



2019 Minerals Yearbook

SILVER [ADVANCE RELEASE]

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SILVER

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In 2019, the United States produced 981 metric tons (t) of silver, which was 5% greater than production in 2018 (table 1). Silver was produced in 12 States in 2019, and Alaska remained the leading silver-producing State, followed by Nevada (table 2). Approximately 49% of domestic silver production was from primary silver ore at 4 mines, 46% was produced from base-metal ores at 10 mines, and the remaining was from gold ores (table 3).

The Engelhard price of silver averaged \$15.30 per troy ounce in 2019, 3% compared with the revised 2018 average price of \$15.73 per troy ounce (table 1).

Traditional use categories for silver included coin and bar fabrication; industrial applications such as brazing alloys and solders, electrical and electronics components, ethylene oxide, photography, and photovoltaics; jewelry; non-coin investments; and silverware. Apart from physical investment and silverware demand (which increased by 13% and decreased by 9%, respectively), silver use in all other categories was essentially unchanged in 2019 from that in 2018 (Alexander and others, 2019, p. 8; Newman and others, 2020, p. 7–8).

In 2019, silver was mined in approximately 60 countries. World production was 26,600 t, essentially unchanged from the revised production of 26,800 t in 2018 (tables 1, 8). Mexico was the leading producer, followed by Peru, China, Russia, Poland, Chile, Australia, Bolivia, and Argentina, in descending order of production. These nine countries, each of which produced more than 1,000 t of silver in 2019, accounted for 81% of the global production of silver. The United States ranked tenth in world silver-mine production in 2019.

Legislation and Government Programs

On September 30, 2019, the amount and value of Deep Storage and Working Stock custodial silver reserves held by the U.S. Mint equaled 498 t with a total market value of \$276 million at \$17.26 per fine troy ounce and a statutory value of \$20.7 million. As custodian, the U.S. Mint is responsible for safeguarding much of the Nation's gold and silver reserves. In accordance with 31 U.S. Code § 5117(b) and 31 U.S. Code § 5116(b)(2), a statutory rate of no less than \$1.2929292 per fine troy ounce was used to value the custodial silver held by the U.S. Mint. Total silver bullion ounces sold increased by 25% in fiscal year (FY) 2019 (October 1, 2018, through September 30, 2019) compared with that in FY 2018. Sales of the American Eagle Silver Bullion Coins increased by 23%, and sales of the America the Beautiful silver dollar increased by 56% in FY 2019 (U.S. Mint, 2019, p. 15–16, 50).

On July 31, September 18, and October 30, the Federal Reserve cut interest rates, to a final range of 1.5% to 1.75%, down from the previous range of 2.25% to 2.5% in the first 6 months of the year. This decrease in Federal Reserve interest rates had the effect of increased silver prices, as well as other

precious metals and other U.S. equities (Federal Reserve System, 2019a–c).

Production

Domestic lode mine production data for silver were compiled by the U.S. Geological Survey from two separate voluntary monthly surveys of U.S. mining operations and from publicly available sources and represented 100% of U.S. mine production listed in table 1. Domestic mine production of silver increased by 5% in 2019 to 981 t, primarily because of increased production at the Lucky Friday Mine in Idaho, the Greens Creek Mine in Alaska, the Red Dog Mine in Alaska, and the Bingham Canyon Mine in Utah. This increase in production was slightly offset by decreased production at the Rochester Mine in Nevada and the Galena Mine in Idaho. Silver in the United States was produced mainly as a principal product, in descending order, at the Greens Creek, Rochester, Galena Complex, and Lucky Friday Mines. Silver was produced as a secondary product at other mines (table 3).

Hecla Mining Co.'s Greens Creek Mine, an underground silver-zinc mine on Admiralty Island in southern Alaska near Juneau, produced 308 t (reported as 9.89 million troy ounces) of silver in 2019, a 21% increase in production compared with that in 2018. This increase was due to higher grade ores and higher throughput. The Greens Creek Mine also announced a 22% increase in silver reserves (Hecla Mining Co., 2020, p. HL10-K 21, HL10-K 38).

In 2019, Teck Alaska Inc.'s Red Dog Mine, in northwestern Alaska, primarily a zinc-lead mine, produced 242 t (reported as 7.8 million troy ounces) of silver in 2019, an 11% increase compared with 218 t (reported as 7 million troy ounces) in 2018. This increase was due to higher recovery rates, somewhat offset owing to a lower throughput of ore because of planned mill shutdowns. The Qanaiaq deposit was opened in the first quarter of 2017 and was expected to provide 20% of the ore feed through 2027 (Athey and Werdon, 2020, p. 40–45).

Coeur Mining, Inc.'s Rochester Mine near Lovelock, NV, a silver surface mine with gold byproduct, produced 117 t of silver in 2019, 25% less than the 2018 production of 157 t. This decreased silver production was due to machine failure of a secondary crusher in the newly installed crushing circuit. This mechanical failure affected crushing rates for ore, which led to reduced throughput (Coeur Mining, Inc., 2020, p. 12–13, 29).

In 2019, the Bingham Canyon Mine, near Salt Lake City, UT, owned by Rio Tinto plc, produced 88 t of silver, a 12% increase compared with the 78 t of silver produced in 2018. The Bingham Canyon Mine was primarily a copper mine, but silver was produced as a secondary product with gold, molybdenum, and other minor metals (Rio Tinto plc, 2020, p. 272).

The Galena Complex silver mine, near Silverton, ID, owned by Americas Gold and Silver Corp., produced 36 t of silver

in 2019, a decrease of 18% compared with 44 t in 2018. This decrease was attributed to lower milled tonnage and lower silver grades. Since production was low, Americas Gold and Silver Corp. announced on September 9 that it would recapitalize the mining operations at the Galena Complex to modernize the infrastructure and operations (Americas Gold and Silver Corp., 2020, p. 13–14).

Workers at Hecla's Lucky Friday Mine, a silver mine in the Coeur d'Alene mining district in northern Idaho, remained on strike in 2019. The strike began on March 13, 2017, after the previous 6-year contract expired in April 2016. In 2019, 19,700 kg of silver was produced at the Lucky Friday Mine, more than 2.5 times the production in 2018. The Lucky Friday Mine had installed a new remote vein miner in order to continue production with reduced personnel during the strike. The strike ended on January 7, 2020, and the company expected full production by the end of 2020. During the strike, limited production continued with salaried personnel (Hecla Mining Co., 2017; 2020, p. HL10-K 22-23, HL10-K 44; Edelen, 2019; KHQ News, 2019).

Consumption

Consumption of silver for fabrication in the United States was 5,698 t in 2019, a slight decrease from the revised consumption of 5,707 t in 2018. The 25% increase in silver consumption for coins was offset by slight decreases in consumption for industrial applications and photovoltaic purposes. Global consumption of silver for fabrication totaled 30,800 t in 2019, essentially unchanged from that in 2018. There were slight decreases in consumption for photographic silver and jewelry fabrication and a 9% decrease in consumption for silverware, but these decreases were offset by a 12% increase in consumption for physical investment in silver (Newman and others, 2020, p. 61, 65, 66; U.S. Mint, 2019, p. 16).

Coin Fabrication.—Approximately 577 t of silver was consumed for coins and medals in the United States in FY 2019, a 25% increase from 461 t in FY 2018. In FY 2019, the U.S. Mint sold 528 t of American Eagle Silver Bullion Coins, an increase of 23% from 430 t in FY 2018, and the sales of the America the Beautiful Silver Bullion Coins increased by 55% in FY 2019 to 48 t from 31 t in FY 2018 (U.S. Mint, 2019, p. 16).

Industrial Applications.—Silver consumed in domestic industrial applications decreased for the first time in 4 years, decreasing by 3% to 3,756 t of silver in 2019 from the revised 2018 consumption of 3,885 t. This decrease was due to a decrease in demand for photovoltaic applications, which was driven by import tariffs imposed by China, as part of the trade dispute between China and the United States, affecting silver powder fabricators (Newman and others, 2020, p. 44, 46).

The principal components of industrial consumption of silver were electrical components and electronics (1,939 t), brazing alloys and solders (202 t), and other applications (1,615 t) (Newman and others, 2020, p. 65–66).

In 2019, the domestic use of silver for electronic and electrical applications totaled 1,939 t, a decrease of 9% from the revised total of 2,140 t in 2018. This decrease was related to the trade dispute between China and the United States (Newman and others, 2020, p. 46). One of silver's electrical applications was

in batteries. The most common silver oxide battery was the small button-cell battery used in calculators, cameras, hearing aids, toys, and watches; these batteries contained about 35% silver by weight. Because of environmental and safety concerns, silver oxide batteries also were being tested as a replacement for lithium-ion batteries in mobile phones and laptop computers. Silver-zinc batteries feature a water-based chemistry and contain no lithium or flammable liquids. Some larger silver oxide and silver-zinc batteries were used in military applications. Silver also was used in conductors, contacts, fuses, switches, and timers (Silver Institute, The, undated).

In 2019, estimated domestic silver powder production for photovoltaic purposes was estimated to have decreased to 420 t from the 2018 production of 560 t, a decrease of 25%, owing to the trade dispute between China and the United States. Silver powder, which was used for solar panel electrical connections, was subject to a 25% tariff in China that was announced on May 13, 2019, by China's State Council Customs Tariff Commission. Manufacturers lost market share to other silver powder producers as a result of this tariff. The tariffs imposed by the Government of China started on June 1, 2019, and included 2,493 products made in the United States (Shendruk and Timmons, 2019; Newman and others, 2020, p. 46).

Silver was one of the essential materials used in the manufacture of photographic films and papers. The decline in the use of silver for photography began in 2000 in response to the growth in digital camera technology and the decline in the production of color film and paper. The use of silver in film and paper for consumer applications declined more rapidly than its use in motion picture film because of the slower adoption of digital formats in motion picture production. Other broad photographic-use categories for silver-containing film and paper included commercial photography, dental and industrial X-ray film, graphic arts, and medical X-ray film. In 2019, domestic use of silver for photographic applications was estimated to be 420 t, a slight decrease from 422 t in 2018 (Newman and others, 2020, p. 61).

Adding silver to solder or brazing alloys helps produce smooth, leak-tight, and corrosion-resistant joints. Silver brazing alloys were used widely in a variety of applications, including air conditioning, refrigeration, and electric power distribution. They also were important in the aerospace and automobile industries. In 2019, 202 t of silver was used domestically in brazing alloys and solders, slightly more than the revised 198 t used in 2018 (Newman and others, 2020, p. 47).

As a catalyst, silver can be used in the form of mesh screens or crystals to produce ethylene oxide and formaldehyde, both of which are essential ingredients in plastics. Approximately 90% of the silver used as an industrial catalyst was for the production of ethylene oxide from ethylene. Aside from plastics, ethylene oxide was used for antifreeze, detergents, and polyester fiber. Ethylene oxide catalyst use in the United States was estimated to have increased by 4% in 2019 to 106 t from 102 t in 2018. Recovery of ethylene oxide was an estimated 98% over an 18- to 36-month cycle, so demand for silver directly depends on the building of new capacity (Newman and others, 2020, p. 46).

Silver membrane switches were used in buttons on electronics such as computer keyboards, microwave ovens, telephones,

televisions, and toys. Silver-based inks and films were applied to composite boards to create electrical pathways in printed circuit boards. Silver-based inks also were used in radio frequency identification (RFID) tags used in hundreds of millions of products to prevent theft and allow easy inventory control. Dental amalgam contains silver, but the use of amalgam has been declining because of concerns about its mercury content (U.S. Food and Drug Administration, 2021). Owing to silver's antibacterial properties, silver also was used in such products as clothing, laundry machines, shoes, and toothbrushes. Silver was embedded in locker room surfaces to reduce staph infections, and silver-based disinfectants have been introduced as a low-cost, environmentally sensitive option for use in care centers and food-processing facilities (Silver Institute, The, undated).

Jewelry and Silverware.—In 2019, domestic consumption of silver for fabrication of jewelry and silverware, excluding scrap, was 441 t, essentially unchanged compared with the 443 t consumed in 2018. Silver consumption for jewelry decreased to 402 t from 404 t in 2018, and silver consumption for silverware was unchanged at 39 t (Newman and others, 2020, p. 55, 56, 67).

Prices

Silver prices finished the year essentially unchanged from the start of 2019, although they ranged widely during the year. The daily Engelhard silver price yearly high was \$19.40 per troy ounce on September 4, and the yearly low was \$14.37 per troy ounce on May 28. The daily average price of silver was \$15.30 per troy ounce, a 3% decrease compared with the revised daily average price of \$15.73 per troy ounce in 2018 (table 1).

Foreign Trade

U.S. exports of silver contained in bullion, dore, and ores and concentrates decreased by 64% to 220 t in 2019 from the revised total of 603 t in 2018. Principal destinations were India (59%), Canada (12%), Switzerland (7%), and Mexico (6%). Exports of bullion, dore, and ores and concentrates decreased by 66%, 20%, and 97%, respectively. India (68%) and Canada (13%) were the top destinations for silver bullion, whereas Switzerland (46%), Mexico (19%), and China (18%) were the top destinations for silver dore. Exports of silver ores and concentrates decreased by 7,600 t, or 97%, in 2019 (table 4).

U.S. imports for consumption of silver contained in bullion, dore, and ores and concentrates decreased slightly to 4,770 t in 2019 from 4,840 t in 2018. The principal import sources were Mexico (56%), Canada (24%), and Argentina (5%). Imports of ores and concentrates and dore decreased by 6% and 10%, respectively, whereas imports of bullion increased slightly. The leading sources of silver imports were Mexico, which supplied 52% of the bullion, 71% of the dore, and 24% of the ores and concentrates, and Canada, which supplied 31% of the bullion and 75% of the ores and concentrates. Argentina was the source for 22% of dore imports (table 6).

World Review

World mine production of silver was 26,600 t in 2019, essentially unchanged from the revised production of 26,800 t in 2018. Mexico continued to be the leading producer of silver, accounting for 22% of world production. Mexico was followed

by Peru (15%); China (13%); Russia (8%); Poland (6%); Australia and Chile (5% each); Argentina, Bolivia, and the United States (4% each); India (3%); and Kazakhstan and Sweden (2% each). These 13 countries accounted for 91% of the global silver production. Silver production increased in Argentina (by 119 t); other countries with significant increases in production were Australia (80 t), India (52 t), the United States (46 t), Indonesia (41 t), Papua New Guinea (32 t), Finland (28 t), China and Morocco (21 t each), Kazakhstan (20 t), Eritrea (14 t), and Honduras (12 t). Overall world mine production decreased in 2019; the most notable decreases were in Peru (300 t), Mexico (130 t), Sweden (48 t), Russia (40 t), Uzbekistan (35 t), Bolivia (33 t), Portugal and the Dominican Republic (26 t each), Chile (20 t), Zambia (14 t), and Canada (13 t) (table 8).

According to The Silver Institute (undated), 29% of global silver production was from silver ores, 32% from lead and zinc ores, 23% from copper ores, 16% from gold ores, and negligible totals from other types of mining operations. Global silver scrap recycling increased to 5,284 t, up from 5,217 t in 2018, owing to increased ethylene oxide capacity and higher scrap silver use in ethylene oxide plants. Jewelry recycling also increased, owing to higher prices. The leading countries for scrap recycling were the United States (1,660 t), China (734 t), Germany (470 t), Japan (327 t), and Russia (264 t) (Newman and others, 2020, p. 9, 26, 37–39).

Global silver consumption was essentially unchanged, totaling 30,848 t in 2019 compared with 30,738 t in 2018. Industrial applications were the leading end uses of silver, accounting for 52% of the total global consumption, followed by jewelry (20%); bars, coins, and medals (19%); and silverware (6%). Silver use in all categories decreased in 2019 except for photovoltaic uses and bars, coins, and medals (which increased by 7% and 12%, respectively), silver use in all other categories decreased in 2019. Consumption for photography and jewelry decreased slightly, whereas silverware consumption decreased by 9%. Consumption for photovoltaics increased by 7% to 3,069 t from 2,877 t in 2018, whereas consumption for photographic uses continued to decrease since 2010, to 1,047 t in 2019, a slight decrease from 1,062 t in 2018 (Newman and others, 2020, p. 61).

World consumption of silver for jewelry decreased slightly in 2019 to 6,262 t from the revised consumption of 6,317 t in 2018. This decrease was primarily driven by reduced consumption in India, which suffered from a slowing economy and the heaviest monsoon season in 25 years, and reduced consumption in China, which decreased owing to reduced consumer sentiment, a response to the trade dispute between the United States and China. These decreases were slightly offset by increased jewelry production in Italy and Thailand, which both increased exports of jewelry (Newman and others, 2020, p. 53–58).

Argentina.—In 2019, silver production in Argentina increased by 12% to an estimated 1,080 t from the revised production of 961 t in 2018 owing to increased output from new projects, such as SSR Mining Inc.'s Chinchillas Mine and Yamana Gold Inc.'s Cerro Moro Mine. SSR's Chinchillas Mine, which is part of its Puna operations, started commercial production in December 2018, produced 239 t of silver in 2019, and had an expected output of 260 metric tons per year (reported as 8.4 million troy ounces per year). Production from the Cerro

Moro Mine began commercial production on June 26, 2018, and in 2019 produced 197 t of silver (SSR Mining Inc., 2020 p. 17–18; Yamana Gold Inc., 2020, p. 33).

Australia.—In 2019, silver production in Australia increased by 6% to 1,334 t from the 1,254 t produced in 2018. Glencore plc's Mount Isa Mine in Queensland produced 171 t of silver in concentrate in 2019, up from 144 t in 2018, owing to a full year of production after its restart in 2018. New Century Resources Ltd.'s Tailings project in Queensland produced 29 t of silver in 2019, primarily owing to increased zinc and silver production. New Century began operations on the Tailings project in August 2018 (New Century Resources Ltd., 2019a, p. 9; 2019b, p. 11; 2019c, p. 1; 2019d, p. 9; Glencore plc, 2020a, p. 78, 237).

Bolivia.—Silver production in Bolivia in 2019 was 1,158 t, a 3% decrease compared with the production of 1,191 t in 2018. This decrease was primarily due to a strike at Sumitomo Corp.'s San Cristobal Mine, where production decreased by 56 t. Workers went on strike on August 18 over demands for bonus and overtime payments. The strike came to a partial end on September 2, and a small group returned to work. Negotiations resumed on September 6, and the conflict ended in February 2020, with a payout to the employees (Mamani, 2019; Pagina Siete, 2019, 2020; Quisbert, 2019; Newman and others, 2020, p. 27).

Canada.—Silver production in concentrate in Canada totaled 379 t in 2019, a 3% decrease from the revised production of 392 t in 2018. This decrease was attributed to decreases in production at Glencore's Kidd Creek operation, Hudbay Minerals Inc.'s Hudson Bay operations, and Agnico Eagle Mines Ltd.'s LaRonde operations. Most of the silver in Canada was produced as a coproduct or byproduct of other metals in 35 mines. Teck Resources Ltd.'s Trail operation produced 435 t of refined silver in 2019, a 21% increase from the 2018 production of 361 t. This increase was due to higher silver content in the company's purchased concentrates. Vale's Sudbury operations produced less silver owing to reduced throughput, and Glencore's Kidd Creek and Agnico Eagle's LaRonde operations had lower ore grades than in 2018 (Agnico Eagle Mines Ltd., 2020, p. 22; Glencore plc, 2020b, p. 12; Hudbay Minerals Inc., 2020; Mining Association of Canada, The, 2020, p. 84–88; Teck Resources Ltd., 2020, p. 22–23).

China.—Silver production in China was 3,443 t in 2019, essentially unchanged from the revised production of 3,422 t in 2018. About 90% of silver produced in the country was produced as a byproduct of copper, lead, and zinc mining, and about 9% came from primary silver mines. In 2019, copper and zinc production increased slightly but lead output decreased slightly, keeping silver production in China overall, as a byproduct of these metals, unchanged. Jewelry consumption in China remained unchanged, accounting for the stable prices of silver. This consumption remaining stable was due to the inability to recover the 13% value-added tax on resale of silver jewelry. Leading silver-producing projects in 2019 included Inner Mongolia Zingye Group Co.'s Xingye project, a zinc-lead-silver project that produced an estimated 373 t of silver, Silvercorp Metals Inc.'s Ying project, a silver project that produced an estimated 186 t of silver, and Shenzhen Zongjin Lingnan Nonfemet Co. Ltd.'s Fankou project, a zinc-lead-silver project

that produced an estimated 134 t of silver (Newman and others, 2020, p. 30, 49, 50, 57–58, 68; Silvercorp Metals Inc., 2020).

Mexico.—In 2019, Mexico was the leading producer of silver in the world with production of 5,919 t, a slight decrease from the 6,049 t produced in 2018. This decrease in production was due to lower grades at some of the major mines, including but not limited to Minera Fresnillo plc's Fresnillo, San Julian, and Saucito Mines. A few mines were put on care-and-maintenance status in 2019, including First Majestic Silver Corp.'s San Martin Mine and Endeavor Silver Corp.'s El Cubo Mine. These decreases were offset by increased production at First Majestic's La Encantada Mine (by 46 t) and Pan American Silver Corp.'s Dolores Mine (by 32 t). Leading silver-producing projects in 2019 included Newmont Corp.'s Penasquito project, a polymetallic project that produced 493 t of silver, and Minera Fresnillo plc's Fresnillo, San Julian, and Saucito projects, which produced 405 t, 405 t, and 534 t of silver, respectively (Endeavour Silver Corp., 2019; First Majestic Silver Corp., 2019, 2020a, b; Fresnillo plc, 2020; Newman and others, 2020, p. 26; Newmont Corp., 2020, p. 66; Pan American Silver Corp., 2020, p. 30).

Peru.—In 2019, Peru was the second leading producer of silver in the world with production of 3,860 t, a 7% decrease from that in 2018. The leading silver-producing mines were Compañía Minera Antamina S.A.'s Antamina Mine (465 t), Compañía de Minas Buenaventura S.A.A.'s Uchucchacua Mine (331 t), and Hochschild Mining plc's Pallancata Mine (226 t).

Silver production at the Antamina Mine decreased by 6% from 495 t in 2018 to 465 t in 2019. Compañía Minera Antamina S.A., which operated and owned the Antamina Mine, was owned by four companies, BHP Billiton plc (33.75%), Glencore (33.75%), Teck Resources (22.5%), and Mitsubishi Corporation (10%) (Glencore plc, 2020a, p. 73; Teck Resources Ltd., 2020, p. 17).

Production of silver at Buenaventura's Uchucchacua Mine decreased to 331 t, 31% less than 480 t in 2018. This decrease was attributed to a decrease in silver head grades and a strike from January 9 until January 30. During the strike, the company performed maintenance, and the strike ended owing to the Peruvian Labor Authority determining that the strike was illegal. Buenaventura also owned or had partial ownership of the following mines: Cerro Verde (19.58%), which produced 146 t of silver in 2019; El Brocal (61.43%), 136 t; Julcani (100%), 81 t; Tambomayo (100%), 80 t; Tantahuatay (40.10%), 23 t; Yanachocha (43.65%), 23 t; Mallay (100%), an estimated 16 t; La Zanja (53.06%), 3 t; and Orcopampa (100%), 1 t (AP News, 2019; Compañía de Minas Buenaventura S.A.A., 2020a, p. 97; 2020b).

Production of silver at Hochschild's Pallancata Mine decreased by 3% to 226 t from 232 t in 2018. The Pallancata Mine had lower grade veins than expected, but higher ore throughput in 2019. On February 13, the Arcata Mine was placed on care-and-maintenance status. In 2018, the Arcata Mine produced 106 t of silver (Hochschild Mining plc, 2020).

Other leading producers in Peru included Volcan Compañía Minera S.A.A. (216 t), Minera Chinalco Peru S.A. (206 t), Southern Peru Copper Corporation Sucursal del Peru (175 t), and Compañía Minera Chungar S.A.C. (137 t) (Ministerio de Energía y Minas, 2020).

Poland.—In 2019, Poland produced 1,469 t of silver, essentially unchanged from the 1,471 t of silver produced in 2018. The leading global silver-producing mine was the KGHM Polska Miedź project, a polymetallic copper mine, which produced 1,249 t of silver, slightly less than the 1,264 t produced in 2018. This decrease was due to reduced amounts of silver contained within the copper ore (KGHM Polska Miedź S.A. Group, 2020).

Russia.—Silver production was estimated to be 2,000 t, slightly less than 2,040 t produced in 2018. The leading silver-producing mine in Russia was Polymetal International plc's Dukat Mine. Silver production at the Dukat Mine decreased by 4% to 491 t from 510 t produced in 2018. Production at Polymetal's Lunnoye silver mine decreased by 20% to 109 t from 137 t produced in 2018. These decreases were due to lower grades of ores at both mines (Polymetal International plc, 2020).

Outlook

The outlook for silver is difficult to determine in the short term. The global coronavirus disease 2019 (COVID-19) pandemic began at the end of 2019, and it was uncertain how it would affect industrial demand and mine production in 2020.

The use of silver in photographic applications is expected to continue to decline. As hospitals convert their X-ray equipment to digital systems, silver use probably will remain only in niche applications such as artistic photography. Growth in demand for automobiles in developing countries is expected to increase silver consumption, as well as demand in more advanced vehicles that use silver for its electrical properties and resistance to oxidation. Consumption of silver in the automotive sector is expected by industry sources to approach 2,800 t of silver annually within 5 years (Newman and others, 2020, p. 12–16, 45, 51)).

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TABLE 1
SALIENT SILVER STATISTICS¹

		2015	2016	2017	2018	2019
United States:						
Mine production:						
Quantity	metric tons	1,090	1,150	1,030	934	981
Value	thousands	\$551,000	\$632,000 ^r	\$566,000	\$473,000	\$502,000
Refinery production:						
Domestic and foreign ores and concentrates	metric tons	1,530	1,530	1,420	1,420	1,420
Scrap (old and new)	do.	869	866	490	632	643
Exports:						
Ores and concentrates	do.	2	16	16	8	(2)
Bullion and dore	do.	815	273	141	595 ^r	219
Imports for consumption:						
Ores and concentrates ³	do.	3 ^r	5	7	8	7
Bullion and dore	do.	5,930	6,160	5,040	4,830 ^r	4,760
Stocks, December 31:						
Industry	do.	130	140	150	170	52
COMEX	do.	5,000	5,710	7,570	9,150	9,860
U.S. Department of the Treasury	do.	498	498	498	498	498
Bullion coin production ⁴	do.	1,520	1,370	746	461	577
Price, average ⁵	dollars per troy ounce	15.72	17.14 ^r	17.08 ^r	15.73 ^r	15.30
Employment, mine and mill workers ⁶		1,329 ^r	1,219 ^r	1,048 ^r	982 ^r	1,003
World, mine production	metric tons	27,600	28,400 ^r	27,300	26,800 ^r	26,600

^rRevised. do. Ditto.

¹Table includes data available through November 19, 2020. Data are rounded to no more than three significant digits, except prices and employment numbers.

²Less than ½ unit.

³Includes silver content of ash and residues.

⁴Source: U.S. Mint. Production is based on fiscal year, with an ending date of September 30 of the year shown.

⁵Price data are the annual Englehard quotations published in S&P Global Platts Metals week.

⁶Employment data are from the U.S. Department of Labor, Mine Safety and Health Administration, for mines classified as (active and temporarily idle) silver mines by the U.S. Geological Survey.

TABLE 2
MINE PRODUCTION OF SILVER IN THE UNITED STATES, BY STATE¹

(Kilograms)

State	2017	2018	2019
Alaska	514,000	465,000	540,000
Arizona	78,900	58,000	64,700
Nevada	265,000	247,000	190,000
Other ²	173,000	164,000	186,000
Total	1,030,000	934,000	981,000

¹Table includes data available through November 19, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes California, Colorado, Idaho, Missouri, Montana, New Mexico, South Carolina, South Dakota, and Utah.

TABLE 3
LEADING SILVER-PRODUCING MINES IN THE UNITED STATES IN 2019, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of silver
1	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Silver-zinc ore.
2	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
3	Rochester	Pershing, NV	Coeur Mining, Inc.	Silver ore.
4	Bingham Canyon	Salt Lake, UT	Rio Tinto Kennecott Corp. ³	Copper-molybdenum ore.
5	Galena Complex	Shoshone, ID	Americas Gold and Silver Corp.	Silver ore.
6	Bagdad	Yavapai, AZ	Freeport-McMoRan Copper Inc.	Copper-molybdenum ore.
7	Mission Complex	Pima, AZ	ASARCO LLC ⁴	Copper ore.
8	Continental Pit	Silver Bow, MT	Montana Resources LLP	Do.
9	Phoenix	Elko, NV	Newmont Mining Corp.	Gold-copper ore.
10	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
11	Round Mountain	Nye, NV	Kinross Gold Corp.	Gold ore.
12	Soledad Mountain	Kern, CA	Golden Queen Mining Consolidated Ltd. (50%) and Gauss LLC (50%)	Do.
13	Chino	Grant, NM	Freeport-McMoRan Copper Inc.	Copper-molybdenum ore.
14	Carlin Mines Operations	Elko, Eureka, and Humboldt, NV	Nevada Gold Mines LLC ⁵	Gold ore.
15	Pinto Valley	Gila, AZ	Capstone Mining Corp.	Copper-molybdenum ore.
16	Morenci	Greenlee, AZ	Freeport-McMoRan Copper Inc.	Do.
17	Denton-Raw	Mineral, NV	Coral Reef Capital LLC	Gold ore.
18	Nevada Ops	Lander, NV	Hecla Mining Co.	Do.
19	Haile	Lancaster, SC	OceanaGold Corp.	Do.
20	Ray	Pinal, AZ	ASARCO LLC ⁴	Copper ore.
21	Cortez Operations	Eureka and Lander, NV	Nevada Gold Mines LLC ⁵	Gold ore.
22	Moss	Mohave, AZ	Northern Vertex Mining Corp.	Do.
23	Wharf	Lawrence, SD	Coeur Mining, Inc.	Do.
24	Betze-Post	Eureka, NV	Barrick Gold Corp.	Do.
25	Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.

Do. Ditto.

¹Table includes data available through November 19, 2020. The mines on this list accounted for more than 99% of U.S. mine production in 2019.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 75, Alaska's mineral industry 2019.

³Wholly owned subsidiary of Rio Tinto Group.

⁴Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

⁵On July 1, 2019, Barrick Gold Corp. and Newmont Goldcorp Corp. concluded the transaction establishing a new joint venture, Nevada Gold Mines LLC (Barrick Gold Corp., 61.5%, and Newmont Goldcorp Corp., 38.5%).

TABLE 4
U.S. EXPORTS OF REFINED SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	Ores and concentrates		Bullion		Dore		Total	
	Silver content (kilograms)	Value (thousands)						
2018	7,830	\$3,890	558,000 ^r	\$311,000	37,600	\$24,900	603,000 ^r	\$340,000
2019:								
Australia	--	--	4,240	2,440	--	--	4,240	2,440
Austria	--	--	141	90	394	215	535	305
Canada	173	77	25,300	14,400	--	--	25,500	14,500
Cayman Islands	--	--	483	265	--	--	483	265
Chile	--	--	89	65	34	21	123	86
China	--	--	2,060	1,040	5,400	2,800	7,450	3,840
Czechia	--	--	2,600	1,430	--	--	2,600	1,430
France	14	8	84	65	--	--	98	73
Germany	--	--	7,020	2,650	205	114	7,220	2,770
Hong Kong	7	8	98	90	34	25	139	122
India	--	--	129,000	61,600	1,330	693	130,000	62,300
Israel	--	--	--	--	81	57	81	57
Italy	--	--	4,190	2,340	332	170	4,520	2,510
Japan	2	5	14	50	--	--	16	55
Mexico	--	--	7,790	5,700	5,590	5,010	13,400	10,700
Oman	8	5	5	5	--	--	13	10
Singapore	--	--	2,340	1,310	726	386	3,070	1,700
Spain	--	--	96	39	1	3	97	41
Switzerland	--	--	2,420	1,210	13,900	7,410	16,300	8,610
Thailand	--	--	218	227	1	3	219	230
Turkey	19	6	30	18	21	19	70	42
United Arab Emirates	--	--	17	16	279	146	296	162
United Kingdom	--	--	653	327	563	288	1,220	614
Other	8	4	904	603	1,080	710	2,000	1,320
Total	231	112	190,000	95,900	29,900	18,100	220,000	114,000

^rRevised. -- Zero.

¹Table includes data available through July 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms ²		Waste and scrap	
	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)
2018	113,000	\$55,500 ^r	919,000 ^r	\$534,000	52,100	\$6,690	423,000	\$237,000 ^r	17,200,000	\$2,490,000 ^r
2019:										
Argentina	--		8	3	30	12	193	94	--	--
Australia	160	97	25	25	361	83	2,110	1,150	147,000	1,700
Belgium	5	3	5,690	3,600	--	--	--	--	2,680,000	194,000
Brazil	--	--	1,710	1,730	1,240	237	740	390	--	--
Canada	190,000	108,000	18,100	10,900	40,400	2,780	138,000	74,300	3,300,000	317,000
Cayman Islands	10	102	5	5	--	--	361	197	--	--
Chile	341	183	--	--	34	6	223	132	--	--
China	5,760	3,100	55,900	34,600	540	112	18,000	12,000	15,900	683
Colombia	20	67	3	5	--	--	174	92	--	--
Costa Rica	632	565	113	79	546	27	1,730	1,040	--	--
Dominican Republic	1,140	507	11	5	66	13	737	381	--	--
France	714	236	61,900	35,900	--	--	4,270	2,630	7,250	328
Germany	597	436	19,600	11,600	39	31	4,250	2,930	2,900,000	258,000
Hong Kong	2,280	987	32,500	19,800	--	--	3,520	2,740	6,390	14,100
India	23,400	9,770	514	300	117	24	58,800	35,900	23	20
Ireland	--	--	21	18	188	36	1,140	722	80	47
Israel	155	56	81	43	--	--	1,080	757	--	--
Italy	4,490	2,270	4,870	2,810	--	--	1,770	1,020	2,190,000	699,000
Japan	--	--	47,200	29,900	--	--	36,400	20,200	4,110,000	227,000
Korea, Republic of	12	12	35,300	22,400	269	93	7,350	5,050	161,000	12,400
Malaysia	215	110	3,700	2,580	51	32	3,060	1,880	837	492
Mexico	3,050	3,300	17,000	14,500	5,800	1,210	86,500	47,400	182,000	27,400
Netherlands	1	15	13,800	8,610	--	--	15	13	57	285
Peru	--	--	57	57	866	165	470	273	--	--
Philippines	49	111	--	--	46	19	3,790	2,690	233	130
Singapore	350	257	129,000	73,700	6,290	3,360	6,550	3,740	471	41
South Africa	14	8	--	--	18	11	3	7	148,000	9,460
Spain	--	--	1,080	723	--	--	9,500	4,850	--	--
Sweden	--	--	--	--	--	--	1,520	872	2,000,000	59,800
Switzerland	42	43	5	4	--	--	6,640	3,680	2,160	73,500
Taiwan	--	--	111,000	69,500	336	19	1,110	1,060	99	121
Thailand	4,160	2,580	1,330	657	924	374	4,310	2,640	(3)	5
Trinidad and Tobago	71	39	--	--	--	--	176	102	--	--
Turkey	22	17	40	27	--	--	138	76	1	108
United Arab Emirates	280	105	3	3	14	3	739	452	--	--
United Kingdom	46	65	33,600	21,500	10	9	21,900	11,800	530,000	856,000
Other	2,320	1,440	405	363	116	27	7,660	4,400	12,000	131
Total	241,000	134,000	595,000	366,000	58,300	8,690	435,000	248,000	18,500,000	2,750,000

See footnotes at end of table.

TABLE 5—Continued
U.S. EXPORTS OF SILVER, BY COUNTRY OR LOCALITY¹

¹Revised. --Zero.

²Table includes data available through July 24, 2020. Data are rounded to no more than three significant digits, may not add to totals shown.

²Containing 99.5% or more by weight of silver.

³Less than $\frac{1}{2}$ unit.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF REFINED SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	Ores and concentrates, ash and residues		Bullion		Dore		Total	
	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)
2018	7,790	\$2,260	3,750,000	\$1,890,000	1,080,000	\$956,000	4,840,000	\$2,850,000
2019:								
Argentina	--	--	--	--	218,000	135,000	218,000	135,000
Australia	--	--	2,640	1,340	--	--	2,640	1,340
Belgium	--	--	77,700	29,100	--	--	77,700	29,100
Bolivia	--	--	115,000	62,800	44,600	27,100	160,000	89,900
Canada	5,460	1,370	1,160,000	609,000	1,340	711	1,170,000	611,000
Chile	--	--	197,000	101,000	592	227	198,000	101,000
China	--	--	620	312	--	--	620	312
Colombia	--	--	132	66	34	17	166	82
Costa Rica	--	--	7	4	114	55	121	59
France	--	--	1,000	435	--	--	1,000	435
Germany	--	--	4,250	2,340	7,390	4,340	11,600	6,680
Italy	--	--	344	50	3,640	2,050	3,980	2,100
Japan	(2)	4	9,980	4,860	--	--	9,980	4,870
Korea, Republic of	--	--	18,900	9,200	--	--	18,900	9,200
Mexico	1,750	494	1,980,000	1,030,000	687,000	668,000	2,670,000	1,700,000
Panama	--	--	230	110	19	9	250	120
Peru	--	--	31,900	17,200	--	--	31,900	17,200
Poland	--	--	186,000	94,200	9,240	5,390	195,000	99,600
Switzerland	--	--	80	51	1,030	657	1,110	708
United Kingdom	--	--	1,070	628	289	181	1,360	808
Other	77	14	1,230	602	334	187	1,640	803
Total	7,290	1,880	3,790,000	1,970,000	973,000	844,000	4,770,000	2,810,000

-- Zero.

¹Table includes data available through July 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms ²		Waste and scrap	
	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)
2018	424,000	\$188,000	407,000	\$64,300	3,250	\$459	380,000	\$179,000	6,710,000	\$405,000
2019:										
Belgium	--	--	--	--	576	25	--	--	368,000	844
Brazil	--	--	70	40	38	--	--	--	102,000	8,010
Canada	169,000	41,200	20,100	1,050	346	104	47,800	24,100	987,000	134,000
Chile	--	--	--	--	--	--	62,200	34,800	41,500	119
China	30	34	4,960	266	--	--	--	--	262,000	58,900
Czechia	24	22	--	--	--	--	150	63	124	78
France	--	--	42,200	2,370	--	--	8	6	23,300	105
Germany	84	72	13,200	7,510	567	40	1,250	887	1,600,000	525,000
Hungary	19,500	740	61,200	3,180	--	--	--	--	--	--
India	71	22	50	29	31	18	189	57	7,670	1,930
Israel	1	3	--	--	--	--	9	9	474	845
Italy	229	105	2	8	--	--	182	335	14,300	3,100
Japan	3	3	150,000	11,500	--	--	786	115	8,460	530
Korea, Republic of	150	39	3	32	209	81	59,200	37,000	4,700	947
Mexico	226,000	117,000	1,010	550	--	--	23,900	4,580	858,000	37,900
Netherlands	--	--	555	23	--	--	8	12	(3)	10
Peru	43,000	22,100	--	--	--	--	6,390	3,030	2	20
Poland	--	--	--	--	--	--	10,000	5,440	5,080	3,430
Singapore	--	--	2,180	1,180	--	--	(3)	3	18,600	2,150
Slovakia	--	--	--	--	--	--	--	--	2,390,000	20,100
Sweden	--	--	447	134	17	2	--	--	65,700	5,030
Switzerland	--	--	936	515	3	2	530	362	--	--
Taiwan	--	--	5,390	248	--	--	72,400	34,900	25,700	3,620
United Kingdom	135	78	942	365	762	225	1,270	776	2,000,000	240,000
Vietnam	--	--	--	--	--	--	--	--	134,000	1,870
Other	80	52	57	29	15	2	347	149	586,000	24,800
Total	458,000	182,000	303,000	29,000	2,640	534	287,000	147,000	9,500,000	1,070,000

-- Zero.

¹Table includes data available through July 24, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

²Containing 99.5% or more by weight of silver.

³Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 8
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Kilograms)

Country or locality ²	2015	2016	2017	2018	2019
Algeria	20	20	20 ^c	50 ^c	40 ^c
Argentina	1,130,000 ^r	995,000 ^r	911,000 ^r	961,000 ^r	1,080,000 ^c
Armenia	14,346	16,000 ^c	15,500 ^c	18,700 ^c	20,300 ^c
Australia	1,430,000	1,418,000	1,120,000	1,254,000	1,334,000
Azerbaijan	133	320	3,429	3,229	3,300 ^c
Bolivia	1,306,098	1,353,202	1,196,416	1,191,024	1,158,000
Botswana	2,801	--	--	--	-- ^c
Brazil	49,000 ^r	77,000 ^r	86,000 ^r	71,000 ^r	72,000
Bulgaria	37,955	52,526	53,053	41,315	40,000 ^c
Burkina Faso	12,441	22,000 ^c	6,000 ^c	1,000 ^c	1,000 ^c
Canada ³	371,000	385,000	368,000 ^r	392,000 ^r	379,000
Chile	1,504,271	1,501,436	1,318,582	1,370,237	1,350,000 ^c
China	3,393,000	3,754,000 ^r	3,601,000 ^r	3,422,000 ^r	3,443,000
Colombia	10,155	10,427	10,922	15,967	8,530
Congo (Kinshasa)	2,412	835	-- ^c	-- ^c	-- ^c
Côte d'Ivoire	587	594	485	137 ^r	--
Cyprus	--	--	96	180	150 ^c
Dominican Republic	99,800	121,749	151,757	166,500	141,000
Ecuador	1,494	934	955	1,000 ^c	1,000 ^c
Eritrea	70,330	13,200	49,921	31,000 ^r	44,836
Ethiopia ^c	1,000	1,000	1,000	1,000	1,000
Fiji ⁴	354	354	350	413 ^r	420 ^c
Finland	13,051	16,348	13,654	12,849	40,461
Georgia ^c	800	900	700	700	700
Ghana ^c	3,200	2,300	1,800	1,800	1,800
Greece	25,170	29,409	23,967	25,237	28,161
Guatemala	862,197	793,083	336,943	--	--
Honduras	34,369	19,275	21,785	31,182	43,579
India	383,479	445,367	526,604	648,600	701,000 ^c
Indonesia	151,934	185,234	329,000	309,000	350,000 ^c
Iran ^c	90,000	90,000	90,000	90,000	90,000
Ireland	3,770	1,080	1,340	1,160	1,578
Japan	4,616	5,076	3,408	3,596	3,492
Kazakhstan	370,404	413,821	441,056	400,000 ^c	420,000 ^c
Korea, North ^c	50,300	30,000	20,000	20,000	20,000
Korea, Republic of	4,586	6,579	8,788	7,090	7,084
Kyrgyzstan	9,890	18,410	17,097	16,000 ^c	13,400 ^c
Laos	51,763	50,904	42,841	37,465	34,442
Malaysia	945	1,075	1,404	1,702	1,680
Mexico	5,591,510	5,408,521	6,108,722	6,049,000	5,919,000
Mongolia	60,000 ^c	69,000 ^c	62,000	60,000	57,000 ^c
Morocco	272,000 ^r	295,000 ^r	306,000 ^r	230,000 ^r	251,000
Namibia ⁵	11,555 ⁶	8,771 ⁷	7,014	4,666	6,220
New Zealand	12,498	7,960	8,022	6,332 ^r	6,000 ^c
Nicaragua	18,577	21,382	15,149	11,263	17,362
Niger	119	120 ^c	120 ^c	120 ^c	120 ^c
Oman	2,645	3,621	120	--	--
Pakistan	9,693	3,110	3,000 ^c	3,000 ^c	3,000 ^c
Papua New Guinea	77,666	90,498	86,700	114,900	147,000
Peru	4,101,568	4,375,337	4,303,541	4,160,162	3,860,306
Philippines	29,952	35,186	31,737	29,782	31,267
Poland	1,407,000	1,482,000	1,490,000	1,471,000	1,469,000
Portugal	37,700	38,600 ^r	40,200 ^r	90,800 ^r	95,300
Russia	2,297,000	2,261,000	2,030,000	2,040,000	2,000,000 ^c
Slovakia	440	449	460	460 ^c	460 ^c
South Africa	51,861	55,622	62,536	46,467	55,903
Spain	27,287	26,099	30,596	30,000 ^c	30,000 ^c

See footnotes at end of table.

TABLE 8—Continued
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Kilograms)

Country or locality ²	2015	2016	2017	2018	2019
Sweden	479,700	515,039	488,135	471,325	423,777
Tajikistan	4,000 ³	3,000	4,300	6,300 ³	6,300 ³
Tanzania	15,569	17,984	10,911	12,041	11,500 ³
Thailand	21,047	35,954	--	--	--
Turkey	190,550	376,640	151,490	197,320	190,000 ³
United States	1,090,000	1,150,000	1,030,000	934,000	981,000
Uzbekistan	230,000 ³	230,000 ³	232,300	223,900	189,000
Zambia	15,000	15,000	15,000	15,000	1,300 ³
Zimbabwe	1,212	1,463	1,480	1,542	1,474
Total	27,600,000	28,400,000 ⁴	27,300,000 ⁴	26,800,000 ⁴	26,600,000

³Estimated. ⁴Revised. -- Zero.

¹Table includes data available through November 30, 2021. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, silver may have been produced in other countries and (or) localities, but available information was inadequate to make reliable estimates of output.

³Silver (or Ag) content of concentrates produced.

⁴Mine output, Ag content.

⁵Silver (or Ag) content of concentrates, estimated.

⁶From gold bullion.

⁷From zinc concentrates.