

## MONGOLIA

*By Damba Galsandorj*

**M**ongolia is sandwiched between Russia to the north and China to the south. It has a land area of some 1.5 million km<sup>2</sup>, about three times the size of France, but a population of only 2.3 million. The country is well endowed with a wealth of minerals, and mining and mineral processing are the mainstays of the economy. Despite this, however, only 25% of the country has been geologically explored in any detail and a key aspect of government policy in the coming years is to encourage exploration and mining activity. They are expected to play an increasingly important role in future economic development and in the country's export-oriented enterprises, and are expected to help realise the government's goal of achieving 6% annual economic growth by 2004.

Currently, 94.1% of the Mongolian territory has been mapped to a scale of 1:200,000 and 16.2% of the country at a scale of 1:50,000. Over 70% of the territory has been surveyed by airborne geophysics.

Foreign and domestic investors have been spending some T6.0 million on exploration annually in recent years and over 2,100 exploration licences have been granted. This exploration activity has identified resources including some 10 Mt of copper, 420,000 t of molybdenum, 3 Mt of lead and zinc, 10,000 t of tin, 1,465 t of gold, 10,000 t of silver, 453 Mt of iron ore, 50,000 t of uranium, 70,000 t of tungsten ore (wolframite), 200,000 t of graphite, 18 Mt of fluor spar, plus large resources of phosphate and other minerals.

Without doubt, the most exciting exploration project currently in progress is Ivanhoe Mines Ltd's Turquoise Hill (Oyu Tolgoi) project located in the southern part of the Gobi Desert about 650 km south of Ulaan Baatar. A major gold-rich porphyry copper deposit has been discovered, with the

mineralisation associated with Devonian monzodiorite intrusions. Drilling to date at Southwest Oyu has outlined an inferred resource of 821 Mt at an average grade of 0.38% Cu and 0.51 g/t Au, using a 0.3% Cu equivalent cut-off grade. A new discovery has been made in a central zone about 1 km from the Southwest zone. The project is now operating more than a dozen drill rigs. Turquoise Hill was originally discovered by BHP (now BHP Billiton) in the 1990s, and Vancouver-based Ivanhoe has secured its 100% interest by spending US\$3.0 million on exploration and paying BHP Billiton US\$5.0 million. The latter retains a 2% net smelter return royalty.

Over the next few years, geological exploration by the State will focus on:

- 1:50,000 scale mapping adjacent to roads and railways, in known orefields, in the vicinity of existing mining operations and in the border regions;
- the delineation of reserves of copper, gold, niobium, tantalum, zirconium and rare earths;
- co-operation with privately-owned entities in reviewing and reconfirming the deposits that have been discovered in the course of mapping and exploration carried out by state agencies;
- the promotion of mineral exploration projects for domestic and foreign private investor participation;
- inviting foreign and domestic investors to explore for primary gold deposits and other precious metals;
- and providing assistance to companies exploring remote areas of the country.

### Mining

In 2001, Mongolia's mining sector accounted for 8.5% of gross domestic product and contributed 49.8% of manufacturing and 49.85% of export products.

Around 85% of mineral exports comprise copper and molybdenum concentrates, and one company, Erdenet Mining Corp., dominates the sector. Erdenet is a Mongolian-Russian joint venture, with the Mongolian Government holding 51% and the Russian company Zarubejtsvetmet Inc. holding 49%. The operations comprise an open-pit mine and concentrator located about 400 km northwest of the capital Ulaan-Baatar in Bulgan Province. Various porphyry-type deposits occur along strike for 22 km and over a width of 5 km. Reserves have been estimated at some 1,300 Mt of ore containing approximately 6 Mt of copper and 170,000 t of molybdenum.

Since the processing plant commenced operating in 1978, Erdenet has treated 370 Mt of ore and the concentrates have yielded 2 Mt of copper and 35,000 t of molybdenum. Ore production has risen from 20 Mt/y in 1991 to around 24 Mt/y currently. The average copper content is 0.8% and the average molybdenum grade in the zone of secondary enrichment is 0.17%. Annual copper concentrate production is 450-480,000 t (27% Cu content) and annual molybdenum concentrate production (50% Mo) is around 2,800 t. For the future, consideration is being given to the construction of a copper smelter and refinery, and an SX-EW plant with a capacity of 10,000-12,000 t/y.

Erdenet employs a total workforce of more than 6,000, including 600 foreign nationals from Russia, Kazakhstan and other countries. The processing plant is linked by rail to the Siberian railway in Russia and also to Mongolia's domestic rail network. In former years, concentrates were sent to the Soviet Union but the current trend is for increased sales to China with deliveries via a direct rail link through Mongolia via Ulaan Baatar.

Another company, Erdmin Co. Ltd, has operated a 3,600 t/y capacity solvent extraction-electrowinning plant to produce cathode copper treating leach solutions from waste dumps near the Erdenet mine. Erdmin has the right to treat all waste at Erdenet for the next 35 years.

In February this year, Swiss commodity trader Marc Rich and Co. Investment AG, announced that it had acquired a 51% interest in a copper deposit located close to Erdenet. It has formed an exploration joint venture (Timur Mineral Mongolia Ltd) with the Mongolian company Nomin House Ltd (49%). Previous work by Russian geologists outlined a resource of some 220 Mt of mineralised material although no grade was given. In addition to copper and molybdenum, the deposit is reported to contain gold, tungsten and silver.

Fluorspar concentrates account for 12% of Mongolia's mineral exports and production has risen significantly in recent years, with annual ore output now running as high as 750,000 t. Most, around 98%, is produced by the Mongolian-Russian joint venture Mongolrostsvetmet Corp. (Monros). The venture operates two fluorspar mines at Bor Ondor and Berkh, plus a concentrator at the former with a capacity to produce 145,000 t/y of acid grade concentrate and 45,000 t/y of metallurgical grade concentrate. Approximately 25% of the fluorspar ore is shipped directly. Monros is continuing with technical renovations at its fluorspar operations in order to improve product quality and competitiveness.

In addition to fluorspar mining, Monros is also a leading gold producer. Its Zaamar mine and alluvial operations in the Tuul River area utilise a bucket-line dredge previously employed in the Tolgoit gold district. Zaamar is targeted to produce 1.4 t/y of gold.

Since the introduction of the government's 'Gold Programme' in 1991, the number of gold-mining enterprises in Mongolia has risen from

three to more than 100, and during the ten years from 1992 cumulative output has totalled 65.5 t, with annual production increasing from 800 kg to more than 11 t currently. The government remains keen to encourage a further expansion of the gold-mining sector, and the Toson and Bayabgol placer deposits are scheduled for development in addition to the primary deposits at Boroo and Tavm.

At Boroo, which is located about 120 km north of Ulaan Baatar, SRK Consulting has estimated mineable reserves of 10.7 Mt at an average grade of 3.3 g/t Au, equivalent to 1.1 Moz of contained gold within a resource base of 2.4 Moz of contained gold. The Australian company AGR Ltd is developing the project and a feasibility study has estimated capital costs of US\$39 million for an operation treating 1.32 Mt/y of ore and producing 150,000 oz/y of gold, with cash operating costs now estimated at US\$167/oz. AGR has engaged a syndicate of banks to raise US\$33 million in project debt finance. The Clough Group of Perth has been awarded a contract by AGR to design and construct a processing plant. The contract includes dismantling an existing gold plant in Western Australia and shipping key components via China. Completion is scheduled for the third quarter of next year.

In January this year it was announced that Cameco Corp. of Canada was acquiring a 51.8% interest in AGR by subscribing for 240 million new shares for proceeds of US\$12 million and providing a US\$4.8 million promissory note, the latter to be used by AGR as payment for a 60% interest in the Gatsuurt gold property, which is adjacent to Boroo and held by Cameco.

Under its mining development policy for the period 2001/04, the government is also seeking to develop the Tumurtie zinc deposit, and complete preparatory work for mining the Tsagaan-Suvraga copper deposit, the Asgat silver deposit in northwestern Mongolia and the Tavan Tolgoit metallurgical grade coal deposit in Omnogovi Aymag.

Mongolia's annual coal production is currently running at about 5 Mt/y and mainly consists of brown coal used in thermal power stations. The two largest mines are Baga Nur and Shariyn Gol. Metallurgical coal output ranges between 50,000 t and 170,000 t/y. Increased use of domestic coal resources would confer substantial savings in energy costs. Erdenet, for example, derives one third of its electricity needs from hydroelectric power stations on Lake Baikal in neighbouring Russia for which it has to pay in hard currency. Erdenet requires generating capacity of some 80 MW and the installation of an independent power plant based on local coal is currently under consideration.

The government has implemented several measures intended to improve Mongolia's legal and business environment in order to encourage foreign and domestic investors. These include:

- amendments to the mineral tax and foreign investment laws;
- a stability agreement to be concluded with strategic investors; and
- the exemption from VAT of gold exported by gold-mining entities.