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The Mineral Industry of Japan

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Japan is a resource-poor industrialized country, and its mineral sector was dominated by the metals and metal products industries. Japan remained the world's second ranked producer of steel after China in 2012, and it was a producer and consumer of nonferrous metals as well. Production of gold, magnesium, and silver partially met its domestic demand, but a large proportion of the raw materials needed to support its manufacturing industries was met through imports. These imports included ores and concentrates to produce copper, lead, nickel, and zinc. The country also imported intermediate products and refined them into metals, such as molybdenum, tin, and tungsten. In terms of value, copper concentrate, iron ore, and rare-earth elements were the most important mineral commodity imports for Japan. The country also imported significant amounts of coke, crude oil, and natural gas, including liquefied natural gas (LNG).

Minerals in the National Economy

Japan was the world's fourth ranked economy after the United States, China, and India. In 2012, Japan's gross domestic product (GDP) based on purchasing power parity was $4.7 trillion, which was an increase of 2% from that of 2011. Industrial production accounted for 26.3% of the GDP, which was an increase of 2% compared with that of 2011. The mineral processing industry was large and included the processing and production of chemicals, fabricated metal products, industrial mineral products, iron and steel, nonferrous metals, and petroleum products for manufacturing and construction industries. Japan's total exports were valued at $734 billion, of which iron and steel products accounted for 5.5%, and the country's total imports were valued at $831 billion, of which petroleum accounted for 15.5%; LNG, 5.7%; and coal, 3.5% (U.S. Central Intelligence Agency, 2013).

Government Policies and Programs

The focus of Japan's resource development policy was to secure stable overseas sources of oil, gas, and mineral resources. The Government planned to continue to invest in developing Africa's mineral resources, particularly rare (minor) metals. The Government stockpiled gallium and indium in addition to seven minor metals (chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium) for the needs of its high-tech industry. Japan Oil, Gas and Metals National Corp. had established the Geologic Remote Sensing Center in Botswana, which trained geological engineers and conducted joint research programs in geologic analysis, exploration, and development. In addition, private companies were also active in the effort to secure access to overseas mineral resources. Sumitomo Corp. joined the Ambatovy nickel project in Madagascar, Itochu Corp. joined the Platreef platinum-group metal (PGM) exploration project in South Africa, and Nippon Steel Corp. joined the Revuboe coking coal project in Mozambique (T. Matsushita, Senior Vice Minister, Ministry of Economy, Trade and Industry, written commun., February 6, 2012).

Production

Japan's mined output of silver and gold decreased by 20% and 17%, respectively, owing to depleted reserves; production of primary and secondary gold also decreased by 22% and 19%, respectively. Production of other nonferrous metals, such as regular-grade aluminum, cobalt metal, refined primary copper, and tin, increased by more than 15%, whereas production of high-purity aluminum, antimony metal, and molybdenum metal decreased by more than 15%. In the iron and steel sector, Japan's production of crude steel and pig iron stayed at about the same level as in 2011, with the exception of ferronickel and ferrochrome output, which increased by 33% and 13%, respectively; nickel content of ferronickel increased by 17%. In the industrial minerals sector, production of cement increased by 6.7% whereas that of nitrogen decreased by 12.9%. In the energy sector, production of bituminous coal, carbon black, and crude petroleum decreased by 22%, 6.3%, and 4.6%, respectively; the decreases in output of the latter two were owing to depleted reserves (table 1).

Structure of the Mineral Industry

Japan's mineral industry is characterized by small-scale, low-tonnage mining operations and high-value-added mineral and metal processing and manufacturing activities. Its mining industry is not significant to the economy, and the country consumes more minerals and metals from imports than it produces. In 2012, mining and quarrying of industrial minerals, including dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stone, was still being done but at a lower level of production than in previous years. Operating mines and employment in the mining industry had been in decline because of depleted ore reserves, high mining costs, and the availability of cheaper imports. Japan had, however, a world-class metallurgical industry for nonferrous metals. The mining and mineral-processing businesses were owned and operated by private companies (table 2).

Mineral Trade

Japan imported raw materials and mineral fuels for its industrial production and use. These imported mineral commodities were mostly bauxite, coal, coke, copper concentrate, iron ore, LNG, and petroleum. In 2012, Japan imported about 1.266 million metric tons (Mt) of copper, 464,000 metric tons (t) of zinc, and 91,000 t of lead, all in concentrates. The country imported 36,000 t of refined copper and exported 546,000 t. Japan imported 24,000 t of refined zinc and 29,000 t of refined lead and exported 136,000 t and 20,000 t,

respectively. The country also imported 1,699,000 kilograms (kg) of silver and exported 3,297,000 kg. Japan imported a total of 210,000 kg of cadmium metal entirely from the Republic of Korea (100%) and exported a total of 952,000 kg of cadmium metal to China (68%), India (21%), and Sweden (10%) (Japan Mining Industry Association, 2013, p. 5, 10, 11–13, 28).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—In 2012, Japan produced 137,000 t of secondary aluminum, which was a decrease of 3.2% compared with the output of 2011, and 3,100 t of primary aluminum. The country exported 281,000 t of rolled aluminum products and 12,700 t of unwrought aluminum and imported 2.75 Mt of unwrought aluminum, 49,700 t of aluminum waste and scrap, and 107,000 t of rolled aluminum products. Domestic consumption of aluminum increased by 1.8% to 3.93 Mt, of which the transportation sector accounted for 42%; building and construction, 14%; fabricated metal, 11%; food packaging, 11%; and other uses, 22% (Japan Aluminum Association, 2013).

Sumitomo Chemical Co. Ltd. produced specialty alumina, such as high-purity alumina (more than 99.99%), which was used for lithium-ion battery materials. The company expanded the production capacity at its Ehime Works by 400 metric tons per year (t/yr) in 2010 and planned to increase it again to 3,200 t/yr by the second quarter of 2012. The increase was in response to the expanding market for hybrid cars and electric vehicles (Roberts, 2012).

Furukawa-Sky Aluminum Corp., which was a maker of rolled aluminum products, agreed to take over Sumitomo Light Metal Industries Ltd., which was a metal fabricator, to reduce costs, accelerate expansion, and strengthen its competitiveness in the international market. The deal was expected to be completed in October 2013 (Suga, 2012).

Antimony.—Nihon Seiko Co. Ltd. was a leading producer of antimony metal and antimony trioxide using imported material. A high-grade antimony deposit was found in the seabed off Amami-Oshama Island in Kagoshima Prefecture. The deposit could become a source of antimony if the supply of material on the world market remained tight (Clarke, 2012).

Cadmium.—At the beginning of 2012, Japan had stocks of 282 t of cadmium metal. With production of 1,856 t and imports of 210 t, the country's supplies increased to 2,348 t. With an apparent consumption of 1,099 t and exports of 952 t for a total demand of 2,051 t, Japan's stocks increased to 297 t at the end of 2012 (Japan Mining Industry Association, 2013, p. 28).

Copper.—The country produced about 1.3 Mt of anode and blister copper from primary sources and 304,000 t from scrap. It also produced about 1.52 Mt of refined copper primarily from imported ore (83.8%), scrap (10.4%), and other sources (5.8%). Consumption of refined copper was reported to be about 930,000 t. Refined copper was used in the manufacturing of wire (62%), brass (37%), and miscellaneous products (1%), such as copper alloys and copper alloy casting (table 3; Japan Mining Industry Association, 2013, p. 11).

Pan Pacific Copper Co. Ltd., which was part of JX Holdings Inc., suspended operations at its 200,000-t/yr copper smelter at Saganoseki in Oita Prefecture in January after a fire damaged an electrical substation. The company was reviewing if its two other copper smelters could make up for the lost production. The company had a smelter at Hitachi in Ibaraki Prefecture and another at Tamano in Okayama Prefecture and had a total combined output capacity of 710,000 t/yr. The company had planned to produce 272,000 t of refined copper from October 2011 to March 2012 (Inoue, 2012).

Gold and Silver.—In 2012, Japan produced about 104,000 kg of gold from imported ore, scrap, domestic ore, and other sources, which accounted for 64%, 13%, 8%, and 15% of the source material, respectively. The country also produced about 1,765,000 kg of silver from imported ore, scrap, domestic ore, and other sources, which accounted for 62%, 17%, 0.4%, and 20% of the source material, respectively. Silver was used for miscellaneous applications (37%), in photographic materials (30%), in extension materials (15%), in point connectors (10%), for silver solder (6%), and as a nitrate for other uses (3%) (table 3; Japan Mining Industry Association, 2013, p. 10).

Iron and Steel.—Nippon Steel Corp. planned to increase the internal capacity of the blast furnace No. 4 at its Yawata Works by 18%. The $410 million overhaul was expected to begin in 2013 and to be completed in 85 days. The overhaul would help solidify the company's competitive strength in the manufacture of iron and steel in the global market (SteelOrbis, 2012).

Japanese electric furnace carbon steel producers were expected to encounter cost increases in electricity and materials, such as graphite electrode, ferrous scrap, and crude oil, beginning in April 2012. Tokyo Electric Power Co. increased its price of electricity. Tokai Carbon decided to increase the sale price of graphite electrodes by 5% to 10%. The price of crude oil remained more than $100 per barrel. The steel producers were likely to launch a price hike to pass along the cost increases to their customers (Steelguru.com, 2012).

Lead.—Japan produced a total of 252,000 t of lead in 2012. Of this amount, 209,000 t was refined lead made from 91,000 t of primary ore (which included imported ore and domestic ore) and 118,000 t of scrap and material from other sources. The remaining 43,400 t was remelted lead. Consumption of refined lead was reported to be 207,000 t. Refined lead was used in batteries (87%), pipe and sheet (6%), chemicals (2%), solder (0.7%), and other miscellaneous applications (4%) (table 3; Japan Mining Industry Association, 2013, p. 12, 14).

Nickel.—Japan produced 41,900 t of refined nickel and 125,000 t of nickel in ferronickel and nickel oxide for a total of 167,000 t of nickel. The country also produced 2,360 t of nickel chemicals. At the end of 2012, stocks of refined nickel, which totaled 3,420 t, and those of ferronickel, which totaled 3,840 t, were stored at producers' facilities (Japan Mining Industry Association, 2013, p. 4, 7).

More than one-half of Japan's nickel supply came from Indonesia, which was scheduled to ban exports of unprocessed nickel in 2014. Sumitomo Metal Mining Co. planned to increase nickel imports from New Caledonia, the Philippines, and the Solomon Islands. The company owned 62.5% of the $1 billion Taganito nickel project in the Philippines, which was to start

production in 2014 at a rate of 27,000 t/yr of nickel (90% of capacity) (Inoue and Obayashi, 2012).

Titanium.—Kobe Steel Ltd. planned to increase its production capacity for titanium alloys and pure titanium. At one of its two plants at Takasago in Hyogo Prefecture, the company planned to construct a new ring-rolling mill to double its ring-rolling capacity; at the other plant, the company planned to install heat-treatment and inspection equipment for large forged products to increase its processing capacity by threefold. Kobe Steel Tube Co. Ltd. had completed a titanium welded tube line to increase its production capacity by 25% to 30% at Shimonoseki in Yamaguchi Prefecture. Demand for titanium was expected to increase owing to strong worldwide demand for civilian aircraft and infrastructure, such as powerplants and desalination plants (Kobe Steel Ltd., 2012).

Zinc.—Japan produced a total of about 606,000 t of zinc. Of this amount, 571,000 t was refined zinc made from 459,000 t of primarily imported ore (80%) and 112,000 t of other sources (18%) and scrap (1.2%). The remaining 34,700 t was remelted zinc. Consumption of refined zinc was reported to be 355,000 t. Refined zinc was used mainly in galvanized sheet (49%), other types of galvanized products (15%), brass (14%), die-casting alloy (11%), chemicals (7%), and miscellaneous uses (1%) (table 3; Japan Mining Industry Association, 2013, p. 13, 15).

Zirconium.—Tosoh Corp. was expanding its production capacities of chemical manganese oxide, high-silica zeolite, and zirconia powder. The company planned to build a new chemical manganese oxide plant at Hyuga Prefecture to produce 5,000 t/yr of the material. When completed in March 2013, the company would have a total capacity of 64,000 t/yr. Tosoh also planned to expand its capacity to produce high-silica zeolite at Yokkaichi with completion scheduled for March 2013. The expansion would double the company's total capacity to produce high-silica zeolite. The company would expand its facilities to produce zirconia powder at Shunan in Yamaguchi Prefecture and at Yokkaichi in Mie Prefecture to increase the total capacity by 20% (Watts, 2012).

Industrial Minerals

Limestone.—Calcium carbonate is derived from limestone, and both its ground and precipitated forms are used by the paper industry for fillers and coatings as an alternative to kaolin. Japan was a leading producer of calcium carbonate in the world. Imerys SA of France shut down its 60,000-t/yr plant in Miyagi Prefecture as a result of the earthquake and tsunami that took place in March 2011, and it brought the plant back online in the beginning of 2012. Fimatec Ltd. also shut down its 60,000-t/yr plant in Fukushima Prefecture and its joint-venture 96,000-t/yr plant in Ishinomaki Prefecture, and it brought the Fukushima plant back online in May 2011 (Ollett, 2012).

Rare Earths.—An estimated resource of 6.8 Mt of rare-earth minerals was discovered 5,600 m deep within the seabed in a 2,600-square-kilometer area located 310 kilometers southwest of Minami-tori-shima Island. The deposit was estimated to be large enough to supply all the needs of Japan's high-tech manufacturing industry. Rare-earth minerals found in mud samples had an average concentration that ranged from 1,000 parts per million (ppm) to 1,700 ppm. The 30-m-thick mud beds could be drilled using oil extraction technology to access the rare-earth deposits. The technology needed to produce the rare-earth minerals on a commercial scale remained to be developed, however (Mining Engineering, 2012).

Japan had been trying to diversify its import sources of rare earths because of China's reduced exports of rare earths to the world market. During the 9 months from January to September 2012, China sold 9,967 t of rare earths to international buyers. Japan also tried to reduce consumption of rare earths by substituting other materials for them in manufacturing and by increasing its recycling of rare-earth materials. In accordance with an agreement signed with the Government of India early in 2012, Japan was expected to begin importing 4,000 t/yr of rare-earth minerals from India, which was about 15% of Japan's annual consumption (Syrett, 2012).

Toyota Tsusho Corp. and an Indian natural resource development company were expected to establish a joint venture for a project in the Indian State of Odisha. India controlled 17% of the world's total resources of mineral sands, but its mineral sand production accounted for only 6% of global output. The proposed plant was to use a byproduct mixture to produce rare earths after uranium and thorium had been extracted from monazite ore by Indian Rare Earths Ltd. Production was expected to begin in April 2012 and to supply between 3,000 t/yr and 4,000 t/yr of rare earths to Japan. Toyota Tsusho also had a project to develop a rare-earth deposit at Dong Pao in Vietnam. The processing plant was expected to be capable of producing 7,000 t/yr of rare earths in 2012 to meet one-fourth of Japan's demand. In Indonesia, the company planned to build a specialized plant using refining technology to recover rare earths from the slag left over from tin smelting on the Island of Bangka (Toyota Tsusho Corp., 2012).

Ensuring a stable supply of rare-earth elements was one of the Government's top priorities for promoting expansion and advancement of Japan's high-tech industry and driving technological innovation in the high-tech sector. Summit Atom Rare Earth Co. LLP, which was a joint venture between Sumitomo Corp. and National Atomic Co. of Kazakhstan, opened a plant at Stepnogorsk in Kazakhstan in November 2012 to recover rare-earth elements from uranium-ore tailings that Kazakhstan had mined in the past. The plant had set a total output target of 1,500 t/yr of rare-earth oxides (REOs) during the initial years and planned to export the REOs to Japan in 2013. Shin-Etsu Chemical Co. Ltd. would provide technological support. The plant also was expected to produce light rare earths (Sumitomo Corp., 2012).

Japan Metals & Chemicals Co., Ltd. and Honda Motor Co., Ltd. developed a process to extract rare-earth metals from various used parts (initially from nickel-metal hydride batteries) in Honda products by utilizing a newly established technology. The new process, which was to be employed at an existing recycling plant, would be the world's first mass-recyling effort for rare earths. The extraction rate was about 80% of rare-earth metals contained in the used parts. The companies expected to expand rare-earth metals recycling in the future (Honda Motor Co., Ltd., 2012).

Mineral Fuels

Petroleum.—JX Nippon Oil & Energy Corp. resumed full operations of its 145,000-barrel-per-day (bbl/d) Sendai oil refinery in March 2012 (1 year after the earthquake and tsunami that struck in March 2011). In January, the refinery resumed partial operations at limited capacity. JX Nippon operated eight oil refineries in Japan with a total capacity of 1,625,500 bbl/d. Cosmo Oil Co.'s 220,000-bbl/d Chibba oil refinery was awaiting permission from the local government to restart the first of two crude distillation units (Maeda, 2012).

Reserves and Resources

Japan has large reserves of industrial minerals, including dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stone. Limestone is the most abundant indigenous mineral resource. The country's reserves of nonferrous metals, such as lead, silver, and zinc, are small, with the exception of a medium gold reserve; gold deposits had been found and were being mined on a small scale in Kagoshima Prefecture on Kyushu Island owing to deep-seated occurrences. The country's coal reserves were reaching depletion. Japan's reserves of gas and oil are negligible (table 4).

Outlook

Owing to the expanding market for hybrid cars and electric vehicles, Japan is expected to increase production of specialty alumina used in lithium-ion batteries. Because of Indonesia's ban on the export of unprocessed nickel beginning in 2014, Japan is expected to source its nickel supplies from New Caledonia and the Philippines. Owing to strong worldwide demand for civilian aircraft and infrastructure, Japan is expected to increase its output of titanium products, such as alloys, metal, and tubes. Japan is expected to diversify its supply sources of rare earths by importing them from such countries as Australia, India, the United States, and Vietnam. With new technological advances, Japan is likely to be able to extract rare earths from the slag production during tin smelting in Indonesia and from uranium-ore tailings in Kazakhstan. In the energy sector, consumption of coal, LNG, and various types of oil may increase as backup powerplants that burn fossil fuels try to compensate for the loss of some nuclear-power-generating capacity. Imports of LNG are expected to increase in the long term in Japan.

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2008	2009	2010	2011	2012
METALS						
Aluminum:						
Alumina[e]	thousand metric tons	320	310	300	280	250
Aluminum hydroxide[e]	do.	700	710	700	690	650
Metal:						
Primary:						
Regular grades[e]	do.	7 [2]	6	5	4	5
High-purity	do.	52	33	49	43	26
Secondary[3]	do.	149	111	126	142	137
Antimony:						
Oxide		6,954	4,884	6,846	7,000 [e]	6,900 [e]
Metal		325	239	304	435	143
Arsenic, trioxide[e]		40	40	40	45 [r]	45
Bismuth		480	423	454	460 [e]	470 [e]
Cadmium, refined		2,126	1,824	2,053	1,755	1,855
Chromium, metal[e]		600	650	700	800	750
Cobalt, metal		1,071	1,332	1,935	2,007	2,542
Copper, metal:						
Blister and anode:						
Primary		1,366,310	1,297,943	1,382,655	1,168,284	1,304,916
Secondary		259,060	243,859	260,245	269,748	303,900
Total		1,625,370	1,541,802	1,642,900	1,438,032	1,608,816
Refined:						
Primary		1,328,157	1,238,012	1,333,787	1,094,999 [r]	1,270,914
Secondary		211,681	201,831	214,901	233,289 [r]	245,440
Total		1,539,838	1,439,843	1,548,688	1,328,288 [r]	1,516,354
Gallium, metal:[e]						
Primary		7	7	6	6	6
Secondary		85	80	78	75	70
Germanium:[e]						
Oxide		50	50	45 [r]	50	50
Metal, polycrystal	kilograms	1,720	1,730	1,750	1,760	1,780
Gold:						
Mine output, Au content	do.	6,868	7,708	8,544	7,922 [r]	7,233
Metal:						
Primary	do.	81,399	89,281	98,398	95,549	74,735
Secondary[4]	do.	43,433	43,979	37,413	36,288	29,544
Total	do.	124,832	133,260	135,811	131,837	104,279
Indium, metal[e]	do.	65,000	67,000	69,000	70,000	71,000
Iron and steel, metal:						
Pig iron	thousand metric tons	86,171	66,943	82,283	81,028	81,405
Electric-furnace ferroalloys:						
Ferrochrome		13,888	7,698	16,208	17,217	19,392
Ferromanganese		431,181	361,375	453,265	456,798	436,171
Ferronickel		301,361	284,884	348,420	279,944	371,913
Silicomanganese		58,884	49,205	49,865	49,798	52,287
Ferromolybdenum		4,554	3,598	4,615	5,167	4,616
Ferrovanadium		3,477	2,560	4,190	3,980	4,403
Unspecified		14,478	12,957	16,374	20,913	19,364
Total		827,823	722,277	892,937	833,817	908,416
Steel, crude	thousand metric tons	118,739	87,534	109,599	107,601	107,232
Semimanufactures, hot-rolled:[e]						
Ordinary steels	do.	84,000	68,000	67,000	65,000	66,000
Special steels	do.	21,000	16,000	15,000	15,000	16,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2008	2009	2010	2011	2012
METALS—Continued						
Lead, metal, refined:						
Primary		107,005	96,794	101,610	100,078	91,037
Secondary		117,900 r	95,402 r	114,218 r	114,986 r	117,957
Total		224,905 r	192,196 r	215,828 r	215,064 r	208,994
Magnesium, metal, secondary[e]		13,000	13,000	14,000	14,000	15,000
Manganese, oxide[e]		45,000	44,000	43,000	43,000	40,000
Molybdenum, metal		1,217	695	1,154	1,234	1,013
Nickel metal:						
Refined		34,861	29,351	40,228	41,290	41,944
Ni content of nickel oxide sinter		61,753 r	58,808 r	59,011 r	50,437 r	52,000 e
Ni content of ferronickel		59,259	54,491	64,349	62,773 r	73,248
Ni content of chemical		2,333	1,669	2,497	2,383	2,362
Total[e]		158,000 r	144,000	166,000	157,000	170,000
Platinum-group metals:						
Palladium, metal	kilograms	7,526	6,675	6,107	7,534	8,052
Platinum, metal	do.	1,442	1,417	1,331	1,765	1,735
Selenium, metal		754	709	754	750 e	755 e
Silicon, multicrystalline		7,471	8,633	8,700 e	12,133	10,964
Silver:						
Mine output, Ag content	kilograms	2,043	1,500 e	1,200 e	4,486	3,577
Metal:						
Primary	do.	2,042,604	1,865,936	1,898,208	1,724,218	1,764,533
Secondary[4]	do.	253,374	326,487	313,931	325,373	348,620
Total	do.	2,295,978	2,192,423	2,212,139	2,049,591	2,113,153
Tantalum, metal[e]		95	95	95	100 r	98
Tellurium, metal		47 r	49 r	47 r	40 r	45 e
Tin, metal, smelter		956	757	841	947	1,133
Titanium:						
Dioxide		225,228	161,928	207,561	214,417	185,320
Metal[e]		45,000	35,000	38,000	40,000	38,000
Tungsten, metal		3,446	1,400	3,361	3,299	3,025
Vanadium, metal[e, 5]		560	560	560	560	580
Zinc:						
Oxide[e]		77,000	75,000	72,000	66,325 r, 2	58,896 2
Metal:						
Primary		502,910	435,905	470,057	444,446	459,322
Secondary		112,623 r	104,699 r	103,951 r	100,228 r	111,990
Total		615,533 r	540,604 r	574,008 r	544,674 r	571,312
Zirconium, oxide[e]		11,000	12,000	13,000	13,000	14,000
INDUSTRIAL MINERALS						
Bromine[e]		20,000	20,000	25,000 r	25,000 r	30,000
Cement, hydraulic	thousand metric tons	62,810	54,800	51,526	51,291	54,737
Clays:[e]						
Bentonite		435,000	432,000	430,000	425,000	420,000
Fire clay, crude		450,000	440,000	440,000	430,000	430,000
Kaolin		11,000	12,000	12,000	13,000	13,000
Diatomite[e]		115,000	110,000	110,000	100,000	100,000
Feldspar and related materials[e]		120,000 r	115,000 r	110,000 r	104,109 r, 2	100,000
Gypsum[e]	thousand metric tons	5,800	5,750	5,700	5,600	5,500

See footnotes at end of table.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2008	2009	2010	2011	2012
INDUSTRIAL MINERALS—Continued						
Iodine		9,500 e	8,232	9,216	9,277	9,315
Lime, quicklime	thousand metric tons	9,528	6,746	8,547	8,005	7,581
Nitrogen, N content of ammonia	do.	1,244	1,021	1,178	1,211	1,055
Perlite[e]		230,000	220,000	210,000	200,000	200,000
Rare-earth oxides[6]		8,435	5,121	10,699	10,700 e	10,800 e
Salt, all types	thousand metric tons	1,200 e	1,200 e	1,122	978	925
Silica:						
Sand	do.	3,664	2,856	3,078	3,003	2,877
Stone, quartzite	do.	10,682	9,189	9,159	9,543	9,306
Sodium compounds, n.e.s.:[e, 7]						
Soda ash		400,000	400,000	410,000 r	430,000 r	450,000
Sulfate, anhydrous		140,000	142,000	142,000	145,000	147,000
Stone, crushed:						
Dolomite	thousand metric tons	3,370	3,122	3,438	3,492	3,361
Limestone	do.	156,813	132,350	133,974	134,176	140,038
Sulfur:						
Byproduct of metallurgy[e]	do.	1,300	1,350	1,400	1,450	1,500
Byproduct of petroleum	do.	2,034	1,864	1,892	1,755	1,747
Talc and related materials:[e]						
Talc		26,000	25,000	24,000	24,000	25,000
Pyrophyllite		350,000	340,000	340,000	350,000	340,000
Vermiculite[e]		6,000	6,000	6,000	6,200 r	6,200
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand metric tons	821	575	729	681	638
Coal, bituminous[e, 8]	do.	1,300	1,100	1,000	900	700
Coke, including breeze, metallurgical	do.	38,568	32,587	37,447	35,379	34,743
Gas, natural:						
Gross[9]	million cubic meters	3,735	3,539	3,396	3,298	3,276
Marketed[e]	do.	3,900	3,700	3,600	3,500	3,500
Petroleum:						
Crude	thousand 42-gallon barrels	6,200	5,795	5,491	5,235	4,995
Refinery products:[e]						
Gasoline:						
Aviation	do.	50	50	50	50	60
Other	do.	360,000	362,000	360,000	355,000	350,000
Asphalt and bitumen	do.	33,000	32,000	31,000	30,000	30,000
Distillate fuel oil	do.	250,000	245,000	242,000	240,000	240,000
Jet fuel	do.	82,000	78,000	76,000	75,000	80,000
Kerosene	do.	170,000	165,000	166,000	165,000	165,000
Liquefied petroleum gas	do.	58,000	56,000	55,000	55,000	60,000
Lubricants	do.	17,000	16,000	14,000	15,000	15,000
Naphtha	do.	139,000	136,000	135,000	130,000	135,000
Paraffin, wax	do.	800	800	750	750	750
Petroleum coke	do.	4,500	4,400	4,300	4,200	4,200
Refinery fuel and losses[10]	do.	150,000	150,000	150,000	150,000	160,000
Residual fuel oil	do.	330,000	300,000	320,000	350,000	355,000
Unfinished oils	do.	50,000	50,000	50,000	50,000	55,000
Total	do.	1,640,000	1,600,000	1,600,000	1,620,000	1,650,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.

[1]Table includes data available through November 4, 2013.

[2]Reported figure.

[3]Includes alloyed and unalloyed aluminum ingot.

[4]Includes metal recovered from scrap and waste.

TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

[5]Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[6]Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

[7]Not elsewhere specified.

[8]All major coal mines had closed by January 2002, but eight smaller mines were still in operation in 2012.

[9]Includes output from gas wells and coal mines.

[10]May include some additional unfinished oils.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co., Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co., Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co., Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co., Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Apmori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co., Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co., Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co., Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; 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	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube and Isa, Yamaguchi Prefecture, and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd.[1]	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 49.29%; Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.17% each; others, 2.91%)	Onahama, Fukushima Prefecture	300,000
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[2]	710,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Besshi/Toyo (Saijyo), Ehime Prefecture	410,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd. (SMM)	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	JX Nippon Mining & Metals Co., Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(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[3]	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[3]	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, 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. [wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd. (SMM)]	do.	22,000
Do. do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do. do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa, Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel & Sumitomo Metal Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		do.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
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	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
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%; 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.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000

Do., do. Ditto. NA Not available.
[1]Coal mining operations continued, but output has been in decline.
[2]Saganoseki Smelter and Refinery and Hitachi Refinery (Nikko Smelting & Refining Co. Ltd.) [450,000 metric tons per year (t/yr)] and Tamano Smelter and Refinery (Hibi Kyoto Smelting Co. Ltd.) (260,000 t/yr).
[3]Secondary lead smelter and refinery.

TABLE 3
JAPAN: SUPPLY AND DEMAND FOR SELECTED NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2010	2011	2012	2010	2011	2012
Stocks at the beginning of the year	104,409	110,279	124,578	17,303	16,521	15,168
Production	1,548,688	1,328,288 r	1,516,354	215,828	215,064 r	208,994
Imports	45,912	126,569	35,876	11,126	22,049	28,869
Total supply	1,699,009	1,565,136 r	1,676,808	244,257	253,634 r	253,031
Exports	528,384	437,247	545,908	40,461	33,367	19,831
Reported consumption	1,104,823 r	1,058,646 r	930,241	192,710 r	191,801 r	206,995
Total demand	1,633,207 r	1,495,893 r	1,476,149	233,171 r	225,168 r	226,826
Stocks at the end	110,279	124,578 r	145,128	16,521	15,168	19,510
Apparent consumption[1]	1,060,346	1,003,311 r	985,772	187,275	205,099 r	213,690
	Refined zinc			Silver (kilograms)		
	2010	2011	2012	2010	2011	2012
Stocks at the beginning of the year	73,600	65,555	92,265	872,325	1,062,722	999,120
Production	574,008	544,674 r	571,312	1,898,208	1,724,218	1,764,533
Remelting	NA	NA	NA	313,931	325,373	348,620
Imports	31,855	77,881	23,960	2,087,621	1,929,204	1,698,639
Total supply	679,463	688,110 r	687,537	5,172,085	5,041,517	4,810,912
Exports	97,745	95,278	135,560	2,733,284	2,837,596 r	3,297,120
Reported consumption	389,036 r	351,848 r	354,789	1,878,619 r	1,737,564 r	1,048,971
Total demand	486,781 r	447,126 r	490,349	4,611,903 r	4,575,160 r	4,346,091
Stocks at the end	65,555	92,265 r	72,389	1,062,722	999,120 r	1,037,918
Apparent consumption[1]	516,163	500,567 r	480,588	1,376,079	1,204,801 r	475,874

rRevised. NA Not applicable.

[1]Apparent consumption is total supply less exports and stocks at yearend.

Source: Japan Mining Industry Association, 2013.

TABLE 4
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2012

(Thousand metric tons unless otherwise specified)

Commodity		Exploitable reserves
Coal[1]		773,000
Dolomite		913,000
Gold ore, Au content	kilograms	159,000
Iodine		5,000 e
Limestone		40,400,000
Pyrophyllite		59,700
Silica sand		73,600
Silica stone, white		462,000

eEstimated.

[1]Recoverable reserves, including brown coal.

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