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The Mineral Industry of Armenia

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Armenia ranked sixth in the world in mine output of molybdenum in 2016 and accounted for 2.2% of world molybdenum output. Besides molybdenum, Armenia produced other metals, such as copper, gold, silver, and zinc, and industrial minerals and products thereof, which included cement, diatomite, gypsum, limestone, and perlite. The country also produced aluminum foil from aluminum imported from Russia, and ferromolybdenum, molybdenum metal, and rhenium salts (ammonium perrhenate and potassium perrhenate) from local ores. It also had developed a diamond-cutting industry based on imported diamond. Armenia possesses resources of copper, gold, iron ore, lead, molybdenum, and zinc. It also has resources of construction materials, such as basalt, granite, limestone, marble, and tuff; semiprecious stones, such as agate, jasper, and obsidian; and other nonmetallic minerals, such as bentonite, diatomite, perlite, and zeolites (Polyak, 2018).

Minerals in the National Economy

In 2016, Armenia's real gross domestic product (GDP) increased by 0.12% compared with an increase of 3.2% in 2015. The nominal GDP in 2016 amounted to $10.6 billion.[1] The share of industrial production in total GDP was 16.7%, and the share of mining and quarrying in total industrial production was 17.9%. In 2016, mining of metallic ores dominated the mining and quarrying sector, accounting for 97.9% of the value of production in this sector. In 2016, industrial production increased by 6.7% compared with that of 2015; mining and quarrying increased by 16.7%; and mining of metallic ores increased by 16.5%. At the same time, metallurgical production in 2016 decreased by 0.6% (National Statistical Service of the Republic of Armenia, 2017, p. 227–234).

Production

In 2016, Armenia's estimated production of bentonite clays increased by 248%. Production of cut-diamond products increased by 54%; that of diatomite, by an estimated 33%; mined gold and mined silver, by an estimated 29% each; copper mine production, by 23%; salt, by 18%; ferromolybdenum, by 17%; and copper smelter production, by 11%. At the same time, production of molybdenum metal decreased by 51%, and that of rolled aluminum, by 45%. Production of hydraulic cement decreased by 36%; that of gypsum, by 24%; rhenium, by 20%; and tuff, by 11.5%. Data on mineral production are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Mineral Trade

In 2016, Armenia had a significant trade deficit, as the country's exports, which were valued at $1.79 billion, were much lower than the country's imports of $3.27 billion. Mineral commodities constituted a significant share of the country's export revenue. The main export commodities were cut diamond, energy (electric power), foodstuffs, nonferrous metals, unwrought copper, and other mineral products. Overall, exports of copper ores, concentrates and other products constituted about one-quarter of the country's export revenue. Mined copper was exported primarily to Bulgaria, China, Georgia, and Romania. Copper and articles made out of copper alone contributed 4.7% to the total export revenue in 2016, which was a decrease from 5.8% in 2015. In 2016, Armenia increased production of copper ores and concentrates to 388,534 metric tons (t) (gross weight) from 315,599 t in 2015 (an increase of 23.1%) and increased exports of copper concentrates to about 397,000 t from 309,200 t in 2015 (an increase of 28.4%), and the revenue received for the copper concentrates and articles made of copper amounted to $357 million, which was a much smaller increase (only 12.7%) because of a decrease in the world copper prices. The main export partners of Armenia were Russia (which accounted for 20.9% of Armenia's export revenue), Bulgaria (8.5%), Georgia (8.2%), Canada and Germany (7.8% each), Iraq (7.7%), China (5.4%), Iran and Switzerland (4.2% each), the United Arab Emirates (3.6%), and Hong Kong (3.2%) (Oganesyan, 2016; National Statistical Service of the Republic of Armenia, 2017, p. 450–476, 480–481; Martirosyan, 2018).

In 2016, Armenia's imports of mineral products included rough diamond, natural gas, and petroleum. The main trade partners for imports were Russia (which provided 30.1%, by value, of Armenia's imports), China (10.9%), Germany (5.7%), Iran and Turkey (5.0% each), Italy (3.9%), Ukraine (3.1%), Georgia (3.0%), and the United States (2.5%) (National Statistical Service of the Republic of Armenia, 2017, p. 482–483).

Commodity Review

Metals

Copper and Molybdenum.—In the beginning of 2016, Armenia had four enterprises engaged in mining copper and molybdenum—the Agarak copper-molybdenum mining and processing complex (ACMC), Dundee Precious Metals Kapan (DPMK), the Teghout copper-molybdenum complex, and the Zangezur copper-molybdenum complex (ZCMC). In March 2016, Polymetal International plc of Russia acquired rights to mine the Shahumian gold-polymetallic deposit from Dundee Precious Metals Inc. of Canada (table 2). Polymetal was a leading producer of mined silver and a significant producer of mined gold in Russia. ACMC and ZCMC also produced molybdenum and rhenium as a byproduct of copper production.

[1]Where necessary, values have been converted from Armenian drams (AMD) to U.S. dollars (US$) at an annual average exchange rate of AMD477.92=US$1.00 for 2015 and AMD480.49=US$1.00 for 2016.

In Armenia, copper production was a significant source of export revenue and jobs, and copper production was among the most significant sources of tax revenue. In 2016, the Teghout copper-molybdenum complex was the seventh-ranked taxpayer in Armenia, having paid a total of $27.8 million in taxes. ZCMC, Polymetal, and ACMC paid $19 million, $6.7 million, and $3 million in taxes, respectively (table 2; OC-Media.org, 2017).

Gold.—In 2016, Armenia produced an estimated 4,000 kilograms (kg) of gold, which was a 29% increase compared with the amount produced in 2015. As of 2016, the two gold producers in the country were Ararat Gold Recovery Co. (AGRC), which mined the Sotk (Zod) deposit, and Polymetal, which mined the Shahumian polymetallic deposit. In addition, Lydian International Ltd. of the United Kingdom was developing the Amulsar deposit and expected to begin production in early 2018 (table 2; Arka.am, 2017a).

In addition to mining the Sotk (Zod) deposit, AGRC, which was a subsidiary of GeoProMining, Ltd. of Russia and also known as GPM Gold, had a gold-processing facility in the city of Ararat. The company also operated the copper-producing facility ACMC. According to GeoProMining, during the 10 years of operations in Armenia, the company had invested a total of about $500 million in the country, of which $160 million had been invested in its gold mill. Since 2014, AGRC had applied the Albion Process technology in its operations. The Albion Process was developed by Glencore plc of Switzerland and had previously been used in the Dominican Republic, Germany, and Spain; Armenia was the fourth country in the world where this technology was used to treat refractory gold. As of 2016, gold production at AGRC was about 3.5 metric tons per year (t/yr), but the company was planning to increase gold production to 3.8 t/yr beginning in 2017. According to the GPM Gold leadership, the gold extraction rate in 2016 was 87%, and the company expected the extraction rate to be 86% in 2017. As of 2016, GPM Gold employed 1,500 workers in Armenia (Arka.am, 2014, 2017b).

In 2016, ZAO Geoteam of Armenia, which was owned by Lydian International, began construction of a mine and infrastructure works at the Amulsar gold deposit located in southeastern Armenia between the Arpa and Vorotan Rivers. According to the most recent estimates, the proved and probable reserves of Amulsar were about 70 t of gold and 300 t of silver; measured and indicated resources of gold were estimated to be about 75 t, and inferred resources, 53 t of gold. The company was planning to begin producing gold on a commercial scale in March 2018. The company planned to invest a total of $370 million and to create 700 permanent jobs. Geoteam was planning to produce between 6,000 and 7,000 kilograms per year of gold and to export between $200 million and $250 million worth of gold annually. Among the shareholders of Lydian International were the International Financial Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) (Delovoy Ekspress, 2014; Vestikavkaza.ru, 2016; Armbanks.am, 2017; Gold.1prime.ru, 2017; Kirsanova, 2017).

In March 2016, Polymetal acquired DPMK, which had a development license for the Kapan gold deposit. Polymetal paid a total of $25 million for the Kapan assets, but Dundee would receive a 2% royalty on all profits from future Kapan production, up to a total of $25 million. The Kapan deposit is located 320 kilometers (km) from Yerevan in southeastern Armenia. The reserves of the Kapan deposit were estimated to be 15.9 million metric tons (Mt) containing about 1.4 million troy ounces (about 43,550 kg) of gold, 24 million troy ounces (about 746,500 kg) of silver, 80,000 t of copper, and 270,000 t of zinc. The assets of the company included an underground mine with an annual capacity of 400,000 t/yr of ore, a traditional flotation beneficiation plant with a capacity of 750,000 t/yr, and related infrastructure. DPMK produced gold-copper-silver and zinc concentrates, all of which was exported. During the previous 5 years, DPMK invested more than $75 million in the production facilities (Petrov, 2016).

Earlier, in April 2015, Polymetal had acquired a 25% share in the Lichkvaz deposit for $3.5 million. The other 75% of the deposit was reportedly owned by LV Gold Mining, which was connected with the ZAO Capital Group of Russia. In addition, Polymetal promised to invest in exploration work at the deposit, to conduct technical studies, and to prepare a comprehensive Join Ore Reserves Committee (JORC)-compliant resource assessment of the deposit. If the company satisfied those conditions, it was to become eligible to acquire another 25% of the asset (Fomag.ru, 2015; Interfax.ru, 2015).

The Lichkvaz deposit is located in the Megri region in Syunik Province, 380 km from the city of Yerevan and less than 70 km from the Kapan mining complex. The region had well developed infrastructure that provided access to qualified labor resources. The deposit had significant resources of gold and copper; silver was considered a byproduct. According to previous estimates, the resources of the deposit were 2.4 Mt of mineralized material grading 6.9 grams per metric ton (g/t) gold that would correspond to approximately 600,000 troy ounces (18.7 t) of gold equivalent. The potential production plans would allow Polymetal to transport the ore mined at the Lichkvaz to the Kapan beneficiation plant for processing (Finam.ru, 2016).

In November 2015, Polymetal acquired an additional 75% of the Lichkvaz deposit and became the sole owner. The decision to buy the deposit was based on the positive results of the exploratory drilling the company conducted during 2015. In April 2016, independent auditors confirmed the 600,000-troy-ounce (18.7 t) gold-equivalent estimate using a JORC-based calculation of 4.3 Mt of ore grading 4.2 g/t metal. Polymetal planned to produce its own estimate of the reserves in 2017 after conducting additional drilling work (Rambler News Service, 2015).

Outlook

In the next few years, Armenia is likely to increase its copper, molybdenum, and rhenium production and to increase its gold production if the Amulsar Mine opens in 2018 and starts production according to schedule. In the next few years, Armenia's economy in general and its mineral industry in particular are expected to continue receiving a boost from lower energy prices and better access to the capital markets of Kazakhstan and Russia following a successful accession to the Eurasian Economic Union in 2015. Armenia's economy, however, could slow down because of recession trends in the

countries of the Eurasian Economic Union and because of the high dependence of the country's export revenues on world market demand for and prices of nonferrous and precious metals.

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TABLE 1
ARMENIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2012	2013	2014	2015	2016
METALS						
Aluminum, metal, products:						
Foil		26,243	27,700	29,231	29,642	29,011
Rolled		21	18	20	11	6
Copper:						
Mine production, Cu content		52,467 r	57,653 r	62,413 r	102,600 r, 3	126,300 3
Smelter production, primary, blister		10,075	10,771	9,814	11,601	12,920
Ferroalloys, ferromolybdenum		5,836	6,619	6,528	5,576	6,518
Gold, mine production, Au content	kilograms	2,896	3,473	3,990 r, e	3,100 e	4,000 e
Iron and steel, products, rebar		--	4,000 e	50,000 e	40,000 e	40,000 e
Molybdenum:						
Mine production, concentrate, Mo content		6,526	6,900	7,162	6,300 e	5,771
Metal		675	746	748	748	367
Rhenium, Re content	kilograms	293	298	351	350 e	281
Silver, mine production, Ag content	do.	22,244	19,458	19,333	15,000	19,300 e
Zinc, mine production, Zn content		7,371 r	9,054 r	8,459 r	6,300 r	6,400
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	438	431	422 r	417	268
Clay and shale, bentonite		4,987	15,387	798	1,592	5,543
Diamond, products, cut	carats	67,000	94,498	59,712	81,288	125,000
Diatomite[e]	thousand metric tons	10	7	7	6	8
Gypsum		30,446	28,679	22,317	19,392	14,800
Lime		27,294	28,238	26,167	23,063	23,143
Perlite		181	53	14 e	-- r	4
Salt		37,800 r	30,800	29,800 r	27,400 r	32,250
Sodium compounds, caustic soda		82	96	61 r	29	--
Stone, crushed, tuff		64,224	53,203	54,514	35,028 r	30,990

eEstimated. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through January 5, 2018. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.

[2]In addition to commodities listed, Armenia may have produced barite and limestone, but available information was inadequate to make reliable estimates of output.

[3]Assumes 32.5% copper content in copper concentrate.

TABLE 2
ARMENIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Metric tons unless otherwise specified)

Commodity	Major operating companies, main facilities, or deposits	Location or deposit name[1]	Annual capacity[e]
Aluminum, rolled and foil	ARMENAL (formerly Kanaker aluminum plant) (United Company RUSAL)	Kanaker	28,000
Caustic soda	OOO Nairit (Government)	Yerevan	100
Cement thousand metric tons	Ararat Cement Factory CJSC	Ararat region	1,200
Do. do.	Hrazdan Cement (VT Bank)	Hrazdan	1,200
Copper:			
Mine output, Cu content	Agarak copper-molybdenum mining and processing complex (ACMC) [GeoProMining, Ltd. (GPM)]	Agarak	NA
Do.	Polymetal International	Kapan	NA
Do.	Zangezur copper-molybdenum complex (ZCMC) [Cronimet Mining GmbH, 60%; OAO Yerevan Pure Iron Plant, 15%; Armenian Molybdenum Production LLC (AMP), 12.5%; Zangezur Mining LLC, 12.5%]	Kajaran	NA
Do.	ZAO Teghout (Vallex Group)	Lori Martz	60,000
Blister	ZAO Armenian Copper Programme (ACP) (Vallex Group)	Alaverdi	15,000
Diamond, cut stones	Aghavni diamond-cutting works[2]	Nor Geghi	NA
Do.	Amma group diamond-cutting works[2]	Artashat	NA
Do.	Andranik-Dashk diamond-cutting works	Nor Hachyn	NA
Do.	Arevakn diamond-producing plant	do.	NA
Do.	Diamond Company of Armenia (DCA)	Yerevan	NA
Do.	Diamond Tech	Talin	NA
Do.	Lori diamond-cutting works	Nor Hachyn	NA
Do.	Lusampor[2]	Melik'gyugh	NA
Do.	Punji diamond-cutting works[2]	Yerevan	NA
Do.	Sapphire diamond-cutting works	Nor Hachyn	NA
Do.	Shoghakan gem-cutting plant	do.	120
Gold kilograms	Ararat Gold Recovery Co. (AGRC) [GeoProMining, Ltd. (GPM)]	Sotk (Zod)	3,500
Do. do.	Polymetal International	Shahumian deposit, Kapan	NA
Molybdenum:			
Mine output, Mo content	Agarak copper-molybdenum mining and processing complex (ACMC) [GeoProMining, Ltd. (GPM)]	Agarak	2,000
Do.	Zangezur copper-molybdenum complex (ZCMC) [Cronimet Mining GmbH, 60%; OAO Yerevan Pure Iron Plant, 15%; Armenian Molybdenum Production LLC (AMP), 12.5%; Zangezur Mining LLC, 12.5%]	Kajaran	8,000
Do.	ZAO Teghout (Vallex Group)	Lori Martz	NA
Metal, ferromolybdenum	Armenian Molybdenum Production LLC (AMP) (Cronimet Mining GmbH, 51%, and Armenian residents, 49%)	Yerevan	3,600
Do.	OAO Yerevan Pure Iron Plant	do.	NA
Perlite metric tons	OAO Aragats Perlit	Aragats deposit	300
Rhenium	Agarak copper-molybdenum mining and processing complex (ACMC) [GeoProMining, Ltd. (GPM)]	Agarak	NA
Do.	Zangezur copper-molybdenum complex (ZCMC) [Cronimet Mining GmbH, 60%; OAO Yerevan Pure Iron Plant, 15%; Armenian Molybdenum Production LLC (AMP), 12.5%; Zangezur Mining LLC, 12.5%]	Kajaran	NA
Steel, rebar	Armenian Steel Casting Enterprise (ASCE) Group	Charentsavan	NA
Zinc, mine output, Zn content	Dundee Precious Metals Kapan (DPMK) (Dundee Precious Metals Inc.)	Kapan	NA

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]Many location names have changed since the breakup of the Soviet Union. Many enterprises, however, are still named or commonly referred to based on the former location name, which accounts for discrepancies in the names of enterprises and the names of locations.
[2]Current existence of the enterprise cannot be confirmed.