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The Mineral Industry of China

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China ranked second behind the United States as the world's leading economic power and was a leading mineral producing and consuming country. In 2011, China's economy remained strong even as most of the developed countries in the West were trying to recover from recession. During the past two decades, China's economic growth was created by a combination of trade and investment, which greatly affected the global commodity market. China imported significant amounts of raw materials and transformed the materials into products for export. The country's demand for energy, minerals, and metals was particularly strong. During the 1980s and 1990s, China's commodity exports went primarily to the United States and Europe; however, during the past several years, intraregional trade in Asia increased significantly, which benefited other emerging economies in Asia, especially those that exported raw materials to China. Strong Chinese demand for natural resources and energy resulted, for example, in large volumes of Australian exports and an increase in Australian jobs and investment (Australian Bureau of Resources and Energy Economics, 2012, p. 18).

The Chinese Government set the country's targeted economic growth rate at 7% in its 12th 5-year plan (2011 through 2015), but the actual rate of growth was higher than the targeted rate. In 2011, the growth in the gross domestic product (GDP) decreased from 9.7% in the first quarter to 8.9% in the fourth quarter. For the year, the GDP growth rate was 9.3% compared with 10.4% in 2010. The slowing of economic growth was attributed to weaker investment and slow growth in the economies of the United States and the European Union, which limited their net exports. Also, the Government tightened monetary and credit policies to contain inflation, particularly in the infrastructure and the real estate sectors (National Bureau of Statistics of China, 2012a, p. 1–9).

The slower rate of growth in China was expected to affect the economic development of other countries in the Asia and the Pacific region, given China's increasing role as an export destination for mineral commodities. As a result, the economic growth of such natural resource exporting countries as Australia, Burma, Indonesia, Mongolia, and Vietnam was expected to slow down (National Bureau of Statistics of China, 2012a, p. 1–9; Citigroup Global Market Inc., 2012a, p. 19).

In 2011, the consumer price index increased by 5.4% compared with an increase of 3.3% in 2010. The country's fixed-asset investment increased by 23.6% to $4.9 trillion, of which the mining sector (including coal, gas, and oil) received $187 billion; the nonmetallic sector received $166 billion; and the ferrous and nonferrous metal sectors received $61 billion each. China's long-term challenge was to continue its economic growth towards a more sustainable path. The GDP growth in the next decade was expected to be slower than during the past two decades (National Bureau of Statistics of China, 2012a, p. 1–9).

During the next decade, China was expected to face the shrinkage of its labor force because of the adoption of the one child policy in the latter part of the 20th century. China's investment-to-GDP ratio was high (49.7% in 2011) compared with that of the Republic of Korea, 29.5%; Taiwan, 21.1%; Japan, 19.9%; and the United States, 15.9%. Also, the country was likely to be confronted with social and environmental issues that had been ignored during the past two decades of development (Citigroup Global Market Inc., 2012a, p. 7; National Bureau of Statistics of China, 2012a, p. 1–9).

Minerals in the National Economy

China is rich in mineral resources and was the world's leading producer of aluminum, antimony, barite, bismuth, cement, coal, fluorspar, gold, graphite, iron and steel, lead, magnesium, mercury, molybdenum, phosphate rock, rare earths, salt, talc, tin, tungsten, and zinc in 2011. China ranked among the top three countries in the world in the production of many other mineral commodities. China was the leading exporter of antimony, barite, fluorspar, graphite, indium, rare earths, and tungsten in the world. The country's demand for chromium, cobalt, copper, iron ore, manganese, nickel, petroleum, platinum-group metals, and potash exceeded domestic supply, and imports were estimated to account for more than 40% of domestic consumption. Mineral trade accounted for about 25% of the country's total trade. China was one of the few countries whose domestic supply of and demand for a variety of mineral commodities affected the world mineral market. The labor force in the mining sector was 6.11 million, or 4.2% of the country's total workforce in 2011 (National Bureau of Statistics of China, 2012b, p. 130).

Government Policies and Programs

China's rapid capital-intensive, export-oriented growth has been successful during the past three decades; however, the global markets it has relied on are expected to be weaker in the future. The existing pattern of growth is energy- and natural-resource intensive and environmentally unsustainable. The constrained supply of major mineral resources and environmental degradation limit the country's ability to maintain its past level of economic growth.

Even though the Government declared the country to be a "social market economic state" more than a decade ago, some sectors remain under Government control, including electricity, gasoline, and coal. The Government projects that, by yearend 2015, the country will have to reduce its energy consumption and carbon dioxide emissions by 16% and 17%, respectively; nitric oxide, by 10%; and sulfur dioxide, by 8% from the levels of 2010. The Government has also indicated that it intends to support and build a more energy-efficient and ecologically friendly society. Its plan to reduce carbon emissions is to be focused on the energy-intensive sectors, such as cement, chemicals, iron and steel, and nonferrous metals. The

Government issued a series of technological and fiscal support policies in 2010 to promote the use of renewable energy. The Government stated that the country's economic growth should be less dependent on export markets in the United States and Europe and thus plans to transform the economy from one that is export focused to one that is consumer driven. The Government also indicated its intent to develop the right talent domestically rather than hire talent from other countries (State Council, The, 2011a, p. 1–5; 2011b; 2012b, p. 1–7).

Small- and medium-sized enterprises, which were largely owned by the private sector, were playing an increasingly important role in the Chinese economy. These enterprises accounted for about 60% of the country's GDP and more than 50% of the Government's tax revenue. They also provided about 80% of employment in urban areas. In 2010, the Government announced that it would offer wider market access to the private sector; however, private enterprises continued to face numerous difficulties, such as heavy tax burdens, difficulty in obtaining bank loans and a scarcity of skilled labor. Private enterprises also faced access obstacles to monopolized sectors, such as the oil and gas, power, and railway sectors. The Government planned to allow the private sector to invest in education, energy, finance, health care, and municipal construction in the next several years. The Government would set up small- and medium-sized development funds to help with the financial issues. It also planned to replace business taxes on certain services with a nationwide value-added tax following a pilot program that had already been introduced in Beijing City, the Provinces of Jiangsu and Zhejiang, and the Pearl River Delta (Citigroup Global Market Inc., 2012b).

The Central Committee of the Communist Party of China met in October and issued a policy guideline (the 12th 5-year plan) for the economic development of the country during the next 5 years (2011 through 2015). The Committee set goals for the country to achieve sustained rapid growth and development in a way that is more people oriented and causes less degradation of the environment.

The Ministry of Industry and Information Technology (MIIT) subsequently issued the 12th 5-year development plans for individual sectors of the economy. In the 12th 5-year development plan for the iron and steel sector, the Government described the development of the iron and steel sector as having taken place mainly in the northern part of the country. In coastal areas, especially in the southeastern part of the country, iron and steel production was lagging behind demand; however, in the Bohai area, iron and steel production exceeded demand. To balance this trend, the Government decided not to approve any new iron and steel construction projects in the Bohai area (which includes the cities of Beijing and Tianjin and the Provinces of Hebei, Shandong, and Liaoning) and the Yangtze Delta (Shanghai City and the Provinces of Jiangsu and Zhejiang). Iron and steel production in the Pearl Delta would increase to meet regional demand. In the western part of the country, the Government planned to expand iron and steel production based on the market conditions, such as the availability of energy and iron ore resources in Xinjiang Autonomous Region and Yunnan Province. The Government estimated that the country would consume between 770 million metric tons per year (Mt/yr) and 820 Mt/yr of steel between 2015 and 2020. It encouraged iron and steel enterprises to invest in chromite, coke, iron ore, and manganese projects in other countries to secure supplies of raw materials. In 2011, China was required to import more than 60% of the iron ore needed to meet domestic demand. Steel enterprises were encouraged to invest more funds on research and development of high-value-added steel products. At yearend 2015, the country would retire all 400-cubic-meter blast furnaces and 30-metric-ton (t) converters and electric arc furnaces. The energy consumption of each ton of steel output would be reduced to 580 kilograms (kg) of standard coal [5,500-kilocalorie (kcal) coal], and the emission of sulfur dioxide would be reduced to about 1 kg (Ministry of Industry and Information Technology, 2011c).

In the 12th 5-year development plan for the nonferrous metals sector issued by the MIIT, the Government estimated that the annual rate of increase in consumption for 10 mineral commodities (aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc) would be about 7.5% between 2011 and 2015 compared with about 15.5% between 2005 and 2010. The apparent consumption of each commodity in 2015 would be as follows (in order of the tonnage of consumption): copper, 24 million metric tons (Mt); aluminum, 9.7 Mt; zinc, 7.2 Mt; lead, 6.2 Mt; magnesium, 750,000 t; nickel, 700,000 t; tin, 191,000 t; titanium, 150,000 t; antimony, 110,000 t; and mercury, 18,000 t. The top 10 aluminum and copper producers would produce 90% of the country's total output, and the top 10 lead and zinc producers would account for 60% of the total. The Government would strictly control the utilization of raw materials and energy and would enforce environmental protection regulations. The development of new projects and the retirement of output capacity of each commodity were expected to be balanced. The aluminum and magnesium producers would gradually relocate to the western part of the country where energy resources are rich. China depended on imported copper and nickel raw materials for metal production so the Government encouraged producers to relocate their plants to the coastal areas. Secondary metal producers of such commodities as aluminum and copper also were encouraged to establish production bases in the coastal areas. The Government encouraged nonferrous metal producers to explore for nonferrous metals and to build alumina and aluminum plants, copper plants, lead and zinc smelters, and nickel plants in foreign countries. The Government would strictly control the dispersion of heavy metals into the environment and nonferrous metal producers will be required to install recycling systems to recover all heavy metals. All obsolete production technology would be abandoned (Ministry of Industry and Information Technology, 2011d, p. 2–22).

The MIIT also issued the 12th 5-year development plan for construction materials. The Government estimated that the consumption of limestone by the cement sector would be 2.3 billion metric tons (Gt); silica for the glass sector, 30 Mt; magnesite, 16 Mt; bentonite, 4.5 Mt; kaolin, 3.8 Mt; talc, 2.2 Mt; and graphite (flake), 950,000 t in 2015. China was expected to increase cement consumption to 2.2 Gt in 2015 from 1.9 Gt in 2010. The Government expected that cement output from the dry kiln process would increase to 81% of total cement

production in 2015 because about 250 Mt of obsolete production capacity would be eliminated during the next 5 years. The top 10 cement producers would account for 35% of the country's cement production in 2015 compared with 25% in 2010. About 50% of cement output would be high-grade Portland cement. The Government would strictly control the expansion of cement output capacity in the country, especially in coastal Provinces. China would devote strong efforts to reducing carbon dioxide emissions by the use of cement exhaust gas in low-temperature waste-heat power generation. Furthermore, the country would utilize more industrial waste instead of clinker in cement production to reduce energy consumption and gas emissions to the environment during the production of clinker (Ministry of Industry and Information Technology, 2011a, b).

In 2011, the Ministry of Finance (MOF) issued temporary resource tax regulations. The guidelines specified the rate of tax for each mineral commodity and the classification of each commodity. Natural gas and oil were taxed at 5% of the market price. Coking coal was 8 yuan per metric ton, but other kinds of coal were taxed based on the location, ranging from 2.5 yuan per metric ton in Beijing City to 4 yuan per metric ton in Henan Province. Industrial minerals were taxed between 2 yuan per metric ton and 20 yuan per metric ton. Iron ore was classified into six categories, and the tax range was between 10 yuan per metric ton and 25 yuan per metric ton. Nonferrous metals were classified into five categories and the tax range was between 0.6 yuan per metric ton and 20 yuan per metric ton. Vein and placer gold were taxed differently. Bastnasite and monazite were each taxed at a rate of 60 yuan per metric ton; middle and heavy rare earths were taxed at a rate of 30 yuan per metric ton. The new tax rates took effect on November 1, 2011, and the Government considered readjusting the resource tax further in 2012. Local governments were authorized to determine resource taxes on mines that were not listed in the guidelines; however, the resource taxes on these mines must be within 30% of that for neighboring mines that are listed in the MOF guidelines (Ministry of Finance, 2011; Zhonghua Renmin Gongheguo Guowuyuan Gongbao, 2011a).

The Government amended the personal income tax regulation, which was issued in 1994. The standard monthly deduction for employment income increased to 3,500 yuan from 2,000 yuan; the tax rate for the lowest bracket was reduced to 3% from 5% and that for the highest bracket remained at 45%, but the monthly taxable income was reduced to 80,000 yuan from 100,000 yuan. The new regulation gave tax relief to low- and medium-income earners and imposed a higher tax on high-income earners. The change aimed to address the income disparity. The new tax rate took effect on September 1, 2011 (Zhonghua Renmin Gongheguo Guowuyuan Gongbao, 2011b).

The State Council issued a strategic new industrial policy to accelerate the development of the next generation of information technology, to promote research and development in biomedical engineering fields, to implement projects for saving energy and for environmental protection, and to develop new applications for high-performance fiber, composite, rare-earth, and nano materials for the aeronautics and astronautics industries. The Government planned to utilize natural resources in the central and western parts of the country and to consolidate small companies in the east (China Chemical Reporter, 2012a; State Council, The, 2012c, p. 1–7).

The Ministry of Commence (MOC) and the National Development and Reform Commission (NDRC) jointly issued a new policy on foreign investment in China. Effective on January 30, 2012, the Government mandates that investment by foreign investors who participate in the prospecting and exploration for iron ore and manganese and in the prospecting for, exploration for, and exploitation of coalbed methane, natural gas, and oil, must be done through Sino-foreign joint ventures. It further encourages foreign investors to use high technology in the production of nano-alumina and aluminum nitride powder, high-purity silicon carbide, silicon nitride, zirconium oxide powder, rutile powder, and high-purity barium titanate. The Government restricts foreign investor participation in the exploration and exploitation of barite (in joint ventures only), gold, platinum-group metals, and silver, high-alumina clay, graphite, phosphate rock, lithium, and pyrite. Smelting and refining of antimony, aluminum, copper, lead, molybdenum, tin, tungsten, and zinc are also restricted. The Government allows foreign investors to participate in rare-earth separation and smelting (in joint ventures only). The Government bans foreign investors from participating in the exploitation of antimony, fluorspar, molybdenum, rare earths, tin, tungsten, and radioactive materials. The Ministry of Land and Resources issued interim regulations on surveying and mapping by foreign organizations in China (Ministry of Commerce, 2011e, various pages; Ministry of Land and Resources, 2011).

Production

China was one of the world's leading producers of aluminum, antimony, barite, bismuth, cement, coal, copper, fluorspar, gold, graphite, indium, iron and steel, lead, lime, magnesium, manganese, molybdenum, phosphate rock, rare earths, salt, silver, talc, tin, tungsten, and zinc. The country's output quantities of these mineral commodities were sufficient to have a significant effect on world markets. In 2011, China's production of such commodities as alumina, aluminum, bauxite, bismuth, cement, coal, copper, gold, graphite, iron and steel, lead, mercury, phosphate rock, silver, tin, titanium, tungsten, and zinc increased compared with that of 2010 (table 1).

China's reform priorities were to improve the efficiency of resource allocation and to boost economic growth. The Government understood that the unbalanced growth of consumption, investment, and net exports could not continue unabated forever. During the past several years, the Government reduced the export tax rebates on ferrous and nonferrous metal products, increased the export duties on energy-intensive metals, and encouraged producers to produce high-value-added products. Owing to increasing domestic and overseas demand, China's minerals and metals output was expected to continue to increase.

Structure of the Mineral Industry

China's mining industry is highly fragmented and has had a poor safety record. Several companies often mined in a single mining area. As a result, miners searched for

resources and ignored laws and regulations regarding safety and the environment. The State Council approved a mining consolidation plan that had been proposed jointly by the Ministry Land and Resources (MLR), the NDRC, and other agencies. Fifteen mineral commodities—antimony, bauxite, coal, copper, gold, iron ore, lead, manganese, molybdenum, phosphorus, potassium, rare earths, tin, tungsten, and zinc—were on the consolidation plan. The Central Government worked with local governments to implement the plan. Small mine operators were targeted to be integrated into large operators through such means as acquisition or joint-management agreements. The State-Owned Assets Supervision and Administration Commission would transfer state-owned assets of these small operators to the large operators. The Government would not allow any expansion of mining boundaries during the consolidation period. The Government would not issue mining operation permits to uncooperative mine operators. Local governments were required to submit their consolidation plans to the MLR for recording. During the past several years, the Government enabled state-owned enterprises to diversify their core business into other sectors, such as by allowing Aluminum Corporation of China (Chinalco) to be a major shareholder of copper companies in the Provinces of Hebei and Yunnan and rare-earth companies in Jiangsu Province and Guangxi Zhuangzu Autonomous Region. Baoshan Iron and Steel (Group) Corp. invested in coal mining in Shanxi Province, and Jiangxi Copper Co. Ltd. took charge of consolidation of rare-earth mining activities in Sichuan Province. Minmetal Group Co. took charge of consolidation of the Hunan Nonferrous Metal Co. and invested in rare-earth separation plants in Jiangxi Province.

Mineral Trade

China had become one of the most important production and consumption centers in the world. According to customs statistics, China's total trade was valued at $3.64 trillion in 2011, which was an increase of 22.5% compared with that of 2010. The value of exports increased by 20.3% to $1.90 trillion. The European Union (EU) was the leading destination for China's exports followed by the United States, Hong Kong, and Japan. The value of China's imports increased by 24.9% to $1.74 trillion. The EU was China's leading source of imports followed by Japan, the Republic of Korea, and the United States. Imports of raw materials, such as bauxite, chromium ore, iron ore, manganese ore, potassium fertilizer, and oil, increased sharply. In 2011, the total value of mineral and metal product trade was $251.7 billion. China's main exports were low-end and semimanufactured goods. Large amounts of capital, technologies, designs, and even raw materials were coming from abroad. Consequently, China posted a trade surplus with countries that consumed manufactured goods, such as the United States and the countries of the European Union, and trade deficits with such countries as Australia, Brazil, Chile, and Indonesia, which produced and exported fuels and minerals (General Administration of Customs of the People's Republic of China, 2012; Ministry of Land and Resources, 2012, p. 13).

The MOC issued circular No. 98, which details the mineral commodities that are under the Government's monitoring list for export. The commodities are ammonium paratungstate; bauxite and refractory clay; coal; coke; concentrates of antimony, cobalt, gold, molybdenum, silver, tin, tungsten, and zinc; dolomite; fluorspar; magnesite; oxides of antimony, magnesium, and tungsten; rare earths; silicon carbide; silver; talc; and unwrought metal and alloys of antimony, beryllium, bismuth, copper, gallium, germanium, nickel, niobium, platinum-group metals, tantalum, tin, and zirconium. Of these exported mineral commodities, antimony and its products, coal, petroleum and its products, silver, and tungsten and its products were under state management. In 2011, the Government encouraged the import of raw materials, such as concentrates of chromite, nickel, niobium, tantalum, titanium, and uranium; antimony concentrates with metal content higher than 30%; copper concentrates with metal content higher than 20%; cobalt concentrates with cobalt content higher than 6%; lead concentrates with lead content higher than 55%; molybdenum concentrates with metal content higher than 51%; zinc concentrates with zinc content higher than 40%; and ferronickel. Beginning on January 1, 2012, the tariff rate on imports of rare-earth compounds was reduced to zero from 5.5%. The MOF announced that the export tariff rates would be changed, including those for many minerals and metals (Ministry of Commerce, 2011b, p. 1–20; Ministry of Finance, 2012, various pages).

China was either the world's leading or one of the world's top three producers of high-alumina clay, antimony, fluorspar, molybdenum, rare earths, tin, and tungsten. The Government indicated that these commodities had been over-exploited during the past several decades, which threatened to deplete these resources. Therefore, the Government decided to regulate the production of these commodities. The MOC also issued guidelines for enterprises that had the right to supply and export antimony, coke, ferroalloys, indium, molybdenum, rare earths, silver, and tungsten. During the past 3 years (2008 to 2010), producers that could produce annually more than 10,000 t of refined antimony or 8,000 t of antimony oxide, 12 t of indium, 6,000 t of molybdenum concentrates (greater than 51% molybdenum content) or ferromolybdenum (greater than 55% molybdenum), or 3,000 t of ammonium paratungstate (equivalent), met the Government requirements. Also, producers must be registered and meet environmental protection regulations for their operations (Ministry of Commerce, 2011a, d).

The Government adjusted the 2012 export quota for magnesia to 1.8 Mt, phosphate rock to 1.2 Mt, bauxite (alumina clay) to 700,000 t, talc to 680,000 t, silicon carbide to 216,000 t, antimony and antimony products (metal content) to 59,400 t, molybdenum to 25,000 t, tin and tin products (metal content) to 18,000 t, tungsten and tungsten products (metal content) to 15,400 t, silver to 5,387 t, and indium to 231 t. The 2012 export quotas for antimony, magnesia, silver, talc, tungsten, and tin decreased compared with those of 2011. The first batch of export quotas for mineral products usually accounted for 60% of the total annual export quota. Analysts predicted that exports of rare metals would decrease gradually at a rate of 2% to 3% per year in the future. A planned reduction of the value-added tax rebate and reduced export quota on energy-intensive products would force producers to reduce their output; this would help to protect and conserve mineral resources and minimize environmental

damage. Although the export quotas for coal, coking coal, and rare earths were not publicly available, the announcement of the changes in the export allocations and an increase in tariffs for those commodities indicate that the export volumes of the commodities would likely be at the same level in 2012 as those of 2011 (Ministry of Commerce, 2011c).

The MOC also announced a first-batch rare-earth export quota of 24,904 t for 2012. The Government specified how much light or middle and heavy rare earths that each company was allocated. This policy was different than in previous years, when the Government had assigned export quotas without specification. The Government withheld export quotas for companies that did not meet the environmental protection guidelines. Of 27 companies and traders, only 9 were cleared to export rare-earth products immediately, and the total rare-earth export volume was 10,546 t. The Government intended to reassign the failing companies' export quotas to other companies if they did not pass the environmental protection guidelines by July 2012 (Ministry of Commerce, 2011f).

In 2009, the EU, Mexico, and the United States requested that the World Trade Organization (WTO) schedule dispute-settlement consultations regarding China's export restraints in the form of export quotas on bauxite, coke, fluorspar, magnesium, manganese, silicon carbide, silicon metal, yellow phosphorus, and zinc. China had imposed additional requirements and procedures in connection with these materials, including restricting the right to export based on previous companies' export information; establishing criteria that foreign-invested enterprises must satisfy in order to export that were different from those that domestic enterprises must satisfy; and requiring exporters to pay fees. The parties maintained that the restraints were significant enough to distort the international market and provide preferential conditions for Chinese industries that used these materials. The Chinese Government's position was that these policies were to protect the environment and natural resources. Consultations are the first step in the resolution of a WTO dispute. A WTO dispute settlement panel was established in 2010 to examine the dispute. The panel ruled that China's restriction on exporting these raw materials was inconsistent with its obligations when the country was admitted to the WTO. Also, that the Chinese Government had not imposed restrictions on production and consumption of these materials in the country. China appealed the panel's decision but the WTO's appellate body upheld the panel's decision that China's export restrictions on these raw materials were inconsistent with its obligations (World Trade Organization, 2011, p. 263–271; 2012, p. 94–123).

Commodity Review

Metals

Aluminum.—China's aluminum production continued to increase in 2011. The aluminum price in China resembled the London Metal Exchange price in 2011. The domestic market price of aluminum reached 17,849 yuan ($2,833) per metric ton in August 2011 and decreased to about 16,002 yuan ($2,540) per metric ton at yearend. The average market price of aluminum for the year was 16,870 yuan ($2,678) per metric ton. In 2011, China remained a net importer of aluminum. The net trade volume of unwrought aluminum increased to 143,172 t in 2011 from 36,322 t in 2010 but was still less than the 1.44 Mt traded in 2009. Unwrought aluminum imports increased during the first 4 months of 2011, even though the country's aluminum smelters, which were located in the Provinces of Guangxi, Henan, Hunan, and Sichuan, had not restarted their operations and several greenfield aluminum smelters in the western part of the country delayed putting their smelters into operation. Also, many aluminum producers reduced their output to cut losses as prices of aluminum declined. About 630,000 t of capacity had been idled in December 2011. China was a net exporter of 576,171 t of unwrought aluminum alloy compared with 332,680 t in 2010. China's unwrought aluminum imports came mainly from Russia, Oman, Australia, South Africa, India, and North Korea (in descending order of volume), and the country's exports went to the Republic of Korea and Japan (in descending order of volume). China consumed about 18.5 Mt of aluminum in 2011. The Government ordered aluminum producers to eliminate prebaked cells that were 100-kiloamperes or smaller (about 618,600 t of production capacity). About 4 Mt of new capacity was installed in 2011. As a result, the country's aluminum output capacity reached 26 Mt/yr at yearend 2011 compared with 22 Mt/yr in 2010. The construction sector was the leading consumer of aluminum and accounted for about 39% of the total followed by transportation, 18%; electronics, 9%; machinery and household appliances, 8% each; packaging, 7%; and others, 11% (Alumina and Aluminum Monthly, 2012a; China Metals, 2012f; Recycling Resources, 2012).

China's bauxite deposits were more than 90% of the diaspore (natural hydrous aluminum oxide) type; the remaining 10% was of the gibbsite (monoclinic aluminum hydroxide) type. There were more than 400 known bauxite occurrences in China for a total resource of about 2 Gt, of which more than 700 Mt was reserves. The Provinces of Guizhou, Henan, and Shanxi and the Autonomous Region of Guangxi together accounted for about 93% of the total reserves. Most of the diaspore ore contained between 45% and 65% alumina, 4% and 14% silicon oxide, and 5% and 25% iron oxide. China followed Australia as the second ranked bauxite-producing country in the world. Owing to the expansion of alumina production during the past 10 years, the country required extensive imports of bauxite to meet the demand from its alumina refineries. Refineries in the coastal Province of Shandong relied on overseas bauxite for their alumina production. China's bauxite imports were 44.8 Mt in 2011 compared with 30.0 Mt in 2010. In 2011, bauxite imports from Indonesia and Australia accounted for 79.7% and 18.8%, respectively, of the total. The trend toward increased bauxite imports was expected to continue in the future. The Government of Indonesia announced that it would restrict raw material exports, which would affect Shandong's alumina refineries in the future because these refineries produced alumina solely from imported bauxite. The Government encouraged enterprises to explore for bauxite resources in African countries and in Australia (Alumina and Aluminum Monthly, 2012b; China Metal Bulletin, 2012j).

China's output of alumina increased by more than 17% in 2011 compared with that of 2010, but China continued to

experience a shortage of alumina. To support the aluminum sector, the country imported large quantities of alumina to meet the demand. In 2011, China imported 1.9 Mt compared with 4.31 Mt in 2010, of which, about 97% was from Australia. China consumed about 38.0 t of alumina in 2011, of which 36.5 Mt was for metallurgical use and 1.5 Mt was for nonmetallurgical use. The shortage of supply of alumina was met from stockpiles. By yearend 2011, more than 10 Mt/yr of alumina output capacity was installed, and the country's alumina output capacity reached 51 Mt/yr. The additional alumina capacity was from greenfield and brownfield projects, including Shandong Weiqiao Aluminum Co. (2 Mt/yr), Shanxi Xing'an Chemical Co. (1.5 Mt/yr), Chalco Zunyi Alumina Co. Ltd. (800,000 t/yr), Chalco Chongqing Co. (800,000 t/yr), Guangxi Xinfa Aluminum and Power Co. Ltd. (800,000 t/yr), Guizhou Galuminum Group Co. Ltd. (800,000 t/yr), Yunnan Aluminum Co. Ltd. (800,000 t/yr), Shanxi Luneng Jinbei Aluminum Co. Ltd. [500,000 metric tons per year (t/yr)], Guangxi Huayin Aluminum Co. Ltd. (400,000 t/yr), Longkou Donghai Alumina Co. Ltd. (400,000 t/yr), Sanmenxia Yixiang Aluminum Co. Ltd. (400,000 t/yr), and Nei Mongol Mongxi Group Co. (200,000 t/yr). Imports of alumina were expected to decrease in the future (Alumina and Aluminum Monthly, 2012a).

According to the MIIT-issued 12th 5-year development plan for the aluminum sector, the country was expected to produce 24 Mt of primary aluminum, and the top 10 smelters would account for 90% of the total output in 2015. Secondary aluminum output would reach 5.8 Mt. About 800,000 t of output capacity would be phased out during that period. Electricity consumption per metric ton of primary aluminum production would be controlled below 12,000 kilowatthours (kWh) in 2015 from 13,084 kWh in 2010. The MIIT urged aluminum enterprises to develop high-value-added aluminum products that could be applied to new strategic industry sectors. China planned to increase its alumina output capacity by 8 Mt/yr by 2015. The increase in alumina output capacity would likely be from the Provinces of Guizhou, Guangxi, and Shanxi where bauxite resources are located. The development of the ability to use red mud and coal containing a high percentage of alumina would be important for the environmental health (Ministry of Industry and Information Technology, 2011e).

Copper.—Because it has limited copper resources, China imported a considerable amount of copper concentrates, scrap anode, and refined metal from overseas markets. Domestic copper mines supplied less than 30% of the country's requirements for copper concentrates. In 2011, China imported 6.38 Mt of copper concentrates, which was 1.43% less than in 2010. Copper concentrates were imported from Chile (22.2%), Peru (15.9%), Australia (9.1%), Mongolia (8.0%), Mexico (7.2%), Canada (4.6%), the United States (4.3%), and others (28.7%). China imported 4.69 Mt of copper scrap from the United States (13.8%), Spain (9.1%), Australia (7.4%), Germany (6.4%), Malaysia (5.2%), the Netherlands (4.6%), France (4.0%), Japan (3.5%), and others (46.0 %); and 2.80 Mt of refined copper from Chile (45.0%), India (8.5%), Japan (6.9%), Kazakhstan (6.0%), Australia (5.1%), Zambia (4.7%), and others (23.8%). In 2011, imports of copper scrap increased by 7.4% compared with those of 2010; however, imports of refined copper decreased by 4.1% owing to a surplus of refined copper in the domestic markets in the first half of 2011. The price of refined copper in the international market decreased to $7,500 per metric ton at yearend from more than $9,000 per metric ton in January 2011, which was lower than the price on the domestic market. If the import tax is included, the price of imported refined copper was less than that of domestic refined copper; therefore, domestic traders imported refined copper during the last quarter of 2011. In 2011, the apparent consumption of refined copper was about 8.0 Mt; however, domestic analysts estimated that the producers and traders stockpiled about 700,000 t of copper in their warehouses and that real copper consumption was about 7.3 Mt, which was about 7.8% higher than that of 2010. The power sector was the leading consumer of copper and accounted for about 46% of the total followed by household appliances, 15%; transportation 11%; electronics, 8%; and others, 20% (China Metals, 2012c; Copper Monthly, 2012).

Owing to domestic smelter and refinery expansions, China's copper output increased sharply during the past several years. China's copper production continued to expand despite the constrained supply of copper concentrates on the world market. In 2011, China's copper smelting and refining output capacities increased by 600,000 t and 1 Mt, respectively, and reached 3.9 Mt/yr and 6.5 Mt/yr, respectively, and the capacities were expected to increase to 5.5 Mt/yr and 8.0 Mt/yr, respectively, in 2015. The output of domestic mined copper was expected to increase to about 1.3 Mt/yr in 2015. According to China Nonferrous Metals Industry Association, the country's average ore grade was 0.77% copper. Owing to lower ore grade and more complicated elemental composition in the ore, the processing recovery rate decreased to 86.58% (China Metal Bulletin, 2012d).

The MIIT published a list of obsolete production technologies and ordered producers to close down those production plants in 2011. A total of 24 copper plants (with a combined output capacity of 425,300 t/yr) that used small reverberatory or electric furnaces were included on the list. During the same period, several greenfield and brownfield copper projects were under construction. Guangxi Nanguo Co. Ltd. (a subsidiary of Southern Nonferrous Smelting Ltd.) planned to invest $570 billion to build a 150,000-t/yr copper smelter at Chongzuo in Guangxi Province. The Government had approved the environmental impact study for the greenfield smelter. Shandong Zhaojin Mining Co. Ltd., which was a gold producer in Shandong Province, invested $160 million to build a copper plant in Jiashi, Xinjiang Uygur Autonomous Region. The plant was designed to produce 90,000 t/yr of blister copper, 100,000 t/yr of refined copper, 50 t/yr of silver, and 1 t/yr of gold. The copper plant was under the management of Xinjiang Xinhui Co. Ltd. and was scheduled to be completed in 2013. After completion, Xinjiang Xinhui would have a total blister copper output capacity of 100,000 t/yr. Copper concentrates were from local miners in Jiashi (China Metals, 2011a, b).

Guangxi Jinchuan Metals Co. Ltd., which was a subsidiary of Jinchuan Nonferrous Metals Group in Gansu Province, planned to invest $480 million to build a copper plant in Fangchenggang, Guangxi Zhuangzu Autonomous Region.

The plant was designed to produce 400,000 t/yr of primary copper and 200,000 t/yr of secondary copper. In addition to the copper plant, the company also planned to build a 400,000-t/yr ferronickel plant and an 80,000-t/yr nickel plant as well as downstream copper and nickel products. Yunnan Tin Corp. planned to put its 50,000-t/yr copper smelter into trial operation in 2012 and to expand to the smelter output capacity to 100,000 t/yr in 2013. Part of the copper concentrates were from its own mines, which had a capacity to produce 20,000 t/yr of copper in concentrates. Hong Kong-registered Xikuang Holdings Ltd. and the government of Ruichang City of Jiangxi Province reached an agreement to build a 150,000-t/yr copper smelter and a 20,000-t/yr copper foil plant in Ruichang (China Metals, 2012a, b, h).

CNMC Fubang Copper Industry Co. Ltd. completed the construction of its 100,000-t/yr copper blister plant in Linxi County, Nei Mongol Autonomous Region. The blister copper would be shipped to its 60,000-t/yr copper refinery to be refined. Sichuan Hongda Co. Ltd. announced that the company would invest $1.6 billion to build a multimetal complex at Shifang Economic Development Zone in Shifang City, Sichuan Province. The complex would hold a 400,000-t/yr refined copper plant and a 40,000-t/yr molybdenum plant. In the first phase of construction, a 200,000-t/yr refined copper plant, 25,000-t/yr ferromolybdenum plant, and 7,500-t/yr molybdenum oxide plant would be built. The Ministry of Environmental Protection approved the environmental impact study. Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd. was scheduled to complete its second 200,000-t/yr copper refinery in 2012. Fangyuan's refined copper capacity would increase to 400,000 t/yr (China Metal Bulletin, 2011c; Copper Monthly, 2011).

Iron Ore and Iron and Steel.—China was the world's leading iron and steel producer, accounting for more than 57% of the world's pig iron production and 45% of the world's crude steel production in 2011. The country's iron and steel sector continued expanding its output in 2011. Production of pig iron and crude steel increased by more than 7% each in 2011 compared with production in 2010. The rate of growth was the slowest of the past several years owing to weak demand for steel products in both the domestic and international markets. In 2011, the total fixed-asset investment in the iron and steel sector was $81.1 billion, which was an increase of 15.5% from that of 2010; of that amount of investment, iron ore mining and processing accounted for 24.5% of the total. The ironmaking and steelmaking output capacity increased to 700 Mt and 850 Mt, respectively, in 2011. The Provinces of Hebei, Jiangsu, and Liaoning ranked as the top three Provinces in fixed-asset investment in the country. Other Provinces and cities, such as Chongqing, Henan, Hunan, and Shandong, also increased investments in the iron and steel sector. Private funds accounted for about 80% of the investment. Apparent consumption of crude steel was 650 Mt, which was 8.0% higher than that of 2010. In 2011, China exported 48.9 Mt of steel products, which was an increase of 14.8% from that of 2010, and imported 15.7 Mt of steel products, which was a decrease of 5.0% from that of 2010. China was a net exporter of 33.2 Mt of steel products. This indicated that more than 50% of the increase in crude steel output was targeted for exported steel products. Exports of China's steel products to Asian countries accounted for 55% of the total exports. Steel products imports from Japan, the Republic of Korea, Taiwan, and the European Union (in descending order of value) accounted for 90% of the total imports (China Metal Bulletin, 2012a; China Metals, 2012d; Hu, 2012).

During the past several years, the country's iron ore production increased sharply; however, the percentage of iron ore (iron content) supplied by domestic producers remained at less than 50% of the demand in 2011, and China continued to depend on iron ore imports to fill the gap. Also, owing to the low iron content and high impurities of domestic ore, pig iron producers preferred imported ore over domestic ore. Imports of iron ore increased to more than 686 Mt in 2011 from 618 Mt in 2010. Australia, Brazil, India, South Africa, and Canada, in descending order of amount imported, were China's key iron ore suppliers. The total amount of iron ore stockpiled at China's 25 major ports was more than 98 Mt at yearend 2011. About 50% of seaborne ore in the world was destined for China.

China's iron and steel producers and the three leading iron ore producers in the world—BHP Billiton Ltd. of Australia, Rio Tinto Ltd. of Australia, and Vale S.A. of Brazil—could not reach contract agreements in 2009. These three international iron ore producers scrapped the annual iron ore pricing system and replaced it with a quarterly pricing system based on the combination of the Steel Index, the Metal Bulletin iron ore indexes, and the Platts iron ore spot market assessment to determine the iron ore price. The data were collected from iron ore traders. Owing to China's increased demand for iron ore, the price (cost, insurance, and freight) of iron ore increased to $163.84 per metric ton in 2011 from $128.99 per metric ton in 2010. As a result, the price of iron ore became more volatile during the year. China's Beijing Custeel E-Commerce Co. Ltd. launched an iron ore spot index in Beijing. The index would be based on imported and domestic iron ore transaction prices. Domestic iron ore price statistics were collected from 33 locations in 15 Provinces. BHP Billiton, Rio Tinto, and Vale joined the China Beijing Metal Exchange (China Metals, 2012g; Rio Tinto Ltd., 2012).

After more than 5 years, the NDRC finally gave permission for Baoshan Iron and Steel Group and Wuhan Iron and Steel Group to build two iron and steel complexes in Guangdong Province and Guangxi Zhunagzu Autonomous Region, respectively. Baoshan would invest about $11 billion in the iron and steel project in Zhanjiang, Guangdong. At its designed capacity, the plant would produce 9.2 Mt of pig iron, 10 Mt of crude steel, and 9.4 Mt of steel products. Wuhan would also invest about $11 billion in the iron and steel project at Fangchenggang, Guangxi. That plant would have a designed capacity to produce 8.5 Mt of pig iron, 9.2 Mt of crude steel, and 8.6 Mt of steel products. Currently, China imported about 70% of high-value-added steel products from overseas. Baoshan planned to produce high-value-added steel products at its Zhanjiang plant to meet domestic customers' demand. Wuhan planned to have its steel products target manufacturing bases of automobiles and home appliances in the southern part of the country and in the countries of Southeast Asia (China Metals, 2012e).

Molybdenum.—China's mined molybdenum output ranked it among the top three producers in the world. China's molybdenum resources were concentrated in the Provinces of Hunan and Shaanxi and in the Nei Mongol Autonomous Region. The Luanchuan area in Henan Province, the Huludao area in Liaoning Province, and the Jinducheng area in Shaanxi Province were China's major molybdenum bases. In 2011, Henan was the leading molybdenum producing Province and accounted for 33% of total molybdenum output; it was followed by Shaanxi, 20%; Nei Mongol, 16%, Liaoning, 8%; and others, 23%. China was a net exporting country of 2,239 t of molybdenum concentrates in 2011. Molybdenum consumption in China increased to about 70,000 t in 2011 from about 20,000 t in 2006. Molybdenum was mainly consumed by the iron and steel sector, which accounted for 78% of total consumption. During the past several years, the country discovered molybdenum deposits, such as Shapinggou in Anhui Province, Wushan Wenquan in Gansu Province, Yuanzhuding in Guangdong Province, Qianerchong in Henan Province, Wushan in Nei Mongol Autonomous Region, and Baishan and Dong Gobi in Xinjiang Uygur Autonomous Region. China's molybdenum production bases were expected to expand to the northern and southern parts of the country in the future (China Metal Bulletin, 2011e; China Nonferrous Metals, 2011a; Liu, 2011; Jiang, Liu, and Zhang, 2012).

Tin.—China was the leading tin-producing country in the world. Owing to increased domestic demand in China, Indonesia replaced China as the leading exporting country, and China became a net importer of tin concentrates. In 2011, China imported 28,791 t of tin concentrates compared with 19,840 t in 2010. Burma accounted for 71.7% of the total imports in 2011 followed by Bolivia, 14.1%; Australia, 6.0%; Laos, 2.8%, and others, 5.4%. In 2011, the volume of tin concentrates from Burma increased by about threefold compared with that of 2010. Burma's tin content in concentrates was lower than those from Australia and Bolivia because most of Burma's tin concentrates had not been processed. Domestic analysts estimated that the tin in concentrates was lower than that of 2010 even though the volume of imports increased. China's imports and exports of unwrought tin were 22,176 t and 1,226 t, respectively. Indonesia was the leading unwrought tin exporter to China and accounted for 38.6% of China's total tin imports, followed by Malaysia, 25.1%; Thailand, 12.5%; Bolivia, 10.2%; and others, 13.6%. China consumed about 155,000 t of tin in 2011 (Lead, Zinc, and Tin Monthly, 2012).

The Government raised the resource tax on tin ore to between 12 yuan and 20 yuan per metric ton depending on grade. China's ore grades were typically less than 1% tin. As a result of the increased resource tax, the production cost of domestic tin in concentrate was expected to increase by a few thousand yuan per metric ton. Prices of tin metal in China resembled those in the international markets in 2011. China's tin producers estimated that the increase in the resource tax would not affect companies' profit margins significantly provided the price of tin metal remained at above $25,000 per metric ton. Most of China's tin producers were located in Provinces of Guangxi, Hunan, and Yunnan. Most of Guangxi's tin mines and producers were located in Nandan County, Hechi City. Owing to the discovery of cadmium pollution in the river of Longjiang in late 2011, the Government ordered nonferrous metal producers in Hechi City to shut down their operations. The Government required all producers to pass an environmental impact evaluation before they would be allowed to restart their operations. As a result of the shutdowns, the supply of tin in concentrates was reduced and affected production at tin smelters in other locations of Guangxi Province in 2012 (China Metal Bulletin, 2012f).

Titanium.—In recent years, China's production of sponge titanium increased substantially and the country became one of the major titanium-producing countries in the world. During the mid-2000s, the demand for titanium increased significantly in the world, and titanium prices increased sharply during that period. Greenfield and brownfield titanium plants were being built in China. In 2011, China had more than 20 titanium sponge plants, and the total output capacity was estimated to be more than 130,000 t/yr. Most of the titanium sponge plants were located in the Provinces of Guizhou, Liaoning, and Sichuan. In China, titanium sponge was produced by the Kroll process. In the Kroll process, titanium oxide (rutile) is converted to titanium tetrachloride through the addition of chlorine gas in the presence of carbon. Titanium tetrachloride is reduced either by magnesium or sodium in an inert atmosphere to avoid contamination of the final product by air or moisture. There was a limited amount of high-quality rutile ore in China, however, and most titanium ores were associated with other elements, such as iron and vanadium. During the past several years, ilmenite was used to produce titanium slag as raw material for producing titanium sponge in China. The quality of China's titanium sponge lagged behind those from Japan and Russia. Only 70% of titanium producers could produce MHT–100 grade titanium sponge (Brinell hardness of less than 100, or mild sponge), which contains between 99.5% and 99.6% titanium. China produced a small volume of soft sponge (MHT–95 grade), which contains 99.7% titanium, and had not produced any MHT–90 grade product, which contains 99.8% titanium. About 30% of Russia's titanium sponge was MHT–90 grade (China Metal Bulletin, 2012b, i).

China's titanium oxide (titanium white) industry continued its expansion during the past several years. The production of titanium oxide increased to 1.8 Mt in 2011 from 1.0 Mt in 2007. There were 60 titanium-oxide-pigment producers with a combined output capacity of 2.3 Mt/yr in 2011 compared with 1.14 Mt/yr in 2006. In addition, about 1.7 Mt of output capacity was either under construction or in the planning stage. By yearend 2015, China's titanium-oxide pigment output capacity could reach 4 Mt/yr. China's titanium oxide was produced mainly from the sulfate process, which accounted for more than 80% of the total capacity. In China, titanium oxide was produced either from recovery from ferrotitanite ore or from ilmenite. In 2011, the country imported 2.3 Mt of titanium ore and concentrates compared with 2.0 Mt in 2010. Titanium ore and concentrates were imported mainly from Australia, India, and Vietnam. In 2012, the Government of Vietnam planned to restrict the export volume of titanium ore and concentrates, which could require China to source titanium resources from other overseas markets. Owing to the tight supply of raw

materials in the domestic market, the price of ferrotitanite ore increased to 3,000 yuan per metric ton in June from 800 yuan per metric ton in January and titanium slag increased to 8,000 yuan per metric ton in June from 3,000 yuan per metric ton in January. As a result of an increase in production costs, anatase titanium oxide increased to 20,000 yuan per metric ton in July from 14,000 yuan per metric ton in January. The Government encouraged titanium-oxide-pigment producers to use the chlorination process instead of the sulfidation process for their new titanium oxide projects. Owing to technological problems, only about 25% of new capacity used the chlorination process (China Chemical News, 2011c; 2012c; China Chemical Reporter, 2012e).

Tungsten.—Tungsten resources were found in 23 Provinces in the country; however, the Province of Hunan and Jiangxi accounted for 80% of the total. China was the leading mined tungsten producing country in the world but was still a net tungsten concentrates importer. In 2011, China imported 9,225 t of tungsten ore and concentrates, which was an increase of 50% from that of 2010. Ores and concentrates were imported mainly from Russia, 22.1%; Canada, 20.9%; Vietnam, 18.2%; Rwanda, 12.1%; Mongolia, 10.3%, and others, 16.4%. About 5,000 t of imported tungsten concentrates was through processing trade. Owing to a shortage of raw material in the domestic market, the price of tungsten concentrates increased to an average of $22,000 per metric ton in 2011, or by 65% compared with that of 2010. In 2011, China exported 27,524 t (tungsten content) of tungsten products mainly to the EU, Japan, the Republic of Korea, and the United States. China's tungsten mining and processing capacity reached 22 Mt and 40 Mt, respectively. Many of the country's tungsten mines had reached their peak production capacity and the metal content in the ore had decreased. As a result, the production costs of these mines increased to about $16,000 per metric ton. In 2011, the country consumed about 37,000 t of tungsten compared with 36,000 t in 2010 (China Metal Bulletin, 2012l).

After more than 50 years of on and off exploration, Jiangxi geologists discovered a significant amount of scheelite resources near the depleted Dahutang tungsten mining area at Wuning County, Jiujiang City, Jiangxi Province, in 2011. The Dahutang Mine was estimated to have tungsten reserves of 3,000 t and had been mined out in the 1950s; however, recent exploration results indicated that tungsten resources in the area of the Dahutang Mine could contain 1 Mt of tungsten metal. The area also had resources of about 559,000 t of copper, 52,900 t of molybdenum, 25,000 t of tin, and 718 t of silver (China Metal Bulletin, 2011d).

Vanadium.—China's vanadium titanomagnetite resources were located mainly in Ma'anshan in Anhui Province, Chengde in Hebei Province, and Panzhihua in Sichuan Province. Vanadium resources also were found in sapropelic coal (coal stone), mainly in the Provinces of Anhui, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, and Zhejiang. Vanadium oxide (V_2O_5) content in coal ranged between 0.1% and 0.5%. Vanadium was produced mainly as a byproduct or coproduct of iron ore mining operations and in the waste stream of coal operations; therefore, reliable production data were not easily obtained. Panzhihua Iron and Steel Group Co. (Pangang) was the leading vanadium slag producer in China; it had the capacity to produce about 260,000 t/yr of vanadium slag containing about 17% vanadium oxide in Panzhihua. Pangang's iron and steel operation in Chengde also recovered vanadium from its ironmaking operation. Pangang invested $3.8 billion to mine vanadium titanomagnetite resources in the Xicheng area in Sichuan Province. The construction of the mine was completed in late 2011, and the mine had the capacity to produce 220,000 t/yr vanadium slag containing 16.8% vanadium oxide (China Metal Bulletin, 2012g).

Cayman Islands-registered and Hong Kong-listed China Vanadium Titanomagnetite Mining Co. Ltd. (a subsidiary of Chuanwei Group Co.) completed its vanadium resource utilization project at Huili County, Sichuan Province, in late 2011. The company's four processing plants had a total processing capacity of 2.6 Mt/yr of vanadium-bearing iron ore, which could produce about 100,000 t/yr of vanadium slag containing about 8,000 t of vanadium oxide (China Vanadium Titanomagnetite Mining Co. Ltd., 2012, p. 6).

The iron and steel sector was the major consumer of vanadium. The price of vanadium was correlated with the price of ferrovanadium steel products. China was estimated to have an output capacity of 110,000 t of vanadium oxide equivalent in 2011, and this output capacity was expected to increase when several mining projects in the Provinces of Gansu, Hunan, Heilongjiang, and Shaanxi were completed during the next 2 years. China was a net exporter of 8,884 t of vanadium oxide. Domestic analysts estimated that the country consumed about 48,000 t of vanadium oxide (China Metal Bulletin, 2012m; Precious and Minor Metals Monthly, 2012).

Industrial Minerals

Cement.—China was the leading cement-producing country in the world and accounted for about 50% of the world's total output. Even with the Government's restricted investment policy for the cement sector, cement output continued to increase. In 2011, cement enterprises invested a total of $22.8 billion, and the country's cement output capacity increased by 165 Mt to about 2.7 Gt. China exported 8.8 Mt of cement in 2011. The Government ordered 762 cement plants to cease their operations in 2010, and about 133 Mt of output capacity was eliminated in 2011. Since October 2009, the Government had not approved any new cement projects. China consumed about 2 Gt of cement, and the Provinces of Anhui, Guangdong, Hebei, Henan, Jiangsu, Shandong, Sichuan, and Zhejiang consumed more than 100 Mt each. The Government expected that demand for cement would decrease during the next several years because most of the stimulus projects that were started in 2008 were completed in 2011 (Ministry of Industry and Information Technology, 2012).

Graphite.—China was the leading graphite-producing country in the world. In China, graphite was mined mainly in the Provinces of Hebei, Heilongjiang, Shandong, and Shanxi and the Nei Mongol Autonomous Region. Many of the graphite producers were small- and medium-sized operations and produced low-value-added graphite products. During the past several years, owing to environmental issues, the

Government shut down or consolidated many small miners and encouraged producers to produce high-value-added products. The Government intended to have several major graphite producers control the vast majority of supply. China's leading graphite-producing Province, Heilongjiang, formed a graphite technology alliance to develop new applications for graphite and urged the Government to shut down illegal miners to stabilize the price. Owing to the amount of electricity consumption, the Government also shut down some synthetic graphite producers in the country (Industrial Minerals, 2012).

Graphite had been widely used in brake pads, lubricants, and steelmaking refractories. During the past several years, the use of flake graphite as an anode for lithium ion batteries also became an important application. Domestic analysts predicted that consumption of graphite in the lithium ion battery sector would increase to about 200,000 t during the next several years. China was the leading exporter of graphite to the world; however, owing to increased domestic demand and the closure and consolidation of many mining facilities, natural graphite exports was expected to decrease gradually in the future (China Chemical News, 2012b).

Lithium.—China has abundant salt lakes that contain lithium, and these lakes accounted for 80% of the country's total lithium resources. Most of the lakes are located in the western part of the country, however, and infrastructure in these areas was relatively undeveloped. Spodumene resources were mainly located in the Altai and the Keketuohai areas in Xinjiang Uygur Autonomous Region and the Kangding area in Sichuan Province. Lepidolite resources were found at the Yichun area in Jiangxi Province. Brine resources were in salt lakes at the Qaidam basin in Qinghai Province and Zabuye Lake in Xizang Autonomous Region. The country's primary lithium products, which were lithium carbonate, lithium hydroxide, or lithium salt, were produced from domestic and imported raw materials. These compounds could be further processed into lithium metal or lithium cobalt oxide. In 2010, China's lithium carbonate output capacity was estimated to be about 30,000 t/yr; lithium hydroxide, 10,000 t/yr; and lithium metal, 1,500 t/yr (China Metal Bulletin, 2012e).

Sichuan Tianqi Lithium Industry Co. Ltd., which used imported spodumene to produce lithium compounds (including carbonate, chloride, and hydroxide), received Governmental approval to mine spodumene resources at Yajiang in Sichuan Province. The Cuola lithium deposit had ore resources of 20 Mt grading 1.3% lithium oxide. The company planned to design a mine to produce 1.2 Mt/yr of ore for about 20 years. The deposit also had beryllium, niobium, and tantalum. The company planned to increase its lithium carbonate and lithium hydroxide output capacity by 5,000 t/yr each, and its anhydrous lithium chloride capacity, by 1,500 t/yr in 2012 (China Metal Bulletin, 2012k).

Galaxy Resources Ltd. of Australia completed the construction of a lithium carbonate plant in the Yangtze River International Chemical Industrial Park at Zhangjiagang, Jiangsu Province, at yearend 2011. The plant was designed to have an output capacity of 17,000 t/yr of battery-grade lithium carbonate. Spodumene concentrate was from Galaxy Resources' Mount Cattlin Mine in Ravensthorpe, Western Australia, Australia. Owing to a shortage of skilled labor, the startup of the plant was delayed for several months. Galaxy signed long-term offtake agreements with 13 cathode producers in China and Mitsubishi Corp. of Japan (Galaxy Resources Ltd., 2011).

Lithium carbonate or lithium hydroxide was the precursor for producing lithium metal and other lithium chemical compounds. The demand for lithium carbonate, especially in the battery sector, increased significantly during the past several years. China's production of lithium carbonate increased to an estimated 23,000 t in 2010 from 18,000 t in 2007. Lithium-ion batteries have the features of high voltage, high energy density, a good charge rate, and stability. There are several types of lithium-ion batteries, namely lithium iron phosphate, lithium manganese oxide, lithium nickel manganese cobalt oxide, lithium cobalt oxide, lithium nickel cobalt aluminum oxide, and lithium titanate. During the past several years, the annual production of electric bicycles increased to about 30 million units from 1.6 million units in 2002. About 2.5% of these units used lithium-ion batteries, whereas others were equipped with lead-acid batteries. The Government encouraged the development of lithium-ion batteries to replace lead-acid batteries in most of electric bicycles to reduce pollution. Novolyte Technologies Inc. invested $25 million to build a 400-t/yr lithium hexafluorophosphate plant at the Nantong Development Zone in Jiangsu Province to be used for production of electric vehicle batteries. Most lithium-ion battery producers were located in Jiangsu Province (China Chemical News, 2011a, b; China Chemical Reporter, 2012d).

Phosphate Rock.—China was one of the world's leading phosphate-rock-producing countries. The country's phosphorus resources were located mainly in the Provinces of Guizhou, Hubei, Sichuan, and Yunnan. Phosphate rock was a strategic mineral; the Government controlled the volume of exports and planned not to approve any phosphate fertilizer plants during the next several years. In 2011, the Government increased its tariff rate on fertilizers and shortened the offseason period benchmark prices of ammonium phosphate. As a result, the volume of monoammonium phosphate exports was reduced to 864,800 t in 2011 from 935,000 in 2010 (China Chemical News, 2012a).

The MIIT issued the 12th five-year plan for the chemical industry and urged local governments to reduce the number of phosphate rock mining companies. The Government also planned to shut down those producers that had an output capacity of less than 150,000 t/yr. Phosphate rock mining enterprises were encouraged to recover valuable commodities, such as fluoride, iodine, magnesium, and silicon, from their tailings. Enterprises were encouraged to produce high-end products, such as organic phosphine, polyphosphate, flame retardants, and water treatment chemicals, for which the country relied on imports to meet its demand (China Chemical News, 2011d).

Potash.—China has limited potassium resources and needed to import a large quantity of potassium compounds for its fertilizer sector. About 95% of potash resources were located in Qinghai Province and the Xinjiang Uygur Autonomous Region, where brine was located. As a result, most potassium salt producers were located in the Charhan area of Qinghai Province. During the past several years, production of potassium

chloride increased to about 3.8 Mt in 2011 from 700,000 t in 2003. Domestic demand exceeded supply, however, and the country imported a large quantity of potassium compounds from overseas markets to meet the demand. According to the Government's 12th five-year plan, domestic potash production could produce 4.5 Mt of potash, or 60% of the country's demand in 2015. The Government projected that Qinghai Salt Lake Industry Co. Ltd. (also known as Qinghai Yanhu Industry Group Co. Ltd.) would increase its output capacity by 1 Mt/yr of potassium chloride and that Xinjiang Lop Nur Potassic Scientific and Technology Development Co. Ltd. would add about 200,000 t/yr of capacity. The Government also intended to develop potassium resources in the Provinces of Gansu, Sichuan, and Yunnan; however, potassium production costs from these areas were expected to be higher than those in Qinghai, and these plants' output capacities would be smaller. In 2011, China imported about 4.1 Mt of potassium compounds (potassium oxide equivalent) and would continue to import potassium compounds to meet the country's demand during the next several years. With the encouragement of the Government, enterprises had invested in several potash projects in Canada and Laos (China Chemical Reporter, 2012c).

Potassium magnesium sulfate had been widely used in the fertilizer sector. Owing to high prices, the annual demand for potassium magnesium sulfate was small, about 300,000 t. Xinjiang Lop Nur Potassic Scientific and Technology Development Co. was the leading potassium magnesium sulfate producer. In China, potassium magnesium sulfate was produced from the tailings of potassium sulfate and potassium chloride production from brine, and most potassium magnesium sulfate producers were located in Qinghai and Xinjiang; however, most consumers were located in the central and southern parts of the country. Even though potassium magnesium sulfate was produced as a byproduct of other operations under the Government's encouragement of utilization of resources, producers were required to pay a resource tax on it. In December 2011, the NDRC and the Ministry of Railway jointly issued a statement indicating that potassium magnesium sulfate was to be included in the catalog of agricultural fertilizer products that have preferential rail transport prices, that it could qualify for preferential freight rates, and that it could be exempt from the railway construction tax. Domestic analysts estimated that the consumption of potassium magnesium sulfate could reach 800,000 t/yr by 2015 (China Chemical Reporter, 2012b).

Rare Earths.—China was rich in rare-earth resources, and the country produced different kinds of rare-earth products. China's rare-earth production accounted for about 90% of the world total, and the volume of exports had a significant effect on the world markets. During the past several years, the Government adjusted the rare-earth production and export quota to protect the domestic resources and the environment. Rare-earth consumption in China had increased steadily, and the country consumed more than 80,000 t/yr of rare earths during the past 2 years compared with 19,300 t in 2000. To maintain the same volume of rare-earth production, the Government decided to reduce the rare-earth export quota to about 30,000 t in 2010 and 2011 from 65,000 t in 2005. China, however, continued to have difficulty controlling rare-earth prices in the world because a significant volume of rare-earth products was exported through unofficial channels. Domestic analysts estimated that about 20,000 t/yr of rare-earth products was unaccounted for (China Metal Bulletin, 2012h).

During the period between 2005 and 2009, the average export price of rare-earth products was less than $10 per kilogram [freight on board (FOB)]. In 2010, the average export price of rare-earth products increased to $23.4 per kilogram because the Government reduced the export quota to 30,300 t (gross weight) from 50,100 t in 2009 and ordered rare-earth producers to abide by the assigned production quota. The total export volume of rare-earth products was 40,385 t (gross weight) in 2010. In 2011, the Government assigned a 30,184 t (gross weight) rare-earth export quota, but the total export volume of rare-earth products was 16,122 t (gross weight), and the average export price of rare-earth products was $159.4 per kilogram (FOB). The decrease in the volume of exports was attributed to strong rare-earth prices in the domestic market. In 2011, the domestic price of europium oxide increased to $4,722 per kilogram in July from $474 per kilogram in January. Because of the high price, many overseas buyers delayed their purchases. Another reason was that rare-earth producers and traders stockpiled their products, resulting in less supply of rare-earth products in the domestic market. The Government also refused to approve any exports of rare-earth products for which the quoted sale price was less than the domestic market price plus all required taxes (China Metal Bulletin, 2011a).

The State Council issued "Opinions on the Promotion of Sustainable and Healthy Development of the Rare Earth Industry," which provided a plan for the development of the country's rare-earth industry during the next several years. The goal was to establish orderly rare-earth operations, including the development of rare-earth resources, followed by separation, smelting, and marketing. The Government would control unregulated exploitation, environmental damage, unregulated production capacity expansion, and illegal trading. Later, the State Council published a paper on the policy and development of China's rare-earth industry (also known as China's rare-earth white paper). According to the document, China's rare-earth reserves accounted for 23%, or 18.59 Mt, of the world's total reserves of 82.59 Mt. In 2011, China produced 96,900 t of rare-earth smelting products, accounting more than 90% of the world's total. During the past several years, China's rare-earth production had not only satisfied domestic demand but also supplied the world's demand. After more than 50 years of exploitation, however, China's rare-earth reserves had decreased rapidly, especially in major mining areas. In Baotou, only 10% of rare earths had been utilized, and the recovery rate of ion adsorption rare earths was less than 50%. In the southern part of the country, where ion adsorption rare earths are located, for each ton of rare-earth product produced, 2,000 t of tailings was generated. Excess exploitation had caused landslides, health and safety issues for local residents, and damage to the environment. In the past, the value of rare earths was not reflected in its selling price and also the damage to the environment was not accounted for. In the future, the development of China's rare-earth sector was expected to be focused on technological innovation and on the scientific application of rare earths and

a balance between exploitation and environmental protection (China Nonferrous Metals News, 2012; State Council, The, 2012a, p. 2–14).

In 2011, the MLR announced that the exploitation quota for rare-earth concentrate was 89,200 t [rare-earth oxide (REO) equivalent], of which 77,000 t was light rare earths and 12,200 t was medium and heavy rare earths. Neither the MLR nor the MIIT announced any exploitation or production quotas for 2012; however, individual Provinces received allocations on both types for the first 6 months and instructions to distribute these quotas accordingly. Without any compiled information, outsiders had difficulty knowing the total production target that was set by the Government. Some rare-earth producers indicated that this arrangement made it easier for their planning. In 2011, when prices of rare earths increased significantly during the first half of the year, rare-earth producers increased their output. Some producers fulfilled their production quota in the first 8 months of the year. State-owned Minmetals Corp. called for rare-earth producers to suspend their operations to "ensure the stable operation of the rare-earth market." Neither Minmetals nor its joint-venture partners had rare-earth mining operations in China in 2011 (China Metal Bulletin, 2012c).

The consolidation of the rare-earth industry continued in 2011. The Government of Nei Mongol Autonomous Region assigned Baotou Iron and Steel [through its subsidiary Baotou Rare Earth Hi-Tech Holding Co. Ltd. (Baotou Hi-Tech)] to be the sole producer and manager of all rare-earth mining, separation, and trading activities in the Autonomous Region. Those domestic producers in the Autonomous Region that met the asset transfer requirement were required to sell their assets to Baotou Hi-Tech. The remainder would be shut down without compensation. The consolidation of 35 rare-earth producers was set to be completed in June 2011; however, many rare-earth producers refused to shut down. Many of these producers received local governments' approval for their operations, and the supply of raw materials was from local small miners; these producers expected Baotou Iron and Steel to provide reasonable compensation for their assets. After further negotiations, 22 rare-earth producers agreed to shut down their operations and 13 rare-earth producers merged into Baotou Hi-Tech (China Nonferrous Metals, 2011b).

After it had completed the consolidation of the rare-earth sector in Nei Mongol, Baotou Iron and Steel proposed to establish a state-owned China Northern Rare Earth (Group) Hi-Tech Co. Ltd., which would include rare-earth producers from the Provinces of Shandong and Sichuan. The company would invest in the development of innovative technologies to improve mining, smelting, and product development. This would further consolidate the rare-earth sector in the northern part of China, where most of the light rare-earth producers were located. The government of Sichuan Province approved the formation of a joint venture between state-owned Sichuan Geological and Mineral Resources Co. Ltd. and privately owned Sichuan Hanlogn Group for the purpose of acquiring Leshan Shenghe Rare Earth Technology Co. Ltd., which was a rare-earth miner in Sichuan. The rare-earth output of Shenghe accounted for 50% of the Province's total and was the only Sichuan company that had an export quota issued by the MOC. Jiangxi Copper Co. Ltd. was another legal rare-earth producer in Sichuan. A state-owned research institute, China Iron and Steel Research Institute Group, acquired the Shandong Weishan Lake Rare Earth Co. Ltd. from Weishan Huaneng Co., Cuzhuang Coal Mining Co., and Aerospace Industry Foundation. Weishan Lake operated the Weishan Lake Mine in Weishan, Shandong Province (China Minin and Metals Weekly, 2011; China Nonferrous Metals Monthly, 2011, 2012).

The Government planned to have three integrated rare-earth enterprises in the southern part of country, where the middle and heavy rare earths are located, to produce more than 80% of the country's middle and heavy rare earth output. The government of Jiangxi Province issued more than 80 mining licenses to Ganzhou Rare Earth Co. Ltd. after the consolidation and shutdown of illegal rare-earth mining activities in the Ganzhou area during early 2000. The MLR planned to reduce rare-earth mining licenses to about 40 from 80 in the Ganzhou area in 2012. Ganzhou Rare Earth would receive nearly all these mining licenses. Baotou Iron and Steel, Chinalco, and Minmetals had set up joint ventures with local rare-earth producers in Jiangxi; however, none of them had mining licenses. The local government was reluctant to give up or transfer these rare-earth mining licenses to state-owned companies (China Metal Bulletin, 2011b).

The Provincial Government of Guangdong established a Guangdong Rare Earth Industry Group to manage the rare-earth sector in Guangdong. Guangdong-based Guangdong Rising Group Co. Ltd., which was the parent company of Guangdong Rising Nonferrous Metals Co. Ltd. and which had two of the four rare-earth mining licenses in Guangdong, was a member of the Guangdong Rare Earth Industry Group. The Guangdong Rare Earth Group could be in charge of the integration of the mining, smelting, and development of high-value-added products in the Province. The Provincial Government of Fujian also planned to establish an integrated rare-earth enterprise in the Province. It appeared that local governments wanted to protect their own rare-earth resources and had no intention of letting state-owned enterprises participate in the reform of their rare-earth sectors, except in the Provinces of Guangxi and Hunan (China Nonferrous Metals, 2012a, b).

After more than 4 years of preparation, China Rare Earth Industry Association was established and placed under the supervision of the MIIT. The functions of the association were to provide guidelines for the development of the rare-earth sector, to collect and analyze statistical information, to brief producers about the Government's policies, to deliver producers' suggestions to the Government, and to regulate the rare-earth market in China. The first task for the association was to provide suggestions on controlling the unregulated mining and export of rare earths, to enforce the rare-earth production quota, and to amend regulations on the management of the rare-earth sector (China Metal Bulletin, 2012c).

Mineral Fuels

Coal.—China had undergone significant economic reform and had one of the world's fastest growing economies. Coal consumption had increased to meet the high demand for

industrial production and power generation. Coal was the country's primary source of energy—two-thirds of the country's electricity was produced by coal-fired powerplants. About 50% of the country's total coal output was consumed by the power sector. Even though China's coal production continued to increase in 2011 because of an increase in demand for coal by every industrial sector, China became a net coal importing country. In 2011, the country imported a total of 182.4 Mt of coal, which accounted for less than 4% of total demand, from Australia, 35%; Indonesia, 24%; Vietnam, 19%; Russia, 9%; Mongolia, 5%; North Korea, 3%; and others, 5%. China exported a total of 14.6 Mt of coal to the Republic of Korea, 44%; Japan, 29%; Taiwan, 22%; and others, 5% (General Administration of Customs of the People's Republic of China, 2012).

The State Council urged Provincial governments to speed up their consolidation efforts, to reduce mine accidents, and to encourage cross-sector and regional mergers. Provincial governments were urged to provide financial and technological support to coal enterprises during their transformation into more efficient and safe coal producers. The consolidation of the coal sector would lead to 10 large coal enterprises with output capacities of more than 100 Mt/yr and 10 coal enterprises with output capacities of 50 Mt/yr. The number of coal producers would be reduced to about 4,000 by 2015. The top 20 large coal enterprises would account for about 60% of the country's coal output. The average annual production of each coal company would increase to more than 1 Mt from 300,000 t. In 2015, the country would have coal output capacity of 4.1 Gt, and coal production and consumption would be controlled at 3.9 Gt. During the past 5 years (2001 to 2005), China's output capacity had increased by 360 Mt/yr, of which the western part of country accounted for 230 Mt/yr; the central part, 110 Mt/yr; and the eastern part, 20 Mt/yr. The Government intended to add 740 Mt/yr of new output capacity by 2015, of which the western part of the country would build 530 Mt/yr; the central part, 185 Mt/yr; and the eastern part, 25 Mt/yr. The Provinces of Gansu, Shaanxi, and Shanxi and Autonomous Regions of Nei Mongol, Ningxi, and Xinjiang would construct a combined 650 Mt/yr of new capacity. In 2015, the distribution of the country's coal output would be to the western part of the country, 2.09 Gt; the central part, 1.35 Gt; and the eastern part, 460 Mt. China's railway would transport a total 2.6 Gt of coal mainly from the western part of the country to the southern and eastern parts of the country (National Development and Reform Commission, 2012, p. 7−14).

Outlook

China's economy is expected to continue to grow in the near future. The country has replaced Japan as the second largest economy in the world behind the United States, and the Government has set the economic growth rate target at 7% for the next 5 years. The Government recognizes that the country cannot depend solely on exports to sustain its economic growth and that the country needs to increase domestic consumption and to have a more transparent financial and legal system. The expected continuation of China's economic growth implies that a strong demand for mineral commodities is likely to continue. China has shortages in supply of most major minerals, including bauxite, chromium, copper, iron, lead, manganese, nickel, oil, and potash, and it relies on imports to meet demand. This trend is expected to continue. The Government, therefore, encourages enterprises to invest in such mineral-rich countries as Australia, Brazil, Burma, Chile, Indonesia, and Mongolia to secure minerals for domestic economic development and growth. The Government is expected to continue its effort to protect the country's resources of minerals, such as antimony, coal, indium, molybdenum, rare earths, tin, and tungsten, and to avoid overexploitation.

China's imports of raw minerals have been increasing in recent years. As a result, the Chinese Government has been promoting reduced dependence on mineral commodity imports and encouraging the production of high-value-added and high-quality downstream products. The Government also promotes the secondary nonferrous metals industry to reduce energy consumption. The Government has not yet achieved great success in meeting these goals. As progress is made toward these goals, the country's dependence on most major mineral commodities could decline; however, China will likely continue to play an important role in the world's metal and mineral markets. Also, China's overseas investments will probably continue until the transition to resource independence takes place. China's overall outward investment is expected to continue to increase and may soon exceed inward foreign direct investment.

The environmental, health, safety, and social performance of the mining and metal enterprises are of concern to the Government. The Government has set guidelines for the development of these enterprises in an attempt to improve protection of the environment, but progress has been slow. The Government plans to continue its effort to address the sustainable development of the mining and metal sectors through air and water pollution prevention and treatment, land protection, mine safety, and reclamation of mine sites.

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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	30,000	35,000	40,000	44,000	45,000
Alumina	do.	19,500	22,800	23,800	29,000	34,100
Metal, refined:						
Primary	do.	12,600	13,200	12,900	16,200	18,100
Secondary	do.	2,750	2,700	3,100	4,000	4,100
Total	do.	15,400	15,900	16,000	20,200	22,200
Antimony:						
Mine, Sb content		163,000	166,000	140,000	150,000	150,000
Metal		147,000	158,000	168,000	193,000 r	200,000
Bismuth:						
Mine output, Bi content		3,500	5,000	6,000	6,500	6,000
Metal		12,100	13,100	12,300	14,000 r	12,500
Cadmium, smelter		4,210	6,960	7,050	7,360 r	7,000
Chromite, gross weight	thousand metric tons	200	200	200	200	200
Cobalt:						
Mine output, Co content		6,100	6,630	6,000	6,380 r	6,800
Metal		7,580	6,700	6,000	4,120 r	4,500
Copper:						
Mine output, Cu content		928,000	1,070,000	1,040,000	1,160,000	1,270,000
Metal:						
Smelter, primary	thousand metric tons	2,110	2,500	2,700	2,900	3,100
Refined:						
Primary	do.	2,400	2,700	2,750	2,950	3,390
Secondary	do.	1,200	1,200	1,400	1,700	1,800
Total	do.	3,600	3,900	4,150	4,650	5,190
Gold, mine output, Au content		275	285	320	345	362
Indium, primary and secondary		380	340	340	330	380
Iron and steel:						
Iron ore, gross weight	thousand metric tons	707,000	824,000	880,000	1,070,000	1,330,000
Pig iron[4]	do.	476,520	470,670	552,830	597,330	640,510
Ferroalloys	do.	17,500	18,300	22,100	24,300	28,400
Steel, crude[4]	do.	489,290	500,490	572,180	637,230	685,280
Steel, rolled[4]	do.	565,610	584,770	694,050	802,760	886,190
Lead:						
Mine output, Pb content	do.	1,410	1,550	1,600	1,980 r	2,400
Metal:						
Smelter, primary	do.	2,040	2,430	2,630	2,800	3,300
Refined:						
Primary	do.	2,140	2,350	2,630	2,800 r	3,200
Secondary	do.	650	850	1,150	1,360	1,400
Total	do.	2,790	3,200	3,780	4,160 r	4,600
Magnesium, metal and alloy		625,000	559,000	501,000	654,000	675,000
Manganese:						
Ore, Mn content	thousand metric tons	2,000	2,200	2,400	2,600	2,800
Metal		1,000,000	1,130,000	1,310,000	1,370,000	1,400,000
Mercury, mine output, Hg content		800	1,300	1,430	1,600	1,500
Molybdenum, mine output, Mo content		67,700	81,000	93,500	96,600 r	103,000
Nickel:						
Mine output, Ni content		67,000	79,500	84,800	80,000 r	89,800
Matte		105,000	114,000	143,000	139,000 r	150,000
Smelter		116,000	129,000	165,000	159,000 r	175,000

See footnotes at end of table.

TABLE 1—Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS—Continued						
Niobium and tanlatum, mine output:						
Nb_2O_5 content		270	300	30	32	30
Ta_2O_5 content		920	900	90	86 r	90
Silicon, metal		1,080,000	1,100,000	993,000	1,140,000 r	1,050,000
Silver, mine output, Ag content		2,700	2,800	2,900	3,500	3,700
Tin:						
Mine output, Sn content		146,000	110,000	97,200	115,000	120,000
Metal		149,000	140,000	140,000	149,000 r	156,000
Titanium:						
Ilmenite, TiO_2 equivalent		550,000	550,000	550,000	700,000 r	850,000
Sponge		45,200	57,000	45,800	57,000 r	68,000
Tungsten, mine output, W content		41,000	50,000	51,000	59,100	61,800
Vanadium, V_2O_5 in vanadiferous slag product		45,200	46,000	52,000	58,000 r	65,000
Zinc:						
Mine output, Zn content	thousand metric tons	3,040	3,340	3,330	3,840 r	4,050
Refined:						
Primary	do.	3,710	4,000	4,200	5,030 r	5,040
Secondary	do.	30	37	90	175 r	173
Total	do.	3,740	4,040	4,290	5,210 r	5,210
INDUSTRIAL MINERALS						
Asbestos		390,000	380,000	440,000	400,000	440,000
Barite	thousand metric tons	4,400	4,600	3,400 r	4,000	4,100
Bentonite	do.	3,300	3,300	3,400	3,400	3,500
Boron, mine, B_2O_3 equivalent		145,000	140,000	145,000	150,000	150,000
Bromine		137,000	135,000	93,000 r	100,000 r	100,000
Cement, hydraulic[4]	million metric tons	1,361	1,400	1,644	1,882	2,099
Diatomite		420,000	440,000	440,000	400,000	440,000
Dolomite	thousand metric tons	8,000	8,000	8,100	8,200	8,200
Feldspar	do.	2,000	2,000	2,000	2,000	2,100
Fluorspar	do.	3,200	4,200 r	3,800 r	4,600 r	4,200
Graphite		800,000	650,000	450,000 r	700,000 r	800,000
Gypsum	thousand metric tons	4,800	4,600	4,500	4,700	4,700
Kaolin	do.	3,210	3,200	3,000	3,260 r	3,200
Lime	do.	170,000	180,000	185,000	190,000	200,000
Lithium minerals, all types		22,000	25,000	26,000	27,000	29,000
Magnesite	thousand metric tons	14,000	15,600	13,000 r	14,000	14,500
Mica		720,000	750,000	700,000	750,000	760,000
Nitrogen, N content of ammonia[4]	thousand metric tons	42,480	41,140	42,290	40,870	43,250
Phosphate rock, P_2O_5 equivalent	do.	15,100	15,200	18,000	20,400	24,000
Potash, marketable, K_2O equivalent	do.	2,600	2,750	3,200	3,600 r	3,800
Rare earths, rare-earth oxide equivalent		120,000	125,000	129,000	120,000	105,000
Salt[4]	thousand metric tons	61,670	66,640	66,630	70,380	67,420
Sodium compounds:						
Mirabilite	do.	6,600	6,600	6,000	6,500	6,000
Soda ash, natural and synthetic[4]	do.	17,650	18,540	19,450	20,350	22,940
Strontium carbonate		330,000	335,000	159,000	200,000	200,000
Sulfur:						
Native	thousand metric tons	960	960	1,000	1,100	1,100
Content of pyrite	do.	4,200	4,300	4,370	4,400	4,400
Byproduct, all sources	do.	3,300	3,350	4,000	4,100	4,200
Total	do.	8,460	8,610	9,370	9,600	9,700
Talc and related materials	do.	2,000	2,200	2,300	2,000	2,200

See footnotes at end of table.

TABLE 1—Continued

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	450,000	447,000	426,000 r	550,000	450,000
Bituminous	do.	2,000,000	2,110,000	2,320,000 r	2,450,000	2,800,000
Lignite	do.	100,000	196,000	256,000 r	240,000	270,000
Total	do.	2,550,000	2,750,000	3,000,000 r	3,240,000	3,520,000
Coke, all types[4]	do.	335,530	323,590	345,020	388,640	432,710
Gas, natural:						
Gross	billion cubic meters	69	80	85	95	102
Marketed	do.	57	68	73	83	90
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,360	1,380	1,370	1,480 r	1,480
Refinery products	do.	3,500	3,700	3,750	4,220	4,470

rRevised. do. Ditto.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through October 1, 2012.

[3]In addition to the commodities listed, China also produces diamond, gallium, germanium, platinum-group metals, rhenium, selenium, stone, tellurium, uranium, and zicronium, but available information is inadequate to make reliable estimates of output.

[4]Reported by China's National Statistical Bureau.

TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum:			
Alumina	Chongqing Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Chongqing	800
Do.	Chongqing Dingtai Tuoyuan Alumina Co.	do.	150
Do.	Nanchuan Pioneer Alumina Co.	do.	200
Do.	Guangxi Huayin Aluminum Co. Ltd.	Guangxi, Bose	1,600
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	1,200
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	1,200
Do.	Chalco Zunyi Aluminum Co. Ltd.	Guizhou, Zunyi	800
Do.	Luoyang Wanji Xiangjiang Aluminum Co. Ltd.	Henan, Luoyang	800
Do.	Sanmenxia Yixiang Aluminum Co. Ltd. (Henan Yima Coal Group)	Henan, Mainchi	600
Do.	Pingdingshan Huiyuan Chemical Co.	Henan, Pingdingshan	300
Do.	Yangquan Coalmine Aluminum (Sanmenxia) Co. Ltd.	Henan, Sanmenxia	1,200
Do.	Orient Hope (Sanmenxia) Aluminum Co. Ltd.	do.	1,200
Do.	Zhengzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Henan, Zhengzhou	2,600
Do.	Zhongzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Hunan, Zhongzhou	3,000
Do.	Shandong Huayu Alumina Co. Ltd. (Shandong Chiping Xinfa Aluminum and Electricity Group)	Shandong, Chiping	1,800
Do.	Longhou Donghai Alumina Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	1,600
Do.	Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	1,500
Do.	Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	1,600
Do.	Shanxi Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shanxi, Hejin	2,200
Do.	Liulin Senze Group	Shanxi, Liulin	600
Do.	Coalmine Aluminum (Sanmenxia) Co. Ltd.	Shanxi, Sanmenxia	1,200
Do.	Shanxi Luneng Jinbei Aluminum Co. Ltd.	Shanxi, Yuanping	2,000
Do.	Wenshan Aluminum Co. Ltd. (Yunnan Aluminum Co.)	Yunnan, Wenshan	800
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	150
Do.	Lanzhou Aluminum Plant	Gansu, Lanzhou	210
Do.	Liancheng Aluminum Plant	do.	235
Do.	Yinhai Aluminum Co. Ltd.	Guangxi, Laibin	125
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	380
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	400
Do.	Chalco Zunyi Aluminum Co. Ltd.	Guizhou, Zunyi	130
Do.	Henan Zhongfu Industry Co. Ltd.	Henan, Gongyi	180
Do.	Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	420
Do.	Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	180
Do.	Henan Zhongmai Mianchi Aluminum Plant	Henan, Mianchi	400
Do.	Sanmenxia Tianyuan Aluminum Co. Ltd.	Henan, Sanmenxia	110
Do.	Shangqiu Aluminum Smelter	Henan, Shangqiu	180
Do.	Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	600
Do.	Henan Shenhuo Aluminum-Electricity Co. Ltd.	Henan, Yongcheng	200
Do.	Zhengzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Henan, Zhengzhou	60
Do.	Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	110
Do.	Hunan Chuanquan Aluminum Co. Ltd.	Hunan, Taoyuan	210
Do.	Fushun Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Liaoning, Fushun	340
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	250
Do.	East Hope Aluminum Plant	do.	800
Do.	Qingtongxia Aluminum Plant (China Power Investment Corp. and Ningxia Qingtongxia Energy Group Co. Ltd.)	Ningxia, Qingtongxia	1,150
Do.	Qiaotou Aluminum Co. Electrolysis Branch	Qinghai, Datong	750
Do.	Qinghai Aluminum Smelter [Aluminum Corporation of China (Chinalco)]	Qinghai, Xining	560
Do.	Qinghai West Mining Baihe Aluminum Co. Ltd.	do.	112
Do.	Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	250
Do.	Shandong Chiping Xinfa Aluminum and Power Group	Shandong, Chiping	360
Do.	Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum—Continued:				
Metal—Continued		Shandong Nanshan Aluminum Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	156
Do.		Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	120
Do.		Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	250
Do.		Zouping Aluminum Co. Ltd.	do.	150
Do.		Huaze Aluminum and Power Co. Ltd.	Shanxi, Hejin	400
Do.		New Orient Aluminum Co. Ltd.	Shanxi, Taiyuan	75
Do.		Shanxi Guanlv Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	500
Antimony		Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.		Hunan Chenzhou Mining Group Co. Ltd.	Hunan, Yuanling	20
Do.		Xikuangshan Twinkling Star Antimony Co. Ltd.	Hunan, Lengshuijiang	37
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan, and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Bismuth	metric tons	Guangzhou Smelter	Guangdong, Guangzhou	300
Do.	do.	Hunan Bismuth Industry Co. Ltd.	Hunan, Chouzhou	3,500
Do.	do.	Shizhuyuan Nonferrous Metals Co. Ltd.	Hunan, Shizhuyuan	1,200
Do.	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	350
Do.	do.	Yunnan Copper Group Co. Ltd.	Nei Mongol, Chifeng	300
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	300
Cadmium	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	1,000
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	800
Coal		Hebei Provincial Government	Hebei	70,000
Do.		Heilongjiang Provincial Government	Heilongjiang	100,000
Do.		Henan Provincial Government	Henan	100,000
Do.		Liaoning Provincial Government	Liaoning	70,000
Do.		Nei Mongol Provincial Government	Nei Mongol	90,000
Do.		Shandong Provincial Government	Shandong	60,000
Do.		Shanxi Provincial Government	Shanxi	400,000
Do.		Sichuan Provincial Government	Sichuan	80,000
Do.		Shenhua Coal Corp.	Nei Mongol, Ningxia, and Shaanxi	150,000
Cobalt	metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	10,000
Do.	do.	Huayou Cobalt Co. Ltd.	Zhejiang, Tongxiang	3,000
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Tongling	170
Do.		Jinlong Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	do.	400
Do.		Wuhu Smelter (Hengxin Copper Industry Group Co.)	Anhui, Wuhu	60
Do.		Zijin Copper Co. Ltd.	Fujian, Shanghang	200
Do.		Baiyin Nonferrous Metals Group Co. Ltd.	Gansu, Baiyin	100
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	600
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	400
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Jiangsu, Zhangjiagang	200
Do.		Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	1,200
Do.		Dongfang Copper Co. (Huludao Nonferrous Metals Group)	Liaoning, Huludao	100
Do.		Chifeng Jingeng Copper Co. Ltd.	Nei Mongol, Chifeng, Harqin Banner	100
Do.		Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd.	Shandong, Dongying	400
Do.		Shandong Jinsheng Nonferrous Metals Corp.	Shandong, Linyi	100
Do.		Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.		Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	200

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Copper, refined—Continued		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	100
Do.		Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	100
Do.		Huili Kunpeng Co. Ltd.	Sichuan, Huili	100
Do.		Tianjin Datong Copper Co. Ltd. (formerly Tianjin Copper Electrolysis Factory)	Tianjin	200
Do.		Yunnan Smelter (Chinalco Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	250
Do.		Hangzhou Fuchunjiang Smelting Co. Ltd.	Zhejiang, Fuchunjiang	100
Gallium	metric tons	Shandong Aluminum Plant	Shandong, Zibo	10
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Germanium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	30
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	30
Do.	do.	Nei Mongol Xilingol Tongtai Germanium Refine Co. Ltd.	Nei Mongol, Xilinhot	20
Do.	do.	Shanghai Lontai Copper Co. Ltd.	Shanghai	10
Do.	do.	Yunnan Lincang Xinyuan Germanium Co. Ltd.	Yunnan, Lincang	30
Do.	do.	Yunnan Chihong Zinc and Germanium Industrial Co. Ltd.	Yunnan, Qujing	50
Gold, refined	do.	Zijin Copper Co. Ltd.	Fujian, Shanghang	5
Do.	do.	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Zhongyan Gold Smelter (Zhongjin Gold Co. Ltd.)	Henan, Sanmenxia	30
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	20
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	20
Do.	do.	Shandong Yanggu Xiangguang Co. Ltd.	Shandong, Yanggu	20
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	5
Do.	do.	Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	100
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	130
Graphite		Jixi Aoyu Graphite Co. Ltd.	Heilongjiang, Jixi and Luo	60
Do.		Nei Mongol Xinghe Jingxin Graphite Co. Ltd.	Nei Mongol, Xinghe	10
Indium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	25
Do.	do.	Guangxi Tanghan Zinc & Indium Co. Ltd.	Guangxi, Hechi	30
Do.	do.	Laibin Smelter [Liuzhou Huaxi (China Tin) Group Co.]	Guangxi, Laibin	50
Do.	do.	Guangxi Debang Technology Co. Ltd.	Guangxi, Liuzhou	75
Do.	do.	Liuzhou Zinc Products Co.	do.	20
Do.	do.	Yintai Technology Co. Ltd.	do.	40
Do.	do.	Yuguang Gold-Lead Co. Ltd.	Henan, Jiyuan	10
Do.	do.	Xiangtan Zhengtan Nonferrous Metal Co. Ltd.	Hunan, Xiangtan	75
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	150
Do.	do.	Nanjing Sanyou Electronic Material Co. Ltd.	do.	50
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	50
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	10
Do.	do.	Yunnan Mengzi Mining and Smelting Co. Ltd.	Yunnan, Honghe	30
Iron and steel:				
Iron ore		Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu (Capital) Mining Co.	Beijing	20,000
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau (Hebei Iron and Steel Group Co.)	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co. (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	5,100
Do.		Meishan Metallurgical Co.	Jiangsu, Nanjing	2,000
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Mining Co.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Iron and steel—Continued:			
Iron ore—Continued	Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.	Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.	Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.	Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys	Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.	Qingshan Holding Group Co. Ltd.	Fujian, Fu'an	300
Do.	Desheng Nickel Industry Co. Ltd.	Fujian, Luoyuanwan	920
Do.	Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.	Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.	Zhejiang Huaguang Smelting Group	Jiangxi, Hengfeng	50
Do.	Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.	Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.	Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.	Shanghai Iron and Steel Co. Ltd.	Shanghai	180
Do.	Emei Ferroalloy Co.	Sichuan, Emei	70
Do.	Hengshan Ferroalloy Co.	Zhejiang, Jiande	70
Crude steel	Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.	Shoudu (Capital) Iron and Steel (Group) Co. (Shougang)	Beijing	4,000
Do.	Liuzhou Iron and Steel Group	Guangxi, Liuzhou	6,000
Do.	Handan Iron and Steel General Work (Hebei Iron and Steel Group Co.)	Hebei, Handan	12,000
Do.	Shougang Qianan Iron and Steel Co. Ltd. (Shougang)	Hebei, Qianan	7,800
Do.	Tangshan Iron and Steel Co. (Taigang) (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	15,000
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	12,000
Do.	Shagang Group Co. Ltd.	Jiangsu, Zhangjiagang	30,000
Do.	Anshan Iron and Steel (Group) Co. (Angang) (Anben Iron and Steel Group)	Liaoning, Anshan	16,000
Do.	Benxi Iron and Steel Co. (Bengang) (Anben Iron and Steel Group)	Liaoning, Benxi	6,000
Do.	Baotou Iron and Steel and Rare Earth Co. (Baogang Group)	Nei Mongol, Baotou	10,000
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel) [Baogang Group]	Shanghai	19,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Shandong Jinan Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Jinan	10,000
Do.	Shandong Laiwu Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Laiwu	10,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	5,000
Do.	Panzhihua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	6,000
Do.	Xinjiang Biyi Iron and Steel Group (Baogang Group)	Xinjiang, Urumqi	6,000
Lead	Jiuhua Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Chizhou	80
Do.	Baiyin Nonferrous Metals Co. Ltd.	Gansu, Baiyin	80
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	100
Do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	100
Do.	Hechi Nanfang Nonferrous Metals Smelting Co. Ltd.	Guangxi, Hechi	80
Do.	Anyang Smelter (Yubei Metal Co.)	Henan, Anyang	160
Do.	Jiyuan Wangyang Smelter (Jiquan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	160
Do.	Jinli Smelter (Jiyuan Jinli Smelting Co.)	Henan, Jiyuan	300
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	do.	350
Do.	Henan Lingye Co. Ltd.	Henan, Lingbao	100
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	100
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	100
Do.	Xuzhou Chunxing Alloy Co. Ltd.	Jiangsu, Xuzhou	150
Do.	Jiangxi Jinde Lead Co. Ltd.	Jiangxi, Shangrao	80
Do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	30
Do.	Shaanxi Dongling Group	Shaaxi, Baoji	100
Do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	Yunnan, Gejiu	100

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Lead—Continued	Kunming Smelter	Yunnan, Kunming	100
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	100
Lithium, $LiCO_3$	Tibet Mineral Development Co. Ltd.	Gansu, Baiyin	5
Do.	Jiangxi Ganfeng Lithium Co. Ltd.	Jiangxi, Xinyu	3
Do.	Sichuan Ni/Co Guorun New Material Co. Ltd.	Sichuan, Pengshan	2
Do.	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Sichuan Tianqi Lithium Industry Co. Ltd. (Chengdu Tianqi Group Co. Ltd.)	Sichuan, Suining	10
Do.	Sichuan Aba Guangsheng Lithium Industrial Co. Ltd.	Sichuan, Wenchuan	2
Do.	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Golmud	10
Do.	Qinghai CITIC Guoan Technology Development Co. Ltd.	do.	20
Do.	Qinghai Lithium Industry Co. Ltd.	Qinghai, Xining	20
Do.	Xinjiang Haoxin Lithium Salt Development Co. Ltd. (former Xinjiang Lithium Co.)	Xinjiang, Urumqi	5
Magnesium	Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	24
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Interprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Taiyuan Tongxiang Magnesium Metal Co. Ltd.	Shanxi, Taiyuan	45
Do.	Taiyuan Yiwei Magnesium Co. Ltd.	do.	21
Do.	Wenxi Biyun Magnesium Co. Ltd.	Shanxi, Wenxi	30
Do.	Wenxi Yinguang Magnesium Group	do.	40
Manganese, metal	Chongqing Tycoon Manganese Co. Ltd.	Chongqing	23
Do.	Guangxi Dameng Manganese Industry Co. Ltd.	Guangxi, Nanning	70
Molybdenum, concentrate	Luoyang Luanchuan Molybdenum Industry Group Co., Ltd.	Henan, Luanchuan	30
Do.	Jinduicheng Molybdenum Industry Group Co. Ltd.	Shaanxi, Huaxian	30
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	130
Do.	Guangxi Yulin Weinie Co. Ltd.	Guangxi, Bobai	18
Do.	Jiangxi Jiangli New Type Material Co. Ltd.	Jiangxi, Fenyi	10
Do.	Jilin Jien Nickel Industry Co. Ltd.	Jilin, Panshi	10
Do.	Inco New Nickel Materials (Dalian) Co. Ltd.	Liaoning, Dalian	32
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Do.	Huili Kunpeng Co. Ltd.	Sichuan, Huili	10
Do.	Xinjiang Fukang Smelter	Xinjiang, Fukang	15
Do.	Xinjiang Xinxin Mining Co. Ltd.	Xinjiang, Fuyun	7
Do.	Yuanjiang Nickel Industry Co. Ltd.	Yunnan, Yuxi	5
Palladium and platinum kilograms	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	3,500
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,500
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Charhan	2,000
Do.	Xinjiang Lop Nur Potassic Salt Scientific and Technology Development Co.	Xinjiang, Ruoqiang	1,200
Rare earths	Fujian Changting Jinlong Rare Earth Co. Ltd.	Fujian, Changting	4
Do.	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Jiangyin Jiahua Advanced Material Resources Co. Ltd. (Neo Material Technologies)	Jiangsu, Jiangyin	3
Do.	Liyang Rhodia Rare Earth New Material Co. Ltd. (Rhodia Group)	Jiangsu, Liyang	12
Do.	Jiangsu Guosheng Rare Earth Co. Ltd.	Jiangsu, Taixing	5
Do.	Yixing Xinwei Leeshing Rare Earth Co. Ltd. (China Rare Earth Holdings Ltd.)	Jiangsu, Yixing	6
Do.	Dingnan Nanfang Rare Earth Co. Ltd.	Jiangxi, Ganzhou, Dingnan	4
Do.	Longnan Guangdong Rising Rare Earth Smelting Co. Ltd.	Jiangxi, Ganzhou, Longnan	4

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Rare earths—Continued		Baotou Iron and Steel and Rare Earths Corp. (Baogang Group)	Nei Mongol, Baotou	55
Do.		Leshan Primet (Puruimei) New Materials Co. Ltd. (US Primet LLC)	Sichuan, Leshan	8
Do.		Sichuan Jiangxi Copper Rare Earth Co. Ltd. (Jiangxi Copper Co. Ltd.)	Sichuan, Mianning	18
Rhenium rhenate	metric tons	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	3
Salt		Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400
Do.		Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250
Silver	metric tons	Zijin Copper Co. Ltd.	Fujian, Shanghang	125
Do.	do.	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	150
Do.	do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	80
Do.	do.	Daye Nonferrous Metals Co.	Hubei, Daye	300
Do.	do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	730
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	430
Do.	do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	80
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	80
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	300
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	150
Do.	do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	160
Do.	do.	Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	450
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	150
Selenium	do.	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	50
Do.	do.	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	300
Strontium, carbonate		Chongqing Chonglong Strontium Co. Ltd.	Chongqing	20
Do.		Chongqing Tongliang Redbutterfly Strontium Co.	do.	120
Do.		Shijiazhuang Zhengding Xian Jinshi Chemical Co. Ltd	Hebi, Shijiazhuang	55
Do.		Hebei Xinji Chemical Group	Hebei, Xinji	60
Do.		Nanjing Jinyan Strontium Co. Ltd.	Jiangsu, Lishui	25
Talc		China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.		do.	Liaoning, Haicheng	50
Do.		do.	Shandong, Qixia	5
Tellurium, concentrate	metric tons	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	50
Tin, smelter		Guihuacheng Smelter (Guangxi Pinggui PGMA Co. Ltd.	Guangxi, Hezhou	8
Do.		Laibin Smelter (Guangxi China Tin Group Co. Ltd.)	Guangxi, Laibin	25
Do.		Chenzhou Smelter (Yunnan Tin Co. Ltd.)	Hunan, Chenzhou	20
Do.		Nanshan Tin Co. Ltd.	Jiangxi, Nankang	10
Do.		Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	20
Do.		Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	70
Do.		Yunnan Gejiu Zili Metallurgy Co. Ltd.	Yunnan, Huogudu	20
Titanium, sponge		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	15
Do.		Guizhou Southwest Titanium Co. Ltd.	Guizhou, Guiyang	3
Do.		Zunbao Titanium Co. Ltd.	Guizhou, Tongzi	10
Do.		Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	20
Do.		Tangshan Tianhe Titanium Co. Ltd.	Hebei, Tangshan	10
Do.		Luoyang Sun Rui Wanji Titanium Industry Co. Ltd.	Henan, Xinan	10
Do.		Chaoyang Baisheng Zirconium Co. Ltd.	Liaoning, Chaoyang	8
Do.		Chaoyang Jintai Titanium Co. Ltd.	do.	7
Do.		Fushun Titanium Co. Ltd.	Liaoning, Fushun	5
Do.		Jinzhou Huashen Nonferrous Metals Plant	Liaoning, Jinzhou	10
Do.		Baoti Titanium Industry Co. Ltd.	Shaanxi, Baoji	10
Do.		Gangqi Xinyu Titanium Co. Ltd.	Sichuan, Panzhihua	5
Do.		Hengwei Titanium Co. Ltd.	do.	5
Do.		Panzhihua Iron and Steel (Group) Co. (Pangang)	do.	15
Do.		Yunnan Metallurgical Group	Yunnan, Lufeng	10

See footnotes at end of table.

TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Tungsten, concentrate	Ninghua Hangluoken Tungsten Mine (Amoi Tungsten Co. Ltd.)	Fujian, Ninghua	4
Do.	Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.	Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.	Jiangxi Tungsten and Rare Earth Co. Ltd.	Jiangxi, Gangzhou	15
Zinc	Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	270
Do.	Hechi Nanfang Nonferrous Metal Smelting Co. Ltd.	Guangxi, Hechi	200
Do.	Liuzhou Nonferrous Metal Smelting Co. Ltd. (former Liuzhou Zinc Products Factory)	Guangxi, Liuzhou	100
Do.	Yugang Gold-Lead Co. Ltd.	Henan, Jiyuan	250
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyan	60
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	500
Do.	Huludao Zinc Smelting Co. (Huludao Nonferrous Metals Group. Co. Ltd.)	Liaoning, Huludao	390
Do.	Zijin Bayannur Co. Ltd. (Zijin Mining Group)	Nei Mongol, Bayannar League	220
Do.	Chifeng NFC Kumba Hongye Zinc Co. Ltd. (China Nonferrous Metals Foreign Engineering and Construction Co. Ltd.)	Nei Mongol, Chifeng	230
Do.	Xingan Copper and Zinc Smelter	Nei Mongol, Xilinuole	100
Do.	Dongling Zinc Industry Co. Ltd. (Dongling Group)	Shaanxi, Baoji	250
Do.	Laibin Smelter	Yunnan, Laibin	60
Do.	Yunnan Jinding Zinc Co. Ltd. (Sichuan Hongda Group)	Yunnan, Lanping	120
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	280

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1]Most companies are owned by either the central Government or a Provincial government.

[2]Listed by Province or Autonomous Region, followed by locality.

TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2011

Commodity	Quantity (metric tons)	Value (thousands)
METALS		
Aluminum:		
Alumina	76,280	$53,506
Metal and alloys:		
Unwrought	766,122	1,789,057
Semimanufactures	3,000,000	10,361,684
Antimony:		
Metal, unwrought	5,062	66,317
Oxide	41,995	512,728
Barium sulfate	2,890,000	241,911
Copper, metal and alloys:		
Unwrought	156,516	1,490,847
Semimanufactures	500,347	4,525,882
Indium, unwrought, including powder	105	69,025
Iron and steel:		
Pig iron and cast iron	870,000	440,978
Steel:		
Bars and rods	6,690,000	5,987,326
Shapes and sections	2,700,000	2,094,512
Sheets and plates	26,580,000	25,562,875
Tube and pipe	1,440,000	3,752,393
Wire of steel or iron	1,700,000	2,149,800
Ferroalloys	930,000	3,611,795
Scrap	25,095	12,813
Magnesium, metal and alloy:		
Unwrought, Mg not less than 99.8%	185,879	555,104
Other unwrought	99,362	328,377
Manganese, unwrought	56,386	201,768
Molybdenum, ores and concentrates	18,732	374,994
Silver, unwrought	1,178	1,303,603
Tin, metal and alloys, unwrought	1,227	38,222
Tungsten, tungstates	5,136	182,165
Zinc:		
Metal and alloys, unwrought	48,369	115,648
Oxide and peroxide	17,608	32,979
INDUSTRIAL MINERALS		
Cement	10,610,000	620,353
Fluorspar	720,000	133,809
Granite	8,040,000	256,840
Graphite, natural	440,000	365,181
Magnesia, fused	2,070,000	662,229
Rare-earth products	16,900	2,667,140
Talc	670,000	156,682
MINERAL FUELS AND RELATED MATERIALS		
Coal	14,660,000	2,716,845
Coke, semicoke	3,300,000	1,487,346
Petroleum:		
Crude oil	2,520,000	1,907,008
Refinery products	25,700,000	20,766,030

Source: General Administration of Customs of the People's Republic of China, 2011, China monthly exports and imports, no. 12.

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2011

(Metric tons unless otherwise specified)

Commodity	Quantity	Value (thousands)
METALS		
Aluminum:		
Bauxite	44,844,914	$2,057,746
Alumina	1,880,000	777,809
Metal and alloys, unwrought	333,123	827,960
Semimanufactures	577,364	3,592,775
Scrap	2,690,000	4,625,509
Chromium, chromite	9,440,000	2,663,791
Cobalt:		
Ore and concentrates	348,191	850,937
Unwrought and powder	11,057	175,504
Copper:		
Ore and concentrates	6,380,000	15,518,135
Anode	416,332	3,780,616
Metal and alloys, unwrought	3,291,469	28,976,396
Semimanufactures	781,623	7,828,354
Scrap	4,690,000	16,351,959
Iron and steel:		
Iron ore	686,080,000	112,406,539
Steel:		
Bars and rods	1,150,000	1,926,600
Seamless pipe	520,000	1,979,468
Shapes and sections	390,000	416,672
Sheets and plates	13,200,000	15,694,346
Scrap	6,770,000	4,136,390
Manganese ore	12,970,000	2,674,563
Nickel:		
Ore and concentrates	48,055,678	4,904,203
Metal, refined greater than 99.95% Ni	11,169	269,007
Metal, other refined	201,310	4,645,652
Titanium dioxide	228,528	703,812
INDUSTRIAL MINERALS		
Diamond kilograms	3,342	6,147,250
Nitrogen, phosphorus, and potassium fertilizers:		
Compound fertilizers	1,020,000	531,911
Diammonium phosphate	90,000	58,573
Potassium chloride	6,400,000	2,691,321
Potassium sulfate	150,000	75,505
Urea	2,064	1,457
MINERAL FUELS AND RELATED MATERIALS		
Coal	182,400,000	20,911,394
Liquefied natural gas	12,210,000	5,765,585
Petroleum:		
Crude oil	253,780,000	196,664,467
Refinery products	40,600,000	32,698,702

Source: General Administration of Customs of the People's Republic of China, 2011, China monthly exports and imports, no. 12.