

THE MINERAL INDUSTRY OF

CHINA

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In 2002, the growth rate of the gross domestic product (GDP) was 8%, which was higher than the 7.8% average of the past 5 years. Strong exports and Government spending were the main components of growth. During 2002, in its first year as a member of the World Trade Organization (WTO), China emerged as the leading destination for foreign direct investment (FDI). Compared with 2001, FDI increased by 12.5% to a record high of \$52.7 billion, and contractual foreign investment (an indicator for future trends) grew by more than 19% to \$82.8 billion. The capital inflow helped China upgrade its technological capacity. The total fixed investment in China reached \$522.4 billion in 2002 (China Daily, 2003a).

The structure of the Chinese economy has undergone significant changes in the past decade, but the changes have been accompanied by increasing unemployment, dislocation, and a growing migrant workforce. Although the official unemployment rate was only 3.6% in the cities in 2001, analysts estimated that the unemployment rate was more than 7% of the urban workforce, or an estimated 25 million people (China Statistical Yearbook, 2002, p. 117). This estimate did not include about 150 million surplus workers in the rural areas. An average 12 million new workers will enter the labor market each year. The Government hoped to create more employment opportunities in the central and western Provinces; rural enterprises, however, would be unlikely to absorb the unemployed workforce in these areas. The development of the rural economy has become a difficult task for the Central Government and will affect the economy as a whole (Citigroup Global Market Inc., 2003, p. 4; Far Eastern Economic Review, 2003).

During the National Congress in November 2002, the 16th Central Committee of the Communist Party of China (CPC) set the goal to maintain the country's economic growth rate at 7% per year for the next 10 years and to provide a quality living environment for its people. China's rapid economic growth posed a major challenge for the management of its natural environment. Land degradation, deficiency in quality and distribution of the available water, high levels of air pollutants, and declining natural forests and mineral resources threatened the sustainability of long-term growth. China had shortages in most major minerals, such as chromium, copper, iron, nickel, and oil, and relied on imports to meet the demand. Since the Government transformed the management of the economy from central planning to a "socialist acceptable market economy" (a Chinese term) in 1993, funds for geologic surveys have been reduced sharply. In 2001, the Government issued guidelines to allow foreign enterprises to conduct mineral exploration in China and allowed explorers to extract mineral resources discovered within exploration areas, hoping to attract more foreign investors to participate in the search for minerals in China, especially in the western part of the country. Because of the hazardous environment, most of minerals in the western part of the country have not been tapped. Geologists estimated that the inland Provinces have about 50% of the country's mineral resources and 85% of the untapped mineral resources, such as coal, copper, iron, natural gas, nickel, phosphate rock, potassium, sodium, and strontium. Also, most Chinese mines were mined down to 500 meters (m) below the surface, and the use rate of mineral resources was lower than that of western countries (China Daily, 2003b).

Government Policies and Programs

During the 16th CPC meeting, political power was transferred from the so-called "Third Generation" of leaders to the "Fourth Generation." A new administration will take office at the 10th National People's Congress (NPC) in March 2003 followed by the transition of personnel from lower to higher offices at central and provincial levels. The number of Ministry-level departments under the State Council will be reduced to 28 from 29. The State Development Planning Commission (SDPC) will be renamed as the State Development and Reform Commission (SDRC) and will be put in charge of the country's economic restructuring. The Ministry of Foreign Trade and Economic Cooperation (MOFTEC) was in charge of foreign trade, and the State Economic and Trade Commission (SETC) and the SDPC were in charge of domestic economic planning and trade. During the transition period, the MOFTEC and the SETC will be abolished, and the Ministry of Commerce will be established and will take over all trade issues. A State Assets Supervision and Management Commission (non-Ministry level) will be established to absorb the relevant functions of the SETC.

The CPC Central Committee Enterprise Commission, and the Ministry of Finance will focus on the management of state-owned enterprises that are under the Central Government; these exclude financial institutions and other state assets, such as land, natural resources, and public service units. The State Family Planning Commission will be renamed the State Population and Family Planning Commission. Under the restructuring plan, the State Council will establish a commission to regulate the banking and financial sector. The State Administration of Work Safety will oversee mining and production safety. The Government also abolished the State Gold Bureau and transferred its functions to the SDRC and the China Gold Association (Business Weekly, 2002, 2003a).

The Government urged the NPC to amend the mineral resources law in 2003. The law was enacted in 1986 and was amended in 1996. The Government believed that the changes were necessary to attract foreign investment in mineral development and production in China. The proposed changes may redefine mineral rights. In the 1996 and 1986 versions, all minerals above and under the surface belonged to and were controlled by the State. In 2000, the State Council issued a decree to allow foreign investors to establish wholly owned mining companies to prospect for and to exploit minerals in China; owing to a lack of clarity in regulations and legal

definitions, however, exploration companies were reluctant to invest large amounts in China. Under the current law, prospectors have mining rights, but the law does not explain clearly how such rights can be guaranteed. In addition, local governments have been known to charge higher taxes and fees for foreign companies to explore in their jurisdictions (China Land and Resources News, 2002e).

The Government also planned to amend the current Foreign Trade Law, which was enacted in 1994. The proposed amendment will explain the implication of trade promotion and how to implement it. After becoming a member of the WTO, the Government's function shifted from managing specific operations of enterprises to ensuring fair and orderly competition and to protecting domestic enterprises when they face discrimination or injury in foreign trade. Intellectual property rights, state trade, and tariff quotas will be incorporated into the new version of the Foreign Trade Law (China Daily, 2002b).

The Government decided to break up the monopoly of the State Power Corp. In December 2002, the Government established the following power-generating groups: the Datang Group, the Huadian Group, the Huaneng Group, the Longyuan Group, and the Power Investment Group. The State Power Regulatory Commission, State Power Grid Company, and South China Power Grid Company also were formed. State Power Grid Company is in charge of the following regional grid companies: Central China (including Sichuan Province and Chongqing City), East China (including Fujian Province), North China (including Shandong Province), Northeast China (including the eastern part of Nei Mongol Autonomous Region), and Northwest China. South Power Grid Company provides for the Provinces of Guangdong, Guizhou, Hainan, and Yunnan and the Guangxi Zhuang Autonomous Region. In northeastern China, the Provinces of Fujian and Hainan have surplus installed electricity generation supply capacity. Power supply and demand in North China, East China, Shandong, Guangxi Zhuang Autonomous Region, and the provinces of Guizhou and Yunnan is balanced; however, Shanghai City and the Provinces of Guangdong and Zhejiang face a power supply shortage (China Economic News, 2003).

Production

China was one of leading countries in the production of aluminum, antimony, bismuth, cement, coal, copper, fluorspar, gold, graphite, iron and steel, lead, magnesium, molybdenum, phosphate rock, rare earths, silver, talc, tin, tungsten, and zinc. In 2002, China produced a total of about 11 million metric tons (Mt) of aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc; this total was a 13.6% increase compared with that of 2001. The growth of output was expected to continue in the future, especially for aluminum and copper.

In the past several years, aluminum metal output increased sharply. In 2003, primary aluminum was expected to reach 5.4 Mt. Aluminum metal output capacity will be expanded to more than 7 million metric tons per year (Mt/yr). According to the companies' expansion and greenfield plans submitted to the Government for approval, China will have an aluminum production capacity of about 10 Mt/yr in 2006. With the rapid increase of aluminum production, the ability of domestic alumina producers to meet demand will be much more difficult. In 2002, China imported about 4.6 Mt of alumina, which accounted for about 46% of the total demand. The strong demand for alumina by aluminum smelters will affect domestic and international market prices of alumina. Aluminum Corporation of China (Chalco) (the sole metallurgical-grade alumina producer in China) increased the alumina price to 2,600 yuan (\$314) per metric ton at yearend from 1,930 yuan (\$233) per ton at the beginning of the year. The trend of alumina price increases was expected to continue in 2003. Chinese aluminum smelters also faced electricity price increases because of power shortages in many areas of the country. To reduce production costs, aluminum smelters formed alliances with power/coal companies to ensure receipt of preferential electricity supply and prices. In 2002, the average power price was 0.31 yuan (\$0.04) per kilowatt-hour; those smelters that received preferential power rates from the Government or power companies, however, paid less than 0.2 yuan (\$0.02) per kilowatt-hour. Analysts anticipated that power supply throughout the country will tighten in 2003; this may affect the aluminum production in the northwestern and eastern parts of China. In 2002, supply exceeded domestic demand, and China became a net exporter of aluminum and its alloys by a total of 206,087 metric tons (t) (Alumina and Aluminum Monthly, 2003b; China Metals, 2003a).

Owing to economic expansion, the production and consumption of copper in China continued to increase. Since 1990, copper consumption in China increased by an average of 9% per year. In 2002, China's copper consumption was estimated to be 2.6 Mt and accounted for about 17% of the world total. Per capita copper consumption remained low compared with other developed areas, such as the United States, Japan, and Western Europe; China's copper consumption, however, was expected to increase continuously in this decade. Copper consumption increased because demand from the construction, electrical appliances, and power sectors increased. The output of domestic copper mines could meet only about 45% of the copper smelters' needs; therefore, China was required to import a large quantity of copper concentrates from, in order of quantity received, Chile, Mongolia, Australia, and Peru. Refined copper was imported mainly from Chile, Kazakhstan, Japan, and Russia, and copper scrap was imported from Japan, the United States, and Hong Kong (imported from other countries and re-exported to China). In 2002, China imported 3.08 Mt of copper scrap, 2.07 Mt of copper concentrates, and 1.18 Mt of refined copper. Even though geologists have discovered several mid-sized copper deposits in the western part of the country recently, mine output was expected to remain at its current level during this decade, and the gap between supply and demand would become larger. In the future, China will overtake Japan as the largest copper concentrates importer in the world. If the supply of copper concentrates in the international market becomes tight, then some Chinese copper producers may be forced to shut down part of their operations. The output of refined copper was expected to increase to 1.9 Mt in 2003 (Copper and Nickel Monthly, 2003b).

Gold production continued to expand in 2002. In the newly issued foreign investment guidelines, gold and other precious metals were moved from the category of “forbidden investment” to the category of “limited investment,” which means that the Chinese gold sector was conditionally open to foreign investors. Gold manufacturing in China used relatively low-level technology, and advanced technology and modern management were required to improve its productivity. Of the 4,000 t of gold resources, about one-fourth required advanced technology for processing. Because of the monopoly policy, many foreign investors hesitated to participate in the Chinese gold mining sector. In 2002, China was the third largest gold consumer in the world behind India and the United States (China Daily, 2002c).

China’s iron ore production rebounded from a 4-year decline and posted a slight increase in 2002. Beginning on April 1, 2002, the resource compensation tax for state-owned iron ore producers was reduced to 5 yuan (\$0.60) per ton from 15 yuan (\$1.81) per ton. Independent iron ore producers had enjoyed the lower compensation tax since 1995. The reduction of the resource compensation tax would help state-owned iron ore producers invest more funds in the technical renovation of their mines and search for more iron ore resources in their mining areas. Because of the upgrade of ore-dressing processes in many plants, the recovery rate of iron ore fine concentrate improved by an average of 1% in 2002. Mining companies were more willing to develop new mines. Ma’anshan Iron and Steel Co. commissioned its Gaocun Mine in 2002. Three new mines—Beiminghe in Hebei Province, Laixin in Shandong Province, and Tianhu in Xinjiang Uygur Autonomous Region—were put into operation. The Government expected that an additional 30 Mt of iron ore output capacity would come onstream to maintain the total iron ore output at the current level during the next several years. In recent years, China became the driving force in the international iron ore market. The world’s largest iron ore producers, such as Companhia Vale do Rio Doce (CVRD), Rio Tinto plc, and BHP Billiton Ltd., increased their output to meet the global demand. Iron ore imports to China were expected to increase continuously during the next several years, and China would replace Japan as the leading iron-ore-importer in the world (China Metallurgical News, 2002b; China Metals, 2003b).

Contrary to many analysts’ predictions, the production of lead and zinc continued to increase in 2002, and China’s net imports of zinc and lead concentrates increased to 781,000 t and 389,000 t, respectively. The Government continued its crackdown on illegal mining activities in the Guangxi Zhuang Autonomous Region and Yunnan Province, which led to reduced supplies of lead and zinc concentrates. The depressed metal market had a great influence on mining operations. The shortage of concentrates in China forced lead and zinc producers to increase their reliance on imported raw materials. Zinc producers, such as Huludao Zinc Smelting Co., Liuzhou Zinc Products Factory, and Zhuzhou Smelter, expressed their concerns about the shortage of concentrates. Huludao closed its No. 3 plant in July 2001 and has not reopened it, and two zinc smelters in Yunnan Province were closed in early 2002. The output of the largest zinc producers—Zhuzhou, Huludao, Shaoguan Smelter, and Baiyin Smelter—decreased by an average of 9% each. Other local-owned producers that owned mines, however, increased their output. The shortage of the supply of lead and zinc concentrates was expected to continue in 2003, although the output of lead and zinc concentrates may increase slightly because the Government approved the resumption of the mining operation in Nandan. Apparent lead and zinc consumption in China continuously grew in the past decade except in 1997. Owing to an increase in domestic demand and depressed zinc prices in the international market, zinc exports experienced consecutive years of decline. Owing to the shortage of concentrates, low refining charges, and treatment charges in the international market, some Chinese lead and zinc producers could face a very difficult decision to either operate at a loss or shut down their smelters in 2003 (China Metals, 2003e; Lead, Zinc and Tin Monthly, 2003a; Mining Journal, 2002b).

Trade

China’s economic reform has been underway for more than 20 years. Beginning in the 21st century, China increased its integration with the international community, and the WTO accession in 2001 accelerated the significant reform trade programs already in place. Although some barriers still remain, Western countries will find it easier to enter the Chinese market. China agreed to implement tariff cuts, two-thirds of which will be implemented by 2004, and the remainder, by 2006. Tariffs will decrease to an average 9.44% in 2006 from 24.6% in 1997. The sectors that will be significantly affected will be automotive, chemical, gem and jewelry, information technology products, and medical equipment.

During 2002, the Chinese Government took steps to implement many of its specific WTO commitments. The Government reviewed 2,500 trade-related laws and regulations for WTO consistency. About 830 of these laws and regulations were repealed, and 325 were amended. Similar reviews also were taking place at the local level. In 2002, the Government amended the copyright law, the intellectual property rights law, and the trademark law and issued a series of new implementing rules. The changes made by China generally were consistent with international norms in most key areas. As part of the WTO accession agreement, China committed to provide full information on the pricing mechanisms of state trading enterprises and to ensure that their import-purchasing procedures were transparent and fully in compliance with WTO rules. China agreed to phase in full trading rights for wholly Chinese-invested enterprises, foreign-invested enterprises, and individuals within a 3-year period. The Government retained the sole right to export a relatively small number of goods, such as crude and processed petroleum and chemical fertilizers.

The MOFTEC issued a list of commodities, which included some ferrous and nonferrous metals, that required export quota license control in 2003. Mineral commodities that were on the Government’s monitor list were ammonium paratungstate; bauxite and refractory clay; coke; concentrates of antimony, tin, tungsten, and zinc; oxides of antimony and tungsten; rare earths; refractory magnesium; silver; and unwrought tin and zinc. The Government adjusted the 2003 export quotas for coal to 100 Mt; coke, 11 Mt; magnesia, 1.3 Mt; fluorspar, 850,000 t; talc, 650,000 t; zinc and zinc products, 600,000 t (metal content); silicon carbide, 230,000 t; antimony and antimony products, 67,000 t (metal content); tin and tin products, 65,000 t (metal content); rare earths, 40,000 t (rare-

earth oxide equivalent); tungsten and tungsten products, 16,300 t (metal content); and silver, 2,200 t (Ministry of Foreign Trade and Economic Corp., 2002).

According to the Customs statistics, total trade was valued at \$620.8 billion in 2002; this was an increase of 21.8% compared with that of 2001. Exports posted an increase of 22.3% to \$325.6 billion, and imports went up by 21.2% to \$295.2 billion. Asian countries, which were China's largest export market, accounted for 52.3% of total exports followed by North America with 22.8% (the United States accounted for 22.5%). The iron and steel trade was valued at \$16.9 billion; nonferrous metals, \$11.3 billion; and nonmetallic minerals, \$9.1 billion. The importing of minerals and metals increased by more than 20% (General Administration of Customs of the People's Republic of China, 2002).

The Government will eliminate border trade on metal products in 2003. Under the border trade system, the tariff duty and value-added tax (VAT) charged was one-half of the normal rate. The border trade VAT on imports of concentrates would not change. In 1996, the Government set up a border trade system to encourage economic development in border areas. The intention was to import small amounts of materials that would be consumed within the border areas. In 2002, China imported about 500,000 t of aluminum through border trade, mainly from Russia; this accounted for more than two-thirds of the total aluminum imports. In 2002, refined copper imported through border trade accounted for about one-half of the total imports; imports from Kazakhstan doubled between 2002 and 2001. During that period, other metals also increased sharply (China Metals, 2003c).

Commodity Review

Metals

Aluminum.—The Central Government was trying to apply strict controls over the expansion of the aluminum sector, and Provincial and local governments were trying to increase employment, to promote social stability, and to reduce social payments. The State Council issued a circular to inform local governments that the Central Government would not support any new greenfield or expansion of aluminum projects, but would support only those projects that would replace obsolete Soderberg cells. Local governments were directed not to approve any greenfield projects without consulting the Central Government. Aluminum producers replaced most highly polluting tiny Soderberg cells with large prebaked cells.

Domestic aluminum market prices were at the 14,000 yuan (\$1,693) per ton level throughout the year. Chinese aluminum producers exported more aluminum and maintained the domestic market price of aluminum at 2002 levels in 2003; increased exports of aluminum from China, however, would be expected to affect the aluminum price in the international market (China Nonferrous Metals News, 2002f).

The Government approved the establishment of the Aluminum Industry Group of China. This new group of 67 members included Chinese aluminum producers, construction companies, research and design institutions, and trading companies. Chalco was the core of the group, and its subsidiaries were the closest knit members. The remaining members were either semiclose or loosely connected. Primary aluminum output from members of the Group accounted for about 70% of the country's total in 2002. The Government believed that forming a large enterprise such as this would help domestic aluminum producers compete in the international market, prevent internal competitiveness, and stabilize the domestic market price. The Group could serve as a channel for communication between the aluminum sector and the Government. It also could serve as a focal point to maximize the country's resource allocation and to share information among its members (Alumina and Aluminum Monthly, 2003a).

Despite Chalco's plan to increase alumina output, China was expected to face an alumina shortage of about 6 Mt/yr by 2005. In 2002, Chalco and Alcoa Inc. of the United States signed a 50-50 joint venture agreement in which the parties agreed to increase the refining and smelting capacities of Pingguo Aluminum Co. (a subsidiary of Chalco) during the next several years. The two companies expected to finalize the necessary arrangements and to obtain Government approvals by the second half of 2003. Pingguo's alumina expansion was expected to be completed in early 2003, and as a result, alumina output would increase to 850,000 metric tons per year (t/yr) and the aluminum smelting capacity would expand to 380,000 t/yr from 130,000 t/yr by 2006. Chalco also signed a three-party agreement with Minmetals Nonferrous Metals Co. Ltd. and Guangxi Investment Ltd. to establish Guangxi Guixi Huayin Aluminum Corp. The new company will mine bauxite and will construct a refinery and smelter in Debao in western Guangxi Zhuang Autonomous Region. Initial output capacities were designed to produce 800,000 t/yr of alumina and 250,000 t/yr of aluminum in 2006. The company's goal was to produce 1.6 Mt/yr of alumina after a few years of operation. Chalco also signed cooperation agreements with the Provinces of Hubei, Hunan, Jiangxi, and Shaanxi to develop their aluminum sectors (Mining Journal, 2002a; 2003b).

The first phase of construction of a 450,000-t/yr refinery in Yuanping County, Xinzhou City, Shanxi Province, remained in the planning stage in 2002. The refinery will use the combination process to produce alumina. The Shanxi Jinbei Aluminum Plant will be the joint venture of the Luneng Group, Shanxi Nonferrous Metals Industry Co., and the Xinzhou City Government. The first-phase construction cost was estimated to be \$350 million, and construction would take about 3 years to complete. The plan also included the construction of a 1.8-Mt/yr bauxite mine, a 300,000-t/yr aluminum smelter, and a 50,000-t/yr magnesium and alloy plant. The Yuanping area has a significant amount of bauxite reserves (217 Mt), and Shanxi Province is rich in coal reserves and accounts for one-fifth of the country's total coal output (Alumina and Aluminum Monthly, 2002b).

Lanzhou Aluminum Co. Ltd. and Pechiney SA of France reached an agreement for technical cooperation to build a 260,000-t/yr aluminum smelter and a 600-megawatt powerplant in Gansu Province. Pechiney will hold a 51% share, and Lanzhou, a 49% share of the joint venture. The Lanzhou Aluminum Plant had a primary aluminum output capacity of 186,000 t/yr, of which 86,000 t/yr was

Soderberg cells and 100,000-t/yr 200-kiloampere (kA) prebaked cells. Initially, Lanzhou planned to invest \$240 million to add a 150,000-t/yr 230-kA prebaked cell smelter, which received approval from the SETC in 2001. Construction was planned to begin in late 2002, and the smelter was to be put into operation in 2005 (Alumina and Aluminum Monthly, 2002c; China Nonferrous Metals Industry, 2002).

Alcan Inc. of Canada and Qingtongxia Aluminum Co. reached an agreement to purchase 50% stake of Qingtongxia's 130,000-t/yr aluminum smelter. The smelter used 200-kA prebaked cells and cost \$209 million to construct in 2001. The purchasing price was under negotiation. Qingtongxia had two other smelters that used Soderberg cells and hoped to use Alcan's invested funds for technical renovation in these two smelters (China Metals, 2002a).

Three aluminum smelters (Baoding Baohua Aluminum Co., Matou Aluminum Group Co., and Shijiazhuang Aluminum Co.) in Hebei Province reached an agreement to merge their operations in 2002. These smelters planned to establish Hebei Aluminum Co. to oversee the operation in late 2002. The merger would boost their bargaining power in securing competitive power rates. The Hebei Provincial Government had tried to consolidate all aluminum smelters in the Province (Metal Bulletin, 2002c).

The State Council approved the Shanxi Aluminum Plant's plan to invest \$1.1 billion in an alumina expansion project. A subsidiary of Chalco, it was the largest alumina producer and had an output capacity of 1.4 Mt/y. After expansion, alumina output capacity will increase to 2 Mt/y. The company also will add 280,000 t/yr of primary aluminum output capacity. The construction was scheduled to start in 2003 and to be completed in 2005 (China Chemical Reporter, 2002a).

The State Council also approved the Zhongzhou Aluminum Plant's expansion project. The project included a 700,000-t/yr ore-dressing plant, a 300,000-t/yr alumina plant that will use the Bayer process, and the development of two mines. Initial cost was estimated to be \$156 million; the Government provided \$3.6 million to start up the project. The construction was scheduled to begin in 2002, and the expanded facility was expected to be commissioned in April 2004 (Alumina and Aluminum Monthly, 2002a).

Antimony.—In 2002, China was the largest antimony producer in the world and accounted for more than 70% of the world total. The quantity of antimony output and exports from China affected the antimony price in world markets. The Chinese Government issued guidelines to reform the antimony sector, designated three ports for antimony exports, and intended to shut down all illegal miners and producers. Export licenses and quotas were issued to credited exporters, and traders were allowed to source antimony products only from legal producers. Since the accident in Nandan, Guangxi Zhuang Autonomous Region, and crackdown on illegal exports in 2001, the world market price of antimony increased to about \$2,850 per ton at yearend 2002 from \$1,100 per ton at yearend 2001. During that period, according to data released by the National Bureau of Statistics, the output of antimony metal decreased by less than 10%; the output of antimony concentrates, however, decreased by more than 40%. According to trade statistics, China's antimony oxide exports and imports ratio was 10 to 1 and China imported about 13,000 t of antimony ore/concentrate from, in order of volume of imports, Russia, Australia, and other countries in 2002. During the past 2 years, the production gap between antimony concentrates and antimony metal increased. Either the statistical data for antimony concentrates were questionable or antimony recovered as a byproduct from other metals was not recorded (Precious and Minor Metals Monthly, 2003). China consumed less than 20,000 t/yr of antimony metal. Major antimony producers feared that the rapid increase in the antimony price would spur the restart of small-scale mining and smelting in China. Even though the Government cracked down on illegal trade activities, Chinese Customs confiscated 2,500 t of antimony metal that was being shipped illegally to Vietnam in November 2002 (China Nonferrous Metals News, 2002c).

Copper.—Owing to the decline of copper prices and the reduced availability of concentrates, China's largest copper producers agreed to reduce copper metal output by 85,000 t in 2002. Jiangxi Copper Co. Ltd. and Yunnan Copper Co. agreed to reduce output by 20,000 t each. Baiyin Nonferrous Metals Co., Daye Nonferrous Metals Co., Luoyang Copper Processing Factory, and Tongling Nonferrous Metals Co. decided to reduce copper output by 10,000 t each and Huludao Oriental Copper Co. reduced output by 5,000 t. At yearend, only Baiyin, Huludao, and Luoyang reduced their refined copper output. The total output of these copper producers increased by 86,197 t in 2002, compared with that of 2001 (Metal Bulletin, 2002a; Copper and Nickel Monthly, 2003c).

In August 2002, the Government approved the establishment of China Nonferrous Metal International Mining Co. Ltd. China Nonferrous Metal Industry Construction Group Co. Ltd. was the core of the new company and accounted for 24.7% of the equity. Members of the new company included Baiyin, Daye, Huludao, Jinchuan Nonferrous Metals Co., Jiangxi, Tongling, West Mining Co., Yunnan, and Zhongtiashan Nonferrous Metals Co., as well as several geological survey bureaus. The purpose of the collaboration was to invest in overseas copper mines as a way to receive stable supplies of raw materials; investment in overseas mines may require as much as \$1 billion, which no domestic company can afford. China Nonferrous Metal Industry Foreign Engineering and Construction Co. (NFC) (a subsidiary of China Nonferrous Metal Industry Construction Group Co. Ltd.) had 85% of the shares in Chambishi Mine in Zambia, thus providing an example for the alliance to follow. NFC bought the mine in 1998 for \$20 million in cash and invested \$150 million to rehabilitate it. A wide range of investment options was under consideration, and NFC intended to pursue mining activities in Asia and southern Africa (China Metals, 2002c).

By yearend 2002, refined copper output capacity of Guixi Smelter (a subsidiary of Jiangxi Copper Co. Ltd.) increased to 400,000 t/yr from 200,000 t/yr. The output capacities of sulfuric acid, silver, and gold will increase to 1.03 Mt/yr, 158 t/yr, and 7.8 t/yr, respectively, in mid-2003. Guixi planned to produce 300,000 t in 2003 compared with 231,000 t in 2002. The company also upgraded the ore output capacity to 100,000 metric tons per day (t/d) at its Dexing Mine. The ore output capacity of its newly acquired Wushan Mine also increased to 3,000 t/d. The company produced about 50% of raw materials from its mines and sourced the remaining raw materials from domestic and international markets. The imbalance in the supply and demand of copper resources in Chinese and overseas markets might have some impact on the company's metal production plan. The company also decided to

expand its downstream production capacity. The construction of a 150,000-t/yr copper rod mill started in September 2002 and was expected to be completed in September 2003. The company signed an agreement with Yates Foil Co. of the United States to invest \$70 million to build a 6,000-t/yr electrolytic copper foil mill in Nanchang, Jiangxi Province; the construction was scheduled to be completed in 18 months. The copper foil will be used mainly in printed circuit boards. The joint-venture equity was 60-40 between Jiangxi and Yates (China Nonferrous Metals News, 2002g, i, j; 2003a).

Ivanhoe Mine Ltd. of Canada and Pacific Minerals Inc. of Canada formed a cooperative alliance to explore copper and gold prospects in the Provinces of Guizhou and Yunnan. The partners signed two cooperation agreements with Yunnan Geological and Mining Co. Ltd. (YGMR), which was owned by the Yunnan Provincial Government, to explore two areas that covered more than 3,000 square kilometers (km²) in Yunnan. The partners targeted deposits of copper and silver with platinum-group metals in a Keweenaw-type native copper geologic environment. Hundreds of native copper-silver mineralization occurrences have been discovered within the joint-venture area. The partners mapped 200-kilometer (km)-long and 80-km-wide areas in several locations. Copper that graded from 2% to 10% and more than 100 grams per metric ton (g/t) silver was discovered in the horizons. Under the terms of the agreements with YGMR, two separate cooperative joint-venture companies will be established. Pacific can earn a 75% interest in one and a 70% interest in the other by contributing \$4 million to each joint venture within 3 years and will have the right to increase its interests to 90% and 87.5%, respectively, by being sole provider of further funding to the joint ventures. YGMR will contribute its mineral rights to the survey area. Under the terms of an agreement between Ivanhoe and Pacific, Ivanhoe can earn up to 80% of Pacific's interest in the Yunnan project by contributing \$1 million in each joint venture, funding the costs of the feasibility study, and arranging funding necessary to put a mine into operation. Ivanhoe and Pacific also identified a similar prospective area of approximately 1,500 km² in Guizhou Province (Ivanhoe Mines Ltd., 2003b).

Ivanhoe signed an agreement with Nei Mongol Huayu Geology and Minerals Exploration Co. Ltd. to explore, develop, mine, and process copper, gold, silver, and other minerals together in Nei Mongol Autonomous Region. The agreement provided Ivanhoe the right to acquire an 80% interest in exploration and mining licenses that will cover 400 km² and will include the Oblaga porphyry copper and gold mine. The Oblaga Mine is located in Bayannuoer Meng League, western Nei Mongol Autonomous Region. The geologic and tectonic settings in the area are similar to the porphyry belt in Mongolia where Ivanhoe's Turquoise Hill and other prospective copper-gold discoveries are located. Rock samples in the Oblaga area contained up to 7.02% copper and 48.21 g/t gold; the 115 samples averaged more than 1% copper and 1 g/t gold (Ivanhoe Mines Ltd., 2003a).

Yunnan Copper Group Co. Ltd. planned to increase its output capacity to 350,000 t/yr of refined copper, 50,000 t/yr of electrolytic zinc, 400 t/yr of silver, and 5 t/yr of gold by 2005. The shortage of copper concentrates was expected to be a major obstacle for the expansion plan. The company had five copper mines—Dahongshan, Dayao, Dongchuan, Mouding, and Yimen—in Yunnan Province. Owing to exhausted copper resources, Yunnan Copper closed down the Dongchuan and Mouding Mines 2 years ago and planned to close down Dayao and Yimen within the next 5 years because of exhausted copper resources. The Dahongshan Mine, which will be put in operation in early 2003, was designed to produce 8,000 t/yr of copper-in-concentrates and 159,000 t/yr of iron ore. To replace its exhausted mines, Yunnan Copper acquired copper mines in other Provinces by cooperation with other enterprises. The company planned to increase copper output to 200,000 t in 2003. Yunnan Copper imported about 60,000 t of copper-in-concentrates in 2002, and was expected to import 100,000 t of copper-in-concentrates in 2003 (Copper and Nickel Monthly, 2002).

Gold and Silver.—Prior to 2002, China's gold market was controlled by the Government, which required that all mined and smelted gold output be sold to the People's Bank of China (PBC) at a fixed price. In 2001, the Government decided to establish a gold exchange in Shanghai and began trial runs on November 28. The initial trial run was set for 3 months, but it was extended for a longer period to ensure smooth transactions. On October 30, 2002, the Shanghai Gold Exchange was finally put into full operation; the delay had been caused by the unsettled issue of taxation. The Shanghai Gold Exchange's 108 members included producers, consumers, traders, and commercial banks; membership was not open to foreign-funded companies. The Bank of China, the China Construction Bank, and the Industrial and Commercial Bank of China were members of the Shanghai Gold Exchange and the Government allowed them to import and export gold and to hedge on overseas gold exchanges. The Ministry of Finance and the State Administration of Taxation agreed that all gold bullion traded on the Shanghai Gold Exchange would be VAT free if not delivered. A VAT would be applied on delivered gold bars, but dealers would be able to receive an immediate refund of the tax. The 17% VAT resulted in inactivity on the China Silver Exchange, which had opened in 2000, and the Shanghai Diamond Exchange until the change in taxation policy in May 2002. The Government intended to set up platinum trade at the Shanghai Gold Exchange in 2003. In 2002, futures trade of gold was not allowed, but it may be introduced in the future if it receives State Council approval. Initially, seven gold producers received certifications to supply gold bars to the Exchange for trading, and four more gold producers were added to the suppliers' list later. The PBC retreated from the gold market completely at yearend 2002 and became a monetary bank. The Government also allowed foreign companies to participate in domestic gold jewelry production under the condition that the companies purchased local raw materials and engaged in investment, processing, wholesale, and retailing in China. The Government hoped that this new policy would encourage more foreign companies to set up joint ventures and to ease the short supply of gold for jewelry in China (China Daily, 2002d).

The Government auctioned the mining rights of the Yingjiaciwu gold mine, which is located 23 km south of Shangrao City, Jiangxi Province. The mine covers an area of 0.04 km². Since 1998, local miners excavated the mine illegally and caused damage to the environment. In 2000, the Jiangxi Provincial Government took over the mine and tried to auction it off. The average ore grade was 10 g/t gold, and the depth to gold was shallow. The winning bid went to Nanfang Mechanical Engineering Ltd. at a cost of \$265,000 for a 4-year license. The transfer of state-owned mining rights for a fee was one of the top priorities in the development of the mineral resources in China (China Land and Resources News, 2002b).

Sino Gold Mining Ltd. of Australia was the only foreign gold producer that was operating the Jianchaling Mine in Shaanxi Province. Sino Guizhou Jinfeng Mining Ltd. (a subsidiary of Sino Gold Mining Ltd.) received Government approval to develop the Jinfeng gold prospect in the village of Niluo, which is located 34 km southeast of Mingu township, Zhefeng County, Qianxinan Prefecture, Guizhou Province. The deposit is located in a large region of gold mineralization known as the Golden Triangle. Mineralization at Lannigou is the result of large steeply dipping faults cutting through Triassic aged sandstones, siltstones, and shales on the western margin of domed Permian limestones. The resource, which was based on a 2-g/t gold cutoff grade, was 9.1 Mt at 6.13 g/t. Sino Gold completed a prefeasibility study on the gold mine. The bankable feasibility study was scheduled to begin in June 2003. Sino Gold had an 85% interest in Jinfeng (Mining Journal, 2003c). The company also owned 51% of the joint-venture company Sino Mining Jinkang Ltd., which held exploration rights over a 233-km² area in the north-central part of Sichuan Province. The joint-venture partner was the Deyang Geochemical Group (a subsidiary of Sichuan Provincial Bureau of Geology and Mineral Resources). Sino Gold had the right to earn a 75% interest in the property and the exclusive rights on any discoveries within a further 2,778- km² area that surrounds the project with a minimum expenditure of \$300,000 during the first 18 months. The area had been surveyed by BHP Ltd. before 1999 when the company decided to withdraw from the gold sector completely. BHP and Sino Gold believed that the area has excellent potential for a large gold deposit (China Nonferrous Metals News, 2002h).

Pacific Minerals continued drilling and metallurgical testing on its 217 gold project in northern Baotou, Nei Mongol Autonomous Region, near the southeastern border with Mongolia. The drilling in the main northeastern zone confirmed the continuity of the gold mineralization and showed an excellent economic potential for the development of a large low-cost open-pit gold mine. The zone and all intersected gold mineralization were tested by using 10 wide-spaced diamond drill holes. Estimates of indicated resources of 35 Mt at a grade of 0.85 g/t gold and inferred resources of 85 Mt at a grade of 0.93 g/t gold, using a 0.6-g/t gold cutoff grade, had been reported as a result of drilling tests. The 217 Project covered an area of 36 km². Ivanhoe could participate in the 217 Project under the terms of an agreement signed in 2002; it had the option to acquire up to 80% of Pacific Minerals' interest (equal to a 76.5% direct interest in the 217 Project) by funding and completing a production feasibility study followed by the arrangement of funding to bring the project into production. Pacific Minerals would continue to test drill the southwestern zone in 2003 (Mining Journal, 2003d).

Pacific Minerals had another precious-metals project (JBS Project) in Yunnan Province. The JBS Project was initially a joint venture (Yunnan Platinum and Palladium Inc.) between British Virgin Islands-incorporated Pacific PGM Inc. (70%) and Yunnan Mineral Resources Exploration Engineering Co. (30%). In December 2001, shareholders of Pacific Minerals approved the acquisition of Pacific PGM and its subsidiary in exchange for Pacific Minerals' 15 million common shares at \$0.40 per share. The JBS deposit comprises two mineralized zones with a combined strike length of 3.4 km and a width of between 200 and 600 m. An audit performed by Pacific Minerals indicated 20.8 Mt of resources in the northern zone, at a grade of 0.94 g/t palladium, 0.61 g/t platinum, 0.10 g/t gold, 0.27% nickel, 0.15% copper, and 0.02% cobalt. Ivanhoe exercised its right to acquire 80% of Pacific Minerals' interest in the JBS Project (China Land and Resources News, 2001; Pacific Minerals Inc., 2003).

Afcan Mining Corp. of Canada acquired Sino Gold's equity interest in Qinghai Dachaidan Mining Ltd. [a joint venture of Sino Gold (85%) and the First Brigade for Geology and Mineral Exploration of Qinghai Province and Dachaidan Gold Mine (a total of 15%)]. Qinghai Dachaidan was formed to develop the Tanjiashan Project at Tanjiashan, Qinghai Province. The Tanjiashan Project included the Jinlonggou and Qinlonggou gold deposits, which have produced about 250 kilogram per year (kg/yr) from open pit and underground operations by using a combination of heap leaching and a flotation-roasting carbon-in-pulp process. The combined resources of the two deposits was estimated to be 3.4 Mt at an average grade of 6 g/t. A feasibility study performed by Beijing General Research Institute of Mining and Metallurgical indicated that the resource could support a 2,200-kg/yr operation for 6 years. Under the terms of the joint venture agreement between Afcan and its Chinese partners, Afcan must arrange financing and begin construction of the new mine before the end of 2003. The cost for the construction was estimated to be \$18 million (Mining Journal, 2003a).

Iron and Steel.—The SETC ordered steel producers to cease all hot-rolled silicon steel production at yearend 2002. Electrical equipment producers were the main hot-rolled silicon steel consumers, and the Government ordered them to stop using it in the first quarter 2003. The phase-out of hot-rolled silicon steel circular had been issued in 1997. Information indicated that substitution of hot-rolled silicon steel with cold-rolled silicon steel could consume 10 megawatthours per metric ton less electricity and would reduce sulfur emission. During the past several years, the demand for silicon steel increased by twofold to 2.5 Mt. The output of cold- and hot-rolled silicon steel, however, increased by 860,000 t and 820,000 t, respectively. The gap between supply and demand was met by imports. If hot-rolled silicon steel production ceased at the end of 2002, despite the expansion of production lines by several steel producers, then China's imports of silicon steel were expected to increase significantly in the next several years (China Metals, 2002d).

The continuous expansion in the iron and steel sector was mainly generated by strong domestic demand. The demand for steel products from such sectors as automobile, infrastructure, real estate, and shipbuilding has increased rapidly in the past several years. Except for Shoudou Iron and Steel (Group) Co. (Shougang), which was the third largest iron and steel producer in China, all major iron and steel enterprises increased their outputs in 2002 compared with those of 2001. Under the 10th Five-Year Plan, China's 10 largest steel producers were to produce about 60% of the country's total steel output in 2005. The production share of these 10, however, continued to decline to 40.7% in 2002 from 49.4% in 2000. During the 16th CPC, the party set the goal to double the GDP between 2000 and 2010 and to double it again between 2010 and 2020. To sustain economic growth, domestic steel consumption would have to reach 250 Mt in 2005 and 300 Mt in 2010 (China Daily, 2002a; China Metallurgical News, 2002a).

In 2002, Shougang announced that it would close Nos. 4 and 5 blast furnaces to reduce pig iron output capacity by 2.5 Mt and reduce crude steel output capacity by 1.7 Mt by shutting down its No. 1 steel plant in Beijing. During the past several years, the

company invested \$206 million in environmental projects to reduce dust, smoke, and sulfur dioxide emissions to improve air quality in Beijing and to prepare for the 2008 Olympic Games in Beijing. The company planned to shut down an additional 2 Mt of steel output by 2010. Shougang closed all its sinter plants in Beijing. The coke plant was moved to Qian'an, Hebei Province. Technical renovations in Beijing facilities were underway, and the company planned to build a 2.5-Mt/yr hot-rolled mill and a 1.5-Mt/yr cold-rolled mill, which would include downstream galvanizing lines and color sheet lines, by the end of 2004. Only about 4 Mt of the crude steel output capacity will be in Beijing by 2005. The company signed an agreement with the Qian'an Government to build a state-of-the-art 2-Mt/yr integrated iron and steel plant (Shougang Qian'an Iron and Steel Co. Ltd.) in Qian'an by 2005. In Qian'an in 2002, Shougang had an iron ore mine, a 6.2-Mt/yr sinter plant, and a 2-Mt/yr pellet plant, which was scheduled to be completed in 2003. After completion of the new plant, Shougang may relocate more production facilities from Beijing to Qian'an (China Daily, 2003c).

Tangshan Jianlong Industry Co. Ltd. (a private company in Tangshan, Hebei Province) planned to build a 5-Mt/yr integrated iron and steel plant in Ningbo, Zhejiang Province. The first phase of construction, which included two 2,500-cubic-meter blast furnaces, two 180-t converters, and a 3,500-millimeter (mm) reversing hot-roll mill for shipbuilding plate, was scheduled to start in 2003. The second phase will add another 2,500-cubic-meter blast furnace, another 180-t converter, and a rolling mill. The total investment was estimated to be \$1.2 billion, and Jianlong will hold a 40% equity. The project partners included Shanghai Fosun Co. (a bio-medicine company) and a Hong Kong-based company. About 90% of the construction materials and equipment will be sourced in China. Jianlong was negotiating with Australian suppliers to import raw materials from Australia (China Metals, 2002e).

Pohang Iron and Steel Corp. (POSCO) of the Republic of Korea and Qingdao Iron and Steel Co. signed an agreement to form an 80-20 joint venture. The partners will build a 150,000-t/yr cold-rolled stainless steel plant in the Huangdao Development Zone at Qingdao, Shandong Province. Construction of the \$180 million plant will start in 2003 and will be completed in 2005. The plant will produce from 0.2- to 2-mm-thick by 1,500-mm-wide cold-rolled stainless steel sheets. The hot-rolled plate will come from POSCO's plant in the Republic of Korea. In 2002, Qingdao relined its two blast furnaces and added a 750-cubic-meter blast furnace. At yearend, Qingdao had a total pig iron output capacity of 2.7 Mt/yr. The company planned to build a 4-Mt/yr integrated iron and steel plant to produce flat steel products in the Huangdao Development Zone by 2005 (China Metals, 2002j).

Union Steel China (the subsidiary of Union Steel of the Republic of Korea) began the first phase construction of its 730,000-t/yr galvanized plant in Jiangyin, Jiangsu Province. The \$100-million project will produce from 0.3- to 1.6-mm-thick by from 600 to 1,300-mm-wide galvanized sheets. Union Steel China had two joint-venture companies (Wuxi Changjiang Sheet Co. Ltd. and Wuxi Pacific Galvanizing Co. Ltd.) with Wuxi Liangxi CR Sheet Co. Ltd. to produce galvanized and color sheets (China Metals, 2002i).

Baoshan Iron and Steel Co. Ltd. (Baosteel) and Rio Tinto Inc.'s Hamersley Iron Pty Ltd. formed a joint venture (Bao-Hirange) to develop an iron ore mine in Paraburdoo, Australia. Baosteel will hold a 40% share of the joint venture for 20 years. The mine has a reserve of 200 Mt of iron ore at a grade of 62% iron. The mine is divided into eastern and western areas. The joint venture planned to complete the construction of the eastern area in May 2004; it has a designed output capacity of 10 Mt/yr. Baosteel and CVRD had a joint-venture (Baovale) agreement to supply 6 Mt/yr of iron ore to Baosteel. Baosteel had to import more than 20 Mt/yr of iron ore from overseas suppliers—43% from Australia, 38% from Brazil, 14% from India, and 5% from other countries (China Metals, 2002b).

Lead and Zinc.—In 2002, Yuguang Gold and Lead Group Co. completed construction of its third lead smelter, which was equipped with an oxygen enriched bottom-blowing system. The smelter was designed to produce 617 t/yr of antimony, 86 t/yr of silver, and 1.6 t/yr of gold. The construction cost of the 50,000-t/yr smelter was \$23.9 million, and the company had a total smelting capacity of 150,000 t/yr. A 60,000-t/yr lead-refining plant was under construction in 2002. After completion in early 2003, Yuguang will have a total refining capacity of 200,000 t/yr, which would make it the largest lead producer in China. The company did not have its own mines, and the supply of concentrates could be a problem for the producer. In July 2002, with Government approval, Yuguang issued 45 million A shares on the Shanghai Securities Exchange Market; the company planned to use the issued funds to upgrade its production facilities (China Metals, 2002g).

In December 2002, Shuikoushan Nonferrous Metals Co. Ltd. started to construct a 80,000-t/yr lead smelter. The \$41.1 million smelter was financed by state bonds (20%) and bank loans (50%) on which the Government would pay the interest for the first 2 years and the smelter, which was scheduled to be completed by yearend 2004, would replace the 60,000-t/yr smelter. The new smelter was designed to recover 96% of the emission gases that would produce 80,000 t/yr of sulfuric acid. The 60,000 t/yr smelter was not equipped with a gas recovery system (China Metals, 2003d).

Nei Mongol Dongshengmiao Lead and Zinc Mining Co. (a joint venture between Gansu Jianxin Industry Co. Ltd. and Glencore Co. Ltd. of Switzerland) commissioned its Dongshengmiao Mine at Bayin, Bayannur Meng Urad Houqi, Nei Mongol Autonomous Region. It was designed to mine 600,000 t/yr of ore and to produce 69,400 t/yr of zinc concentrates that contain no less than 47% zinc and 14,200 t/yr of lead concentrates that contain no less than 45% lead. Total investment was \$18.5 million. The Nei Mongol Provincial Government planned to build a 50,000-t/yr lead and zinc smelter near the mine site. The seven deposits in the area had total proven reserves of 12.6 Mt of zinc and 900,000 t of lead (China Nonferrous Metals News, 2002a; Lead, Zinc, and Tin Monthly, 2002a).

Kumba Resources Ltd. of South Africa, Chifeng Hongye Zinc Smelting Co. Ltd., and Biyinuoer Lead and Zinc Co. signed a joint-venture agreement for expanding output capacity of the Hongye Zinc Refinery at Chifeng, Nei Mongol Autonomous Region; Kumba will take over the operation of the refinery. The refinery had an output capacity 24,000 t/yr of zinc slab, and the joint venture planned to expand the output capacity to 50,000 t/yr of zinc slab and 85,000 t/yr of sulfuric acid. Kumba will hold a 60% interest, and the Chinese partners will hold the remaining 40%. Construction of the new plant was scheduled to begin in early 2003 and was expected to be put into operation in January 2004 (China Nonferrous Metals News, 2002k; Mining Journal, 2002c).

Nickel.—Because demand exceeded supply in China, the domestic No. 1 refined nickel (99.90% Ni) price increased to 74,500 yuan (\$9,000) per ton in December 2002 from 55,500 yuan (\$6,710) per ton in January 2002 and was expected to continue to increase in 2003. In 2002, production of nickel concentrates and nickel metal increased compared with that of 2001; China was a net importer of 27,023 t refined nickel. From production and trade statistical data, the apparent nickel consumption appeared to be lower in 2002 compared with that of 2001; for the stainless steel sector, however, which was the major consumer of nickel, production increased in 2002. At yearend 2001, about 6,000 t of nickel was stockpiled in warehouses. Because the price of nickel went up sharply in the international market during the last several months of the year, traders were hesitant to import more nickel. The actual consumption of nickel could be higher than the apparent consumption in China. The output of refined nickel was expected to reach 65,000 t, and the consumption could increase to about 110,000 t in 2003. Nickel was imported mainly from Australia, Canada, and Russia. The State-owned Minmetals Group and Cubaniquel of Cuba signed a supply agreement to import nickel and cobalt from Cuba with a total value of \$34 million (China Nonferrous Metals Monthly, 2002).

In 2001, Jilin Geological Prospecting Bureau and Inco Mining Co. of Canada signed an agreement to explore nickel resources jointly in Jilin Province. In 2002, Inco contributed \$10 million for a 60% share of the joint venture, and Jilin provided the prospecting rights and existing geologic data at the Hongqiling nickel deposit in the Panshi area. Inco also signed a cooperation agreement with Jilin Nickel Industrial Group and contributed \$10 million to an undisclosed project (China Land and Resources News, 2002c; Copper and Nickel Monthly, 2003a).

Jinchuan Nonferrous Metals Corp. had a metal output capacity of 60,000 t/yr of copper and 60,000 t/yr of nickel. The company undertook a mining expansion, which was expected to take several years to complete. Because its mine production could supply only concentrates that contain about 45,000 t of nickel and 30,000 t of copper, the company was forced to source nickel and copper concentrates from the Kalatongke Mine in Xinjiang Uygur Autonomous Region and from Mongolia. In 2002, Jinchuan signed a purchase agreement with Sally Malay Mining Ltd. of Australia to purchase all Sally Malay's proposed concentrate output, which contained about 6,600 t of nickel, 3,000 t of copper, and 600 t of cobalt. The company planned to double its copper and nickel output capacities by 2010 (China Metals, 2002f).

Tin.—In 2002, China was the leading tin-producing country in the world. Owing to weak demand, depressed tin prices in the international markets, and concentrate shortage, output of tin metal decreased by more than 10% in 2002 compared with that of 2001. China's unwrought tin exports decreased by more than 29% to 32,181 t, and tin alloy exports also decreased slightly to 10,397 t. Chinese tin producers predicted that if tin prices in the international market continued to drop, then China might export less than 30,000 t of refined tin in 2003. China consumed about 48,000 t of tin, of which tin solder accounted for 50%. Domestic tin consumption was expected to increase slowly but steadily in the next several years because of the expanded demand for tin from the electronics sector (Lead, Zinc, and Tin Monthly, 2003b).

China's largest tin producer, Yunnan Tin Industry Group Co., shut down its 25,000-t/yr Ausmelt furnace in September 2002 for 2 months of maintenance. Initially, the company planned to increase production to 28,000 t in 2002, but the market conditions forced the company to reduce refined tin output to about 25,000 t, of which 23,000 t was from its Gejiu operation and 2,000 t, from its Hunan Province subsidiary Chenzhou Mineral Resource Investment Co. The company planned to shut down all its tin furnaces when the newly installed Ausmelt furnace reached full capacity. Yunnan Tin supplied about 60% of its concentrates from its own mines, and the rest came from local mines in Yunnan.

Owing to a flooding incident in Nandan, Guangxi Zhuang Autonomous Region, and declining tin concentrate supplies in the Guangxi area, Huaxi (China Tin) Group Co. also reduced its tin output to about 13,000 t in 2002 and planned to produce 15,000 t in 2003. Since the Nandan accident, the Government cracked down on most of the illegal mining activities in Guangxi Zhuang Autonomous Region and Yunnan Province. The supply of tin concentrates from these two areas decreased in 2002. In 2002, China imported 3,159 t of tin concentrates. The Government decided to shut down the No. 100 ore body in Nandan permanently and allowed Gaofeng Mining Co. Ltd. (a subsidiary of Huaxi) to apply for the mining license for the No. 105 deposit. Recently, geologists discovered a large tin deposit in Qianlishan, Hunan Province, which may contain up to 700,000 t of contained tin resources (China Land and Resources News, 2002d; China Metals, 2002h; Lead, Zinc, and Tin Monthly, 2002b).

Tungsten.—In 2002, China was the leading tungsten producing country in the world, and its output accounted for more than two-thirds of the world total. The country had difficulty, however, holding tungsten prices stable in the domestic and international markets. The Government and the tungsten producers met yearly to find ways to maintain the tungsten market price and to control production. The Government forced major tungsten producers to reduce their output, to close down illegal mining, and to set a tungsten export quota. The Government also set the total tungsten export quota at 17,000 t (W content) and the production quota at 43,740 t for 2002. The export quota share of each producer was to be based on its output capacity—tungsten producers in Jiangxi Province were allocated 59.6% of the total output quota; Hunan Province, 20.0%; Yunnan Province, 8.0%; Guangdong Province, 6.0%; and the remaining assigned to Guangxi Zhuang and Nei Mongol Autonomous Regions and the Provinces of Fujian, Zhejiang, Anhui, and Qinghai. Producers were restricted to exporting only their own products, and traders must source tungsten products from authorized operating producers and miners. After the China Chamber of Commerce of Metals, Minerals, and Chemicals Importers and Exporters verified contracts between producers and traders and export prices, the MOFTEC issued an export license. Legal exporters reached a consensus on setting floor prices for major tungsten products. Despite these actions, the prices of tungsten could be held only for a short period in the international markets because there was a surplus of tungsten in the domestic market. China consumed about 11,000 t of tungsten in such sectors as building, electronics, and iron and steel. As a measure to control exports, the Government awarded 15 enterprises tungsten export rights in 2002 (China Tungsten Industry, 2002; Metal Bulletin, 2002d).

In December, two state-owned companies, Jiangxi Rare Earth and Rare Metals Tungsten Group Corp. (JRRTC) and Minmetals, agreed to form the China Rare Earth and Rare Metals Tungsten (Group) Co. Ltd. in Nanchang. Minmetals will invest about \$96 million to upgrade production technologies and facilities at JRRTC's subsidiaries in 2003. JRRTC operated a number of mines in Jiangxi Province that included Dajishan, Dangping, Hukeng, Pangushan, Piaotang, Tieshanlong, Xialong, and Xiaolong. Minmetals planned to acquire a 51% share in the new company within 3 years. If the merger is successful, then Minmetals will play a significant role in the tungsten sector. Minmetals also held a 30% share in the Shanghai-listed Xiamen Tungsten Co. Ltd. and was negotiating to acquire Nanchang Cemented Carbide Plant in Jiangxi Province (China Daily, 2002f; China Nonferrous Metals News, 2003b).

Industrial Minerals

Cement.—In 2002, China was the world's leading cement-producing country, and its output accounted for more than 35% of the world's total. More than 7,000 cement producers were registered, but analysts estimated that the actual number might be closer to 9,000 because of the fragmentation of the sector and the small size of many plants. About 12 producers had output capacities of more than 1 Mt/yr. During the past several years, cement production grew at an average rate of about 10% per year. The cement sector may soon face excessive production, and the Government urged investors to analyze the cement sector carefully because supply and demand were basically balanced. During the past couple of years, the Government ordered cement producers to close down plants that used obsolete technology. The Government also encouraged cement producers to reshuffle the cement sector through mergers, takeovers, and regroupings, especially urging east coast producers to take over obsolete plants in the western area and to protect the environment in the west. All new cement plants must meet an output capacity of 2,000 t/d (Building Materials Industry Information, 2002).

Lafarge Dujiangyan Cement Co. Ltd. (a joint venture between the Lafarge Group of France and Chengdu DJY Building Materials Co. Ltd.) inaugurated its 1.4-Mt/yr cement plant that used a dry process production line in Dujiangyan, which is located 60 km from Chengdu, Sichuan Province. The total investment was about \$150 million. Lafarge held 75% of the equity and was responsible for managing the company. The Lafarge Group signed an agreement to purchase a 70% share of a cement plant that had an output capacity of 600,000 t/yr in Chongqing City. The Lafarge Group planned to invest \$20 million in 2003 to modernize the plant and to increase output capacity to 1.2 Mt/yr. It also had a cement plant (Chinefarge) in Beijing, which had an output capacity of 700,000 t/yr (Lafarge, 2002).

Magnesium.—In 2002, China was the largest magnesium-producing country in the world. China's primary magnesium metal was produced mainly by the silicothermic, or Pidgeon process; dolomite and ferrosilicon are the raw materials used. The process was considered to be obsolete by western standards. During the past several years, China's magnesium sector changed dramatically. In the 1990s, plants that produced about 5,000 t/yr were considered to be large. In the 1990s, more than 400 magnesium producers had a total output capacity of more than 200,000 t/yr. Through mergers and careful modifications, new plants were being built with less capital and increased output. Capital costs for a new plant ranged from \$300 to \$500 per ton of installed capacity. Operating costs of the large and more efficient plants ranged from \$1,230 to \$1,450 per ton. About 150 magnesium producers had a total output capacity of about 400,000 t/yr. Nine producers had output capacities of more than 10,000 t/yr each. The Shanxi Huayu Magnesium Group increased its output capacity by 20,000 t/yr in 2002. The company and a Japanese company agreed to form a joint venture (Jinhe Huayu Magnesium Co. Ltd.) to invest \$6.4 million to build a 10,500-t/yr magnesium plant in Shanxi Province. The Wenxi Yinguang Magnesium Group was scheduled to add a 20,000-t/yr magnesium ingot plant in 2003; after completion, the company will have a total output capacity of 40,000 t/yr of magnesium ingot and 8,000 t/yr of magnesium alloy. China International Trust and Investment Corp. (CITIC) signed a contract with the Qinghai Provincial Government to develop the magnesium resources in Qinghai Province jointly. CITIC planned to invest \$266 million to mine boron, lithium, and potassium in the Xi Taijnar Salt Lake and to build a 50,000-t/yr magnesium ingot plant, a 35,000-t/yr lithium salt plant, and a 35,000-t/yr boric acid plant in Qinghai Province. China Steel Corp. of Taiwan was considering building a 100,000-t/yr magnesium ingot plant in Qinghai Province. The China Magnesium Industry Association, which was established in 2002, predicted that China will produce 350,000 t in 2005 (China Nonferrous Metals News, 2002b; Magnesium Monthly Review, 2002).

In 2002, the sole European Union magnesium producer, Pechiney Electrometallurgie closed its Marignac plant in France. This led the European Commission to consider repealing the 2001 dumping duty on magnesium from China in 2002. The Chinese magnesium producers, however, could not escape the dumping duty in the United States. The U.S. Department of Commerce ruled that granular magnesium from Canada produced from Chinese magnesium ingot was within the subject of country origin. Countries that exported granular pure magnesium made from Chinese pure magnesium ingot were required to post cash deposits of between 24.6% and 305.56% ad valorem (Metal Bulletin, 2002b).

Rare Earths.—In 2002, China was the leading rare-earth producer and exporter in the world and exported more than two-thirds of its output. In 2002, China's rare-earth output continued to expand. Of the total rare-earth concentrate output, Nei Mongol Autonomous Region accounted for more than 60% followed by Sichuan Province, 18%, and Jiangxi Province, 17%. Of the rare-earth smelters, 170 had a total smelting capacity of 180,000 t/yr; most were located in the Provinces of Sichuan, Jiangxi, and Jiangsu and the Nei Mongol Autonomous Region. About two-thirds of the smelters operated at less than one-half of their output capacities. The country consumed about 20,000 t or about 25% of the world total consumption (China Nonferrous Metals News, 2003c).

Since 1995, China had become the dominant rare-earth producer and had supplied more than 80% of the world's rare earths, such as concentrates, intermediate products, and chemicals. Because of overproduction and exports, supply exceeded demand in domestic and

international markets, and China's rare-earth producers were struggling to maintain a profitable margin in recent years. The Government urged rare-earth producers to export more high-value-added products. The weak demand for rare earths in the international market and oversupply in the domestic market affected rare-earth prices in 2002. The Government decided not to issue new licenses for the prospecting and mining of rare earths until the end of 2005. The suspension was aimed at curbing the price decline and the price war among domestic rare-earth producers. In 2002, the State Council approved the restructuring of the domestic rare-earth sector. It will be reorganized into two regional groups—China North Rare Earth Group Co. and China South Rare Earth Group Co. The northern group will be formed and led by the Nei Mongol Rare Earth Group, Gansu Rare Earth Group Co., and rare-earth producers from the Provinces of Shandong and Sichuan. Rare-earth producers from Shanghai and the Provinces of Guangdong, Hunan, Jiangsu, and Jiangxi will be merged into the southern group; the Government appointed Chinalco to be the leader for the establishment of the southern group and to be a major shareholder for the group (China Nonferrous Metals News, 2002e, 2003d).

Strontium.—China's strontium sector developed quite rapidly during the past decade and may become a major supplier in the world. More than 20 strontium carbonate producers had a total output capacity of 160,000 t. In 2002, most of these producers are located in the Chongqing area where celestite is mined. The largest strontium carbonate producer was Chongqing Tongliang Redbutterfly Strontium Co. (a Sino-Japanese joint venture); it had an output capacity of 45,000 t/yr. In 2002, a 30,000-t/yr strontium carbonate plant was commissioned at Yongxi, Dazu, and Chongqing City. Qinghai Dafengshan S&T Co. Ltd. was established in Xining, Qinghai Province. The company planned to invest \$18 million to develop the Dafengshan strontium resources in Qinghai Province. A mine with output capacity of 300,000 t/yr was under construction and was scheduled to start production in 2003. Geologists estimated that the Dafengshan area had strontium resources of 18 Mt. China exported about 60% of its output (China Nonferrous Metals News, 2002d; Building Material Industry Information, 2003).

Mineral Fuels

Coal.—Coal mine safety continued to be a major problem for the Chinese Government. The State Administration of Coal Mine Safety Supervision and the State Administration of Safety in Production Supervision were established under the SETC to oversee the country's coal mine production safety. During the past several years, the Government intensified its efforts to enforce coal mine safety regulations by closing down thousands of coal mines for safety violations. Because of profit temptation, many coal mines restarted their operations after the inspection team left. As a result of several major coal mine accidents throughout the country in 2002, more than 6,000 miners died. Most of these accidents were at county-level coal mines and accounted for more than 70% of the accidents and deaths. County officials depended on tax revenues from coal mines to support the county. The Central Government assigned the safety inspectors, but the local governments provided the funding. The Government intended to merge large- and medium-sized coal producers into several enterprises, of which two or three would have an output capacity of 100 Mt/yr each and another five to six would each produce more than 50 Mt/yr of coal. Hopefully, under the restructuring program, coal mine safety will improve in the future (China Daily, 2002g).

In 2002, China's coal production reached a record high. The output of coal was from state-owned large mines, state-owned local mines, and county mines. In 1996, the output ratio was 39 to 16 to 45. After years of the Government's efforts to shut down small and unsafe mines, the output ratio changed to 51 to 19 to 30 in 2002. In 2002, except for the Provinces of Guangdong, Jiangsu, Jilin, and Zhejiang, the Guangxi Zhuang Autonomous Region, and the Chongqing Municipality, all other areas posted an increase in coal output compared with that of 2001. The increased coal demand from such sectors as cement, metallurgy, and power was the main reason for the increased output. The power sector was the largest consumer and accounted for about one-half of coal consumption (China Coal News, 2003a).

Coal from China was a major force in the Asian coal market. During the past few years, China's coal exports dramatically increased. Total coal exports decreased slightly to 84 Mt compared with about 90 Mt in 2001 but registered an increase compared with 32 Mt in 1998; most of the increase was from steam coal, particularly in the northern Asian market. China's coal exports to Japan, the Republic of Korea, and Taiwan increased sharply during the past several years. Coal from Australia and Indonesia to the northern Asian region declined because buyers from this area wanted to diversify their supply sources. Chinese coal exports increased because of the economic reform during the past several years that encouraged the coal sector to become more efficient and competitive. The Government assisted the coal sector in developing a coal distribution infrastructure and provided export incentives (China Coal News, 2003b).

The largest state-owned coal enterprise in China, Shenhua Group Co. Ltd., secured a \$6 billion line of credit from China Development Bank. The company planned to invest \$2 billion in a direct coal liquefaction (DCL) process plant at Majiata, Nei Mongol Autonomous Region; the process had been developed by Hydrocarbon Technologies Inc. (HTI) of the United States. Shenhua acquired 15% of the rights to the technology. Direct liquefaction is the transformation of coal into hydrocarbon liquids by hydrogenation. Several years ago, HTI set up a pilot plant in China under a Sino-U.S. science and technology agreement. Shenhua expected to produce fuel from the DCL process at a cost lower than that from crude oil. HTI will participate in the construction of the project as an advisor on basic engineering. Several Chinese organizations approached Sasol Ltd. of South Africa, which was the first user of commercial coal liquefaction, to participate in coal liquefaction projects in China, but Sasol turned them down. Sasol's process is a two-stage process and the DCL process is a single-stage process. Environmentally friendly coal liquefaction may reduce environment pollution and also improve self-sufficiency in energy (China Coal, 2002).

Oil and Gas.—Because the rapid economic growth increased the demand for oil, China became more dependent on oil imports to balance supply and demand. In 2002, crude oil imports increased by 15% to more than 69 Mt, and crude oil exports decreased by 4.5% to 7.2 Mt. China became the second largest crude-oil-importing country in Asia behind Japan (Business Weekly, 2003b).

About 90% of Chinese oil output came from onshore wells. China's largest producing oilfield, Daqing Oilfield in Heilongjiang Province, produced more than 50 Mt/yr of crude oil, which accounted for about one-third of the country's total output. After more than 40 years, Daqing entered the last stage of its production. Daqing was expected to produce about 48 Mt in 2003, and its crude oil output was expected to continue to decline in the next decade. In 2002, the Daqing Bureau discovered a large natural gas deposit near its oilfield in Songliao Basin. Geologic resources were estimated to be 30 billion cubic meters; about 20 billion cubic meters was available for tapping. During testing, the daily output of a single well reached 530,000 cubic meters. Of the natural gas, 97% was methane, and the rest was carbon dioxide and hydrogen (China Land and Resources News, 2002a).

The Government decided to establish a nationwide natural gas pipeline network. The proposed project divided the natural gas market into the following regions: Bohai, central-south, northeast, northwest, southeast, southwest, Yangtze River, and Zhongyuan. In 2002, the total length of natural gas pipelines was about 11,000 km; about one-half of the total was in Sichuan Province. The natural pipeline project will be conducted in three stages (2001-05, 2006-10, and 2011-20). The Government predicted that the demand for natural gas would reach 63 billion cubic meters in 2005, 97 billion cubic meters in 2010, and 142 billion cubic meters in 2020. China will continue to import natural gas from Russia and its neighboring countries (China Chemical Reporter, 2002b).

In 2002, China signed two liquefied natural gas (LNG) contracts. The North West Shelf Consortium of Australia beat out rivals from Indonesia and Qatar to win a 25-year \$12 billion contract to supply LNG to China's LNG terminal, which is located near Shenzhen, Guangdong Province. The Consortium will supply at least 3 Mt/yr of LNG starting 2005. China National Offshore Oil Corp. (CNOOC) will take stakes in the Australia Northwest Shelf Gasfield. CNOOC awarded a second LNG contract to a consortium led by Pertamina of Indonesia and British Petroleum Plc (BP). LNG will be supplied from the BP operating gasfield (Tangguh) in Indonesia's Papua Province. Under the terms of the \$8.5 billion contact agreement, BP will supply up to 2.6 Mt/yr of LNG to a planned terminal on Meizhou, Fujian Province, for 25 years. Pertamina will sell a 12.5% share of the Tangguh gasfield to CNOOC (China Daily, 2002e).

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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES ^{1,2}

(Metric tons unless otherwise specified)

Commodity ³	1998	1999	2000	2001	2002	
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	8,200	8,500	9,000	9,800	11,000
Alumina, gross weight	do.	3,330	3,840	4,330	4,650	5,450
Metal, refined, primary and secondary	do.	2,440	2,810	2,990	3,570	4,510
Antimony:						
Mine, Sb content		97,400	89,600	110,000	140,000 ^r	100,000
Metal		82,000	84,500	106,000	148,000	124,000
Bismuth:						
Mine output, Bi content		240	2,680	1,120	1,250	950
Metal		820	860	770	1,230	700
Cadmium, smelter		2,130	2,150	2,370	2,510	2,440
Chromite, gross weight	thousand tons	200	220	208	182	180
Cobalt:						
Mine output, Co content		40	250	90	150	1,000
Metal		410	300	410	680 ^r	980
Copper:						
Mine output, Cu content		487,000	520,000	593,000	587,000	568,000
Metal:						
Smelter, primary		839,000	837,000	1,020,000	1,150,000	1,180,000
Refined						
Primary	thousand tons	870	836	1,020	1,220	1,300
Secondary	do.	340	344	350	300	350
Total	do.	1,210	1,180	1,370	1,520	1,650
Gold, mine output, Au content		178	173	180	185	192
Iron and steel:						
Iron ore, gross weight	thousand tons	247,000	237,000	223,000	220,000	231,000
Pig iron	do.	118,600 ⁴	125,390 ⁴	131,010 ⁴	155,540 ⁴	170,850 ⁴
Ferroalloys	do.	3,558 ⁴	3,810	4,030	4,500	4,840
Steel, crude	do.	115,590 ⁴	124,260 ⁴	128,500 ⁴	151,630 ⁴	182,370 ⁴
Steel, rolled	do.	107,380 ⁴	121,100 ⁴	131,460 ⁴	160,680 ⁴	192,520 ⁴
Lead:						
Mine output, Pb content		581,000	549,000	660,000	676,000	641,000
Metal:						
Smelter, primary		567,000	597,000	830,000	840,000	916,000
Refined						
Primary		665,000	821,000	998,000	984,000	1,100,000
Secondary		92,000	97,000	102,000	211,000	230,000
Total		757,000	918,000	1,100,000	1,200,000	1,330,000
Magnesium metal, primary		70,500	120,000	190,000	200,000	230,000
Manganese ore, gross weight	thousand tons	5,300	3,190	3,500 ^r	4,300 ^r	4,500
Mercury, mine output, Hg content		230	200	200	190	495
Molybdenum, mine output, Mo content		30,000	29,700	28,800	28,200	29,300
Nickel:						
Mine output, Ni content		48,700	49,500	50,300	51,500	54,000
Matte		47,000	50,100	57,000	59,000 ^r	60,000
Smelter		40,100	44,400	50,900	49,500	52,400
Silver, mine output, Ag content		1,300	1,360	1,600	1,910	2,950
Tin:						
Mine output, Sn content		70,100	80,100	99,400	95,000	62,000
Metal, smelter		79,300	90,800	112,000	105,000	82,000
Titanium, sponge		2,250	1,660	1,900	2,470	3,650
Tungsten, mine output, W content		30,000	31,100	37,000	38,500	49,500
Vanadium, in vanadiferous slag product		15,500	26,000	30,000	30,000	33,000

See footnotes at end of table.

TABLE 1--Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES ^{1,2}

(Metric tons unless otherwise specified)

Commodity ³	1998	1999	2000	2001	2002	
METALS--Continued						
Zinc:						
Mine output, Zn content	thousand tons	1,270	1,480	1,780	1,700	1,550
Refined, primary and secondary	do.	1,490	1,700	1,980	2,040	2,100
INDUSTRIAL MINERALS						
Asbestos		300,000 ^r	329,000 ^r	315,000 ^r	310,000 ^r	270,000
Barite	thousand tons	3,300	2,800	3,500	3,600	3,100
Boron, mine, boron oxide equivalent		137,000	110,000	145,000	150,000	145,000
Bromine		40,000	42,000	42,000	40,000	42,000
Cement, hydraulic	thousand tons	536,000 ⁴	573,000 ⁴	597,000 ⁴	661,040 ⁴	725,000 ⁴
Diatomite		335,000	340,000	350,000	350,000	370,000
Dolomite	thousand tons	6,700	6,600	6,700	6,700	7,000
Fluorspar	do.	2,350	2,400	2,450	2,450	2,450
Graphite		224,000	300,000	430,000	450,000	450,000
Gypsum	thousand tons	6,800	6,700	6,800	6,800	6,850
Kyanite and related materials		3,050	3,000	3,100	3,150	3,200
Lithium minerals, all types		16,000	15,500	16,000	16,000	16,000
Magnesite	thousand tons	2,400	2,450	4,070	3,580	3,700
Nitrogen, N content of ammonia	do.	25,800	28,300	27,700	28,200	30,000
Phosphate rock, phosphorus oxide equivalent	do.	7,500	6,000	5,820	6,300	6,900
Potash, marketable, potassium oxide equivalent	do.	120	260	380	385	450
Rare earths, rare-earth oxide equivalent		60,000	70,000	73,000	81,000	88,000
Salt	thousand tons	22,420 ⁴	28,124 ⁴	31,280 ⁴	34,105 ⁴	36,024 ⁴
Sodium compounds: soda ash, natural and synthetic	do.	7,440 ⁴	7,654 ⁴	8,342 ⁴	9,144 ⁴	10,330 ⁴
Sulfur:						
Native	do.	230	280	290	290	290
Content of pyrite	do.	4,490	3,860	3,370	3,090	3,240
Byproduct, all sources	do.	1,450	1,630	1,900	2,000	2,200
Total	do.	6,170	5,770	5,560	5,380	5,730
Talc and related materials	do.	3,800	3,900	3,500	3,500	3,600
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	do.	229,000	182,000	176,000	190,000 ^r	200,000
Bituminous	do.	960,000	822,000	781,000	965,000 ^r	1,140,000
Lignite	do.	50,800	45,600	42,000	47,800 ^r	50,000
Total	do.	1,240,000	1,050,000	999,000	1,200,000 ^r	1,390,000
Coke, all types	do.	128,060 ⁴	121,100 ⁴	121,840 ⁴	131,310 ⁴	142,800 ⁴
Gas, natural:						
Gross	billion cubic meters	23	25	27	30	33
Marketed	do.	18	20	22	24	26
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,200	1,190	1,200	1,210	1,240
Refinery products	do.	950	920	1,470 ^r	1,460 ^r	1,530

^rRevised.

¹Table includes data available through August 30, 2003.

²Estimated data are rounded to no more than three significant digits; may not add to totals shown.

³The country also produces diamond, gallium, germanium, indium, platinum-group metals, and uranium; no reliable basis, however, is available for the estimation of output levels.

⁴Reported by China's State Statistical Bureau.

TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies ¹	Location of main facilities	Annual capacity ^e
Aluminum:			
Alumina	Pingguo Aluminum Co.	Guangxi, Pingguo	850
Do.	Guizhou Aluminum Plant	Guizhou, Guiyang	650
Do.	Zhengzhou Aluminum Plant	Henan, Zhengzhou	1,300
Do.	Zhongzhou Aluminum Plant	Hunan, Zhongzhou	800
Do.	Shandong Aluminum Plant	Shandong, Zibo	850
Do.	Shanxi Aluminum Plant	Shanxi, Hejin	1,400
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	150
Do.	Lanzhou Aluminum Plant	Gansu, Lanzhou	205
Do.	Liancheng Aluminum Plant	do.	190
Do.	Pingguo Aluminum Co.	Guangxi, Pingguo	380
Do.	Guizhou Aluminum Plant	Guizhou, Guiyang	400
Do.	Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	176
Do.	Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	180
Do.	Henan Huanghe Mianchi Aluminum Plant	Henan, Mianchi	115
Do.	Sanmenxia Tianyuan Aluminum Co. Ltd.	Henan, Sanmenxia	110
Do.	Shangqiu Aluminum Smelter	Henan, Shangqiu	115
Do.	Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	200
Do.	Henan Shenhuo Aluminum-Electricity Co. Ltd.	Henan, Yongcheng	200
Do.	Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	73
Do.	Zhengzhou Aluminum Plant	Hunan, Zhengzhou	60
Do.	Jilin Aluminum Co.	Jilin, Panzhi	70
Do.	Fushun Aluminum Plant	Liaoning, Fushun	165
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	216
Do.	Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	240
Do.	Qinghai Aluminum Smelter	Qinghai, Xining	255
Do.	Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	80
Do.	Huaxin Aluminum Industry Co.	Shandong, Chiping	160
Do.	Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125
Do.	Shandong Aluminum Plant	Shandong, Zibo	55
Do.	Taiyuan Oriental Aluminum Co.	Shanxi, Taiyuan	75
Do.	Shanxi Guanlu Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.	Yunnan Aluminum Plant	Yunnan, Kunming	130
Antimony	Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.	Xikuangshan Twinkling Star Co. Ltd.	Hunan, Lengshuijiang	25
Asbestos	China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan, and Lu Liang	130
Barite	do.	Guizhou, Xiangshou	NA
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 Shaanxi	40,000
Cobalt	tons Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	1,200

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies ¹	Location of main facilities	Annual capacity ²
Copper, refined	Jinchang Smelter (Tongling Nonferrous Metals Co.)	Anhui, Tongling	80
Do.	Jinlong Smelter (Tongling Nonferrous Metals Co.)	do.	100
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	60
Do.	Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.	Daye Nonferrous Metals Co.	Hubei, Daye	150
Do.	Guixi Smelter (Jiangxi Copper Metals Co.)	Jiangxi, Guixi	400
Do.	Huludao Copper Smelter (Huludao Zinc Smelting Co.)	Liaoning, Huludao	100
Do.	Taiyuan Copper Industry Co.	Shanxi, Taiyuan	30
Do.	Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	80
Do.	Tianjin Copper Electrolysis Factory	Tianjin	25
Do.	Yunnan Smelter	Yunnan, Kunming	160
Gas, natural	China National Petroleum Corp.	Sichuan	10
Gas, natural	billion cubic meters		
Gold, refined	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Shandong, Laizhou	15
Do.	do.	Shandong, Zhaoyuan	15
Graphite	China National Nonmetallic Industry Corp.	Shandong, Laixi and Pingdu	190
Iron and steel:			
Iron ore	Maanshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.	Shoudu (Capital) Mining Co.	Beijing	20,000
Do.	Meishan Metallurgical Co.	Shanghai	2,000
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.	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, Panzhuhua	13,000
Do.	Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys	Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.	Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.	Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
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	Maanshan Iron and Steel Co.	Anhui, Maanshan	3,000
Do.	Shoudu (Capital) Iron and Steel (Group) Co. (Shougang)	Beijing	6,500
Do.	Handan Iron and Steel General Work (Handan)	Hebei, Handan	2,400
Do.	Tangshan Iron and Steel Co. (Taigang)	Hebei, Tangshan	2,300
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	10,000
Do.	Anshan Iron and Steel (Group) Co. (Angang)	Liaoning, Anshan	8,500
Do.	Benxi Iron and Steel Co. (Bengang)	Liaoning, Benxi	2,700
Do.	Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	3,500
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel)	Shanghai	13,000

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies ¹	Location of main facilities	Annual capacity ^c
Crude steel--Continued	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	2,500
Do.	Panzhuhua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	3,000
Lead	Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.	Shaoguan Smelter	Guangdong, Shaoguan	100
Do.	Yubei Metal Smelter	Henan, Anyang	150
Do.	Jiyuan Wangyang Nonferrous Smelter	Henan, Jiaozuo	45
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	200
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	80
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	100
Do.	Kunming Smelter	Yunnan, Kunming	100
Magnesium	Fushun Aluminum Plant	Liaoning, Fushun	5
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Interprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Wenxi Yinguang Magnesium Group	Shanxi, Wenxi	40
Do.	Minhe Magnesium Plant	Qinghai, Minhe	7
Molybdenum, concentrate	Luanchuan Molybdenum Co.	Henan, Luanchuan	8
Do.	Jinduichang Mining Corp.	Shaanxi, Huaxian	9
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	60
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	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	40
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.	Nei Mongol, Baotou	25
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
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 Industrial Co.]	Guangxi, Laibin	25
Do.	Pinggui Mining Bureau	Guangxi, Zhongshan	8
Do.	Yunnan Tin Industry Co.	Yunnan, Gejiu	55
Titanium	Zunyi Titanium Plant	Guizhou, Zunyi	5
Do.	Fushun Aluminum Plant	Liaoning, Fushun	1
Tungsten, concentrate	Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.	Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.	Nanchang Co.	Jiangxi, Nanchang	15
Zinc	Northwest China Lead-Zinc Smelter	Gansu, Baiyin	150
Do.	Shaoguan Smelter	Guangdong, Shaoguan	170
Do.	Liuzhou Zinc Products Factory	Guangxi, Liuzhou	100
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyan	60
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	300
Do.	Huludao Zinc Smelting Co.	Liaoning, Huludao	330
Do.	Laibin Smelter	Yunnan, Laibin	60

^cEstimated; estimated data are rounded to no more than three significant digits. NA Not available.

¹Companies are owned by either a State Government or a Provincial Government.

TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2002

(Metric tons)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Alumina	20,000	\$7,817
Metal and alloys:		
Unwrought	787,845	1,098,324
Semimanufactures	188,744	454,060
Antimony metal, unwrought	20,276	28,716
Barium sulfate	1,710,000	55,925
Copper, metal and alloys:		
Unwrought	81,328	130,960
Semimanufactures	171,710	495,535
Iron and steel:		
Ferrosilicon	540,000	240,741
Pig iron and cast iron	400,000	51,889
Steel:		
Bars and rods	1,450,000	363,792
Shapes and sections	380,000	102,233
Sheets and plates	1,800,000	571,036
Tube and pipe	490,000	437,665
Magnesium carbonate and oxide	2,010,000	240,697
Manganese, unwrought	126,757	97,222
Tin, metal and alloys, unwrought	42,578	155,531
Tungsten, tungstates	6,078	30,489
Zinc:		
Metal and alloys, unwrought	495,987	393,400
Oxide and peroxide	87,051	56,944
INDUSTRIAL MINERALS		
Cement	5,180,000	164,820
Fluorspar	1,010,000	105,466
Graphite, natural	321,795	46,144
Talc	730,000	67,553
MINERAL FUELS		
Coal	83,540,000	2,562,007
Coke, semicoke	13,570,000	957,500
Petroleum:		
Crude oil	7,210,000	1,232,489
Refinery products	10,680,000	2,384,596

Source: General Administration of Customs of the People's Republic of China, 2002, China monthly exports and imports, no. 12.

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2002

(Metric tons unless otherwise specified)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Alumina	4,570,000	\$752,952
Metal and alloys, unwrought	581,757	782,650
Semimanufactures	475,663	1,272,135
Scrap	447,254	240,543
Chromium, chromite	1,140,000	78,907
Copper:		
Ore and concentrates	2,070,000	809,450
Metal and alloys, unwrought	1,330,146	2,154,181
Semimanufactures	917,727	2,282,695
Scrap	3,080,096	1,068,886
Iron and steel:		
Iron ore	111,500,000	2,769,096
Steel:		
Bars and rods	1,030,000	529,650
Scrap	7,850,000	895,644
Seamless pipe	1,370,000	1,079,717
Shapes and sections	230,000	102,942
Sheets and plates	21,170,000	10,179,231
Manganese ore	2,080,000	151,438
INDUSTRIAL MINERALS		
Diamond	kilograms 11,350	997,134
Fertilizers:		
Compound fertilizers	7,750,000	1,312,302
Potassium chloride	6,650,000	768,327
Potassium sulfate	300,000	50,606
Urea	790,000	91,825
Sodium carbonate	293,685	30,293
Titanium dioxide	187,966	308,706
MINERAL FUELS		
Coal	10,810,000	328,460
Petroleum:		
Crude oil	69,410,000	12,757,344
Refinery products	20,340,000	3,798,994

Source: General Administration of Customs of the People's Republic of China, 2002, China monthly exports and imports, no. 12.