

2016 Minerals Yearbook

JAPAN

THE MINERAL INDUSTRY OF JAPAN

By Spencer D. Buteyn

In 2016, Japan's nominal gross domestic product (GDP) was \$4.94 trillion, and its real GDP increased by 1.0%. Japan's mineral sector was dominated by the metals- and mineral-processing industries. Japan had one of the world's leading mineral-processing sectors, and in 2016, continued to rely heavily on the import of minerals to supply its manufacturing sector owing to the lack of domestic mineral reserves. Metallic ores and concentrates that were imported by Japan included copper, gold, iron, lead, nickel, platinum-group metals, silver, tin, and zinc. Japan also imported cadmium metal, refined lead, and refined zinc. In 2016, Japan remained the world's second-ranked producer (excluding United States production) of raw steel, accounting for 6.5% of world production, behind China, which accounted for 50%. Japan was also the second-ranked producer (excluding United States production) of titanium sponge, accounting for 32% of global production, and selenium, 23%. Japan was the world's fourth-ranked producer (excluding United States production) of indium metal, accounting for 10% of global production; cadmium metal, 8.3%; tellurium, 8.1%; and bromine, 5.8%. Japan had the largest reserves of iodine in the world at 5 million metric tons (Mt) and its production of iodine remained second (excluding United States production) only to Chile in 2016, accounting for 33% of world production (International Monetary Fund, 2017b; Japan Mining Industry Association, 2017, p. 12–13, 28; Japan Statistics Bureau, 2017b, p. 27; Anderson, 2018a–c; Bedinger, 2018; Fenton, 2018; Schnebele, 2018a, b; Tolcin, 2018).

Minerals in the National Economy

The mining and quarrying industry played only a minor role in Japan's economy, accounting for 0.1% of the GDP in 2015 (the latest year for which data were available), whereas the manufacturing industry accounted for 20.4% of the GDP. In 2016, 21,269 individuals and 1,957 establishments were engaged in the mining and quarrying industry. In 2014 (the latest year for which data were available), manufactured goods shipments were valued at \$2.78 trillion¹ [305 trillion Japanese yen (JPY)]. Of this amount, chemicals and related products accounted for 9.2%; iron and steel, 6.3%; petroleum and coal products, 6.1%; fabricated metal products, 4.6%; electronic parts, devices, and electronic circuits, 4.5%; nonferrous metals and products, 3.1%; and ceramic, stone, and clay products, 2.4%. Japan was dependent on imports for 90.5% of its energy supply. This was largely owing to nuclear energy being substituted by coal, natural gas, and petroleum following the March 11, 2011, magnitude 9.1 Tohoku earthquake and related tsunami in northern Honshu that resulted in the Fukushima

nuclear disaster. Coal, natural gas, and petroleum accounted for 92.3% of Japan's primary energy supply in fiscal year 2014² compared with 82.3% in fiscal year 2010 (Hayes and others, 2017, p. 91; Japan Statistics Bureau, 2017b, p. 30, 32, 66, 75, 77).

In 2016, Japan's outward foreign direct investment (FDI) increased by 24.3% to a record high of \$169.6 billion. This increase was owing to the \$30.8 billion SoftBank Group Corp. acquisition of ARM Holdings plc, a United Kingdom-based semiconductor design company, in September 2016. The United States and the United Kingdom were the leading two destinations for Japanese outward FDI, accounting for 30.8% and 28.2%, respectively. The manufacturing of iron and nonferrous metals and mining accounted for 2.7% and 2.4% of Japan's outward FDI, respectively. Outward FDI to the manufacturing of iron and nonferrous metals increased by 48.4% in 2016, and that to mining decreased by 16.0%. In 2016, inward FDI to Japan increased by 648% to \$39.3 billion owing largely to investments in Japan's electrical and electronics, pharmaceutical products, and service sectors. The United States and the United Kingdom were the leading contributors to Japan's inward FDI, accounting for 16.0% and 14.3%, respectively. Inward FDI to mining was valued at \$16 million in 2016, which was an increase of 9.7%. Inward FDI for the manufacture of iron and nonferrous metals was negative, with a disinvestment of \$55 million compared with a \$72 million disinvestment in 2015. Inward FDI for petroleum was also negative, with a \$1.5 billion disinvestment following a disinvestment of \$4 million in 2015 (Japan External Trade Organization, 2017b, p. 21, 26; 2018a–d).

Government Policies and Programs

The Agency for Natural Resources and Energy, which was a part of the Ministry of Economy, Trade and Industry (METI), is responsible for formulating Japan's mineral policies. The Japan Oil, Gas and Metals National Corp. (JOGMEC), which was formed in 2004 through the merger of the Japan National Oil Co. and the Metal Mining Agency of Japan, is charged with the implementation of the policies set by the METI, as well as securing a stable supply of natural resources for the country required to sustain continuous economic growth. In November 2016, the JOGMEC Act was amended to allow JOGMEC to purchase overseas resource companies and lease seismic survey vessels to private companies for the purpose of natural gas and petroleum exploration (Kikkawa, 2013, p. 34–35; Japan Oil, Gas and Metals National Corp., 2017a, p. 2; 2017b).

Japan's mining industry is managed according to the Mining Act of 1950 (law No. 289 of 1950), which replaced the Mining Act (law No. 45 of 1905) and the Placer Act (law No. 13 of 1909).

¹Where necessary, values have been converted from Japanese yen (JPY) to U.S. dollars (US\$) at the annual average exchange rate of JPY 110.101=US\$1.00 for 2014 and JPY 113.138=US\$1.00 for 2016. fiscal year is defined as beginning on April 1 and ending on March 31 of the following year.

²Japan's fiscal year is defined as beginning on April 1 and ending on March 31 of the following year.

The Commodity Exchange Act of 1950 (law No. 239) allowed for the establishment of commodities exchanges and the trading of commodities (including minerals), and law No. 26 addressed mine pollution from suspended or abandoned mines and other mineral facilities. The 2012 amendment to the Mining Act of 1950 defined two classes of minerals: specified minerals and nonspecified minerals. Specified minerals are defined as those that the Government of Japan designates as particularly important to the national economy, which include petroleum and natural gas. An area either containing or likely to contain specified minerals could be deemed a Specified Area by the METI. Under the amendments, the METI accepts applications from interested developers for Specified Areas during a period of no shorter than 6 months, after which the METI selects what it deems to be the most suited developer for the area. Nonspecified minerals include all minerals not listed as a specified mineral. The original first-come-first-served system established in the Mining Act of 1950 still applies for nonspecified minerals; however, under the amendments, applicants for both types of minerals must demonstrate financial solvency and the technical capabilities necessary to carry out development of a site (Ministry of Economy, Trade and Industry, 2006, p. 1–3; Clifford Chance LLC, 2012; Japan Oil, Gas and Metals National Corp., 2017b).

JOGMEC manages the stockpiling of liquefied petroleum gas (LPG), metals, and crude petroleum. LPG and crude petroleum are stockpiled under three programs: national stockpiles, which are run directly by the Government; stockpiles managed by private petroleum companies, which by law are obligated to perform stockpiling; and stockpiles held jointly with petroleum producing nations. Private companies with stockpiling obligations can receive loans from JOGMEC for the purchase of LPG and petroleum for the purpose of stockpiling. At the end of fiscal year 2016, 296 million barrels (Mbbbl) of petroleum and 15.7 Mbbbl of LPG were stored at national stockpiles, and 18.3 Mbbbl of petroleum and 17.5 Mbbbl of LPG were stored at private stockpiles. JOGMEC also stockpiles rare metals, which it defines as a collective term for metallic minerals that are difficult to separate or extract, unevenly distributed globally, in danger of supply disruption, and important to Japan's manufacturing industry. JOGMEC maintains a 42-day supply of rare metals at national stockpiles, and an 18-day supply is maintained at private stockpiles (Japan Oil, Gas and Metals National Corp., 2017a, p. 26–27; 2018b, c).

Production

Significant increases in production included that of refined copper (secondary), by 22%; smelted copper (secondary), 21%; alumina, 20%; ferrochromium, 13%; refined silver (secondary), 12%; and nickel content of chemicals, 11%. Notable decreases in production included that of molybdenum, by 46%; refined gallium (primary), 40%; refined bismuth, 32%; refined antimony, 20%; ferronickel (gross weight, 16%, and Ni content, 10%); mine output of gold, 16%; smelted zinc (secondary), 13%; paraffin wax, 12%; and refined tellurium, 12% (table 1).

Structure of the Mineral Industry

Japan's mineral industry was primarily owned and operated by private companies. The coal and metallic mining industries in Japan remained relatively small compared with its industrial mineral mining and metal-processing industries. Few metal mines remained in operation in Japan. They included the Hishikari gold mine in Kagoshima Prefecture, which was operated by Sumitomo Metal Mining Co. Ltd., and the Kushiro coal mine in Hokkaido Prefecture, which was operated by Kushiro Coal Mine Co., Ltd. and was the last underground coal mine in the country. In 2012 (the latest year for which data were available), there were 1,533 quarries (gravel, sand, and stone) operating in Japan, 197 mines producing minerals for the ceramics industry, 41 enterprises that were affiliated with natural gas and crude petroleum production, 14 coal mines, 14 metal mines, and 40 enterprises involved in the mining of other minerals. In addition, 86 enterprises were engaged in the administrative or ancillary economic activities directly related to mining (table 2; Japan Statistics Bureau, 2017a, p. 266).

Mineral Trade

Japan's economy relied heavily on the import of mineral fuels and both ferrous and nonferrous metallic ores and concentrates. In 2016, Japan was the fourth-ranked consumer of coal and crude petroleum, and the fifth-ranked consumer of natural gas in the world. Imports accounted for 99.68% of Japan's consumption of crude petroleum, 97.56% of natural gas, and 99.35% of coal. Japan's total imports decreased by 6.4% in 2016 to \$607 billion. The category of mineral fuels, which accounted for 18.2% of total imports, had the largest percentage decrease in 2016, decreasing by 26.6% to \$111 billion. Among the mineral fuels imported, the value of petroleum products decreased by 34.8% to \$9.8 billion; liquefied natural gas (LNG), by 34.3% to \$30.0 billion; crude petroleum, by 24.7% to \$50.9 billion; LPG, by 24.4% to \$4.1 billion; and coal, by 6.3% to \$15.1 billion. The decreases in the value of mineral fuel imports were owing to the decline in global prices of crude petroleum and natural gas. Among the raw materials imported, the value of iron ore and concentrate imports accounted for 0.6% of total imports and decreased by 20.9% to \$7.4 billion, and that of nonferrous metallic ores accounted for 1.8% of total imports and decreased by 4.9% to \$10.9 billion. All of Japan's consumption of copper and zinc ores and concentrates was met by imports. Within manufactured goods, the value of nonferrous metal imports decreased by 11.2% to \$12.4 billion; iron and steel products, by 7.0% to \$6.5 billion; manufactures of metals, by 2.3% to \$10.3 billion; and nonmetallic mineral wares, by 0.8% to \$6.3 billion. The value of semiconductor imports, which accounted for 3.8% of total imports, decreased by 6.7% to \$23 billion (BP p.l.c., 2017, p. 9; Japan External Trade Organization, 2017a; 2017b, p. 4; Japan Oil, Gas and Metals National Corp., 2017a, p. 1).

Japan's leading import partner in 2016 was China (exclusive of Hong Kong), which accounted 25.8% of Japan's total imports, followed by the United States, 11.1%; Australia, 5.0%; the Republic of Korea, 4.1%; and Taiwan, 3.8%. Australia and Saudi Arabia were Japan's leading sources for imported mineral

fuels, by value, with each accounting for 17% of the total value of mineral fuel imports. Within mineral fuels, Saudi Arabia was the leading supplier of crude and partly refined petroleum, by value, accounting for 35% of the total, followed by the United Arab Emirates, 25%; Qatar, 9.4%; Russia, 6.5%; and Iran, 6.4%. The United States was Japan's leading supplier of imported chemicals, by value, accounting for 17.5% of the total (Japan External Trade Organization, 2017a; Japan Statistics Bureau, 2017a, p. 172–173).

In 2016, the value of Japan's total exports increased by 3.1% to \$645 billion. The category of transportation equipment, which accounted for 24.7% of total exports, increased by 6.4% to \$159 billion. Within the transportation equipment category, cars accounted for 58% of the value of transportation equipment exports, followed by motor vehicle parts, 20%; ships, 7.5%; buses and trucks, 7.3%; and motorcycles, 1.5%. This increase was attributed to increased exports of automobiles to China and the United States, as well as increased exports of motor vehicle parts to countries in East Asia (including China). Within manufactured goods, the value of exports of iron and steel products decreased by 13.8% to \$26.2 billion and the value of exports of nonferrous metals decreased by 3.3% to \$11.4 billion. The value of exports of manufactures of metals increased by 3.7% to \$10.5 billion and the value of exports of nonmetallic mineral wares increased by 3.1% to \$7.6 billion (Japan External Trade Organization, 2017a; 2017b, p. 14).

Japan's leading export partner in 2016 was the United States, which accounted for 20.2% of Japan's total exports. The United States had been Japan's leading export partner since 2013. Following the United States were China (exclusive of Hong Kong), which accounted for 17.7% of total exports; the Republic of Korea, 7.2%; Taiwan, 6.1%; and Hong Kong, 5.2%. China (exclusive of Hong Kong) was the leading importer of iron and steel products from Japan, in terms of value, and accounted for 16.3%, followed by the Republic of Korea, 14.2%; Thailand, 13.1%; the United States, 6.7%; and Taiwan, 5.4%. The United States was the leading destination for motor vehicles exported by Japan, accounting for 38.9% of the total value, followed by Australia, 6.0%; China (exclusive of Hong Kong), 4.7%; the United Arab Emirates, 4.1%; and Canada, 2.7% (Japan Statistics Bureau, 2017b, p. 112).

Commodity Review

Metals

Aluminum.—Japan's aluminum industry largely consists of rolling, extrusion, and die-casting companies that manufacture products for the construction, packaging, and transportation industries. Japan lacked any primary aluminum production following the discontinuation of electrolytic smelting at Nippon Light Metal Co. Ltd.'s (a wholly owned subsidiary of Nippon Light Metal Holdings Co. Ltd.) Kambara Complex in Shizuoka City, Shizuoka Prefecture, in March 2014. In 2016, Japan imported 1.4 Mt of unwrought aluminum (not alloyed), 1.1 Mt of unwrought aluminum (alloyed), 149,500 metric tons (t) of wrought aluminum, and 39,300 t of aluminum waste and scrap. Japan produced 788,800 t of secondary aluminum in 2016. Australia was Japan's leading source of primary and alloyed

aluminum imports, accounting for 21.8% of the total, followed by the United Arab Emirates, 15.9%; Russia, 13.2%; New Zealand, 10.2%; and Brazil, 9.1%. In 2016, 4.1 Mt of aluminum products was produced in Japan, of which 49% was rolled and extruded and 34% was casted and die-casted. The transportation industry accounted for 41% of the amount of aluminum products consumed and exported by Japan, followed by the construction industry and the fabricated metal industry, 12% each, and the food and beverage industry, 11%. Japan exported 6% of its aluminum products that were produced in 2016 (Japan Aluminium Association, 2017, p. 3, 4, 5, 7; 2018, p. 1, 5).

Iron and Steel.—Japan's steel industry depended entirely on the import of both iron ore and metallurgical coal. Japan imported 130.02 Mt of iron ore in 2016, sourced mainly from Australia and Brazil, which supplied 59.5% and 27.6% of the total, respectively. In 2016, Japan imported 59.95 Mt of metallurgical coal, sourced mainly from Australia, which supplied 71% of the total. Japan was a net exporter of ferrous scrap, exporting 8.70 Mt in 2016 (Japan Iron and Steel Federation, 2017a).

Of the 80 Mt of pig iron produced in Japan in 2016, 99.7% was used in the production of steel, with the remainder used in casting. Of the nearly 105 Mt of raw steel produced in 2016, 77% was classified as ordinary steel and 23% as specialty steel. About 93 Mt of hot-rolled steel products was produced in 2016. The construction industry was the leading consumer of ordinary steel products in Japan, accounting for 26.2% of the total consumption of ordinary steel. Construction activities were depressed in the first half of 2016 owing to labor shortages and rising costs; however, construction increased owing to the rebuilding efforts following the April 14 magnitude 6.2 earthquake and April 16 magnitude 7.3 earthquake in Kumamoto City, Kumamoto Prefecture. Property damage caused by the earthquake was estimated to be \$34 billion (JPY 3.8 trillion). Demand for ordinary steel in the construction industry increased by 2.5% in 2016, and was the first increase in 3 years. The automobile industry was the leading consumer of specialty steel products and the second-ranked consumer of ordinary steel products, accounting for 32.1% and 19.9%, respectively (Japan Times, 2016; Japan Iron and Steel Federation, 2017b, 2018; Kiyota and others, 2017).

Zinc and Cadmium.—Japan did not produce zinc ore in 2016 and had relied solely on imports of raw material since 2008 to supply its zinc refining industry. In 2016, Japan imported 449,000 t of zinc ore, of which Bolivia was the leading source (supplying 26% of Japan's total zinc ore imports), followed by Australia and Peru, which supplied 23% each; the United States, 14%; and Mexico, 12%. Akita Smelting Co. Ltd., which was a joint venture of Dowa Mining Co. Ltd., JX Nippon Mining & Metals, Sumitomo Metal Mining Co. Ltd., and Mitsubishi Materials, operated Japan's largest zinc refinery in Iijima, Akita Prefecture, which had a capacity of 200,400 metric tons per year. Japan produced 438,650 t of primary zinc from imported ores in 2016, which was a 4% decrease compared with production 2015, and 95,129 t of secondary zinc, which was a 13% decrease as compared with production in 2015. Cadmium was produced as a byproduct of zinc processing. In 2016, Japan produced 1,988 t of cadmium, which was an increase of 1.5%

compared with production in 2015, and imported 60 t, which was an increase of 50%. Japan's stocks of cadmium totaled 266 t at the beginning of 2016 and totaled 282 t at the end of the year. Japan's apparent consumption of cadmium decreased by 39% to 539 t, whereas exports increased by 36% to 1,493 t (Japan Mining Industry Association, 2017, p. 13, 28; Japan Oil, Gas and Metals National Corp., 2018a, p. 35).

Mineral Fuels and Related Materials

Petroleum and Petroleum Refinery Products.—Japan relies almost exclusively on the import of crude petroleum, producing only enough crude petroleum domestically to meet the equivalent of about 1 day of Japan's crude petroleum consumption. To meet Japan's demand for petroleum refinery products, the country's petroleum industry has adopted a method that the Petroleum Association of Japan refers to as the domestic petroleum refining system. Under the domestic petroleum refining system, large amounts of crude petroleum are imported, and a majority of petroleum refining takes place domestically, as opposed to the country importing a large variety of petroleum products. In fiscal year 2014 (the latest year for which data were available), domestic production accounted for 83.5% of the country's total supply of fuel oil. As of February 2016, 23 petroleum refineries were active in the country and had a combined (total) capacity of 3.9 million barrels per day. According to BP p.l.c., Japan was ranked fourth in petroleum refinery production in 2016, accounting for 4% of the world's total. In terms of volume, Japan's consumption of petroleum products has declined steadily since the year 2000. Between fiscal year 2000 and fiscal year 2014, demand for petroleum products declined by a total of 22.5%. Declining demand for petroleum products was attributed to oil-use reduction policies adopted following the two oil crises of the 1970s. These policies included increasing the use of nuclear energy, banning the construction of new heavy-fuel powerplants, and ratifying policies preferential to LNG. Another factor attributed to declining demand was the falling birthrate, aging population, and decreased automobile use by young adults in urban areas (Petroleum Association of Japan, 2017, p. 9–11, 74).

Outlook

The International Monetary Fund projected that Japan's real GDP would increase by 1.2% in 2017 and 0.6% in 2018. This growth would be accounted for by increased exports. A decreasing labor force is expected to negatively affect the country's future growth in the medium term. The iron ore supply for Japan's steel industry will remain sufficient owing to new iron ore mines in Australia and Brazil. Restrictions on coal mining in China and the closure of coal mines in North America are expected to affect Japan's supply of metallurgical coal. Production of nonferrous metals is likely to remain relatively stable owing to Japan's long-term supply of metals sourced from Government-owned, domestically stored stockpiles, exploration and development of overseas resources by Japanese-owned companies, and increasing recycling of domestic scrap (International Monetary Fund, 2017a, p. 16, 47;

Japan Iron and Steel Federation, 2017a; Japan External Trade Organization, 2018d).

The 2011 Fukushima nuclear accident resulting from the earthquake and tsunami in northern Honshu has had lasting effects on Japan's energy sector. Confidence in nuclear power remains low among Japanese citizens. Japan's energy self-sufficiency, the ratio of domestic production of primary energy and consumption of primary energy, was 6% in 2015, down from 19.9% in 2010, owing to the shutdown of all 54 of Japan's nuclear reactors in 2011. This has led to an increase in crude petroleum and petroleum product imports in recent years. Increasing Japan's energy self-sufficiency is a major goal of the Government's energy policy; that is, that the country reach 24.3% self-sufficiency by fiscal year 2030. This policy aims to increase Japan's nuclear and renewable energy production, which is likely to lead to a decrease in natural gas and petroleum imports (Ministry of Economy, Trade and Industry, 2015, 2017; Agency for Natural Resources and Energy, 2017; Silverstein, 2017).

References Cited

- Agency for Natural Resources and Energy, 2017, Simple table of total energy statistics FY2016: Agency for Natural Resources and Energy. (Accessed April 2, 2018, at http://www.enecho.meti.go.jp/statistics/total_energy/xls/stte_2016a.xlsx.) [In Japanese.]
- Anderson, C.S., 2018a, Indium: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 78–79.
- Anderson, C.S., 2018b, Selenium: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 146–147.
- Anderson, C.S., 2018c, Tellurium: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 166–167.
- Bedinger, G.M., 2018, Titanium and titanium dioxide: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 174–175.
- BP p.l.c., 2017, BP statistical review of world energy: London, United Kingdom, BP p.l.c. 49 p. (Accessed March 30, 2018, at <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of-world-energy-2017-full-report.pdf>.)
- Clifford Chance LLC, 2012, New mining law for Japan: Clifford Chance LLC. (Accessed July 12, 2018, via <https://onlineservices.cliffordchance.com>.)
- Fenton, M.D., 2018, Iron and steel: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 82–83.
- Hayes, G.P., Myers, E.K., Dewey, J.W., Briggs, R.W., Earle, P.S., Benz, H.M., Smoczyk, G.M., Flamme, H.E., Barnhart, W.D., Gold, R.D., and Furlong, K.P., 2017, Tectonic summaries of magnitude 7 and greater earthquakes from 2000 to 2015: U.S. Geological Survey Open-File Report 2016–1192, 148 p. (Accessed July 2, 2018, at <https://pubs.usgs.gov/of/2016/1192/ofr20161192.pdf>.)
- International Monetary Fund, 2017a, World economic outlook: International Monetary Fund, April, 258 p. (Accessed July 13, 2017, at <http://www.imf.org/~media/Files/Publications/WEO/2017/April/pdf/text.ashx?la=en>.)
- International Monetary Fund, 2017b, World economic outlook database: International Monetary Fund, April. (Accessed July 14, 2017, at <http://www.imf.org/external/pubs/ft/weo/2017/01/weodata/WEOApr2017all.xls>.)
- Japan Aluminium Association, 2017, Japanese aluminium industry: Japan Aluminium Association, 13 p. (Accessed April 2, 2018, at https://www.aluminum.or.jp/english/common/pdf/e_industry.pdf.)
- Japan Aluminium Association, 2018, Aluminum statistics—January 2018: Japan Aluminium Association, 6 p. (Accessed April 2, 2018, at http://www.aluminum.or.jp/english/statistics/files/1516667706_813678.pdf.)
- Japan External Trade Organization, 2017a, Japan's international trade in goods (yearly)—2016: Japan External Trade Organization. (Accessed March 31, 2018, at https://www.jetro.go.jp/ext_images/en/reports/statistics/data/gaikyo2016e.xls.)

- Japan External Trade Organization, 2017b, JETRO global trade and investment report 2017: Japan External Trade Organization, 60 p. (Accessed March 31, 2018, at https://www.jetro.go.jp/ext_images/en/reports/white_paper/trade_invest_2017_overview.pdf.)
- Japan External Trade Organization, 2018a, FDI flow by country and region—Historic data—Inward: Japan External Trade Organization. (Accessed April 2, 2018, at https://www.jetro.go.jp/ext_images/en/reports/statistics/data/country2_e_17cy.xls.)
- Japan External Trade Organization, 2018b, FDI flow by country and region—Historic data—Outward: Japan External Trade Organization. (Accessed April 2, 2018, at https://www.jetro.go.jp/ext_images/en/reports/statistics/data/country1_e_17cy.xls.)
- Japan External Trade Organization, 2018c, FDI flow by industry—Quarterly data (4th quarter, 2017)—Inward: Japan External Trade Organization. (Accessed June 15, 2018, at https://www.jetro.go.jp/ext_images/en/reports/statistics/data/industry2_e_17Q4.xls.)
- Japan External Trade Organization, 2018d, FDI flow by industry—Quarterly data (4th quarter, 2017)—Outward: Japan External Trade Organization. (Accessed June 15, 2018, at https://www.jetro.go.jp/ext_images/en/reports/statistics/data/industry1_e_17Q4.xls.)
- Japan Iron and Steel Federation, 2017a, The steel industry of Japan—Domestic demand: Japan Iron and Steel Federation. (Accessed April 2, 2018, at <http://www.jisf.or.jp/en/statistics/sij/documents/P6-7.pdf>.)
- Japan Iron and Steel Federation, 2017b, The steel industry of Japan—Raw materials and logistics: Japan Iron and Steel Federation. (Accessed April 2, 2018, at <http://www.jisf.or.jp/en/statistics/sij/documents/P10-11.pdf>.)
- Japan Iron and Steel Federation, 2018, Annual statistics 2017 calendar year: Japan Iron and Steel Federation. (Accessed March 31, 2018, at <http://www.jisf.or.jp/en/statistics/production/documents/ENG2017CYRevised.xls>.)
- Japan Mining Industry Association, 2017, Monthly statistics: Tokyo, Japan, Japan Mining Industry Association, October 3, 30 p.
- Japan Oil, Gas and Metals National Corp., 2017a, Annual report year ended March 31, 2017: Japan Oil, Gas and Metals National Corp., 49 p. (Accessed March 31, 2018, at <http://www.jogmec.go.jp/content/300350621.pdf>.)
- Japan Oil, Gas and Metals National Corp., 2017b, Summary of JOGMEC: Japan Oil, Gas and Metals National Corp., 5 p. (Accessed March 30, 2018, at <http://www.jogmec.go.jp/content/300196199.pdf>.)
- Japan Oil, Gas and Metals National Corp., 2018a, Mineral resources material flow 2017: Japan Oil, Gas and Metals National Corp., March, 360 p. (Accessed April 3, 2018, at http://mric.jogmec.go.jp/wp-content/uploads/2018/03/material_flow2017.pdf.) [In Japanese.]
- Japan Oil, Gas and Metals National Corp., 2018b, Stockpiling system: Japan Oil, Gas and Metals National Corp. (Accessed March 31, 2018, at http://www.jogmec.go.jp/english/stockpiling/stockpiling_10_000002.html.)
- Japan Oil, Gas and Metals National Corp., 2018c, What is rare metal stockpiling: Japan Oil, Gas and Metals National Corp. (Accessed March 31, 2018, at http://www.jogmec.go.jp/stockpiling/stockpiling_10_000001.html.) [In Japanese.]
- Japan Statistics Bureau, 2017a, Japan statistical yearbook 2018: Japan Statistics Bureau, 747 p. (Accessed March 30, 2018, at <http://www.stat.go.jp/english/data/nenkan/67nenkan/zenbun/en67/top.html>.)
- Japan Statistics Bureau, 2017b, Statistical handbook of Japan 2017: Japan Statistics Bureau, 197 p. (Accessed March 30, 2018, at <http://www.stat.go.jp/english/data/handbook/pdf/2017all.pdf>.)
- Japan Times, 2016, Kumamoto quakes caused ¥3.8 trillion damage, official estimate shows: The [Tokyo] Japan Times, September 29. (Accessed April 2, 2018, at <https://www.japantimes.co.jp/news/2016/09/29/national/kumamoto-government-estimates-%C2%A53-8-trillion-damage-done-april-earthquakes/#.WsK7tGGNaQ>.)
- Kikkawa, Takeo, 2013, Why has Japan revised the Mining Act?—Historical and contemporary background: Hitotsubashi Journal of Commerce and Management, v. 47, p. 33–42.
- Kiyota, T., Ikeda, T., Konagai, K., and Shiga, M., 2017, Geotechnical damage caused by the 2016 Kumamoto earthquake, Japan: International Journal of Geoengineering Case Histories, v. 4, no. 2, p. 78–95. (Accessed July 2, 2018, at https://www.geocasehistoriesjournal.org/pub/article/download/IJGCH_4_2_1/pdf_21.)
- Ministry of Economy, Trade and Industry, 2006, Commodity Exchange Act (Act No. 239 of August 5, 1950): Ministry of Economy, Trade and Industry, 227 p. (Accessed March 30, 2018, at <http://www.meti.go.jp/policy/commerce/b00/pdf/b00000005.pdf>.)
- Ministry of Economy, Trade and Industry, 2015, Long-term energy supply and demand outlook: Ministry of Economy, Trade and Industry, 12 p. (Accessed April 3, 2018, at http://www.meti.go.jp/english/press/2015/pdf/0716_01a.pdf.)
- Ministry of Economy, Trade and Industry, 2017, Japan's energy: Ministry of Economy, Trade and Industry, 16 p. (Accessed April 3, 2018, at http://www.enecho.meti.go.jp/en/category/brochures/pdf/japan_energy_2016.pdf.)
- Petroleum Association of Japan, 2017, [Petroleum industry in Japan 2016]: Petroleum Association of Japan, September, 71 p. (Accessed April 5, 2018, at http://www.paj.gr.jp/statis/data/data/2016_data.pdf.) [In Japanese.]
- Schnebele, E.K., 2018a, Bromine: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 38–39.
- Schnebele, E.K., 2018b, Iodine: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 80–81.
- Silverstein, Ken, 2017, Japan circling back to nuclear power after Fukushima disaster: Forbes, September 8. (Accessed April 3, 2018, at <https://www.forbes.com/sites/kensilverstein/2017/09/08/japan-may-be-coming-full-circle-after-its-fukushima-nuclear-energy-disaster/#7900fddb30e8>.)
- Tolcin, A.C., 2018, Cadmium: U.S. Geological Survey Mineral Commodity Summaries 2018, p. 40–41.

TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2012	2013	2014	2015	2016
METALS					
Aluminum:					
Alumina ^c	250,000	250,000	100,000	15,000	18,000
Aluminum metal:					
Primary	4,500 ^r	3,000 ^r	500 ^r	--	--
Secondary	788,200 ^r	809,400 ^r	827,300 ^r	776,700 ^r	788,800
Powder	10,785	11,409	11,783	11,648	11,630
Antimony, refinery production, metal	143	139	94	15	12
Bismuth, refinery production, primary, metal	470	480	588	632	428
Cadmium, refinery production, primary, metal	1,855	1,826	1,829	1,959	1,988
Cobalt, refinery production, Co content	2,542	2,747	3,654	4,259	4,305
Copper:					
Refinery production:					
Primary	1,270,914	1,210,242	1,296,641	1,243,072	1,259,426
Secondary	245,440	257,900	257,583	240,059	293,595
Smelter production, blister and anode:					
Primary	1,304,916	1,249,332	1,290,640	1,175,101	1,137,864
Secondary	303,900	313,636	310,029	296,486	358,810
Ferrous alloys:					
Ferrochromium	19,392	21,671	22,000 ^r	20,000 ^r	22,500
Ferromanganese	436,171	460,936	463,345	465,952	473,740
Ferromolybdenum	4,616	4,550	--	--	--
Ferronickel:					
Gross weight	371,913	402,768	379,291	396,969	333,448
Ni content	73,248	80,554	70,070	74,224	66,690
Ferrovandium	4,403	4,433	--	--	--
Silicomanganese	52,287	24,741	--	--	--
Other, unspecified ³	19,364	19,394	79,912	73,651	77,453
Gallium, refinery production, primary, metal ^c	kilograms	8,000	8,000	5,000	3,000
Gold:					
Mine production, Au content	do.	7,233	7,411	7,115	6,455
Refinery production, metal:					
Primary	do.	74,735	63,070	71,109 ^r	86,376
Secondary	do.	29,544	30,699	30,390	31,717
Indium, refinery production, primary, In content ^c	do.	71,000	72,000	70,000	70,000
Iodine		9,315	9,334	9,814	10,610
Iron and steel:					
Pig iron	thousand metric tons	81,405	83,849	83,872	81,011
Raw steel	do.	107,232	110,595	110,666	105,134
Products, semimanufactured, hot-rolled:					
Ordinary steels	do.	74,900	77,000	77,000	74,100 ^r
Specialty steels	do.	19,896	19,960	20,914	18,887 ^r
Lead, refinery production:					
Primary		91,037	92,227	87,303	85,655
Secondary		117,957	115,888	115,370	108,736
Molybdenum, metal		743 ^r	829	1,020	824
Nickel, Ni content:					
Chemicals		2,362	2,191	5,673	10,045 ^r
Metal		41,944	46,405	56,129	64,068
Oxide sinter		52,000 ^e	48,900 ^e	45,900 ^e	48,197
Platinum-group metals, refinery production, primary:					
Palladium, metal	kilograms	8,052	6,239 ^r	6,969	7,073 ^r
Platinum, metal	do.	1,735	1,273 ^r	1,124 ^r	1,379 ^r
Selenium, Se content	do.	755,000 ^e	741,294	782,451	772,768
					752,173

See footnotes at end of table.

TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2012	2013	2014	2015	2016
METALS—Continued					
Silver:					
Mine production, Ag content kilograms	3,577 ^r	3,644 ^r	3,541 ^r	4,616 ^r	5,076
Refinery production, metal:					
Primary do.	1,764,533	1,023,887	1,050,373	1,096,213	1,228,857
Secondary do.	348,620	707,591	741,443	786,632	846,627
Tellurium, refinery production, Te content do.	43,000 ^e	34,279	36,919	37,356	32,911
Tin, smelter production, primary	1,133	1,786	1,746	1,688	1,620
Titanium, titanium dioxide	185,320	173,904	177,569	174,770	179,154
Tungsten, metal	2,748	3,459	3,459	3,154	3,391
Zinc:					
Oxide	58,896	57,840	60,920	59,224	56,729
Smelter production:					
Primary	459,322	470,573	458,481	457,786	438,650
Secondary	111,990	116,718	124,540	108,833	95,129
INDUSTRIAL MINERALS					
Cement and clinker:					
Clinker thousand metric tons	49,969	51,585	52,169	50,471	50,224
Cement, hydraulic do.	54,737	57,962	57,913	54,827	53,255
Clay and shale:					
Fuller's earth	110,000	110,000	110,000	110,000	110,000
Kaolin	13,000	13,000	13,000	13,000	13,000
Diamond, industrial carats	34,000	34,000	34,000	34,000	34,000
Gypsum thousand metric tons	5,002	4,771	4,674	4,670	4,670
Iodine	9,315	9,334	9,814	10,610	9,993
Lime:					
Quicklime thousand metric tons	7,581	7,619	7,911	7,336	7,341
Slaked lime do.	1,370	1,434	1,401	1,378	1,342
Nitrogen, ammonia, N content do.	867	828	787	790	725
Salt, unspecified do.	925 ^r	929 ^r	928 ^r	938	928
Soda ash, synthetic	344,000	361,000	341,000	230,000 ^r	217,000
Stone, sand, and gravel:					
Silica, mine production, unspecified thousand metric tons	2,877	2,964 ^r	2,932	2,845	2,762
Stone, crushed:					
Dolomite do.	3,361	3,493	3,446	3,366	3,223
Limestone do.	140,038	148,066	148,008	142,916	139,332
Quartzite do.	9,306	9,291	9,496	8,988	9,068
Sulfur, byproduct, S content:					
Metallurgy do.	1,695	1,634	1,691	1,629	1,700
Petroleum do.	1,747	1,779	1,751	1,733	1,818
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand metric tons	1,320	1,200	1,200	880 ^r	800
Coke, metallurgical do.	34,743	35,154	34,163	32,402	33,159
Natural gas million cubic meters	3,276	2,995	2,882	2,734	2,754
Petroleum:					
Crude thousand 42-gallon barrels	4,994	4,322	4,051	3,751	3,453
Refinery production:					
Asphalt do.	24,726	21,998	20,732	19,763	19,385
Distillate fuel oil do.	272,915	237,214	218,289	199,694	209,355
Gas oil do.	242,743	266,674	257,746	264,608	258,360
Gasoline do.	337,588	341,730	336,768	341,865	340,346
Jet fuel do.	83,156	92,521	96,098	100,303	99,788
Kerosene do.	118,117	113,555	105,869	97,692	100,000
Liquefied petroleum gas do.	48,503	52,845	50,900	50,957	48,953

See footnotes at end of table.

(Metric tons, gross weight, unless otherwise specified)

³For the years 2014, 2015, and 2016, other ferroalloys included ferrochromium, ferromolybdenum, ferrosilicon, ferrotungsten, and ferrovandium.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(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	1,170
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,760
Do.		Hachinohe Cement Co., Ltd.	Hachinohe, Aomori Prefecture	1,530
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	13,500
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,080
Do.		Myojo Cement Co., Ltd.	Itoigawa, Niigata Prefecture	2,480
Do.		Nippon Steel Chemical Co., Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co., Ltd.	Muroran, Hokkaido Prefecture	1,590
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	14,400
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Kumagaya and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Tsukumi, Oita Prefecture; and Kamiiso, Hokkaido Prefecture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,940
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,870
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube and Isa, Yamaguchi Prefecture, and Kanda, Fukuoka Prefecture	10,700
Coal, bituminous		Kushiro Coal Mine Co. Ltd.	Kushiro, Hokkaido Prefecture	1,000
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	226,000
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 50.45%; Dowa Mining Co. Ltd., 32.13%; Furukawa Co. Ltd., 7.98%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.29% each; others, 0.85%)	Onahama, Fukushima Prefecture	250,000
Do.	do.	Pan Pacific Copper Co., Ltd. (JX Nippon Mining & Metals Co., Ltd., 66%, and Mitsui Mining and Smelting Co., Ltd., 34%)	Saganoseki, Oita Prefecture; Hitachi, Ibaraki Prefecture; and Tamano, Okayama Prefecture	710,000
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.	JX Nippon Mining & Metals Co., Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000
Indium, metal		Dowa Metals and Mining Co.	Iijima, Akita Prefecture	NA
Do.		Mitsui Mining and Smelting Co.	Takehara, Hiroshima Prefecture	NA
Do.		Sumitomo Mining Co.	Harima, Hyogo Prefecture	NA
Do.		JX Nippon Mining Metals Co.	Isohara, Ibaraki Prefecture	NA
Do.		Materials Eco-Refining Co.	Onahama, Fukushima Prefecture	NA
Do.		Nippon Rare Metal Inc.	Yokohama, Kanagawa Prefecture	NA
Do.		Shinko Chemical Co.	Amagasaki, Hyogo Prefecture	NA
Do.		Kisan Kinzoku Chemicals Co.	Osaka, Osaka Prefecture	NA

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(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
Lead, refined	do.	Kamioka Mining and Smelting Co. Ltd.	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.)	Hosokura, Miyagi Prefecture	22,200
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co., Ltd.	Torigatayama, Kochi Prefecture; Oita, Oita 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
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. [wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd. (SMM)]	do.	22,000
Do.	do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,700
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

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, refined	million 42-gallon barrels	JX Nippon Oil & Energy Corp.	Mizushima, Marifu, Nishihara, Oita, Osaka, and Negishi refineries	465
Do.	do.	Cosmo Oil Co. Ltd.	Chiba, Sakai, and Yokkaichi refineries	165
Do.	do.	Idemitsu Kosan Co., Ltd.	Aichi, Chiba, and Idemitsu refineries	195
Do.	do.	Taiyo Oil Co. Ltd.	Shikoku refinery	43
Do.	do.	Showa Yokkaichi Sekiyu Co., Ltd.	Yokkaichi refinery	93
Do.	do.	TonenGeneral Sekiyu K.K.	Kawasaki, Sakai, and Wakayama refineries	199
Do.	do.	Toa Oil Co. Ltd.	Keihin refinery	26
Do.	do.	Fuji Oil Co. Ltd.	Sodegaura refinery	52
Do.	do.	Kyokuto Sekiyu Co. Ltd.	Chiba refinery	55
Do.	do.	Kashima Oil Co. Ltd.	Kashima refinery	92
Do.	do.	Seibu Oil Co. Ltd.	Yamaguchi refinery	44
Do.	do.	Nansei Sekiyu K.K. (Petroleo Brasileiro S.A., 100%)	Okinawa refinery	36
Pyrophyllite		Ohira Cozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
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	33,900
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,900
Do.		Nippon Steel & Sumitomo Metal Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,200
Do.		do.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,800
Do.		Nisshin Steel Co. Ltd.	Kuri, Hiroshima Prefecture; Osaka City; Shunan, Yamaguchi Prefecture; and Toyo, Ehime Prefecture	4,000
Tantalum	metric tons	Japan New Metals Co. Ltd.	Akita, Akita Prefecture	95
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Miyama, Fukuoka Prefecture	NA
Titanium:				
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. (JX Nippon Mining & 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	155,000
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
Zinc, refined	do.	Akita Smelting Co. Ltd. [Dowa Mining Co. Ltd., 57%; JX Nippon Mining & 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%; JX Nippon Mining & 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	139,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000

Do., do. Ditto. NA Not available.

TABLE 3
JAPAN: SUPPLY AND DEMAND FOR SELECTED NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2014	2015	2016	2014	2015	2016
Stocks at the beginning of the year	86,805	131,497	114,517	30,708	35,086	30,947
Production	1,554,224	1,483,131	1,553,113	202,673	194,391	199,090
Imports	68,804	37,901	31,458	26,849	34,120	28,699
Total supply	1,709,833	1,652,529	1,699,108	260,230	263,597	258,736
Exports	505,950	540,561	615,894	5,708	5,392	6,657
Reported consumption	974,591	914,679	937,369	218,498	217,990	211,117
Total demand	1,480,541	1,455,240	1,553,263	224,206	223,382	217,834
Stocks at the end of the year	131,497	114,517	110,868	35,086	30,947	25,380
Apparent consumption	1,072,386	997,451	972,346	219,436	227,258	226,699
	Refined zinc			Refined silver (kilograms)		
	2014	2015	2016	2014	2015	2016
Stocks at the beginning of the year	68,932	91,923	87,146	964,069	909,373	733,421
Production	583,021	566,619	533,689	1,791,816	1,882,845	2,075,484
Imports	25,640	28,948	22,495	1,693,036	1,629,595	1,897,125
Total supply	677,593	687,040	643,330	4,676,904	4,643,010	4,883,601
Exports	82,206	120,831	81,123	3,740,987	4,050,374	4,525,024
Reported consumption	388,701	371,535	470,231	1,044,679	992,103	956,608
Total demand	470,907	492,366	436,389	4,785,666	5,042,477	5,481,632
Stocks at the end of the year	91,923	87,146	91,976	909,373	733,421	833,611
Apparent consumption	503,464	479,063	479,231	26,549	140,785	475,034

Source: Japan Mining Industry Association, 2017.