 2002. As a result, Japan's mining capacity of nonferrous metals had been reduced considerably by the end of 2001, and coal mining capacity, to near zero by January 2002. The number of workers in the major nonferrous metal mines was reduced by 356 to 616 in 2001; the number of workers in industrial minerals decreased by 357 to 11,265 in 2001; and the number of workers in the coal mines was reduced by 1,176 to 1,561 in 2001 and to near zero by January 2002 (Ministry of Economy, Trade and Industry, 2001d, p. 27, 35; 2001e, p. 115).

In the mineral processing sector, the steel industry continued to cut its employment to 178,716 from 191,347 in 2000. The industry's production capacity of pig iron decreased slightly to 94.13 million metric tons per year (Mt/yr) from 94.63 Mt/yr in 2000, and the production capacity of crude steel also decreased slightly to 145.29 Mt/yr from 145.78 Mt/yr in 2000. The nonferrous metal industry, which included smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, reduced the total number of its regular employees by 180 to 6,057 in 2001. Japan's production capacity of refined copper increased by 27,600 metric tons per year (t/yr) to 1.46 Mt/yr in 2001; that of refined gold and lead remained steady at 164.4 t/yr and 274,200 t/yr, respectively, in 2001; that of refined silver increased by 60 t/yr to 2,916 t/yr in 2001; and that of zinc increased by 3,600 t/yr to 703,200 t/yr in 2001. Japan's cement industry cut the total number of its regular employees by 220 to 4,013 and reduced its cement clinker capacity by 3.42 Mt/yr to 86.68 Mt/yr in 2001 (Ministry of Economy, Trade and Industry, 2001a, p. 124, 126; 2001c, p. 112-115; 2001d, p. 44-45).

Commodity Review

Metals

Alumina and Aluminum Hydroxide.—Japan relied 100% on imports of bauxite for the manufacture of alumina and aluminum hydroxide. In 2001, Japan imported 2.1 million metric tons (Mt) of bauxite, which was valued at \$53 million. The major supplying countries were Australia (48.9%), Indonesia (38.8%), India (9.1%), and China (2.2%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture, Showa Denko K.K. at its Yokohama plant in Kanagawa Prefecture, and Sumitomo Chemical Co. Ltd. at its Ehime plant in Ehime Prefecture.

In 2000 (the last year for which data are available), shipments of domestically produced alumina totaled 230,482 metric tons (t), of which 128,717 t was for the manufacture of refractories; 34,022 t, for ceramics; 11,734 t, for abrasives; 1,633 t, for welding rods; and 54,376 t, for other uses. Japan exported 100,809 t of alumina principally to China, the Republic of Korea, and Taiwan in 2000. Shipment of domestically produced aluminum hydroxide totaled 265,174 t, of which 138,249 t was for the manufacture of flocculate materials;

27,185 t, for rubber and plastics; 15,456 t, for synthetic zeolite; 2,680 t, for fluoride; and 81,604 t, for other uses. Japan exported 112,276 t of aluminum hydroxide principally to the Republic of Korea, Taiwan, and Thailand in 2000 (Japan Aluminum Association, 2001, p. 11, 18).

Aluminum.—Japan's production of primary aluminum (unwrought aluminum) by NLM at the Kambara refinery in Shizuoka Prefecture amounted to about 0.35% of Japan's requirements for primary aluminum in 2001. Virtually all Japan's requirements for primary aluminum were met by imports. Imports of primary aluminum totaled 2.61 Mt in 2001, of which 1.81 Mt was primary aluminum ingots and 796,094 t was primary aluminum alloys. The import bill for primary aluminum, which included ingots and alloys, was valued at \$3.9 billion (Ministry of Finance, 2001b, p. 646-647).

Because of its heavy reliance on imports, Japan's supply sources of primary aluminum were widely diversified. According to the estimate by Marubeni Corp., which was one of Japan's major trading companies, for fiscal year 2001, about 46.2% of imported primary aluminum was supplied from Japan's 10 overseas aluminum smelter projects in which the Japanese aluminum and major trading companies held substantial equity shares in those smelters in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, the United States, and Venezuela (table 7). About 49.7% of the imported aluminum was supplied under long-term contracts from the world's major producers of primary aluminum; and about 4% was from the spot market (Marubeni Corp., 2001).

Among the primary aluminum overseas' suppliers, the major supplying countries were Australia (25.0%), Russia (24.5%), New Zealand (8.0%), Brazil (7.1%), Indonesia (5.2%), Canada (5.1%), Venezuela (4.2%), South Africa (4.0%), the United Arab Emirates (3.8%), and China (3.6%). The United States supplied only 22,297 t and accounted for 0.8% of imported primary aluminum in 2001 (Ministry of Finance, 2001b, p. 646-647).

To secure more captive supplies of primary aluminum from overseas smelters, Mitsubishi Corp. (Mitsubishi) and its partners Billiton plc of the United Kingdom and Industrial Development Corp. of South Africa Ltd. in Mozambique Aluminum Co. (MOZAL) announced in June 2001 that they would go ahead with the \$860 million MOZAL 2 expansion project to double the capacity of the aluminum smelter in Maputo, Mozambique, to 506,000 t/yr of primary aluminum. The construction work on MOZAL 2 started soon after the announcement, and commissioning was scheduled for late 2003 with full production expected in mid-2004. Mitsubishi, which owned a 25% interest in MOZAL 1 and MOZAL 2, would increase its share of production to 126,000 t/yr in 2004 from 63,000 t/yr in 2001 (Mitsubishi Corp., 2001\$).

Because of economic downturn, domestic demand for primary aluminum decreased by 11.2% in 2001 to 1.92 Mt, of which 1.61 Mt was for rolling and extrusion; 94,038 t, for casting; 60,333 t, for secondary aluminum ingot; 38,014 t, for electric wire; 31,005 t, for steelmaking (deoxidization); 21,992 t, for diecasting; and 65,998 t, for other uses. The yearend stocks of primary aluminum decreased to 276,981 t from 289,624 t in 2000, of which 134,468 t was dealers inventory;

128,861 t, consumers inventory; and 13,652 t, the single primary aluminum producer inventory (Ministry of Economy, Trade and Industry, 2001d, p. 160-161).

Exports of primary aluminum, which included aluminum ingots and aluminum alloys, totaled 12,567 t and were valued at \$24.7 million in 2001. The major buyers of aluminum ingots (1,986 t) in 2001 were the Republic of Korea (43.6%), Malaysia (11.4%), Thailand (8.6%), China (8%), Belgium (7.3%), and Germany (6.4%). The major buyers of aluminum alloys (10,581 t) in 2001 were Indonesia (23.8%), Australia (21.9%), the Republic of Korea (21.4%), the Philippines (12.1%), China (7.3%), and Germany (4.7%) (Ministry of Finance, 2001a, p. 562-563).

Chromium.—Japan relied on imports to meet all chromium requirements for its iron and steel industry. Japan's imports of chromium ore and concentrate decreased by 18.1% to 411,120 t and were valued at \$27 million in 2001. The major suppliers were South Africa (66%), India (27%), and Iran (3%) (Ministry of Finance, 2001b, p. 167).

Consumption of chromium ore and concentrate by the iron and steel industry decreased by 10% to 328,623 t, of which 208,292 t was consumed by the ferroalloy industry and 120,331 t, by others. The iron and steel industry's yearend inventory of chromium ore amounted to 154,168 t, which was equivalent to 6 months of consumption (Ministry of Economy, Trade and Industry, 2001c, p. 87).

Production of ferrochromium decreased by 14.5% to 111,167 t in 2001 owing to high production costs and low import prices. Imports of ferrochromium, which included high- and low-carbon ferrochromium, decreased by 4.7% to 739,688 t in 2001. The major supplying countries were South Africa (53%), Kazakhstan (20%), Zimbabwe (12%), India (7%), and China (6%). Imports of ferrochromium were valued at \$333.9 million in 2001 (Ministry of Finance, 2001b, p. 607).

Consumption of ferrochromium, which included high-carbon ferrochromium (795,881 t) and low-carbon ferrochromium (42,764 t), decreased by 4.4% to 838,645 t in 2001, of which 834,537 t was consumed by steel producers and 4,108 t, by ferroalloy producers (Ministry of Economy, Trade and Industry, 2001c, p. 117). Exports of ferrochromium totaled 2,686 t, of which 2,573 t was low-carbon ferrochromium and 114 t, high-carbon ferrochromium. The major buyers of ferrochromium were the United States (86%) and Thailand (8%). Exports of ferrochromium were valued at \$5.6 million (Ministry of Finance, 2001a, p. 483).

Cobalt.—Japan relied 100% on imported cobalt matte and other intermediate products of cobalt for metal production. Sumitomo Metal Mining, which was Japan's sole producer of cobalt metal and cobalt salts (cobalt sulfate and cobalt oxide), operated a cobalt refinery in Niihama, Ehime Prefecture, with a rated capacity of 600 t/yr (Arumu Publishing Co. Ltd., 2002, p. 81). Japan also imported cobalt metal, cobalt oxide, and cobalt hydroxide to meet its cobalt requirements.

In 2001, imports of cobalt matte, other intermediate products of cobalt, cobalt ingots, and other articles of cobalt totaled 7,973 t and were valued at \$189.9 million. The major suppliers in 2001 were Canada (22.3%), Finland (17.4%), Australia

(12.5%), Norway (11.5%), Zambia (10.9%), Belgium (7.1%), Congo (Brazzaville) and Congo (Kinshasa) (5.8% combined), and Morocco (3.8%). Japan also imported 1,304 t of cobalt oxide and 180 t of cobalt hydroxide. Belgium and Finland were the two principal suppliers of cobalt oxides and accounted for 77.5% and 16.2%, respectively. Belgium and Finland were also the top two suppliers of cobalt hydroxide and accounted for 52.8% and 35.6%, respectively. Import bills for cobalt oxide and hydroxide amounted to \$36 million (Ministry of Finance, 2001b, p. 178, 654).

Domestic demand for cobalt metal in 2001 decreased by 12.4% to 2,473 t, of which 1,001 t was for specialty steel; 420 t, for pipe, plate, rod, and wire; 327 t, for ultrahard tool steel (cemented carbides); 233 t, for manufacturing of magnetic materials; 176 t, for catalysts; and 316 t, for other end uses. The decreased demand for cobalt was most significant in the magnetic materials sector, which dropped by 55%. Demand for cobalt metal for manufacturing of specialty steel decreased by 27% (Ministry of Economy, Trade and Industry, 2001d, p. 170-171). In addition to the Government statistics on demand for cobalt in the domestic market, cobalt consumed by the manufacturers of batteries, which had been adversely affected by lower production of nickel-metal hydride batteries, was estimated to be 4,000 t in 2001. According to an estimate by Mitsui & Co., the overall demand for cobalt in Japan was about 8,200 t in 2001 compared with 8,700 t in 2000 (Arumu Publishing Co. Ltd., 2002, p. 84).

Copper, Lead, and Zinc.—Mine production of copper, lead, and zinc was by the Kamioka Mining and Smelting Co. Ltd. at the Kamioka Mine in Gifu Prefecture and the Toyoha Mining Co. Ltd. at the Toyoha Mine in Hokkaido Prefecture. Mitsui Mining and Smelting Co. Ltd. (the parent company of Kamioka Mining and Smelting) decided to cease its mining (copper-lead-zinc-silver) operations at the Kamioka Mine at the end of June 2001 because of low ore grade at the mining site and the high cost to mine the rich ore bodies (Metal Bulletin, 2001b). As a result, the overall mine output of copper, lead, and zinc decreased substantially. In 2001, domestic mine output of copper, lead, and zinc was equivalent to 0.05%, 2.12%, and 6.91%, respectively, of Japan's raw material requirements for its copper, lead, and zinc smelting and refining industries (Ministry of Economy, Trade and Industry, 2001d, p. 24-25, p. 41-43).

In 2001, Japan was the world's largest importer of copper concentrate and one of the world's major importers of lead and zinc concentrates. Japan's imports of copper concentrate decreased by 8.1% to 4.1 Mt and were valued at \$2.03 billion in 2001 because of the cutback in refined copper production in the second half of 2001. The major suppliers of copper concentrate in 2001 were Chile (43.3%), Indonesia (19.7%), Canada (12.3%), Papua New Guinea (8.8%), Australia (6.8%), and Argentina and Peru (2.8% each). Japan's imports of lead and zinc concentrates were 186,136 t and 1.16 Mt and were valued at \$60 million and \$243 million, respectively, in 2001. The major suppliers of lead concentrate were Australia (36.3%), the United States (35.4%), Peru (10.2%), and Bolivia (6.2%). The major suppliers of zinc concentrate were Australia (41.0%), Peru (13.9%), the United States (11.6%), Canada (10.7%), and Mexico (10.2%) (Ministry of Finance, 2001b, p. 166-167).

To secure more captive copper concentrate from overseas nonferrous metals mines in which Japanese nonferrous metal mining companies held substantial portion of equity (table 8) and provided long-term loan, Sumitomo Metal Mining decided to invest in an exploration and development project of copper, gold, and platinum-group metals in Mexico. Nippon Mining and Metals Co. Ltd. decided to provide long-term loan in a development project of copper and gold in Australia in 2001.

In October 2001, Sumitomo Metal Mining reached an agreement with Fairfield Minerals Ltd. and Santoy Resources Ltd. of Canada to participate in the Tropic joint-venture (copper, gold, and platinum-group metals) project, which is about 20 kilometers (km) northeast of the port city of Mazatlan in Sinaloa State, Mexico. Under the agreement, Sumitomo Metal Mining would earn 51% interest in the Tropic project by investing \$3 million on exploration during a 3-year period. It could earn 70% interest by providing full funding, completing a bankable feasibility study, financing, and constructing within 18 months following a 50% debt finance decision (Mining Journal, 2001d; Santoy Resources Ltd., 2001§).

In August 2001, Nippon Mining and Metals signed an agreement with Cadia Holdings Pty. Ltd. (a wholly owned subsidiary of Newcrest Mining Ltd. of Australia) to extend an \$80 million loan as a part of construction funds of the Ridgeway Mine near Orange in New South Wales, Australia, in return for a long-term purchase of 150,000 t/yr of gold-rich copper concentrate produced from Cadia Holdings' Cadia Hill Mine and the nearby Ridgeway Mine between 2001 and 2009 (Nippon Mining and Metals Co. Ltd., 2001a§).

To cut cost and increase efficiency in the procurement of copper concentrate, Nippon Mining and Metals and Mitsui Mining and Smelting Co. Ltd. established a new joint venture United Copper Resources Co. Ltd. (UCRC) in March 2001. Each company owned 50%. UCRC started operations on April 1, 2001 (Nippon Mining and Metals Co. Ltd., 2001b§).

Despite a sharp decline in domestic demand for copper and zinc, metal production of copper, lead, and zinc remained steady because of a substantial increase in exports of copper and zinc and a slight decrease in demand for lead in 2001. Because of economic downturn, demand for copper, lead, and zinc decreased in the domestic market. Exports of copper and zinc, however, increased substantially because of the effects of Japanese transplants in China and Southeast Asian countries. Increased exports of copper and zinc had helped Japan's nonferrous metals smelting and refining industry to maintain high capacity utilization rates of 97.6% for copper, 86.1% for lead, and 91.6% for zinc (Ministry of Economy, Trade and Industry, 2001d, p. 36-38, 45).

Imports of refined copper decreased by 19.5% to 163,304 t and were valued at \$284.3 million. The major suppliers of refined copper were Chile (44.3%), Zambia (13.2%), Australia and Indonesia (8.9% each), the Philippines (7.5%), Peru (6.9%), and Burma (5.2%). Imports of refined lead increased by 51.3% to 37,153 t and were valued at about \$24.6 million. The principal suppliers of refined lead were China (91.5%) and Peru (4.5%). Imports of zinc slab (refined zinc, not alloyed) decreased by 21.3% to 63,580 t and were valued at about \$64.8 million. The major suppliers of zinc slab were China (78.7%), Peru (17.2%), and Canada (3.6%) (Ministry of Finance, 2001b,

p. 627-628, 640).

Domestic demand for refined copper decreased by 18.2% to 1.1 Mt in 2001. Domestic demand for refined copper, by sector, was 706,374 t for wire and cable, 371,816 t for brass mill, and 21,674 t for others. The overall stocks of refined copper decreased by 20.6% to 70,910 t at the end of December (Ministry of Economy, Trade and Industry, 2001d, p. 152). Exports of refined copper increased by 39.0% to 416,017 t and were valued at \$662.8 million. The major buyers of refined copper were China (49.6%), Taiwan (31.7%), the Republic of Korea (6.0%), Malaysia (3.2%), Thailand (3.1%), the United States (2.2%), Indonesia (2.1%), and Vietnam (1.6%). Most of the 45,137 t of unrefined copper and copper anodes was exported mainly to the Republic of Korea (93.8%) and Taiwan (4.7%). Exports of unrefined copper and copper anodes were valued at \$92.0 million (Ministry of Finance, 2001a, p. 554).

In 2001, domestic demand for refined lead decreased by 3% to 243,651 t, of which 184,219 t was for storage batteries; 29,325 t, for inorganic chemicals; and 30,107 t, for other uses. The overall stocks of primary lead dropped by 27.4% to 23,413 t at the end of December (Ministry of International Trade and Industry, 2001d, p. 154). Exports of refined lead decreased sharply to 747 t from 1,564 t in 2000. The two major buyers of refined lead in 2001 were China (59.8%) and the Philippines (31.8%) (Ministry of Finance, 2001a, p. 568).

In 2001, domestic demand for zinc slab decreased by 11.2% to 545,106 t. Demand for sheet galvanizing (52.4%), other plating (16.2%), brass mill products (10.9%), zinc die-cast products (10.0%), inorganic chemicals (5.9%), and other uses (4.6%) also decreased. The overall stocks of zinc slab increased by 1.7% to 113,640 t at the end of December (Ministry of Economy, Trade and Industry, 2001d, p. 158). Exports of zinc slab increased by 36.0% to 72,792 t. The major buyers were Taiwan (41.9%), the Philippines (19.1%), Indonesia (10.7%), the United States (9.6%), Bangladesh (7.4%), and Vietnam (4.8%) (Ministry of Finance, 2001a, p. 568).

Gold and Silver.—Mine production of gold and silver decreased in 2001 because of decreased ore output and lower ore grade. Gold mine production was mainly by Sumitomo Metal Mining from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko (main mine) and Yamada deposits in the Hishikari mining area, produced about 7.7 t of gold in 2001. Ore production from the Hishikari Mine totaled about 176,000 t and averaged 44.1 grams per metric ton gold (Bulletin of Japan Mining Industry Association, 2002, p. 144). Ore reserves at the Hishikari Mine were estimated to be 4.6 Mt and to have a gold content of about 161 t (Sumitomo Metal Mining Co. Ltd., 2001, p. 10). Other small-scale productive gold and silver mines were the Kouryu Mine in the southwestern part of Hokkaido Prefecture and the Akesi, the Iwato, and the Kasuga Mines in Kagoshima Prefecture. The Kamioka and the Toyoha Mines produced most of Japan's mined silver as a byproduct of their lead and zinc mining operations.

In overseas mineral exploration, Sumitomo Metal Mining was conducting the \$33 million final feasibility study for the Pogo area (Stone Boy) gold project in eastern interior Alaska in 2001. The feasibility study was expected to be completed in the first

half of 2002, and the Pogo gold mine was scheduled to start operations in 2004 (Sumitomo Metal Mining Co. Ltd., 2001, p. 10). According to Teck Cominco of Canada, which owned a 40% interest in the project, an underground mine at Pogo would be constructed with a 1,750-foot vertical shaft sunk to two main gold-bearing veins from the top of Pogo Ridge and would cost between \$200 million and \$250 million. The mine construction was expected to start following a favorable Federal environmental impact statement and record of decision in early 2002. Sumitomo Metal Mining and Teck Corp. reportedly had spent about \$50 million on the Pogo gold project as of 2001 (Alaska Journal of Commerce, 2001§).

Nippon Mining and Metals, which had 50% interest in the Kainantu gold project in Eastern Highlands Province of Papua New Guinea, reportedly had agreed to withdraw from the joint venture with Highlands Pacific Ltd. of Australia as a result of a reassessment of its corporate strategy. As a result, Highlands Pacific had resumed 100% ownership of the project in May 2001 (Highlands Pacific Ltd., 2001§).

Production of refined gold increased by 7% owing mainly to increased input from imported ore despite decreased input from domestic ore and scrap materials in 2001. Refined gold produced from imported ore increased by 14% to 113,338 kilograms (kg), domestic ore decreased by 23% to 6,456 kg, scrap decreased by 23% to 8,947 kg, and other raw materials increased by only 0.5% to 27,085 kg. Production of refined silver decreased by 3.8% owing to a lower input from domestic and imported ores and scrap. Refined silver produced from imported ore decreased by 3.3% to 1,444 t, domestic ore decreased by 50.5% to 33 t, scrap decreased by 6.4% to 328 t, and other materials increased by 3.0% to 488 t (Ministry of Economy, Trade and Industry 2001d, p. 40-41).

Imports of gold ingots and powder dropped sharply (43.2%) to 39,860 kg because of the substantial decline in domestic gold demand for industrial use in 2001. Imports of silver ingots and powder also dropped sharply (44.3%) to 872 t because of decreased domestic silver demand for all end users, especially for photographic materials and silver nitrate for other uses. The major suppliers of gold ingots and powder in 2001 were Australia (42.8%), Papua New Guinea (12.9%), Brazil (12.5%), Uzbekistan (12.0%), Switzerland (8.4%), Canada and the United Kingdom (2.5% each), and Russia (1.5%). The major suppliers of silver ingots and powder in 2001 were Mexico (38.5%), Peru (19.1%), Australia (17.7%), the Republic of Korea (11.6%), the United States (8.0%), and the United Kingdom (2.3%). Import bills for gold ingots and powder were \$348 million and that for silver ingot and powder were \$127 million (Ministry of Finance, 2001b, p. 601-602).

Overall demand for gold, which included dental and medical, industrial use, industrial arts and crafts, and private investment and other uses, decreased to 262,495 kg in 2001 from 294,778 kg in 2000. Of this overall domestic demand for gold, dental and medical increased to 23,653 kg in 2001 from 21,221 kg in 2000; industrial use decreased to 119,629 kg in 2001 from 178,876 kg in 2000; industrial arts and crafts increased to 4,893 kg in 2001 from 4,222 kg in 2000; and private investment and other uses increased to 114,320 kg in 2001 from 90,459 kg in 2000. The sharp decline in demand for industrial use in 2001 was owing to a sharp drop in electronics and

telecommunications and in jewelry, which declined to 70,916 kg and 21,739 kg in 2001 from 106,086 kg and 43,119 kg, respectively, in 2000 (Arumu Publishing Co. Ltd., 2002, p. 123).

Domestic demand for silver decreased by 24.9% to 2,958 t in 2001 owing mainly to a sharp decline in the demand for photographic materials and for other uses. Demand for photographic materials decreased to 1,663 t in 2001 from 1,726 t in 2000; silver nitrate for other uses to 150 t in 2001 from 335 t in 2000; rolled products, to 193 t in 2001 from 208 t in 2000; electric contacts, to 111 t in 2001 from 140 t in 2000; and other uses, to 637 t in 2001 from 1,215 t in 2000 (Ministry of Economy, Trade and Industry 2001d, p. 176).

Exports of refined gold ingots and powder increased by 203.8% to 14,323 kg and were valued at \$121 million in 2001. The major buyers of refined gold ingots and powder were Hong Kong (36.9%), the Republic of Korea (33.2%), the United Kingdom (12.3%), and Taiwan (4.7%). Exports of silver ingots and powder decreased by 15.8% to 249.5 t and were valued at \$15 million in 2001. The major buyers of refined silver and powder were Singapore (27.1%), the Republic of Korea (20.9%), Malaysia (13.8%), China (11.2%), Taiwan (9.7%), Hong Kong (9.0%), and the United Kingdom (4.7%) (Ministry of Finance, 2001a, p. 479-480).

Iron and Steel.—Japan relied on imports to meet virtually all the iron ore requirements for its iron and steel industry. Imports of iron ore totaled 126.3 Mt and were valued at \$3.1 billion in 2001. The average cost, insurance, and freight (c.i.f.) import price of iron ore was \$24.31 per metric ton in 2001 compared with \$24.49 per ton in 2000. The major suppliers of iron ore were Australia (55.4%), Brazil (19.6%), India (12.4%), South Africa (4.0%), the Philippines (2.9%), and Chile (2.5%). Imports of pig iron dropped by 78.7% to 181,313 t and were valued at \$22 million. The average c.i.f. import price of pig iron was \$121.69 per ton compared with \$135.65 per ton in 2000. The major suppliers of pig iron in 2001 were Australia (43.6%), Brazil (25.5%), North Korea (14.4%), South Africa (8.5%), Taiwan (5.2%), and China (2.7%) (Ministry of Finance, 2001b, p.162, 607).

Consumption of iron ore by the iron and steel industry totaled 109.2 Mt in 2001, of which 83.6 Mt was for sintering; 24.7 Mt, for ironmaking; 837,000 t, for steelmaking; and 132,000 t, for other uses. Consumption of other iron ore raw materials by the iron and steel industry included 4.5 Mt of imported pellets, 600,000 t of imported iron sand, 281,000 t of imported ferruginous manganese ore, and 12.0 Mt of other iron ore materials. Consumption of other major raw materials in 2001 was 62.5 Mt of coking coal, 35.4 Mt of coal coke, 12.9 Mt of limestone, 4.5 Mt of quicklime, 1.5 Mt of dolomite, 1.4 Mt of serpeninite, 487,496 t of silica stone, and 164,556 t of fluorite (Ministry of Economy, Trade and Industry, 2001c, p. 80-83, 86-93).

In 2001, pig iron production decreased by 2.7% to 78.8 Mt, of which 78.3 Mt was for steelmaking and 523,000 t was for foundry (Ministry of Economy, Trade and Industry, 2001c, p. 24). The total ironmaking capacity decreased slightly to 94.1 Mt/yr from 94.6 Mt/yr in 2000, and the number of blast furnaces (38) and other furnaces (4) for ironmaking decreased

to 42 from 43 in 2000 (Ministry of Economy, Trade and Industry, 2001c, p. 112).

Crude steel production decreased by 3.4% to 102.9 Mt in 2001 largely owing to the weaker domestic demand for steel especially by the construction and manufacturing sectors. Of the total crude steel produced in 2001, 72.4% was processed by basic oxygen furnaces (L.D. converter), and 27.6%, by electric furnaces (Ministry of Economy, Trade and Industry, 2001c, p. 32-33). In the steelmaking sector, the number of basic oxygen furnaces (64) remained unchanged in 2001, and the number of electric arc furnaces decreased to 407 from 409 in 2000. The overall crude steel production capacity decreased to 145.8 Mt/yr from 146.9 Mt/yr in 2000 (Ministry of Economy, Trade and Industry, 2001c, p. 113).

In 2001, Japan was the world's second largest producer of crude steel and accounted for about 12% of world total (International Iron and Steel Institute, 2002b§). Among Japan's top five steelmakers in 2001, Nippon Steel Corp., which produced 26.2 Mt of crude steel, was the third largest steel-producing company in the world after Arcelor of the European Union and POSCO of the Republic of Korea; NKK Corp., which produced 14.8 Mt, ranked 9th; Kawasaki Steel Corp., which produced 13.3 Mt, ranked 10th; Sumitomo Metal Industries, Ltd., which produced 11.7 Mt, ranked 12th; and Kobe Steel Ltd., which produced 6.7 Mt, ranked 26th (International Iron and Steel Institute, 2002a§).

To cope with overcapacity and to cut cost, Japan's iron and steel industry began its first consolidation and realignment in 2001. In November 2001, Japan's Fair Trade Commission (the Japanese equivalent of the U.S. Federal Trade Commission) approved a merger plan by Kawasaki Steel and NKK to consolidate their entire operations by April 2003. The merger would create a giant steelmaker with a combined crude steel capacity of 33.8 Mt/yr in 2003. The two companies planned to merge in October 2002 to form a new company called JFE Holdings and to cut crude steel production capacity by 2 Mt/yr and 6,000 jobs to reduce costs by \$658 million within 4 years. The shareholders of Kawasaki Steel would get 55% of the share in JFE (Metal Bulletin, 2001c, d).

To cope with the fluctuation in demand and intensive competition and to secure its leading position in Japan's steel industry, Nippon Steel reached an agreement in December 2001 with Kobe Steel to form an alliance, which involved joint procurement of raw materials and distribution of steel products. Additionally, Nippon Steel began its merger negotiations with Sumitomo Metal Industries in certain fields and on a comprehensive tie-up in steel operations, which included cooperation in materials procurement, production, distribution, and mutual supply of semifinished products to cut costs (Nikkei Weekly, 2001d, e).

Because of the cutback in private capital investment, demand for steel in the construction and manufacturing sector declined in 2001. As a result, Japan's demand for steel declined. Exports of iron and steel, however, continued to move higher, especially to the East Asian market (China, the Republic of Korea, and Taiwan). In 2001, the overall domestic demand for steel products decreased by 4.9% to 62.6 Mt, of which 53.3 Mt was ordinary steel products and 9.4 Mt, specialty steel products. Exports of iron and steel products increased by 4.5% to 30.5

Mt, which was a 16-year high. Japan's domestic demand for ordinary steel products declined in all end-use markets except automobiles and shipbuilding. Domestic demand for specialty steel products also declined in most end-use markets except home and office appliances and shipbuilding (table 9).

Exports of iron and steel products included 3.1 Mt of steel ingots and semifinished products, 22.1 Mt of ordinary steel products, 4.1 Mt of specialty steel products, and 1.2 Mt of other iron and steel products (Japan Iron and Steel Federation, 2002, p. 12-13). Exports of iron and steel products to the Asian markets increased by 2.8% to 23.0 Mt in 2001. Exports to the European and the Middle Eastern markets increased by 39.7% each and to the Oceanian markets by 24.5%; exports to the Western Hemisphere (North America and South America) and the African markets decreased by 4.8% and 1.6%, respectively, in 2001. Exports of iron and steel products to the United States, however, increased by 3.2% to 2.2 Mt in 2001 (table 10). Export earnings from iron and steel products were valued at \$14.8 billion in 2001 (Japan Iron and Steel Federation, 2002§).

Imports of iron and steel products decreased sharply by 21.5% to 6.1 Mt in 2001; this was the lowest level in 15 years. Of the total imports, 3.6 Mt was ordinary steel products; 1.9 Mt, pig iron, steel ingots, and semimanufactured steel; and 600,000 t, other steel products (Japan Iron and Steel Federation, 2002, p. 18-19). Among the major suppliers of the ordinary steel products, the Republic of Korea accounted for 61.5%; Taiwan, 27.3%; and China, 3.9%. Imports for iron and steel products were valued at \$3.0 billion (Japan Iron and Steel Federation, 2002§).

Manganese.—All Japan's manganese ore requirements were met by imports. In 2001, Japan imported 1.02 Mt of high-grade manganese ore; 122,045 t, ferruginous manganiferous ore; 82,776 t, low-grade manganese ore; and 3,260 t, high-grade manganese dioxide ore. The major suppliers of high-grade manganese dioxide ore were Gabon (68.9%), Mexico (15.9%), and China (15.3%). The major suppliers of high-grade manganese ore were South Africa (62.6%) and Australia (34.9%). The major suppliers of low-grade manganese ore were India (74.4%) and South Africa (25.5%). The major suppliers of ferruginous manganiferous ore were Ghana (47.4%), India (40.5%), and South Africa (10.7%). Imports of manganese ores amounted to \$121.2 million (Ministry of Finance, 2001b, p. 166).

Consumption of manganese ore for production of ferroalloys increased by 1.5% to 630,930 t, that for steelmaking decreased by 19.0% to 156,586 t, and that for other uses increased by 29.4% to 60 t in 2001. Production of ferromanganese increased by 9.1% owing to increased consumption for steelmaking in 2001 (Ministry of Economy, Trade and Industry, 2001c, p. 86, 117). Imports of ferromanganese decreased by 21.7% to 54,549 t because of increased domestic production in 2001. The major suppliers were South Africa (37.6%), China (43.6%), and Australia (5.6%) (Ministry of Finance, 2001b, p. 586).

Consumption of domestically produced high- and low-carbon ferromanganese for steelmaking in 2001 increased by 4.2% to 402,516 t, of which 328,154 t was high-carbon ferromanganese and 74,362 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2001c, p. 117). Exports of

ferromanganese decreased by 36.7% to 28,018 t in 2001. The major buyers were Taiwan (34.9%), the Republic of Korea (17.8%), Australia (12.5%), Indonesia (8.6%), Malaysia (5.8%), Saudi Arabia (5.1%), and India (4.3%). Export earnings from ferromanganese were valued at \$17.6 million in 2001 (Ministry of Finance, 2001a, p. 483).

In 2001, Japan was the world's largest producer of electrolytic manganese dioxide (EMD). Japan's EMD producers were Japan Metal & Chemicals Co. Ltd. at its Takaoka plant (18,000 t/yr) in Toyama Prefecture and its Hunan plant (10,000 t/yr) in China; Mitsui Mining and Smelting at its Takehara plant (24,600 t/yr) in Hiroshima Prefecture and its County Cork plant (19,000 t/yr) in Ireland; and Tosoh Corp. at its Hyuga plant (34,000 t/yr) in Miyazaki Prefecture and its Salonika plant (18,000 t/yr) in Greece. Japan's EMD production capacity, which included three overseas plants, totaled 123,600 t/yr in 2001 and accounted for 38.2% of the world's production capacity of 323,200 t/yr (Arumu Publishing Co. Ltd., 2002, p. 32).

Nickel.—Japan relied 100% on imported raw materials to meet its nickel requirements in 2001. Japan was the world's largest importer and consumer of nickel and the second largest producer of nickel metal after Russia in 2001 (International Nickel Study Group, 2002, p. 8, 10). All nickel ores and nickel mattes were imported for production of ferronickel, nickel chemicals (salts), nickel oxide sinter, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel also were imported to meet the nickel requirements of the battery, magnetic materials, nonferrous alloys, and specialty steel industries, as well as other end users.

In 2001, imports of nickel ore decreased by 3.5% to 4.4 Mt and were valued at \$159 million. The three suppliers of nickel ore were Indonesia (43.4%), the Philippines (29.7%), and New Caledonia (26.9%). Imports of nickel matte, in gross weight, increased by 5.1% to 117,349 t and were valued at \$459 million. The two suppliers of nickel matte were Indonesia (68.8%) and Australia (31.2%). Imports of ferronickel, in gross weight, increased by 20.8% to 45,470 t and were valued at \$85.2 million. The four suppliers of ferronickel were New Caledonia (72.5%), Indonesia (13.4%), the Dominican Republic (10.4%), and Colombia (3.7%). Imports of refined nickel decreased by 51.3% to 28,139 t and were valued at \$183 million. The top nine suppliers of refined nickel were Australia (29.1%), Zimbabwe (12.0%), Russia (10.8%), Norway (9.8%), Canada (9.0%), China and South Africa (8.8% each), the United Kingdom (6.7%), and Brazil (3.9%). Imports of nickel oxide sinter decreased by 42.3% to 907 t and were valued at \$4.6 million. Australia, which was the dominant supplier of nickel oxide sinter, accounted for 99.2%. Imports of nickel powders and flakes decreased by 26.4% to 8,246 t and were valued at \$71.6 million. The two major suppliers were the United Kingdom (44.0%) and Canada (43.5%). Imports of nickel waste and scrap increased by 2.4% to 16,040 t and were valued at \$92 million. The major suppliers were Russia (39.0%), Zimbabwe (24.3%), the United States (12.9%), Canada (4.2%), and South Africa (3.9%) (Ministry of Finance, 2001b, p. 167, 607-608, 645).

In 2001, imports of nickel ore from New Caledonia dropped by 48.5% or by 1.1 Mt to 1.2 Mt because of suspended ore shipments by Société Minière du Sud Pacifique S.A. (SMSP), which shipped all its ore to New Caledonia's ferronickel plant to be in line with its Government's long-term policy to increase exports of value-added nickel products. As a result, ferronickel production by Pacific Metals Co. Ltd., which received a considerable portion of its ore feed from SMSP, was affected in 2001 (Metal Bulletin, 2001e).

To supplement the shortfall of nickel ore from New Caledonia, Pacific Metals, Nippon Yakin Kogyo Co. Ltd., and Sumitomo Metal Mining signed a new long-term purchase agreement in November 2001 with PT Antam Tbk of Indonesia to import more than 2 Mt/yr of high-grade saprolitic nickel ore beginning in 2002. PT Antam exported about 1.3 Mt of nickel ore to Japan in 2000 (Mining Journal, 2001b).

Consumption of nickel ore by the ferroalloy industry decreased by 6.3% to 3.2 Mt in 2001. Production of ferronickel was by Hyuga Smelting Co. Ltd. in Hyuga, Miyazaki Prefecture; Nippon Yakin Kogyo at Oheyama in Miyazu, Kyoto Prefecture; and Pacific Metals in Hachinohe, Aomori Prefecture. Consumption of ferronickel, in gross weight, for steelmaking increased to 295,082 t from 265,239 t in 2000 because of increased production of nickel-based stainless steel (Ministry of Economy, Trade and Industry, 2001c, p. 74, 86, 117). Exports of ferronickel increased by 6.0% to 121,708 t, of which 55% went to Taiwan, and 44.9%, to the Republic of Korea. Export earnings from ferronickel were valued at \$127 million (Ministry of Finance, 2001a, p. 483).

Production of refined nickel was solely by Sumitomo Metal Mining at its nickel refinery that used its matte chlorine leaching electrowinning process in Niihama, Ehime Prefecture. The 36,000-t/yr nickel refinery used imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and exports. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce nickel oxide sinters, granules, and briquettes for domestic consumption and export.

In January 2001, a ship carrying 2,200 t of nickel-in-matte, which was produced from PT Inco's Soroako smelter in Sulawesi, Indonesia, sank in high seas off the coast of Japan. About 80% of the nickel matte was bound for Tokyo Nickel and 20% for Sumitomo Metal Mining. The lost value of the nickel, which was insured, was estimated to be about \$13 million. Production of nickel oxide sinter and refined nickel by the two Japanese producers reportedly was not adversely affected (Engineering and Mining Journal, 2001).

To secure more long-term supplies of raw material (nickel-cobalt mixed sulfide) to feed its Niihama's nickel-cobalt refining facilities, Sumitomo Metal Mining announced in July 2001 that it had launched the Rio Tuba project for construction of a treatment (processing) plant adjacent to an ore stockpile site near the Rio Tuba Mine on Palawan Island in the Philippines. At the ore stockpile site, about 16 Mt of lateritic low-grade nickel oxide ore from the Rio Tuba Mine had been accumulated during the course of mining since the 1980s. The treatment plant, which was scheduled to start operations in summer 2004, would use high-pressure acid-leach (HPAL) technology for the

production of nickel-cobalt mixed sulfide from lateritic low-grade nickel oxide ore at low cost. The treatment plant would produce about 10,000 t/yr of nickel and 700 t/yr of cobalt in mixed sulfide. All mixed sulfide production would be delivered to the nickel-cobalt refining facilities in Niihama. The \$150 million plant would be a joint venture between Sumitomo Metal Mining, Rio Tuba Nickel Mining Corp., and two Japanese trading companies—Mitsui & Co. Ltd. and Nissho Iwai Corp. (Mining Journal, 2001c; Sumitomo Metal Mining Co. Ltd., 2001, p. 11).

Domestic demand for refined nickel decreased by 13.8% to 62,267 t owing to decreased demand in every sector of end users in 2001. Among the end users, production of specialty steel decreased by 10.0% to 45,113 t; galvanized sheet, by 20.9% to 4,312 t; batteries, by 11.8% to 3,571 t; copper and copper-base alloys, by 25.9% to 2,798 t; magnetic materials, by 47.3% to 1,440 t; other users, by 17.3% to 4,653 t. Catalysts were unchanged at 380 t (Ministry of Economy, Trade and Industry, 2001d, p. 168-169). Exports of refined nickel decreased by 50.4% to 478 t and were valued at \$3 million in 2001. The major buyers were the Republic of Korea (43.4%), China (26.4%), Indonesia (8.8%), Singapore (7.7%), and Thailand (5.8%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 10.4% to 25,480 t and were valued at \$133 million in 2001. The principal buyers were the Republic of Korea (68.7%) and Taiwan (30.6%). Exports of nickel powders and flakes decreased by 31.1% to 816 t in 2001 and were valued at \$24.6 million. The major buyers were China (34.4%), Hong Kong (23.9%), France (15.4%), and the United States (11.4%). Exports of nickel waste and scrap increased by 4.6% to 713 t and were valued at \$2.3 million in 2001. The major buyers were the United States (28.7%), the United Kingdom (23.5%), Belgium (10.1%), Taiwan (9.2%), and the Republic of Korea (8.8%) (Ministry of Finance, 2001a, p. 561).

Titanium.—In 2001, Japan was the world's largest producer of titanium sponge metal and was one of the world's major producers of titanium dioxide pigment (Arumu Publishing Co. Ltd., 2002, p. 56). All the raw material requirements for production of titanium metal and dioxide pigment, however, were supplied by imports. Rutile was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed mainly by the manufacturers of synthetic rutile and titanium dioxide pigment. Small amounts of rutile and ilmenite were consumed as blast furnace additives in the steel industry.

Imports of titanium ore (rutile) increased by 40.3% to 112,802 t because of a stronger demand for titanium sponge in 2001. The major suppliers were Australia (49.4%), Canada and India (20.4% each), and South Africa (6.8%). Imports of ilmenite increased by 10.9% to 373,027 t. The major suppliers were Vietnam (36.7%), Australia (27.6%), Canada (13.1%), Egypt (7.6%), India (6.1%), and Malaysia (4.6%). Imports of titanium slag decreased by 12.5% to 122,977 t. The two suppliers were South Africa (70%) and Canada (30%). Import bills for rutile, ilmenite, and titanium slag were valued at \$50.6 million, \$40.7 million, \$48.5 million, respectively, in 2001 (Ministry of Finance, 2001b, p. 167).

Production of titanium sponge increased by 27.5% in 2001 because of stronger domestic demand and tight supply in overseas markets, especially in the United States. To cope with the high demand in 2001 and strong demand outlook in 2002, Sumitomo Sitix Corp. had launched a \$30 million expansion project to raise the capacity of its Amagasaki plant in Hyogo Prefecture to 17,000 t/yr in 2002 from 15,000 t/yr in 2001. Toho Titanium Co. Ltd. decided in August 2001 to spend \$8.2 million for installing new facilities at its Chigasaki plant in Kanagawa Prefecture to raise its sponge production by 20% (Metal Bulletin, 2001a, f).

Total titanium sponge shipments increased by 30.9% to 25,107 t in 2001. According to the Japan Titanium Society, domestic shipments of titanium sponge increased to 14,328 t in 2001 from 11,475 t in 2000. Exports of titanium sponge increased to 10,779 t in 2001 from 7,712 t in 2000. Imports of titanium sponge increased to 9,100 t in 2001 from 6,264 t in 2000. Total shipments of titanium mill products increased to 14,434 t in 2001 from 11,946 t in 2000; domestic shipments of titanium mill products increased to 7,307 t in 2001 from 6,049 t in 2000, and exports of titanium mill products increased to 7,127 t in 2001 from 5,897 t in 2000 (Arumu Publishing Co. Ltd., 2002, p. 56).

In the domestic market, according to the Japan Titanium Society, shipments of titanium mill products to the manufacturers of the chemical plants increased to 1,219 t from 1,060 t in 2000. Shipments to the manufacturers of power-generation and water-desalination plants increased to 805 t from 488 t in 2000. Shipments to the distributors increased to 1,325 t from 1,279 t in 2000. Shipments to the manufacturers of consumer, medical, and sports leisure goods increased to 1,369 t from 1,305 t in 2000. Shipments to the manufacturers of heat exchange equipment and others increased to 1,311 t from 1,053 t in 2000. Shipments to the aircraft manufacturers increased to 554 t from 254 t in 2000. Shipments to the manufacturers of automobiles increased to 499 t from 473 t in 2000. Shipments to the manufacturers of architectural and civil engineering materials decreased to 72 t from 113 t in 2000. Shipments to the manufacturers of shipping, marine, and energy materials increased to 153 t from 24 t in 2000 (Arumu Publishing Co. Ltd., p. 59).

According to Government trade statistics, exports of titanium sponge increased by 42.8% to 11,044 t and were valued at \$80.9 million in 2001. The major buyers were the United States (57.6%), the United Kingdom (38.9%), and the Republic of Korea (5.6%) (Ministry of Finance, 2001a, p. 572). Exports of titanium waste and scrap and titanium powder increased 72.5% to 4,177 t and were valued at \$17.8 million. The major buyers were the United States (73.9%), Taiwan (15.5%), the United Kingdom (3.4%), and Germany (2.7%). To meet the domestic requirements, Japan imported 9,100 t of lower grade titanium sponge, waste, scrap, and powder, which were valued at \$63.7 million. The principal suppliers in 2001 were Russia (41.3%), the United States (27.3%), and Kazakhstan (26.7%) (Ministry of Finance, 2001b, p. 654).

In 2001, Imports of titanium mill products increased to 1,223 t from 1,066 t in 2000 and were valued at \$51.3 million. The principal suppliers were the United States (56.3%), Russia (16.67%), and Ukraine (11.4%) (Ministry of Finance, 2001b, p.

654). Exports of titanium mill products increased to 8,836 t from 6,701 t in 2000 and were valued at \$211.4 million in 2001. The major buyers were Sweden (14.2%), the Republic of Korea (13.7%), Taiwan (13.0%), France (10.6%), Italy (7.0%), the United States (6.5%), Germany (6.2%), Denmark (6.1%), and the Netherlands (4.7%) (Ministry of Finance, 2001a, p. 572).

Production of titanium dioxide decreased because of the weaker demand in domestic and overseas markets in 2001. According to Government statistics, the industry's capacity was 325,800 t/yr, and the capacity utilization was 78.9% in 2001 (Ministry of Economy, Trade and Industry, 2001b, p. 286-287). According to the Japan Titanium Dioxide Industry Association, only six companies were operating in 2001. Tohkem Products Corp., which operated a 30,000-t/yr plant in Akita, Akita Prefecture, had not been in operation since 2000. The industry's total capacity, according to the Association, was estimated to be 322,200 t/yr in 2001 (Arumu Publishing Co. Ltd., 2002, p. 100).

According to the Japan Titanium Dioxide Industry Association, total shipments of titanium dioxide to domestic market decreased by 5% to 173,953 t in 2001, of which 77,602 t was for manufacture of paints and coating materials; 35,359 t, for printing inks and pigments; 18,352 t, for synthetic resin (plastics); 18,198 t, for papers; 3,104 t, for chemical fibers; 2,121 t, for rubber; 1,508 t, for condenser; and 17,709 t, for other end uses (Arumu Publishing Co. Ltd., 2002, p. 100).

In 2001, imports of titanium oxide totaled 14,298 t and were valued at \$19.6 million. The major suppliers were China (37.5%), France (35.3%), and the Republic of Korea (13.6%) (Ministry of Finance, 2001b, p. 179). Exports of titanium oxides decreased by 16.7% to 23,531 t in 2001 and were valued at \$64.7 million. The major buyers in 2001 were China (31.8%), Taiwan (27.9%), the Republic of Korea (15.8%), Indonesia (4.4%), the Netherlands (2.7%), Thailand and India (2.1% each), and the United States (2.0%) (Ministry of Finance, 2001a, p. 110).

Industrial Minerals

Cement.—In 2001, Japan was the fourth largest cement producer after China, India, and the United States (van Oss, 2002). Japan's cement production decreased by 5.6% to 76.6 Mt in 2001 because of a decrease in domestic investment in private dwellings and public works projects. Japan's apparent consumption of cement decreased to 68.6 Mt in 2001 from 72.3 Mt in 2000, and per capita apparent consumption decreased to 539 kg in 2001 from 569 kg in 2000. In 2001, the industry comprised 20 producers (companies), which operated 36 plants with 64 kilns and were concentrated mainly in the Chugoku (Kansai and Kanto) and the Kyushu areas where most of Japan's limestone reserves are located (Japan Cement Association, 2002§).

According to Government statistics, Japan's cement clinker capacity decreased to 86.7 Mt/yr from 90.1 Mt/yr in 2000, and the capacity utilization rate was 95.9% compared with 91.6% in 2000. The number of regular employees in the cement industry decreased to 4,013 from 4,233 in 2000. Production of cement clinker decreased to 71.7 Mt from 75.5 Mt in 2000, and production of cement decreased to 76.5 Mt from 81.1 Mt in

2000. In 2001, 53.9 Mt of ordinary portland cement was produced; 17.7 Mt, blast-furnace slag cement; 3.4 Mt, high early strength portland cement; 694,000 t, moderate heat portland cement; 412,000 t, flyash cement; 350,000 t, other cement; and 88,000 t, white cement. The major raw materials consumed by the cement industry included 80.9 Mt of limestone, 13.0 Mt of clay, 6.3 Mt of blast furnace ore slag, 6.1 Mt of silica stone, and 2.7 Mt of gypsum (Ministry of Economy, Trade and Industry, 2001a, p. 56-61, 111-112, 124, 126).

In February 2001, Aso Cement Co. Ltd. and Lafarge S.A. of France, which was the world's second largest cement producer, reached an agreement for Lafarge to purchase a 39.4% stake in a new company to be spun off from Aso Cement. The move made Lafarge the first foreign cement producer to enter into the Japanese market and was part of Lafarge's long-term strategy of building a foothold in Japan (Nikkei Weekly, 2001b).

Aso Cement, which had about 3.5% of Japan's market share, separated its cement division from its other activities and changed its name to Aso Corp. and created a new company named Aso Cement Co. Ltd., which, in turn, was owned by Aso Corp. (60.6%) and by Lafarge (39.4%). The new company's principal assets were the Tagawa plant with a 1.3-Mt/yr capacity and the Kanda plant with a 1.7-Mt/yr capacity (both in Fukuoka Prefecture on Kyushu Island), a network of 24 service stations, research facilities, and holdings in other businesses, which included a number of ready-mix concrete companies (Industrial Minerals, 2001a).

In 2001, domestic demand for cement decreased by 5.1% to 67.5 Mt. Exports of cement, which included clinker remained at 7.6 Mt (Japan Cement Association, 2002§). According to Government trade statistics, exports of cement clinker increased by 36% to 3.56 Mt in 2001. Exports of portland cement, however, decreased by 19.6% to 4.01 Mt in 2001. Exports of cement clinker had been increasing and exports of portland cement, decreasing in the past 2 years. In 2001, the major buyers of cement clinker were China (51.9%), Hong Kong (13.5%), Spain (9.3%), Côte d'Ivoire (6.1%), Singapore (5.3%), and Chile (3.5%). The major buyers of portland cement were Singapore (35.9%), Hong Kong (20.0%), Taiwan (16.7%), Nigeria (11.9%), the Philippines (7.9%), and Kuwait (3.3%). Export earnings from cement clinker and portland cement were \$57.4 million and \$80.7 million, respectively, in 2001. The average export free-on-board (f.o.b.) price of portland cement increased to \$22.69 per ton from \$21.06 per ton in 2000 (Ministry of Finance, 2001a, p. 98). Imports of cement, which included aluminous, portland, and white cement, increased by 14.5% to 1.18 Mt in 2001. The major suppliers were the Republic of Korea (94.4%) and China (4.0%). The average import c.i.f. price of portland cement decreased to \$32.94 per ton from \$44.64 per ton in 2001 (Ministry of Finance, 2001b, p. 165).

Limestone.—Japan was 100% self-sufficient in limestone in 2001. The country remained one of the world's top limestone producers, although production decreased by 1.8% owing mainly to decreased consumption by the cement and construction industries. In Japan, most of the major limestone quarries were owned and operated by cement, construction, or steel companies (table 2).

Total sales of domestically produced limestone decreased to 187.2 Mt from 190.6 Mt in 2001. Sales of limestone, by end user, were cement, 83.6 Mt compared with 87.5 Mt in 2000; aggregate, 36.6 Mt compared with 37.1 Mt in 2000; iron and steel industry, 22.2 Mt compared with 22.9 Mt in 2000; roads, 11.5 Mt compared with 13.2 Mt in 2000; lime, 9.8 Mt compared with 10.4 Mt in 2000; potassium carbonate, 5.6 Mt compared with 5.9 Mt; and other uses, 17.9 Mt compared with 13.6 Mt in 2000 (Ministry of Economy, Trade and Industry, 2001d, p. 134-135).

In 2001, the country imported 285,923 t of limestone flux, limestone, and other calcareous stone mainly from the Philippines (33.1%), Malaysia (29.8%), Vietnam (24.8%), and China (12.0%) (Ministry of Finance, 2001b, p. 165). Japan exported 2.7 Mt of limestone flux, limestone, and other calcareous stone mainly to Taiwan (51.4%), Hong Kong (23.1%), and Australia (17.9%) (Ministry of Finance, 2001a, p. 98).

Zirconia.—Japan relied 100% on imports to meet zirconium ore requirements for production of zirconia (ZrO_2) to meet the domestic requirement for refractories, electronic, abrasive, advanced (fine) ceramics, sensors, and glass materials. Imports of zirconium ore and concentrate decreased by 3.3% to 84,124 t and were valued at \$43.9 million in 2001. The major suppliers of zirconium ores and concentrates were Australia (53.5%), South Africa (35.2%), the United States (5.6%), and Russia (5.2%). The average import c.i.f. price per ton of zirconium ore and concentrate rose to \$522.16 per ton in 2001 from \$430.05 per ton in 2000 owing to tight supply in the world market and the depreciation of the Japanese yen in 2001.

Production of zirconia was by Daiichi Kigenso Kagaku Kogyo Co. Ltd., Nippon Denko Co. Ltd., Shin Nippon Kinzoku Chemical Co. Ltd., Showa Denko Co. Ltd., Sumitomo Osaka Cement Co. Ltd., Tosoh, and five other chemical and steelmaking companies. To meet the rising domestic demand for zirconia ceramics, Nippon Denko completed an expansion project at a cost of about \$10 million to raise the capacity of its Tokushima plant in Tokushima Prefecture to 1,400 t/yr from 450 t/yr in early 2001. Tosoh also completed an expansion project to raise the capacity of its Nanyo plant in Yamaguchi Prefecture to 1,300 t/yr from 620 t/yr, and Sumitomo Osaka Cement tripled the output of its Kaizuka plant in Osaka Prefecture to 300 t/yr from 100 t/yr in fall 2001 (Industrial Minerals, 2001b).

To secure long-term supplies of zirconia, Kawaretsu Mining Co. Ltd. (a subsidiary of Kawasaki Steel) and Itochu Corp. (a major Japanese trading company) signed a memorandum of understanding (MOU) in May 2001 with Alkane Exploration Ltd. (a wholly owned subsidiary of Australian Zirconia Ltd.) to acquire equity in Australian Zirconia and to assist with the development of the Dubbo zirconia project in New South Wales, Australia. Under the MOU, the two Japanese companies were to acquire a 40% interest in Australian Zirconia for about \$25 million (A\$45 million) on completion of the feasibility study and to provide technical and marketing expertise. They also were to negotiate to have 100% of the marketing rights and to assist in raising additional capital to fund development in excess of their subscription funds (Mining Journal, 2001a). To

meet the domestic demand for zirconia, Japan imported between 900 and 1,100 t/yr of zirconia mainly from Australia, the United Kingdom, and the United States during 1997 and 2001 (Arumu Publishing Co. Ltd., 2002, p. 37).

In 2001, domestic demand for zirconia totaled 8,830 t, of which 47.6% was for refractories; 6.6%, abrasives; 5.8%, electronic materials; 5.4%, sensors; 5.3%, advanced (fine) ceramics; 4.4%, ceramic pigments; 3.4%, glass; and 21.5%, other materials (Arumu Publishing Co. Ltd., 2002, p. 37).

Mineral Fuels

Coal.—Japan was the largest coal importer and the seventh largest coal consumer in the world (Mining Magazine, 2001). Japan's coal production was equivalent to only 2% of its coal requirement in 2001. Japan relied on imports to meet 100% of its requirements for coking coal and anthracite and about 96.5% of its requirements for steam coal in 2001 (Ministry of Economy, Trade and Industry, 2001e, p. 114, 119-121).

In 2001, coal was produced mainly by Taiheiyo (Pacific) Coal Mining Co. Ltd. from its Kushiro Colliery in Hokkaido Prefecture and Matsushima Coal Mining Co. Ltd. from its Ikeshima Colliery in Nagasaki Prefecture. Because of lower priced coal imports and the end of Government subsidies in fiscal year 2001, Matsushima Coal Mining closed its Ikeshima coal mine on November 29, 2001, after 42 years of operations in Sotome, Nagasaki Prefecture (Asian Journal of Mining, 2001). For the same reasons, Taiheiyo Coal Mining was to close its Kushiro coal mine at the end of January 2002 after 81 years of operations in Kushiro, Hokkaido Prefecture. The coal sector dismissed more than 1,100 workers in 2001 and was expected to dismiss an additional 1,500 workers in January 2002 (Asian Journal of Mining, 2002).

Following the end of the Government subsidies, major Japanese trading companies, which previously had focused their natural resources businesses on distribution, began a new course in providing project financing to secure long-term coal supplies from overseas. In March 2001, Mitsubishi reportedly had arranged a \$823 million project financing to acquire coal development rights from BHP Billiton Ltd. and other natural resources development companies in Australia. According to the industry analysts, Mitsubishi raised its exposure to large-scale resources projects that promised a higher rate of return and that other major Japanese trading companies are likely to follow Mitsubishi's lead and use project financing to fund long-term coal development projects in coming years (Coal Age, 2002).

In 2001, Japan's coal imports, which were based on trade statistics of the Ministry of Finance, totaled 155.8 Mt, of which 93.9 Mt was bituminous coal (other than coking coal); 57.2 Mt, coking coal, and 4.7 Mt, anthracite. The total value of imported coal was estimated to be \$6.2 billion in 2001 (Ministry of Finance, 2001b, p. 168-169). Japan's coal imports, which were based on statistics of the Ministry of Economy, Trade and Industry, however, totaled only 151.7 Mt. According to the Ministry of Economy, Trade and Industry (2001e, p. 124-129), imports of coking coal decreased by 6.5% to 60.6 Mt. Imports of steam coal increased by 13.3% to 87.4 Mt. Imports of anthracite increased by 21.5%, to 3.7 Mt. The major suppliers of coking coal were Australia (64.3%), Canada (16.6%), China

(9.8%), and Indonesia (4.3%). The major suppliers of steam coal were Australia (55.9%), China (21.4%), Indonesia (15.1%), the United States (2.2%), and South Africa (1.4%). The principal suppliers of anthracite were China (54.7%) and Vietnam (30.7%) (Ministry of Economy, Trade and Industry, 2001e, p. 116-118).

Because of increased demand for coal mainly by the power generation (utility) sector, overall demand for coal in 2001 increased by 4.2% to 154.6 Mt in 2001. Demand for steam coal increased by 12.3% to 90.3 Mt in 2001, of which 2.9 Mt was domestic and 87.4 Mt was imported. Demand for steam coal by the power generation sector increased by 9.0% to 61.9 Mt and the manufacturing sector increased by 19.2% to 27.7 Mt owing mainly to an increase in demand by the ceramics, stone, and clay products and iron and steel industries. Demand for steam coal by the ceramics, stone, and clay products industry increased by 41.5% to 12.3 Mt in 2001. Demand for steam coal by the iron and steel industry increased by 16.1% to 3.2 Mt. Demand for steam coal by other sectors increased by 89.4% to 727,700 t in 2001. Demand for coking coal (all imported) by the manufacturing sector decreased by 6.5% to 60.6 Mt owing mainly to a decrease in demand by the iron and steel and coking industries. In 2001, demand for coking coal by the iron and steel industry decreased by 4.9% to 56.5 Mt, and the coking industry decreased by 24.1% to 4.1 Mt. Demand for anthracite increased by 21.6% to 3.7 Mt owing mainly to a 32% increase in demand by the iron and steel industry in 2001 (Ministry of Economy, Trade and Industry, 2001e, p. 115, 119-121).

Natural Gas and Petroleum.—In 2001, Japan was one of the world's top importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was very small because of its limited indigenous resources. Japan's natural gas and crude petroleum reserves were estimated to be 40.03 billion cubic meters and 58.58 million barrels (Mbbbl), respectively, in 2001 (Oil & Gas Journal, 2001). In 2001, domestic production of natural gas and crude petroleum totaled about 2.5 billion cubic meters and 4.8 Mbbbl, respectively, compared with 86 billion cubic meters and 1,559 Mbbbl of domestic consumption of natural gas and crude petroleum (Ministry of Economy, Trade and Industry, 2001e, p. 26-27, 30-34).

Japan relied on imports to meet 97.1% of its domestic natural gas requirements and 99.7% of its crude petroleum requirements. Japan imported 83.1 billion cubic meters of natural gas in the form of LNG and 1,554 Mbbbl of crude petroleum in 2001 (Ministry of Economy, Trade and Industry, 2001e, p. 32-34). The major suppliers of LNG were Indonesia (30.5%), Malaysia (20.5%), Australia (13.6%), Qatar (11.7%), Brunei (11.0%), the United Arab Emirates (9.3%), the United States (2.3%), and Oman (1.1%). Imports of LNG were valued at \$13.1 billion in 2001 (Ministry of Finance, 2001b, p. 174). Crude petroleum imports were mainly from the Middle East (88.4%) and Asia (8.7%), which included China. The major suppliers of crude petroleum were the United Arab Emirates (24.1%), Saudi Arabia (22.3%), Iran (12.7%), Qatar (10.6%), Kuwait (7.3%), Oman (5.9%), Indonesia (4.3%), the neutral zone (the area shared equally by Kuwait and Saudi Arabia) (5.3%), and China (1.7%) (Ministry of Economy, Trade and

Industry, 2001e, p. 32-34). Imports of crude petroleum were valued at \$38.6 billion in 2001 (Ministry of Finance, 2001b, p. 170). The average import c.i.f. price of crude petroleum was \$25.28 per barrel in 2001 compared with \$28.53 per barrel in 2000, and the average import c.i.f. price of LNG was \$237.88 per ton (¥28,902 per ton) in 2001 compared with \$242.85 per ton (¥26,179 per ton) in 2000 (Ministry of Economy, Trade and Industry, 2001e, p. 144-145).

Production of refined petroleum products totaled 1,522.2 Mbbbl in 2001 compared with 1,532.9 Mbbbl in 2000. In 2001, refined petroleum products were produced by 22 oil companies that operated 36 refineries with a total capacity of 5.27 million barrels per day mostly along the east coast of Honshu. The capacity utilization rate in 2001 was about 81.1% (Ministry of Economy, Trade and Industry, 2001e, p. 69).

In 2001, domestic demand for refined petroleum, by product, was as follows: heavy fuel oil, 425 Mbbbl; gasoline, 373 Mbbbl; naphtha, 296 Mbbbl; diesel (distillate fuel oil), 274 Mbbbl; kerosene, 196 Mbbbl; jet fuel, 69 Mbbbl; asphalt, 34 Mbbbl; lubricants, 17 Mbbbl; and paraffin, 686,000 barrels (bbl). To meet its domestic demand, Japan imported a total of 222 Mbbbl of refined petroleum products in 2001. The imported refined petroleum products included 177 Mbbbl of naphtha, 18.0 Mbbbl of kerosene, 11.2 Mbbbl of heavy fuel oil, 8.3 Mbbbl of diesel, 7.3 Mbbbl of gasoline, 673,000 bbl of jet fuel; 226,400 bbl of lubricants, 224,200 bbl of asphalt, and 21,000 bbl of paraffin (Ministry of Economy, Trade and Industry, 2001e, p. 70-71).

Consumption of domestically produced natural gas totaled 3 billion cubic meters, of which 49.6% was consumed by the gas industry; 18.7%, the electric power industry; 14.5%, the oil and gas industry; 12.1%, the chemical industry; and 5.1%, other manufacturing and service industries. Additionally, Japan consumed 55.5 Mt, or 83.1 billion cubic meters, of imported natural gas in the form of LNG, of which 68.5% was consumed by the electric power industry for power generation; 30.7%, for the city gas industry; and 0.8%, for industrial use mainly by the iron and steel industry (Ministry of Economy, Trade and Industry, 2001e, p. 110).

At the end of 2001, Japan's stockpile of crude petroleum, partially refined, and refined petroleum products totaled 161 days supply, of which the national stockpile was 84 days, and the private stockpile, 77 days (Ministry of Economy, Trade and Industry, 2001e, p. 144-145).

Reserves

Japan's reserves of limestone and other industrial minerals, such as iodine, pyrophyllite, and silica stone, are large. Coal reserves were substantial, but not large, and very costly to produce. With the exception of gold and zinc, its ore reserves for metallic minerals and other minerals, especially oil and gas, are negligible (table 3).

Infrastructure

Japan has one of the world's most modern and complete infrastructures for its mining and mineral processing industries. Despite its small land area, Japan has a highway system of 1.15 million kilometers (Mkm), of which 863,003 kilometers (km) is paved, and a railroad network of 23,654 km, of which 20,491

km is 1.067-meter (m) narrow gauge (12,732 km electrified), 3,059 km is 1.435-m standard gauge (all electrified), 77 km is 1.372-m narrow gauge (all electrified), and 27 km is 0.762-m narrow gauge (all electrified). Highway and railroad networks link not only all major seaports and coastal cities on the four major islands, but also connect Honshu to the islands of Kyushu and Shikoku in the south and Hokkaido in the north by means of bridges and tunnels.

Japan's domestic and international telecommunication services were among the best in the world with satellite earth stations—five Intelsat (four Pacific Ocean and one Indian Ocean), one Intersputnik (Indian Ocean region), and one Inmarsat (Indian and Pacific Ocean regions); submarine cables to China, the Philippines, Russia, and the United States (via Guam); and 357 Internet service providers (1999 estimate). For electric power transmission, Japan has a route length of 88,500 km and a circuit length of 155,000 km (1995 estimate). For power distribution, Japan's total length of line distances, which included high- and low-voltage, was 1.18 Mkm (1995 estimate); this was concentrated in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. Japan also has an extensive pipeline system—natural gas, 1,800 km; refined petroleum products, 322 km; and crude petroleum, 84 km.

Japan had 25 major ports and more than 2,000 minor ports to receive raw materials from overseas and to export manufactured products. The major port facilities, which included terminals and warehouses, were among the most indispensable parts of the infrastructure for the mineral industry because of their role in receiving imported raw materials, such as coal, crude petroleum, iron ore, LNG, nonferrous ore, and phosphate rock for mineral processing plants and powerplants, as well as exporting value-added mineral and metal products. The important seaports of the major mineral processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Harima, Himeji, Hiroshima, Kawasaki, Kinuura, Kobe, Kushiro, Mizushima, Moji, Nagoya, Osaka, Sakai, Sakaide, Shimizu, Tokyo, and Yokohama on Honshu; Fukuoka, Kita Kyushu, and Oita on Kyushu; and Hakodate, Muroran, and Tomakomai on Hokkaido.

Japan had 173 airports; of those, 142 had paved runways, and 31, unpaved runways. Japan also had 16 heliports. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita (New Tokyo), and Osaka. Japan's first round-the-clock airport, Kansai International, opened in September 1994 on reclaimed offshore land in Osaka Bay.

Outlook

The domestic mining activities are expected to drop significantly in 2002 from those of 2001 because of the permanent closures of one major nonferrous metal mine and two remaining major coal mines and the significant economic downturn in the second half of 2001. Metal production of copper and zinc is expected to decrease in anticipation of an economic downturn and weakening demand for nonferrous metal in the domestic markets in 2002. Production of crude steel is also expected to decrease because the Japanese economy and the economies of the Southeast Asian nations were expected to slow down significantly in 2002. To sustain its

economic health and to prevent economic recession, Japan is expected to export more ferrous and nonferrous metals to China and other Asian countries where the economies are expected to continue to grow in the coming years. Imports of coal, nonferrous metals, and other minerals are expected to remain at high levels in 2002.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, thus ensuring a steady economic growth, Japan is expected to continue its active search for direct investment in joint exploration and development of minerals in developed and developing countries, especially in Australia, Canada, Chile, China, Mexico, Peru, and the United States. The targeted minerals were antimony, chromium, coal, columbium (niobium), copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

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

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
METALS					
Aluminum:					
Alumina, gross weight thousand tons	368	359	335	337	340 e/
Aluminum hydroxide, gross weight do.	728	738	737	782	780 e/
Metal:					
Primary:					
Regular grades do.	17	16	11	7	7
High-purity do.	36	35	35	41	27
Secondary 3/ do.	1,277	1,155	1,158	1,214	1,171
Antimony:					
Oxide	10,916	10,197	10,348	11,051	8,789
Metal	122	170	178	146	101
Arsenic, high-purity e/	66	110	110	100	100
Bismuth	550	479	481	520	551
Cadmium, refined	2,473	2,337	2,567	2,472	2,460
Chromium, metal e/	800	900	700	750 r/	1,000
Cobalt metal	264	329	247	311	350
Columbium (niobium) and tantalum, tantalum metal e/	80	80	85	85	90
Copper:					
Mine output, Cu content	932	1,070	1,038	1,211	744
Metal:					
Blister and anode:					
Primary	1,214,172	1,171,657	1,256,276	1,331,352	1,328,489
Secondary	136,274	131,979	133,188	149,282	139,764
Total	1,350,446	1,303,636	1,389,464	1,480,634	1,468,253
Refined:					
Primary	1,157,299	1,149,266	1,215,248	1,290,091 r/	1,287,165
Secondary	121,400	128,086	126,301	147,260 r/	138,526
Total	1,278,699	1,277,352	1,341,549	1,437,351	1,425,691
Gallium metal:					
Primary e/	6	6	12	14	16
Secondary	57 r/	54 r/	47 r/	56 r/	74 e/
Germanium:					
Oxide e/	11	10	10	10	10
Metal kilograms	1,039	454	765	1,809	1,615
Gold:					
Mine output, Au content do.	8,384	8,601	9,405	8,400	7,815
Metal:					
Primary do.	136,079	129,859	147,719	146,061	155,826
Secondary 4/ do.	18,502	19,288	20,107 r/	19,280 r/	19,831
Total do.	154,581	149,147	167,826 r/	165,341 r/	175,657
Indium metal do.	24,407	29,413	40,465	55,078	55,000 e/
Iron and steel:					
Iron ore and iron sand concentrate:					
Gross weight	3,595 r/	1,720 r/	1,450 r/	1,454 r/	750
Fe content	1,537 r/	699 r/	589 r/	523 r/	258
Metal:					
Pig iron and blast furnace ferroalloys thousand tons	78,519	74,981	74,520	81,071	78,836
Electric-furnace ferroalloys:					
Ferromanganese	186,432	142,931	119,777	130,074	111,167
Ferromanganese	376,633	334,081	315,152	337,694	368,293
Ferronickel	352,840	345,772	332,293	367,181	367,739
Ferrosilicon	--	951	1,452	--	--
Silicomanganese	74,897	70,886	65,744	67,926	62,238
Other:					
Ferromolybdenum	4,328	3,443	3,391	3,699	3,485
Ferrotungsten	62	61	43	42	109
Ferrovandium	4,232	4,073	3,349	4,108	3,613
Unspecified	5,021	1,101	6,077	7,171	5,733
Total	1,004,445	903,299	847,278	917,895	922,377
Steel, crude thousand tons	104,545	93,548	94,192	106,444	102,866
Semimanufactures, hot-rolled of ordinary steels do.	82,201	73,379	73,221	83,048	78,927
Semimanufactures, hot-rolled of special steels do.	16,517	14,774	14,224	15,747	15,835

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
METALS--Continued					
Lead:					
Mine output, Pb content	5,227	6,198	6,074	8,835	4,997
Metal, refined:					
Primary	142,326	144,542	125,514	129,469 r/	127,358
Secondary	154,438	157,555	167,915	182,209 r/	175,088
Total	296,764	302,097	293,429	311,678 r/	302,446
Magnesium metal, secondary	10,934	7,807	7,732	10,000 r/ e/	10,000 e/
Manganese, oxide	57,920	52,341	57,993	63,379	51,095
Molybdenum metal	699	632	586	626	610
Nickel metal:					
Refined	26,889	29,397	30,481	36,230	32,526
Ni content of nickel oxide sinter	26,899	25,435	34,482	47,020 r/	49,600
Ni content of ferronickel	72,079	69,202	67,166	74,753 r/	69,112
Ni content of chemical	2,536	2,511	2,570	2,700	2,400
Total	128,403	126,545	134,699	160,703	153,638
Platinum-group metals:					
Palladium metal kilograms	1,899	4,151	5,354	4,712	4,805
Platinum metal do.	693	533	737	782	791
Rare-earth oxide 5/	5,161	4,728	5,092	5,619	5,109
Selenium, elemental	546	550	546	612	735
Silicon, high-purity	5,486	5,340	3,844	4,688	4,334
Silver:					
Mine output, Ag content kilograms	87,180	94,472	94,004	103,781	80,397
Metal: do.					
Primary do.	2,094,097	2,203,697	2,257,888	2,384,739	2,293,028
Secondary 4/ do.	218,999	415,757	503,938	345,358	303,804
Total do.	2,313,096	2,619,454	2,761,826	2,730,097	2,596,832
Tellurium, elemental	25	39	35	36	39
Tin, metal, smelter	507	500	568	593	668
Titanium:					
Dioxide	241,417	251,275	269,193	270,272	256,961
Metal	24,462	24,182	18,898	19,458	24,815
Tungsten metal	4,759	4,082	4,357	4,993	3,607
Vanadium metal e/ 6/	250	250	250	250	250
Zinc:					
Mine output, Zn content	71,569	67,670	64,263	63,601	44,519
Oxide	79,688	77,183	78,928	82,816	75,414
Metal:					
Primary	500,603	513,916	524,979	541,704	541,277
Secondary	149,605	138,771	158,637	157,047 r/	142,777
Total	650,208	652,687	683,616	698,751 r/	684,054
Zirconium oxide	6,820	7,270	7,660 r/	8,540 r/	7,930
INDUSTRIAL MINERALS					
Asbestos e/	18,000	18,000	18,000	18,000	18,000
Bromine, elemental e/	15,000	15,000	15,000	15,000	15,000
Cement, hydraulic thousand tons	91,938	81,328	80,120	81,097 r/	76,550
Clays:					
Bentonite	495,646	443,566	428,247	415,115	405,738
Fire clay, crude	560,759	577,666	558,110	506,314	475,665
Kaolin	110,915	83,257	53,092	25,739	19,976
Diatomite e/	194,000	190,000	190,000	190,000	180,000
Feldspar and related materials: e/					
Feldspar	55,000	50,000	52,000	52,000	50,000
Aplite	310,000	310,000	330,000	330,000	310,000
Gypsum thousand tons	5,371	5,305	5,549	5,917	5,874
Iodine, elemental	6,036	6,142	6,152	6,157	6,643
Lime, quicklime thousand tons	8,104	7,646	7,594	8,106	7,589
Nitrogen, N content of ammonia do.	1,509	1,389	1,385	1,410	1,318
Perlite	290,000	251,400	260,000 e/	250,000 e/	255,000 e/
Salt, all types thousand tons	1,329	1,293	1,327	1,374 r/	1,350 e/
Silica sand	3,305,595	3,049,263	2,763,658	2,745,903	2,537,448
Silica stone (quartzite) thousand tons	18,074	16,235	15,548	15,578	14,213

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
INDUSTRIAL MINERALS--Continued					
Sodium compounds, n.e.s.:					
Soda ash	801,169	721,747	721,752	669,203	461,204
Sulfate	203,530	177,407	174,139	163,057	146,780
Stone, crushed and broken:					
Dolomite	thousand tons	4,013	3,873	3,648	3,539
Limestone	do.	201,399	183,955	180,193	185,569
Sulfur:					
S content of pyrite	do.	39	23	41	30
Byproduct:					
Of metallurgy	do.	1,339 r/	1,322	1,363	1,384 r/
Of petroleum	do.	2,013	2,081 r/	2,054 r/	2,071 r/
Talc and related materials:					
Talc e/		53,000	50,000	50,000	45,000
Pyrophyllite		913,822	764,099	694,317	692,998
Vermiculite e/		15,000	15,000	15,000	15,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	thousand tons	776	723	761	788
Coal:					
Anthracite	do.	2	--	--	--
Bituminous 7/	do.	4,272	3,663	3,906	3,126 r/
Total	do.	4,274	3,663	3,906	3,126 r/
Coke including breeze:					
Metallurgical	do.	41,089	39,554	36,473	38,394
Gashouse including breeze	do.	135	14	--	--
Gas, natural:					
Gross 8/	million cubic meters	2,279	2,301	2,280	2,453
Marketed	do.	2,367	2,373	2,362	2,507
Petroleum:					
Crude	thousand 42-gallon barrels	5,296	4,982	4,592	4,656 r/
Refinery products:					
Gasoline:					
Aviation	do.	59	50	104	45 r/ e/
Other	do.	336,158	347,422	353,730	356,530 r/
Asphalt and bitumen	do.	35,733	34,216	34,259	33,909 r/
Distillate fuel oil	do.	302,870	289,777	280,122	268,022
Jet fuel	do.	58,015	66,205	65,732	66,828
Kerosene	do.	173,725	174,133	167,744	175,399
Liquefied petroleum gas	do.	59,090	55,413	56,187	56,926
Lubricants	do.	17,819	16,541	16,939	16,677
Naphtha	do.	120,981	113,234	113,080	112,935
Paraffin	do.	790	807	842	837
Petroleum coke e/	do.	950	950	900	900
Refinery fuel and losses e/ 9/	do.	160,000	160,000	150,000	150,000
Residual fuel oil	do.	467,311	451,494	435,916	429,153
Unfinished oils e/	do.	60,000	60,000	50,000	50,000
Total e/	do.	1,790,000	1,770,000	1,730,000	1,720,000

e/ Estimated. p/ Preliminary. r/ Revised. -- Zero.

1/ Table includes data available through October 25, 2002.

2/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes unalloyed ingot and alloyed ingot.

4/ Includes recovered from scrap and waste.

5/ Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

6/ Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

7/ Included small amount of anthracite from 1998 to 2001.

8/ Includes output from gas wells and coal mines.

9/ May include some additional unfinished oils.

Sources: Ministry of Economy, Trade and Industry (Tokyo). Yearbook of Minerals and Nonferrous Metals Statistics, 2001; Yearbook of Iron and Steel Statistics, 2001; Yearbook of Chemical Industries Statistics, 2001; Yearbook of Ceramics and Building Materials Statistics, 2001; and Yearbook of Production, Supply and Demand of Petroleum, Coal and Coke, 2001. Japan Aluminum Association (Tokyo). Aluminum Statistics, annual report, 2001.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
Cement	Aso Cement Co. Ltd.	Tagawa and Kanda, Fukuoka Prefecture	3,000	
Do.	Daiichi Cement Co. Ltd.	Kawasaki, Kanagawa Prefecture	1,169	
Do.	Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762	
Do.	Hachinohe Cement Co. Ltd.	Hachinohe, Aomori Prefecture	1,533	
Do.	Hitachi Cement Co. Ltd.	Hitachi, Ibaraki Prefecture	941	
Do.	Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Aomori Prefecture; Higashiyama, Higashiiwa-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467	
Do.	Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075	
Do.	Myojo Cement Co. Ltd.	Itoigawa, Niigata Prefecture	2,482	
Do.	Nippon Steel Chemical Co. Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855	
Do.	Nittetsu Cement Co. Ltd.	Muroran, Hokkaido Prefecture	1,589	
Do.	Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722	
Do.	Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402	
Do.	Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; Tosa, Kochi Prefecture; and Kawara, Fukuoka Prefecture	29,904	
Do.	Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936	
Do.	Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869	
Do.	Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710	
Do.	Ube Industries Ltd.	Ube, Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736	
Coal	Matsushima Coal Mining Co. Ltd. 1/	Ikeshima in Sotome, Nagasaki Prefecture	1,400	
Do.	Taiheiyo (Pacific) Coal Mining Co. Ltd. 2/	Kushiro, Hokkaido Prefecture	2,200	
Copper, refined metric tons	Hibi Kyodo Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; and Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	218,400	
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	220,800
Do.	do.	Nippon Mining and Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture	182,400
Do.	do.	do.	Saganoseki, Oita Prefecture	270,000
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd., 4.17%; Mitsubishi Materials Corp., 49.29%; Mitsubishi Cable Industries, Ltd., 4.17%; and others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi, Ehime Prefecture	270,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold: In concentrate	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000	
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	18,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining and Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000
Limestone	Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000	
Do.	Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture; Hanezuru, Tochigi Prefecture; and Shiriya, Aomori Prefecture	23,000	
Do.	Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500	
Do.	Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000	
Do.	Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200	
Do.	Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000	
Do.	Todaka Mining Co. Ltd.	Todaka-Tsukumi, Oita Prefecture	12,000	

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Limestone--Continued:		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd. owned 52.4% and Mitsubishi Corp., 11.2%)	Oami-Shirasato, and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd. owned 11% and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%; Godo Shingen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd. owned 50% and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; and Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Iodine, crude	metric tons	Nippon Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; and Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead:				
In concentrate		Kamioka Mining and Smelting Co. Ltd. (wholly owned subsidiary of Mitsui Mining and Smelting Co. Ltd.) 3/	Kamioka, Gifu Prefecture	3
Do.		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.)	Toyoha, Hokkaido Prefecture	7
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd. 4/	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
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.) 5/	Hosokura, Miyagi Prefecture	21,600
Manganese:				
In electrolytic dioxide		Japan Metals & Chemicals Co. Ltd.	Takaoka, Toyama Prefecture	18
Do.		Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	25
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	do.	19,000
Do.	do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000
Pyrophyllite				
Do.		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				
Do.		Kawasaki Steel Corp.	Mizushima, Okayama Prefecture, and Chiba, Chiba Prefecture	17,405
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		NKK Corp.	Fukuyama, Hiroshima Prefecture, and Keihin, Kanagawa Prefecture	16,430
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Titanium:				
In sponge metal		Sumitomo Sitix Corp. (Sumitomo Metal Industries, Ltd., 92.4%; and Kobe Steel Ltd., 7.6%)	Amagasaki, Hyogo Prefecture	15
Do.		Toho Titanium Co. Ltd. (Nippon Mining and Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; and others, 33%)	Chigasaki, Kanagawa Prefecture	11
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%)	Kobe, Hyogo Prefecture	17,400

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Titanium--Continued:			
In dioxide--Continued: metric tons	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	13,200
Do.	do. Ishihara Sangyo Kaisha Ltd. (Mitsui & Co. Ltd., 11%)	Yokkaichi, Mie Prefecture	154,800
Do.	do. Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do. Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do. Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Do.	do. Tohkem Products Corp.	Akita, Akita Prefecture	30,000
Zinc:			
In concentrate	Kamioka Mining and Smelting Co. Ltd. 3/	Kamioka, Gifu Prefecture	35
Do.	Toyoha Mining Co. Ltd.	Toyoha, Hokkaido Prefecture	45
Refined metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining and Metals Co. Ltd., 24%; Sumitomo Metal Mining Co Ltd., 14%; and Mitsubishi Materials Corp., 5%)	Iijima, Akita Prefecture	195,600
Do.	do. Hachinohe Smelting Co. Ltd. (Dowa Mining Co. Ltd., 20%; Mitsui Mining and Smelting Co. Ltd., 50%; Nippon Mining and Metals Co. Ltd. and Mitsubishi Materials Corp., 10% each; and Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 5% each)	Hachinohe, Aomori Prefecture	117,600
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. Nikko Mikkaichi Recycle Co. Ltd. 6/	Mikkaichi, Toyama Prefecture	18,000
Do.	do. Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do. Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

1/ Coal mining operations ceased in December 2001.

2/ Coal mining operations to be ceased in January 2002.

3/ Lead and zinc mining operations ceased in June 2001.

4/ The plant was renovated to a secondary lead smelter to recycle batteries in 1995.

5/ The plant became a secondary lead smelter to recycle batteries in 1995.

6/ The plant, which closed in October 1995, was renovated to a secondary zinc refinery in 1997 and reopened in 1998.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Coal 1/	785,000
Copper ore, Cu content	40
Dolomite 2/	1,200,000
Gold ore, Au content	180,000 kilograms
Iodine	5,000 e/
Lead ore, Pb content	600
Kaolin	36,000
Limestone 3/	58,000,000
Pyrophyllite	160,000
Silica sand 4/	201,000
Silica stone, white 5/	881,000
Silver ore, Ag content	2,400
Zinc ore, Zn content	3,200

e/ Estimated.

1/ Recoverable reserves, including 17 million metric tons of lignite.

2/ Average ore grade is 17.9% MgO.

3/ Average ore grade is 53.8% CaO.

4/ Average ore grade is 78.0% SiO₂.

5/ Average ore grade is 92.8% SiO₂.

Sources: Research Institute of Economy, Trade and Industry (Tokyo).

TABLE 4
JAPAN: MINERALS TRADE 1/

(Million dollars)

Code	Commodity Description	Imports			Exports		
		1999	2000	2001	1999	2000	2001
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,353	1,464	1,345	308	312	286
26	Ferrous and nonferrous metal ores, slag, ash	6,222	7,004	6,486	20	35	29
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	49,861	77,478	70,368	1,225	1,520	1,508
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	2,850	3,536	2,941	1,806	2,114	1,814
31	Fertilizers	489	529	482	92	93	81
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	941	1,027	1,062	843	949	831
69	Ceramic products	543	634	643	1,169	1,364	1,100
70	Glass and glassware	1,034	1,422	1,218	2,087	2,711	2,326
71	Natural or cultured pearls, precious or semi-precious, precious metals, metals clad with precious metals, and articles thereof; imitation jewellery; coin	6,383	7,432	5,937	1,669	1,940	1,698
72	Iron and steel	2,756	3,445	2,481	11,367	12,957	11,159
73	Articles of iron and steel	1,821	2,232	2,363	5,390	5,426	5,708
74	Copper and articles thereof	1,021	1,127	812	2,226	2,579	2,247
75	Nickel and articles thereof	831	1,463	905	205	415	311
76	Aluminum and articles thereof	4,633	5,564	4,879	1,592	1,625	1,323
78	Lead and articles thereof	21	27	36	12	13	9
79	Zinc and articles thereof	88	124	89	111	95	88
80	Tin and articles thereof	157	175	115	28	50	46
81	Other base metals; cermet; articles thereof	680	838	766	480	591	619
	Total, minerals trade	81,684	115,521	102,928	30,630	34,789	31,183
	Grand total, Japan merchandise trade	309,640	379,763	349,099	417,450	479,167	403,121

1/ Values have been converted from Japanese yen (¥) to U.S. dollars (US\$) at the rate of ¥113.9=US\$1.00 for 1999, ¥107.8=US\$1.00 for 2000, and ¥121.5=US\$1.00 for 2001.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 1999-2001.

TABLE 5
JAPAN: EXPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Destinations, 2000	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	455	1,873	9	India 653; Republic of Korea 212; Canada 102.
Aluminum:				
Ore and concentrate	21	300	--	All to Taiwan.
Oxides and hydroxides	307,318	337,317	12,942	Republic of Korea 204,406; Taiwan 42,123; China 25,807.
Ash and residue	8,174	10,150	--	China 5,380; North Korea 3,094; Taiwan 1,097.
Metal including alloys:				
Scrap	27,635	34,673	72	China 29,308; Hong Kong 3,796; Philippines 654.
Unwrought	10,515	10,002	3,281	China 1,851; Malaysia 485; Thailand 393.
Semimanufactures	354,418	311,679	26,620	China 72,917; Taiwan 45,801; Thailand 27,319.
Antimony:				
Oxides	2,339	2,321	200	Thailand 367; Republic of Korea 340; Singapore 334.
Metal including alloys, all forms	187	180	40	Thailand 119; Spain 36; India 10.
Arsenic, metal including alloys, all forms	28	42	36	United Kingdom 2; Singapore 2.
Beryllium, metal including alloys, all forms	3	8	(2/)	China 4; Republic of Korea 3.
Bismuth, metal including alloys, all forms	3	3	(2/)	Mainly to Taiwan.
Cadmium, metal including alloys, all forms	4	(2/)	--	Mainly to France.

See footnotes at end of table.

TABLE 5--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Destinations, 2000	
			United States	Other (principal)
METALS--Continued				
Chromium:				
Ore and concentrate	95	8,322	--	China 8,298; Republic of Korea 17; Taiwan 5.
Oxides and hydroxides	5,032	4,932	1,073	Republic of Korea 2,096; Taiwan 297; China 135.
Metal including alloys, all forms	346	218	32	Republic of Korea 144; Taiwan 27; Netherlands 7.
Cobalt:				
Ore and concentrate	71	50	--	All to China.
Oxides and hydroxides	193	234	5	Canada 101; Taiwan 27; Republic of Korea 25.
Metal including alloys, all forms	751	1,106	264	Hong Kong 175; Taiwan 144; China 117.
Columbium and tantalum, tantalum metal including alloys, all forms				
	302	385	94	Germany 112; United Kingdom 64; China 62.
Copper:				
Mattes	1,167	60	--	All to Indonesia.
Oxides and hydroxides	1,439	1,961	9	Singapore 1,085; China 438; Republic of Korea 280.
Sulfate	4,029	3,330	49	Taiwan 2,504; Hong Kong 255; Republic of Korea 223.
Metal including alloys:				
Scrap	83,901	110,853	46	China 104,708; Vietnam 1,939; Hong Kong 1,792.
Unwrought	373,857	82,714	6,192	Republic of China 52,702; Taiwan 12,518; China 3,387.
Semimanufactures	317,476	329,287	30,955	Malaysia 46,124; China 45,038; Hong Kong 43,238.
Germanium; metal including alloys, all forms	(2/)	1	(2/)	Mainly to Taiwan.
Gold:				
Waste and scrap kilograms	25	528	--	Switzerland 516; Germany 12.
Metal including alloys, unwrought and partly wrought do.	62	69	(2/)	Singapore 24; Taiwan 15; Switzerland 3.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	29,042	78,831	--	China 78,800; Republic of Korea 20.
Metal:				
Scrap thousand tons	4,315	2,895	29	Republic of Korea 1,242; China 1,184; Taiwan 210.
Pig iron, cast iron, related materials do.	1,734	224	--	Republic of Korea 189; Taiwan 26; Indonesia 8.
Ferroalloys:				
Ferrochromium	1,461	2,541	2,237	Thailand 164; South Africa 40; Malaysia 34.
Ferromanganese	19,397	44,248	9,337	Taiwan 17,673; Republic of Korea 6,441; Indonesia 2,245.
Ferromolybdenum	23	22	--	Thailand 13; Republic of Korea 6; Philippines 3.
Ferronickel	111,310	114,828	--	Taiwan 71,179; Republic of Korea 43,397; China 252.
Ferrosilicomanganese	3,103	4,928	13	Republic of Korea 4,701; Taiwan 214.
Ferrosilicon	5,059	4,883	248	Republic of Korea 1,647; Indonesia 1,041; Thailand 949.
Silicon metal	586	489	29	Republic of Korea 209; China 131; Finland 45.
Unspecified	3,602	3,592	2,769	Thailand 182; Taiwan 180; India 142.
Lead:				
Oxides	132	112	11	Taiwan 61; China 24; Thailand 9.
Ash and residue containing lead	23	61	--	All to Belgium.
Metal including alloys:				
Scrap	9,368	5,164	--	Republic of Korea 4,910; India 165; Hong Kong 62.
Unwrought	6,861	6,475	(2/)	Malaysia 4,270; Thailand 994; China 736.
Semimanufactures	376	644	28	China 331; Malaysia 66; Taiwan 59.
Lithium, oxides and hydroxides	21	24	1	Taiwan 10; Indonesia 3; Malaysia 2.
Magnesium, metal including alloys:				
Scrap	74	43	6	United Kingdom 29; China 8.
Unwrought	34	143	--	Taiwan 129; China 137.
Semimanufactures	454	1,241	--	Taiwan 1,227; Philippines 3; Thailand 2.
Manganese:				
Oxides	2,036	2,370	186	Republic of Korea 993; China 727; Taiwan 173.
Metal including alloys, all forms	35	44	(2/)	China 26; Taiwan 10; Philippines 3.
Mercury	7	39	33	North Korea 2; Hong Kong 1.
Molybdenum:				
Ore and concentrate:				
Roasted	18	3	--	All to the Philippines.
Oxides and hydroxides	24	108	--	China 71; Italy 18; Germany 10.
Metal including alloys, all forms	90	156	23	Republic of Korea 70; Taiwan 38; Germany 9.

See footnotes at end of table.

TABLE 5--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Destinations, 2000	
			United States	Other (principal)
METALS--Continued				
Nickel:				
Oxides and hydroxides	4,580	3,873	861	Hong Kong 866; Taiwan 805; China 486.
Matte and speiss	thousand tons 7,906	23,072	6	Republic of Korea 16,905; Taiwan 6,156; Hong Kong 3.
Metal including alloys:				
Scrap	488	681	134	United Kingdom 342; Republic of Korea 100; China 77.
Unwrought	503	1,222	19	Republic of Korea 447; Singapore 367; United Kingdom 162;
Semimanufactures	6,430	10,619	694	Republic of Korea 1,723; Hong Kong 1,520; China 680.
Platinum-group metals:				
Waste and sweepings	5	77	--	Mainly to United Kingdom.
Metal including alloys, unwrought and partly wrought:				
Palladium, value	thousands \$88	\$172	\$89	Austria \$42; Republic of Korea \$17; Taiwan \$24.
Platinum, value	do. \$9	\$115	\$13	Hong Kong \$52; Taiwan \$10; Philippines \$3.
Rhodium, value	do. (2/)	\$8	--	Taiwan \$3; Germany \$3; Republic of Korea \$1.
Iridium, osmium, ruthenium, value	do. (2/)	\$8	\$1	Republic of Korea \$5; China \$1.
Unspecified, value	do. \$1	\$9	\$1	Hong Kong \$3; Taiwan \$2; Switzerland \$2.
Rare-earth metals including alloys, all forms	289	199	8	China 161; Hong Kong 18; Germany 7.
Selenium	525	528	1	China 169; Hong Kong 154; United Kingdom 70.
Silicon	2,768	3,269	487	Republic of Korea 689; Malaysia 585; Taiwan 395.
Silver metal including alloys, unwrought and partly wrought, value	thousands \$4	\$85	\$2	Taiwan \$36; Malaysia \$8; Republic of Korea \$6.
Tin, metal including alloys:				
Scrap	697	975	70	United Arab Emirates 288; Belgium 250; Latvia 219.
Unwrought	310	341	70	Malaysia 175; Taiwan 41; Singapore 31.
Semimanufactures	2,517	2,434	13	Hong Kong 715; China 291; Republic of Korea 264.
Titanium:				
Ore and concentrate	6	15	--	China 10; Singapore 5.
Oxides	31,235	28,263	766	China 7,728; Taiwan 7,602; Republic of Korea 5,371.
Metal including alloys, all forms	16,802	16,856	7,321	United Kingdom 3,181; Sweden 987; Netherlands 933.
Tungsten, metal including alloys, all forms	1,362	1,538	353	Germany 711; Taiwan 127; Republic of Korea 65.
Uranium and thorium; metal including alloys, all forms	93	66	1	United Kingdom 65.
Vanadium, metal including alloys, all forms	29	52	5	Indonesia 12; Republic of Korea 11; Taiwan 7.
Zinc:				
Oxides	1,752	2,480	603	China 514; Taiwan 222; Thailand 214.
Blue powder	65	58	--	India 31; Belgium 18; Thailand 3.
Ash and residue containing zinc	2,284	1,690	--	Republic of Korea 1,417; Taiwan 273.
Metal including alloys:				
Scrap	6,489	6,598	--	China 3,904; Taiwan 1,808; Hong Kong 882.
Unwrought	79,379	55,658	323	Taiwan 20,192; Philippines 12,092; Indonesia 7,864.
Semimanufactures	3,862	5,218	755	China 1,509; Indonesia 823; United Kingdom 320.
Zirconium:				
Ore and concentrate	159	92	--	China 55; Philippines 20; Malaysia 11.
Metal including alloys, all forms	41	159	57	China 38; Republic of Korea 20; Taiwan 20.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	21,227	20,788	7	Republic of Korea 13,069; China 2,188; Taiwan 1,619.
Artificial:				
Corundum	26,027	27,312	4,687	Republic of Korea 7,331; Taiwan 3,748; China 2,839.
Silicon carbide	11,037	11,731	1,533	Republic of Korea 5,550; Malaysia 1,428; Taiwan 1,380.
Dust and powder of precious and semiprecious stones, including diamonds, value	thousands \$12	\$14	\$4	Thailand \$6; Switzerland \$5; Republic of Korea \$2.
Grinding and polishing wheels and stones	8,879	9,357	1,613	Indonesia 1,377; Republic of Korea 977; Thailand 799.
Asbestos, crude	20	--		
Barite and witherite	2	--		
Boron:				
Crude natural borates	180	300	--	All to Malaysia.
Oxides and acids	325	551	(2/)	Republic of Korea 280; Taiwan 164; Thailand 39.
Cement	thousand tons 7,681	7,637	(2/)	Taiwan 2,348; Singapore 1,285; China 954.
Chalk	1,639	1,201	--	Republic of Korea 779; Taiwan 306; Hong Kong 80.

See footnotes at end of table.

TABLE 5--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Destinations, 2000		
			United States	Other (principal)	
INDUSTRIAL MINERALS--Continued					
Clays, crude:					
Bentonite	2,372	1,780	26	Indonesia 619; Thailand 538; Israel 208.	
Chamotte or dinas earth	66	84	--	Republic of Korea 61; Indonesia 23.	
Fire clay	4,665	3,665	12	Taiwan 1,229; Bangladesh 551; Egypt 500.	
Kaolin	13,628	7,554	47	Taiwan 3,345; China 2,200; Thailand 882.	
Unspecified	24,790	19,569	92	Indonesia 5,219; Taiwan 2,630; Malaysia 2,014.	
Diamond, natural:					
Gem, not set or strung	carats	3,234	7,507	89	Mainly to Denmark.
Industrial stones	thousand carats	3,095	2,925	565	Republic of Korea 2,925; Thailand 395; Germany 239.
Dust and powder	do.	17,204	19,299	7,740	Switzerland 4,307; Republic of Korea 3,038; Philippines 1,804
Diatomite and other infusorial earth		2,206	1,139	--	Taiwan 591; Republic of Korea 159; Vietnam 110.
Feldspar		6,422	7,166	--	Taiwan 5,925; Thailand 919; Hong Kong 266.
Fluorspar		407	227	--	Singapore 110; Taiwan 97; Thailand 20.
Fertilizer materials:					
Crude, n.e.s.		959	1,451	15	Taiwan 604; China 387; Malaysia 319.
Manufactured:					
Ammonia		4,595	4,439	545	Taiwan 1,259; Singapore 1,125; Republic of Korea 394.
Phosphatic		15,176	183	13	Taiwan 136; Republic of Korea 34.
Unspecified and mixed		979,194	1,078,282	10,170	Malaysia 349,442; Vietnam 265,035; Philippines 247,690.
Graphite, natural		1,894	1,707	672	Germany 336; Republic of Korea 193; Taiwan 120.
Gypsum and plaster		4,064	4,124	6	Republic of Korea 900; Hong Kong 855; Bangladesh 629.
Iodine		4,653	4,736	1,186	United Kingdom 743; France 665; India 470.
Kyanite and related materials		3,314	3,607	3	Republic of Korea 2,747; Taiwan 305; Thailand 137.
Lime		3,947	3,625	120	Republic of Korea 2,014; Taiwan 846; Malaysia 252.
Magnesium compounds:					
Magnesite, crude		174	83	--	Taiwan 32; Philippines 30; Indonesia 21.
Oxides and hydroxides		13,850	14,602	4,337	Republic of Korea 1,860; Taiwan 1,496; Germany 1,296.
Mica:					
Crude including splittings and waste		862	951	244	Indonesia 188; Republic of Korea 161; Taiwan 130.
Worked including agglomerated splittings		1,020	958	34	Austria 405; China 116; Thailand 99.
Nitrates, crude		121	298	5	Thailand 144; Indonesia 100; Philippines 28.
Phosphorus, elemental		90	30	(2/)	Republic of Korea 26; Indonesia 2.
Pigments, mineral:					
Natural, crude		7	23	--	All to India.
Iron oxides and hydroxides, processed		35,766	40,357	4,946	Republic of Korea 10,792; China 7,110; Thailand 4,281.
Precious and semiprecious stones, other than diamond:					
Natural	kilograms	5,419	12,782	1	Hong Kong 10,176; Thailand 1,603; Republic of Korea 1,000.
Synthetic	do.	176,963	168,758	4,582	Thailand 40,188; China 22,645; Indonesia 19,871.
Pyrite, unroasted		44	47	--	New Zealand 20; Taiwan 20; Singapore 4.
Quartz crystal, piezoelectric	kilograms	121,884	89,887	970	Philippines 21,161; Malaysia 15,971; Germany 11,435.
Salt and brine		2,044	1,337	51	Thailand 431; Russia 226; Taiwan 195.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		5,064	20,087	--	China 9,673; Spain 371; Republic of Korea 123.
Worked, value	thousands	\$329	\$371	\$46	Republic of Korea \$134; China \$41.
Dolomite, chiefly refractory-grade		357	511	--	Taiwan 360; Malaysia 92; Republic of Korea 40.
Gravel and crushed rock		45,406	21,757	43	Indonesia 4,700; Russia 4,038; Republic of Korea 3,683.
Limestone other than dimension	thousand tons	3,131	3,118	(2/)	Taiwan 1,512; Hong Kong 834; Australia 585.
Quartz and quartzite		1,971	1,663	14	Republic of Korea 723; Taiwan 302; United Kingdom 300.
Sand other than metal-bearing and sand and gravel		11,772	12,062	1	Taiwan 6,039; Republic of Korea 1,286.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand tons	1,058	1,064	--	China 506; Republic of Korea 207; Indonesia 108.
Colloidal, precipitated, sublimed		812	468	6	Indonesia 144; Taiwan 103; Republic of Korea 84.
Dioxide		14	18	--	Republic of Korea 15; Vietnam 3.
Sulfuric acid	thousand tons	1,458	1,224	239	Taiwan 217; China 138; Australia 126.
Talc, steatite, soapstone, pyrophyllite		6,830	8,920	587	Taiwan 1,997; China 1,737; Singapore 1,545.

See footnotes at end of table.

TABLE 5--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Destinations, 2000	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Vermiculite, perlite, chlorite	19,832	16,890	12	Republic of Korea 14,346; Taiwan 2,307; China 144.
Other, slag and dross, not metal-bearing thousand tons	2,926	3,460	128	Taiwan 1,997; Australia 154; United Arab Emirates 146.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	28	17	--	All to Singapore.
Carbon black	22,474	22,956	2,129	Thailand 4,243; China 3,402; Republic of Korea 3,259.
Coal:				
Anthracite	138	101	--	Azerbaijan 44; Malaysia 19; India 14.
Other	1,480	970	--	Thailand 557; Indonesia 377; China 36.
Coke and semicoke thousand tons	2,790	2,611	1,754	Brazil 341; India 204; Philippines 96.
Peat including briquets and litter	211	89	--	Republic of Korea 48; China 41.
Petroleum:				
Crude thousand 42-gallon barrels	(2/)	118	--	All to China.
Refinery products:				
Liquefied petroleum gas do.	287	555	(2/)	Republic of Korea 529; Taiwan 19; Singapore 5.
Mineral jelly and wax do.	433	431	165	Republic of Korea 61; Taiwan 30; South Africa 14.
Asphalt, bitumen and other residues do.	1,322	1,364	--	China 1,270; Republic of Korea 64; Vietnam 15.
Bituminous mixtures do.	1	1	--	Mainly to Russia.
Petroleum coke do.	456	(2/)	(2/)	Mainly to the Netherlands.
Unspecified do.	39,891	21,246	5,089	Republic of Korea 4,306; Hong Kong 3,023; China 2,179.

-- Zero.

1/ Data presented in this table are from Japan Exports and Imports Commodity by Country, 1999 and 2000. Table prepared by Regina Coleman, International Data Unit.

2/ Less than 1/2 unit.

TABLE 6
JAPAN: IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Sources, 2000	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	347	384	128	China 177; France 63; Russia 9.
Aluminum:				
Ore and concentrate thousand tons	2	2	(2/)	Australia 1; Indonesia 1.
Oxides and hydroxides	86,100	91,894	6,732	Australia 74,289; Republic of Korea 3,068; China 2,974.
Ash and residue	3,010	1,820	--	Russia 1,582; Norway 127; Philippines 35.
Metal including alloys:				
Scrap	160,641	130,423	28,430	China 9,811; Taiwan 7,919; Singapore 7,538.
Unwrought thousand tons	2,659	2,605	60	Russia 695; Australia 624; Brazil 257.
Antimony:				
Ore and concentrate	96	40	--	All to China.
Oxides	8,270	8,497	336	China 6,259; United Kingdom 877; Taiwan 722.
Metal including alloys, all forms	8,576	10,965	1	China 10,941; Kyrgyzstan 21; Taiwan 2.
Arsenic, metal including alloys, all forms	103	45	--	China 40; Netherlands 5.
Beryllium, metal including alloys, all forms	6	3	1	Mainly from United Kingdom.
Bismuth, metal including alloys, all forms	242	361	(2/)	China 131; Belgium 130; Republic of Korea 23.
Cadmium, metal including alloys, all forms	3,351	4,056	(2/)	Republic of Korea 1,540; Belgium 620; Canada 595.
Chromium:				
Ore and concentrate	380,115	501,727	102	South Africa 297,075; India 107,998; Iran 33,957.
Oxides and hydroxides	3,104	3,472	567	China 1,046; United Kingdom 655; Germany 524.
Metal including alloys, all forms	2,343	3,202	863	China 1,161; France 637; United Kingdom 407.
Cobalt:				
Oxides and hydroxides	2,800	3,354	5	Belgium 3,085; Finland 164.
Metal including alloys, all forms	7,476	10,337	92	Canada 1,928; Zambia 1,427; Norway 1,144.

See footnotes at end of table.

TABLE 6--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Sources, 2000	
			United States	Other (principal)
METALS--Continued				
Columbium and tantalum, tantalum metal including alloys, all forms	228	409	115	Thailand 95; United Kingdom 55; China 43.
Copper:				
Ore and concentrate thousand tons	4,286	4,469	1	Chile 1,898; Indonesia 1,024; Canada 528.
Matte including cement copper	28	--	--	
Oxides and hydroxides	3,612	3,297	1,580	Malaysia 955; Vietnam 316; Australia 200.
Sulfate	419	429	35	Thailand 168; Taiwan 140; China 40.
Ash and residue containing copper	12,531	1,946	--	Malaysia 1,100; Philippines 697.
Metal including alloys:				
Scrap	174,450	190,221	16,036	Singapore 27,944; Malaysia 22,097; Philippines 19,352.
Unwrought	5,919	8,695	443	Chile 4,891; Republic of Korea 1,669; Russia 1,406.
Germanium, metal including alloys, all forms	3	7	(2/)	China 4; Belgium 1.
Gold:				
Waste and sweepings	146	198	(2/)	Malaysia 67; Singapore 65; Taiwan 35.
Metal including alloys, unwrought and partly wrought kilograms	108,393	72,796	5,728	Australia 26,779; Uzbekistan 6,885; Papua New Guinea 6,148.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	120	122	(2/)	Australia 71; Brazil 24; India 17.
Metal:				
Scrap thousand tons	282	321	58	Taiwan 57; Russia 35; Australia 21.
Pig iron, cast iron, related materials do.	240	919	4	China 520; Brazil 128; South Africa 114.
Ferroalloys:				
Ferrochromium	599,836	776,327	--	Kazakhstan 114,222; South Africa 424,616; Zimbabwe 73,561.
Ferromanganese	89,569	69,683	--	China 24,601; South Africa 22,028; Republic of Korea 4,217.
Ferromolybdenum	2,192	3,346	--	China 3,186; Chile 160.
Ferronickel	34,283	37,630	--	New Caledonia 28,500; Indonesia 5,439.
Ferrosilicochromium	3,171	5,818	67	China 5,591; Zimbabwe 160.
Ferrosilicomanganese	227,219	223,747	--	China 18,280; Australia 15,786; Ukraine 10,712.
Ferrosilicon	440,149	504,762	274	China 313,875; Brazil 71,209; Russia 62,758.
Silicon metal	179,884	194,362	4	China 134,575; Australia 20,978; Norway 16,576.
Unspecified	24,948	40,529	4,521	China 13,812; Brazil 10,076; United Kingdom 2,087.
Lead:				
Ore and concentrate	167,880	185,584	76,122	Australia 52,785; Peru 22,632; Bolivia 16,816.
Oxides	43,025	49,514	23	China 27,174; Taiwan 11,929; Mexico 4,070.
Ash and residue containing lead	20	--	--	
Metal including alloys:				
Scrap	133	(2/)	--	All from China.
Unwrought	21,084	31,383	1	China 25,935; Australia 1,589; Peru 1,570.
Semimanufactures	1,615	2,201	12	France 838; China 639; United Kingdom 351.
Lithium, oxides and hydroxides	1,572	1,558	1,402	China 95; Taiwan 41; Russia 19.
Magnesium, metal including alloys:				
Scrap	269	948	--	All from Taiwan.
Unwrought	34,678	38,221	284	China 30,546; Norway 5,828; Canada 942.
Semimanufactures	2,506	4,092	378	China 2,459; Russia 1,207.
Manganese:				
Oxides	1,440	2,946	7	China 1,090; Greece 786; Belgium 490.
Metal including alloys, all forms	39,936	43,270	1,109	China 33,491; South Africa 8,494.
Mercury	10	7	(2/)	Mainly from Spain.
Molybdenum:				
Ore and concentrate:				
Roasted	26,474	32,389	4,332	Chile 14,127; China 4,500; Mexico 4,133.
Unroasted	3	13	--	Mainly from Austria.
Oxides and hydroxides	1,147	1,167	269	Chile 553; Iran 248; China 66.
Metal including alloys:				
Semimanufactures	189	291	97	Austria 130; China 38.
All forms	244	541	103	China 246; Germany 136; Republic of Korea 19.
Nickel:				
Ore and concentrate thousand tons	3,906	4,579	--	New Caledonia 2,305; Indonesia 1,211.
Matte	86,370	111,690	--	Indonesia 73,536; Australia 38,154.

See footnotes at end of table.

TABLE 6--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Sources, 2000		
			United States	Other (principal)	
METALS--Continued					
Nickel--Continued:					
Oxides and hydroxides	103	125	8	Finland 107; Canada 5.	
Metal including alloys:					
Scrap	11,738	15,665	2,238	Zimbabwe 4,122; Russia 3,936; Taiwan 916.	
Unwrought	48,906	58,325	188	Australia 11,464; China 10,062; Russia 9,730.	
Platinum-group metals, waste and scrap	391	480	61	Taiwan 211; Thailand 99; Republic of Korea 40.	
Rare-earth metals including alloys, all forms	4,659	7,077	11	China 6,993; Republic of Korea 22; Estonia 20.	
Selenium	42	46	(2/)	Philippines 24; Belgium 17; United Kingdom 3.	
Silicon, high-purity	184,596	200,375	4,284	China 134,435; Australia 20,989; Norway 16,576.	
Silver, ore and concentrate	14,076	14,157	--	Peru 8,281; Chile 5,876.	
Tin, metal including alloys:					
Scrap	89	196	--	Republic of Korea 88; Singapore 80; China 17.	
Unwrought	28,894	32,483	14	China 13,675; Indonesia 10,571; Thailand 4,681.	
Semimanufactures	706	409	4	Singapore 324; Hong Kong 21.	
Titanium:					
Ore and concentrate	96,150	80,392	--	Australia 54,285; South Africa 13,296; India 11,584.	
Oxides	11,073	15,303	66	China 6,898; France 4,396; Republic of Korea 2,068.	
Metal including alloys, all forms	4,096	7,527	1,994	Russia 2,806; Kazakhstan 1,379; Taiwan 236.	
Tungsten:					
Ore and concentrate	1,794	1,514	--	Russia 992; Portugal 304; China 218.	
Metal including alloys, all forms	169	700	37	China 276; Republic of Korea 116; Germany 80.	
Uranium and thorium, metal including alloys, all forms	1,512	2,595	16	Canada 1,771; France 807.	
Vanadium, metal including alloys, all forms					
Oxides and hydroxides	3,700	4,539	4	China 2,039; South Africa 1,536; Australia 920.	
Ash and residue containing zinc	49	242	--	China 2; United Kingdom 240.	
Metal including alloys, all forms	103	238	154	Germany 79; United Kingdom 3; Russia 1.	
Zinc:					
Ore and concentrate	thousand tons	1,123	1,063	136	Australia 450; Peru 149; Canada 84.
Oxides		16,064	19,378	454	China 10,566; Republic of Korea 5,170; Taiwan 1,688.
Blue powder		988	1,995	3	Singapore 1,061; Republic of Korea 490; Malaysia 422.
Ash and residue containing zinc		18,190	26,884	5,138	Taiwan 8,034; Republic of Korea 5,956; Spain 4,523.
Metal including alloys:					
Scrap		349	69	11	Republic of Korea 41; Taiwan 17.
Unwrought		62,891	85,627	4	China 61,396; Peru 13,790; Canada 5,227.
Semimanufactures		3,464	6,686	68	China 3,131; Singapore 1,061; Belgium 666.
Zirconium:					
Ore and concentrate		74,647	86,952	1,926	Australia 51,333; South Africa 30,528; Russia 2,771.
Metal including alloys, all forms		654	704	421	France 233; United Kingdom 17.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		14,359	16,234	5,080	China 5,205; India 4,334; Mexico 1,025.
Artificial:					
Corundum		131,748	172,991	413	China 120,400; Australia 9,812; Hungary 9,345.
Silicon carbide		66,119	76,934	148	China 68,956; Brazil 3,741; Norway 2,144.
Dust and powder of precious and semiprecious stones including diamonds, value					
	thousands	\$68	\$34	\$33	China \$5; Republic of Korea \$2; Switzerland \$2.
Grinding and polishing wheels and stones		4,421	5,245	362	China 3,179; Thailand 926; Austria 147.
Asbestos, crude		117,143	98,595	5,256	Canada 51,618; Zimbabwe 20,780; South Africa 7,648.
Barite and witherite		113,018	108,156	222	China 105,095; North Korea 2,594; Thailand 228.
Boron:					
Crude natural borates		52,872	46,150	20	Turkey 41,780; Russia 3,400; Republic of Korea 850.
Oxides and acids		35,919	38,085	17,331	Russia 11,891; Italy 4,349; Chile 3,832.
Cement	thousand tons	1,091	1,378	(2/)	Republic of Korea 1,219; China 139; France 14.
Clays, crude:					
Bentonite		173,122	224,126	190,299	China 33,140; India 360; New Zealand 114.
Chamotte or dinas earth		17,935	12,564	--	China 5,165; Republic of Korea 3,731; South Africa 3,348.
Fire clay		2,241	5,809	2,100	China 3,604; Germany 105.
Fuller's earth		8,239	8,224	5,198	China 2,406; Australia 620.
Kaolin	thousand tons	1,339	1,401	966	Brazil 229; Indonesia 83; China 59.
Unspecified		176,503	176,333	4,835	China 151,907; South Africa 15,642.

See footnotes at end of table.

TABLE 6--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1999	2000	Sources, 2000	
				United States	Other (principal)
INDUSTRIAL MINERALS--Continued					
Diamond, natural:					
Gem, not set or strung	thousand carats	3,097	2,735	68	India 1,955; Belgium 241; Israel 237.
Industrial stones	do.	1,556	524	124	Ireland 296; Republic of Korea 47; United Kingdom 15.
Dust and powder	do.	101,873	113,250	25,087	Ireland 37,523; China 35,106; Ukraine 8,194.
Diatomite and other infusorial earth		7,927	9,048	7,497	China 1,298; Thailand 159; Netherlands 48.
Feldspar		1,805	1,781	48	India 827; China 499; Malaysia 238.
Fluorspar		535,413	562,147	--	China 426,945; Mexico 109,137; Thailand 7,880.
Fertilizer materials					
Crude, n.e.s.		116,472	64,850	16	Republic of Korea 27,943; China 20,683; Indonesia 9,766.
Manufactured:					
Ammonia		28,831	25,740	15,943	Canada 20,493; Indonesia 16,174; Taiwan 117.
Phosphatic		143,594	314,522	157,196	China 100,429; Israel 8,511; Republic of Korea 3,304.
Potassic	thousand tons	878	954	209	Canada 447; Russia 604; Germany 460.
Unspecified and mixed	do.	1,016	2,130	744	Canada 452; Jordan 304; Indonesia 92.
Graphite, natural		111,615	143,906	363	China 135,869; North Korea 3,397; Sri Lanka 3,373.
Gypsum and plaster	thousand tons	2,546	2,495	(2/)	Thailand 1,192; Australia 767; Mexico 514.
Iodine		290	363	74	Mainly to Chile.
Lime		72	15,728	--	Thailand 15,000; Philippines 524; China 179.
Magnesium compounds:					
Magnesite, crude		1,607	2,244	--	China 2,104; Australia 140.
Oxides and hydroxides		22,759	27,598	1,273	Israel 4,437; Mexico 3,800; Taiwan 1,540.
Other		2,394	238	--	All from China.
Mica:					
Crude including splittings and waste		44,968	45,369	535	China 27,530; India 6,687; Canada 2,956.
Worked including agglomerated splittings		258	421	2	China 284; Belgium 77; Switzerland 23.
Nitrates, crude		22,083	22,048	--	Chile 21,909; Germany 119; China 20.
Phosphates, crude	thousand tons	933	899	--	China 343; South Africa 258; Morocco 140.
Phosphorus		25,208	26,163	940	China 24,612; Netherlands 494; Germany 106.
Pigments, mineral:					
Natural crude		208	249	--	Australia 187; Austria 51; United Kingdom 11.
Iron oxides and hydroxides, processed		26,246	31,123	3,593	China 11,985; Germany 8,623; Republic of Korea 4,497.
Precious and semiprecious stones, other than diamond:					
Natural		459	609	15	Brazil 347; China 103; South Africa 81.
Synthetic	kilograms	98,903	119,246	37,151	Republic of Korea 32,128; France 28,913; China 8,854.
Pyrite, unroasted		4,166	6,243	--	All from China.
Quartz crystal, piezoelectric	kilograms	66,396	115,272	6,296	Russia 57,578; China 20,388; Malaysia 6,449.
Salt and brine	thousand tons	8,236	7,974	1	Mexico 4,356; Australia 3,347; China 239.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	do.	373	306	4	China 60; India 45; South Africa 43.
Worked	do.	1,353	1,438	2	China 1282; Italy 43; Republic of Korea 15.
Dolomite, chiefly refractory-grade	do.	1,875	1,975	(2/)	China 773; Thailand 546; Philippines 397.
Gravel and crushed rock		269,985	332,624	502	Taiwan 146,028; Republic of Korea 66,148; Philippines 28,615.
Limestone other than dimension		234,240	282,820	304	Philippines 133,885; Malaysia 87,412; Vietnam 34,773.
Quartz and quartzite		120,832	265,610	5,526	India 192,388; Republic of Korea 31,351; China 22,923.
Sand other than metal-bearing and sand and gravel	thousand tons	4,873	13,474	11	China 7,479; Republic of Korea 3,689; Australia 1,634.
Sulfur:					
Elemental:					
Crude including native and byproduct		177	535	--	China 520; Republic of Korea 15.
Colloidal, precipitated, sublimed		1,133	1,298	22	Republic of Korea 1,161; France 110; Germany 5.
Sulfuric acid		26	6	1	Mainly from Taiwan.
Talc, steatite, soapstone, pyrophyllite		404,581	403,257	5,988	China 332,614; Australia 62,183.
Vermiculite, perlite, chlorite		181,452	191,478	1,317	China 165,234; South Africa 15,952; Switzerland 4,960.
Other; slag and dross, not metal-bearing		725,471	815,684	6,368	Taiwan 240,698; Republic of Korea 208,132; Indonesia 81,313.

See footnotes at end of table.

TABLE 6--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1999	2000	Sources, 2000	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	614,536	613,301	2,558	Venezuela 610,227; Trinidad and Tobago 516.
Carbon black	60,876	84,341	5,370	Thailand 49,285; Republic of Korea 20,808; Canada 1,766.
Coal:				
Anthracite thousand tons	2,782	3,677	(2/)	China 1,708; Vietnam 1,033; Australia 576.
Bituminous do.	130,845	138,641	4,196	Australia 84,649; China 15,155; Indonesia 13,249.
Briquettes of anthracite and bituminous coal and lignite	14,320	17,324	376	Russia 10,354; China 6,594.
All grades including briquettes thousand tons	3,572	2,958	--	Australia 940; Canada 367; China 179.
Coke and semicoke do.	1,297	2,693	--	China 2,690; Australia 2; Germany 1.
Gas, natural; liquefied do.	51,724	53,690	1,226	Indonesia 17,967; Malaysia 10,959; Qatar 5,833.
Peat including briquettes and litter	147,772	151,957	1,313	Canada 94,896; Germany 14,781; China 12,817.
Petroleum:				
Crude thousand 42-gallon barrels	4,949,540	1,560,184	7,817	China 395,170; Saudi Arabia 395,170; United Arab Emirates 385,637.
Refinery products:				
Liquefied petroleum gas do.	167,692	174,672	206	Saudi Arabia 74,027; United Arab Emirates 44,448; Australia 11,514.
Mineral jelly and wax do.	186,137	171,712	38,179	China 54,701; South Africa 25,533; Indonesia 24,480.
Asphalt, bitumen and other residues do.	2,811	2,819	1,416	China 914; Republic of Korea 480.
Bituminous mixtures do.	6	7	1	United Kingdom 4; Republic of Korea 1.
Petroleum coke do.	23,955	26,119	17,998	China 3,533; Canada 2,234; Republic of Korea 1,074.

-- Zero.

1/ Data presented in this table are from Japan Exports and Imports Commodity by Country, 1999 and 2000. Table prepared by Regina Coleman, International Data Unit.

2/ Less than 1/2 unit.

TABLE 7
JAPAN: OVERSEAS ALUMINUM SMELTING PROJECTS IN 2001

Company name (project name) and country	Annual capacity (metric tons)		Type of power	Production started	Shipment to Japan started	Shipment to Japan 2001 e/ (metric tons)	Major equity holder and/or other holders	Participated Japanese companies and their equity share
	Total	Japanese share						
New Zealand Aluminium Smelters Ltd. (NZAS), New Zealand	313,000	67,600	Hydro	April 1971	July 1971	66,000	Comalco Ltd. of Australia, 78.4%	Sumitomo Chemical Co. Ltd., 21.6%.
Alcan Smelters and Chemical Ltd. (ALPAC), Canada	90,000	45,000	do.	Unknown	January 1977	35,000	Alcan Aluminum Ltd. of Canada, 50%	Nippon Light Metal Co. Ltd., 50%.
Intalco Aluminum Corp.	272,000	106,000	do.	1966	Unknown	84,000	Alcoa Inc. 61%	Mitsui & Co., Ltd., 32%; and YKK Corp., 7%.
Eastalco Aluminum Co. (ALUMAX), United States 1/	174,000	68,000	Thermal	1970				
Industria Venezolana de Aluminio C.A. (VENALUM), Venezuela	450,000	90,000	Hydro	February 1978	December 1978	130,000	Corp. Venezolana de Guayana (CVG) of Venezuela, 80%	Showa Denko K.K., 7%; Sumitomo Chemical Co. Ltd., 4%; Kobe Steel Ltd., 4%; Mitsubishi Materials Corp., 3%; Mitsubishi Aluminum Co. Ltd., 1%; and Marubeni Corp., 1%.
P.T. Indonesia Asahan Aluminum (Asahan), Indonesia	225,000	133,000	do.	February 1982	October 1982	115,000	Indonesian Government, 41%	Nippon Asahan Aluminium Co. Ltd. (a 13-member Japanese consortium), 59%.
Boyne Island Smelter Ltd. (Boyne reduction lines 1, 2), Australia	260,000	130,000	Thermal	do.	July 1982	238,000 (lines 1-3)	Comalco Ltd. of Australia, 50%	Sumitomo Light Metal Co. Ltd., 17%; Ryowa Development Pty. Ltd., 9.5%; YKK Aluminum Pty. Ltd., 9.5%; Kobe Steel Ltd., 9.5%; and Sumitomo Chemical Co. Ltd., 4.5%.
Boyne Island Smelter Ltd. (Boyne reduction line 3), Australia	230,000	94,000	do.	July 1997	October 1997		Comalco Ltd. of Australia, 59.25%	Sumitomo Light Metal No. 2 Co. Pty. Ltd., 17%; Ryowa Development II Pty. Ltd., 14.25%; and YKK Aluminium Pty. Ltd., 9.5%.
Alcoa of Australia Ltd. (Portland), Australia	350,000	80,500	do.	November 1986	Unknown	78,000	Alcoa of Australia, 45%; Eastern Aluminum Co., 10%; China International Trust & Investment Corp., 22%	Marubeni Corp., 23%.
Aluminio Brasileiro S.A. (Albrás), Brazil	345,000	169,000	Hydro	July 1985	November 1986	175,000	Companhia Vale do Rio Doce, 51%	Nippon Amazon Aluminum Co. (a 32-member Japanese consortium), 49%.
Mozambique Aluminum Co. (Mozal 1), Mozambique 2/	250,000	63,000	do.	June 2000	Unknown	63,000	Billiton plc, 47.11%; Industrial Development Corp. of South Africa, 24.04%; Government of Mozambique, 3.85%	Mitsubishi Corp., 25%.
Aluminerie Alouette Inc. (Alouette), Canada	230,000	46,000	do.	June 1992	September 1992	48,000	Austria Metal AG, 20%; SGF, 20%; VAW, 20%; Hogovens Group, 20%	Kobe Steel Ltd., 13.33% and Marubeni Corp., 6.67%.

e/ Estimate based on Japanese fiscal year ending March of the following year.

1/ The two smelters under the company ALUMAX were acquired by Alcoa Inc. in July 1998.

2/ Phase 2 (Mozal 2) will add a further 253,000 metric tons per year of aluminum capacity by 2003.

Source: Japan Aluminum Association, Japan Overseas Aluminum Smelting Projects; U.S. Geological Survey, Primary Aluminum Plant Worldwide--1998, Part I--Detail, p. 4, 22, and 155; Marubeni Corp., Sources of Imported Primary Aluminum (Fiscal Year Base), 1998-2002.

TABLE 8

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2001

Item	Location and name of the project		
	Northern Territory, Australia	New South Wales, Australia	British Columbia, Canada
	McArthur River	Northparkes	Mount Polley
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation.
Participated Japanese companies and their equity share	Nippon Mining and Metals Co. Ltd., 15%; Mitsui and Co. Ltd., Mitsubishi Materials Corp., and Marubeni Corp., 5% each	Sumitomo Metal Mining Co. Ltd., 13.3%; and Sumitomo Corp., 6.7%	Sumitomo Corp., 47.5%.
Majority equity holder and/or other equity holder	Mount Isa Mines Ltd. of Australia, 70%	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 52.5%.
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold
Estimated reserves and ore grade	227 million metric tons, 4.1% lead, 9.2% zinc, 41 grams per ton silver	80 million metric tons, 1.12% copper, 0.56 gram per ton gold	81.5 million metric tons, 0.3% copper, 0.42 gram per ton gold.
Type of mine	Underground	Open pit and underground	Open pit.
Total cost of the project	\$A246 million	\$A303 million	Can\$123 million.
Japanese share	\$A22 million	\$A75.6 million	Can\$109 million.
Annual production capacity	1,300,000 metric tons of crude ore, containing 6.2% lead, 13.9% zinc, and 63 grams per ton silver	5,230,000 metric tons of crude ore, containing 1.3% copper plus 0.6 gram per ton gold	6,500,000 metric tons of crude ore.
Annual shipment to Japan	25,000 metric tons of lead and 56,000 metric tons of zinc in mixed concentrate	11,000 metric tons of copper in concentrate plus gold value	15,000 metric tons of copper concentrate plus gold value.
Construction started	August 1993	May 1993	September 1996.
Production started or planned	September 1995	October 1995	June 1997.
Item	Location and name of the project		
	British Columbia, Canada	Region III, Chile	Region I, Chile
	Huckleberry	La Candelaria	Collahuasi
Nature of project involvement	Equity participation and provided loan	Investment in exploration and development	Equity participation and provided loan.
Participated Japanese companies and their equity share	Mitsubishi Materials Corp., 31.5%; Dowa Mining Co Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; and Marubeni Corp., 6.25%	Sumitomo Metal Mining Co. Ltd., 15%; and Sumitomo Corp., 5%	Mitsui and Co. Ltd., 6.9%; Mitsui Mining and Smelting Co. Ltd., 1.5%; and Nippon Mining and Metals Co., Ltd., 3.6%.
Majority equity holder and/or other equity holder	Princeton Mining Corp. of Canada, 50%	Phelps Dodge Corp. of the United States, 80%	Falconbridge Ltd. of Canada, 44%; Manto Minorco S.A. of Luxembourg, 44%.
Mineral commodity involved	Copper	Copper and gold	Copper.
Estimated reserves and ore grade	162 million metric tons, 0.47% copper	399 million metric tons, 1.06% copper, 0.25 gram per ton gold	3,100 million metric tons, 0.82% copper.
Type of mine	Open pit	Open pit	Open-pit.
Total cost of the project	Can\$136 million	\$592 million	\$1,760 million.
Japanese share	\$78 million	\$296 million	\$174 million.
Annual production capacity	6,000,000 metric tons of crude ore	11,000,000 metric tons of crude ore containing 1.1% copper	25,000,000 metric tons of crude ore containing 1.3% copper.
Annual shipment to Japan	28,500 metric tons of copper in concentrate	60,000 metric tons of copper in concentrate plus gold value	83,000 metric tons of copper in concentrate.
Construction started	1996	April 1993	1996.
Production started or planned	October 1997	March 1995	January 1999.
Item	Location and name of the project		
	Region IV, Chile	Region III, Chile	Sumbawa Island, Indonesia
	Los Pelambres	El Bronce	Batu Hijau
Nature of project involvement	Equity participation	Investment in exploration and development	Equity participation.
Participated Japanese companies and their equity share	Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; and Mitsui and Co. Ltd., 1.25%	Nittetsu Mining Co. Ltd., 60%	Sumitomo Corp., 26%; Sumitomo Metal Mining Co. Ltd., 5.0%; Mitsubishi Materials Corp., 2.5%; and Furukawa Co. Ltd., 1.5%.
Major equity holder and/or other equity holder	Antofagasta Holding (subsidiary of Luksic Group of the United Kingdom), 60%	El Bronce SA of Chile, 40%	Newmont Gold Co. (United States), 45%; P.T. Pukuafu Indah (Indonesia), 20%.
Mineral commodity involved	Copper and molybdenum	Copper	Copper and gold
Estimated reserves and ore grade	2,400 million metric tons, 0.63% copper	20 million metric tons, 1.5% copper	1,022 million metric tons, 0.52% copper, 0.41 gram per ton gold.
Type of mine	Open pit	Underground	Open pit.
Total cost of the project	\$1,355 million	\$132 million	\$1,925 million.
Japanese share	\$835 million	\$116 million	\$513 million.
Annual production capacity	38,000,000 metric tons of crude ore, containing 0.75% copper and 0.02% molybdenum	1,820,000 metric tons of crude ore, containing 1.5% copper	43,800,000 metric tons of crude ore.
Annual shipment to Japan	220,000 metric tons of copper in concentrate	10,000 metric tons of copper in concentrate	101,400 metric tons of copper in concentrate
Construction started	November 1997	May 1999	September 1996.
Production started or planned	April 2000	2001 or later	October 1999.

TABLE 8--Continued
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECT OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2001

Item	Location and name of the project		
	Mexico, Mexico	Guerrero, Mexico	Ancash, Peru
	Tizapa	Rey de Plata	Antamina
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Investment in exploration and development
Participated Japanese companies and their equity share	Dowa Mining Co. Ltd., 39%; and Sumitomo Corp., 10%	Dowa Mining Co. Ltd., 39%; and Sumitomo Corp., 10%	Mitsubishi Corp., 10%.
Major equity holder and/or other equity holder	Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%	Noranda Inc. of Canada and Billiton plc of the United Kingdom, 33.75% each, and Teck Corp. of Canada, 22.5%
Mineral commodity involved	Copper, lead, and zinc	Copper, lead, and zinc	Copper and zinc
Estimated reserves and ore grade	5.3 million metric tons, 0.7% copper, 1.64% lead, 7.9% zinc plus gold and silver	3 million metric tons, 0.5% copper, 2.1% lead, 8.3% zinc plus gold and silver	560 million metric tons, 1.8% copper, 1.0% zinc, and 0.03% molybdenum.
Type of mine	Underground	Underground	Open pit.
Total cost of the project	\$38.2 million	\$45.4 million	\$2,296 million.
Japanese share	\$35.1 million	\$41.3 million	\$404 million.
Annual production capacity	541,000 metric tons of crude ore	321,000 metric tons of crude ore	25,600,000 metric tons of crude ore
Annual shipment to Japan	50,000 metric tons of zinc in concentrate	46,740 metric tons of zinc in concentrate	200,000 metric tons of copper and 80,000 metric tons of zinc concentrates.
Construction started	May 1992	January 1998	1998.
Production started or planned	November 1994	October 2000	July 2001.

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2001, p. 210-217.

TABLE 9
 JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	1997	1998	1999	2000	2001
Automobiles:	12,431	10,593	10,574	11,970	12,020
Ordinary steel	9,722	8,314	8,211	9,310	9,430
Specialty steel	2,709	2,279	2,363	2,660	2,590
Construction:	15,057	13,633	14,074	14,840	14,270
Ordinary steel	14,283	12,945	13,360	14,060	13,550
Specialty steel	774	688	714	780	720
Conversion and processing:	7,052	5,828	6,171	6,490	6,170
Ordinary steel	3,423	2,848	3,079	3,090	2,910
Specialty steel	3,630	2,980	3,092	3,400	3,260
Electric machinery and equipment:	2,543	2,106	2,062	2,330	2,070
Ordinary steel	2,417	2,003	1,954	2,190	1,940
Specialty steel	126	103	108	140	130
Home and office appliances:	851	709	697	810	760
Ordinary steel	623	523	522	610	550
Specialty steel	228	186	175	200	210
Industrial machinery and equipment:	3,105	2,267	2,167	2,400	2,230
Ordinary steel	1,741	1,284	1,171	1,330	1,290
Specialty steel	1,364	983	996	1,070	940
Shipbuilding and marine equipment:	3,339	3,242	2,950	3,250	3,620
Ordinary steel	3,260	3,166	2,881	3,130	3,480
Specialty steel	79	76	69	120	140
Steel dealers:	23,068	19,114	19,176	21,310	19,160
Ordinary steel	21,656	17,994	18,099	20,030	17,930
Specialty steel	1,412	1,120	1,077	1,280	1,230
Tanks and containers:	2,006	1,789	1,763	1,760	1,640
Ordinary steel	1,985	1,769	1,750	1,740	1,620
Specialty steel	21	20	13	20	20
Other:	797	637	596	720	680
Ordinary steel	624	531	488	610	570
Specialty steel	173	106	108	110	110
Total	70,248	59,918	60,225	65,880	62,620
Ordinary steel	59,733	51,377	51,510	56,100	53,270
Specialty steel	10,515	8,541	8,715	9,780	9,350

Source: The Japan Iron and Steel Federation. The Steel Industry of Japan 2001; Monthly Report of the Iron and Steel Statistics, v. 45, no. 7, July 2002, p. 10-11.

TABLE 10
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY COUNTRY OF DESTINATION

(Thousand metric tons)

Destinations	1997	1998	1999	2000	2001
Asia:	17,647	15,556	20,729	22,405	23,037
China	2,659	2,477	2,960	4,062	4,566
Hong Kong	1,644	1,568	1,641	1,735	1,363
Korea, Republic of	3,566	2,756	5,366	6,029	6,537
Malaysia	1,661	1,138	1,616	1,464	1,515
Taiwan	2,428	2,959	3,080	2,557	2,528
Thailand	2,194	1,749	2,553	2,793	2,572
Singapore	1,183	918	900	776	700
Other countries	2,312	1,991	2,613	2,989	3,256
Middle East	848	1,146	1,283	1,090	1,523
Europe	734	1,192	1,004	854	1,193
Americas:	3,553	8,914	4,313	4,000	3,808
Argentina	45	96	90	8	55
Brazil	66	65	34	41	31
Canada	178	592	443	499	244
Colombia	104	178	110	176	246
United States	2,704	7,020	2,803	2,137	2,206
Venezuela	34	94	30	52	57
Other countries	422	869	803	1,087	969
Africa	408	409	339	371	365
Oceania:	345	434	544	441	553
Australia	275	381	483	382	498
New Zealand	57	47	57	50	43
Other countries	13	6	4	9	12
Total	23,535	27,651	28,212	29,161	30,478

Source: Japan Iron and Steel Federation, The, 2002, Monthly Report of the Iron and Steel Statistics, v. 45, no. 7, July, p. 14-17.