



# 2009 Minerals Yearbook

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## JAPAN

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# THE MINERAL INDUSTRY OF JAPAN

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Japan is a resource-poor industrialized country. Its free-market economy was the third largest in the world after the United States and China. The country continued its high levels of consumption of nonfuel minerals and mineral fuels. Production of gold, magnesium, and silver partially met domestic demand. The country was the Asia and the Pacific region's leading consumer of imported ferrous (iron ore) and nonferrous (bauxite, copper, and zinc) metals by its large manufacturing sector, and it also imported significant amounts of coke, crude oil, and natural gas. Hydropower, liquefied natural gas (LNG), and nuclear power were also used to meet its energy needs. Japan's mineral sector, which was dominated by the metals and metal products industries, was a major producer and exporter of metals to the world market.

## Minerals in the National Economy

In 2009, Japan's gross domestic product based on purchasing power parity was \$4.15 trillion, which was a decrease of 5.3% from that of 2008. Japan has relatively few mineral resources, and it imported raw materials and energy for its industrial production and use. The mineral industry played an important role in supplying industrial raw materials to Japan's manufacturing and construction industries. In particular, the mineral processing industry was large and included processing of chemicals, fabricated metal products, industrial mineral products, iron and steel, nonferrous metals, petroleum, and petroleum products.

## Government Policies and Programs

To secure mineral resources to meet domestic demand, the Government's mineral policies included promotion of overseas exploration and materials recycling, buildup of a stockpile of rare metals, and technological developments related to essential metals and minerals. The Agency for Natural Resources and Energy under the Ministry of Economy, Trade and Industry formulated the mineral policies. Japan Oil, Gas and Metals National Corp. (JOGMEC) was responsible for implementing these policies. The company engaged in joint-venture projects overseas in which it provided exploration expertise and financing and acquired an equity stake that was transferred to a Japanese mining and metal company (Japan Oil, Gas and Metals National Corp., 2009).

## Production

Owing to a weak demand for steel products, Japan's production of crude steel, pig iron, and ferroalloys decreased by 26%, 22%, and 13%, respectively, compared with the output in 2008. The country's nonferrous metals, except cobalt, mined gold, and silicon metal, decreased in output owing to the economic downturn. Output of high-grade aluminum metal and secondary aluminum decreased by 37% and 26%, respectively.

Antimony metal, molybdenum metal, tin metal, and tungsten all showed declines in production. Production of rare-earth oxides and titanium dioxide decreased significantly owing to reduced imports of rare earths and titanium minerals. Because of the construction slowdown, output of limestone, quartzite, quicklime, and silica sand decreased and so did that of cement and nitrogen in ammonia. Production of carbon black and coke also declined, and Japan had to rely on imports of coke to meet its needs (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 because the country consumes more minerals and metals from imports than it produces. Mining and quarrying of industrial minerals was still being done but at a lower level of production than in previous years. Dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stone were mined in 2009. Operating mines and employment in the mining industry have 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. Mining and mineral-processing businesses were owned and operated by private companies (table 2).

## Mineral Trade

In 2009, Japan imported about 1.2 million metric tons (Mt) of copper, 99,000 metric tons (t) of lead, and 470,000 t of zinc, all in concentrates. Copper concentrate came mainly from Chile (39%), Indonesia (20%), Peru (15%), and Australia (8%). Lead concentrate was imported from Australia (48%), the United States (29%), and Bolivia (19%) and zinc concentrate was supplied by Australia (32%), Peru (25%), and Bolivia (22%). The country imported a total of 385,000 kilograms (kg) of cadmium metal from the Republic of Korea (57%), Mexico (22%), Germany (10%), and Canada (10%); it exported a total of 1,405,000 kg of cadmium metal to China (82%) and India (18%) (Japan Mining Industry Association, 2010, p. 4).

Japan depended heavily on imported energy and tried to diversify its energy sources and to maintain high levels of energy efficiency. Important energy sources were coal, hydropower, LNG, nuclear power, and petroleum.

## Commodity Review

### Metals

**Cadmium.**—At the beginning of 2009, Japan had stocks of 352,000 kg of cadmium metal. With production of 1,824,000 kg

and imports of 385,000 kg, the country's supplies increased to 2,561,000 kg. With an apparent consumption of 982,000 kg and exports of 1,405,000 kg for a total demand of 2,387,000 kg, Japan's stocks of cadmium metal reduced to 174,000 kg at the end of 2009 (Japan Mining Industry Association, 2010, p. 27).

**Copper.**—The country produced about 1.3 Mt of anode and blister copper from primary sources and 244,000 t from scrap. It also produced about 1.4 Mt of refined copper primarily from imported ore (86%), scrap (6.8%), and other sources (7.2%). Refined copper was used in the manufacturing of wire (64%), brass (34%), and such miscellaneous products as copper alloy and copper alloy casting (1.5%) (table 3; Japan Mining Industry Association, 2010, p. 10).

Mitsubishi Materials Corp. (MMC)'s Onahama copper smelter was running at 70% of its capacity after a fire in mid-March 2009 forced part of the facility to be closed. The smelter had a production capacity of 258,000 metric tons per year (t/yr) of copper cathode. It was expected to resume full operations in mid-July (Thomson Reuters, 2009a).

MMC and Copper Mountain Mining Corp. of Canada agreed to redevelop the Similco copper mine near Princeton, British Columbia, Canada, by mid-2011. MMC would invest in the mine through its 100%-owned special purpose company to be established in British Columbia. The mine ceased production in 1996 owing to low copper prices. MMC had treated the Similco copper concentrate produced before the mine closure. MMC agreed to acquire a 25% equity interest in the mine through subscribing to shares of Similco Mines Ltd. MMC also agreed to purchase all the copper concentrate production, which was estimated to be about 150,000 t/yr (Mitsubishi Materials Corp., 2009).

**Gold and Silver.**—In 2009, Japan produced about 133,000 kg of gold from imported ore, other sources, scrap, and domestic ore, which accounted for 60%, 19.3%, 13.7%, and 6.8%, respectively. The country also produced about 1,866,000 kg of silver from imported ore, scrap, domestic ore, and other sources, which accounted for 58%, 12%, 0.7%, and 29%, respectively. Silver was used in photographic materials (32%), as nitrate for other uses (9%), in point connectors (8%), for silver solder (5%), in extension materials (10%), and for miscellaneous applications (36%) (table 3; Japan Mining Industry Association, 2010, p. 9).

Sumitomo Metal Mining Co. Ltd. (SMM) and Sumitomo Corp. planned to buy Teck Resources Ltd. of Canada's 40% stake in the Pogo gold mine in Alaska for \$245 million plus working capital and to make SMM the operator of the mine. The mine had estimated gold reserves of 109 t and produced 11 to 12 t/yr of gold. SMM previously had held a 51% interest in the mine and Sumitomo Corp. had held a 9% interest. After acquiring Teck's interest, SMM would own an 85% interest and Sumitomo Corp. would own a 15% interest. Sumitomo Metal Mining Pogo LLC was formed to take over mine management and operation. Domestically, SMM continued to operate the Hishikari gold mine in Kagoshima Prefecture (Reuters, 2009).

**Iron and Steel.**—Kobe Steel Group was a leader in the development of direct-reduction (DR) and new ironmaking technologies. The company secured orders for large-scale DR plants in the Middle East and planned to produce and market iron nuggets using its ITmk3® process in Vietnam. Given the

depletion and high prices of high-grade iron ore and coking coal, this process was beneficial because it can turn iron ore fines and pulverized steaming coal into high-purity iron nuggets (96% to 97% iron content). A plant at Hoyt Lakes in Minnesota would be the first commercial plant to use this process and would have the ability to produce 500,000 t/yr of iron nuggets in 2010. Kobe Steel also completed the construction of a pellet plant in Bahrain. The new plant had a production capacity of 6 million metric tons per year (Mt/yr) of pelletized pulverized iron ore for use in blast furnaces or DR plants (Kobe Steel Group, 2010).

JFE Steel Corp. blew in the No. 3 blast furnace at its West Japan Works (Kurashiki) for operation beginning in February 2010. The blast furnace had been idle since January 2009 but had undergone revamping in October. The inner volume of the blast furnace was increased to 5,055 cubic meters from 4,359 cubic meters at a cost of \$312 million. The automotive industry was expected to continue with its high demand for high-end steel, which was a JFE Steel specialty (JFE Steel Corp., 2009c).

Sumitomo Metal Industries, Ltd. (Sumitomo Metals) conducted a blow-in of its Wakayama steel works' new No. 1 blast furnace in July 2009. The new blast furnace replaced the No. 4 blast furnace, which had achieved the world's record for the longest blast-furnace operating life of about 27 years and 4 months and produced more than 47 Mt of steel. The new \$530 million No. 1 blast furnace had a capacity of 7,500 metric tons per day and an inner volume of 3,700 cubic meters. Production of crude steel at Wakayama would increase to 4.5 Mt/yr. The new No. 1 coke oven and sintering plant with increased capacity also started operations in 2009 (Sumitomo Metal Industries, Ltd., 2009c).

Nippon Steel Corp. responded to the sharp and substantial decrease in demand for steel products by reducing steel output; this was achieved by suspending operations of the No. 1 blast furnace at the Oita works in Oita Prefecture in February 2009 and the No. 2 blast furnace at the Kimitsu works in Chiba Prefecture also in February. The company also reduced the operations of its coke ovens at the Kimitsu, the Nagoya, the Oita, and the Yawata works (Nippon Steel Corp., 2009a).

Nippon Steel resumed operations of one of the three blast furnaces at its Kimitsu works in September 2009 and one of the two blast furnaces at its Oita works in August. The decision was made in response to the rebound in the demand for steel from carmakers and electrical appliance manufacturers and increasing exports to China and other Asian countries (Daily Yomiuri Online, 2009).

Sumitomo Metals proceeded with investments of \$280 million in innovative steelmaking processes at its Kokura steel works. The main facilities were for secondary refining and for a phosphorus removal furnace. Secondary refining was to remove nonmetallic inclusions in steel, such as oxides and sulfides, for the manufacturing of super-functional steel and super-clean steel. The simple refining process separated the removal processes of phosphorus and carbon in a basic oxygen furnace. Most of the carbon was removed from pig iron in primary refining. The phosphorus removal furnace was expected to be completed in October 2010 (Sumitomo Metal Industries, Ltd., 2009a).

Sumitomo Metals and China Steel Corp. of Taiwan obtained the Government of Vietnam's approval to invest \$1.15 billion in an advanced steel sheet project at My Xuan, which is located 60 kilometers southeast of Ho Chi Minh City, Vietnam. China Steel Sumiki Vietnam Joint Stock Co. (in which China Steel held a 51% interest; Sumitomo Metals, 30%; Sumitomo Corp., 5%; and others, 14%) was formed in May 2009 to produce a full line of high-grade steel sheet products for automobiles. Production of 1.6 Mt/yr was planned to meet demand from Vietnam and nearby countries (Sumitomo Metal Industries, Ltd., 2009b).

To secure a local production base to serve customers in the Indian market, JFE Steel and JSW Steel Ltd. of India signed a collaboration agreement in November 2009 for the production of value-added steel products, such as automotive steel, in India. The agreement included the sharing of production technologies, the supply of substrate materials for hot-rolled, cold-rolled, and galvanized products, and joint service activities. Future collaboration could extend to production of other steel products, energy reduction, environment protection, quality control, and material procurement. JFE Steel, which had a production capacity of 33 Mt/yr, was the second ranked steel producer in Japan. JSW Steel, which had 7.8 Mt/yr of capacity, was the leading privately owned steel producer in India (JFE Steel Corp., 2009a).

Nippon Steel completed its acquisition of new shares of Suzuki Metal Industry Co. Ltd. (which brought its share of the company to 66.59%) and made Suzuki Metal a subsidiary. Suzuki Metal produced and sold valve spring wire, piano wire, stainless steel wire, titanium wire, and special wire products. Suzuki Metal acquired Haldex Garphyttan AB of Sweden and renamed it Suzuki Garphyttan AB. This acquisition made Suzuki Metal the leading valve spring wire manufacturer in the world (Nippon Steel Corp., 2009b).

In 2009, Japan produced 2.35 Mt of stainless steel, which was 27% less than in 2008, of which nickel-based steel accounted for 1.36 Mt (58%) and chrome-based steel accounted for 987,000 t (42%). Production of the two types of stainless steel decreased by 18% and 36%, respectively, owing to weak demand for big-ticket items (Japan Mining Industry Association, 2010, p. 3).

**Lead and Zinc.**—Japan produced a total of 247,600 t of lead in 2009. Of this amount, 192,200 t was refined lead made from 96,800 t of primary ore (which included imported ore and domestic ore) and 95,400 t of scrap and material from other sources. The remaining 55,400 t was remelted lead. Refined lead was used in batteries (90%), chemicals (3%), pipe and sheet (1%), and other miscellaneous applications (4%). The country produced a total of about 573,000 t of zinc. Of this amount, 541,000 t was refined zinc made from 436,000 t of primarily imported ore (80%) and 105,000 t of scrap (0.3%) and other sources (19%). The remaining 32,000 t was remelted zinc. Refined zinc was used mainly in galvanized sheet (47%), other types of galvanized products (18%), brass (12%), die-casting alloy (10%), and chemicals (9%) (table 3; Japan Mining Industry Association, 2010, p. 11-14).

**Minor (Rare) Metals.**—The Government conducted a review of its stockpiling of seven minor metals. To better reflect the metal needs of the country's high-tech industry, two new metals, gallium and indium, would be added to the stockpiles.

Gallium is used in light-emitting diodes, which are used in mobile phones and flat-screen televisions, and indium is used in flat-panel screens in televisions and computer monitors. Among the seven minor metals already stockpiled, the Government was considering increasing its stocks of cobalt, molybdenum, tungsten, and vanadium and selling stocks of chromium, manganese, and nickel. Many minor metals were byproducts of metals production, such as copper and zinc, which decreased in output owing to the economic downturn. The country planned to increase supplies from the current average of 19.5 days' worth of stocks to 42 days (Thomson Reuters, 2009b).

Toshiba Corp. aimed to set up a rare-metals joint venture with Kazatomprom of Kazakhstan that would produce dysprosium, neodymium, and rhenium. These rare metals were byproducts of uranium production. Toshiba had worked with Kazatomprom on uranium mine development. Neodymium is used in high-power magnets for electric motors of hybrid cars. The two companies would apparently consider working together on producing other rare metals, such as beryllium and tantalum, for use in nuclear powerplants (Thomson Reuters, 2009c).

**Nickel.**—SMM increased its capital investment of \$22 million in Nickel Asia Corp. (NAC) of the Philippines to boost its equity interest by 8.5% to 25%. NAC was one of the leading nickel mining and ore-producing companies in the Philippines. NAC's Rio Tuba Nickel Mining Corp. supplied nickel ore to Coral Bay Nickel Corp., which SMM operated, for nickel refining using high-pressure acid leach (HPAL) technology. NAC was actively involved in SMM's Taganito HPAL project, to which NAC's Taganito Mining Corp. supplied nickel ore. In Japan, SMM also planned expansion of its Nihama nickel refinery in Ehime Prefecture (Sumitomo Metal Mining Co., Ltd., 2009).

### *Industrial Minerals*

**Cement.**—Taiheiyo Cement Corp. responded to a decline in domestic cement demand and proposed the R<sup>3</sup> (recover, reform, and reconstruct) plan, which was a comprehensive cost-cutting plan, in May 2009. The company planned to reduce personnel and overhead costs within 1 year to enhance operational efficiency. It also proposed to develop a production plan and revise business policies within several years. The company reorganized seven inhouse companies into four for the cement, environmental, international, and mineral resources businesses and consolidated the ceramics, construction materials, electronics, and real estate businesses into the newly established Group Management Department (Taiheiyo Cement Corp., 2009).

### *Mineral Fuels*

**Coal.**—JFE Steel planned to acquire a 20% interest in the Byerwen coal project in the northern Bowen Basin of northeastern Queensland in Australia from QCoal Pty. Ltd. A long-term offtake contract was signed in which JFE Steel agreed to take delivery of 2 Mt/yr of coking coal from the project. The Port of Abbot Point would serve the coal project. The shipments would ensure a stable supply of coking coal to JFE's steelworks. The proposed open-cut mine would produce 10 Mt/yr of coking

coal in 2012 and be one of the leading coal mines in Australia (JFE Steel Corp., 2009b).

To strengthen the bilateral relationship between Japan and Vietnam in the field of mineral resources, including high-quality coal (anthracite) used by Japanese steel companies and rare earths used in high-technology devices, a ministerial-level meeting was held in Vietnam in January 2009. Three projects were announced: technology cooperation in coal between the Japan Coal Energy Center and Vietnam National Coal Mineral Industries Group (VINACOMIN); joint coal exploration between New Energy and Industrial Technology Development Corp. and VINACOMIN; and business cooperation in resource development between the Japan Bank for International Cooperation and VINACOMIN. In addition, support for an infrastructure feasibility study project around rare-earth mines was also announced (Ministry of Economy, Trade and Industry, 2009).

**Natural Gas.**—Tokyo Gas Co. selected the City of Hitachi in Ibaraki Prefecture as the site for its fourth LNG regasification terminal. The \$1.04 billion investment covered docks for tankers, storage tanks, and regasification equipment. The new terminal was scheduled to begin operations in 2017. The company operated three facilities in Japan. It also operated two LNG receiving facilities in Yokohama and one at Sodegaura in Chiba Prefecture. The company would deliver 50,000 t/yr of LNG to a satellite terminal for regasification by truck from Sodegaura and sell it to Hitachi Ltd. Tokyo Gas' industrial gas sales had increased at an average of 7% per year and accounted for 40% of all its gas sales (Oil & Gas Journal, 2009b).

**Petroleum.**—China National Petroleum Corp. (CNPC) planned to buy a 49% stake in Nippon Oil Corp.'s 115,000-barrel-per-day (bbl/d) Osaka refinery. The refinery had a 27,000-bbl/d catalytic cracker and a 17,000-bbl/d catalytic reformer and produced 40,000 bbl/d of distillates. The Osaka facility was a joint venture in which Nippon Oil held 51% of the shares and CNPC held the remaining shares. The deal would reduce part of Japan's excess refining capacity (Oil & Gas Journal, 2009a).

Nippon Oil and Japan Energy Corp. planned to reduce their combined refining capacity by 400,000 bbl/d by March 2010. The companies would reduce capacity by another 200,000 bbl/d by early 2015. Decreasing fuel demand and a merger between the two companies to form JX Holdings Inc. were the reasons behind the move (Petroleum Economist, 2009b).

In 2009, the Government wanted to begin a new strategic reserve of petroleum products by stockpiling light products and middle distillates. Japan currently stockpiled only crude oil (Petroleum Economist, 2009a).

## Reserves and Resources

Japan has large reserves of industrial minerals, including dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stones. 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 gold; gold deposits had been found and were being mined on a small scale in Kagoshima Prefecture on Kyushu Island. Japan's reserves of gas and oil are negligible (table 4).

## Outlook

In line with its mineral policy to secure and diversify its long-term supply of raw materials, Japan is expected to continue its active search (through JOGMEC) for direct investment in joint exploration and development of minerals (particularly natural gas, nonferrous metals, and petroleum) in developed and developing countries. The country is expected to remain an important player in international mining because of the investments its mining and trading companies are making to secure the importation of ores and concentrates for the smelting, refining, and fabricating industries; coal for powerplants; and end-use metals for the manufacturing industries.

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

(Metric tons unless otherwise specified)

Commodity	2005	2006	2007	2008	2009	
<b>METALS</b>						
<b>Aluminum:</b>						
Alumina <sup>c</sup>	thousand metric tons	350	330	300	320	310
Aluminum hydroxide <sup>e</sup>	do.	740	720	700	700	710
<b>Metal:</b>						
<b>Primary:</b>						
Regular grades	do.	7	7	6	7	6 <sup>e</sup>
High-purity	do.	45	50	51	52 <sup>r</sup>	33
Secondary <sup>2</sup>	do.	188 <sup>r</sup>	149 <sup>r</sup>	153 <sup>r</sup>	149 <sup>r</sup>	111
<b>Antimony:</b>						
Oxide		7,792	7,778	7,939	6,954	6,700 <sup>e</sup>
Metal		253	275	270	325	239
Arsenic, trioxide <sup>e</sup>		40	40	40	40	40
Bismuth		463	425	408	480 <sup>r</sup>	423
Cadmium, refined		2,297	2,286	1,939	2,126	1,824
Chromium, metal <sup>c</sup>		700	700	500	600	650
Cobalt, metal		471	920	1,084	1,071	1,332
<b>Copper, metal:</b>						
<b>Blister and anode:</b>						
Primary		1,319,247	1,409,087	1,367,310	1,366,310	1,297,943
Secondary		198,516	219,203	245,208	259,060	243,859
Total		1,517,763	1,628,290	1,612,518	1,625,370	1,541,802
<b>Refined:</b>						
Primary		1,227,528	1,342,350	1,369,814	1,328,157	1,238,012
Secondary		167,756	189,705	207,004	211,681	201,831
Total		1,395,284	1,532,055	1,576,818	1,539,838	1,439,843
<b>Gallium, metal:<sup>c</sup></b>						
Primary		10	8	8	7	7
Secondary		86 <sup>3</sup>	93 <sup>3</sup>	90	85	80
<b>Germanium:<sup>c</sup></b>						
Oxide		50	50	50	50	50
Metal, polycrystal	kilograms	1,731 <sup>3</sup>	1,682 <sup>3</sup>	1,700	1,720	1,730
<b>Gold:</b>						
Mine output, Au content	do.	8,318	8,904	8,869	6,868	7,708
<b>Metal:</b>						
Primary	do.	146,182	144,164	117,529	81,399	89,281
Secondary <sup>4</sup>	do.	23,710	23,952	38,331	43,433	43,979
Total	do.	169,892	168,116	155,860	124,832	133,260
Indium, metal <sup>c</sup>	do.	70,000	55,000	60,000	65,000	67,000
<b>Iron and steel, metal:</b>						
Pig iron	thousand metric tons	83,058	84,270	86,771	86,171	66,943
<b>Electric-furnace ferroalloys:</b>						
Ferrochrome		12,367	13,056	12,016	13,888	7,698
Ferromanganese		448,616	406,162	420,151	431,181	361,375
Ferronickel		391,074	335,884	351,503	301,361	284,884
Silicomanganese		94,725	59,424	52,901	58,884	49,205
Ferromolybdenum		4,019	4,229	4,573	4,554	3,598
Ferrovandium		2,360	2,042	3,205	3,477	2,560
Unspecified		10,057	13,123	13,982	14,478	12,957
Total		963,218	833,920	858,331	827,823	722,277
Steel, crude	thousand metric tons	112,471	116,226	120,203	118,739	87,534
<b>Semimanufactures, hot-rolled:</b>						
Ordinary steels	do.	80,828	83,139	86,704	84,000 <sup>r,e</sup>	68,000 <sup>e</sup>
Special steels	do.	20,360	20,982	21,498	21,000 <sup>r,e</sup>	16,000 <sup>e</sup>

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	2005	2006	2007	2008	2009
METALS—Continued					
Lead:					
Mine output, Pb content	3,437	777	--	--	--
Metal, refined:					
Primary	106,638	108,271	104,527	107,005	96,794
Secondary including remelted	167,980	171,743	171,795	172,454	150,871
Total	274,618	280,014	276,322	279,459	247,665
Magnesium, metal, secondary <sup>c</sup>	11,000	12,000	12,000	13,000	13,000
Manganese, oxide <sup>c</sup>	45,500	45,500	45,000	45,000	44,000
Molybdenum, metal	901	1,253	1,172	1,217 <sup>r</sup>	710
Nickel metal:					
Refined	29,399	29,254	30,402	34,861	29,351
Ni content of nickel oxide sinter	56,700	53,800	60,151	60,000 <sup>e</sup>	58,000 <sup>e</sup>
Ni content of ferronickel	76,390	66,058	68,346	59,259	54,491
Ni content of chemical	2,208	2,531	2,270	2,333	1,669
Total	164,697	151,643	161,169	156,000 <sup>e</sup>	144,000 <sup>e</sup>
Platinum-group metals: <sup>c</sup>					
Palladium, metal kilograms	5,400	5,400	5,500	5,500	5,600
Platinum, metal do.	760	760	770	770	780
Rare-earth oxides <sup>5</sup>	6,432	8,243	8,561	8,435	5,121
Selenium, metal	625	730	806	754	709
Silicon, multicrystalline	6,923	6,987	7,364	7,471	8,633
Silver:					
Mine output, Ag content kilograms	54,098	11,463	5,300	2,043 <sup>r</sup>	1,500 <sup>e</sup>
Metal:					
Primary do.	2,202,794	2,253,203	2,263,009	2,042,604	1,865,936
Secondary <sup>4</sup> do.	192,177	228,000	391,869	253,374	326,487
Total do.	2,394,971	2,481,203	2,654,878	2,295,978	2,192,423
Tantalum, metal <sup>c</sup>	95	95	95	95	95
Tellurium, metal	34	35	41	40 <sup>e</sup>	38 <sup>e</sup>
Tin, metal, smelter	754	854	879	956	757
Titanium:					
Dioxide	259,015	239,916	245,976	225,228	161,928
Metal <sup>c</sup>	31,000	39,000	42,000	45,000	35,000
Tungsten, metal	4,056	3,566	3,813	3,446	1,400
Vanadium, metal <sup>e, 6</sup>	560	560	560	560	560
Zinc:					
Mine output, Zn content	41,452	7,169	--	--	--
Oxide	74,843	77,234	77,102	77,000 <sup>e</sup>	75,000 <sup>e</sup>
Metal:					
Primary	536,768	504,532	495,632 <sup>r</sup>	502,910 <sup>r</sup>	435,905
Secondary, including remelted	138,453	148,715	143,063 <sup>r</sup>	147,957 <sup>r</sup>	136,844
Total	675,221	653,247	638,695	650,867 <sup>r</sup>	572,749
Zirconium, oxide <sup>c</sup>	10,000	10,800	11,000	11,000	12,000
INDUSTRIAL MINERALS					
Bromine <sup>c</sup>	20,000	20,000	20,000	20,000	20,000
Cement, hydraulic thousand metric tons	69,629	69,942	67,685	62,810	54,800
Clays: <sup>c</sup>					
Bentonite	421,629 <sup>3</sup>	425,000	430,000	435,000	432,000
Fire clay, crude	460,000	460,000	450,000	450,000	440,000
Kaolin	10,500	10,500	11,000	11,000	12,000
Diatomite <sup>c</sup>	130,005 <sup>3</sup>	130,000	120,000	115,000	110,000
Feldspar and related materials <sup>c</sup>	800,000	800,000	750,000	700,000	700,000
Gypsum thousand metric tons	5,913	5,796	5,850	5,800 <sup>e</sup>	5,750 <sup>e</sup>
Iodine	8,095	8,724	9,282	9,500 <sup>e</sup>	9,600 <sup>e</sup>
Lime, quicklime thousand metric tons	8,879	9,014	9,359	9,528	6,746

See footnotes at end of table.



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

(Metric tons unless otherwise specified)

Commodity	2005	2006	2007	2008	2009
INDUSTRIAL MINERALS—Continued					
Nitrogen, N content of ammonia	1,083	1,091	1,114	1,244 <sup>r</sup>	1,021
Perlite <sup>c</sup>	240,000	240,000	230,000	230,000	220,000
Salt, all types	1,227	1,166	1,190	1,200 <sup>e</sup>	1,200 <sup>e</sup>
Silica:					
Sand	4,549	4,593	4,314	3,664	2,856
Stone, quartzite	12,600	12,936	12,258	10,682	9,189
Sodium compounds, n.e.s.: <sup>e, 7</sup>					
Soda ash	400,000	400,000	400,000	400,000	400,000
Sulfate, anhydrous	138,000	138,000	140,000	140,000	142,000
Stone, crushed:					
Dolomite	3,534	3,695	3,655	3,370	3,122
Limestone	165,240	166,621	165,982	156,813	132,350
Sulfur:					
Byproduct of metallurgy	1,284	1,343	1,250	1,300 <sup>e</sup>	1,350 <sup>e</sup>
Byproduct of petroleum	1,972	1,950	1,966	2,034	1,864
Talc and related materials: <sup>e</sup>					
Talc	25,491 <sup>3</sup>	25,500	26,000	26,000	25,000
Pyrophyllite	351,111 <sup>4</sup>	350,000	345,000	350,000	340,000
Vermiculite <sup>c</sup>	6,000	6,000	6,000	6,000	6,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	805	827	835	821	575
Coal, bituminous <sup>8</sup>	1,114	1,341	1,340 <sup>e</sup>	1,300 <sup>e</sup>	1,100 <sup>e</sup>
Coke, including breeze, metallurgical	38,095	38,543	38,707	38,568	32,587
Gas, natural:					
Gross <sup>9</sup>	3,120	3,302	3,708	3,735	3,539
Marketed	3,265	3,494	3,900 <sup>e</sup>	3,900 <sup>e</sup>	3,700 <sup>e</sup>
Petroleum:					
Crude	5,772	5,643	6,041	6,200	5,795
Refinery products:					
Gasoline:					
Aviation <sup>c</sup>	50	50	50	50	50
Other	368,102	364,070	365,000 <sup>e</sup>	360,000 <sup>e</sup>	362,000 <sup>e</sup>
Asphalt and bitumen	33,288	32,777	33,000 <sup>e</sup>	33,000 <sup>e</sup>	32,000 <sup>e</sup>
Distillate fuel oil	251,729	251,311	247,000 <sup>e</sup>	250,000 <sup>e</sup>	245,000 <sup>e</sup>
Jet fuel	69,946	76,390	80,000 <sup>e</sup>	82,000 <sup>e</sup>	78,000 <sup>e</sup>
Kerosene	177,091	167,779	175,000 <sup>e</sup>	170,000 <sup>e</sup>	165,000 <sup>e</sup>
Liquefied petroleum gas	56,352	55,696	57,000 <sup>e</sup>	58,000 <sup>e</sup>	56,000 <sup>e</sup>
Lubricants	16,580	16,706	16,500 <sup>e</sup>	17,000 <sup>e</sup>	16,000 <sup>e</sup>
Naphtha	135,792	136,140	138,000 <sup>e</sup>	139,000 <sup>e</sup>	136,000 <sup>e</sup>
Paraffin, wax	902	824	850 <sup>e</sup>	800 <sup>e</sup>	800 <sup>e</sup>
Petroleum coke	4,394	4,810	4,600 <sup>e</sup>	4,500 <sup>e</sup>	4,400 <sup>e</sup>
Refinery fuel and losses <sup>e, 10</sup>	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	400,936	373,047	350,000 <sup>e</sup>	330,000 <sup>e</sup>	300,000 <sup>e</sup>
Unfinished oils <sup>c</sup>	50,000	50,000	50,000	50,000	50,000
Total <sup>c</sup>	1,720,000	1,680,000	1,670,000	1,640,000	1,600,000

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

<sup>1</sup>Table includes data available through November 10, 2010.

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

<sup>3</sup>Reported figure.

<sup>4</sup>Includes metal recovered from scrap and waste.

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

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

<sup>7</sup>Not elsewhere specified.

<sup>8</sup>All major coal mines had closed by January 2002, but eight smaller mines were still in operation in 2009.

<sup>9</sup>Includes output from gas wells and coal mines.

<sup>10</sup>May include some additional unfinished oils.

TABLE 2  
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co., Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co., Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co., Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co., Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Aomori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co., Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co., Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co., Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; and Tosa, Kochi Prefecture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube and Isa, Yamaguchi Prefecture, and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd. <sup>1</sup>	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 49.29%; Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.17% each; others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Pan Pacific Copper Co., Ltd. (Nippon Mining & Metals Co., Ltd., 66%, and Mitsui Mining and Smelting Co., Ltd., 34%)	Saganoseki, Oita Prefecture; Hitachi, Ibaraki Prefecture; and Tamano, Okayama Prefecture <sup>2</sup>	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.	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 2009

(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 <sup>3</sup>	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 <sup>3</sup>	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	12,720
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 2009

(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.		Mitsuisi, Okayama Prefecture	180
Do.	Shokozan Kogyosho Co. Ltd.		Yano-Shokozan, Hiroshima Prefecture	180
Do.	Showa Kogyo Co. Ltd.		Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude	JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)		Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.	Kobe Steel Ltd.		Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.	Nippon Steel Corp.		Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.	Sumitomo Metal Industries, Ltd.		Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Do.	Nisshin Steel Co. Ltd.		Kuri, Hiroshima Prefecture; Osaka City; Shunan, Yamaguchi Prefecture; and Toyo, Ehime Prefecture	4,000
<b>Titanium:</b>				
In sponge metal	Sumitomo Titanium Corp. (Sumitomo Metal Industries, Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)		Amagasaki, Hyogo Prefecture	24
Do.	Toho Titanium Co. Ltd. (Nippon Mining & 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%; 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%; 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.

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

<sup>2</sup>Saganoseki Smelter and Refinery and Hitachi Refinery [450,000 metric tons per year (t/yr)] and Tamano Smelter and Refinery (260,000 t/yr).

<sup>3</sup>Secondary lead smelter and refinery.

TABLE 3  
JAPAN: SUPPLY AND DEMAND FOR SELECT NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2007	2008	2009	2007	2008	2009
Stocks at the beginning	102,807	101,931	124,379	17,562	14,224	22,134
Production	1,576,818	1,539,838	1,439,843	219,423	224,905	192,196
Imports	102,273	90,470	42,256	24,800	25,497	9,144
Total supply	1,781,898	1,732,239	1,606,478	261,786	264,626	223,474
Exports	428,079	423,455	626,685	19,147	26,246	55,521
Reported consumption	1,241,893	1,219,740	907,929	229,581	211,261	159,093
Total demand	1,669,972	1,643,195	1,534,614	248,728	237,507	214,614
Stocks at the end	101,931	124,379	103,869	14,224	22,134	17,303
Apparent consumption	1,251,888	1,184,405	875,924	228,415	216,246	150,650
	Refined zinc			Silver (kilograms)		
	2007	2008	2009	2007	2008	2009
Stocks at the beginning	93,878	82,069	94,521	1,190,744	881,919	959,905
Production	597,650	615,533	540,604	2,263,009	2,042,604	1,865,936
Remelting	NA	NA	NA	391,869	253,374	326,487
Imports	53,145	45,287	27,533	1,540,073	2,098,409	1,343,705
Total supply	744,673	742,889	662,658	5,385,695	5,276,306	4,496,033
Exports	74,187	84,505	155,985	2,205,575	1,978,353	1,696,462
Reported consumption	487,578	450,010	318,922	2,262,457	1,868,883	1,392,946
Total demand	561,765	534,515	474,907	4,468,032	3,847,236	3,089,408
Stocks at the end	82,069	94,521	73,760	881,919	959,905	872,325
Apparent consumption	588,417	563,863	432,913	2,298,201	2,338,048	1,927,246

NA Not applicable.

Source: Japan Mining Industry Association.

TABLE 4  
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2009

(Thousand metric tons unless otherwise specified)

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

<sup>e</sup>Estimated.

<sup>1</sup>Recoverable reserves, including brown coal.

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