THE MINERAL INDUSTRY OF

CHINA

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The decision of the Chinese Government to pursue gradual economic reform of the country since the late 1970's has resulted in very strong economic growth in the last decade, attracting a large amount of foreign investment and creating growth in exports and imports since the economy opened up. The foreign exchange reserves grew to more than $140 billion by the end of 1998.

In the Year of the Tiger, it has been difficult for China to maintain its economic growth, while many other Asian countries were in recession. In order to attain the 8% growth target for 1998, the Government initiated a massive infrastructure-spending program designed to jump-start the economy in the first quarter of the year (China Economic News, 1998a, d). In 1998, investment by state-owned enterprises increased by 22% compared with the previous year (Washington Post, 1998). In the second half of the year, the National People's Congress Standing Committee approved for the Government to issue an additional 100 billion yuan (8.27 yuan equals to US$1.00) of state bonds and to adjust the central financial budget in order to enhance economic growth. In 1998, the People's Bank of China (Central Bank) lowered the interest rate three times on savings and loans, encouraging people to save less, spend more, and to reduce the interest burdens on enterprises so that they would have more funds for investment.

The State Statistical Bureau (SSB) reported that the economy grew by 7.8% in 1998, compared with that of 1997 (China Daily, 1999a). Western economists questioned the reliability of the statistical data that the SSB collected. The retail price index, an indicator of consumer demand, dropped 2.5% and the consumer price index fell by 0.8% in 1998, compared with those of 1997 (China Statistical Information and Consultancy Service Center, 1998). Also, the flat foreign investment and total foreign trade figures published by SSB did not support the economic growth rate datum.

In the summer of 1998, China experienced the worst flooding in the past 50 years. The flooded areas covered nearly one-tenth of the country. The damage to Chinese agriculture was huge. More than 21 million hectares of land in the most fertile areas of the country, the Chang Jiang (Yangtze River), were underwater. The spread of flooding to northeastern China disrupted iron and steel and oilfield production in that area.

Many economists believed that the official statistics appeared to overstate the real growth because the Government statisticians relied on the economic reports from provincial governments to explicate the national figures. Officials from the SSB believed that exaggerations about economic growth rate did exist in some regions (China Daily, 1999g), but adjustment had been made in the national figure for such biases. In order to eliminate statistical errors, the SSB will change their data collection method in the future. Whatever the exact growth rate, the problems that China faces are significant and structural.

In 1998, a deepening deflationary trend caused industrial product stockpiles and weak consumer demand resulting in the slowdown of the Chinese economy. Slow sales prompted many companies into fierce price wars in many oversupplied sectors, including agricultural products, construction materials, petrochemical products, steel, and textiles. The decline in sales of these commodities also was attributed to competition of the smuggle imported goods that were cheaper by depreciation of regional currencies in neighboring countries against the renminbi since mid-1997. The Government set up special task forces to crackdown on smuggling.

Critical reform of state-owned enterprises was being held back in the third-quarter of 1998 owing to worry over unemployment and the social unrest that could result if too many people lose their jobs. Shoudu (Capital) Iron and Steel Corp. failed to pay its workers for more than 2 months (Financial Times, 1999a). The same concern also affected the reform of government bureaucracy, which was announced in March 1998. Banking reform was put on hold by the order of the Government to lend billions of yuan to key state-owned enterprises and infrastructure projects in order to maintain the country's targeted economic growth rate (Washington Post, 1998).

Government Policies and Programs

The ongoing reform of state-owned enterprises, the social security system, the housing system, education, and the medical care system have a huge impact on Chinese consumer confidence. The reform of state-owned enterprises is to break the "iron rice bowl" system. The new social security system under consideration is to provide basic insurance for unemployed and retired workers. In the proposal, the state, the enterprise, and the individual are required to make contributions to the system. Moreover, the reform of housing, education, and medical care also require individuals to save in advance for expenditure on all these systems, which are going to be operated by the state on a pay-as-you-go basis. Therefore, the need for individual savings has increased dramatically.

The reform movement seemed to start smoothly, but the Asian financial crisis affected the Chinese economy. The Government had banned the construction of new iron and steel plants. The move was aimed to tackle overcapacity and price

wars in the industry. The separation of the management and regulatory functions within the metallurgical sector was slower than expected. At the end of 1998, owing to the fear of unemployment, the conversion of small-sized state-owned enterprises into worker-owned shareholding cooperatives was nearly stopped (Asian Wall Street Journal, 1998; Financial Times, 1998a). The Government released a list of 114 items informing the industrial sectors that the Government would not support their production, including production of low-quality equipment in coal mining, metallurgy, petrochemicals, textiles, and power supply. In 1999, the output of steel would be reduced by 10% and 20 small steel plants would be closed. Cement production would be cut by 100 million metric tons (Mt). Two hundred and fifty-seven glass plants would be closed. The technological upgrade and expansion of five oil refineries would be suspended for 3 to 5 years because the country's 220 oil refineries were operating at only about 70% of their capacity. The three petrochemical foreign-Sino joint ventures (BP Amoco PLC, BASF AG, and Royal Dutch/Shell Group) worth $8 billion would be delayed until the market environments were more suitable. The Government wanted to stimulate the slow economy by spending more on infrastructure than on industry. The Government believed that the reduction on industrial production would help to reduce severe stockpiles, improve efficiency, and control price wars. The production cutback will apply mainly to manufacturers using obsolete technology (Asian Wall Street Journal, 1999).

The separation of state-owned enterprises from the Government was expected to be completed by the end of 1998. Rather than privatizing the companies or to achieve decision-making independence, the 500 to 1,000 large- and medium-sized state-owned companies will be controlled by the Ministry of Finance, the Central Bank, the State Economic and Trade Commission (SETC), and the newly established Central Working Committee of Large-Scale Enterprises, which is under the Communist Party's personnel department. These agencies will not be involved in any direct planning, but they will serve as stockholders and will be given broad instructions concerning what is expected as Government stockholders. These Government agencies, however, have the power to hire or fire managers and to control mergers, acquisitions, and bankruptcies.

In 1998, the Government tightened the foreign exchange procedures governing the selling of foreign exchange by banks to importers. The foreign exchange reserves had grown substantially, from $21 billion in 1993 to $139 billion 1997; however, the growth rate was flat in 1998 even with a trade surplus of $43 billion (General Administration of Customs of the People's Republic of China, 1998). The sluggish growth of foreign exchange was mainly because of widespread illegal practices among foreign trade companies. Companies were found presenting forged customs declaration documents that overstated the amount of foreign exchange needs for imports or that the reported import transaction may not even have existed. These fraudulent purchases were a way to supply foreign exchange liquidity for speculative trading in the currency black markets (China Monitor, 1998). Under the foreign exchange regulations, Chinese enterprises are required to report and convert 85% of their export earnings into renminbi at designated foreign exchange banks. Some exporters had presented forged trade documents that understated the amount of their foreign earnings and that led to less selling of foreign exchange to banks. Also, on the fear of possible devaluation of the renminbi, enterprises held onto their foreign currency. Instead of converting foreign currency to renminbi, some enterprises borrowed the renminbi funds from banks to meet their local payments. Beginning September 1, 1998, banks were required to verify the value and actual arrival of imports. For payments of $100,000 and more, banks must receive a certificate from customs certifying that the declaration document showing the value of imports and date of arrival was correct. To stop the illegal hoarding of export earnings, the State Administration of Foreign Exchange required all Chinese enterprises to report and repatriate the earnings held in foreign bank accounts by October 30. No new regulations were introduced in the announcement and the measures should have only limited impact on legitimate business operations; however, overseas suppliers have experienced increased delays in payments (Financial Times, 1998b).

On December 29, 1998, the National People's Congress (NPC) finally passed the security's law, which was under consideration for 6 years. The law will take effect on July 1, 1999. The law details the stipulations on preventing market risk and standards of market operation to protect the interests of investors. The law sets out broad powers for the market regulators, stiffens the punishments for trading and issuing irregularities, and stops brokerages from using customers' funds for trading on the firms' accounts. It states clearly the separation of trading and underwriting operations and divides the banking, trust, and securities business. The law, however, did not clarify rules governing the transfer of state-owned or "legal person" shares, a problem that had proved a critical obstacle to western investors to understand the shareholding structure of state-owned enterprises.

In 1998, NPC also passed three regulations related to exploration and mining—the provisions governing transfers of right of mineral exploration and prospecting and right of mining; land administration law of the People's Republic of China; and regulations for implementation of the land administration law of the People's Republic of China. The former Ministry of Metallurgical Industry issued regulations on mining permits of gold (China Gold, 1998b). The State Environmental Protection Administration issued a notice that all coal mines containing more than 3% sulfur will be shut down by the year 2002 (Economic Daily, 1998b).

Production

In the summer of 1998, owing to flooding, many mines, plants, and smelters were shut down in Guangdong, Guangxi, Hubei, Hunan, Jiangxi, Liaoning, and Shaanxi. Heavy rains and landslides destroyed mining facilities, roads, and railways. Fujiawu Copper Co., a 5,000-metric-tons-per-year (t/yr) mine and smelter complex, was buried under heavy rains and landslides. It might take years in order for the Fujiawu Mine to resume full production. The tantalum and niobium producer,

Jiujiang Nonferrous Smelter, was under water; roads connected to the outside world were cut off. Production facilities were destroyed. Floods reduced the daily crude oil output in Daqing Oilfield in Heilongjiang by 2% in August and wells in Jilin Oilfield were seriously damaged.

The demand for alumina and aluminum is expected to increase in the next several years. China's aluminum output capacity increased by about 280,000 metric tons (t) from Baotou, Baiyin, Guizhou, Yunnan, and other small smelters to a total of 2.8 Mt in 1998. Domestic aluminum prices dropped to the lowest level in the past 5 years and closed at about 13,300 yuan per metric tons (yuan/t) in November. Low prices and high energy costs forced several smelters to halt production. In 1998, China imported more than 1.5 Mt of alumina, mainly from Australia, to meet domestic demand. To maintain economic growth, the Government decided to continue its infrastructure and housing investment policy in 1999. Owing to the recovery from the Asian financial crisis in neighboring countries, exports of aluminum and its products are expected to increase in 1999.

In 1998, domestic copper concentrates only supplied about 60% of Chinese demand, therefore, China was required to import more than 1 Mt of copper concentrates from Mongolia, Chile, and Australia. Mongolia continued to be the largest supplier to China. Imports of scrap copper, unwrought copper and its alloys increased in 1998. The increase in copper imports was caused by higher copper prices in the domestic market than those in the international market, preferential tax policies on copper imports in the first 6 months of the year, and barter trade. Owing to the Asian financial crisis, exports of semimanufacturing copper products decreased slightly. At yearend, copper stocks at the Shanghai Metal Exchange increased by 61,000 t from the beginning of the year (China Nonferrous Metals Monthly, 1999), and an additional 60,000 t was in producers' warehouses.

Domestic copper consumption remained flat. Cheaper semimanufacturing copper products from Taiwan, the Republic of Korea, and Japan affected the demand of refined copper and depressed copper prices in domestic markets. Per tonnage market prices of number one (No. 1) refined copper declined from 17,500 yuan in January to 15,000 yuan in December. Over supply of copper in the domestic market and cheaper imports continue to pressure domestic producers to reduce production costs and to improve productivity in the coming years.

The growth of steel consumption remained weak in China. The steel market continued its downward trend, while steel product prices declined throughout the year. In 1998, steel imports declined by 6%; however, exports dropped more than 22% compared with those of 1997. The decline of steel exports was mainly caused by the Asian financial crisis. China exported more than 80% of its steel products to the East and Southeast Asian countries. The currency devaluations in the East and Southeast Asian countries also affected the competitiveness of Chinese steel products against those from Japan and Taiwan for exporting to those countries. Even with the post-flood reconstruction and a 200-billion yuan infrastructure construction, according to SSB, steel stockpiles went up by 5% in 1998, compared with that of 1997 (China Metals, 1999c). It appears that the oversupply of steel products in both domestic market and the Asian market will continue in 1999.

China is one of the fastest growing markets for stainless steel in the world. In the past 15 years, the demand for stainless steel products increased six-fold. Stainless steel consumption is expected to increase to 1 Mt in 2000 and 1.5 Mt in 2005. The consumption pattern of stainless steel in China is changing. Usage in aerospace, chemical, and energy will grow less rapidly, compared with those of automobile manufacturing and light industry. The demand of stainless steel sheet and strip accounts for 60% to 65% of total consumption. The balance is made up by long products and stainless steel pipe and tube. Between 1992 and 1996, import of stainless steel sheet and strip doubled. Because of technological and output capacity problems, China's major stainless producers—Fushun in Liaoning, Great Wall in Sichuan, No. 3 and No. 5 in Shanghai, and Taiyuan in Shanxi only had a total output capacity of 400,000 t/yr. Moreover, many domestic stainless steel products were not up to international quality standards; therefore, market share of domestic producers decreased from 79.2% in 1989 to 29.7% in 1996 and also most imports were high-grade sheet products. China intended to reduce its dependence on imports and planned to increase its stainless steel production to 700,000 t of its output capacity of 1 Mt in 2000, of which sheet and strip would be about 470,000 t. The goal was expected to be met by the technological upgrade of existing plants and new facilities that were under construction—Krupp Thyssen Nirosta and Shanghai Pudong Iron and Steel Corp., Taiyuan and Usinor of France, and by Baoshan and three Japanese companies. The Government believed that the home market share of domestic stainless steel will reach to about 80% in 2000 (China Metallurgical News, 1998f).

The Government urged the Chinese steelmakers to reduce their output of crude steel by 10% in 1999. To achieve the reduction, small scale and unprofitable steel mills will be closed, including those blast furnaces of less than 50 cubic meters (m^3), basic oxygen furnaces under 10 t, and electric arc furnaces of less than 5 t capacity. Open hearth furnaces accounted for about 5% of crude steel output in 1998 and the Government planned to retire all open hearth furnace steel production by 2000. Also, SETC issued a circular to limit steel imports to 7 Mt in 1999, compared with the 12.4 Mt actually imported in 1998. The circular also stated that steel products that can be produced domestically should not be imported. China's steel imports are under a "registration system" by which steel importers register with the Ministry of Foreign Trade and Economic Corp. (MOFTEC). The contracts do not have to be approved by the trade authorities. Sino-foreign joint ventures have become a major steel import group in that they have no obligation to comply with the restriction. In 1998, the State Development and Planning Commission (SDPC) called for a steel import ceiling at 7 Mt; however, the country imported 5 Mt more at yearend.

In 1998, the fertilizer market was quite volatile. For decades, fertilizer sales were monopolized by the authorized local agricultural materials companies. In 1998, the Government

granted fertilizer enterprises the freedom to set prices in line with market fluctuation and to sell products directly to farmers. Intensified trade competition between regions resulted in fertilizer companies undercutting each other's prices. At the same time, the Government approved the China National Chemical Import and Export Corp.'s (Sinochem) right to engage in internal trade of chemical fertilizers and allowed the China Agriculture Production Materials (Group) Co. the right to import chemical fertilizers as well as Sinochem. Since the suspension of the import of nitrogenous fertilizers, the balance between supply and demand improved. The Government, however, will continue to control the volume of imported chemical fertilizers. In 1999, the Government plan for chemical fertilizers output is 30 Mt of nitrogenous fertilizers, 6.6 Mt of phosphate fertilizers, and 400,000 t of potassic fertilizers. China has a shortage of potassic fertilizers and compound phosphate fertilizers because of limited resources and output capacities (China Daily, 1999d).

In China, there are about 20 boron producers with a total output capacity of 250,000 t. Major producers are Dandong Kuandian Borax Ore, Dashiqiao Township Bureau, Dashiqiao Fenshui General Chemical Plant, Liaoning Kuandian Borax Plant, Liaoning Kuandian Dongfang Chemical Plant, and Yinkou Chemical Plant in Liaoning Province, Ji'an Boron Mine, Ji'an City Borax Plant and Tonghua Meida Chemical Industrial Co. Ltd. in Jilin Province. Borax producers are either located in the northeast or northwest while consumers are in the south and southeast. China's congested transportation system creates delays for transporting raw materials from producers to consumers. Therefore, consumers in the south and southeast import a large amount of boron products and the domestic borax market becomes oversupplied. Due to the oversupply, per tonnage market price of borax declined from 3,200 yuan in 1997 to 2,400 yuan in 1998 (China Chemical Reporter, 1999). In the past couple of years, the consumption of borax gradually increased to about 180,000 t. About 40% of borax was used in producing boric acid, 20% in the ceramic sector, 18% in the glass sector, and the remaining in other sectors.

Trade

In 1998, the regional financial crisis affected Chinese exports. The country's total trade value decreased by 0.4%, compared with that of 1997. Declining exports to Asian countries hit China hard. In 1997, China exported a total of $183 billion worth of goods and services, of which 59% was targeted to Asia. In 1998, Asian countries accounted for 51% of China's total exports; however, the value of exports to southeast Asian countries decreased by more than 20%. As a result, China announced export stimulus measures in June and July to provide easier export credits, relax export licences, and increase tax rebates. On July 10, 1998, export licences for aluminum, caustic soda, nickel, scrap steel, and soda ash were eliminated (China Chemical News, 1998). Tax rebates on aluminum, lead, and zinc were raised from 9% to 11% on September 1, 1998. Some selected commodities such as cement, coal, and 23 large state-owned steel enterprises received the full 17% rebate (Economic Daily, 1998a).

The trade policy decisionmaker, MOFTEC, planned to overhaul the functions of the ministry in 1999. The focus of the ministry will shift from the task of daily management to policymaking and negotiation to forestall trade disputes. It aims to establish an administrative system that will be an import and export licence control mechanism, with transparent quota allocation procedures and lesser nontariff barriers to promote fair trade competitiveness. Before, in China, state-owned trade enterprises had monopolized right on licences and quotas. In 1999, new bidding regulations will be adopted so that non-state-owned enterprises will have a chance to compete for export quotas. Previously, private companies were required to go through state-owned trading companies to import and export their products. In 1998, MOFTEC granted 20 private companies the right to engage directly in foreign trades; however, state-owned trading companies still enjoy easier access to bank borrowing than their wholly owned private counterparts (China Daily, 1999h; Financial Times, 1999b).

Market access remains one of the critical issues for China's joining the World Trade Organization (WTO). The issue is how fast China will proceed in economic reforms and open its market to freer world trade and foreign competition. China wants to join the WTO without agreeing to a deadline for making further concessions for liberalization of certain markets such as agricultural, financial, retail, trade, and distribution services. The European Union and the United States want to set a definitive time for the lifting of China's high tariffs and strict import barriers, which protects its state-owned domestic industries. All parties continue their discussions on conditions for China's admission to the WTO (Journal of Commerce, 1999b).

China encouraged companies to increase investment in Latin America, as well as stimulating trade. In 1998, China-Latin America trade was $13.6 billion, 2.6% of China's total trade (General Administration of Customs of the People's Republic of China, 1998). Exporters were encouraged to skirt U.S. and European Union quotas on some goods by moving processing operations to Latin America with their own equipment and raw materials as a way to expand exports. Trade and consultation centers will be established in Argentina and Brazil to assist Chinese companies. Chinese economic and trade committees held discussions with Argentina, Brazil, Cuba, Mexico, Uruguay, and Venezuela and signed cooperation agreements with several Latin American countries.

The State Council decided to reduce the number of futures exchange markets from 14 to 3, which are Dalian, Shanghai, and Zhengzhou. The Shenzhen Nonferrous futures market will be closed on March 20, 1999. Only aluminum and copper will be traded in the futures markets (China Nonferrous Metals Monthly, 1998).

Commodity Review

Metals

Aluminum.—The State Development and Planning Commission approved the Jiaozuo Wanfang Aluminium Co. in

Jiaozuo, Henan Province, to build an aluminum pilot plant equipped with 280-kiloampere (kA) prebaked electrolytic cells. The plant will have an output capacity of 62,400 t/yr of aluminum. The 280-kA prebaked electrolytic cell was designed by the Qingyang Smelter of Zhengzhou Light Metals Institute. The State Development Bank will finance 60% of the total investment of 1.04 billion yuan and the remaining 40% will be funded by the company. The company will pay 5 million yuan to the former China National Nonferrous Metals Industry Corp. (CNNC) for acquiring the technology. The Government also approved the construction of a 37,000-t/yr carbon plant (China Metals, 1998q).

Dengfeng Aluminium Co. Ltd. in Henan Province invested $24 million to add 68 75-kA prebaked electrolytic cells to expand its output capacity from 28,000 to 40,000 t/yr in 1998. As part of Dengfeng Plant Group, the company received a preferential electricity price from its parent company so that the cost for aluminum production was lower than at other smelters in the region, putting the company in a much more advantageous position for selling aluminum in the domestic market than other companies (China Metals, 1998m).

E'meishan Aluminium Smelter, a subsidiary of E'meishan Ferroalloy (Group) Co., in Sichuan Province, completed its first phase construction of 36 60-kA Soderberg cells with an output capacity of 5,000 t/yr. After shutting down its 8,000-t/yr ferroalloy plant in 1998, E'meishan Ferroalloy (Group) Co. changed its name to E'meishan Aluminium (Group) Co. Ltd. The second phase construction was expected to begin in 1999 and would increase the smelter output capacity to 50,000 t/yr. The investment cost for second phase construction was estimated to be 500 million yuan. According to an official from the company, per tonnage aluminum production cost was 12,000 yuan, disregarding interest payments (China Metals, 1998h).

The first phase construction of Xin'an Aluminium Smelter, a subsidiary of Luoyang Xin'an Electricity Corp., in Luoyang, Henan Province, was completed. The 420-million yuan smelter, equipped with 58 160-kA prebaked electrolytic cells, has an output capacity of 25,000 t/yr. The 280 million yuan second phase construction began in October 1998. It was expected to be completed in June 1999 with an additional 78 electrolytic cells for the smelter. The smelter will have a total output capacity of 55,000 t/yr by October 1999 (China Nonferrous Metals News, 1998i).

Owing to the high cost of power, Jiangsu Aluminium Smelter in Xuzhou, Jiangsu Province, was forced to close 42 electrolytic cells in 1997. Under the agreement between the city government and a power company, the power rate was reduced to 0.39 yuan per kilowatt-hour (kWh) and the smelter resumed its full operation in March 1998. Also, the smelter and Datun Coal Electricity Co. in Peixian agreed to merge into a group company. After the merger, Datun and a Hong Kong-based company planned to build a new 100,000-t/yr smelter near the Datun powerplant, and the old smelter would be converted into a 4,000 t/yr aluminum foil and pipe fabrication plant. The new smelter will use 180-kA prebaked electrolytic cells. The first phase construction will cost about 600 million yuan and will have an output capacity of 50,000 t/yr. It is expected to be completed in 2001. The proposal received initial approval from the National Power Corp., a parent company of Datun Coal Electricity Co. (China Nonferrous Metals News, 1999a).

Owing to high power rate, Xiangxiang Aluminium Co., a subsidiary of former CNNC, in Hunan Province, was forced to shut down its 12,000 t/yr aluminum operation in October. The closure reduced the company's aluminum production by 4,000 t in 1998. It would affect the company's caustic soda production (China Metals, 1998e).

On October 9, Alcoa of the United States and State Nonferrous Metals Industry Administration (SANMI) signed a memorandum of understanding in Pittsburgh to study the feasibility of the two parties forming a joint venture in China (Alcoa press release, October 9, 1998, Alcoa signs memorandum of understanding with China State Nonferrous Metals Industry Administration, accessed October 12, 1998 at URL http://biz.yahoo.com/bw/981009/alcoa_chin_1.html). In August and September, Alcoa's expert teams visited 12 Chinese refineries, smelters, and fabricating plants and selected three plants—Pingguo Aluminium Industry Co. in Guangxi, Southwest Aluminium Fabricating Plant (SWAFP) in Chongqing, and Qinghai Aluminium Smelter in Qinghai, as the priority for cooperation. The fabricating plant is the top priority for Alcoa. Alcoa intended to penetrate into the Chinese aluminum alloy market. Alcoa has two small aluminum fabricating joint ventures in China—one in Shanghai and the other in Yunnan Province. SWAFP was built in 1990's with the equipment manufactured in German. It is the most advanced aluminum fabricating mill in China. It was designed to produce 160,000 t/yr of sheet and strip and had the capability to produce aluminum can stock. The plant was under financial difficulties and largely idled. For years, Pechiney of France has been negotiating to form a joint venture with SWAFP in two shops producing thin sheet and strip. Pingguo Aluminium Industry Co., the newest aluminum complex in China, is a joint venture between former CNNC and the Guangxi Provincial Government. Since the disbandment of CNNC, SANMI and the local government were negotiating who should have the control over Pingguo. Alcoa used to be interested in the Shanxi Aluminium Plant, but Alcan of Canada signed a memorandum of understanding with Shanxi Aluminium Co. to build a 240,000-t/yr aluminum smelter and a powerplant in Taiyuan in 1996. In 1998, Alcan decided to include the refinery into its joint-venture plan (China Metals, 1998b; Metal Bulletin, 1998c).

On December 18, 1998, Fuling Aluminium Smelters, in Chongqing, began its third phase construction to expand output capacity to 30,000 t/yr in 2000. In the first and second phases, a combined output capacity was 12,000 t/yr of aluminum from 78 Soderberg electrolytic cells. In the third phase, 135-kA prebaked electrolytic cells will be used. The 200-million yuan project was expected to be funded from listing the new company in the domestic stock market which included holders of the Chuandong Electricity (Group) Co. Ltd. and Guizhou Aluminium Plant. Under the share holding agreements, Guizhou Aluminium Plant will provide technology and alumina and Chuandong will supply power at a preferential rate of 0.32 yuan per kilowatt hour (China Nonferrous Metals

News, 1998d).

The renovation project of Yunnan Aluminium Plant, a subsidiary of Yunnan Aluminium Stock Co. Ltd., was proceeding smoothly. In October, 20 electrolytic cells were put into trial runs. After completing renovation in 1999, the smelter will have a total output capacity of 120,000 t/yr. In April, the China Security Regulatory Commission approved Yunnan Aluminium Stock Co. Ltd. to be listed in the domestic stock market (China Nonferrous Metals News, 1998j).

The Henan Provincial Government approved the Sanmenxia Tian Yuan Aluminium (Group) Co. Ltd.'s (Tian Yuan), formerly Sanmenxia Aluminium Plant, plans to build a 100,000-t/yr aluminum smelter in two stages. The first phase design to produce 50,000 t/yr of aluminum was included in the 1998 provincial planning and investment budget. On December 31, 1997, Tian Yuan and a Hong Kong-based company formed a joint venture, 20-80, to build a powerplant. On July 30, the first unit of the powerplant began generating electricity and the second unit was expected to be placed into operation at yearend of 1998 (China Nonferrous Metals News, 1998h).

Baiyin Nonferrous Metals Co., Hong Kong-based Simsen Metals Holding Co., and American AES Corp. negotiated to form a joint venture in Lanzhou, Gansu Province. Baiyin put its 880 million yuan, 50,000-t/yr aluminum smelter in the joint venture, and the Hong Kong and American companies would invest $200 million to build a 250-megawatt (MW) thermal powerplant and to expand the smelter output capacity to 80,000 t/yr. Baiyin invested 20 million yuan to renovate its alumina feeding system by introducing a computerized pipe-feeding technology from Switzerland to replace the manual feed. The renovation was expected to reduce unit consumption of alumina and improve efficiency (China Metals, 1998c).

The State Development Planning Commission decided to remove a 0.02 yuan per kilowatt hour power surcharge on 13 aluminum smelters/companies—Baiyin, Baotou, Fushun, the Great Wall, Guizhou, Liancheng, Lanzhou, Pingguo, Qinghai, Qingtongxia, Shandong, Tongchuan Xinguang, and Yunnan in 1998 and 1999. These smelters/companies met the government's two criteria to have output capacity over 50,000 t/yr and to use prebaked electrolytic cells (China Metals, 1999b).

Copper.—In June, six major Chinese copper producers—Daye, Jiangxi, Jinchuan, Tongling, Yunnan, and Zhongtiashan—formed a Copper Enterprises Coordination Committee at Kunming, Yunnan Province, under the auspices of the Chinese Nonferrous Metals Industry Association, and then met again in July at Guixi, Jiangxi Province, to discuss domestic copper issues. These producers decided to reduce their planned 750,000 t target production for 1998 by 90,000 t. In 1997, the total output for six producers was 539,700 t. They appealed to the Government for equal copper export and import tariffs. Copper import duty was at 2% while export duty was 30%. The producers believed that about 100,000 t of refined copper was illegally imported and urged the Government to control smuggling. They also appealed to the Government to decrease tax-free and tax-favored imports of copper. Such quotas were normally awarded to defense enterprises; however, much of the imported copper went to the open market instead of being used by the assigned enterprises (China Metals, 1998a, g; Mining Journal, 1998a). Beginning on August 1, the Government adjusted the export duties to 0% for refined copper and semimanufacturing products (China Nonferrous Metals News, 1998g). Local copper smelters from provinces of Guangdong, Jiangsu, Jiangxi, and Zhejiang also planned to reduce copper production by 70,000 t. These were mainly scrap-fed copper smelters (China Nonferrous Metals News, 1998c).

Tongguanshan Copper Mine in Anhui Province closed its last pit as reserves were exhausted. It started copper mining in the 1950's and produced about 14,000 t/yr of copper in concentrates in the past three decades (China Metals, 1998f).

Beijing Copper Plant stopped its production in November 1997. In 1998, the plant filed for bankruptcy owing to heavy losses. The plant was built in 1956 and after several renovations, had an annual output capacity of 15,000 t of cathode, 33,000 t of semimanufactured products, and 103,000 t of wire rod (China Metals, 1998d).

Zen International Resource of Canada decided to terminate the agreement with the Fujian Bureau of Geology and Mineral Resources in the Zijinshan gold-copper project in Fujian Province. According to an official from Zen, the Chinese partner declined to allow personnel from Zen to have free access to the property and did not vacate the property as previously agreed. Also, the deposit's metal grades were too low to justify investing more money at current metal prices (Northern Miner, 1998b).

Jiangxi Copper Co. and Tai-I Electric Wire and Cable Co. Ltd., a group including Tai-I Group from Taiwan and Japan's Sumitomo and First Electric, formed two joint ventures—Tai-I Copper (Guangzhou) Co. Ltd. and Tai-I Jiangxi Copper Co. Ltd.—in Guangzhou, Guangdong Province. Jiangxi held 15% of shares and the remaining 85% would be held by the group. The Tai-I Copper would invest $41 million to build a 21,000-t/yr emerald wire plant that was expected to be completed in July 1999. Tai-I Jiangxi Copper planned to invest $29.5 million to build a bare wire plant to have an output capacity of 90,000 t/yr. Raw material will be source from either Jiangxi Copper Co. or imported copper, depending on whether the finished products are exported. Exports of copper products are subjected to a 30% duty unless the products are based on processing imported copper or concentrates. The emerald wire will be mainly exported and the bare wire will be sold in the domestic market (China Nonferrous Metals News, 1998g).

Ningbo Orient Copper Co.'s 80 million yuan copper smelter in Cixi, Zhejiang Province, began operating in December. It has a designed output capacity of 30,000 t/yr of blister copper. Ningbo Orient planned to import 120,000 t/yr copper concentrates from suppliers in Australia, Chile, and South Africa. The company also has two copper wire and rod mills with a total output capacity of more than 10,000 t/yr in the same location (China Metals, 1998k).

The Sichuan Copper-Nickel Co. received an approval from SDPC for expanding its Lala Copper Mine. It will cost the company about 178 million yuan, of which 127 million yuan

will be loaned from the State Development Bank. After completion, the output capacity will increase to 3,000 metric tons per day (t/d) of ore and will process 3,500 t/yr of copper. In addition, it will process 41 t of cobalt, 76 kilograms (kg) of gold, 35,500 t of iron, 304 kg of silver, and 205 t of molybdenum. Construction is expected to begin in February 1999 and to be completed in 18 months. Concentrates will be sold to Chengdu Electric Refinery, a sister company, and Yunnan Copper Co. (China Metals, 1999a).

Gold.—China potentially may have much larger reserves of undiscovered gold than has been reported. In 1993, the Government opened its gold sector to foreign investors. Many large gold mining companies rushed to explore for gold in China. Five years later, Newmont Mining and FMC of the United States and Barrick Gold of Canada shut down their China operations, citing bureaucratic delays and business disputes with their partners.

Confusion over regulations, red-tape delays, and unclear jurisdiction frustrated foreign companies. Moreover, falling gold prices, depressed equity markets and rising development costs reduced the potential profit margin. China Clipper Gold was forced to suspend its operation in Jilin Province while caught in the middle of political struggles between the provincial government and the military jurisdiction. The fall in the price of gold and precious metals forced companies such as Asia Minerals in Canada to seek private financing instead of the stock market to meet payments. Under those strained circumstances, relations deteriorated between Asia Minerals and its Chinese partner, Shandong Zhaoyuan City Gold Corp. Asia Minerals decided to terminate the joint venture after spending $2 million on a feasibility study and another $4 million on mine development (Northern Miner, 1998b). Some foreign mining companies anticipated that the gold price and equity market would improve—therefore, they tried to maintain their joint ventures by continuing a friendly relationship with local partners.

On December 8, SANMI announced that the first phase construction of its Jianchaling nickel and gold mine in Hanzhong City, Shaanxi Province, was completed. The project was financed through Sino Mining International, a subsidiary of SANMI in Australia, Rothchild Australia, and the Industrial and Commercial Bank of China. The mine contains 21.7 Mt of ore and the average ore grade is 7.5 grams per metric ton (g/t) gold. The mine is designed to produce 2 t of gold per year (China Nonferrous Metals News, 1998e).

Three gold mining companies, Cangshang, Jincheng, and Wang'ershan, in Laizhou City, Shandong Province, decided to merge by forming the Laizhou Shi Jincang Mining Co. Ltd. to improve competition. After merging, Jincang has a combined mining capacity of 3,200 t/d and will produce about 4 t of gold per year (China Metallurgical News, 1998b).

The construction of the 180-million-yuan Kangjin gold smelter started in Yangxin, Hebei Province. The smelter will be managed and operated by local investors. After completion, the smelter will have a designed capacity to produce 1.5 t of gold, 9.2 t of silver, and 10,000 t of refined copper (China Gold, 1998a).

Iron and Steel.—Endorsed by SETC and SDPC, an Antidumping Office was set up under the State Administration of Metallurgical Industry. In September, the Office issued antidumping regulations for the domestic steel sector to ensure fair competition despite the oversupply in the market. Steel products would not be sold below production costs and major steel producers were required to report their production costs regularly to the Antidumping Office for computing the national average of steel products that would be used for the minimum selling price. China's 35 large- and medium-sized steel producers signed an agreement supporting the policy (China Daily, 1998a).

In 1998, the State Council approved 92 metallurgical enterprises that were either merged or declared bankruptcy. SETC used more than 2.6 billion yuan to writeoff bad loans. Large state-owned enterprises were encouraged to merge or to layoff employees in order to increase efficiency instead of declaring bankruptcy. Small state-owned enterprises were allowed either to declare bankruptcy or to be taken over by other enterprises. The largest metallurgical enterprises merging was the SETC's decision to form the Shanghai Baoshan Iron and Steel Group Corp. (Shanghai Baogang) by merging the Baoshan Iron and Steel Corp. (Baogang), the Shanghai Meishan Group Co. Ltd., and the Shanghai Metallurgical Group Corp. The Shanghai Metallurgical Group Corp. was formed from Shanghai No. 1 Iron and Steel Group Ltd., Shanghai No. 2 Steel Co. Ltd., Shanghai Pudong Iron and Steel Group Co. Ltd. (former Shanghai No. 3 Iron and Steel Plant), Shanghai No. 5 Iron and Steel Group Co. Ltd. and Shanghai Carbon Factory, and eight more research institutes and ferroalloy plants in Shanghai. Baogang had 46 subsidiaries located in China and other countries involving iron and steel production and trade. Shanghai Meishan Group Co. Ltd. had 23 subsidiaries participating in iron and steel production, trade, and real estate in Shanghai areas (Zhonghua Renmin Gongheguo Guowuyuan Gongbao, 1998). The newly established steel conglomerate is the third-largest state-owned enterprise, behind two newly formed petrochemical companies. The conglomerate will have a combined crude steel output capacity of 20 million metric tons per year (Mt/yr). The priority for Shanghai Baogang will be to modernize and revamp the Meishan and Shanghai Metallurgical Corp. plants. In April, Baogang's 3-Mt/yr No. 2 steel plant was put into operation, equipped with two Kawasaki-designed furnaces. In the same month, the second 700,000-t/yr cold strip mill also began production. The mill intended to produce blackplate of 1,420 millimeters (mm) width and 0.18 to 0.50 mm thickness for tinplate. A 400,000-t/yr wire rod mill was expected to come on-stream in early 1999. A 1-Mt/yr twin-shell electric arc furnace for producing seamless rounds and square billet had come on-stream in 1996; however, because of technical problems, this had not been realized. The ultimate goal for Shanghai Baogang is to become a base for producing high-quality steel products for the automobile, shipbuilding, construction, and petrochemical sectors (China Metallurgical News, 1998d). In 1998, Baogang also took over 60% shares in the Shanghai Yichang Steel Strip Co., a Sino-United States joint venture between the China Material Development &

Investment Corp., Shanghai No. 1 Iron and Steel Works, Shanghai Jiu Shi Corp., Shanghai Investment & Trust Corp., and American-Shanghai Pacific Partners Corp. The remaining 40% shares would be divided between the previous share holders. The plant has a design output capacity of 500,000 t/yr of 0.2 to 0.8 mm gauge strip (Metal Bulletin Monthly, 1999).

Baogang decided to invest billions of yuan to build a port on one of the Zhou Shan islands to handle all of its iron ore shipments. Baogang imports more than 12 Mt of iron ore from Australia, Brazil, Peru, and South Africa yearly. Baogang uses the Beilun Port in Ningbo to handle its iron ore shipments and then transfers them into smaller vessels to a shallower port in Baoshan. Ningbo is the second largest port behind Shanghai in China and is the only port that can handle 300,000 t of cargo at one time (International Bulk Journal, 1998). The new port is about 90 kilometers (km) from Baoshan and will be able to handle 250,000 deadweight tons vessels.

A $210-million stainless steel cold-rolled mill was put into operation in November 1998. The mill is operated by the Ningbo Baoxin Stainless Steel Co. Ltd., a 66-34 Sino-Japanese joint venture—Baogang, 54%; Nisshin Steel, 20%; Ningbo City's Zhe Yong Iron and Steel, 12%; and 7% each by traders Hanwa and Mitsui & Co. Mitsubishi Heavy Industries of Japan supplied the Z-mill; DMS of France provided the AP line; Nisshin Steel furnished the polishing line; and a local company provided the slitting and shearing facilities. All of the raw materials required for the mill will be imported from Nisshin Steel (Metal Bulletin, 1998a). The company planned to produce 50,000 t of stainless steel coil in 1999 and to reach its designed output capacity of 80,000 t/yr within 2 years.

The Government approved Jiuquan Iron and Steel (Group) Co. in Jiuquan, Gansu Province, to take over Xi'an Iron and Steel Plant in Xi'an, Shaanxi Province. Xi'an was a local "backbone enterprise"—however, with heavy debt, the plant either declared bankruptcy or merged with another company. State Banks wrote off part of Xi'an's liabilities and allowed Jiuquan to suspend Xi'an's interest payment for 6 years. Xi'an had a designed output capacity of 250,000 t/yr of crude steel and 400,000 t/yr rolled steel (China Metallurgical News, 1998c). Another merger took place between Xinjiang Bayi Iron and Steel (Group) Co. and Shaanxi Carbon Product Plant. The carbon plant produced 5,000 t/yr graphite anode. After merging, Bayi planned to invest 20 million yuan to upgrade and expand the output capacity of graphite anodes (China Metals, 1999d). Also, Taiyuan Iron and Steel (Group) Co. in Taiyuan, Shanxi Province, took over Linfen Iron and Steel Co. in Linfen, which produced 400,000 t of pig iron and 250,000 t of crude steel yearly (China Metallurgical News, 1998b).

The construction of Jiuquan's Heigou iron mine started in December 1998. The Heigou Mine is part of the Jingtieshan deposit, which was discovered in 1955. The other mine, Huashugou, has been operating for 40 years and its resource has begun to decline. Initially, the Jingtieshan deposit had proven reserves of 484 Mt of iron ore. The Heigou has proven reserves of 158 Mt of iron ore at an average grade of 36.14% Fe. The construction of the Heigou Mine will be carried out in two phases. The first phase will cost about 370 million yuan and will have output capacity of 2 Mt/yr. It is expected to be completed in the first half of 2002. The second phase construction will be completed in 2010. At that time, the Heigou mine will have a total output capacity of 6 Mt/yr (China Geology and Mineral Resources News, 1998b). Jiuquan commissioned its 500,000-t/yr reversing mill. The mill is equipped with a 500,000-t/yr converting furnace, a continuous casting line, a thermal furnace, and a oxygen generator. The mill was designed to produce normal steel plate, shipbuilding plate, and pipeline plate (China Metals, 1998j).

Suzhou Iron and Steel (Group) Co. Ltd. in Suzhou, Jiangsu Province, commissioned its 1.7 billion yuan electric arc furnace plant. The 100-t electric arc furnace and 100-t ladle furnace were imported from Mannesmann of Germany. The casting and rolling mills were supplied by Danieli of Italy. The plant has a designed output capacity of 450,000 t/yr of specialty steel. The company planned to produce 250,000 t of specialty steel in 1999 and to run at full capacity by 2001. Suzhou produces about 400,000 t of pig iron, 350,000 t of crude steel, and 340,000 t of rolled steel per year (China Metals, 1998o).

In 1998, Zhangjiagang Posco Stainless Steel Co., a joint venture between Shagang Group in Jiangsu Province and Posco of the Republic of Korea, began production. The company has a designed output capacity of 125,000 t/yr of stainless steel cold-rolled sheets and coils gauged between 0.3 to 3 mm. Posco holds 80% of the equity. Most of the equipment was imported from the United States. The total investment was $290 million (China Metallurgical News, 1999). The Dalian Posco Coat Steel Corp.'s 50,000-t/yr painted steel line, a joint venture between Posco and China Ferrous Metal Material Corp., was expected to be put into operation in March 1999. The joint venture between Allegheny Ludlum of the United States and Shanghai No. 10 Iron and Steel Work, Shanghai Stal Precision Stainless Steel Co., began operation. The plant is designed to produce 20,000 t/yr ultrathin stainless steel cold-rolled strip (Metal Bulletin, 1998b). Another stainless steel project, the Shanghai Krupp Stainless's 72,000-t/yr stainless steel plant construction, started in 1998 and was expected to be completed in 2001 (Metal Bulletin, 1998f).

The Government approved the development plan for the Bijiguo iron and titanium deposit in Yangxian, Shaanxi Province. The deposit has proven reserves of 100 Mt of iron and titanium ore, at an average grade of 28.4% Fe and 5.49% Ti (China Geology and Mineral Resources News, 1998c).

China's first Consteel process plant, supplied by Techint of Italy, started construction at Guiyang Steel Works in Guizhou Province. The project included a 60-t electric arc furnace, a 60-t ladle furnace, and a three-strand caster with a designed capacity of 300,000 t/yr of alloy steel billets. The Consteel process included scrap preheating and continuous raw material charging. The investment cost was estimated at 628.7 million yuan; the plant was scheduled to be put into operation in June 2000 (China Metallurgical News, 1998a).

Tangshan Iron and Steel Co. commissioned its 2,560 m^3 oxygen blast furnace in September. With the addition of 1.7-Mt/yr furnace, the company would have an output capacity of 4.2 Mt/yr of iron. The company also began replacing its four 15-t converting furnaces with two 150-t furnaces in January and was expected to be completed in December 1999. After

completion, the company will have a total output capacity of 4.3 Mt/yr of steel. The company planned to overhaul its two 1,260-m^3 furnaces in 1999 to improve their efficiency (China Metals, 1998p).

Binjiang Special Steel Plant, a subsidiary of Xingcheng Steel Works Co. Ltd., in Jiangsu Province, officially started production in July after the commission of its 100-t electric arc furnace in late 1997. The short-process special steel line, which included a 100-t LH furnace, a 100-t VD furnace, a 5-strand continuous casting and rolling mill, were imported from Mannesmann Demag and Walzwerkstechnik of Germany and Chugai Ro Co. Ltd. of Japan. The plant was designed to produce 600,000 t/yr of 600 different types special steels including spring steel, gear steel, railway steel, and alloy structural steel (China Metals, 1998r).

Three major steel producers, Anshan, Baotou, and Panzhihua, reached an agreement to divide equally the Chinese railway steel market and coordinate their price quotations. The three producers agreed to strictly carry out state-set prices and would not reduce the price unilaterally. Any discount on different processing technologies, freight charges, and ways of payment were to be controlled within 3% of standard prices (China Metals, 1998n).

In 1998, Wuhan Iron and Steel Corp. completed the replacement of its six open hearth furnaces at the No. 1 steel plant with two 100-t blast oxygen converters. Converters were supported with a 100-t ladle refining furnace and a 100-t VD furnace and were connected to two 5-strand, 5-flow continuous billet caster. Wuhan has two other steel plants. The No. 2 plant is equipped with three 90-t converters and four continuous slab casters. The No. 3 plant had two 250-t converters and two 2-flow casters. The combined steel output capacity was 8 Mt/yr (China Metallurgical News, 1998g).

Lead and Zinc.—In Xuzhou, Jiangsu Province, Chunxin Alloy Co. Ltd. and several enterprises from Chongqing City and Guangdong Province formed a lead recycled company, Chunxin Group, to process 200,000 t/yr of waste storage batteries. The processing plant will be in Peizhou, northwest of Xuzhou. It is designed to produce 60,000 t/yr of refined lead and its alloy. Chunxin Group has waste lead recycling facilities in Chongqing, Guangdong, Hebei, Jiangsu, Liaoning, and Xinjiang (China Nonferrous Metals News, 1998b).

In 1998, the joint exploration project between Naneco Mineral Ltd. of Canada and Hulunbei Nonferrous Metals Co., a subsidiary of former CNNC, on their Jiawula lead-zinc deposit went smoothly. The Jiawula deposit, 145 km south of the city Manzhouli, Nei Mongol Autonomous Region, covers an area of 25 square kilometers (km^2). Over 40 ore bodies are exposed on the surface. Naneco estimates the deposit contains more than 20 Mt of copper, lead, silver, and zinc. The Shenyang Nonferrous Metals Research & Design Institute feasibility study indicated a geologic reserve of 7.34 Mt of 0.38% Cu, 3.26% Pb, 124.4 g/t Ag, and 5.19% Zn with a mining reserve of 5.17 Mt of 0.46% Cu, 3.38% Pb, 140.8 g/t Ag, and 5.70% Zn. Naneco holds a 75% interest prior to payout and a 70% interest after payout from its investment in the project. The investment will facilitate the upgrading of current mill capability from 200 t/d to 1,000 t/d, additional mine development and infrastructure improvements as well as an intensive exploration program (Naneco, 1998).

In May, China Nonferrous Metals Construction Corp. Ltd. (CNMC) and the Ministry of Finance of Mongolia signed a contract to form a joint venture, Tsairt Mineral Co. Ltd., for developing the Tumurtiin Ovoo zinc deposit in Subaatar Province, Mongolia. The Tumurtiin Ovoo zinc deposit has proven reserves of 7.55 Mt of zinc. CNMC will invest $10 million to build a 300,000-t/yr mining and milling facility and zinc concentrates will be exported to China. In return, the Mongolian Government provided CNMC with a 15-year preferential investment and tax package (China Nonferrous Metals News, 1998a).

Nickel.—In 1998, the domestic nickel market was sluggish. Because the price on domestically produced nickel was higher than that of imported nickel, Chinese manufacturers used more imported nickel. The domestic market had a surplus of nickel. The import duty for nickel was 3%, while the export duty for Chinese nickel was 40%. Domestic nickel producers urged the Government to reduce the gap between import and export duties. They also recommended to the Government to limit the import of stainless steel to help the domestic nickel sector and to expand the output of stainless steel, which would increase the nickel demand in China.

The economic downturn in Asian countries and delayed payments by domestic consumers, caused Jinchuan Nonferrous Metals Corp., China's largest nickel and cobalt producer, to reduce its nickel output to 35,000 t in 1998. The company also produced 225 t of cobalt metal and 710 kg of platinum-group metals (PGM). The company intended to technically upgrade and expand its production capacity of its flash furnace in order to cut production costs. The company planned to retire its electric furnace in 2000. Additionally, the company prepared to diversify its downstream production lines by developing high-value-added products (China Nonferrous Metals News, 1998f).

Tungsten.—There are more than 170 tungsten companies in China. The total output capacities are concentrates, 70,000 t/yr; tungstate, 65,000 t/yr; and ammonium paratungstate (APT), 35,000 t/yr. Total domestic consumption is about 10,000 t of tungsten per year. Chinese tungsten output accounted for more than 70% of the world total; therefore, it is a major price controller in the world. In 1998, China's domestic tungsten market remained sluggish; however, owing to oversupply, prices on the world market were also low. In November, the Chinese Tungsten Association met at Nanchang, Jiangxi Province, to discuss ways to control production and exports. Many local tungsten mining and processing companies were operating without licences. As a result of this unauthorized competition, several state-owned tungsten mining companies had gone bankrupt and many of them requested the Government to provide subsidies in order to continue operating. Weak demand caused the decline in concentrates and APT prices in both domestic and world markets. The per-tonnage average price of concentrates

(containing more than 65% of WO_3) declined from 20,000 yuan in January to 18,000 yuan in December, as well as for APT from 55,000 yuan to 38,500 yuan. Export prices on tungsten products also declined (China Nonferrous Metals News, 1999d).

In Chenzhou, Hunan Province, the 60 million yuan expansion project on the Shizhuyuan Mine was completed in October. Shizhuyuan is polymetallic mine containing bismuth, lead, molybdenum, tungsten, and zinc. It has proven reserves of 230,000 t Bi, 110,000 t Mo, and 620,000 t W. After the expansion, the mine output capacity will increase to 1,000 t/d and the output capacities for bismuth, molybdenum, and tungsten will be increased to 700 t/yr, 900 t/yr, and 2,500 t/yr, respectively. The lead, tungsten, and zinc concentrates are sold to Zhuzhou Smelter and Zhuzhou Hard Alloy Plant. The bismuth and molybdenum concentrates are smelted in Shizhuyuan's own smelter (China Metals, 1998l).

Industrial Minerals

Fertilizer.—Harver International Group of the United States and Jiangxi Huatong Enterprise Group agreed to establish a joint venture, Jiangxi Huatong Chemical Co. Ltd., to develop the phosphate resources in Shangrao, Jiangxi Province. The company will invest 87 million yuan (66 million yuan from Harver), to use the CDK kiln process developed by Changsha Mining Institute to produce phosphoric acid from low-grade phosphate ore in Shangrao. The designed output capacity was 15,000 t/yr (China Chemical Reporter, 1998d).

China Oil and Natural Gas Corp. decided to build a 450,000-t/yr ammonia and 800,000 t/yr urea plant in Chongqing. The corporation also intended to cooperate with a foreign company to build a 300,000-t/yr ethylene plant in the same location. Both plants will use natural gas as raw material. The total investment will be more than 9 billion yuan (China Chemical Reporter, 1998c).

Magnesium.—In 1998, the European Union's (EU) executive body, the European Commission (EC) enforced dumping duties on unwrought alloyed magnesium from China. The action was led by a complaint made by the Euroalliages trade group on behalf of the sole EU producer of unalloyed magnesium, Pechiney Electrometallurgie. The complaint alleged that the volume and prices of Chinese magnesium caused lower prices in the European market and resulted in an adverse effect on its financial situation. Since the EC imposed dumping duties on imports of Russian and Ukrainian magnesium in 1995, the Chinese share in the EU market increased from 0.5% in 1993 to 22.8% in 1997. Effective on November 7, the EC imposed a 5-year minimum import price of 2,622 ECU for unwrought alloyed magnesium from China (Metal Bulletin, 1998e).

Most Chinese exporters also faced dumping duty in the United States at 108.26% on 99.8% or higher pure magnesium. Importers were required to post a cash deposit for the merchandise, which included the applicable dumping duty. The dumping duty, however, only applied to primary magnesium by weight, but magnesium which contained 50% or more by weight did not conform to alloy specifications. The dumping duty did not apply to primary magnesium anodes, granular primary magnesium, secondary magnesium, and remelted magnesium. Many Chinese magnesium producers began to convert their ingot plants to granular primary magnesium and alloy plants. Domestic analysts estimated that there were more than 30 granular primary magnesium plants with an estimated total output capacity of 50,000 t (China Nonferrous Metals News, 1999b).

Owing to magnesium dumping charges by the EU, India, and the United States, the Government assigned the China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters and the China Magnesium Industry Association to set up a magnesium export committee managing the export value and prices. In October, Government officials and magnesium producers met at Taiyuan, Shanxi Province to discuss the bottom price for magnesium exports. Twenty top magnesium producers agreed that the minimum price for exports was $1,950 per ton before 1999 and then should be increased to $2,320 per ton in 1999 (Metal Bulletin, 1998d). In 1998, China exported 866,000 t of magnesium from Tianjin port, of which 734,000 t was unwrought magnesium (China Nonferrous Metals News, 1999c).

Sodium Compounds.—China is the second largest soda ash producer behind the United States in the world. The growth rate of domestic soda ash output was higher than that of consumption. There are more than 60 domestic producers with a total output capacity in excess of 7.5 Mt/yr. About 98% of soda ash is produced by the synthetic method, of which, the Hou's process accounts for 60% and the Solvay process, 38%. Soda ash produced through trona only accounts for 2%, mainly from the provinces of Nei Mongol and Henan. Most soda ash plants are along the east coast of China—Dalian Chemical Industry Co. in Liaoning, Hubei Shuanghuan Chemical Group Co. in Hubei, Lianyungang Soda Plant of Nanjing Chemical Industrial (Group) Co. Ltd. in Jiangsu, Shandong Haihua (Group) Co. Ltd. in Shandong, Tangshan Sanyou Soda (Group) Co. Ltd. in Hebei, Tianjin Soda Plant of Bohai Chemical Industry (Group) Co. Ltd. in Tianjin, Qingdao Alkali Industry Co. Ltd. in Shandong, Yikezhaomeng Chemical Industry General Corp. in Nei Mongol, and Zigong Honghe Chemical Co. Ltd. in Sichuan. In 1998, China consumed about 6.2 Mt of soda ash and exported about 700,000 t, while importing around 84,000 t, mainly from the United States. Oversupply of soda ash in the domestic market caused prices to drop more than 30% in 1997 and 1998. Some small soda ash producers such as Delingha Soda Plant, Hami Soda Plant, Jiangxi Ammonia Plant, Jiaxing Chemical Fertilizer Plant, Liangzhu Chemical Fertilizer Plant, Lushun Chemical Fertilizer Plant, and Xi'an Nitrogenous Fertilizer Plant suspended their operations in 1998. China's 10 major producers and government officials met on September 1 to discuss ways to stabilize soda ash prices. At the conclusion of the meeting, the per tonnage minimum price (including taxes) of soda ash was 1,080 yuan (Building Materials Industry Information, 1998). Owing to the surplus of soda ash in the market and the sluggish demand in the chemical sector, the market price is expected to continue to

decline in 1999.

Henan Oilfield, Yuanxing Trona Co. Ltd. of Nei Mongol, and Tongbo County State Assets Operation Co. reached an agreement to jointly develop the Henan Anpeng Trona Mine in Tongbo, Henan Province. The mine was discovered by the Henan Oilfield during oil prospecting in 1976. Henan Oilfield built a 10,000-t/yr trona plant in 1992. Owing to technical and capital problems, the plant never met its designed capacity. The three companies planned to renovate the existing plant and expand its output capacity to 200,000 t/yr. The trona mine has proven reserves of 48.49 Mt (China Chemical Reporter, 1998a).

The caustic soda sector also had a difficult time in China in 1998. Overcapacity and oversupply forced the association and the Government to set the minimum price for 30% liquid caustic soda at 400 yuan per ton, including taxes (China Chemical News, 1998). China's caustic soda output capacity expanded very rapidly in the past decade. Output of caustic soda exceeded demand. Major caustic soda producers are in the east coast of China and account for about 60% of the country's 7.5 Mt output capacity. The diaphragm cell method accounts for about 70% of caustic soda production; the ion exchange membrane cell method for 22%; while the remaining is either by mercury cell method or lime method.

In 1998, Tianjin Chemical Plant completed its renovation plan to switch the production of caustic soda from mercury process to ion membrane cell process. The mercury process consumed more energy and caused serious pollution problems. The new unit has an output capacity of 85,000 t/yr of caustic soda (China Chemical Reporter, 1998b).

Mirabilite producers in Huaiyin, Jiangsu Province, Yuancheng, Shanxi Province, and Meishan, Sichuan Province, formed a liaison company, Jiangsu Nanfeng Co. Ltd., to manage the production and marketing of their products. Producers in these areas believed that domestic sodium sulfate market was oversupplied, therefore, producers began to lower prices. China produced more than 3 Mt of anhydrous sodium sulfate; however, the country only consumed about 2 Mt. Prices on sodium sulfate gradually declined in the past 2 years. The new company was expected to coordinate all sodium sulfate production and to create profitable margin for its alliance (China Geology and Mineral Resources News, 1998d).

Sichuan geologists discovered a large mirabilite deposit in Pengshan, Sichuan Province. The deposit covers an area that is 22 km long and 2 km wide with an average thickness of 4 meters (m). Exploration at the ore body delineated an indicated resource of about 4.58 billion tons of mirabilite at a grade of 36% to 40%. Officials in Pengshan have formed a development team to exploit this deposit (China Geology and Mineral Resources News, 1998e).

Other Minerals and Metals.—China produces more than 30 t of indium, of which most is exported to Japan. Major domestic indium producers are the Shaoguan Smelter in Guangdong Province, the Huludao Zinc Smelter and the Shenyang Smelter in Liaoning Province, the Yunnan Tin Co. in Yunnan Province, and the Zhuzhou Smelter in Hunan Province.

China is a net importer of PGM. The country produced about 1 t of PGM while consuming more than 3 t. Jinchuan Nonferrous Metals Co. accounts for about 70% of China's platinum and palladium output. The Catalyst Branch of No. 3 Petroleum Plant of Fushun Petrochemical Corp. invested 2.3 million yuan to build a PGM recovery unit in Fushun, Liaoning Province. The company planned to recover 450 kg of number 2 grade platinum, containing 99.95% Pt, from 150 t of catalysts (China Chemical News, 1999b).

Zhengzhou Aluminium Plant of the Great Wall Aluminium Co. restarted its gallium (Ga) recovery processing unit from its alumina production unit. The company invested 10 million yuan to build a gallium unit in 1982. Owing to technical difficulties, the unit was never put into operation. In 1998, the company produced 10 kg of high-purity gallium from the "mother liquid" in the alumina processing unit. The unit has a designed capacity to recover 6 t/yr Ga. Shandong Aluminium Co. is another gallium recovery alumina producer with the maximum output capacity of 7 t/yr; however, the company only produces less than 1 t Ga yearly (China Metals, 1998i). China produced about 60 t primary and secondary gallium yearly (China Nonferrous Metals News, 1999e).

According to a Ministry of Land and Mineral Resources' geologic report, geologists discovered 1,600 t of germanium at the Shengli coal deposit in Xilin Hot, Nei Mongol Autonomous Region. The deposit contains 244 grams per ton of germanium. This would account for about 30% of the country's total germanium reserves (Zhongquo Meitan Bao, 1999).

China's largest lithium plant was under construction in Yibin, Sichuan Province. After completion in July 1999, Jianzhong Chemical General Plant will be able to produce 150 t/yr of lithium metal for domestic market (China Chemical News, 1999a).

Integrated Carbonics Corp. (ICC) of the United States announced the commencement of its pilot plant to process large volume of high purity and expandable graphite project in China. In 1997, ICC formed a joint venture with Limao Graphite Group in Heilongjiang Province. The joint venture aimed to build and operate a processing plant to produce 3,000 t/yr high-purity graphite for the global market. Limao operates a 50,000-t/yr graphite mine in Jixi, Heilongjiang Province (Industrial Minerals, 1998).

Mineral Fuels

China plans to invest about 100 billion yuan to upgrade its urban power grids in the next 3 years. Constrained power supply significantly restricted the economic development in many regions. With economic development and a rising standard of living, energy demand for household use has increased sharply in the past several years. However, the efficiency of blowers, water pumps, and coal pulverizers in China's thermal powerplants is low. The average thermal efficiency of industrial furnaces and kilns is 10% to 20% lower than that of western countries. Therefore, without technical modernization, the supply energy in the coastal areas of east and south will remain tight in the next century.

On December 13, the Government announced that it would shut small powerplants with less than 125,000 kilowatts in each generator's installed capacity in 1999. Most of these powerplants were built by town and county governments and other social institutions with permission of the provincial government. Their low rate of combustion and lack of desulfurizing equipment caused environmental problems for the country. According to Government statistics, these plants emitted 47.5% of the total sulfur dioxide to the atmosphere. During 1980's, small powerplants played a significant role to ease power shortage and to support the economic growth for provinces such as Fujian and Guangdong (China Daily, 1999c).

The Governments of Australia, China, the Netherlands, and the United Nations Development Program (UNDP) committed a total of $25.8 million to accelerate the development of renewable energy in China. The Government believed that China required such projects to support industrial needs. Some 60 million people in China live in areas without access to electricity. Many areas have limited supply of electricity (Journal of Commerce, 1999c).

Coal.—As part of the institutional restructuring of the State Council, the Ministry of Coal Industry (MCI) was replaced by the State Coal Industry Bureau under SETC. The State Council decided to transfer 94 major state-owned coal enterprises (mines) under the supervision of former MCI to the provincial governments. The central government with assistance of provincial governments would continue managing financial, social services, and assets of these enterprises. The Government would coordinate with related bank institutions to decide how to convert construction loans and interest rebates, which were under the MCI, to other institutions. Beginning July 1998, all transferred coal enterprises would pay their relevant taxes to provincial governments instead of the central government. Provincial governments would have the authority to manage the revenue that they collected. The central government would send inspectors to 30 coal enterprises, and the provincial governments would inspect the other 64 coal enterprises (Zhongguo Meitan Bao, 1998c).

In 1998, China reduced its coal production by 100 Mt from that of 1997, however, the nation still maintained its position as the world's largest producer. Despite that, China produced more than it required and stockpiles went up by 15 Mt since the beginning of the year. Domestic sales plummeted at all key state-owned mines in 1998. Reasons for the slow demand were the cutback in production at many heavy users such as power, metallurgical, building materials, and chemical sectors and improved technological efficiency. Many medium-sized state-owned coal mines suspended operation for part of the year. In 1997, the coal sector ended 12 straight years of heavy losses, posting a net profit of 200 million yuan. In 1998, however, major coal enterprises reported aggregate losses of 3.71 billion yuan (China Daily, 1999a). The Government planned to increase its coal exports and to reduce coal production by 250 Mt in 1999. Small mine output accounted for about 46% of the country's total.

The State Council was determined to close 25,800 small coal mines at the end of 1999. The criteria for shutdown were firstly, mines without mining licenses and production permits and those small coal miners inside of state-owned coal mine properties after January 1, 1997; and secondly, small coal miners inside state-owned coal mine properties before January 1, 1997, and with mining licenses but without production permits; small coal mines with high sulfur content and without desulfuration facilities; small mines outside state-owned mine properties that held mining licenses but would not receive production permits after February 1999; and finally, small coal mines having mining licenses and production permits inside state-owned coal mine properties before January 1, 1997, but whose presence inside state-owned coal mines would affect the country's developing plans (however, these miners would receive compensation). All decisions must be based on the mining and mineral resources law, coal law, mining safety law, and environmental protection law. The State Coal Industry Bureau will respond to implement all mine closure programs (Zhongguo Meitan Bao, 1998b). Most closures were expected to come from among 7,500 small pits run by township and village enterprises. Owing to mine closures, about 1 million jobs would be cut. The restructuring aimed to reverse the decline of coal prices and to improve profitability of major state-owned mines.

With the former China Coal Industry Enterprise Management Association as its core and 11 other related associations, the China Coal Industry Association (CCIA) was established. CCIA would serve as a bridge between the Government and coal enterprises. CCIA was registered with the Ministry of Civil Affairs and was under the guidance of State Coal Industry Bureau. The association would draft a series of industrial regulations related to quality, technology, and management standards. These new regulations are expected to improve the management, to maintain stable market prices, and to promote scientific cooperation with foreign countries within the coal sector (China Daily, 1999e).

China exported 32.29 Mt coal, 90% through the China National Coal Import and Export (Group) Corp. (CNCIEC), mainly to Japan, the Republic of Korea, and Southeast Asian countries. CNCIEC launched a series of strategic plans to increase coal exports. The company opened three export ports in Vostochny, Russia; Lanshan in Rizhao, Shandong Province; and Jingtang in Hebei Province for its east Asian customers. To the southeast Asian countries, CNCIEC used the Nanning-Kunming railway to transport coal from Panjiang in Guizhou Province to Fangcheng Port in Guangxi Zhuang Autonomous Region. The company provided financial assistance to major coal production bases in Shanxi Province by upgrading their coal-washing facilities so that the quality of coal would meet international consumer requirements (China Daily, 1999b).

Kanawha Scales and Systems (KSS) signed a $3.5 million contract to design and to build two unit train loadout systems for the Anjialing open pit coal mine in Shanxi Province. The mine was the second phase of the Antaibo Mine project. According to KSS, the mine has estimated coal reserves of 2.18 billion tons and has a designed output of 15 Mt/yr (Mining Journal, 1998b).

The Jungar Coal Industry Corp. and Dongsheng Coal Industry Corp. announced the merger to establish a new

company, Jungar Shenfu Dongsheng Coal Co. Ltd. Shenfu-Dongsheng coalfield is on the border of Shanxi Province and Nei Mongol Autonomous Region. Prior to merging, the two companies competed for capital funds for projects, which led to overspending in facility constructions. The merger received approval from the State Council and provincial governments (Zhongguo Meitan Bao, 1998a).

As one of the worst hazards to coal miners, coalbed methane caused hundreds of explosions and killed about 500 people a year in China. Now, however, coalbed methane has become a source of clean fuel. China has 35 trillion cubic meters of coalbed methane reserves that are concentrated in three major basins—Huabei, Ordos, and Qinshui. China had attempted to develop coalbed methane in the past four decades; however, this was hampered by lack of funds and obsolete technology. In the past several years, with assistance from UNDP's technology transfer program, China acquired modern coalbed methane test equipment and staff training from western countries. China planned to establish a system to produce 10 billion cubic meters of coalbed methane by the year 2010. Because of the danger in exploiting methane gas in deep coal mines, the Government planned to introduce preferential loan and exemption polices to accelerate development, in addition to current incentives such as import duty exemption on needed equipment and a 5% value added tax rate (Journal of Commerce, 1999a).

The China United Coalbed Methane Co. (CUCBM), or Zhonglian Coalbed Gas Co. Ltd., announced the discovery of a large coalbed methane deposit in the southeast part of Shanxi Province. The deposit covers an area of 1,200 km^2 with an estimated reserves of 200 billion m^3. The company planned to produce 4 billion m^3 per year coalbed methane from the deposit (China Geology and Mineral Resources News, 1998a).

CUCBM signed three contracts with Atlantic Richfield Co. (Arco) of the United States to jointly evaluate three coalbed methane prospects in Sanjiao, North Sanjiao, and Shilou in Shanxi Province. Arco holds 49% in the prospects while CUCBM holds the remaining 51%. The three prospects cover an area of 5,000 km^2 in Linxin, Shanxi Province, also in the Ordos basin. CUCBM also has a contract with Philip Petroleum Co. of the United States to develop coalbed methane in 3,400 km^2, north of the Arco lease in the Ordos basin (Journal of Commerce, 1998). CUCBM was negotiating with several foreign investors to expand its cooperation in the Liupanshui area of Guizhou Province, the Fengcheng area of Jiangxi Province, the Gujiao and Jincheng areas of Shanxi Province, and areas in Henan Province and Xinjiang Uygur Autonomous Region (China Economic News, 1998b).

Oil and Gas.—For many years, the oil and gas sector was divided into onshore and offshore sectors. The China National Oil and Natural Gas Corp. [or China National Petroleum Corp. (CNPC)] produced most oil and gas onshore, while China National Offshore Oil Corp. (CNOOC) was responsible for offshore oil and gas exploration and production. The National Petrochemical Corp. (Sinopec) was China's major refiner and petrochemical manufacturer. Prospecting, production, refining, marketing, import and export were in charge by different ministries/companies. Upstream and downstream production, domestic and foreign trades, onshore and offshore operations were totally separated. The separation of upstream and downstream production caused disproportionate in both sectors. In July, China's petroleum sector underwent massive restructuring as part of the Government's effort to downsize the bloated bureaucracy of its industrial enterprises. The Government created two conglomerate groups, CNPC and Sinopec, based on the existing CNPC and Sinopec. To achieve this, Sinopec transferred 19 refineries and petrochemical enterprises to CNPC and CNPC transferred 12 producing entities to Sinopec. Location of enterprises under CNPC are in Chongqing, Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Sichuan, Qinghai, Xinjiang, and Xizang. Those enterprises under Sinopec are Anhui, Beijing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Shanghai, Shanxi, Tianjin, Yunnan, and Zhejiang. After regrouping, CNPC produces 67% of the country's oil; Sinopec accounts for 22%; while CNOOC and the National Star Petroleum Corp. (CNSPC), a small upstream company formed in 1996, produced the remainder. CNSPC will operate properties developed earlier by former Ministry of Geology and Mineral Resources, which will continue to function separately from CNPC and Sinopec, produce the remaining 11%. China East United Petrochemical Corp. was abolished (Zhongguo Shiyou Bao, 1998).

In the past, Chinese oil companies set their own priority to produce as much oil as possible for the domestic market. Production costs and profit margins were relatively insignificant. The decline of oil prices in the world market widened the price gap between domestic and international markets. Prices of imported crude oil and products, including import taxes, were about 300 to 500 yuan cheaper than the domestic exfactory prices. The large price gap led to rampant smuggling. In 1998, the wholesale prices of oil products dropped between 10% to 25% compared with those of 1997. Consumers, however, did not benefit from the decline of oil prices because retail oil companies sold their products at prices fixed by the Government. When the domestically mandated crude oil prices rose above the world market prices, Sinopec, which bought all nonexported domestic crude oil production, began importing cheaper feedstock rather than buying domestic crude oil. Also, owing to the Asian economic crisis, the large volume of oil products smuggling into the country caused a serious oversupply of crude oil and products in the domestic market. Since the Government announced the antismuggling policy in July, it appeared that it had been moderately successful. China's three major oil companies reportedly made a net profit at yearend compared with a net loss in midyear (China Daily, 1999f).

After the restructuring of this sector, oil producers were reorienting their strategies to fit into the international oil market. CNPC planned to reduce its oil output by 2% and production costs by 5% in 1999. The company also planned to eliminate 100,000 workers in 2000. Sinopec, which operated Shengli and Zhangyuan oilfields and other oilfields in southern China, decided to cut high-cost output by 1.2 Mt and to cancel its plan to build 440,000 t low-efficiency refineries. CNSPC aimed to reduce its operation costs by 10%. CNOOC planned

to reduce its per barrel production costs from $11.78 to less than $10 in the next several years. The Government decided to close down 122 small refineries and to reduce its crude oil processing capacity by 15 Mt, or 12% of China's total. Because of increasing demand for clean energy, oil producers have begun their focus on the development of natural gas resources and constructing a pipeline network to channel its abundant gas reserves in western Provinces to the more prosperous east coast.

Arco and Texaco Corp. of the United States signed a contract with CNOOC to develop the offshore oilfield, Qinhuangdao 32-6, in Bohai Bay. CNOOC will be the operator of the field with a 51% share. Arco and Texaco each have a 24.5% share. It was expected that exploration and development would be completed by January 1999 and then production started by mid-2001. Annual output was scheduled at 3.4 Mt in 2002. Estimated reserves exceeded 1 billion barrels. The field is 20 km offshore in 20 m of water. The block has proven reserves of 170 Mt oil (China Economic News, 1998c).

CNOOC and Agip SpA of Italy agreed to jointly explore an area 850 km^2 Block 9/11, in the northern Qikou Sag at the west of Bohai Bay. The average depth of water is 10 m. Under the terms of agreement, Agip will cover for all exploration risks (China Daily 1998b).

Natural gas remained underused in China. Because of the shortfall on oil production and environmental pollution by the extensive use of coal, natural gas will become an important source of energy in the next century in China. Currently, the focus of natural gas exploration is on the producing areas—Sichuan, Shaanxi-Gansu-Ningxi, Qinghai, Xinjiang, Bohai, and the South China Sea.

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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1994	1995	1996	1997	1998
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	3,700	5,000	6,200	8,000	8,200
Alumina, gross weight	do.	1,850	2,200	2,550	2,940 r/	3,330
Metal, refined, primary and secondary	do.	1,500	1,870	1,900	2,180 r/	2,440
Antimony:						
Mine, Sb content		91,000	125,000	129,000	131,100 r/	110,000
Metal		101,200	130,000	128,000	120,100 r/	82,000
Bismuth:						
Mine output, Bi content		610	740	610	550 r/	600
Metal		850	800	750 r/	760 r/	750
Cadmium, smelter		1,280	1,450	1,570	1,980 r/	2,000
Cobalt:						
Mine output, Co content		270	980	190	200 r/	210
Metal		200	240	230	470 r/	480
Copper:						
Mine output, Cu content		395,600	445,000	439,000	495,500 r/	476,400
Metal:						
Smelter, primary		482,400	538,000	615,600	789,000 r/	810,000
Refined, primary and secondary		736,100	1,080,000	1,120,000	1,180,000	1,211,000
Gold, mine output, Au content		132	140	145	175	178
Iron and steel:						
Iron ore, gross weight	thousand tons	240,170	249,350	249,550	268,000 r/	210,000
Pig iron	do.	97,410 3/	105,300 3/	107,200 3/	115,110 r/ 3/	118,600 3/
Ferroalloys	do.	3,360 3/	4,320 3/	4,180 3/	4,040 r/ 3/	3,540 3/
Steel, crude	do.	92,610 3/	95,360 3/	101,240 3/	108,940 r/ 3/	114,350 3/
Steel, rolled	do.	84,280 3/	89,800 3/	93,380 3/	99,780 r/ 3/	105,100 3/
Lead:						
Mine output, Pb content		461,900	520,000	643,000	712,000 r/	556,000
Metal:						
Smelter, primary		366,000	360,000	363,000	466,500 r/	470,000
Refined, primary and secondary		467,900	608,000	706,000	707,500 r/	707,000
Magnesium metal, primary		24,000	93,600	73,100	75,990 r/	70,500
Manganese ore, gross weight	thousand tons	5,800 r/	6,900	7,600	6,000 r/	6,100
Mercury, mine output, Hg content		470	780	510	830 r/	225
Molybdenum, mine output, Mo content		21,400	33,000	29,600	33,300 r/	30,000
Nickel:						
Mine output, Ni content		36,900	41,800	43,800	46,600 r/	48,700
Matte		37,200	42,600	46,400	39,900 r/	41,000
Smelter		31,300	38,900	44,600	43,300 r/	48,100
Silver, mine output, Ag content		810	910	1,140	1,300	1,400
Tin:						
Mine output, Sn content		54,100	61,900	69,600	67,500 r/	79,000
Metal, smelter		67,800	67,700	71,500	67,700 r/	79,300
Titanium, sponge		850	1,720	2,130	2,340 r/	2,250
Tungsten, mine output, W content		27,000	27,400	26,500	24,960 r/	24,700
Vanadium (in vanadiferrous slag product)		5,400	13,700	14,000	15,000	15,500
Zinc:						
Mine output, Zn content		990,300	1,011,000	1,120,000	1,210,000 r/	1,100,000
Refined, primary and secondary		1,012,000	1,077,000	1,184,000	1,434,000 r/	1,468,000
INDUSTRIAL MINERALS						
Asbestos		303,100	263,000	293,000	288,000 r/	250,000
Barite	thousand tons	1,500	1,800	2,500	3,500	3,700
Boron, mine, B_2O_3 equivalent		188,200	294,600	157,000	135,600 r/	140,000
Bromine		31,400	32,700	41,400	50,100 r/	40,000
Cement, hydraulic	thousand tons	421,180 3/	475,910 3/	491,190 3/	511,730 r/ 3/	513,500 3/
Diatomite		250,000	300,000	320,000	330,000	335,000

See footnotes at end of table.

TABLE 1--Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1994	1995	1996	1997	1998
INDUSTRIAL MINERALS--Continued						
Dolomite	thousand tons	4,150	8,090	5,520	6,500	6,700
Fluorspar	do.	900	2,000	2,000	2,400	2,450
Graphite		183,000	204,000	185,000	310,000 r/	270,000
Gypsum	thousand tons	6,820	7,340	7,780	9,100 r/	9,000
Kyanite and related materials		2,500	2,500	2,500	3,000	3,050
Lithium minerals, all types		16,000	16,000	16,500	17,000	17,100
Magnesite	thousand tons	990	2,050	2,100	2,400 r/	2,400
Nitrogen, N content of ammonia	do.	20,100	22,600	23,000	25,300	25,500
Phosphate rock and apatite, P_2O_5 equivalent	do.	7,430	7,960	6,350	7,530 r/	7,500
Potash, marketable, K_2O equivalent	do.	74	80	110	115	120
Rare earths, rare-earth oxide equivalent		30,700	48,000	55,000	53,000	60,000
Salt	thousand tons	29,746 3/	29,780 3/	29,035 3/	30,830 r/ 3/	22,420 3/
Sodium compounds, soda ash, natural and synthetic	do.	5,814 r/ 3/	5,977 r/ 3/	6,693 r/ 3/	7,258 r/ 3/	7,200 3/
Sulfur:						
Native	do.	330	160	170	200 r/	210
Content of pyrite	do.	5,870	5,930	5,990	6,040 r/	4,490
Byproduct, metallurgical	do.	820 r/	940 r/	1,100 r/	1,400 r/	1,450
Total	do.	7,020	7,030	7,260	7,640 r/	6,150
Talc and related materials	do.	2,400	2,400	2,400	2,350	2,300
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	do.	248,000	260,000	286,000	242,000	250,000
Bituminous and lignite	do.	992,000	1,101,000	1,088,000	1,114,000	985,000
Total	do.	1,240,000	1,361,000	1,374,000	1,356,000	1,235,000
Coke, all types	do.	114,770 3/	135,010 3/	136,400 3/	137,310 3/	128,060 3/
Gas, natural:						
Gross	billion cubic meters	17	18	20	23 r/	23
Marketed	do.	15	16	17	18	18
Petroleum:						
Crude (including crude from oil shale)	llion 42-gallon barrels	1,080	1,100	1,170	1,180	1,200
Refinery products	do.	950	950	980	980	950

r/ Revised.

1/ Table includes data available through May 20, 1999.

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

3/ Reported by China's State Statistical Bureau.

TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies 1/	Location of main facilities	Annual capacity e/
Aluminum:				
Alumina		Pingguo Aluminum Industry Co.	Guangxi, Pingguo	300
Do.		Guizhou Aluminum Plant	Guizhou, Guiyang	400
Do.		Changcheng (Great Wall) Aluminum Corp.	Henan, Zhongzhou	200
Do.		do.	Hunan, Zhengzhou	640
Do.		Shandong Aluminum Plant	Shandong, Zibo	650
Do.		Shanxi Aluminum Plant	Shanxi, Hejin	1,200
Metal		Baiyin Aluminum Plant	Gansu, Baiyin	50
Do.		Lanzhou Aluminum Plant	Gansu, Lanzhou	82
Do.		Liancheng Aluminum Plant	do.	85
Do.		Pingguo Aluminum Industry Co.	Guangxi, Pingguo	100
Do.		Guizhou Aluminum Plant	Guizhou, Guiyang	240
Do.		Changcheng (Great Wall) Aluminum Corp.	Hunan, Zhengzhou	50
Do.		Fushun Aluminum Plant	Liaoning, Fushun	100
Do.		Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	200
Do.		Qinghai Aluminum Smelter	Qinghai, Xining	200
Do.		Shandong Aluminum Plant	Shandong, Zibo	60
Do.		Jiaozuo Aluminum Plant	Henan, Jiaozuo	100
Do.		Sanmenxia Aluminum Plant	Henan, Sanmenxia	50
Do.		Yanji Aluminum Plant	Jilin, Yanji	15
Do.		Baotou Aluminum Plant	Nei Mongol, Baotou	120
Do.		Tongchuan Aluminum Plant	Shaanxi, Tongchuan	50
Do.		Taiyuan Aluminum Plant	Shanxi, Taiyuan	30
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	120
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Coal		Ministry of Coal Industry	Hebei	70,000
Do.		do.	Heilongjiang	100,000
Do.		do.	Henan	100,000
Do.		do.	Liaoning	70,000
Do.		do.	Nei Mongol	90,000
Do.		do.	Shandong	60,000
Do.		do.	Shanxi	400,000
Do.		do.	Sichuan	80,000
Cobalt	tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	400
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Co.)	Anhui, Tongling	80
Do.		Jinlong Smelter (Tongling Nonferrous Metals Co.)	Anhui, Tongling	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	20
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	130
Do.		Guixi Smelter (Jiangxi Copper Metals Co.)	Jiangxi, Guixi	200
Do.		Huludao Copper Smelter (Huludao Zinc Smelting Co.)	Liaoning, Huludao	100
Do.		Shenyang Smelter	Liaoning, Shenyang	100
Do.		Shanghai Smelter (Jiangxi Copper Metals Co.)	Shanghai	80
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	100
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Gold, refined	thousand kilograms	China National Gold Corp.	Henan, Lingbao	10
Do.		Laizhou Gold Co.	Shandong, Laizhou	15
Do.		Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Graphite		China National Nonmetallic Industry Corp.	Shandong, Laixi and Pingdu	190

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies 1/	Location of main facilities	Annual capacity e/
Iron and steel:			
Iron ore	Maanshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.	Shoudu (Capital) Iron and Steel (Group) 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.	Hubei, Wuhan	5,100
Do.	Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.	Anshan Iron and Steel (Group) 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.	Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.	Kuming Iron and Steel Co.	Yunnan, Kuming	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.	Beijing	10,000
Do.	Handan Iron and Steel General Work	Hebei, Handan	2,400
Do.	Tangshan Iron and Steel Co.	Hebei, Tangshan	2,300
Do.	Wuhan Iron and Steel (Group) Co.	Hubei, Wuhan	8,000
Do.	Anshan Iron and Steel (Group) Co.	Liaoning, Anshan	10,000
Do.	Benxi Iron and Steel Co.	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.	Shanghai	10,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	2,500
Do.	Panzhihua Iron and Steel (Group) Co.	Sichuan, Panzhihua	3,000
Lead	Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.	Shaoguan Smelter	Guangdong, Shaoquan	35
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	55
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Mining Bureau	Hunan, Hengyang	30
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	80
Do.	Shenyang Smelter	Liaoning, Shenyang	70
Do.	Kunming Smelter	Yunnan, Kunming	20
Magnesium	Fushun Aluminum Plant	Liaoning, Fushun	5
Do.	Minhe Magnesium Plant	Qinghai, Minhe	7
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	40
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,350
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Ministry of Chemical Industry	Qinghai	40

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies 1/	Location of main facilities	Annual capacity e/
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	Ministry of Chemical Industry	Anhui	200
Do.	do.	Qinghai	320
Talc	China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.	do.	Liaoning, Haicheng	50
Do.	do.	Shandong, Qixia	5
Tin, smelter	Dachang Mining Administration	Guangxi, Dachang	5
Do.	Yunnan Tin Industry Co.	Yunnan, Gejiu	20
Do.	Laibin Smelter	Yunnan, Laibin	12
Titanium	Zunyi Titanium Plant	Guizhou, Zunyi	5
Do.	Fushun Aluminum Plant	Liaoning, Fushun	1
Tungsten, concentrate	China National Nonferrous Metals Industry Corp.	Guangdong, Guangxi, Hunan, Jiangxi, and Zhejiang	60
Zinc	Northwest China Lead-Zinc Smelter	Gansu, Baiyin	130
Do.	Shaoquan Smelter	Guangdong, Shaoquan	160
Do.	Liuzhou Zinc Products Factory	Guangxi, Liuzhou	32
Do.	Shuikoushan Mining Bureau	Hunan, Hengyan	28
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	250
Do.	Huludao Zinc Smelting Co.	Liaoning, Huludao	320
Do.	Shenyang Smelter	Liaoning, Shenyang	20
Do.	Laibin Smelter	Yunnan, Laibin	50

e/ Estimated. NA Not available.
1/ Companies are owned by either the State Government or Provincial Government.

TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1998

(Metric tons)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Bauxite	80,000	$7,107
Alumina	30,000	9,357
Metal and alloys:		
Unwrought	326,898	447,696
Semimanufactures	109,354	242,723
Antimony metal, unwrought	18,946	27,143
Barium sulfate	1,770,000	68,679
Copper, metal and alloys:		
Unwrought	121,415	205,582
Semimanufactures	93,143	303,933
Iron and steel:		
Ferrosilicon	270,000	145,365
Pig iron and cast iron	2,420,000	324,481
Steel:		
Bars and rods	510,000	159,600
Shapes and sections	90,000	32,234
Sheets and plates	1,770,000	605,145
Tube and pipe	310,000	320,307
Magnesium carbonate and oxide	2,050,000	249,600
Manganese, unwrought	68,804	75,679
Tin, metal and alloys, unwrought	53,573	266,950
Tungsten:		
Tungstates	12,675	59,184
Ore	190	394
Zinc:		
Metal and alloys, unwrought	382,894	402,308
Oxide and peroxide	57,448	48,006
INDUSTRIAL MINERALS		
Cement	8,200,000	290,457
Fluorspar	1,320,000	129,474
Graphite, natural	180,752	42,876
Talc	700,000	55,907
MINERAL FUELS		
Coal	32,290,000	1,067,788
Coke, semicoke	11,460,000	789,390
Petroleum:		
Crude oil	15,600,000	1,527,450
Refinery products	4,360,000	738,906

Source: China's Customs Statistics (1998.12).

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1998

(Metric tons)

		Quantity	Value (thousands)
METALS			
Aluminum:			
Alumina		1,570,000	$354,219
Metal and alloys, unwrought		306,988	397,169
Semimanufactures		341,294	844,918
Scrap		277,168	168,163
Chromium, chromite		710,000	80,887
Copper:			
Ore		1,180,000	458,313
Metal and alloys, unwrought		268,399	473,250
Semimanufactures		546,625	1,374,704
Scrap		956,644	258,948
Iron and steel:			
Iron ore		51,770,000	1,467,763
Pig iron and cast iron		20,000	4,076
Steel:			
Bars and rods		2,760,000	828,632
Seamless pipe		770,000	743,485
Shapes and sections		320,000	145,053
Sheets and plates		8,340,000	4,283,486
Manganese ore		1,180,000	90,334
INDUSTRIAL MINERALS			
Diamond	kilograms	538	301,148
Fertilizers:			
Compound fertilizers		8,500,000	1,761,542
Potassium chloride		5,120,000	606,271
Potassium sulfate		530,000	114,591
Urea		120,000	17,221
Sodium carbonate		84,238	12,932
Titanium dioxide		79,134	121,744
MINERAL FUELS			
Coal		1,580,000	68,454
Petroleum:			
Crude oil		27,320,000	3,274,537
Refinery products		21,740,000	2,405,176

Source: China's Customs Statistics (1998.12).