

THE MINERAL INDUSTRY OF ARMENIA

By Richard M. Levine

Armenia's mineral industry in recent years was primarily involved in mining nonferrous and industrial minerals. Armenia has large molybdenum reserves and was mining one-third of the former Soviet Union's (FSU) output of molybdenum; the molybdenum was associated with copper. Armenia also mined copper-zinc deposits. It has a gold mining industry, and its nonferrous ore byproducts include barite, gold, lead, rhenium, selenium, silver, tellurium, and zinc.

The nation has a large industrial minerals industry and was the largest producer of perlite in the FSU. It produced a number of other industrial minerals, including clays, diatomite, dimension stone, limestone, salt, and semiprecious stones, and had a diamond cutting plant. Armenia, reportedly, also has significant high-quality iron ore reserves, which have not been mined. In 1996, however, Armenia had practically no mineral fuel production and was dependent on imported mineral fuels.

Indications are that Armenia could have deep oil and natural gas reserves, but Armenia had conducted exploration to a depth of only about 5 kilometers (km) (Respublika Armeniya, 1996a,b). The Government of Armenia signed an agreement between its Ministry of Energy and a joint Armenian-American company for exploring for oil and gasfields in the Ararat Valley (Yerevan Snark, 1996).

In 1996, efforts were underway to explore for and assess coal resources as a potential domestic source of mineral fuel. Under an agreement with the U.S. Agency for International Development, the U.S. Geological Survey (USGS) was assisting Armenia in the exploration and assessment of coal resources. The USGS under the agreement is to supply Armenia with geophysical and drilling equipment, establish laboratories for coal-quality analysis and assessment in Armenia, and train Armenian specialists at USGS centers and in Armenia.

The search for fuel sources was of vital importance because the country was experiencing a severe energy shortage. The resulting countrywide cutting of trees for fuel has greatly exacerbated Armenia's ecological problems, increased the threat of landslides, and affected agricultural yields. For example, the 1,200 hectares that had been chopped down on the slopes around the city of Vanadzor created a large threat of landslides. Reportedly the green zone around the city of Yerevan has been 85% destroyed, and illegal cuttings have created an ecological threat for the drainage area of Lake Sevan (Respublika Armeniya 1996a).

According to Armenian geologic assessments, Armenia has reserves of seven metals valued at \$50 billion at current world prices, of which copper accounts for 38% of these reserves, iron and molybdenum for 25% each, gold for 7.3%, silver for 1.6%,

and lead and zinc combined for 3.1%. Armenia also has some rare-earth metals deposits which were not included in the evaluation. (Summary of World Broadcasts, 1997). However, in 1997 the Armenian Government decided to reappraise its ore deposits so that they could be evaluated according to Western, rather than Soviet, reserve definitions (Interfax Mining and Metals Report, 1997d).

In 1996, Armenia's gross domestic product and industrial output increased by 5.8% and 1.2% respectively compared with those of 1995. This was a continuation of the trend for these indicators increasing that began in 1994 (Interfax Statistical Report, 1997a). According to data provided by Armenia's Foreign Investment Department in response to a U.S.G.S. Minerals Questionnaire, in 1996 compared with 1995 there were reported increases in production of caustic soda by 2.4% to 4,300 metric tons (t), of cement by 23.5% to 281,700 t, of copper in concentrate production by 7% to 9,088 t, and of rolled copper by 300% to 57 t. In 1996 compared with 1995, there were reported decreases in rolled aluminum output of 42.6% to 255 t, of aluminum foil output by 72.5% to 380 t, and of salt output by 19.5% to 26,400 t.

In 1996, Armenia's main export commodities were minerals and mineral products. The categories "unprocessed and processed diamonds," "precious metal scrap and waste," and "jewelry and nonprecious metals" comprised 66% of the country's exports compared with 46% in 1995 while the category "mineral products" comprised another 7% compared with 11% in 1995. Armenia was also a significant mineral importer with the category "mineral products" (chiefly mineral fuels) accounting for 24% of total imports, of which more than 80% was from Russia and Turkmenistan while "precious stones and products with precious stones" (chiefly uncut diamonds) comprised 17% of total imports. In 1996, Armenia recorded a \$565 million trade deficit of which \$150 million was with countries of the Commonwealth of Independent States and the remainder with the rest of the world (Interfax Statistical Report, 1997b). There were a total of 675 joint ventures and wholly owned foreign companies (Interfax Statistical Report, 1997c).

Privatization, which has been underway since 1994, has been extended to medium and large scale enterprises with 51% of the labor force employed in the private sector (Interfax Statistical Report, 1997b). The country has enacted liberal laws regarding foreign investors' rights, including laws on repatriation of profits, licensing, duties, and quotas on exports in an effort to attract foreign investment. (Respublika Armenia, 1996c; Hovannisyanyan, 1995). However, in November the Armenian Government issued a list of enterprises that would not be

privatized during the next 2 to 3 years. These include the country's main precious metal producer Armzoloto, and the country's copper and molybdenum mining enterprises (Interfax Mining and Metals Report, 1996h).

The Armenian Minister of Industry stated that in 1996 the metals industry suffered from a drop in world prices for several nonferrous metals. Despite a more than 30% increase in molybdenum in ore production, profits from its sale fell considerably.

The gem-cutting industry also registered a more than 50% growth in output, but only a 16% increase in profits. Shogakhn, a state-owned gem cutting plant that produced cut and polished diamonds, was the chief producer of cut gemstones (Interfax Mining and Metals Report, 1997e). In 1996, Shogakhn was producing between \$35 million and \$38 million worth of precious stones, mostly for export to Belgium, Cyprus, and Japan. The Belgian firm Backes and Strauss was purchasing about \$25 million per year of cut diamonds and extending Armenia about \$5 million per year in credit to purchase rough diamonds. In 1997, Shogakhn intended to increase its purchases of rough diamonds from De Beers to between \$50 million and \$60 million. Armenia was also considering resuming tolling arrangements for processing Russian rough diamonds, which it discontinued in 1996. Founded in 1981, Shogakhn has the capacity to produce between 100,000 and 120,000 carats per year of gem diamonds cut to between 0.001 and 1.5 carats, and employs 750 people. (Interfax Mining and Metals Report, 1997g).

The Minister of Industry said that Armenia was making satisfactory progress with its Metallurgiya (Metallurgy) program to develop Armenia's mining and metallurgical sector. Nevertheless, the Minister stated that the country needs large investments by reputable foreign companies to achieve major progress in the development of its mining and metallurgical industries. Even without such major investment, the country plans to raise copper and molybdenum concentrate production by 50% in 1997 compared with that of 1996 (Interfax Mining and Metals Report, 1997e).

Armenia is the FSU's biggest producers of molybdenum concentrate. The Zangezur enterprise, in the Kapan (formerly Kafan) district of southern Armenia, mines the large Kadzharan copper-molybdenum deposit, which is one of the world's biggest molybdenum resources. The Kadzharan field contains 90.7% of Armenia's total molybdenum reserves (Interfax Mining and Metals Report, 1997c). In 1996, Zangezur produced 3,400 t of molybdenum concentrate with a molybdenum content ranging between 50% and 60% compared with 1990 when Zangezur produced 7,800 t of molybdenum concentrate with a 50% molybdenum content. Zangezur also produced 4,486 t of copper in copper concentrate compared with 6,100 t of copper in copper concentrate in 1990. The copper concentrate is marketed by the Liechtenstein-registered Vallex Corp. through its Manes-Vallex joint venture in which Vallex has a 53% share (Interfax Mining and Metals Report, 1997c).

The Armenian authorities were considering the possibility of raising \$30 million to build a plant to produce molybdenum

oxides at the Zangezur enterprise. The new facility would produce about 8,000 metric tons per year (t/yr) of molybdenum oxides. In mid-1996, the Government gave its general approval to the project and sought to find a foreign investor (Interfax Mining and Metals Report, 1997c). Also, in 1996, Armenia began producing ferromolybdenum from concentrates from the Kadzharan field at an experimental facility for producing high-purity iron in Yerevan (Interfax Mining and Metals Report, 1997b). Armenia has two other copper-molybdenum deposits, the Dastakert and the Agarak, where molybdenum accounts for over 80% of the value of mined output (Shabad, 1969).

In 1996, the Kapan mining and beneficiation complex, which mines the Kapan copper deposit and the Shaumian copper-zinc deposit in southern Armenia, produced 2,470 t of copper in concentrate, which was approximately the same level as that of 1994. Besides copper, the Kapan complex produced 557 t of zinc in concentrate compared with 458 t in 1995 (Interfax Mining and Metals Report, 1997i). Kapan in 1996 was mining ore with a 0.93% copper content and producing concentrate with a 22% to 25% copper content from the Kapan deposit and producing concentrates with a copper content of 16% and a zinc content of 51% from Shaumian ores. Plans called for Kapan in late 1997 to commission a facility to produce lead concentrates, initially in small quantities (Interfax Mining and Metals Report, 1997i).

Plans call for increasing output at the Agarak copper and molybdenum complex, near the border between Iran and Armenia by developing the Aygedzor copper and molybdenum field. Also, in 1996, Armenia restarted mining at the Shamlug copper deposit in the north of the country (Interfax Mining and Metals Report, 1997b). In August, the Armenian Government approved plans to construct two copper smelters—one to be built in Kapan with the capacity to produce up to 25,000 t/yr of copper and the other to be built in Alaverdi with the capacity to produce 5,000 t/yr of copper and copper products. The Kapan smelter would receive raw material from the Kadzharan, Kapan, and Shaumian deposits and the Alaverdi smelter from the Alaverdi and Shamlug fields.

A smelter at Alaverdi had been shut down in the late 1980's; it had been producing up to 50,000 t/yr of copper (Interfax Daily Business Report, 1996). Indications are that copper production began again at Alaverdi in 1996, initially from scrap, but later from concentrate from Kadzharan (Interfax Mining and Metals Report, 1997b). The new Kapan plant also will produce up to 900 kilograms per year of gold, 12 t/yr of silver, 6 t/yr of selenium, as well as bismuth, cadmium, and tellurium (Interfax Mining and Metals Report, 1997h). Plans also call for the Kapan plant to construct a facility to produce 8,500 t/yr of zinc, mainly from ores from the Shaumian deposit (Interfax Mining and Metals Report, 1997i).

According to data Armenia supplied on the U.S.G.S. Minerals Questionnaire, Armenia produced 244 kilograms (kg) of gold in 1996 compared with 514 kg in 1995. Up to 2.5 t/yr of gold had been produced in the 1980's (Interfax Mining and Metals Report, 1997b). Armenia was hoping to launch the recovery of its gold mining industry by initiating a project to recover gold from tailings at the Ararat gold mill, 50 km from

the capital of Yerevan (Interfax Mining and Metals Report, 1997i). The Armenian Government at the end of June ratified an 8-year joint-venture agreement with a U.S. firm, Global Gold, to help build and run a facility to extract from 750 to 800 kg of gold from up to 1.5 million metric tons per year of tailings at Ararat. The end product will be gold dore that at present would have to be refined outside Armenia. The joint venture is known as the Armenian Gold Recovery Company. Global Gold reportedly will take a 65% share of the profits; Kilborn Engineering Pacific Ltd., a Canadian company, will be the chief designer for the gold recovery facility at Ararat. An Armenian Ministry of Industry official stated that the agreement with Kilborn fell within the agreement signed by Global Gold (Interfax Mining and Metals Report, 1996).

Specialists from Armenia's mineral reserve commission were insisting on an appraisal of the amount of gold in tailings at the Ararat mill to be processed by the Armenian Gold Recovery Company joint venture. The commission stated that no detailed study of the waste had been made and that these reserves ought to be appraised in the same way as natural deposits (Interfax Mining and Metals Report, 1996). The wastes at Ararat, reportedly totaling more than 20 million metric tons with an average gold content of 1 gram per ton, have built up during the last 20 years. These wastes also are an ecological liability, particularly to farming in the region (Interfax Mining and Metals Report, 1996).

The Armenian Government approved a plan proposed by the Ministry of Industry to build the country's first gold refinery in Yerevan with a capacity to produce 5 t/yr of gold and 20 t/yr of silver. The refinery will process gold from concentrates from the Ararat complex, anode slimes from copper smelting, wastes from zinc processing, and scrap metal. Plans also call for producing byproduct rhenium, selenium, and tellurium at the refinery (Interfax Mining and Metals Report, 1996).

A priority of the Armenian Government is to overcome the transport and energy blockade situation the country has endured for the last 6 years. Shortly after yearend, the Armenian Prime Minister signed a protocol with Russia's Gazprom for the delivery of Russian gas via Armenia to Turkey. This protocol, if it were to be successfully carried out, would signify a breach in the barrier that has existed in trade and other economic relations between Armenia and Turkey. The contemplated delivery volume is from 3 billion to 9 billion cubic meters per year of gas. Thus, for the first time Armenia could become a transit country for gas deliveries (Nezavisimaya Gazeta, 1997). In accordance with this agreement, the parties would undertake jointly to plan, finance, and maintain Armenia's gas infrastructure.

Agreement was also reached on the installation of a gas pipeline to Turkey. Armenia will render Gazprom assistance in planning and surveying for the installation of the pipeline. Gazprom, in turn, has undertaken to ensure supplies of natural gas to Armenia. The Ministry of Energy of Armenia and Gazprom furthermore are to jointly draw up proposals for the generation of electric power using Russian gas at currently available powerplants in Armenia with a view eventually to its joint sale to third countries. The Armenian Government and

Gazprom signed an agreement on the creation in Armenia of a joint-stock company that will manage the operating gas main, create new capacity for gas transport, and supervise all supply questions (Nezavisimaya Gazeta, 1997).

Armenia's immediate prospects for alleviating its energy crisis appear to lie more in the political sphere than in the domestic resource development sphere as it is still uncertain whether Armenia has adequate economic hydrocarbon reserves. Despite the agreement between Armenia and Russia on constructing a pipeline to transport gas to Turkey, it still will require a change in Turkish policy for Turkey to relax its embargo on Armenia without a resolution to Armenia's conflict with Azerbaijan acceptable to Azerbaijan and Turkey. In the case of copper production, increased output from the two new proposed smelters would significantly enhance Armenia's export earnings, but would only contribute a small percentage to the world's copper supply. The situation with regards to molybdenum, however, is considerably different. With the expansion of mine output and construction of the proposed molybdenum processing plant at the Zangezur enterprise, Armenia could become a major world molybdenum producer.

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Major Sources of Information

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ArmPatent (State Patent Office)
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TABLE 1
ARMENIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity		1992	1993	1994	1995	1996
Bentonite		200	100	100	110 2/	275 2/
Cement		500	200	200	228 2/	282 2/
Copper, concentrate, Cu content	metric tons	2,000	500	500	8,080 2/	9,080 2/
Gold	kilograms	500	500	500	514 2/	244 2/
Limestone		1,000	500	100	26 2/	441 2/
Molybdenum, concentrate, Mo content	metric tons	1,000	500	500	1,500	1,800
Perlite		50	10	10	NA	NA
Salt	metric tons	100,000	50,000	30,000	32,800 2/	26,400 2/
Silver	kilograms	NA	NA	NA	184 2/	626 2/

NA Not available.

1/ Includes data available through Dec. 17, 1997.

2/ Reported figure.

TABLE 2
ARMENIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity e/
Copper, mine output, Cu content		Kapan copper mining directorate	Kapan	30
		Shamlug mining directorate	Shamlug	
		Akhtala mining directorate	Akhtala	
		Zangezur copper-molybdenum complex mining Kadzharan deposit	Kadzharan	
		Agarak copper-molybdenum mining and processing complex	Agarak	
Diamonds, cut stones	thousand carats	Shogakhn gem cutting plant	Nor-Achin	120
Gold	metric tons	Zod mining complex	Zod	2
		Megradozor deposit	Megradozor	
Molybdenum, mine output, Mo content		Zangezur copper-molybdenum complex mines Kadzharan deposit	Kadzharan	8
		Agarak copper-molybdenum mining complex	Agarak	
Perlite		Aragats mining and beneficiation complex	Aragats	200

e/ Estimated