

THE MINERAL INDUSTRY OF MONGOLIA

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Mongolia's nonfuel mineral resources include asbestos, bauxite, clays, copper, diamond, fluor spar, gold, gemstones, graphite, gypsum, iron, lead, limestone, magnesium, manganese, molybdenum, phosphate, platinum, rare earths, salt, sand and gravel, silica, silver, tin, tungsten, zeolite, and zinc. Its mineral fuel resources included coal, petroleum, and uranium. However, only coal, copper, fluor spar, gold, gypsum, limestone, molybdenum, salt, sand and gravel, silica, tin, tungsten, and uranium were produced in 1996. (See table 1.) Most of the mining operations were in the north-central and eastern parts of the country. Mongolia was the third largest fluor spar producer in the world and was one of the top three producers of copper and molybdenum in Asia and the Pacific region in 1996.

In the June 1996 national parliamentary general election, the Democratic Union Coalition, which is led by the Mongolian National Democratic Party, defeated the ruling communist Mongolian Peoples' Revolutionary Party to gain control of the State Great Hural. The new Government consolidated the previously established 14 Cabinet Ministers into 9. The former Ministry of Energy, Geology, and Mining (MEGM) was abolished. The former MEGM's jurisdiction over fuel and energy was transferred to the Ministry of Infrastructure Development. The former MEGM's jurisdiction over geology, geological exploration, mining, metallurgy, and mineral extraction was transferred to the Mining and Geology Department of the Ministry of Agriculture and Industry. Under the Mining and Geology Department, there were a Geology Division, a Mining Division, and a Mine and Geological Regulatory Agency.

The mining industry comprised several large joint-venture companies mining and processing copper, fluor spar, gold, limestone, and molybdenum; several large state-owned companies mining coal; several small state-owned and privately owned companies mining construction aggregate, sand and gravel, silica sand, tin, tungsten, and many small privately owned companies mining gold. The output of the mining industry was at a higher level in 1996 than in 1995 because of increased mine production of copper, fluor spar, gold, and molybdenum. Coal production was also at slightly higher level in 1996 than in 1995 because of improved productivity, when the deteriorated machinery and equipment were replaced with a new and more efficient one.

According to the State Statistical Office (SSO), the Mongolian economy, as measured by real gross domestic product (GDP), grew 2.6% in 1996 compared with 6.3% in 1995. The slower GDP growth in 1996 was attributed mainly to a significant drop in the agriculture production resulting from

a series of natural disasters, such as prairie fires and harsh winter conditions. Industrial production also decreased because of a weaker domestic demand for manufactured goods. However, the output of the mining industry increased in 1996 mainly because of increased productivity at the Baga Nuur coal mine, at the Erdenet copper-molybdenum mining and milling complex, and at the Bor Ondor fluor spar mining and milling complex following the upgrading of equipment and facilities in the past 2 years.

In 1996, the output of the mining sector accounted for about 8% of Mongolia's GDP. Minerals exports accounted for about 59% of Mongolia's total export earnings and mineral imports accounted for 20% of Mongolia's imports in 1996. According to SSO, the external trade total turnover decreased to \$861.2 million in 1996 from \$888.6 million in 1995. Export earnings, excluding gold, decreased to \$422.9 million in 1996 from \$473.3 million in 1995, while import bills increased to \$438.3 million in 1996 from \$415.3 million in 1995. According to SSO, exports of mineral products were valued at \$250 million in 1996, compared with \$309.9 million in 1995, while imports of mineral products were valued at \$87.8 million in 1996, compared with \$83.0 million in 1995. The major export mineral products were ore and concentrates of copper, fluorite, and molybdenum. The major import mineral products were coal, ferrous and nonferrous metal products, and refined petroleum products.

In copper and molybdenum mining and milling, the Erdenet Mining Corp. (EMC) produced 351,500 metric tons (t) of copper concentrate and 4,684 t of molybdenum from the Erdenet Mine in Bulgan Aymag of north-central Mongolia in 1996. The copper concentrate contained about 29% of copper with high content of silver and selenium. The molybdenum concentrate contained about 47% of molybdenum with high content of rhenium and selenium. At the Erdenet Mine, the mining capacity remained at 20 million metric tons per year (Mt/yr) of ore and the concentrator was capable of producing 430,000 t of copper concentrate and about 5,000 t of molybdenum concentrate. According to *Mining Journal*, EMC planned to expand the mining capacity at the Erdenet Mine to 30 Mt/yr by the year 2005. Ore reserves in the Erdenet area were estimated at about 900 million metric tons (Mt) with average ore grade of 0.8% copper and 0.018% molybdenum (*Mining Journal*, 1997). EMC, a Mongolian-Russian joint-venture firm, is owned 51% by the Government of Mongolia and 49% by the Government of Russia.

In copper refining, Erdmin Co. Ltd. had completed construction of a 3,600-metric-ton-per-year (t/yr) solvent-

extraction and electrowinning (SX-EW) pilot plant in October 1996 to extract copper from tailing in the mine dump and waste rock near the Erdenet Mine. The construction cost of the pilot plant was estimated at \$9.1 million, of which 80% was financed by Marubeni Corp., a major Japanese trading company. In return, Marubeni will have the right to purchase up to 60% of the plant's copper cathode output for export mainly to Japan (Metal Bulletin, 1996; Nikkan Kogyo Shinbun, 1996). Erdmin is 51% owned by EMC and 49% by Nescor Minerals Inc. of the United States. In March 1996, Armada Gold Corp. (AGC), a Canadian gold mining company, acquired 49% equity interest in Erdmin through Nescor Minerals of the United States. According to AGC, the pilot plant was expected to start production with an initial rate of 3,629 t/yr of copper cathode in early 1997. The operating cost of the SX-EW pilot plant was estimated at between \$0.23 and \$0.30 per pound of copper. The stockpiled waste rock (oxide ore) and tailing in the mine dump, which will be processed by the SX-EW technology near the Erdenet Mine, were estimated to contain about 694,000 t of copper. A feasibility study for building a commercial plant with a capacity of 38,555-t/yr plant near the pilot plant was expected to be conducted in 1997 (Armada Gold Corp., 1997).

Exports of copper and molybdenum concentrates were 486,100 t and 5,500 t, respectively, in 1996. Copper concentrates were exported mainly to China, Japan, Russia, and Switzerland, while molybdenum concentrates were exported all to Russia in 1996. In 1996, EMC reportedly shipped some of its copper concentrate to the Balkash copper smelter in Kazakhstan for smelting and refining (Far Eastern Economic Review, 1997). However, the Balkash smelter declared bankruptcy and failed to deliver 10,800 t of refined copper. As a result, EMC was owed about \$27 million by the Balkash smelter.

In gold mining, gold production reached a record high in 1996. Mongolrosvetmet Corp. (MONROS), Mongolia's largest gold producer, produced about 1.5 t of gold from its operations in the Tolgoyt and Zaamar Districts. MONROS commissioned a 77-bucket dredge in the Tuul River area of the Zaamar District in 1995. The remaining 3.8 t of gold was produced by several state-owned and more than 60 privately owned small companies operating at many of the placer gold deposits in north-central and southwestern Mongolia. The major gold mining areas were at Tolgoyt (Tolgoit), Ikh Ulent, Sharin Gol, Havchuu, Ikh Uvuljuu, and Burhant, all in north-central Mongolia; at Mukhar Ereg and Uvur Chuluut in the Bayakhongor area of southwestern Mongolia; and at Khailaast, Tsagan Chulut, Tosongin Gol, and 13 other placer deposits along the Tuul River, all in the Zaamar District of north-central Mongolia. Official statistics published by SSO on gold production was 5.2 t in 1996. However, according to a local press report, about 6.1 t of gold had been produced in 1996 (Mongolian Business Times, 1997).

Mongolia Gold Resources Ltd. (MGR) of Canada, in joint venture with the Government of Mongolia through Mongol Alt Corp. (a privately owned company), completed a revised feasibility study in 1996 for developing the Bumbat property in the Zaamar District, about 219 kilometers (km) northwest of

Ulaanbaatar. According to MGR, the revised feasibility study, which was prepared by H.A. Simon Mining Group using results of the 1995 drill program, called for development of an open pit mine and a stone-crushing mill to process 300 metric tons per day of ore to produce about 1.6 t of gold per year (Mongolia Gold Resources Ltd., 1997). The average production cost was estimated at about \$3,890 per kilogram with an overall gold recovery rate of about 97%. Construction of the mine and mill as well as installation of electrical power had begun at the Bumbat property site in the fall of 1996 (Mongolia Business Review, 1996a). Gold production at the Bumbat property was expected to start in the spring of 1997. The established gold resources in the area were estimated to contain about 20 t of gold (Mongolia Gold Resources Ltd., 1996).

At the Boroo property, about 130 km north of Ulaanbaatar, several companies including a Ulaanbaatar-based ALTAI Mining Co. Ltd. and Gippsland Resources of Australia reportedly were reassessing the property in 1996. According to previous exploration and feasibility studies conducted by Morrison Knudsen Gold Co. of the United States, the gold resources at the Boroo property had been estimated to contain about 37 t of gold.

Production of tin and tungsten remained low in 1996. Tin was mined at the Bain-Mod (Modot), the Khujkhan, and the Kharmaitin mines. Tungsten was mined at the Burentsogt Mine in Dornod Aymag in southeastern Mongolia. The Ulaan Uul and the Khovd Gol mines in Bayan Olgii in western Mongolia and the Tsagaan Davaa tungsten mine in Tov Ayamg in north-central Mongolia, near Ulaanbaatar, remained close in 1996. The Government continued to promote exploration and development of the Undur Tsagaan tungsten deposit in Hentiy Aymag, where ore reserves had been estimated by the Government at 186 Mt, grading 0.17% tungsten trioxide and 0.2% of molybdenum oxide.

Production of fluorspar was 565,100 t in 1996, of which about 78% of the ore were processed into fluorspar concentrate and the remainder was sold as direct-shipping ore. In 1996, production of fluorspar concentrate rose 8% to 130,000 t. The fluorspar concentrate contained between 96% and 98% of calcium fluorite. Most of the direct-shipping fluorspar ore and fluorspar concentrate were exported to Kazakhstan, Russia, and Ukraine. In 1996, exports of fluorspar concentrate rose by 20% to 155,200 t. MONROS, the major fluorspar producer, operated an underground mine and an open pit mine as well as a fluorspar concentrator at Bor Ondor in Hentiy Aymag. It also operated open pit mines at Khar-Airag, Khajuu (Khazhu) Ulaan, and Urgon (Orgon) in Dornogovi Aymag; and an underground mine at Berh in Hentiy Aymag. MONROS planned to expand the capacity of its concentrator to 200,000 t/yr in the next 5 years. However, the company has not yet secured the financing for its expansion project (Mining Magazine, 1996).

Coal production rebounded to 5.1 Mt in 1996 from 4.9 t in 1995. Most coal production was of brown coal and lignite. About 75% of the total coal output was consumed by the utility industry for power generation in 1996. The Baga Nuur, the Shariyn Gol, and the Shivee Ovoo mines were the three major producing mines in 1996. In the past years, Morrison Knudsen

Corp. of the United States had been providing technical assistance to improve the efficiency and safety of the coal mining operations in Mongolia with financial assistance from the United States Agency for International Development. In 1996, Mongolia reportedly received a \$35 million soft loan from the International Development Association of the World Bank as part of the \$62 million financing package to modernize and upgrade the Baga Nuur and the Shivee Ovoo mines.

In oil exploration, SOCO International, Inc., a wholly owned subsidiary of Snyder Oil Corp. of the United States, announced in September 1996 that it had discovered oil at the Sotamo 21-2 exploratory well in Block XXI in the Tamtsag Basin of northeastern Mongolia. SOCO planned to drill four more wells in the Basin in 1997. In the past 2 years, SOCO had drilled four wildcat wells resulting in two oil discoveries. According to SOCO, it had successfully exported its first cargo of Mongolian crude petroleum, produced from the Sotamo 19-2 well, under a purchase contract, to China National Petroleum Corp. at a net price of \$20.75 per barrel after a transportation allowance (Mongolia Business Review, 1996b). In January, New Concept Technologies International Ltd. of Canada acquired 20% working interest in the Tamtsag Basin in Mongolia for \$7.5 million. In April, Territorial Resources Inc. of the United States reportedly signed a letter of intent to increase its 1.1% interest in the SOCO Tamtsag Mongolia Inc. to 13.2%.

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Major Sources of Information

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Major Publication

Statistical Office of Mongolia: Monthly Bulletin of Statistics, 1996.

TABLE 1
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity 2/ | 1992 | 1993 | 1994 | 1995 | 1996 p/ |
|---|---------|--------|-----------|-----------|---------|
| Cement, hydraulic thousand tons | 133 | 82 | 86 | 109 | 106 |
| Coal do. | 6,247 | 5,609 | 5,012 r/ | 4,871 | 5,111 |
| Copper, mine output, Cu content | 105,100 | 96,900 | 99,600 | 100,400 | 101,900 |
| Fluorspar: | | | | | |
| Acid grade thousand tons | 97 | 77 | 88 | 120 | 130 |
| Submetallurgical and other grade e/ do. | 287 | 276 | 85 | 119 r/ | 124 |
| Total e/ | 384 | 353 | 173 | 239 r/ | 254 |
| Gold, mine output, Au content 3/ kilograms | 900 | 1,200 | 2,000 | 4,800 | 5,300 |
| Gypsum e/ thousand tons | 25 | 25 | 25 | 25 | 25 |
| Lime, hydrated and quicklime do. | 68 | 51 | 66 | 51 | 55 |
| Molybdenum, mine output, Mo content | 1,610 | 2,050 | 2,100 | 1,830 | 2,200 |
| Salt, mine output | 979 r/ | 603 r/ | 200 r/ | 497 r/ | 429 |
| Silver, mine output, Ag content e/ 4/ kilograms | 18,000 | 17,500 | 18,900 r/ | 19,100 r/ | 19,300 |
| Steel, crude | -- | -- | 12,222 | 22,239 | 22,605 |
| Tin, mine output, Sn content e/ | 190 | 150 | 100 | 150 | 100 |
| Tungsten, mine output, W content e/ | 260 | 250 | 150 | 200 | 200 |
| Uranium, mine output, U content e/ | 120 | 100 | 100 | 100 | 100 |

e/ Estimated. r/ Revised. p/ Preliminary.

1/ Table includes data available through Apr. 18, 1997.

2/ In addition to the commodities listed, crude construction materials such as sand and gravel, varieties of stone such as limestone, and silica are produced, but available information is inadequate to make reliable estimate of output levels.

3/ Includes reported raw gold production and estimated gold contained in copper concentrate.

4/ Silver contained in copper concentrate.

Source: Statistical Office of Mongolia (Ulaanbaatar). Monthly Bulletin of Statistics, Dec. 1996. p. 76, 77.