



# 2008 Minerals Yearbook

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## CHINA

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# THE MINERAL INDUSTRY OF CHINA

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During the past three decades, China has made remarkable gains in industrialization and development. The gross domestic product (GDP) has maintained a growth of about 9% per year. The role of private sector market mechanisms expanded steadily, whereas direct Government control over economic activity diminished gradually. In the financial and mineral sectors, where reforms lagged, major large mineral and metal producers and many banks remained either state owned or under the ownership of the Provinces. After many years of development, Chinese enterprises were faced with the challenges of needing to increase their competitiveness through innovation and to create jobs to keep the labor force employed. Chinese exporters remained assemblers and manufacturers of products, without having much knowledge of and without producing innovations in the technology. China had a huge unskilled labor force but a shortage of skilled labor. To sustain its economic development, the Government had been expanding the requirements for all education levels, improving adult literacy, and providing training to rural and urban workers.

China was one of the leading economic and trade powers in the world, one of the top destinations for foreign direct investment, and an export destination of choice. During the past several years, the Government's economic policy was to prevent economic slowdown and fight inflation. In 2008, because of the global economic downturn and natural disasters (severe snowstorms, floods, and an earthquake in Sichuan Province), China's economic growth rate was 9%, which was less than the 13% rate of growth in 2007. Industrial production increased by 9.5% compared with that of 2007. The consumer price index (a measurement of inflation) rose to 5.9% in 2008 compared with 4.8% in 2007. The global financial crisis had only a limited direct effect on China's financial system but it affected the country's export market. China's export volumes in 2008 decreased by 7.3% in November and 7.6% in December compared with the same months in 2007. Imports also decreased by more than 10% during those 2 months. One factor in the decrease in imports was the destocking of raw materials. The official urban unemployment rate increased by 0.2% to 4.2% in 2008; large sections of the working population, however, (including migrant workers) were not eligible to register as unemployed. There were more than 80 million migrant workers (National Bureau of Statistics of China, 2009).

## Minerals in the National Economy

China is rich in mineral resources and was the world's leading producer of aluminum, antimony, barite, bismuth, coal, fluorspar, gold, graphite, iron and steel, lead, phosphate rock, rare earths, talc, tin, tungsten, and zinc in 2008. It 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, coal, fluorspar, graphite, rare earths, and tungsten in the world. The country's demand for chromium,

cobalt, copper, iron ore, manganese, nickel, petroleum, and potash exceeded domestic supply, and imports were estimated to account for more than 30% of domestic consumption. Mineral trade increased by 33.5%, and accounted for 25.7% of the country's total trade in 2008. China was one of the few countries whose domestic supply and demand of a variety of mineral commodities affected the world mineral market. The labor force in the mining sector was 5.35 million, or 4.5% of the country's total workforce in 2007.

## Government Policies and Programs

In 2008, owing to the global financial crisis, China's economic growth declined to 6.8% in the fourth quarter from 12.6% in the second quarter. Industrial value-added growth also decreased. Much of the slowdown was the result of weak domestic and international demand. Exports accounted for about 40% of the GDP; of that amount, about one-half was from processing trade; the share of exports in value-added products was less than 20%. Because global growth prospects were distinctly unfavorable for the future, China's export growth was expected to decline during the next 2 years. The weak export outlook would affect investment in export-oriented industries, which was estimated to be about 15% of overall investment in China.

To control inflation and to cool off the economy in 2007, the Government tightened its monetary policies. As a result, the overall real investment growth in 2008, especially in the construction sector, was lower than in 2007. The slowdown in the construction sector contributed to a sharp slowdown in several upstream industries, such as cement, copper, and steel. In November 2008, the State Council announced a fiscal stimulus package worth about 4 trillion yuan (\$586 billion) during 2009-10 to promote stable growth in the domestic economy. As part of the package, the Government identified 10 areas where it sought to increase domestic demand and growth, including affordable housing; environmental protection and waste treatment; rural infrastructure investment for drinking water, electricity, and gas; technological innovation for research and development; transportation infrastructure, such as airports, highways, and railways for transporting coal and passengers; and post-disaster reconstruction areas in Sichuan Province. The Government also reformed the value-added tax (VAT) nationwide in 2009 to allow capital spending to be deducted from the VAT, thereby reducing the enterprise tax burden. With the approval of the Government, bank lending increased rapidly during the last quarter of 2008 (Citigroup Global Market Inc., 2008).

Also in the last quarter of 2008, the Government announced that 10 major industries in China—automobile manufacturing, electronic information, equipment manufacturing, iron and steel, light industry, logistics, nonferrous metals, petrochemical, shipbuilding, and textiles—were to be reformed and upgraded. These industries accounted for more than 80% of the country's total industrial output value and about one-third of the

GDP. The Government considered that the reform of these industries could help China compete more effectively with other developed countries. After more than three decades of development, the existing structure of these industries no longer met the requirements of the modern business world. The Chinese enterprises were considered to be weak in independent innovation, had low measures of competitiveness and productivity, depended heavily on external demand, and had undiversified product lines. The reform concentrated on tax relief, expanding credit lines, providing 100 billion yuan (\$14.7 billion) in research and development funds during 2009-10, and urging enterprises to merge (China Economic News, 2009c).

During the past two decades, the Government approved, in principle, the Provisional Rules on the Value-Added Tax, the Provisional Rules on the Consumption Tax, and the Provisional Rules on the Business Tax. The production-based VAT was introduced in 1994 to increase the Government's tax revenue and curb excess investment; this tax, which accounts for 31% of the country's tax revenue, caused much confusion for producers and exporters, however. During the past several years, the Ministry of Finance (MOF) and the State Administration of Taxation had urged the Government to reform the production-based VAT. In 2003, the Government started a trial operation to convert the production-based VAT to a consumption-based VAT for eight industries, which included equipment manufacturing and petrochemical production in several Provinces. The Government's plan was to convert to the consumption-based VAT throughout the whole country by the end of 2010. The reformed VAT would reduce the enterprise tax burdens on the equipment manufacturing industry. The Government would abolish the exemption for the VAT on imported equipment and the VAT refund for purchases of domestically manufactured equipment by foreign investors. Both domestic and foreign investors would be taxed at the same rate. The resource tax rate on mined mineral products would increase to 17% from 13%, including imports, except for salt, the tax on which would remain at 13% (China Economic News, 2008; Ministry of Finance, 2008b).

The State-owned Assets Supervision and Administration Commission planned to merge smaller and underperforming state-owned enterprises with other state-owned enterprises. The Commission's plan was to reduce state-owned enterprises to between 30 and 50 from 100 by yearend 2010. The Commission also banned state-owned enterprise employees, particularly management staff, from holding shares in their affiliates and subsidiaries but allowed them to hold shares of their own companies. They were also not allowed to invest in companies that had a business connection with their enterprises. These regulations did not apply to listed companies that were held mainly by the state. The Government would strictly control the participation of state-owned enterprises in investment or acquisition of foreign companies during the global financial crisis. The MOF and other agencies jointly issued the basic standards for enterprise internal control guidelines that would be implemented on July 1, 2009 (China Economic News, 2009b; Citigroup Global Market Inc., 2009).

In 2008, the Ministry of Land and Resources (MLR) issued the national plan on mineral resources (2008-15). The plan established annual production targets for coal [3.3 billion metric

tons (Gt)]; iron ore (1.1 Gt); oil [200 million metric tons (Mt)]; tin [150,000 metric tons (t)]; antimony (140,000 t); rare earths (rare-earth oxide content) (140,000 t); and tungsten (78,000 t) in 2015. The Government projected that coal consumption would total 3.5 Gt; iron ore, 1.5 Gt; oil, 500 Mt; aluminum, 14 Mt; and copper, 7.6 Mt in 2020. The country was expected to face a shortage of 19 mineral commodities among the 45 major mineral commodities produced. The dependence on imports of copper and potash was expected to be 70%; oil, 60%; and iron ore, 40%. During the past several decades of exploration, geologists believed that about one-third of total mineral resources had been discovered in China. Most of the undiscovered mineral resources were expected to be located in the western part of the country.

The Government planned to establish special funds for the exploration of bauxite, chromite, copper, iron ore, lead, manganese, nickel, potash, and zinc. Exploitation of antimony, barite, fluorspar, graphite, magnesite, phosphate rock, rare earths, talc, tin, and tungsten would be strictly monitored, and exports of these commodities would be placed in a quota system. Production of bauxite and molybdenum would also be based on the Government's plan. The Government would monitor the production of germanium, indium, niobium, vanadium, and other rare metals. The Government would establish a strategic mineral reserve system on such commodities as chromium, coal, copper, germanium, indium, manganese, oil, rare earths, and tungsten. The Government would not issue any mining license to companies that used obsolete mining methods and would encourage companies to modernize their mining technologies to minimize the harm to the country's ecological system. The MLR also issued regulations on the management of the geologic survey system in 2008 (Ministry of Land and Resources, 2008a, b).

Owing to the global financial crisis, the demand for nonferrous metals had decreased and prices of nonferrous metals declined significantly during the second half of 2008. During the past several years, China's nonferrous metal output capacity had increased rapidly, and, globally, the nonferrous metals supply exceeded demand in 2008. Even though nonferrous metal producers shut down their operations temporarily, the prices of nonferrous metals continued to decrease, and China's nonferrous metal producers requested help from the Government. The State Council ordered the State Reserve Bureau (SRB) to stockpile 1 Mt of aluminum, 400,000 t of copper, 400,000 t of lead and zinc, and 30 t of indium from domestic producers to stabilize metal prices in the domestic market. The Government also urged Provincial and local governments to do the same for other metals. Metal producers urged the Government to stockpile such other commodities as antimony, nickel, tin, and tungsten that were in short supply or important to the country's economy. The Provincial government of Yunnan announced that it would stockpile a total of 1 Mt of aluminum, copper, lead, tin, and zinc. A local government in Jiangxi Province planned to stockpile rare earths and tungsten (China Metal Bulletin, 2009f; Recycling Resources, 2009).

The Ministry of Commerce (MOC) and the MLR jointly issued regulations on the administration measures on foreign investment in mineral prospecting. The Government encourages

foreign investors to participate in mineral prospecting and exploration in China. Under the guidelines for foreign investment, if foreign investors are involved in prospecting for a mineral commodity that is in the restricted category, the MOC is the sole approval and management agency. For other categories, the Provincial or local government has the power to approve prospecting by a foreign investor with the concurrence of the MLR local office. Foreign prospectors are required to submit an annual report that details the progress of their prospecting, their tax payment, their environmental protection work, and their land usage to the approval agency before March of each year. If the foreign prospector discovers a commodity that is in the forbidden category, the prospector must transfer the prospecting license to a lawful prospector (Ministry of Commerce, 2008a).

The Government planned to establish a national coal exchange that would provide coal market information to both buyers and producers. Owing to insufficient market information, producers from the northern China were shipping their coal to southern China without having reliable infrastructure information. Each year, millions of tons of coal was stored on the docks of coastal ports waiting to be shipped. Coal-fired powerplants in southern China were turning to overseas coal suppliers for their needs. The National Development and Reform Commission (NDRC) was looking for an appropriate location for the proposed national coal exchange. Shanxi Province and the Nei Mongol Autonomous Region were the two major coal producers in China and there was surplus coal production in these two Provinces. NDRC planned to have a trial run for the exchange in 2010 and to launch a coal futures market in 2012 (China Energy Weekly, 2009a).

The State Electricity Regulatory Commission planned to allow more power consumers to bypass the grid companies and to purchase electricity directly from power producers. In 2005, the Government allowed large power consumers in northeastern Jilin Province and Taishan in Guangdong Province to purchase electricity from power producers. Other consumers must purchase electricity from grid companies. Direct trade between consumers and power companies would affect the grid companies' monopoly. In 2007, the Government had discontinued the practice of giving preferential power rates to energy-intensive users, such as those that produce aluminum, ammonia, caustic soda, cement, copper, ferroalloys, yellow phosphorus, and zinc. In July 2008, the NDRC increased the price of electricity by 25 yuan per million-watthour. Owing to the global financial crisis and the decrease in the demand for electricity, some local governments went against the policy of the central Government and reinstated the preferential power rates for energy intensive-users as a way to stimulate the local economy. The Government planned to allow about 15 large aluminum producers to bypass the grid companies and to purchase electricity from power companies directly. The price of the electricity would be negotiated between the aluminum producers and the power companies (China Metals, 2008b; China Energy Weekly, 2009b).

The MOC planned to release investment regulations for Chinese companies in foreign countries. According to the proposed regulations, any Chinese company investment of more than \$100 million in a country that does not have diplomatic

relations with China or that is politically unstable is subject to Government approval. A Provincial government can approve investment of more than \$10 million in foreign countries. With energy and mineral projects, the MOC will consult with China's embassy in the foreign country and with related associations before issuing its approval (Metallurgical News, 2009).

The Chinese Government had become more concerned about the continual inflow of foreign exchange into China because of the potential effect on the stability of China's economy. The State Administration of Foreign Exchange Circular nos. 29, 30, and 31 introduced a new mechanism for tracking the inflow of foreign exchange through trade accounts into China. Exporters are required to open special bank accounts for the collection of export proceeds in foreign exchange and to perform foreign debt registration for any advance collection of export proceeds in foreign exchange before actually exporting the goods. Importers are required to perform similar foreign debt registration. The regulation does not allow a company to convert export proceeds collected in advance into Chinese currency to finance its operation until the actual export has taken place (PricewaterhouseCoopers, 2008).

China's mineral resources law was enacted in 1986 and amended in 1996. The Government believed that the changes were necessary to attract foreign investment in mineral development and production in China. In 2003, the MLR established a mineral-resources-law consultation committee to seek recommendations from domestic and overseas mining experts. After several years of discussion, the resource tax item remained an issue of some disagreement among individual agencies within the Government. The MLR planned to complete a draft of the amended regulation by 2009. A new energy law was also at the final stage of consultation before being submitted to the National People's Congress for approval (Metallurgical News, 2008).

## Production

China was one of the world's leading countries in the production of aluminum, antimony, barite, bismuth, cement, coal, copper, fluor spar, gold, graphite, indium, iron and steel, lead, lime, magnesium, manganese, molybdenum, phosphate rock, rare earths, salt, silver, talc, tin, tungsten, and zinc. The output quantity of these mineral commodities could have significant effects on world markets. In 2008, production of such commodities as aluminum, antimony, bismuth, coal, copper, gold, iron and steel, lead, manganese, molybdenum, nickel, phosphate rock, soda ash, tin, titanium, and zinc increased compared with that of 2007 (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 export tax rebates on ferrous and nonferrous metal products, increased export duties on energy-intensive metals, and encouraged producers to produce high-value-added products. Owing to increasing domestic and overseas demand, the growth of China's minerals and metals output was expected to continue.



The MLR announced that the production quota in 2009 for antimony (metal content), rare earths (rare-earth oxide content), and tungsten (tungsten trioxide content) were 90,180 t, 82,320 t, and 68,555 t, respectively. In 2008, the production targets for rare earths and tungsten were 87,620 t and 66,850 t, respectively, and there was no production quota for antimony. A set of production quotas was assigned to each Province. The Ministry of Industry and Information Technology (MIIT) set the national production quota for rare earths at 110,700 t in 2009, which was higher than that set by the MLR. During the past several years, the actual outputs of rare earths were higher than the MLR quota. The MIIT rare-earth quota appeared to be more reflective of the actual output of the country. In 2008, local governments were in charge of allocating quotas to rare-earth producers. The MIIT was established in 2008 during the restructuring of the State Council and it appeared that there was a lack of communication between the MIIT and the MLR about which agency should assign the national rare-earth production quota. For antimony, Hunan Province was allocated 36,000 t followed by Guangxi Zhuangzu Autonomous Region, 17,000 t; Yunnan Province, 4,000 t; Gansu Province, 2,100 t; Henan Province, 1,500 t; Guizhou Province, 1,300 t; and nine other Provinces, less than 1,000 t each in 2009. The Government held off assigning the remaining 25,000 t of the national antimony quota until further notice. For rare earths, Nei Mongol Autonomous Region accounted for more than 50% of the total allocation followed by Sichuan Province, Jiangxi Province, and Guangdong Province. Jiangxi Province would be the leading tungsten production base followed by Hunan Province, Yunnan Province, Henan Province, and Guangdong Province. The MLR announced that it would not accept any new antimony, rare-earths, or tungsten exploration and mining permit applications until June 30, 2010 (Ministry of Land and Resources, 2009).

China's State Council approved a 3-year plan to stimulate the nonferrous metal industry, which would focus on industrial restructuring and technology innovation. The Government planned to eliminate obsolete smelting capacity, which would include 600,000 metric tons per year (t/yr) of lead, 400,000 t/yr of zinc, and 300,000 t/yr of copper at yearend 2009 and 800,000 t/yr of small-scale prebaked cells (prebaked cells of less than 160 kiloamperes) for production of aluminum by yearend 2010. Direct-current power consumption for each ton of aluminum produced would be reduced to 12,500 kilowatts per hour. The total energy consumption of lead smelting would be reduced by 380 kilograms (kg) of standard coal equivalent per ton of lead. The rate of recovery of sulfur from nonferrous metal production would increase to 97%, which would reduce emissions of sulfur dioxide by 850,000 t/yr. The Government urged the industry to consolidate through merger of nonferrous metal producers. The goal was for the top 10 copper producers to produce about 90% of the total copper production by 2011 and the top 10 aluminum, lead, and zinc producers to produce 70%, 60%, and 60%, respectively, of the country's total production. The Government would not approve new construction or expansion of aluminum smelters during the next 3 years and would control strictly any project for new or expanded capacity for copper, lead, magnesium, titanium, and

zinc producers. The Government encouraged the production of more value-added nonferrous metal products. Secondary aluminum and copper outputs were expected to account for 25% and 35%, respectively, of total production. The Government also encouraged cross-sector mergers, such as of aluminum and coal producers or aluminum and power producers (Ministry of Industry and Information Technology, 2009b).

In 2008, the total fixed-asset investment of the nonferrous metals industry was 233.2 billion yuan (\$35 billion), which was a 40% increase from that of the previous year. Of this amount, newly started fixed-asset investment accounted for 88% of the total, and only \$641 million was foreign direct investment. Of the total nonferrous metals investment, mining development accounted for 22.2%; smelting, 47.5%; and processing, 30.3%. The aluminum sector accounted for 38% of the total smelting investment followed by copper, 14%; lead and zinc, 12%; and others, 36%. Owing to the global financial crisis and the Government's macro-control policy, the growth of fixed-asset investment in the nonferrous metals industry was expected to slow down during the next 2 years (China Metals, 2009c).

### Structure of the Mineral Industry

China's mining industry is highly fragmented and 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 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 Assets Administration 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, which was scheduled to be completed by yearend 2008. 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 (China Economic News, 2009c).

According to the Government's stimulus plan, company consolidation was one of the priorities. The governments of the Provinces of Guangdong, Guangxi, Hebei, Shandong, and Shanxi decided to merge their iron and steel producers into larger enterprises. The Government extended its suspension of the issuance of new coal exploration permits until March 31, 2011 (China Mining and Metals Weekly, 2009b).

### Mineral Trade

According to the customs statistics, China's total trade was valued at \$2.56 trillion in 2008; this was an increase of 17.8% compared with that of 2007. Exports posted an increase of 17.2% to \$1.43 trillion, and imports were up by

8.2% to \$1.13 billion. The United States remained the leading destination for China's exports followed by the European Union (EU), Hong Kong, and Japan. Japan was China's leading source of imports followed by the Republic of Korea and the EU. Imports of raw materials, such as bauxite, chromium ore, iron ore, manganese ore, potassium fertilizer, and oil, increased sharply. In 2008, the value of mined mineral product imports increased to \$231.1 billion, which was an increase of 59.2% from that of 2007. The value of mined mineral product exports increased to \$14.7 billion, which was an increase of 43.8% (General Administration of Customs of the People's Republic of China, 2008).

The MOC issued Circular no. 22, which included a list of mineral commodities that were banned for processing trade in 2008. Mineral commodities that were on the Government's monitoring list for export were ammonium paratungstate; bauxite and refractory clay; coal; coke; concentrates of antimony, cobalt, gold, silver, tin, tungsten, and zinc; dolomite; fluor spar; magnesite; oxides of antimony, magnesium, and tungsten; platinum; rare earths; silicon carbide; silver; talc; and unwrought metal and alloys of antimony, copper, nickel, tin, and zinc. The MOC issued Circular no. 121 that removed cobalt concentrates from the Government's list of banned exports and several companies received exemptions for allowing import processing trade on concentrates of copper and nickel in 2009. Cobalt sulfide, palladium chloride, and other precious compounds were removed from the banned export processing list (Ministry of Commerce, 2008e).

All antimony products would be required to be registered and exported through the Port of Beihai in Guangxi Zhuangzu Autonomous Region, the Port of Huangpo in Guangdong Province, and the Port of Tianjin City. The Port of Dalian in Liaoning Province was designated as the port of issuance of export licenses for magnesite, which could be exported through the Port of Changchun in Jilin Province, the Ports of Dalian and Manshouli in Heilongjiang Province, and the Port of Qingdao in Shandong Province. The Government adjusted the 2009 export quotas for phosphate rock to 1.5 Mt; magnesite, to 1.4 Mt; bauxite, to 950,000 t; talc, to 610,000 t; fluor spar, to 550,000 t; silicon carbide, to 216,000 t; antimony and antimony products (metal content), to 58,700 t; molybdenum, to 25,500 t; tin and tin products (metal content), to 23,300 t; tungsten and tungsten products (metal content), to 14,600 t; silver, to 5,100 t; and indium, to 233 t. The first batch of export quotas for mineral products usually accounted for 60% of the total export quota. 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. The import quota for ammonium phosphoric acid was set at 6.90 Mt; complex fertilizer, 3.45 Mt; and urea, 3.30 Mt. Imports of mined mineral products would be subject to a 17% mineral tax, as were domestic mined mineral products. On August 20, 2008, the export tariff rate for aluminum products was levied at 15%; the rate for coke was increased to 40% from 25%; and the rate for coking coal and bituminous coal was increased to 10% from 5%. The Government intended to discourage traders from exporting coal products, which would help ensure sufficient supply and stabilize prices in the domestic market during the harvest period.

The MOF planned to reduce the export tariff rate for oxides of aluminum, molybdenum, and tungsten, molybdenum and tungsten chemical products, molybdenum and indium powders, and unwrought indium and molybdenum to 5% from a range of 10% to 15% beginning on July 1, 2009 (Ministry of Commerce, 2008b, c, f; Ministry of Finance, 2008a; 2009).

Owing to an increase in domestic demand and to conserve domestic mineral resources, the Government reduced export quotas on key commodities. 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 volume of the commodities would likely decrease in 2009 compared with that of 2008. The total export quota for coke was 12.01 Mt; of that amount, the first batch was 9.62 Mt and the second batch was 2.39 Mt in 2008. In 2009, the first batch export quota for coke was 5.78 Mt. The total export quota for rare earths (rare-earth oxide) was 34,156 t (22,780 t for the first batch and 11,376 t for the second batch) for domestic rare-earth producers and 8,210.5 t for Sino-foreign joint-venture producers in 2008. In 2009, the first batch export quota for rare earths was 15,043 t for domestic rare-earth producers. The Sino-foreign joint venture rare-earth producers were assigned a total of 6,685.1 t (Ministry of Commerce, 2008g-j).

## Commodity Review

### Metals

**Aluminum.**—Owing to a winter storm, the power supply system in the Provinces of Guizhou, Guangxi, Hunan, and Sichuan was damaged and forced aluminum smelters in these Provinces to shut down their operations in February. The earthquake in Sichuan Province destroyed several aluminum smelters in the earthquake area in May. The global financial crisis reduced the demand for aluminum in China and the world; nevertheless, China's aluminum metal production continued to increase in 2008. To support the aluminum sector, China had imported large quantities of alumina to meet the demand. In 2003, the country imported 5.6 Mt of alumina, which accounted for about 50% of total demand. By 2008, the volume of imported alumina was 4.6 Mt, mainly from Australia and India, but the imported alumina met only about 17% of the country's demand. During the past several years, about 23 alumina projects were either completed or under construction and more than 10 alumina projects were in the feasibility stage. By yearend 2008, China's alumina output capacity could reach 36 million metric tons per year (Mt/yr) (Alumina and Aluminum Monthly, 2009).

Owing to the rapid expansion of alumina output capacity and the weak demand for alumina, the price per metric ton of alumina decreased five times to about 2,000 yuan (\$294) at yearend from 4,200 yuan (\$615) at the beginning of 2008. The price per metric ton of aluminum also decreased from the peak of 19,727 yuan (\$2,900) in March to 12,045 yuan (\$1,770) in December. Owing to a surplus of alumina in the domestic market, Aluminum Corporation of China (Chinalco) shut down about 1 Mt of alumina output capacity during the second half

of the year. Owing to the surplus of aluminum on the domestic market, 20 major aluminum producers agreed to reduce output by 5% to 10% in July. At yearend, about 4.4 Mt of aluminum output capacity was idled, which did not include about 2 Mt of output capacity that had not been put into operation. To prevent further decline in the price of aluminum on the domestic market, the SRB purchased a total of 590,000 t of aluminum from domestic aluminum producers at a price of between 12,490 yuan (\$1,836) and 12,350 yuan (\$1,816) per metric ton; about 50% of the aluminum was purchased from Chinalco (China Metals, 2009e).

The rapid expansion of alumina output capacity could create fierce competition for bauxite resources. The Provinces of Guangxi, Guizhou, Henan, Shandong, and Shanxi accounted for about 90% of the country's bauxite resources. After years of exploitation, bauxite resources in Shandong Province were nearly depleted. Aluminum refineries in Shandong Province relied on imported bauxite to meet their demand. In 2008, China imported 25.79 Mt of bauxite compared with 23.26 Mt in 2007, mainly from, in descending order of amount imported, Indonesia, Australia, and India. During the past several years, China discovered several new bauxite deposits, including the Chongzuoshi and the Fusui deposits (both in Guangxi Zhuangzu Autonomous Region); the Cahuyuan and the Heitutian deposits at Qingzhen, the Luobuchong deposit at Zhijin, the Tianmashan deposit at Xiuwan, and the Wachangping deposit at Wuchuan (all in Guizhou Province); the Fudian-Minchi deposit in Henan Province; the Baode and the Jinggou deposits at Yangqu, and the Pangjianzhuang deposit at Jiaokou (all in Shanxi Province); and the Sanjiang deposit at Dianxi in Yunnan Province. China had bauxite resources of 2.0 Gt in 2006 (China Nonferrous Metals, 2008, 2009a).

In 2008, the NDRC approved the following two alumina projects: Aluminum Corp. of China. Co. Ltd. (Chalco) subsidiary Zhongzhou Aluminum Plant's 700,000-t/yr expansion plan and Yunnan Aluminum Co. Ltd.'s 800,000-t/yr project in Wenshan, Yunnan Province. The Wenshan alumina project was a joint investment of Wenshan Chengxiang Development and Investment Co., Yunnan Aluminum Co. Ltd., Yunnan Dounan Manganese Co. Ltd., and Yunnan Metallurgical Group. The Wenshan alumina project included the construction of a 1.78-Mt/yr bauxite mine and a coal-fired powerplant. The mine had bauxite reserves of 110 Mt, and Yunnan Aluminum continued to explore bauxite resources in the Wenshan area. Yunnan had a 500,000-t/yr aluminum smelter and a 160,000-t/yr aluminum semimanufacturing plant in Yunnan. After completion of the alumina project in 3 years, Yunnan Aluminum would become an integrated aluminum producer (Alumina and Aluminum Monthly, 2008).

After more than 2 years of construction, Yangquan commissioned its 1.2-Mt/yr aluminum refinery in December 2007. The Shanxi Provincial government allocated all local bauxite resources, except two mines, to support the project. About 90 Mt of bauxite reserves was discovered in the eastern part of Shanxi Province. Hangzhou Jinjiang Group started the construction of a 200,000-t/yr chemical-grade alumina refinery at Tiandong, Guangxi Zhuangzu Autonomous Region, in December 2008. Hangzhou Jinjiang's subsidiary Coalmine

Aluminum (Sanmenxia) Co. Ltd. commissioned its 500,000-t/yr aluminum refinery at Xiaoyi, Shanxi Province, which was the first phase of Hangzhou Jinjiang's 2-Mt/yr alumina project (China Metals, 2009f).

Other alumina expansion projects included Shanxi Yangquan Coal Industry (Group) Co. Ltd. at its existing facility at Yangquan; Luoyang Xiangjiang Wanji Aluminum Co. Ltd. at Luoyang, Henan Province; Chalco's Pingguo Aluminum Co. in Guangxi Province; the Zhengzhou Aluminum Plant in Henan Province; and the Luneng Jinbei Aluminum Co. Ltd. in Shanxi Province. Refineries were being constructed by such companies as (in order of location) Chalco Nanchuan Aluminum Co. in Chongqing City; Chalco Zunyi Aluminum Co. and Galuminium (Guizhou) Co. Ltd. in Guizhou Province; Guixi Huayin Aluminum Co. Ltd. in Guangxi Province; Henan Zhongmei Aluminum Co. Ltd., Huiyuan Chemical Engineering Co. Ltd., and Xinyuangfeng Industry Co. in Henan Province; Shanxi Wusheng Aluminum Co. Ltd. in Shanxi Province; and Yunnan Aluminum Co. Ltd.'s Wenshan plant in Yunnan Province. By 2010, China's alumina output was expected to have increased sufficiently to meet domestic demand (China Metals, 2008c).

Datang Group's subsidiary Datang International Power Generation Co. completed the construction of 3,000-t/yr alumina pilot plant at Ordos (Erduosi), Nei Mongol Autonomous Region. Datang had developed an extraction technology to extract alumina from fly ash produced from the Datang Tuoketuo coal-fired powerplant, which contained nearly 50% alumina. The company also demonstrated that the purity of alumina met the industrial specifications. The alumina can be used for the production of aluminum-silicon-titanium alloy. The company planned to build a 200,000-t/yr alumina extraction plant and a 140,000-t/yr alloy plant. In 2006, Erduosi Aluminum Co. conducted a similar extraction process, and a 400,000-t/yr alumina plant was under construction and was expected to be completed in 2009 (China Nonferrous Metals, 2009c).

Despite the Government's macro-control policy, the country's aluminum output continued to increase by about 5% compared with that of 2007, although the growth rate was the lowest since 2000. To further control the expansion of aluminum output capacity, the Government eliminated all preferential power prices. Owing to the increased aluminum export duty rate, the export volume of aluminum metal decreased to 160,793 t in 2007 and 110,127 t in 2008; however, China's aluminum imports were 111,363 t in 2007 and 121,641 t in 2008. China's aluminum imports were mainly from, in descending order of amount imported, Russia, Australia, and India. China became a net importer of aluminum in 2008. Apparent aluminum consumption in 2008 was about 13.2 Mt. During the past 2 years, the decrease in aluminum exports was in part the result of the Government levying an export tariff on primary aluminum. No export tariffs were levied on aluminum alloys or high-end semimanufactured products in the first half of 2008, however. During the first 7 months of 2008, the volume of alloy exports increased by 140% compared with the same period in 2007. On August 20, 2008, the Government levied a 15% export duty on alloys. As a result, the export of these products decreased significantly during the second half of 2008. China's aluminum metal output capacity was estimated to be



about 19 Mt/yr in 2008. Several aluminum expansion projects were expected to be completed in 2008, including at the Baotou Aluminum Plant, the East China Aluminum Plant, the Henan Xichuan Aluminum Plant, the Huomei Hongjun Aluminum Plant, the Kaili Yangguang Aluminum Plant, the Qingtongxia Aluminum Plant, the Renping Xingda Aluminum Plant, the Tianyuan Aluminum Plant, the Weiming Aluminum Plant, and the Weiqiao Aluminum and Power Plant (China Metals, 2008a).

During the past 2 years, Chinalco was active in the international mineral market. In 2007, Chinalco took over Peru Copper Inc. of Canada for \$2 billion and, in 2008, Chinalco joined with Alcoa Inc. of the United States to purchase a 12% share of Rio Tinto plc for \$14 billion. Chinalco planned to invest \$19.5 billion to acquire a share of Rio Tinto's properties, which included a bauxite mine, an aluminum refinery and smelter, an iron ore mine, and a power station in Australia and a copper mine in Chile. The transaction required the approval of Rio Tinto's shareholders and the Australian Government (Metal Bulletin, 2009).

**Antimony.**—China was the leading antimony producing country in the world. Changes in the volume of China's production and exports could affect prices of antimony in the world market. China's antimony resources are located in the Provinces of Guangdong, Guangxi, Hunan, Sichuan, and Yunnan. Guangxi, Hunan, and Yunnan were the top antimony producing Provinces in China and accounted for 90% of the country's total antimony metal output in 2008. Owing to the expansion of smelting capacity during the past several years and to the Government's shutting down of many illegal mining activities in the Provinces of Guangxi, Hunan, and Yunnan, the supply of domestic antimony concentrates was insufficient to meet the smelters' demand; therefore, the country imported a large quantity of antimony concentrates mainly from Kazakhstan and Turkmenistan. China imported 19,264 t of antimony concentrates and 1,553 t of antimony oxide in 2008. China exported 52,389 t of antimony oxide and 9,453 t of unwrought antimony, mainly to Japan, the Republic of Korea, and the United States. About one-third of antimony products was unaccounted for; therefore, the exported volume of antimony products was likely to be higher than the reported customs statistics (China Metal Bulletin, 2009a).

The Chinese Government considered antimony to be one of the protected and strategic minerals, and exploitation and production of antimony was controlled strictly. Even with the Government's macro-control policy, however, antimony metal output continued to increase in recent years. The Government added antimony to the production quota list and restricted the exploration for antimony. In 2007, the Government cancelled the export VAT rebate and levied a 5% export tariff on antimony ingot. As a result, a large volume of antimony products was exported through Vietnam to other countries illegally. Owing to a snow storm in the Hunan Province and contamination of water resources by an antimony smelter in Lemshuijiang, antimony production was disrupted during the first half of 2008. During the same period, the Government enforced the patrol at the border between China and Vietnam and at the Guangzhou Port in Guangdong Province. The price of antimony increased to about \$6,000 per metric ton in Europe. Because of the high

price of antimony ingot on the international market, antimony producers increased their output. China's antimony consumption was estimated to be about 70,000 t in 2008. Owing to the production quota set by the Government and the declining demand for antimony in East Asia and the United States, China's antimony output was expected to decrease to less than 100,000 t, and the price of antimony was expected to decline in 2009 (China Metal Bulletin, 2009e).

**Cobalt.**—China was one of the leading mobile phone producers in the world. The demand for cobalt batteries has driven the rapid expansion of cobalt-refining facilities in China. The country had limited cobalt resources and required a large quantity of cobalt to support the development of the cobalt battery sector. In 2008, China imported 254,511 t of cobalt concentrates compared with 118,144 t in 2007. The cobalt content in imported concentrates was about 6%, which was equal to about 15,000 t of cobalt. The volume of unwrought cobalt and powder exports and imports were 2,886 t and 8,829 t, respectively, in 2008. The net import of cobalt was about 21,000 t. The country produced a total of about 4,000 t of cobalt (1,200 t from mine output and 2,800 t from secondary recovery). Domestic analysts estimated that the consumption of cobalt was about 12,600 t and that stockpiled cobalt totaled about 4,500 t in 2008. The increase in the volume of cobalt concentrate imports, mainly from the Democratic Republic of the Congo, was caused by the lower metal content in concentrates. The use of cobalt in batteries accounted for 50% of the total consumption, followed by cement carbide, 13%; glazing, 10%; chemical catalysts, 8%; magnets, 5%; and others, 14% (China Metal Bulletin, 2009b).

**Copper.**—Owing to domestic smelter and refinery expansions, China's copper output increased sharply during the past several years. Many domestic analysts believed that the rate of China's copper production would be slower than in previous years because of the constrained supply of copper concentrates on the world market and because Chinese copper smelters accepted a treatment charge/refining charge (TC/RC) of \$47.2 per metric ton/4.72 cents per pound in 2008, which was about 35% lower than the charges in 2007. China's copper producers had difficulty making a profit with such a low TC/RC because of increased production costs. Nonetheless, China's leading copper producers planned to continue their output capacity expansions during the next several years. China's copper smelting and refining output capacity reached 3.1 Mt/yr and 4.6 Mt/yr, respectively, in 2008, and the capacities were expected to increase to 4.0 Mt/yr and 5.0 Mt/yr, respectively, in 2010. Thus, the output of domestic mined copper was expected to increase to about 1 Mt/yr in 2010. The China Smelting Purchasing Team, which was made up of nine major copper producers in China, agreed to the 2009 copper concentrate contract with BHP Billiton Ltd. on a TC/RC of \$75 per metric ton/7.5 cents per pound, which was about 58% higher than the charges in 2008 but was lower than \$200 per metric ton/20 cents per pound in 2005. The TC/RC was expected to remain low during the next 2 years. With low TC/RC fees, most of China's copper producers faced financial difficulties and relied on treatment of such byproducts as gold, silver, and sulfuric acid to increase revenue (China Metals, 2009d).



With the expansion of refining capacity in China and the high price of copper on the international market during the first half of 2008, the volume of copper imports was expected to decrease for the year. China imported 1.46 Mt of refined copper, mainly from Chile, Japan, and Kazakhstan, which was 2.4% less than in 2007. About 500,000 t of refined copper capacity was added in 2008, and production of refined copper increased to about 335,000 t in November and 301,000 t in December from 267,000 t in January. When the price of copper decreased sharply during the second half of 2008, many copper producers shut down their operations for maintenance, which also contributed to the decrease in the volume of copper imports. Given the high price, however, many domestic traders took advantage of price differences between the London Metal Exchange and the Shanghai Metal Exchange and imported a large quantity of copper in the latter part of the year. The SRB may have purchased as much as 700,000 t of copper from overseas during the second half of 2008 (China Mining and Metals Weekly, 2009a).

During the past several years, copper consumption in China increased by an average of more than 10% per year. The increase in copper consumption was caused by increased demand from the construction, electrical appliance, and power sectors. The power sector accounted for about 50% of the total copper consumption, and the demand was expected to continue to increase in the next several years as the electricity supply network throughout the country is expanded. In 2008, refined copper apparent consumption was estimated to be 4.81 Mt. The actual copper consumption in 2008 might have been lower. In 2008, local governments stockpiled a large volume of copper to support local producers. The stockpile policies of the SRB and the local governments were quite different. The SRB purchased metals and transferred them to its warehouses; local governments provided funds to producers for metals and minerals but the metals and minerals remained in the producers' warehouses (China Metals, 2009b).

Continental Minerals Corp. of Canada completed its feasibility study to develop the Xietongmen copper-gold project, which is located near the city of Rikaze (Xigaze or Shigatse), 240 kilometers (km) west of Lhasa, Xizang Autonomous Region. According to the feasibility study, the Xietongmen deposit contained proven and probable reserves of 182.1 Mt of ore at an average grade of 0.453% copper, 4.03 grams per metric ton (g/t) silver, and 0.62 g/t gold at a 0.15% copper cutoff. The feasibility study recommended a 40,000-metric-ton-per-day copper concentrator to process ore mined by the open pit method. Copper would be recovered by flotation to produce 530,000 t/yr of copper concentrates containing 25% copper, 5.9 t (190,000 troy ounces) of gold, and 53.8 t (1.73 million troy ounces) of silver. The capital cost was estimated to be \$476.2 million and the life of the mine was 14 years. Power for this project would be provided by the regional powerplant. A 250-km railway between Lhasa and Rikaze would be constructed. Concentrates would be trucked to either Lhasa or Rikaze and then shipped by railway to Jinchuan Nonferrous Metals Corp. in Jinchang, Gansu Province. Continental and Jinchuan signed an agreement for capital and equity financing, concentrate offtake, and necessary mine building support

for the Xietongmen project. The Government approved the conservation plan, environmental impact assessment, and reclamation report. The Industrial and Commercial Bank of China and the Standard Bank Group Ltd. would be the underwriters and mandated lead arrangers for the project's finance debt. Continental planned to apply for the mining license to develop the mine. The Government planned to invest about \$544 billion to upgrade the infrastructure of the area (Continental Minerals Corp., 2009).

The first-phase construction of the Yulong copper open pit mine at Dajiang County, Changdu (Qamdo) Prefecture, Xizang Autonomous Region, was partially completed in 2008. The Yulong deposit had proven reserves of 6.5 Mt of copper and 150,000 t of molybdenum, and the indicated copper resources could reach 10 Mt. Yulong Copper Co. Ltd. was established to handle the operation by Qinghai Western Mining Co. Ltd. (58%), Fujian Zijin Mining Co. Ltd. (22%) Xizang No. 6 Geology and Survey Team (10%); Changdu District State Owned Capital Management and Operation Co. (8%), and Xizang Mining and Development Corp. (2%). The first-phase operation was designed to produce 30,000-t/yr of copper by solvent extraction and electrowinning (SX-EW). The construction of a 10,000-t/yr copper leaching operation was completed in August, and an additional of 20,000-t/yr leaching operation would be completed in 2010. The company planned to have a total refined copper output capacity of 100,000 t/yr. The Yulong deposit had three ore bodies—No. 1, 2, and 5. The No. 1 ore body was sulfide ore, which accounted for 75% of the total reserves. The No. 2 ore body was oxide ore, and the copper content in the ore was as high as 4%. The No. 5 ore body contained both oxide and sulfide ore. The first phase of development was to mine the No. 2 ore body. Also, in Zhag'yab County, Changdu Prefecture, geologists discovered a 1-Mt copper content deposit (Copper and Nickel Monthly, 2008c; China Metal Bulletin, 2009c).

With Government approval to diversify its core operations, Chinalco reached a strategic cooperation agreement with the government of Yunnan Province to acquire a 49% share of Yunnan Copper Group Co. Ltd. Other shareholders were Yunnan Province State Asset Commission (47%), Yunnan Tin Group (2%), and Yunnan Investment Holding Group Co. Ltd. (2%) in 2007. In August 2008, Chinalco changed the name of Yunnan Copper to Chinalco Yunnan Copper Group Co. Ltd. Chinalco's equity at Yunnan Copper increased by 4% in 2008. Yunnan Copper subsidiary Kungpeng Co. Ltd. started the construction of a 100,000-t/yr copper anode plant in Liangshan County, Sichuan Province, in 2008, which included a 300,000-t/yr sulfuric acid plant and a 10,000-t/yr nickel plant. The construction was scheduled to be completed in 2010. Another Yunnan Copper subsidiary, Diqing Mining Co. Ltd., started producing copper cathode by SX-EW method at the Yangla copper mine (China Metals, 2008d).

Shandong Dongying Fangyang Group Co. Ltd. completed the construction of its 100,000-t/yr copper smelter in Dongying, Shandong Province. Jiangxi Copper Co. Ltd. was scheduled to complete the setup of a 50,000-t/yr Kaldor furnace from Outotec Co. of Finland and to expand its smelting capacity to increase the total refined copper output capacity to 900,000 t/yr from

700,000 t/yr in 2009. Ningbo-based Jintian Copper Co. Ltd. was expected to complete the construction of its 120,000-t/yr secondary smelting plant in Yingtan City, Jiangxi Province, in 2009. Hengyang Jinhua planned to build a 50,000-t/yr refined copper plant in Hengyang, Hunan Province. Daye Nonferrous Metals Co. Ltd. planned to double its refined copper output capacity to 400,000 t/yr in 2010. Xinjiang Xinwang Mining Co. Ltd. completed the construction of its 10,000-t/yr blister copper plant in Habahe County, Altay Prefecture, Xinjiang Uygur Autonomous Region, in 2008, and the company planned to join with Tongling Nonferrous Metals Group Holding Co. Ltd. to build a 50,000-t/yr blister copper plant in the same location. Zijin Mining Group started the construction of its 200,000-t/yr copper smelter in Shanghang, Fujian Province. Chifeng Jinjian Copper Co. Ltd., in which Tongling had a 51% equity interest, started the construction of a 100,000-t/yr copper smelter in Chifeng, Nei Mongol Autonomous Region.

**Iron and Steel.**—According to the State Council's iron and steel stimulus guidelines, crude steel output capacity reached 660 Mt/yr in 2008. The average output capacity of each steel producer was less than 1 Mt/yr. The top five iron and steel producers accounted for 28.5% of the country's total output. Most of the iron and steel producers produced low-value-added products and were located in inland cities. China was required to import high-value-added products. The Government's production target for crude steel in 2009 and 2011 was set at 460 Mt and 500 Mt, respectively, and the consumption of crude steel was set at 430 Mt and 450 Mt, respectively. The Government planned to retire all 300-cubic-meter blast furnaces and 20-t converters and electric arc furnaces (EAF) at yearend 2010 and 400-cubic-meters blast furnaces and 30-t converters and EAF at yearend 2011. Within 3 years, about 72 Mt/yr of ironmaking capacity and 25 Mt of steelmaking capacity would be eliminated. Privately owned iron and steel producers, which used small furnaces and converters for their operations, would be affected most by the Government's stimulus guidelines.

The Government's target was to eliminate all blast furnaces of less than 1,000 cubic meters in the future. The Government urged iron and steel enterprises to merge together in line with the government of Shandong Province's merging of the Province's two leading iron and steel companies—Jinan Iron and Steel Group and Laiwu Iron and Steel Group—to form the Shandong Iron and Steel Group. The newly merged company planned to build a 20-Mt/yr iron and steel plant in the coastal city of Rizhao. The Hebei Provincial government merged Handan Iron and Steel General Work (Hangang) and Tangshan Iron and Steel Co. (Tanggang) to form Hebei Iron and Steel Group.

The Government also urged iron and steel producers to create transregional enterprises, such as Baoshan Iron and Steel (Group) Corp.'s (Baogang Group) acquisition of Hangzhou Iron and Steel Co. and Ningbo Iron and Steel Co. Ltd. in Zhejiang Province and Bayi Iron and Steel Co. in Xinjiang Uygur Autonomous Region. Baogang Group joined with Guangdong Province's iron and steel enterprises to establish the Guangdong Iron and Steel Group Corp. The merger of Wuhan Iron and Steel (Group) Co. (Wugang) and iron and steel enterprises in Guangxi Zhuangzu Autonomous Region was another example.

The Government hoped that the consolidation would help the sector's efficiency; increase its bargaining power with suppliers of raw materials; and reduce competition within the sector. The Government planned to withhold 50 Mt of iron ore resources and to distribute them to large- and medium-sized iron and steel enterprises (Ministry of Industry and Information Technology, 2009a).

China was the world's leading producer of pig iron and crude steel. Domestic iron ore production could not meet domestic demand; therefore, China depended on iron ore imports to fill the gap. Imports of iron ore increased to more than 443 Mt in 2008, which was 15% more than in 2007. Australia, Brazil, India, South Africa, and Canada, in descending order of amount imported, were China's key iron ore suppliers. During the past 5 years, the volume of domestic iron ore output increased sharply; owing to the low iron content and high impurities of the ore, pig iron producers preferred imported ore. The iron ore supplied by domestic producers decreased to less than 50% of the demand in 2008 from 75% in the 1990s. About 50% of seaborne ore in the world was destined for China during the past 2 years. Owing to China's increased demand for iron ore, the contract prices of iron ore increased in 4 consecutive years, by 71.5% in 2005, 19.0% in 2006, 9.5% in 2007, and 65.0% to 96.5% in 2008 compared with each of the previous years. Owing to the rising production costs, the prices of domestic iron ore also increased during the past several years. The contract prices of iron ore were expected to decrease in 2009 because of the decrease in demand for steel products throughout the world (General Administration of Customs of the People's Republic of China, 2008).

Owing to the global financial crisis, the demand for steel products decreased sharply in the domestic and international markets during the second half of 2008. Monthly crude steel output decreased to about 38 Mt in December from 47 Mt in June and pig iron output also decreased to 36 Mt in December from 42 Mt in July. As a result, about 90 Mt of imported iron ore was stockpiled at 22 of China's major ports in December. The average price of imported iron ore was \$136.20 per metric ton; however, the average market price of deliverable Indian ore at a grade of 63% iron was less than \$90 per metric ton in November. Domestic iron ore at a grade of 66% iron decreased to 730 yuan (\$107) per metric ton in Hebei Province. China's iron ore mines that were under construction included Baiyunxi by Baotou Iron and Steel and Rare Earth Co., Huoqiu in Anhui Province, Luohe by Ma'anshan Iron and Steel Co., Sijiaying by Tanggang, Xingshan by Shoudu Iron and Steel (Group) Co. (Shougang), and Yuanjiacun by Taiyuan Iron and Steel Co. (Taigang). Jiangxi Geological Survey Institute reported the discovery of a 1-Gt magnetite iron ore deposit on the border of Angren and Cuoqin Counties, Xizang Autonomous Region. The ore grade was in the range of 50% to 60% iron. Hongda Group and Panzhuhua Iron and Steel (Group) Co. planned to develop the 3.8-Gt polymetallic iron ore deposit in Yanbian County, Sichuan Province. The iron content of the deposit was in the range of 30% to 50% (China Mining and Metals Weekly, 2008; China Iron and Steel Association, 2009).

Starting on January 1, 2009, China Iron and Steel Association would implement an iron ore import contract agent system to

regulate the import price of iron ore. Iron and steel producers would be allowed to import the needed volume. Traders would be allowed to charge 3% to 5% commission. Most of the small iron and steel producers did not participate in the long-term contract system and depended on certified traders to supply iron ore for their operations. The implementation of a contract agent system was expected to balance the supply and demand of iron ore on the domestic market.

The Chinese Securities Regulatory Commission approved the launch of steel futures contracts for rebar and wire rod at the Shanghai Futures Exchange. The wire rod contract would have a daily price change limit of 5%. The minimum deposit would be 7% of the contract value. Each lot would be 10 t with a minimum settlement unit of 300 t (China Economic News, 2009a).

With the Government's encouragement and approval, China's iron and steel producers looked overseas to secure iron ore supplies. China's state-owned iron and steel producers, such as Angang, Baogang, Shagang, Shougang, and Wugang, signed joint-development agreements with companies in Australia, Brazil, Canada, Kyrgyzstan, and Mongolia. Shougang, through its subsidiaries in Hong Kong, acquired a 40% share of Mount Gibson Iron. Ltd. in Australia. Wugang signed a memorandum of understanding with IronClad Mining Ltd. of Australia to jointly develop the Hercules and the Wilcherry Hill iron ore projects in South Australia. Wugang also acquired a 15% share of Australia's Centrex Metals Co. Discussion was underway between Wugang and Australian-listed Aquila Resources Ltd. to develop four iron ore projects in the Pilbara region in Australia. Wugang also discussed with Admiralty Resources NL of Australia to develop Admiralty's iron ore project in Chile. Angang and Gindalbie Metals Ltd. of Australia formed a 50-50 joint venture to develop the Karara iron ore project in Australia. Minmetals Mining Corp. Ltd., which was a subsidiary of state-owned trading company Minmetals Corp. (Minmetals), discussed with Toronto-listed Macarthur Minerals Ltd. the acquisition of additional share of the Lake Giles project in Australia. Shagang took a 47% share of Australian Bulk Minerals Ltd. (ABM). ABM solely owned the Savage River magnetite iron ore operation in Tasmania and held 70% ownership of the Southdown magnetite project in Western Australia. Sinosteel Corp., which was one of the leading iron ore traders in China, acquired shares of Midwest Corp. Ltd. and Murchison Metals Ltd. of Australia. Mylin Resources Group signed a memorandum of understanding with the Kyrgyzstan Government to prospect and develop the Dzhetym iron ore deposit near the border between Kyrgyzstan and China.

China was one of the fastest growing markets for stainless steel in the world. China's stainless steel production increased to 7.2 Mt in 2007 from 4.6 Mt in 2005. In early 2008, many analysts expected that China's stainless steel output would increase to 9 Mt. Owing to the global financial crisis and weak demand, the output of stainless steel decreased to 6.9 Mt but the output capacity reached 12 Mt/yr in 2008. Of the total output, the Cr-Ni series accounted for 50.6%; Cr series, 26.8%; and Cr-Mn series, 22.6%. In 2008, China imported 1.21 Mt of stainless steel and exported 1.06 Mt. The apparent consumption was about 7.1 Mt in 2008 compared with 7.5 Mt in 2007.

Starting on January 1, 2008, the Government increased the tariff to 10% from 5% on hot-rolled stainless steel coil with a thickness of less than 4.75 millimeters (mm) and hot-rolled stainless steel plate with a thickness less than 3 mm. The export volume of these products decreased by more than 50% in 2008 compared with the volume in 2007. As a result, many small downstream stainless steel producers shut down their operations, especially in the coastal areas, during the second half of 2008. The leading stainless steel producers were, in order of production capacity, Taigang, Baogang, Jiuquan Iron and Steel Co. Ltd., Zhangjiagang Pohang Iron and Steel Co., and Yieh United Iron and Steel Co. (China Metals, 2009a).

**Nickel.**—The production of stainless steel accounted for more than 60% of total nickel consumption, and electroplating accounted for 15%. The ferroalloy and battery sectors accounted for 8% and 5% of nickel consumption, respectively. Owing to the global financial crisis, China's stainless steel production and exports of nickel products decreased in 2008. The decrease in the export of nickel products was also caused by the Government's introduction of a 15% tariff rate on refined nickel exports and by the ban on processing trade of imported nickel concentrates in 2008. The Government planned to eliminate the ban on nickel processing trade on February 1, 2009. China's apparent consumption of nickel was about 378,000 t in 2008 (Copper and Nickel Monthly, 2009).

In China, nickel metal was produced from hydrometallurgical and pyrometallurgical processes. Before 2004, nickel metal was produced solely by the pyrometallurgical process, and the output of Jinchuan Nonferrous Metal Corp. accounted for 80% of the country's total. Owing to an increase in stainless steel production, the demand for nickel increased by more than 20% per year during the past 4 years. Because of limited nickel resources, China imported a large quantity of nickel from overseas, mainly from Indonesia, New Caledonia, and the Philippines. In 2008, China imported 12,318,022 t of nickel ore and concentrate, 25,253 t of nickel matte, and 9,600 t of refined nickel. Most of the imported ore was laterite ore, which contained less than 2% nickel. Between 2005 and 2007, the laterite was mainly used to produce nickel pig iron to substitute for the use of nickel metal in stainless steel production. During that period, prices of refined nickel on the domestic and international markets reached more than \$20,000 per metric ton and domestic nickel pig iron producers expanded their operations. The price of refined nickel started to decline in June 2008, and the price of domestic refined nickel decreased to 86,000 yuan (\$12,600) per metric ton in December from 240,000 yuan (\$35,300) per metric ton in January. The nickel pig iron production was energy-intensive, and the average production cost was 60,000 yuan (\$8,800) per metric ton. The nickel content in nickel pig iron was in the range of 2% to 5% and some might be as high as 8%. The nickel content in nickel pig iron can be used for the production of low-level nickel stainless steel products and for other products, which requires the addition of nickel metal to increase the nickel content. When the price of refined nickel decreased, many nickel pig iron producers shut down their operations because of the high production costs. Therefore, about 7.8 Mt of laterite ore was stockpiled in domestic ports at yearend (China Metal Bulletin, 2008a, 2009b).



In 2008, two Chinese companies employed acid leaching hydrometallurgy technology to produce electrolytic nickel from imported laterite ore. Jiangxi Jiangli New-Type Materials Co. Ltd.'s 10,000-t/yr-capacity nickel plant was located in Fenyi County, Jiangxi Province. Jiangli planned to expand nickel output to 100,000 t/yr in the future. Guangxi Yulin Weinie Co. Ltd. commissioned its stage one 5,000 t/yr nickel plant in June, and stage two would be completed in 2009. After completion, the company would have a total output capacity of 18,000 t/yr. The plant was located in Bobai County, Guangxi Zhuangzu Autonomous Region (Copper and Nickel Monthly, 2008a, b).

Vale Inco Ltd. of Canada invested \$63 million to build a nickel plant in Dalian, Liaoning Province. The plant was designed to produce 32,000 t/yr of Utility® nickel (a refined form of nickel), which was developed by Inco for use in the stainless steel sector. The construction of the plant was completed in 2008. Inco subsidiaries Korea Nickel Corp. and Taiwan Nickel Refining Corp. also produced this kind of nickel. The plant would be owned and operated by Vale Inco New Nickel Materials (Dalian) Co. Ltd., which was a Sino-foreign joint-venture company in which Inco held a 98% equity share and Ningbo Sunhu Chemical Products Co. Ltd. held a 2% share. Raw material would be supplied from Inco's Goro nickel project in New Caledonia (Vale Inco Ltd., 2007).

### **Industrial Minerals**

**Cement.**—China was the leading cement producing country in the world and accounted for almost 50% of the world's total. Even with the Government's restricted investment policy for the cement sector, cement output continued to increase. In 2008, the total investment in the cement sector was \$15 billion. The output capacity of cement increased by 150 Mt/yr, which was the highest rate increase since 2001. The per capita consumption of cement increased to about 1,000 kg in 2007 from 200 kg in 1990. Cement production was an energy-intensive industry, and the Government did not encourage exporting large amounts of cement. Therefore, the Government reduced the VAT export rebate to 11% from 13% in September 2006 and to 0% in July 2007. Cement exports decreased to 13.2 Mt in 2008 from 33.0 Mt in 2007 and 36.1 Mt in 2006 (China Cement Association, 2009).

During the past several years, the Government ordered cement producers to close down plants that used obsolete technology and encouraged cement producers to reshuffle the cement sector through mergers, regroupings, and takeovers. There were more than 6,000 cement producers in China in 2005, and the Government set the target of reducing the number of cement producers to 3,500 by 2010. In 2008, the use of dry rotary kilns for cement production increased to 61% from 14% in 2004 and was expected to increase to 70% in 2009. The use of a dry rotary kiln to produce 1 t of clinker consumed 115 kg of standard coal; a vertical kiln, 160 kg; and a wet kiln, 208 kg. About 70 Mt of obsolete production capacity was eliminated in 2007. China's demand for cement was expected to increase by 6% per year through 2012. The central and eastern parts of the country would remain the leading cement markets because of the increase in regional construction expenditures. The

northwestern and southwestern parts of China were expected to grow faster than in previous years because of the Government's development strategy for the western part of the country. Nonresidential construction would continue to be the leading end use for cement (China Construction News, 2008).

**Lithium.**—China had some of the largest lithium resources in the world. The country has abundant salt lakes, which accounted for 80% of the country's total lithium resources; however, most of the lakes are located in the western part of the country. Infrastructure in those areas was relatively undeveloped. Before 2004, the country's lithium carbonate was produced from either domestic or imported spodumene. The process required a large amount of energy because the grounded ore was calcined to 1,100° C. Purification was another technical challenge for this process. During the past decade, domestic scientists worked with foreign experts to develop technology to extract lithium from saline sources that contained high levels of dissolved magnesium ion. China's lithium carbonate output capacity was estimated to be about 20,000 t/yr in 2007. Lithium salts were used by battery, glass, ceramics, and lubricant sectors, of which the lithium battery industry had the fastest growth among these industries during the past decade, and this growth was expected to increase significantly in the future. China's demand for lithium salt has grown rapidly during the past several years, and lithium salt output capacity was expected to increase to 60,000 t/yr in 2010 (China Chemical Reporter, 2009).

Xizang (Tibet) Mining Co.'s subsidiary Zabuye Lithium High-Tech Co. Ltd. planned to expand its lithium salt output capacity by 20,000 t/yr. Zabuye Lake is located 4,421 meters above sea level in the north of Zhongba County, Rikaze District, which is located 1,050 km west of Lhasa, Xizang Autonomous Region. The total area of the lake was 247 square kilometers, and the brine contained 1,527 milligrams per liter of lithium. The lithium content of Zabuye was three times that at Dongtaijiaier Lake in Qinghai Province. In 2004, Zabuye had an output capacity of 7,500 t/yr of salt, which contained about 75% lithium carbonate. The salt was shipped to Baiyin Zabuye Lithium Co. Ltd. (a subsidiary of Zabuye), which was located in Baiyin, Gansu Province, for further separation and purification. The plant had an output capacity of 5,000 t/yr of lithium salt (3,000 t/yr of lithium carbonate and 2,000 t/yr of lithium hydroxide). Zabuye also planned to increase the separation plant output capacity to 25,000 t/yr. The total investment was estimated to be \$161 million. In 2008, Zabuye produced a total of 1,556 t of lithium carbonate and lithium hydroxide (China Chemical Reporter, 2009).

Galaxy Resources Ltd. signed a letter of intent with the local government to build a lithium carbonate plant in the Yangtze River International Chemical Industrial Park at Zhangjiagang, Jiangsu Province. Galaxy awarded a contract to Hatch Consulting Shanghai Co. Ltd. to perform a definitive feasibility study. The Urumqi Engineering and Research Institute of Nonferrous Metals would assist Hatch in this study. The raw material (spodumene) would come from Galaxy's Mount Cattlin lithium deposit in Ravensthorpe, Australia (Galaxy Resources Ltd., 2009).

**Rare Earths.**—China was rich in rare-earth resources and the country produced different kinds of rare-earth products. Since the 1990s, China had become the leading rare-earth



supply country in the world. During the past decade, China's rare-earth production accounted for about 90% of the world total. Rare-earth consumption in China had increased steadily. The country consumed about 73,000 t of rare earths in 2007 and 68,000 t in 2008 compared with 19,300 t in 2000. Rare earths was a strategic commodity in China. Foreign investors were prohibited from mining rare earths and were restricted from participating in rare-earth smelting and separation projects. Although China's total output capacity was huge, the average capacity for each producer was small. As a result, the profitability was low and the product quality was inconsistent between different shipments. Because of oversupply of rare-earth products in domestic markets, producers exported their products at prices that were less than their production costs, and they depended on the export VAT rebate to make up the difference to become profitable. In 2005, the Government cancelled the export VAT rebate and levied an export tariff of 25% on some rare-earth products (China Metal Bulletin, 2009d).

The dominant position of China's rare earths in the world was expected to become more important because of the wide range of cutting-edge environmental technology, such as wind turbines, low-energy light bulbs, and hybrid cars, that depend on rare-earth metals. Owing to an increase in domestic demand, the Government gradually reduced the export quota during the past several years. In 2008, domestic rare-earth producers were allocated a total of 34,156 t (in rare-earth oxide content), of which the first batch was 22,780 t and the second batch was 11,376 t. Sino-foreign joint-venture rare-earth producers were allocated a total of 8,210.5 t in 2008. The Government approved 23 domestic rare-earth producers and traders to have the right to perform rare-earth trading in China. Only 20 domestic rare-earth producers and traders were awarded export rights, and the first batch export quota was reduced to 16,043 t in 2009. Sino-foreign rare-earth producers were allowed to export a total of 6,685.1 t in 2009 (Ministry of Commerce, 2008d).

In 2002, the State Council approved the restructuring of the domestic rare-earth sector and the establishment of two regional groups—China Northern Rare Earth Group Co. and China Southern Rare Earth Group Co. Owing to the reluctance of local governments and rare-earth producers, the establishment of the two groups was unsuccessful. During the past several years, the Government continued to urge rare-earth producers to merge into several large groups and to eliminate duplicate projects. Rare-earth producers realized that the bitter competition among each other was causing financial losses and that integrating the rare-earth producers could benefit the rare-earth sector in China. In 2007, Rare Earth Hi-Tech Co. changed its name to Baotou Rare Earth Co. and started to discuss with other rare-earth producers in the Nei Mongol Autonomous Region the possibility of forming Baotou Rare Earth International Trading Co. and establishing a rare-earth concentrates reserve base in the Region. Mianning County in Sichuan Province was China's second ranked rare-earth producing base. In 2007, the local government shut down mining activities in Mianning County because miners were using obsolete technology to exploit and process rare earths and were causing environmental damage in the county. In 2008, Jiangxi Copper Corp. obtained rare-earth mining rights in Maoniuping, Mianning County, and planned to

use advanced mining and processing technology to produce rare earths (Precious and Minor Metals Monthly, 2008).

Dingnan Dahua New Materials Co. Ltd., Ganxian Hongjin Rare Earth Co. Ltd., and Minmetals Nonferrous Metals Co. Ltd. formed a joint-venture company, Minmetals Ganzhou Rare Earth Co. Ltd., to process rare-earth resources in Ganzhou, Jiangxi Province, in 2008. Most of China's ion-absorption type of rare earths was located in Ganzhou. There were 88 rare-earth producers in Ganzhou, and 90% of them ceased their operations because of weak prices. Jiangxi Province had an ion-absorption type of rare earths reserve of 2.3 Mt. Minmetals Ganzhou Rare Earth had a rare-earth separation capacity of 8,500 t/yr and planned to expand the separation capacity to 13,500 t/yr within 5 years. The joint venture also planned to develop value-added rare-earth products for the aerospace and electronics sectors (China Chemical Reporter, 2008).

China Nonferrous Metal Industry's Foreign Engineering and Construction Co. Ltd. (CNMI), Fengyuan Development Co. Ltd., Jiangsu Zhuoqun Nano Rare Earth Co. Ltd., and Shengchang Rare Earth Material Co. Ltd. jointly established a rare-earth company—China Nonferrous South Rare Earth (Xinfeng) Co. Ltd.—to build a 7,000-t/yr rare-earth separation plant in Shaoguan, Guangdong Province. Rare-earth operations at CNMI's Zhujiang Smelter in Guangzhou, Guangdong, Shengchang, and Zhuo Quo would be shut down when the Xinfeng plant started operation. The Government approved the establishment of the new company and the relocation plan of the Zhujiang smelter (China Nonferrous Metals, 2009b).

Guangdong Guangsheng Nonferrous Metals (Group) Co. Ltd.'s subsidiary Guangcheng Nonferrous Metals Co. Ltd. was the sole legal rare-earth mining company in Guangdong Province. The Government approved Guangcheng's application to list on the stock exchange and to consolidate eight rare-earth mining, smelting, and processing companies and five tungsten mining companies in Guangdong. Guangcheng had a rare-earth smelting and separation capacity of 8,000 t/yr (China Nonferrous Metals, 2009b).

China's companies were looking for rare-earth investments overseas. East China Exploration planned to acquire a 25% interest in Australia's Arafura Resources Ltd., which had the Nolans rare-earths-phosphate-uranium project in Northern Territory, Australia. China Nonferrous Metals Mining (Group) Co. Ltd. agreed to acquire a 51.6% interest at Lynas Corp. Ltd. Lynas's Mount Weld rare-earth mining project was under construction in Western Australia. If the transaction is completed, China would continue to be the globally dominant player in the rare-earth industry in the future (China Mining and Metals Weekly, 2009c).

### ***Mineral Fuels***

**Coal.**—China has undergone significant economic reform and has one of the world's fastest growing economies. Coal consumption has increased to meet the high demand for industrial production and power generation. Coal was the primary source of energy—two-thirds of the country's electricity was produced by coal-fired plants. About 50% of the country's total coal output was consumed by the power sector.

During the first 8 months of 2008, demand for coal was high, and the country faced a severe shortage of coal in the Provinces of Guizhou, Henan, Jiangxi, and Qinghai. The per metric ton price of 5,500-kilocalorie coal increased to more than 1,000 yuan (\$147) at Qinhuangdao Port, which the country's major coal transshipment port. Beginning in September, because of the global financial crisis, the demand for electricity declined. The price of coal also decreased to less than 600 yuan (\$88) per metric ton. At yearend, the country stockpiled about 200 Mt of coal, which was an increase of 35% compared with the amount stockpiled in 2007, of which 50.9 Mt was stored at the coal mine's warehouses; 43.3 Mt at powerplants; and 19.7 Mt at major port warehouses. The average coal selling price of major coal producers was 356.3 yuan (\$54) per metric ton and the production cost was 338.5 yuan (\$50) per metric ton. In 2008, the total fixed investment of the coal sector was \$35 billion. According to the China Coal Association, the country produced 27.16 Gt of coal, which was higher than that reported by the China Coal Trade and Development Association (26.9 Gt) and the NDRC (26.2 Gt). Owing to increased domestic demand, China's coal exports decreased to 45.43 Mt in 2008 from 53.17 Mt in 2007 to (in descending order by volume of exports) the Republic of Korea, Japan, and Taiwan. Coal imports decreased to 40.40 Mt in 2008 from 51.02 Mt in 2007, and were mainly from (in descending order by volume of imports) Vietnam, Indonesia, Mongolia, Australia, and North Korea (National Development and Reform Commission, 2009; Wang, 2009).

In the 1990s, the Government allowed coal producers to sell their products at market prices; however, the price of steam coal for powerplants was negotiated between coal producers and powerplant operators yearly under the Government guidelines; the coal was known as "planned coal." The Government set the price of electricity. In 2006, the Government allowed coal producers and powerplant operators to negotiate coal prices. In 2007 and 2008, the price of steam coal increased on the domestic and international markets, but the Government adjusted the electricity price only slightly. Owing to increased production costs, coal producers were unwilling to lower the price of coal, and power companies were not allowed to increase the electricity price. As a result, power companies faced significant financial losses during the past 2 years. In 2008, power companies and coal producers could not agree on the price of steam coal for 2009, and no contract was signed during the negotiation period. Eventually, under the Government's guidance, China's six leading power companies and coal producers agreed that the price of coal would be 10 yuan for every 100 kilocalorie, an increase of about 10% from that of the previous year. China's National Energy Administration (NEA) was the energy management agency; it did not oversee state-owned power companies, which were under the State-owned Assets Supervision and Administration Commission. The NEA's recommendation would be an important factor in the State Council's decision to approve negotiated contracts, however (China Energy Weekly, 2009c).

Shanxi Province was China's leading coal producing Province, and its coal output accounted for more than 20% of the country's total coal output. The Shanxi coal reserve

ranked third after Xinjiang Uygur Autonomous Region and Nei Mongol Autonomous Region. The government of Shanxi Province planned to consolidate state-owned coal producers into five enterprises—Datong Coal Mine Group, Jincheng Bituminous Coal Group, Lu'an Mining Group, Shanxi Coking Coal Group, and Yangquan Coal Industry Group—and China Coal Pingshuo Co., which was a subsidiary of China National Coal Group Corp. The enterprises would acquire surrounding coal producers. By yearend 2010, Shanxi would have four coal enterprises that each would have a coal output capacity of more than 50 Mt/yr and three coal enterprises that would have an output capacity of more than 100 Mt/yr each. These enterprises would account for 75% of Shanxi's total coal output. The total number of shafts in the Province would be less than 1,000 in 2011 from 2,600 in 2008, and each of them would have an output capacity of greater than 3 Mt/yr. The government of Shanxi Province encouraged locally owned coal producers to merge with other coal producers to create larger companies. The government of Henan Province also planned to consolidate its state-owned coal miners into two large enterprises. Nei Mongol Autonomous Region could replace Shanxi Province as the leading coal producing province in China by 2012. About 90 Mt/yr of coal output capacity was expected to be put into operation in 2009 (China Metal Bulletin, 2008b).

## Outlook

Even while recovering from a series of natural disasters and the global financial crisis, China's economy is expected to continue to grow in the near future. The Government set the economic growth rate target at 8% during next 2 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 sustainability of China's economic growth implies that strong demand for mineral commodities is likely to continue. China has shortages in the supply of most major minerals, such as bauxite, chromium, copper, iron, lead, manganese, nickel, oil, and potash, and relies on imports to meet the 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 has been promoting a reduction in resource dependency and the production of higher-value-added downstream products. The Government has not yet achieved great success in meeting this goal. As progress is made toward this goal, the country's dependence on most major mineral commodities could decline. For the near term, 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 become a major phenomenon 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 mining and metal enterprises is 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. Owing to ineffective enforcement through supervision and monitoring, however, 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<sup>1,2</sup>

(Metric tons unless otherwise specified)

Commodity <sup>3</sup>	2004	2005	2006	2007	2008	
<b>METALS</b>						
<b>Aluminum:</b>						
Bauxite, gross weight	thousand metric tons	17,000	22,000	27,000	30,000	35,000
Alumina	do.	6,990	8,540	13,700	19,500	22,800
<b>Metal, refined:</b>						
Primary	do.	6,900	7,800	9,360	12,600	13,200
Secondary	do.	1,660	1,940	2,350	2,750	2,700
Total	do.	8,560	9,740	11,700	15,400	15,900
<b>Antimony:</b>						
Mine, Sb content		125,000	152,000	153,000	163,000	166,000
Metal		125,000	138,000	140,000	147,000	183,000
<b>Bismuth:</b>						
Mine output, Bi content		3,000	3,000	1,520	3,500	5,000
Metal		11,700	10,600	11,800	12,100	12,000
Cadmium, smelter		4,530	4,080	3,790	4,210	4,300
Chromite, gross weight	thousand metric tons	200	200	200	200	200
<b>Cobalt:</b>						
Mine output, Co content		1,260	2,100	1,840	6,100	6,000
Metal		5,600	7,150	8,200	7,580	7,600
<b>Copper:</b>						
Mine output, Cu content		742,000	762,000	873,000	928,000	940,000
<b>Metal:</b>						
Smelter, primary	thousand metric tons	1,500	1,750	1,920	2,110	2,500
<b>Refined:</b>						
Primary	do.	1,580	1,850	2,000	2,400	2,700
Secondary	do.	620	750	1,000	1,200	1,400
Total	do.	2,200	2,600	3,000	3,600	4,100
Gold, mine output, Au content		215	225	245	275	285
Indium		200	300	350	320	310
<b>Iron and steel:</b>						
Iron ore, gross weight	thousand metric tons	320,000	420,000	601,000	707,000	824,000
Pig iron	do.	251,850 <sup>4</sup>	343,750 <sup>4</sup>	412,450 <sup>4</sup>	476,520 <sup>4,r</sup>	470,670 <sup>4</sup>
Ferroalloys	do.	8,670	10,700	14,300	17,500	18,300
Steel, crude	do.	272,800 <sup>4</sup>	353,240 <sup>4</sup>	419,150 <sup>4</sup>	489,290 <sup>4,r</sup>	500,490 <sup>4</sup>
Steel, rolled	do.	297,230 <sup>4</sup>	377,710 <sup>4</sup>	468,930 <sup>4</sup>	565,610 <sup>4,r</sup>	584,770 <sup>4</sup>

See footnotes at end of table.



TABLE 1—Continued  
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

Commodity <sup>3</sup>	2004	2005	2006	2007	2008
METALS—Continued					
Lead:					
Mine output, Pb content	998,000	1,140,000	1,330,000	1,410,000	1,550,000
Metal:					
Smelter, primary	1,460,000	1,790,000	2,090,000	2,040,000	2,200,000
Refined					
Primary	1,510,000	1,850,000	2,130,000	2,140,000 <sup>r</sup>	2,350,000
Secondary	430,000	537,000	590,000	650,000 <sup>r</sup>	850,000
Total	1,940,000	2,390,000	2,720,000	2,790,000 <sup>r</sup>	3,200,000
Magnesium, metal and alloy	442,000	470,000	520,000	625,000	559,000
Manganese:					
Ore, Mn content	1,100	1,500	1,600	2,000	2,200
Metal	492,000	566,000	730,000	1,000,000	950,000
Mercury, mine output, Hg content	1,140	1,100	760	800	800
Molybdenum, mine output, Mo content	38,500	40,000	43,900	67,700	81,000
Nickel:					
Mine output, Ni content	75,600	72,700	82,100	67,000 <sup>r</sup>	72,000
Matte	74,000	83,500	99,800	105,000	110,000
Smelter	75,800	95,100	102,000	116,000	129,000
Niobium and tantalum, mine output:					
Nb <sub>2</sub> O <sub>5</sub> content	105	110	120	270	300
Ta <sub>2</sub> O <sub>5</sub> content	320	310	440	920	900
Silicon, metal	750,000	840,000	900,000	950,000	980,000
Silver, mine output, Ag content	2,450	2,500	2,600	2,700	2,800
Tin:					
Mine output, Sn content	118,000	126,000	126,000	146,000	110,000
Metal	115,000	122,000	132,000	149,000	129,000
Titanium:					
Ilmenite, TiO <sub>2</sub> equivalent	420,000	450,000	500,000	550,000	550,000
Sponge	4,810	9,160	18,100	42,000	44,300
Tungsten, mine output, W content	59,900	51,200	45,000	41,000	43,500
Vanadium, in vanadiferous slag product	40,000	42,500	42,500	45,200	46,000
Zinc:					
Mine output, Zn content	2,390	2,550	2,840	3,040	3,200
Refined, primary and secondary	2,720	2,780	3,170	3,740	4,000
INDUSTRIAL MINERALS					
Asbestos	400,000	400,000	360,000	390,000 <sup>r</sup>	380,000
Barite	3,900	4,200	4,400	4,400	4,600
Bentonite	3,000	3,100	3,200	3,300	3,300
Boron, mine, B <sub>2</sub> O <sub>3</sub> equivalent	135,000	140,000	145,000	145,000	140,000
Bromine	80,000	104,000	124,000	130,000	135,000
Cement, hydraulic	970,000 <sup>4</sup>	1,068,850 <sup>4</sup>	1,236,770 <sup>4</sup>	1,361,170 <sup>4,r</sup>	1,388,380 <sup>4</sup>
Diatomite	390,000	410,000	420,000	420,000	440,000
Dolomite	7,500	7,800	8,000	8,000	8,000
Feldspar	1,800	1,900	1,950	2,000	2,000
Fluorspar	2,700	2,800	3,000	3,200	3,250
Graphite	700,000	720,000	720,000	800,000	800,000
Gypsum	29,000	32,000	4,200 <sup>r</sup>	4,800 <sup>r</sup>	4,600
Kaolin	7,000 <sup>r</sup>	7,720 <sup>r</sup>	7,520 <sup>r</sup>	7,380 <sup>r</sup>	3,850
Lime	140,000	150,000	160,000	170,000	175,000
Lithium minerals, all types	18,000	19,000	20,000	22,000	25,000
Magnesite	6,500	6,600	6,700	8,000	10,000
Nitrogen, N content of ammonia	34,770 <sup>4</sup>	37,850 <sup>4</sup>	40,660 <sup>4</sup>	42,480 <sup>4</sup>	41,140 <sup>4</sup>
Phosphate rock, P <sub>2</sub> O <sub>5</sub> equivalent	7,650	9,130	11,600	15,100	15,200
Potash, marketable, K <sub>2</sub> O equivalent	770	1,500	1,800	2,600 <sup>r</sup>	2,750

See footnotes at end of table.

TABLE 1—Continued  
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

Commodity <sup>3</sup>	2004	2005	2006	2007	2008
<b>INDUSTRIAL MINERALS—Continued</b>					
Rare earths, rare-earth oxide equivalent	98,000	119,000	133,000	120,000	125,000
Salt thousand metric tons	37,100 <sup>4</sup>	46,610 <sup>4</sup>	56,630 <sup>4</sup>	59,760 <sup>4</sup>	59,520 <sup>4</sup>
Sodium compounds:					
Mirabilite do.	6,300	6,300	6,500	6,600	6,600
Soda ash, natural and synthetic do.	13,024 <sup>4</sup>	14,211 <sup>4</sup>	15,600 <sup>4</sup>	17,650 <sup>4,r</sup>	18,540 <sup>4</sup>
Strontium carbonate	270,000	300,000	320,000	330,000	335,000
Sulfur:					
Native thousand metric tons	820	900	950	960	960
Content of pyrite do.	3,730	4,010	3,810	4,200	4,300
Byproduct, all sources do.	2,600	2,800	3,000	3,300	3,350
Total do.	7,150	7,710	7,760	8,460	8,610
Talc and related materials do.	2,200	2,300	2,400	2,000 <sup>r</sup>	2,200
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal:					
Anthracite thousand metric tons	464,000	487,000	442,000 <sup>r</sup>	450,000 <sup>r</sup>	460,000
Bituminous do.	1,450,000	1,670,000	1,780,000 <sup>r</sup>	2,000,000 <sup>r</sup>	2,150,000
Lignite do.	80,000	98,000	105,000 <sup>r</sup>	100,000 <sup>r</sup>	110,000
Total do.	1,990,000	2,260,000	2,330,000 <sup>r</sup>	2,550,000	2,720,000
Coke, all types do.	177,480 <sup>4</sup>	232,820 <sup>4</sup>	280,540 <sup>4</sup>	328,940 <sup>4</sup>	323,590 <sup>4</sup>
Gas, natural:					
Gross billion cubic meters	41	50	59	62	76
Marketed do.	34	42	51	52	66
Petroleum:					
Crude, including crude from oil shale million 42-gallon barrels	1,300	1,320 <sup>r</sup>	1,350 <sup>r</sup>	1,360 <sup>r</sup>	1,380
Refinery products do.	2,600	2,800	3,000	3,500	3,500

<sup>r</sup>Revised. do. Ditto.

<sup>1</sup>Estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Table includes data available through June 30, 2009.

<sup>3</sup>China also produces diamond, gallium, germanium, platinum-group metals, stone, and uranium, but available information is inadequate to make reliable estimates of output.

<sup>4</sup>Reported by China's State Statistical Bureau.

TABLE 2  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>3</sup>
Aluminum:			
Alumina	Chongqing Dingtai Tuoyuan Alumina Co.	Chongqing	150
Do.	Nanchuan Pioneer Alumina Co.	do.	200
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.	Guanxiangxia Aluminum Co. Ltd.	Hebei, Yicheng	200
Do.	Luoyang Wanji Xiangjiang Aluminum Co. Ltd.	Henan, Luoyang	800
Do.	Yixiang Aluminum Co. (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.	East 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.	Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	1,600
Do.	Shandong Huayu Alumina Co. Ltd. (Shandong Chiping Xinfu Aluminum and Electricity Group)	Shandong, Chiping	1,800
Do.	Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	1,500
Do.	Shanxi Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shanxi, Hejin	2,200
Do.	Shanxi Luneng Jinbei Aluminum Co. Ltd.	Shanxi, Yuanping	1,000
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 Shenhua 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	Liaoning, Fushun	190
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	250
Do.	East Hope Aluminum Plant	do.	330
Do.	Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	580
Do.	Qiaotou Aluminum Co. Electrolysis Branch	Qinghai, Datong	350
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 Xinfu Aluminum and Power Group	Shandong, Chiping	360
Do.	Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125
Do.	Shandong Nanshan Industry Co. Ltd.	Shandong, Longkou	280
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 Guanlu Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.	Yunnan Aluminum Plant	Yunnan, Kunming	500

See footnotes at end of table.

TABLE 2—Continued  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>3</sup>
Antimony		Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.		Xikuangshan Twinkling Star 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
Cadmium		Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	1
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.	Ningxia, Nei Mongol, and Shaan	150,000
Cobalt	metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	1,200
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.		Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	400
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	200
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Jiangsu, Zhangjiagang	200
Do.		Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	900
Do.		Dongfang Copper Co. (Huludao Nonferrous Metals Group)	Liaoning, Huludao	100
Do.		Chifeng Jingeng Copper Co. Ltd.	Nei Mongol, Chifeng, Harqin Banner	100
Do.		Dongying Fangyuan Nonferrous Metals Co. Ltd.	Shandong, Dongying	200
Do.		Shandong Jinsheng Nonferrous Metals Corp.	Shandong, Linyi	100
Do.		Shandong Yanggu Xiangguang Co. Ltd.	Shandong, Yanggu	400
Do.		Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	200
Do.		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	30
Do.		Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	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, Shaoguan	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.	Lincang Xinyuan Germanium Co. Ltd.	Yunnan, Lincang	30
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	10

See footnotes at end of table.



TABLE 2—Continued  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>3</sup>
Gold, refined	metric tons	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	18
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
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
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	Laibin Smelter [Liuzhou Huaxi (China Tin) Group Co.]	Guangxi, Laibin	100
Do.	do.	Liuzhou Zinc Products Co.	Guangxi, Liuzhou	20
Do.	do.	Yuguang Gold-Lead Co. Ltd.	Henan, Jiyuan	10
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	30
Do.	do.	Yunnan Mengzi Mining and Smelting Co. Ltd.	Yunnan, Honghe	50
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, Handan	3,800
Do.		Tangshan Iron and Steel 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
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhuhua 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 (Handan)	Hebei, Handan	10,000
Do.		Shougang Qianan Iron and Steel Co. Ltd. (Shougang)	Hebei, Qianan	4,500
Do.		Tangshan Iron and Steel Co. (Taigang)	Hebei, Tangshan	12,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	12,000

See footnotes at end of table.

TABLE 2—Continued  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>3</sup>
Iron and steel—Continued:			
Crude steel—Continued	Shagang Group Co. Ltd.	Jiangsu, Zhangjiagang	30,000
Do.	Anshan Iron and Steel (Group) Co. (Angang)	Liaoning, Anshan	16,000
Do.	Benxi Iron and Steel Co. (Bengang)	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, Jinan	10,000
Do.	Shandong Laiwu Iron and Steel Group Co.	Shandong, Laiwu	10,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	5,000
Do.	Panzhuhua 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, Shaoguan	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 Nonferrous Smelter	Henan, Jiaozuo	100
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	300
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.	Kunming Smelter	Yunnan, Kunming	100
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	100
Lithium, LiCO <sub>3</sub>	Baiyin Zabuye Lithium Co. Ltd. (Zabuye Lithium High-Tech Co. Ltd.)	Gansu, Baiyin	5
Do.	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Sichuan Tianqi Lithium Industry Co. Ltd. (Chengdu Tianqi Group Co. Ltd.)	Sichuan, Suining	7
Do.	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Golmud	10
Do.	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

See footnotes at end of table.

TABLE 2—Continued  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>3</sup>	
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	120	
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.	Xinjiang Fukang Smelter	Xinjiang, Fukang	15	
Do.	Xinjiang Xinxin Mining Co. Ltd.	Xinjiang, Fuyun	7	
Do.	Yuanjiang Nickel Industry Co. Ltd.	Yunnan, Yuxi	5	
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.	Nanghai East Corp.	Nanghai	5,000	
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Charhan	2,000	
Rare earths	Gansu Rare Earths Co.	Gansu, Baiyin	32	
Do.	Jiangxi Rare Earths Co.	Jiangxi, Nanchang	1	
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5	
Do.	Baotou Iron and Steel and Rare Earths Corp. (Baogang Group)	Nei Mongol, Baotou	55	
Do.	Shanghai Yaolong Nonferrous Metals Co.	Shanghai	2	
Salt	Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400	
Do.	Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250	
Silver	metric tons	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	80
Do.	do.	Daye Nonferrous Metals Co.	Hubei, Daye	100
Do.	do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	600
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	415
Do.	do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	80
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	80
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	300
Do.	do.	Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	450
Strontium, carbonate	Chongqing Chonglong Strontium Co. Ltd.	Chongqing	20	
Do.	Chongqing Tongliang Redbutterfly Strontium Co.	do.	120	
Do.	Hebei Xinji Chemical Group	Hebei, Xinji	130	
Do.	Nanjing Jinyan Strontium Co. Ltd.	Jiangsu, Lishui	20	
Talc	China National Nonmetallic Industry Corp.	Guangxi, Longshen	130	
Do.	do.	Liaoning, Haicheng	50	
Do.	do.	Shandong, Qixia	5	
Tin, smelter	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	25	
Do.	Pinggui Mining Bureau	Guangxi, Zhongshan	8	
Do.	Nanshan Tin Co. Ltd.	Jiangxi, Ganzhou	10	
Do.	Yunnan Tin Industry Co.	Yunnan, Gejiu	55	
Titanium, sponge	Guizhou Southwest Titanium Co. Ltd.	Guizhou, Guiyang	3	
Do.	Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	14	
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.	3	
Do.	Fushun Titanium Co. Ltd.	Liaoning, Fushun	5	
Do.	Jinzhou Huashen Nonferrous Metals Plant	Liaoning, Jinzhou	4	
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	

See footnotes at end of table.

TABLE 2—Continued  
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies <sup>1</sup>	Location of main facilities <sup>2</sup>	Annual capacity <sup>e</sup>
Zinc	Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoguan	180
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.	Nei Mongol, Bayannar League	220
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	160

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

<sup>1</sup>Most companies are owned by either the central Government or a Provincial government.

<sup>2</sup>Listed by Province or Autonomous Region, followed by locality.



TABLE 3  
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2008

Commodity	Quantity (metric tons)	Value (thousands)
<b>METALS</b>		
<b>Aluminum:</b>		
Alumina	44,142	\$29,558
<b>Metal and alloys:</b>		
Unwrought	841,292	2,136,194
Semimanufactures	1,900,000	6,366,035
Antimony metal, unwrought	9,453	52,680
Barium sulfate	3,840,000	200,991
<b>Copper, metal and alloys:</b>		
Unwrought	102,724	854,036
Semimanufactures	517,522	4,157,241
<b>Iron and steel:</b>		
Pig iron and cast iron	250,000	127,921
<b>Steel:</b>		
Bars and rods	12,620,000	11,540,374
Shapes and sections	3,650,000	3,313,761
Sheets and plates	28,790,000	29,267,799
Tube and pipe	1,340,000	3,004,565
Scrap	204,217	94,796
Manganese, unwrought	240,547	852,925
Molybdenum, ores and concentrates	23,626	867,249
Rare-earth products	54,963	687,770
Tin, metal and alloys, unwrought	559	11,306
Tungsten, tungstates	5,421	115,602
<b>Zinc:</b>		
Metal and alloys, unwrought	71,320	147,442
Oxide and peroxide	32,779	61,743
<b>INDUSTRIAL MINERALS</b>		
Cement	26,040,000	1,098,795
Fluorspar	660,000	190,606
Granite	1,210,000	188,256
Graphite, natural	600,000	163,980
Magnesia, fused	2,270,000	335,326
Talc	690,000	123,469
<b>MINERAL FUELS AND RELATED MATERIALS</b>		
Coal	45,430,000	5,240,265
Coke, semicoke	12,130,000	5,807,369
<b>Petroleum:</b>		
Crude oil	4,160,000	2,979,552
Refinery products	17,030,000	13,665,164

Source: General Administration of Customs of the People's Republic of China, 2008, China monthly exports and imports, no. 12.

TABLE 4  
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2008

(Metric tons unless otherwise specified)

Commodity	Quantity	Value (thousands)
<b>METALS</b>		
Aluminum:		
Alumina	4,590,000	\$1,775,694
Metal and alloys, unwrought	260,102	564,138
Semimanufactures	618,620	3,188,836
Scrap	2,150,000	2,540,178
Chromium, chromite	6,480,000	2,714,382
Copper:		
Ore and concentrates	5,190,000	10,440,152
Anode	197,571	1,404,611
Metal and alloys, unwrought	1,702,039	11,660,119
Semimanufactures	934,950	7,567,250
Scrap	5,580,000	5,969,151
Iron and steel:		
Iron ore	443,560,000	60,531,628
Steel:		
Bars and rods	960,000	1,516,407
Scrap	3,590,000	2,467,387
Seamless pipe	1,060,000	4,144,345
Shapes and sections	330,000	370,277
Sheets and plates	12,730,000	16,011,819
Manganese ore	7,570,000	3,469,752
Nickel:		
Ore and concentrates	12,318,022	2,064,439
Metal	9,600	248,459
Titanium dioxide	250,651	526,263
<b>INDUSTRIAL MINERALS</b>		
Diamond	kilograms 3,388	3,025,786
Fertilizers:		
Compound fertilizers	640,000	402,556
Diammonium phosphate	100,000	126,104
Potassium chloride	5,140,000	2,831,054
Potassium sulfate	110,000	46,309
Urea	67	97
<b>MINERAL FUELS AND RELATED MATERIALS</b>		
Coal	40,400,000	3,509,106
Petroleum:		
Crude oil	178,880,000	129,334,996
Refinery products	38,850,000	30,044,320

Source: General Administration of Customs of the People's Republic of China, 2008, China monthly exports and imports, no. 12.

TABLE 5  
CHINA: RESERVES OF MAJOR MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Antimony, Sb	950
Barite, ore	million metric tons 100
Bauxite	do. 750
Bentonite	do. 890
Chromite, ore	5,800
Coal	billion metric tons 330
Copper, Cu	29,000
Fluorite, mineral	34,000
Gas, natural	billion cubic meters 3,200
Gold, Au	metric tons 1,900
Graphite, mineral	55,000
Iron ore, ore	million metric tons 22,000
Kaolin, ore	do. 650
Lead, Pb	13,000
Magnesite, ore	million metric tons 1,900
Manganese, ore	do. 220
Mirabilite, Na <sub>2</sub> SO <sub>4</sub>	do. 10,000
Molybdenum, Mo	4,300
Nickel, Ni	3,000
Petroleum	million metric tons 2,800
Phosphorus, ore	do. 3,700
Potash, KCl	340,000
Rare earths, rare-earth oxide	18,000
Salt, NaCl	billion metric tons 190
Silver, Ag	43
Sulfur, natural, S	240
Talc, ore	million metric tons 120
Tin, Sn	1,500
Tungsten, WO <sub>3</sub>	2,400
Vanadium, V <sub>2</sub> O <sub>5</sub>	13,000
Zinc, Zn	42,000
do. Ditto.	