



# 2006 Minerals Yearbook

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## JAPAN

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# THE MINERAL INDUSTRY OF JAPAN

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Japan's economy ranked second after the United States among the G7 major advanced economies, which are Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. In 2006, Japan's gross domestic product (GDP) amounted to \$4.4 trillion (\$4.2 trillion based on purchasing power parity) compared with that of the United States, which was \$14.4 trillion (\$12.2 trillion based on purchasing power parity); Japan's per capita GDP was \$34,181 (\$32,530 based on purchasing power parity) compared with that of the United States, which was \$41,886 (\$41,124 based on purchasing power parity) (International Monetary Fund, 2007).

In 2006, Japan was one of the world's leading producers of bromine, cadmium metal, cement, copper metal, diatomite, feldspar, gypsum, indium metal, iodine, lime, nickel metal, perlite, silica sand, selenium, crude steel, sulfur, talc (including pyrophyllite), tellurium, titanium sponge and pigment, and zinc metal. Because Japan has limited indigenous mineral resources, the country relied heavily on imports of a wide variety of minerals and intermediate mineral products to meet the raw material requirements of its large chemical and ferrous and nonferrous metals manufacturing and electricity generating sectors. Japan, however, has substantial indigenous resources of iodine, limestone, pyrophyllite, silica sand, and silica stone (table 3).

In 2006, Japan was one of the world's major importers and consumers of primary aluminum, cadmium metal, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, gold metal, ilmenite and rutile, indium metal, iron ore, lead ore and metal, liquefied natural gas (LNG), lithium metal, manganese ore and metal, magnesium, nickel ore and metal, crude petroleum, phosphate rock, platinum group metals, potash, rare earths, industrial salt, silicon metal, silver metal, tin metal, tungsten ore and ammonium tungstate, zinc ore and metal, and zircon. Japan was one of the world's major producers and exporters of fabricated aluminum and copper products, cement and cement products, ceramic products, inorganic chemicals, refined copper, compound fertilizers, electrolytic manganese dioxide (EMD), glass and glassware products, high-purity rare (minor) metals, iodine, iron and steel, and titanium sponge metal and titanium products.

## Minerals in the National Economy

The mining sector was the smallest sector of Japan's industry-based economy. According to the Government statistics on the real GDP by economic activity of Japan's national accounts, the mining sector accounted for only 0.11% of the real GDP in 2005 (the latest year for which data were available). The mineral processing industry, which included processing of chemicals (1.73%), iron and steel (0.91%), fabricated metal products (0.84%), petroleum and coal products (0.74%), industrial mineral products (0.68%), and nonferrous metals (0.37%), accounted for 5.27% of the real GDP. The mineral industry,

which covered the mining and mineral processing industries, accounted for 5.38% of the real GDP. The output of the mineral processing industries accounted for about 23% of the output of the manufacturing sector, which in turn, accounted for 22.5% of Japan's real GDP (Economic and Social Research Institute, 2007).

The mineral industry was important to the Japanese economy because of the vital role it played in supplying the primary industrial materials to Japan's large manufacturing and construction industries and because of its contributions to Japan's GDP. The contribution of the mining industry to Japan's employment, however, has been declining because of the ongoing restructuring of the mining industry. The metal mining industry had shrunk the most mainly because of depleted ore reserves, high production costs, and the availability of cheaper imports. In 2006, Japan's major nonferrous metal mines had been reduced to 1 gold mine that had only about 210 employees compared with more than 15 major nonferrous mines that had a total of about 7,130 employees in 1986 (Ministry of International Trade and Industry, 1986; Japan Oil, Gas and Metals National Corp., 2007). For the mining industry, which included metals and industrial minerals mining, the total number of employees had decreased to about 30,000 in 2006 from 80,000 in 1986 (Ministry of Internal Affairs and Communication, 2007a-c).

## Government Policies and Programs

To establish a basic framework for developing Japan's mineral resources, the Mining Act of 1950 (Law No. 289) was enacted on December 20, 1950, and amended once in 1962. Under the law, the State has the power to grant the right to mine and obtain unmined minerals. The Ministry of Economy, Trade and Industry (METI) is the main Government agency that administers the law; the Agency for Natural Resources and Energy (ANRE) under METI is responsible for drafting the country's mineral policies, which are then implemented by Japan Oil, Gas and Metals National Corp. (JOGMEC). Japan's Basic Environment Law of 1993 (Law No. 91), which was enacted on November 13, 1993, is administered by the Ministry of Environment (ME). The Environmental Impact Assessment Law of 1997 (Law No. 81) is administered by the ME and the METI (Ministry of Economy, Trade and Industry, 2007; Ministry of Environment, 2007a, b).

Japan's policy objective with regard to mineral resources is to secure a stable supply of resources to ensure continuing growth in its industry-based economy. JOGMEC was established by the METI on February 24, 2004, to implement the Government's mineral policies and to undertake mineral programs that would secure a stable supply of mineral resources and energy for the country (Agency of Natural Resources and Energy, 2007).

To achieve this objective, JOGMEC provides information and technological expertise to support Japanese companies at all

stages from the acquisition of exploration and production rights to production; assumes responsibility for the management of the national stockpile of crude oil, liquefied petroleum gas (LPG), and rare metals; and supports activities to control domestic and overseas mine pollution. The Metals Strategy & Exploration Unit of JOGMEC provides mineral resources information services, conducts domestic and overseas exploration and geologic surveys, finances domestic and overseas mineral exploration and development projects, supports technology development projects, administers stockpiling of rare metals (chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium), and conducts mine pollution control activities for domestic abandoned mines (Sakasegawa, 2006, p. 2-4).

## Production

Mine production of all nonferrous metals (except gold) declined in 2006 because of depleted ore reserves, but that of most industrial minerals (except gypsum and salt) increased. In particular, mine production of lead, silver, and zinc from the Toyoha Mine in Hokkaido Prefecture decreased sharply because the mine was closed permanently on March 31, 2006, owing to ore depletion (Metals Place, 2006a). Limestone production increased because of its increased use in the production of cement, concrete aggregate, iron and steel, and soda and glass. Production of coal increased in 2006 despite a decrease in the number of small-scale coal mines to six from seven in 2006. According to Japan Coal Energy Center, only six small-scale open pit coal mines and one major underground coal mine operated in Hokkaido Prefecture in 2006 (Shinji Tomita, Assistant Manager, Resources Department, Japan Coal Energy Center, written commun., October 19, 2007). The output of natural gas increased and that of crude petroleum decreased in 2006. The production amount of crude petroleum and natural gas, however, remained insignificant when compared with Japan's requirements.

In the nonferrous mineral processing sector, production of cobalt metal, refined copper, gold, refined lead, molybdenum metal, rare-earth oxides, refined silver, tin, and titanium increased, but production of other nonferrous metals, such as antimony oxide, bismuth, cadmium, nickel, silver, tungsten metal, and slab zinc (refined zinc) decreased. Among the nonferrous metals, production of cobalt metal increased substantially owing to the increased supply of raw materials from the Philippines. Titanium sponge metal also increased considerably owing to expanded capacity and stronger domestic and overseas demand in the United States and the European Union. In ferrous mineral processing, production of both pig iron and crude steel increased owing to the stronger overall domestic demand and increased exports to China and the Republic of Korea.

In the industrial mineral processing sector, production of cement and other construction-related materials was higher than that of 2005 owing to the continued increase in domestic demand for the construction of dwellings and of such buildings as factories, plants, and warehouses despite a slowdown in public works projects. Production of most refined petroleum products was lower in 2006 because of weaker demand resulting

from increased prices for gasoline, distillate fuel oil, kerosene, and LPG (table 1).

## Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining and quarrying 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 number of major nonferrous metal mines was reduced to one by the second quarter of 2006. The coal mining sector consisted of six small-scale open pit mines and one major underground mine (Kushiro) in Hokkaido Prefecture. The total number of industrial minerals mines and quarries, which produced mainly dolomite, feldspar, fire clay, limestone, pyrophyllite, silica stone, and silica, however, held steady in 2006.

In the mineral processing sector, the number of iron and steel industry employees decreased to 157,065 from 157,512 at the end of 2005. The industry's production capacity of pig iron increased to 83.94 million metric tons per year (Mt/yr) from 83.34 Mt/yr at the end of 2005, and the production capacity of crude steel also increased to 128.74 Mt/yr from 124.12 Mt/yr at the end of 2005. The total number of employees in the nonferrous metals industry, which included the smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, increased to 5,269 from 5,105 at the end of 2005. In 2006, Japan's production capacity of refined copper decreased slightly to 1,551,400 from 1,554,000 metric tons per year (t/yr); that of refined gold remained unchanged at 186 t/yr, as did that of refined lead (275,000 t/yr) refined silver (2,800 t/yr), and refined zinc (750,000 t/yr). Japan's cement industry increased the number of regular employees by 1.15% to 3,351 but cut its cement clinker capacity by 2.2% to 74.35 Mt/yr (Ministry of Economy, Trade and Industry, 2006a, p. 123, 136; 2006c, p. 107-108, 162, 164).

## Mineral Trade

In 2006, Japan's merchandise imports totaled \$579.1 billion<sup>1</sup> and its merchandise exports totaled \$647.0 billion. The merchandise trade surplus decreased by 14% to \$67.9 billion from \$79.0 billion in 2005 mainly because of a large increase in the import values of mineral fuels and ores and concentrates of ferrous and nonferrous minerals that resulted from larger import quantities and higher import unit prices in 2006.

Japan's imports of raw materials and minerals fuels increased by 24.0% to \$182.0 billion and accounted for 31.4% of total merchandise imports, which were valued at \$579.1 billion. The higher import bill for minerals was the direct result of higher import unit prices of all minerals, especially for such raw materials as ferrous and nonferrous metal ores, LNG, petroleum, and petroleum products. Of the \$182.0 billion worth of raw material and mineral fuel imports, \$99.2 billion was

<sup>1</sup>Values have been converted from Japanese yen (¥) to U.S. dollars (\$) at a rate of ¥116.3=US\$1.00 for 2006.

for crude petroleum; \$22.9 billion, for LNG; \$16.1 billion, for refined petroleum products; \$14.4 billion, for nonferrous ores and concentrates; \$13.9 billion, for coal; \$8.1 billion, for LPG; and \$7.2 billion, for iron ore and concentrate. Exports of minerals and processed mineral products increased by 15.0% to \$62.7 billion in 2006 and accounted for 9.7% of Japan's total merchandise exports, which were valued at \$647.0 billion. Exports of iron and steel products, fabricated metals, and nonferrous metals totaled \$49.7 billion. Exports of industrial minerals and processed industrial mineral products totaled \$7.4 billion in 2006 compared with \$6.9 billion in 2005 (Ministry of Finance, 2005, 2007).

## Commodity Review

### Metals

**Bauxite and Alumina and Aluminum.**—Production of aluminum hydroxide [alumina trihydrate (ATH)] and alumina, was by Japan's leading ATH producer Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture, which had the capacity to produce 365,000 t/yr of ATH and 163,000 t/yr of alumina; by Showa Denko K.K. (SDK) (Japan's second ranked producer of ATH) at its Yokohama plant in Kanagawa Prefecture, which had the capacity to produce 220,000 t/yr of ATH and 105,000 t/yr of alumina; and by Sumitomo Chemical Co. Ltd. at its Ehime plant in Ehime Prefecture, which had the capacity to produce 200,000 t/yr of ATH and 105,000 t/yr of alumina (Japan Aluminum Association, 2003, p. 11).

During the past 5 years, Japan's production of ATH was estimated to be between 730,000 metric tons (t) and 750,000 t, and that of alumina, between 330,000 t and 370,000 t. Under the Government guidelines on disposal of red mud generated during the processing of bauxite ore, the Japanese ATH and alumina producers were expected to terminate the dumping of red mud by 2015. At the same time, demand for ATH in Japan and other Asian countries had been increasing, especially for water treatment chemicals, phosphate-free detergent builders, artificial marble, and flame retardants. In 2006, NLM and Sojitz Corp. of Japan signed a basic agreement with Vietnam National Chemical Corp. and its wholly owned subsidiary South Basic Chemicals Ltd. Co. to undertake a feasibility study for the construction of an ATH plant that would be the largest of its kind in Asia. Construction of the ATH plant in Lam Dong Province in southern Vietnam was planned to begin in 2008 at an estimated cost of about \$345 million. The plant's production capacity would be 550,000 t/yr. Earlier in May 2006, SDK and Marubeni Corp. of Japan had signed an agreement with PT Antam Tbk of Indonesia and Straits Trading Amalgamated Resources Ltd. to build a 300,000-t/yr chemical-grade alumina and ATH plant in Indonesia (Industrial Minerals, 2006; Japan Corporation News Network, 2006; Sojitz Corp., 2006).

Production of primary aluminum (unwrought aluminum) by NLM at the Kambara smelter in Shizuoka Prefecture held steady at the 2005 level of 6,500 t, but the amount was insignificant compared with Japan's annual requirements for primary aluminum. In 2006, imports of primary aluminum increased by 2.0% to 3,036,058 t, of which 1,898,634 t was ingot and

1,137,424 t, aluminum alloys (World Bureau of Metal Statistics, 2007, p. 21).

About 50% of the total primary aluminum imports were from Japan's overseas aluminum smelter projects in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, and Venezuela. In 2006, Japan imported primary aluminum and aluminum alloy from more than 50 countries worldwide. Among those countries, the major suppliers were Russia (23.5%), Australia (19.4%), China (11.9%), Brazil (7.3%), New Zealand (7.1%), Indonesia and South Africa (5.5% each), Canada (4.9%), the United Arab Emirates (3.2%), and Venezuela (3.1%). The United States supplied 25,181 t and accounted for only 0.8% of Japan's imports of primary aluminum and aluminum alloys in 2006 (World Bureau of Metal Statistics, 2007, p. 21).

Consumption of primary aluminum totaled about 2.32 million metric tons (Mt). Exports of primary aluminum totaled 24,314 t, of which aluminum ingots accounted for 5,363 t, and aluminum alloys, 18,951 t. The total exports were valued at \$73.1 million (World Bureau of Metal Statistics, 2007, p. 21).

Overall domestic demand for aluminum mill products by end use increased to 4.45 Mt from 4.35 Mt in 2005. Domestic demand for aluminum mill products by end use was 39.4% for transportation, 15.3% for building and construction, 11.5% for fabricated metal, 9.8% for food packaging, 4.1% for industrial machinery, 4.0% for electrical appliance and communication machinery, 4.9% for exports, and 10.9% for other uses (Japan Aluminum Association, 2007).

**Chromium.**—Japan relied on imports to meet all its chromium ore and concentrate requirements for the production of chromium and ferrochromium metal powder. According to the Ministry of Finance's trade statistics, Japan's imports of chromium ore and concentrate dropped by 31.1% to 136,362 t and were valued at \$26.4 million in 2006. The major suppliers were India (68.3%), South Africa (13.2%), the Philippines (10.2%), and Turkey (3.7%) (TEX Report, The, 2007f).

Domestically produced ferrochromium rebounded in 2006 to 13,058 t from 12,367 t in 2005. Imports of ferrochromium decreased by 13.8% to 879,213 t and were valued at \$768 million. The major overseas suppliers of ferrochromium were South Africa (52.8%), Kazakhstan (30.9%), India (6.4%), Russia (5.0%), Zimbabwe (2.4%), and China (2.0%) (Ministry of Economy, Trade and Industry, 2006c, p. 37; TEX Report, The, 2007d).

Consumption of ferrochromium decreased slightly to 915,915 t in 2006 from 922,799 t in 2005, of which 866,183 t was high-carbon ferrochromium and 49,732 t, low-carbon ferrochromium (Ministry of Economy, Trade and Industry, 2006c, p. 215). Exports of ferrochromium decreased by 10.1% to 3,141 t, of which 3,089 t was low-carbon ferrochromium and 52 t, high-carbon ferrochromium. Export earnings of ferrochromium were \$11.1 million in 2006. The principal buyers of low-carbon ferrochromium were the United States (81.5%) and Thailand (10.0%). The principal buyers of high-carbon ferrochromium were Indonesia (35.3%), the Republic of Korea (25.2%), and Thailand (22.3%) (TEX Report, The, 2007c).

In 2006, the sole producer of chromium metal was Nippon Denko Co. Ltd., which operated an 800-t/yr plant at Oshima in Toyama Prefecture; the plant used the aluminothermic reduction

method. Nippon Denko produced about 700 t of chromium metal in 2006. The amount of chromium metal production by JEP Materials Co. Ltd., which had a 1,000-t/yr plant that used the silicothermic method at Shinninato in Toyama Prefecture, was not available. To supplement the domestic chromium metal production shortfall, Japan imported 5,582 t of chromium metal powder, which was valued at \$56 million. The major suppliers were China (56.1%), the United States (15.3%), Russia (12.5%), France (8.7%), and the United Kingdom (5.2%) (Arumu Publishing Co. Ltd., 2007, p. 94; TEX Report, The, 2007e).

In Japan, chromium metal was consumed mainly for the manufacture of electronic materials, heat-resisting steel, nonferrous alloys and superalloys, welding rods, and other uses. Domestic demand for chromium metal was estimated to be more than 5,500 t in 2006. The main end users were the manufacturers of superalloys, which accounted for more than 50%; of nonferrous alloys, about 20%; and of welding rods and other materials, 25%.

**Cobalt.**—Japan relied 100% on imported cobalt matte mainly from Australia, Canada, and Finland and on imported intermediate products of nickel-cobalt-mixed sulfide mainly from the Coral Bay Nickel Project on Palawan Island in the Philippines for cobalt metal production by Sumitomo Metal Mining Co. Ltd. (SMM) at its Niihama nickel-cobalt refining complex in Ehime Prefecture on Shikoku Island. SMM was the sole producer of cobalt metal and cobalt salt in 2006. The company's cobalt refining capacity had been expanded to about 1,000 t/yr in 2005 because of increased feed materials (nickel-cobalt-mixed-sulfide) imported from Coral Bay Nickel Corporation (54% owned by SMM) in the Philippines, which had begun operation in April 2005 (Cobalt Development Institute, The, 2007).

Refined cobalt production rose sharply by 95.7% to 920 t in 2006 from 470 t in 2005. The 2006 sharp increase in cobalt metal production reflected increased feed from the Coral Bay Nickel Project. To meet domestic requirements, Japan imported a total of 12,696 t of cobalt matte, cobalt ingots, cobalt powder, and cobalt scrap worth \$405 million in 2006. The major suppliers were Finland (34.5%), Australia (19.6%), Canada (15.7%), Zambia (9.2%), Norway (7.2%), Belgium (3.6%), and the United States (2.2%) (TEX Report, The, 2007e). In 2006, Japan also imported 370 t of cobalt oxide and 1,494 t of cobalt hydroxide. The principal suppliers of cobalt oxide were Taiwan (55.4%) and Belgium (32.2%). The major suppliers of cobalt hydroxide were the United States (55.6%), Taiwan (30.1%), and Belgium (11.0%) (Arumu Publishing Co. Ltd., 2007, p. 76).

According to Government statistics, domestic demand for cobalt metal decreased slightly by 0.6% to 2,996 t in 2006, of which 31% was for specialty steel; 16%, for pipe, plate, rod and wire; 14%, for ultra hard tool steel; 11%, for catalysts; 9%, for magnetic materials; and 19%, for other end uses (Ministry of Economy, Trade and Industry, 2006c, p. 284-285). According to an estimate by Mitsui & Co. Ltd., Japan's overall demand for cobalt, which included cobalt ingot, powder, and salt, increased to about 14,000 t in 2006 from 13,000 t in 2005. Japan was the world's leading consumer of cobalt and accounted for about 25% of the world's total consumption, which was estimated to be 55,200 t in 2006 (Arumu Publishing Co. Ltd., 2007, p. 74).

**Copper, Lead, and Zinc.**—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's only lead and zinc mining company. The mine was permanently closed by Nippon Mining and Metals Co. Ltd. (the parent company of Toyoha Mining) at the end of March because the mine's ore reserves were depleted. For the first 3 months of 2006, the mine produced 7,169 t of zinc and 777 t of lead in concentrates; the mine also produced about 7.3 t of byproduct silver and small amounts of copper and indium (Ministry of Economy, Trade and Industry, 2006d, p. 138). In 2006, Japan relied on imported ores and concentrates to meet 88% of the raw materials requirements of its copper smelters and refineries; 48% of the raw material requirements of its lead smelters and refiners, and 80% of the raw material requirements of its zinc smelters and refineries (Japan Mining Industry Association, 2007, p. 58, 71, 85, Appendix p. 16-17).

Japan was one of the world's major markets of copper, lead, and zinc concentrates. In 2006, Japan's imports of copper ore and concentrates (in metal content) increased by 0.6% to 1,327,000 t from 1,319,000 t in 2005. The major suppliers of copper concentrate in terms of metal content were Chile (47.9%), Indonesia (17.9%), Canada (10.6%), Australia (9.0%), Peru (5.7%), Papua New Guinea (4.3%), the United States (1.4%), and the Philippines (1.2%). Japan's imports of lead ore and concentrates (in metal content) decreased by 8.5% to 93,630 t from 102,340 t in 2005. The major suppliers of lead ore and concentrate in terms of metal content were Australia (53.4%), the United States (34.1%), Peru (5.4%), and Canada (5.0%). Japan's imports of zinc ore and concentrates (in metal content) increased by 12.4% to 595,464 t from 529,995 t in 2005. The major suppliers of zinc ore and concentrate in terms of metal content were Australia (37.0%), Peru (23.8%), the United States (12.1%), Bolivia (10.6%), Mexico (4.7%), Canada (4.4%), Chile (2.7%), and India (1.8%) (Japan Mining Industry Association, 2007, p. 59, 76, 90).

To secure a long-term stable supply of the raw materials required by Japan's nonferrous metals smelters and refineries, Pan Pacific Copper Co. Ltd. (PPC) (a joint venture of Nippon Mining and Metals and Mitsui Mining and Smelting Co. Ltd.) through its wholly owned subsidiary PPC Canada Enterprise Corp. offered to acquire 90.1% equity interest in Regalito Copper Corp. in March 2006. As required by the acquisition agreement, PPC Canada acquired shares of Regalito Copper for \$137 million in May 2006. Regalito Copper, which was a copper exploration company, operated and held exploration rights in the Regalito copper mine district, which is located about 115 kilometers (km) southeast of Copiapo in Region III, Chile. The 46,000-hectare area was estimated to have copper ore reserves (in the measured and indicated category) of 628 Mt at a grade of 0.43% copper using a 0.25% copper cutoff grade. According to PPC, the company planned to conduct a copper feasibility study during 2006 and 2008 and to construct a smelter in 2010. The company planned to start operations in 2011 and produce 100,000 to 150,000 t/yr of copper cathode. According to JOGMEC, with PPC's acquisition of Regalito Copper, Japan acquired its first 100% owned overseas copper mine (Metals Place, 2006b, c, f; PRNewsWire, 2006; Japan Oil, Gas and Metals National Corp., 2007).

In September 2006, Sumitomo Corp. (SC), which was one of Japan's major trading companies, formed a strategic alliance with Apex Silver Mines Ltd. of the United States to acquire a 35% equity interest in Apex Silver Mines' San Cristobal open pit lead-silver-zinc project for \$224 million plus future payments from the latter's shares of metal production. In connection with the acquisition, SC also was granted a 2-year option to earn a 35% interest in certain of Apex Silver Mines' exploration projects in Argentina, Bolivia, Mexico, and Peru. The San Cristobal lead-silver-zinc project is located at 3,800 to 4,500 meters above sea level near the Salar of Uyuni in Nor Lipez Province of the Potosi Department and about 500 km south of La Paz, Bolivia. According to an estimate by Apex Silver Mines, the San Cristobal Mine has about 19.1 Mt of oxide ore at grades of 119.6 grams per metric ton (g/t) silver, 0.07% zinc, and 0.60% lead and 196.5 Mt of sulfide ore at grades of 54.6 g/t silver, 1.74% zinc, and 0.56% lead. The total minable reserves are 215.6 Mt at grades of 60.3 g/t silver, 1.6% zinc, and 0.56% lead. The San Cristobal project was expected to be the leading producer of silver and zinc in the world. According to the company's operating plan, during the first 5 years, the mine production was expected to average 271,000 t/yr of zinc, 86,000 t/yr of lead, and 659 t/yr of silver. With its expected mine life of 16 years, the mine's annual production was expected to average 200,000 t of zinc, 62,000 t of lead, and 594 t of silver. The company was expected to start its initial production in the third quarter of 2007 (Japan Corporation News Network, 2006; Mining Journal, 2006b; Apex Silver Mines Ltd., 2007).

SC and SMM jointly announced in December 2006 that they and their joint-venture partner Rio Tinto Ltd. of Australia had approved the development of a new ore body named E48 at the Northparkes Mine in New South Wales, Australia, at a cost of about \$160 million. The ore reserves at the E48 ore body were estimated to be 35 Mt at grades of 1.04% copper and 0.46 g/t gold. The development of the E48 ore body was scheduled to begin in April 2009, after the approval was received from the New South Wales Department of Planning. The development of the E48 ore body would extend the Northparkes mining operation for 7 years to 2016 (table 7; Sumitomo Metal Mining Co. Ltd., 2006e).

In 2006, Japan's metal production of copper increased by 9.8% to more than 1.5 Mt mainly because of capacity expansions at the Tamano refinery to 260,000 t/yr from 228,000 t/yr and at the Toyo refinery (Bessi refinery) to 410,000 t/yr from 365,000 t/yr, as well as increased domestic demand for copper. Metal production of refined lead increased by 2.0% owing to a sharp increase in domestic demand for storage batteries. Metal production of slab zinc decreased slightly owing to the higher than normal level of inventory that accumulated during the previous year and stagnant domestic demand (Ministry of Economy, Trade and Industry, 2006c, p. 270, 272, 276).

During 2006, SMM continued to undertake its copper expansion project at the Toyo smelter and refinery complex at Saijyo, Ehime Prefecture. The copper-refining capacity was increased to 410,000 t/yr at the end of fiscal year 2006 (March 31, 2007) and was expected to be increased further to 450,000 t/yr before the end of fiscal year 2008 (March 31, 2009). The acquisition of a 16.8% equity interest in

the Cerro Verde copper mine in Peru, which had commenced production in February 2006, was part of the strategy to increase and secure up to 60% of the company's proprietary ore ratio for copper (captive copper ore and concentrate to feed the planned increase in the refined copper production capacity at the Toyo Smelter) (Sumitomo Metal Mining Co., Ltd., 2007, p. 11).

Mitsui Mining and Smelting and Nippon Mining and Metals, which had integrated the copper refining operations of Mitsui Mining and Smelting's Hibi Kyodo Smelting Co. Ltd. in Tamano, Okayama Prefecture, and Nippon Mining and Metals' Nikko Smelting and Refining Co. in Hitachi, Ibaraki Prefecture, and Saganoseki, Oita Prefecture, and transferred them to PPC in December 2005, reportedly would invest about \$39 million to add a new ship in the summer of 2008 to transport copper concentrate to their nonferrous metals processing complexes. PPC's refining capacity was 710,000 t/yr in 2006 (Pan Pacific Copper Co. Ltd., 2006). The new vessel would increase the companies' overall annual transport volume of copper concentrate and related raw materials by 63% to 215,000 t. The vessel would transport copper concentrate from Chile to Japan and to the Japan-Korea copper-refining joint venture LS Nikki Copper Inc. in the Republic of Korea. The vessel also would transport exports of sulfuric acid (byproduct of copper refining) from Japan to Chile (Metals Place, 2006a).

In 2006, imports of refined copper increased by 1.6% to 75,229 t. The major suppliers of refined copper were Chile (40%), Peru (20%), the Philippines (8%), Australia (5.3%), and Zambia (2.7%). Imports of refined lead increased sharply by 83.4% to 34,955 t. The dominant supplier of refined lead was China (99.3%). Imports of slab zinc decreased by 11.4% to 45,649 t. The major suppliers of slab zinc were China (23.3%), Peru (23.0%), Namibia (15.2%), Argentina (7.5%), Australia (5.4%), Canada (5.3%), and Brazil (4.9%) (Ministry of Economy, Trade and Industry, 2006c, p. 270, 272; Japan Mining Industry Association, 2007, p. 59, 76, 91).

In 2006, domestic demand for refined copper increased by 4.4% to 1.25 Mt. Domestic demand for refined copper, by sector, was 780,232 t for wire and cable; 452,408 t, for brass mill products; and 19,551 t, for others. In 2006, exports of refined copper increased by 25.7% to 319,815 t. The major buyers of refined copper were China (42.2%), Taiwan (35.2%), the Republic of Korea (8.4%), Indonesia (5.3%), Thailand (3.6%), and the United States (2.2%). Exports of unrefined copper (blister) and anode copper decreased by 21.3% to 9,292 t. Unrefined copper and copper anodes were exported mainly to the Republic of Korea (46.6%), Taiwan (20.1%), China (12.5%), and Hong Kong (10.5%) (Ministry of Economy, Trade and Industry, 2006c, p. 270; Japan Mining Industry Association, 2007, p. 59).

In 2006, domestic demand for refined lead increased by 69.9% to 244,731 t, of which 215,349 t was for storage batteries; 11,865 t, for inorganic chemicals; 4,398 t, for solder; 2,389 t, for lead pipe and sheet; and 6,326 t, for other uses. Exports of refined lead increased by 3.9% to 4,404 t. The major buyers of refined lead were Indonesia (41.2%), Taiwan (39.8%), and China (12.0%) (Ministry of Economy, Trade and Industry, 2006c, p. 272; Japan Mining Industry Association, 2007, p. 76).

In 2006, domestic demand for slab zinc increased by 2.6% to 469,523 t, of which 219,376 t was for galvanized sheet; 75,332 t, for other galvanizing uses; 67,281 t, for brass mill products; 48,484 t, for die-cast alloy; 32,816 t, for inorganic chemicals; and 26,234 t, for other uses (Ministry of Economy, Trade and Industry, 2006c, p. 274). Exports of zinc slab increased by 36.6% to 73,369 t. The major buyers were Taiwan (29.8%), Indonesia (22.5%), Vietnam (13.7%), the Philippines (8.0%), Bangladesh (6.5%), Malaysia (5.4%), and Thailand (2.7%) (Ministry of Economy, Trade and Industry, 2006c, p. 276; Japan Mining Industry Association, 2007, p. 91).

**Gold and Silver.**—Mine production of gold was mainly by SMM from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko, Sanjin, and Yamada deposits in the Hishikari mining area, produced about 190,000 t of ore that averaged 39.4 g/t gold in 2006 (Japan Mining Industry Association, 2007, p. 123). Other small-scale gold and silver mines were the Arkesi and the Kasuga Mines in Kagoshima Prefecture. In 2006, Toyoha Mining produced only a small amount of Japan's mined silver as a byproduct of lead and zinc mining operations from the Toyoha Mine in Hokkaido Prefecture because the mine was permanently closed at the end of March 2006. Japan's overall mine production of gold and silver was about 8,820 kilograms (kg) and 18,751 kg, respectively (Ministry of Economy, Trade and Industry, 2006d, p. 138).

In February 2006, SMM (51%) and its partners Teck Cominco Ltd. of Canada (40%), and SC (9%) completed construction of the Pogo gold mine, which is located about 145 km southeast of Fairbank, Alaska. Gold production began on February 12, 2006, which was 1 month ahead of the originally scheduled date. The project was proceeding with the rampup of production toward full capacity. During the second half of 2006, the designed throughput was found to be unsustainable because of inadequate tailing filtration capacity. The mine reportedly was operated at between 50% and 60% of design capacity. Full capacity production was expected after installation of a third filter in the first quarter of 2007 (Sumitomo Metal Mining Co. Ltd., 2006b, c, f).

The total estimated capital cost of the Pogo gold mine had been revised three times to \$378 million in August 2006 from \$357 million in October 2005 and \$321 million in March 2005 compared with the original estimate of about \$280 million in 2004. The 2006 estimated capital cost reflected installation of a third filter, modification of the handling system for filter tailings to boost production capacity in 2006, and higher than expected contractor, equipment, fuel, labor, and steel costs in Alaska during the construction period (Metals Place, 2006d; Mining Journal, 2006a).

The Pogo gold mine was claimed by SMM as one of the highest quality gold deposits in the world with an estimated resource of 152 t of gold. The company estimated that gold production at full capacity would total 12 t/yr, or 385,000 troy ounces per year, of which SMM would receive 6.12 t/yr for approximately 10 years (Mining Journal, 2006a).

In 2006, metal production of primary gold decreased by 1.4%. Metal production of primary silver, however, increased by 2.3% owing to an increased supply of raw materials and scrap inputs

from domestic sources at silver refineries. Imports of gold (ingot and powder) dropped sharply by 57.7% to 30,278 kg and were valued at \$1.01 billion. The major suppliers of gold ingot and powder were Australia (44.6%), Uzbekistan (27.7%), Canada (11.5%), the United Kingdom (5.2%), and Hong Kong (5.1%). Imports of silver (ingot and powder) increased by 42.7% to 1,839 t and were valued at \$666 million. The major suppliers of silver ingots and powder were the Republic of Korea (33.6%), Mexico (23.7%), Peru (19.1%), Australia (10.8%), and the United States (7.0%) (Japan Mining Industry Association, 2007, p. 33, 46).

In 2006, the demand for gold, which included dental, medical, electrical, and electronic uses; industrial arts and crafts; jewelry; and private investment, decreased by 32.1% to 202,600 kg from 298,000 kg in 2005 mainly owing to a sharp decline in private investment. The demand for gold by end use was for dental and medical uses, which increased to 21,500 kg from 20,900 kg in 2005; electrical, electronic, and communication apparatus, which increased to 106,200 kg from 100,700 kg; private hoarding, which decreased to a negative 44,000 kg from a positive 81,000 kg; gold plating, which increased to 21,900 kg from 20,100 kg; jewelry, which increased sharply to 39,100 kg from 20,500 kg; industrial arts and crafts, which decreased to 4,600 kg from 4,800 kg; pottery and porcelain, which decreased to 1,300 kg from 1,400 kg; decorations and badges, which increased to 1,400 kg from 1,200 kg; and other uses, which increased to 48,600 kg from 45,600 kg (table 4; Arumu Publishing Co. Ltd., 2007, p. 125).

Demand for silver increased by 2.9% to 2,242 t in 2006. Demand for silver by end use was for silver nitrate used for photography, 1,005 t; silver nitrate for other purposes, 308 t; for electrical contacts, 189 t; rolled products, 221 t; brazing alloy (silver solder), 107 t; and other uses, 412 t (table 5; Ministry of Economy, Trade and Industry, 2006c, p. 290).

Exports of gold ingot and powder increased sharply by 230% to 66,778 kg in 2006 and were valued at \$1,291.6 million. The major buyers of refined gold ingot and powder were the United Kingdom (52.0%), Australia (27.3%), Singapore (6.7%), Hong Kong (5.4%), and Switzerland (1.8%). Exports of silver ingot and powder increased by 43.4% to 1,605.2 t in 2006 and were valued at \$144.9 million. The major buyers of refined silver and powder were China (22.9%), the Republic of Korea (18.3%), the Philippines (11.6%), Taiwan (10.9%), Singapore (9.0%), Hong Kong (5.5%), Malaysia (5.2%), and the United States (4.4%) (Japan Mining Industry Association, 2007, p. 34, 47).

**Iron and Steel.**—Japan relied on imports to meet all the iron ore requirements of its iron and steel industry. In 2006, imports of iron ore increased by 1.6% to 134.4 Mt and were valued at \$7.14 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore was \$53.14 per metric ton compared with \$42.23 per metric ton in 2005 and \$29.56 per metric ton in 2004. The major suppliers of iron ore were Australia (59.5%), Brazil (22.7%), India (7.0%), South Africa (3.9%), the Philippines (3.7%), Canada (1.1%), and Chile (1.0%). Imports of pig iron increased by 37.2% to 1.43 Mt and were valued at \$479.49 million. The average c.i.f. import price of pig iron was \$336.41 per ton compared with \$312.33 per ton in 2005, and \$291.86 per ton in 2004. The major suppliers of pig iron were

China (51.3%), Russia (20.9%), India (12.6%), Brazil (7.1%), Taiwan (4.5%), South Africa (1.6%), and North Korea (1.4%) (TEX Report, The, 2007b, g).

In 2006, pig iron production increased by 1.4% to about 84.3 Mt, of which 83.7 Mt was for steelmaking, and 533,900 t, for foundry. The iron manufacturing capacity increased to 83.9 Mt/yr from 83.3 Mt/yr in 2005. The number of furnaces for iron manufacturing remained unchanged at 30; the number of blast furnaces, at 28; and other furnaces, at 2 (Ministry of Economy, Trade and Industry, 2006c, p. 32, 107).

In 2006, Japan's crude steel production increased by 3.3% to 116.2 Mt, of which 85.9 Mt was processed by basic oxygen furnaces (LD converters), and 30.3 Mt, by electric arc furnaces (EAFs). The total steel manufacturing capacity increased by 3.7% to 128.7 Mt/yr from 124.1 Mt/yr in 2005. The number of EAFs for steel manufacturing decreased to 410 from 412 in 2005. The number of basic oxygen furnaces (LD converters) remained unchanged at 63; the LD converter manufacturing capacity increased to 88.8 Mt/yr from 84.2 Mt/yr in 2005. The number of EAFs decreased to 347 from 349 in 2005 and the manufacturing capacity of the EAFs remained unchanged at 40 Mt/yr (Ministry of Economy, Trade and Industry, 2006c, p. 44, 107).

According to the International Iron and Steel Institute, Japan was the world's second ranked producer of crude steel and accounted for 9.4% of the world total in 2006. Among Japan's top four steelmakers, Nippon Steel Corp., which produced 32.7 Mt of crude steel, was the second ranked steel-producing company in the world after ArcelorMittal of Luxembourg, which was established after the merger of Arcelor and Mittal Steel in 2005. JFE Steel Corp., which produced 32.0 Mt, ranked 3d; Sumitomo Metal Industries, Ltd., which produced 13.6 Mt, ranked 18th; and Kobe Steel Ltd., which produced 7.7 Mt, ranked 34th (International Iron and Steel Institute, 2007, p. 3-4).

In December 2006, Nippon Steel and Companhia Vale do Rio Doce of Brazil signed a strategic alliance agreement that provides for administrative cooperation in joint projects and in the investigation of new joint coal and iron ore development projects, and mutual cooperation on ferroalloys production. Also in December 2006, Nippon Steel and Pohang Iron and Steel Co. Ltd. (POSCO) of the Republic of Korea agreed to jointly conduct annual benchmark price negotiations for iron ores beginning in fiscal year 2007 and to jointly conduct market studies on the worldwide supply and demand situation for iron ores (Nippon Steel Corp., 2006a, b).

In December 2006, JFE Steel and ThyssenKrupp Stahl AG of Germany agreed to extend for another 5 years, beginning in April 2007, the comprehensive cooperation agreement on automotive steel sheet and related research and development that the two companies had signed in April 2002. In September 2006, JFE Steel signed a basic agreement with Dongkuk Steel Mill Ltd. of the Republic of Korea to strengthen their existing partnership through an expansion of their capital ties. Under the basic agreement, the two companies agreed to finalize three separate agreements to 1) cooperate in Dongkuk Steel's construction of a 1.5-Mt/yr plate mill in Dangjin, Republic of Korea, 2) provide manufacturing technology support for production of high-grade steel plate, and 3) continue to provide

stable supplies of slab for high-grade steel plate production. Under the basic agreement, JFE Steel would increase its equity stake in Dongkuk Steel to 15% from 4%, and Dongkuk Steel would increase its equity shares of JFE Holdings to \$86 million (¥10 billion) from \$43 million (¥5 billion) by the end of September 2007 (JFE Steel Corp., 2006a, b).

According to data compiled by the Japan Iron and Steel Federation, Japan's demand for steel, as measured by domestic orders for ordinary and specialty steel products, increased by 3.2% to about 70.1 Mt, of which 56.4 Mt was ordinary steel products and 13.7 Mt, specialty steel products. The increased domestic demand for steel in 2006 was a result of increased demand in every category of end use. Demand for steel by the manufacturers of automobiles and by the manufacturers of industrial machinery and equipment reached the highest level to date with a 4.1% increase and a 12.5% increase, respectively. Increased demand for steel from motor vehicle manufacturers reflected increased production of four-wheel-drive vehicles for export. Increased orders from industrial machinery and equipment were owing to increased exports of mining machinery for the development of worldwide resources (table 5; Japan Iron and Steel Federation, 2007a).

In 2006, exports of iron and steel increased by 7.9% to 35.2 Mt, of which 81.4% went to the Asia and the Pacific region; 6.7%, to North America; 4.4%, to the Middle East; 4.2%, to Latin America; 2.2% to the European Union (15 countries) and Russia; and 1.1%, to Africa. Among the major buyers, exports of iron and steel to the Republic of Korea, represented 24.9% of the total compared with 23.7% in 2005; to China, 17.6% compared with 17.7% in 2005; to Thailand, 10.6% compared with 12.6% in 2005; to Taiwan, 10.0% compared with 11.1% in 2005; and to the United States, 5.7% compared with 4.4% in 2005. In terms of export volume, the Republic of Korea remained the leading market for Japan's iron and steel exports. Thailand was the only country to which Japan's exports of iron and steel continuously increased during the past 5 years (table 6). Of the total exports of iron and steel in 2006, 24.3 Mt was ordinary steel products; 5.3 Mt, specialty steel products; 4.5 Mt, steel ingots and semifinished products; 0.63 Mt, secondary products; 39,000 t, pig iron; and 338,000 t, others (including cast-iron pipes, clad plate, and ferroalloys). In 2006, export earnings from iron and steel products increased by 8.0% to \$32,011 million (Japan Iron and Steel Federation, 2007b).

In 2006, imports of iron and steel products decreased by 4.6% to 8.0 Mt owing mainly to an 11.4% decrease in imports of ordinary steel products; the import bill for iron and steel decreased by 9.7% to \$6,892 million. Of the total imports, 3.7 Mt was ordinary steel products; about 3.5 Mt was ferroalloys, pig iron, semimanufactured steel, and steel ingot; 592,000 t was secondary steel wire and other secondary steel products; and 237,000 t was specialty steel products. Of the ordinary steel products imported, imports of hot-rolled sheets and strips decreased by 2.8% to 1.6 Mt and those of cold-rolled sheets and coils decreased by 21.1% to 0.91 Mt. Imports of specialty steel products decreased by 19.4% to 237,000 t. The major suppliers of ordinary steel products were the Republic of Korea (57.3%), Taiwan (24.3%), and China (15.7%) (Japan Iron and Steel Federation, 2007b).



**Manganese.**—Japan relied on imports to meet all its manganese raw material requirements for the iron and steel and EMD industries. In 2006, Japan imported 960,163 t of high-grade manganese ore valued at \$155.8 million; 77,548 t of high-grade manganese dioxide ore valued at \$12.7 million; and 5,671 t of low-grade manganese ore valued at \$0.7 million. The major suppliers of high-grade manganese ore were South Africa (60.3%) and Australia (35.7%). South Africa supplied 95.5% of Japan's low-grade manganese ore imports and Australia supplied 98.6% of Japan's high-grade manganese dioxide ore imports (TEX Report, The, 2007g).

Production of ferromanganese decreased by 9.5% to 406,200 t, and production of silico-manganese decreased by 37.3% to 59,424 t (Ministry of Economy, Trade and Industry, 2006c, p. 34, 36). Imports of ferromanganese increased by 58.2% to 97,800 t. The major suppliers were China (48.9%), the Republic of Korea (19.3%), Australia (16.9%), South Africa (12.7%), Taiwan (2.0%), and India (1.5%). Japanese imports of silico-manganese increased by 16.6% to 273,400 t. The principal suppliers were China (73.6%), Ukraine (10.2%), Kazakhstan (6.2%), and Australia (4.1%). The import bill for ferromanganese and silico-manganese totaled \$252.4 million (TEX Report, The, 2007d).

Consumption of high- and low-carbon ferromanganese for steel manufacturing increased by 6% to 444,000 t, of which 378,000 t was high-carbon ferromanganese and 66,000 t, low-carbon ferromanganese. Consumption of silico-manganese increased by 19% to 363,000 t (Ministry of Economy, Trade and Industry, 2006c, p. 215). Exports of ferromanganese decreased by 13.5% to 8,300 t. The major buyers were the United States (42.2%), Taiwan (19.2%), Malaysia (14.5%), Thailand (10.2%), and Singapore (4.8%). Export earnings from ferromanganese totaled \$9.6 million (TEX Report, The, 2007c).

**Nickel.**—Japan was the world's leading importer and consumer of nickel, but relied on imports to meet all its nickel raw material requirements. In 2006, Japan was the world's third ranked producer of nickel metal after Russia and Canada (World Bureau of Metal Statistics, 2007, p. 104). Nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide and powder, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel were imported to meet the nickel requirements of the battery, catalyst, magnetic material, nonferrous alloy, plating, and specialty steel industries, and other end users.

In 2006, imports of nickel ore, in gross weight, dropped by 11.5% to 4.21 Mt and were valued at \$339.2 million. The suppliers of nickel ore were Indonesia (51.9%), New Caledonia (24.7%), and the Philippines (23.4%). Imported nickel ore from Indonesia contained 36,600 t of nickel; from New Caledonia, 17,800 t of nickel; and from the Philippines, 16,600 t of nickel. Imports of nickel matte, in gross weight, held steady at 106,400 t and were valued at \$1.46 billion. Imported nickel matte from Indonesia contained 70,430 t of nickel, which accounted for 88.3% of total nickel matte imported in 2006; Australia, 8,786 t of nickel, which accounted for 11%; and China, 540 t of nickel, which accounted for 0.7% (Japan Mining Industry Association, 2007, p. 99; TEX Report, The, 2007e, g).

Imports of ferronickel, in gross weight, decreased by 7.3% to 44,700 t and were valued at \$224.5 million. Ferronickel imported from New Caledonia contained 8,848 t of nickel, which accounted for 65.1% of the total ferronickel imported in 2006; from Colombia, 2,642 t of nickel, which accounted for 19.4%; the Dominican Republic, 1,511 t, which accounted for 11.1%; Indonesia, 408 t, which accounted for 3.0%; and other countries, 180 t, which accounted for 1.3%. Imports of refined nickel decreased by 4.6% to 47,500 t and were valued at \$1.05 billion. The major suppliers of refined nickel were Norway (19.2%), Russia (17.4%), Australia (14.0%), South Africa (12.3%), Zimbabwe (10.0%), Brazil (9.7%), Canada (7.0%), the United Kingdom (6.2%), and China (2.4%). Imports of nickel oxide sinter, in gross weight, increased by 26.2% to 963 t and were valued at \$14.6 million; Australia was the single dominant supplier of nickel oxide and accounted for 96.7% (Japan Mining Industry Association, 2007, p. 99; TEX Report, The, 2007c, e, g).

In January 2006, Dynatec Corp. of Canada and SC announced that the finalized arrangements were made with Impala Platinum Holding Ltd. (Implats) to allow Dynatec and SC to proceed with the Ambatovy nickel laterite development project in Madagascar. As a result of these arrangements, Implats had withdrawn from the project and Dynatec equity ownership in the project increased to 75%; SC's interest was 25%. Dynatec and SC reportedly were seeking a third partner to the project. At the same time, the two companies were undertaking a \$25 million work program to revise and update the 2005 feasibility study. The work program was scheduled to be completed by April 2006. The Ambatovy project is a large-scale nickel-cobalt project that is located about 80 km east of the Madagascar capital Antananarivo. According to Dynatec's 2005 feasibility study, the Ambatovy project's nickel mine could produce 60,000 t/yr of nickel, 5,600 t/yr of cobalt, and 186,000 t/yr of ammonium sulfate. Ambatovy's project life was estimated to be about 27 years. The average cash operating cost for the first 10 years was estimated to be \$0.67 per pound of nickel. The total capital cost was estimated to be \$2.25 billion. The mine construction was expected to begin in June 2006, and the production of nickel was scheduled to begin in 2008 (Mining Journal, 2005; Metals Place, 2006g).

On October 30, 2006, Dynatec announced the signing of a shareholders agreement for the Ambatovy nickel project. According to the agreement, Dynatec would retain a 40% ownership interest and was appointed as the project operator; SC and a Republic of Korea consortium (led by the Korea Resources Corp., and including Daewoo International Corp., Keangnam Enterprise Ltd., and STX Corp.) would each hold a 27.5% interest in the project; and SNC-Lavalin Inc. would own a 5% interest (Dynatec Corp., 2006; Reuters Ltd., 2006).

SMM and Sumic Nickel Netherlands, which was a joint venture of SMM (52.38%) and Mitsui & Co. (47.62%), signed an agreement with Inco Ltd. of Canada in April 2005 to acquire a 21% equity interest in Goro Nickel S.A. for \$150 million. Inco's Goro nickel-cobalt project, which is located in New Caledonia, is owned by Inco (69%), Sumic Nickel Netherlands (21%), and New Caledonia's three Provinces (10%). The Goro nickel-cobalt project, which will use hydrometallurgical process (HPAL) technology, was scheduled to produce about 60,000

t/yr of nickel in nickel oxide and between 4,000 t/yr and 5,000 t/yr of cobalt in cobalt carbonate by mining and treating about 4 Mt/yr of ore. In 2006, Inco's Goro nickel-cobalt project was acquired by the Brazilian company Companhia Vale do Rio Doce, which moved slowly toward an end-of-2008 target date for production startup because of opposition from environmental groups, Kanak communities, and unions despite the completion of construction of most of the mining and processing facilities at the mine site. Under the agreement, Sumic Nickel Netherlands was obligated to provide its share of the financing required to complete the project and to buy its share of the nickel and cobalt (about 6,600 t/yr of nickel oxide and 500 t/yr of cobalt carbonate) produced from Goro (Mining Watch Canada, 2006; Sumitomo Metal Mining Co. Ltd., 2006a; 2007, p. 22).

To secure nickel resources, SMM was planning to explore for nickel and cobalt on Santa Isabel in the Solomon Islands, and the Department of Mines had issued SMM a letter of intent before issuing a prospecting license. In 2006, SMM reportedly was developing low-grade ore using the HPAL technology and undertaking an exploration project (Metals Place, 2005; Sumitomo Metal Mining Co. Ltd., 2007, p. 13, 19).

In 2006, production of ferronickel, in gross weight, decreased by 14.1% to about 335,900 t; the ferronickel contained about 66,100 t of nickel. Ferronickel producers were Pacific Metals Co. Ltd. of Hachinohe, Aomori Prefecture, which produced 35,532 t of nickel; SMM of Hyuga, Miyazaki Prefecture, which produced 18,757 t of nickel; and YAKIN Oheyama Co. Ltd. at Oheyama near Miyazu, Kyoto Prefecture, which produced 11,769 t of nickel (Arumu Publishing Co. Ltd., 2007, p. 68).

Consumption of ferronickel for steel manufacturing, in gross weight, decreased by 8.7% to 305,847 t in 2006 (Ministry of Economy, Trade and Industry, 2006c, p. 215). Exports of ferronickel increased by 5.8% to 132,900 t and were valued at \$533.6 million, 49.2% of which went to the Republic of Korea; 40.8%, to Taiwan; and 10.0%, to China (TEX Report, The, 2007c).

Refined nickel was produced solely by SMM at its nickel refinery in Niihama, Ehime Prefecture. The 36,000-t/yr refinery used its own matte-chlorine-leaching-electrowinning (MCLE) technology to process imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and export. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce briquettes, granules, and nickel oxide sinters for domestic consumption and export.

After SMM began commercial operation of a processing plant at the Coral Bay Nickel Project in the Philippines in 2005, SMM announced in April 2006 that it had finalized plans to double the production capacity of the high-pressure acid leach (HPAL) plant at its affiliate Coral Bay Nickel Corp. (CBNC), which is located at Rio Tuba in the southern part of Palawan Island. According to SMM, the successful ramping-up of the operation encouraged SMM to build the second line; the new production line would be constructed at an investment of \$285 million with production planned to begin in April 2009. CBNC produced nickel-cobalt mixed sulfide, which contain 55%, or 10,000 t, nickel and 700 t cobalt (Sumitomo Metal Mining Co. Ltd., 2006d).

In 2006, the domestic demand for refined nickel decreased by 2.6% to 56,500 t owing mainly to weakened demand by the manufacturers of specialty steel, galvanizing sheet, and catalysts. The domestic demand for refined nickel by the manufacturers of specialty steel decreased by 4.6% to 44,100 t; galvanizing sheet, by 23.2% to 2,500 t; and catalysts, by 23.7% to 332 t. Demand for refined nickel by the manufacturers of batteries increased by 18.9% to 3,640 t; magnetic steel, by 26.9% to 2,350 t; and by other end users, by 11.2% to 3,570 t (Ministry of Economy, Trade and Industry, 2006c, p. 282).

In 2006, exports of refined nickel dropped sharply by 76.3% to 396 t from 1,673 t in 2005. Export earnings from refined nickel were valued at \$7.3 million compared with \$22.9 million in 2005. The major buyers of refined nickel were China (57.7%), Thailand (11.3%), the Republic of Korea (9.8%), the Philippines (5.9%), and India (5.8%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy decreased by 45.1% to 18,960 t and were valued at \$201 million. The principal buyers were Taiwan (51.0%), the Republic of Korea (44.9%), and the Netherlands (3.9%) (TEX Report, The, 2007c).

**Titanium.**—In 2006, Japan was the world's leading producer of titanium sponge metal and accounted for 28.4% of the world total (Arumu Publishing Co. Ltd., 2007, p. 51). Japan also was one of the world's major producers of titanium dioxide pigment. Japan imported its raw material requirements for the production of titanium sponge metal and titanium dioxide pigment mainly from Australia, India, and Vietnam. Titanium ore (rutile) was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed by the manufacturers of synthetic rutile and titanium dioxide pigment.

According to the estimate by Advanced Materials Japan Corporation, production of titanium sponge increased by 25.8% to 39,000 t because of increased domestic demand and increased exports in 2006. According to the statistics published by the Japan Titanium Society and the Ministry of Finance, total titanium sponge shipments increased by 21.1% to 37,000 t in 2006; shipments of titanium sponge to the domestic market increased by 14% to 24,328 t; exports of titanium sponge increased by 37.6% to 12,667 t, while imports of titanium sponge decreased by 13.5% to 3,397 t. In 2006, exports of titanium sponge went mainly to the United States (65.4%) and the United Kingdom (24.2%); imports of titanium sponge were mainly from Russia (45.6%), the United States (16.8%), Kazakhstan (15.9%), and Ukraine (8.4%). Total shipments of titanium mill products decreased by 25.6% to 17,317 t from 18,147 t in 2005; shipments of titanium mill products to the domestic market decreased by 5.0% to 9,577 t from 10,086 t in 2005, and exports of titanium mill products decreased by 4.0% to 7,740 t from 8,061 t in 2005 (Arumu Publishing Co. Ltd., 2007, p. 51).

To help meet the rising worldwide demand for titanium sponge metal, Sumitomo Titanium Corp. raised its sponge production capacity to 24,000 t/yr in 2006 from 18,000 t/yr in 2005 at a cost of about \$53.6 million for the construction of 12 reducing furnaces and one distillation tower at its Amagasaki plant near Osaka. Toho Titanium Co. Ltd. raised its sponge production capacity to 15,000 t/yr in 2006 from 13,000 t/yr in

2005 (Metals Place, 2006e; Arumu Publishing Co. Ltd., 2007, p. 51).

Production of titanium dioxide decreased by 7.4% to 239,916 t in 2006 owing mainly to a 1.4% decrease in overall shipments to 248,039 t. Japan's domestic shipments of titanium dioxide by end use were paints and coating materials (46%); printing inks and pigments (22%); synthetic resin (plastics) (11%); paper (9%); chemical fibers, rubbers, and condensers (1% each); and others (9%) (Ministry of Economy, Trade and Industry, 2006b, p. 57; Roskill's Letter from Japan, 2006).

### *Industrial Minerals*

**Cement.**—In 2006, Japan was the world's fourth ranked cement producer and consumer after China, India, and the United States. According to Japan Cement Association, the cement industry comprised 18 companies, 32 cement plants, and 58 kilns; the industry's kiln capacity was 70.2 Mt/yr. In 2006, the industry produced 66.7 Mt of clinker and 73.2 Mt of cement. Domestic sales totaled 57.6 Mt; exports amounted to 10.1 Mt; and imports amounted to 1 Mt. Japan's apparent cement consumption was 58.6 Mt and the per capita apparent consumption was 459 kg in 2006 compared with 462 kg in 2005 (Japan Cement Association, 2006b).

According to the Ministry of Economy, Industry and Trade, the cement industry's total clinker capacity decreased by 2.2% to 74.4 Mt/yr from 76.1 Mt/yr; the total number of regular employees, however, increased slightly to 3,351 from 3,313 in 2005. Production of portland cement clinker decreased to 66.6 Mt from 66.7 Mt in 2005; and production of cement totaled 69.9 Mt compared with 69.6 Mt in 2005. Of the total cement produced in 2006, ordinary portland cement accounted for 72.5%; portland blast-furnace cement, 20.7%; high early-strength and moderate-heat portland cement, 5.8%; and fly ash cement and other cement, 1.0%. The cement industry consumed 75.8 Mt of limestone, 10.7 Mt of clay, 5.3 Mt of silica stone, 5.0 Mt of blast furnace ore slag, and 2.6 Mt of gypsum. Cement sales increased by 1.0% to 69.5 Mt in 2006 (Ministry of Economy, Trade and Industry, 2006a, p. 66-69, 119).

In 2006, exports of clinker decreased by 46.8% to 3.3 Mt; exports of cement and cement clinker held steady at about 10.1 Mt. Japan's exports of cement and cement clinker by region were to the Asia and the Pacific region, 73.2%; Africa, 14.9%; the Middle East, 11.4%; and other regions, 0.5%. The major cement importers were the Republic of Korea (16.0%), Singapore (15.0%), Malaysia (7.4%), China (7.1%), Hong Kong (6.8%), Australia (6.4%), and other countries (41.3%). Japan's cement imports totaled about 1 Mt. The Republic of Korea was the dominant supplying country (Japan Cement Association, 2006a).

**Limestone.**—Japan was one of the world's leading limestone producers. In 2006, limestone production increased by about 1% to 166.6 Mt; domestic demand for limestone increased by only 0.4% to 157.2 Mt. Domestic demand by end user was 41.9% for cement manufacturing, 22.4% for concrete aggregate, 15.3% for iron and steel manufacturing, 4.6% for road construction, 6.7% for soda and glass manufacturing, and 15.1% for other uses (Ministry of Economy, Trade and Industry, 2006d, p. 142).

**Silica.**—Japan was one of the major producers of silica sand in the Asia and the Pacific region. In the past 5 years, Japan produced between 4.5 and 4.9 Mt/yr. In 2006, silica sand production increased slightly to 4.6 Mt. Domestic demand for silica sand totaled about 4.4 Mt, of which about 25.5% was for soda and glass manufacturing; 13.4%, for casting and refractories; 8.8%, for concrete aggregate; 2.3%, for iron and steel manufacturing; and 50.0%, for cement manufacturing, road construction, and all other uses (Ministry of Economy, Trade and Industry, 2006d, p. 142).

### *Mineral Fuels*

**Coal.**—Japan relied on imports to meet all its annual requirements for coking coal and anthracite mainly for the iron and steel industry, and about 99% of its annual requirements for steam (thermal) coal mainly for the cement, chemical, electric power, and paper and pulp industries. Japan produced a small quantity of steam coal from seven coal mines. All seven coal mines were located in Hokkaido Prefecture, for consumption by the local power generation plants.

In 2006, coal was produced mainly by an underground mine operated by Kushiro Coal Mine Co. Ltd., and six small-scale open pit mines in Hokkaido Prefecture. The Kushiro Mine, which was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia, produced about 800,000 t, and the remaining six small-scale coal mining companies produced a total of about 540,000 t. According to Japan Coal Energy Center, the Government-funded training and technology transfer project at the Kushiro coal mine was extended to fiscal year 2009 (ending March 31, 2010) (Shinji, Tomita, Assistant Manager, Resources Department, Japan Coal Energy Center, written commun., October 19, 2007).

According to the Ministry of Finance, Japan's coal imports decreased from 180.80 Mt in 2005 to 177.04 Mt in 2006, of which 5.96 Mt was anthracite coal; 79.68 Mt, coking coal; and 91.40 Mt, thermal coal. The total import bill for coal in 2006 amounted to \$13.9 billion, of which \$0.49 billion was for anthracite; \$7.73 billion, for coking coal; and \$5.68 billion, for thermal coal. The average price per metric ton for anthracite coal was \$82.10; for coking coal, \$96.03; and for thermal coal, \$62.13; and overall average price per metric ton of coal was \$78.06 compared with \$76.33 in 2005. In 2006, the major suppliers of anthracite coal were Vietnam (36.6%), China (35.2%), Australia (14.3%), and Russia (11.1%). The major suppliers of coking coal were Australia (54.8%), Indonesia (24.2%), Canada (8.9%), China (6.1%), Russia (4.0%), New Zealand (1.2%), and the United States (0.5%). The major suppliers of thermal coal were Australia (64.1%), China (14.9%), Indonesia (13.3%), Russia (5.8%), and Canada (1.7%) (TEX Report, The, 2007a).

To diversify its overseas coal supply sources, the Japanese Government signed an agreement with the Mongolian Government in February 2006 to conduct a joint survey of coal reserves in the eastern part of the Gobi Desert in Mongolia. The joint survey would be conducted beginning on April 1, 2006, until the end of March 2010. The survey would cover a 60,000-square-kilometer area, which stretches southeast from

Ulan Bator, which is the nation's capital. The survey would examine geologic structure, coal quality, and coal reserves. Preferential rights would be given to Japanese companies to negotiate with the Mongolian Government once the presence of coal reserves is confirmed (Daily Yomiuri, The, 2006).

**Natural Gas and Petroleum.**—Japan was one of the world's leading consumers and importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was insignificant because of the country's limited indigenous oil and gas reserves. Japan's natural gas and crude petroleum reserves were estimated to be 39.6 billion cubic meters and 58.5 million barrels (Mbbbl), respectively (Oil & Gas Journal, 2006).

To secure its long-term supply of oil and natural gas, the Japanese Government announced a new energy policy in 2006. The new energy policy called for Japan to draw about 40% of its imported oil from gasfields, oilfields, and production facilities owned by Japanese companies by 2030. In 2006, Inpex Holdings Inc. (Inpex), in which the Japanese Government owned a 29% stake, disclosed plans to invest as much as \$6 billion to develop natural gas off the northwestern coast of Australia. Inpex also planned to develop the Azadegan oilfield in Iran and had activities in Brazil and the Caspian Sea, as well as in Indonesia. The Government encouraged other major oil and trading companies, such as Japan Petroleum Exploration Co. (Japex), Mitsubishi Corp., Mitsui & Co., to become more aggressive in overseas investments in Equatorial Guinea and Libya (Barta, 2006).

In 2006, domestic production of natural gas increased by 5.8% to 3.3 billion cubic meters, of which about 98.8% was produced from gasfields mainly in the Prefectures of Niigata (65.4%) and Hokkaido (13.3%); 1.1%, from oilfields mainly in Akita Prefecture; and an insignificant amount from coalfields. In 2006, crude petroleum production decreased by 2.2% to 5.64 Mbbbl. Japan relied on imports to meet virtually all its annual natural gas and crude oil requirements for its power generating and oil refining industries. In 2006, Japan imported 76.2 billion cubic meters (50.91 Mt) of natural gas in the form of LNG. However, according to the Ministry of Finance's trade statistics, imports of LNG totaled 63.53 Mt (95.1 billion cubic meters) and were valued at \$18.02 billion. The major suppliers of LNG were Malaysia (21.6%), Australia (19.8%), Indonesia (18.4%), Qatar (12.3%), Brunei (12.0%), the United Arab Emirates (8.6%), Oman (3.7%) and the United States (2.1%) (Ministry of Economy, Trade and Industry, 2006d, p. 22-23, 24-25, 105-107).

Crude petroleum imports of 1.53 billion barrels (Gbbbl) were mainly from the Middle East (89.2%) and Southeast Asia (4.4%). The major suppliers of crude petroleum were Saudi Arabia (30.0%), the United Arab Emirates (25.4%), Iran (11.5%), Qatar (10.2%), Kuwait (7.1%), Indonesia (2.8%), the Neutral Zone (of Kuwait and Saudi Arabia) (2.2%), and Oman (1.5%) (Ministry of Economy, Trade and Industry, 2006d, p. 26-29).

Japan's petroleum industry comprised 19 companies with a total number of about 20,000 employees. The petroleum refining industry consisted of 30 operating refineries that were owned and operated by 18 oil-refining companies that had a total combined refining capacity of 4.83 million barrels per day. The

crude petroleum processing capacity utilization rate was 82.9% in 2006 compared with 87.2% in 2005 (Petroleum Association of Japan, 2007, p. 9, 65).

In 2006, demand for crude petroleum (crude petroleum processed by the domestic refineries) decreased by 2.7% to 1.47 Gbbbl, of which 99.7% was imported crude petroleum. Domestic demand for refined petroleum, by product, was as follows: gasoline, 382.7 Mbbbl; heavy fuel oil, 314.0 Mbbbl; naphtha, 312.3 Mbbbl; diesel (gas oil), 231.3 Mbbbl; kerosene, 165.6 Mbbbl; jet fuel, 34.2 Mbbbl; asphalt, 20.1 Mbbbl; lubricants, 13.0 Mbbbl; and paraffin wax, 479,550 barrels (bbl) (Ministry of Economy, Trade and Industry, 2006d, p. 78-79).

Consumption of domestically produced natural gas increased by 5.8% to 4 billion cubic meters, of which the gas industry (distribution for household uses) accounted for 55.1%; oil and gas industry use, 13.9%; electric power generation, 12.2%; chemicals, 12.1%; and other manufacturing and services uses, 6.7%. Of the 63.71 Mt (95.37 billion cubic meters) of imported LNG, about 70% was consumed by the electric power industry for power generation and about 30% was for household gas and industrial use (Ministry of Economy, Trade and Industry, 2006d, p. 24, 83).

At the end of 2005, Japan's stockpile of crude petroleum and partially refined and refined petroleum products amounted to a 175-day supply. This total included 93 days in the national (Government-owned) stockpile and 82 days in the private (privately owned) stockpile (Ministry of Economy, Trade and Industry, 2006d, p. 152-153).

## Reserves

Japan's reserves of several industrial minerals, such as limestone, dolomite, iodine, phrophyllite, and silica stones, are large. Japan has some coal reserves but they are very costly to mine. With the exception of gold, the remaining reserves of several nonferrous metals, such as lead, silver, and zinc, are very small; resources of other mineral fuels, such as natural gas and oil, are negligible (table 3).

## Outlook

Japan's economy is forecasted to continue to grow at a rate of 2% in 2007 and then to grow at a slower pace of 1.8% in 2008 (International Monetary Fund, 2007). Domestic mining activities during the next 2 years are expected to be at a slightly lower level than 2006 because of the depleting ore reserves. Metal production of copper and zinc is expected to hold steady or to be at a slightly higher level than that of 2006 because of increased demand for metals in light of the continuing growth in the national economy. During the next 2 years, production of crude steel is expected to exceed 115 Mt because of the continued strong demand from the Japanese automobile and machinery and equipment sectors and because of an anticipated increase in exports to such Asian countries as the Republic of Korea, Taiwan, and Thailand. Production of titanium sponge metal is expected to remain at a slightly higher level than that of 2006 because of the continuing strong domestic demand and increasing orders coming from the United States and the United

Kingdom. Production of cement and limestone is expected to hold steady with no further cutback in public works spending.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue to export more ferrous and nonferrous metals and cement clinker and cement to China, the Republic of Korea, Southeast Asian countries, and Taiwan where the economies are expected to continue to improve in the coming years. Imports of coal, iron ore, nonferrous metals, and other minerals are expected to increase during the next 1 to 2 years as the consumption of raw materials trends upward in the iron and steel, nonferrous metals, and utility industries.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, which will help to ensure 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, Indonesia, Mexico, Peru, the Philippines, and the United States. The targeted minerals are antimony, chromium, coal, copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, niobium (columbium), crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

## References Cited

- Agency of Natural Resources and Energy, 2007, The purpose of Japan's mineral resources policy: Agency of Natural Resources and Energy. (Accessed October 15, 2007, at <http://www.enecho.meti.go.jp/english/energy/mineral/policy.html>.)
- Apex Silver Mines Ltd., 2007, San Cristobal operating plan summary: Apex Silver Mines Ltd., January, 25 p. (Accessed November 4, 2007, at <http://www.apexsilver.com/pdf/opplan/opplansummary.pdf>.)
- Arumu Publishing Co. Ltd., 2007, 2007 Annual review—Industrial rare metals: Arumu Publishing Co. Ltd., no. 123, July, 132 p.
- Barta, Patrick, 2006, Japanese firms intensify search for oil and natural gas overseas: *The Wall Street Journal*, May 17, p. B3A.
- Cobalt Development Institute, The, 2007, 2006 Cobalt news—Production statistics: Cobalt Development Institute, February, p. 3. (Accessed October 31, 2007, at [http://www.thecdi.com/cdi/images/news\\_pdf/cobalt\\_news-Feb07.pdf](http://www.thecdi.com/cdi/images/news_pdf/cobalt_news-Feb07.pdf).)
- Daily Yomiuri, The, 2006, Japan, Mongolia to sign coal survey agreement: *The Daily Yomiuri Shimbun*, 1 p. (Accessed February 13, 2006, at <http://www.yomiuri.co.jp/dy/business/20060307TD08008.htm>.)
- Dynatec Corp., 2006, Ambatovy project—New partnership: Richmond Hill, Ontario, Canada, Dyantec Corp. press release, October 30, 1 p. (Accessed August 21, 2007, at <http://www.dynatec.ca/operations/feasibility.php>.)
- Economic and Social Research Institute, 2007, Real gross domestic product classified by economic activities: Economic and Social Research Institute. (Accessed October 22, 2007, at [http://www.esri.cao.go.jp/en/sna/h17-kaku/17fcm3r\\_en.xls](http://www.esri.cao.go.jp/en/sna/h17-kaku/17fcm3r_en.xls).)
- Industrial Minerals, 2006, ATH plants for Vietnam—Japanese companies race to replenish Asian ATH supply: *Industrial Minerals*, no. 468, September, p. 14.
- International Iron and Steel Institute, 2007, Major steel-producing countries and top steel-producing companies 2005 and 2006, in *World Steel in Figures, 2007*: International Iron and Steel Institute, September 4, 16 p. (Accessed November 14, 2007, at <http://www.worldsteel.org/pictures/storyfiles/WSIF07web%20v.6.pdf>.)
- International Monetary Fund, 2007, Japan, in *World Economic Outlook Database*: International Monetary Fund. (Accessed October 22, 2007, via <http://www.imf.org/external/pubs/ft/weo/2007/02/weodata/index.aspx>.)
- Japan Aluminum Association, 2003, Aluminum statistical yearbook 2002: Japan Aluminum Association, October 1, 68 p.
- Japan Aluminum Association, 2007, Demand for aluminum in terms of end uses, in *Aluminum Statistics*: Japan Aluminum Association, February, 1 p. (Accessed October 30, 2007, at [http://www.aluminum.or.jp/statistics/pdf/statistics\\_e/2007/feb07\\_6pdf](http://www.aluminum.or.jp/statistics/pdf/statistics_e/2007/feb07_6pdf).)
- Japan Cement Association, 2006a, Export: Japan Cement Association, 1 p. (Accessed November 26, 2007, at <http://www.jcassoc.or.jp/2eng/ee.html>.)
- Japan Cement Association, 2006b, Production, sales, consumption: Japan Cement Association, 2 p. (Accessed November 26, 2007, at <http://www.jcassoc.or.jp/cement/2eng/ed1.html>.)
- Japan Corporation News Network, 2006, Nippon Light Metal and Sojitz to construct aluminum hydroxide plant in Vietnam: Japan Corporation News Network, July 4, 1 p. (Accessed July 12, 2007, at [http://www.japancorp.net/Article.asp?Art\\_ID=12830](http://www.japancorp.net/Article.asp?Art_ID=12830).)
- Japan Iron and Steel Federation, 2007a, The steel industry of Japan 2007—Domestic market: Japan Iron and Steel Federation, 2007, 5 p. (Accessed October 15, 2007, at <http://www.jisf.or.jp/en/statistics/sij/docs/DomesticMarket.pdf>.)
- Japan Iron and Steel Federation, 2007b, The steel industry of Japan 2007—Steel trade: Japan Iron and Steel Federation, 2007, 4 p. (Accessed October 15, 2007, at <http://www.jisf.or.jp/en/statistics/sij/docs/0708SteelTrade.pdf>.)
- Japan Mining Industry Association, 2007, Bulletin of Japan Mining Industry Association: Japan Mining Industry Association, v. 60, no. 7, August 25, 173 p.
- Japan Oil, Gas and Metals National Corp., 2007, Item 8—Progress of overseas mine development by Japanese mining companies, in *News Reports: Mineral Resources Information Center*, Japan Oil, Gas and Metals National Corp., no. 106, December 12, 9 p. (Accessed November 5, 2007, at [http://www.jogmec.go.jp/mric\\_web/current/06\\_106.html](http://www.jogmec.go.jp/mric_web/current/06_106.html).)
- JFE Steel Corp., 2006a, JFE Steel renews comprehensive cooperation agreement with ThyssenKrupp Steel: Tokyo, Japan, JFE Steel Corp. news release, December 14, 2 p. (Accessed November 14, 2007, at [http://www.jfe\\_steel.co.jp/en/release/2006/061214.html](http://www.jfe_steel.co.jp/en/release/2006/061214.html).)
- JFE Steel Corp., 2006b, JFE Steel strengthens ties with South Korea's Dongkuk Steel: Tokyo, Japan, JFE Steel Corp. news release, September 25, 2 p. (Accessed November 14, 2007, at [http://www.jfe\\_steel.co.jp/en/release/2006/060925.html](http://www.jfe_steel.co.jp/en/release/2006/060925.html).)
- Metals Place, 2005, Japanese firm eyes nickel in Isabel, Solomon Islands: *Metals Place*, August, 1 p. (Accessed June 7, 2006, at <http://metalsplace.com/metalsnews/?a=2101>.)
- Metals Place, 2006a, Japanese copper firms to buy transport ship for US\$39 million: *Metals Place*, January 17, 1 p. (Accessed November 9, 2006, at <http://metalsplace.com/metalsnews/?a=3605>.)
- Metals Place, 2006b, Japan's Dowa to replace Nippon Mining as indium list price setter: *Metals Place*, March 3, 1 p. (Accessed June 7, 2006, at <http://metalsplace.com/metalsnews/?a=4140>.)
- Metals Place, 2006c, Japan's Pan Pacific acquires Regalito Copper for \$137 million: *Metals Place*, 1 p. (Accessed November 9, 2006, at <http://metalsplace.com/metalsnews/?a=4252>.)
- Metals Place, 2006d, Japan's Sumitomo Metal Mining, Sumitomo Corp to invest more in Alaska gold mine: *Metals Place*, August 23, 1 p. (Accessed November 9, 2006, at <http://metalsplace.com/metalsnews/?a=6615>.)
- Metals Place, 2006e, Japan's Sumitomo Titanium hike sponge output 33% to 24,000 metric tons: *Metals Place*, 1 p. (Accessed October 25, 2006, at <http://metalsplace.com/metalsnews/?a=4279>.)
- Metals Place, 2006f, Pan Pacific Copper acquires nearly all shares of Regalito: *Metals Place*, 1 p. (Accessed November 9, 2006, at <http://metalsplace.com/metalsnews/?a=5017>.)
- Metals Place, 2006g, Sumitomo, Dynatec to advance Ambatovy nickel project: *Metals Place*, 1 p. (Accessed November 9, 2006, at <http://metalsplace.com/metalsnews/?a=3697>.)
- Mining Journal, 2005, Sumitomo joins Ambatovy nickel: *Mining Journal*, August 12, p. 1, 10.
- Mining Journal, 2006a, Pogo cost rise: *Mining Journal*, August 25, p. 5.
- Mining Journal, 2006b, Sumitomo buys San Cristobal stake: *Mining Journal*, September 29, p. 12.
- Mining Watch Canada, 2006, New Caledonia: *Mining Watch*, 3 p. (Accessed January 20, 2007, at [http://www.miningwatch.ca/index.php?New\\_Caledonia](http://www.miningwatch.ca/index.php?New_Caledonia).)
- Ministry of Economy, Trade and Industry, 2006a, Yearbook of ceramics and building materials statistics: Tokyo, Japan, Ministry of Economy, Trade and Industry, June 29, 2007, 138 p.
- Ministry of Economy, Trade and Industry, 2006b, Yearbook of chemical industries statistics: Tokyo, Japan, Ministry of Economy, Trade and Industry, June 30, 2007, 247 p.

- Ministry of Economy, Trade and Industry, 2006c, Yearbook of iron and steel, non-ferrous metal and fabricated metals statistics: Tokyo, Japan, Ministry of Economy, Trade and Industry, June 29, 2007, 313 p.
- Ministry of Economy, Trade and Industry, 2006d, Yearbook of mineral resources and petroleum products statistics: Tokyo, Japan, Ministry of Economy, Trade and Industry, August 31, 2007, 158 p.
- Ministry of Economy, Trade and Industry, 2007, Laws administered by METI: Ministry of Economy, Trade and Industry. (Accessed October 24, 2007, at <http://www.meti.go.jp/english/information/data/laws.html>.)
- Ministry of Environment, 2007a, Environmental impact assessment law, Law no. 81 of 1997: Ministry of Environment. (Accessed October 24, 2007, at <http://www.env.go.jp/en/laws/policy/assess/index.html>.)
- Ministry of Environment, 2007b, The basic environmental law, Law No. 91 of 1993: Ministry of Environment. (Accessed October 24, 2007, at <http://www.env.go.jp/en/laws/policy/basic/index.html>.)
- Ministry of Finance, 2005, Trade statistics, exports and imports by principal commodity, 2005 (Calendar year 2005, fixed annual): Ministry of Finance, March 15, 2006 release. (Accessed October 11, 2007, at [http://www.customs.go.jp/toukei/shinbun/happyou\\_e.htm](http://www.customs.go.jp/toukei/shinbun/happyou_e.htm).)
- Ministry of Finance, 2007, Trade statistics, exports and imports by principal commodity, 2006 (Calendar year 2006, fixed annual): Ministry of Finance, March 15. (Accessed October 11, 2007, at [http://www.customs.go.jp/toukei/shinbun/happyou\\_e.htm](http://www.customs.go.jp/toukei/shinbun/happyou_e.htm).)
- Ministry of Internal Affairs and Communication, 2007a, Employed persons by industry, employment status and sex (1953-2002) in chapter 19, Labor and wages of Historical statistics of Japan (1868 to 2002): Ministry of Internal Affairs and Communication, 5 p. (Accessed October 23, 2007, at <http://www.stat.go.jp/data/chouki/zuhyou/19-08.xls>.)
- Ministry of Internal Affairs and Communication, 2007b, Employed persons by industry (2002-2006) in chapter 12, Labor of Statistical Handbook of Japan 2007: Ministry of Internal Affairs and Communication, 17 p. (Accessed October 23, 2007, at <http://www.sat.go.jp/data/handbook/c12cont.htm#cha12-2>.)
- Ministry of Internal Affairs and Communications, 2007c, Land and climate, and population, in Statistical Handbook of Japan: Ministry of Internal Affairs and Communication. (Accessed September 12, 2006, at <http://www.stat.go.jp/english/data/handbook/index.htm>.)
- Ministry of International Trade and Industry, 1986, Kogyo Binran [Mining handbook]: Ministry of International Trade and Industry, March 31, 1987, p. 2-3.
- Nippon Steel Corp., 2006a, Nippon Steel/Companhia Vale do Rio Doce (CVRD of Brazil) strategic alliance agreement: Tokyo, Japan, Nippon Steel Corp. news release, December 18, 1 p. (Accessed November 14, 2007, via <http://www.nsc.co.jp>.)
- Nippon Steel Corp., 2006b, Nippon Steel/POSCO joint negotiation on iron ore annual benchmark prices for fiscal 2007: Tokyo, Japan, Nippon Steel Corp. news release, December 11, 1 p. (Accessed November 14, 2007, via <http://www.nsc.co.jp>.)
- Oil & Gas Journal, 2006, Worldwide look at reserves and production: Oil & Gas Journal, v. 104, no. 47, December 18, p. 22-23.
- Pan Pacific Copper Co. Ltd., 2006, Our business fields—Production: Pan Pacific Copper Co. Ltd., 2 p. (Accessed November 7, 2007, at [http://www.ppcu.jp/eng/about\\_ppc/production.html](http://www.ppcu.jp/eng/about_ppc/production.html).)
- Petroleum Association of Japan, 2007, Petroleum industry in Japan: Petroleum Association of Japan, 68 p. (Accessed November 27, 2007, at <http://www.paj.gr.jp/statis/data/2007/AR2007.pdf>.)
- PRNewswire.com, 2006, Pan Pacific Copper Co. Ltd. and Regalito Copper Corp. announce mailing of offering documents and directors' circular to shareholders of Regalito Copper Corp.: PRNewswire, April 3, 2 p. (Accessed November 5, 2007, at <http://prnewswire.com/cgi-bin/stories.pl?ACCT=104&Story=/www/story/04-03-2006/00043327108&EDATE>.)
- Reuters Ltd., 2006, S Korea group to invest \$1.1 billion in nickel: Reuters Ltd., October 30, 1 p. (Accessed July 26, 2007, at <http://asia.news.yahoo.com/061030/3/2s27o.html>.)
- Roskill's Letter from Japan, 2006, Titanium dioxide—Fall in exports to China: Roskill's Letter from Japan, no. 355, March, p. 9.
- Sakasegawa, T., 2006, Facilitating mining investment from Japan to Africa, JOGMEC presentation at Junior Mining Congress 2006, Johannesburg, South Africa, July 4, 2006, 14 p.
- Sojitz Corp., 2006, Sojitz and Nippon Light Metal Co. to undertake feasibility study for construction of aluminum hydroxide plant for chemical process application in Vietnam: Tokyo, Japan, Sojitz Corp. news release, November 20, 2 p. (Accessed June 12, 2007, at <http://www.sojitz.com/en/news/2006/061120.html>.)
- Sumitomo Metal Mining Co. Ltd., 2006a, Electric damage halts the operation at Pogo gold Mine (update): Sumitomo Metal Mining Co. Ltd., October 26, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/img2006/20061031e.pdf](http://www.smm.co.jp/w_news/img2006/20061031e.pdf).)
- Sumitomo Metal Mining Co. Ltd., 2006b, Production situation of Pogo gold mine: Sumitomo Metal Mining Co. Ltd., April 25, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/news\\_E/20060425\\_e.html](http://www.smm.co.jp/w_news/news_E/20060425_e.html).)
- Sumitomo Metal Mining Co. Ltd., 2006c, Resumption of ore processing at Pogo gold mine: Sumitomo Metal Mining Co. Ltd., December 20, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/img2006/20061220e.pdf](http://www.smm.co.jp/w_news/img2006/20061220e.pdf).)
- Sumitomo Metal Mining Co. Ltd., 2006d, Sumitomo Metal Mining to expand HPAL plant at Coral Bay Nickel Corp. in the Philippines: Sumitomo Metal Mining Co. Ltd., March 28, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/news\\_E/20060328\\_e.html](http://www.smm.co.jp/w_news/news_E/20060328_e.html).)
- Sumitomo Metal Mining Co. Ltd., 2006e, The development of new ore body at the Northparkes Mines, Australia: Sumitomo Metal Mining Co. Ltd., December 1, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/imp2006/20061201e.pdf](http://www.smm.co.jp/w_news/imp2006/20061201e.pdf).)
- Sumitomo Metal Mining Co. Ltd., 2006f, The Pogo gold mine has commenced its gold production: Sumitomo Metal Mining Co. Ltd., February 13, 1 p. (Accessed October 31, 2007, at [http://www.smm.co.jp/w\\_news/news\\_E/20050616\\_e.html](http://www.smm.co.jp/w_news/news_E/20050616_e.html).)
- Sumitomo Metal Mining Co. Ltd., 2007, Annual report 2007—Mineral resources and metals: Sumitomo Metal Mining Co. Ltd., March, 78 p. (Accessed October 31, 2007, at <http://www.smm.co.jp/E/ir/pdf/AR007e.pdf>.)
- TEX Report, The, 2007a, CY 2006 Coal imports by types & source: The TEX Report, January 31, v. 39, no. 9173, p. 15.
- TEX Report, The, 2007b, CY 2006 Iron ore imports into Japan: The Tex Report, January 31, v. 39, no. 9173, p. 5.
- TEX Report, The, 2007c, Japan exports of ferroalloys and nickel in December 2006: The TEX Report, February 5, v. 39, no. 9176, p. 8-9.
- TEX Report, The, 2007d, Japan imports of ferroalloys in December 2006: The TEX Report, January 31, v. 39, no. 9173, p. 9.
- TEX Report, The, 2007e, Japan's imports of rare-metals in December 2006: The TEX Report, February 1, v. 39, no. 9174, p. 12.
- TEX Report, The, 2007f, Japan's imports of raw materials ores for ferroalloys production in December 2006: The TEX Report, February 1, v. 39, no. 9174, p. 11.
- TEX Report, The, 2007g, Japan's imports of raw materials in December 2006: The TEX Report, January 31, v. 39, no. 9173, p. 7.
- World Bureau of Metal Statistics, 2007, Aluminum—Japan: World Metal Statistics, v. 60, no. 4, April 18, 150 p.

TABLE 1  
JAPAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006	
<b>METALS</b>						
<b>Aluminum:</b>						
Alumina	thousand metric tons	333	363	380 <sup>e</sup>	350 <sup>e</sup>	330 <sup>e</sup>
Aluminum hydroxide	do.	724	740	750 <sup>e</sup>	740 <sup>e</sup>	720 <sup>e</sup>
<b>Metal:</b>						
<b>Primary:</b>						
Regular grades	do.	6	6	6	7	7
High-purity	do.	40	44	55	45	50
Secondary <sup>2</sup>	do.	1,239	1,261	1,015	1,039 <sup>r</sup>	1,070
<b>Antimony:</b>						
Oxide		9,052	8,235	8,716	7,792	7,778
Metal		183	121	222	253	275
Arsenic, trioxide <sup>c</sup>		40	40	40	40	40
Bismuth		474	513	522	463	425
Cadmium, refined		2,444	2,509	2,233	2,297	2,286
Chromium, metal <sup>c</sup>		1,600	1,500	1,600	700	700
Cobalt, metal		354	379	421	471	920
<b>Copper, metal:</b>						
<b>Blister and anode:</b>						
Primary		1,317,291	1,343,353	1,270,495	1,319,247	1,409,087
Secondary		182,069	172,724	194,927	198,516	219,203
Total		1,499,360	1,516,077	1,465,422	1,517,763	1,628,290
<b>Refined:</b>						
Primary		1,211,111	1,251,728	1,188,491	1,227,528	1,342,350
Secondary		189,968	178,637	191,653	167,756	189,705
Total		1,401,079	1,430,365	1,380,144	1,395,284	1,532,055
<b>Gallium, metal:</b>						
Primary <sup>c</sup>		8	9	9	10 <sup>r</sup>	8
Secondary		80	83	78 <sup>r</sup>	86 <sup>r</sup>	93
<b>Germanium:</b>						
Oxide <sup>c</sup>		20	30	50	50	50
Metal, polycrystal	kilograms	803	621	943	1,731	1,682
<b>Gold:</b>						
Mine output, Au content	do.	8,615	8,143	8,021	8,318	8,904
<b>Metal:</b>						
Primary	do.	144,748	161,399	136,616	146,182	144,164
Secondary <sup>3</sup>	do.	21,160	22,549	23,183	23,710	23,952
Total	do.	165,908	183,948	159,799	169,892	168,116
Indium, metal <sup>c</sup>	do.	60,000	70,000	70,000	70,000	70,000
<b>Iron and steel, metal:</b>						
Pig iron	thousand metric tons	80,979	82,091	82,974	83,058	84,270

See footnotes at end of table.

TABLE 1—Continued  
JAPAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006	
METALS—Continued						
Iron and steel, metal—Continued:						
Electric-furnace ferroalloys:						
Ferrochrome	91,937	19,427	13,472	12,367	13,056	
Ferromanganese	356,717	371,831	437,389	448,616	406,162	
Ferronickel	370,973	369,099	374,213	391,074	335,884	
Silicomanganese	70,965	58,043	73,041	94,725	59,424	
Other:						
Ferromolybdenum	2,375	2,691	3,323	4,019	4,229	
Ferrotungsten	9	12	--	--	--	
Ferrovanadium	3,592	3,491	2,178	2,360	2,042	
Unspecified	6,376	3,813	7,321	10,057	13,123	
Total	902,944	828,407	910,937	963,218	833,920	
Steel, crude	107,745	110,511	112,718	112,471	116,226	
thousand metric tons						
Semimanufactures, hot-rolled:						
Ordinary steels	do.	80,838	81,769	83,354	80,828	83,139
Special steels	do.	17,451	18,735	19,843	20,360	20,983
Lead:						
Mine output, Pb content	5,723	5,660	5,512	3,437	777	
Metal, refined:						
Primary	107,744	105,460	94,272	106,638	108,271	
Secondary	178,016	189,831	188,603	167,980 <sup>r</sup>	171,743	
Total	285,760	295,291	282,875	274,618 <sup>r</sup>	280,014	
Magnesium, metal, secondary <sup>c</sup>	9,000	10,000	10,000	11,000	12,000	
Manganese, oxide	45,867	49,115	45,680	45,500 <sup>e</sup>	45,500 <sup>e</sup>	
Molybdenum, metal	465	561	812	901	1,253	
Nickel metal:						
Refined	32,297	34,991 <sup>r</sup>	32,729 <sup>r</sup>	29,399	29,254	
Ni content of nickel oxide sinter	48,950	52,700	60,300	56,700	53,800	
Ni content of ferronickel	74,418	74,804	73,655	76,390	66,058	
Ni content of chemical	1,820	2,084	2,082	2,208	2,531	
Total	157,485	164,579 <sup>r</sup>	168,766 <sup>r</sup>	164,697	151,643	
Platinum-group metals: <sup>c</sup>						
Palladium, metal	5,618 <sup>4</sup>	5,500 <sup>4</sup>	5,300	5,400	5,400	
Platinum, metal	762 <sup>4</sup>	770 <sup>4</sup>	750	760	760	
Rare-earth oxides <sup>5</sup>	5,423	5,521	6,015	6,432	8,243	
Selenium, metal	752	734	599	625	730	
Silicon, multicrystalline	4,457 <sup>r</sup>	5,045	6,135	6,923	6,987	
Silver:						
Mine output, Ag content	81,416	78,862	75,689	54,098	11,463	
Metal:						
Primary	do.	2,259,551	2,453,204	2,208,270	2,202,794 <sup>r</sup>	2,253,203
Secondary <sup>3</sup>	do.	291,955	258,754	219,047	192,177	228,000
Total	do.	2,551,506	2,711,958	2,427,317	2,394,971 <sup>r</sup>	2,481,203
Tantalum, metal <sup>c</sup>	90	95	95	95	95	
Tellurium, metal	29	33	33	23	24	
Tin, metal, smelter	659	662	707	754	854	
Titanium:						
Dioxide	240,469	253,453	253,364	259,015	239,916	
Metal	25,199	18,923	23,110	31,000 <sup>e</sup>	39,000 <sup>e</sup>	
Tungsten, metal	3,302	3,333	4,166	4,056	3,565	
Vanadium, metal <sup>e, 6</sup>	1,000	1,000	1,000	1,000	1,000	

See footnotes at end of table.



TABLE 1—Continued  
JAPAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006	
<b>METALS—Continued</b>						
<b>Zinc:</b>						
Mine output, Zn content	42,851	44,574	47,781	41,452	7,169	
Oxide	74,515	75,090	75,813	74,843	77,234	
<b>Metal:</b>						
Primary	547,183	532,704	534,830	536,768	504,532	
Secondary	126,723	153,411	132,417	138,453	148,715	
Total	673,906	686,115	667,247	675,221	653,247	
Zirconium, oxide <sup>c</sup>	8,650	8,800	9,800	10,000	10,800	
<b>INDUSTRIAL MINERALS</b>						
Bromine <sup>c</sup>	20,000	20,000	20,000	20,000	20,000	
Cement, hydraulic	thousand metric tons	71,828	68,766	67,376	69,629	69,942
<b>Clays:</b>						
Bentonite	437,772	425,945	455,282	421,629	425,000 <sup>e</sup>	
Fire clay, crude <sup>c</sup>	480,000 <sup>4</sup>	460,000	470,000	460,000	460,000 <sup>e</sup>	
Kaolin	11,756	12,409	11,553	10,500	10,500 <sup>e</sup>	
Diatomite	123,827	111,690	126,225	130,005	130,000 <sup>e</sup>	
Feldspar and related materials <sup>c</sup>	1,334,000	1,140,000	1,006,000	1,000,000	1,000,000	
Gypsum	thousand metric tons	5,644	5,764	5,865	5,913	5,796
Iodine	6,548	6,524	7,264	8,095	8,724	
Lime, quicklime	thousand metric tons	7,420	7,953	8,507	8,879	9,014
Nitrogen, N content of ammonia	do.	1,192	1,061	1,101	1,083	1,091
Perlite <sup>c</sup>	250,000	250,000	240,000	240,000	240,000	
Salt, all types <sup>7</sup>	thousand metric tons	1,282	1,263	1,225	1,227	1,166
<b>Silica:</b>						
Sand	do.	4,893	4,699	4,705	4,549 <sup>r</sup>	4,593
Stone, quartzite	do.	13,568	12,838	12,218	12,600	12,936
<b>Sodium compounds, n.e.s.:<sup>8</sup></b>						
Soda ash <sup>c</sup>	410,000 <sup>4</sup>	400,000	400,000	400,000	400,000	
Sulfate, anhydrous	137,713	132,807	130,107	138,000	138,000 <sup>e</sup>	
<b>Stone, crushed:</b>						
Dolomite	thousand metric tons	3,450	3,579	3,726 <sup>r</sup>	3,534 <sup>r</sup>	3,695
Limestone	do.	170,166	163,565	161,858	165,240	166,621
<b>Sulfur:</b>						
Byproduct of metallurgy	do.	1,326	1,281	1,263	1,284	1,343
Byproduct of petroleum	do.	1,865	1,951	1,895	1,972	1,950
<b>Talc and related materials:</b>						
Talc	22,142	24,328	18,253	25,491	25,500 <sup>e</sup>	
Pyrophyllite	416,188	408,435	405,222	351,111	350,000 <sup>e</sup>	
Vermiculite <sup>c</sup>	6,400	6,200	6,200	6,200	6,200	
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Carbon black	thousand metric tons	755	788	804	805	827
Coal, bituminous <sup>9</sup>	do.	1,368	1,338	1,339	1,114 <sup>r</sup>	1,341
<b>Coke including breeze:</b>						
Metallurgical	do.	38,417	38,544	38,314	38,095	38,542
<b>Gas, natural:</b>						
Gross <sup>10</sup>	million cubic meters	2,571	2,844	2,883	3,120	3,302
Marketed	do.	2,679	3,038	3,048	3,265	3,494

See footnotes at end of table.

TABLE 1—Continued  
JAPAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006	
<b>MINERAL FUELS AND RELATED MATERIALS—CONTINUED</b>						
<b>Petroleum:</b>						
Crude	thousand 42-gallon barrels	4,548	5,161	5,247	5,772 <sup>r</sup>	5,643
<b>Refinery products:</b>						
<b>Gasoline:</b>						
Aviation <sup>e</sup>	do.	40	50	50	50	50
Other	do.	364,129	367,687	366,662	368,102	364,070
Asphalt and bitumen	do.	31,537	32,586	34,475	33,288	32,777
Distillate fuel oil	do.	250,932	242,311	243,425	251,729	251,311
Jet fuel	do.	65,263	60,013	64,846	69,946	76,390
Kerosene	do.	169,472	177,963	167,348	177,091	167,779
Liquefied petroleum gas	do.	53,593	53,107	50,881	56,352	55,696
Lubricants	do.	16,630	16,314	16,561	16,580	16,706
Naphtha	do.	119,298	122,355	125,252	135,792	136,140
Paraffin, wax	do.	833	915	902	902	824
Petroleum coke	do.	4,549	4,000	4,533	4,394	4,810
Refinery fuel and losses <sup>e,11</sup>	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	398,673	435,763	406,901	400,936	373,047
Unfinished oils <sup>e</sup>	do.	50,000	50,000	50,000	50,000	50,000
Total <sup>12</sup>	do.	1,670,000	1,710,000	1,680,000	1,720,000	1,680,000

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>p</sup>Preliminary. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through November 5, 2007.

<sup>2</sup>Includes alloyed and unalloyed ingot.

<sup>3</sup>Includes metal recovered from scrap and waste.

<sup>4</sup>Reported figure.

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

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

<sup>7</sup>Reported figure for fiscal year, which began on April 1 and ended on March 31 of the following year.

<sup>8</sup>Not elsewhere specified.

<sup>9</sup>All major coal mines had closed by January 2002, but eight smaller mines were still in operation in 2006.

<sup>10</sup>Includes output from gas wells and coal mines.

<sup>11</sup>May include some additional unfinished oils.

<sup>12</sup>Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Economy, Trade and Industry. Yearbook of Iron and Steel, Non-Ferrous Metal, and Fabricated Metals Statistics, 2006; Yearbook of Chemical Industries Statistics, 2006; Yearbook of Ceramics and Building Materials Statistics, 2006; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2006. Japan Aluminum Association, Aluminum Statistics, 2006. Arumu Publishing Co. Ltd. Industrial Rare Metals Annual Review No. 123, 2007. U.S. Geological Survey Minerals Questionnaire, 2001-04.

TABLE 2  
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(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	2,400
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, Higashiiwai-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; and Tosa, Kochi Prefecture	28,800
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 and Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd. <sup>1</sup>	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 49.29%; Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.17% each; and others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Pan Pacific Copper Co. Ltd. (PPC) (Nippon Mining & Metals Co. Ltd., 66%, and Mitsui Mining and Smelting Co. Ltd., 34%) <sup>2</sup>	Saganoseki, Oita Prefecture; Hitachi, Ibaraki Prefecture; and Tamano, Okayama Prefecture	710,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Besshi/Toyo (Saijo), Ehime Prefecture	410,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd. (SMM)	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
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. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2—Continued  
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 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., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%, and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 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%; Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippon Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
<b>Lead:</b>				
In concentrate		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.) <sup>3</sup>	Toyoha, Hokkaido Prefecture	4
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd. <sup>4</sup>	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. (SMM)	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.) <sup>4</sup>	Hosokura, Miyagi Prefecture	22,200
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
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34

See footnotes at end of table.

TABLE 2—Continued  
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
<b>Nickel:</b>				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. [wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd. (SMM)]	Hyuga, Miyazaki Prefecture	22,000
Do.	do.	Yakin Oheyama 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. (SMM)	Niihama, Ehime Prefecture	36,000
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuisi, 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		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
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
<b>Titanium:</b>				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	24
Do.		Toho Titanium Co. Ltd. (Nippon Mining and Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	15
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%, and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Ishihara Sangyo Kaisha Ltd.	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
<b>Zinc:</b>				
In concentrate		Toyoha Mining Co. Ltd. <sup>3</sup>	Toyoha, Hokkaido Prefecture	42
Refined	metric tons	Akita Smelting Co. Ltd. [Dowa Mining Co. Ltd., 57%; Nippon Mining and Metals Co. Ltd., 24%; Sumitomo Metal Mining Co. Ltd. (SMM), 14%; Mitsubishi Materials Corp., 5%]	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; Nippon Mining and Metals Co. Ltd., 27.8%; Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	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.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000

<sup>1</sup>Coal mining operations continued following the establishment of Kushiro Coal Mining Co. Ltd. in 2002.

<sup>2</sup>Saganoseki Smelter and Refinery, Hitachi refinery of Nippon Mining and Metals Co. Ltd. [450,000 metric tons per year (t/yr)] and Tamano Smelter and refinery of Mitsui Mining & Smelting Co. Ltd., which owned Hibi Kysodo Smelting Co. Ltd. (was expanded to 260,000 t/yr from 228,000 t/yr in 2006).

<sup>3</sup>Lead and zinc mining operations at the Toyoha Mine were scheduled to cease by the end of March 2006.

<sup>4</sup>Secondary lead smelter and refinery.

TABLE 3  
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity	Exploitable reserves
Coal <sup>2</sup>	773,000
Dolomite	913,000
Gold ore, Au content	kilograms 159,000
Iodine	5,000 <sup>e</sup>
Limestone	40,400,000
Pyrophyllite	59,700
Silica sand	73,600
Silica stone, white	462,000

<sup>e</sup>Estimated.

<sup>1</sup>Reserves as of 2004.

<sup>2</sup>Recoverable reserves, including brown coal.

Source: Natural Resources and Fuel Department, Agency of Natural Resource and Energy.

TABLE 4  
JAPAN: DOMESTIC DEMAND FOR GOLD AND SILVER

Item	2002	2003	2004	2005	2006
Gold:					
Dental and medical	kilograms 21,765	22,373	21,383	20,881	21,514
Electrical, electronic, and communication	do. 80,415	85,112	86,315	100,718	106,213
Gold plating	do. 22,513	23,512	23,612	20,118	21,895
Jewelry	do. 37,128	20,489	20,189	20,451	39,139
Decorations and badges	do. 1,392	1,499	1,412	1,244	1,365
Pottery and porcelain	do. 1,149	1,532	1,420	1,415	1,328
Fountain pens	do. 15	15	--	--	--
Watches	do. 785	790	786	799	988
Industrial arts and crafts	do. 4,697	4,879	4,653	4,785	4,618
Private hoarding	do. 85,569	79,481	80,526	80,983	-44,248 <sup>1</sup>
Other	do. 47,755	48,317	49,302	45,572 <sup>r</sup>	48,631
Total	do. 303,183	287,999	289,598	298,117	202,564
Silver:					
Silver nitrate for photography	metric tons 1,532	1,365	1,243	969	1,005
Silver nitrate for other uses	do. 220	295	307	299	308
Electrical contacts	do. 153	219	260	209	189
Brazing alloy	do. 98	95	105	102	107
Rolled products	do. 216	228	248	214	221
Other	do. 455	474	434	385 <sup>r</sup>	412
Total	do. 2,674	2,676	2,597	2,178	2,242

-- Zero.

<sup>1</sup>Negative figure indicates the selling of private hoards of gold.

Source: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, Nos. 121, 122, and 123; Ministry of Economy, Trade and Industry, Yearbook of Iron and Steel, Nonferrous Metals, and Fabricated Metals Statistics, 2006.

TABLE 5  
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	2002	2003	2004	2005	2006
<b>Automobiles:</b>					
Ordinary steel	10,310	10,580	10,760	11,140	11,650
Specialty steel	2,990	3,230	3,640	4,150	4,270
Total	13,300	13,810	14,400	15,290	15,920
<b>Construction:</b>					
Ordinary steel	13,580	13,300	13,380	13,130	13,390
Specialty steel	640	710	720	690	740
Total	14,220	14,010	14,100	13,820	14,130
<b>Conversion and processing:</b>					
Ordinary steel	2,790	2,760	2,800	2,560	2,590
Specialty steel	3,560	3,880	4,340	4,790	4,890
Total	6,350	6,640	7,140	7,350	7,480
<b>Electric machinery and equipment:</b>					
Ordinary steel	1,840	1,940	2,030	2,010	2,080
Specialty steel	130	160	180	160	170
Total	1,970	2,100	2,210	2,170	2,250
<b>Home and office appliances:</b>					
Ordinary steel	540	580	610	600	610
Specialty steel	200	200	190	180	200
Total	740	780	800	780	810
<b>Industrial machinery and equipment:</b>					
Ordinary steel	1,360	1,650	1,920	2,070	2,370
Specialty steel	980	1,180	1,390	1,460	1,600
Total	2,340	3,830	3,310	3,530	3,970
<b>Shipbuilding and marine equipment:</b>					
Ordinary steel	3,420	3,530	4,290	4,860	5,000
Specialty steel	180	210	140	140	150
Total	3,600	3,740	4,430	5,000	5,150
<b>Steel dealers:</b>					
Ordinary steel	17,480	17,070	17,400	16,510	16,800
Specialty steel	1,210	1,350	1,470	1,440	1,470
Total	18,690	18,420	18,870	17,950	18,270
<b>Tanks and containers:</b>					
Ordinary steel	1,560	1,600	1,600	1,440	1,480
Specialty steel	20	20	30	40	60
Total	1,580	1,620	1,630	1,480	1,540
<b>Other:</b>					
Ordinary steel	500	410	430	420	420
Specialty steel	110	120	140	120	110
Total	610	530	570	540	530
<b>Total domestic demand:</b>					
Ordinary steel	53,380	53,420	55,220	54,740	56,400
Specialty steel	10,020	11,060	12,240	13,170	13,660
Grand total	63,400	64,480	67,460	67,910	70,060

Source: The Steel Industry of Japan 2005-2007, The Japan Iron and Steel Federation.

TABLE 6  
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY PRINCIPAL DESTINATION

Destinations	2002		2003		2004		2005		2006	
	Quantity (thousand metric tons)	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Quantity (thousand metric tons)	Percentage of total
<b>Asia:</b>										
China	6,532	18.0	6,435	18.7	6,894	19.5	5,783	17.7	6,198	17.6
Hong Kong	1,542	4.2	1,207	3.5	1,184	3.4	873	2.7	858	2.4
Indonesia	1,164	3.2	926	2.7	1,068	3.0	1,234	3.8	946	2.7
Korea, Republic of	9,198	25.3	8,978	26.1	8,952	25.4	7,738	23.7	8,758	24.9
Malaysia	1,704	4.7	1,742	5.1	1,642	4.7	1,145	3.5	1,113	3.2
Taiwan	3,263	9.0	3,280	9.5	3,235	9.2	3,605	11.1	3,528	10.0
Thailand	3,350	9.2	3,593	10.4	3,863	10.9	4,099	12.6	3,724	10.6
Other	3,586	9.9	2,932	8.5	2,857	8.1	2,527	7.8	3,023	8.6
<b>Total</b>	<b>30,339</b>	<b>83.5</b>	<b>29,093</b>	<b>84.5</b>	<b>29,695</b>	<b>84.1</b>	<b>27,004</b>	<b>82.8</b>	<b>28,148</b>	<b>80.0</b>
<b>Oceania:</b>										
Australia	593	1.6	629	1.8	489	1.4	450	1.4	438	1.2
Other	73	0.2	71	0.2	67	0.2	78	0.2	57	0.2
<b>Total</b>	<b>666</b>	<b>1.8</b>	<b>700</b>	<b>2.0</b>	<b>556</b>	<b>1.6</b>	<b>528</b>	<b>1.6</b>	<b>495</b>	<b>1.4</b>
<b>Africa</b>	<b>432</b>	<b>1.2</b>	<b>364</b>	<b>1.1</b>	<b>312</b>	<b>0.9</b>	<b>331</b>	<b>1.0</b>	<b>368</b>	<b>1.0</b>
<b>Middle East:</b>										
Iran	259	0.7	319	0.9	279	0.8	304	0.9	294	0.8
Saudi Arabia	392	1.1	413	1.2	247	0.7	398	1.2	543	1.5
Other	423	1.2	440	1.3	475	1.3	681	2.1	713	2.0
<b>Total</b>	<b>1,074</b>	<b>3.0</b>	<b>1,172</b>	<b>3.4</b>	<b>1,001</b>	<b>2.8</b>	<b>1,383</b>	<b>4.2</b>	<b>1,550</b>	<b>4.4</b>
<b>Europe:</b>										
European Union	332	0.9	360	1.0	489	1.4	460	1.4	477	1.4
Other	383	1.1	382	1.1	609	1.7	308	0.9	305	0.9
<b>Total</b>	<b>715</b>	<b>2.0</b>	<b>742</b>	<b>2.2</b>	<b>1,098</b>	<b>3.1</b>	<b>768</b>	<b>2.4</b>	<b>782</b>	<b>2.2</b>
<b>North America:</b>										
United States	1,485	4.1	1,076	3.1	1,428	4.0	1,451	4.5	1,991	5.7
Other	315	0.9	231	0.7	214	0.6	229	0.7	364	1.0
<b>Total</b>	<b>1,800</b>	<b>5.0</b>	<b>1,307</b>	<b>3.8</b>	<b>1,642</b>	<b>4.7</b>	<b>1,680</b>	<b>5.2</b>	<b>2,355</b>	<b>6.7</b>
<b>Latin America:</b>										
Mexico	684	1.9	634	1.8	697	2.0	636	2.0	910	2.6
Other	613	1.7	399	1.2	300	0.8	274	0.8	577	1.6
<b>Total</b>	<b>1,297</b>	<b>3.6</b>	<b>1,033</b>	<b>3.0</b>	<b>997</b>	<b>2.8</b>	<b>910</b>	<b>2.8</b>	<b>1,487</b>	<b>4.2</b>
<b>Grand total</b>	<b>36,323</b>	<b>100.0</b>	<b>34,412</b>	<b>100.0</b>	<b>35,302</b>	<b>100.0</b>	<b>32,604</b>	<b>100.0</b>	<b>35,185</b>	<b>100.0</b>

Source: The Japan Iron and Steel Federation, Monthly report of the iron and steel statistics, January 2007; and The Steel Industry of Japan 2002-06.



TABLE 7  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2006

		Australia			
		McArthur River, Northern Territory	Northparkes, New South Wales	Cadia Hill/Ridgeway	Endeavor
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Investment in exploration and development	Long-term loan	Equity participation.
Participating Japanese companies and their equity share	ANT Minerals Pty Ltd., <sup>1</sup> 25% (ANT Minerals was 50% owned by Nippon Mining and Metals Co. Ltd., and 16.7% owned each by three other Japanese companies)	Sumitomo Metal Mining Oceania Pty., 13.3%, and SC Mineral Resources Ltd. of Australia, 6.7%	Pan Pacific Copper Co. Ltd. (PPC)	Toho Zinc Co. Ltd., 25%.	
Majority equity holder and/or other equity holder	Mount Isa Mines Ltd. (MIM), 75% MIM was part of Xstrata Zinc	North Broken Hill Peko Ltd. of Australia, 80%	NewCrest Mining Co. Ltd.	CBH Resources Ltd., 75%.	
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold	Lead and zinc.	
Estimated reserves and ore grade	39.9 million metric tons, 5.5% lead, 12.6% zinc, 55 grams per metric ton silver	63.7 million metric tons, 1.108% copper, 0.487 gram per metric ton gold	Cadia, 210 million metric tons, 0.61% copper, 1.86 grams per metric ton gold; Ridgeway, 61 million metric tons, 0.75% copper, 2.4 grams per metric ton gold	15 million metric tons, 5.4% lead, 8.7% zinc.	
Type of mine	Underground	Open pit and underground	Cadia, open pit; Ridgeway, underground	Underground.	
Total cost of the project	\$296 million (Australian)	\$303 million (Australian)	\$726 million (Australian) (Cadia and Ridgeway)	\$30 million (Australian).	
Japanese share	\$29 million (Australian)	\$75.6 million (Australian)	\$80 million (cash in Australian \$)	\$9 million (Australian).	
Annual production capacity	1,194,000 metric tons of crude ore containing 5.6% lead, 13.5% zinc	3,934,000 metric tons of crude ore containing 1.12% copper plus 0.46 gram per metric ton gold	22,054 million metric tons of crude ore, 0.75 grams per metric ton gold (Cadia)	1.2 million metric tons of crude ore, 180,000 metric tons of zinc.	
Annual shipment to Japan	4,338 metric tons of lead and 23,052 metric tons of zinc in mixed concentrate	22,098 metric tons of copper in concentrate	50,000 metric tons of copper and 11 metric tons of gold	Unknown.	
Construction started	August 1993	May 1993	Cadia, 1996; Ridgeway, 2000	Unknown.	
Production started or planned	September 1995	October 1995	Cadia, 1998; Ridgeway, 2002	September, 2003.	
See footnotes at end of table.					

TABLE 7—Continued  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN  
 THE 1990s AND 2000s, AN UPDATE IN 2006

Nature of project involvement	Canada		Equity participation and provided loan	Chile
	British Columbia			
	Mount Polley <sup>2</sup>	Huckleberry		
Participating Japanese companies and their equity share	Sumitomo Corp. (SC) sold its 47.5% equity interest to Imperial Metals Corp. in 2000	Mitsubishi Materials Corp., 31.25%; Dowa Mining Co. Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; Marubeni Corp., 6.25%	Mitsui and Co. Ltd., 7.4%; Mitsui Mining and Smelting Co. Ltd., 1.0%; Nippon Mining and Metals Co. Ltd., 3.6%.	Equity participation and provided loan.
Majority equity holder and/or other equity holder	Imperial Metals Corp. of Canada, 100% <sup>1</sup>	Princeton Mining Corp. of Canada, 50%	Falconbridge Ltd. of Canada, 44%, and Anglo American plc of the United Kingdom, 44%.	
Mineral commodity involved	Copper and gold	Copper	Copper.	
Estimated reserves and ore grade	81.5 million metric tons, 0.3% copper, 0.42 gram per metric ton gold	56.5 million metric tons, 0.51% copper, 0.014% molybdenum	1,804.3 million metric tons, 0.90% copper.	
Type of mine	Open pit	Open pit	Open pit.	
Total cost of the project	\$123 million (Canadian)	\$136 million (Canadian)	\$1,760 million.	
Japanese share	\$109 million (Canadian)	\$78 million (Canadian)	\$375 million.	
Annual production capacity	6,500,000 metric tons of crude ore	6,951,000 metric tons of crude ore containing 0.55% copper, 0.01% molybdenum	43,120,000 metric tons of crude ore, 1.00% copper.	
Annual shipment to Japan	15,000 metric tons of copper in concentrate plus gold value	35,798 metric tons of copper in concentrate	96,023 metric tons of copper in concentrate.	
Construction started	September 1996	1996	1996.	
Production started or planned	June 1997	October 1977	January 1999.	

See footnotes at end of table.

TABLE 7--Continued  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN  
 THE 1990s AND 2000s, AN UPDATE IN 2006

Chile--Continued				
Region III				
	La Candelaria	Atacama Cozan	Ojos del Salado	Regalito
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity ownership.
Participating Japanese companies and their equity share	Sumitomo Metal Mining Co. Ltd. (SMM), 16%, and Sumitomo Corp. (SC), 4%	Nittetsu Mining Co. Ltd., 60%	Sumitomo Metal Mining Co. Ltd. (SMM) Ltd. and Sumitomo Corp. (SC) planned to acquire 16% and 4%, respectively	Pan Pacific Copper Co. Ltd. (PPC), 100%.
Major equity holder and/or other equity holder	Phelps Dodge Corp. of the United States, 80%	Inversiones Errazuriz Ltda. of Chile, 40%	Phelps Dodge Corp. of the United States, 100% (80%, after Japanese partners acquire their shares)	Pan Pacific Copper Co. Ltd. (PPC) acquired 100% equity interest from Regalito Copper Corp. in May 2006.
Mineral commodity involved	Copper and gold	Copper	Copper	Copper.
Estimated reserves and ore grade	307.5 million metric tons, 0.73% copper, 0.205 gram per metric ton gold	30 million metric tons, 1.5% copper, 0.26 gram per metric ton gold	13.7 million metric tons, 1.33% copper, 0.27 grams per metric ton gold	628 million metric tons, 0.43% copper in the measured and indicated category; a feasibility study would be conducted during 2006 and 2008.
Type of mine	Open pit	Underground	Underground	Unknown.
Total cost of the project	\$592 million	\$111 million	Estimated cost \$125 million	Unknown.
Japanese share	\$296 million	\$101 million	\$25 million	Unknown.
Annual production capacity	22,735,000 metric tons of crude ore, 0.79% copper	1,820,000 metric tons of crude ore	2,346,000 metric tons of crude ore, 1.35% copper	Unknown.
Annual shipment to Japan	85,313 metric tons of copper in concentrate	13,000 metric tons of copper in concentrate	Unknown	100,000 to 150,000 metric tons of copper cathode.
Construction started	April 1993	May 1999	1929, but ceased operations in 1998	Planned in 2010.
Production started or planned	March 1995	June 2003	2004 resumed operations	2011.
See footnotes at end of table.				

TABLE 7--Continued  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN  
 THE 1990s AND 2000s, AN UPDATE IN 2006

Nature of project involvement	Chile--Continued		Indonesia, Batu Hijau,		Mexico	
	Los Pelembres, Region IV	Equity participation	Sumbawa Island	Equity participation	Tizapa, Mexico City	Investment in exploration and development.
Participating Japanese companies and their equity share	Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui and Co. Ltd., 1.25%		Sumitomo Corp. (SC), 26%; Sumitomo Metal Mining Co. Ltd. (SMM), 5.0%; Mitsubishi Materials Corp., 2.5%; Furukawa Co. Ltd., 1.5%		Dowa Mining Co. Ltd., 39%, and Sumitomo Corp. (SC), 10%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp. (SC), 10%.
Major equity holder and/or other equity holder	Antofagasta plc of the United Kingdom, 60%		Newmont Gold Co. of the United States, 45%, and P.T. Pukuafu Indah of Indonesia, 20%		Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%.
Mineral commodity involved	Copper		Copper and gold		Copper, lead, and zinc	Copper, lead, and zinc.
Estimated reserves and ore grade	3,076.1 million metric tons, 0.62% copper		1,320,000 metric tons, 0.31% copper, 0.43 gram per metric ton gold		2,471 million metric tons, 0.61% copper, 1.36% lead, 6.56% zinc plus gold and silver	2.9 million metric tons, 0.68% copper, 2.56% lead, 8.78% zinc plus gold and silver.
Type of mine	Open pit		Open pit		Underground	Underground.
Total cost of the project	\$1,360 million		\$1,925 million		\$38.2 million	\$45.4 million.
Japanese share	\$61.4 million		\$513 million		\$35.1 million	\$41.3 million.
Annual production capacity	46,000,000 metric tons of crude ore, 0.81% copper		45,540,000 metric tons of crude ore containing 0.62% copper and 0.75 gram per metric ton gold		497,000 metric tons of crude ore 6.0% zinc, 2.0% lead, 0.4% copper	330,000 metric tons of crude ore.
Annual shipment to Japan	163,200 metric tons of copper in concentrate		92,128 metric tons of copper in concentrate		23,500 metric tons of zinc in concentrate	Unknown zinc in concentrate.
Construction started	November 1997		September 1996		May 1992	January 1998.
Production started or planned	April 2000		October 1999		November 1994	October 2000.

See footnotes at end of table.

TABLE 7--Continued  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN  
 THE 1990s AND 2000s, AN UPDATE IN 2006

Nature of project involvement	Peru		
	Antamina, Ancash Investment in exploration and development	Cerro Verde, Arequipa Equity participation (planned)	Pallca, Ancash Equity participation.
Participating Japanese companies and their equity share	Mitsubishi Corp., 10%	Sumitomo Metal Mining Co. Ltd. (SMM), and Sumitomo Corp. (SC) planned to acquire 16.8% and 4.2%, respectively	Mitsui & Co. Ltd., 30%.
Major equity holder and/or other equity holder	Noranda Inc. of Canada and BHP Billiton plc of the United Kingdom, 33.75% each, and Teck Cominco Ltd. of Canada, 22.5%	Phelps Dodge Corp., 53.6%; Compania de Minas Buenaventura S.A.A., 18.2%; others, 7.2%	Mitsui Mining and Smelting Co. Ltd., 70%.
Mineral commodity involved	Copper, zinc, and molybdenum	Copper	Lead and zinc.
Estimated reserves and ore grade	466 million metric tons, 1.18% copper, 0.98% zinc, and 0.03% molybdenum	1,033 million metric tons, 0.514% copper, 0.018% molybdenum	6 million metric tons, 1% lead, 12% zinc.
Type of mine	Open pit	Open pit	Underground.
Total cost of the project	\$2,296 million	\$850 million	\$6.2 million.
Japanese share	\$404 million	About \$265 million	Unknown.
Annual production capacity	25,600,000 metric tons of crude ore	180,000 metric tons of copper in concentrate	31,400 metric tons or 16,000 metric tons of metal (planned).
Annual shipment to Japan	10,579 metric tons of copper in concentrate	Approximately 90,000 metric tons of copper in concentrate	Unknown.
Construction started	1998	Unknown	2005.
Production started or planned	June 2001	The fourth quarter of 2006	March 2006.

See footnotes at end of table.

TABLE 7--Continued  
 JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN  
 THE 1990s AND 2000s, AN UPDATE IN 2006

Nature of project involvement	The Philippines	United States
	Padcal, Luzon	Pogo, Alaska
Long-term loan		Mine owned by Sumitomo Metal Mining Co. Ltd. (SMM)
Participating Japanese companies and their equity share	Pan Pacific Copper Co. Ltd. (PPC) (Nippon Mining and Metals Co. Ltd., 66% and Mitsui Mining and Smelting Co. Ltd., 34%)	Teck Cominco Co., 40%, and SC America Minerals, Inc., 9%.
Majority equity holder and/or other equity holder	Philex Mining Corp.	Sumitomo Metal Mining America Inc., 51%.
Mineral commodity involved	Copper and gold	Gold.
Estimated reserves and ore grade	34.9 million metric tons, 0.28% copper, 0.78 gram per metric ton gold	152 metric tons.
Type of mine	Underground	Underground.
Total cost of the project	\$15 million	\$280 million.
Japanese share	\$15 million	\$168 million.
Annual production capacity	8,970,000 metric tons of crude ore (0.28% Cu, 0.41 g/t Au) or 70,000 metric tons of copper concentrate	12 metric tons of gold.
Annual shipment to Japan	15,000 metric tons of copper and 2 metric tons of gold in copper concentrate	Unknown.
Construction started	December 2003	June 2004.
Production started or planned	2006	March 2006.
<sup>1</sup> ANT Minerals Pty Ltd. (50% owned by Nippon Mining and Metals Co. Ltd., 16.7% owned each by Mitsui & Co. Ltd., Toyoha Mining Co. Ltd., and Marubeni Corp.), which owned 25% interest in McArthur River Mine, sold all its interest to Xstrata plc, through Mount Isa Mines Ltd., which was part of Xstrata Zinc (one of the Xstrata plc companies) in September 2005.		
<sup>2</sup> SC Minerals Canada Ltd. (a wholly owned subsidiary of Sumitomo Corp.) sold its 47.5% interest in Mount Polley Copper Project to Imperial Metals Corp. of Canada for \$4.5 million by the end of 2000.		

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2002, p. 210-217; Japan Oil, Gas and Metals National Corp., Metal Mining Data Book, 2006, p. 221-225.