



2008 Minerals Yearbook

MONGOLIA

THE MINERAL INDUSTRY OF MONGOLIA

By Susan Wacaster

After decades of having a state-controlled economy, Mongolia transitioned to a market-based economy in 1990 and adopted a new Constitution in 1992 that emphasized private ownership practices. In the early 1990s, animal husbandry was the leading sector of the economy; in recent years, however, the real gross domestic product (GDP) had been augmented by the mining sector. Before 1990, some mineral resources were directed for export to eastern European countries, whereas production of coal, petroleum, and some salts was primarily for domestic use. Since then, the country had become increasingly reliant upon mineral resources for its economic development, and began exporting mineral commodities to Canada, China, the European Union, Russia, and the United States. In 2007, mineral sector revenues accounted for 39% of the national budget. In 2008, Mongolia was the world's third ranked producer of fluorspar after China and Mexico, producing both acid and metallurgical grades (Miller, 2009; World Bank, The, 2009a, b).

The Geological Survey of Mongolia was established in 1939 and began collaborating with the Soviet Union and east European countries at that time. From 1939 to 1990, significant deposits of copper, fluorite, gold, iron, lead, molybdenum, phosphate, quartz, tin, tungsten, uranium, and zinc were discovered and mined. From 1940 to 1970, quartz, placer tin, and tungsten-tin vein deposits were mined out with assistance from the Soviet Union. Rare-earth metal deposits were discovered in various areas of eastern Mongolia. By 2001, about 94% of the country had been geologically mapped at the 1:200,000 scale and 1:50,000-scale maps were completed for 16% of the territory. At that time, 70% of the country had been covered by airborne geophysical surveys. In 2008, about 25% of the country was covered by general exploration work and geologic mapping at the 1:50,000 scale. Mongolia was found to have more than 6,000 mineral deposits, and the Mongolian Government had classified 34 of those as strategically significant, including coal, copper, gold, phosphorus, and silver deposits (Dugerjav and others, 2001; Mineral Resources Authority of Mongolia, 2009).

Minerals in the National Economy

The mining industry's contribution to the total GDP increased to 28.2% in 2008 from 12.6% in 2002. Mongolia's economy was heavily affected by the global economic crisis of 2008 as the prices of Mongolia's main exports, including coal, copper, and zinc, fell to 2004 levels. Mongolia's preliminary estimate of GDP growth for 2008 was reported to be 8.9% compared with 9.9% in 2007. Foreign direct investment was received primarily by the mining sector; however, the value added for the year was only 1.7% (Mineral Resources Authority of Mongolia, 2009; World Bank, The, 2009b).

Government Policies and Programs

The Government's reliance upon mining as a source of revenue had increased since 2005 with the introduction of a windfall profits tax (imposed, for example, on sales of copper ore and concentrate and levied at a rate of 68% on the difference between actual copper prices and the sum of a base price for ore plus the cost of smelting) and reductions in the value-added tax (an incremental tax levied on the value added at each stage of processing; effectively, a sales tax on the ultimate consumer). The windfall tax has become an important input to the national budget, contributing 7.8% of total public revenues in 2007, and has been a main source of revenue for Mongolia's Government Development Fund. The Mongolian Minerals Act of 2006 entitles the Government to an ownership interest of up to 34% in mining properties generally, and up to 50% in properties defined as strategic (World Bank, The, 2009b).

Amendments to the Minerals Act of 2006 were proposed that could change the Government's ownership percentages, but they were not passed in 2008. In June, parliamentary elections were held in which the main parties disputed whether the Government, or private companies, should hold the majority interest in the country's mineral deposits. The winning party, which reportedly campaigned for Government interests, gained 46 of the 76 seats in the Parliament whereas the opposing party won about 20 seats. The elections were contested, and violence broke out in the country, which resulted in a state of emergency. The outgoing Parliament had been trying to amend the Minerals Law to prevent the Government from finalizing development agreements with major international mining companies. Under the law as it stood, the Government held up to a 50% interest in mineral deposits if state funds were used to discover them and up to 34% if state funds were not used. A proposed amendment would give the Government at least 34% ownership in general and at least 51% for strategic properties (Bank Information Center, 2008; Western Prospector Group Ltd., 2009, p. 8).

Production

In 2008, production of cement, coal, iron ore, lime, crude petroleum, and silver increased compared with production in 2007 whereas the production of other important mineral commodities, including copper, fluorspar, gold, molybdenum, and zinc, decreased from 2007 to 2008. The decrease in gold production was reportedly related to a \$750 per troy ounce threshold level for the windfall tax, which was raised to \$850 in hopes of increasing the volume of gold sold to the Central Bank of Mongolia. Small producers had been stockpiling or otherwise moving the gold to avoid paying the tax, thereby adding to the Government's revenue shortfall. Production of iron ore increased by more than 400% to 1,387 metric tons (t) in 2008 from 265 t in 2007; however, iron ore was currently being mined by Chinese companies and no reports were readily available

that could explain the increase. Crude petroleum production increased to 1,174,000 barrels (bbl) in 2008 from 913,000 bbl in 2007, likely owing to the increased drilling and exploration being done as petroleum blocks were developed throughout the country. In 2008, a total of 448 wells were drilled, including 307 in the Toson Uul XIX Block, 75 in the PSC-97 Block, 57 in the Tamsag XXI Block, 5 in the Buir XXII Block, 3 in the Tariach XV Block, and 1 in the Matad-XX Block (Khan Resources Inc., 2009, p. 3; Petroleum Authority of Mongolia, 2009).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities. In 2008, there were 213 actively operating mining companies in Mongolia that employed about 45,900 people. In 2008, 5,202 licenses, including 4,111 exploration and 1,091 mining licenses, covered an area of about 49.4 million hectares (ha). The number of deposits that were registered by the Mineral Council of Mongolia increased to 88 in 2008 from 29 in 2005. Domestic companies held a greater number of mining licenses than foreign companies and joint ventures (about 67% of the total); however, the licenses held by foreign and joint-venture companies covered larger areas (Mineral Resources Authority of Mongolia, 2009).

In September 2008, Ivanhoe Mines Ltd. of Canada received \$47 million from Rio Tinto to purchase equipment for the Oyu Tolgoi copper and gold mine project, which was located in the Omnogavi Province of Mongolia. The Oyu Tolgoi project was Ivanhoe Mines' principal mineral resource property. (The Ovoot Tolgoi Coal Mine is the group's other important project in the country.) Ivanhoe Mines received another \$74.5 million from Rio Tinto in November as part of the purchase and sale agreement, for a total of \$121.5 million. Ivanhoe Mines was to use the funds for future development of the Oyu Tolgoi project. As of early 2009, the two companies were continuing to work with the Mongolian Government to facilitate approval of the draft investment agreement for the Oyu Tolgoi project (Ivanhoe Mines Ltd., 2009, p. 11-13).

The conditions of a joint-venture agreement between Ivanhoe Mines and Entrée Gold Inc. of Canada were satisfied after Ivanhoe Mines spent greater than \$35 million on two properties covered by the agreement (the Javkhlant and the Shivee Tolgoi licenses). Ivanhoe Mines gained an 80% interest in minerals below 560 meters (m) and a 70% interest in minerals above that level in the deposits. The exploration licenses that were renewed in June were due to expire in 2010 and would expire if they were not converted to mining licenses by that time. In March 2008, Ivanhoe Mines announced the estimated inferred resources at the Heruga deposit—a recently discovered deposit of the Oyu Tolgoi project on lands covered by the joint-venture agreement with Entrée—to be 760 million metric tons (Mt) grading 0.48% copper, 0.55 gram per metric ton (g/t) gold, and 142 g/t molybdenum, using a 0.60% copper equivalent cutoff grade (Entrée Gold Inc, 2009; Ivanhoe Mines Ltd., 2009, p. 13).

Western Prospector Group Ltd. of Canada had mineral properties in Mongolia, including the Saddle Hills uranium project and the Baganuur and the Choybalsan coal projects. The company had been exploring for mineral deposits in Mongolia since 2004. As of December 31, 2007, the company held 19

exploration licenses on about 178,000 ha throughout Mongolia; however, some of those licenses had been under litigation. The properties included six coal exploration projects and the Gurvanbulag Central uranium project, which was composed of 13 mineral exploration licenses in northeastern Mongolia. In May 2008, Khan Resources, Inc. filed an offer to acquire all the outstanding common shares of Western Prospector to consolidate its position in the Saddle Hills district and benefit from the development of Khan Resources' Dornod uranium deposit and Western Prospector's Gurvanbulag uranium deposit in the same district. Western Prospector declined that, and subsequent, offers. In July 2008, it was announced the Tinpo Holdings Industrial Co. Ltd. had an agreement to acquire all the outstanding common shares of Western Prospector in a takeover bid. By October, Khan Resources' offers had expired and Tinpo had withdrawn its offer (Khan Resources Inc., 2009, p. 1, 8-11; Western Prospector Group Ltd., 2009, p. 1-8).

Mineral Trade

In 2008, about 75% of Mongolia's total export revenue was derived from mineral commodities. Of that percentage, copper accounted for 33%; gold, 24%; coal, 7%; zinc, 6%, and petroleum, 4%. Mongolia received 66% of its total export revenue from China, followed by Europe, 17%; the United States and Canada, 11%; Russia, 3%; and the remainder, from other countries (Mineral Resources Authority of Mongolia, 2009; World Bank, The, 2009b).

Mongolia was the United States' 161st ranked trade partner, with \$110 million in two-way goods traded in 2008, and was a member of the United States Generalized System of Preferences (GSP) program. The GSP program was created by the U.S. Congress in 1974 to expand the United States' trade options while creating economic opportunities in developing countries. The program has provided for duty-free trade for about 130 countries and territories. Out of \$51.5 million in total Mongolian exports to the United States, \$5.6 million entered the United States duty free compared with \$906,500 of GSP duty-free exports out of \$84 million in total Mongolian exports received in 2007 (Office of the U.S. Trade Representative, 2009a).

In 2008, Mongolia was the United States' 139th ranked supplier of goods. Inorganic chemicals valued at \$6 million was the third ranked good and unspecified fluorspar and salt, together valued at \$2 million, were the 5th ranked goods received by the United States from Mongolia. Mongolia was the United States' 163rd ranked goods export market in 2008, but no mineral products were among the top ranked products received by the country (Office of the U.S. Trade Representative, 2009b; World Bank, The, 2009b).

Commodity Review

Metals

Copper, Gold, and Molybdenum.—In December 2008, Ivanhoe Mines made a discovery of high-grade copper and gold mineralization at the Oyu Tolgoi project, which is located in the South Gobi desert about 550 kilometers (km) south of

Ulaanbaatar and 80 km north of the Mongolian-China border. Porphyry copper, gold, and molybdenum have been found along a 20-km zone of deposits. Zones of high-grade copper and gold mineralization were intersected across a distance of 370 m grading 0.83 g/t gold, 0.53% copper, and 64 g/t molybdenum. These zones included an intersection of 78.3 m grading 2.13 g/t gold, 0.82% copper, and 126 g/t molybdenum and a sub-interval of 16.3 m grading 4.70 g/t gold, 1.56% copper, and 168 g/t molybdenum. The Oyu Tolgoi mineral district formed from an island arc terrain, and lies in an east-west-trending belt that runs through southern Mongolia; it is about 200-km wide and 750-km long. In 2003, geophysical surveys and deep drilling led to the discovery of the largest deposit in the district, the Hugo Dummet North, where advanced argillic alteration in basaltic rocks developed over a vertical interval of 500 m above quartz monzodiorite intrusions that accompanied porphyry-style copper-gold mineralization. Ivanhoe Mines had been seeking an investment agreement with the Government to develop the Oyu Tolgoi project for several years. An initial draft investment agreement was negotiated between Ivanhoe Mines and Rio Tinto with the Government of Mongolia; however, the draft agreement was withdrawn by the Prime Minister later in the year (prior to the 2008 elections) for review and evaluation by independent experts (Hayashi and others, 2008; Ivanhoe Mines Ltd., 2009, p. 9-13).

In 2008, Ivanhoe Mines completed 36,092 m of drilling at the Oyu Tolgoi project. The company planned to continue drilling to determine whether there was a continuous, high-grade mineralized connection between major deposits in the north and the Heruga deposit to the south. The new discovery was located between the Heruga deposit, which is located on the joint Ivanhoe Mines-Entrée license area in 2007, and the Southern Oyu deposits that were delineated by exploration between 2001 and 2005 (Ivanhoe Mines Ltd., 2009, p. 11-13).

In June 2008, Centerra Gold Inc. began processing low-grade ores at a newly commissioned heap-leach facility at its wholly owned Boroo Mine. The Boroo Mine is located 110 km northwest of Ulaanbaatar near the Trans-Mongolian railway. The Boroo Mine is an open pit operation that began commercial production in 2004 and produced more than 37,000 kilograms (kg) (1.2 million troy ounces) of gold through the end of 2008. In 2008, the Boroo Mine produced about 6,000 kg (193,000 troy ounces) of gold, including heap-leach production of about 780 kg (25,000 troy ounces). The company received a temporary 6-month permit to start production at the facility in April as final permits and a feasibility study were pending (Centerra Gold Inc., 2009, p. 15-17).

Erdene Resource Development Corp.'s Zuun Mod Molybdenum project was a porphyry molybdenum deposit with copper and rhenium located in Bayankhongor Province about 950 km southwest of Ulaanbaatar. The property consisted of a single license, registered with the wholly owned subsidiary Anian Resources XXK, that totaled about 50,000 ha. The property had been under exploration since 2005 and was acquired from Gallan Minerals Ltd. in 2005. The Zuun Mod was one of the largest molybdenum projects in northern Asia. In 2007, a drilling program identified three mineralized zones within a 3.5-km-long area of the South Corridor. A May 2008

resource estimate included total measured and indicated resources of about 65.8 million kilograms (Mkg) (145 million pounds) of molybdenum and 82.6 Mkg (182 million pounds) of copper that averaged from 0.06% to 0.08% Cu. The company reported at least two areas where higher grade mineralization (0.07% to 0.09% Mo) was found within 50 m from the surface. A prefeasibility program was planned for 2009 (Erdene Resource Development Corp., 2009, p. 2, 13-14).

Mineral Fuels and Related Materials

Coal.—Mongolia had 26 main coal deposits throughout the country composed mostly of lignite and subbituminous-grade coal, but also bituminous-grade coal. In 2008, 95% of the country's electricity was generated from coal-fired powerplants and greater than 80% of the coal consumed in the country was used to generate electricity. Coal was in demand year-round. Prices decreased in the summer, however, which allowed some consumers with capital to buy relatively large amounts of coal (that is, in truckloads of about 5 t) at relatively reduced prices, whereas those consumers who did not have the liquidity to buy in bulk spent more for individual sacks of coal (about 25 kg) throughout the year (Bayarsaikhan, 2009; World Bank, The, 2009b).

The country implemented a plan of action for the coal industry with objectives outlined for the years 2008 through 2012. Those objectives included creating a smokeless household fuel supply (using processes that remove volatile elements from coal), implementation of coal liquefaction and gasification projects (using processes that derive liquid fuels, such as gasoline and diesel, from coal), provision of a stable coal supply to powerplants (by renovating the Baganuur and the Shivee Ovoo coal mines, which began operations in 1978 and 1992, respectively), and development of coalbed methane gas as an energy source through implementation of projects with the Mongolian Geological Survey and creation of a legal environment for use of the fuels (Bayarsaikhan, 2009).

Official estimates showed that the value of the investment needed for a smokeless fuel manufacturing project was \$7.5 million and would produce 120,000 metric tons per year (t/yr) of coal briquets and 100,000 t/yr of a semicoke product. One feasibility study to build a coal liquefaction plant in Mongolia estimated that the total capital required would be about \$2.4 billion. Such a plant would process greater than 6,000 metric tons per day of coal and produce about 11,300 barrels per day (bbl/d) of diesel, 7,000 bbl/d of fuel oil, 6,300 bbl/d of gasoline, and 900 bbl/d of liquefied petroleum gas (LPG). Another study determined that a coal liquefaction project, based on the Tugrugnuur lignite deposit project located 170 km southeast of Ulaanbaatar, would require between \$3 billion and \$4 billion, would produce 18,000 bbl/d of gasoline and some quantity of LPG, and was reportedly under way with an estimated completion date of 2013 (Bayarsaikhan, 2009; Industrial Corporation Mongolia, 2009).

SouthGobi Energy Resources, Ltd. of Canada was expanding coal sales to China from the company's Ovoot Tolgoi Mine in southern Mongolia. In April, SouthGobi received Government approval to mine coal at the Ovoot Tolgoi coal mine and

subsequently began mining and stockpiling coal from the West field. The Ovoot Tolgoi open pit coal mine was located 45 km north of the border with China. SouthGobi controlled 43 licenses on more than 16,000 square kilometers in Mongolia. Ivanhoe Mines had an 80% share in SouthGobi (SouthGobi Energy Resources Ltd., 2009).

Petroleum.—Mongolia's sedimentary basins were divided into 25 exploration blocks for international bidding, and the Petroleum Authority of Mongolia was working to add four more. Exploration blocks were located mostly in the southern half of the country in central, eastern, and western Mongolia. The East Gobi sedimentary basin encompassed four petroleum subbasins in east-central Mongolia. The Zuun Bayan basin was discovered in 1941 when there was intensive exploration and extraction. The Tamsag basin was discovered in eastern Mongolia in the 1990s and a 2001 Chinese National Oil Corp. survey of the basin estimated its reserves to be 1.5 billion bbl. In recent years, other fields have been explored and exploited, including the Tasagaan Els basin and some basins in western Mongolia. Exploration activities from 1994 to 2008 included 17,600 km of two-dimensional seismic work, 6,000 km of three-dimensional seismic work, the drilling of 448 wells, and foreign direct investment of \$952 million (Prost, 2004; Amarsaihan, 2009; Petroleum Authority of Mongolia, 2009).

In 2008, petroleum exploration and production activities were being conducted by one Canadian company (Shaman Resources, LLC); three Chinese companies (PetroChina Daching Tamsag-Mongolia LLC, Dong Sheng Petroleum LLC, and China Golden Sea, LLC); and one Mongolian company (Petro Matad LLC). The Toson-Uul and PSC-97 Blocks were production blocks with 50 and 31 producing wells, respectively. The Toson-Uul Block produced 3,800 bbl/d and the PSC-97 Block produced 1,800 bbl/d, and together, the blocks have produced, cumulatively, about 3.4 Mbbbl (of which 3.1 Mbbbl was exported because the country does not have a refinery to process the petroleum). The country reported that, by 2010, PetroChina Daching Tamsag-Mongolia would produce about 3 million barrels per year (Mbbbl/yr) and that, by 2015, that number would reach 11.3 Mbbbl/yr (Amarsaihan, 2009; Petroleum Authority of Mongolia, 2009).

In 2008, Mongolia imported 92% of its petroleum products from Russia, about 6% from China, less than 2% from Korea, and less than 1% from Kazakhstan. The country had future plans to construct a crude oil refinery and expand exploration in the Dornogob and the Tamsag basins. Mongolian gasoline prices increased by 40% during the summer months of 2008 owing to the combined effects of steeply increasing world crude oil prices and an announcement from Russia that Russia's export tax would be increased by 20% starting in August. Consequently, Russia announced a plan to cut taxes on crude oil to stimulate domestic oil production after the country's oil production decreased because of rising production costs and maturing fields (World Bank, The, 2009b).

Uranium.—Most identified uranium deposits were located in the eastern part of the country; however, exploration had not been completed in western Mongolia. Important sites were located in Dornod, Gurvanbulag, and Mardai. In 2008, Mongolia's objective was to develop a nuclear fuel cycle. To

do so, the country planned to increase uranium reserves, create nuclear front-end production capabilities, and become a regional fuel cycle center. In February 2009, a state-owned uranium company, Mon-Atom, LLC, was established to deal with uranium exploration and development. The company would also be involved with alternative energy sources, including bioenergy, solar, and wind.

Khan Resources received a 3-year renewal of its exploration license of the Dornod uranium project, which is located about 650 km east of Ulaanbaatar. The company started a definitive feasibility study, submitted reserve calculations as required by the Government for conversion from an exploration to a mining license (resource estimates submitted to the Government varied slightly because of reporting requirements, but were similar to the NI43-101-compliant estimate), and constructed a power-line tower and a sedimentation pond. The Dornod property was composed of an open pit mine and an underground deposit. The open pit mine produced 590,000 t of material between 1988 and 1995. The underground deposit remained partially developed with two shafts and about 20,000 m of drifts. The property had an indicated reserve of about 29.2 Mkg (64.3 million pounds) of U_3O_8 , and Khan Resources had an overall interest in about 20.2 Mkg (44.4 million pounds) of U_3O_8 (Gombo, 2009; Khan Resources Inc., 2009).

Outlook

At the end of 2008, the legislative and business choices required to create a successful and sustainable mining industry were still being debated in Mongolia. By yearend, the country had not signed an investment agreement with Ivanhoe Mines (with Rio Tinto) on the Oyu Tolgoi project. The Government was at a point at which it could either make agreements with international mining groups who have the technical ability and capital to develop deposits or continue to stall on agreements until interested parties pull out of the country, leaving undeveloped mineral resources to be optioned. Until agreements on the country's largest and most valuable mineral properties are resolved and enough time passes for those projects to become producers, the economic downturn of 2008 may linger. Mongolia, however, is experiencing rapid change. Its infrastructure is still being developed and its territory is still being explored. By the time the Minerals Act is revised and current development projects are under way, the mineral wealth will still be available, but it remains to be seen how that wealth will be distributed and directed.

References Cited

- Amarsaihan, Dashzeveg, 2009, Potential for Mongolia's oil industry development: The U.S.–Mongolia business forum, 4th, Washington, DC, June 9, Presentation, unpaginated.
- Bank Information Center, 2008, Election controversy raises questions for Mongolia's mining sector: Washington, DC, Bank Information Center, July 2. (Accessed August 1, 2008, at <http://www.bicusa.org/en/Article.3837.aspx>.)
- Bayarsaikhan, Bazardorj, 2009, The coal development and utilization in Mongolia and need for coal conversion technology: The U.S.–Mongolia business forum, 4th, Washington, DC, June 9, Presentation, unpaginated.
- Centerra Gold Inc., 2009, Management's discussion and analysis for the fiscal year ended December 31, 2008: Toronto, Ontario, Canada, Centerra Gold Inc., 52 p.

- Dugerjav, Lhamsurengiin, Gotovsuren, Ayurzana, and Dejidmaa, Gunchin, 2001, Policy and strategy in the development of mineral resources in Mongolia, chap. XXII of *Economic and Social Commission for Asia and the Pacific*, ed., Review of policies, strategies, and activities in sustainable development of land and mineral resources in Asia and the Pacific: New York, New York, United Nations, p. 359-416.
- Entrée Gold Inc., 2009, Consolidated financial statements—December 31, 2008: Vancouver, British Columbia, Canada, Entrée Gold Inc., 32 p.
- Erdene Resource Development Corp., 2009, Annual report 2008: Dartmouth, Nova Scotia, Canada, Erdene Resource Development Corp., 34 p.
- Gombo, Tsogtsaikhan, 2009, Perspectives of nuclear energy development in Mongolia: The U.S.–Mongolia business forum, 4th, Washington, DC, June 9, Presentation, unpaginated.
- Hayashi, Ken-Ichiro, Khashgerel, Bat-Erdene, and Kavalieris, Imants, 2008, Mineralogy, textures, and whole-rock geochemistry of advanced argillic alteration—Hugo Dummett porphyry Cu-Au deposit, Oyu Tolgoi mineral district, Mongolia: *Mineralium Deposita*, v. 43, August 26, p. 913-932.
- Industrial Corporation Mongolia, 2009, Coal-to-gasoline complex: Ulaanbaatar, Mongolia, Industrial Corporation Mongolia. (Accessed August 3, 2009, at <http://icm.mn/gazoline.html>.)
- Ivanhoe Mines Ltd., 2009, Financial statements December 31, 2008: Vancouver, British Columbia, Canada, Ivanhoe Mines Ltd., 91 p.
- Khan Resources Inc., 2009, 2008 Annual report: Toronto, Ontario, Canada, Khan Resources Inc., 44 p.
- Miller, M.M., 2009, Fluorspar: U.S. Geological Survey Mineral Commodity Summaries 2009, p. 58-59.
- Mineral Resources Authority of Mongolia, 2009, Mongolia: Ulaanbaatar, Mongolia, Mineral Resources Authority of Mongolia, 6 p.
- Office of the U.S. Trade Representative, 2009a, GSP in use—Country specific information—Mongolia's export opportunities through GSP: Washington, DC, Office of the U.S. Trade Representative. (Accessed July 21, 2009, at http://www.ustr.gov/sites/default/files/uploads/gsp/asset_upload_file69_15355.pdf.)
- Office of the U.S. Trade Representative, 2009b, Mongolia: Washington, DC, Office of the U.S. Trade Representative. (Accessed July 21, 2009, at <http://www.ustr.gov/countries-regions/china/mongolia>.)
- Petroleum Authority of Mongolia, 2009, Petroleum Authority of Mongolia 2009: Ulaanbaatar, Mongolia, Petroleum Authority of Mongolia, 8 p.
- Prost, G.L., 2004, Tectonics and hydrocarbon systems of the East Gobi basin, Mongolia: *American Association of Petroleum Geologists*, v. 88, no. 4, April, p. 485-513.
- SouthGobi Energy Resources Ltd., 2009, Mongolia: Vancouver, British Columbia, Canada, South Gobi Energy Resources Ltd., 7 p.
- Western Prospector Group Ltd., 2009, Consolidated financial statements for the year ended December 31, 2008 and 2007: Vancouver, British Columbia, Canada, Western Prospector Group Ltd., 24 p.
- World Bank, The, 2009a, Mongolia country brief: Washington, DC, The World Bank Group. (Accessed July 26, 2008, at <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/MONGOLIAEXTN/0,,contentMDK:20190297~pagePK:1497618~piPK:217854~theSitePK:327708,00.html>.)
- World Bank, The, 2009b, Mongolia quarterly: Washington, DC, World Bank Group, 17 p.

TABLE 1
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2004	2005	2006	2007	2008
Cement, hydraulic thousand metric tons	62	112	141	180	270
Coal, unspecified do.	6,794	8,256	7,885	9,560	9,692
Copper:					
Mine output, Cu content	130,000	126,547	129,693	130,160	126,796
Metal, refined	2,376	2,475	2,618	3,007	2,587
Fluorspar:					
Acid grade thousand metric tons	148	134	138	131	116
Submetallurgical and other grade do.	206	233	255	250	219
Total do.	354	367	393	381	335
Gold, mine output, Au content ³ kilograms	19,240	24,120	22,561	17,473	15,184
Gypsum ^e thousand metric tons	25	25	26	26	26
Iron ore:					
Gross weight do.	33	168	180	265	1,387
Iron content do.	21	109	116	170	888
Lime, hydrated and quicklime do.	30	81	60	43	55
Molybdenum, mine output, Mo content	1,141	1,188	1,404	1,978	1,900 ^e
Petroleum, crude thousand 42-gallon barrels	216	201	369	913	1,174
Salt, mine output	1,550	1,896	1,154	1,143	103
Silver, mine output, Ag content ^{e, 4} kilograms	28,000	28,000	28,000	28,100	28,890 ⁵
Steel, crude	54,900	65,500	70,000	80,400	81,400
Stone, crushed thousand metric tons	--	--	269	208	207 ⁶
Tungsten, mine output, W content	77	54	85	245 ^f	142
Zinc, mine output, Zn content	--	11,400	54,850	77,350	71,800

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^fRevised. do. Ditto. -- Zero.

¹Table includes data available through August 10, 2009.

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

³Reported raw gold production but excludes gold contained in copper concentrate.

⁴Based on 55 grams per metric ton silver in copper concentrate.

⁵Reported figure.

⁶Converted from cubic meters assuming a density of 2.0 metric tons per cubic meter.

Sources: National Statistical Office of Mongolia (Ulaanbaatar); Mongolian Statistical Yearbook 2004; Mineral Resources Authority of Mongolia, Output of Mineral Commodities (Minerals Questionnaire 2003-07).

TABLE 2
MONGOLIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity ^e
Cement		Khutul Cement and Lime Factory	Darkhan, Darkhan-Uul Province	500
Coal		Government Coal Mining Enterprise	Baganuur Mine, Tov Province	4,000
Do.		do.	Shivee Ovoo Mine, Dundgovi (Middle Gobi) Province	2,000
Do.		Chinhua-Mak Nariin Sukhait Co. (Sino-Mongolian joint venture)	Nariin Sukhait Mine, Omnogovi (South Gobi) Province	3,000
Do.		SouthGobi Energy Resources Ltd. (Ivanho Mines Ltd., 80%)	Ovoot Tolgoi Mine, Omnogovi (South Gobi) Province	3,000
Copper, Cu in concentrates		Erdenet Mining Corp. (Mongolia-Russia joint venture)	Erdenet, Bulgan Province	130
Gold	metric tons	Boroo Gold Co. (100% Centerra Gold, Inc.)	Bayangol, Selenge Province	10
Do.		Altan Dornod Mongolia Co. Ltd.	Zaamar placer gold deposit along the Tuul River	3
Do.		Mongolrostsvetmet Corp. (Mongolia-Russia joint venture)	do.	2
Fluorspar		do.	Bor-Undur Mine in Darkhan, Khenti Province	300
Do.		do.	Urgen Mine in Dornogobi Province	150
Do.		do.	Airag Mine in Dornogobi Province	150
Molybdenum, Mo in concentrates	metric tons	Erdenet Mining Corp. (Mongolia-Russia joint venture)	Erdenet, Bulgan Province	2,000
Steel		Darkham Metallurgy Plant	Darkhan, Darkhan-Uul Province	100
Tungsten (WO ₃ content)	metric tons	A state-owned company	Hovd Gol area, Bayan-Ulgii Province	150
Zinc, Zn in concentrates		Tsait Minerals Co. Ltd. (Sino-Mongolian joint venture)	Sukhe Bator, Sukhbaatar Province	70

^eEstimated. Do., do. Ditto.

