

THE MINERAL INDUSTRY OF

KAZAKHSTAN

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Kazakhstan, which, after Russia, was the second largest country in land area to form from the republics of the former Soviet Union (FSU), was endowed with large reserves of a wide range of minerals. Kazakhstan, along with Russia, was one of the major mineral producing republics of the FSU and produced a major portion of the FSU's output of a number of metals, including beryllium, bismuth, cadmium, chromite, copper, ferroalloys, rhenium, titanium, lead, magnesium, uranium, and zinc. It had significant production of a number of other metals, industrial minerals, and fuels, including arsenic, barite, coal, gold, tungsten, molybdenum, natural gas, oil, and phosphate rock.

In 1994, Kazakhstan's gross domestic product (GDP) decreased by 25% compared with 1993 while industrial output decreased by 28.5%. These reported decreases were more than in the previous 2 years when they were in the range of 10% to 15%.² Labor problems were affecting the mining industry as miners at the Karaganda coalfields went on strike in January 1995. One of the major demands of the miners was for payment of back wages.³

Government Policies and Programs

The President of Kazakhstan listed four priority areas for foreign investment with the first being the energy sector; the second, processing facilities for agricultural and farm products; and the third and fourth, respectively investment in gold resources and the nonferrous metals mining and metallurgical sector. Major western oil companies, including U.S.-based Chevron Corp., had either invested or were considering investment possibilities in the development of Kazakhstan's hydrocarbon resources.⁴

Kazakhstan announced a plan for developing its metals industries. This plan called for developing reserves of bauxite, copper, iron, lead and zinc, and titanium raw materials. Kazakhstan was planning to finance part of this development by attracting foreign investment.⁵ Also, in 1994, Uzbekistan and Kyrgyzstan formed the Central Asian Union to reduce tariffs in the region and to coordinate fiscal and monetary policies.

Kazakhstan's Minister of Geology and the Use of Underground Resources announced that the Ministry was prepared to sell 31% of the shares in geological exploration enterprises on the world market to attract foreign investment. He stated that 70% of geological exploration in 1993 was financed with foreign funds.⁶

It was reported that, in 1995, the State Property Committee approved a list of enterprises to be privatized that included the Irtysh polymetallic mining and metallurgical complex, the East Kazakhstan copper chemical complex that mined and beneficiated copper-zinc ore, the Dzhezkazgan copper mining and metallurgical complex, the Dzhezdy manganese mining complex, the Karaganda steel mill, the Lisakovsky iron ore mining and beneficiation complex, the Maikainzoloto gold mining firm, the Yermak ferroalloys plant, the Zhezkent lead-zinc mining and beneficiation complex, the Achisay lead-zinc mining and beneficiation complex, and the Chilisay phosphate rock mining directorate.⁷

Environmental Issues

Kazakhstan's program for development of its metals mineral base called for a number of measures to improve environmental protection at mining and metallurgical facilities. Under this plan, the Leninogorsk lead-zinc mining and metallurgical complex planned to improve sulfur recovery and sulfuric acid production facilities; the Ust-Kamenogorsk titanium-magnesium plant planned to construct a shop to recover gaseous emissions and to upgrade its smelters; the Ust-Kamenogorsk lead-zinc plant and the Irtysh copper smelter planned to improve recovery of gaseous emissions; and the Ust-Kamenogorsk lead-zinc plant planned to eliminate effluents from its water. Also under the plan, the Chimkent lead plant planned to introduce recycling technology for lead and plans to build a burying facility for arsenic wastes; and the Balkhash copper plant planned to renovate its electrolysis shop and put in facilities for cleaning sulfuric gases and recycling the sulfur.⁸

Production

Kazakhstan mineral production data for 1994 for a number of nonferrous metals was reported to the U.S. Bureau of Mines (USBM) for the first time, in response to a USBM minerals questionnaire. This data was classified as state secret during most of the Soviet era. There data are included in table 1 of this report.

Structure of the Mineral Industry

In 1994, three ministries involved in the development of

mineral resources were the Ministry of Geology and Conservation of Natural Resources (MINGEO), the Ministry of Energy and Fuel, and the Ministry of Industry. In summer 1994, the President of Kazakhstan signed a decree that divided the Ministry of Energy and Fuel into a Ministry for the Oil and Gas Industry and a Ministry for the Energy and Coal Industries.

In the current system, which was similar to the Soviet system, with some name changes, the Ministry of Geology was responsible for mineral exploration and management of mineral reserves, the Ministry of Energy and Fuel and its successor ministries were responsible for production of hydrocarbons, and the Ministry of Industry was responsible for ore production. In the area of foreign investment, MINGEO would act as the coordinating agency, and all applications by foreign mining firms would be filed with MINGEO.⁹

Kazakhstan's privatization program entailed the issuing of vouchers to the population. Privatization funds also were established, through which it would be possible to invest vouchers for shares of privatized enterprises. At the beginning of 1994, the Government of Kazakhstan State Property Committee decided to speed up the process of privatization by issuing tenders for domestic and foreign investors to buy 38 of the country's largest enterprises, including many major mineral producing enterprises.

Commodity Review

Metals

Aluminum.—The Pavlodar alumina plant in Kazakhstan was the largest producer of alumina in the FSU, with a capacity to produce 1.2 million metric tons per year (Mmt/a) of alumina. The Pavlodar plant also produced 40% of the gallium output of the FSU. The Pavlodar plant used domestic, Commonwealth of Independent States (C.I.S.), and imported bauxites. The Pavlodar plant was considering constructing an integrated aluminum smelter with a capacity of 215,000 metric tons per year (mt/a). The initial plans were to develop an aluminum smelter when the plant was constructed in 1959, but the U.S.S.R. Ministry of Nonferrous Metallurgy decided instead to construct aluminum smelters in Tajikistan and at Sayanogorsk in Russia. Pavlodar shipped most of its alumina to Russia to Sayanogorsk and Novokuznetsk, and some to Bratsk.

Owing to a shortage of domestic bauxites to supply Pavlodar, the plan for the development of the metals base of Kazakhstan issued in 1994 called for developing the Taldy-Aschisay Mine with a projected capacity of 400,000 mt/a of bauxite and expanding production at the Bela and Eastern Ayatsky Mines to raise their bauxite outputs to 600,000 mt/a each.¹⁰

Asbestos.—Besides Russia, Kazakhstan was the only other producer of asbestos in the FSU, with production at the Dzhetgara complex in Kustanay oblast. Reserves at

Kustanay were reportedly 29.1 million metric tons (Mmt) and comprised more than 20% of asbestos reserves in the FSU.¹¹

Chromite.—The Donskoy complex in Kazakhstan had produced more than 95% of the chromite output of the FSU. Output of chromite at Donskoy had fallen sharply from its peak levels of more than 3.5 Mmt/a at the end of the Soviet period. The Donskoy mining and beneficiation complex reportedly produced 2.15 Mmt of chromite in 1994 and planned to produce 2.3 Mmt in 1995. Reserves at Donskoy's two open pits reportedly were on the verge of depletion and development of a third open pit had been delayed. Plans called for increasing production at the Molodezhny underground mine at Donskoy with a capacity to produce 1.7 Mmt/a. In the first 10 months of 1994, Molodezhny produced only 380,000 metric tons mt and was not in production during November and December 1994.¹² Plans called for producing 4 Mmt/a of chromite by the year 2000. Chromite production occurred at three open pit mines and one underground mine. Underground mining accounted for almost one-half of the output, and it was envisaged that underground mining would account for three-fourths of output by the year 2000.¹³ The Yermak and Aktyubinsk ferroalloy plants in Kazakhstan consumed about 70% of Donskoy's output.

Copper.—Kazakhstan had about one-third of both the copper mining and metal production capacity of the FSU. Production came from two main enterprises, the Dzhezkazgan and the Balkhash enterprises in central Kazakhstan.

The Dzhezkazgan copper mining and metallurgical complex had a capacity to produce an estimated 250,000 mt/a of copper metal. The copper concentrates smelted at Dzhezkazgan, which came primarily from the enterprise's own mines, had a high sulfur content, and Dzhezkazgan sought to address the environmental problems that had been caused by sulfur emissions.¹⁴

Development was planned at the Samarskoye copper-gold deposit with reported reserves of between 1.5 and 2.5 Mmt of ore with 610,000 mt copper in ores grading 1.86% copper and more than 250,000 mt of copper in ores grading 0.69% copper. The gold content of the ore ranged from 0.5 to 1.5 grams per metric ton (g/mt). Development was planned with financing, in part, from Japan's Eximbank, which was considering loaning money for development of this deposit.¹⁵

As part of its program to develop the country's metals base announced in 1994, plans called for developing a new mining complex at the Fifty Years of October copper deposit that was part of the Balkhash copper enterprise. This new complex was projected to produce 2.3 Mmt/a of ore for the production of more than 40,000 mt/a of copper. Plans also called for developing mining and beneficiation complexes at the Aktogay and Bozshakol copper deposits in eastern Kazakhstan with reported respective projected capacities of 125,000 mt/a and 60,000 mt/a of copper. Also under this

program, it was planned to complete development of the Ainini and Aktsipass copper mines, which were part of Dzhezkazgan, with reported respective capacities of 32,000 mt/a and 51,000 mt/a of copper.¹⁶

Plans called for constructing a 40,000 mt/a copper anode plant and tankhouse at Irtysh, which is part of the Ust-Kamenogorsk lead-zinc complex; negotiations were being conducted with foreign firms.

A longer-term project at Irtysh involved increasing copper smelting capacity from 40,000 mt/a to 100,000 mt/a. Blister copper production at Irtysh in 1993 and 1994 reportedly was approximately 35,000 mt/a, and expansion of the acid plant at Irtysh would increase output by 15,000 to 20,000 mt/a.

Completion of the acid plant at Irtysh was targeted for 1996. Irtysh received its concentrates from five mines with two more, the Maleyevskiy and Artemovskiy, under development.¹⁷

Kazakhstan reportedly was importing copper in concentrate from the Erdenet complex in Mongolia and, in 1994, imported 34,000 mt of copper in concentrate. This concentrate was processed at the Balkhash copper metallurgical plant.

Ferroalloys.—Kazakhstan, which produced practically all of the chromite in the FSU, had a large ferroalloy industry producing chrome and silica-based ferroalloys at the Yermak and Aktyubinsk ferroalloy plants. Of Kazakhstan's total production of more than 1 Mmt of ferroalloys, less than 10% was consumed domestically. Exports of ferrosilicon from Kazakhstan had been of concern for the past decade and had resulted in a number of trade actions and sanctions against these exports.

Gold.—In 1994, gold production in Kazakhstan increased 6% compared with 1993's production of 13 mt, which would make 1994 output about 14 mt. This 6% increase referred to native gold produced by the Altynalmaz state precious metals and stones company and not to byproduct gold production. The increase was attributed to the modernization of existing mines and the development of new fields, including the Akbakai, Vasilovskoye, and Bakyrchik. The Altynalmaz Company was created in January 1993 and included about 20 mining enterprises, 7 mining and beneficiation complexes, geological exploration and mine development enterprises, and a jewelry branch Kazkvartsamostvety.¹⁸

Kazakhstan has 146 gold deposits, of which 25 are placer and 121 lode deposits. Eight lode fields, some of which have not been developed, contain 49% of the reserves. These fields are the Bakyrchik, Vasilovskoye, Mizeck, Suzdalskoye, Bolshevik, Akbakai, Bestyube, and Zholymbet. Some fields, controlled by Altynalmaz, according to company representatives, would be economically viable if Altynalmaz possessed the technology to extract the full range of mineral components and also to meet environmental standards.¹⁹

Kazakhstan was seeking foreign investment to develop small- and medium-size deposits. Initial plans called for development of the Bakyrchik, Vasilovskoye, and Akbakai

deposits, with the aid of foreign investors.²⁰

The State program for the gold industry called for beginning production of refined gold at the Tselinny mining and chemicals plant, which produced uranium, and at the Ust-Kamenogorsk lead-zinc plant. Also, it was planned to begin processing gold ore at the Achisay polymetallic and Zyryanovsk lead plants. Plans called for the country to eventually increase gold production to 50 mt/a.²¹

The Bakyrchik joint venture, in which the United Kingdom's Bakyrchik Gold PLC had a 40% interest and Kazakhstan's State gold mining concern Altynalmaz had the remaining 60%, reportedly poured its first gold in July 1994 at its Auezov operation in northeastern Kazakhstan. This operation used the Redox process for preoxidation treatment of sulfide ore concentrates. The ore at Bakyrchik was basically quartz with arsenopyrite and pyrite mineralization. Total reserves were reportedly over 31 mt with an average grade of 8.49 g/mt of gold. The processing plant had the capacity to process 150,000 mt/a of ore.

The Redox technology and the design and construction services were supplied by MTL, a division of MinCorp Ltd. of Englewood, Colorado. Plans for the second stage of this project called for wider application of the Redox technology after the process was mastered in the first stage. Stage two of the joint venture also called for increasing gold production at the mine, at which time the joint venture would take control of the mining operations.²² In July 1994, Bakyrchik poured its first gold dore at its new processing facility. Capacity was reported as 1.4 mt/a (45,000 troy ounces), with final capacity projected to be 8.6 mt/a (275,000 troy ounces).²³

Iron Ore.—In summer 1994, Kazakhstan announced a program to develop its metals mineral base. This program called for expanding production of iron ore at the Sokolovsko-Sarbay mining and beneficiation complex by increasing capacity from the current 15 Mmt/a to 20 to 25 Mmt/a of iron ore concentrates. In 1994, it was estimated that this complex was producing at less than one-half of capacity. The program also called for increasing pellet production at Sokolovsko-Sarbay to 12 Mmt/a.

Under this program, Kazakhstan also planned to expand iron ore output at the Western Karazhal iron ore mine and to build a new beneficiation plant. This plant would be designed to process 6 Mmt of ore and produce 3.8 Mmt of concentrate.

Plans also called for constructing a beneficiation plant at Kachar, with an initial output capacity of 7 Mmt/a of concentrate and a final capacity of 17 Mmt/a of concentrate. The program further envisioned stabilizing output at the Ken-Tobe Mine at 700,000 mt/a by modernizing facilities.²⁴

Lead and Zinc.—Kazakhstan was the major lead- and zinc-producing republic of the FSU, mining more than 60% of the lead and 50% of the zinc, and smelting more than 90% of the lead and almost 50% of the zinc in the FSU.

Production occurred primarily at enterprises in eastern Kazakhstan, including several of the largest lead- and zinc-producing enterprises of the FSU, such as the Leninogorsk, Ust-Kamenogorsk, and Zyryanovsk mining and metallurgical complexes.

The Ust-Kamenogorsk lead-zinc mining and metallurgical complex utilized both shaft furnaces and the Kivtset autogenous smelter developed in Kazakhstan. Plans were to upgrade smelting capacity at Ust-Kamenogorsk using Kivtset smelters. Plans also called for expanding zinc production capacity, while upgrading environmental protection controls.²⁵

Both the Leninogorsk and Zyryanovsk complexes reportedly have large reserves that could be developed if investment funds were available. The Leninogorsk complex reportedly has an additional 35 Mmt of ore reserves, if developed to a depth of 1 kilometer (km).

The Leninogorsk complex sought to engage in joint ventures to develop three deposits. Foreign investment was sought to provide state-of-the-art technology and equipment to develop these deposits. The first was the Dolinnnoye lead-zinc deposit that contained byproduct gold grading at 5 g/mt of gold with total gold reserves of 22 mt.²⁶

The second was the Chekmar deposit at the Leninogorsk complex, which had a projected capacity of 3 Mmt/a of lead and zinc ore. According to the management of the Leninogorsk complex, annual metal production from Chekmar ore was projected to be 40,400 mt of zinc, 12,800 mt of lead, 2,500 mt of copper, 380 kilograms (kg) of gold in alloys, and 14 mt of silver in alloys. Sixty percent of this projected capacity was to be produced from open pits. Infrastructural development work at this deposit had already begun.

The third deposit, for which Leninogorsk was seeking foreign investment, was the Novo-Leninogorsk deposit with the copper, lead, and zinc content of the ore reportedly 0.16%, 1.43%, and 4.04%, respectively, and the gold content 1.54 g/mt and silver content 32.8 g/mt.

Furthermore, this deposit, according to the management at Leninogorsk, contained barite-polymetallic ore comprising 20% of total reserves grading 33.45% barite; the respective contents of copper, zinc, lead, gold, and silver in the barite-polymetallic reserves 0.20%, 2.2, 2.8%, 6.5%, and 114.8 g/mt. It was projected that a mining complex could be developed based on this deposit that could produce 1.25 Mmt/a of ore for the production of 52,400 mt of barite, 789 mt of copper, 11,000 mt of lead, 36,000 mt of zinc, 1,300 kg of gold, and 27,900 kg of silver.²⁷

Other deposits slated for development included the Artemovskiy deposit, part of the East Kazakhstan Copper and Chemical complex, with a projected capacity of 800,000 mt/a of lead and zinc ore, and the Shalkiya deposit in southern Kazakhstan, with a reported projected capacity to produce 3 Mmt/a of lead and zinc ore.²⁸

Rare Metals.—Kazakhstan planned to significantly increase production of a number of rare metals. Kazakhstan accounted for 76.7% of the FSU's reserves of rhenium, 78.4% of its bismuth reserves, 37% of its cadmium reserves, 35.3% of its gallium reserves, 27% of its beryllium reserves, 20% of its selenium reserves, and 14.1% of its tellurium reserves. By 1998, Kazakhstan planned to increase rhenium production by 10% to 15%, gallium production by 25% to 30%, and scandium and vanadium production by 30%.²⁹

At the Dzhezkazgan copper mining complex, in addition to copper, the complex produced byproduct bismuth, cadmium, gold, osmium, rhenium, and silver. These byproduct metals were produced at Dzhezkazgan, with for except silver and gold, which were sent to the Ust-Kamenogorsk plant in Kazakhstan for processing. Also, there was no complete metallurgical cycle at Dzhezkazgan to produce rhenium or osmium metal. Dzhezkazgan produced ammonium salts of rhenium for use in the oil industry and as catalysts in alloy production for the space industry.³⁰

In February 1994, the Aktau chemical and hydrometallurgical plant that produced uranium, scandium, and rare-earth metals stopped production at its rare-earth metals shop due to a lack of orders and because a large number of specialists engaged in rare-earth metals production stopped working at the plant. Government assistance was being requested to prevent shutdown of the mines.³¹

Titanium.—The Ust-Kamenogorsk plant, which had an estimated capacity of 35,000 mt/a of titanium sponge, had produced 40% of the titanium sponge in the FSU.³² Titanium raw material came from Ukraine and other raw materials from Russia. Curtailments in raw materials shipments caused raw material shortages at Ust-Kamenogorsk.³³

Kazakhstan and Russia were the largest producers of titanium sponge in the C.I.S. sponge production capacity at the Ust-Kamenogorsk plant in Kazakhstan similar to the capacity of Russia's only titanium sponge plant. Ust-Kamenogorsk reportedly was the most modern plant in the C.I.S. and had a fully integrated production cycle to the ingot stage. It was the only plant in the C.I.S. that used vacuum distillation of sponge.

Kazakhstan's titanium industry previously had been integrated with that of the other FSU republics, receiving its raw materials from Ukraine and Russia and producing titanium sponge primarily consumed in Russia by the defense industry. The fall in C.I.S. demand, Kazakhstan, like other C.I.S. producers, sought to earn hard currency for its titanium. Large exports of titanium sponge from the C.I.S. at low prices in 1994, contributed to the oversupply of titanium on world markets and the closure of capacities in the United States and other countries.³⁴

In 1993, the Kazakhstan Government created a program for the development of its titanium industry. The program called for the development of ilmenite deposits, including the Kara-Otkel and Peschanka deposits in eastern Kazakhstan,

and the Shekash ilmenite-zirconium deposits in the Aktyubinsk region of Kazakhstan. The program further called for the completion, renovation, and expansion of current metallurgical facilities at the Ust-Kamenogorsk plant aimed at increasing sponge production capacity by 25% and the creation of titanium dioxide production capacity.³⁵

In summer 1994, as part of its program for developing its base and nonferrous metals industries, the Government announced plans to develop a mining and beneficiation complex at the Shekash deposit having the capacity to produce 6,000 mt of ilmenite, 11,200 mt of rutile, and 1,100 mt of zircon during the 1995-97 period. The program also called for completion of the Kara-Otkel mining and beneficiation complex in eastern Kazakhstan with a capacity to produce 100,000 mt of ilmenite, 20,000 mt of rutile and 14,000 mt of zircon concentrate in 1996 and for the completion of the Kokchetav mining and beneficiation complex with the annual capacity to produce 41,000 mt of ilmenite, 18,000 mt of rutile, and 31,000 mt of zircon concentrate.³⁶

Mineral Fuels

Coal.—Coal production in 1994, compared with 1993, decreased 7% to 104 Mmt.³⁷ Kazakhstan was the FSU's third largest coal producer after Russia and Ukraine. Production occurred at the Ekibastuz basin comprised primarily of subbituminous coals; the remainder was mainly bituminous coal, including coking coal from the Karaganda basin.³⁸ Both Ekibastuz and Karaganda were administered by the state corporation Kazakhstanugol formed in February 1992, which was subordinate to the Ministry of Energy and Fuel.

Ekibastuz was comprised of four open pits, the largest of which was the Bogatyr with a production of about 50 Mmt/a. Reserves at Ekibastuz were reportedly 7 billion mt; coals ranged from gas through gas-fat, fat and coking, to lean caking, and were high in ash content but low in sulfur content.

At Karaganda, production primarily was from underground mines; practically all were mechanized longwall mines, but surface mining was increasing. Karaganda produced both thermal and metallurgical coals. Reserves are reportedly 25 billion mt. Karaganda was comprised of 26 underground mines and three open pits. The underground mines varied in size from about 500,000-mt/a output to more than 3 Mmt/a output. The three open pits were the Chekinsky, reportedly producing about 2 Mmt/a; the Molodezhnyy, 4.5 Mmt/a; and the Shubarkolsky, more than 3 Mmt/a.³⁹

Natural Gas.—Natural gas production in 1994 decreased 33% to 4.5 billion cubic meters (m³).⁴⁰ The Kazakh Ministry of Oil and Gas signed an agreement with Russia's main gas producing concern, Gazprom, for Gazprom to participate in the development of the Karachaganak oil and gas condensate field, one of the world's largest. It is in the Ural Mountains,

near the Russian, border, with reportedly 1.3 trillion m³ of recoverable gas reserves, 850 Mmt of condensate reserves, and 340 Mmt of oil reserves. In 1993, the British-Italian alliance Gas-Agip won a tender for exclusive rights to develop Karachaganak, but then agreed to share this right with Gazprom.⁴¹

Petroleum.—Oil production in 1994 decreased to 20.3 Mmt from 23 Mmt in 1993.⁴² The Chevron Corp., engaged in a joint venture to develop the Tengiz Oilfield, still sought to establish a pipeline route to export oil from Tengiz.

Chevron's projected output for Tengiz was 130,000 barrels per day (bbl/d) by yearend 1994, and 700,000 bbl/d by the year 2010. The development of the Tengiz deposit was delayed because a resolution had not been found to determine the route for the oil export pipeline. It originally had been intended to build a new pipeline through Azerbaijan and Turkey. The only pipeline available to transport Tengiz oil passed through Russia, which had limited the amount of oil that could be shipped through this pipeline.⁴³

Uranium.—Kazakhstan, Russia, and Uzbekistan each produced about one-third of the uranium output of the FSU. Plans called for Kazakhstan to develop its own nuclear powerplants that would operate on domestically supplied fuel and thus reduce Kazakhstan's uranium exports.⁴⁴

In 1994, Kazakhstan announced an agreement with Kyrgyzstan for the period 1994-2000, under which Kazakhstan's uranium mines would ship 1,000 mt/a of uranium concentrate with a 40% to 45% uranium content to the Kara-Balta plant in Kyrgyzstan for processing. The Kazakhstan National Atomic Energy and Industry Co. would market the processed product, uranium oxide, with Kazakhstan receiving 71% of the profits and Kyrgyzstan 29%.⁴⁵

In November, the United States and Kazakhstan acknowledged that more than one-half metric ton of enriched uranium had been moved from a storage facility at the Ulbinskiy plant in Oskemen, Kazakhstan, to storage at a Tennessee nuclear complex to safeguard this material.⁴⁶

Infrastructure

Kazakhstan, approximately four times as larger than as the State of Texas, is the second largest country in land area and fourth most populous to form from the FSU.

Kazakhstan borders Russia to the north, China to the east, and Kyrgyzstan, Uzbekistan, and Turkmenistan to the south. Kazakhstan extends from the Volga River to the Altai Mountains and from plains in western Siberia to desert in central Asia. Although landlocked, Kazakhstan borders two major inland seas, the Aral and the Caspian. The Aral Sea, however, was drying up as a result of a major environmental catastrophe, resulting in the contamination of agricultural lands and populated regions by salts and contaminants blown from the dry sea bottom. It was also causing climate changes that are less conducive to agriculture, including hotter

temperatures and less rainfall.

Major lakes in Kazakhstan include the Alakol, Balkhash, and Zaysan. There are about 4,000 km of navigable river routes. The major rivers are the Ertis (Irtysh),⁴⁷ Syrdarya, Ishim, Ile, (Ili) and (Chu). These rivers were important sources of hydroelectric power and provided water for irrigation.

As of 1990, Kazakhstan had 14,460 km of railroads, not including industrial lines, and 189,000 kms of highways, of which 80,900 km was dirt roads. In 1992, the country had more than 2,800 km of crude oil pipelines and more than 3,400 km of gas pipelines.

Outlook

The outlook for Kazakhstan's mineral industry could be quite favorable given the size and variety of its mineral reserves and the fact that it has a wide range of mineral commodities produced in excess of its consumption needs that could be exported. Most of these minerals were exported to the C.I.S. countries, particularly Russia, although a larger percentage of these minerals were shipped to world markets in 1994.

Kazakhstan has the potential to be a much larger supplier of minerals to world markets if it diverts trade away from the C.I.S. and further develops its mineral reserves. Several factors are important. As Kazakhstan makes the transition to market economy criteria, it is not yet clear as to what percentage of its mineral production would be economically competitive under market economy conditions, particularly given the cost of transporting these minerals to world markets. Also, by trading its minerals within the C.I.S., Kazakhstan is able to obtain a large number of commodities needed by other sectors of its economy at below world market prices and may consider this as favorable terms of trade.

In addition, a number of Kazakhstan's mineral industries will require substantial investment to become major world suppliers. For example, Kazakhstan has large petroleum reserves that require considerable investment and state-of-the-art technology to develop. The exploitation of Kazakhstan's large petroleum reserves is already being planned with the participation of Chevron Corp., and this development will be a significant source of fuel and hard currency earnings.

Kazakhstan has significant production of a wide range of ferrous and nonferrous metals and is capable of increasing production of these metals if investment is made in developing deposits and mines and in renovating metallurgical facilities.

It remains to be seen to what extent foreign investors can be attracted to participate in the development of some of Kazakhstan's major mineral industries, including its copper and lead-zinc industries. Kazakhstan's future as a major

world mineral producer will depend in large measure on its ability to attract investment to develop and renovate its mineral industries.

¹Text prepared July 1995.

²Interfax Business Report (Denver, Colorado), Feb. 7, 1995, p. 3.

³Kazakhstanskaya Pravda (Almaty). Jan. 14, 1995, pp. 1,2.

⁴Daily Telegraph (London). Mar. 21, 1994, p. 28.

⁵Interfax Mining and Metals Report (Denver, Colorado). June 24-July 1, 1994, pp. 11,12.

⁶Interfax Business Report (Denver, Colorado), Oct. 20, 1994, p. 6.

⁷Infomine (London). Mar. 29, 1995, pp. 2,3.

⁸Work cited in footnote.

⁹Mining Journal (London). Mar. 11, 1994, p. 11. Interfax Mining and Metals Report (Denver, Colorado), June 10-17, 1994, p. 2.

¹⁰Work cited in footnote 4.

¹¹Interfax Mining and Metals Report (Denver, Colorado). Dec. 17-31, 1993, p. 7.

¹²Infomine (London). Mar. 29, 1995, p. 3.

¹³Metal Bulletin (London). Nov. 29, 1993, p. 10.

¹⁴_____. May 3, 1993, p. 6.

¹⁵Interfax Business Report (Denver, Colorado), Apr. 4, 1994, p. 7.

¹⁶Work cited in footnote 4.

¹⁷Metal Bulletin (London). May 12, 1994, p. 7.

¹⁸Interfax Mining and Metals Report. Jan. 13-20, 1995, pp. 14-16.

¹⁹Work cited in footnote 17.

²⁰Interfax Mining and Metals Report. (Denver, Colorado), Nov. 26-Dec. 3, 1993, p. 9. Mining Journal (London). Mar. 11, 1994, p. 10.

²¹Work cited in footnote 17.

²²Mining Magazine. (London). Aug. 1994, p. 58. Interfax Statistical Report (Denver, Colorado). June 10-17, 1994, p. 14.

²³American Metal Market (New York, NY). July 21, 1994, p. 2.

²⁴Work cited in footnote 4.

²⁵Metal Bulletin (London). May 12, 1994, p. 9.

²⁶Interfax Mining and Metals Report (Denver, Colorado), Feb. 25-Mar. 3-4, 1994, pp. 8-9.

²⁷Information from The Role of a Partner in a Joint Venture, an unpublished paper by the management of the Leninogorsk complex, 1994.

²⁸Work cited in footnote 4.

²⁹Metal Bulletin (London). Mar. 10, 1994, p. 5

³⁰Interfax Statistical Report (Denver, Colorado), June 10-17, 1994, p. 14.

³¹Summary of World Broadcasts, British Broadcasting Corp., (Reading England). Feb. 25, 1994, WD 11 Kazakh TV, Feb. 16, 1994. Metal Bulletin (London). Sept. 20, 1993, p. 15.

³²Interfax Mining and Metals Report (Denver, Colorado), Feb. 5-12, 1993, p. 15, 16. American Metal Market (New York, NY.) Feb. 2, 1994.

³³Interfax Mining and Metals Report (Denver, Colorado), Feb. 5-13, 1993.

³⁴American Metal Market, Titanium Supplement (New York, NY). Sept. 30, 1994, pp. A1-15.

³⁵Interfax Mining and Metals Report (Denver, Colorado), July 3-10, 1992, p. 10.

³⁶Work cited in footnote 4.

³⁷Interfax Statistical Report (Denver, Colorado). Feb. 10-17, 1995, p. 26.

³⁸Interfax Mining and Metals Report (Denver, CO). Mar. 19-25, 1994, p. 6.

³⁹Mining Magazine (London). June 1994, pp. 357-358.

⁴⁰Interfax Business Report (Denver, Colorado), Feb. 7, 1995, p. 5.

⁴¹_____. Dec. 12, 1994, p. 3. Foreign Broadcast Information Service, Mar. 3, 1995, p.76, Interfax in English, 1639 gmt, Mar. 2, 1995. Foreign Broadcast Information Service (Washington, DC). Jan. 14, 1994, p. WD 15, Kazakh Radio, Alma-Ata, Dec. 21, 1993.

⁴²Interfax Business Report (Denver, Colorado), Feb. 7, 1995, p. 5.

⁴³Moscow News, (Moscow). No. 39, Sept. 30-Oct. 6, 1994, pp. 5,9.

⁴⁴Interfax Mining And Metals Report (Denver, Colorado), Sept. 10-17 1993, p. 7.

⁴⁵_____. (Denver, Colorado), June 17-24, 1994, p. 2.

⁴⁶_____. (Denver, Colorado), Nov. 25-Dec. 1, 1994, p. 3.

⁴⁷New names and spellings are given when available. The old names will appear in parentheses the first time the new name is used.

TABLE 1
KAZAKHSTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1992	1993	1994
METALS			
Alumina	1,100,000	1,000,000	700,000
Arsenic trioxide	2,000	2,000	1,500
Bauxite	3,040,000 3/	3,000,000	2,430,000 3/
Beryllium, metal	NA	NA	NA
Bismuth, metal kilograms	90,000	90,000	84,500 3/
Cadmium, metal	650	650	601 3/
Chromite	3,500,000	2,900,000	2,020,000 3/
Copper:			
Mine output, metal content	250,000	250,000	202,000 3/
Metal:			
Smelter	310,000	310,000	282,000
Refined	310,000	310,000	282,000 3/
Ferroalloys:			
Ferrochromium	400,000	328,000 3/	185,000
Ferrosilicon	500,000	450,000	350,000
Gold, mine output	24	25	26
Iron and steel:			
Pig iron	4,660,000 3/	3,540,000 3/	2,430,000 3/
Steel, crude	5,680,000 3/	4,280,000 3/	2,840,000 3/
Steel, finished	4,100,000	3,400,000	2,300,000
Iron ore, marketable	17,300,000	13,000,000	10,500,000
Lead:			
Mine output, metal content	170,000	170,000	160,000
Metal, refined	160,000	160,000	150,300 3/
Magnesium	20,000	20,000	15,000
Manganese ore, marketable	100,000	150,000	133,000
Molybdenum, mine output, metal content	600	600	490 3/
Silver	900	900	800
Tin, mine output, metal content	500	500	400
Titanium, metal	30,000	30,000	27,200 3/
Tungsten, metal, W content	100	100	90
Zinc:			
Mine output, metal content	180,000	180,000	172,600 3/
Metal, smelter	170,000	170,000	160,000
INDUSTRIAL MINERALS			
Asbestos, all grades	300,000	225,000	187,500 3/
Barite	200,000	200,000	175,000
Boron	100,000	90,000	80,000
Cement	6,000,000	5,000,000	4,000,000
Fluorspar	100,000	90,000	80,000
Phosphate rock	3,500,000	2,500,000	1,740,000
Sulfur	200,000	150,000	100,000
MINERAL FUELS			
Coal	127,000,000	112,000,000	104,000,000 3/
Natural gas million cubic meters	8,800	6,800	4,500 3/
Petroleum, crude	26,000,000	23,000,000	20,300,000 3/
Uranium concentrate, U content	3,000	2,700	2,000

e/Estimated. NA Adequate information is unavailable to form a production estimate.

1/ Previously published and 1994 data are rounded by the Bureau of Mines to three significant digits.

2/ Table includes data available through Aug. 25, 1995.

3/ Reported figure.

TABLE 2
KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity e/
Alumina	Pavlodar alumina refinery	Pavlodar	1,200,000.
Arsenic, trioxide	Chimkent polymetallic enterprise and other nonferrous metallurgical enterprises	Shymkent (Chimkent)	3,500.
Asbestos	Dzhetygara complex	Kustanay oblast	1,000,000 total.
Do.	Chilisay complex	Aktyubinsk phosphorite basin	
Barite	Karagailinskiy mining and beneficiation complex	Karagaili region	
Do.	Tujuk Mine	Alma-Ata region	300,000 total.
Do.	Achisay polymetallic complex	Kentau region	
Bauxite	Turgai, Krasnooktyabr bauxite mining complexes	Central Kazakhstan	600,000 total.
Beryllium, metal	Ulbinskiy metallurgical plant	Oskemen (Ust-Kamenogorsk)	NA.
Bismuth, metal	Ust-Kamenogorsk lead-zinc metallurgical plant	do.	70 total.
Do.	Leninogorsk Lead Smelter	Leninogorsk	
Cadmium	Leninogorsk mining and beneficiation complex	do.	1,200.
Chromite	Donskoy mining and beneficiation complex	Khromtau region	3,800,000.
Coal	Karaganda basin	Central and North Central part of the country	50,000,000.
Do.	Ekibastuz basin	do.	85,000,000.
Do.	Maykuben basin	do.	10,000,000.
Do.	Turgay basin	do.	1,000,000.
Copper, mining, recoverable copper content	Balkhash	Balkhash region	200,000.
Do.	Dzhezkazgan	Dzhezkazgan region	250,000.
Do.	Irtysk	Irtysk region	10,000.
Do.	Leninogorsk	Leninogorsk region	15,000.
Do.	Zhezkent	Zhezkent region	25,000.
Do.	Zyryanovsk mining and beneficiation complexes	Zyryanovsk region	5,000.
Do.	East Kazakhstan copper-chemical complex	Ust-Kamenogorsk region	10,000.
Copper: Metallurgy, metal	Balkhash	Balkhash region	150,000.
Do.	Dzhezkazgan	Dzhezkazgan region	250,000.
Do.	Irtysk smelting and refining complexes	Irtysk region	40,000.
Ferroalloys	Aktyubinsk plant	Aqtöbe (Aktyubinsk)	High-carbon 60% ferrochrome, 150,000 medium-carbon 60% ferrochrome, 130,000.
Do.	Yermak plant	Ermak (Yermak)	Ferrosilicon 700,000 ferrosilicochrome, 700,000; high-carbon ferrochrome 400,000.
Gallium	Pavlodar alumina plant	Pavlodar	NA.
Gold	Byproduct of polymetallic ores and native gold mining	Colocated with nonferrous metals mining	30.
Iron and steel:			
Pig iron	Karaganda Steelworks	Karaganda	5,000,000.
Steel, crude	do.	do.	6,300,000.
Steel, finished	do.	do.	4,700,000.
Iron ore, marketable	Sokolovsko-Sarbay, Lisakovskiy mining and metallurgical complexes	Kustanay oblast	25,000,000 total.

See footnotes at end of table.

TABLE 2- Continued
KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity e/
Lead and zinc, mining: (recoverable lead and zinc content of ore)	Achisay	Kentau and Karatau regions	Lead 40,000, zinc 20,000.
Do.	Akchatau	Balkhash region	Lead 10,000, zinc 30,000.
Do.	Irtysk	Ust-Kamenogorsk region	Lead 10,000, zinc 50,000.
Do.	Karagaili	Karagaili region	Lead 20,000 zinc 55,000.
Do.	Leninogorsk	Leninogorsk region	Lead 60,000, zinc 120,000.
Do.	Tekeli	Tekeli, Taldi-Kurgan regions	Lead 20,000, zinc 30,000.
Do.	Zhayrem	Zhayrem region	Lead 20,000, zinc 40,000.
Do.	Zyryanovak complexes	Zyryanovak region	Lead 20,000, zinc 40,000.
Do.	East Kazakhstan copper-chemical complex	Ust-Kamenogorsk region	Zinc 15,000 (lead currently not recovered).
Do.	Kounrad Mine	Balkhash complex	6,000 total.
Do.	Karaobinskoye deposit	Karaoba region	
Do.	Sayak deposit	Sayak region	
Metal	Akchatau molybdenum metal plant	Dzhezkazgan oblast	NA.
Petroleum and natural gas	Aktyubinskneft	Aktyubinsk region	28,000,000 (total crude oil), 10 mil- lion cubic meters.
Do.	Embaneft	Embinskiy district	
Do.	Mangyshlakneft	Mangyshlak Peninsula	
Do.	Tengiz deposit	Tengiz deposit	
Phosphate rock	Karatau production association	Dzhambul and Chimkent oblast	10,000,000 total.
Do.	Chilisay mining directorate	Aktyubinsk phosphorite basin	
Rare metals (columbium, indium, selenium, tellurium)	Aktau complex	Shevchenko	NA.
Do.	Belogorsky rare metals plant	Belogorsk	NA.
Do.	Chimkent polymetallic plant	Shymkent	NA.
Do.	Ust-Kamenogorsk lead-zinc plant	Oskemen	NA.
Do.	Akchatau mining and beneficiation complex	Dzhezkazgan oblast	NA.
Rhenium	Balkhash copper mining and metallurgical complex	Balqash (Balkhash)	NA.
Tantalum	Yermak ferroalloy plant	Ermak	NA.
Tin	Akchatau mining and beneficiation complex	Akzhal deposit Dzhezkazgan oblast	700.
Titanium, metal	Ust-Kamenogorsk titanium- magnesium plant	Oskemen	35,000.
Silver, byproduct	Ust-Kamenogorsk	do.	
Do.	Leninogorsk	Leninogorsk	1,200 total.
Do.	Chimkent metallurgical plants	Shymkent	

See footnotes at end of table.

TABLE 2- Continued
 KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity e/
Uranium, U content	Stepnogosk	Stepnogosk	
Do.	Shevchenko	Shevchenko	
Do.	Taboshara	Taboshara	3,500 total.
Do.	Prikaspiskiy ore enrichment center	Shevchenko	
Do.	Tselinny chemical complex	Stepnogosk	

e/ Estimated

*New names and spellings are given when available. The old name will appear in parentheses the first time the new name is used.