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The Mineral Industry of Japan

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Note: In this chapter, information for 2017 is followed by information for 2018.

Owing to the depletion of domestic mineral resources and the lack of mine production, Japan imported metallic ores and concentrates of copper, gold, iron, lead, nickel, platinum-group metals, silver, tin, and zinc for its manufacturing industries. Japan also imported cadmium metal, refined lead, and refined zinc. In 2017, Japan remained the second-ranked importer of metallic ores, slag, and ash, accounting for 9% of global trade of these materials, by value, following China (which accounted for 55%). Japan ranked fourth in the world in imports and consumption of crude petroleum, fourth in coal consumption, and fifth in consumption of natural gas (Japan Mining Industry Association, 2017, p. 12–13, 28; BP p.l.c., 2018, p. 9, 24; Global Trade Tracker, 2020).

The metals and mineral-processing industries dominated Japan's mineral sector. In 2017, Japan ranked second in pig iron production, accounting for 7% of world production (following China, which accounted for 61%) and produced 6% of the world's output of raw steel (also ranking second following China, which produced 49%). Japan continued to rank second in the production of titanium sponge[1] and selenium,[1] accounting for 28% and 27% of global production, respectively. Japan ranked third in production of indium metal (accounting for nearly 10% of global production) and cadmium metal[1] (8%), fourth in production of tellurium[1] (8%) and bromine[1] (5%), and seventh in production of talc and pyrophyllite (5%). Japan was estimated to have the world's largest reserves of iodine at 5 million metric tons (Mt) and to account for about 34% of world iodine production,[1] ranking second in world production behind Chile (63%) (Anderson, 2019a–c; Bedinger, 2019; Bolen, 2019; Schnebele, 2019a, b; Tolcin, 2019; Tuck, 2019).

Minerals in the National Economy

In 2017, Japan's nominal gross domestic product (GDP) was $4.86 trillion, and real GDP increased by 1.9% compared with that of 2016. The manufacturing, construction, and mining and quarrying industries accounted for 21%, 5.5%, and 0.1%, respectively, of Japan's GDP in 2016 (the latest year for which data were available). In 2016, 19,467 people at 1,851 establishments were engaged in the mining and quarrying industries (Japan Statistics Bureau, 2018, p. 30, 32; World Bank, The, 2019a, b).

In 2017, Japan's total outward foreign direct investment (FDI) decreased by 3.0% to $168.6 billion. Of this total, outward FDIs towards the manufacturing of metals and the refining of petroleum were valued at $2.9 billion and $125.3 million, respectively, compared with $3.7 billion and $55.7 million in 2016. FDI toward the mining industry was negative, with a disinvestment of $3.6 billion compared with an investment of $4.0 billion in 2016 (Japan External Trade Organization, 2018b, d).

Total inward FDI to Japan decreased by 52.1% to $18.8 billion in 2017. Inward FDI to the mining industry increased to $164.6 million from $15.9 million in 2016. Inward FDIs in the manufacturing of metals and the refining of petroleum products were all negative, with disinvestments of $14.3 million and $15.3 million, respectively, compared with disinvestments of $55.3 million and $1.5 billion in 2016 (Japan External Trade Organization, 2018a, c).

Government Policies and Programs

Because of the lack of domestic mineral reserves, the goal of the Government of Japan's mineral policy is to secure a stable mineral supply for the country's metal industry and for electricity generation. To protect against supply disruptions, Japan maintains Government-owned mineral stockpiles and mandates mineral companies to maintain privately owned stockpiles. The Agency for Natural Resources and Energy—a part of the Ministry of Economy, Trade and Industry (METI)—formulates Japan's mineral policies. Japan Oil, Gas and Metals National Corporation (JOGMEC) implements the policies set forth by METI and has the goal to secure a stable supply of natural resources to sustain the country's economic growth. As a result of the amendment of the JOGMEC Act in 2016, JOGMEC has the power to purchase overseas resource companies, diversify fundraising, and lease seismic survey vessels for natural gas and petroleum exploration to private companies (Japan Oil, Gas and Metals National Corp., 2017, p. 2; 2018).

Japan's mining and quarrying industry is regulated under the 1950 Mining Act (No. 289 of 1950) as amended by the 2011 Mining Act (No. 84 of 2011). The amendment (1) requires those applying for a mining permit to supply additional information about their financial and (or) technical capabilities; (2) designates petroleum, natural gas, and deep-sea minerals as "specified minerals," which are considered particularly necessary for the country's economic stability, and establishes new procedures so that permission to mine specified minerals is given to the applicant whose qualifications most match the permission criteria; and (3) requires advance permission to conduct mineral exploration (Ministry of Economy, Trade and Industry, 2011; Kikkawa, 2013).

Production

In 2017, significant increases in production included that of refined antimony (83%); nickel, chemicals (Ni content) (50%); refined bismuth (23%); platinum metal (18%); refined tellurium (15%); molybdenum metal (13%); tungsten metal (11%); and alumina (11%, estimated). Major decreases in production

[1]Production for the United States has been withheld to avoid disclosing proprietary information and is not included in the world total.

included that of mined silver (33%); iodine (12%); lubricating oil and distillate fuel oil (11% each); and paraffin wax (10%). Data on mineral production are in table 1.

Structure of the Mineral Industry

Japan's mineral industry was owned and operated primarily by private companies. In 2016 (the latest year for which data were available), Japan had 1,389 stone quarries, which employed 11,956 people; 194 ceramic material mines, 3,265 people; 33 other mineral mines, such as those for diatomite and clay minerals, 226; 25 natural gas and petroleum operations, 784; 17 coal mines, 581; and 6 metal mines, 213 (Ministry of Economy, Trade and Industry, 2017a). Table 2 is a list of major mineral industry facilities.

Mineral Trade

In 2017, the total value of Japan's exports increased by 8% to $697.2 billion. The value of mineral fuel exports (not specified) increased by 20% to $9.9 billion; exports of manufactured goods made of iron and steel and nonferrous metal products increased by nearly 10% to $52.6 billion (Japan External Trade Organization, 2018e; 2018f, p. 2, 4).

In 2017, the total value of Japan's imports increased by 11% to $671.0 billion. Among the raw materials imports, iron ore and concentrate imports accounted for 1.4% of total imports, by value, and increased by 31% to $9.6 billion. Nonferrous metallic ore accounted for 1.8% of total imports and increased in value by 13% to $12.3 billion. Among the manufactured goods, the value of nonferrous metal imports increased by 25% to $15.5 billion; iron and steel products, by 26% to $8.2 billion; and manufactures of metals, by 1.5% to $10.5 billion. The value of semiconductor imports accounted for 3.7% of total imports and increased by 8% to $24.9 billion (Japan External Trade Organization, 2018e; 2018f, p. 2, 4).

In 2017, Japan imported about 37,000 metric tons (t) of bauxite, of which China supplied 96%; 4.7 Mt of copper concentrates (Chile, 44%); 126.6 Mt of iron ores (including roasted iron pyrites) (Australia, 58%); 123,000 t of lead concentrates (Australia, 39%; and the United States, 31%); 3.6 Mt of nickel ores (Philippines, 57%; and New Caledonia, 43%); 438,000 t of titanium ores and concentrates (India, 25%; and South Africa, 24%); 37,000 t of silver concentrates (Mexico, 48%); and 819,000 t of zinc concentrates (Bolivia, 26%; Peru, 23%; Australia, 21%; and the United States, 14%) (Global Trade Tracker, 2020).

The value of mineral fuel imports increased by 27% in 2017 owing to an increase in global commodity prices. Mineral fuel imports were valued at $141 billion and accounted for 21% of the total import value. Imports of coal increased by 50% to $22.9 billion; petroleum products, by 40% to $13.7 billion; liquefied petroleum gas (LPG), by 32% to $5.4 billion; crude petroleum, by 25% to $63.6 billion; and liquefied natural gas (LNG), by 16% to $34.8 billion. The quantity of mineral fuel imports remained about the same as in 2016. Japan imported 175.8 Mt of bituminous coal, of which Australia supplied 47%; 162.5 Mt of crude petroleum (Saudi Arabia, 39%); and 83.7 Mt of LNG (Australia, 31%) (BP p.l.c., 2018, p. 24, 25, 34, 35; Japan External Trade Organization, 2018d; 2018f, p. 4–5; Japan Ministry of Finance, 2018; Tsukimori, 2018).

Commodity Review

Metals

Copper.—Japan relied entirely on imports of copper concentrate to supply its copper refining industry. Refined copper production (primary and secondary) in 2017 was 1.49 Mt of which, about 520,000 t was exported (table 3; Japan Mining Industry Association, 2018, p. 25).

Pan Pacific Copper Co. Ltd., which was the leading refined copper producer in Japan, planned to increase the capacity of the smelter at its plant in Saganoseki, Oita Prefecture, by 10% to a processing capacity of 235 metric tons per hour (equal to 2.1 million metric tons per year) of copper concentrates. The $134 million to $152 million[2] overhaul began in 2017 and was expected to be fully completed in 2019. The expansion would allow the company to increase the throughput of lower grade imported ores and still supply enough smelter copper to maintain a steady level of refined copper production. The smelter had the capacity to produce 450,000 metric tons per year of copper (Nikkei.com, 2017; Pan Pacific Copper Co. Ltd., 2020).

Indium.—Japan was a major consumer, producer, and recycler of indium. In 2017, Japan's domestic consumption of indium was 762 t, accounting for 52% of global consumption. Japan accounted for an estimated 51% of the world's indium-tin oxide (ITO) production in 2017. The leading global application of indium was production of ITO, which was used primarily as thin-film coating on flat-panel display screens (Japan Oil, Gas and Metals National Corp., 2019, p. 211–213).

In 2017, Japan imported 363 t of indium metal, powder, and scrap, which was an increase of 88% from that of 2016, owing to the run-down in inventory levels in 2016. The major suppliers were the Republic of Korea (57%), China (22%), Canada (10%), and Taiwan (9%). Japan did not export indium in 2017. During the year, the country produced 70 t (estimate) of primary refined indium and 567 t of secondary refined indium from recycled material to meet domestic demand (Roskill's Letter from Japan, 2018a, p. 14; 2018c, p. 23; Japan Oil, Gas and Metals National Corp., 2019, p. 212, 213, 215).

Iron and Steel.—In 2017, Japan ranked second in the world in raw steel production (105 Mt) after China (832 Mt). Japan exported 43 Mt of steel (a decrease of 7.7% from that of 2016) valued at $28 billion and was the world's second-ranked exporter of steel after China, which exported 67 Mt valued at $43 billion. The Republic of Korea was the leading destination for Japan's steel exports (received 23%, or 10 Mt), followed by China (16%) and Thailand (13%) (World Steel Association, 2018, p. 9; Global Trade Tracker, 2020).

After Nippon Steel & Sumitomo Metal Corp. (NSSMC) acquired Nisshin Steel Co. Ltd. on March 13, Japan's three major raw steelmakers were NSSMC (which produced 47.36 Mt of raw steel in 2017), JFE Steel Corp. (30.15 Mt), and Kobe

[2]Where necessary, values have been converted from Japanese Yen (JPY) to U.S. dollars (US$) at the annual average exchange rate of JPY 112.11=US$1.00 for 2017.

Steel Ltd. (7.74 Mt) (Nippon Steel & Sumitomo Metal Corp., 2017; World Steel Association, 2018, p. 8).

In 2016 (the latest year for which data were available), Japan's automobile industry was the leading consumer of specialty steel products (accounting for 36.6% of consumption), followed by machinery and equipment (12.3%). Further processing accounted for 32.1% of specialty steel products consumption. For ordinary steel products, the construction sector was the leading consumer, accounting for 26.2%, followed by the automobile industry (19.9%), shipbuilding (9.3%), and machinery and equipment (7.0%) (Japan Iron and Steel Federation, 2017).

Selenium.—In Japan, selenium was produced as a byproduct of its metal refining. In 2017, Japan produced 729,132 kilograms (kg) of selenium. Japan exported 611,325 kg of selenium, which was an increase of 2.5% from that of 2016. The average price of Japan's exports increased to $33 per kilogram in 2017 from $15 per kilogram in 2016. The increase in the average price was owing to high demand from China's metallurgy industry and India's glass industry. China was the leading destination for Japan's selenium exports (receiving 24%, or 149 t), followed by Hong Kong (22%, or 134 t), India (16%, or 95 t), and the Netherlands (11%, or 65 t). Selenium was recovered as a byproduct of refining copper as well as of processing gold, lead, nickel, platinum, and zinc ores. The principal uses for selenium include metallurgy, glass manufacturing, agriculture, chemicals and pigments, and electronics, in order of world consumption (Anderson, 2018; Roskill's Letter from Japan, 2018b, p. 24–25; Global Trade Tracker, 2020).

Titanium.—Japan depends entirely on imports of titanium ore and concentrate (ilmenite, upgraded ilmenite, and titanium slag) to satisfy the country's demand. In 2017, production of titanium dioxide (TiO_2) accounted for 90% of the country's consumption of titanium ore and concentrate, followed by the production of titanium metal (5% to 6%) and welding rods (4% to 5%). TiO_2 was used mainly for white pigment by the automotive industry. The production of TiO_2 increased by 7.2% to 191,997 t in 2017 owing to increased demand for production of TiO_2-based white pigment (Roskill's Letter from Japan, 2018d, p. 16; Japan Oil, Gas and Metals National Corp., 2019, p. 394).

In 2017, Osaka Titanium Technologies Co., Ltd. and Toho Titanium Co., Ltd.—Japan's only titanium sponge producers—produced about 50,300 t of titanium sponge. Japan exported 24,260 t of titanium sponge, of which the United States received 19,379 t (or 80%). Titanium sponge imported by the United States was consumed mainly by the aerospace industry (Roskill's Letter from Japan, 2018e, p. 7; 2018f, p. 6; Japan Oil, Gas and Metals National Corp., 2019, p. 395).

Industrial Minerals

Iodine.—Iodine is used for X-ray contrast media, polarizing film, disinfectants, and catalysts. In Japan, raw iodine was extracted from natural-gas brine found in the pores of unconsolidated marine sediments. Local governments regulated the pumping of natural-gas brine to prevent land subsidence. Owing to these restrictions, iodine production had not increased significantly, remaining at a constant level for the past decade. The production of raw iodine in 2017 was 8,839 t, which was less than the average annual production of 9,500 t from 2007 to 2016 (table 1; Kaneko and Kaiho, 2014, p. 231, 237; ISE Chemicals Corp., undated). Japan exported about 4,850 t of iodine (an increase of 7% from that of 2016), of which Norway received 20%; China, 19%; India, 14%; and the United States, 11% (Global Trade Tracker, 2020).

Mineral Fuels

After the shutdown of most nuclear powerplants following the March 2011 Tohoku earthquake (magnitude 9.1) and related tsunami, natural gas has made up an increasing share of Japan's primary energy consumption, increasing to 22% of the country's total energy consumption in 2017 from 17.2% in 2010. In addition, petroleum (including LPG) accounted for 42.4% of the country's primary energy consumption in 2017, followed by coal (23.8%), renewable energies (7.2%), hydroelectricity (3.3%), and nuclear energy (1.7%). Nuclear energy accounted for 10.6% of the country's primary energy supply in 2010 before the earthquake (Petroleum Association of Japan, 2019, p. 8).

Natural Gas.—Japan was the world's leading importer of natural gas. Japan imported 114 billion cubic meters of natural gas (83.6 Mt of LNG) in 2017, accounting for 29% of the world's natural gas imports. Australia supplied 31% of the imports, followed by Malaysia (18%) and Qatar (12%). Japan was expected to remain reliant on LNG imports unless nuclear powerplants are brought back online in the future (BP p.l.c., 2018, p. 34; Global Trade Tracker, 2020).

Petroleum and Petroleum Refinery Products.—In 2017, Japan produced 3.53 million barrels of crude petroleum, which was equivalent of about 1 day of Japan's consumption. Japan ranked fifth globally in production of refined petroleum production in 2017, accounting for 3.9% of the world's total. As of June 2017, 22 petroleum refineries were active in the country with a total capacity of 3.52 million barrels per day (Ministry of Economy, Trade and Industry, 2017b, p. 4; BP p.l.c., 2018, p. 22; 2019b; Petroleum Association of Japan, 2018, p. 44).

In 2017, Taiyo Oil Co. Ltd. acquired the 100,000-barrel-per-day Nishihara refinery in Okinawa from Nansei Sekiyu KK—a subsidiary of Petróleo Brasileiro S.A., Brazil's state-owned petroleum company. The facility had been on care-and-maintenance status since 2015, and Taiyo did not announce plans to restart production at the facility. Taiyo intended to use the terminal only to support its operating Shikoku refinery in Ehime Prefecture (Brelsford, 2017).

MINERAL INDUSTRY HIGHLIGHTS IN 2018

In 2018, Japan ranked 2d in world production of tellurium, accounting for 13% of global production, behind China (which accounted for 61%); 3d in production of raw steel (5.7%), behind China (51%) and India (5.9%); and 10th in production of talc and pyrophyllite (2%). The country's ranking in production of other mineral commodities—equal to or more than 5% of world production—remained unchanged from that of 2017 (Anderson, 2020; Bolen, 2020; Tuck, 2020).

Minerals in the National Economy

In 2018, Japan's nominal GDP was $4.97 trillion, and real GDP increased by 0.8% compared with that of 2017. The total value of Japan's exports increased by 5.8% to $737.8 billion. The value of exported mineral fuels (not specified) increased by 18.7% to $11.8 billion; the value of exported manufactured goods of iron and steel and nonferrous metals products increased by 7.7% to $56.7 billion (Japan External Trade Organization, 2019).

The total value of Japan's imports increased by 11.5% to $748.1 billion. The value of imported nonferrous metallic ores increased by 15.2% to $14.2 billion, and iron ore imports decreased by 3.5% to $9.3 billion. Among manufactured goods, the value of imported nonferrous metal increased by 17.1% to $18.1 billion; iron and steel products, by 12.6% to $9.2 billion; and manufactures of metals, by 11.4% to $11.7 billion (Japan External Trade Organization, 2019; World Bank, The, 2019a, b).

The total value of imported mineral fuels increased by 23.8% to $174 billion. Imports of petroleum products increased by 36.5% to $18.7 billion; crude petroleum, by 26.5% to $80.5 billion; LNG, by 23.0% to $42.8 billion; LPG, by 16.4% to $6.3 billion; and coal, by 11.2% to $25.4 billion. The increase in the value of imported mineral fuels was driven mostly by an increase in global commodity prices, such as a 31.6% price increase for Brent crude petroleum; 24.1% for LNG; and 17.4% for coal (BP p.l.c., 2019a, p. 2, 37, 47; Japan External Trade Organization, 2019).

Production

Significant production increases in 2018 included that of tellurium (by 52%); refined antimony (50%); primary refined gold (30%); secondary smelter copper (14%); lubricating oil (11%); and secondary refined copper (10%). Major decreases in production included that of asphalt (by 15%); silicomanganese (14%); naphtha, refined cobalt, and kerosene (12% each); crude petroleum (11%); and refined primary lead, LPG, and natural gas (10% each) (table 1).

Commodity Review

Metals

Gold.—In 2018, Japan mined 6,453 kg of gold, all from the Hishikari Mine (in Kyushu) that was operated by Sumitomo Metal Mining Co. Ltd. Since 1985, production fro the Hishikari Mine had totaled more than 240 t of gold from ore with average grades of 30 to 40 grams per metric ton (g/t) gold, which is higher than the average grade (5 g/t) of the world's major mines (Japan Mining Industry Association, 2019; Sumitomo Metal Mining Co. Ltd., 2019).

In 2018, METI granted prospecting rights at its gold projects near historic gold mines to Japan Gold Corp. of Canada. These projects were, in chronological order of prospecting rights granted, the Ohra-Takamine project and the Tobaru project in southern Kyushu; the Ikutahara project in northern Hokkaido; and the Kamitsue project in northern Kyushu. Japan Gold planned to commence drilling at the Ohra-Takamine project sites in 2019. The Ohra-Takamine and the Tobaru projects encompass gold-silver mines in the Hokusatsu-Kushikino mining district. This district included the Hishikari Mine and historic mines, such as the Kushikino Mine. The Ikutahara project covers more than 17 historic gold mines, including the Konamai Mine. The Kamitsue project is located 10 kilometers (km) southeast of the Taio Mine (Japan Gold Corp. 2018a–d).

Rare Earths.—No mines produced rare earths in Japan. Japanese academics, however, discovered a deposit of rare earths under the 5,700-meter deep seabed within Japan's exclusive economic zone (2,500-square-kilometer area) located 310 km southwest of Minami-Torishima Island in 2012. Although the technology needed to produce the rare earths on a commercial scale remained to be developed, the deposit was estimated to be large enough to supply all the needs of Japan's high-tech manufacturing industry. A 2018 analysis estimated the resources of the deposit to be 16 Mt of rare earths, including yttrium equivalent to 780 years of 2018 global demand; 730 years of dysprosium, 620 years of europium; and 420 years of terbium (Asanuma, 2018; Sankei News, The, 2018).

Outlook

The International Monetary Fund projected that Japan's real GDP would increase by 0.5% in 2021. An aging population and a decreasing labor force are likely to affect the country's future growth in the medium term (International Monetary Fund, 2020, p. 9, 52).

Japan is likely to continue to rely on imports of ores and concentrates for metal production and to remain the world's second-ranked importer of those materials, by value; however, mined gold production may increase if the projects around historic gold mines are successful. By volume, Japan's petroleum consumption has decreased in recent years and may continue to decrease owing to the energy transition from petroleum to natural gas and renewable resources, the restart of nuclear powerplants, and innovation in fuel-saving technologies (Petroleum Association of Japan, 2018, p. 10; Yanagisawa and others, 2018, p. 11–14; BP p.l.c., 2019b).

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2014	2015	2016	2017	2018
METALS						
Aluminum:						
Alumina[e]		100,000	15,000	18,000	20,000	20,000
Metal:						
Primary		538 [r]	--	--	--	--
Secondary		827,300	776,700	788,800	758,500	826,600
Products, powder		11,783	11,648	11,630	12,550	12,695
Antimony, refinery, metal		94	15	12	22	33
Bismuth, refinery, Bi content[3]		588	632	428	525	571
Cadmium, refinery, primary		1,829	1,959	1,988	2,142	1,979
Cobalt, refinery, metal		3,654	4,259	4,305	4,159	3,669
Copper:						
Smelter, blister and anode:						
Primary		1,290,640	1,175,101	1,137,864	1,118,626	1,142,778
Secondary		310,029	296,486	358,810	369,525	421,735
Total		1,600,669	1,471,587	1,496,674	1,488,151	1,564,513
Refinery:						
Primary		1,296,641	1,243,072	1,259,426	1,166,194	1,241,100
Secondary		257,583	240,059	293,707 [r]	321,886	353,417
Total		1,554,224	1,483,131	1,553,133	1,488,080	1,594,517
Ferroalloys:						
Ferrochromium[e]		16,000 [r]	15,000 [r]	15,000 [r]	16,000	16,000
Ferromanganese		463,345	465,952	473,740	456,460	451,700
Ferromolybdenum		4,088 [r]	2,870 [r]	3,349 [r]	3,530	3,500 [e]
Ferronickel:						
Gross weight		379,291	396,969	333,448	312,324	339,844
Ni content[e]		70,100 [r]	71,200 [r]	70,300 [r]	65,300	68,200
Ferrovanadium[e]		4,400 [r]	4,000 [r]	4,000 [r]	--	--
Silicomanganese		26,500 [r]	22,700 [r]	22,700 [r]	24,500	21,100
Other, unspecified		79,912	73,651	77,453	79,809	73,094
Gallium[e]	kilograms	8,000	5,000	3,000	3,000	3,000
Gold:						
Mine, Au content	do.	7,115	7,700	6,455	6,372	6,453
Refinery:						
Primary	do.	71,109	82,029	86,376	80,285	104,736
Secondary	do.	30,390	31,717	30,044	29,965	30,255
Indium, refinery, primary, In content[e]	do.	70,000	70,000	70,000	70,000	70,000
Iron and steel:						
Pig iron	thousand metric tons	83,872	81,011	80,186	78,330	77,328
Steel:						
Raw steel	do.	110,666	105,134	104,775	104,661	104,319
Products, semimanufactured, hot-rolled:						
Ordinary steel	do.	76,968 [r]	74,132 [r]	73,187 [r]	72,097	71,645
Specialty steel	do.	20,914	18,887	19,449	20,344	20,794
Lead, refinery:						
Primary		87,303	85,655	84,660	87,366	78,223
Secondary		115,370	108,736	114,430	112,052	118,338
Molybdenum, mine, Mo content		1,195 [r]	1,025 [r]	761 [r]	862	893
Nickel, Ni content:						
Chemicals		5,673	10,045	11,153	16,773	15,624
Metal		56,129	64,068	63,132	61,377	57,517
Oxide sinter		45,900 [e]	47,500 [r, e]	46,900 [r, e]	43,558	45,438
Platinum-group metals, refinery, primary, metal:						
Palladium	kilograms	6,969	7,073	7,172	7,715	8,264
Platinum	do.	1,124	1,379	1,485	1,747	1,827

See footnotes at end of table.

TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2014	2015	2016	2017	2018
METALS—Continued						
Selenium, Se content	kilograms	782,451	772,768	752,173	729,132	749,677
Silver:						
Mine, Ag content	do.	3,541	4,616	5,076	3,408	3,596
Refinery:						
Primary	do.	1,050,373	1,096,213	1,228,857	1,186,463	1,101,845
Secondary	do.	741,443	786,632	846,627	774,247	759,050
Tellurium, refinery, Te content	do.	36,919	37,356	32,911	37,754	57,231
Tin, smelter, primary		1,746	1,688	1,620	1,624	1,650
Titanium, dioxide		177,569	174,770	179,154	191,997	190,000 e
Tungsten, metal		3,459	3,154	3,391	3,777	4,093
Zinc:						
Oxide		60,920	59,224	56,729	61,901	62,000 e
Metal, smelter:						
Primary		458,481	457,786	438,650	436,656	441,651
Secondary		124,540	108,833	95,129	87,263	79,459
INDUSTRIAL MINERALS						
Arsenic trioxide[e]		45	45	45	45	45
Bromine[e]		20,000	20,000	20,000	20,000	20,000
Cement:						
Clinker	thousand metric tons	52,169	50,471	50,224	51,806	51,014
Hydraulic	do.	57,913	54,827	53,255	55,195	55,307
Clay, bentonite		250,000 r, e	250,000 r, e	253,602 r	250,000 e	250,000 e
Diatomite		50,000 e	50,000 e	40,681	40,000 e	40,000 e
Gypsum, mine	thousand metric tons	4,674	4,670	4,670	4,600 e	4,300 e
Iodine		9,814	10,610	9,993	8,839	9,136
Lime:						
Quicklime	thousand metric tons	7,911	7,336	7,341	7,431	7,575
Slaked lime	do.	1,401	1,378	1,342	1,363	1,381
Nitrogen, ammonia, N content	do.	787	790	725	717	673
Salt, unspecified	do.	928	938	928	926	925 e
Sand and gravel, industrial, silica	do.	2,932	2,845	2,762	2,695	2,524
Soda ash, synthetic		341,000	230,000	217,000	220,000	220,000 e
Stone, construction, crushed:						
Dolomite	thousand metric tons	3,446	3,366	3,223	3,359	3,440
Limestone	do.	148,008	142,916	139,332	141,634	142,212
Quartzite	do.	9,496	8,988	9,068	9,261	9,631
Sulfur, byproduct, S content:						
Metallurgy	do.	1,691	1,629	1,700	1,583	1,600 e
Petroleum	do.	1,751	1,733	1,818	1,789	1,697
Talc and related materials, pyrophyllite[e]		160,000 r	160,000 r	160,000 r	160,000	160,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous	thousand metric tons	1,200	1,200 r	1,666 r	1,700 e	1,700 e
Coke, metallurgical:						
All sources	do.	34,163	32,402	33,159	32,739	32,573
From petroleum refinery	do.	1,100	1,213	1,229	1,319	1,297
Natural gas, gross	million cubic meters	2,882	2,734	2,754	3,008	2,707
Petroleum:						
Crude	thousand 42-gallon barrels	4,051	3,751	3,453	3,532	3,138
Refinery:						
Asphalt	do.	20,732	19,763	19,385	19,957	16,966
Distillate fuel oil	do.	218,289	199,694	209,355	186,969	184,739
Gas oil	do.	257,746	264,608	258,360	263,408	252,994
Gasoline	do.	336,768	341,865	340,346	338,002	322,852

See footnotes at end of table.

TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2014	2015	2016	2017	2018
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:—Continued						
Refinery:—Continued						
Jet fuel	thousand 42-gallon barrels	96,098	100,303	99,788	95,256	93,249
Kerosene	do.	105,869	97,692	100,000	100,005	88,298
Liquefied petroleum gas	do.	50,900	50,957	48,953	52,446	46,978
Lubricating oil	do.	15,381	14,861	15,707	13,932	15,447
Naphtha	do.	115,110	120,804	125,811	118,190	103,436
Paraffin wax	do.	478	518	458	505	543
Total	do.	1,220,000	1,210,000	1,220,000	1,190,000	1,130,000

[e]Estimated. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through September 5, 2019. All data are reported unless otherwise noted. Petroleum product totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]In addition to the commodities listed, aluminum hydroxide, chromium, diamond (synthetic), germanium, manganese, rare-earth oxides, tantalum, titanium sponge, and vanadium as a byproduct of metallurgy may have been produced, but available information was inadequate to make reliable estimates of output.

[3]Refined bismuth was produced as a byproduct of zinc production.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bromine		Tosoh Corp.	Tokuyama	24
Cadmium		Akita Zinc Co. Ltd.	Iijima, Akita Prefecture	NA
Do.		Hachinohe Smelting Co. Ltd.	Hachinohe, Aomori Prefecture	NA
Do.		Kamioka Mining & Smelting Co. Ltd.	Hida, Gifu Prefecture	NA
Do.		Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	NA
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	940
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	860
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	1,070
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	4,500
Copper, refined		Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72
Do.		Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	226
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
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	740
Gold:				
Mine, Au content	kilograms	Sumitomo Metal Mining Co. Ltd. (SMM)	Hishikari Mine, Kagoshima Prefecture	7,000 e
Refined	do.	JX Nippon Mining & Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	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.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000
Indium, metal	do.	Dowa Metals and Mining Co. Ltd.	Iijima, Akita Prefecture	70,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	NA

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iodine, crude	metric tons	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Ise Chemical Industries Corp. (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.	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.	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
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
Lead, refined	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)	Hosokura, Miyagi Prefecture	22,200
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	30,000
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
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, Otia 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. [Sumitomo Metal Mining Co. Ltd. (SMM), 100%]	do.	22,000
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
Do.	do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
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
Petroleum, refined	million 42-gallon barrels	Cosmo Oil Co. Ltd.	Chiba, Sakai, and Yokkaichi refineries	165
Do.	do.	Fuji Oil Co. Ltd.	Sodegaura refinery	52
Do.	do.	Idemitsu Kosan Co. Ltd.	Aichi, Chiba, and Idemitsu refineries	195

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, refined—Continued	million 42-gallon barrels	JX Nippon Oil & Energy Corp.	Mizushima, Marifu, Nishihara, Oita, Osaka, and Negishi refineries	465
Do.	do.	Kashima Oil Co. Ltd.	Kashima refinery	92
Do.	do.	Kyokuto Sekiyu Co. Ltd.	Chiba refinery	55
Do.	do.	Nansei Sekiyu K.K. (Taiyo Oil Co. Ltd., 100%)	Nishihara refinery, Okinawa	36 [1]
Do.	do.	Seibu Oil Co. Ltd.	Yamaguchi refinery	44
Do.	do.	Showa Yokkaichi Sekiyu Co. Ltd.	Yokkaichi refinery	93
Do.	do.	Taiyo Oil Co. Ltd.	Shikoku refinery	43
Do.	do.	Toa Oil Co. Ltd.	Keihin refinery	26
Do.	do.	TonenGeneral Sekiyu K.K.	Kawasaki, Sakai, and Wakayama refineries	199
Pyrophyllite		Ohira Kozan 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
Selenium		Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	NA
Do.		Mitsui Metal Mining & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	NA
Do.		Nippon Rare Metals Inc.	Iwaki, Fukushima Prefecture	NA
Do.		Pan Pacific Copper Co. Ltd.	Saganoseki, Hitachi, and Tamano	NA
Do.		Sumitomo Metal Mining Co. Ltd. (SMM)	Saijo, Ehime Prefecture	NA
Silver, mine, Ag content	kilograms	do.	Hishikari Mine, Kagoshima Prefecture	5,000 [e]
Steel, raw		JFE Steel Corp. (JFE Holdings Inc., 100%)	Chiba, Chiba Prefecture; Kawasaki (Keihin), KanagawaPrefecture; 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.		do.	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		Osaka Titanium Technologies Co. Ltd. (Sumitomo Metal Industries, Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	40
Do.		Toho Titanium Co. Ltd. (JX Nippon Mining & Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	25
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 Ltd.	Ube, Yamaguchi Prefecture	16,800

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc, refined	metric tons	Akita Smelting Co. Ltd. [Dowa Mining Co. Ltd., 57%; JX Nippon Mining & Metals Co., Ltd., 24%; Sumitomo Metal Mining Co. Ltd. (SMM), 14%; Mitsubushi 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.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,000

[e]Estimated. Do., do. Ditto. NA Not available.
[1]On care-and-maintenance status since 2015.

TABLE 3
JAPAN: SUPPLY AND DEMAND FOR SELECTED NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2016	2017	2018	2016	2017	2018
Stocks at the beginning of the year	114,517	110,868	107,361	30,947	25,380	17,575
Production[1]	1,553,133 r	1,488,080	1,594,517	199,090	199,418	196,561
Imports	31,458	24,549	24,586	28,699	39,806	45,073
Total supply	1,699,108	1,623,497	1,726,464	258,736	264,604	259,209
Exports	615,894	518,183	605,194	6,657	581	2,447
Reported consumption	937,369	981,235	1,062,686	211,117	223,792	264,261
Total demand	1,553,263	1,499,418	1,667,880	217,834	224,373	266,708
Stocks at the end of the year	110,868	107,361	110,418	25,380	17,575	23,124
Apparent consumption[2]	972,346	997,953	1,010,852	226,699	246,448	233,638
	Refined silver (kilograms)			Refined zinc		
	2016	2017	2018	2016	2017	2018
Stocks at the beginning of the year	733,421	833,611	867,312	87,146	91,976	88,920
Production[1]	2,075,484	1,940,720	1,860,895	533,689	523,919	521,110
Remelting	177,571	188,149	210,139	NA	NA	NA
Imports	1,897,125	2,117,411	2,171,629	22,495	28,519	28,200
Total supply	4,883,601	5,079,891	5,109,975	643,330	644,414	638,230
Exports	4,525,024	4,679,752	4,585,442	81,123	73,313	74,305
Reported consumption	956,608	1,021,673	1,054,827	355,266	354,920	356,246
Total demand	5,481,632	5,701,425	5,640,269	436,389	428,233	430,551
Stocks at the end of the year	833,611	867,312	990,611	91,976	88,920	82,250
Apparent consumption[2]	– 475,034 r, 3	– 467,173 3	– 466,078 3	470,231	482,181	481,675

rRevised. NA Not available.

[1]Data may be slightly different from table 1 because the calculation in this table originated from Japan Mining Industry Association (May, 2020).

[2]Defined as total supply – (exports + stocks at the end of the year).

[3]If the sum of exports and end-of-year stocks is greater than total supply, apparent consumption is negative.