THE MINERAL INDUSTRIES OF

THE COMMONWEALTH OF INDEPENDENT STATES

ARMENIA, AZERBAIJAN, BELARUS, GEORGIA, KAZAKHSTAN, KYRGYZSTAN, MOLDOVA, RUSSIA, TAJIKISTAN, TURKMENISTAN, UKRAINE, AND UZBEKISTAN

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The Commonwealth of Independent States (CIS) was created in December 1991 by republics of the former Soviet Union (FSU). In the adopted declaration, the participants of the CIS declared that their interaction was to be based on the principle of the sovereign equality of all the members and that the member states were independent and equal subjects of international law. The CIS is not a state and does not have supranational powers (Executive Committee of the Commonwealth of Independent States, 2001§[1]). In 2001, the members of the CIS were Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

In September 1993, the CIS signed an agreement for the creation of an economic union "to form common economic space grounded on free movement of goods, services, labor force, capital; to elaborate coordinated monetary, tax, price, customs, external economic policy; to bring together methods of regulating economic activity and create favorable conditions for the development of direct production relation" (Interstate Statistical Committee of the Commonwealth of Independent States, undated§).

The southern tier of states of the CIS comprises the three Caucasus countries of Armenia, Azerbaijan, and Georgia and the five Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. These countries on the border of the Islamic world through which the traders of the "Silk Route" once passed are now important for their geopolitical significance and for their economic significance as potential world suppliers of oil and other minerals. Because of the lack of more-intensive coverage of these countries' nonfuel mineral industries (except for those of Kazakhstan) in recent years, this report on the CIS countries will focus more on the nonfuel mineral industries of these Silk Route countries. Refer to the report on the CIS countries for 2000 for more-extensive coverage of the mineral fuel industries of the CIS countries and to the annual reports on these countries' fuel industries from the U.S. Department of Energy's U.S. Energy Information Administration.

[1]References that include a section twist (§) are found in the Internet References Cited section.

Armenia

Armenia is a mountainous country. More than 70% of its territory is at elevations of more than 1,500 meters (m) above sea level, and 40%, at elevations of more than 2,000 m. By the end of the Soviet era, Armenia had been mining one-third of the Soviet Union's output of molybdenum. It also mined copper, copper-zinc, and native gold deposits. Significant byproduct constituents in the country's nonferrous ores included barite, gold, lead, rhenium, selenium, silver, tellurium, and zinc.

Armenia had a large industrial minerals industry and at the end of the Soviet era was the largest producer of perlite in the Soviet Union. It produced a number of other industrial minerals, which included clays, diatomite, dimension stone, limestone, salt, and semiprecious stones, and had a diamond cutting industry. Armenia, however, had practically no mineral fuel production.

The country has identified 18 metals deposits with copper, gold, iron, lead, molybdenum, silver, and zinc; of these, 12 deposits of nonferrous and precious metals were either being worked or under development. The largest mining enterprise was the Zangezur copper-molybdenum mining and beneficiation complex (Agabalyan, 2001).

Deposits were being developed by using open pit or underground or both of these methods. All underground mining in Armenia is in mountainous terrain. Open pit mining was conducted at the Agarak and Zangezur copper-molybdenum complexes and will be used to develop the Mgartskoye gold field, which recently confirmed reserves of 2 metric tons (t) each of gold and silver. Investment in developing Mgartskoye reportedly was to be recouped in 1 year. Many gold deposits in the area are similar to Mgartskoye. Development of the Sotkskoye gold field was by underground and open pit methods. Underground methods either were being used or will be used to develop the Alaverdi, Kapan, and Shamlug copper deposits, the Akhtal polymetallic deposit, the Megradzor gold deposit, and the Lichkvazkoye, Terterasarskoye, and Shaumyanskiy Rayon gold-polymetallic deposits. On occasion, as in the case of the Kapan deposit, some open pit mining was also being done. The Kapan copper deposit and the Shamlug gold-polymetallic deposit were being developed by one mining enterprise, which reduced the expenses because of the sharing of facilities that

include the beneficiation plant. The Ararat gold extraction plant was planning to restart its open pit gold mining operations (Agabalyan, 2001).

Armenia was interested in developing the Razdanskiy Rayon iron ore deposit, which is located on the slopes of the Sulagyan Mountains. The ore was reportedly of very good quality and suitable for the production of pure iron, special steels, and precision alloys, which were said to be of the highest quality (Agabalyan, 2001).

The diamond-cutting industry was expanding and accounted for a significant share of the country's export earnings. Armenia had four state diamond-cutting plants and a number of private diamond-cutting enterprises (Interfax Mining and Metals Report, 2000a; U.S. Embassy, Yerevan, Armenia, 2000§). Cut diamond and jewelry made up 35% of Armenia's exports (Interfax Central Asia and Caucasus Business Report, 2002a§).

The country's first diamond-cutting plant Shoghakn (Sapphire) was established during the Soviet period in 1973 in Nor Hajyn near Yerevan. Russia's exports of uncut diamond to Armenia ceased in 1995 but resumed in 1999 on the basis of an intergovernmental agreement for the delivery of Russian raw diamond to Armenia between 1999 and 2001 whereby the Russian mining company Almazy Rossii Sakha (ALROSA) agreed to supply Armenia with 30,000 carats per year of Russian diamond (Foreign Broadcast Information Service, 1998§).

Armenia's diamond-cutting industry established other sources of supply. In 1992, the Arslanian cutting works in Belgium established the Lorii diamond-cutting enterprise. In 1999, Lorii employed about 400 diamond cutters. It worked under an agreement in which the Belgian company supplied uncut diamond to Lorii, and Lorii then returned the cut diamond to Arslanian for sale. Arslanian also supplied uncut diamonds to the privately owned Aghavni and Andranik diamond-cutting plants that were established near the Lorii plant in the 1990s, to the state-controlled Lusampor plant in Aragtsotn Province, and to the private Amma plant in the town of Artashat in Ararat Province. The Belgian firm Tashe also was a supplier of diamond to Armenian cutting enterprises and, together with Arslanian, established the diamond-cutting company Arevakan L.L.C.

Diamond Company of Armenia (DCA) in Yerevan started operations in May 1999. DCA's main supplier and distributor was De Amdel N.V. from Belgium, which was affiliated with De Beers. DCA was owned by the British company Furfano, Ltd., which was registered in the Shannon offshore zone in Ireland (Interfax Mining and Metals Report, 2000b). The largest state diamond-cutting enterprise was Shoghakn.

Dicalite Europe NV, part of the U.S. firm Grefeo Minerals Inc., purchased the state enterprise Aragats Perlite for $1.42 million in June 1998. Dicalite obtained the rights to mine the Aragats-Perlite deposit for 22 years and to extract 1.11 million metric tons per year (Mt/yr) (600,000 cubic meters) of raw material. The Aragats deposit's reserves were reportedly about 160 million metric tons (Mt), which was more than one-half of Armenia's total perlite reserves (Khachataryn, 1999§). Dicalite exported raw material from this deposit to its own perlite processing enterprises in Europe. Prior to the beginning of the 1990s, the company traditionally purchased perlite from Armenia. Products obtained from its perlite processing were sold on Western European markets and to the recently growing Russian market. For the lease period (22 years), Dicalite had the right to export all of its production or about 24 Mt of raw material (15% of the reserves of the Aragats deposit) from the country on the basis of an agreement signed with the Ministry of Environmental Protection (Khachataryn, 1999§).

Azerbaijan

Azerbaijan occupies 86,600 square kilometers (km^2) and has lowland, piedmont, and mountainous terrains. Owing to its location on the Caspian Sea, it possesses large oil and gas reserves in offshore and onshore regions of the Caspian. Azerbaijan's most significant reserves in terms of value were its oil reserves, which are located offshore in the Caspian Sea. A large number of major foreign firms were involved in projects to develop these reserves. The mountainous regions contain a variety of nonfuel mineral deposits.

On the slope of the Caucasus Mountains, the Dashkasan iron ore deposit served as the base for the construction of the Azerbaijan mining and beneficiation complex, which was the largest iron ore mining enterprise in the Transcaucasus, and had produced more than 1.4 Mt/yr of high-grade iron ore concentrate. Almost all the concentrate had been sent to the Rustavi steel mill in neighboring Georgia. Cobalt also was mined from the Dashkasan deposit. Not far from Dashkasan, the Zaglik alunite deposit, which was the largest in the CIS, was developed. The alunite was used for alumina production at a refinery in Gyandzha 46 kilometers (km) from the mine; the refinery also produced sulfuric acid and potassium sulfate, which is a nonchloride potash fertilizer. The alumina supplied the domestic Sumqayit aluminum smelter (Mamedov and Khalil-zade, 2001).

In the mountainous region, the Kedabeksiy Rayon deposit produced copper and byproduct gold and silver for more than a century. Because of the technology that was used in the past, only ore with more than 2.5% copper was mined; the rest was left in the ground or in waste and tailings piles. In 1991, a new assessment of the Kedabeksiy Rayon deposit determined that 4 Mt of ore with a copper content of less than 2.5% remained and that the waste piles from processing contained material with a copper content of 0.45%, a gold content of 2.3 grams per metric ton (g/t), and a silver content of 27.3 g/t. The country found these wastes and secondary quartzite from the Kedabeksiy Rayon deposit to be of interest for secondary processing of copper, gold, and silver; the secondary quartzite was suitable for heap leaching to extract gold.

In prior years, arsenic had been mined in the Dzhul'finskiy region, barite in the Khanlarskiy region, molybdenum in the Ordubadskiy region, lead and zinc polymetallic ore in the Norashenskiy and Ordubadskiy regions, and iron pyrites in the Khanlarskiy region. The mountainous region also contained a number of large enterprises that produce, for example, facing materials from the Buzgovskiy and Shakhtakhtinskiy deposits, travertine from the Nakhichevan District, and marble from Dashkasan (Mamedov and Khalil-zade, 2001).

Large layers of bentonite clays are in the Dash-Salakhlinskoye deposit in the Kazakhskiy region, on the base of which an open pit with the capacity to extract more than 1 Mt/yr was developed in the 1970s. All the bentonite from the deposit

was used in the Soviet Union for the production of iron ore pellets, but in 2001, the enterprise was practically at a standstill for lack of orders (Mamedov and Khalil-zade, 2001).

Along with deposits that had been developed, a number of undeveloped deposits for minerals, such as copper, gold, lead, silver, and zinc, have been explored in the mountainous section of the country. Reserves have been established at some of these undeveloped deposits, and preparations were being made for development. The largest of these in terms of reserves was the pyrite polymetallic Filizchayskiy deposit, which also was the largest such deposit in the European part of the FSU. The Katekhskoye, Katsdagskoye, and Khikhinskoye deposits in the Sheki-belokanskiy zone on the southern slope of the Caucasus contain large amounts of copper, iron, lead, sulfur, and zinc. Owing to the complexity of these ores, however, new technologies will have to be developed to process them economically. Other copper deposits have been discovered in other areas of the Caucasus region of Azerbaijan, such as the Karadagskiy porphyry-copper deposit in the Shamkhorskiy region; this deposit has been studied for production by means of bioleaching, and a complex has been designed that would produce 30,000 metric tons per year (t/yr) of copper (Mamedov and Khalil-zade, 2001).

The mountainous regions of Azerbaijan have a number of gold deposits. Azerbaijan has contracted with RV Investment Group Services of the United States under a production-sharing agreement to develop nine gold deposits. In the coming decade, plans call for the country to have a gold mining and metal production industry (Mamedov and Khalil-zade, 2001). In the Nakhichevan region, large dolomite resources with seams of between 5,500 and 6,000 m and larger crop out on the surface of ground that is not suitable for agriculture and not far from transport links (Mamedov and Khalil-zade, 2001).

If further developed with proper ecological safeguards, the nonfuel mineral resources of Azerbaijan could resolve a number of social problems that have arisen from a lack of jobs in the countryside, which was driving people to abandon villages and thus transferring the problems of unemployment to the larger cities and their environs (Mamedov and Khalil-zade, 2001).

Belarus and Moldova

Belarus and Moldova each had one of the two steel minimills built in the FSU. Neither country possessed significant mineral resources except for potash in Belarus. Belarus also had a large oil refining industry that was mainly controlled by Russian companies.

Georgia

Although mining in Georgia dates back thousands of years, rapid development of the country's mineral resources occurred in the period between 1930 and 1980 when mining commenced at more than 200 deposits for a variety of minerals, such as arsenic, barite, bentonite, coal, diatomite, gold, and zeolites, and a range of nonferrous metals. Manufacturing enterprises, metallurgical plants, and other processing facilities that used these mineral products were constructed. A large portion of the mineral products, which included arsenic, barite, copper and gold concentrates, facing stone, gold-bearing ores, ferroalloys, lead concentrates, manganese concentrates, zeolites, and zinc concentrates, was exported (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

Following the dissolution of the Soviet Union in 1991, the mineral industry experienced a severe decline. The Chiat'ura manganese deposit and the Madneuli barite-polymetallic ore deposit, however, played an important role in the revival of the country's mineral industry. Before the Soviet revolution and during the Soviet period, Chiatura was a major supplier of high-grade manganese ore, but production had been declining even during the Soviet period. Following the dissolution of the Soviet Union, manganese output dropped sharply.

The Chiaturmarganets manganese mining company, which mined the Chiat'ura deposit, hoped to sign a deal to supply 200,000 t/yr of ore to Delta Export Ltd. of the United States. The Georgian company had found it hard to sell its products in recent years. Recent sales to Czech and Russian investors, who worked closely with Chiaturmarganets in 1998-99, had been erratic, and the enterprise had not been able to win new markets. In 2001, it produced 11,000 t of manganese concentrate. Chiaturmarganets was incorporated in 1993. Charter capital was $110 million. The state owned 79.9% of the shares. The Chiat'ura-Sachkhera manganese field, which the company developed, was estimated to contain more than 200 Mt of ore (Interfax Mining and Metals Report, 2001a).

Georgia had a list of explored reserves awaiting development. Georgian analysts from the mineral sector believe that developing the country's nonferrous, precious, and rare-metals reserves that are located in the mountainous regions of the country should be the sector's top priority.

For a 50-year period, the Madneuli barite-polymetallic deposit, which was the country's largest mining enterprise; the Kvaisinskiy barite-zinc deposit; and the Lukhumskoye and Tsanskoye arsenic deposits have produced more than 20 Mt of gold-copper ore, more than 9 Mt of gold-bearing quartzite, 4.8 Mt of barite- and barite-gold-bearing ores, more than 3 Mt of silver-lead-zinc ores, and not less than 110,000 t of arsenic ore. Since the 1930s, two mining-chemical enterprises had mined and processed arsenic ores from the Lukkhumskoye and Tsanskoye deposits to produce a variety of products, which had been shipped to enterprises throughout the Soviet Union (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

As of 2001, only the Madneuli deposit was still being mined. The Government owned more than 98% of the shares of the joint stock company Madneuli; the remainder was owned by the workers. Madneuli is located close to the capital T'bilisi in a region with good energy and transport infrastructure. The deposit was open pit mined. Barite and barite-gold-bearing ores had been processed at the Madneuli beneficiation plant, which produced barite and gold-bearing sulfide concentrates. Because of a lack of demand for barite, the barite was no longer being processed but was being stored in special warehouses near the open pits (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

In the process of stripping, barite-polymetallic (lead-zinc) and copper-zinc ores were produced that were not processed because of the lack of processing capacity and inadequate technology. These ores were stored in warehouses. About one-half of the deposit's explored reserves of barite-containing, barite-polymetallic, and copper-zinc ores had already been mined but were being stored where they were oxidizing and undergoing

other changes to their chemical properties. Gold-bearing secondary quartzite ores were also being stored (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

In 1997, the Georgian-Australian joint venture Quartzite Ltd. put into operation the Madneuli gold extraction plant with the capacity to produce 2 t/yr of gold at the open pit. The most significant ore reserves were gold-copper ores, which were processed at the Madneuli flotation plant, which exported the gold-copper concentrates. Expansion at Madneuli will depend on improving the technology for obtaining gold-copper and gold-pyrite concentrates, introducing heap leaching to produce copper from the low-grade ores being stockpiled, and introducing technology to produce high-quality barite and gold-bearing sulfide concentrates and to process copper-zinc and barite-polymetallic ores. Additional metals could be obtained by processing 22.7 Mt of tailings from the processing of gold-copper and barite-bearing ores at the flotation plant. These ores, which are being stored in two tailings ponds, contained 11.7 t of gold and 243.8 t of silver. The overburden from Madneuli could be processed to produce cement, ceramics, construction materials, packing materials, and turquoise jewelry. Also, additional exploration could increase the reserves of gold-copper ores (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

Exploration in recent years has indicated the potential for the development of deposits of nonferrous, precious, and rare-metals ores and industrial minerals, such as antimony, arsenic, barite, gold, lead, and zinc. The country had not reevaluated its reserves according to the requirements for reserves for a market economy since they were evaluated during the Soviet era according to the Soviet reserve classification system for nonmarket economy conditions. The country could benefit from technologically upgrading its mineral industry from exploration through all stages of production (Dzhanelidze, Kuteliya, and Chokhonelidze, 2001).

Kazakhstan

Kazakhstan is the second largest country in land area after Russia to form from the republics of the FSU. It is endowed with large reserves of a wide range of fuels, industrial minerals, and metallic ores, and its metallurgical sector was a major producer of a large number of metals from domestic and imported raw materials. Its metal mining sector produced chromite, copper, iron, lead, and zinc ores, and its metallurgical sector produced such metals as beryllium, bismuth, cadmium, copper, ferroalloys, lead, magnesium, rhenium, steel, titanium, and zinc. The country had significant production of other nonferrous and industrial mineral products, such as arsenic, barite, gold, molybdenum, phosphate rock, and tungsten. The country was a large producer of mineral fuels, which included coal, natural gas, oil, and uranium. Revenues from oil production were a major contributor to the country's economy and will greatly increase as projects under development reach their projected targets and new major discoveries become developed (U.S. Energy Information Administration, 2002b§).

Kazakhstan has large reserves of mineral resources that are of world significance. According to the country's Ministry for Energy and Mineral Resources, Kazakhstan ranked first in the world in reserves of barite and tungsten; second in reserves of chromite, phosphate rock, and uranium; third in reserves of copper, lead, and zinc; fourth in reserves of molybdenum; sixth in reserves of gold; and eighth in reserves of iron ore (Shkol'nik, 2001).

When Kazakhstan acquired independence in 1991, it possessed a large mineral production complex. Since then, Kazakhstan pursued a policy of adapting to a market economy and privatization to preserve and develop its mineral industry.

In 2001, Kazakhstan's mining industry extracted 32 types of nonferrous, precious, and rare metals from which its metallurgical industry produced 70 types of metal products. Practically the entire minerals industry has undergone some degree of privatization. According to Kazakhstan's constitution, all mineral resources belong to the Government, which awards contracts to develop these resources for specific time periods. Despite an influx of investment in its mineral industry, the industry still faced several problems that included the direction of investment funds—increasing extraction (92%) and exploration (8%). Almost no funds were being directed towards exploring for metallic ores, which will result in the depletion of most of these ores at existing enterprises by 2020. Furthermore, extraction was to be used primarily on high-grade ores, which could exacerbate this situation (Shkol'nik, 2001). For example, the average grade of zinc ores at the Tishinskiy deposit is 6.6% zinc, but the ore being mined grades between 8.6% and 9.9% zinc, which could lead to its depletion by 2005 and make extraction of the remaining ore unprofitable (Shkol'nik, 2001).

The mineral industry accounted for about 60% of Kazakhstan's industrial production, and 95% of the mineral products produced were exported. About 75% of foreign direct investment was in the mineral production sector. The oil and gas sector followed by the nonferrous metals sector were the most significant sectors for exports and direct foreign investment (Ellmies, 2001, p. 9-13).

In 2001, the oil industry accounted for approximately 30% of the Government's budget revenues, and oil accounted for about one-half of Kazakhstan's export earnings (U.S. Energy Information Administration, 2002b§). Ferrous, nonferrous, and precious metals accounted for a significant part of the country's export earnings. In 2001, Kazakhstan exported $267.4 million in precious metals, which was 30% less than that of 2000. The country exported 822,600 t of ferroalloys, which was 3% less than in 2000. The value of ferroalloy exports, however, grew by 7% to $315.1 million. Exports of flat rolled products, which included tin plate, fell by 3% to 3.176 Mt; the value fell by 24% to $577.2 million. Lead exports fell by 16% to 131,200 t; the value fell by 15% to $54.7 million. Exports of refined copper grew 2% to 399,200 t; the value, however, fell by 9% to $609 million. Unprocessed zinc exports increased 2% to 235,800 t; the value, however, fell by 20% to $157.7 million. Exports of iron ore grew 38% to 7.385 Mt; the value, however, increased by 65% to $84.8 million. Imports of iron and steel products for railway tracks increased 110% to 65,800 t; the value increased by 140% to $22.8 million. Imports of iron and steel pipes grew 62% to 433,600 t; the value increased by 81% to $377.8 million (Interfax Central Asia and Caucasus Business Report, 2002d§).

With the dissolution of the Soviet Union in 1991, Kazakhstan experienced a severe economic crisis owing to its economy's dependence on trade with Russia. In the mid-1990s, the country's economy, which was heavily dependent on exports to Russia, began to experience a revival in industrial production.

This was disrupted by the Asian and the Russian financial crises of 1998; production at many of the country's industries came to a standstill, and the national currency, the tenge, was significantly devalued. The crisis of 1998 led to a rise in the country's trade deficit and foreign debt. Following this crisis, foreign investments in a number of projects were frozen or abandoned. In 1999 and 2000, however, the country experienced significant economic growth that continued into 2001. The increase in prices for mineral products, particularly oil, accounted for a significant part of the recovery (Ellmies, 2001, p. 9-13).

The mineral industry in the mid-1990s had been badly in need of investment and restructuring, which led to a large number of enterprises being put under foreign management through concessionaire contracts. A large percentage of mining and metallurgical enterprises had been put under the control of foreign managers, who, in exchange for a share of the profits and ownership rights to stock, were investing in modernizing the enterprises, increasing output, increasing exports, decreasing costs, and upgrading technology to meet environmental standards (Zharkenov, 1997).

In 2000, the country began a new round of privatization by offering to sell remaining Government shares in major mineral industry enterprises, such as the uranium producer KAZatomprom, the lead and zinc producer KazZink, and the Ust-Kamenogorsk titanium-magnesium plant (Ellmies, 2001, p. 9-13).

Kyrgyzstan

Kyrgyzstan has a wide variety of explored mineral resources, which has enabled the country to construct enterprises for the production of construction materials, fuels, and nonferrous and precious metals. Toward the end of the Soviet era in the late 1980s, Kyrgyzstan's mineral processing industries were supplying the Soviet Union with all its metallic antimony, 64% of its mercury metal, 80% of its rare-earth metals, 25% of its monocrystalline silicon, and 15% of its uranium (Kudayabergenov and Stavinskiy, 2001).

Between 1930 and 1985, the mineral industry played a leading role in Kyrgyzstan's economy through the development of enterprises to produce antimony, mercury, rare earths, and uranium and other metallic and nonmetallic resources. In 2001, the major operating mineral industry enterprises in the country were the Kadamzhay antimony mining and metallurgical complex, the Kumtor and Makmal gold mining enterprises, and the Khadarkan mercury mining and metallurgical complex. Many of the ores previously mined were complex ores often with high concentrations of primary metals and byproduct metals that were not extracted and were being stored in waste dumps with large quantities of resources (Bokonbayev, 2001).

The country is far from world centers of consumption and was planning to improve its transport network, which included its air, rail, and road systems. A law was passed that prioritized the construction of the Balykchi-Kara-Kechye-Dzhalal-Abad rail line, which will unite the northern and southern sections of the country with China and provide an export route through Torugart, China. Roads were also being planned for a direct route to China and for a route through other Central Asian countries to Europe and Russia.

As a result of denationalization, the level of privatization as of January 1, 2001, was 68.6% of the total enterprises that had been state owned on January 1, 1991. In 1998, privatization of monopolies in the basic sectors of the country's economy started. Among the enterprises in the minerals and energy sectors that Kyrgyzstan has been trying to privatize with the attraction of investments were the Kadamdzhay Antimony Complex, the Kara-Balta ore mining enterprise, the Kyrgyz Chemical Metallurgical Works, and Kyrgyzenergo [Kyrgyz energy] (Bishkek AKIpress, 2001§).

The Kyrgyz Government authorized the joint stock company Kyrgyzaltyn to represent the country in discussions with investors on the creation of joint ventures for gold development and to participate in such joint ventures and in the management of mineral development firms that would include those that were developing antimony, tin, and tungsten resources.

Exploration primarily for gold, high-quality silicon, platinum-group metals (PGMs), precious stones, and tantalum was being conducted on a limited basis by using Government funds. Since 1992, the budget for exploration has not exceeded $600,000 per year. Foreign investors were involved mainly in exploring for gold and included such firms as Barrick Gold Corporation, Cameco Corporation, Newmont Gold Company, Normandy Ltd., Phelps Dodge Corporation, TEK Corp., and others. Firms from Australia, Canada, Israel, Russia, and the United Kingdom have formed 14 joint ventures for gold exploration (Kudayabergenov and Stavinskiy, 2001).

All explored and developed oil and gas deposits are in the foothills of the Fergana Valley in the southern part of the country; there are seven oil, four gas and oil, two natural gas, and one oil-condensate deposits. Total oil resources were estimated to be 98 Mt, of which 13.3 Mt was considered to be extractable by using available technology. Explored natural gas reserves were estimated to be 7.6 billion cubic meters. Explored bituminous and lignite coal reserves were estimated to be more than 2 billion metric tons (Gt), of which 425 Mt was considered to be suitable for open pit mining; mining enterprises in production were estimated to have hundreds of years of reserves. Much of Kyrgyzstan has not been explored for hydrocarbons owing to a lack of funding (Kudayabergenov and Stavinskiy, 2001).

The country has explored reserves of such metals as bismuth, beryllium, copper, and silver, which are not being mined, but could be of commercial interest. Although the country was not mining iron ore, it does possess reserves that it considered to be economically suitable for development. It also possesses reserves of thorium, uranium, and zirconium, which it believed were of commercial interest. The country listed 227 explored deposits of nonmetallic resources, such as agglomerate, basalt, clays, dimension stones, graphite, fluorspar, gypsum, limestone, loam, mica, sand and gravel, sulfur pyrites, and wollastonite. These nonmetallic raw materials were being extracted from scores of enterprises (Kudayabergenov and Stavinskiy, 2001).

The country processed uranium ore that was mined in other countries at the Kara-Balta mining and metallurgical complex, which produced uranium oxide from natural uranium. Kara-Balta has the capacity to produce 1,200 t/yr of uranium oxide. Kara-Balta also produced refined gold and silver, chemical compounds of molybdenum, tin and tungsten from concentrates, and scrap from the production processes for these metals. The

plant used hydrometallurgical processing and produced products that were exported to countries in Europe, the FSU, and North America. The raw materials processed by Kara-Balta were imported from Kazakhstan, Russia, and other countries of the CIS and were also produced domestically.

Kyrgyzstan has reserves of a number of nonferrous metals, such as tin and tungsten, with reserves that total 209,700 t and 124,000 t, respectively. Since 1992, the joint-stock company mining enterprise Enil'chek extracted between 30,000 and 70,000 t/yr of ore for the production of between 150 and 350 t/yr of tin and between 90 and 120 t/yr of tungsten in concentrate, which it shipped to Russia and other CIS countries (Kudayabergenov and Stavinskiy, 2001).

Reserves of mercury ore and complex mercury-antimony-fluorspar ores from the Chauvan, Khaydarkan, and Novoye Chonkoy deposits total about 20 Mt, and the Bol'shoy Khaydarkan deposit, about 11.6 Mt. These deposits form the base for the Khaydarkan mercury mining and beneficiation complex (Kudayabergenov and Stavinskiy, 2001).

Rare-earth metals reserves of the cerium and yttrium group at the Kutessay II deposit total 51,500 t. Ores from the Aktyuzskiy mining directorate, which mined this deposit, were processed by the Kyrgyzskiy Chemical and Metallurgical Plant (Kudayabergenov and Stavinskiy, 2001).

Total gold resources in Kyrgyzstan were estimated to be between 2,500 and 4,000 t, of which 1,000 t was at identified deposits. As of January 1, 2000, the Government had listed 471 t of gold reserves at 13 lode and 22 placer deposits with gold in placer deposits that totaled about 6 t. The largest gold deposits were Kumtor with 288 t; Taldy-Bulak Levoberezhnyy, 80.4 t; Dzheruy, 74.7 t; and Makmal, 25.5 t. About 45 deposits were considered to be of interest for future exploration, each estimated to have resources of more than 5 t of gold (Kudayabergenov and Stavinskiy, 2001). A preliminary assessment of the Kumyshtag silver deposit in Talasskaya Oblast indicated about 2,000 t of silver reserves in ore at a grade of up to 270 g/t silver, and another at the Aktyube-Karagoyskoye deposit in Oshskaya Oblast indicated 1,000 t of silver resources in ore at a grade of as much as 150 g/t silver (Kudayabergenov and Stavinskiy, 2001).

Kyrgyzstan is seeking not only to continue with the successful development of its gold resources, but to preserve its existing mineral production industries and to develop a range of its other mineral resources.

Russia

Russia accounted for about 14% of the world's total mineral extraction (Razovskiy, 2001). The mineral industry was of great importance to the Russian economy. Enterprises considered to be part of the mineral raw material complex contributed more than 70% of the budget revenues derived from exports; oil and gas were the chief export earners. Despite decreased total metal output compared with the Soviet period, Russia produced more aluminum, lead, and zinc in 2001. It produced, however, only about 20% as much tin compared with the Soviet period (Kozyrev and Karmanov, 2001).

Since 1995, Russian nonferrous metals output was generally increasing. Plans called for expanding nonferrous metals production capacity when necessary and where possible. Despite its economic importance and production potential in terms of facilities and resources, the nonferrous mining and metallurgy sector was experiencing a number of problems. Russian analysts rated only about 10% of the technology used in this sector as being "world class" (Yelyutin and others, 2001). Much of the technology was not state-of-the-art in terms of pollution abatement. Equipment at enterprises was wearing out, and products from many enterprises were not competitive on world markets. Labor productivity in this sector was almost one third below that of advanced industrialized countries, and energy expenditures per unit of output were between 20% and 30% higher (Yelyutin and others, 2001).

According to assessments of analysts from the Russian Federation Ministry of the Economy's Department of the Economics of Metallurgy, reserves were generally sufficient at the 1995 to 2000 levels of extraction to supply existing enterprises that had mined iron ore for at least 15 to 20 years and nonferrous metals for 10 to 30 years (Yatskevich, 2000). A major problem was that the resource base for enterprises in the nonferrous metals sector was not competitive in terms of quality with that of producers in other countries; only the resource base for antimony, copper, nickel, and, in part, molybdenum was considered to be of competitive quality (Sysoyev, 2000).

At the end of October, parliamentary hearings were held by the state Duma on the development and conservation of Russia's mineral-resource base. During the decade following independence, many of the operating enterprises, which had been depleting the highest grade ores at their deposits, left remaining reserves that are subeconomic. In 2001, about 50% of the explored reserves, in volume, were considered to be marginally economic. Production at a number of the major deposits for placer gold, natural gas, nonferrous metals, and petroleum was declining. Mining conditions were deteriorating as the depths and lengths of mine workings were increasing and ore grades were decreasing. Oil production rates have decreased because of declines in formation pressure. From 1990 to 2000, coal and oil production fell by more than 33%; gas production, by 9%; marketable iron ore, about 20%; steel, 45%; copper, molybdenum, nickel, titanium, and tungsten, between 11% and 63%; and rare-earth metals, more than 90% (Russian Mining, 2001).

Domestic consumption of mineral products fell by an even larger percentage. Still, additions to mineral reserves, such as bauxite, copper, gold, iron ore, lead, molybdenum, nickel, rare-earth metals, and zinc, were not compensating for their depletion. Accordingly, by 2010, Russia could face the depletion of about one-half of its reserves for bauxite, gold, lead, petroleum, phosphates, and silver; by 2015, copper, tungsten, and zinc; by 2020, coal and manganese; and by 2025, natural gas (Russian Mining, 2001).

The Federal program "Ecology and Natural Resources," which was developed in 2010, contained provisions for expenditures from the federal budget for replacement of the mineral resource base. A number of tax policies, which included the scheduled repeal of the depletion allowance in 2002, were expected to create conditions that will inhibit exploration and additions to the resource base (Russian Mining, 2001).

As a result of parliamentary hearings, recommendations were made to increase the state's participation in developing the

country's resource base through 2025 based on promoting the principle of self-sufficiency, encouraging some exports, and restricting imports of minerals and fuels. Reforms were advocated for tax codes and licensing procedures; introducing antimonopoly laws to encourage the formation of medium-sized mining and oil and gas extraction enterprises; increasing Russia's participation in international organizations that deal with issues regarding the production, consumption, and sales of mineral products; and better delineation of the roles of the federal and regional authorities in mineral development (Russian Mining, 2001).

In 2001, Russia's gross domestic product (GDP) increased by about 5% compared with that of 2000. In 2001, output of nonferrous metals increased by 4.9% in value, and output of ferrous metals decreased slightly by 0.2% compared with that of 2000 (Interfax Mining and Metals Report, 2002al). For specific nonferrous metals commodities, production measured in physical output increased compared with that of 2000—for magnesium and its alloys, 43.3%; molybdenum concentrates, 25.7%; rolled titanium, 24.7%; cobalt (unspecified), 14.9%; lead metal, which included secondary, 14.6%; molybdenum metal, 8.3%; alumina, 7%; gold, 6.2%; brass (rolled), 5.9%; refined copper, 5.8%; bronze (rolled), 5.4%; copper in concentrate, 5%; zinc metal, 3.2%; aluminum, 1.9%; nickel (unspecified), 1.8%; and tungsten concentrate, 1.5%. Production decreased compared with that of 2000 for tin in concentrate, 19.6%, zinc in concentrate, 8.6%; lead in concentrate, 7.2%; bauxite, 3.9%; tin metal, 3%; and tungsten metal, 0.4% (Interfax Mining and Metals Report, 2002an).

Russia was operating its aluminum smelters at practically full capacity; and copper, zinc, and nickel metallurgical facilities were operating at 97.2%, 92.5%, and 84.4%, respectively, of capacity. In 2001, capital investment in the iron and steel industry increased by 12.8%, and in the nonferrous metals sector, by 31.6% compared with that of 2000 (Interfax Mining and Metals Report, 2002al).

Ferrous metals output decreased mainly because growth in output for steel pipes and finished rolled products slowed to 8.5% from 45.3% and to 0.9% from 14.8%, respectively, in 2000 compared with that of 2001. Furthermore, in 2001, production of electric furnace ferroalloys and iron ore decreased by 7.6% and 4.6%, respectively, compared with that of 2000.

In 2001, coal production increased; output increased in the Kuznetsk Basin, which was Russia's main coal-producing region, by 11.7% to 127.6 Mt (Interfax Mining and Metals Report, 2002ak). Russian oil production increased by 7.4%, but natural gas production decreased by somewhat less than 1% in 2001 compared with that of 2000. The fall in oil prices in 2001 contributed to slower growth in the country's GDP in 2001 compared with that of 1999 and 2000 when higher oil prices fueled Russia's economic growth.

Total profits decreased in the nonferrous metals sector—48.3% of all producers operated at a loss in 2001 compared with 41.1% in 2000. In 2001, profits decreased in the iron and steel industry to Rub32.7 billion (approximately $1.026 billion) compared with Rub65.1 billion (approximately $2.042 billion) in 2000. The percentage of enterprises that operated at a loss increased to 37% compared with 26% in 2000 (Interfax Mining and Metals Report, 2002al).

Domestic consumption had fallen drastically for most metals in the post-Soviet period. Exports, which comprised a very large percentage of production, generally exceeded 75% of output and reached 90% or more for certain commodities. The amount of domestic consumption of metals, however, was increasing. In 2001, domestic consumption of copper, nickel, and aluminum increased by 40.6%, 38.6%, and 7%, respectively, compared with that of 2000. In 2001, domestic rolled steel consumption was 23.6 Mt, which equaled 46% of total output. Domestic consumption of rolled steel and steel pipe increased by 8.8% and 3.8%, respectively, compared with that of 2000 (Interfax Mining and Metals Report, 2002al). A restoration of domestic demand for metals, which was still very weak, would be an essential component for achieving steady economic growth in the metals sector.

In 2001, Russian exports of core nonferrous metals decreased in value by $1.8 billion to $7.24 billion compared with that of 2000. Practically all exports of nonferrous metals were to countries outside the CIS and totaled $7.1 billion; exports to the CIS totaled $140 million. Aluminum accounted for 49.7% of the value of nonferrous exports, nickel, 14.4%; and copper 13% (Interfax Mining and Metals Report, 2002al).

In 2001, Russia exported between 72% and 83% of its nonferrous metals productions compared with between 80% and 90% in 2000. Russia exported 3.07 Mt of primary aluminum valued at $3.61 billion, 592,000 t of refined copper valued at $870.2 million, and 188,000 t of primary nickel valued at $1.06 billion (Interfax Mining and Metals Report, 2002af). Russian exports of nickel, aluminum, and copper decreased by 10%, 5%, and 2.5%, respectively, in tonnage in 2001 compared with those of 2000 (Interfax Mining and Metals Report, 2002al). In 2001, Russian exports of copper outside the CIS decreased by 8%; nickel, 5%; and aluminum, 4% compared with those of 2000 (Interfax Mining and Metals Report, 2002af).

In 2001, Russian exports of ferrous rolled metals to countries outside the CIS decreased by 23% to 7.81 Mt compared with those of 2000. Exports fell by 12% for ferroalloys to 336,700 t but rose by 63% for pig iron to 5.8 Mt. Russia exported 13.67 Mt of iron ore products, which was 11.1% less than that of 2000. These included 6.56 Mt of iron ore concentrate, 6.3 Mt of pellets, and 814,000 t of agglomerate (Interfax Mining and Metals Report, 2002ae, ag).

Scrap and waste exports shrank dramatically because of high export duties that were imposed. In an effort to avoid these duties, exporters increased exports of aluminum and copper manufactured products, which were intentionally to be used as scrap rather than for their nominal purpose. Ferrous scrap exports also decreased but by a far lesser extent (Interfax Mining and Metals Report, 2002al).

A major problem that confronted the metallurgical industry was the sharp increase in scrap exports. From 1995 to 1998, exports of steel scrap increased to 356,500 t/yr from 28,600 t/yr, and those of aluminum scrap, to 367,300 t/yr from 11,900 t/yr. A number of entrepreneurs began to export scrap and thefts of equipment to sell as scrap were numerous. Besides the economic and safety problems that arose from dismantling equipment and infrastructure for scrap, problems also arose from scrap being exported that had radioactive and other chemical contaminates. The Russian Government passed laws and enacted regulations to try to control the export of scrap. In 2001, scrap and waste exports shrank by 88% compared with

those of 2000 owing to high export duties but also to the fact that exporters acted to avoid these duties by exporting aluminum and copper products actually intended for use as scrap (Interfax Mining and Metals Report, 2002al).

In 2001, Russia, which was the world's largest natural gas exporter and second largest oil exporter, increased its natural gas exports and net oil exports. In December, however, in accordance with a request from the Organization of Petroleum Exporting Countries (OPEC), of which Russia was not a member, Russia pledged to reduce its oil exports in the first quarter of 2002. Because the Russian Government maintained a lower price than the world price for natural gas sold on domestic markets, the natural gas production industry was heavily dependent on exports as a source of revenue. To maintain its level of gas exports in light of decreasing production and increasing domestic consumption, Russia was contracting to purchase additional gas from Turkmenistan (U.S. Energy Information Administration, 2002c§).

In March 1999, Russia signed the Kyoto Protocol on limiting greenhouse gasses, but had not ratified it. Russia was the third largest emitter of greenhouse gasses after the United States and China; Russia's emissions were double those of Germany and Japan, which ranked fourth and fifth, respectively. Under the protocol, Russia would not have to reduce emissions, but rather maintain emissions at their 2001 level from 2008 to 2012. Russia's commitments were based on the fact that its 2001 level of emissions were about 25% below that of its 1990 level of emissions, which was considered to be the base level. According to forecasts that were substantiated by the Russian Government in its "Energy Strategy Until the Year 2020," Russia's emissions will remain below its base level during the coming decade. Under the protocol, Russia would be required to establish a national emissions control system to monitor and control emissions. Russia was considered to have the potential to increase energy efficiency and to achieve energy savings (Kokorin, 2001).

Tajikistan

Tajikistan is a mountainous country in Central Asia; altitudes range from 300 to 7,450 m above sea level; up to 93% of the country's territory is mountainous with the highest parts in the Pamir and Tyanshan mountain ranges. Almost one-half of the territory of the country is located at altitudes above 3,000 m. The majority of the population, however, lives in the mountain valleys.

In the early 1930s, the Soviet Government began a systematic study of the country's resources. Since then, more than 400 deposits have been explored for such minerals as antimony, boron, celestite, construction materials, fluorspar, gas, gold, iron, lead-zinc, mercury, molybdenum, oil, salt, silver, decorative stone, and tungsten. In a number of deposits, commercial quantities of bismuth, cadmium, gallium, germanium, indium, selenium, thallium, tellurium, and other elements have been found in the ores.

The country was producing aluminum, antimony, arsenic, boron, celestite, cement, coal, construction materials, fluorspar, gold, lead and zinc, mercury, molybdenum, natural gas, petroleum, semiprecious and decorative stones, salt, silver, strontium, tin, tungsten, and uranium. During the Soviet period, open pits, underground mines, and mining and beneficiation complexes and processing plants were established for the production of chemical raw materials, fuels, nonferrous metals, and nonmetallic mineral products. Its reserves of antimony, boron, lead, silver, and zinc enabled Tajikistan to occupy a leading place among the republics of the Soviet Union. According to the reserve classification system that was used in the Soviet Union, the country has what are termed "industrial reserves" of metals, which include bismuth, cadmium, copper, gallium, germanium, indium, tellurium, thallium, selenium, and others (Orifov and Dzhanobilov, 2001).

The Karamazar region was the major region where mineral deposits were developed. By 1934, the Kansayskoye lead-zinc mining complex and the Takaeliyskiyi metallurgical plant had been constructed in this region. Before the outbreak of World War II, coal, gas, lead-zinc, rare-earth metals, load and placer gold, and oil deposits were discovered at Karamazar.

By 1939, the country's first coal mine was commissioned at Shurab, and the Altyn-Topkan and the Adrasman lead-zinc mining and beneficiation complexes were constructed. During World War II, the KIM oil well and the Shurab coal deposit were commissioned; at the Marguzor-Magianskiye deposits, alluvial mining began for the production of antimony concentrates. During this same period, production began of tungsten concentrates for the Soviet Union's defense needs at the Chorukh-Dayron deposit. Production also began for the defense industries of antimony at the Shing-Magianskiye group of deposits, arsenic at the Mosrif deposit, tin and tungsten at the Takfon deposit, and tungsten at the Maykhura deposit (Orifov and Dzhanobilov, 2001).

During the war years, uranium deposits were collocated at the Adrasman, Taboshar, and other lead-zinc polymetallic deposits in the Karamzar region. These deposits became the basis for the establishment of complex No. 6 for the extraction and processing of uranium ore. By 1935, a processing unit had been commissioned to treat uranium ore at the Taboshar mining complex. These uranium deposits became the basis for the Soviet Union's uranium industry and supplied the uranium for the Soviet Union's first nuclear reactor (Orifov and Dzhanobilov, 2001).

The largest enterprise in the mineral sector and one of the largest primary aluminum plants in the FSU was the Tajik aluminum plant (Tadaz) in Tursunzada in the southwestern part of the country. It had the capacity to produce about 520,000 t/yr of primary aluminum; its entire alumina supply was to be imported.

During the 1990s, only a few mineral production enterprises were still operating, and production at some of these had halted by the end of the decade. These included the Adrasman mining and beneficiation complex, which developed copper-bismuth and lead-silver ores for processing in other regions of the FSU, in particular the Shymkent lead plant in Kazakhstan; the Altyn-Topkan mining directorate, which developed the Altyn-Topkan and Paybuylak lead-zinc deposits and supplied concentrates to metallurgical facilities at the Almalyk mining and metallurgical complex in Uzbekistan until 1997; and the Anzob mining and beneficiation complex, which mined the reserves of the Dzhikrutskoye antimony-mercury deposit and supplied metallurgical enterprises in Kyrgyzstan. Owing to a lack of operating funds, production at Adramsman and Altyn-Topkan

had practically ceased by 1997 (Orifov and Dzhanobilov, 2001).

The Adrasman mining and beneficiation complex (formerly the Adrasman lead-zinc mining and beneficiation complex) was founded in 1967 on the base of the former chemical production shop of the Leninabad mining/chemical complex; it was subordinate to the Soviet Union's Ministry of Medium Machine Building, which controlled much of the defense-related production. Until 1997, the beneficiation plant at Adrasman had been processing copper-bismuth and lead-zinc ores. The concentrates were shipped to metallurgical facilities in the CIS, particularly the Shymkent lead plant in Kazakhstan. In 1985, the beneficiation plant was reconstructed to increase its processing capacity to 650,000 t/yr from 450,000 t/yr of ore from the Komimansurskoye deposit. Although Adrasman had been producing concentrates for the production of bismuth, copper, fluorspar, gold, silver, and zinc, the most valuable component of the ore mined at Adrasman was silver (Orifov and Dzhanobilov, 2001).

Owing to a lack of funds, production at Adrasman practically ceased in 1997. Restoration of production at Adrasman, which is located in an area with reportedly significant reserves of lead-zinc, lead-silver, fluorspar-silver, and copper-bismuth ores, was considered to be feasible. The fluorspar content of commercial grade ores was, on average, 23.5%, which enabled the production of fluorspar concentrate. The silver content of the ores was 85.5 g/t. The copper-bismuth ores contained 0.71% copper, 0.1221% bismuth, 152.2 g/t silver, and 0.95 g/t gold. Main output of Adrasman included concentrate with a lead content of 43% and a silver content of 5,943 g/t. Future processing of copper-bismuth and fluorspar-silver ores would not require renovation of the plant. Commercially produced bismuth concentrates contained 2.03% bismuth, 12% copper, and 2.844 g/t silver. Fluorspar-silver ores were processed in a separate section; a sulfide product was produced that contained 1,360 g/t silver and a fluorspar concentrate that contained 92% calcium fluoride (Orifov and Dzhanobilov, 2001).

Near the Adrasman complex, which had been developing the Konimansur deposit, was the Bol'shoy Konimansur deposit, which had undergone detailed exploration during the Soviet period. It was the largest polymetallic silver porphyry deposit in the FSU. Plans had called for construction of a mining enterprise with the capacity to mine 15 Mt/yr of ore, but following the dissolution of the Soviet Union, these plans were indefinitely postponed (Orifov and Dzhanobilov, 2001).

Gold mining had begun during the Soviet period. The Tadzhikzoloto production association organized placer mining production at four alluvial placers of the Yak-Suyskoye deposit in the southern part of the country. The civil war of the 1990s, however, practically ended these placer mining operations. In 1995, Darvaz, which was a Tajik-British joint venture, was formed to develop the Yak-Suyskoye deposit, which had explored reserves of about 17 t in Khatlonskaya Oblast; production was slowly being reinstituted (Orifov and Dzhanobilov, 2001).

In 1985, the Kansaykskaya factory, which had been processing lead-zinc ores, was reconstructed to process 165,000 t/yr of gold-bearing ores from the Aprelevka, Burgunda, Kyzyl-Cheku, and Shkol'noye deposits by using gravitation-flotation technology. Based on the Kayrakkumskiy mining enterprise, the Aprelevka joint venture was formed in 1997; the Canadian firm Graf International Ltd. was to mine gold ores from the above deposits and others. As of 2001, the Aprelevka joint venture had not produced any gold (Orifov and Dzhanobilov, 2001).

The country's largest gold deposits are located in the Zeravshan valley, where, during the Soviet period, the Chore, Duoba, Dzhilau, and Taror deposits were prepared for development. A gold-mining complex and accompanying infrastructure was built on the base of the Taror deposit near the village of Pendzhikent. Mining began during the Soviet period but ceased after the dissolution of the Soviet Union. On the base of the existing complex, the Zeravshan joint enterprise was created in 1994 by the Government of Tajikistan (51%), Commonwealth and British Minerals (CBM) of the United Kingdom (a wholly owned subsidiary of Nelson Gold Corporation Limited) (44%), and the International Finance Corporation (5%). CBM controlled and managed production at the enterprise. In 2001, Zeravshan was mining gold ore from the Dzhilau open pit for processing at its plant, which crushed the ore and also used a leaching method to extract gold; the gold was then sent for refining (Orifov and Dzhanobilov, 2001).

The country mined decorative and precious and semiprecious stones, such as agates, amethyst, clinohumite, granite, laurite, marble for dimension stone, onyx marble, rubies, and spinel and tourmaline marbles. Marbles that are quarried from the Dal'yan deposit in the Shakhristankiy region, the Dashtak deposit in the Darvaz region, and the Tilyagul' deposit in the Pendzhikent region are distinguished by their highly decorative quality. The Yavan electrochemical complex processed dolomite from the Paskhivskoye deposit and salt from the Tut-Bulakskoye deposit to produce chemical raw materials. The Dushanbe cement complex developed the Kharangonskoye limestone deposit and the Varzobskoye loam deposit.

Until recently, practically all salt consumed in Tajikistan was imported from other CIS countries. In 2001, however, the country was able to satisfy its salt requirements almost completely through the development of the Kamysh-Kurganskoye and the large Khodzha-Muminskoye deposits by the Ashtskiy and Voseyskiy salt plants, respectively (Orifov and Dzhanobilov, 2001).

The country's fuel requirements had been met almost completely through imports of oil products and coal from other CIS countries. Previously, Tajikistan had extracted between 700,000 and 800,000 t/yr of coal and between 300,000 and 350,000 t/yr of crude oil. By 2001, the extraction of coal and oil did not exceed 50,000 t/yr, and plans called for reviving and expanding fuel production (Orifov and Dzhanobilov, 2001).

Turkmenistan

Turkmenistan has a variety of unevenly distributed mineral deposits. More than 80% of the country's territory is composed of the Kara-Kum Desert, with mountainous regions in the west and south (Kopet-Dag Range) and the foothills of the Zeravshan and Tyan-Shan' ranges in the east. The country's major mineral resources are its oil and gas reserves; Turkmenistan was one of the leading countries in the world in the quantity of its natural gas reserves (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country's leading nonfuel mineral enterprises were the Arpaklenskiy barite-witherite and the Cheleken ozokerite

mining enterprises, the Gaurdak sulfur plant, the Karabogazsulfate association, the Kara-Kum sulfur plant, and the Oglanlinskiy bentonite mining enterprise (Odekov, Krasil'nikov, and Bumshmakin, 2001).

One of the largest enterprises that extracted chemical raw materials was the Karabogazsulfate association. The raw material base for this enterprise was the Kara-Bogaz Gol lagoon off the Caspian Sea where production began in 1940. The association produced bischofite, epsomite, Caspian Sea salt, Galauber's salt, and sodium sulfate (Odekov, Krasil'nikov, and Bumshmakin, 2001).

In the western part of the country, the Boyadagskoye, Cheleken, and Nebitdag deposits of iodine-bromine waters were under development. The productive horizons are at depths of between 400 to 800 m; the average iodine content of the waters was between 26 and 35 milligrams per liter (mg/L); and the average bromine content ranged from 380 to 400 mg/L. The waters were processed at the Cheleken and the Nebitdag iodine-bromine plants (Odekov, Krasil'nikov, and Bumshmakin, 2001).

All the deposits in Turkmenistan were being developed by enterprises subordinate to the Ministry of the Oil and Gas Industries and of Mineral Resources, the Ministry of Energy, and the Ministry of Construction Materials. For various reasons, which included the breakdown of economic contacts among the countries of the CIS, the decrease in mineral extraction was large. Since 1998, however, this trend reversed. The Government program, A Strategy for the Social-Economic Development of Turkmenistan to the Period of 2010, called for conducting exploration for iron ore, nonferrous metals, radioactive metals, rare metals, alunite, bentonite, fluorspar, phosphates, and zeolites and a range of construction materials. This exploration was planned to result in the development of new deposits. For those already explored deposits, the main goal will be to widen the assortment and to improve the quality of mineral products, in part, by reequipping enterprises in the mining sector and conducting market research to enable the country to sell its goods on world markets more effectively (Odekov, Krasil'nikov, and Bumshmakin, 2001).

As of 2001, Turkmenistan had an inventory of 162 nonfuel mineral deposits with confirmed reserves, these included 2 deposits of celestite, 10 of mineral salts (7 of sodium and 3 of potash), 2 of kaolin, 2 of natural sulfur, 3 of coal, 1 of bentonite, 2 of ozokerite, 1 of natural pigments, 2 of carbonate material for soda production, 7 of barite, 2 of marble onyx, and 128 of various construction materials, which included 3 deposits of gypsum; 3 of cement raw materials; 3 of glass raw materials; 7 of dimension stone; and 5 of filing stone. Of these deposits, 62 were under development.

The country had developed the Kugitangskoye polymetallic ore deposit near the city of Gowurdak in the southwestern part of the country. The lead-zinc ores were mined by underground methods from 1942 to 1967. The mine was closed owing to the depletion of the ore (Odekov, Krasil'nikov, and Bumshmakin, 2001).

In the 1970s, the country explored two large strontium deposits, the Arikskoye and Sakrytminskoye, in the region near the city of Gowurdak. The reserves at each deposit were said to be in the millions of metric tons. The Arikskoye deposit was mined by open pit methods from 1986 to 1991; during this period, 85,000 t of celestite concentrate was produced that was processed in Tajikistan and in the Ukraine. After the beneficiation plant at the mine was closed in 1992, small amounts of rich ore were extracted for the production of celestite for weighting materials for drilling solutions (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country also had one of the first developed uranium deposits in Central Asia; it is located 250 km to the northeast of Turkmenbashy. Mining of ore that averaged 2% uranium began in 1955. The deposit was first developed by sinking 10 underground shafts and then by open pit mining. Mining ceased at an unspecified time in the past owing to the depletion of reserves (Odekov, Krasil'nikov, and Bumshmakin, 2001).

Along with oil and gas, the country produced coal from the Tuarkyrskoye deposit of oxidized coal. This deposit is located 250 km to the southeast of the port city of Turkmenbashy. The ash content of the coal is between 22% and 30%, and the output of humic acid was between 30% and 98%. This deposit was being developed from small open pits for the production of chemical raw materials. Sections of the deposit could be developed by underground mining to supply fuel for local use (Odekov, Krasil'nikov, and Bumshmakin, 2001).

Development of the Oglaninskoye bentonite deposit began in 1934. Ore was mined by the open pit method. The peak output was 100,000 t/yr of lump bentonite. Until 1992, bentonite from Oglaninskoye was shipped to 70 enterprises in the FSU for use in iron ore concentration and porcelain ceramics production. In 1999, a plant with a 50,000-t/yr capacity to produce bentonite powder was commissioned. Remaining confirmed bentonite reserves equaled 14 Mt (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Bakhardenskoye quartz sand deposit, which is located 15 km from the Bakharden railroad station, had reserves of 2.4 Mt, which were being developed by open pit to supply the Ashkhabad glass plant. Production was stopped in 1972 owing to requirements for the higher quality raw materials that were imported from Russia and Tajikistan; production, however, resumed again in 1994. The Kelyatinskoye dolomite deposit, which is located 80 kilometers to the northwest of Ashkhabad, was being developed by open pit mining; it will supply the Ashkhabad glass plant. It had reserves of 3.39 Mt and extracted about 6,000 t/yr. The Badaurmazskoye and Annauskoye deposits, with reserves of 6 Mt and 600,000 t, respectively, also supplied quartz sand to the Ashkhabad glass plant. The Kyzylkainskoye kaolin-bearing sand deposit, which is located 250 km to the north-east of Turkmenbashy, with reserves of 29.6 Mt had a complex raw material used for the production of artificial leather and cloth, electronic goods, fine ceramics, glass for packaging and illumination, sanitary engineering and china earthenware goods, and sheet glass. The sands in their natural form are suitable for producing refractory bricks. The deposit was developed by open pit mining since 1995, and 80,000 t/yr was extracted. The raw material was processed at the Ashkhabad kaolin plant, which produced 20,000 t/yr of kaolin concentrate. The kaolin plant began operations in 1997. In producing the kaolin concentrate, the sand siftings were not used in glass production, although they would be suitable for use in glass manufacturing after processing (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Tuarkyskoye secondary kaolin deposit, which is located 9 km from the Kyzylkainskoye deposit, had reserves of 4 Mt that

are suitable for use in producing sheets of ceramic facing stone and as an additive in the production of refractory goods. The deposit had been prepared for industrial development. The Bakhchganyncheshme natural pigment deposit, which is located 28 km southwest of the city of Serdar, had reserves of 77,800 t and comprises oxidized sulfide ore suitable for the production of brown, red, and yellow pigments after treatment. The deposit has not yet been developed (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Gowurdak native sulfur deposit, which is located in the southeastern part of the country 260 km from the city of Turkmenabat (formerly Chardzhou), was mined by underground methods from 1935 to 1964 and then by open pit mining. Since 1971, the deposit was also mined by using the Frasch process. Peak production was achieved in 1990 with the extraction of 1.7 Mt of ore to produce 478,000 t of sulfur. Since 1997, mining has ceased because of the inability to market output profitably. Remaining sulfur reserves were 18.3 Mt (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Kara-Kum sulfur deposit, which is located in the center of the Kara-Kum Desert 250 km to the north of Ashkhabad, was mined from 1930 to 1961 by open pit methods. The sulfur was processed at two plants in the villages of Darvaz and Zeagli. The exploitation of this deposit ceased owing to the depletion of reserves and the development of the Gowurdak deposit. Other sulfur deposits include the Kugitangskoye deposit with 9.1 Mt of reserves of sulfur suitable for development by using the Frasch method (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Karlyuk potash deposit, which has sylvinite seams or sylvinite mixed with carnallite, had reserves of 2.017 Mt potassium oxide (K_2O) with the K_2O content of the ore 18.41%; it is located 55 km from the city of Gowurdak. The potash is considered to be suitable for use as fertilizer. In 1975, an experimental solution mine was commissioned, and plans called for constructing the Central Asia potash complex. In 1997-98, however, the experimental mine was dismantled. The Karabilk'skoye potash deposit, which is located 17 km to the south of Gowurdak, is analogous to Karalyuk in type and amount of reserves, but was not developed (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Kuulinskoye native salt deposit, which is located 40 km to the north of Turkmenbashy, is coincident with a 200-km^2 salt lake on the banks of the Caspian Sea. Following extraction and remaining 1 year in mounds, the salt is considered to be first-class table salt and also suitable for the production of caustic soda, chlorine, and soda ash. Peak output was 650,000 t/yr. The salt was exported to Armenia, Azerbaijan, Bulgaria, Kazakhstan, Russia, Sweden, Uzbekistan, and Yugoslavia. By 2001, however, production had fallen to 250,000 t/yr. Reserves were listed at 36.7 Mt (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Babakhodzha common salt deposit, which is located 20 km to the south of the city of Balkanabat, is a 28,000-km^2 dry salt lake. The salt corresponds in quality to feed and industrial salt, with reserves of 7.3 Mt. The deposit was under some development until 1980 but has not been worked since then (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Gowurdak rock salt deposit, which is located 8 km from Gowurdak, is suitable for underground solution mining. The salt reserves of 1.849 Mt can be used as raw material to produce caustic soda ash and in chemical water treatment. Extraction was 15,000 t/yr (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Kugintanskoye rock salt deposit, which is located 75 km from Gowurdak, is analogous to the Gowurdak deposit. The salt in its natural state is suitable for feed and industrial uses, but after processing, it is suitable for table salt. Reserves suitable for underground mining were 19.6 Mt in 1933. The deposit has been periodically developed with an output of about 2,000 t/yr. The salt was exported to Kazakhstan and Uzbekistan (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Khodzhakiyamskoye rock salt deposit, which is located 4 km west of Gowurdak, had reserves of 100.9 Mt confirmed in 1998 that are suitable for underground mining and industrial use. The deposit has not been developed (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The Uzunkuduksoye rock salt deposit, which is located 20 km from Gowurdak, had reserves of 886,000 t suitable for open pit development and for use as animal feed. The deposit was being mined at the rate of 2,000 t/yr. The salt was used in Turkmenistan and exported to Kazakhstan and Uzbekistan (Odekov, Krasil'nikov, and Bumshmakin, 2001).

Hydrothermal barite deposits were being mined in the region of the village of Kara-Kala in the western part of the country. A group of small deposits are distributed over an area of more than 5,000 km^2. Barite extraction began in the 1920s at the Kumytash deposit. In 1930, on the base of the Arpaklen deposit, the first witherite mine in the Soviet Union was developed. Arpaklen and a group of small witherite deposits were mined until the middle of 1941. Peak production of barite witherite reached 10,000 t/yr with about 100,000 t of barite and witherite ore extracted (Odekov, Krasil'nikov, and Bumshmakin, 2001).

Deposits of the limestone that is used in the chemical industry were explored in the Gowurdak-Kugitanskiy region. The Gowurdak limestone deposit, which is located 4 km to the northeast of Gowurdak, had reserves of 205.3 Mt confirmed in 1970. The limestone is suitable for soda ash production. The deposit was not developed. The Karadzhumal'skoye limestone deposit, which is located 60 km from Gowurdak, had reserves of 105.1 Mt confirmed in 1970. The limestone is suitable for soda ash production. This deposit also was not developed (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has seven explored reserves of materials for facing materials—the Krasnovodskoye deposit of tuff and granites, and the Charshanginskoye, Geopktepinskoye, Gowurdakskoye, Kaylyu, Tagarinskoye, and Tyuzmergenskoye limestone deposits. Reserves from these deposits have been confirmed as suitable for producing slabs for inside applications in buildings. The Tagarinskoye deposit, which is located 8 km from Gowurdak, produced about 1,000 cubic meters per year of material from a quarry (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has three deposits that contain raw materials for cement production—the Bezmenskoye bench gravel and loam deposit, the Gingol'skoye limestone and marl deposit, and the Kugintanskoye limestone and clay deposit. The Bezmenskoye deposit, which is located near Ashkhabad, had been mined since 1950 and supplied the Bezmenskiy cement plant, which was the country's only cement plant. In 1996, extracted bench gravel

totaled 1.2 Mt, and extracted loam, 120,000 t. Remaining reserves at the deposit are 41.6 Mt of bench gravel and 11.9 Mt of loam. In 2000, the Bezmenskiy cement plant was moved to the village of Kelyata, which is located 90 km to the west of Ashkhabad (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has three deposits of gypsum and anhydride—the Bordzhaklinskoye, Gowurdak, and Krasnovodsk; the Bordzhaklinskoye was not mined. The Gowurdak, which is located 2 km northwest of the city of Gowurdak, immediately abuts the Gowurdak sulfur deposit. The gypsum from this deposit is suitable for the production of gypsum molding plaster and construction solutions and as an additive in cement and sulfuric acid production. The deposit has been mined since 1974, but production had been sharply curtailed since 1992. The gypsum had been used by cement plants in the Soviet Union (the Central Asian republics and Siberia) and exported to Sweden and Denmark. In 2001, small amounts of gypsum were shipped to the cement plant in Kelyata. Gypsum reserves at Gowurdak reportedly were 63.8 Mt. In the 1980s, the Krasnovodsk deposit, which is located 9 km to the east of the city of Turkmenbashi, was producing from about 150,000 to 160,000 t/yr, but by 2001, production had been reduced to 25,000 t/yr of gypsum (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has five deposits that were used to supply raw material to produce keramzit, which is a light-weight concrete aggregate; only the Yagmanskoye argillite deposit, which is located 45 km to the northwest of the city of Balkanabat, was being mined. This deposit has been mined since 1978, and annual production reached 200,000 cubic meters. Argillite was used by five keramzit plants in the country and also by a number of plants in Kazakhstan and Uzbekistan. Remaining argillite reserves were 36.2 million cubic meters (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has six explored limestone deposits that were suitable for the production of filing stone; four were being mined. The Aeroport deposit, which is located 21 km northeast of Turkmenbashy, had reserves of 23.1 million cubic meters and output of 2,000 cubic meters per year; the Mukrinskoye deposit, which is located 20 km southwest of Gowurdak, had 18.8 million cubic meters of reserves and output of 25,000 cubic meters per year; the Bekdashskoye deposit, which is located 200 km to the north of Turkmenbashy, had reserves of 10.1 million cubic meters and output of 5,000 cubic meters per year; and the Dostluksoye deposit, which is located 230 km to the southeast of Turkmenabat, had reserves of 734,000 cubic meters and output of 2,000 cubic meters per year (Odekov, Krasil'nikov, and Bumshmakin, 2001).

The country has many deposits of raw materials that were suitable for construction materials, of which the most notable were the Ufrinskoye deposit for the production of gravel, which had output of 900,000 cubic meters per year; the Dushaksoye sand and gravel deposit, which had output of 1.15 million cubic meters per year; the Kalaimorskoye sand and gravel deposit, which had output of 925,000 cubic meters per year; the Kubatayskoye deposit of granites, which were used for the production of gravels and had output of 740,000 cubic meters per year; and the Kernayskoye deposit of sands and shale, which were used for the production of gravels and had output of 36,000 cubic meters per year (Odekov, Krasil'nikov, and Bumshmakin, 2001).

Ukraine

Ukraine is the largest country solely in Europe in land area. At the end of the 1980s, Ukraine mined about 5% of the world's output of mineral products (Gurskiy and Kalinin, 2000). Since the breakup of the Soviet Union, production in Ukraine's mineral sector had fallen precipitously. Nevertheless, in 2001, Ukraine continued to be a major world producer of coal, ferroalloys, ilmenite, iron ore, manganese ore, and steel.

The country had been a lesser producer of a number of other metallic mineral products, which included alumina, aluminum, cadmium, germanium, secondary lead, magnesium, mercury, nickel, rutile, uranium ore, secondary zinc, zircon, zirconium, and a large number of industrial minerals, which included dolomite, graphite, kaolin, limestone fluxes, potash, quartz, salt, soda ash, and a variety of building materials. Because of the large reduction in demand that followed the breakup of the Soviet Union, Ukraine sharply reduced or ceased producing a number of these commodities. Based on the former economic importance of Ukraine's mineral industry, its large amounts of capital stock and infrastructure, and its employment of a significant segment of the work force, its successful functioning was considered to be critical for the country's economic renewal (Gurskiy and Kalinin, 2000).

Ukraine's mining and metallurgical complex consisted of about 300 enterprises, which included 35 secondary metals plants, 30 scientific research and design organizations, 26 mining enterprises, 20 nonferrous metals plants, 17 iron and steel mills, 17 refractory production plants, 16 coke-chemical plants, 10 metals goods plants, 7 pipe plants, and 3 ferroalloys plants. The complex employed 500,000 persons, 270,000 of which were employed at ironmaking and steelmaking and ferroalloys enterprises (Kharakhulakh, 2001).

After a decade-long decline, Ukraine's GDP increased by 6% in 2000 compared with that of 1999 and by 9% in 2001 compared with that of 2000. Ukraine had experienced about a 60% contraction in economic activity from 1992 until 2000. Thus, the recovery that began in 2000 was of prime importance. Industrial production, which accounted for about one-third of the GDP, grew by 14% compared with that of 2000. Among the industrial sectors that showed exceptional growth in 2001 were the ferrous and nonferrous metals sectors and the machine-manufacturing sector. Output in the fuel sector, however, declined owing to a sharp reduction in oil refining (Berengaut and others, 2002).

For 2001, Ukraine reported monthly growth rates in the mining sector, which included extraction of mineral fuels, ranging from 3.3% to 8.8% compared with comparable months of the previous year. In the metallurgical sector, the increased growth rates ranged from 4.9% to 27.4%; in all but 4 months, the growth rates were more than 10%. Other increases in production in 2001 compared with 2000 were reported for soda ash, 13.2%; rolled steel, 12.4%; cement, 8.9%; crude steel, 5.5%; synthetic ammonia, 3.4%; and sulfuric acid, 0.3%. Decreases were reported for steel pipes, 4%, and caustic soda, 0.1% (Berengaut and others, 2002).

Ukraine's economic recovery in 2000 was led by its strong 26% growth in exports, in terms of U.S. dollars, compared with

those of 1999. Russia, which was Ukraine's leading trading partner, accounted for 23% of Ukraine's total exports in 2000. Ukraine exported aluminum, crude steel, iron ore, rolled ferrous metals, and steel pipes. In 2001, Ukraine's growth in exports was 10% compared with that of 2000. Destinations of exports and major export items remained similar to those of 2000. Russia, which remained the leading destination, accounted for 22% of Ukraine's total exports. Metals and metal products were the key category of exports and composed 41% of total exports despite antidumping actions and a less favorable world market for steel. Chemical products, machinery, and minerals remained important export categories, each accounting for about 10% of total exports (Berengaut and others, 2002).

On July 14, 1999, the Ukrainian Parliament adopted a law conducting an economic experiment at the enterprises of mining and metals companies that pertains to coke enterprises, foundries, iron ore beneficiation plants and mining enterprises, steel mills, and pipe plants. This law provided tax benefits for mining and metal industry firms from July 1999 through January 2002. The law attempted to help Ukrainian firms increase their working capital to upgrade production facilities and avoid barter transactions in purchasing critical supplies, such as energy and fuel (U.S. Embassy Kiev, Ukraine, 1999§).

After 10 years of independence, Ukraine's energy industry was in a state of crisis despite all efforts undertaken by the Government to alleviate the problem, and the country was not being adequately supplied with energy. The most important energy resource was coal, which accounted for 90% of all production of domestic energy resources. Conditions for its extraction, however, were among the most difficult in the world. The coal industry required a large investment because of the poor condition of the mines and the depreciation of equipment. Explored reserves of oil and gas are not large, and the country will need to import these fuels in the coming years. The situation in the nuclear power sector was also fraught with difficulties with a major effort still needed to ensure safety at the Chernobyl nuclear reactor (Laptev, 2002).

Uzbekistan

In 2001, the mineral industry of Uzbekistan played an important role in the country's economy. It accounted for more than 29% of the total volume of industrial output, employed more than 8% of the industrial workforce, and contained more than 14% of the country's capital stock. Shortly after independence in 1991, the Government began to develop the oil and gas industries, the energy industry, and the nonferrous metals, chemical, and machine manufacturing industries. These industries produced more than 70% of the country's industrial output (Alimkhodzhayev, 2001).

Between 1991 and 1999, the volume of oil extraction, which included condensates, grew by more than 2.8 times, and the volume of gas extracted grew by more than 25%. As a result, Uzbekistan became energy independent and a gas exporter to Kazakhstan, Kyrgyzstan, and Tajikistan. Owing to the breakdown in the economies of the countries of the FSU and the economic ties among these countries, however, domestic demand for its metals, such as copper, molybdenum, tungsten, and zinc, decreased; consequently, production decreased (Alimkhodzhayev, 2001).

The country identified more than 2,800 deposits with more than 100 types of mineral raw materials, 65 of which were being used in industry and agriculture. Among the largest of the deposits are those for nonferrous metals, precious metals, fuels, and many types of industrial minerals. More than 100 deposits underwent detailed exploration, the majority of which are located in mountainous regions. These included 51 deposits for precious metals; 41 for nonferrous, rare, and radioactive metals; 7 for fluorspar; and 4 for ferrous metals. Uzbekistan reportedly ranked among the leading 5 countries of the world in what it termed its confirmed reserves of gold and uranium and among the 10 leading countries of the world in the extraction of gold and uranium. It reportedly occupied the number two spot in the world in the quantity of its potential gold resources. Within the CIS, Uzbekistan was the second leading gold producer and the third leading copper and silver producer (Alimkhodzhayev, 2001; Rakhimov and Alimkhodzhayev, 2001; Akhmedov, 2002).

Deposits that were developed included copper, feldspar, fluorspar, gold, lead, lithium, phosphates, potash, silver, and zinc. The majority of the explored deposits are suited for open pit development and simple beneficiation technologies, thus making it possible to extract a large percentage of the useful components of the ore. Among the most notable deposits that were developed were the Muruntau gold deposits; the Dalneye, Kal'makyr, and Sary-Cheku copper porphyry deposits; the Shavasay rare-metals deposit with cesium, lithium, and rubidium; and the Ingichke and Llyangar tungsten deposits (Alimkhodzhayev, 2001; Rakhimov and Alimkhodzhayev, 2001; Akhmedov, 2002).

Uzbekistan reportedly was fourth in the world in the quantity of its gold reserves and ninth in the world in its level of gold extraction (Akhmedov, 2002). The country discovered 48 gold deposits, which included 39 gold-bearing deposits and 9 complex deposits that contain gold. Among the largest deposits is the Muruntau gold deposit located in the Kyzyl Kum region. There are more than 10 other gold deposits under study in the Kyzyl Kum region, which included the Adzhibugut, Balpantau, Bulutkan, Daugiztau, and Tsurbay. The gold deposits in the Kyzyl Kum are in desert and hilly terrain. They reportedly have a relatively high gold content and are suited for open pit development. Mines developed at these deposits would have access to infrastructure, which would include energy, transport, and water. Uzbekistan also has a number of gold deposits located in its mountainous regions; those in western Uzbekistan, however, were not near existing infrastructure. These western deposits form the core base for the Uzalmazzolota association. In the eastern part of the country, some gold was being mined by using adits and shafts (Alimkhodzhayev, 2001; Rakhimov and Alimkhodzhayev, 2001; Akhmedov, 2002).

The country has several explored silver reserves. The Kosmanachi, Okzhetpies, and Vysokovoltnoye gold-silver deposits in Namanganskaya Oblast have been prepared for development. Large silver reserves are associated with complex copper porphyry reserves from deposits in the Almalyk mining region (Akhmedov, 2002).

The country's main copper reserves are in the ores of the Almalyk region, which also contain large reserves of gold, molybdenum, rhenium, selenium, silver, sulfur, and tellurium. These other ore constituents compose more than 40% of the

value of the ore (Akhmedov, 2002).

Uzbekistan has six explored tungsten deposits with large resources. Because of their low tungsten content and complex geologic and mining setting, however, they were not under development. In 2001, exploration of the new Sautbayi tungsten deposit in the Kyzyl Kum was completed, according to the reserve classification system used in Uzbekistan industrial reserves of tungsten had a tungsten trioxide content of 0.49%. According to a technical-economic assessment, mining the deposit could be profitable and could supply raw material to the Uzbekistan refractory and hard metals plant (Akhmedov, 2002).

Uzbekistan had a leading role in the world in the production of uranium. Since 1996, uranium extraction increased, but the growth in reserves lagged behind the growth in output. Reserves prepared for development were sufficient for an additional 15 years; what are termed in Uzbekistan "prognosticated resources" could extend this period to 20 years (Akhmedov, 2002).

Because Uzbekistan lacks domestic iron ore production, the Uzbek metallurgical complex used secondary materials. The State Geological Committee (Goskomgeologiya) evaluated the first-stage sectors of the Syurenata deposit for development of iron ore in Tashkentskaya Oblast. The reserves were evaluated to be 16 Mt of iron ore that contains 5.4 Mt of iron with an iron content of 34%. Development of these reserves would enable the Uzbek metallurgical complex to expand steel production (Akhmedov, 2002).

In 1999, evaluations of new sectors of the Dautashskoye manganese deposit in Kashkadarynskaya Oblast began, and a joint venture was organized to develop these resources. The joint venture planned to mine 40,000 t/yr of ore from which 15,000 t/yr of commercial-grade concentrate could be produced. This quantity of concentrate would satisfy the demand for manganese by the country's manganese-consuming enterprises and leave some manganese concentrate for export (Akhmedov, 2002).

The country was exploring for diamonds with the assistance of Australian geologists and completed evaluations of the Karashokho and Koksay sectors in the Navoi District, which were deemed to have significant prognosticated resources. Diamond of 0.2 to 0.4 carats that could be used in industrial and jewelry applications was discovered (Akhmedov, 2002).

In the central Kyzyl Kum, the reserves of the Dzheroy-Sardara Moroccan-type phosphate deposit were estimated to be 57.7 Mt of phosphate anhydride that were prepared for development. Construction of the Kyzyl Kum phosphate complex was completed, and commercial development began. Phosphate will be processed at the Almalyk and the Samarkand chemical plants. To enlarge the Kyzyl Kum complex's reserve base, exploration of the nearby Karaktata and Severnyy Dzhetymatau deposits was being conducted (Akhmedov, 2002).

Uzbekistan also has a raw material base for the production of potash fertilizers at the Tyubegatanskoye deposit in southern Uzbekistan; the deposit has what are termed in Uzbekistan's reserve classification system "explored reserves" of 200 Mt of raw salts with a potassium chloride content of 36.8% (Akhmedov, 2002).

Raw material from the Suppatashskoye fluorspar deposit in Namaganskaya Oblast, which has reserves of 5.147 Mt, is suitable not only for the production of traditional concentrates, but also for the production of high-purity welding electrodes for specially designated uses (Akhmedov, 2002).

Resources of the Taskazganskoye graphite deposit in Navoiyskaya Oblast can serve as a raw material base for production of a number of products for use in aviation, electronics, and other uses (Akhmedov, 2002).

Scientific studies were conducted to find a raw material base for the agrochemical industry. In the southern part of the country, the Arabdasht and Khaydag bentonite deposits, which have reserves of 20.6 Mt, were being prepared for development. Use of bentonite will increase the cotton yield while decreasing the need for traditional fertilizers, improving the irrigation of the soil, and conserving moisture. In the republic of Karakalpakastan, glauconite resources were assessed to be 21 Mt. Studies were being conducted of small phosphate deposits from which material could be directly applied for local use without beneficiation (Akhmedov, 2002).

A raw material base for thermal insulating materials has been established. Explored vermiculite reserves of the western sector of the Tebinbulakskoye deposit were assessed to contain 173,000 t and will enable the production of 25,000 square meters per year of expanded vermiculite for a 25-year period (Akhmedov, 2002).

The country annually imported more than 20 types of mineral products. The State Geological Committee put forth a program to develop local deposits to produce 20 types of mineral products, 15 of which (for example, barite, caustic soda, potash, and refractory materials) will entirely end the country's dependence on imports (Akhmedov, 2002).

Two of the country's largest enterprises were the Navoi mining and metallurgical complex, which produced gold and uranium, and the Almalyk mining and metallurgical complex, which produced copper, lead, zinc, and byproduct metals. The majority of mineral production enterprises were joint-stock companies in which the Government owned a percentage of the stock (Alimkhodzhayev, 2001).

The country was trying to attract foreign investment, particularly to develop nonferrous metals (aluminum, molybdenum, tungsten trioxide, zinc, and others) and precious metals (gold). Tenders, which specify the terms for investment, were the most common form of offerings to foreign investors to participate in the reconstruction of existing projects and construction of new projects. The Zarafshan joint venture with Newmont Mining Corp. of the United States to extract gold by using heap leaching from tailings piles at the Navoi complex that mines the Muruntau deposit was cited as an example of highly successful cooperation with foreign investors. Oxus Resources Corp. from the United Kingdom was participating in a joint venture to extract gold in the central Kyzyl Kum region within the framework of the Amantaytau Goldfields joint venture; the joint venture was completing a feasibility assessment that recommended underground development of sulfide ore deposits. Since 1994, the Zarispark joint venture has been in operation to produce high-quality-jewelry. The state-owned Navoi gold mining complex owned an interest in this joint venture, which mined and processed the gold from which the jewelry was produced (Alimkhodzhayev, 2001).

Near the city of Angren in Tashkent Oblast, which was an area with highly developed infrastructure, the Kyzylalmasay and Kochubulak gold deposits were explored. Discussions were

underway between the Uzbek State Committee for Geology and Uzalmazzoloto from Uzbekistan and foreign firms, which included Newmont Mining and Mitsui & Co., Ltd. from Japan; these firms could form a consortium for a joint venture.

The stock company Ugol' [Coal] was cooperating with the German firm Kuhlenkampff & Konitzky GmbH to produce and sell beneficiated kaolin from the Angren coal deposit. Also a large effort was being planned to reconstruct and develop enterprises to produce nitrogenous fertilizers by relying mainly on attracting foreign investment (Alimkhodzhayev, 2001).

Commodity Review

Metals

Aluminum.—***Azerbaijan.***—Following the collapse of the Soviet Union, aluminum production in Azerbaijan went into decline. In 1996, the Government transferred Aluminum Production Association (PO) Glinozem in Ganca to outside management by the British company Trans World Metals, Ltd.; Glinozem, which was an alumina refinery, was one of the industry's main enterprises and the only plant in the world that processed alunite as a raw material to produce alumina. Almost 2 years later, Trans World abandoned the production association because the company thought that alumina production in Azerbaijan was unprofitable (Velizde, 2000). Besides alunite, the Glinozem refinery also processed bauxite.

Stock Company (AO) Azerbaydzhanskiy Alyuminiy (Azeral) was created in April 2000 from Zaylik Aluminum Combine, Ganca PO Glinozem, and the Sumqayit Nonferrous Metals Plant. The alunite production division, which was a part of Azeral, produced alumina from alunite and was capable of producing more than 500,000 t/yr of alunite; it was idle in 1999 (Buryantseva, 2000).

In 2001, Azerbaijan's alumina production decreased by 56.4% compared with that of 2000 (Interfax Mining and Metals Report, 2002i). In 2000, the alumina plant produced only 77,000 t of alumina, and production at this plant was to be increased eventually to 450,000 t/yr. The aluminum plant had the capacity to produce only 55,000 t of primary aluminum, and accordingly, its capacity was to be increased to between 100,000 and 150,000 t/yr (Buryantseva, 2000).

In October 2000, the Azerbaijan Ministry of State Property officially announced the results of the tender for the right to mange Azeral for 25 years. The winner was the Dutch company Fondel Metal Participations BV. The company offered $1 billion and committed to pay about $300 million in the first 3 years (Butrin, 2000).

Kazakhstan.—The company Aluminum Kazakhstan in Pavlodar, which produced alumina, but not aluminum, produced 1.22 Mt of alumina in 2001 compared with 1.21 Mt in 2000. The company set a record high target of producing 1.4 Mt in 2002. Aluminum Kazakhstan comprised the Pavlodar Aluminum Plant, which produced alumina; the Krasnooktyabrskiy and Torgayskiy bauxite mines; the Keretegas lime mine; and a power and heat plant. Kazakhstan's Government owned 31.64% of the company, and unspecified legal entities and some private shareholders, the remainder (Interfax Mining and Metals Report, 2002d).

Russia.—Russia was the world's second largest aluminum producer after the United States. Its industry included 11 aluminum smelters and 5 alumina refineries. The industry was controlled by two major holding companies, Russian Aluminum Company (RUSAL) and Siberian-Urals Aluminum Company (SUAL). RUSAL was the second largest aluminum company in the world in production of aluminum after Alcoa Inc. of the United States and was owned equally by shareholders of the Siberian Aluminum Group and the shareholders of the Russian oil company Sibneft (Plunkert, 2000; Interfax Mining and Metals Report, 2002aa).

In addition to being the second largest producer of primary aluminum and alloys in the world with 10% of global production, RUSAL was the largest producer in Russia with 70% of the nation's output. Its operations encompassed the complete cycle of aluminum production from bauxite mining to primary and fabricated aluminum production and the sale of aluminum products. RUSAL exported about 2 Mt/yr of primary aluminum and aluminum alloys, and total annual revenues exceeded $4 billion. Headquartered in Moscow, Russia, RUSAL's plant and facilities were located throughout Russia and the CIS; it also owned and operated facilities in Guinea and Romania. With more than 73,000 employees, RUSAL was one of Russia's largest employers (Russian Aluminum Company, 2002§).

SUAL controlled 20% of Russia's primary aluminum production capacity and 40% of its alumina production capacity; it included the Bogoslovskiy, Irkutsk, Kandalasha, and Urals smelters and the Severural, South Urals, and Timan bauxite mines. SUAL had the capacity to produce 1.2 Mt/yr of alumina and 600,000 t/yr of aluminum (Interfax Mining and Metals Report, 2000c).

Russia had only two aluminum can manufacturers—Rostar, which was part of RUSAL, and a plant in Narofominsk, which was part of Rexam Plc. of the United Kingdom (Rexam Plc, 2003§). Can-Pack Company from Poland was planning to build an aluminum can plant in the Leningrad region; construction was scheduled to begin in 2002 and to be completed in 2003. The plant would be completed in two stages and would have the capacity to produce 1.6 million cans per year (Interfax Mining and Metals Report, 2002g).

In 2001, Russian aluminum production increased by 2.1%, and all the major aluminum smelters increased production; some were expanding capacity (Interfax Mining and Metals Report, 2002j). Russian alumina production also increased in 2001 by 6.7% (Interfax Mining and Metals Report, 2002i).

The aluminum industry consumed about 10% of the country's total electricity consumption, and large aluminum smelters were developed in conjunction with major hydroelectric powerplants in Siberia. About 85% of the country's bauxite and 65% of its alumina were produced in the Urals. Problems existed with the industry's inadequate raw material base and with the need to modernize the plants, particularly in the area of energy-saving technologies. Russia produced about 40% of the alumina it required. Almost all aluminum produced in the country was exported. Bratsk was Russia's largest smelter followed by Krasnoyarsk; these two smelters had more than double the capacity of the country's other major smelters (Interfax Mining and Metals Report, 2000c).

In 2001, RUSAL produced almost 2.5 Mt of primary aluminum and alloys, which was 1.8% more than the 2.4 Mt it

produced in 2000. RUSAL's alumina production increased by 12.9% to more than 2.2 Mt compared with almost 2.0 Mt in 2000. Its output of foil decreased by 1.6% to 29,849 t compared with 30,332 t in 2000 (Interfax Mining and Metals Report, 2002aa). RUSAL also produced more than 721.8 million aluminum cans, which was a 67.1% increase compared with the almost 431.8 million cans in 2000; this included almost 639.7 million beverage cans compared with almost 362.6 million beverage cans in 2000 (Interfax Mining and Metals Report, 2002aa).

In 2001, RUSAL exported nearly 82% of its output and planned to export nearly 83% in 2002. The United States consumed nearly 11% of the company's exports; Southeast Asian countries, 32%; and European countries, the remainder (Interfax Mining and Metals Report, 2002aa).

In 2001, the number of global traders RUSAL used to sell aluminum on the world market decreased from seven to two. RUSAL was planning to undertake efforts to set up its own trading infrastructure (Interfax Mining and Metals Report, 2002aa).

Tajikistan.—The Tajik aluminum plant (TadAz) in Tursunzade produced 289,000 t of aluminum in 2001 and exported 287,000 t of aluminum valued at $398 million, which accounted for 55% of Tajikistan's exports. TadAz had a capacity to produce 517,000 t/yr if all 12 pot lines and 3 prebaked anode lines were in operation. The maximum output from TadAz was 460,000 t in 1989. When the Rogun hydroelectric powerplant, which will have the capacity to produce 3.6 billion kilowatthours per year (GkWh/yr), is commissioned, TadAz can produce at capacity, and Tajikistan's electric-power-generating capacity will rise to 13.3 GkWh/yr. TadAz was supplied with alumina from Azerbaijan, Russia, and Ukraine (Interfax Mining and Metals Report, 2002as).

Antimony.—***Kyrgyzstan.***—Reserves of antimony ore in Kyrgyzstan at the Abshir, Kadamzhay, Kassan, Khaydarkan, Novoye, Severnyy Aktash, and Tereksay deposits totaled 16 Mt of ore that contained about 270,000 t of antimony. The Kadamzhay antimony mining and processing complex extracted these ores and processed some concentrate imported from Kazakhstan and Sakha Yakutia in Russia. Kadamzhay had two mines, the Kadamzhayskiy and Tereksayskiy, with beneficiation plants that had design capacities of 200,000 t/yr and 60,000 t/yr, respectively, and metallurgical facilities in the village of Kadmzhay that had the capacity to produce 28,000 t/yr of metallic antimony and its compounds. In 1990, Kadamzhay produced 17,608 t of metallic antimony, but in recent years, it was producing about 1,200 t/yr of metallic antimony and its compounds. It sold its output to Kazakhstan, Russia, Ukraine, the United Kingdom, Uzbekistan, Venezuela, and other countries. The raw material base for the Kadamzhay Mine is the Kadamzhay and Northern Aktash deposits that had reserves of 6.3 Mt of ore that contained 95,000 t of antimony. Reserves at the Kadamzhay Mine were sufficient for 15 years (Kudayabergenov and Stavinskiy, 2001).

The raw material base for the Tereksayskiy Mine is the Tereksay and Kassan deposits that had more than 1.1 Mt and 768,000 t of ore, respectively. Although the ores from Kassan contained 40,000 t of antimony, they are not processed because of their high arsenic content; technology was lacking to eliminate the arsenic safely. Reserves were sufficient to supply the Tereksayskiy Mine for an additional 8 years. If technology were available for processing oxide ores and arsenic-bearing ores, then it would prolong the life of the mine to 20 years. Plans called for developing a group of gold-antimony deposits in the vicinity of the Tereksayskiy Mine; these deposits have total reserves of between 100,000 and 120,000 t of antimony that grades from 1% to 5% antimony and that contains 40 t of byproduct gold in ore that grades from 1 to 6 g/t gold (Kudayabergenov and Stavinskiy, 2001).

Tajikistan.—The Dzhikrutskoye antimony-mercury deposit had been developed for the Anzob mining and beneficiation plant (GOK), which, in 2001, had the capacity to mine and process 350,000 t/yr of ore. The mine at Dzhikrutskoye had reserves adequate for an additional 15 years of production. Deeper levels of the deposit were being explored to add to the reserve base, which enabled the complex to project the expansion of its capacity to 700,000 t/yr for 15 years. The Skal'noye deposit, which was discovered in the area of the complex, could serve as an additional reserve base for Anzob or become a separate development. The additional reserves at greater depths at the Dzhikrutskoye deposit and the reserves of the Skal'noye deposit were also characterized by high contents of gold, thallium, and other elements; the antimony reserves from these deposits could make Tajikistan one of the leading sources of antimony in the FSU and could enable the country to become one of the leading producers of this metal in the FSU. The Anzob GOK was supplying its antimony and mercury concentrates to metallurgical enterprises in Kyrgyzstan, but Tajikistan had begun organizing production of metallic antimony and extracting byproduct gold, mercury, and other elements (Orifov and Dzhanobilov, 2001).

Beryllium.—***Kazakhstan.***—According to an agency of the Kazakhstan Stock Exchange, the Ul'ba metallurgical plant, which was part of Kazakhstan's national nuclear corporation Kazatomprom, produced 23% of the world's beryllium metal in alloys. The Ul'ba plant operated on imported beryllium ore. In 2001, the Ul'ba plant produced 737 t of beryllium products, which was 71% more than that of 2000. Ul'ba was one of the only plants in the world that produced beryllium metal. Ul'ba was experiencing sustained growth owing to a long-term contract signed with Brush Wellman Inc. of the United States in September 2000. On the basis of long-term supply contracts and the company's stockpiles, the Ul'ba plant had enough raw materials to maintain production for 20 years (Interfax Mining and Metals, 2002q).

Chromium.—***Kazakhstan.***—The Donskoy GOK near Chromtau in the Kempirsay region in the southern Urals was the world's second largest chromite producer. The complex reportedly had about 158 Mt of ore reserves of chromite with an average chromic oxide (Cr_2O_3) content of 50.3% and the capacity to produce about 5 Mt/yr of chromite (Ellmies, 2001, appendix 2).

The Donskoy GOK was part of the Kazakchrom holding company, which included the Aksu and Aktyubinsk ferroalloys plants and the Kazakhmarganets manganese mining firm. Kazakchrom employed about 15,000 workers. About one-half of the chromite produced was exported, and the other one-half

was used domestically for ferroalloy production and other uses. The Aktyubinsk and Aksu ferroalloy plants had the capacity to produce about 300,000 t/yr and 200,000 t/yr, respectively, of ferrochrome. Most of the ferrochrome was exported, and some was consumed domestically at the Ispat Karmet steel mill (Ellmies, 2001, p. 35-36).

In the next 10 years, the complex will have switched entirely to underground mining. The Donskoy GOK commissioned Stage 1 of the Ten Years of Independence Mine, which will become the world's largest chromite mine. This underground mine will initially produce 2 Mt/yr of ore; projected capacity was 4 Mt/yr. The mine reportedly had reserves adequate for a century of production, and the ore grades 50% Cr_2O_3 (Interfax Central Asia and Caucasus Business Report, 2001a§).

Copper.—***Armenia.***—In 2001, Armenia produced 16,800 t of copper concentrate, which was 20% more than the 14,000 t it produced in 2000. The production of copper in concentrate increased by 34.1% in 2001 compared with that of 2000; nearly all mines increased production in 2001. Most of the concentrates were exported. The biggest producer, Zangezur Copper and Molybdenum Combine, raised output by 12% year-on-year in terms of value (Interfax Central Asia and Caucasus Business Report, 2002b§; Yerevan Arminform, 2002§).

Kazakhstan.—Corporation Kazakhmys Open Joint-Stock Company (OJSC) was the only company in Kazakhstan engaged in the extraction, processing, and production of copper. The main product of the company was cathode copper, which corresponded to world standards and was confirmed by certificates issued by the Zhezkazgan branch of Natseck OJSC of the state certification system of Kazakhstan (certificates dated April 20, 2001, KSS #0003913). It was among the world's 10 major copper companies (Kazakhstan Stock Exchange, 2002§).

Enterprises of Corporation Kazakhmys OJSC were located in the central and eastern regions of Kazakhstan. The majority were located in Satpayev and Zhezkazgan. Offices that represented the corporation were in Almaty and Astana (Kazakhstan Stock Exchange, 2002§).

Corporation Kazakhmys OJSC was engaged in a complete production cycle from the extraction to the production of finished goods. The corporation produced copper and zinc concentrates, cathode copper, wire rods, precious metals, sulfuric acid, and coal and generated electricity and heat. From 1995 to 2000, production and processing of ores increased by 2.6 to 2.8 times (Kazakhstan Stock Exchange, 2002§). In 2001, production of blister copper reached 407,000 t, and refined copper, 395,000 t (Yun, 2002).

Corporation Kazakhmys OJSC was founded in 1992 from the research and production enterprise Zhezkazgancvetmet OJSC, the Zhezkazgan Territorial Committee on State Property, and employees of the Zhezkazgancvetmet mining and metallurgical enterprise. By the first half of 1995, the company was on the verge of bankruptcy. In 1997, Zhezkazgancvetmet OJSC had been renamed Corporation Kazakhmys OJSC (Kazakhstan Stock Exchange, 2002§).

On June 12, 1995, 80% of the shares owned by the Zhezkazgan Territorial Committee on State Property were presented to SAMSUNG of the Republic of Korea to manage Corporation Kazakhmys OJSC. In May 1996, Deutschland GmbH (the manager of Samsung Deutschland GmbH) won a tender to obtain 40% of Corporation Kazakhmys OJSC's shares. According to management contracts concluded in June 1995 and May 1996, Samsung Deutschland had the right to manage the company and the block of shares owned by the Government of Kazakhstan. Samsung Deutschland began a program of stabilization intended to increase production and to settle previously accumulated debts to the budget, the employees (wages), and the suppliers of electricity (Kazakhstan Stock Exchange, 2002§).

From 1995 to 1997, Corporation Kazakhmys OJSC's mining enterprises and beneficiation plants were reequipped with equipment that was more productive. The copper smelter was overhauled, and obsolete equipment was replaced. Construction of the Annenskiy Mine, which had been underway for 20 years, was completed. Commissioning the first stage of the mine increased ore production by 2 Mt/yr. At the beginning of 1997, ownership of the Balkhash mining and metallurgical complex (GMK), which employed 10,390 workers and produced more than 110,000 t/yr of cathode copper, was acquired by Corporation Kazakhmys OJSC, which then acquired control of the joint-stock company Zheskent GMK, which employed more than 3,500 employees and produced more than 50,000 t/yr of copper concentrate and 25,000 t/yr of zinc concentrate. It also acquired the joint-stock company East Kazakhstan copper-chemical complex, which employed more than 3,400 workers and produced 25,000 t/yr of copper concentrate and 50,000 t/yr of zinc concentrate. To ensure a stable energy supply, Corporation Kazakhmys OJSC bought the Zhezkazgan heat and power plant and acquired the right to manage the coal mines of the joint-stock company Borly, which employed more than 3,300 workers and produced from 5.1 to 5.5 Mt/yr of coal (Kazakhstan Stock Exchange, 2002§).

Corporation Kazakhmys OJSC was transformed into a vertically integrated enterprise with its own coal mining, electricity generation, and metal ore mining, beneficiation, smelting, and refining capacities. The company's plans included further increasing production of cathode copper, expanding the ore base by developing the Zhilandy deposit and new mines at the Zhezkazgan deposit, increasing the manufacture of copper wire rod, introducing new types of copper products, increasing production of gold and silver in bullion and granules, mastering new resource-saving and ecologically beneficial technologies, renovating equipment at beneficiation and metallurgical plants, and implementing measures on environmental protection (Kazakhstan Stock Exchange, 2002§).

Corporation Kazakhmys OJSC had a host of subsidiary enterprises that provided a variety of functions that included exploration, insurance, and research. On January 1, 2001, the portion of these subsidiary companies totaled 1.8% of the assets of Corporation Kazakhmys OJSC (Kazakhstan Stock Exchange, 2002§).

Corporation Kazakhmys OJSC's production used solely its own raw material base from which it extracted more than 37 Mt/yr of ore. Corporation Kazakhmys OJSC had licenses to develop 23 sites with coal, construction materials, and copper and polymetallic ores. For copper, these sites in central Kazakhstan include what are described by Corporation Kazakhmys OJSC as the Jalimambet and Kounrad deposits, the very large Zhezkazgan copper ore deposit, the large Zhilandy

group of sites, and the small Sayak-1 and Tastau deposits; in southern Kazakhstan, the Shatyrkol' copper-molybdenum deposit; and in eastern Kazakhstan, the Artemovskoye and Belousovskoye-Irtyshskoe deposits, the large Orlovskoye ore deposit for polymetallic ores and the small Nikolayevskoe, Shemonaikhinkoe, and Yubileynoye-Snigirikhaskoe ore deposits (Kazakhstan Stock Exchange, 2002§).

In the past 5 years, the following projects were put into operation by Corporation Kazakhmys OJSC for copper ore extraction: the Annenskiy Mine (4 Mt/yr), the Itauz open pit at the Zhilandy site (2 Mt/yr), and the 73/75 Mine (2 Mt/yr). A gold and silver refinery and the Shatyrkol' mine were commissioned in 2000 (Kazakhstan Stock Exchange, 2002§).

The following companies purchased and traded production from Corporation Kazakhmys OJSC: Samsung Deutschland, copper; Glencore International AG (30%), Dantrade AG (25%), Kazzinc OJSC (25%), and other firms (20%), zinc concentrate; Alashankou Yanger Co. Ltd. (46%), Ichen Co. Ltd. (47%), and Alashankou Santaim Co. Ltd. (7%), copper wire rods (Kazakhstan Stock Exchange, 2002§).

Because Kazakhstan had no major consumers of copper, zinc concentrate, and other products, Corporation Kazakhmys OJSC focused on export markets. Thus, 100% of cathode copper, 99.9% of copper wire rods, and 80% of zinc concentrate were exported. The company had a steady demand for its output on export markets, which included non-CIS countries. Major consumers of cathode copper were Europe except Greece, 39%; Turkey, 22%; Greece, 14%; Saudi Arabia, 13%; China, 7%; and the Republic of Korea, 6%. [The cited source's percentages for cathode copper consumption add to 101%, but based on information available, this discrepancy cannot be reconciled.] The major consumers of precious metals were the Kazakhstan banks, Marc Rich of Switzerland, and SAMSUNG (Kazakhstan Stock Exchange, 2002§).

Russia.—According to a statement made by the Russian delegation to the International Copper Study Group in 1998, Russia possessed about 10% of the world's copper reserves, although estimates by the U.S. Geological Survey (USGS) placed the reserves at closer to 5% of the world's total (International Copper Study Group, 1998; Edelstein, 2003). The majority of its reserves are in copper-nickel sulfide ores at the Noril'sk complex in East Siberia and pyritic copper sulfide ores in the Urals. More than 50% of the reserves are in deposits under development or in production. Ore grades were reportedly competitive with other producing deposits in the world (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). Approximately 70% of the country's reserves are in East Siberia; 20%, in the Urals; and 10%, in the North Caucasus (Haeusser and others, 1994, p. 124). From 65% to 70% of ore mined was from copper-nickel sulfide deposits, and the remainder, from pyrite ores.

In 2001, Russia ranked seventh in the world in mine output of copper (Edelstein, 2001). Noril'sk Nickel Mining and Metallurgical Company [OJSC MMC Noril'sk Nickel (Noril'sk)], which was the country's major copper mining enterprise, produced more than 70% of the country's copper and was mining copper-nickel sulfide ore with an average copper content of about 5%. The remainder of the country's copper was produced at mining and metallurgical enterprises in the Urals region. Mining enterprises in the Urals, however, were able to supply only somewhat less than 50% of the ore requirements of the copper-producing metallurgical plants in the Urals (Kozitsyn, 2001).

Noril'sk planned to increase its copper production at its Polar Division in East Siberia. At the Polar Division, the Oktyabr'skiy underground mine was producing almost 70% of Noril'sk's copper mine output. Most of the remaining copper ore produced by the Polar Division came from the Komsomol'skiy and Taymyrskiy underground mines (Piven' and others, 1996). To maintain and increase levels of platinum-group metal (PGM) production, which was a major product of the company, Noril'sk planned to increase output of cuprous ore from the Oktyabr'skiy Mine to compensate for the fall in extraction of rich high-nickel-content ores, which were being depleted. Plans called for increasing cuprous ore production at Oktyabr'skiy to 1.6 Mt/yr in 2002 from 100,000 t/yr in 1999. During this same period, production of rich copper-nickel ores was to decrease to 3.4 Mt/yr from 4 Mt/yr (Piven' and others, 1999). Because the cuprous ores at Noril'sk are more than 40% higher in copper content than the nickel-rich ores, this should result in a significant increase in copper production (Natural Resources Canada, unpub. data, 1999). Also, Noril'sk was planning to develop cuprous ores at other mines as alternatives to nickel-rich ores that were being depleted.

Unlike ores mined by Noril'sk, ores mined in the Caucasus and Urals regions were from copper and copper-zinc deposits and not as economically competitive with other deposits in the world. These ores have lower copper grades than those from Noril'sk, and although these copper ores in the Urals are complex ores that contain cadmium, copper, gold, silver, zinc, and other metals, the total value of ore constituents was lower than that of Noril'sk ores. The zinc content of these ores in the largest developed deposits did not exceed 1.8%, and the copper content, 1.0%. Furthermore, many of these deposits were almost depleted (Novikov and Sazonov, 2000).

Most of the copper-producing enterprises in the Urals were consolidated into the Urals GMK. In 2000, the Urals GMK represented 21 metallurgical, mining, and other enterprises in the Urals region (Interfax Mining and Metals Report, 2002ax).

In the Urals, growth in reserves in the near term would be in areas contiguous to and beneath existing reserves. Underground mines were being developed beneath the Molodezhnyy, Sibay, and Uchaly open pits in the Urals because of the depletion of reserves suitable for open pit development. Also in the Urals, copper mines were being developed at the Aleksandrinskoye deposit, which was part of the Mednogorsk complex; the Letneye deposit to supply the Gai complex; and the Safyanovoskoye deposit (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999).

The Urals GMK made plans to invest $400 million to develop the large Udokan copper deposit in Chita Oblast in the Transbaikal area of Siberia. The 6-year project called for developing a mining capacity of 10 Mt/yr to produce between 130,000 and 150,000 t/yr of copper concentrate. Udokan reportedly had reserves of 20 Mt of copper in ore that averaged 1.5% copper. About 70% of the reserves can be open pit mined. The Russian Ministry of Natural Resources was planning to call for a tender for development rights to Udokan in which a major bidder was expected to be Corporation Kazakhmys OJSC (Interfax Mining and Metals Report, 2002ax).

The country was slow in incorporating secondary materials in the production process. Production of copper from scrap and wastes increased to more than 100,000 t in 2000. Officially, Russia reported exporting only 18,800 t of copper in scrap in 2000; this was a huge reduction from the 201,200 t that it exported in 1999. According to estimates, however, more than 115,000 t of copper in products and goods was exported for sale as secondary copper in 2000; this was not considered to be a rational use of these products (Boytenko, 2001; Smirnov, 2001).

Ferroalloys.—***Kazakhstan.***—Kazakhstan was the major producer of chromite in the CIS and also produced some manganese ore. These domestically produced raw materials were used by Kazakhstan's two major ferroalloy plants—the Aksu and Ferrokhrom, which were part of Kazakhrom. Kazakhstan's Government and Kazakhstan's Mineral Resource Corp. owned 31.1% and 28.75%, respectively, of Kazakhrom. Kazakhstan was a large producer of chromium and silicon ferroalloys and also produced some manganese ferroalloys (Europe Steel Plc, 2000§).

In 2001, Kazakhstan's production of ferroalloys increased by 3% to 1.13 Mt compared with that of 2000. Ferrosilicon production increased by 9% to 145,000 t; ferrosilicon manganese, by 37% to 141,000 t; and ferrosilicon chrome, by 43% to 79,800 t. Ferrochrome production, however, fell by 5% to 761,000 t. Production of high-carbon ferromanganese with a carbon content of more than 2% soared by 396% year-on-year to 5,300 t (Interfax Mining and Metals Report, 2002o).

Russia.—Russia lacked significant production of two of the major minerals used in ferroalloy production, chrome and manganese, which were produced mainly in Kazakhstan and Ukraine during and subsequent to the Soviet period; during the Soviet period, Georgia also had been a significant producer of manganese, but production had fallen sharply in the past decade. Russia produced mainly blast furnace ferromanganese, electric-furnace chromium and silicon ferroalloys, and ferroalloys from other metals, such as molybdenum, nickel, titanium, tungsten, and vanadium.

In 2001, Russian production of ferroalloys decreased by 7.6% compared with that of 2000. Production decreased by 28.3% to 210,600 t of 60% ferrochrome; production, however, increased by 5.2% to 707,100 t of 45% ferrosilicon. Russia's largest ferroalloys producers were the Chelyabinsk electrometallurgical enterprise and the Kuznetsk ferroalloys plant, which was a major ferrosilicon producer. The Chelyabinsk enterprise attributed the decrease in output in 2001 to a decrease in demand from Russian consumers and an increase in cheap imports from Ukraine (Interfax Mining and Metals Report, 2002am).

Ukraine.—Ukraine was the major producer of manganese in the CIS. Ferroalloy plants in Ukraine produced only manganese and silicon ferroalloys owing mainly to a lack of domestic resources of other alloying minerals. The country imported other ferroalloys. In 2001, Ukraine's ferroalloy production grew by 2% to 1.41 Mt compared with that of 2000 (Interfax Mining and Metals Report, 2002f).

The Nikopol' ferroalloy plant in Ukraine specialized in the production of silicomanganese and high-carbon ferromanganese and had begun production of medium-carbon ferromanganese. The Zaporozh'ye ferroalloy plant produced manganese ferroalloys (silicomanganese, all grades of ferromanganese, and manganese metal) and silicon ferroalloys (all grades of ferrosilicon). The basic product of the Stakhanov ferroalloy plant was ferrosilicon of all grades. Previously, about 100,000 t of blast furnace ferromanganese was produced at the Konstantinovskiy and Kramatorskiy metallurgical plants, but production at Kramatorskiy ended in 1999.

Gold.—***Armenia.***—The Ararat Gold Recovery Company joint venture (AGRC) was set up in July 1998 to mine the Meghradzor and Zod gold lodes and to recycle the tailings at the recovery plant. In 2001, Armenia's Government signed 50% of the shares in AGRC to Canada's First Dynasty Mines Ltd., which made it the sole foreign partner of the joint venture. The joint venture had a 20-year license to mine the two lode fields and will invest to develop the lodes and recover gold from tailings at the Ararat gold recovery plant. The joint venture also had the exclusive right to conduct geological exploration within a radius of 20 km of the Meghradzor and Zod deposits (Interfax Mining and Metals Report, 2002f).

In 2001, 30,000 t of ore was mined at Meghradzor. By 2006, 2.6 t/yr of gold will be produced from 534,000 t of ore at a grade of 5.6 g/t gold with a recovery rate of 90% (Interfax Mining and Metals Report, 2002f).

During the next 7 years, the Zod lode was expected to yield 8.7 t of gold from 2.058 Mt of mined ore at a grade of 5.9 g/t gold with a recovery rate of 72%. Gold production was projected to increase to 1.8 t/yr recovered from 500,000 t of ore in 2005 from 30 kilograms per year recovered from 7,800 t of ore in 2002 (Interfax Mining and Metals Report, 2002f).

From 1998 to 2001, the Ararat joint venture recovered 3 t of gold from 6 Mt of the 12 Mt of tailings available to the Ararat recovery plant; 1.8 t of gold was recovered in 2000. The remaining 6 Mt should be processed by the end of 2003 to yield another 3 t of gold, of which 1.6 t was to be recovered in 2002 and 1.4 t in 2003 (Interfax Mining and Metals Report, 2002f).

Kyrgyzstan.—Since 1986, the Makmal gold deposit was under development and produced between 1 and 2.4 t/yr of gold. Expansion of the reserve base at Makmal was being studied, which could significantly increase gold output. The Sultan-Sary deposit has 20 t of explored gold reserves with an average gold content of 6 g/t. The deposit was producing between 300 and 500 kilograms per year of gold (Kudayabergenov and Stavinskiy, 2001).

The Kumtor deposit in Kyrgyzstan reportedly ranked 5th as the lowest cost producer of gold and 16th in the world in the size of its gold reserves (Kudayabergenov and Stavinskiy, 2001). In 2001, Kumtor's total gold reserves were estimated to be more than 250 t. The general agreement to develop the Kumtor project by the Kumtor Gold Company joint venture was signed on December 4, 1992. Kumtor Gold was owned by the Kyrgyzstan Government (two-thirds) and Canada's Cameco Corporation (one-third). Kumtor Operating Company (a wholly owned subsidiary of Cameco) was the project operator.

Kumtor Gold mined about 100 t of gold since production started in May 1997 (Interfax Mining and Metals Report, 2002s). Construction of the mill to process the gold ore was completed in December 1996, and commercial production at the mill began on May 1, 1997. The mill's production capacity was 670,000 troy ounces per year (20.8 t/yr), of which Cameco's

share was approximately 220,000 ounces per year (6.8 t/yr) (Cameco Corporation, 2001§).

Kumtor Gold targeted production at 20.7 t, or 666,116 ounces, of gold in 2002, which would be less than the 23.4 t, or 752,719 ounces, of gold it produced in 2001. According to Kumtor Gold, gold production would fall mainly because of lower grade ore, which averaged 5.14 g/t gold in 2001 and could fall to 4.67 g/t in 2002. In 2001, the cost for producing an ounce of gold by Kumtor Gold was $142, which was the lowest since mine startup (Interfax Mining and Metals Report, 2002s; Cameco Corporation, 2002§).

Kumtor Gold produced about 10% of Kyrgyzstan's GDP. In 2001, the company contributed $16.5 million to the national budget in taxes and other payments (Interfax Mining and Metals Report, 2002s). The company employed almost 1,600 workers; about 90% are citizens of Kyrgyzstan (Cameco Corporation, 2002§).

The Kyrgyz Government authorized the joint-stock company Kyrgyzaltyn to represent the country in discussions with investors for creating joint ventures for gold development and for Kyrgyzaltyn to participate in such joint ventures (Kudayabergenov and Stavinskiy, 2001). The Dzher-Uy deposit was prepared for development in 1985 and was acquired in 2001 by Talas Mining Company, which was a joint venture between Kyrgyzaltyn and Norox Mining Company Ltd. (a subsidiary of Oxus Mining plc of the United Kingdom). The deposit would be developed initially by open pit to mine 650,000 t/yr of ore and then by underground methods to mine 350,000 t/yr (Kudayabergenov and Stavinskiy, 2001).

The Taldy-Bulak gold deposit was being studied for development. Its reserves were reevaluated and mining was being planned from only the richest ore from the deposit (Kudayabergenov and Stavinskiy, 2001).

Russia.—In 2000, Russia mined 152.5 t of gold, which included 11 t of byproduct gold, and recovered 1.8 t of gold from scrap. In 2001, Russian gold production reached a 10-year high with production increasing by 8.2% compared with that of 2000. A total of 639 enterprises mined gold in 2001. Lode deposits accounted for 45% of output. The country's two largest gold mining enterprises were Omolon Gold Company, which was the largest in the Magadan region, and Polius Gold Company, which was located in the Krasnoyarsk Territory. In 2002, more than 50% of Russia's gold production was projected to be from lode deposits; total mine output was projected to be more than 175 t (Interfax Mining and Metals Report, 2002ad, aj).

In 2001, the Magadan region produced 30.15 t of gold, or 2.9% more compared with that of 2000. About 325 enterprises were mining gold in the Magadan region. Reportedly, 197 producers in the region received a production quota of 44 t for 2002; this production increase was to be at existing deposits and through development of new sites. [It appears from this reporting from two different sources that either 197 producers controlled about 325 enterprises or about 128 separate enterprises did not receive production quotas.] Omolon Gold sent 13.5 t of gold to the Kolyma refinery in the same region (Interfax Mining and Metals Report, 2002t, u).

Polius Gold produced 16 t of gold in 2001, which was 10% more compared with that of 2000. The company mined the Olimpiady gold lode with reserves reported to be between 700 and 1,000 t. Olimpiady was one of Russia's largest gold deposits with ore at a grade of 8 g/t gold. Polius Gold planned to mine between 25 and 30 t/yr of gold. The 10% increase was projected because of the commissioning of the second stage of the ore mill at the Olimpiady gold lode (Interfax Mining and Metals Report, 2002y).

The Irkutsk region produced 16 t of gold in 2001 and had its 2002 quota set at 17 t. About 90 companies were engaged in gold production in the Irkutsk region; the largest one was Lenzoloto, which produced 8.4 t in 2001 (Interfax Mining and Metals Report, 2002m).

The Sakha Yakutiya Republic produced about 16 t of gold in 2001 and planned to produce 18 t in 2002. Output in 2001 was almost 1 t less than that of 2000 and was below the republic's 20 t production target for 2000 and 2001 (Interfax Mining and Metals Report, 2002bg).

Uzbekistan.—The Nawoiy Integrated Mining and Metals complex, which mined the Muruntau deposit, was one of the world's largest gold mining enterprises; more than 50 t/yr of gold was produced in 2001. The Zarafshan-Newmont joint venture was established in 1992 by Newmont Mining Corp. of the United States (50%), the Uzbek State Committee for Geology and Mineral Resources, and the Nawoiy Integrated Mining and Metals Complex of Uzbekistan. Credit was provided by international financial institutions, which included the European Bank for Reconstruction and Development (EBRD). The joint venture recovered gold from stockpiled ore at the Muruntau open pit. Zarafshan-Newmont had permission to process 220 Mt of lean ore at a grade of 1.4 g/t that had accumulated over the years at Muruntau. Work on the Zarafshan-Newmont processing facility began in October 1993 and was completed in 1995 (Interfax Mining and Metals Report, 2002bj).

The joint venture planned to process 60 Mt of ore at a grade of more than 1.6 g/t during the first 5 years of the project. During the second stage, which should last 10 years or longer, the joint venture was to process ore at a grade of 1.1 g/t. The design capacity for processing was 13.8 Mt/yr of ore (Interfax Mining and Metals Report, 2002bj).

The joint venture recovered 16.7 t in 1999 and 15.43 t in 2000. In 2001, it produced 13.048 t of gold, which was 14.5% less than that of 2000. The drop in production was attributed to the joint venture starting to process material with leaner gold content. It intended to sustain future gold production at around 13 t/yr. In 2002, the joint venture expected to produce 13.64 t (Interfax Mining and Metals Report, 2002bj).

Also in 2002, the joint venture would use the last of a credit of $30 million granted in 2001 by the EBRD to build a new leaching pad to process additional ore. The project should extend the joint venture's life until 2015 and keep gold production at projected levels (Interfax Mining and Metals Report, 2002bj).

In 2001, at the Almalyk mining and metallurgical complex in Uzbekistan, byproduct gold production increased to 13.407 t compared with 13.135 t in 2000 (Interfax Mining and Metals Report, 2002bf).

Iron and Steel.—***Russia.***—In 2001, Russia produced 58.97 Mt of crude steel, which was 0.4% more than that of 2000; 47.1 Mt of rolled steel, which was 0.8% less than that of 2000; and

44.98 Mt of pig iron (including blast furnace ferroalloys), which was 0.3% more than in 2000. Sheet accounted for 41.1% of total rolled output (Interfax Mining and Metals Report, 2002ah). With almost all of its major stainless steel producers increasing output, Russia produced 95,300 t of rolled stainless steel in 2001, which was 11.3% more than that of 2000 (Interfax Mining and Metals Report, 2002ao). With output increasing at practically all major Russian pipe mills, steel pipe output increased 8.5% in 2001 compared with that of 2000. Pipe output increased owing to increased demand from oil and gas industries. Pipe output was also stimulated by the Russian Government's decree in May that introduced protective measures against low-cost pipe imports (Interfax Mining and Metals Report, 2002aq).

Beginning in 1994, Russia and the European Union (EU) have signed general agreements on steel trade. The last one, which was signed in 1997, expired in December 2001. In early 2002, the EU and Russia agreed on terms for deliveries of Russian steel for the next 3 years. The agreement stated that, starting in 2002, the quotas for deliveries of Russian steel to the EU will be increased by 28% more than the 840,000 t Russia was entitled to ship to the EU in 2001. The quotas will then be increased by 2.5% in 2003 and 2004. If Russia was to lift its export duties on ferrous scrap metal, then the quotas would be raised another 12% or proportionately depending how much the scrap export duties are lowered. In April, Russia imposed a duty of 15% of customs value, but not less than €15 per metric ton of scrap metal exports. If Russia joined the World Trade Organization during the next 3 years, then the new agreement with the EU would cease to be valid (Interfax Mining and Metals Report, 2002ac).

In December, the United States announced the beginning of investigations of a number of countries whose steel exports may have been damaging to the U.S. economy; Russia was named among these states. In 1999, agreements between Russia and the United States already limited steel exports to the United States. The next round of Russian-United States consultations on possible limitations on Russian steel exports was to be held in Washington, DC, in February 2002. In March 2002, the United States declared that, for a 3-year period, it would impose duties that would range from 8% to 40% on a wide variety of types of imported steel from a number of countries, which included Russia (Interfax Mining and Metals Report, 2001c, 2002be).

This action by the United States could have economic consequences for the Russian steel industry and economy because the United States had accounted for 17% of Russia's steel exports. Consolidated payments from the Russian steel industry to the national budget could shrink to $20 billion in 2002 from between $50 billion and $51 billion in 2001. To maintain its domestic steel industry, Russia was pursuing imposing import duties on steel from other CIS countries, in particular Kazakhstan and Ukraine (Interfax Mining and Metals Report, 2002ap).

As part of an international effort to reduce excess steelmaking capacity, Russia agreed to join a pact reached at the Organisation for Economic Co-operation and Development (OECD) steel forum in Paris, France, and to reduce its steelmaking capacity by 10 Mt/yr by 2010. Although Russia had the capacity to produce more than 66 Mt/yr of steel, it produced only 50 Mt in 2001. The country will not necessarily decrease output because increases in domestic consumption could significantly affect its production levels (Interfax Mining and Metals Report, 2002ai).

Development of the Russian steel industry in the post-Soviet period was influenced by a number of domestic factors, most notably those that affected the machine-manufacturing industry and the investment climate. Since 1991, machine manufacturing has undergone three cycles. The first cycle, which was from 1991 to 1995, was a period of rapidly declining production; the second cycle, which was from 1996 to 1998, was a period of more slowly decreasing production and stagnation in many branches of the economy; and the third cycle, which began in 1999, was characterized by a very positive growth in production. From 1991 to 1998, the decrease in the domestic demand for steel products by the machine-manufacturing sector was more than fivefold; at the beginning of the 1990s, this had been the largest consumer of Russian steel products and had accounted for about 40% of domestic demand. The decrease in the demand for steel products in the domestic construction sector, which included industrial construction, pipeline construction, railroad construction, and the maintenance of existing industrial infrastructure, was fourfold. Since 2000, however, demand revived in practically all domestic sectors, which included agricultural machinery, armaments, infrastructure maintenance, oil and gas development and transport, and the railroad (Brodov and Makarova, 2002).

Russia, which was a major exporter of ferrous metal products, accounted for 10% of world exports. During the economic crisis of 1998, Russia was able to increase its exports significantly and thus preserve its steel industry, but this also led foreign countries to initiate dumping charges and to institute quotas and tariffs on Russian exports. Russia was also importing ferrous metals, many of which were contained in imported machinery and equipment. Ukraine was a major exporter of ferrous metals to Russia, particularly for those ferrous metals products in which Ukraine had specialized during the Soviet period (Brodov and Makarova, 2002).

Ukraine.—Ukraine had the world's seventh largest steel-producing industry in 2001, and its share of the global steel market increased to 4% in 2001 from 3.7% in 2000. In 2001, Ukraine produced 33.1 Mt of steel, which was 5.4% more than that of 2000; 29.1 Mt of all types of rolled output, which was 7% more than that of 2000; and 26.4 Mt of pig iron, which was 3% more than that of 2000. In 2001, however, pipe production fell by 4% to 1.6 Mt compared with that of 2000, and production of scrap metal fell by 8.7% to 5.3 Mt compared with that of 2000 (Interfax Mining and Metals Report, 2002ba).

Although Ukraine did not agree to reduce its steelmaking capacity at the OECD steel forum in Paris in February 2002, Ukraine, according to its National Program of Development for the Mining and Metals Sector, intended to reduce capacity for pig iron production by 5.75 Mt; for crude steel, 5.91 Mt; and for rolled products, 3.9 Mt by 2010. Steelmaking enterprises, however, did not confirm these capacity reductions. In 2001, Ukraine exported 28.7 t of steel products, which equaled 87% of its metal output. Steel exports generated 47% of Ukraine's foreign exchange revenues (Interfax Mining and Metals Report, 2002az).

Information on ownership of Ukraine's steel industry was not

complete, but on the basis of available information, a single group of owners in Donets'k controlled four of the country's eight largest steel mills—Alchevs'k, Azovstal', Donets'k, and Yenakiyeveskiy—and two of the five largest pipe plants—Dnepropetrovsk and Khartsyzsk. A portion of these assets has been consolidated into the Industrial Union of Donbas (IUD). The IUD was involved in the management of Khartsyzsk, in which it directly owned a controlling stake, and also in the management of Alchevs'k, Azovstal', and Dnepropetrovsk, in which it owned a minority stake. The IUD formed business partnerships with other Donets'k-based metal market enterprises, which included Closed Joint Stock Company (CJSC) ARS, the Danko-Media group, Kontsern Energo, and Leman Ukraine Ltd. (a subsidiary of Leman Commodities S.A.), but information was not available regarding possible ownership links with these enterprises (Metal Bulletin, 2002).

Danko's main asset was the Yenakiyeveskiy steel mill with the capacity to produce 1.2 Mt/yr; Danko acquired the controlling share in 1986. Danko was also a trading company. Energo reportedly owned the Donets'k metal works, which was divided in two with the new part named CJSC MMW Istil-DMZ (a subsidiary of The International Steel & Tube Industries Ltd. of the United Kingdom, formerly part of the trading firm Metals Russia) (Metal Bulletin, 2002).

After the group from Donets'k, the most significant group of owners was the Privat Bank group from Dnepropetrovsk. Its Privat intertrading subsidiary had management control of the 1.23-Mt/yr-capacity Dnepropetrovsk steel mill and holdings in the Konstantnovskiy steel mill and the Zaporozh'ye rolling mill. Its management control of Dnepropetrovsk consisted of managing a Government-owned 42% share of the enterprise, which could be a step towards ownership. This arrangement was also used at the Dneprovskiy steel mill where the majority Government holding was managed by the Kharkiv-based Ukrsibbank (Metal Bulletin, 2002).

Ukraine's largest steelmaker Krivorozhstal was owned and operated by the Government. The pipemaking facilities were dominated by the Interpipe group, which owned the country's largest pipe producer Nizhnedneprovskiy plant and the steel pipe plant at Nikopol'. Il'ichstal Company was the majority owner of the Il'ich plant at Mariupol'. The specialty steelmaker Dneprospetsstal was owned by the Metallurgiya group, which recently sold its ferroalloy interests to Privat Bank to concentrate on developing Dneprospetsstal and its power industry interests (Metal Bulletin, 2002).

Transparency regarding ownership was just beginning. The only significant shareholdings traded on the local stock market were minority stakes in the Il'ich steel mill and the Nizhnedneprovskiy pipe plant (Metal Bulletin, 2002). Foreign ownership was becoming more common with some emigrants heading this involvement.

Midland Resources of Canada controlled the Zaporozh'ye steel mill, which was Ukraine's third largest steel producer. The venture capital group Sigma Bleyzer, whose owner lived in Texas, owned a more than 75% share in the Makeevka pipe plant (Metal Bulletin, 2002).

The steel industry was highly dependent on exports. Ukraine exported 87% of its output, which totaled 28.7 Mt of steel in 2001. Domestic steel consumption in 2001 increased to 4.4 Mt, but this was still 14% to 15% of total output. Barter as a share of sales fell to 2.7% in 2001 from 3.5% in 2000 (Interfax Mining and Metals Report, 2002ba).

A number of countries had imposed restrictions on steel imports from Ukraine. In early 2002, 3-year duties of between 8% and 30% were imposed on most steel imports into the United States from Ukraine and a number of other countries. These United States duties, it was estimated, could cost Ukraine between $63 million and $220 million per year (Interfax Mining and Metals Report, 2002bc).

Iron Ore.—***Russia.***—Russia's iron ore output in 2001 decreased by 4.8% to 82.5 Mt compared with that of 2000. Production of iron ore concentrate decreased by 4.2% to 77.7 Mt, and that of pellets by 9.2% to 27.8 Mt (Interfax Mining and Metals Report, 2002ab).

According to the Minister of Natural Resources, Russia had more than 27% of the world's reserves of iron ore (Yatskevich, 2000). In 2001, 26 iron ore deposits were under development; reserves were adequate for 15 to 20 years at the 2001 rate of extraction. These reserves average, however, about 35% iron, which is low by world standards. The ratio of overburden to ore is four times greater on average than in other countries, which greatly increases the comparative cost of iron ore extraction. Large quantities of what are termed in the Russian Reserve Classification System "explored reserves" occur in the Kursk Magnetic Anomaly (KMA). These explored reserves are potential sources of new development (Kozlovskiy and Shchadov, 1999; Novikov and Yastrzhembskiy, 1999). Explored reserves in the KMA in the Russian Reserve Classification System categories A, B, C1, and C2 reportedly total 47 Gt, of which 29 Gt was considered to be rich ores (Gornaya Entsiklopediya, 1989, p. 357).

Russia's production of commercial iron ore was centered in mining enterprises that extract finely disseminated magnetite ores. The country's beneficiation technology was not state-of-the-art, and the quality of the concentrates in iron and silica content did not often correspond with the demands of the metallurgical industry. More than 80% of concentrates were produced by wet magnetic separation. The majority of concentrates have iron contents of between 66.5% and 68.5%. The quality of the concentrates produced in Siberia was limited because of the one-stage concentration process used, and that produced in the Urals, by characteristics of the ores, which limit, for example, the quality of concentrate produced from the Kachkanar enterprise's titaniferrous magnetites to between 62.5% and 63% iron by using a three-stage system (Sukhoruchenkov and others, 2001).

The KMA territory included the Belgorod and Kursk Oblasts and parts of the Bryansk, Orlov, and Voronezh Oblasts in Russia and also part of the Khar'kov Oblast in Ukraine. Only the central part of the KMA, however, was being mined for iron ore and other minerals. Iron ore mining in the KMA began in 1952 at the Korobkovskoye deposit where iron quartzites were extracted by underground mining. Open pit mining was used by the Lebedinskiy, Mikhaylovskiy, and Stolinskiy GOKs. Underground mining started at the Yakolevskoye deposit (Kusherenko, 2001).

Ukraine.—Ukraine has about 30 Gt of explored iron ore reserves, which was more than 24% of the explored iron ore reserves in the FSU and about 15% of the world's iron ore

reserves. Practically all iron ore reserve data was compiled before the dissolution of the Soviet Union in 1991 and was based on the Soviet reserve reporting system. Two-thirds of the explored reserves (more than 18 Gt) were in the Krivoy Rog Basin, with about 4.5 Gt of reserves in the Kremenchug, 3 Gt in the Azov, and 500 Mt in the Beloye Ozero iron ore districts. Ores from the Azov District were considered to be a prime target for future development owing to the fact that they would be easy to concentrate.

Iron ore mining in Ukraine was based on the extraction of magnetic quartzites and rich hematite ores. These can be processed to produce concentrates that average 65% iron for magnetic quartzites and between 56% and 61% iron for the hematite ores, which was lower than the averages for concentrates being sold on world markets.

The Krivoy Rog Basin, which was the leading iron ore-producing region, had reserves that were adequate for 6 to 16 years of development depending on the mining enterprise. Considerable resources are located beneath planned development depths at Krivoy Rog; and these resources, if placed in the reserve category, could extend the mining period of enterprises in the Krivoy Rog to an average of 30 years (Kolosov, 2001).

In 2001, Ukraine's iron ore production decreased by 1.8% to 54.65 Mt compared with that of 2000. Some enterprises showed an increase in production, and others, a decrease. Production increased by 9.9% at the Severnyy GOK, by 9.8% at the Novokrivorozhkskiy GOK, and by 5.4% at the Yuzhnyy GOK (Interfax Mining and Metals Report, 2002n).

Materials in tailings dumps from concentration totaled more than 3 Gt and included iron-rich tailings. From these tailings, production of concentrates at a grade of 65% iron was considered to be feasible. The large amount of overburden being stored could be processed. An approach was called for that was more comprehensive and used waste products to recover economic value and to reduce the environmental load (Kolosov, 2001).

Lead and Zinc.—***Kazakhstan.***—In 2001, Kazakhstan produced about 5.76 Mt of lead-zinc ore, which was more than the 5.64 Mt it produced in 2000. The country also produced 158,800 t of lead metal, which was less than the 185,800 t it produced in 2000, and 276,900 t of zinc metal, which was more than the 262,600 t it produced in 2000 (Interfax Statistical Report, 2002).

Kazakhstan had reserves of about 15 Mt of lead and 35 Mt of zinc and was one of the world's leading producers of these commodities. The deposits, which produced about 70% of the country's lead and zinc output in 2001, are in the Leninogorsk and Zyryanovsk regions of northeastern Kazakhstan; these deposits have been mined since their discovery in 1770. With the dissolution of the Soviet Union, the production of these metals rapidly declined. Production, however, was significantly restored as a result of foreign investment, particularly from Glencore AG of Switzerland. The country was still operating far below capacity. The majority of the country's lead and zinc was produced by Kazzinc, which produced 70% of Kazakhstan's zinc and 35% of its lead, and the Zhayrem GMK, which produced about 50% of the country's lead and almost 20% of its zinc. The rest of Kazakhstan's lead and zinc was produced mostly as a byproduct of copper production. Most of the lead and zinc production was exported, but some was consumed domestically at the Ispat Karmet steel works and the Taldy-Kurgan accumulator and battery plant (Ellmies, 2001, p. 43-45).

Lead-zinc ore was mined at 11 deposits; the concentrates were processed at the Chimkent, Leninogorsk, and Ust'-Kamenogorsk lead-zinc smelting enterprises and the Balkhash copper complex. Refining these lead and zinc ores also yielded bismuth, cadmium, germanium, gold, indium, silver, tellurium, and thallium. The Chimkent refinery, which had the capacity to produce 160,000 t/yr of lead, was the largest lead smelter in the FSU; it also produced about 20 t/yr of bismuth and 10 t/yr of cadmium. The Austria-Kazakhstan joint venture JV RR Kazakhstan Trade and Finance acquired the Chimkent works and invested in two new production lines. This joint venture, however, went bankrupt in 1999, and Yuzhpolimetal acquired the assets (Ellmies, 2001, p. 43-45).

Kazzinc was under the control of Switzerland's KazAstur Zinc, which has owned 62.4% since June 1997; KazAstur Zinc was a wholly owned subsidiary of Glencore. Kazzinc had the capacity to mine 5 Mt/yr of crude ore and had 26,000 employees. It comprised the following enterprises: the Leninogorsk polymetallic GMK with smelting capacity to produce 107,000 t/yr of zinc, 30,000 t/yr of lead, and cadmium, gold, silver, and other byproduct metals; the Zyryanovsk lead-zinc mining complex; the Ust'-Kamenogorsk metallurgical plant with the capacity to produce 160,000 t/yr of zinc, 145,000 t/yr of lead, and 43,000 t/yr of copper; and the Tekeli lead-zinc mining complex with the capacity to produce 30,000 t/yr of zinc in ore and 15,000 t/yr of lead in ore (Ellmies, 2001, p. 43-45).

Russia.—In 2001, Russia's production of lead in concentrate decreased by 7.2% compared with that of 2000, but production of lead metal, which included secondary lead, increased by 1.7%. Russia's production of zinc in concentrate decreased by 8.6% compared with that of 2000, but production of zinc metal increased by 3.2% (Interfax Mining and Metals, 2002an).

Russia was the second leading producer of lead and zinc in the CIS following Kazakhstan and was the main consumer of these metals in the CIS. While part of the Soviet Union, the Russian Republic had been a net importer of lead and zinc. Consumption of lead and zinc, however, fell precipitously in Russia since the breakup of the Soviet Union in 1991. Domestic mine output and metal production of lead were still less than consumption levels, but zinc consumption had fallen to a degree where mine output and metal production levels were near consumption levels (Interfax Mining and Metals Report, 2002an).

The vast majority of Russia's lead was mined in the eastern part of the country, and the vast majority of its zinc was mined in the Urals. The Far East region accounted for 62.8% of the country's lead mined and 9.2% of its lead reserves; the East Siberia region, 17.7% and 75.9%; the Urals, 12.6% and 1.8%; the West Siberia region, 4.3% and 11.1%; and the North Caucasus, 2.4% and 2%. The Urals accounted for 86.7% of the country's zinc mined and 26.5% of its reserves; the Far East region, 9.2% and 4%; the West Siberia region, 2.1% and 10.5%; and the North Caucasus, 1.8% and 2.2% (Yatskevich, 2000).

The Dalpolimetall Mining and Metals Complex (GMK Dalpolimetall), which was a lead-zinc producer in Dal'negorsk

in the Russian Far East's Primor'ye Territory, produced more than 70% of Russia's lead concentrates and more than 14% of its zinc concentrates. GMK Dalpolimetall was established on September 15, 2001, in the city of Dal'negorsk with a charter capital of Rub680 million (approximately $21.5 million). AO GMK Dalpolimetall owned 51% of the shares, and ZAO Svintsovo Zavod owned the remaining 49%. Its main business was the mining of polymetallic ores of bismuth, lead, and zinc. The company exported 80% of its output (Interfax Mining and Metals Report, 2002k).

In 2001, the Chelyabinsk electrolytic zinc plant produced 155,000 t of zinc, which was more than 65% of Russia's production. The Chelyabinsk enterprise exported about 20% of its output and used the rest to supply about 300 Russian metallurgical and machine manufacturing enterprises. In 2002, Chelyabinsk planned to produce 160,000 t of zinc. A new 200,000-t/yr-capacity electrolytic zinc smelter at Chelyabinsk was to be commissioned in 2002 to replace an old 146,000-t/yr-capacity smelter. The new smelter would not only have a larger production capacity, but would also meet 2001 environmental standards. The company's main shareholders were Euromin S.A. of Switzerland (51.74%), the Chelyabinsk enterprise's employees (6.2%), and the Chelindbank (6.15%) (Interfax Mining and Metals Report, 2002h).

Manganese.—***Ukraine.***—Ukraine contains about 75% of the FSU's manganese ore reserves (Danil'yants and others, 1999). The Balansovoy reserves ("economic reserves" according to the Soviet Reserve Classification System) of manganese ore are located in the Nikopol' Basin and total about 2.2 Gt. Located within the Nikopol' Basin are the Bol'shoy Tomak deposit, which accounted for 1.58 Gt of manganese ore; the Ordzhonikidze sector (western Nikopol'), 310 Mt; and the Marganets sector (eastern Nikopol'), 280 Mt (U.S. Bureau of Mines, 1994). Three types of ores—oxide, carbonate, and mixed oxide-carbonate—occur. The average grade of the oxide ore was 27.1% manganese; the oxide-carbonate ore, 25.6% manganese; and the carbonate ore, 17% manganese. Since 1975, Ukraine has mined oxide-carbonate and carbonate ores in addition to the richer oxide ores, which were being depleted. The carbonate ores were more difficult to process and were not suitable for producing high-grade concentrate (Bundesanstalt für Geowissenschaften und Rohstoffe, 1996; Postolovskiy and others, 2000).

In 2001, Ukraine produced 2.7 Mt of manganese concentrate, which was 1% less than that of 2000 (Interfax Mining and Metals Report, 2002bb). In 2001, the country was the world's second largest producer of manganese ore by manganese content (Jones, 2002). It produced less than 40% of the peak amount of manganese concentrate that it produced in the 1980s. The Ukrainian Republic had accounted for more than 85% of the manganese produced in the Soviet Union. Since the dissolution of the Soviet Union in 1991 and the end of Soviet political and economic control in Eastern Europe, the demand for manganese in this region, which was the primary consuming area, fell sharply. The country's manganese output was consumed domestically at ferroalloy plants and steel mills, but the output of these domestic industries had also fallen sharply.

In 2001, the Ordzhonikidze GOK, which was Ukraine's largest manganese concentrate producer, produced 1.696 Mt of concentrate, which was 7% less than that of 2000. Ordzhonikidze, which is located in the Dnepropetrovsk region, mined all its ore by open pit method (Interfax Mining and Metals Report, 2002bb).

Prior to a share issue in September, which tripled charter capital, Blumberg Industries LLC (United States) owned 24.9% of Ordzhonikidze's shares; other shareholders were Rafels Commodities Ltd. (United Kingdom, 23.88%) and St. John Trading Ltd. (Cyprus, 24.55%). Ukraine's Inter-regional Stock Union was the nominal holder of 26.37% of Ordzhonikidze's shares, and private individuals and various legal entities, among them Privat Intertrading, held the rest (Interfax Mining and Metals Report, 2002bb).

The Marganets mining and beneficiation complex, which was a manganese concentrate producer from the Dnepropetrovsk region, was Ukraine's only enterprise that mined manganese by underground methods. It mined 80% of its manganese underground and 20% from open pits. The Marganets enterprise included five underground mines (Nos. 1, 2, 3/5, 8, and 9/10), two open pits (Basansky and Grushevsky), a beneficiation plant, and a research and development complex for chemical equipment (Interfax Mining and Metals Report, 2002v).

Marganets' biggest consumers were Ukraine's Nikopol' and Zaporizhzhya ferroalloy plants. Privatbank owned 23.6% of Marganets' shares; Varkidge Limited, 10.4%; Blumberg Industries (United States), 25%; St. John Trading, 9.5%; Ulrich Limited (Cyprus), 8.5%; Oksidental Ltd., 8.2%; and Rafels Commodities, 9.5% (Interfax Mining and Metals Report, 2002v).

Marganets planned to mine 2.945 Mt/yr of ore by 2010. This will include 1.78 Mt from underground mines and 1.165 Mt from open pits. The company also planned to produce 1.14 Mt of manganese concentrate in 2002, which will require it to mine 2.29 Mt of ore and to strip 6.6 million cubic meters of overburden (Interfax Mining and Metals Report, 2002v).

To sustain production as a result of the depletion of reserves at the Nos. 1 and 2 underground mines, Marganets planned to commission the first stage of a separate section of the No. 9/10 underground mine in the first half of 2002 (Interfax Mining and Metals Report, 2002v).

Mercury.—***Kyrgyzstan.***—The state-owned Khaydarken mercury complex in Kyrgyzstan's Osh region produced 574.4 t of mercury metal in 2001, which was 4.5% more than the 549.9 t it produced in 2000. The complex exported 481.3 t of mercury, which was 8.4% less than that of 2000. The Khaydarken plant was the largest mercury producer in the CIS. The Kyrgyz State Property Fund owned all the shares of Khaydarken. At the end of 2001, Khaydarken's stockpiles contained 189.4 t of mercury (Interfax Central Asia and Caucasus Business Report, 2002c§).

Reserves of mercury ore and complex mercury-antimony-fluorspar ores from the Khaydarken/Novoye Chon-Koy-Su/Chauvay deposit total about 20 Mt and about 11.6 Mt for the Bol'shoy Khaydarken deposit, which formed the base for the Khaydarken Mercury GOK. The complex contained several mines and a beneficiation plant. Its main products were metallic mercury and fluorspar concentrate. Khaydarken produced only 600 t of mercury metal in 2000 compared with 800 t in 1990. Plans called for Khaydarken to process rich ores from small

nearby deposits and also mercury-containing wastes stored in Russia, Western European countries, and other countries. Output was shipped to Asia, Europe, Russia, and other CIS countries (Kudayabergenov and Stavinskiy, 2001).

At the beginning of the 1990s, the Khaydarken complex, which was in an extremely difficult situation, was producing products at costs above the world price owing to the decrease in demand for mercury in agriculture, electronics, medicine, and other sectors of the economy. Khaydarken undertook a number of organizational changes, which included closing the unprofitable Chauvayskiy Mine and having the Ulutau Mine mothballed. Thus, production ceased at two of the three underground mines, and the volume of output was reduced by one-half. Application of economic criteria to the mining operations enabled Khaydarken to achieve economic stability and produce products for sale at competitive prices on world markets in the past several years (Aytmatov and Yalymov, 2001).

Molybdenum.—***Armenia.***—Production of molybdenum concentrate grew by 8.6% to 7,500 t in 2001 from 6,900 t in 2000. Sales of concentrates came to 41 billion dram ($8.5 million), which was 10 billion dram more than in 2000. Nearly all the concentrates were exported. Most mines increased production in 2001. Zangezur copper and molybdenum complex, which was the largest producer, raised output by 12% in value compared with that of 2000 (Yerevan Arminform, 2002§).

The Kadzharan copper-molybdenum deposit, which is located in the southern part of Armenia 33 km from the administrative center of Kapan, was one of the largest sources of molybdenum in the CIS and the world. Construction of the Kadzharan (later Zangezur) mining and beneficiation complex began in 1940 to develop this deposit. The complex produced its first copper and molybdenum concentrates in 1951. Although mining was initially underground, by 1959, all mining was from open pits. By 1985, capacity had been raised to the point where the complex was mining and processing 8.5 Mt/yr of copper-molybdenum ore; plans at that time called for the capacity to be increased in stages to 20.4 Mt/yr. The last general assessment of reserves at Kadzharan, which was completed in 1985, listed more than 1.5 Gt of explored reserves of copper-molybdenum ore, which was adequate to supply the complex for several centuries (Akopyan and others, 2001).

Following the dissolution of the Soviet Union in 1991, the rapid decline in production at the Zangezur complex resulted in a shutdown of work in 1993; the decline was caused by the loss of ties to former markets and the effects of the war with Azerbaijan, which included being blockaded. Production, however, resumed in 1995, and by 2000, the complex was mining and processing 7.1 Mt of ore; plans called for 7.6 Mt to be mined and processed in 2001. In an effort to process concentrates to produce more value-added products, the complex began production of molybdenum trioxide (Akopyan and others, 2001).

Also, during the decade following the dissolution of the Soviet Union, Armenia resurrected production at the Agarak copper-molybdenum mining and processing complex. The complex was able to mine and process 2 Mt/yr of ore, which was 70% of its design capacity. Armenia exported products from Agarak and Zangezur to six countries, which included Russia (Akopyan and others, 2001).

Nickel.—***Russia.***—OJSC MMC Noril'sk Nickel, which was one of Russia's leading enterprises and had metal mines and production facilities in East Siberia and on the Kola Peninsula, produced about 96% of Russia's nickel and 20% of the world's output of nickel; MMC Noril'sk Nickel mined copper-nickel mixed sulfide ores that also contain significant amounts of cobalt, copper, gold, and PGM. The vast majority of nickel and other metals produced by MMC Noril'sk Nickel were from its mines in East Siberia on the Taymyr Peninsula. The company also mined some nickel and other metals on the Kola Peninsula. Russia's remaining nickel was produced from laterite deposits in the Urals.

Ufaleynikel, which was a nickel producer from the Chelyabinsk region in the Urals, had the capacity to produce 17,000 t/yr of nickel, 5,000 t/yr of ferronickel, and 1,900 t/yr of cobalt. It produced 12,000 t of nickel in 2001 (Interfax Mining and Metals Report, 2002aw).

MMC Noril'sk Nickel's production increased to 223,000 t of nickel in 2001 from 217,000 t in 2000 (Prokhorov, 2002). Production increased because the company mined more ore and processed pyrrhotite tailings and other milling and metallurgical wastes.

Besides nickel, MMC Noril'sk Nickel's mines and plants produced coal, cobalt, copper, precious metals (gold, PGM, and silver), selenium, industrial sulfur, tellurium, and other products. The company was engaged in the exploring for, mining of, enriching of, and metallurgical processing of minerals; in the production, marketing, and sales of nonferrous and precious metals and nonmetallic minerals; and in the production of thermoelectric power for its own needs. MMC Noril'sk Nickel accounted for 4.3% of Russian exports. Its share of Russia's GDP was 1.9% and of Russia's industrial output was 2.8%, which equaled 27.9% of the nonferrous industry's output (Noril'sk Nickel, undated§).

The presence of copper-nickel mixed sulfide ore deposits on the Taymyr Peninsula in East Siberia has been known since the 17th century, but research into their industrial potential only began in the 1920s. On June 23, 1935, the Council of People's Commissars of the Soviet Union passed a resolution on building the Noril'sk combine. The Commissariat of Home Affairs (NKVD) (the country's secret police agency) initially directed the development of the project. In 1939, the Noril'sk complex produced its first copper-nickel matte. By 1953, the complex was producing 90% of the Soviet Union's PGMs, 35% of its nickel output, 30% of its cobalt, and 12% of its copper (Noril'sk Nickel, undated§).

In East Siberia, MMC Noril'sk Nickel's Polar Division operated six underground mines, one open pit, and processing facilities, which included concentrators, smelters, and refineries. Two company enterprises on the Kola Peninsula, Pechenganickel and Severonickel, produced copper and nickel. The Pechenganickel mining and metallurgical complex was in the northwest of the Kola Peninsula and had two industrial sites near the towns of Nikel' and Zapolyarnyy. Inco built the complex in 1940 in a part of Finland that became part of the Soviet Union after World War II. The Severonickel complex, which was built in 1935, operated in the town of Monchegorsk

in the Murmansk region (Noril'sk Nickel, undated§).

On November 4, 1989, the Council of Ministers of the Soviet Union passed a resolution that created the State Concern for Non-ferrous Metals Production Noril'sk Nickel. The State Concern brought together the Noril'sk complex, the Pechenganickel and Severonickel complexes, and the Olenegorsk mechanical works on the Kola Peninsula with the Krasnoyarsk nonferrous-metals-processing plant in Krasnoyarsk, East Siberia, which produced PGMs and the Gipronickel Institute in St. Petersburg. These enterprises were united into a unified concern for producing and processing mixed sulfide ores (Noril'sk Nickel, undated§).

Following the dissolution of the Soviet Union, the Norilsk complex was called State Concern for the Production of Non-ferrous and Precious Metals Noril'sk Nickel. In June 1993, it was transformed by a decree of the President of the Russian Federation into the Russian Joint Stock Company (RAO) Noril'sk Nickel for the Production of Non-ferrous and Precious Metals. In 1994, in accordance with privatization plans, shares in the company were distributed, in part, to the workforce and for sale by voucher auctions. The control packet of shares (38% of the shares, or 51% of the voting shares) was retained, however, as state property. In November 1995, this controlling share was placed for sale at a mortgaging auction; the winner of the auction would lend the Government money and hold the shares as collateral. As a result of this auction, Uneximbank became the holder of the controlling packet of shares in RAO Noril'sk Nickel. Then, in August 1997, the investment company Swift, which represented Uneximbank's interests, acquired this controlling packet of shares for about US$270 million. As part of the announced terms of the acquisition, Swift transferred to RAO Noril'sk Nickel's accounts $300 million for the development of the Pelyatka gas condensate field near Noril'sk and Rub400 billion to maintain the social and civic infrastructure in the Noril'sk industrial region and to pay off outstanding debts of RAO Noril'sk Nickel to the state Pension Fund (Noril'sk Nickel, undated§).

In 2000, the Noril'sk enterprise again was restructured, its capitalization was transferred from RAO Noril'sk Nickel to Noril'sk Mining Company, which was renamed the Open Joint Stock Company Mining and Metallurgical Company Noril'sk Nickel in February 2001. This restructuring involved an additional share issue by Noril'sk Mining Company. The shares were placed through closed subscriptions among the shareholders of RAO Noril'sk Nickel and paid for by RAO Noril'sk Nickel's shares. RAO Noril'sk Nickel had swapped 96.92% of its shares by the end of 2001. An additional swap of shares for the RAO Noril'sk Nickel shareholders was to be conducted until July 17, 2002, for those who did not exchange their securities during the previous stages of restructuring. The company's largest shareholder became the Interros Group (Noril'sk Nickel, undated§).

Although resources of nickel-rich ore were depleting at existing mines, MMC Noril'sk Nickel planned to expand production at existing mines of copper-rich and disseminated ores, which have a lower nickel content and a relatively high PGM content. MMC Noril'sk Nickel was also planning to develop two new mines (the Glubokiy and Skalistyy) with nickel-rich ore, each of which will have the capacity to produce 2 Mt/yr of ore. The Glubokiy Mine was not slated for development until after 2010. The Skalistyy Mine was already under development and could be in full production in about 3 to 5 years. A third mine with nickel-rich ore could be developed after 2015. Along with increased volumes of cuprous and disseminated ores that were to be mined, these new mines should also compensate for the depleting reserves of nickel-rich ores at existing mines and allow Noril'sk to maintain a high level of nickel production (Levine and Wilburn, 2003§).

Platinum-Group Metals.—***Russia.***—In addition to being the world's second largest producer of PGMs after South Africa in 2001, Russia was the world's largest palladium producer because the ratio of palladium to platinum is higher in Russian ores than in South African ores. MMC Noril'sk Nickel mined more than 90% of the country's PGM output from mixed sulfide ores from its deposits at its Polar Division. An estimated 10 t/yr of PGMs (mostly platinum) was mined from placer deposits in the Russian Far East, Siberia, and the Urals; the largest placer mining companies were the Amur Prospectors cartel and the stock company AO Koryakgeoldobycha (Boryako, 2002).

All MMC Noril'sk Nickel's PGM mining is at its Polar Division where the ratio of palladium to platinum in the ore ranges from about 2.6 to 1 to 3.95 to 1. The Polar Division complex developed the Noril'sk, Oktyabr'skiy, and Talnakh deposits. These deposits have ores with varying PGM compositions—the Noril'sk deposit averages 71% palladium, 25% platinum, and 4% other PGMs; the Oktyabr'skiy deposit averages 64.5% palladium, 24.5% platinum, and 11% other PGMs; and the Talnakh deposit averages 64.8% palladium, 16.4% platinum, and 18.8% other PGMs (Smirnov, 1977). MMC Noril'sk Nickel's mining operations on the Kola Peninsula produced no PGM.

In 2001, PGM sales accounted for about 51% of Noril'sk's revenue; palladium accounted for about 33%; platinum, almost 14%; rhodium, almost 4%; and ruthenium and iridium, less than 1%. The volume in tonnage of PGM output increased by less than 1% in 2001, although from 1996 through 2001, the physical volume of PGM output had increased by about 28%. Production decreased by 14% in 1997 compared with that of 1996. Production increased, however, by 9% in 2000 compared with that of 1999; 4% in 1999 compared with that of 1998, and 30% in 1998 compared with that of 1997 (OJSC MMC Noril'sk Nickel, 2001§).

In 2001, Noril'sk's development strategy was oriented towards maximizing PGM production rather than nickel production. The company's remaining resources were richer in PGM relative to copper and nickel than ores that were previously mined and were being mined. Although mining was depleting the region's nickel-rich ores, the deposits still contained large resources with a high PGM content. Nickel-rich, copper-rich, and disseminated ores were the three forms of mixed sulfide ores that comprise the resource base at the Polar Division. The nickel content of cuprous and disseminated ores is considerably lower than in nickel-rich ores. The copper content of cuprous ores is slightly lower than in nickel-rich ores but much lower than in disseminated ores. Unlike base metal content, PGM content remains relatively high for all ore types. The PGM content of the nickel-rich ores that are now being mined averages between 9 to 13 g/t PGM, and of copper-rich ores, from 8 to 11 g/t PGM. The PGM content of disseminated

ores ranges from 3 to 9 g/t; the PGM content of low-sulfide disseminated ores was quite comparable to the PGM content of nickel-rich ores. The PGM content in tailings was still quite high at 8 g/t. The quantities of these three types of ores and the tailings will affect Noril'sk's future as a PGM producer (Levine and Wilburn, 2003§).

Since World War II, most of the Polar Division base-metal production came from the mining of nickel-rich ores, generally from pockets with high-grade nickel or copper. Although PGM grades may have been significant, PGMs were treated as a byproduct of base-metal production. By 2000, however, disseminated ores constituted 82.2%; nickel-rich ores, only 10.5%; and cuprous ores, 7.3% of the district's total ore resources. Of total PGM resources, 65.9% was in disseminated ores; 20.8%, in nickel-rich ores; and 13.3%, in copper-rich ores (Valetvov and others, 2000). Stockpiled pyrrhotite (magnetic pyrites) tailings from previous mining operations constitute a resource of about 5% of total resources (Levine and Wilburn, 2003§).

If the ore is selectively mined, then ore feed grades can be significantly higher. The copper-rich ores had a generally higher palladium-to-platinum ratio than other ores. The palladium-to-platinum ratio in the other ores is somewhat variable, but the dominance of palladium to platinum is constant (Levine and Wilburn, 2003§).

As the district shifts from exclusively producing nickel-rich ores to producing other types of ores, the percentage of value attributed to PGMs will increase. On the basis of reported 1998 prices, PGMs made up almost 25% of the total value of nickel-rich ores and more than 50% of the value of disseminated ores (Hilliard, 1998; Levine and Wilburn, 2003§).

Noril'sk began to emphasize its Polar Division's PGM capacity about 1998. As nickel-rich reserves from Noril'sk Nickel's older mines were being depleted, the company was developing its abundant resources of copper-rich and disseminated ores. Noril'sk's plan envisioned opening two new underground mines (Glubokiy and Skalistyy) between 2000 and 2010, which will mine nickel-rich ores. The Glubokiy Mine may come into production by 2010. The Skalistyy Mine, which was originally scheduled to reach full production in 2001, appeared to be scheduled to achieve full production by 2005 (Piven' and others, 1996). A new mine may be opened to develop nickel-rich ores in the northern part of the Talnakh deposit after 2015 (Valetvov and others, 2002).

In addition, mining at the Oktyabr'skiy Mine was shifting from nickel-rich ores to copper-rich ores that have one-fourth of the nickel content but 90% of the PGM content (Piven' and others, 1999). Increased production of disseminated ores at other Polar Division mines was planned. Production at the two oldest mines (Medvezhiy Ruchey and Zapolyarnyy) was to expand into the recovery of low-sulfide disseminated ore that contains a much higher PGM content than ore recovered in 2001 (Valetvov and others, 2002). Meanwhile, Noril'sk Nickel continued to develop the capability to recover PGMs from abundant pyrrhotite tailings that accumulated from many years of mining (OJSC MMC Noril'sk Nickel, 2001§).

Apparently, total PGM production was planned to increase between 2000 and 2010. According to a USGS analysis of Noril'sk's plans, total PGM production was planned to increase by almost 50% from the 2000 level by 2010. By 2010, the percentage of reserves of nickel-rich ore would decrease and that of disseminated ore, which included low-sulfide disseminated ore, would increase as a percentage of the total available ore (Levine and Wilburn, 2003§).

On the basis of USGS projections, PGM production from disseminated ore could be maintained well beyond 100 years at projected 2010 PGM production levels. These projections were based on resources planned for development at Noril'sk and did not include placer mine production or development of other Russian PGM resources nor do they include economic or technical factors or changing market conditions (Levine and Wilburn, 2003§).

By mining a mixture of the different ore types and opening new mines, Noril'sk can extend the life of the various ore types (especially the nickel-rich ore). By appropriate blending and sequencing of the opening of new mines, appropriate ore grades could be maintained for a longer time than by sequentially mining high-grade nickel-rich ore zones and then mining lower grade ore types (Levine and Wilburn, 2003§).

Noril'sk has large resources of PGMs, which may be economically exploitable. USGS production projections were based on what could be possible if adequate investment and technology were available. Such an analysis is dependent on numerous cost factors, which include the future prices of PGMs and other cohosted metals. Furthermore, Noril'sk may not have mastered the technology for expanding mining or processing disseminated ores at all mines recovering nickel- and copper-rich ores or for processing low-sulfide disseminated ores. The USGS analysis did not deal with the issue of Noril'sk obtaining investment funds for future mine development or expansion of processing facilities to process larger quantities of ores of different types. Thus, issues that relate to future costs and the relative value of metals, new technologies, and acquisition of adequate investment funds could affect Noril'sk's future development prospects (Levine and Wilburn, 2003§).

The Krasnoyarsk Nonferrous Metals Plant (Krastsvetmet) and the Ekaterinburgskiy (EZOTsM) and Priobsk precious-metals plants process PGMs in Russia (OJSC MMC Noril'sk Nickel, 2001§). Krastsvetmet, which was Russia's major processor of PGM, processed 4% more PGMs in 2001 than it did in 2000; this repeated the 3% to 4% growth in 2000. Noril'sk will continue to supply Krastsvetmet in 2002 under the same terms as those of 2001. Krastsvetmet produced palladium and platinum ingots and powders; iridium, osmium, rhodium, and ruthenium powders; gold; and silver. The Krasnoyarsk Territory's state property management committee wholly owned Krastsvetmet (Interfax Mining and Metals Report, 2002r).

EZOTsM (a public stock company) became operational on October 23, 1916, as the first Russian plant refining PGMs. In 2001, EZOTsM produced precious metals from primary and secondary sources of gold and PGMs (iridium, osmium, palladium, platinum, and rhodium). EZOTsM refined precious-metal-containing raw materials that included concentrates, scrap, and wastes, into ingots and powder, and either sold the refined metals to the State Repository for Precious Metals or to banks or fabricated the metals into a range of products and semimanufactured products. It produced a large number of products from precious metals for industrial applications, which included such highly complex products for industrial use as catalytic netting, electrical contacts, glass apparatus, laboratory

dishes, plates, powders, salts, thermocouples, tubes, wire, and alloys for stomatology.

By the end of the 1980s and the beginning of the 1990s, EZOTsM had also begun to produce a range of consumer products, which included jewelry. It was a unique plant within Russia and the CIS and the only plant that produced a full range of products from precious metals. It employed about 1,000 workers, 100 of whom were engaged in research (Timofeyev and Dmitriyev, 2001).

The traditional form of output for the plant had been catalysts and catalytic netting; in particular, platinum netting used for producing hydrocyanic acid and nitric acid. The plant was one of the first in Russia to produce measuring ingots from gold, platinum, and silver. The plant received international certification that confirmed the quality of its gold, palladium, platinum, and silver ingots for "good delivery" (Timofeyev and Dmitriyev, 2001).

EZOTsM refined iridium and produced iridium products from raw materials, which included concentrates and scrap. Technologies used at the plant enabled it to produce iridium of 99.95% purity. The plant was striving to widen its product range and to improve the quality of iridium products. From iridium, the plant produced mainly crucibles and containers used in high-temperature applications and radioisotopes. The plant also produced foil, ingots, rolled products, and wire (Yermakov and others, 2001). A future application for iridium being researched at the plant was its use in electrodes for ignition in automobile spark plugs that can last more than 250,000 km (Timofeyev and Dmitriyev, 2001).

EZOTsM supplied semimanufactures not only to Russia's jewelry production enterprises, but also produced jewelry from gold, palladium, platinum, and silver. EZOTsM, which was a leader in Russia in developing platinum jewelry production, developed alloys of palladium and platinum to be used in jewelry and also the solders used in alloys. The plant also had one of the first accredited laboratories for analyzing the quantity of precious metals in alloys, metals, products, solutions, and so forth. The plant's services were used at home and abroad (Timofeyev and Dmitriyev, 2001).

In the Soviet era, the production and consumption of platinum jewelry had been minuscule. Platinum was considered to be a strategic metal under the control of the state; and the state did not promote a market for platinum jewelry. After receiving a patent for a newly developed alloy for platinum jewelry in 1996, however, EZOTsM began producing platinum jewelry. It considered itself in a favorable position to produce jewelry owing to its long history of processing PGMs and, consequently, was developing a range of jewelry products and semiproducts used to produce finished jewelry (Timofeyev and others, 2002).

Tin.—***Kyrgyzstan.***—Tin was mined in such deposits as Trudovoye and Uchkoshkon in the Sary-Dzhas District in the southeastern part of Kyrgyzstan. Since 1992, the joint stock company mining enterprise Enil'chek has been extracting between 30,000 and 70,000 t/yr of ore for the production of between 150 and 350 t/yr of tin and between 90 and 120 t/yr of tungsten in concentrate, first from the At-Dzhaylau deposits and then from the Lesistyy sector of the Trudovoye deposit. The local Enil'chek prospecting cartel joint stock company shipped its output to Russia and other CIS countries (Kudayabergenov and Stavinskiy, 2001). Enil'chek developed the Kurgak Mine and a beneficiation plant with the capacity to process 100,000 t/yr in the Sary-Dzhas District (Aytmatov and Yalymov, 2001; Kudayabergenov and Stavinskiy, 2001).

The Trudovoye deposit was declared to be one of the largest tin deposits in the CIS with 149,100 t and 95,600 t of tin and tungsten reserves, respectively. An auction held for the right to develop the Central sector of the deposit was won by Deputatskiy Tin GOK from Russia, Enil'chek, and the Kyrgyzaltyn firm (Aytmatov and Yalymov, 2001).

In 2001, the Tyan'Shan'olovo GOK, which was created to develop the partially completed Sary-Dzhas Mine, began commercial operations and supplied 30 t of tin concentrate to Russia's Novosibirsk tin smelter. It planned to supply 250 t in 2002. Tyan'Shan'olovo was a limited liability company owned by OJSC Novosibirsk Integrated Tin Works (50%) and the Kyrgyz firms OSOO Amart (30%), Enil'chek (10%), and OOO Dzhangart (10%) (Interfax Mining and Metals Report, 2002au).

Russia.—OJSC Novosibirsk Integrated Tin Works, which was a monopoly tin producer, controlled Russia's only major tin smelter and a large share of the country's tin mining enterprises. In 1999, Novosibirsk acquired 52% of the shares of Dalolovo, which was established to develop the Solnechnyy deposit in Primor'ye; 50% of Tyan'Shan'olovo (Kyrgyzstan); and 51% of Khinganskoye'olovo (Jewish Autonomous District). It also owned 15% of Deputatskiy'olovo (Sakha Yakutiya) and was to be the trustee of the state-owned 11% share of this company for 3 years. Novosibirsk's owners included Russia's Sibirskaya Mnogoprofilnaya Kompaniya, FTK SibElfin, and ED-SIB-A, which owned 18%, 15%, and 14% of the shares, respectively. Other holders included ZAO Credit Suisse First Boston and the Depository and Clearing Center (Moscow) (Interfax Mining and Metals Report, 2001b).

In 2001, Novosibirsk produced 4,548 t of tin metal, which was 17% less than the 5,326 t it produced in 2000. Also, its solders output fell to 2,111 t compared with 2,287 t in 2000 (Interfax Mining and Metals Report, 2002x, w).

In 2001, Novosibirsk planned to buy 2,750 t of tin concentrate from Deputatskiy'olovo, which would be 7.8% more compared with that of 2000. Deputatskiy'olovo increased concentrate production owing to an investment program that provided $5 million to $6 million. Commercial mining at Tyan'Shan'olovo began in 2001. Also in 2001, Novosibirsk invested to rehabilitate Dalolovo by buying bulldozers, excavators, loaders, and other machinery. Dalolovo was set up to develop the Solnechnyy tin deposit, which the Solnechnyy mining and beneficiation complex had developed. Dalolovo's main owner was Novosibirsk (52%) (Interfax Mining and Metals Report, 2002w).

Titanium.—***Kazakhstan.***—AO Ust'-Kamenogorsk Titanium and Magnesium complex was Kazakhstan's only titanium-sponge-producing plant. Lacking its own domestic sources of titanium raw materials, the company adapted its technology to process imported raw materials, which included rutile and titanium slag. It produced enamels, magnesium, magnesium powder, metallic scandium, scandium oxide, titanium dioxide and sponge, and vanadium pentoxide. AO Ust'-Kamenogorsk exported all its titanium sponge and most of its magnesium to countries outside the FSU (Interfax Central Asia and Caucasus

Business Report, 2001a§). Belgium's Specialty Metals Company owned 65.67% of the shares in AO Ust'-Kamenogorsk, and Kazakhstan owned 15.5% (Interfax Central Asia and Caucasus Business Report, 2002d§). In 2001, sales from AO Ust'-Kamenogorsk, reported in the country's currency, increased by 76.3% compared with that of 2000 (Interfax Mining and Metals Report, 2002p).

Russia.—The Verknyaya Salda Metallurgical Production Association (VSMPO), which was the world's leading milled titanium producer, produced about 16,000 t/yr of titanium products for the aerospace and engineering industries. The company was located in Sverdlovskaya Oblast in the Urals. VSMPO exported 11,823 t of titanium products in 2001, which was a 50.4% increase compared with the 7,860 t it exported in 2000. VSMPO sold 70% of its output under long-term contracts with major aerospace and aviation companies, such as Airbus Industries S.A.S., Boeing Corporation, General Electric Aircraft Engines (a division of General Electric since 1987), and Rolls-Royce plc. VSMPO had a charter capital of Rub11,806,000 that consisted of 1-ruble common shares. ZAO Soyuz-Verkhnyaya Salda of Sverdlovskaya Oblast owned 38.61% of the shares in VSMPO, ZAO Credit Suisse First Boston 20.28%, and Depository-Clearing Company (Moscow) 16.55% (Interfax Mining and Metals Report, 2002ar; Foreign Broadcast Information Service, 2002§).

The Avisma Titanium-Magnesium complex, which was Russia's only titanium sponge producer, was one of the world's largest producers of titanium sponge with about 30% of the world production. VSMPO owned 75% of Avisma's shares; the Avisma company workers, 15%; and the Solikamsk Magnesium Plant, 10% (Interfax Daily Business Report, 2002§).

Following the September 11, 2001, terrorist attacks, Boeing informed VSMPO that it would not fulfill a number of major titanium supply contracts for an undetermined period of time because of losses by Boeing. VSMPO was the second largest supplier of parts for Boeing; between 18% and 20% of the weight of Boeing's latest models comprised titanium alloys manufactured by VSMPO (Belimov, 2001).

Ukraine.—Ukraine, which was the only major producer of titanium raw materials in the CIS, produced mainly ilmenite and also rutile. In 2001, the Vol'nogorsk State GMK in the Dnipropetrovs'k region increased outputs of rutile concentrate by 7.6% to 60,800 t and of ilmenite concentrate by 10% to 179,300 t compared with those of 2000. The GMK, which was established in 1961, mined and processed titanium-zirconium ores and was on the list of enterprises that were not to be privatized (Interfax Mining and Metals Report, 2002bd).

The state-owned Zaporizhya titanium and magnesium plant, which was Ukraine's only producer of titanium sponge, had the capacity to produce 20,000 t/yr of titanium sponge and germanium, magnesium, and silicon products. The plant exported most of its output outside the CIS. In January 2002, Zaporizhya spun off its silicon semiconductor division in accordance with a Government dictate; the new division became the state-owned Semiconductor Plant (Interfax Mining and Metals Report, 2002bi, bk).

Ukraine's state-owned Titan firm, which was the country's largest titanium dioxide (TiO_2) producer, produced 53,000 t of TiO_2 in 2001, which was a 6.9% increase compared with that of 2000. Titan accounted for 1.4% of the world's TiO_2 production and exported about 80% of its production. Titan supplied about 25% of the TiO_2 consumed in Russia (Interfax Mining and Metals Report, 2002ay).

Tungsten.—***Kyrgyzstan.***— Detailed information on tungsten can be found in the "Kyrgyzstan" part of the "Tin" section of this chapter.

Russia.—Tungsten reserves are geographically distributed as follows: North Caucasus, 46%; East Siberia, 29%; and the Russian Far East, 24%. The tungsten trioxide (WO_3) content of these reserves is on average 2.2 times lower than that of deposits under development in other countries (Novikov and Yastrzhembskiy, 1999). The Tyrnyauz tungsten and molybdenum GOK in the Kabardino-Balkariya Republic in the North Caucasus was Russia's largest tungsten producer. It reportedly had proven commercial tungsten reserves of 374.1 Mt of ore in categories A+B+C1, of which 264.1 Mt was suitable for underground mining and 110 Mt was suitable for surface development. Despite its large reserves, the ore grades at Tyrnyauz are considerably lower than those in foreign operations (Levine, 1997).

The only deposits that could be claimed to contain high enough quality ore to be considered reserves from a market economy perspective were those under development at the Lermontov and Primorskiy GOKs in the Russian Far East, which have ore with an average WO_3 content that ranges from 1% to 2.2%. These deposits, however, were reported to be nearly depleted. At the other tungsten mining enterprises, the average WO_3 content of the ore ranges from 0.17% to 0.24% (Novikov and Sazonov, 2000).

Tungsten reserves were decreasing. Production could be maintained by expanding capacity for mining tungsten ore at the Dzhida and Tyrnyauz complexes and also by developing reserves at the Aginskoye deposit in the Sakha Yakutiya Republic, the Kti-Teberdaskoye deposit in the North Caucasus, and a number of other small deposits with rich ore (Kozlovskiy and Shchadov, 1999).

Russian tungsten production was important to the United States because Russia, after China, was the second largest supplier of imported tungsten materials. In 2000, total imports of tungsten from Russia to the United States were 1,710 t of contained tungsten, which was 26% less than what Russia supplied the United States in 1999. In 2000, Russian tungsten exports to the United States were mainly tungsten oxide (49%), tungsten concentrates (23%), ammonium paratungstate (15%), tungsten waste and scrap (9%), and ferrotungsten and tungsten metal powder (each 2%) (Shedd, 2001).

The Tyrnyauz GOK produced 40% of Russia's tungsten-molybdenum concentrate. In a few years, the Tyrnyauz complex could produce the majority of Russia's tungsten because the Lermontov and Primorskiy GOKs in the Russian Far East could stop operating owing to depleted reserves and a lack of funds. Tyrnyauz produced 1,000 t of tungsten concentrate in 2001, which was 20% less than that of 2000. Ore extraction decreased by 15% to 600,000 t. Output fell because of mountain torrents in the second half of the year that interfered with mining operations and caused considerable damage to facilities (Interfax Mining and Metals Report, 2002av).

All the Tyrnyauz concentrates, which were produced in the form of tungsten anhydride at the Gidrometallurg plant at

Nal'chik in the North Caucasus, were exported to Rotterdam, Netherlands. The Russian republic of Kabardino-Balkariya owned 50% plus one share of the Tyrnyauz plant, which was privatized in 1999 (Interfax Mining and Metals Report, 2002av).

Vanadium.—***Russia.***—In 2001, about 7,000 t of vanadium pentoxide and 4,300 t of ferrovanadium were produced by Vanadii-Tulachermet, which was Russia's major producer of vanadium and vanadium alloys; it was located in the Tula region of central Russia. In 2001, production of vanadium pentoxide (V_2O_5) increased by 11% compared with that of 2000, but net profit was 11.3% less than in 2000 because world prices for V_2O_5 fell by 24%. The enterprise exported most of its output to Southeast Asia and Western Europe. As of April 2001, Western Projects L.L.C. of the United States owned 14.96% shares of Vanadii-Tulachermet stock; ZAO Intersintez (Moscow), 13.29%; Alef-Bank (Moscow), 13.17%; OOO Adamant (Moscow), 10.02%; and OOO Ivan (Tula, Russia), 9.32%. Information was not available on the ownership of the remaining shares of the enterprise (Interfax Mining and Metals Report, 2002at).

Zirconium.—***Ukraine.***—The Vol'nogorsk State GMK in the Dnipropetrovs'k region, which was the only producer of zirconium in the CIS, increased output of zirconium concentrate by 2% to 33,600 t in 2001 compared with that of 2000. The complex, which was established in 1961, was on the list of enterprises that were not to be privatized (Interfax Mining and Metals Report, 2002bd).

Industrial Minerals

Barite.—***Kazakhstan.***—Demand for barite by Kazakhstan's oil industry was 200,000 t/yr. Most of Kazakhstan's oil producers bought barite abroad mainly from Turkey and Iran. In 2001, the Yuzhpolimetall complex in southern Kazakhstan planned to produce more than 43,000 t of barite concentrate. By 2005, Yuzhpolimetall planned to raise production of barite concentrate to 200,000 t (Interfax Central Asia and Caucasus Business Report, 2001b§).

Diamond.—***Armenia.***—In 2001, Armenia exported $100 million in cut diamonds, which was 9% less than it exported in 2000. Armenia's cutting industry is working at only about one-third of its capacity. ALROSA, which was major supplier of rough diamonds to Armenia, estimated that Armenia was capable of processing 1.2 million carats per year, compared with its annual output of between 300,000 and 350,000 carats in 2001 (Interfax Mining and Metals, 2002e).

According to the terms of a new trade agreement signed with Russia, Russia will greatly increase it supply of diamonds to Armenia from the 2001 level of 30,000 carats; Russia will supply Armenia with 400,000 carats of gem diamond per year from 2002 to 2004 and then 450,000 carats per year in 2005 and 2006. Russia will also supply 400,000 carats of industrial diamond to Armenia in 2002 and increase this by 100,000 carats per year until 2006. The diamond will be supplied under annual export quotas approved by the Russian Government and under contracts signed by ALROSA and Almazjuvelirexport with an authorized Armenian agency in accordance with the legislation of both countries. ALROSA will supply its own diamond for jewelry manufacturing, and Almazjuvelirexport will supply diamond owned by the Sakha Yakutiya Republic, which are suitable for jewelry. Under the agreement, Armenia was not allowed to reexport uncut diamond supplied or to export partially cut diamond. The diamond to be received from Russia will constitute about one-half of Armenia's cutting plant requirements. The country will probably import the other one-half from Belgium and Israel (Interfax Mining and Metals Report, 2002e).

Armenia was deciding how to distribute the Russian rough diamond among cutting plants by taking into consideration the various plants' diamond-cutting capacities and assessments of their financial condition and marketing record. In 2001, Russian diamond were allocated to 43 cutting enterprises, but 10 to 15 of them used either none or only part of their allocation owing to financial and market constraints (Interfax Mining and Metals, 2002e).

Russia.—The Russian diamond industry was controlled by ALROSA Company Limited, which was based in the Sakha Yakutiya Republic. ALROSA's largest shareholders were the Russian Ministry of State Property, 32%; the Sakha Yakutiya Republic's State Property Committee, 32%; the Russian Social Welfare Fund for Servicemen, 5%; and eight administrative districts in which ALROSA operated (8% among them) (Interfax Mining and Metals Report, 2002bh).

In 2001, ALROSA produced 20,500 carats valued at $1.543 billion and increased mine output by 2.6% compared with that of 2000. Sales of uncut diamond increased to $1.738 billion in 2001 from $1.46 billion in 2000. In 2001, combined revenues from the sale of cut and uncut diamond exceeded those of 2000 by $195.5 million, or 12.7%. ALROSA, which produced $130 million instead of $150 million worth, however, did not attain its production target for cut diamond in 2001 (Interfax Mining and Metals Report, 2002c).

ALROSA was planning to spend $2.8 billion during the next 5 years mainly to develop underground mining operations at the Aikhal, Mirny, and Udachnyy enterprises in Sakha Yakutiya and at the Lomonosov project in Arkhangel'skaya Oblast. In 2001, the International Mine was ALROSA's only underground mining operation. ALROSA will spend $350 million to develop the Lomonosov project. Production at Lomonosov was expected to start in 2003 (U.S. Geological Survey, unpub. data, 2002).

In 2002, the Sever-Almaz firm was planning to start developing the Arkhangel'skaya pipe, which was part of the Lomonosov deposits. More than 71% of the stock in Sever-Almaz was owned by ALROSA. The deposits were estimated to contain $12 billion in diamond of which more than one-half was considered to be gem quality (Interfax Mining and Metals Report, 2002z).

In the next few years, ALROSA planned to raise mine output to $2 billion per year. To achieve this, the company will have to finish building an underground mine at the Mir diamond pipe and a section of the Aikhal underground mine and to start constructing an underground mine at the Udachnaya pipe and an open pit at the Komsomol'skaya pipe (Interfax Mining and Metals Report, 2002c).

Although the open pit at Mir was depleted, the pipe could yield diamond for many more years by mining underground.

The Aikhal underground mine should go onstream in 2006; the Mir underground mine, in 2007-08; and the Udachnyy underground mine, in 2010 (Interfax Mining and Metals Report, 2002b, l). By switching to underground mining, ALROSA believed that it had enough reserves to last for an additional 40 years (Interfax Mining and Metals Report, 2002a).

In 2001, about 50% of ALROSA's production came from several mining and beneficiation enterprises. The Udachnyy GOK, which comprised the Udachnyy and Zarnitsa Mines, produced about 25%; this percentage was projected to increase to 35% by 2010. The Mirny mining and beneficiation enterprise comprised the International and Mir Mines, which produced about 25%; this percentage was projected to decrease to 17% by 2010. The Aikhal GOK comprised the Aikhal and Komsomol'skiy Mines, which produced about 20%; this percentage was projected to decrease to 18% by 2010. The Anabaraskiy GOK comprised alluvial mines and produced about 5%; this percentage was projected to remain at 5% by 2010. Although the Nyurbinskiy GOK comprised the Botuobinskiy and Nyurbinskiy Mines, it was not in operation in 2001; it was projected to produce 25% of ALROSA's output by 2010 (U.S. Geological Survey, unpub. data).

ALROSA officials stated that geological exploration needed to be increased. Promising sites included the Verkne-Modunskoye field, which is located 120 km from the city of Udachnyy, where four pipes were discovered in Soviet times. Mining each of the pipes separately was not considered to be feasible at that time. According to the officials, the project could succeed with modern technology and if the pipes were mined together. Further exploration was being carried out at the site (Interfax Mining and Metals Report, 2002c).

Fluorspar.—***Kyrgyzstan.***—In 2001, the state-owned Khaydarken mercury complex from Kyrgyzstan's Osh region produced 1,175 t of fluorspar concentrate, which was a 63.6% decrease compared with 3,000 t produced in 2000. Fluorspar from Kyrgyzstan was consumed by such countries as Kazakhstan, Russia, and Ukraine. The complex had trouble selling its concentrate because its prices were too high owing, in part, to the cost of shipping the concentrate via Kazakhstan, Tajikistan, and Uzbekistan. In 2001, the complex exported 1,888 t of its fluorspar concentrate, which was a decrease of 42.9% compared with that of 2000. At the start of 2002, stockpiles contained 3,677.3 t of fluorspar concentrate. The Kyrgyz State Property Fund owned all Khaydarken shares. Khaydarken was on the list of enterprises scheduled for privatization (Interfax Central Asia and Caucasus Business Report, 2002c§).

Russia.—Russia has 68% of the fluorspar reserves in the CIS; the remaining reserves were in Kazakhstan, 16.5%; Uzbekistan, 6.7%; Tajikistan, 4%; Kyrgyzstan, 0.6%; and Ukraine (small deposits). Russia reportedly had 16.4 Mt of confirmed fluorspar reserves in 32 fluorspar deposits, of which 11 were developed. The average fluorite content of Russia's reserves range from 41.9% to 59%; Russia had no single deposit with high-grade ore. Russian fluorspar production fell precipitously to 6,200 t of fluorspar concentrate in 1997 from 365,000 t of fluorspar concentrate in 1992. The industry then began to revive when production increased from 120,200 t of fluorspar concentrate in 1998 to 153,800 t in 1999 and to 187,600 t in 2000 (Zuev, 2002).

Most fluorspar was mined in two eastern regions of the country—in the Maritime (Primor'ye) region of the Russian Far East by the Yaroslavskiy GOK and in the Chita region of the Transbaikal area by the Kalanguiskiy fluorspar mining complex and by the Usugli Mine. A number of other small producers were also active. The Yaroslavskiy GOK developed the Vosnesenskoye and Pogranichnoye deposits.

Mineral Fuels

Coal.—***Kazakhstan.***—Kazakhstan's total geological coal resources were assessed to be between 150 and 160 Gt, of which 62% are termed "economic reserves of brown coal," and the remainder, "hard coal" in Kazakhstan's Reserve Classification System. The majority of these reserves are in the central part of the country in the Ekibaztuz, Karaganda, and Maykuben coal basins and the Borlinskoye, Kuu-Chekinskoye, Shubarkol'skoye, and Yubeleynoye deposits (Aliyev, 2001).

Kazakhstan was a large coal producer, consumer, and exporter. It had been the third largest coal producer in the Soviet Union behind only Russia and Ukraine in total output. In the 1990s, coal accounted for about one-half of Kazakhstan's total primary energy consumption, although coal consumption fell by about 50% during this period. In 2000, the country's coal consumption increased for the first time since independence (U.S. Energy Information Administration, 2002b§).

Between 1992 and 1999, the country's coal production, which was centered in the Ekibaztuz and Karaganda Basins, declined by 54%. After nearly a decade of decline, coal production increased in 2000. In 2001, the country's main coal mining enterprise Bogatyr' Access Komir (BAK) (a subsidiary of Access Industries, Inc. of the United States) maintained its 2000 coal production level with production of about 30 Mt of coal from the Bogatyr' and Severnyy coalfields in northern Kazakhstan. Maykuben-Vest, which mined brown coal in the Pavlodar region, produced about 1.8 Mt of coal in the first 10 months of 2001; this was 57.6% more than in the same period in 2000. Through the first 6 months of 2001, the Vostochnyy open pit mine increased production by more than 25.2% to more than 9 Mt compared with that of 2000 (U.S. Energy Information Administration, 2002b§).

Kazakhstan, which was the largest exporter of coal to the FSU, accounted for almost one-half of the FSU's coal shipments. Russia remained the largest importer of Kazakhstan's coal followed by Ukraine. Kazakhstan announced plans to increase coal production to more than 85 Mt/yr by 2005, of which about two-thirds will be used domestically and one-third will be exported (U.S. Energy Information Administration, 2002b§).

Kyrgyzstan.—In 2001, Kyrgyzstan listed 70 coal deposits with reserves that totaled 2.3 Gt; 20 deposits registered reserves of more than 1 Gt. At the majority of deposits, however, the coal resources are characterized by complex geological and mining conditions, which require the introduction of technological solutions (Aytmatov and others, 2001).

Kyrgyzstan's coal industry was one of its oldest mineral producing industries. Up until 1980, the industry had been continuously increasing output. Production peaked between

1976 and 1980 when output averaged about 4.2 Mt/yr; about 2.6 Mt/yr came from underground mines, and 1.6 Mt/yr, from open pits. Since 1980, production had been continuously decreasing, with a steep decline following the dissolution of the Soviet Union in 1991. By 2000, the country was mining only 320,000 t of coal. The industry was in dire economic straits owing to the industry's lack of ability to compete in either domestic or export markets with the rise in the cost of inputs and the removal of Government subsidies. The distances involved in reaching customers combined with the low quality of the coal resulted in the industry's former reserves being regarded as too uneconomic even for production for the domestic markets (Aytmatov and others, 2001).

In 2001, the coal industry had 12 operating mines and open pits and 5 auxiliary enterprises and organizations. Coal was mined at the Almalyk, Dzhergalan, Karakeche, Kok-Yangak, Kyzyl-Kiya, Sulyukta, and Tash-Kumyr deposits (Aytmatov and others, 2001).

Russia.—The Russian coal industry experienced a period of declining production and restructuring following the dissolution of the Soviet Union. During the past 3 years, production increased as the Russian economy grew and domestic demand for coal increased. The greatest increases in coal output were in the West Siberian economic region, specifically in the Kuznets Basin (Kuzbass), where coal production for the past 3 years increased by 32.9% and also in the East Siberian economic region where coal production increased during this period by 19.8%; increases were smaller in the northern economic region (17%) and the Far East economic region (4.4%). Production in the remaining economic regions where coal was produced declined. For example, production in the Urals economic region decreased by 37%, and the North Caucasus economic region, by 13%. Worker productivity reportedly averaged 120 metric tons per month mined. The rates of accidents and fatalities decreased during the past 3 years; the rate of fatalities decreased to 0.45 from 0.8 per 1 Mt of coal extracted (Tropko, 2002).

The coal industry has been investing in new capacity along with phasing out unprofitable enterprises. In 2001, the industry added 21.5 Mt of capacity; 15.5 Mt of this increase was based on reequipping enterprises, and 6 Mt, on constructing new capacity. In 2001, total capacity of the mines and open pits increased to 279 Mt compared with 267.5 Mt in 2000. Because of the process of privatization that took place when the industry was restructured, the Russian coal industry comprised more than 500 private enterprises and their subsidiaries in 2001. Private firms accounted for 72% of the country's coal output with a target set for 2002 to rise to 92% with the sale of Government assets (Tropko, 2002).

The coal industry, however, was facing competition selling to powerplants that were shifting to using natural gas, which was cheaper than coal. In 2001, coal accounted for 28.3% of fuel supplied to electric powerplants, and natural gas, 66.6% (Tropko, 2002).

Ukraine.—Ukraine has 34.1 Gt in proven coal reserves, which accounted for about 15% of the FSU's total coal reserves (U.S. Energy Information Administration, 2002e§). The decrease in coal extraction since independence ended in 1998. Coal extraction reached 81 Mt in 2000 and 83.9 Mt in 2001. Goals were set to stabilize coal extraction at between 85 and 90 Mt. Most of Ukraine's coal is mined in the Donets Basin (Donbas) in the eastern region of the country.

The decline in Ukraine's coal production during the 1990s was caused, in large part, by the collapse of domestic demand and the closing of heavy industry as Ukraine's economy contracted. The coal industry had 193 mines and employed around 450,000 workers. About two-thirds of the mines were unprofitable. The industry experienced numerous problems, such as hazardous working conditions, large debts, outmoded equipment, consumer nonpayment, inefficiency and low productivity, labor strikes, and unpaid wages. Ukraine's coal mining sector remained heavily subsidized by the Ukrainian Government and had the world's highest death rate mostly because of obsolete equipment and low safety standards. Ukraine had nearly 300 coal mining fatalities in 2001 (U.S. Energy Information Administration, 2002b§).

Privatization in the coal sector has progressed slowly since the process began. A $300 million World Bank structural adjustment loan designed to close down more than 80 unprofitable open pits between 1997 and 2000 had not resulted in the closure of even one-half of those mines (U.S. Energy Information Administration, 2002b§).

In September, Ukraine's cabinet approved an $8.8 billion program to revive the country's coal sector during the next 10 years. The program will promote the industry by engaging in a number of fiscal measures to improve asset management and to seek investment. The program called for reducing the industry's high level of debts before proceeding with further privatization. The program also sought to improve mine safety and to reduce the number of coal mines to 157 in 2010. Ukraine has been reluctant to close mines owing to the social costs of closing mines in areas with few other jobs (U.S. Energy Information Administration, 2002e§).

Natural Gas.—***Azerbaijan.***—Azerbaijan was forced to import natural gas to meet domestic demand, even though it has proven natural gas reserves of roughly 155 billion cubic meters (4.4 trillion cubic feet) with the potential to discover significant additional reserves. The infrastructure was inadequate for delivering the full production of natural gas from offshore fields, which are the source of the majority of the country's production. Consequently, much natural gas was flared instead of being piped to markets. In 1999, the country enacted a law that required new oil development projects to include a plan for developing their natural gas resources. With production decreasing at the Bakharly field, which was the country's main source of natural gas, Azerbaijan's future natural gas production will depend on development of the Gunesli, Nakhchyvan, and Shah-Deniz offshore fields (U.S. Energy Information Administration, 2002a§).

The Shah-Deniz field was considered to be the world's largest natural gas discovery since 1978 and was estimated to contain between 700 billion cubic meters (25 trillion cubic feet) and 1.1 trillion cubic meters (39 trillion cubic feet) of natural gas. The field should produce its first natural gas by 2004. With the development of this offshore field, the country could become a major net exporter of natural gas during the next decade (U.S. Energy Information Administration, 2002a§).

Kazakhstan.—In 2001, Kazakhstan produced about 11.6 billion cubic meters (400 billion cubic feet) of natural gas, which was a slight increase compared with that of 2000.

Because it had 1.85 trillion cubic meters (65 trillion cubic feet) of proven natural gas reserves, Kazakhstan was ranked among the top 20 countries in the world in terms of natural gas reserves. Because of a lack of infrastructure, Kazakhstan's natural gas reserves were significantly underdeveloped. Kazakhstan lacked pipelines to connect its natural gas reserves, which are located mainly in the western part of the country with its areas of large potential consumption in the northern and southern regions. Many of the country's oil producers flare natural gas instead of using it because Kazakhstan has no transport infrastructure. To improve the development of the country's natural gas industry, Kazakhstan's Government passed in August 1999 a law that required subsoil users, such as oil companies, to include natural gas utilization projects in their development plans (U.S. Energy Information Administration, 2002b§).

More than 40% of Kazakhstan's proven natural gas reserves was in one field, the giant Karachaganak field, which is located near the northwestern border with Russia. Kazakhstan's other significant natural gas deposits included the Tengiz, Urikhtau, and Zhanazhol fields. Undeveloped offshore areas, which included the giant Kashagana offshore oil field, were thought to hold large amounts of natural gas (U.S. Energy Information Administration, 2002b§).

Russia.—Russia was the world's largest natural gas producer and exporter and had the world's largest natural gas reserves. It had almost 50 trillion cubic meters (more than 1,700 trillion cubic feet) of proven natural gas reserves. Natural gas accounts for more than 54% of Russia's energy consumption (U.S. Energy Information Administration, 2002c§).

In 2001, Russia produced about 581 billion cubic meters (20 trillion cubic feet) of natural gas, which was a slight decrease compared with that of 2000. It consumed about 390 billion cubic meters (14 trillion cubic feet) and had almost 190 billion cubic meters (7 trillion cubic feet) in net natural gas exports. In 2002, Russia planned to increase natural gas production to about 600 billion cubic meters (more than 21 trillion cubic feet) and projected domestic natural gas consumption to increase to about 413 billion cubic meters (more than 14.5 trillion cubic feet).

Gazprom, which was the state-run natural gas monopoly, held nearly one-third of the world's natural gas reserves and produced nearly 94% of Russia's natural gas. Gazprom employed approximately 38,000 workers and was Russia's largest earner of hard currency. Gazprom's tax payments accounted for about 25% of the Government's tax revenues. It also operated the country's almost 145,000-km natural gas pipeline grid and 43 compressor stations. Russian oil companies, however, have flared much of their associated natural gas instead of treating it and selling it to Gazprom because, in part, satisfactory agreements were not concluded between the oil and the gas industries regarding shipping associated gas through Gazprom's pipeline grid (U.S. Energy Information Administration, 2002c§).

Gazprom's main producing areas were the Urengoy and Yamburg fields in northern West Siberia in the Yamal-Nenets region. It was planning for the future development of the giant Bovanenko field on the Yamal Peninsula and other fields in the Yamal-Nenets region, which included the giant Pestsovoyy and Zapolyarnyy fields to the north in the Ob-Taz Gulf area. Rosshelf (a subsidiary of Gazprom) was responsible for the development of the Schtokmanov field in the Barents Sea and other fields in the North Caucasus, Precaspian, Timan-Pechora, and Volga-Urals regions. Production in the Urengoy and Yamburg natural gasfields, however, was declining, and planned development of new fields continued to be delayed as a result of lack of investment resources (U.S. Energy Information Administration, 2002c§).

Development of the giant Zapolyarnyy field, which was brought onstream in October 2001 and should offset the decline in the company's production, was the only recent investment in new natural gas production that Gazprom has made. Development of future fields, most of which are located in the remote regions that lack the infrastructure to deliver the natural gas to consumers, will require much higher levels of investment (U.S. Energy Information Administration, 2002c§).

In an attempt to spur investment in the industry and to raise production levels, steps were taken to end Gazprom's monopoly position and to restructure the natural gas sector. In November 2000, the Government ordered Gazprom to give other companies the right to use up to 15% of its pipeline capacity. In May 2001, Gazprom's board of directors replaced its long-time director (U.S. Energy Information Administration, 2002c§).

The Russian Government's policy of keeping domestic natural gas prices artificially low means that the country's natural gas industry was heavily dependent on exports for revenues to finance its production. In 2001, the majority of Russia's gas exports went to customers outside the CIS. Gazprom supplied Europe with 25% of its natural gas. With several new export pipelines planned for or already under construction, Russia hoped to increase this percentage in the next decade (U.S. Energy Information Administration, 2002c§).

In an effort to diversify its export routes and reach new markets, Russia planned to build several new natural gas export pipelines. The Blue Stream pipeline to Turkey was the major planned project for Russia's export diversification strategy. The pipeline, which will supply Turkey with almost 16 billion cubic meters (212 billion cubic feet) per year of natural gas via twin pipelines laid on the bottom of the Black Sea, was nearing completion and should be operational by fall 2002 (U.S. Energy Information Administration, 2002c§).

In December 2001, Russia resolved a dispute with Ukraine that concerned Ukraine's unsanctioned removal of natural gas from the Russia pipeline system and accordingly canceled plans to build another pipeline to bypass Ukraine. Plans were proceeding for the construction of the second branch for the Yamal-Europe pipeline via Belarus. In addition, Russia was considering pipelines to the east to China (U.S. Energy Information Administration, 2002c§).

To maintain its export level in the face of declining production, Gazprom, through natural gas trader Itera, contracted to buy more than 10 billion cubic meters (350 billion cubic feet) of gas from Turkmenistan in 2002. As Kazakhstan, Turkmenistan, and Uzbekistan continued to develop their natural gas industries and increase their production, senior Russian officials called for an Eurasian alliance, which will, in some ways, be similar to OPEC and would unite Russia with these three large natural gas-producing countries in Central Asia (U.S. Energy Information Administration, 2002c§).

Turkmenistan.—With natural gas production of almost 80 billion cubic meters per year (3 trillion cubic feet per year),

Turkmenistan was the second largest natural gas producer following Russia among the republics of the Soviet Union. After Turkmenistan became independent, its natural gas began to compete for markets with Russia's natural gas. Turkmenistan's only natural gas export pipeline routes ran through Russia, and Russia began to limit Turkmenistan's natural gas exports. Turkmenistan's natural gas production, consequently, decreased throughout the 1990s. As a result of resolving a pricing dispute with Russia and the construction of an export pipeline to Iran, Turkmenistan's natural gas production began to increase in 1998. In 2001, the country produced more than 46.3 billion cubic meters (1.6 trillion cubic feet) of natural gas, with domestic consumption of only about 736 million cubic meters (26 billion cubic feet). The state-owned Turkmengaz produced 85% of this total, and the state-owned oil-producer Turkmenneft, the remaining 15% (U.S. Energy Information Administration, 2002d§).

Turkmenistan was one of the world's leading countries in natural gas reserves with proven natural gas reserves of almost 2.9 trillion cubic meters (101 trillion cubic feet). Its largest natural gas fields are in the Amu-Dar'ya Basin. About one-half of the country's natural gas reserves were estimated to be in the giant Daulatabad-Donmez field. Besides the Amu-Dar'ya Basin, Turkmenistan had large natural gas reserves in the Murgab Basin and, in particular, the giant Yashlar deposit, which contained an estimated 765 billion cubic meters (27 trillion cubic feet). During the last decade, Turkmenistan discovered 17 new natural gas deposits in the Dashoguzskiy, Lebapskiy, and Maryyskiy regions (U.S. Energy Information Administration, 2002d§).

Turkmenistan's economic growth was closely linked to increasing its natural gas production and exports, and the country was continuing to explore and develop new deposits. The country has not been able to develop its natural gas resources fully because it lacked pipeline outlets to world markets. For the country to develop its natural gas production potential, the problem of getting its natural gas to customers who will pay in hard currency and in a timely manner needs to be solved. Now Turkmenistan must transport its natural gas through Russian pipelines to CIS states that either could not pay fully in cash or were late in paying. For example, in October 2000, Turkmenistan agreed to resume exporting natural gas to Ukraine, which had been suspended in May 1999 because of its $281 million natural gas debt (U.S. Energy Information Administration, 2002d§).

In May 2001, Turkmenistan concluded a major natural gas export deal with Ukraine. Under the terms of the agreement, Turkmenistan will provide Ukraine with about 2.65 trillion cubic meters (8.83 trillion cubic feet) of natural gas between 2002 and 2006. Turkmenistan will sell Ukraine approximately 40 billion cubic meters (1.41 trillion cubic feet) of natural gas in 2002 and 50 billion cubic meters (1.77 trillion cubic feet) in 2003; the remaining deliveries will be agreed to later provided that Ukraine makes timely payments. Ukraine agreed to pay 60% in cash for Turkmenistan's natural gas; the remainder will be paid through Ukraine's participation in 20 construction and industrial projects in Turkmenistan, which will be worth $412 million (U.S. Energy Information Administration, 2002d§).

Uzbekistan.—Uzbekistan ranked as the second largest natural gas producer after Russia in the FSU and was one of the top 10 natural-gas-producing countries in the world. Since becoming independent, Uzbekistan has increased its natural gas production by more than 30%. The country has estimated natural gas reserves to be almost 1.9 trillion cubic meters (66.2 trillion cubic feet). Natural gas was produced from 52 fields in the country; 12 major deposits, which included the Gazli, Khauza, Pamuk, and Shurtan-Say, accounted for more than 95% of Uzbekistan's natural gas production. These deposits are concentrated in the Amu-Dar'ya Basin and in the Mubarek area (U.S. Energy Information Administration, 2002f§).

Uzbekistan's natural gas fields were heavily exploited in the 1960s and 1970s by the Soviet Union. As a result, production was declining at several older fields, such as the Uchkyr and Yangikazgan. To offset these declines, Uzbekistan was increasing its pace of development of existing fields, such as the Gazli and Shurtan-Say; developing new fields; and exploring for new reserves. The Shurtan-Say field, which began producing in 1980 and is located in the Kashkad'ya region in the southwestern part of Uzbekistan, was the second largest in the country after Gazli and accounted for approximately 36% of Uzbekistan's natural gas output in 2001 (U.S. Energy Information Administration, 2002f§).

Owing to its high sulfur content, the majority of Uzbekistan's natural gas requires processing. Most natural gas was processed at the Mubarek gas-processing plant, which had a throughput capacity of more than 28 billion cubic meters per year (1 trillion cubic feet per year). In December 2001, Uzbekneftegaz commissioned the Shurtan Gas-Chemical Complex, which included installations to clean natural gas, a natural gas booster compressor station, and a plant with the capacity to produce 137,000 t/yr of liquefied natural gas and 125,000 t/yr of polyethylene. The complex, which was located near the Shurtan-Say gasfields, was completed at a cost of $1 billion (U.S. Energy Information Administration, 2002f§).

In addition to the Shurtan plant, Uzbekneftegaz engaged in several projects to ensure the country's natural gas supply; for example, opening the Khodzhaabad underground natural gas storage facility in the Andizhan region in 1999. The Khodzhaabad facility made possible increased natural gas shipments to Uzbekistan's industrial heartland in the Fergana Valley. In January 2001, Trinity Energy of the United Kingdom committed to investing more than $400 million during a 40-year period in exploration and production of gas condensate deposits in the Ustyurt Plato region. In March 2002, Russia's Itera and Lukoil signed a production-sharing agreement (PSA) with Uzbekneftegaz to form a joint-stock company to develop several new gas fields in Uzbekistan, which included the giant Kan-Dam field. Natural gas reserves at the fields covered by the PSA are estimated at almost 330 billion cubic meters (8.1 trillion cubic feet), including approximately more than 150 billion cubic meters (5.4 trillion cubic feet) at the Kan-Dam structure. Itera and Lukoil each will hold 45% shares in the company, and Uzbekneftegaz will keep a 10% stake in the joint stock company (U.S. Energy Information Administration, 2002f§).

Petroleum.—***Azerbaijan.***—Azerbaijan's economic development was based on its vast oil and natural gas resources in the Caspian Sea region. Production of crude oil and refinery products composed about 20% of Azerbaijan's GDP and more

than 70% of Azerbaijan's exports. Revenues from oil-related exports accounted for almost 50% of budget revenues. Owing to extensive oil development combined with a lack of environmental protection measures, Azerbaijan's coastline and the Caspian Sea suffered heavy environmental damage during the Soviet era. Following independence, Azerbaijan's enormous potential reserves in undeveloped offshore Caspian fields attracted international investors and multinational energy companies began major investments in the country's oil sector (U.S. Energy Information Administration, 2002a§).

In 2001, Azerbaijan's oil production increased for the fourth straight year. Output rose to 14.9 Mt in 2001 from 14 Mt in 2000. More than 80% of Azerbaijan's oil production was from offshore fields with a significant percentage coming from the shallow-water section of the Guneshli field 100 km off the country's coast. At yearend 2001, Azerbaijan had signed 21 major agreements for oil development with 33 companies from 15 countries. Not all these projects were successful. Owing to development of new fields in the Caspian Sea through joint ventures and production-sharing agreements (PSAs), Azerbaijan's oil exports could exceed 1 million barrels per day (Mbbl/d) by 2010 and 2 Mbbl/d within 20 years (U.S. Energy Information Administration, 2002a§).

Azerbaijan International Operating Company (AIOC), which was the country's first PSA, began production in 1997; AIOC comprised State Oil Company of Azerbaijan (SOCAR) and 9 major international oil companies. AIOC was developing three offshore fields [Azeri, Chirag, and the deepwater portions of Guneshli (ACG)]; total reserves were estimated to be 4.3 billion barrels (Gbbl) (about 585 Mt) of oil. Since November 1997, almost all the country's increases in oil production have come from AIOC. From November 1997 through yearend 2001, AIOC had produced a total of 133.5 million barrels (about 18.2 Mt) of oil mostly from the Chirag-1 stationary platform. In the coming decade, increases in production were projected to come primarily from further development of these offshore fields (U.S. Energy Information Administration, 2002a§).

Azerbaijan failed to resolve disputes with Iran and Turkmenistan that concerned competing claims to the Khazar, Kyapaz-Serdar, and Osman fields in the Caspian Sea. In July 2001, tensions erupted in the South Caspian when a BP ship, which had been licensed to explore Azerbaijan's Alov, Araz, and Sharg concessions, was ordered to leave the area by an Iranian gunboat. Iran considered the area, which it calls Alborz, to be a part of the Iranian sector of the Caspian Sea (U.S. Energy Information Administration, 2002a§).

Azerbaijan's only oil export routes were the "northern" Baku-Novorossiysk pipeline route, which transported oil to Russia's Black Sea coast, and the "western" Baku-Sup'sa pipeline, which transported oil to Georgia's Black Sea coast. Oil refinery products were also exported by rail to Georgia's Black Sea ports (U.S. Energy Information Administration, 2002a§).

For Azerbaijan to increase its oil exports, it will need to construct new pipelines. Although several oil export pipelines from the Caspian Sea region have been under consideration, Azerbaijan has consistently supported the proposed Baku-Ceyhan pipeline "Main Export Pipeline," which would export oil from Azerbaijan and possibly Kazakhstan along a 2,253-km route from Baku via Georgia to the Turkish Mediterranean port of Ceyhan, thereby bypassing the Bosphorus Straits (U.S. Energy Information Administration, 2002a§).

Azerbaijan's crude oil was refined domestically at two refineries—the Azerineftyag (Baku) refinery, which had a capacity of 230,000 barrels per day (bbl/d), and the Azerneftyanajag (New Baku) refinery, which had a capacity of 212,000 bbl/d. Both refineries needed modernization. The U.S. Trade and Development Agency was financing a $600,000 feasibility study for upgrading the two refineries and the specialized oil port of Dubandi (U.S. Energy Information Administration, 2002a§).

Kazakhstan.—Following Russia, Kazakhstan was the second largest oil-producing country in the FSU. Kazakhstan has proven petroleum reserves that were estimated to be 5.4 Gbbl (about 735 Mt). In addition, Kazakhstan's onshore and offshore petroleum resources are estimated to be from 30 to more than 50 Gbbl (about 4.1 to 6.8 Gt), which far exceeded its proven reserves. The giant Kashagana offshore field alone could contain up to 50 Gbbl (6.8 Gt) of oil (U.S. Energy Information Administration, 2002b§).

Output increased by more than 12% in 2001 to 39.7 Mt from 35.3 Mt in 2000. A number of major oil fields, which included Ayrankul, Chinarevskoye, North Buzachi, Sazankuark, and Saztyube, recently came onstream. Such fields as Alibekmola, Kozhasay, and Urikhtau, were set to begin producing in the near future. Kazakhstan could significantly increase its oil production in the coming decade; oil production was expected to reach 1.2 Mbbl/d (almost 60 Mt/yr) in 2005, 2 million bbl/d (almost 100 Mt/yr) by 2010, and up to 2.5 Mbbl/d (almost 125 Mt/yr) by 2015 (U.S. Energy Information Administration, 2002b§).

Kazakhstan's economic growth during the past 3 years has been based on increased oil exports and the fiscal policies and economic initiatives instituted in 1999. Foreign investment in the country's oil industry was one of the main factors responsible for Kazakhstan's economic growth. Since achieving independence in 1991, Kazakhstan has received approximately $13 billion in foreign investment in its oil and natural gas industries (U.S. Energy Information Administration, 2002b§).

International projects included joint ventures with Kazakhstan's national oil company Kazmunaigaz (formerly Kazakoil) and PSAs and exploration/field concessions. Large foreign investment in Kazakhstan's oil sector since 1991 enabled the country to increase its oil production to 39.7 Mt in 2001 from 25.8 Mt in 1992 (U.S. Energy Information Administration, 2002b§).

Most of the increase in output will come from three enormous fields—Karachaganak, Kashagana, and Tengiz. ChevronTexaco Corp. was a partner with Kazakhstan in the Tengizchevoil joint venture to develop the Tengiz field, which has 6 to 9 Gbbl (816 Mt to 1.2 Gt) of estimated oil reserves. Production at Tengiz has increased to about 250,000 bbl/d (12.5 Mt/yr) by mid-2002 from 25,000 bbl/d (1.25 Mt/yr) in 1993. ChevronTexaco planned to increase production to 400,000 bbl/d (almost 20 Mt/yr) by 2005, and if adequate export routes are developed, then the joint venture could reach peak production of 750,000 bbl/d (about 37 Mt/yr) by 2010 (U.S. Energy Information Administration, 2002b§).

Karachaganak Integrated Organization (KIO), which was a consortium led by BP and Agip (Italy), was developing the

Karachaganak field. The field had estimated reserves of 2.3 Gbbl (313 Mt) of oil and gas condensate and about 453 billion cubic meters (16 trillion cubic feet) of natural gas. Development at Karachaganak has focused on producing gas condensate (U.S. Energy Information Administration, 2002b§).

Preliminary drilling results indicated that the offshore Kashagana field had huge reserves. The field was being claimed as the largest oil discovery in the world in the past 30 years. In February 2001, Italy's ENI (Agip's parent company) won a contested battle among partners in the Offshore Kazakhstan International Operating Company (OKIOC) to be the operator for the Kashagana field. Subsequently OKIOC was renamed Agip Kazakhstan North Caspian Operating Company (Agip KCO) (U.S. Energy Information Administration, 2002b§).

In March, Agip KCO discovered oil at the Kashagana West 1 well, which is located about 40 km from the first drilled oil well (Kashagana East 1). Agip KCO released estimates that the Kashagana field, which includes the West 1 and East 1 wells, could hold between 7 and 9 Gbbl (950 Mt to more than 1.2 Gt) of proven oil reserves. The field has been conservatively estimated to hold an additional 38 Gbbl (5.2 Gt) in resources. The first stage of development, which was planned for 2005, was expected to produce 100,000 bbl/d. With further development of this field, Kazakhstan will become one of the five leading oil producers in the world. Before this, however, Kazakhstan needed to resolve major issues that involved its ownership rights to Caspian offshore fields and to establish export routes for its oil (U.S. Energy Information Administration, 2002b§).

Development of offshore resources in the Caspian Sea has been slowed by the ongoing dispute among the littoral states over ownership rights. The disagreement involved a debate that concerned how the sea should be treated under international law and whether the littoral states should share the Caspian Sea's resources in common or if each state should establish its own zone of ownership and, if so, how to delineate these zones. Kazakhstan has signed bilateral agreements with Azerbaijan, Russia, and Turkmenistan and pledged to divide their sections of the Caspian Sea along median lines; however, disputed claims of ownership between Azerbaijan and Iran and Azerbaijan and Turkmenistan have heightened tensions in this region (U.S. Energy Information Administration, 2002b§).

Developing export routes for bringing landlocked Kazakhstan's oil to world markets has been the other major issue. Thus far, Kazakhstan's oil has been exported through the Russian pipeline system. Lack of other export routes has hindered a further growth in exports. In March 2001, with the launch of the approximately 1,593-km Caspian Pipeline Consortium (CPC) pipeline, Kazakhstan took a major step towards increasing its oil exporting potential. The 1.34-Mbbl/d-capacity pipeline will enable Kazakhstan to pipe its oil directly from the Tengiz field to Russia's Black Sea port of Novorossiysk. The pipeline was officially opened on November 27, 2001.

Besides the CPC pipeline, a number of additional oil-export pipeline routes from the Caspian Sea region were under consideration or under development. Kazakhstan had expressed support for the Baku-Ceyhan Main Export Pipeline, but had not officially pledged to use the pipeline, thus not foreclosing any export options (U.S. Energy Information Administration, 2002b§).

Kazakhstan had three major oil refineries—in the northern region at Pavlodar, in the western region at Atyrau, and in the southern region at Shymkent. Their combined total refining capacity was 427,000 bbl/d (U.S. Energy Information Administration, 2002b§).

Russia.—Russia was one of the world's leading oil producers. Russia's oil production increased by 7.4% to 348 Mt in 2001 from 324 Mt in 2000. In February 2002, its oil production surpassed that of Saudi Arabia for the first time since the Soviet era and made Russia, at least temporarily, the world's leading oil producer. Russia had the world's eighth largest oil reserves; proven oil reserves were 48.6 Gbbl (about 6.6 Gt). Because of aging equipment and poorly developed fields, Russia was finding it difficult to develop its reserves. Russia's rate of oil production exceeded its rate of discovery of new reserves by a significant margin. To sustain and increase its oil production from 2001 levels will require large amounts of capital to develop new fields and to extend the life of existing oilfields with exhausted and low-yield reserves (U.S. Energy Information Administration, 2002c§).

A major restructuring of Russia's oil sector, which involved decentralization, began in 1992; privatization of Russian oil assets began in 1995. Hundreds of new participants have entered the oil sector at all levels of production and trade to form diverse types of enterprises, which included private, cooperative, municipal, public, joint stock, joint venture, and foreign owned. Still, fewer than one dozen major vertically integrated companies (VICs), which were mostly privatized oil companies formed between 1992 and 1998, controlled the majority of the Russian oil industry (Khartukov, 2002).

These VICs consisted of private companies, government-owned entities, and regional oil companies. The five largest VICs—OAO Lukoil, OAO Yukus, Siberian Oil Co., Surgutneftegaz (OAO SNG), and Tyumen Co.—were privately owned with, at most, symbolic state participation and operated nationally and, at times, internationally. The Government-owned major companies were represented by the 100% state-owned Rosneft and the Russian-Belarusian state-controlled Transneft, which almost fully monopolized crude oil pipeline shipments, and the 75% state-controlled Transnefteprodukt, which monopolized control of oil product shipments. On a regional level, the two major large, but not fully integrated enterprises, Baskir Fuel Co. and Tatneft, operated in the republics of Bashkortostan and Tatarstan, respectively, in the Volga-Urals region. Although these two companies were partly privatized, they were virtually controlled by the republic governments (Khartukov, 2002).

A number of other oil companies could fit into these categories of private, state-owned, and regional, but they would not qualify as major oil companies. The major Russian oil companies can be compared with major foreign firms in terms of production and reserves, but not in terms of capitalization. The shareholding structure of private oil companies was obscure with an interconnected network of wealthy Russian financiers, oil-related investment firms, and commercial banks that appeared to control these companies (Khartukov, 2002).

The sharp increase in oil prices in 1999 and 2000 provided Russian oil companies with revenues to upgrade infrastructure and to undertake new exploratory drilling. Besides further

developing oil fields in the West Siberia region where, as of 2001, most of the country's oil was produced, Russian oil producers were engaged in exploring the Russian sector of the Caspian Sea and uniting with foreign oil producers to develop oil projects in the Arctic region, eastern Siberia, and Sakhalin Island in the Russian Far East (U.S. Energy Information Administration, 2002c§). Foreign companies that were considering new investments in Russia were asking, however, for protection against unexpected changes in tax and regulatory policies as a precondition for investing in Russia (Herrick, Barrionuevo, and Whalen, 2002).

Besides being one of the world's leading oil producers, Russia was also one of the world's largest oil exporters. In 2001, its net oil exports were increased to 4.91 Mbbl/d (about 244 Mt), which made Russia the world's second largest oil exporter after Saudi Arabia. The decline in world oil prices in 2001 slowed Russia's economic recovery, which had been driven, in part, by high world oil prices in 1999 and 2000. The fall in world oil prices after September 11, 2001, resulted in members of OPEC requesting Russia and other non-OPEC members to reduce their oil exports to increase prices. In December 2001, Russia agreed to cut its oil exports by 150,000 bbl/d during the first half of 2002. Russia's state budget for 2002 was to be based on an average oil price of $23 per barrel and a minimum price of $18 per barrel (U.S. Energy Information Administration, 2002c§).

Despite Russia's pledge to reduce its oil exports by 150,000 bbl/d in the first half of 2002, Russian oil production was still forecast to post a 1.9% year-on-year increase in 2002. Although Russian Government officials pledged to limit the country's oil exports, new export routes, such as the Baltic Pipeline System, have provided a disincentive for Russian oil producers to reduce their output. Russia's oil exports could be higher if more pipeline export capacity was added. Many of Russia's oil pipelines were in disrepair; however, the country's main export pipeline, which was the 1.2-Mbbl/d-capacity Druzhba pipeline, was operating at close to capacity (U.S. Energy Information Administration, 2002c§).

With the increase in revenues from oil exports in recent years, Transneft took steps to upgrade the country's pipeline system. Transneft emphasized building new export pipelines to increase and diversify export routes for oil exporters. It constructed the new Baltic Pipeline System and was considering a possible pipeline to China (U.S. Energy Information Administration, 2002c§).

Russia had 42 oil refineries that had a total processing capacity of 6.9 Mbbl/d. Many of these refineries were in need of modernization. Refining capacity far exceeded the domestic demand for refined products of 2.38 Mbbl/d in 2001 (U.S. Energy Information Administration, 2002c§).

Turkmenistan.—Turkmenistan had 546 Mbbl (more than 74 Mt) of proven oil reserves and had resources of up to 1.7 Gbbl (about 231 Mt) mainly in offshore areas of the Caspian Sea and in the western part of the country. The country's oil production rapidly increased to 156,400 bbl/d (almost 7.8 Mt) in 1999 from 81,000 bbl/d (4 Mt) in 1995, but the rate of increase has greatly slowed since then; Turkmenistan produced 159,000 bbl/d (about 7.9 Mt) in 2001 and consumed 52,000 bbl/d (about 2.6 Mt). The state oil company Turkmenneft produced approximately 90% of this total; the remainder was produced by the state natural gas company Turkmengaz and several foreign oil companies that operated under PSAs (U.S. Energy Information Administration, 2002d§).

In the first 4 months of 2002, Turkmenistan was striving to increase its oil output to 200,000 bbl/d (more than 9.9 Mt) from additional production from newly developed wells in the western part of the country. In accord with a 10-year program, Turkmenistan planned to raise its oil production to almost 1 Mbbl/d (almost 50 Mt/yr) by 2010. To achieve this target, Turkmenistan will need $25 billion in foreign investment in its oil and natural gas sectors between 2002 and 2010. Projects that could substantially increase Turkmenistan's oil production, however, have stalled owing to problems with Government regulations, which included regulations that impeded exports. Because foreign investors do not have access to export pipelines that were controlled by state-owned firms, they were forced to sell the oil and natural gas they produced through the state commodities exchange or to send it to refineries. Oil and natural gas, however, were sold in Turkmenistan at fixed prices that were well below world market levels. Turkmenistan was making an effort to draft legislation that will expand opportunities for foreign investors to export oil and natural gas and that will include liberalizing pipeline transport, which could include easing access and reducing costs, and easing tax burdens (U.S. Energy Information Administration, 2002d§).

Turkmenistan had two refineries—the 120,500-bbl/d refinery at Seydi and the 116,500-bbl/d refinery at Turkmenbashy. Both facilities were slated for modernization and expansion to meet the country's expected increases in oil production and demand. In 2001, work on modernization was underway with financing from German and Japanese sources. French and Iranian firms have been engaged in modernization projects. France's Technip was awarded a contract to build a lubricants-blending plant scheduled for completion in 2004 (U.S. Energy Information Administration, 2002d§).

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TABLE 1
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
ARMENIA						
Metals:						
Copper:						
Concentrate, Cu content		9,000 e/	9,200 e/	9,600 e/	7,231 3/	7,056
Blister		5,000	3,000	5,000 e/	4,000	4,000
Gold e/	kilograms	500	350	400	400	400
Molybdenum, concentrate, Mo content		1,800 e/	2,500 e/	2,800 r/	6,044 r/	5,770
Rhenium (supply) e/	kilograms	NA	1,000	700	700	750
Silver	do.	1,000	1,000	1,200 e/	1,300 e/	1,300 e/
Zinc, concentrate, Zn content		830 e/	825 e/	879	528	745
Industrial minerals:						
Cement	thousand tons	297	300	287	219	276
Clays, bentonite (powder)		2,750 e/	3,000 e/	3,493	2,807	3,000 e/
Limestone	thousand tons	1,700	1,700	1,700 e/	12,800 r/	11,900
Perlite e/		6,000	35,000	35,000	35,000	35,000
Salt		26,000 e/	24,911	26,955	30,000	28,800
AZERBAIJAN 4/						
Metals:						
Aluminum:						
Alumina	thousand tons	10 r/	(4/) r/	76	217 r/	95
Aluminum, primary		4,800	-- r/	-- r/	-- r/	--
Alunite		50,000	--	--	23,000 r/	NA
Iron ore, marketable e/		2,200	6,600	--	NA r/	NA
Steel:						
Crude		24,600	8,000 r/ e/	-- r/	-- r/	--
Rolled		20,000	3,000	-- r/	-- r/	--
Pipes		13,000	3,100	100	4,000 r/	1,600
Ingots and castings		NA	8,292	381	846	NA
Industrial minerals:						
Caustic soda		23,400	21,000	20,800	30,000 e/	30,000 e/
Cement		314,800	201,000	171,400	200,000	500,000
Iodine e/	kilograms	300,000	300,000	300,000	300,000	300,000
Fertilizers, mineral		5,700	600	40	NA	NA
Gypsum e/		60,000	60,000	60,000	60,000	60,000
Salt		2,500 e/	3,518	2,978	3,801	4,000 e/
Sulfuric acid		52,500	24,000	24,000	24,000 e/	24,000 e/
Mineral fuels and related materials:						
Natural gas	thousand cubic meters	5,963,900	5,590,000	6,000,000	5,600,000	5,500,000
Natural gas plant liquids	thousand 42-gallon barrels	2,555	2,555	2,555	2,190 r/	NA
Petroleum, crude	thousand metric tons	9,027	11,420	13,800	14,100	14,900
BELARUS						
Metals, steel:						
Crude	thousand tons	1,220	1,412	1,449	1,623	1,852
Rolled	do.	1,072	1,250	1,300	1,400	1,500
Pipes		30,700	47,200	33,100 r/	37,000 r/	42,800
Industrial minerals:						
Cement	thousand tons	1,876	2,035	2,100 r/	1,847	1,803
Nitrogen, N content of ammonia	do.	590 e/	685	765	730	725
Potash, K_2O equivalent	do.	3,247	3,451	4,553	3,786	4,495
Salt 5/		297,100	355,200	344,318	310,741	301,000
Sulfur e/		20,000	20,000	20,000	20,000	20,000
Sulfuric acid	thousand tons	698	640	650 e/	650 e/	650 e/
Mineral fuels and related materials:						
Natural gas	million cubic meters	246	252	256	257	255
Peat:						
Horticultural use		253,000	99,000	100,000 e/	100,000 e/	100,000 e/
Fuel use		2,768,000	2,035,000	3,090,000	3,786,000 r/	4,495,000
Total		3,021,000	2,134,000	3,190,000	3,886,000 r/	4,595,000
Petroleum:						
Crude	thousand tons	1,822	1,830	1,840	1,851 r/	1,852
Refined	do.	11,900	11,539 r/	11,486 r/	13,528 r/	13,346

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
GEORGIA					
Metals:					
Copper, mine output, Cu content e/	4,100 3/	6,000	7,000 r/	8,000	8,000
Gold kilograms	700 e/	700 e/	2,043	2,924	2,000 e/
Iron and steel:					
Ferroalloys, electric furnace: e/					
Ferromanganese	4,000	10,000	6,500 r/	7,000 r/	7,000
Silicomanganese	16,600	35,000	25,000 r/	25,000 r/	25,000
Total	20,600	45,000	31,500 r/	32,000 r/	32,000
Steel:					
Crude	104,242	56,400 r/	7,000 r/	49,500	50,000
Finished products, rolled	86,700 r/	42,700 r/	7,200 r/	1,000	1,000 e/
Lead, mine e/	200	200	200	200	200
Manganese ore, marketable	14,200 r/	16,000 r/	47,900	59,100	70,000 e/
Silver kilograms	NA	NA	29,487	33,884	33,000 e/
Zinc, mine output, Zn content e/	200	200	200	200	200
Industrial minerals:					
Barite e/	20,000	20,000	15,000	15,000	15,000
Cement	90,600	200,000	342,200	347,700	300,000
Clays, bentonite	12,000	11,000 e/	9,891	7,084	7,000 e/
Nitrogen, N content of ammonia	84,000	64,000	104,000	135,000	60,000
Zeolites	6,000	NA	NA	NA	NA
Mineral fuels and related materials:					
Coal, bituminous	5,443 r/	13,608 r/	16,329 r/	19,958 r/	4,000
Natural gas thousand cubic meters	NA	NA	NA	1,000 r/	400
Petroleum:					
Crude	143,000	119,200	91,300	109,500	100,000
Refined	30,400 r/	53,100 r/	56,500	24,500	NA
KAZAKHSTAN					
Metals:					
Alumina thousand tons	1,095	1,085	1,158	1,217	1,220
Bauxite	3,380,000 r/ e/	3,436,800	3,606,500	3,729,600	3,667,700
Arsenic trioxide e/	1,500	1,500	1,500	1,500	1,500
Beryllium, metal e/	100	100	100 r/	100 r/	100
Bismuth, metal e/	50	50	55	55	130
Cadmium, metal	745	1,622	1,246	257	170
Chromite	1,795,900 r/	1,602,700	2,405,600	2,606,600	2,045,800
Cobalt, mine output, Co content e/	300	300	300	300	300
Copper:					
Mine output, Cu content	316,166	337,600 r/	374,000 r/ e/	430,000 r/	470,100
Metal:					
Smelter, undifferentiated	327,397 r/	351,336 r/	383,457	413,859	430,000 e/
Refined, primary	301,100 r/	324,900	361,889 r/	394,722 r/	421,800
Gold:					
Mine output, Cu content kilograms	18,700 e/	18,100 e/	20,236	28,171	27,100
Metal, refined do.	9,700 e/	8,900	9,655	11,529	16,569
Iron and steel:					
Iron ore, marketable thousand metric tons	12,600 r/	8,693	9,091 r/	16,160 r/	14,140
Metal:					
Pig iron	3,040,000	2,594,000	3,438,082	4,000,000 r/	3,911,000
Ferroalloys:					
Ferrochromium	600,000	535,000	731,563	799,762	761,900
Ferrochromiumsilicon	48,000 e/	33,550	49,282	55,634	79,800
Ferromanganese	-- r/	-- r/	--	1,075 r/	5,329
Ferrosilicon	133,000 e/	92,000 e/	140,263	133,269	145,800
Silicomanganese	55,000 e/	57,000 e/	78,495	102,719	141,200
Other	9,000	8,000	9,000 e/	9,000 e/	9,000 e/
Total	845,000 r/	725,550 r/	1,008,603	1,101,459 r/	1,143,029
Steel:					
Crude	3,900,000	3,089,000	4,116,000 r/	4,770,000 r/	4,693,900
Finished, rolled	3,000,000	2,519,000	3,186,000	3,700,000	3,700,000

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
KAZAKHSTAN--Continued						
Metals--Continued:						
Lead:						
Mine output, Pb content		31,000 r/ e/	30,000	34,100 r/ e/	40,000 r/ e/	37,700
Metal, smelter, primary and secondary		81,974	118,632	160,000 e/	185,800	158,800
Magnesium		8,972	9,000 e/	11,031	10,380	16,000 e/
Manganese ore:						
Crude		400,000	634,100	980,000 r/	1,136,000 r/	1,403,000
Marketable		230,000 e/	399,000	563,000	720,000	646,700
Molybdenum, mine output, Mo content		100 e/	100 e/	155	215	225 e/
Nickel, mine output, Ni content e/		-- r/	--	--	30 r/	3,200
Rhenium (supply) e/	kilograms	1,800	2,400	2,400	2,400	2,500
Silver:						
Mine output, Ag content		690,000	726,321	904,644	927,110	981,900
Metal, refined		390,000 e/	535,800	654,606	670,000	700,000
Tin, mine output, Sn content		NA	NA	119,643	218,863	219,000 e/
Titanium, metal		13,000 e/	12,000 e/	8,767	8,280	14,000
Vanadium, mine output, V content e/		900	1,000	1,000	1,000	1,000
Zinc:						
Mine output, Zn content		224,051	224,300	288,300 r/	325,000 r/	344,300
Metal, smelter, primary and secondary		188,996	240,728	249,327	262,200 r/	276,900
Industrial minerals:						
Asbestos, all grades		182,000	155,400	139,300	233,200	271,300
Barite, concentrate		38,000 r/ e/	9,000	13,300 r/	14,000 r/ e/	45,000 e/
Boron e/		30,000 r/	30,000 r/	30,000 r/	30,000 r/	30,000
Cement		661,000 e/	600,000 e/	837,800	1,175,000	1,957,000
Clay, kaolin e/		50,000	60,000	70,000	70,000	70,000
Nitrogen, N content of ammonia e/		75,000	--	--	--	--
Phosphate rock	thousand tons	1,000 e/	100 e/	68	33	97
Sulfur, byproduct: e/						
Metallurgy		139,000	212,000	245,000	300,000	300,000
Natural gas and petroleum		778,000	933,000	1,070,000	1,200,000	1,400,000
Total		917,000	1,150,000	1,320,000	1,500,000	1,700,000
Mineral fuels and related materials:						
Coal	thousand metric tons	72,600	69,800	58,378	74,872	79,000
Natural gas	million cubic meters	8,100	7,900	9,946	11,542	11,600
Natural gas plant liquids	thousand 42-gallon barrels	20,075	18,250	27,010	39,420 r/	NA
Petroleum, crude:						
Gravimetric units		25,800,000	25,900,000	30,100,000 r/	35,300,000 r/	39,700,000
Converted, volumetric units e/	thousand 42-gallon barrels	190,000	190,000	221,000 r/	260,000 r/	292,000
Refinery products		9,200,000	8,000,000 e/	7,205,000 r/	NA	NA
Uranium concentrate, U content		1,000	1,074	1,367	1,752 r/	2,018
KYRGYZSTAN						
Metals:						
Antimony:						
Mine output, Sb content e/		1,200 3/	150	100	150	150
Metal and compounds		4,401	1,298	1,320	1,505	1,200
Gold e/	kilograms	17,400 3/	22,000	20,000	22,000	24,000
Mercury:						
Mine output, Hg content e/		550	250	300	257	270
Metal		610 e/	620	620 r/	550 r/	579
Molybdenum		NA	225 e/	250	250 e/	250 e/
Industrial minerals:						
Cement		658,000	709,400	386,300	500,000 r/	500,000
Fluorspar concentrate		4,176	3,200 e/	2,997	3,000 e/	1,175
Rare earths:						
Concentrate, gross weight		NA	8,590 e/	11,878	14,900 r/	7,700
Rare-earth oxide equivalent:						
Compounds	kilograms	NA	691 r/	956 r/	NA r/	NA e/
Metals	do.	NA	6,355 r/	5,159	7,736	3,800 e/

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
KYRGYZSTAN--Continued					
Mineral fuels and related materials:					
Coal	521,500	432,400	417,000	424,900	477,300
Natural gas million cubic meters	24	18	25	32	33
Petroleum, crude	84,800	78,300	77,000	77,100	75,500
MOLDOVA					
Metals, crude steel	810,000	718,000	796,000	909,000 r/	966,000
Industrial minerals:					
Cement	121,800	74,000	50,000	222,000	158,100
Gypsum	14,400	19,800	18,500	32,000 r/	55,200
Lime	9,900	12,700	5,200	3,100	3,200
Sand and gravel cubic meters	346,700	248,300	317,700	276,400 r/	306,600
Mineral fuels, peat e/	475,000	475,000	475,000	475,000	475,000
RUSSIA					
Metals:					
Aluminum:					
Ore and concentrate:					
Alumina thousand tons	2,400 e/	2,465	2,657	2,850 e/	3,050
Bauxite e/	3,350,000	3,450,000	3,750,000	4,200,000	4,000,000
Nepheline concentrate, 25% to 30%	940,000	889,000	772,000	814,000	960,000
Metal, smelter, primary	2,906,020	3,004,728	3,146,232	3,245,000	3,300,000 e/
Antimony, mine output, Sb content (recoverable) e/	6,000	4,000	4,000	4,500	4,500
Arsenic, white e/	1,500	1,500	1,500	1,500	1,500
Beryllium, beryl, cobbed, 10% to 20% BeO e/ 6/	1,000	1,000	1,000	1,000	1,000
Bismuth, mine output, Bi content e/	50	35	50	50	50
Cadmium metal, smelter e/	790	800	900	925 3/	950
Chromium, chrome ore, marketable	151,000 r/ e/	150,000 r/ e/	115,100 r/	92,000 r/ e/	69,926
Cobalt: e/					
Mine output, recoverable Co content	3,300	3,200	3,300	3,600	3,800
Metal, refined	4,100	3,500	3,600	4,400	5,000
Copper:					
Ore, Cu content, recoverable e/	505,000	500,000 3/	530,000	570,000	620,000 3/
Metal:					
Blister: e/					
Primary	535,000	510,000	540,000	580,000	600,000
Secondary	35,000	40,000	158,000	200,000	200,000
Total	570,000	550,000	698,000	780,000 3/	800,000
Refined:					
Primary	535,000	543,000	600,000	640,000 e/	650,000
Secondary	65,000	77,000	150,000	200,000 e/	244,500
Total	600,000	620,000	750,000	840,000 e/	894,500
Gold, mine output, Au content kilograms	124,000 e/	114,900	125,870	143,000	152,500
Iron and steel:					
Iron ore, 55% to 63% Fe	70,900,000	72,343,000	81,311,000	86,630,000	82,800,000 e/
Metal:					
Pig iron	37,327,000	34,827,000	40,854,200	44,618,100	44,980,000
Direct-reduced iron	1,730,000 e/	1,550,000	1,880,000	2,000,000 r/	1,900,000
Ferroalloys: e/					
Blast furnace:					
Ferromanganese	47,100 3/	65,000 3/	90,000	70,700	70,700
Ferrophosphorus	3,600 3/	3,500	3,500	3,500	3,500
Spiegeleisen	7,000	7,000	7,000	7,000	7,000
Electric furnace:					
Ferrochromium	247,000	203,000 3/	249,000 3/	274,000 3/	210,600 3/
Ferrochromiumsilicon	5,000	4,000	4,500	4,500	4,000
Ferronickel	40,000	30,000	33,000	35,000	30,000
Ferrosilicon	510,000	496,000 3/	601,000 3/	652,000 3/	707,100 3/
Silicon metal	40,000	40,000	40,000	40,000	40,000
Other	40,000	40,000	40,000	40,000	35,000
Total	940,000	889,000	1,070,000	1,130,000	1,110,000

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
RUSSIA--Continued						
Metals--Continued:						
Iron and steel--Continued:						
Metal--Continued:						
Steel:						
Crude		48,499,300	43,821,800	51,524,100	59,097,500	59,000,000
Finished, rolled		37,800,000	35,134,000	40,900,000	46,900,000	47,100,000
Pipe		3,500,000	2,816,000	3,004,000	4,385,000	5,010,000
Lead:						
Mine output, recoverable Pb content		16,000	13,000	13,000	13,300 e/	12,300 e/
Metal, refined, primary and secondary e/		52,000	36,000	62,000	59,000	67,500
Magnesium: e/						
Magnesite		1,040,000	851,845 3/	900,000	1,000,000	1,100,000
Metal, including secondary		39,500 3/	41,500 3/	45,000	45,000	45,000
Manganese, mine output, Mn content e/		21,000	21,000	22,000	23,000	23,000
Mercury e/		50	50	50	50	50
Molybdenum e/		2,000	2,000	2,400	2,400	2,600
Nickel: e/						
Mine output, recoverable Ni content		280,000 r/	290,000 r/	300,000 r/	315,000 r/	325,000
Matte		366	98	114	517	97
Nickel products:						
Ferronickel		8,000 r/	8,000 r/	9,000 r/	7,000 r/	8,000
Metal		208,000 r/	203,000 r/	215,000	225,000	230,000
Oxide sinter		12,000 r/	14,000 r/	12,000 r/	14,000 r/	12,000
Chemicals		2,000	2,000	2,000	2,000	2,000
Total		230,000	227,000	238,000	248,000	252,000
Platinum-group metals: e/						
Platinum		30,000 r/	30,000 r/	32,000 r/	35,000 r/	35,000
Palladium		70,000 r/	70,000 r/	75,000 r/	84,000 r/	72,000
Other		13,500 r/	13,500 r/	13,700 r/	14,100 r/	--
Total		114,000 r/	114,000 r/	121,000 r/	133,000 r/	107,000
Rhenium (supply) e/	kilograms	NA	900	1,100	1,100	1,200
Silver e/	do.	400,000	350,000	375,000	370,000	380,000
Tin: e/						
Mine output, recoverable Sn content		7,500	4,500	4,500	5,000	--
Metal, smelter:						
Primary		6,700	3,000	3,400	4,700	4,569 3/
Secondary		1,000	500	400	500	500
Total		7,700	3,500	3,800	5,200	5,069 3/
Titanium, sponge e/		21,000	22,000	22,000 r/	23,000 r/	23,000
Tungsten concentrate, W content e/		3,000	3,000	3,500	3,500	3,600
Vanadium metal e/		9,000	9,000	9,000	9,000	9,000
Zinc: e/						
Mine output, recoverable Zn content		121,000	115,000	132,000 3/	136,000 3/	124,000
Metal, smelter, primary and secondary		189,000	192,000	221,000	230,000	237,000
Zirconium, baddeleyite concentrate, averaging 98% ZrO_2		5,745	6,293	6,800	6,500 e/	6,500 e/
Industrial minerals:						
Asbestos, grades I-VI		710,000 e/	600,000 e/	675,000 r/	750,000 r/	750,000 e/
Barite e/		60,000	60,000	60,000	60,000	60,000
Boron e/		1,000,000 r/	1,000,000 r/	1,000,000 r/	1,000,000 r/	1,000,000
Cement, hydraulic		26,700,000	26,000,000	28,400,000 e/	32,400,000	35,100,000
Clays, kaolin (concentrate)		50,000	50,000	40,600	45,000	45,000 e/
Diamond: e/						
Gem	thousand carats	11,200	11,600	11,500	11,600	11,600
Industrial	do.	11,200	11,600 r/	11,500	11,600	11,600
Synthetic	do.	80,000	80,000	80,000	80,000	80,000
Total	do.	102,000	103,000 r/	103,000	103,000	103,000
Feldspar e/		45,000	40,000	45,000	45,000	45,000
Fluorspar, concentrate 55% to 96.4% CaF_2		6,200	120,200	153,800	187,600	190,000 e/
Graphite e/		6,000	6,000	6,000	6,000	6,000
Gypsum		559,000	609,400	650,000	700,000	700,000 e/
Iodine e/	kilograms	250,000	280,000	300,000	300,000	300,000

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 p/
RUSSIA--Continued					
Industrial minerals--Continued:					
Lime, industrial and construction e/	7,626,000 3/	7,000,000	7,000,000	8,000,000	8,000,000
Lithium minerals, not further specified e/	2,000	2,000	2,000	2,000	2,000
Mica e/	100,000	100,000	100,000	100,000	100,000
Nitrogen, N content of ammonia	7,150,000	6,500,000	7,633,100	8,735,000	8,685,000
Peat, fuel use	3,363,000 r/	1,767,000 r/	3,350,000 r/	2,100,000 r/	2,100,000 e/
Phosphate rock: e/					
Gross weight	9,800,000	10,100,000	11,400,000	11,100,000	10,500,000
P_2O_5 content:					
Apatite concentrate, 37% to 39.6%	3,300,000	3,735,000 3/	4,161,000 3/	4,150,000 3/	3,900,000 3/
Sedimentary rock, 19% to 30%	300,000	300,000	300,000	300,000	300,000
Total	3,600,000	4,040,000	4,460,000	4,450,000	4,200,000
Potash, marketable, K_2O equivalent e/	3,400,000	3,500,000	4,200,000	3,700,000	4,300,000
Salt, all types	2,100,000	2,200,000	3,200,000	3,200,000 e/	2,800,000 e/
Sodium compounds, n.e.s., carbonate	1,700,000	1,600,000 e/	NA	NA	2,370,000
Sulfur: e/					
Native	50,000	50,000	50,000	50,000	50,000
Pyrites	400,000	254,000	300,000	350,000	400,000
Byproduct, natural gas	2,950,000	3,940,000	4,410,000	4,900,000	5,300,000
Other	350,000	411,000	510,000	600,000	500,000
Total	3,750,000	4,660,000	5,270,000	5,900,000	6,250,000
Sulfuric acid	6,100,000	5,840,000	208,000	184,000	185,000
Talc e/	90,000	79,000	90,000	100,000	100,000
Vermiculite e/	25,000	25,000	25,000	25,000	25,000
Mineral fuels and related materials:					
Coal:					
Anthracite thousand metric tons	13,600	10,400	9,900	1,050	NA
Bituminous do.	146,400	142,700	155,800	172,060	NA
Lignite do.	85,200	78,800	83,400	83,740	NA
Total 9/ do.	245,000	232,000	249,000	256,850	269,000
Coke, 6% moisture content	25,600,000	23,600,000	28,100,000 e/	60,000,000	60,000,000 e/
Gas, natural, marketed million cubic meters	571,000	591,400	592,000	584,000	581,000
Natural gas plant liquids 42-gallon barrels	71,175,000	80,300,000	84,315,000	84,680,000 r/	86,505,000
Oil shale	2,000,000 e/	1,715,000	1,950,000 e/	1,676,000	NA
Petroleum:					
Crude in:					
Gravimetric units thousand metric tons	306,000	303,300	305,000 e/	324,000 r/	348,000
Volumetric units e/thousand 42-gallon barrels	2,250,000	2,230,000	2,240,000	2,390,000	2,560,000
Refinery products 7/ thousand metric tons	178,000	164,000	175,000 r/	174,000	178,362
Uranium concentrate, U content e/	2,000	2,000	2,000	2,000 r/	2,000
TAJIKISTAN 8/					
Metals:					
Aluminum, primary	206,400	196,300	229,100	300,000	289,000
Antimony, Sb content of concentrate e/	1,200 3/	1,500	1,800	2,000	2,500
Bismuth, mine e/	5	5	5	5	5
Gold kilograms	2,550	3,000	2,700 e/	2,700 e/	2,700 e/
Lead, Pb content of concentrate e/	800	800	800	800	800
Mercury, Hg content of concentrate e/	40	35	35	40	40
Silver, Au content of concentrate kilograms	NA	5,000	5,000 e/	5,000 e/	5,000 e/
Industrial minerals:					
Cement	36,400	17,700	30,000	50,000	70,000
Fluorspar e/	9,000	9,000	9,000	9,000	9,000
Gypsum e/	26,000	31,700	35,000	35,000	35,000
Nitrogen, N content of ammonia e/	10,000	10,000	10,000	10,000	10,000
Mineral fuels and related materials:					
Coal	17,000	16,000	16,600	20,700	20,000
Natural gas thousand cubic meters	41,600	32,400	40,000	40,000	50,000
Petroleum, crude	26,000	19,400	20,000 e/	40,000 r/	50,000
TURKMENISTAN					
Industrial minerals:					
Bentonite e/	50,000	50,000	50,000	50,000	50,000
Bentonite powder e/	250 3/	250	250	250	250

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
TURKMENISTAN--Continued						
Industrial minerals--Continued:						
Bischofite e/		90 3/	90	100	100	100
Bromine e/	kilograms	130,000 3/	150,000	150,000	150,000	150,000
Cement e/		450,000	450,000	450,000	450,000	NA
Epsomite		NA	NA	NA	NA	NA
Ferrous bromide (51% Br) e/		83 3/	80	85	85	85
Gypsum e/		85,000	100,000	100,000	100,000	100,000
Iodine e/	kilograms	87,100 3/	90,000	150,000	150,000	150,000
Lime		16,000	15,000	16,000 e/	16,000 e/	16,000 e/
Nitrogen, N content of ammonia e/		60,700 3/	75,000	75,000	75,000	75,000
Salt e/		216,500 3/	215,000	215,000	215,000	215,000
Sodium sulfate e/		56,552 3/	55,000	60,000	60,000	60,000
Sulfur e/		9,227 3/	9,000	9,000	9,000	9,000
Mineral fuels and related materials:						
Natural gas	million cubic meters	17,300	14,000 e/	22,800 e/	47,000	46,300
Natural gas plant liquids	42-gallon barrels	6,205,000	6,205,000	6,205,000	5,840,000 r/	NA
Petroleum, crude e/		4,700,000 3/	6,500,000	7,800,000	7,350,000	7,900,000
UKRAINE						
Metals:						
Alumina	thousand tons	1,080 e/	1,291	1,230	1,360	1,370
Aluminum:						
Primary		100,500	106,700	115,425	119,290	121,034
Secondary		NA	71,164	110,940	128,952	130,000
Cadmium, metal e/		25	25	25	25	25
Germanium e/		22	22	22	NA	NA
Iron and steel:						
Iron ore, marketable		53,000,000 e/	50,758,000	47,769,100	55,883,200	54,650,000
Metal:						
Pig iron		20,561,000	20,840,000	21,937,000 r/	25,700,000 r/	26,400,000
Ferroalloys:						
Blast furnace:						
Ferromanganese		125,000 e/	112,400	57,800	85,400 e/	85,000 e/
Spiegeleisen e/		2,500	2,500	2,500 r/	5,400	5,000 e/
Electric furnace:						
Ferromanganese		160,000 e/	150,000 e/	199,539	252,679	250,000 e/
Ferrosilicon		300,000 e/	222,511	243,600	323,417	325,000 e/
Silicomanganese		560,000 e/	485,560	498,905	684,040	685,000 e/
Other e/		25,000	20,000	25,000	25,000	25,000 e/
Total		1,172,500	992,971	1,027,344	1,375,936	1,380,000 e/
Steel:						
Crude		25,600,000	23,461,000	27,390,000	31,780,000	33,110,000
Finished, rolled		19,525,000	17,776,000	19,300,000	22,500,000	25,300,000
Pipe		1,844,300	1,519,300	1,175,000	1,670,000	1,600,000
Lead, refined (secondary)		11,000 e/	9,000 e/	9,902	15,034	12,000 e/
Magnesium, primary		10,000 e/	5,043	3	3 r/ e/	3 e/
Manganese:						
Marketable ore		3,040,000	2,226,000	1,984,800	2,740,600	2,700,100
Mn content e/		1,030,000	755,000	675,000	930,000	930,000
Mercury e/		25	20	NA	NA	NA
Nickel, mine output, Ni content of ore		--	--	--	--	1,500
Silicon e/		1,000	1,000	1,000	NA	NA
Titanium:						
Ilmenite concentrate, 42% TiO		500,000 r/ e/	507,435	536,542	576,749	600,000 e/
Rutile concentrate, 95% TiO e/		50,000	50,000	49,000	58,600	60,000
Metal, sponge e/		1,200	4,000	4,000	4,000 r/	6,100
Zinc, metal, secondary e/		2,000	--	--	--	--
Industrial minerals:						
Bromine e/	thousand kilograms	3,000	3,000	3,000	3,000	3,000
Cement		5,098,000	5,591,200	5,828,100	5,311,400	5,500,000 e/
Clays: e/						
Bentonite		300,000	300,000	300,000	300,000	300,000
Kaolin		250,000	201,670 3/	221,526 3/	225,000	225,000

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
UKRAINE--Continued						
Industrial minerals--Continued:						
Diamond, synthetic e/	carats	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000
Graphite		5,000 e/	5,104	7,461	7,431	7,500
Nitrogen, N content of ammonia		3,400,000 e/	3,300,000	3,711,000 r/	3,577,000 r/	3,700,000
Potash, K_2O content e/		60,000 3/	35,000	50,000 r/	85,000 r/	75,000
Salt, rock		2,500,000 e/	2,500,000 e/	2,185,300	2,286,500	2,300,000
Soda ash e/		NA	390,000	460,000 3/	500,000	650,000
Sulfur, native		100,000	97,000	80,000 e/	80,000 e/	80,000
Zirconium concentrates e/		65,000	65,000	69,000	75,000	75,000
Mineral fuels and related materials:						
Coal:						
Hard	thousand tons	NA	41,750	45,216	40,983	NA
Brown	do.	NA	1,409	1,184	1,067	NA
Coking	do.	NA	32,608	35,424	38,940	NA
Total	do.	76,900	75,767	81,824	80,990	83,900
Coke		15,000,000 e/	13,956,700	17,309,700	19,362,600	19,500,000
Natural gas	thousand cubic meters	18,131,000	17,967,000	18,092,100	17,847,100	18,200,000
Natural gas plant liquids	42-gallon barrels	9,490,000	9,125,000	8,395,000	5,110,000 r/	5,000,000
Peat e/		1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Petroleum:						
Crude:						
As reported	gravimetric tons	4,131,200	3,894,800	3,797,900	3,692,900	3,700,000
Converted e/	42-gallon barrels	30,400,000	28,600,000	27,900,000	27,200,000	27,200,000
Refinery products		12,833,000	13,510,000	13,800,000 r/	NA	NA
Uranium concentrate, U content e/		500	500	500	600 3/	500
UZBEKISTAN						
Metals:						
Aluminum, secondary		2,700	2,500 r/	1,900 r/	1,500 r/	3,000 e/
Copper:						
Mine output, Cu content		73,000 r/	65,000 r/	60,000 r/ e/	65,000 r/ e/	65,000 e/
Metal: e/						
Blister:						
Primary		80,000	89,930 3/	72,000	75,000	75,000
Secondary		5,000	5,000	5,000	5,000	5,000
Total		85,000	94,930 3/	77,000	80,000	80,000
Refined:						
Primary		105,000	89,930 3/	72,000	75,000	75,000
Secondary		5,000	5,000	5,000	5,000	5,000
Total		110,000	94,930 r/ 3/	77,000	80,000	80,000
Gold	kilograms	81,700 e/	80,000	66,028	62,276	87,000 e/
Molybdenum, mine output, Mo content e/		500	500 r/	500 r/	500 r/	500
Rhenium (supply) e/	kilograms	NA	NA	NA	NA	NA
Silver, mine output	do.	85,000 r/ e/	85,000 r/ e/	88,700	89,900	80,000 e/
Steel:						
Crude		365,000 r/	344,000	343,000 e/	420,000	460,000
Rolled		350,000	322,000	300,000	400,000	430,000
Tungsten, mine output, W content e/		250	200	--	--	--
Zinc, metal, smelter, primary e/		53,000	52,000	27,000	18,000	20,000
Industrial minerals:						
Cement		3,300,000	3,400,000 e/	4,471,000	3,521,000	4,000,000 e/
Clays, kaolin e/		5,500,000	5,500,000	5,500,000	5,333,000 3/	5,500,000
Feldspar		NA	NA	300	4,300	4,300 e/
Fluorspar		90,000 e/	80,000 e/	--	--	--
Graphite e/		60	60	60	60	60
Iodine e/	kilograms	--	500	2,000	2,000	2,000
Mineral fertilizers		955,000	976,000	900,000	800,000 r/	NA
Nitrogen, N content of ammonia		950,000	875,000	790,000	810,000	670,000
Phosphate rock, gross weight e/	thousand tons	--	100	150	300	300
Sulfur, byproduct: e/						
Metallurgy		165,000	170,000 3/	175,000	160,000 r/	160,000
Natural gas and petroleum		250,000	275,000 3/	280,000	285,000 r/	300,000
Total		415,000	445,000 3/	455,000	445,000 r/	460,000

See footnotes at end of table.

TABLE 1--Continued
COMMONWEALTH OF INDEPENDENT STATES: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000	2001 p/
UZBEKISTAN--Continued						
Mineral fuels and related materials:						
Coal		3,130,000	2,950,000	3,033,000	2,556,000	3,000,000
Natural gas	million cubic meters	51,200	54,800	55,600	55,600	56,350
Natural gas plant liquids	42-gallon barrels	16,425,000	16,425,000	16,425,000	21,900,000 r/	NA
Petroleum and gas condensate		7,891,000	8,100,000	8,100,000	NA	7,450,000
Uranium, mine output, U content		1,764	2,000	2,159	2,350 r/	2,400

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. -- Zero.
1/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.
2/ Table includes data available through November 2002.
3/ Reported figure.
4/ For some metals, including copper, gold, lead, molybdenum, silver, and zinc, and for a number of industrial minerals that Azerbaijan had produced, information was not sufficient to derive production estimates or to determine if production had ceased.
5/ Includes byproduct salt from potash production.
6/ It appears that Russia in the mid-1990s stopped mining beryllium ore. Beryllium ore was reportedly not produced in 1998.
7/ Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy and nonenergy products but exclude losses.
8/ Tajikistan produces a number of other mineral commodities not listed in the table for which information is inadequate to derive estimates.
9/ Total coal production numbers rounded.

TABLE 2
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
ARMENIA			
Aluminum, rolled and foil	Kanaker aluminum plant	K'anak'err	25,000
Copper:			
Mine output, Cu content	Facilities:		30,000 4/
	Agarak copper-molybdenum mining and processing complex	Agarak	
	Kapan mining directorate	Kapan	
	Zangezur copper-molybdenum complex mining Kadzharan deposit	Kadzharan	
	Not in operation:		
	Akht'ala mining directorate	Akht'ala	
	Shamlugh mining directorate	Shamlugh	
Blister	Manes and Vallex joint stock company	Alaverdi	15,000
Diamond, cut stones	Aghavni diamond-cutting works	Nor Geghi	NA
Do.	Amma group diamond-cutting works	Artashat	NA
Do.	Andranik diamond-cutting works	Nor Hachyn	NA
Do.	Diamond Company of Armenia (DCA)	Yerevan	NA
Do.	Lori diamond-cutting works	Nor Hachyn	NA
Do.	Lusampor	Melik'gyugh	NA
Do.	Punji diamond-cutting works	Yerevan	NA
Do.	Sapphire diamond-cutting works	Nor Hachyn	NA
Do. thousand carats	Shoghakan gem-cutting plant	do.	120
Gold kilograms	Zod mining complex (mining ceased in 1997)	Zod	2,000
Do. do.	Ararat gold processing-tailings recovery plant	Ararat	1,000
Do.	Megradzor deposit (mining ceased in 1997)	Megradzor	NA
Do.	Lichkvazkoye, Shaumyanskiy Rayon, Sotkskoye, Terterasarskoye deposits		NA
Iron ore	Hrazdan deposit	Sulagyan Mountains	NA
Molybdenum, mine output, Mo content	Zangezur copper-molybdenum complex, mining Kadzharan deposit	Kadzharan	20,400
Do.	Agarak copper-molybdenum mining and processing complex	Agarak	2,000
Perlite thousand tons	Aragats-Perlite mining and beneficiation complex	Aragats deposit	1,110
Zinc, mine output, Zn content	Kapan mining directorate	Kapan	NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
AZERBAIJAN			
Aluminum thousand tons	Sumgait smelter	Sumqayit	100-150
Alumina	Gyandzha refinery	Ganca	100,000
Alunite ore	Zaglik alunite mining directorate	Zaglik	600,000
Arsenic		Dzhul'finskiy region	NA
Barite		Khanlarskiy region	NA
Cement			1,000,000 4/
	Karadagly cement plant	Karadagly	
	Tauz cement plant	Tauz region	
Clay, bentonite	Dash-Salakhlinskoye deposit	Kazakhskiy region	1,000,000
Copper	Karadaskiy complex	Shamkhorskiy region	30,000
Copper, byproduct gold and silver	Kedabekskiy Rayon deposit		NA
Copper, gold, iron, lead, sulfur, zinc	Katekhskoye, Katsdagskoye, Khikhinskoye deposits	Sheki-Belokanskiy zone, southern Caucasus	NA
Dolomite		Nakhichevan region	NA
Iodine and bromine	Baku, Karadagly, Neftechala plants	Process oil well brines at plants in Baku, Karadagly, Neftechala	NA
Iron ore, marketable	Dashkasan mining directorate	Dashkasan region	1,400,000
Lead-zinc ore		Ordubadskiy and Norashenskiy regions	NA
Limestone		Dashkasan region	NA
Molybdenum		Ordubadskiy region	NA
Natural gas, processing	Karadagly plant	Near Baku	NA
Petroleum and natural gas: 5/			
Crude petroleum and gas condensate	State Oil Company of Azerbaijan (SOCAR) for natural gas production	Production from 37 onshore deposits, including deposits on the Ashperon Peninsula and in the Izhnekurin Valley	3,000,000 4/
Do.	do.	Production from 17 offshore fields with more than 45% of natural gas produced from the Bakharly field and more than 50% of crude petroleum produced from the Guneshli field	12,000,000 4/
Do.	Azerbaijan International Operating Company (AIOC) for oil production	Azeri, Chirag-1, Guneshli offshore fields	7,000,000 4/
Do.	Alov, Araz, Khazar, Kyapaz-Serdar, Osman, Sharg offshore fields	Caspian Sea	NA
Natural gas million cubic meters			6,000 4/
	State Oil Company of Azerbaijan (SOCAR) for natural gas production	Production from 37 onshore deposits, which includes deposits on the Ashperon Peninsula and in the Izhnekurin Valley	
		Production from 17 offshore fields with more than 45% of natural gas produced from the Bakharly field and more than 50% of crude petroleum produced from the Guneshli field	
Do.	do.	Gunesli, Nakhchyvan, Shah-Deniz offshore fields	NA
Petroleum, refined 24-gallon barrels	Azernefteyag (formerly Baku) refinery	Baku	83,950,000 6/
Do. do.	Azernefteyagandzhah (formerly Novo-Baku) refinery	do.	77,380,000 6/
Pyrite, polymetallic		Filizchayskiy deposit	NA
Steel:			
Crude	Azerboru production amalgamation	Sumqayit	800,000
Rolled	do.	do.	700,000
Pipe, tubes	do.	do.	540,000
Stones, facing	Buzgovskiy and Shakhtakhtinskiy deposits		NA
Sulfur pyrites		Khanlarskiy region	NA
Travertine		Nakhichevan region	NA
BELARUS			
Cement	Krichevskiy and Volkovysk plants	Mahilyowskaya and Wawkavysk Voblasts'	2,200,000
Diamond	Kristall plant	Homyel'skaya Voblasts'	NA
Nitrogen, N content of ammonia	Grodno "Azot"+E148 Association	Hrodna region	1,000,000
Peat, fuel use	Production at 37 enterprises producing mainly briquets	All regions of country	5,000,000 7/

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
BELARUS--Continued			
Petroleum:			
Crude	Belarusneft Association	Southeastern part of country	2,000,000
Refined	Mazyr refinery	Mazyr	16,000,000 8/
Do.	Naftan refinery	Navapolatsk	8,450,000 8/
Potash, K_2O equivalent	Belaruskaliy Association	Salihorsk area	5,000,000
Steel:			
Crude	Belarus electric steelworks	Zhlobin	1,400,000
Pipe	Mahilyow metallurgical works	Mahilyowskaya Voblasts'	80,000
GEORGIA			
Arsenic:			
As content of ore			2,000 4/
	Lukhumi deposit	Racha	
	Tsana deposit	Svanetiya	
Metal and compounds	Racha mining and chemical plant	Racha	NA
Do.	Tsana mining and chemical plant	Ts'ana	NA
Barite	Chordskoye deposit	Onis Raioni (Onskiy Rayon)	70,000
Do.		Madneuli deposit	NA
Barite-zinc		Kvaisinskiy deposit	NA
Bentonite	Gumbrskoye and Askanskoye deposits	Gumbra and Askana regions	200,000 4/
Cement	Rust'avi cement plant	Rust'avi	1,500,000
Coal	Tkibuli-Shaorskoye, Tkvarchelskoye deposits	Akhalts'ikhis Raioni, Tqibuli, Tqvrach'eli regions	300,000 4/
Copper, Cu content of ore	Madneuli complex	Marneulis Raioni	12,000
Diatomite	Kisatibskoye deposit	K'isat'ibi region	150,000
Ferroalloys:			
Ferromanganese	Zestafoni plant	Zestap'onis Raioni	100,000
Silicomanganese	do.	do.	250,000
Manganese sinter	do.	do.	250,000
Gold	Georgian-Austrian joint venture Quartzite	Madneuli deposit	3
Lead-zinc:			
Pb content of ore	Kvaisi deposit	Kvaisi	1,200
Zn content of ore	do.	do.	3,000
Manganese, marketable ore	Chiaturmarganets complex	Chiat'ura-Sach'kheris Raioni field	200,000
Petroleum:			
Crude	About 60 wells accounting for 98% of output	Mirzaani, Sup'sa, Zemo T'elet'i regions	200,000 4/
Refined	Batumi refinery	Bat'umi	NA
Steel, crude	Rust'avi steel mill	Rust'avi	1,400,000
KAZAKHSTAN			
Alumina	Pavlodar aluminum plant	Pavlodar	1,250,000
Arsenic trioxide	Chimkent polymetallic enterprise and other nonferrous metallurgical enterprises	Shymkent	3,500
Asbestos	Dzhetygara complex	Qostanay	1,000,000 4/
	Chilisay complex	Aqtobe phosphorite basin	
Barite			300,000 4/
	Karagaylinskiy and Zhayrem mining and beneficiation complexes	Karagayly and Zhayrem deposits	
	Tujuk Mine	Almaty	
	Achisay polymetallic complex	Kentau region	
Bauxite	Turgayskiy and Krasnooktyabrskiy bauxite mining complexes	Central Kazakhstan	4,000,000
Beryllium, metal	Ul'ba metallurgical plant	Oskemen	NA
Bismuth, metal			70 4/
	Ust-Kamenogorsk lead-zinc metallurgical plant	Oskemen	
	Leninogorsk lead smelter	Leninogorsk	
Do.	Chimkent refinery	Shymkent	20
Cadmium	do.	do.	10
Do.	Leninogorsk mining and beneficiation complex	Leninogorsk	1,200
Chromite, mine output:			
Cr_2O_3 content (50.3%)	Donskoy GOK mining and beneficiation complex	Near Khromtau, Kempirsai region	5,000,000
Cr_2O_3 content (50%)	do.	Ten Years of Independence Mine	4,000,000
Coal	Karaganda Basin	Central and north-central parts of the country	50,000,000
Do.	Ekibastuz Basin	do.	85,000,000

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
KAZAKHSTAN--Continued			
Coal--Continued:	Maykuben Basin	do.	10,000,000
Do.	Turgay Basin	Central and north-central parts of the country	1,000,000
Copper:			
Mining, recoverable, Cu content	Irtysh	Ertis region	10,000
Do.	Leninogorsk	Leninogorsk region	15,000
Do.	Zyryanovsk mining and beneficiation complexes	Zyryanovsk region	5,000
Do.	Kazakhmys (OJSC) Balkhash mining and metallurgical complex	Zhezkazgan region	200,000
Mining, recoverable, Cu content--	Kazakhmys (OJSC) East Kazakhstan copper-chemical complex	East Kazakhstan region	12,000
Do.	Kazakhmys (OJSC) Zhezkent mining and metallurgical enterprise	Zhezkent region	25,000
Do.	Kazakhmys (OJSC) Zhezkazgan mining and metallurgical enterprise	Zhezkazgan region	250,000
Mining, gross weight of ore	Kazakhmys (OJSC) deposits:		37,400,000 4/
	Jalimambet, Kounrad, Sayak-1, Tastau, Zhezkazgan, Zhilandy	Central Kazakhstan	
	Shatyrkol' (Cu-Mo)	Southern Kazakhstan	
	Artemovskoye, Belousovskoye-Irtyshskoe, Nikolayevskoe, Orlovskoye, Shemonaikhinkoe, Yubileynoye-Snigirikhaskoe	Eastern Kazakhstan	
Do.	Kazakhmys (OJSC) Annenskiy mine	Annenskiy deposit	4,000,000
Do.	Kazakhmys (OJSC) 73/75 mine		2,000,000
Do.	Kazakhmys (OJSC) Itauz open pit mine	Zhilandy deposit	2,000,000
Metal:			
Blister	Ust-Kamenogorsk plant	Oskemen	37,100
	Kazakhmys (OJSC):		
Cathode	Balkhash mining and metallurgical complex	Zhezkazgan region	110,000
Do.	Zhezkazgan mining and metallurgical enterprise	do.	250,000
Metallurgy	Balkhash mining and metallurgical complex	do.	150,000
Do.	Zhezkazgan mining and metallurgical enterprise	do.	250,000
Do.	Irtysh smelting and refining complex	Ertis region	40,000
Refined	Ust-Kamenogorsk plant	Oskemen	6,600
Ferroalloys:			
Ferrochrome:			
High-carbon 60%	Aktybinsk plant	Aqtobe	200,000
Medium-carbon 60%	do.	do.	200,000
Do.	Aksu plant	Aksu	200,000
Ferrosilicon	do.	do.	700,000
Ferrosilicochrome	do.	do.	700,000
Ferrochrome, high-carbon	do.	do.	500,000
Silicomanganese	do.	do.	90,000
Gallium	Pavlodar aluminum plant	Pavlodar	NA
Gold	Byproduct of polymetallic ores and native gold mining	Byproduct gold colocated with nonferrous metals mining	30
Iron and steel:			
Pig iron	Ispat-Karmet Steelworks	Karaganda	5,000,000
Steel, crude	do.	do.	6,300,000
Iron ore, marketable	Lisakovskiy and Sokolovsko-Sarbay mining and metallurgical complexes	Qostanay	25,000,000
Lead:			
Mining, recoverable Pb content of ore	Achisay	Karatau and Kentau regions	40,000 4/
Do.	Akchatau	Zhezkazgan region	10,000
Do.	Irtysh	Oskemen region	10,000
Do.	East Kazakhstan copper-chemical complex	East Kazakhstan region	NA
	KazZinc subsidiaries:		
Do.	Leninogorsk mining-metallurgical complex	Leninogorsk region	60,000
Do.	Tekeli lead-zinc mining complex	Taldyqorghan and Tekeli regions	15,000 4/
Do.	Zyryanovsk lead-zinc complex	Zyryanovsk region	20,000
Do.	Karagayly	Karagayly region	20,000

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
KAZAKHSTAN--Continued			
Lead--Continued:			
Mining, recoverable Pb content of ore--Continued:	Sary-Arkapolimetal	Zhayrang region	20,000
Do.	Zhezkent	Semey region	NA
Refined	KazZinc Ust-Kamenogorsk metallurgical plant	Oskemen	145,000
Do.	KazZinc Leninogorsk mining-metallurgical comple	Leninogorsk region	30,000
Do.	Chimkent refinery	Shymkent	160,000
Magnesium, metal	Ust-Kamenogorsk titanium-magnesium plant	Oskemen	20,000
Manganese, crude ore			2,550,000 4/
	Atasurda	Atasu	
	Kazakmarganets	Zhezdy	
	Sary-Arkapolimetal	Zhayrang region	
Molybdenum:			
Metal	Akchatau molybdenum metal plant	Zhezkazgan region	NA
Mining, recoverable content of ore			6,000 4/
	Balkhash complex	Kounrad Mine	
	Karaobinskoye deposit	Karaoba region	
	Sayak deposit	Sayaq (Sayak) region	
Natural gas million cubic meters			12,000 4/
	Aktyubinskmunaigaz	Aqtobe	
	Embamunaigaz	Emba District	
	Huricane Kumkol Munai	Aral Sea region	
	Karachaganak field	Northwestern Kazakhstan	
	Mangistaumunaigaz	Mangghhyshlaq Peninsula	
	Tengizchevroil joint venture	Tengiz deposit	
		Zhanazhol deposit	
		Urikhtau deposit	
	Agip Kazakhstan North Caspian Operating Company (AGip KCO)	Kashagana offshore field	
	Uzenmunaigaz	Uzen deposit	
Petroleum:			
Crude			32,000,000 4/
	Aktyubinskmunaigaz	Aqtobe	
	Embamunaigaz	Emba District	
	Huricane Kumkol Munai	Aral Sea region	
	Karachaganak Integrated Organization (KIO)	Karachaganak field	
	Mangistaumunaigaz	Mangghhyshlaq Peninsula	
	Uzenmunaigaz	Uzen deposit	
Do.	Alibekmola, Ayrankul, Chinarevskoye, Kozhasay, North Buzachi, Sazankurak, Saztyube, Urikhtau deposits		NA
Do. 24-gallon barrels per day	Tengizchevroil joint venture	Tengiz deposit (peak production by 2010)	750,000
Do. do.	Agip Kazakhstan North Caspian Operating Company (AGip KCO)	Kashagana offshore field	100,000
Refined, crude oil throughput do.	Atyrau Pavlodar, Shymkent refineries	Atyrau, Pavlodar, Shymkent	427,000 4/
Phosphate rock	Chilisay mining directorate	Aqtobe phosphorite basin	10,000,000 4/
	Karatau production association	Shymkent and Zhambyl regions	
Rare metals [columbium (niobium), indium, selenium, tellurium]	Aktau complex	Aktau	NA
Do.	Belogorsky rare metals plant	Belogorskiy	NA
Do.	Chimkent polymetallic plant	Shymkent	NA
Do.	Ust-Kamenogorsk lead-zinc plant	Oskemen	NA
Do.	Akchatau mining and beneficiation complex	Zhezkazgan region	NA
Rhenium	Balkhash copper mining-metallurgical complex	Zhezkazgan region	NA
Silver, refined			800 4/
	Chimkent metallurgical plants	Shymkent	
	Leninogorsk	Leninogorsk	
	Ust-Kamenogorsk	Zhezkazgan region	
Tantalum	Yermak ferroalloy plant	Aksu	NA
Tin	Akchatau mining and beneficiation complex	Akzhaik deposit, Zhezkazgan region	700

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
KAZAKHSTAN--Continued			
Titanium, metal	Ust-Kamenogorsk titanium-magnesium plant	Oskemen	35,000
Uranium, U content			3,500 4/
	Prikaspiskiy ore enrichment center	Aqtau	
	Shevchenko	do.	
	Stepnogorsk	Stepnogorsk	
	Taboshara	Taboshara	
	Tselinny chemical complex	Stepnogorsk	
Zinc:			
Concentrates	Kazakhmys (OJSC) East Kazakhstan copper-chemical complex	East Kazakhstan region	50,000
Do.	Kazakhmys (OJSC) Zhezkent mining and metallurgical enterprise	Zhezkent region	25,000
Metal	KazZinc Ust'-Kamenogorsk metallurgical plant	Oskemen	160,000 9/
Do.	KazZinc Leninogorsk mining and metallurgical complex	Leninogorsk	107,000 9/
Ore	Tishinskiy deposit		NA
Do.	(KazZinc) Tekeli lead-zinc mining complex	Taldyqorghan and Tekeli regions	30,000 4/
KYRGYZSTAN			
Antimony:			
Sb content of ore	Kadamzhai and Khaidarkan complexes	Kadamzhaiskiy Rayon, Khaidarkan region	2,400 4/
Ore	Kadamzhai beneficiation plant	Kadamzhai deposit	200,000
Do.	Terek-Sayskiy beneficiation plant	Terek-Sayskiy deposit	60,000
Metal and compounds	Kadamzhai metallurgical facility	Kadamzhaiskiy Rayon	28,000
Antimony-fluorspar-mercury	Khaidarkan mining and metallurgical complex	Chauvi-Chonkoy-Khaidarkan deposit	NA
Cement	Kantskiy cement plant	Kant	1,500,000
Coal	Seven underground mines, five open pits, includes deposits: Almalyk, Dzhergalan, Kara-Kiche, Kok-Yangak, Kyzyl-Kiya, Sulyukta, Tashkumyr	Southwestern, central, and northeastern parts of the country	2,200,000 4/
Fluorspar, concentrate	Khaidarkan mining and metallurgical complex	Khaidarkan deposit	5,000
Gold:			
Au content of ore	Makmalzoloto	Makmal deposit	3
Do.	Kumtor Gold Company	Kumtor deposit	22
Do. kilograms	Solton-Sary Mine	Naryn	500
Do.	Taldybulak Levoberezhny deposit		NA
Au content of ore, open pit	Kyrgyzaltyn-Noroks Mining Company JV	Dzher-Uy deposit	650,000
Au content of ore, underground	do.	do.	350,000
Refined	Kara-Balta refinery	Chuskaya Oblast'	22
Mercury:			
Hg content of ore	Khaidarkan mining and metallurgical complex	Bol'shoy Khaidarkan, Chauvi, Chonkoy, Khaidarkan, Novoye deposits	700 4/
Metal	do.	do.	1,000
Molybdenum, for nonmetallurgical uses	Molibden Joint Stock Company	Chuskaya Oblast'	NA
Do.	Kara Balta mining and metallurgical complex		
Natural gas million cubic meters	Kyrgyzazmunayzat	Approximately 300 wells; Changyr-Tash, Chigirchik Pereval, Izbaskentskoye, Kara-Agach, Mayluu-Suu, Susahoye, Togap-Beshkenskoye deposits (major)	100 4/
Petroleum	do.	do.	150,000
Rare earths:			
Cerium and yttrium	Aktyuzskiy mining directorate	Kutessai II deposit	NA
Concentrates, gross weight	Kyrgyz chemical and metallurgical plant	Aktyuz-Boordu deposit	14,000
Compounds and metals, rare-earth oxide equivalent	do.	Orlovka	8,000
Silver	Kumyshtag deposit	Talasskaya Oblast'	NA
Do.	Karagoyskoye deposit	Oshskaya Oblast'	NA
Tin	Uchkoshkon deposit	Sary-Dzhas field	NA
Do.	Tyan'Shan'olovo mining-beneficiation complex	do.	NA
Do.	Enil'chek JSC mining enterprise	Atdzhaylau deposit	150
Do.	do.	Trudovoye deposit	350
Do.	Enil'chek JSC, Kyrgyzaltyn, Deputatskiy mining and beneficiation complex	do.	149,100

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
KYRGYZSTAN--Continued			
Tungsten	Enil'chek JSC, Kyrgyzaltyn, Deputatskiy mining and beneficiation complex	Trudovoye deposit	149,100
Do.	Enil'chek JSC mining enterprise	Atdzhaylau deposit	90
Do.	do.	Trudovoye deposit	120
Uranium oxide, processed	Kara-Balta mining and metallurgical complex	Chuskaya Oblast'	1,200
MOLDOVA			
Natural gas thousand cubic meters	Redeco Moldova oil and gas company	Victorovca gas field	5,000
Oil	do.	Valeni oil field	100,000
Steel, crude	Moldova Steel Works minimill	Ribnita, Transnistria region	1,000,000
RUSSIA			
Alumina	Achinsk	Achinsk in East Siberia	900,000
Do.	Bogoslovsk	Ural'skiye Gory	1,050,000
Do.	Boksitogorsk	European north	200,000
Do.	Nadvoitsy	Nadvoitsy in Karelia	266,000
Do.	Uralsk	Kamensk region	536,000
Do.	Volkhov	Volkhov, east of St. Petersburg	45,000
Aluminum, primary smelters	Bogoslovsk	Krasnotur'insk	175,000
Do.	Bratsk	Bratsk	950,000
Do.	Irkutsk	Irkutskaya Oblast'	300,000
Do.	Kandalaksha	Kola Pennisula	75,000
Do.	Krasnoyarsk	Krasnoyarskiy Kray	875,000
Do.	Nadvoitsy	Nadvoitsy in Karelia	75,000
Do.	Novokuznetsk	Novokuznetsk	300,000
Do.	Sayansk	Sayanogorsk	425,000
Do.	Uralsk	Kamensk	80,000
Do.	Volgogard	Volgogradskaya Oblast'	175,000
Do.	Volkhov	Volkhov, east of St. Petersburg	20,000
Antimony:			
Sb content of concentrate			6,000 4/
	Sarylakh deposit	Ust'-Nera region	
	Sentachan deposit	Northeastern Sakha (Yakutiya) Republic	
Compounds and metals	Ryazsvetmet plant	Ryazanskaya Oblast'	NA
Apatite, concentrate	Khibiny apatite asociation	Kola Peninsula	15,000,000
Do.	Kovdor iron ore mining association	do.	700,000
Asbestos	Kiyembay	Orenburgskaya Oblast'	500,000
Do.	Tuvaasbest	Tuva Autonomous region	250,000
Do.	Uralaasbest	Central Urals	1,100,000
Bauxite	North-Urals mining company	Severoural'sk region	NA
Do.	South-Urals mining company	South Urals	NA
Do.	Severnaya Onega Mine	Northwest region	800,000
Boron, boric acid	Bor Association	Maritime Territory	140,000
Do.	Amur River complex	Far East	8,000
Do.	Alga River chemical complex	do.	12,000
Chromite	Saranov complex	Saranovskiy	200,000
Coal	Donets (east) Basin	Rostovskaya Oblast'	30,000,000
Do.	Kansk Achinsk Basin	East Siberia	50,000,000
Do. thousand tons	Kuzntesk Basin (Kuzbass)	West Siberia	160,000
Do.	Moscow Basin	Moscow region	15,000,000
Do.	Neryungri Basin	Sakha (Yakutiya) Republic	15,000,000
Do.	Pechora Basin	Komi Republic	30,000,000
Do.	South Yakutia Basin	Sakha (Yakutiya) Republic	17,000,000
Cobalt:	Noril'sk Nickel	Noril'sk, Kola Peninsula	4,000
Do.	Rezh and Yuzhuralnikel enterprises	South Urals	2,100
Do.	Ufaleynikel company	Chelyabinsk region, Urals	1,900
Do.	Tuva cobalt	Khovu-Aksy, Tuva Autonomous region	NA
Copper:			
Concentrate, Cu content	Buribai enterprise	Buribay region	5,000
Do.	Gai complex	Gai region	40,000
Do.	Kirovgrad complex	Kirovgrad region	12,000
Do.	Krasnoural'skiy complex	Krasnoural'skiy region	12,000
Do.	Noril'sk complex	Noril'sk region, Kola Peninsula	400,000

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies or deposits	Location or deposit name	Annual capacity e/
RUSSIA--Continued				
Copper--Continued:				
Concentrate, Cu content--Continued:		Urap complex	Stavropol'skiy Kray	7,000
Do.		Sredneuralsk complex	Ekatrinenburg region	12,000
Do.		Uchali complex	Uchalinskiy Rayon	40,000
Metal		Kirovgrad (smelting)	Kirovgrad	150,000
Do.		Krasnoural'skiy (smelting)	Krasnoural'sk	60,000
Do.		Kyshtym (refining)	Kyshtym	70,000
Do.		Mednogorsk (smelting)	Mednogorsk	40,000
Do.		Noril'sk (smelting and refining)	Nori'lsk	500,000
Do.		Psysh (refining)	Psysh	350,000
Do.		Severonikel (smelting)	Monchegorsk	20,000
Do.		Sredneuiralsk (smelting)	Revda	140,000
Ore		Noril'sk Polar Division	Oktyabr'skiy deposit, East Siberia	1,600,000
Do.		Molodezhnyy, Sibay, Uchali open pits	Urals	NA
Do.		Mednogorsk complex	Aleksandrinskoye deposit	NA
Do.		Gai complex	Letneye deposit	NA
Do.		Rezh nickel plant	Safyanovoskoye deposit	NA
Do.		Udokan deposit	Chita Oblast	10,000,000
Diamond:				
Gem	thousand carats	Almazy Rossii-Sakha Association (ALROSA) Udachnyy mining and beneficiation enetrprise	Zarnitsa and Udachnyy Mines	NA
Do.	do.	ALROSA Mirny mining and beneficiation	Mir and International Mines	NA
Do.	do.	ALROSA Aikhal mining and beneficiation	Aikhal and Komsomol'skiy Mines	NA
Do.	do.	ALROSA Anabaraskiy mining and beneficiation	Alluvial mines	NA
Do.	do.	ALROSA Nyurbinskiy mining and beneficiation	Nyurbinskiy and Botuobinskiy Mines	NA
Industrial	do.	ALROSA	Aykhal, Mirnyy, Udachnaya areas of Sakha (Yakutiy Republic; Mir, Komsomol'skaya, Verkne-Modunskoye pipes; Lomonosov in Arkhangel'skaya Oblast'	12,000 4/
Feldspar		Kheto-Lanbino and Lupikko deposits	Karelia	NA
Ferroalloys		Kosaya Gora iron works	Kosaya,Gora	200,000
Do.		Kuznetsk ferroalloys plant	Novokuznetsk	400,000
Do.		Lipetsk iron and steel works	Lipetskaya Oblast'	NA
Do.		Serov ferroalloy plant	Serov	NA
Do.		Chelyabinsk electrometallurgical plant	Chelyabinskaya Oblast'	450,000
Do.		Chusovoy iron and steel plant	Chusovoy	NA
Do.		Klyuchevsk ferroalloy plant	Dvurechensk	160,000
Ferronickel		Ufaleynikel company	Chelyabinsk region, Urals	5,000
Ferrovanadium		Vanadii-Tulachermet	Tula, North Caucasus	NA
Fluorspar		Abagaytuy deposit	Transbaikal	NA
Do.		Usugli mine	do.	NA
Do.		Kyakhtinsky deposit	do.	NA
Do.		Kalanguy mining complex	Chita region, Transbaikal	NA
Do.		Yaroslavsky mining and beneficiation complex	Pogranichnoye and Vosnesenskoye deposits, Russian Far East maritime (Primor'ye) region	NA
Gold	kilograms	Mining regions:		200,000 4/
		Buryat	Buryatiya Republic	
		Irkutsk (Lenzoloto Gold Company)		
		Krasnoyarsk (Polius Gold Company)	Krasnoyarskiy Kray (Olimpiady deposit)	
		Magadan (Omolon Gold Company)	Magadanskaya Oblast'	
		Maritime	Maritime Territory	
		Tuva	Tuva Autonomous region	
		Yakut-Sakha	Sakha (Yakutiya) Republic	
Iron ore		Kursk Magnetic Anomaly (KMA):		50,000,000 4/
		Lebedi and Stoilo	Gubkin	
		Mikhailovka	Zheleznogorsk	
Do.		Northwest:		22,000,000 4/
		Kostomuksha	Kostomuksha	
		Kovdor	Kola Peninsula	
		Olenegorsk	Olenegorsk	

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
RUSSIA--Continued			
Iron ore--Continued:	Urals:		22,000,000 4/
	Akkermanovka	Novotroitsk	
	Bakal	Bakal	
	Goroblagodat	Kushva	
	Kachkanar	Kachkanar	
	Magnitogorsk	Magnitogorsk	
	Peshchanka	Rudnichnyy	
Do.	Siberia:		18,000,000 4/
	East:		
	Korshunovo	Zheleznogorsk	
	Rudnogorsk	Rudnogorsk	
	West:		
	Abakan	Abaza	
	Sheregesh	Sheregesh	
	Tashtagol	Tashtagol	
	Teya	Vershina Tei	
Lead, metal	Dalpolymetal lead smelter	Rudnaya in the Maritime District	20,000
Do.	Elektrozinc lead smelter	Vladikavkaz in North Caucasus	30,000
Lead-zinc:			
Lead, recoverable Pb content of ore	Altay mining and benefication complex	Altay mountains region, South Siberia	2,000
Do.	Dalpolymetal mining and benefication complex	Maritime Territory	20,000
Do.	Nerchinsk polymetallic complex	Chitinskaya Oblast'	7,000
Do.	Sadon lead-zinc complex	Severnaya Osetiya-Alaniya Republic	5,000
Do.	Salair mining and benefication complex	Kemerovo Oblast'	2,000
Zinc, recoverable Zn content of ore	Altay mining and benefication complex	Altay mountains region, South Siberia	1,000
Do.	Dalpolymetal mining and benefication complex	Maritime Territory	25,000
Do.	Nerchinsk polymetallic complex	Chitinskaya Oblast'	12,500
Do.	Sadon lead-zinc complex	Severnaya Osetiya-Alaniya Republic	14,000
Do.	Salair mining and benefication complex	Kemerovo Oblast'	10,500
Magnesite	Satka deposit	Chelyabinsk Oblast'	3,800,000
Magnesium, metal (for sale)	Avisma plant	Berezniki	22,000
Do.	Solikamsk plant	Solikamsk	21,500
Mica	Aldan	Sakha (Yakutiya) Republic	NA
Do.	Karel	Karelia	NA
Do.	Kovdor	Kola Peninsula	NA
Do.	Mam	Irkutsk complex	NA
Molybdenum	Dzhida tungsten-molybdenum mine	West Transbaikal	NA
Do.	Sorsk molybdenum mining enterprise	Sorsk region	NA
Do.	Tyrnyauz tungsten-molybdenum mine	North Caucasus	NA
Do.	Shakhtaminskoye molybdenum mining enterprise	Chitinskaya Oblast'	NA
Natural gas million cubic meters	Komi Republic	Komi Republic	8,000
Do. do.	Noril'sk area	Noril'sk area	5,500
Do. do.	North Caucasus	North Caucasus	6,000
Do. do.	Sakhalin	Far East	2,000
Do. do.	Tomsk Oblast	West Siberia	500
Do. do.	Tyumen Oblast including:	do.	575,000 4/
Do. do.	Medvezhye field	do.	(75,000)
Do. do.	Urengoi field	do.	(300,000)
Do. do.	Vyrngapur field	do.	(17,000)
Do. do.	Yamburg field	do.	(170,000)
Do. do.	Bovanenko field	Yamal Peninsula	NA
Do. do.	Pestsovoyy field	Ob-Taz Gulf area	NA
Do. do.	Zapolyarnyy field	do.	NA
Do. do.	Schtokmanov field	Barents Sea	NA
Do. do.	Urals	Ural'skiye Gory	45,000
Do. do.	Volga	Volga region	6,000
Do. do.	Yakut-Sakha	Sakha (Yakutiya) Republic	1,500
Nepheline syenite	Apatite complex	Kola Pennisula	1,500,000
Do.	Kiya-Shaltyr Mine	Goryachegorsk region, east Siberia	NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
RUSSIA--Continued			
Nickel:			
Metal:			
Smelting	Nori'lsk Nickel	Noril'sk	160,000
Do.	do.	Pechenga	50,000
Do.	do.	Monchegorsk	50,000
Refining	do.	do.	100,000
Do.	do.	do.	140,000
Nickel in products and in FeNi	Rezh, Ufaleynikel, Yuzhuralnikel enterprises	South Urals	65,000
Nickel in ore	Noril'sk Nickel Association	Noril'sk region, Kola Peninsula	300,000
Do.	Ufaleynikel company	Chelyabinsk region, Urals	17,000
Do.	Yuzhuralnikel company	South Urals	3,000
Oil shale	Leningradslanets Association	Slantsy region	5,000,000
Petroleum	East Siberia, Tomsk Oblast	Tomskaya Oblast'	11,000,000
Do.	European Russia, Astrakhan	North Caspian Sea basin	700,000
Do.	European Russia, Bashkortostan	Ural'skiye Gory	28,000,000
Do.	European Russia, Checheno-Ingush Republic	Southern Caucasus	4,500,000
Do.	European Russia, Dagestan	North Caucasus	700,000
Do.	European Russia, Kaliningrad Oblast	Baltic coast	1,800,000
Do.	European Russia, Komi Republic	Northwest	15,000,000
Do.	European Russia, Krasnodar Kray	North Caucasus	2,000,000
Do.	European Russia, Orenburg Oblast	Ural'skiye Gory	13,000,000
Do.	European Russia, Perm Oblast	do.	12,000,000
Do.	European Russia, Samara	Volga region	16,000,000
Do.	European Russia, Saratov Oblast	do.	1,500,000
Do.	European Russia, Stavropol Kray	North Caucasus	2,000,000
Do.	European Russia, Tatarstan	Volga region	40,000,000
Do.	European Russia, Udmurt Republic	Ural'skiye Gory	9,000,000
Do. thousand tons		Tyumenskaya Oblast', West Siberia	300,000 4/
Do. do.	Kogolym field	do.	(34,000)
Do. do.	Krasnoleninskiy field	do.	(12,000)
Do. do.	Langepas field	do.	(30,000)
Do. do.	Megion field	do.	(18,000)
Do. do.	Nizhnevartovsk field	do.	(70,000)
Do. do.	Noyabrsk field	do.	(37,000)
Do. do.	Purneftegaz field	do.	(12,000)
Do. do.	Surgat field	do.	(48,000)
Do. do.	Uray field	do.	(8,000)
Do. do.	Varegan field	do.	(10,000)
Do.	Sakhalin Island	Sakhalin Island	2,500,000
Phosphate rock	Kingisepp complex	Leningradskaya Oblast'	NA
Do.	Lopatino, Yegorevsk deposits	Moscow Oblast'	NA
Do.	Polpinskoye deposit	Bryanskaya Oblast'	NA
Do.	Verkhnekamsk deposit	Ural'skiye Gory	NA
Phosphate rock, apatite concentrate	Khibiny Apatit Association	Kola Peninsula	20,000,000
Do.	Kovdor iron mining complex	do.	700,000
Platinum-group metals:			
Ore	Nori'lsk Nickel	Polar Division, Siberian deposits:	
Do.	do.	Noril'sk	135
Do.	do.	Oktyabr'skiy and Talnakh	NA
Do.	AO Koryakgeoldobycha, Amur Prospectors	Placer deposits (mostly platinum), Urals, Siberia, Russian Far East	10 4/
Metals	Krasnoyarsk Nonferrous Metals Plant	Krasnoyarskiy Kray	NA
Do.	Ekaterinburgskiy plant (EZOTsM)	Ekaterinburg	NA
Do.	Priobsk plant	Priobsk	NA
Potash, K_2O equivalent	Uralkaliy	Verkhnekamsk deposit	3,000,000
Do.	Silvinit	Solikamsk-Berezniki regions, Ural'skiye Gory	2,000,000
Silver	Dukat Mine 10/	Magadanskaya Oblast'	1,000
Soda ash	Achinsk plant	East Siberia	595
Do.	Achinsk plant	East Siberia	595
Do.	Berezniki plant	Ural'skiye Gory	1,080
Do.	Pikalevo plant	Leningradskaya Oblast'	200

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
RUSSIA--Continued			
Soda ash--Continued:	Sterlitamak plant	Sterlitamak	2,135
Do.	Volkhov plant	Leningradskaya Oblast'	20
Steel, crude	Amurstal	Komsomol'sk-na-Amure	1,600,000
Do.	Asha	Asha	450,000
Do.	Beloretsk	Bashkirskoye	380,000
Do.	Chusovoy	Chusovoy	570,000
Do.	Elektrostal	Moscow	314,000
Do.	Gorky	Nizhniy Novgorod	78,000
Do.	Gur'yevsk	Gur'yevsk	160,000
Do.	Karaganda	Karaganda	6,300,000
Do.	Lipetsk	Lipetskaya Oblast'	9,900,000
Do.	Lys'va	Lys'va	350,000
Do.	Magnitogorsk	Magnitogorsk	16,200,000
Do.	Mechel (Chelyabinsk)	Chelyabinskaya Oblast'	7,000,000
Do.	Nizhniy Tagil	Nizhniy Tagil	8,000,000
Do.	Nizhniy Sergi	Nizhniye Sergi	300,000
Do.	Nosta (Orsk-Kahlilovo)	Novotroitsk in Orenburgskaya Oblast'	4,600,000
Do.	Novosibirsk	Novosibirskaya Oblast'	1,100,000
Do.	Omutninsk	Omutninsk	210,000
Do.	Oskol Electric Steel	Staryy Oskol	2,500,000
Do.	Petrovsk-Zabaykal'skiy	Petrovsk-Zabaykal'skiy	426,000
Do.	Revda	Revda	281,000
Do.	Salda	Sverdlovskaya Oblast'	1,900
Do.	Serov A.K.	Serov	1,000,000
Do.	Serp i Molot	Moscow	70,000
Do.	Severskiy	Polevskoy in Sverdlovskaya Oblast'	825,000
Do.	Severstal (Cherepovets)	Cherepovets	14,000,000
Do.	Sibelektrostal	Krasnoyarskiy Kray	110,000
Do.	Sulin	Sulin	280,000
Do.	Taganrog	Taganrog	925,000
Do.	Tulachermet Scientific and Industrial Association	Tula	18,400
Do.	Verkh-Isetskiy	Ekatrinenburg	132,000
Do.	Volgograd	Volgogradskaya Oblast'	2,000,000
Do.	Vyksa	Vyksa	540,000
Do.	West Siberian	Novokuznetsk	6,900,000
Do.	Zlatoust	Zlatoust in Chelyabinskaya Oblast'	1,200,000
Do.	Kuznetsk	Novokuznetsk	4,700,000
Talc	Onotsk deposit	Irkutskaya Oblast'	NA
Do.	Kirgiteysk deposit	Krasnoyarskiy Kray	NA
Do.	Miass deposit	Chelyabinskaya Oblast'	NA
Do.	Shabrovsk deposit	Sverdlovskaya Oblast'	NA
Tin:			
Ore	Novosibirsk Khinganskoye olovo (Jewish Autonomous District) mining-beneficiation complex	Khabarovskiy Kray	NA
Do.	Novosibirsk Dalolovo mining-beneficiation compl	Solnechnyy deposit, Primor'ye	NA
Do.	Novosibirsk Deputatskiy olovo mining-beneficiatic complex	Sakha (Yakutiya) Republic	NA
Do.	Iultin mining and beneficiation complex	Magadanskaya Oblast'	NA
Do.	Khrustalnyy mining and beneficiation complex	Maritime Territory	NA
Do.	Pevek mining and beneficiation complex	Magadanskaya Oblast'	NA
Metal	Novosibirsk smelter	Novosibirskaya Oblast'	NA
Do.	Podol'sk smelter	Podol'sk	NA
Do.	Ryazan smelter	Ryazanskaya Oblast'	NA
Titanium:			
Metal	Berezniki plant	Berezniki	40,000
Do.	Moscow plant	Moscow	NA
Do.	Podol'sk plant	Podol'sk	NA
Products, areospace-engineering	Verknyaya Salda Metallurgical Production Association (VSMPO)	Sverdlovskaya Oblast', Urals	NA
Sponge	Avisma Titanium-Magnesium complex		NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
RUSSIA--Continued			
Tungsten:			
Concentrates, W content	Aginskoye deposit	Sakha (Yakutiya) Republic	NA
Do.	Antonovogorsk	East Transbaikal	NA
Do.	Balkan	Northeast of Magnitogorsk, Ural'skiye Gory	NA
Do.	Belukha	East Transbaikal	NA
Do.	Bom-Grokhom	West Transbaikal	NA
Do.	Dzhida	do.	NA
Do.	Iultin	Magadanskaya Oblast'	NA
Do.	Kti-Teberdaskoye deposit	North Caucasus	NA
Do.	Lermontov	Russian Far East	NA
Do.	Primor'ye	Russian Far East	NA
Do.	Solnechnyy	Southern Khabarovskiy Kray	NA
Do.	Tyrnyauz tungsten-molybdenum mining and processing complex	Kabardino-Balkariya, North Caucasus	NA
Metal, tungsten anhydride	Gidrometallurg plant	Nal'chik, North Caucasus	NA
Uranium, U content	Priargunskiy mining and chemical enterprise	Krasnokamensk	3,000
Vanadium:			
Metal	Chusovoy and Nizhniy Tagil plants	Ural'skiye Gory	17,000
Ore	Kachkanar iron mining complex	Ural'skiye Gory	NA
Pentoxide	Vanadii-Tulachermet	Tula, North Caucasus	NA
Zinc:			
Zn content of ore	Bashkir copper-zinc complex	Sibai in southern Urals	5,000
Do.	Buribai copper-zinc mining complex	Buribai in southern Urals	1,500
Do.	Gai copper-zinc mining-beneficiation complex	Gai in southern Urals	25,000
Do.	Kirovgrad copper enterprise	Kirovgrad in central Urals	1,200
Do.	Sredneuralsk copper complex	Revda in central Urals	5,000
Do.	Uchali copper-zinc mining and beneficiation complex	Uchalinskiy Rayon in southern Urals	90,000
Metal	Chelyabinsk electrolytic zinc plant	Chelyabinskaya Oblast'	200,000
Do.	Elektrozink plant	Vladikavkaz in North Caucasus	100,000
TAJIKISTAN			
Aluminum	Tajik aluminum plant (TadAZ)	Tursunzade	517,000
Antimony	Anzob mining and beneficiation complex	Dzhizhikrutskoye Sb-Hg deposit	700,000
Do.	Isfara hydrometallurgical plant	Isfara	500
Do.	Shing-Magianskiye deposit		NA
Antimony concentrates	Marguzor-Magianskiye alluvial deposits		NA
Arsenic	Mosrif deposit		NA
Bismuth	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	25
Do.	Isfara hydrometallurgical plant	Isfara	500
Bismuth, copper, fluorspar, gold, silver, zinc (ore processing)	Adrasman mining and beneficiation complex	Kanimansurskoye deposit (mining ceased in 1997)	650,000 4/
Boron	Ak-Arkhar deposit	Badakhshan region	NA
Coal	Isfara hydrometallurgical plant	Isfara	300,000
Do.	Shurab brown coal	Shurab region	NA
Do.	Fan-Yagnob hard coal deposits	Pyandzh region	50,000
Copper-lead-zinc	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	2,500
Dolomite	Yavan electrochemical complex	Pashkharvoskoye deposit	NA
Fluorspar, concentrate	Takob mining and beneficiation complex	Takob and Krasnye Kholmy deposits	60,000 4/
Gold kilograms	Tajikzoloto mining-beneficiation complex, Pamir Artel	Darvazy, Rankul placer deposits, placers in central and southern parts of country	5,000 4/
Do. do.	Zerafshan Gold Company	Dzhilau, Jilau, Taror deposits, Sughd Oblast'	2,500 4/
Do. do.	Darvaz joint venture	Yak-Suyskoye deposit, Khatlonskaya Oblast'	2,000
Do. do.	Aprelevka joint venture	Aprelevka deposit	200
Do. kilograms	Chore, Kum-Manor, Shahbas deposits	Zarashon Valley	NA
Do.	Vostokredmet refinery	Chkalovsk	NA
Gold, ore processing	Kansayskaya factory	Aprelevka, Burgunda, Kyzyl-Chek, Shkol'noye	165,000 4/
Lead-zinc	Kansayskoye mining complex	Kara-Mazar region	NA
Do.	Altyn-Topkan mining directorate	Altyn-Topkan deposit (mining ceased in 1997)	NA
Do.	do.	Pay Bulak deposit (mining ceased in 1997)	NA
Do.	Adrasman mining and beneficiation complex		
Do.	Takaeliyskiy metallurgical complex		

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
TAJIKISTAN--Continued			
Limestone	Dushanbe cement complex	Kharangonskoye deposit	NA
Loam	do.	Varzobskoye Ushchel'ye deposit	NA
Marble	Dashtak deposit	Darvaz region	NA
Do.	Jilikul deposit	Pendzhikent region	NA
Do.	Dal'yan Bolo deposit	Shakhristanskiy region	NA
Mercury	Anzob mining and beneficiation complex	Dzhizhikrutskoye deposit	150
Natural gas and petroleum thousand cubic meters	Sixteen oil-gas deposits under exploration, includir	Fergana depression	200,000 4/
Do. do.	Ayritanskoye, Madaniyatskoye, and Ravatskoye Beshtentyakskoye, Kichik-Belskoye, Shaambary, Uzunkhorskoye deposits	Southern Tajik depression	200,000 4/
Salt	Yavan electrochemical complex	Tut-Bulakskoye deposit	NA
Do.	Voseyskiy plant	Khodzha-Muminskoye deposit	NA
Do.	Ashtskiy plant	Kamyshkurganskoye deposit	NA
Do.	Khoja-Sartez, Samanchi, Tanabchi deposits		NA
Silver	Adrasman mining and beneficiation complex	Bolshoy Kanimansur deposit	15,000
Strontium	Chaltash, Chikultan, Daudyr deposits	Khatlon region	180,000
Tin-tungsten	Tafkon deposit		NA
Tungsten, ore	Maykhura deposit	95 km of Dushanbe, central Tajikistan	150,000
Uranium, U content	Adrasman, Maylisu, Taboshar, Usugai deposits	Kara-Mazar region, northern Tajikistan	NA
Do.	Vostokredmet plant	Chkalovsk	NA
Vanadium, pentoxide	do.	do.	350,000
TURKMENISTAN			
Ammonia thousand tons	Maryazot Association	Mary region	400,000 9/
Argillite cubic meters	Keramzit plant	Yagmanskoye deposit	200,000 9/
Barite-witherite	Arpaklenskiy mining enterprise	Arpaklen deposit	10,000 9/
Do.	Kumytash deposit and other deposits		NA
Bischofite, epsomite, Galauber's salt, sea salt	Karabogazsulfate Association	Kara-Bogaz-Gol Lagoon, off the Caspian Sea	NA
Bromine	Cheleken plant	Cheleken region	4,740 9/
Do.	Nebitdag plant	Vyshka, Stantsiya	2,370 9/
Cement, from:			
Bench gravel and loam	Bezmeinskiy cement plant	Bezmeinskoye deposit	1,400,000
Limestone and clay	Kugitangskoye deposit		NA
Limestone and marl	Gingol'skoye deposit		NA
Clays:			
Bentonite	Oglanly Mine	Oglanly region	100,000 9/
Kaolin	Ashkhabad glass plant	Kyzylkainskoye deposit	80,000
Do.	Tuarkyrskoye deposit	250 kilometers southeast of Turkmenbashi	NA
Coal, oxidized	do.	do.	NA
Dolomite	Ashkhabad glass plant	Kelyatinskoye deposit	6,000
Gypsum	IA Turkmenmineral	Mukry, Tagorin deposits	300,000 9/
Do.	Wastes from Gaurdak sulfur deposit	Gaurdak, Gora	400,000 9/
Do.	Krasnovodsk Aylagy (anhydride) deposit	9 kilometers east of Turkmenbashi	160,000 9/
Iodine	Cheleken plant	Cheleken region	355 9/
Do.	Nebitdag plant	Vyshka, Stantsiya	255
Limestone	Gaurdak deposit	4 kilometers northeast of Gaurdak	NA
Do.	Kara-Dzhumalakskoye deposit	60 kilometers from Gaurdak	NA
Limestone, for facing materials	Charshanginskoye, Gaurdakskoye, Geok-Tepinskoye, Kaylyu, Krasnovodsk Aylagy (tuff and granite), Tyuzmergenskoye deposits		NA
Do. cubic meters	Tagarinskoye deposit	8 kilometers from Gaurdak	1,000
Limestone, for filing stone do.	Aeroport deposit	21 kilometers northeast of Turkmmenbashi	2,000 9/
Do. do.	Bekdashskoye deposit	200 kilometers north of Turkmmenbashi	5,000 9/
Do. do.	Dostluksoye deposit	230 kilometers southeast of Turkmenabat	2,000 9/
Do. do.	Mukrinskoye deposit	60 kilometers southwest of Gaurdak	25,000 9/
Natural gas million cubic meters	Achakskoye, Dauletabad, Donmez, Gygyrlinskoye, North and South Naipskiye, West Shatlykskiye, Yashlar deposits	Onshore in eastern and southwestern parts of country and offshore in Caspian Sea; Amu-Dar'ya and Murgab Basins; Dashoguzskiy, Lebapskiy, Maryyskiy deposits	90,000 4/
Ozokerite	Cheleken mining enterprise		NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
TURKMENISTAN--Continued			
Petroleum:			
Crude	Barsa-Gelmesskoye, Burunskoye, Cheleken, Gograndagskoye, Kamyshldzhinskoye, Korturtepinskoye, Kum Dag, Kuydzhikskoye, Okaremskoye deposits	Onshore in southwestern part of country and offshore in the Caspian Sea	5,500,000 4/
Refined 24-gallon barrels per day	Chardzhouskiy Rayon refinery	Seydi, Chardzhouskiy Rayon	120,500
Do. do.	Turkmenbashi refinery	Turkmenbashi	116,500
Pigment, natural	Bakhchesu/Cheshme/Gadyn deposit	28 kilometers southwest of Serdar	NA
Potash (sylvinite, carnallite)	Karlyuk deposit (experimental mine closed 1998)	25 kilometers from Gaurdak	NA
Do.	Karabil'skoye deposit	17 kilometers south of Gaurdak	NA
Quartz sand	Annauskoye, Babadurmazskoye, Bakhardenskoye deposits		NA
Rock salt	Gaurdak deposit	8 kilometers from Gaurdak	15,000
Do.	Khodzhaguymaskoye deposit	4 kilometers west of Gaurdak	NA
Do.	Kugitangskoye deposit	75 kilometers from Gaurdak	2,000
Do.	Uzun-Kudukskoye deposit	20 kilometers from Gaurdak	2,000
Salt	Kuulinskoye deposit	40 kilometers north of Turkmenbashi	650,000
Sand and gravel cubic meters	Dushaksoye deposit		1,150,000 9/
Do. do.	Kala-I-Morskoye deposit		925,000 9/
Do. do.	Kernayskoye deposit		36,000 9/
Do. do.	Kubatayskoye deposit		740,000 9/
Do. cubic meters	Ufrinskoye deposit		900,000 9/
Sodium sulfate	Karabogazsulfate Association	Bekdash	400,000 9/
Strontium (celesite)	Arikskoye deposit (mining ceased 1992)	Near Gaurdak	NA
Do.	Shakhtaminskoye deposit	do.	NA
Sulfur	IA Turkmenmineral	Gora deposit	340,000 9/
Do.	Gaurdak plant	Gaurdak deposit (mining ceased 1997)	500,000
Do.	Darvaza, Segli-Kar, Kara-Kum sulfur plants	Kara-kum deposit (mining ceased 1962)	NA
Do.	Kugitangskoye deposit	75 kilometers from Gaurdak	NA
UKRAINE			
Alumina	Mykolayiv refinery	Mykolayivs'ka Oblast'	1,200,000
Do.	Zaporozh'ye (Dneprovsk) refinery	Zaporiz'ka Oblast'	245,000
Aluminum, primary	Zaporozh'ye (Dneprovsk) smelter	do.	120,000
Coal:			
Hard thousand tons	Donets coal basin with about 225 mines produces more than 90% of Ukraine's coal	Dnipropetrovs'ka, Donets'ka, Luhans'ka Oblasts'	130,000 4/
Do.	Lviv-Volynskiy Basin produces remainder from 18 mines	Western Ukraine	6,000,000 4/
Brown	Dneprovskoye Basin	Central Ukraine	7,000,000
Ferroalloys:			
Ferrochrome	Zaporozh'ye plant	Zaporiz'ka Oblast'	NA
Ferromanganese (high and medium C)	do.	do.	NA
Do.	Nikopol' ferroalloys plant	Nikopol'	250,000
Ferromanganese, blast furnace	Konstantinovskiy metallurgical plant		NA
Do.	Kramatorskiy metallurgical plant (production ended in 1999)		NA
Manganese metal	Zaporozh'ye plant	Zaporiz'ka Oblast'	NA
Ferrosilicon	Nikopol' ferroalloys plant	Nikopol'	200,000
Do.	Stakhanov plant	Luhans'ka Oblast'	NA
Silicomanganese	Stakhanov plant	Luhans'ka Oblast'	1,200,000
Do.	Zaporozh'ye plant	Zaporiz'ka Oblast'	160,000
Do.	Nikopol' ferroalloys plant	Nikopol'	NA
Graphite	Zavalyevskiy graphite complex	Zavalyevskiy deposit	40,000
Iron ore:			
Underground mining	Krivbassruda production association with 16 mines	Kryvyy Rih Basin	15,000,000 4/
Do.	Eksplutatsionnaya Mine of the Zaporizhzhskiy iron ore complex	do.	3,500,000
Open pit mining	Inguletskiy, Kamysh-Burunskiy, Novokrivorozhski Poltaviskiy, Severnyy, Tsentralnyy, Yuzhniy mining and beneficiation complexes	Kryvyy Rih Basin	90,000,000 4/
Kaolin	Prosyanovskoye mining and beneficiation complex	Dnipropetrovs'ka Oblast'	NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
UKRAINE--Continued			
Lead, secondary	Ukrtsink plant	Kostyantynivka	70,000
Magnesium	Zaporozh'ye plant	Zaporiz'ka Oblast'	10,000
Do.	Magnii concern	Kalush	18,000
Manganese:			
Ore, marketable			6,000,000 4/
	Marganets, Ordzhonikdze mining and beneficiation complexes	Nikopol' basin	
	Tavricheskiy complex (under development)	Bol'shoy Tokmak basin	
Metal	Zaporozhye plant	Zaporiz'ka Oblast'	40,000
Sinter	Nikopol' ferroalloys plant	Nikopol	3,000,000
Mercury	Nikitovskiy mining and metallurgical complex	Donets'ka Oblast'	120
Nickel, Ni content in FeNi	Pobuzhhskiy mining and beneficiation complex, comprising three open pit mines and smelter	Pobugskoye Basin	7,000 4/
Potash, K_2O equivalent	Khlorvinil production association, Stebnik potash p	Pricarpathian region	300,000
Steel, crude	Donets'k and Industrial Union of Donbas Alchevs'k steel mill	Alchevs'k	4,500,000
Do.	Donets'k and Industrial Union of Donbas Azovstal' steel mill	Mariupol'	4,000,000
Do.	Donets'k and Industrial Union of Donbas Donets'k steel mill	Donets'ka Oblast'	1,300,000
Do.	Donets'k and Industrial Union of Donbas Dnepropetrovsk pipe plant		NA
Do.	Donets'k and Industrial Union of Donbas Khartsyzsk pipe plant		NA
Do.	Donets'k and Danko Yenakiyeveskiy steel mill		1,200,000
Do.	Donets'k and Privat Bank Dnepropetrovsk pipe plant		1,230,000
Do.	Donets'k and Privat Bank Zaporozh'ye rolling mill	Zaporiz'ka Oblast'	2,300,000
Do.	Donets'k and Privat Bank Dneprovskiy steel mill	Dniprodzerzhyns'k	3,850,000
Do.	do.	Dnipropetrovs'ka Oblast'	1,900,000
Do.	Donets'k and Privat Bank Konstantnovskiy steel mill		NA
Do.	Donets'k and Privat Bank Dneprospetssstal	Zaporiz'ka Oblast'	1,400,000
Do.	Il'yich plant	Mariupol'	7,300,000
Do.	Kirov plant	Makeyevka	4,000,000
Do.	Kryvy Rih plant	Kryvyy Rih	10,650,000
Do.	Interpipe group Nizhnedneprovskiy pipe plant		NA
Do.	Interpipe group Nikopol' pipe plant		NA
Sulfur	Sera production association	Rozdol mining complex mines (Rozdol, Soroks, Zdhidalchev deposits); Yarvorov complex mines (Nemirov-Yazov deposits in Livivs'ka and Kyyivs'ka Oblasts')	1,500,000 4/
Titanium:			
Ilemenite, concentrate			600,000 4/
	Irshanskiy mining and beneficiation complex	Irsha Valley	
	Vol'nogorsk state mining/metallurgical complex	Dnipropetrovs'k region	
	Verkhnedneprovskiy mining/metallurgical complex	Verkhnedneprovsk region	
Rutile	do.	do.	60,000
Do.	Vol'nogorsk state mining/metallurgical complex	Dnipropetrovs'k region	NA
Sponge	Zaporozh'ye titanium-magnesium plant	Zaporiz'ka Oblast'	20,000
Uranium	Zheltye Vody complex	Northern part of Kryvyy Rih Basin	NA
Zinc, secondary	Ukrtsink plant	Kostyantynivka	25,000
Zirconium:			
Ore, zircon	Verkhnedneprovskiy mining/metallurgical	Verkhnedneprovsk region	100,000
Do.	Vol'nogorsk state mining and metallurgical comple	Dnipropetrovs'k region	NA
Metal and compounds	Pridneprovskiy chemical plant	Dnipropetrovs'ka Oblast'	NA
Do.	Kharkiv physical-technical institute	Kharkivs'ka Oblast'	NA
UZBEKISTAN			
Bismuth	Ustarassay deposit (depleted)	Chotqol and Kuraminskiy Khrebet regions	NA
Cesium, lithium, rubidium	Shava-Say deposit		NA

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
UZBEKISTAN--Continued			
Clays:			
Bentonite	Arab-Dasht and Khaudag deposits		NA
Kaolin	Angren deposit	Angren region	8,000,000
Coal	Central Asian Coal Association (mining): Angren brown coal deposit	do.	6,000,000
Do.	Baysunskoye and Shargunskoye deposits	Surkhandarya region	1,000,000 4/
Copper:			
Mine output, Cu content	Almalyk mining and metallurgical complex	Dalneye, Kalmakkyrgan, Sary-Cheku deposits	100,000 4/
Metal	Almalyk refinery	Olmaliq	130,000
Diamond	Karashok and Kok-Say deposits	Nawoiy District	NA
Feldspar	Karichasayskoye and other deposits	Deposits in Samarqand and Toshkent Wiloyati region Karakalpakstan (Kara-Kalpakskaya ASSR)	120,000 4/
Fertilizers	Ammophos production association	Olmaliq	NA
Do.	Azot production association	Farghona	NA
Do.	Elektrokhimprom production association	Chirchiq	NA
Do.	Kokand superphosphate plant	Qo'qon	NA
Do.	Naviazot production association	Nawoiy Wiloyati	NA
Do.	Samarkand chemicals plant	Samarqand	NA
Fluorspar	Agata-Chibargata, Aurakhmat, Kengutan, Kyzylbaur, Naugarzan, Nugisken deposits	East of Toshkent Wiloyati	150,000
Do.	Syrpatash deposit	Namanganskaya Oblast'	NA
Gold kilograms	Adzhi-Bugutty, Balpantau, Bulutkan, Donguz-Tau, Muruntau, Taurbay deposits	Kyzylkum region	85,000 4/
Do.	Nawoiy Integrated Mining and Metals complex	Muruntau deposit	50
Do.	Kochbulak and Kyzyl-Al'ma-Say deposits	Tashkentskaya Oblast'	NA
Do.	Almalyk mining and metallurgical complex	Dalneye, Kalmakkyrgan, Sary-Cheku deposits	NA
Graphite	Tadzhi-Kazgan deposit	Navoiyskaya Oblast'	NA
Iron ore	Syurenata deposit	Tashkentskaya Oblast'	NA
Lead, mine output, Pb content	Almalyk mining and metallurgical complex; Altyn-Topkan and Uchkulach deposits	Uchkulach deposit in Toshkent Wiloyati; Altyn-Topk deposit in Kurama mountain range in Tajikistan (in March 1999, Altyn-Topkan transferred to control of Tajikistan)	40,000 4/
Manganese	Dautashskoye deposit	Kashkadar'inskaya Oblast'	40,000
Molybdenum:			
Mine output, Mo content	Almalyk mining and metallurgical complex; Kalmakyr, Sarycheku deposits	Toshkent Wiloyati	900 4/
Metal	Uzbek refinery and hard metals plant	Chirchiq	NA
Natural gas liquids million cubic meters	Mubarek gas processing plant	Muborak	28,000
Do.	Shurtan gas-chemical complex	Shurtan-Say deposit, Kashkad'ya region	137,000
Petroleum and natural gas:	More than 160 oil and gas deposits; 92 deposits under exploration:	Bukhoro-Khiwa, Sukhandarya Oblast, southwest of Gissarak, and Ustyurtskiy regions and Farghona Valley	
Natural gas million cubic meters	Gazli, Kandym, Khauzak, Kokdumalak, Pamuk, Shurtan-Say deposits (major)	Amu-Dar'ya Basin; Mubarek area	70,000 4/
Do.	Itera/Lukoil (Russia), Uzbekneftegaz JSC	Kan-Dam field	NA
Natural gas condensate	Trinity Energy (United Kingdom)	Ustyurt Plato region	NA
Petroleum:			
Crude	Kokdumalak and Mingbulak deposits (major)		9,000,000 4/
Refinery products	Fergana oil refinery	Farghona region	8,800,000
Do.	Bukhara oil refinery	Bukhoro	2,500,000
Phosphate	Kyzyl Kum complex	Dzheroy-Sardarin Moroccan type, Karaktay, and Severnyy Dzhetymtau deposits	NA
Polyethylene	Shurtan gas-chemical complex	Shurtan-Say deposit, Kashkad'ya region	125,000
Potash	Tyubegatan deposit	Southern Uzbekistan	NA
Silver	Kosmanachi, Okzhetpes, Vysokovoltnoye deposits	Namanganskaya Oblast'	NA
Steel, crude	Bekabad steel mill	Bekabad	1,100,000
Sulfur	Mubarek gas processing plant complex	Muborak	2,000,000

See footnotes at end of table.

TABLE 2--Continued
COMMONWEALTH OF INDEPENDENT STATES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2001 1/ 2/ 3/

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies or deposits	Location or deposit name	Annual capacity e/
UZBEKISTAN--Continued			
Tungsten:			
Mine output, W content			1,200 4/
	Koytash deposit	Northeastern Uzbekistan	
	Ingichka, Lyangar deposits	Zirabulak Mountains	
	Ugat deposit	Northern Uzbekistan	
Mine output, WO_3 content (0.49%)	Sautbay wolframite deposit	Kyzylkum region	NA
Metal	Uzbek refractory and hard metals plant	Chirchiq	NA
Uranium, U content	Naviazot mining and metallurgical complex	Navoiy region	3,000
Vermiculite square meters	Tebin-Bulak deposit		25,000

e/ Estimated. NA Not available.
1/ Table includes data and information available through April 2003.
2/ Estimated data are rounded to no more than three significant digits.
3/ Many location names have changed since the breakup of the Soviet Union. Many enterprises, however, are still named or commonly referred to based on the former location name, which accounts for discrepencies in the names of enterprises their locations.
4/ Capacity estimates are totals for all enterprises that produce that commodity.
5/ For a listing of production-sharing agreements for oil and gas development, refer to the USACC Investment Guide to Azerbaijan 2001, United States-Azerbaijan Chamber of Commerce, Washington, DC.
6/ Capacity for crude petroleum distillation.
7/ Total peat for fuel use production.
8/ Crude throughput.
9/ Reported figure.
10/ Coproduct and byproduct of gold and nonferrous metals mining.

TABLE 3
COMMONWEALTH OF INDEPENDENT STATES: GROSS DOMESTIC PRODUCT AND INDUSTRIAL OUTPUT IN 2001

(Output as a precentage of those in 2000 in constant prices)

Country	Gross domestic product	Industrial output
Armenia	109.6	103.8
Azerbaijan	109.9	105.1
Belarus	104.1	105.4
Georgia	104.5	98.9
Kazakhstan	113.2	113.5
Kyrgyzstan	105.3	105.4
Moldova	106.1	114.2
Russia	105.0	104.9
Tajikistan	110.2	114.8
Turkmenistan	NA	NA
Ukraine	104.5	114.2
Uzbekistan	109.0	NA

NA Not available.

Source: Interfax Information Services B.V. Statistical Report, 2002, Key Socioeconomic Indicators for Individual CIS Nations in 2001, Key Results Indicators by Economic Sector in CIS Nations, March 15-22, v. 11, issue 12, p. 3, 7-8.