

WORLD SILVER SURVEY 2021



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World Silver Survey 2021

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This is the thirty-first annual edition of the World Silver Survey produced for The Silver Institute. World Silver Survey 2021 was produced by the Metals Focus team. The information contained herein is based in part on the analysis of publicly available data such as hallmarking series, trade statistics, company reports and other public-domain information. More importantly, it is also based on a large series of interviews with the industry's main players, carried out over the year by the team. This work generates the essential data to allow the compilation of reliable estimates for world supply and demand and inform the analysis of market structures, and the degree of significance of any changes and developments.

Metals Focus is grateful to the many miners, refiners, bullion dealers, bankers and fabricators throughout the world who have contributed their time and information to ensuring that the picture of the industry described in the World Silver Survey is as complete and accurate as possible.

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Fresnillo plc has seven operating mines, all of them in Mexico – Fresnillo, Saucito, Ciénega (including the San Ramón satellite mine Las Casas Rosario & Cluster Cebollitas), Herradura, Soledad-Dipolos¹, Noche Buena and San Julián (Veins and Disseminated Ore Body), three development projects – the Pyrites Plant at Fresnillo, the optimisation of the beneficiation plant also at Fresnillo and Juanicipio, and six advanced exploration projects – Orisyvo, Centauro great potential and Centauro Deep, Guanajuato, Rodeo and Tajitos as well as a number of other long term exploration prospects.

Fresnillo plc has mining concessions and exploration projects in Mexico, Peru and Chile. Fresnillo plc has a strong and long tradition of exploring, mining, a proven track record of mine development, reserve replacement, and production costs in the lowest quartile of the cost curve for silver. Fresnillo plc's goal is to maintain the Group's position as the world's largest primary silver company and Mexico's largest gold producer.

¹Operations at Soledad-Dipolos are currently suspended.

Industrias Peñoles, S.A.B. de C.V.



Peñoles is a mining group with integrated operations in smelting and refining non-ferrous metals, and producing chemicals. Peñoles is the world's top producer of refined silver, metallic bismuth and sodium sulfate, and the leading Latin American producer of refined gold and lead. The Company was founded in 1887 and it is part of "Grupo BAL", a privately held diversified group of independent Mexican companies. Peñoles' shares have traded on the Mexican Stock Exchange since 1968 under the ticker PE&OLES. Peñoles highlights:

- Began operations in 1887 as a mining company.
 - Has integrated operations in the areas of exploration, mining, metallurgy and chemicals.
 - Listed on the Mexican Stock Exchange since 1968; the stock is included in the IPC index.
 - One of the largest net exporters in Mexico's private sector.
-

Pan American Silver Corp.



Pan American Silver owns and operates silver and gold mines located in Mexico, Peru, Canada, Argentina and Bolivia. We also own the Escobal mine in Guatemala that is currently not operating. As the world's second largest primary silver producer with the largest silver reserve base globally, we provide enhanced exposure to silver in addition to a diversified portfolio of gold producing assets. Pan American Silver has a 27-year history of operating in Latin America, earning an industry-leading reputation for corporate social responsibility, operational excellence and prudent financial management. We are headquartered in Vancouver, B.C.

In 2020, Pan American produced 17.3 million ounces of silver and 522,400 ounces of gold. As at June 30, 2020, proven and probable silver mineral reserves were approximately 550 million ounces and gold mineral reserves were approximately 5.2 million ounces.

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Chapter 1

- The impact of the COVID pandemic, and the considerable interest this created for safe haven assets, underpinned the 27% rise in the 2020 annual silver price to a seven-year high of \$20.55.
- Lockdown restrictions led to the largest annual drop in Metals Focus' mine production series, with total supply falling below 1,000Moz (31,000t) for the first time in our dataset.
- Demand losses in 2020 were also notable, led by jewelry, silverware and industrial offtake, which comfortably offset a healthy recovery in physical investment.

Summary

Introduction

The extraordinary events of 2020 have had a profound effect on virtually all markets around the globe and silver has been no exception. The metal's supply/demand fundamentals, investment, prices, trade-flows and inventories have all experienced sensational fluctuations over the past 12 months or so, including a handful of historical records being achieved. Looking ahead, the effect of the pandemic are set to remain relevant to silver for some time to come.

The impact of the pandemic on most elements of physical demand and supply was relatively straightforward. As a number of key silver mining countries were hit hard by lockdown restrictions, global silver supply declined. This was more than offset, however, by losses across most of silver's physical demand segments, which suffered as a result of restrictions to economic activity as well as depressed consumer sentiment and/or income loss. This resulted in the largest silver market surplus since at least 2010, the earliest year for which Metals Focus tracks data.

Silver Supply and Demand

											Year on Year	
Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021F	2020	2021
Supply												
Mine Production	795.9	845.3	881.9	896.4	899.4	862.9	848.4	833.2	784.4	848.5	-6%	8%
Recycling	216.0	192.7	175.0	166.5	164.5	167.8	167.8	170.5	182.1	196.2	7%	8%
Net Hedging Supply	-	-	10.7	2.2	-	-	-	13.9	8.5	10.0	-39%	18%
Net Official Sector Sales	3.6	1.7	1.2	1.1	1.1	1.0	1.2	1.0	1.2	1.5	18%	27%
Total Supply	1,015.5	1,039.8	1,068.7	1,066.2	1,065.0	1,031.7	1,017.3	1,018.7	976.2	1,056.3	-4%	8%
Demand												
Industrial	450.5	460.8	450.0	457.0	491.5	518.7	513.4	514.6	486.8	524.0	-5%	8%
...of which photovoltaics	55.0	50.5	48.4	54.1	93.7	101.8	92.5	98.7	101.0	105.0	2%	4%
Photography	52.5	45.8	43.6	41.2	37.8	35.1	33.8	32.7	27.6	28.8	-16%	4%
Jewelry	159.0	186.9	192.8	201.6	188.4	195.3	202.0	200.3	148.6	184.4	-26%	24%
Silverware	40.7	46.5	53.6	57.9	53.9	59.6	67.6	62.1	32.6	43.1	-48%	32%
Net Physical Investment	241.9	301.9	284.6	312.6	213.6	156.2	165.6	185.7	200.5	252.8	8%	26%
Net Hedging Demand	40.4	29.3	-	-	12.0	1.1	7.4	-	-	-	na	na
Total Demand	985.1	1,071.2	1,024.6	1,070.4	997.2	966.0	989.8	995.4	896.1	1,033.0	-10%	15%
Market Balance												
Market Balance	30.5	-31.5	44.1	-4.2	67.8	65.7	27.6	23.3	80.1	23.3	244%	-71%
Net Investment in ETPs	53.6	4.7	-0.3	-17.1	53.9	7.2	-21.4	83.3	331.1	150.0	298%	-55%
Market Balance less ETPs	-23.2	-36.2	44.3	12.9	13.9	58.5	49.0	-60.0	-251.0	-126.7	319%	-50%
Silver Price (US\$/oz, London price)	31.15	23.79	19.08	15.68	17.14	17.05	15.71	16.21	20.55	27.30	27%	33%

Source: Metals Focus

Silver Prices & Gold:Silver Ratio*



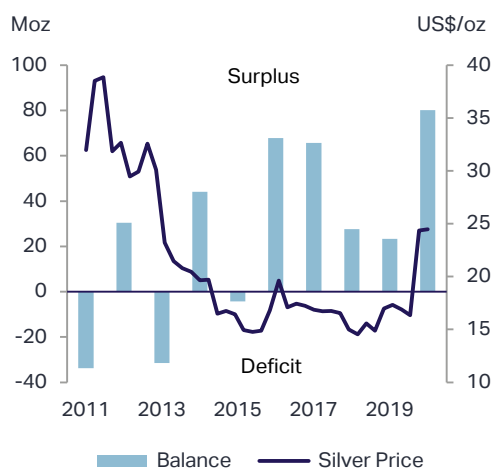
* Monthly averages

Source: Bloomberg

One notable exception was physical investment. A growing appetite for safe haven assets and, initially, the strength of the gold price all boosted investors' appetite for silver bars and coins last year, culminating in an 8% rise overall. Investment in other arenas also experienced a vintage year in 2020, with record inflows into silver ETPs and, at times, also exceptionally strong OTC buying. Negative real interest rates and yields for the US dollar, as well as most other major currencies, were arguably the single most important factor driving investors towards precious metals last year. The unprecedented fiscal policy interventions and related concerns about a possible overheating and/or eventual fiscal reckoning further down the line (as ballooning debts need to be repaid) have also been key factors supporting silver and gold investment demand over the past twelve months.

The pandemic also disrupted the inner workings of the silver bullion market. This was perhaps most notable in the explosion of the silver exchange for physical premium (EFP; the difference between the spot price and active COMEX futures contract) over April-July in particular. This, coupled with changes in mine output and physical demand in some key destinations, also fueled dramatic changes in silver bullion trade flows in 2020 as well as shifts in reported inventories, most notably into COMEX-approved depositories.

Market Balance



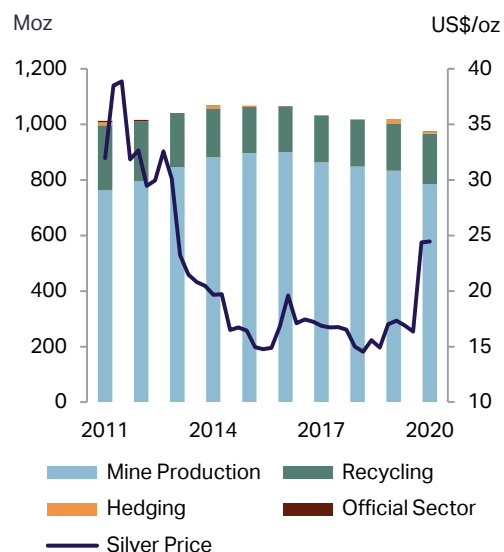
Source: Metals Focus, Bloomberg

Overall, silver prices benefited from the impact of the COVID-19 crisis on investor sentiment last year. This was neither immediate nor straightforward, however. The aftermath of the pandemic's spread across Europe and North America initially drove silver prices sharply down both in absolute terms and relative to gold. As far as the latter point is concerned, the gold:silver ratio topped 127 in March, which was an all-time-high and 27% higher than the previous record seen in the early 1990s. Later in the year, however, the silver price gathered momentum, rallying to a peak of nearly \$30 in August and in doing so easily outpacing gold. This resulted in an annual average silver price of \$20.55, which was up 27% y/y and the highest since 2013.

Looking ahead, there is no doubt that virtually all segments of silver demand will register gains this year and that these will more than offset the inevitable increase in mine supply. We expect that this will see the market balance fall back to levels which are virtually identical to 2019. Crucially, we forecast that both physical retail and institutional investment demand will remain strong throughout 2021. Silver should gain from the "best of both worlds" narrative. In other words, silver will benefit both from its precious metals credentials, against the backdrop of low interest rates and concerns about inflation, and its industrial metal ones, given a synchronized post-pandemic recovery and policy-makers' focus on silver-consuming green energy applications.

This should help prices build on last year's gains. Metals Focus' projections see silver rally to a peak of \$32 before the end of the year, culminating in a full-year average of \$27.30, which will be 33% higher than the 2020 figure.

Global Supply



Source: Metals Focus, Bloomberg

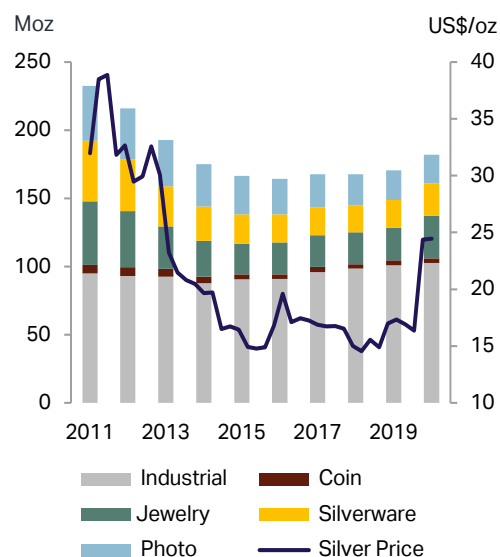
Silver Supply in 2020

In 2020, global **mine production** suffered its biggest decline of the last decade, falling by 5.9% y/y to 784.4Moz (24,399t). This was caused by temporary mine closures in several major silver producing countries in the first half of the year as a direct result of the COVID-19 pandemic. Output from primary silver mines declined by 11.9% y/y to 209.4Moz (6,513t). This exceeded the drop that silver by-product output from lead-zinc and gold mines suffered, which fell by 7.4% to 248.3Moz (7,724t) and by 5.7% to 123.3Moz (3,834t), respectively. Countering this trend, silver production from copper mines increased by 3.5% y/y to 198.3Moz (6,169t).

At the country level, the largest declines were in nations which implemented COVID-19 lockdowns that required mines to temporarily halt operations. This led to substantially lower silver production in Peru (-26.1Moz, 810t), Argentina (-10.0Moz, 311t), Mexico (-9.6Moz, 299t) and Bolivia (-7.2Moz, 223t). Despite the disruption caused by the pandemic, mines in other countries were able to continue operating at full capacity throughout the year and output increased in Chile (+9.1Moz, 284t), India (+1.2Moz, 38t) and Australia (+1.2Moz, 37t).

Substantial new **hedges** by Peñoles and KGHM Polska Miedź led the increase in the global delta-adjusted hedge book to 40.0Moz (1,244t). Option positions continued to be the favored contract, increasing to 34.2Moz (1,062t) by year-end, while forward positions also rose to 5.8Moz (182t).

Global Recycling, by Source



Source: Metals Focus, Bloomberg

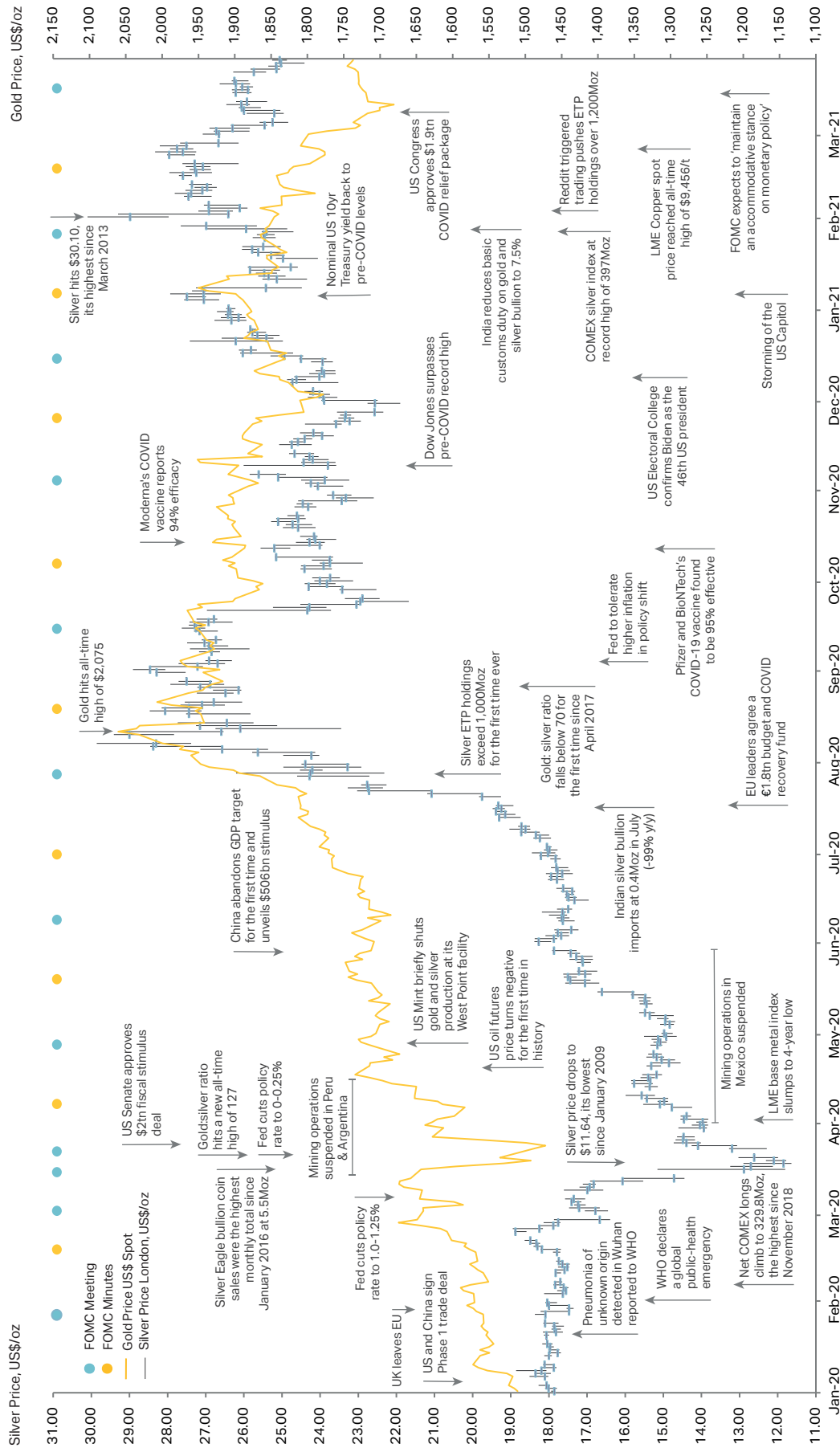
Global silver **recycling** increased for a second straight year in 2020, rising by a notable 7% to a seven-year high of 182.1Moz (5,665t). High silver prices were an important catalyst, with much of the increased volumes last year coming from jewelry and silverware, especially in India. Scrap generated from industrial end-uses, the biggest source of global silver recycling, also rose. This largely reflected gains from the recovery of silver from spent ethylene oxide (EO) catalysts. By contrast, photographic scrap fell slightly due to ongoing structural losses, while coin scrap also eased.

Net supply from the **official sector** also rose by a healthy 18% last year, but remained trivial in absolute terms at just 1.2Moz (37t).

Silver Demand in 2020

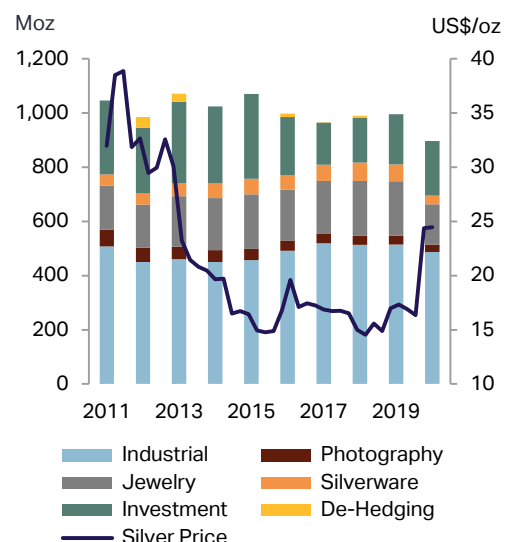
After rising for two years, global silver demand weakened by 10% in 2020 to 896.1Moz (27,872t) as the impressive gains in physical investment were more than offset by heavy losses in jewelry and silverware. After falling just short of record levels in 2019, **industrial** fabrication fell 5% last year to a five-year low of 486.8Moz (15,142t). Unsurprisingly, this was overwhelmingly due to the impact of the COVID-19 pandemic on economic activity and, in turn, many silver end-users. Regional performances diverged, with Europe suffering a notable 8% decline, while North America rose by 2%, chiefly through higher

Silver vs Gold Price (London, \$/oz) and Key Events in 2020 - 2021



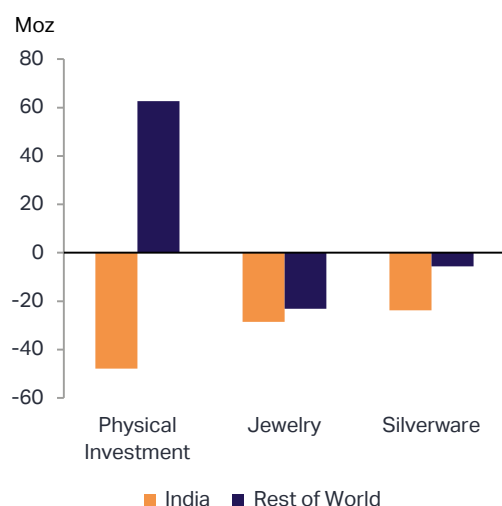
NB: Black line indicates daily trading range
Source: Metals Focus, Bloomberg

Global Demand



Source: Metals Focus, Bloomberg

Y/Y Change in Physical Investment Jewelry & Silverware in 2020



Source: Metals Focus

demand in such areas as silver powder for photovoltaic (PV) ends. Demand in East Asia also fell overall, although performances were very mixed at the country-level; losses were seen in China but Japan and Taiwan enjoyed gains. On a sectoral basis, electronics & electrical demand fell a modest 4% as gains for PV offset losses elsewhere. Other industrial offtake in turn fell 7% as a strong showing for EO catalysts could only partially counter India's heavy losses in this segment. In general, thrifting and substitution had a limited impact on silver use as the price was insufficiently high for long enough to trigger interest and as many areas present little room for further savings.

The secular decline in **photography** continued last year, as demand fell by a sizable 16% to 27.6Moz (859t), the lowest in our series and down 60% from its 2010 peak. This was driven by the COVID-19 pandemic, which was felt across the whole range of photographic applications.

Global **jewelry** fabrication in 2020 fell by a hefty 26% to a low in our series back to 2010 of 148.6Moz (4,622t) and also registering its first drop since 2016. Nearly half of the global decline was driven by losses in the largest fabricator India where rising silver prices coupled with the negative impact of the pandemic on consumer spending meant that demand fell to its lowest since 2013. Chinese fabrication also weakened sharply, declining for the seventh year, as COVID-19 impacted business in the traditional Q1 peak buying season last year. To a lesser extent, the ongoing structural shift from conventional plain jewelry to pieces with fashionable designs also weighed on the fine weight sold in China. Losses in western markets were also steep, as the impact of weak consumption was magnified by widespread retailer destocking. The resulting drop in Italian exports therefore largely explains the fall in European fabrication. Similarly, Thai fabrication fell to an eight-year low as exports to the US and Europe were hit by COVID-19 damage.

Far exceeding the drop in jewelry, **silverware** fabrication nearly halved in 2020 to a low for our series of 32.6Moz (1,014t). The main culprit was the slump in Indian fabrication, which fell by 58% due largely to the economic slowdown and the pandemic driven cancellations of weddings and social events. Excluding South Asia, the drop in global fabrication was still a noteworthy 23%.

Net **physical investment** jumped by 8% y/y to 200.5Moz (6,236t) last year, its highest level since 2016. At the regional level, the largest gains were seen in western markets with the jump led by US (+69%) and then Europe (+23%). A lack of products was also keenly felt in the US and Europe, as investment soared in tandem with product supply disruption. In both, investor interest was fueled by the onset of the pandemic, combined with marked price weakness in March. China also recorded its first increase for physical investment in eight years. A good portion of these gains, however, were offset by a collapse in Indian silver investment, which fell by 85%, due to lockdown restrictions and heavy profit taking later in the year.

Chapter 2

- Total supply is forecast to grow by 8% this year, chiefly as mining recovers from COVID disruption, but also as higher prices lift jewelry and silverware recycling.
- Global demand is expected to surge by 15% as all fabrication segments benefit from economies coming back to life and as coin and bar purchases build on 2020's gains.
- The annual average silver price is forecast to rise by a healthy 33% in 2021 through its appeal to investors in both precious and industrial metals.

Market and Price Outlook

Introduction

More than one year into the worst pandemic since the Spanish flu, uncertainties regarding the return to normality abound. Vaccination progress has been mixed. It is promising that nearly one-third of the US population has already been vaccinated. However, roll-out in most other major economies, notably in the EU, has been slower. Supply constraints, consumer preferences for specific vaccines and general skepticism towards them are all creating frictions. The emergence of new, stronger variants of the virus could also be another headwind. So too is the evidence that, although economically disruptive, movement restrictions do have a dramatic impact on the spread of the disease. These headwinds may see, at the very least, travel restrictions and in many countries localized controls remain a theme for months to come.

The outlook for monetary and fiscal policy this year is clearer. There is for example a strong consensus that policy rates are all but certain to remain unchanged across all of the major currencies through to end-2021. It is also likely that widespread fiscal accommodation will remain in place for the rest of the year. The medium-term outlook, however, remains uncertain. US yields are starting to price in Fed securities tapering in early 2022 and rate hikes late that year, even as "dot plots" show no rate increases until 2023. Following unprecedented direct government support for consumers and businesses in 2020-21, there are also growing concerns that a fiscal reckoning looms. Calls by the current US administration to raise corporate taxes next year, for example, pose risks to the outlook for company earnings.

Another longer-term concern is that, in spite of the change in US administration, trade tensions with China look set to continue. Elsewhere, the pandemic has also rekindled trade protectionism, with the European Union for instance having enacted legislation that allows its members to block exports of vaccines to countries outside the bloc. Equity markets have so far maintained an extremely positive stance. The S&P500 recently broke through the 4,000 mark for the first time and most other equity indices are up year-to-date. Meanwhile, US 2-year breakevens (measures inflation expectations and is the difference between inflation-protected and nominal treasury yields) have traded in a 2.25-2.75% range since early January, having spent most of 2019 and 2020 below 1.5% and compared to a February CPI figure of 1.7%.

Taking all this into account, Metals Focus' base case assumptions see the economic recovery that is underway continue over the rest of the year. While equity prices seem overvalued over the long-term, we believe that they will remain supported for the time being by the persistence of excess liquidity. Nominal US yields further down the curve may inch further higher, but we

Gold, Silver & Copper Prices

Index, 2nd January 2020 = 100



Source: Bloomberg, Metals Focus

expect that most of that will be “absorbed” by rising inflation expectations, leaving real yields negative for some time to come. As far as the dollar is concerned, we are on balance bearish, on the basis of current account deficits and still undervalued emerging markets. Having said this, the relative strength of the US economic recovery and the scope for higher yields, even if only moderately so, should limit the currency’s downside.

To be clear, we continue to have major concerns about economies and markets around the globe. Exceptionally high levels of government debt, markets’ over-dependence on liquidity injections and equity prices premised on strong and sustained gains in earnings all suggest that there is a risk of a major correction and/or liquidity crisis on the horizon. However, barring a dramatic worsening of the pandemic or some unexpected shock, we cannot see this emerging within the next 12 months.

As for silver’s supply and demand fundamentals, our full year projections for 2021 show gains for every single line in our supply-demand table. Mine production for example is expected to rise by 8%, as output recovers after last year’s COVID-19-related disruptions. Recycling is also expected to increase, helped by the stronger silver price. A higher price should also continue to encourage producer hedging, resulting in a year-on-year increase in that segment. Overall, supply is forecast to rise by 8% to 1,056.3Moz (32,854t) in 2021.

Gold:Silver Ratio



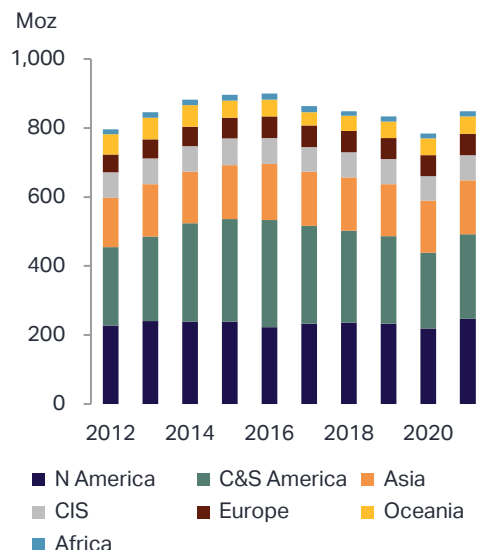
Source: Bloomberg

We expect industrial fabrication to increase by 8% to a record 524.0Moz (16,299t). Within that, electrical and electronic offtake is forecast to rise by 7%, underpinned by further gains from the solar sector, a recovery in vehicle manufacturing and strong consumer electronics demand. Although jewelry and silverware are expected to enjoy double-digit gains, at 184.4Moz (5,734t) and 43.1Moz (1,340t) respectively, we expect their full year totals will fall short of pre-pandemic levels. This reflects the impact higher silver prices, considering the dollar price averaged around \$16 during 2018-19.

We also believe 2021 will be another strong year for silver investment. Demand for bars and coins is forecast to rise by more than a quarter to 252.8Moz (7,862t), becoming the highest annual figure since 2015. ETP inflows are unlikely to match last year’s sensational levels, but at 150Moz (almost 4,700t) we expect these will remain historically very high. Institutional investment in the futures and OTC markets should also remain healthy. Silver benefits from a “best of both worlds” narrative, linked to its dual nature being both a precious and industrial metal. Growing attention on silver-consuming green energy applications is also encouraging investors to look at the metal.

In our view, all of this is conducive to further price gains from current levels. We therefore expect silver to rise to a peak of \$32 later in the year and that it will average \$27.30 overall in 2021, achieving a 33% y/y increase.

Mine Production Forecast



Source: Metals Focus

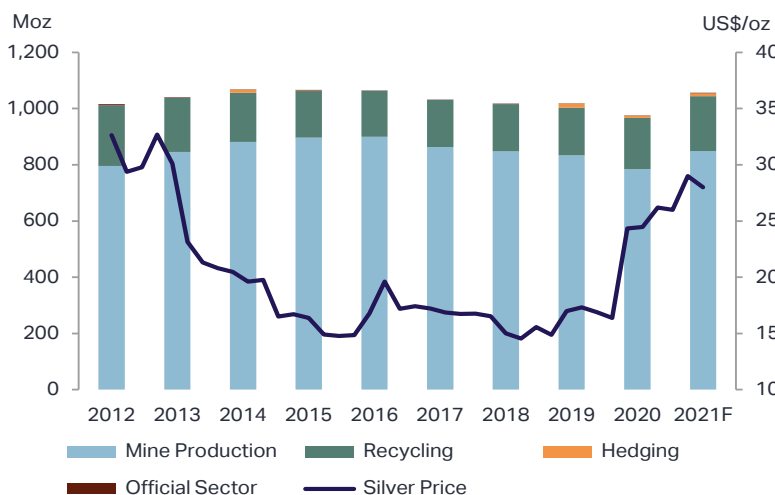
Supply Outlook

We expect global silver **mine production** to rebound strongly in 2021, rising by 8.2% y/y to 848.5Moz (26,392t). Mined silver output had largely returned to full capacity by the end of 2020 as miners had successfully implemented new procedures to protect workers and ramped-up production rates following temporary mine closures due to nationwide lockdowns earlier in the year. As a result, combined with the global vaccine roll-out, mines are expected to operate at full capacity throughout the year, which will be the primary driver behind production growth. The biggest increases will be from those countries where mining was most heavily impacted by the pandemic last year, such as Mexico (+23.6Moz, 735t), Peru (+16.5Moz, 515t) and Bolivia (+9.1Moz, 285t). Mexico is expected to have particularly robust growth as new projects, such as Cerro Los Gatos, Juanicipio and Capela, ramp-up production rates. These increases will be lessened by grade-related declines at individual mines elsewhere, but the relatively high silver price should ensure there are not additional drops in output due to market-induced mine closures.

We expect that a forecast rise in the spot price and possible increased price volatility will lead producers to maintain their stance of protecting longer-term price stability in 2021. Consequently, we anticipate a further rise in **hedging** activity of 10.0Moz (311t).

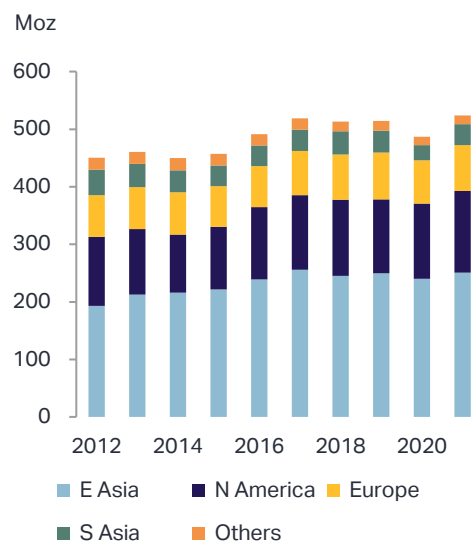
Global silver **recycling** in 2021 is forecast to grow at a slightly faster pace of 8% to a nine-year high of 196.2Moz (6,103t), led by strong, largely price-driven, increases for jewelry and silverware. Further gains in EO recycling in 2021, plus growth in other areas and for most countries due to higher prices and an easing of COVID restrictions should all feed through to total industrial scrap rising by as much as 7% this year. Following an increase in 2020, net **official sector** sales are also likely to see further upside this year.

Global Supply Forecast



Source: Metals Focus, Bloomberg

Industrial Fabrication Forecast



Source: Metals Focus

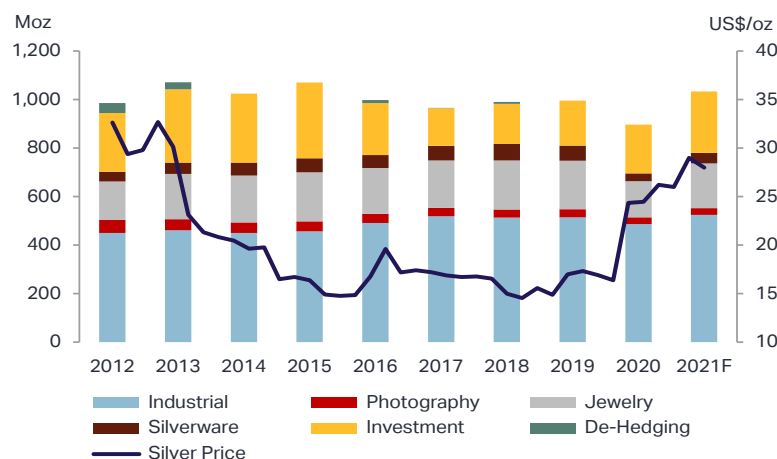
Demand Outlook

Industrial demand globally is expected to see an 8% rise this year to a record high for our series back to 2010 of 524.0Moz (16,299t). Much of the increase will come from a re-opening of economies and investment in green energy solutions, as illustrated by our expectations respectively of healthy gains for end-use in ethylene oxide catalysts and photovoltaics. Silver use in the automotive industry should also be robust, aided by surging sales of electric vehicles. Demand overall is also benefiting from still limited thrifting and substitution. **Photographic** fabrication could even rise this year, as pent-up demand briefly reverses its longer term structural decline.

Jewelry fabrication is forecast to increase by a substantial 24% in 2021 to 184.4Moz (5,734t). This will primarily be driven by retailers' follow through re-stocking and, more importantly, easing COVID restrictions and an economic recovery. That said, this will still fall short of 2019 levels due to high prices and lingering COVID damage. The biggest rebound is expected in India where fabrication could jump by as much as 50% mainly through the recovery in economic activity and the low base effect. In the US, we are confident of buoyant gains for consumption and even more so for fabrication this year as the economy recovers. Global **silverware** demand is also forecast to rebound this year (by 32%), with the improvement largely driven by India.

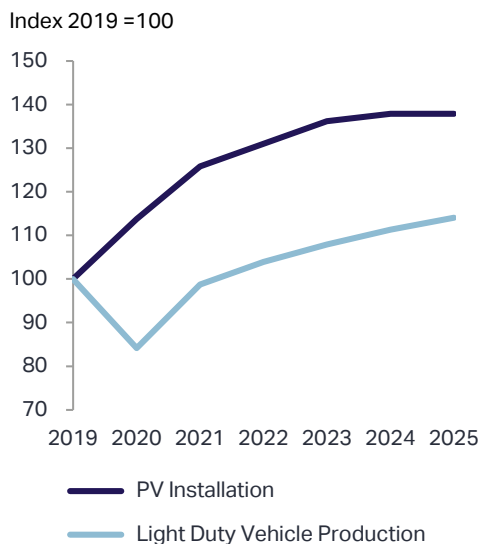
Net physical investment is likely to see further strong gains in 2021, with demand forecast to rise by 26% to 252.8Moz (7,862t), its highest level since 2015. Western markets will build on gains from 2020, while the sharp bounce back in India will be driven by the base effect and investors there taking advantage of the recent price correction. That said, the expected decline in China will offset some of these gains. We also forecast a rise of 150Moz (4,666t) for ETPs, their second ever largest annual rise.

Global Demand Forecast



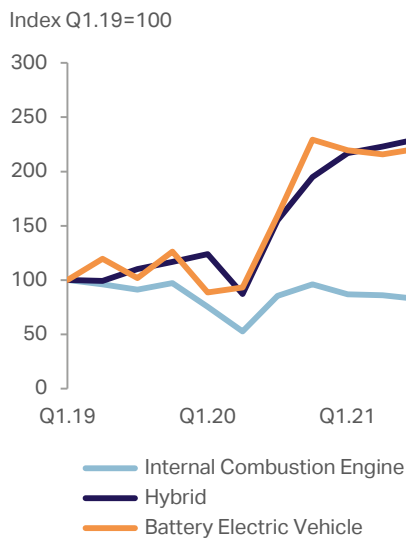
Source: Metals Focus, Bloomberg

Longer-Term Industrial Demand Indicators



Source: GTM, Metals Focus, LMC Automotive

Quarterly Vehicle Production by Powertrain



Source: Metals Focus, LMC Automotive

The Longer-Term Outlook for Silver

Strong growth in **mine production** this year is expected to be followed by continued growth in the medium term. This will be driven by increased output from a number of major operating mines alongside new projects, with a significant contribution coming from primary silver operations in Mexico. In the longer term, four to five years out, investment will be required to bring earlier stage projects into production to offset losses from reserve depletion and grade decline. Without sufficient investment, output will begin to decline. A re-start of Pan American Silver's Escobal mine, which has been in care and maintenance since 2017, could have a meaningful impact on global output. At full capacity, it is one of the biggest silver producing mines in the world but there is currently no confirmed schedule for a re-start.

Recycling looks likely to fall in 2022 and for the next few years after. Much will just be due to jewelry and silverware scrap's reaction to falling prices, while photography's structural losses should also resume. Industrial scrap could show longer term gains however due to tighter environmental regulations.

Silver demand should enjoy solid growth from 2022 onwards. **Industrial** offtake for instance will initially benefit from the post-COVID re-opening of economies, but perhaps of more interest is its structural potential. Silver's end-use in the automotive arena should grow fast for example, as vehicle output bounces back and as we see a surge for electric vehicles, which have a much higher silver loading than conventional vehicles. The proliferation of 5G devices and networks will also act as a useful boost, as could induction chargers and cold sintering powders. Demand in photovoltaic applications however soften slightly as the benefits from growth in capacity installations are countered by notable thrifting on the use of silver per cell. Overall however, thrifting and substitution only pose modest threats as so many established areas offer so little room for cuts in the metal's use.

The big swing factor of the last few years, **physical investment**, remains hard to call looking ahead as various markets could see contrasting rates of profit taking and bargain hunting in reaction to prices moves. Importantly though, we are not expecting any structural changes in either of its core US and Indian markets that might threaten net investor purchases.

Jewelry demand has a clearer path to steady gains looking ahead as economic activity normalizes and growth should flow through from our forecast of a medium easing in silver prices. Western sales of branded items also show promise, as does India through the rising popularity there of sterling silver among organized retailers. Increases for **silverware** led by India and driven by softer prices are also expected in the next few years, with no structural change on the horizon as a major threat. **Photographic** offtake is, however, expected to see secular losses continue, if at a slower pace.

Chapter 3

- 2020 witnessed strong investment inflows into silver among both institutional and retail investors.
- Most significant was the record rise in silver ETPs. Physical bars and coin sales also rose to a four-year high, led by the US.
- In spite of near-term headwinds from rising yields and a firmer dollar, we expect the economic backdrop to remain generally supportive for silver investment in 2021.

Investment

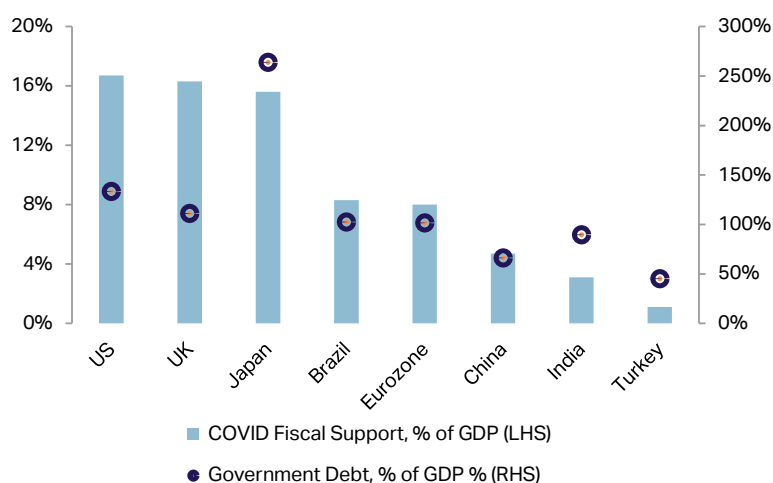
Introduction

Building on its gains in 2019, silver investment saw notable growth during 2020 and this was the chief driver of the metal's strong price gains. Sizable investment was recorded from both institutional and retail investors. Silver exchange-traded products (ETPs), where retail investors account for the lion's share of holdings, grew by a staggering 331Moz (10,299t) last year, driving global holdings above a billion ounces (31,000t) for the first time ever by July. Sales of silver bars and coins jumped by 8% y/y to 200.5Moz (6,236t) in 2020, although the annual total was still a third lower than 2015's record level. Strong investor interest was also evident on commodity exchanges, with several of them achieving record trading volumes last year.

The improved investor appetite was largely due to an unprecedented wave of quantitative easing and fiscal stimulus across all major economies to help contain the COVID-19 crisis. Lower short-term interest rates and a slump in nominal and real yields typically benefit precious metals by limiting the opportunity cost of holding such zero-yielding assets and this certainly benefited silver. The possibility of future inflation as a result of these extraordinary measures was another factor. While gold was the main beneficiary among precious metals in the early stage of the pandemic, investment flows into silver accelerated later. This owed much to an early spike in the gold:silver ratio. This touched a record high of 127:1 in March 2020, making the white metal appear extremely undervalued.

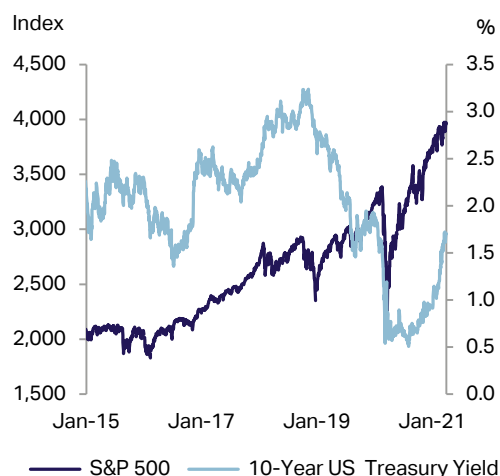
Even though safe haven-driven investment inflows slowed later in the year, silver benefited from a strong rebound in the industrial metals complex. A

COVID-19 Fiscal Support



Source: the IMF, ECB, WEF

S&P 500 & 10-Year US Treasury Yield



Source: Bloomberg

Silver's Correlation with Gold and the LME Index



Source: Bloomberg

larger than expected fiscal deal in the US, a V-shaped rebound in the Chinese economy and vaccine roll-outs all contributed to sharp gains in industrial metal prices and calls for a commodity supercycle. In addition, optimism towards silver-consuming green energy applications proliferating has further encouraged investments in the metal.

This positive sentiment partly explains why profit taking in ETPs and the futures market has been far more restrained for silver than for gold since late 2020. Additional support also came from a brief spike in retail investor activity in late January 2021, following posts on social media platforms, such as Reddit, calling for a coordinated retail investor effort to push silver higher. Against this backdrop and despite sustained downward pressure on gold prices during 2021-to-date, the gold:silver ratio managed to fluctuate near seven-year lows below 70, and so a long way below its March 2020 peak.

Outlook

Notwithstanding the short-term headwinds arising from increasing bond yields and a strengthening of the dollar, the macroeconomic backdrop should remain favorable for gold and ultimately also benefit silver investment. Specifically, monetary and fiscal policies are likely to remain expansionary for the foreseeable future, even if there is a rise in inflationary pressures. This in turn will mean that real yields are set to remain low or negative, limiting the cost of holding precious metals. Importantly, with equity markets near record highs and valuations looking increasingly stretched, rising yields will continue to pose a risk to equity markets and prompt a rotation into precious metals. Some investors also believe that tail risks abound as we move away from today's extraordinary fiscal and monetary positions in an era of record debt accumulation. While gold will be the main beneficiary of these factors, silver should also enjoy healthy interest from investors.

Current optimism for a major economic recovery also means that silver will benefit from the ongoing bull run in the industrial metals complex. Related to this is growing interest in a green energy led fiscal stimulus. Even though such developments are unlikely to result in a material change in silver's overall fundamentals in the near term, they may continue to stoke investor interest in the metal. This means that silver is likely to maintain its out performance of gold this year.

Institutional Investor Activity

Leaving aside a short period of forced liquidations during a melt-down in global commodity and equity markets, the pandemic had a positive impact on institutional investor demand for silver. Interestingly, while institutional investor activity was undoubtedly instrumental to silver prices, growth in it last year was at times dwarfed by interest from retail players. This was highlighted by a more subdued rise in trading volumes on platforms where professional investors play a dominant role.

Annual Turnover on Major Commodity Exchanges & LBMA¹

Million ounces	2019	2020	Y/Y
SHFE ²	68,878	172,279	150%
COMEX ³	120,746	130,633	8%
LBMA	99,391	101,670	2%
SGE T+D ²	27,824	67,191	141%
MCX	5,295	7,561	43%
COMEX Micro ³	354	2,450	591%
LME	354	35	-90%
Tocom/OSE	7	15	106%

1. Turnover on all exchanges includes futures, spot or deferred contracts where applicable; turnover on LBMA includes spot, swap and forward.

2. The SHFE and SGE record each transaction twice, from the point of view of the buyer and also the seller. However, to compare these volumes with other exchanges, the reported figures have been halved (as shown above).

2. On COMEX, 5,000oz for its standard futures contract & 1,000oz for micro futures contract

Source: Bloomberg, respective exchanges

Commodity Exchanges

2020 witnessed a major pick-up in silver trading, with several exchanges posting record high turnover. As mentioned above, growth in retail investor participation was particularly strong last year, which helped the **Shanghai Futures Exchange (SHFE)** overtake COMEX to become the largest exchange for silver futures trading.

Starting with **COMEX**, aggregate turnover of the standard 5,000oz futures contracts (typically the most liquid silver futures contract) rose by 8% y/y to a new all-time high in 2020. Modest as the increase may appear, a number of factors are worth highlighting. First, last year's growth came from an already elevated base, as trading volumes had posted successive all-time highs from 2017 onwards. More importantly, as discussed in the Focus Box (on page 20), a widening exchange for physical (EFP) spread encouraged some institutional investors to shift away, even if only temporarily, from COMEX. By contrast, turnover of the 1,000oz micro contract exploded last year, jumping almost seven-fold, thanks to solid retail investor interest.

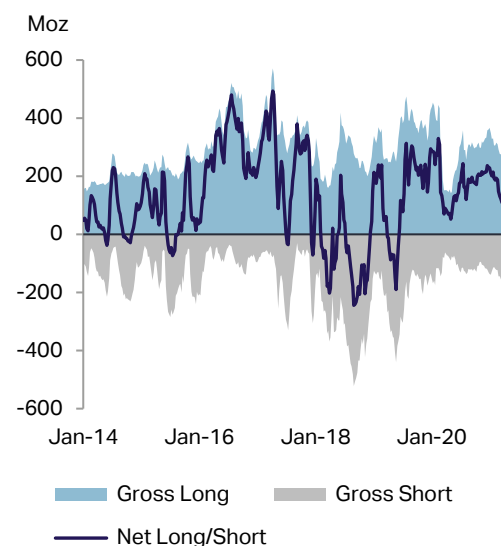
Looking at activity in more detail, silver suffered aggressive long liquidations in the early stages of the pandemic when investors cut exposure to riskier assets across the board. By early May, net managed money longs fell to a mere 52.3Moz (1,628t), down by some 80% from pre-COVID levels. Thereafter, net positions rapidly recovered, as sentiment towards precious metals turned increasingly positive. A strengthening base metals complex also played a part. As silver prices broke above psychologically important thresholds, this provided an additional boost to investor confidence. By late July, net longs bounced back to above 240Moz (7,460t) before closing the year slightly lower at 230Moz (7,155t).

Turning to 2021-to-date, net managed money longs have more than halved, with end-March positioning falling to levels last seen in May 2020. Increasing caution towards gold has been the principal driver behind this decline, which itself is a result of rising bond yields.

Aggregate turnover on the **SHFE** jumped by 150% in 2020 to achieve a new record total. Such a remarkable increase reflected silver's extraordinary price swings last year. It is worth remembering that silver trading on the Chinese exchanges has long been dominated by tactical/short-term investors. This is why trading volumes recorded successive declines over 2015-18, when a lackluster price performance undermined investor interest towards the metal. In 2020, however, a sharp pull-back in prices first encouraged heavy bargain hunting. Later on, the rebound in prices encouraged aggressive trend following purchases among retail investors.

The **Shanghai Gold Exchange (SGE)** recorded a 141% and 52% y/y rise in its T+D and spot trading turnover respectively during 2020. Similar to the

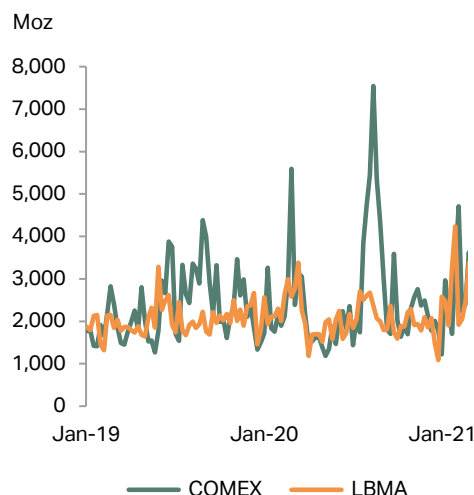
Investors' Positions on Comex*



*Managed money positions

Source: CFTC

Comex & LBMA: Weekly Turnover



Source: CME Group, LBMA, Nasdaq

SHFE, investors responded positively to the remarkable turnaround in silver prices. Faced with an explosion of retail investor activity, the SGE raised margin requirements from 10% to 19% over July-October in order to protect investors from a surge in price volatility. In November, 17 banks suspended the opening of new accounts for precious metals trading, following new guidance by the Chinese banking authorities. 2021-to-date has seen further tightening rules on individual trading, which will affect trading volumes.

Elsewhere, the **Multi Commodity Exchange of India (MCX)** also recorded notably higher trading volumes in 2020, as investor interest was fueled by the rally in the Indian rupee silver price to record highs. Additional support came from weakening physical demand and rising local supply. As a result, physical deliveries onto the MCX in 2020 jumped 85%, albeit from a low base.

Over-the-Counter Market (OTC)

With ETP inflows (331Moz, 10,299t) in 2020 comfortably exceeding the market surplus (80.1Moz, 2,493t), additional stocks had to be released by existing holders in order to meet the shortfall. A small part of the difference can be explained by net futures outflows, but this still implies there were massive liquidations in the OTC market during the year. At first glance, this contradicts our understanding that there were healthy western

COVID Disruptions and the EFP Spike

As noted elsewhere in this report, one of the effects that the COVID-19 crisis had on the silver market, and indeed other precious metals markets, was its boost to exchange-for-physical (EFP) prices. Silver EFP is the difference between the active COMEX contract and the spot price. It is normally nominal in magnitude and relatively stable. However, as the pandemic unfolded, the EFP rallied to a peak of \$0.98/oz in April and remained historically high until September.

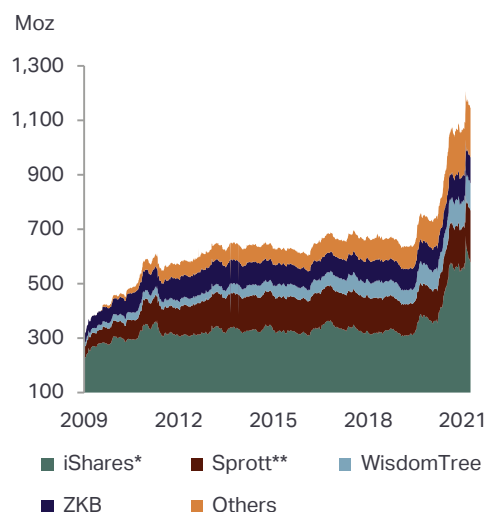
Futures and spot prices are rarely identical. The timing of settlement and location of delivery are after all different. The deliverables also in theory vary slightly; 1,000-ounce bars of 999 purity for both, but with slightly wider weight tolerances for London Good Delivery. Ample inventories, efficient logistics, the fungibility of silver and an abundance of refining/recasting capacity all mean that these differences are normally trivial.

Market makers will typically take a short futures position to service their clients and hedge it with a London OTC long one. The factors mentioned above, coupled with the fact that physical deliveries against futures are rare (they are usually

rolled over or cash-settled), mean that the basis risk is minimal. The onset of COVID-19 however created a risk that these norms may not hold. Lockdowns disrupted mines and refineries and logistics frictions created concerns that it might not be possible to ship metal across the Atlantic, should dealers need to deliver against futures positions. This was more relevant for gold, where a conversion from 400-ounce to either 100-ounce or kilobars would be required before making COMEX delivery, but the fear also spread to silver and other precious metals. Risk departments at a number of key market makers saw this as an unacceptable potential liability.

This caused a rush to buy-back short futures positions, pushing their price relative to spot silver higher. This created a self-fulfilling prophecy, as the rising EFP itself amplified the potential liability and further curtailed the supply of futures. In the end, these risks did not crystallize. Indeed, not only did market makers avoid realizing losses, but ended up making extraordinary profits, by shorting now expensive futures and delivering cheaper physical against them. This also resulted in metal moving from London to COMEX vaults.

Silver ETP Holdings



*iShares Silver Trust; **Combined holdings of Sprott Gold & Silver and Sprott Silver

Source: Bloomberg, respective issuers

investor purchases in the OTC market. We believe this can be explained by liquidations of silver inventories elsewhere, for instance in some Asian markets. Feedback from our contacts suggests that western institutional investment in OTC instruments benefited from the silver-bullish factors mentioned elsewhere as well as a shift of activity from futures, due to the EFP spike. Demand for physical silver picked up among high-net-worth investors and family offices last year. Silver's high beta relationship with gold also led to aggressive tactical buying over the summer.

Exchange-Traded Products (ETPs)

2020 witnessed record inflows into silver ETPs. With a rise of 331Moz (10,299t) or 45%, global ETP holdings surpassed one billion ounces (31,100t) for the first time, before closing the year at 1.07Boz (33,182t).

The bulk of last year's inflows occurred during March-August, when holdings jumped by 323.7Moz (10,068t). This was triggered by investors' flight to safe-haven assets amid growing fears about the pandemic. A sharp fall in silver prices during the March sell-off also prompted sizable bargain hunting, as some investors believed that the metal was oversold, particularly in light of the record high gold:silver ratio. Over the same period, ETPs also benefited from a severe shortage of silver bullion coins and bars, especially in the US.

The Reddit Effect on Silver Investment

In late January and early February 2021, silver experienced a short-lived, but aggressive, spurt of price volatility. Momentarily, its price broke over \$30, a level not seen since 2013. This was triggered by comments on social media platforms, initially and notably Reddit, calling for a coordinated retail investor effort to buy silver and force its price higher. Some posts proposed there was systematic shorting of silver by major financial institutions, creating an opportunity to trigger a short squeeze. Crucially, this happened while the controversies surrounding the GameStop short squeeze and resulting attention by markets were at their peak.

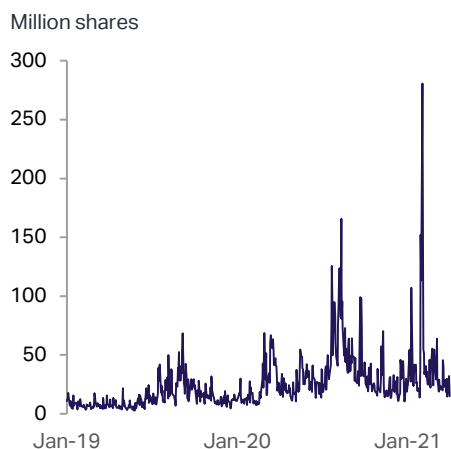
This fueled a rush of investor buying across all "arenas" of silver investment, both retail and institutional. Massive inflows into silver ETPs, an explosion of ETP and futures trading volumes and anecdotal evidence of shortages of retail physical products all emerged over the next few days.

Soon enough it became clear that a Reddit silver squeeze would not last. In our view this was to be expected. First and foremost, we do not believe there is systematic shorting of silver by

major market players. Second, the silver market is considerably larger than that of the earlier, single stock targets of Reddit communities. Finally, the market is highly regulated, for example by the CFTC, which could potentially step in. This makes cornering it, which is effectively what the proposed coordinated buying hoped to achieve, extremely difficult.

The incident, however, does seem to have had a lasting effect on silver investment. Prices have retraced but remain considerably higher than they had been at the start of the year. Our field research also suggests physical investor appetite for the metal has remained healthy, more or less consistently, since early February. This interest seems to be fueled by a confluence of various factors, such as optimism towards silver's green energy demand prospects, its relative historical undervaluation compared to other precious metals and some investors' concerns about the new US administration's policies. Strictly speaking, therefore, this sustained demand is not directly linked to the Reddit squeeze. Having said this, we believe the event certainly helped the metal get on to more investors' radars, which in turn boosted the buying that we have recently seen.

iShare Silver Trust Daily Turnover



Source: Bloomberg

Inflows then slowed dramatically from September onwards, as bargain hunting subsided after a sharp rebound in prices. Vaccine-driven optimism also started to dent precious metals' safe haven appeal. Interestingly, despite these headwinds, profit taking remained limited in silver ETPs, with bouts of fresh investment evident on major price dips later in the year. This largely reflects the fact that retail investors have traditionally accounted for the bulk of silver ETP holdings. Liquidations from such players at higher prices are usually restrained and gradual.

In the first few weeks of 2021 ETP inflows accelerated again. As highlighted in the focus box on page 21, investor buying was especially strong in late January/early February, led by a coordinated retail investor effort to push silver higher. Within a few days, ETP holdings jumped by almost 120Moz (3,700t) to a new all-time high of 1.2Boz (37,535t), more than 90% of which went to the iShares Silver Trust. In spite of some profit taking thereafter, global holdings still recorded an 8% increase through to end-March.

Physical Investment

Net global physical investment rose by 8% in 2020 to a four-year high of 200.5Moz (6,236t). In our view, demand would have been even stronger were it not for COVID-related supply disruptions. These caused a lack of products, an issue most keenly felt in the US and Europe, where physical investment jumped by 69% and 23% respectively. A large portion of these gains, however, was offset by an 85% decline in Indian investment. Turning to 2021, retail investment so far has remained buoyant, with the full year total projected to rise by another 26%.

Physical Investment Forecast

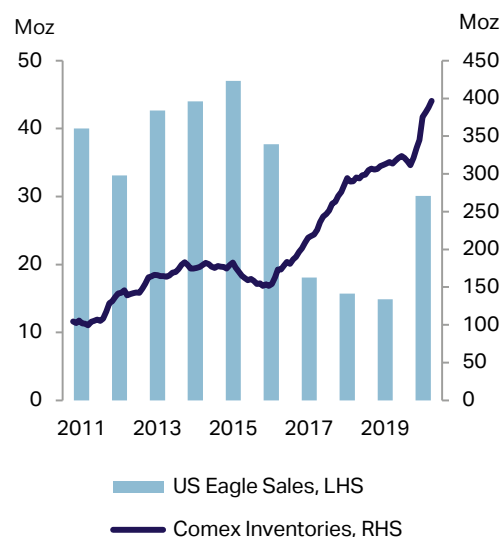
Million ounces	2020	2021F	Y/Y
Bars	72.0	105.1	46%
Coins	128.5	147.7	15%
Global Total	200.5	252.8	26%

Source: Metals Focus

The importance of the **US** performance last year cannot be overstated. Excluding this market, global physical investment would have dropped by 12% in 2020. Instead, the US recorded its largest annual increase in our series of 32.0Moz (995t), with the full year total of 78.2Moz (2,433t) achieving a four-year high. Last year's gains emerged after the widespread lockdown restrictions were imposed in March, prior to which US coin and bar demand had been steady, if unexciting. However, from March onwards, retail investors ramped-up their purchases of all precious metals. Product shortages, extended manufacturing lead times (partly due to COVID restrictions) and, with them, sharply higher wholesale and retail premiums quickly emerged. Normally selective retail investors (those who might prefer a particular brand) purchased whatever stock a dealer held. At times, when bullion coin inventories ran low, investors bought up commemorative coins, some of which became better priced given the run-up in bullion coin premiums.

After a quiet start to this year, physical investment in the US has once again burst into life, partly through the social media phenomenon covered in the earlier focus box. While this provided the catalyst for the surge in US demand,

US Silver Eagle Sales vs Comex Inventories



Source: US Mint, Comex

the buying has been concentrated among mainstream investors who have little interest in the conspiracy theories featured in chat rooms. In keeping with last year, product shortages have quickly emerged. Once again, that also reflects a lack of supply, in part as COVID restrictions have affected some coin and bar manufacturers. Looking ahead, one interesting marker will be the introduction over the summer of a newly designed American silver Eagle bullion coin (the gold Eagle is also being redesigned). At the time of writing, the launch date is still being finalized, but this should provide an additional boost to US physical investment during the latter part of this year.

European investment surged by 23% in 2020 to the highest annual total in our series. While Germany remained by far the largest market for silver bars and coins, gains were widespread across the region. Investor interest was fueled by the onset of the pandemic, combined with a major pull-back in silver prices. Similar to the US, last year's growth was restrained by a lack of readily available bullion products during March-June when buying was particularly strong. This period was characterized by a jump in premiums and very little selling back in the secondary market. Indeed, many dealers often reported that stocks were sold as soon as they were received. Even though investment weakened later in the year, overall volumes remained high by historical standards. In essence, this reflected an ongoing desire for hard assets among investors, in the wake of negative interest rates and continued macroeconomic uncertainties. A dramatic rebound in silver prices to multi-year highs provided an additional boost to investor confidence.

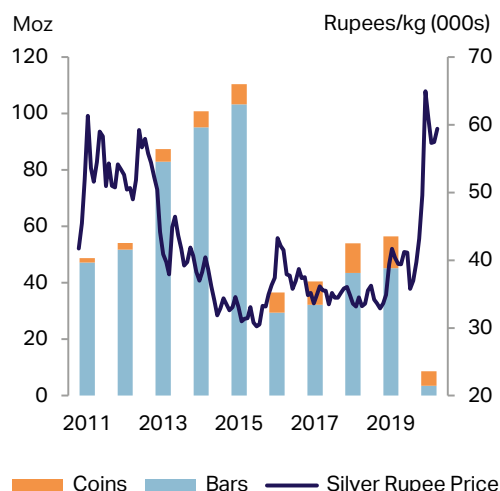
India was the only major physical investment market that reported a drop in 2020, primarily due to the lockdown and heavy profit taking in response to record rupee silver prices. With an 85% y/y decrease, the total for 2020 was the lowest in our series starting from 2010. Prior to the lockdown, investment had been solid. In fact, the price correction in March prompted many investors to buy silver, leading to a shortage in the domestic market and higher premiums. Such purchases, however, came to an abrupt halt, after

Physical Investment

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
United States	117.1	98.6	119.1	109.2	120.5	99.6	55.0	43.6	46.2	78.2	69%
Germany	35.6	23.0	27.1	19.5	21.0	23.9	23.1	25.0	34.1	42.6	25%
India	48.8	54.1	87.4	100.8	110.4	36.5	40.5	54.0	56.5	8.7	-85%
Canada	4.8	4.8	6.6	7.4	7.6	7.2	4.7	4.6	5.0	7.9	57%
China	20.9	22.9	21.2	11.7	11.5	11.1	7.7	6.8	6.2	6.9	11%
Other Europe	11.0	7.2	7.9	7.3	9.7	10.8	9.1	10.9	11.7	13.5	15%
Others	34.8	31.2	32.5	28.7	31.8	24.4	16.1	20.7	25.9	42.7	65%
Global Total	273.1	241.9	301.9	284.6	312.6	213.6	156.2	165.6	185.7	200.5	8%

Source: Metals Focus

Indian Coin & Bar Demand



Source: Metals Focus, Bloomberg

the government announced a nationwide lockdown at end-March. As a result, dealers could not deliver physical silver on time, while investors could not make cash payments, in some cases leading to legal disputes.

In spite of a re-opening of the economy, the sharp price rally between March and August further hampered local investment. With Indian rupee prices hitting a fresh all-time high, worries about a near-term price correction stimulated heavy profit taking, especially among those that suffered during silver's volatile run after 2011. It is worth noting that Indian investors have bought more than 630Moz (18,000t) of investment products over the last decade on hopes that silver would eventually revisit its 2011 peak. Our trade discussions revealed that more than 35Moz (1,000t) were sold in the second half of 2020. This six month period saw net disinvestment, resulting in a deep price discount in the local market.

For 2021, we expect investment demand will recover sharply, helped by positive price expectations. Should the rupee price fall below Rs.60,000/kg, we could see demand surge. That said, overall volumes will remain historically low, as higher prices later could also lead to further profit-taking by investors.

After seven consecutive years of losses, Chinese physical investment saw an 11% rise in 2020 to 6.9Moz (214t). Due to unfavorable VAT treatment (13% is levied on the full value of silver products), the silver bar and coin market tend to be driven by gifting and collector purchases. Despite softer consumer sentiment, silver sales were underpinned by improving confidence in silver prices and the successful launch of the Forbidden City 600th Anniversary coin collection by the China Gold Coin Incorporation. The extraordinary demand for the new commemorative issue last year, together with rising silver prices, are expected to undermine collector demand in 2021.

Coins & Medals Fabrication

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Canada	24.0	19.8	30.6	32.4	37.6	36.2	21.0	21.0	25.8	33.3	29%
United States	45.4	36.1	45.8	46.4	49.1	39.4	19.3	17.1	20.5	32.7	60%
Australia	11.1	10.5	8.6	8.5	12.7	13.2	10.7	10.4	12.7	17.1	35%
UK	0.9	0.7	2.5	2.2	3.5	3.5	3.1	3.5	3.2	9.7	205%
China	11.7	12.0	12.0	11.7	11.5	11.4	8.0	7.5	7.0	7.7	10%
Austria	17.9	8.8	14.5	4.6	7.3	3.4	2.1	2.1	2.9	7.2	148%
India	1.6	2.3	4.5	5.7	7.2	7.1	8.3	10.5	11.3	5.2	-54%
South Africa	0.0	0.0	0.8	0.0	0.6	0.0	1.2	3.7	3.6	3.9	8%
Germany	4.0	1.3	1.3	1.3	1.9	4.3	4.0	4.0	3.9	3.9	0%
Mexico	1.7	1.3	0.7	0.7	1.1	1.2	1.2	0.6	0.4	0.4	14%
Others	7.7	7.9	9.2	8.7	9.1	6.3	6.1	7.2	7.6	7.4	-3%
Global Total	126.1	100.7	130.6	122.2	141.6	126.0	84.9	87.7	98.8	128.5	30%

Source: Metals Focus

Above-Ground Silver Stocks

The silver market registered its fifth consecutive annual surplus in 2020. Moreover, at 80.1Moz (2,493t) this was the largest surplus we have seen since at least 2010, which is as far back as Metals Focus' data goes. Throughout the whole eleven years, global above-ground stocks of silver have increased by a net cumulative 339.1Moz (10,547t). This excludes retail investors' coin and bar holdings, which rose by 200.5Moz (6,236t) last year and by 2.5 billion ounces (78,798t) since the end of 2009.

Interestingly, in contrast to previous years, increases in 2020 in identified inventories (namely those for which publicly available data is available) fell short of the global surplus. As illustrated in the table, these only rose by 51.5Moz (1,602t), leaving a 28.6Moz (891t) balance which was, by implication, added to stocks held outside these four categories. This was broadly in line with our understanding that there were material flows into Swiss bonded warehouses as well as our analysis of trade-flows into Canada and ETP holdings data, pointing to net inflows of silver into that country.

Looking at these figures in a little more detail, 2020 saw the 81.6Moz (2,539t) decline of silver inventories held in London vaults (as reported by LBMA) broadly match the 79.4Moz (2,469t) increase in COMEX stocks. This was consistent with trade data showing material outflows from the UK and inflows into the US over the course of the year. Flows out of London vaults and into COMEX stocks were largely due to arbitrage

Identifiable Silver Bullion Inventories*

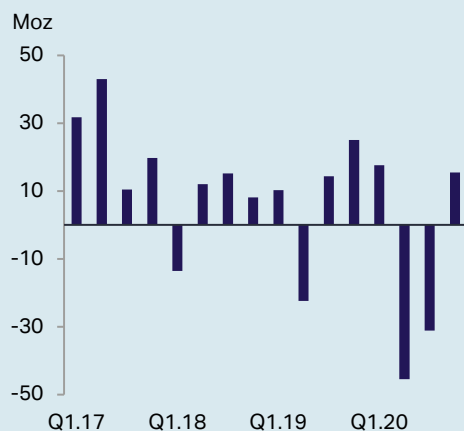
Million ounces	2018	2019	2020	Y/Y
London vaults	1,137.7	1,162.2	1,080.5	-7%
Comex	293.9	317.2	396.5	25%
SGE	68.5	108.2	130.0	20%
SHFE	35.8	63.2	95.2	51%
Total	1,535.9	1,650.8	1,702.3	3%

*Year-end; Source: Metals Focus, LBMA, Comex, SGE, SHFE

opportunities of delivering physical metal against futures contracts. The latter traded considerably higher than spot over periods of the year, for reasons explained in the Focus Box on page 20. Ultimately, COMEX stocks reached a record high of 400Moz (12,434t) in early February but have since fallen sharply.

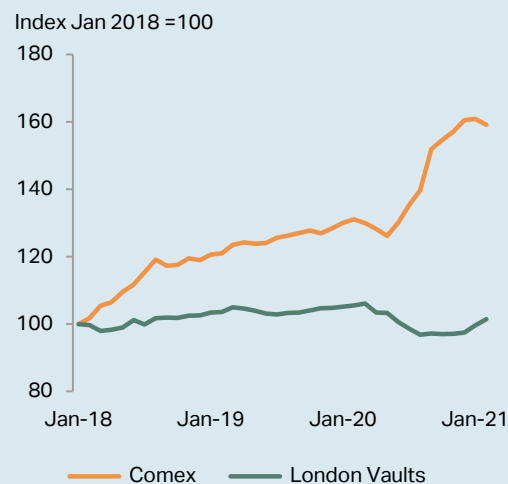
Chinese reported stocks were up last year, with SGE and SHFE inventories rising by 20% and 51% respectively. Strong silver production from the processing of silver bearing base metals concentrates by local smelters and refiners continued to provide the country with ample supplies. Coupled with weaker local demand and limited appetite from India (traditionally a key export market for Chinese-branded silver bars), this resulted in a build-up of stocks over the course of 2020. This trend has reversed this year, in the face of strong physical investment demand in a number of western markets.

UK Net Silver Bullion Imports



Source: HM Customs & Excise

Comex vs London* Vault Inventories



*Includes silver stored at LBMA-member custodian vaults

Source: Metals Focus, LBMA, Comex

Chapter 4

- Global silver mine supply fell by 5.9% y/y in 2020 to 784.4Moz (24,399t) due to disruptions from the COVID-19 pandemic.
- Primary silver mines' total cash costs declined by 5.7% y/y to \$4.73/oz due to weaker producer currencies and higher by-product revenues from gold.
- We are expecting mine production this year to increase by 8.2% y/y to 848.5Moz (26,392t) as minimal COVID-19 disruption allows most mines to run at full capacity.

Mine Supply

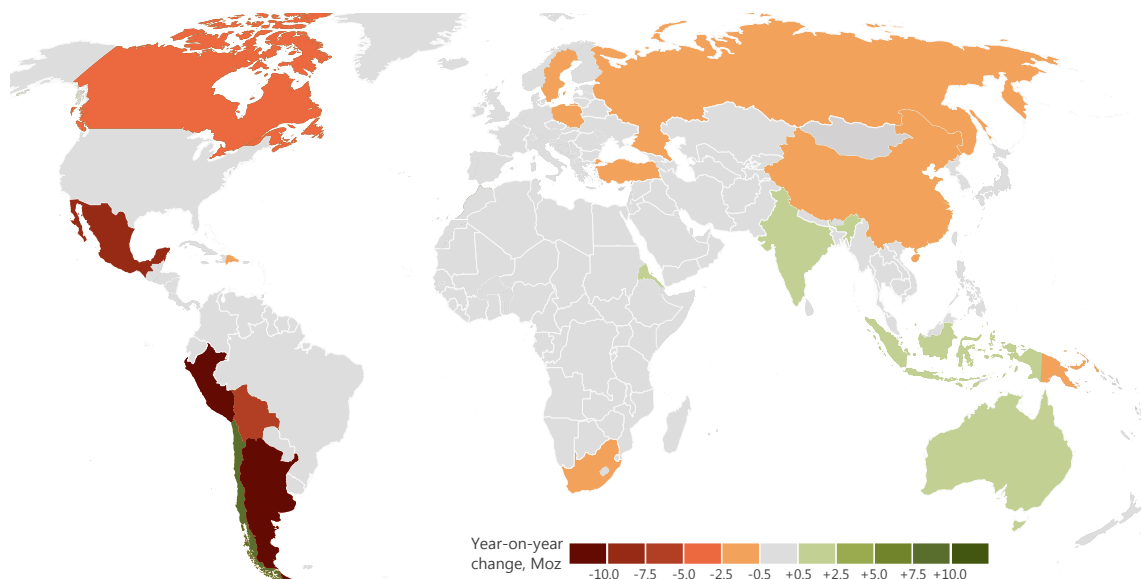
Mine Production

In 2020, global mined silver production fell by 5.9% y/y to 784.4Moz (24,399t), the biggest decline in our series going back to 2010. This was a direct result of the COVID-19 pandemic which led to temporary mine closures in several major silver producing countries in the first half of the year. Output ended the year down 13.3Moz (414t) on our forecast in last year's World Silver Survey and a full 54.4Moz (1,704t) down on expectations at the beginning of 2020.

Production from primary silver mines fell by the most (-11.9%) due to their concentration in countries where mining was heavily impacted by the pandemic. Silver output from lead-zinc mines (-7.4%) and gold mines (-5.7%) also declined, while output from copper mines increased (+3.5%). Overall, the most significant year-on-year drops in mined silver production emerged in Peru (-26.1Moz, 810t), Argentina (-10.0Moz, 311t) and Mexico (-9.6Moz, 299t). These declines were all driven by COVID-19 related temporary mine closures. Despite the disruption caused by the pandemic, mining in some countries was unaffected, with output rising in Chile (+9.1Moz, 284t), India (+1.2Moz, 38t) and Australia (+1.2Moz, 37t).

We are expecting minimal disruption to silver mining from the ongoing pandemic which will allow the vast majority of mines to operate at full capacity throughout 2021. As a result, mined silver output will rebound strongly and is anticipated to increase by 8.2% y/y to 848.5Moz (26,392t).

Major Changes to Global Mine Production, 2020 versus 2019



Source: Metals Focus

Top 20 Producing Countries

Million ounces	2019	2020	Y/Y
Mexico	187.8	178.1	-5%
Peru	135.7	109.7	-19%
China	110.7	108.6	-2%
Chile	38.2	47.4	24%
Australia	42.6	43.8	3%
Russia	44.7	42.5	-5%
Poland	40.4	39.4	-2%
United States	31.4	31.7	1%
Bolivia	37.1	29.9	-19%
Argentina	32.9	22.9	-30%
India	20.4	21.6	6%
Kazakhstan	17.1	17.3	2%
Sweden	14.4	13.4	-7%
Canada	13.5	9.3	-31%
Morocco	8.1	8.4	4%
Indonesia	7.2	8.3	14%
Uzbekistan	6.1	6.3	2%
Papua New Guinea	4.7	4.2	-10%
Dominican Republic	4.5	3.8	-15%
Turkey	3.2	3.6	11%
Others	32.5	34.2	5%
Global Total	833.2	784.4	-6%

Source: Metals Focus

North America

Silver mine production in North America fell by 5.8% y/y to 219.2Moz (6,817t). This was the result of lower production from Mexico and Canada, which fell by 9.6Moz (299t) and 4.2Moz (129t), respectively. Production from the US was little changed, rising by just 0.3Moz (10t).

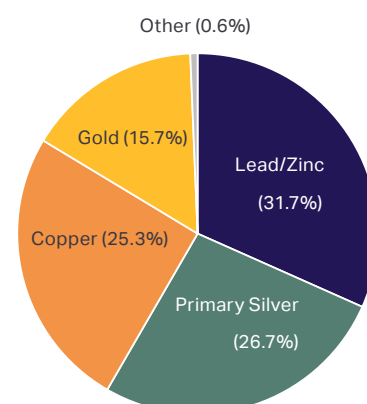
The 5.1% y/y decline in **Mexico's** silver production was due to temporary mine closures resulting from the COVID-19 pandemic. Mines were forced to halt operations from March 30, 2020, as a nationwide lockdown was put into place. However, some mines were granted exemptions and allowed to continue operations while implementing measures to protect workers. By end-May, all restrictions on mining had been lifted and operations were allowed to return to full production rates. The largest decrease in 2020 was at Pan American Silver's La Colorada mine, where silver production fell by 3.2Moz (99t) as COVID-19 disruption led to operations temporarily halting and also prevented work required to access higher grade ore. Silver output from Fresnillo, the world's largest silver producer, dropped by 2.9% y/y to 50.3Moz (1,564t) due to lower grades at Saucito, which was partially offset by higher grades at San Julian and the availability of development ore from Juanicipio. Despite COVID-19 stoppages, output from Peñasquito increased by 6.2Moz (192t) as the mine was able to operate for more days compared to the previous year when production was severely impeded by blockades.

Production in the **US** rose by just 1.0% y/y, driven by higher output at Hecla's Lucky Friday and Greens Creek mines. Lucky Friday's output rose due to the completion of ramp-up activities in Q4.20. The strike by unionized workers at Lucky Friday, which started in March 2017, came to an end in January 2020. Hecla expects grade increases at depth in Lucky Friday, which will improve silver output moving forward. Meanwhile, Greens Creek's production reached a record high of 10.5Moz (327t) due to higher silver grades.

Silver Mine Production, by Source Metal in 2020

Million ounces	Primary				
	Lead/Zinc	Silver	Copper	Gold	Other
North America	26.8	117.3	16.2	58.3	0.6
Central & South America	66.0	43.0	73.8	37.3	0.0
Europe	13.2	1.6	44.8	1.3	0.0
Africa	2.9	5.7	2.8	3.3	0.0
CIS	15.3	20.2	24.4	8.1	3.0
Asia	100.9	7.7	31.0	9.5	1.5
Oceania	23.2	13.9	5.4	5.5	0.0
Total	248.3	209.4	198.3	123.3	5.1

Source: Metals Focus



Top 20 Producing Companies

Million ounces	2019	2020	Y/Y
Fresnillo ¹	51.8	50.3	-3%
KGHM Polska Miedź ²	45.6	43.5	-5%
Glencore	32.0	32.8	2%
Newmont	15.9	27.8	75%
CODELCO	15.6	24.6	58%
Hindustan Zinc Ltd. ^{3,4}	20.4	21.6	6%
Southern Copper Corp.	20.3	21.5	6%
Polymetal Intl. plc	21.6	18.8	-13%
Pan American Silver Corp.	25.9	17.3	-33%
Hecla Mining Company	12.6	13.5	7%
Buenaventura ⁵	20.1	12.4	-38%
Industrias Peñoles ⁶	10.6	12.3	16%
Volcan Cia Minera S.A.A.	15.6	12.1	-22%
BHP ²	13.2	12.0	-9%
South32 Ltd. ²	12.3	11.6	-6%
First Majestic Silver	13.2	11.6	-12%
Boliden A.B. ⁷	12.0	11.4	-5%
Yamana Gold Inc.	10.6	10.4	-3%
Teck Resources Inc. ⁸	10.5	10.1	-3%
Hochschild Mining plc ⁹	16.8	9.8	-42%

NB: 1 - Excludes Silverstream contract, 2 - Payable silver production, 3 - Hindustan Zinc is a Vedanta Group company, 4 - Production from integrated operations only, 5 - Includes production from associated companies, 6 - Excludes 100% Fresnillo plc., 7 - Silver in concentrate, 8 - Estimated attributable mined production, 9 - Attributable production

Source: Company Reports, Metals Focus

Mine Production Forecast, by Region

Million ounces	2020	2021	Y/Y
C&S America	220.1	246.7	12%
N America	219.2	245.4	12%
Asia	150.6	156.4	4%
CIS	70.9	72.3	2%
Europe	60.8	62.2	2%
Oceania	48.1	50.5	5%
Africa	14.8	15.0	1%
Global Total	784.4	848.5	8%

Source: Metals Focus

In **Canada** silver production decreased by 30.8% y/y to 9.3Moz (290t). This was largely due to Coeur placing Silvertip into care and maintenance in February 2020 due to poor market conditions. However, Canada's silver output is expected to recover this year as Alexco Resource Corp's Keno Hill, a high-grade operation, commissioned its mill and began production in Q4.20.

Central & South America

Silver production in Central and South America was adversely affected by COVID-19 disruption, falling by 13.4% y/y to 220.1Moz (6,846t). This was the biggest decline in our series going back to 2010 and primarily driven by lower output in Peru (-26.1Moz, 810t), Argentina (-10.0Moz, 311t) and Bolivia (-7.2Moz, 223t). However, these losses were partially mitigated by a 9.1Moz (284t) rise in silver production from copper mines in Chile.

Silver production in **Peru** was the most heavily impacted by the COVID-19 pandemic, falling by 19.2% to 109.7Moz (3,411t). Peru entered its first lockdown on March 16, 2020, at which point most mines were required to halt operations. From early May, operations were able to begin re-starting, although companies had to implement rigorous health and safety protocols, which slowed the return to full production capacity. At Buenaventura's Uchucchacua, the biggest silver mine in the country, output more than halved year-on-year, declining to 5.0Moz (156t). Meanwhile, Hochschild's Pallancata and Inmaculada were similarly impacted with output down by 3.6Moz (111t) and 1.7Moz (53t), respectively.

In **Argentina**, silver production declined by 30.3% y/y to 22.9Moz (714t). This was caused by COVID-19 disruption, with the government initially mandating mine closures from the March 20, 2020. Most mines had returned to production by the end of Q2.20 but subsequent localized outbreaks led to individual suspensions at several operations. Similar restrictions to those implemented in Peru and Argentina were also enacted in **Bolivia** resulting in a 19.3% y/y decline in silver output to 29.9Moz (930t). **Chilean** silver production was largely unaffected by the pandemic, rising by 9.1Moz (284t) y/y due to higher by-product silver production from the country's copper mines.

Asia

Silver production in Asia was almost flat year-on-year, rising by just 0.2% to 150.6Moz (4,683t). Increased output from India (+1.2Moz, 38t) and Indonesia (+1.0Moz, 33t) was almost offset by a 2.2Moz (68t) drop in production from **China** due to COVID-19 related temporary mine closures in Q1.20.

Indonesian output rose by 14.5% y/y to 8.3Moz (258t). This was driven by the continued ramp-up of underground operations at Grasberg which pushed silver grades higher and increased the mine's production by 1.2Moz (37t) y/y. In **India**, the 6.1% rise to 21.6Moz (672t) was driven by increased output from Hindustan Zinc's Sindesar Khurd, the result of higher grades.

Mine Production

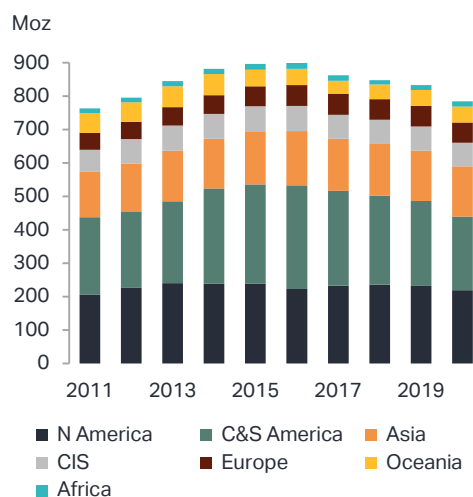
Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
North America											
Mexico	153.6	172.3	187.1	185.4	192.1	174.3	187.0	194.5	187.8	178.1	-5%
United States	36.0	34.1	33.6	37.9	35.0	37.0	33.2	29.8	31.4	31.7	1%
Canada	17.1	21.4	19.9	15.2	11.9	11.6	12.7	11.8	13.5	9.3	-31%
Sub-total	206.7	227.8	240.7	238.5	239.0	222.8	232.8	236.1	232.6	219.2	-6%
Central & South America											
Peru	114.1	114.1	123.5	126.5	136.2	152.9	155.6	147.1	135.7	109.7	-19%
Chile	41.5	38.3	37.6	50.2	48.1	46.6	40.4	40.0	38.2	47.4	24%
Bolivia	39.0	38.8	41.4	43.1	42.0	43.5	38.5	38.3	37.1	29.9	-19%
Argentina	23.6	24.7	26.6	29.6	36.4	31.9	29.2	30.9	32.9	22.9	-30%
Dominican Republic	0.6	0.9	2.6	4.4	3.1	3.9	4.9	5.1	4.5	3.8	-15%
Brazil	0.5	0.5	0.9	1.1	1.6	2.5	2.8	2.3	2.1	2.2	3%
Honduras	1.6	1.7	1.7	1.9	1.1	0.6	0.7	1.0	1.4	1.2	-18%
Guatemala	8.8	6.6	9.1	27.6	27.7	27.0	10.8	0.0	0.0	0.0	na
Others	1.7	1.5	1.4	1.2	1.2	1.1	1.1	1.3	2.2	3.0	40%
Sub-total	231.3	227.0	244.8	285.5	297.4	310.1	284.0	265.9	254.2	220.1	-13%
Europe											
Poland	37.9	37.3	38.8	38.4	39.2	40.9	41.7	40.9	40.4	39.4	-2%
Sweden	9.1	9.8	10.8	12.7	15.8	16.4	15.5	15.0	14.4	13.4	-7%
Spain	1.0	1.1	1.2	1.1	1.4	1.5	1.9	2.1	2.1	2.5	20%
Portugal	1.0	1.1	1.4	1.5	1.5	1.4	1.3	1.8	1.7	1.6	-9%
Greece	0.9	0.8	1.2	1.1	0.8	0.8	0.9	0.6	0.6	1.0	55%
Others	1.1	1.4	1.5	1.5	1.6	1.6	1.5	1.5	2.4	3.0	24%
Sub-total	51.0	51.5	55.0	56.4	60.3	62.6	62.9	61.9	61.6	60.8	-1%
Africa											
Morocco	7.8	7.1	7.4	7.7	8.7	9.5	9.8	7.4	8.1	8.4	4%
Eritrea	0.1	1.0	0.5	1.7	3.2	3.2	2.5	1.7	2.2	2.7	26%
South Africa	3.1	2.8	2.4	1.8	1.9	2.0	2.2	1.6	2.0	1.3	-37%
DR Congo	0.7	0.9	2.6	1.0	0.9	0.1	0.1	0.1	0.1	0.1	-1%
Others	1.9	2.5	3.0	3.2	2.9	2.4	2.4	2.3	2.4	2.3	-2%
Sub-total	13.7	14.2	15.9	15.4	17.5	17.1	17.0	13.2	14.7	14.8	1%
Commonwealth of Independent States											
Russia	39.3	45.4	44.4	46.1	51.1	46.6	42.0	43.1	44.7	42.5	-5%
Kazakhstan	19.8	20.6	21.2	18.3	16.3	17.7	18.8	19.7	17.1	17.3	2%
Uzbekistan	4.7	4.8	5.9	5.9	5.9	6.0	6.0	6.0	6.1	6.3	2%
Armenia	1.8	2.1	2.3	2.4	2.5	2.4	2.6	2.0	2.4	2.7	10%
Tajikistan	0.1	0.6	0.6	1.0	1.1	1.3	1.5	1.5	1.4	1.5	5%
Others	0.4	0.2	0.2	0.2	0.3	0.6	0.5	0.6	0.6	0.6	-10%
Sub-total	66.2	73.6	74.7	73.9	77.1	74.6	71.3	72.9	72.4	70.9	-2%

Mine Production

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Asia											
China	105.9	112.6	118.1	118.4	118.5	120.7	115.8	110.0	110.7	108.6	-2%
India	6.5	9.3	10.7	8.4	12.0	14.0	16.9	21.2	20.4	21.6	6%
Indonesia	6.9	6.2	7.8	7.0	9.9	10.8	10.0	10.1	7.2	8.3	14%
Turkey	8.9	7.1	6.5	6.4	6.6	6.7	4.9	4.7	3.2	3.6	11%
Iran	2.1	2.3	2.2	2.3	2.2	2.5	2.5	2.5	2.6	2.7	3%
Mongolia	0.8	0.8	1.3	1.7	2.0	2.2	1.8	1.7	1.6	1.7	1%
Laos	0.5	0.6	1.1	1.3	1.7	1.6	1.4	1.2	1.1	1.1	1%
Philippines	1.5	1.6	1.3	0.7	1.0	1.1	1.0	1.0	1.0	0.8	-23%
Thailand	0.7	1.1	1.2	1.1	0.8	1.3	0.1	0.1	0.1	0.1	0%
Others	1.5	1.6	1.8	1.8	1.6	2.1	1.9	2.3	2.2	2.2	-2%
Sub-total	135.4	143.2	151.8	149.1	156.2	163.1	156.3	154.8	150.3	150.6	0%
Oceania											
Australia	55.5	55.5	59.2	59.4	46.0	45.6	36.0	40.3	42.6	43.8	3%
Papua New Guinea	2.9	2.6	2.9	3.0	2.3	3.2	2.1	3.0	4.7	4.2	-10%
Others	0.9	0.4	0.5	0.6	0.6	0.4	0.4	0.3	0.1	0.1	-59%
Sub-total	59.3	58.5	62.5	63.1	48.9	49.2	38.6	43.6	47.5	48.1	1%
Global Total	763.5	795.9	845.3	881.9	896.4	899.4	862.9	848.4	833.2	784.4	-6%

Source: Metals Focus

Global Mine Production



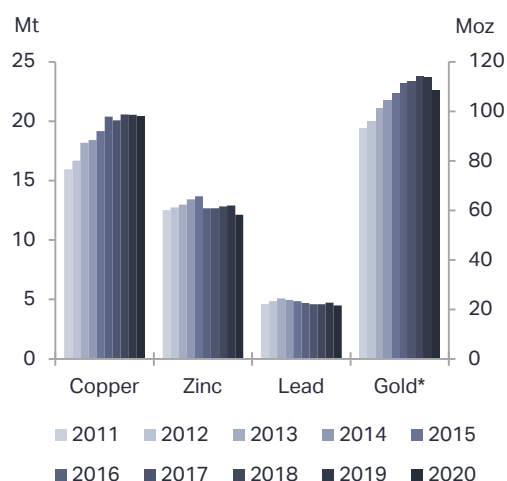
Source: Metals Focus

Other Regions

In Oceania, silver production grew by 1.3% y/y to 48.1Moz (1,496t), primarily due to a rise in output from **Australia**. Higher grades at Rosebery and increased throughput at Century Tailings helped push the country's production to 43.8Moz (1,362t), an increase of 2.8% y/y. Elsewhere in the region, production in **Papua New Guinea** declined by 10.3% y/y to 4.2Moz (132t) driven by lower silver output from Harmony's Hidden Valley as throughput and grade both fell year-on-year.

In the CIS, production fell by 2.1% y/y to 70.9Moz (2,205t). Planned lower grades at Dukat, Novosibirskoye and Omolon contributed to a 4.9% y/y decrease in production in **Russia** to 42.5Moz (1,323t). At Omolon, the lower grades are anticipated to continue moving forward. Silver output from Europe fell by 1.3% to 60.8Moz (1,892t). This was due to a 2.5% y/y drop in silver in concentrate production from KGHM's operations in **Poland**, alongside lower by-product silver output from base metal mines in **Sweden**.

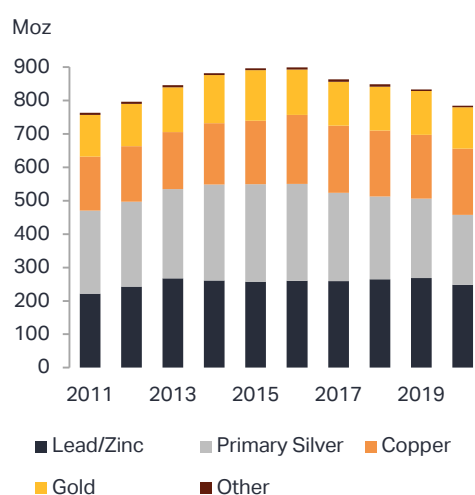
Global By-Product Production



*Gold in Moz, RHS

Source: ICSG, ILZSG, Metals Focus

Mine Production by Source Metal



Source: Metals Focus

By-Product Analysis

The majority of silver is produced as a by-product, with 73% of mined silver production in 2020 coming from lead-zinc, copper and gold mines. In 2020, COVID-19 related disruption led to year-on-year declines in global lead (-5.0%), zinc (-5.9%) and gold (-4.4%) production. Copper output was less impacted by the pandemic and remained almost unchanged year-on-year.

Lead-zinc mines are the biggest contributor to global mined silver supply, producing 248.3Moz (7,724t) of silver in 2020, 32% of the global total. China is the biggest producer of both lead and zinc, accounting for 44% and 34% of global mined output respectively in 2020. The COVID-19 pandemic led to temporary mine closures in China during February which resulted in year-on-year declines in Chinese lead (-1.8%) and zinc (-3.7%) output. This was the primary driver behind the 2.0% y/y drop in the country's silver production. Globally, silver output from lead-zinc mines declined by 7.4% y/y, largely due to COVID-19 disruption to mines in Central & South America and North America, alongside China.

Global **copper** output in 2020 was almost flat year-on-year, declining by just 0.1% to 20,517kt. The two biggest copper producing countries, Chile and Peru, both had lower output year-on-year. Chilean production fell by 1.0% to 5,732kt due to declining grades at several key mines, including Centinela and Los Bronces. Meanwhile, Peruvian copper output fell by 12.5% to 2,149kt due to COVID-19 disruption. However, these declines were offset by higher production from Indonesia, driven by rising grades at Grasberg, alongside higher output from the ramp-up of new projects such as Cobre Panama in Panama and Bystrinsky in Russia. Despite flat copper output year-on-year, by-product silver production from this source increased by 3.5% y/y to 198.3Moz (6,169t). This was due to higher silver output from copper mines in Chile, primarily from state-owned miner Codelco, whose silver production grew by 58% y/y to 24.6Moz (767t).

The 4.4% y/y drop in **gold** production was primarily due to temporary mine closures resulting from the COVID-19 pandemic. This led to lower gold production in countries such as Peru (-29.3%), South Africa (-9.5%) and Mexico (-9.1%). Meanwhile, output from Papua New Guinea declined by 27.6% y/y as Porgera, the second biggest gold mine in the country, was placed into care & maintenance in April following a dispute with the government concerning the renewal of its mining lease. As a result of these losses, silver output from gold mines fell by 5.7% y/y to 123.3Moz (3,834t).

Despite the on-going pandemic, miners have implemented procedures to protect workforces and continue production. This, combined with the global vaccine roll-out, should result in minimal disruption from COVID-19 to mining operations in 2021. As a result we expect production of lead, zinc, copper and gold, alongside associated silver production, to rebound strongly this year.

The Impact of COVID-19 on Silver Mine Supply

The COVID-19 pandemic had a huge impact on mined silver supply in 2020 and was the overwhelming cause of the 48.8Moz (1,518t) y/y decline in global output. However, the impact was actually greater than this as mined silver production had been expected to grow by 6.0Moz (186t) y/y in 2020 prior to the pandemic breaking out. Therefore lost silver production as a result of the pandemic can be estimated at 54.4Moz (1,704t).

China was the first country impacted by the virus and, although mining operations were mostly impacted in February, they began returning to normal production rates in March. The World Health Organization declared a global pandemic on March 12, 2020, and shortly after this several major silver producing countries, including Mexico, Peru and Bolivia, enacted lockdown policies which required mines to temporarily halt operations. Elsewhere, in countries such as Canada, restrictions varied between provinces or states, while in countries such as Australia and Russia production was able to continue as normal.

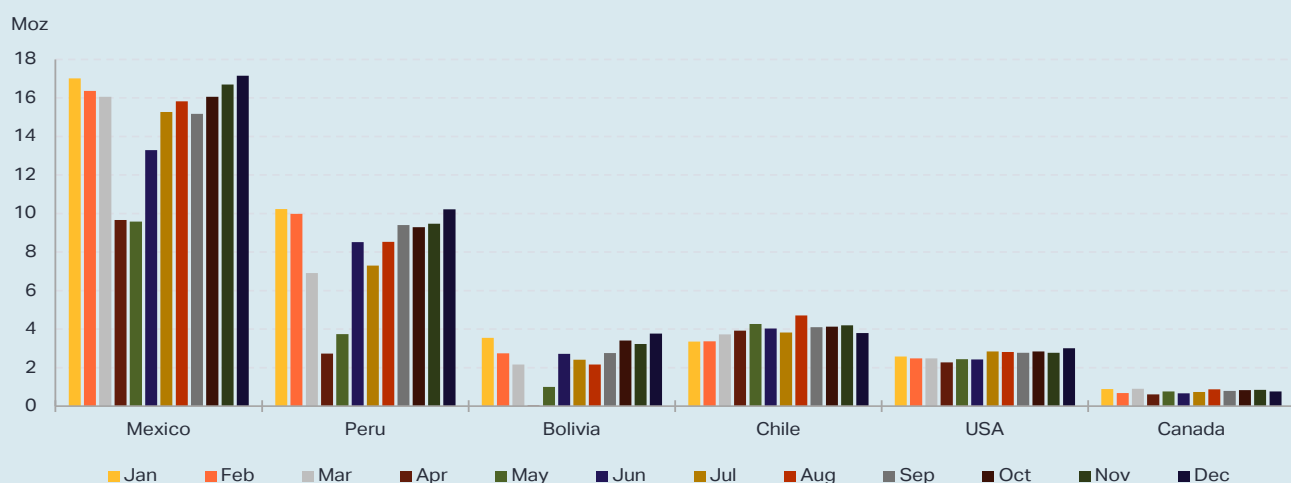
Countrywide restrictions impacting mining were lifted by end-May, with Mexico the last major silver producer to allow all mines to return to full production rates on May 30, 2020. Before returning mines to full capacity, operators put into place new

protocols to protect workers such as testing, quarantine, new mandatory personal protective equipment (PPE) and limiting staff numbers on-site. Implementing these measures, alongside isolated outbreaks at individual mine sites, slowed the return to full production rates in several countries. However, by the end of Q3.20 silver output from most major producers had returned to full capacity.

This timeline of events meant that the biggest impact of the COVID-19 pandemic on mined silver supply was in the first half of 2020. Geographically, output from Central & South America and North America was most heavily impacted due to temporary mines closures in countries such as Mexico, Peru, Bolivia and Canada. Meanwhile, output from other regions, such as the CIS and Oceania, was largely unaffected.

By the end of 2020, miners had successfully implemented strategies to mitigate the risk of outbreaks at their sites and were operating at full production rates. This, combined with the continued global roll-out of vaccines, suggests that COVID-19 related disruption to silver production will be minimal this year with mines able to operate at full capacity throughout 2021.

Monthly Reported Mined Silver Production in 2020



Source: Metals Focus, Country reported monthly mine production statistics

Primary Silver Production Costs

US\$/oz (by-product*)	2019	2020	Y/Y
North America			
Total Cash	4.03	3.57	-12%
All-In Sustaining	11.93	10.85	-9%
Central & South America			
Total Cash	7.52	9.42	25%
All-In Sustaining	13.13	16.14	23%
CIS			
Total Cash	9.12	7.64	-16%
All-In Sustaining	11.86	9.81	-17%
Asia			
Total Cash	-2.36	-0.17	na
All-In Sustaining	3.68	6.37	73%
Oceania			
Total Cash	2.02	1.20	-41%
All-In Sustaining	7.85	5.30	-32%
Global Total			
Total Cash	5.02	4.73	-6%
All-In Sustaining	11.61	11.17	-4%

* Costs shown on a by-product accounting basis.

Source: Metals Focus Silver Mine Cost Service

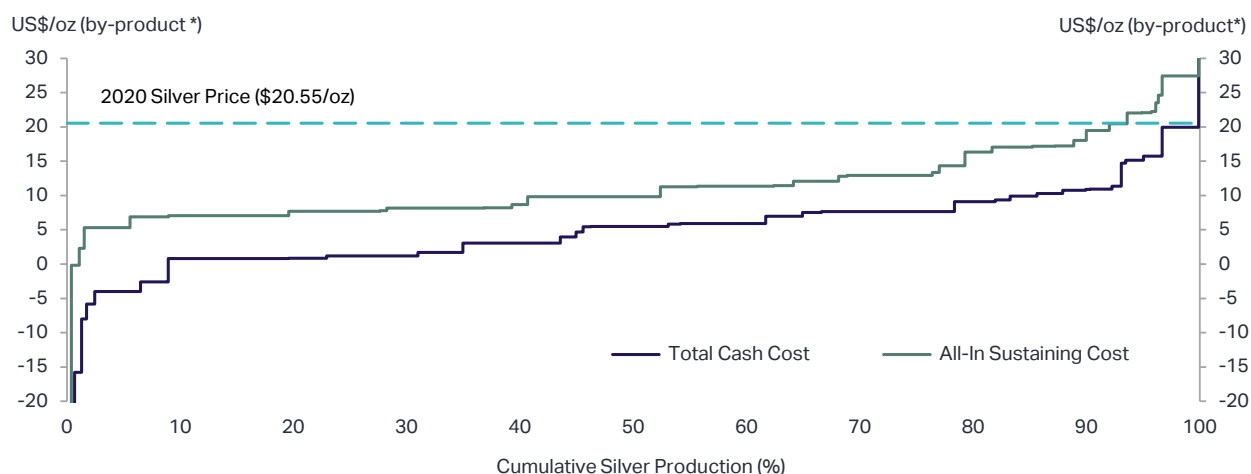
Primary Silver Production Costs

The cost analysis in this section covers roughly 75% of primary silver mine supply. These operations derive most of their revenue from silver over the life-of-mine. Primary silver mining total cash costs (TCC) dropped by 5.7% y/y to \$4.73/oz, while all-in sustaining costs (AISC) fell by 3.7% y/y to \$11.17/oz.

Temporary mine closures in the first half of 2020 as a result of the COVID-19 pandemic put upward pressure on unit costs, particularly during ramp-up and ramp-down phases between closure periods. Miners also incurred additional pandemic related costs from new procedures designed to protect their workforces such as testing and quarantine alongside supplementary PPE. However, these factors were offset by the weakening local currencies of key silver producing countries against the US dollar, higher by-product revenues and as falling oil prices fed through to lower on-site diesel costs.

Most silver mines are polymetallic in nature and often produce appreciable amounts of lead, zinc, gold and/or other metals. Revenue generated from these metals lower cash costs as by-product credits. Zinc and lead prices decreased by 10.9% and 8.6% respectively year-on-year, while the copper price increased by 3.0%. Revenues from zinc and lead production were further impacted by high treatment charges, which is the cost charged by a smelter to recover metal from concentrate. Zinc treatment charges were at a record-high of \$295/t, while lead treatment charges were at a two-year high of \$180/t. However, gold had the biggest impact on silver miners by-product credits in 2020; a 27.2% y/y rise in the gold price pushed by-product credits significantly higher and was a major reason for lower silver TCC and AISC.

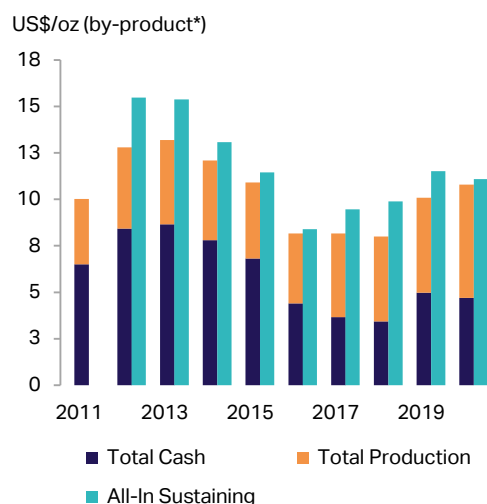
Global Primary Silver Mine Production Costs in 2020



* Cost shown on a by-product accounting basis.

Source: Metals Focus Silver Mine Cost Service

Global Production Costs



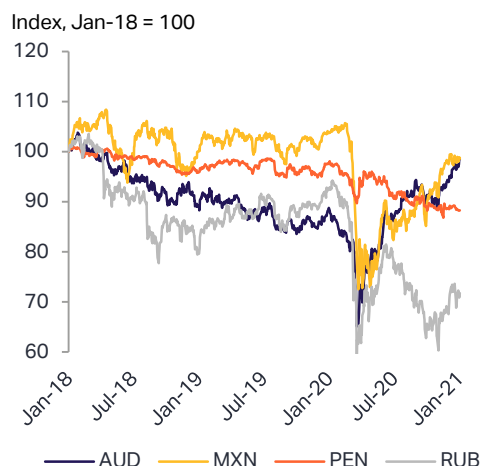
*Cost shown on a by-product accounting basis
Source: Metals Focus Silver Mine Cost Service

Looking ahead to this year, we expect COVID-19 disruption to ease significantly due to a combination of the global vaccine roll-out and new procedures implemented by miners to protect their workforces. This will allow the vast majority of silver mines to run at full capacity throughout the year which will push operating costs lower. By-product credits can be expected to increase year-on-year as lead, zinc and copper prices all rose strongly in the second half of 2020 and so far remain at elevated levels this year. Meanwhile, despite a recent pull-back, the gold price remains strong and is expected to stay high throughout the rest of the year. However, rising oil prices, which feed through to diesel prices, will exert some upward pressure on mine site costs. Meanwhile, rising margins for silver miners as a result of higher silver prices and lower costs will allow for greater discretionary sustaining capital expenditure which put upward pressure on AISC. Taken together, these factors are expected to lead to a fall in both TCC and AISC this year.

Regional Performances

Average TCC and AISC of primary silver mines operating in North America decreased to \$3.57/oz (-12.5%) and \$10.85/oz (-9.0%) respectively. This decline emerged despite temporary closures of silver mines in Mexico due to COVID-19 and was primarily driven by increased by-product credits from the higher gold price.

Exchange rates to US dollar



AUD - Australian dollar, MXN - Mexican peso, PEN - Peruvian sol, RUB - Russian ruble
Source: Bloomberg, Metals Focus

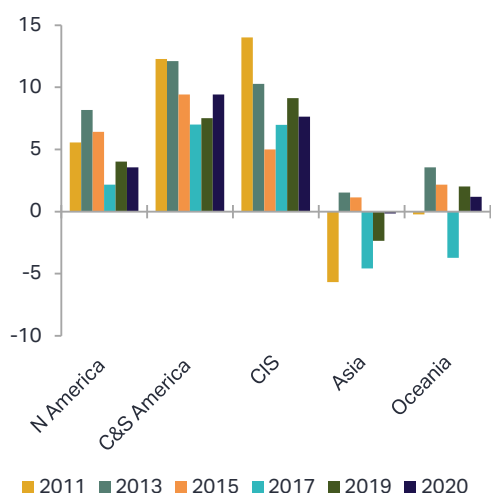
In Mexico, TCC averaged \$2.79/oz (-25.8%) and AISC averaged \$10.01/oz (-15.1%). Temporary mine closures as a result of the pandemic did put some upward pressure on costs. However, this was counteracted by an 11.6% y/y weakening of the Mexican peso to the US dollar alongside the closure of high-cost mines such as La Parrilla, San Martin and Del Toro in late 2019 and early 2020. Higher gold by-product credits and lower sustaining capital spending also contributed to declining TCC and AISC. This trend emerged at Fresnillo's biggest silver mine, Saucito, where TCC fell to \$0.80/oz (-65.2%) due to higher gold by-product credits and lower diesel costs. Meanwhile, reported AISC dropped to \$6.94/oz (-36.7%) due to lower sustaining capital expenditure.

In the US, at Hecla's Greens Creek mine TCC increased to \$5.49/oz (+178.7%) and AISC rose to \$8.57/oz (+43.1%). This was driven by an 87% rise in treatment charges, lower zinc and lead prices, decreasing by-product credits alongside higher costs for labor and equipment maintenance. Lucky Friday, also owned by Hecla, officially returned to full production in Q4.20, reporting TCC of \$9.34/oz and AISC of \$18.22/oz. In Canada, Coeur's Silvertip mine was suspended in February 2020 due to concerns over the economic viability of the project.

In Central & South America average TCC and AISC rose to \$9.42/oz (+25.3%) and \$16.14/oz (+22.9%), respectively. This was largely a result of disruption

Regional Total Cash Costs

US\$/oz (by-product*)



* Cost shown on a by-product accounting basis.

Source: Metals Focus Silver Mine Cost Service

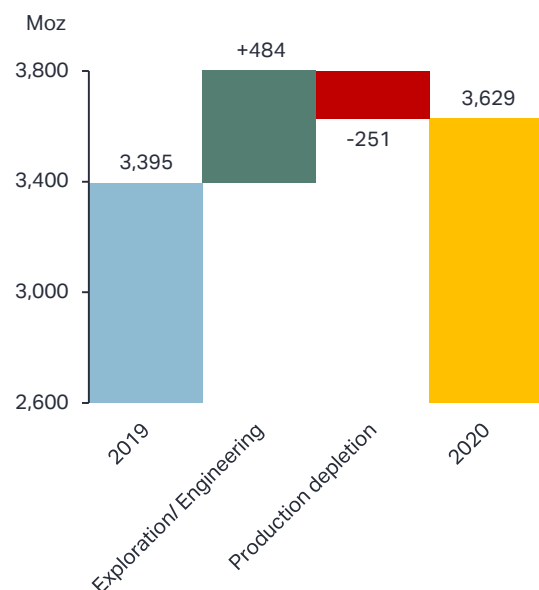
from the COVID-19 pandemic which led to temporary mine closures of silver mines in Peru, Bolivia and Argentina.

In Peru, Buenaventura's Uchucchacua had higher TCC and AISC in 2020 at \$19.95/oz (+106.5%) and \$28.45/oz (+86.4%), respectively. The significant cost increase was due to COVID-19 disruption which initially led to the mine temporarily halting operations, followed by a reduced workforce adversely impacting production volumes. This was exacerbated by lower prices for the mine's by-product lead and zinc output. In Argentina, SSR Mining reported a 8.3% rise in AISC to \$15.22/oz at its Puna operations. This increase was caused by two COVID-19 related stoppages during the year.

In the CIS, Polymetal's Dukat achieved lower TCC and AISC, which fell to \$7.64/oz (-16.2%) and \$9.81/oz (-17.2%), respectively. Dukat processed larger volumes of lower grade ore, but this was offset by an 11.8% y/y weakening of the Russian rouble to the US dollar and higher gold by-product credits due to increased price and production volumes. Capital expenditure also declined year-on-year, aiding the decline in AISC.

At South32's Cannington in Australia, TCC and AISC fell to \$1.20/oz (-40.7%) and \$7.70/oz (-1.9%), respectively. Improved underground mine performance supported efficient mill operations during the first half of 2020, which contributed to higher silver grades and lower unit production costs. This was partially offset by the planned surface maintenance in Q3.20.

Reserve Replacement – Primary Silver



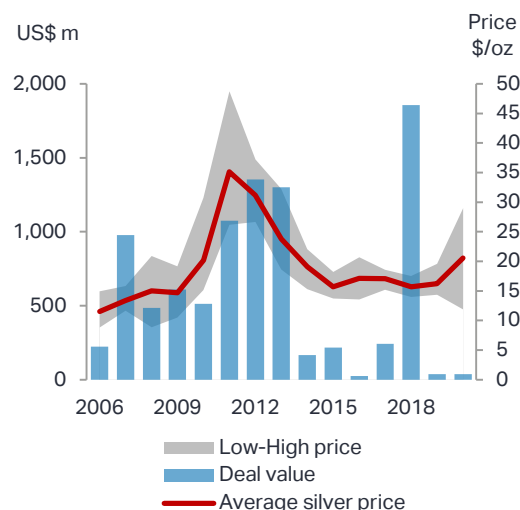
Source: Metals Focus

Reserves & Resources

Mineral ore reserves at primary silver mines significantly increased by 233Moz (7,252t), or 6.9%, y/y to 3,629Moz (112,864t) as new initial reserve estimates and resource conversion exceeded mining depletion. Total identified resources excluding reserves totaled 7,284Moz (226,551t), a decline of 2.3% y/y as resource conversions to reserves surpassed the delineation of new resources through exploration.

The extensive exploration program undertaken by Coeur Mining successfully added 68Moz (2,116t) and 9Moz (277t) to reserves at Rochester and Palmarejo, respectively, while also upgrading some of their inferred resources into measured and indicated. Infill drilling continues at the company's Silvertip Mine to further define the economic viability of the deposit. Initial reserve estimates at Polymetal's Prognoz (+142Moz, 4,423t) and the recently public-listed Gatos Silver's Cerro Los Gatos (+95Moz, 2,943t) significantly added to global primary silver reserves. These increases greatly offset reserve depletion from mine extraction across the industry, such as at Hecla's Greens Creek (-19Moz, 607t), Polymetals' Dukat (-10Moz, 319t) and Pan American Silver's Dolores (-9Moz, 283t).

Value of Completed Deals



Values aggregated in year deals are announced
Source: Bloomberg

Corporate Activity

The value of completed merger and acquisition activity in the primary silver sector was flat year-on-year in 2020 at just US\$38m from 12 deals. However, a number of transactions announced in the second half of last year which have yet to be completed are excluded from this total. The proposed value of these pending transactions is sufficient, should enough be completed, for the value of merger and acquisition activity in 2020 to eventually surpass 2019 levels. However, the low value of these pending transactions means that the eventual total will remain modest.

The COVID-19 pandemic meant that most silver producers were focused on managing the impact of the pandemic on their operations, rather than growing their companies through mergers and acquisitions. Activity did pick up in the second half of the year, although transaction values were low and focused on the junior sector. For example, in September, Southern Silver Exploration completed a US\$15m transaction to acquire the remaining 60% share of its Cerro Las Ministas project in Durango, Mexico. Meanwhile, in November Thomson Resources announced a deal, initially valued at US\$8.6m, for the Webb and Conrad silver projects in New South Wales, Australia. This deal was subsequently completed on March 31, 2021.

The most significant corporate activity in the silver mining industry in 2020 occurred outside of mergers and acquisitions. Gatos Silver completed its initial public offering on November 2, 2020, and began trading on the NYSE and TSX. Gatos Silver is the majority owner of the Cerro Los Gatos mine in Mexico, which began production in September 2019 and reached design capacity by end-2020. The mine is expected to produce 7.8Moz (243t) of silver in 2021 which would make it one of the top 20 silver mines in the world.

Hedge Book Composition*

Million ounces	2019	2020	Y/Y
Forwards	3.9	5.8	48%
Options	27.6	34.2	24%
Total	31.5	40.0	27%

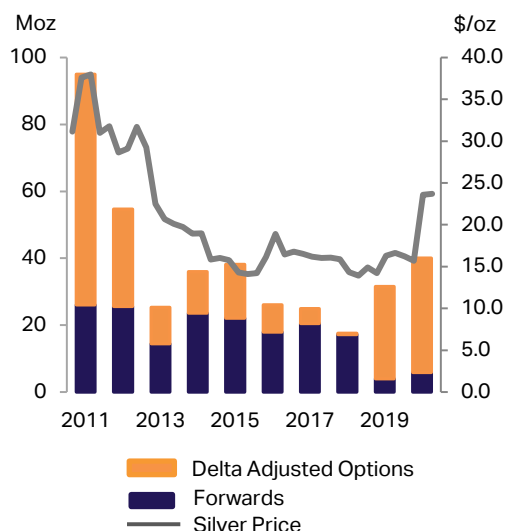
* Delta-adjusted positions at end-period
Source: Metals Focus

Producer Hedging

Silver producers continued to add to their hedge books during 2020. We estimate that the global delta-adjusted hedge book increased by 26.9% y/y to 40.0Moz (1,244t). Forwards increased by 48.4% y/y to 5.8Moz (182t) and options by 23.9% y/y to 34.2Moz (1,062t).

Hedging activity in H1.20 was relatively subdued, with only Minera Frisco and Peñoles taking out new positions. This changed substantially in Q3.20 as producers took advantage of the rising silver spot price to enter into new positions that expanded the hedge book by 34.4Moz (1,071t). Peñoles remained the leading hedged silver producer in 2020. At the end of the year, it held outstanding options for 25.8Moz (803t) with strike prices for the puts and calls of \$17.53/oz and \$25.63/oz respectively. Forward contracts increased to 4.2Moz (130t) at \$26.74/oz for forward sales and 1.76Moz at \$27.00/oz (55t) for forward buys. These contracts cover approximately 40% of expected 2021 production.

Hedge Book Evolution*



* Delta adjusted position at end-period

Source: Metals Focus

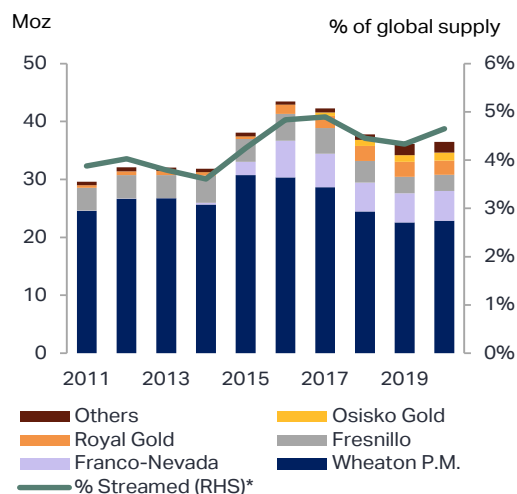
KGHM Polska Miedź significantly increased its hedge book during Q3.20 entering into a seagull contract, two put options and a call, covering production out to Q4.23. At year-end, outstanding positions stood at 24.6Moz (765t) with average strike prices of \$16.00/oz for the sold puts, \$26.50/oz for the bought puts and \$42.50/oz for the sold calls.

Harmony increased its zero cost collar contracts for Hidden Valley in Q3.20. By year-end, these positions stood at 2.3Moz (72t) with average floor prices of \$19.51/oz and average cap prices of \$21.32/oz. These positions cover approximately 30% of production to Q4.22. Hecla also added to their options positions during 2020. Year-end put options stood at 1.1Moz (34t) with a strike price of \$16.50/oz. Finally, Minera Frisco increased their forwards position during the year. Based on expiry dates, the estimated final hedge book position for 2020 was 3.4Moz (106t) with an average strike price of \$19.00/oz.

Silver Streaming

Silver produced covered by streaming and royalty contracts remained little changed in 2020, rising by 1.0% or 0.3Moz (11t) y/y in 2020. This increase contrasted with the decline in global mine supply and was a result of higher output from Peñasquito, for which Royal Gold holds a royalty and Wheaton Precious Metals retains a stream.

Silver Royalty and Streaming



Percentage of global mine supply covered by royalty and streaming agreements.

Source: Metals Focus

Major deals for ounces in production remained scarce, unsurprising as activity in the space is typically counter-cyclical to metal prices. As occurred in the low price environment of 2015/16, miners often turn to royalty and streaming to secure funding when other sources of finance are limited. In contrast, last year higher revenues have driven free cashflow, increasing funding options for those miners who have predominately not needed to turn to streaming and royalties in order to secure project financing and de-stress balance sheets. With limited new deals, the almost flat streamed production in 2020 was a result of less disruption at Peñasquito, following the blockade in 2019, and additional volumes from project development balancing losses from the impact of COVID-19 and declining reserve grades. Wheaton Precious Metals acquired a stream covering 100% of the silver production from Aris Gold's Marmato, which is planning an expansion, for \$110m. The company also acquired a stream for 50% of the silver production from Capstone Mining's Cozamin for \$150m. Franco-Nevada acquired a 1% net smelter return royalty on SolGold's Alpala project for \$100m.

Four new royalty companies entered the market in 2020. Although each has a different value proposition, their general corporate strategy is to seek value in smaller deals that the majors may not consider. However, the higher cost of capital these companies will often experience may limit their growth potential. As a result they will likely struggle to gain significant market share from the majors. However, the market in acquiring third-party royalties has now become more competitive.

Chapter 5

- Silver recycling in 2020 increased by 7% to a seven-year high.
- Most of the increase came from price-driven gains in Indian jewelry and silverware scrap.
- Industrial scrap also rose but only slightly, while photographic and coin scrap fell.
- Total recycling in 2021 is forecast to rise by 8% thanks to yet higher silver prices and an easing of COVID disruption.

Recycling

Introduction

Global silver recycling in 2020 rose a notable 7% to a seven-year high of 182.1Moz (5,665t). Much of this increase came from jewelry and silverware, with India providing the bulk of these gains and whose growth was primarily the result of higher silver prices. Scrap from industrial sources also rose, in part because of gains in the recycling of ethylene oxide (EO) catalysts and despite the disruption to refining cycles elsewhere stemming from the COVID pandemic. In contrast, photographic scrap fell slightly due to ongoing structural losses, while coin scrap also eased.

Recycling in 2021 is forecast to grow at a slightly faster pace of 8% as further strong, largely price-driven, gains for jewelry and silverware are joined by growth in the other sectors, in part the result of fewer COVID restrictions.

Industrial

Industrial scrap in 2020 saw its sixth consecutive annual rise, with growth of 2% to 102.7Moz (3,193t). That small change masks divergent results between countries, however; India and Europe registered losses while East Asia saw gains for example. These gaps were typically due to varying levels of COVID disruption. Electronics recycling in the West for instance fell as businesses held off from replacing obsolescent equipment and as consumers were unable or unwilling to recycle old equipment. In China, however, electronic scrap swung to gains during the year as the government and IT companies supported consumer recycling. One segment that saw growth was the recycling of EO catalysts due scheduled end-of-life changeouts, and this field looks sufficient to have lifted total industrial recycling in North America. Volumes overall were also helped by higher prices, which encouraged greater attention to waste disposal, while factory closures for some freed up time for housekeeping and the clearing out of material that was no longer needed.

Further gains in EO recycling in 2021, plus higher prices and an easing of COVID restrictions, should feed through to growth in other areas and for most countries, with total industrial scrap forecast to rise by 7% this year.

Jewelry

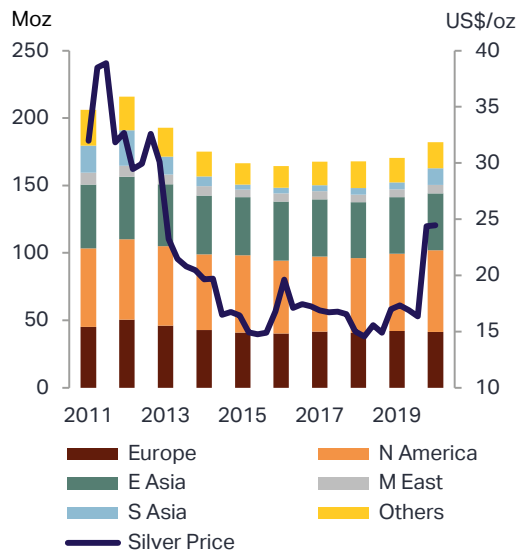
Jewelry recycling surged by 30% in 2020 to an eight-year high of 31.2Moz (971t). Over 70% of all gains came from South Asia, where growth was driven by inventory melt by retailers as a result of COVID damage and also by higher silver prices. There was, however, little distress selling by consumers. Gains in the rest of the world were smaller at just 5%. Increases were typically driven by higher prices, rather than distress selling, although it is worth noting that inventory melt also appeared modest. Jewelry recycling in western countries was also hit by the impact of logistical restrictions on the

Global Recycling Forecast, by Region

Million ounces	2020	2021F	Y/Y
Europe	41.3	43.7	5.7%
North America	60.6	66.7	9.9%
Middle East	6.3	7.6	20.9%
South Asia	12.4	14.9	19.9%
East Asia	42.1	42.3	0.5%
CIS	10.8	11.7	8.4%
Other	8.6	9.4	9.3%
Global Total	182.1	196.2	7.7%

Source: Metals Focus

Global Recycling



Source: Metals Focus, Bloomberg

refining chain, while Chinese recycling remained constrained by high margins on many products. Selling back in Turkey actually fell as economic and political instability plus a fast depreciating lira curtailed the selling back of precious metals. Volumes worldwide this year are forecast to rise by a robust 12% due to a mix of higher prices and inventory melt plus modest distress selling, with almost all countries expected to see gains.

Silverware

Silverware scrap in 2020 also grew strongly, up 17% to a six-year high of 23.8Moz (740t). The bulk of the rise again came from South Asia and through higher silver prices. Recycling elsewhere in the world was up a modest 2%, but results were quite varied. Some countries saw losses due to logistical disruption, especially in the first half. Others in contrast saw full year growth, typically through gains in the second half due to higher prices. Distress selling was limited and this, in conjunction with depleted near-market stocks, helps explain why volumes from this rest of world grouping were around half those of their 2011 peak. Global volumes are forecast to grow by a further 13% this year thanks to yet higher prices and, perhaps more importantly, the easing of COVID-related restrictions, right through from refining operations to the ability (and willingness) of consumers to visit collectors.

Photography

Photographic recycling fell by a modest 2% in 2020 to 21.1Moz (656t). The fact that we saw a further decline and yet another new low for our series (going back to 2010) reflects the structural decline in the traditional silver halide business caused by the switch to digital. It is of note, however, that the drop was notably smaller than the 2011-19 average of 7%, even with the disruption to logistics that the pandemic caused. That this occurred points to the incentivization of recycling by higher silver prices, particularly in the dominant sector of old x-rays. We should not forget that most refineries handling this material were able to stay open for almost all last year, being deemed essential businesses. Yet higher prices in 2021 are forecast to generate a temporary reversal of structural losses, with a 1% rise expected.

Recycling, by Source

Year on Year

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021F	2020	2021
Industrial	93.1	92.5	87.8	90.7	91.0	96.0	98.5	101.0	102.7	109.5	2%	7%
Photographic	37.4	33.8	30.9	28.4	26.2	24.4	23.0	21.6	21.1	21.3	-2%	1%
Jewelry	41.0	31.1	26.3	22.5	23.4	23.3	23.3	24.1	31.2	34.8	30%	12%
Silverware	38.1	29.4	25.2	21.4	20.5	20.4	19.7	20.4	23.8	27.0	17%	13%
Coin	6.4	5.8	4.8	3.5	3.3	3.8	3.3	3.4	3.4	3.6	-1%	7%
Global Total	216.0	192.7	175.0	166.5	164.5	167.8	167.8	170.5	182.1	196.2	7%	8%

Source: Metals Focus

Recycling

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Germany	17.7	15.9	14.8	14.5	14.3	14.3	14.2	14.8	15.1	15.3	1%
UK	7.5	6.9	6.9	6.7	7.0	7.1	7.9	7.6	8.4	7.7	-8%
Italy	8.9	10.1	8.1	6.6	5.8	5.5	5.2	5.0	5.1	4.8	-5%
France	4.9	5.7	5.0	4.3	3.8	3.4	3.2	3.1	3.1	3.1	1%
Others	12.3	11.7	11.3	10.7	10.0	10.0	11.1	10.1	10.3	10.3	0%
Sub-total	51.4	50.4	46.1	42.8	40.9	40.3	41.7	40.7	42.1	41.3	-2%
CIS											
Russia	11.7	11.5	9.9	8.0	6.7	6.5	7.9	10.0	8.5	9.3	10%
Others	3.1	3.1	2.3	1.8	1.4	1.4	1.4	1.5	1.5	1.4	-2%
Sub-total	14.8	14.6	12.2	9.8	8.1	8.0	9.3	11.4	10.0	10.8	8%
North America											
United States	62.5	53.0	53.3	51.4	53.2	49.9	51.5	51.4	53.4	56.5	6%
Others	8.0	6.6	5.6	4.7	4.1	4.1	4.0	4.0	4.0	4.1	2%
Sub-total	70.5	59.7	59.0	56.1	57.3	53.9	55.5	55.4	57.4	60.6	6%
Middle East											
Turkey	4.5	4.1	3.7	3.4	2.5	2.5	2.5	2.7	2.7	2.5	-7%
Others	4.4	4.0	3.8	3.7	3.0	3.5	3.5	3.0	3.2	3.8	20%
Sub-total	8.9	8.1	7.4	7.1	5.5	6.0	6.0	5.7	5.9	6.3	7%
South Asia											
India	18.9	21.7	10.8	6.0	3.1	3.4	3.6	4.0	4.2	10.1	144%
Others	4.0	4.6	2.3	1.3	0.7	0.7	0.8	0.9	0.9	2.2	152%
Sub-total	22.9	26.3	13.1	7.3	3.8	4.1	4.4	4.8	5.0	12.4	145%
East Asia											
China	28.5	25.0	24.4	24.0	25.0	24.3	23.6	23.2	23.6	23.8	1%
Japan	12.0	11.2	11.4	11.0	11.0	11.4	11.4	10.9	10.5	10.0	-5%
Taiwan	4.8	4.1	3.5	3.3	2.6	3.0	2.8	2.6	2.9	2.9	2%
Others	6.6	6.2	6.4	5.2	4.6	5.3	4.7	4.7	4.9	5.4	11%
Sub-total	52.0	46.5	45.7	43.5	43.3	43.9	42.5	41.4	41.8	42.1	1%
Other Regions											
C&S America	5.9	4.8	4.0	3.5	3.1	3.4	3.5	3.6	3.6	3.8	6%
Africa	3.6	3.3	3.0	3.0	2.8	2.8	2.9	2.8	2.9	3.0	6%
Oceania	2.5	2.4	2.3	2.1	2.0	2.0	1.9	1.9	1.9	1.7	-10%
Sub-total	12.0	10.4	9.2	8.5	7.8	8.2	8.3	8.3	8.4	8.6	2%
Global Total	232.4	216.0	192.7	175.0	166.5	164.5	167.8	167.8	170.5	182.1	7%

Source: Metals Focus

Chapter 6

- The pandemic had a dramatic impact on the silver bullion trade in several key centers.
- UK exports last year rose to their highest since 2008, driven by a surge in shipments to North America.
- A record high for US imports was largely to satisfy increased COMEX deliveries, while Canadian imports also posted a record total.
- In sharp contrast, Indian bullion imports slumped to a multi-decade low, due to weaker demand and investor liquidations.

Bullion Trade

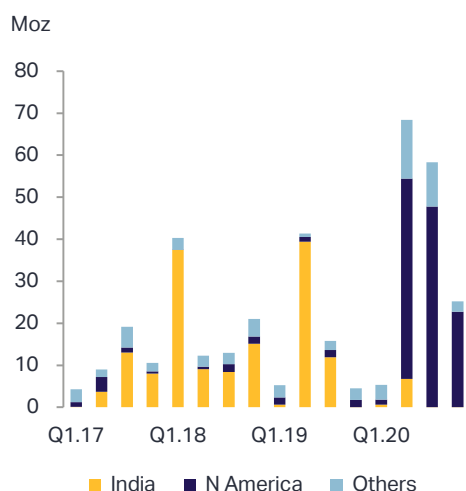
Introduction

The impact of the pandemic on the global silver market has been much discussed in this report and arguably one of its more palpable effects was on silver bullion flows, even though sea freight was largely unaffected. In particular, the combination of temporary mine closures in the likes of Mexico, Peru and Bolivia, together with strong investor demand in the US and the need for bullion in Canada, saw the latter two achieve record high silver bullion imports in 2020. The London market played a key role in supplying both markets, which contributed to UK bullion exports achieving a 12-year high. The jump in investment demand also underpinned gains in the silver price, which were exacerbated in India by a weak rupee that drove domestic prices to new highs. This, together with localized restrictions, had a pronounced impact on the country's imports which fell to multi-decade lows.

Europe

London and Switzerland are pivotal to the global silver market, being home (respectively) to the biggest identifiable stock of silver bullion and sizable silver refining capacity. As the pandemic unfolded, and with it demand for large bars in the US and Canada, stocks that were held in London were quickly mobilized. From just 0.6Moz (18t) of deliveries in March last year, combined UK exports to the above two ramped-up, peaking at 29.3Moz (910t) in June. For the year as a whole, Canada took 81.0Moz (2,519t) from the UK, and the US a further 38.3Moz (1,192t) from the UK.

UK Bullion Exports*



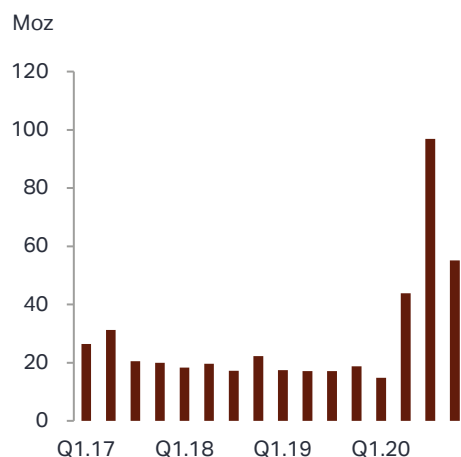
Source: Metals Focus, IHS Markit. *Gross weight

Three other developments in London were noteworthy last year. First, the slump in demand in India led to a collapse in its imports from the UK to just 7.4Moz (232t), a drop of 86%. Second, UK shipments to Switzerland jumped, to help meet the shortfall caused by weaker Swiss silver imports, either from mining operations that had temporarily closed or from those gold mines (containing by-product silver) impacted by air freight restrictions. Finally, the UK became a net bullion exporter for the first time since 2008, with London vaults seeing a net outflow of 43.4Moz (1,349t) during 2020. As significant as this development was last year, it assumed more importance during early 2021, as a rising share of silver bullion held in London was allocated to ETPs.

North America

The pandemic affected North American silver bullion trade in several ways. Perhaps most high profile was the impact in the US on the exchange for physical (EFP) premium, which jumped to unprecedented levels (see the Investment chapter for more on this). This quickly resulted in huge demand for silver to deliver into COMEX-approved depositories. At the same time though, two other issues were playing out. First, some North and South American mines had been forced to temporarily close, which hit shipments

North American Bullion Imports*



Source: Metals Focus, IHS Markit. *Gross weight

into the US. Second, US industrial demand remained healthy (some end-users had been deemed an essential service), while physical investment had surged. As a result, 4-9 premiums jumped as suppliers raced to secure metal. As a result, US imports from non-traditional sources ramped-up, including from Poland, Russia, South Korea and Kazakhstan. In total, US imports rose by 38% y/y to a record total last year of 231.5Moz (7,200t). Canadian imports also surged by 227% y/y in 2020 to 82.0Moz (2,552t). This reflected exceptionally strong ETP demand and coin and bar fabrication and, at the margin, the impact of COVID-19 on the country's mine production (trade data for the US and Canada are on a gross, rather than fine silver basis).

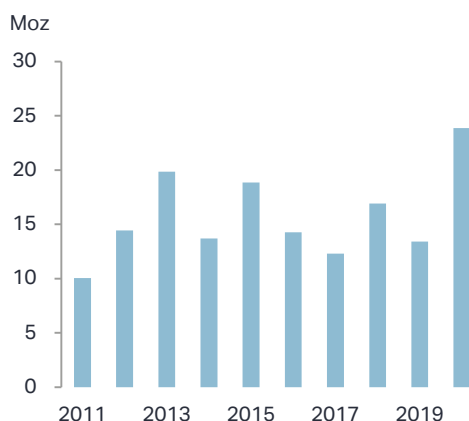
Middle East

Middle East bullion exports jumped by 83% in 2020, having halved the previous year. This recovery was almost all due to a tripling of Turkish exports as a result of a significant rise in shipments bound for the US, Singapore and Switzerland. Middle East bullion imports also grew, by 78% as a surge in Turkish imports was accompanied by firmer UAE imports. As for 2021, we forecast a meaningful fall in both exports and imports, due to expectations of lower Turkish physical investment and the use of existing trade stocks, which will be mobilized to meet local demand rather than being exported.

South Asia

Indian silver imports (covering bullion and semi-manufactured forms) fell by 63% to 71.3Moz (2,218t) last year, recording its steepest fall since 2016. This is also only the fourth time in two decades that imports have slipped below 80Moz (2,500t). The drop in bullion imports specifically (-88%) was even more remarkable and it is the only time that these imports have fallen below 32Moz (1,000t) since the turn of the millennium.

Middle Eastern Bullion Imports

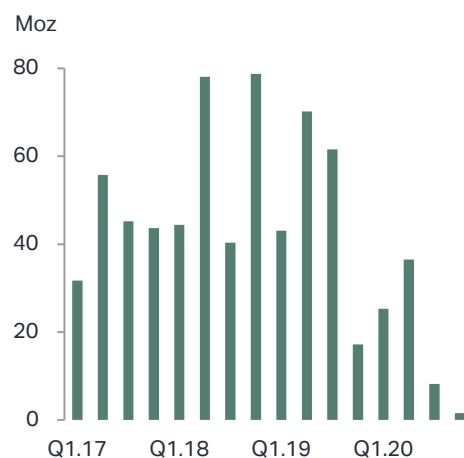


Source: Metals Focus, IHS Markit

The fall in imports should be viewed in the context of the pandemic and rising silver prices. Even though shipments weakened throughout 2020, the drop in the first half was less severe, with a 47% y/y fall to 61.8Moz (1,921t). Our discussions with key importers revealed that most believed the lockdown would be short-lived, with silver demand expected to quickly recover once restrictions were eased. It is also worth noting that, with most silver bullion imported via sea freight, shipping lines remained unaffected, as restrictions only applied to airlines. In sharp contrast, second half imports slumped, by 88% to just 9.4Moz (294t). This reflected the collapse in demand as the pandemic spread. In addition, rupee prices hit record highs and the investor liquidations that emerged further reduced the need for bullion imports.

The combination of a slowdown in demand and investor selling back meant that most of the silver imported in the first half remained unsold, sitting in bonded warehouses. Overall, we estimate that some 42-51Moz (1,300-1,600t) of stock remained in the free trade and warehousing zones (FTWZs), commodity exchanges and vaults across the country at the end of the year.

Indian Bullion Imports*



Source: Metals Focus, IHS Markit. *Gross weight

While some of this material would have been used in 2021, we may not see a recovery in imports until a meaningful reduction in stock emerges.

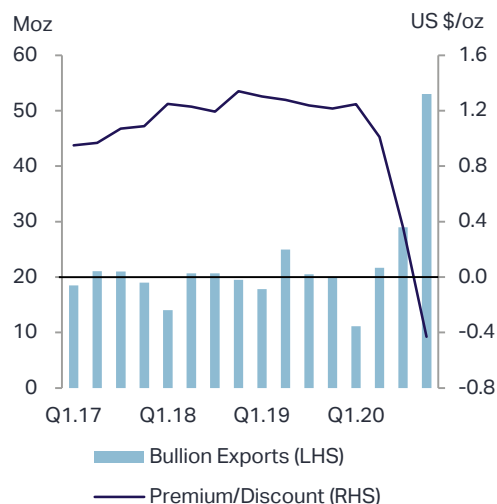
Looking at the import composition, the majority (93%) was delivered into the Sri City and Kandla FTWZs, although the latter (which opened in 2019) has seen its share rise from 12% that year to 36% in 2020. As for the origins of this bullion, nearly half arrived from Hong Kong, followed by the UK (15%) and Russia (12%). Interestingly, only Russia gained market share last year.

East Asia

China has traditionally been a net exporter of silver due to its structural oversupply in the local market. In part, this is fueled by the large volume of refined silver produced both from the processing of imported base metal concentrates and also from its own mines, whose silver output ranks third globally. Last year, the country's net silver exports were further buoyed by strong base metal prices and the local silver price's discount to London.

As a result of the VAT treatment of silver (13% is levied on the total value of silver products), local silver prices listed on the Shanghai Gold Exchange (SGE) and Shanghai Futures Exchange (SHFE) usually trade at a premium to London. However, since last August, domestic prices have been at a discount, from \$0.1-1.3/oz. The main driver has been the growth in Chinese silver inventories; the SGE and SHFE reported silver stocks at end-2020 of 130Moz (4,044t, up 20% y/y) and 95Moz (2,961t, up 51% y/y), respectively.

Chinese Bullion Exports*



Source: Metals Focus, IHS Markit. *Gross weight

Mainland China's silver bullion imports fell by 13% y/y to 6.2Moz (192t) for two reasons. First, refining of imported base metal concentrates rose last year, but with demand weaker there was less need to import refined silver. Second, the local price discount discouraged the manufacture of imported bullion into products for re-export (known as a "processing trade" the imported bullion is no longer subject to VAT). Meanwhile, as many local refineries are LBMA-accredited, the sizable price discount encouraged several to mobilize locally-held silver and have this delivered into London. This left the country's silver bullion exports up by 38% y/y in 2020 at 115Moz (3,572t). The majority of this metal was shipped to Hong Kong, which rose by 39% y/y to 114.5Moz (3,560t).

Hong Kong's reported bullion imports rose by 1% to 55.4Moz (1,722t) in 2020, even though imports from mainland China declined by 8% to 34.8Moz (1,083t). The massive discrepancy between that figure and what China reported as exports into Hong Kong suggests that some metal is probably not recorded by Hong Kong customs as it is not the final destination. This can be inferred from the data on silver bullion exports, which jumped by 46% y/y to 134.9Moz (4,197t). The growth was mainly due to the shipments to the UK reaching 42.4Moz (1,319t). The UK, which imported no silver from Hong Kong in 2018 and 2019, replaced India as the largest silver importer in 2020. Shipments to India recorded a third consecutive annual fall, down by 47%.

Chapter 7

- Industrial silver fabrication slipped by 5% to a 5-year low of 486.8Moz (15,142t) in 2020. The chief cause was the COVID pandemic with high silver prices of limited impact.
- Europe, China and even more so India faced losses, while the US and Japan saw gains.
- Industrial offtake is forecast to rise by 8% in 2021 to a record high as economies re-open and through green energy initiatives.
- Photographic demand fell by a steep 16% in 2020 as fewer general hospital visits led to lower end-use in conventional x-rays.

Industrial & Photography

Industrial Demand

Introduction

Industrial silver demand fell by 5.4% to a five-year low of 486.8Moz (15,142t). Unsurprisingly, this drop was overwhelmingly due to the COVID-19 pandemic and its direct impact on activity (such as factory closures for silver end-users) and its indirect influence, driving a 3.3% fall in global GDP. In comparison, the 27% rise in the annual average silver price had only a marginal impact. The results on a regional basis varied notably, with Europe suffering the largest fall (-8%) due mainly to more stringent lockdowns, while North America rose by 2%, chiefly through higher demand for photovoltaic (PV) cells and ethylene oxide (EO) catalysts. East Asia fell 4%, driven mainly by losses in China which in turn were to the benefit of Japan and Taiwan. Offtake in India fell a marked 29% as its price sensitive segments were hit by silver's rally. On a sectoral basis, electronics & electrical demand dropped a modest 4% as gains for PV offset losses elsewhere closer to brazing alloy's -11%. Other industrial offtake in turn fell 7% as a strong showing for EO catalysts only partially countered India's heavy losses in this segment.

We are forecasting an 8% rise this year for global industrial demand to a record high for our series (dating back to 2010). Much will come from a re-opening of economies, although still limited thrifting and substitution and investment in green energy solutions (mainly PV) are also important.

Europe

Industrial silver offtake in Europe fell by 8% to a four-year low of 74.7Moz (2,325t) in 2020, with most countries seeing losses similar to the regional average. Unsurprisingly, the key driver here were COVID restrictions and disruption. Even if a fabricator were able to remain open, perhaps only closing for a day or so as new practices were adopted, many OEMs faced much lengthier closures. Most factories in Italy for example were shut from March 20 to May 5. Even when all were open, parts and labor shortages still led to notable losses in silver end-use. That said, demand saw a strong recovery in the second half (versus the first) as economies re-opened.

One aspect of the re-opening that is worth noting is reports of a rising number of home renovations (in particular air-conditioning units) due to greater home working. Offtake was also helped by limited sign of thrifting or substitution, in part as the silver price was insufficiently high to trigger intensive programs to minimize silver use (and not forgetting that dollar weakness from June onwards took the edge off the price rise in euro terms). One important end-use that is worth singling out is vehicle production. This

Global Industrial Demand Forecast

Million ounces	2020	2021F	Y/Y
Europe	74.7	79.8	7%
North America	131.1	141.5	8%
South Asia	26.7	36.6	37%
East Asia	240.0	251.1	5%
Others	14.2	15.1	6%
Global Total	486.8	524.0	8%

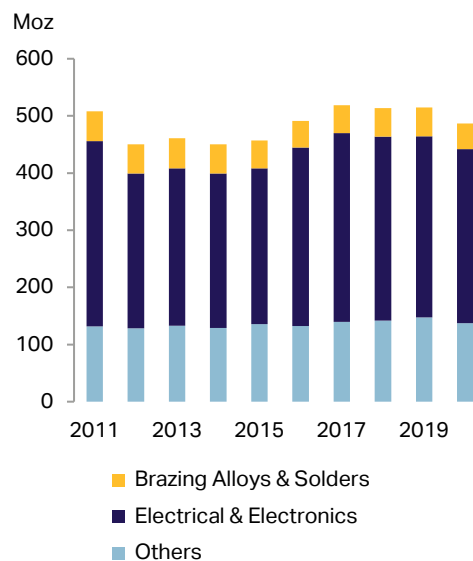
Source: Metals Focus

Industrial Demand

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Germany	32.0	28.6	28.9	29.4	28.9	29.1	30.1	31.2	31.0	29.2	-6%
United Kingdom	12.8	13.8	13.9	14.5	12.7	13.2	16.6	16.6	19.0	17.7	-7%
France	10.4	9.5	9.5	9.1	8.6	8.4	8.7	9.1	9.3	8.5	-9%
Italy	8.8	8.4	8.3	8.5	8.5	8.4	8.7	9.1	9.2	7.9	-14%
Others	12.7	12.0	12.6	12.2	11.9	12.0	12.4	12.7	12.7	11.4	-10%
Sub-total	76.6	72.4	73.1	73.7	70.7	71.2	76.5	78.7	81.2	74.7	-8%
North America											
United States	150.6	114.3	107.8	96.2	103.1	119.5	124.2	126.7	123.0	126.2	3%
Others	5.7	5.7	5.8	4.6	5.7	6.0	5.6	5.7	5.9	5.0	-16%
Sub-total	156.3	120.0	113.6	100.8	108.8	125.5	129.9	132.4	128.9	131.1	2%
South Asia											
India	48.3	44.0	40.3	37.9	35.7	35.9	37.3	40.2	37.8	26.7	-29%
Sub-total	48.3	44.0	40.3	37.9	35.7	35.9	37.3	40.2	37.8	26.7	-29%
East Asia											
China	85.4	85.6	92.3	97.3	100.2	105.0	117.4	121.3	121.3	111.4	-8%
Japan	84.6	73.4	86.7	87.0	90.5	104.6	108.7	93.6	99.1	99.9	1%
South Korea	20.6	21.9	22.2	20.2	19.0	18.0	19.1	19.1	18.4	17.4	-5%
Taiwan	12.2	11.1	10.5	10.5	10.2	10.0	9.4	9.7	8.8	9.0	2%
Others	1.0	1.0	1.3	1.0	1.8	1.4	1.3	1.5	2.0	2.2	13%
Sub-total	203.7	193.1	213.0	216.1	221.6	239.0	255.8	245.2	249.5	240.0	-4%
Other Regions											
C&S America	7.7	6.6	6.7	7.0	6.9	7.2	6.5	3.9	4.3	3.1	-28%
Middle East	6.1	5.6	6.0	6.9	6.4	5.8	6.0	6.0	5.7	5.2	-9%
Oceania	4.5	4.6	4.4	4.4	4.3	4.4	4.2	4.4	4.5	3.6	-20%
CIS	3.7	3.0	2.4	1.9	1.5	1.6	1.6	1.7	1.8	1.5	-15%
Africa	1.1	1.2	1.4	1.3	1.0	0.9	0.9	1.0	1.0	0.9	-15%
Sub-total	23.1	21.0	20.8	21.5	20.1	19.9	19.3	16.9	17.2	14.2	-17%
Global Total	508.1	450.5	460.8	450.0	457.0	491.5	518.7	513.4	514.6	486.8	-5%

Source: Metals Focus

Global Industrial Demand



Source: Metals Focus

fell by a steep 23% last year in Europe as COVID shuttered factories and undermined consumer spending and sentiment. There was at least some support from the doubling in output of battery-electric vehicles (BEVs) and the 89% rise for hybrids, all of which have a much higher silver loading than do vehicles with an internal combustion engine.

We are forecasting a rebound of 7% this year as economies reopen, even if more a second half event, and despite high silver prices. It is too soon to expect much from newer areas, such as pastes for flexible screens, but booming BEV and hybrid output and rising vehicle sophistication will help.

North America

North American industrial silver demand in 2020 rose by 2% to 131.1Moz (4,079t). This might surprise given the pandemic's disruption to economic activity. However, there were strong contributions from photovoltaic (PV) powder and ethylene oxide (EO) catalysts and, if we exclude those two, offtake fell by just over 5%. There was also marked variation within the year; demand only saw notable losses in the second quarter and it was quite common for end-users to have swung to y/y gains by the fourth quarter.

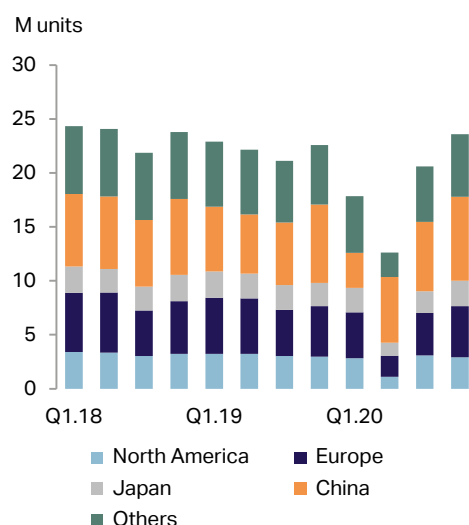
The double-digit increase in demand seen for powders going to photovoltaic cells was largely driven by last year's 14% rise in PV installations, in turn largely the result of many governments' intensive green energy programs (see page 48). US demand was also helped by rising powder exports, in particular those to Taiwan, which rose by 68% in weight terms. All that said, trade war and market share issues are still visible in terms of US output in 2020 still being the second lowest in the past five years. The growth for EO demand was in turn due to both the rise in new EO plant capacity plus ongoing growth from changeouts of previously installed catalysts.

Electrical & Electronics Demand

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Japan	71.1	59.8	72.2	73.6	75.8	91.0	94.6	79.3	84.7	86.9	3%
China/Hong Kong	57.7	56.9	61.2	65.2	67.2	73.2	85.2	88.7	88.1	80.8	-8%
United States	99.3	65.6	56.0	44.2	46.9	65.0	66.9	68.7	62.4	63.4	2%
Germany	20.7	17.7	17.7	18.2	17.3	17.7	18.3	19.0	18.5	16.6	-10%
India	16.9	16.1	14.9	14.3	13.6	13.8	14.3	15.3	13.6	11.7	-13%
South Korea	8.5	8.4	8.7	9.3	8.5	8.3	8.6	8.4	7.9	7.4	-7%
Others	49.9	46.5	44.7	45.1	42.9	42.9	42.3	42.0	41.5	37.4	-10%
Global Total	324.1	270.9	275.4	269.8	272.3	311.8	330.1	321.4	316.6	304.3	-4%

Source: Metals Focus

Global Light Duty Vehicle Quarterly Production



Source: LMC Automotive

Looking at just the US, industrial demand in the remaining categories dipped by just over 4% and so broadly in line with the 3.5% fall in the country's GDP. The two being similar illustrates how thrifting and substitution were of little importance last year. This was largely due to many areas of demand being so long established that avenues for further cuts in silver use are limited. The silver price was not sufficiently high for long enough to drive concerted efforts to minimize silver use. Lastly, end-users had far more pressing issues in terms of adapting to challenging conditions under COVID restrictions.

Another supportive factor was industrial operations in general being far less impacted by restrictions than consumer facing activity. Indeed, several end-use sectors were deemed essential and so shutdowns were limited to adaptation to new regulations. Further support was higher government spending in certain areas and robust sales of consumer electronics linked to the rise in home working and schooling. The latter change also assisted silver through rising home renovations, often to air-conditioning units. This extended into the corporate space too, with reports of healthy interest in any equipment that might assist with air quality management in spaces where large numbers of people might meet. This helped brazing alloy demand, but we still estimate that overall this fell by 8% due to air-conditioning solutions often being non-silver bearing and a drop in end-use in the automotive industry (North American vehicle output in 2020 fell by 20%).

North American industrial demand in 2021 is forecast to see robust growth of 8% to a 10-year high. Both PV and EO demand should see healthy gains, but offtake elsewhere should recover strongly too as economies re-open.

South Asia

India's industrial offtake of silver fell 29% last year to 26.7Moz (832t), the lowest in our series going back to 2010 as the COVID-induced economic slowdown impacted most industrial demand segments.

Brazing Alloys & Solder Demand

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
China	20.8	21.8	24.0	25.0	25.5	24.1	24.5	24.8	25.1	22.5	-10%
United States	6.7	6.4	6.1	6.0	5.7	5.9	6.2	6.4	6.5	6.0	-8%
South Korea	3.4	3.2	3.0	2.7	2.6	2.3	2.4	2.4	2.3	2.1	-8%
Japan	2.4	2.0	2.0	1.9	1.8	1.8	2.0	2.1	2.1	1.9	-10%
Germany	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.2	2.1	1.8	-12%
India	2.9	2.6	2.4	2.3	2.1	2.2	2.2	2.3	2.2	1.7	-21%
Italy	1.9	1.8	1.8	1.7	1.6	1.6	1.7	1.8	1.8	1.5	-16%
Others	11.3	10.7	10.7	9.1	7.3	7.0	7.6	7.9	8.3	7.3	-12%
Global Total	52.1	51.1	52.4	51.0	48.8	46.9	48.7	49.8	50.3	44.9	-11%

Source: Metals Focus

Silver's Exciting Potential in Green Energy

With a growing focus on carbon neutrality to help achieve sustainable development, so far nearly 30 countries have set goals for net-zero carbon emissions within the next decade. The consensus over decarbonization to tackle the climate crisis and the favorable government policies that have as a result emerged should continue to drive the expansion of the green energy sector. This focus box sets out how that might occur and its impact on silver.

We have to begin with photovoltaic (PV) power as the leading current source of green electricity. It is of note that, despite COVID disruption, the PV market proved its resilience last year. Newly added solar capacity saw further growth, with the total estimated to have surpassed 130GW for the first time ever. The PV market continued to expand geographically too as 18 countries achieved the 1GW mark last year, compared to just six in 2010. This led to silver offtake in PV reaching 101.0Moz (3,142t) in 2020.

Importantly, this occurred despite an 80% drop in the average silver loading per cell over the last decade. Much of this was the result of innovation in metalization which led to the average width of the electrode, busbar and finger (both are electrical conductors to collect the DC current on the PV panel) shrinking from 100µm to 30µm. Despite that, at end-2020, silver's share of total PV module costs had risen slightly to around 11% due to the rise in the silver price and lower module manufacturing costs. Cost pressures should continue to weigh on the silver content, with the finger width for example expected to drop by 30% to 20µm by 2025. Even if silver thrifting and substitution is almost inevitable, its progress is nonetheless checked as it is difficult to quickly replace due to concerns over production compatibility and alternatives' reliability.

Silver thrifting, however, does have the benefit of lowering cost and this, economies of scale and huge efficiency gains have cut the cost of solar electricity on average by almost 90%. This has allowed solar power to become the most competitive source of renewable energy, which helps explain optimistic projections of future capacity growth. New generation cells (such as hetero-junction back contact cells) also have the potential to drive costs down even further, often through efficiency gains.

It is worth noting that the rapid deployment of renewables has propelled the hybridization of systems through combining different green resources (wind, hydropower, biomass, wave and hydrogen) to overcome the crucial defect of intermittent power supplies.

However, energy storage seems the best solution to improve flexibility and enhance these power systems' potential. Driven by the demand from automotive and consumer electronic markets, lithium-ion batteries have become the leading power storage solution due to their efficiency and affordable cost (the average price has fallen nearly 90% over the past decade). However, growing energy storage needs have begun to outstrip battery supply capabilities and so hydrogen has started to attract significant attention as an alternative. Today, most of the hydrogen used has been extracted from natural gas due to the higher cost of "green hydrogen" (derived from splitting water into hydrogen and oxygen through electrolysis from renewables). However, the falling cost of solar and wind electricity has given green hydrogen the potential to become affordable. As per its hydrogen strategy, the EU plans to add 6GW of renewable hydrogen electrolyzers by 2024 (which would produce one million tonnes of hydrogen) and 40GW by 2030.

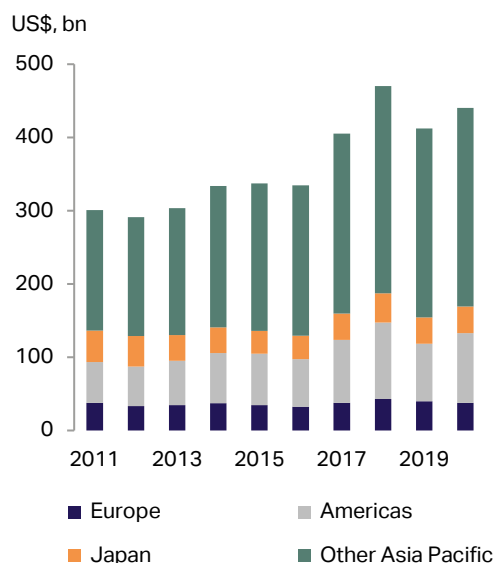
As a result, the energy storage market is expected to growth exponentially over the next few years. From only 4.5GW last year, new storage capacity additions are forecast to more than double to 10GW in 2021 and jump to over 40GW by 2022. The wide-scale adoption of these storage systems is projected to drive the renewables sector further. This will also help silver offtake in solar deployment and power grid construction. Silver demand is also being created through automotive electrification, both directly in the vehicle and indirectly with infrastructure requirements. All this sets out strong potential for "green silver", even if probable thrifting and substitution of silver temper future demand growth.

PV Silver Demand & Cell Loadings*



*denotes silver loadings per photovoltaic cell; Source: GTM, Metals Focus

Global Semiconductor Billings

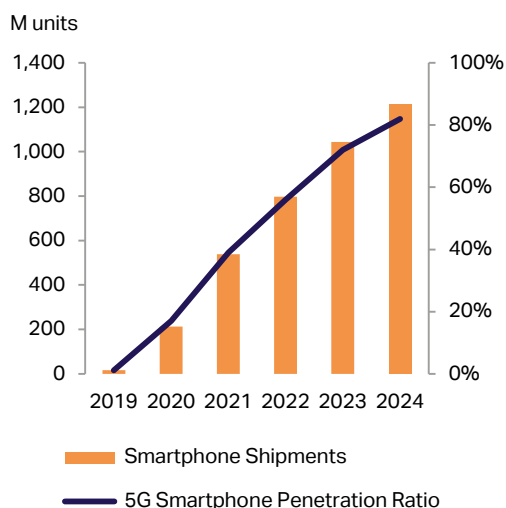


Source: Semiconductor Industry Association

The electrical and electronics sector was slightly better off with a decline of 13% y/y. Electrical demand in the high voltage applications in H1.20 struggled due to a slowdown in transmission and sub-station installations amid nationwide lockdowns. With economic activity resuming in H2.20, particularly in Q4, demand for switchgear for infrastructure development and the power sector saw a rebound. After a brief drop during the peak lockdown period, electronics demand benefited from the boost to consumer electronics sales due to widespread working from home. India's cell phone manufacturing and exports also continued to grow strongly (helping propel total electronics exports to an all-time high by the end of 2020). For example, Apple and Samsung are ramping up local capacity after the government rolled out a production linked incentive (PLI) scheme in July. Brazing alloys demand fell by a notable 21% in 2020 due in part to the economic slowdown and despite strong sales of refrigerators and air-conditioning units in H2.20. There were also ongoing efforts to cut the number of contact points in devices and some cost-sensitive uses continued to shift towards lower silver-containing alloys.

Demand in the "other industrial" category saw the biggest fall last year as most of its elements underperformed. This reflects the largely informal nature of most areas here, making them vulnerable to the economic slowdown and high prices. Food industry usage for example fell due to higher prices and a cutback in purchases of silver-coated sweets and betel nuts. The zari industry continues to see thrifting, and fewer weddings and social events meant that sales of zari fell notably. Offtake from the glass industry was also weak due to a slowdown in the construction and automotive sectors.

5G Smartphone Ratio



Source: IDC, Metals Focus

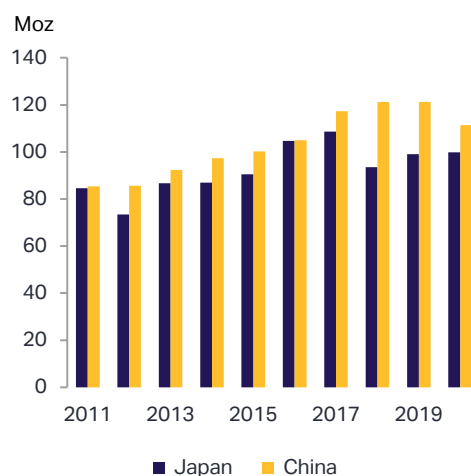
India's industrial demand is likely to recover well this year and recoup most of its 2020 losses, even if the resurgence of COVID-19 remains a key risk. The PLI scheme is expected to boost electronics fabrication further, while other sectors will benefit from generally improved economic activity.

East Asia

East Asian industrial silver demand fell by 4% to a four-year low of 240Moz (7,463t) in 2020. This was largely attributable to the supply shock in China, which benefited Japan and Taiwan, helping offset losses elsewhere.

Chinese industrial silver demand fell by 8% y/y to 111.4Moz (3,466t) last year. Any gains linked to the stay-at-home economy were offset by reduced shipments of PV powders, as well as weaker automotive-related demand, due to falling vehicle output. On the PV front, the pace of solar PV additions slowed in H1.20, owing to the suspension of manufacturing and construction works amid lockdown measures. However, with the rush of installations of 22.3GW last December, the country's newly added capacity outpaced earlier forecasts, to finish the year with 48.2GW, the second highest in history. However, domestic powder supply was seriously disrupted (falling to 2017 levels) as a key fabricator was located in the main city hit by the pandemic.

Industrial Fabrication: Japan and China



Source: Metals Focus

Looking ahead, global commitments to carbon neutrality should continue to drive diversification of the PV industry and push its integration with different green resources and energy storage solutions. As 80% of global panels and modules are produced in China, a healthy outlook for the industry is expected to underpin the local solar industry. Coupled with their significant cost advantages, this should help local powder fabricators recapture market share and return to an upward growth trajectory this year.

Offtake for consumer electronics was hit by weaker consumer sentiment given the uncertain economic situation, which led to a fall in expenditure on non-essential items. Even though there was a surge in shipments of notebook PCs, triggered by the needs for remote work and education, these were offset by a slump in smartphone sales. A similar trend occurred for the electrical sector as lower power grid infrastructure investment weighed on both the low-voltage and high-voltage markets. Auto-related applications were also hit by sluggish vehicle sales, in spite of increasing sophistication and electrification. The recovery in the electrical & electronics segments looks promising this year, but headwinds from a shortage of semiconductor chips has harmed vehicle output and may cause ripple effects that threaten consumer electronics shipments. Although Chinese telecom suppliers faced challenges from US sanctions and tariffs, wireless applications were supported by the acceleration of 5G network deployment in the country. Given that China is aiming to achieve full 5G coverage in urban and rural areas by end-2025, network upgrades and emerging applications using the technology will underpin growth in consumer electronics.

Brazing alloys demand fell to 22.5Moz (701t). Offtake in HVAC applications (heating, ventilation, air-conditioning and refrigeration) dropped, as losses in the automotive sector more than offset a rebound in the household market. Moreover, pressures from substitution to non-copper/silver based materials were escalating due to rising metal prices. Elsewhere, despite the slight rise in fixed asset investment, railway network construction was scaled back in 2020 after years of rapid expansion. Given that domestic rail infrastructure investment is expected to fall further this year, demand will rely on the wide-scale rail developments across the globe for the Belt and Road Initiative.

Contrary to our expectations, **Japanese** industrial fabrication rose last year, albeit by just 1%. This was exclusively due to the healthy increase in PV powder fabrication seen over the year. The aforementioned disruptions to Chinese powder makers' operations, coupled with far milder pandemic-related restrictions enforced in Japan, helped local manufacturers gain market share. Demand from other industrial applications suffered declines in the upper single digits. Looking ahead, we expect a modest increase to Japanese fabrication this year, as the boost from the wider post-COVID-19 recovery is partially offset by the effect of Chinese PV powder manufacturers reclaiming some of their lost market share.

Silver's New and Emerging Uses

There are not many new industrial technologies that do not involve the use of silver in some capacity. In this section, we consider three new or emerging ways that have the potential to generate a material rise in silver demand.

Cold sintering silver powder

Sintering is a process by which particles are made to make contact with each other through heat or pressure, much in the way that snowflakes are compressed to form snowballs. When silver particles undergo sintering, their superior thermal and conductive nature can be taken advantage of when they are sintered in particular formations.

From a technical perspective, the process allows silver to both replace current technologies and enable new ones. In semiconductors, for example, cold sintered silver powder could replace lead soldering as the principal die attach technology. Conventional die attach technologies are based on soft solders, with melting points below 200°C. With the stricter temperature requirements for new applications in the fields of wireless communication, automotive, medical, aerospace and aviation, higher operation temperatures have resulted in solder fatigue and failure. However, stronger sinter bonds could improve the performance and reliability of devices. Unlike soldering, cold sintered silver could be processed on a far smaller footprint without movement during attachment, which provides greater accuracy under precise process control.

Low-temperature interconnecting techniques minimize thermal effects on heat-sensitive components. As such, electric circuits can be printed onto different substrates like paper, plastic and polymeric materials. The excellent optical transparency, electrical conductivity and mechanical flexibility of cold sintering silver (all important for transparent conductive film) mean that end-uses such as displays, touch screens, OLEDs and solar cells could all benefit from the technology. There are also environmental advantages to cold sintering, notably lower energy use and carbon emissions and the elimination of lead (in soldering).

5G and EMI shielding

There are several areas in which silver demand is expected to increase due to the roll-out of 5G. For infrastructure, the number of small-cell base stations is expected to be 40-60 times that of 4G networks and so surging shipments of multiple-input/multiple-output (MIMO) antennae and an increasing number of switch

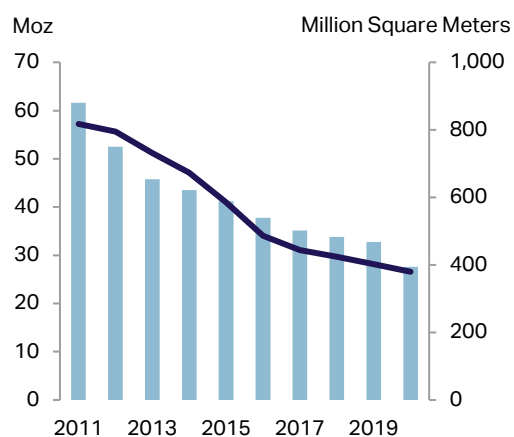
contacts in relays and inverters is expected to lift silver offtake. The faster, more stable and secure connectivity available thanks to 5G also facilitates the spread of the Internet of Things (IoT) with emerging applications for various areas, including automotive, healthcare, agriculture and smart cities, all of which mean strong prospects for silver demand here.

The dawn of 5G has created greater challenges for electromagnetic interference (EMI) shielding. The frequencies of several components in 5G phones are so high that they can influence and interfere with each other. Furthermore, multiple boosters will be required to ensure that the signal is powerful enough to penetrate walls and other solid objects, further increasing electromagnetic noise. EMI can disrupt critical wireless communications used by the medical, military, aerospace and mass transit sectors, hence the importance of shielding. Traditionally, shielding has been achieved using metal housings or sputtered materials. While metal housing (often aluminum) is becoming unviable due to miniaturization, copper-based shielding through sputtering has been the other dominant technology. Silver pastes and inks, however, offer decisive advantages as they are far more scalable at a relatively lower cost and allow for greater flexibility in terms of the substrates and novel configurations. With the wide adoption of 5G networks, the risk of exposure to ultra-high frequency transmission therefore generates tremendous potential for silver as an alternative.

Induction chargers

Induction charging passes an electric current between two coils; when the current is sent through a primary coil, it creates a magnetic field that generates another electric current in the receiver coil, and silver-plated coils have been proven to improve performance. While the technology is far from new (it is in electric toothbrushes, for example) the number of applications that may adopt this is rising. This is in large part driven by consumer demand for frequent and wireless charging outside of the home. Induction charging is already prevalent in high-end smartphones and wearable devices, which means the mid to low end of the market will likely follow. A significant potential market for induction charging is in vehicles. There are still, however, several questions to be overcome before widespread implementation can occur, namely who provides (and pays for) the infrastructure, as well as organizing standardization among manufacturers. Currently, induction charging is also less efficient than conventional charging. That said, real-world testing is underway and it is likely that commercial vehicles, such as taxis and buses, will be early adopters.

Photographic Demand & Paper Production



Source: Metals Focus, Photofinishing Newsletter

South Korean demand fell by 5%, due to weaker smartphone and automobile sales. Demand is projected to recover this year due to an improving local and world economy boosting domestic consumption and exports. Thanks to orders diverted from other countries, particularly of semiconductors and consumer electronics, **Taiwan's** industrial offtake defied the drag of the COVID crisis to grow by 2%. Demand is expected to continue benefiting from the supply chain reshuffle following China:US tensions and the pandemic.

Photographic Demand

Demand for silver in photographic applications fell by 16% to 27.6Moz (859t) last year. This was mainly due, of course, to the COVID-19 pandemic, which impacted the whole range of photographic applications. Demand for consumer and professional film and paper production declined, while even the previously growing market for instant films saw its first drop since 2010 (albeit modest at just 4%). In addition to lower consumer purchases, production facilities generally operated at below normal capacity, as manufacturers sought to comply with new safety measures and restrictions.

Medical x-ray related demand also fell as patients were reluctant to visit hospitals in the midst of the pandemic, while medical resources were also diverted to COVID-19 treatments. This hit routine and non-urgent use, which accounts for the bulk of demand. At the same time, the shift from analog, silver halide x-ray film to digital radiography paused, as overstretched hospitals could not deal with the cost and effort of switching. However, once conditions begin to normalize, the transition to digital radiography is expected to resume.

The motion picture industry also suffered, with projects paused as conditions made filming difficult. Non-destructive testing was similarly heavily affected by the pandemic; many of the industries that are significant end-users of industrial radiography (namely oil and gas, automotive, aerospace and public infrastructure) saw significant and in some cases total shutdowns. Demand is expected to recover, thanks to increasingly stringent safety standards, pent-up demand and aging public infrastructure.

Photographic Demand

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe & N America	41.9	38.0	34.8	32.5	30.3	27.3	25.1	23.8	22.6	21.1	-7%
East Asia	18.0	12.8	9.8	9.8	9.6	9.0	8.7	8.4	8.3	6.5	-22%
Others	1.8	1.7	1.2	1.3	1.3	1.4	1.4	1.6	1.8	0.0	-99%
Global Total	61.6	52.5	45.8	43.6	41.2	37.8	35.1	33.8	32.7	27.6	-16%

Source: Metals Focus

Chapter 8

- Jewelry fabrication fell by a steep 26% in 2020, driven by COVID's disruption to economic activity and consumer spending. Retailer de-stocking and high silver prices also hit some markets, in particular India.
- Jewelry demand is forecast to recover by 24% in 2021 as lockdowns ease and despite higher silver prices.
- Silverware demand fell by 48% in 2020 due mainly to COVID-led losses in India, but is forecast to rebound by 32% this year.

Global Jewelry Fabrication Forecast

Million ounces	2020	2021F	Y/Y
Europe	24.6	29.6	20%
North America	16.5	18.5	12%
Middle East	6.7	7.3	10%
South Asia	41.4	61.9	50%
East Asia	52.4	59.4	13%
CIS	3.7	3.9	5%
Others	3.2	3.7	14%
Global Total	148.6	184.4	24%

Source: Metals Focus

Jewelry & Silverware

Jewelry

Introduction

Global jewelry fabrication in 2020 fell by a notable 26% to a low in our series back to 2010 of 148.6Moz (4,622t). The main reason for this was the COVID pandemic, both in terms of its direct impact (such as the closure of retailers and factories) and indirect (through harm to the global economy). Evidence for this can be found in most countries seeing steep losses in the spring and then a recovery over the summer, just as the silver price was rallying. That said, record high prices in India were important in its heavy fall - one that accounted for over half the global decline. Jewelry consumption fell less steeply than fabrication as retail stocks were sharply reduced. Follow-through restocking and, more importantly, easing COVID restrictions and an economic recovery lead us to forecast demand growth of 24% this year. That falls 8% short of 2019 levels due to high prices and lingering COVID damage.

Europe

Last year, European jewelry **fabrication** fell by a noteworthy 18% to a low for our series back to 2010 of 24.6Moz (765t). Much of the decline was due to losses for the dominant producer, Italy, whose exports suffered heavily. High silver prices had little effect and instead the main driver was the COVID pandemic. This was clearly visible in terms of its direct impact on output and shipments; Italian exports in January/February 2020 were up 4% y/y, but April's were down 95% in weight terms. Our contacts noted that any shipments in the latter month were more likely to be fabricated earlier and/or recorded late, with Italian jewelry factories fully closed for all of April. As factories re-opened on May 5th, production was slow to recover as new working practices had to be adopted and output was largely just the fulfillment of orders placed earlier. Most contacts feel that business had not returned to anything close to normal until at least July. Even with an improving second half though, full year Italian exports (excluding re-exports) fell by 21% in weight terms. Within the mix, shipments to the US performed best, while those to wholesale hubs were the weakest (exports to the United Arab Emirates for example fell by 49% in 2020).

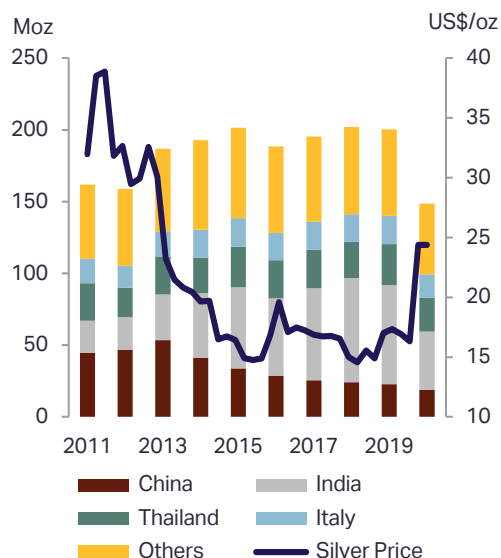
Other countries in Europe saw similar fabrication losses, although of more relative importance to those results was weak domestic sales due to the consumers willingness and ability to shop being hit hard by COVID. That was also exacerbated by heavy de-stocking by retail chains as people were either unable or fearful about replacing sold inventory. With the opening of economies and a partial replacement of stocks, we are expecting solid growth of 20% for European fabrication this year, although high silver prices and still burdensome COVID restrictions make a return to 2019 levels unlikely.

Jewelry Fabrication

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Italy	17.2	15.4	17.9	19.5	20.0	18.8	19.5	19.3	19.9	16.2	-19%
Germany	3.4	3.4	3.5	3.4	3.5	3.4	3.4	3.5	3.5	3.1	-13%
France	2.1	2.0	2.0	1.9	2.0	2.0	1.9	1.9	1.8	1.5	-16%
Others	4.3	4.2	4.6	4.7	4.7	4.6	4.7	4.6	4.7	3.8	-19%
Sub-total	26.9	24.9	27.9	29.6	30.2	28.7	29.5	29.3	29.9	24.6	-18%
North America											
United States	11.1	11.7	12.3	13.0	13.6	12.9	13.2	13.0	12.9	10.7	-17%
Mexico	4.7	5.0	4.5	5.4	5.7	5.8	4.9	5.0	4.5	3.1	-30%
Canada	3.3	3.3	3.6	3.8	3.5	3.6	3.4	3.3	3.2	2.7	-18%
Sub-total	19.2	20.0	20.5	22.2	22.8	22.3	21.5	21.2	20.6	16.5	-20%
Middle East											
Turkey	3.6	4.0	4.9	6.3	6.7	4.9	4.9	5.9	6.0	4.4	-26%
Others	2.2	2.5	2.6	2.7	3.2	3.0	2.8	3.5	3.0	2.3	-24%
Sub-total	5.8	6.5	7.4	9.0	9.8	7.9	7.7	9.4	9.0	6.7	-25%
South Asia											
India	22.3	22.8	31.8	45.1	56.6	53.9	64.2	72.5	69.0	40.5	-41%
Others	1.0	0.9	1.0	1.1	1.2	1.2	1.4	1.5	1.5	0.9	-41%
Sub-total	23.2	23.7	32.8	46.2	57.8	55.1	65.5	74.1	70.5	41.4	-41%
East Asia											
Thailand	26.3	20.3	26.1	24.7	28.2	26.6	26.9	25.2	28.5	23.7	-17%
China	44.6	46.9	53.4	41.1	33.8	28.7	25.5	24.3	22.8	18.9	-17%
Indonesia	2.6	3.0	4.1	6.1	4.9	5.2	5.1	5.3	5.6	4.8	-15%
South Korea	2.6	2.7	3.3	2.9	3.1	2.7	2.7	2.5	2.5	2.0	-18%
Japan	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.5	-10%
Others	1.6	1.7	1.7	1.6	1.5	1.5	1.6	1.7	1.8	1.5	-13%
Sub-total	78.9	75.7	89.9	77.8	72.9	66.2	63.3	60.5	62.8	52.4	-16%
Other Regions											
CIS	4.3	4.5	4.4	4.0	4.5	4.3	4.1	3.7	3.5	3.7	5%
C&S America	1.9	2.0	2.1	2.2	2.0	2.0	1.9	2.0	2.1	1.8	-15%
Africa	1.0	1.1	1.2	1.2	1.1	1.0	1.0	1.1	1.1	0.9	-21%
Oceania	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.5	-20%
Sub-total	7.9	8.2	8.3	8.1	8.1	8.1	7.8	7.5	7.5	7.0	-7%
Global Total	161.9	159.0	186.9	192.8	201.6	188.4	195.3	202.0	200.3	148.6	-26%

Source: Metals Focus

Global Jewelry Fabrication



Source: Metals Focus, Bloomberg

De-stocking helps explain why Europe's jewelry **consumption** fell by a slightly smaller amount than fabrication last year. For example, we do not feel that the 35% drop in UK silver jewelry hallmarking is a fair reflection of UK sales. The actual drop could well have been close to results in its neighbor France, where silver jewelry sales fell by 15% in unit terms according to Société 5. Sales generally were boosted by strong gains for online sales, but it is worth noting that e-commerce typically means lower stocks. It had been thought that silver might have outperformed gold, having a lower sticker price and being better suited to the shift to online and branded goods. This, however, was not evident in any clear way. Société 5 for instance report a drop of 11% for French gold jewelry in unit terms. Part reason for this is high silver prices pushing some consumers to look at costume jewelry. We have for example received feedback of firm sales of plated brass jewelry in Italy.

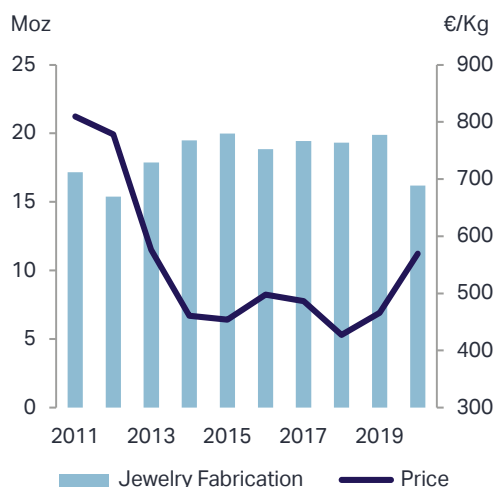
North America

US jewelry fabrication in 2020 fell by 17% to a 10-year low of 10.7Moz (334t). As ever, the chief culprit was the COVID pandemic. This is indicated by the US Department of Commerce's statistics on all jewelry and watch sales which show January 2020 at +7.5%, followed by a swift descent to April's -50.5%. By June, the figures had turned positive and August-December enjoyed double-digit y/y gains. That is a jewelry consumption story, but this is the more important one in the US as its silver jewelry market is the second biggest globally by weight and easily the largest by value.

On a consumption basis, last year was still tough, but we estimate that the decline in weight terms was a more modest 11%. This gap with the fabrication result is largely explained by heavy de-stocking by retailers who were either unable to replace pieces that had been sold or were cautious about doing so given the challenging economic backdrop. This also explains why imports fell so heavily (in weight terms, they were down 23%). There were also structural reasons for lower stocks, such as the shift to online sales, curbside pick-up and drop-shipments (when a consumer places an order with a retailer but delivery of the item goes straight from the fabricator or wholesaler to the consumer). Hard data on stocks is hard to come by, but the key player, Signet, stated that its inventory at the end of its fiscal Q4 was 13% lower y/y.

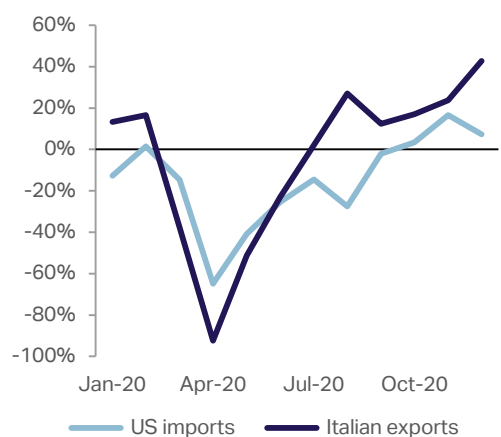
Data from Signet are also useful in illustrating the phenomenal growth for online sales; their Q4 revenue from e-commerce was up 66% y/y, whereas that from bricks & mortar stores was up just 1%. This boom for online (or omni-channel) retailing was critical to explaining why the country's full year results were not too disappointing and why the second half enjoyed such a strong rebound. Another important factor in explaining the strength of the second half was consumers happily spending their government stimulus checks. Also on the political front, any tensions before and after the presidential election in November had no real impact on sales. Jewelry also benefited from the diversion of expenditure from travel and other

Italian Silver Jewelry Fabrication



Source: Metals Focus

Western Silver Jewelry Trade: y/y change for each month*



Source: IHS Markit. * basis US\$ value.

experiences to physical goods. Some sources also commented that jewelry performed well as it remains visible on a Zoom call, in a way that purses and shoes do not. There were also reports of consumers being keen to acquire goods seen as symbolic. This is felt to have benefited gold and platinum most and is one reason why silver slightly underperformed those two. Other reasons include the popularity of the yellow look in fashion terms and the fact that Mothers' Day, whose price points suit silver more, occurred on May 10th and so in the worst few months of the pandemic's disruption.

The second half recovery was far from uniform though: those without a strong online presence saw much less robust results. This often affected small independents, who were also hit by being obliged to close under lockdowns whereas many generalist retailers could keep their doors open.

With the opening up of the broader economy and at least partial re-stocking, we are confident of buoyant gains for consumption and even more so for fabrication this year, even with higher silver prices. However, should pent-up consumer purchases fade and expenditure shift back to travel and the like, these year-on-year gains could be much more apparent in the first half.

Middle East

Jewelry demand in the Middle East fell by 25% in 2020 to 6.7Moz (208t).

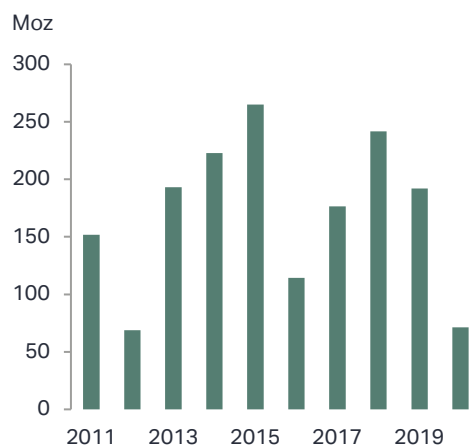
Turkey, the largest fabricator, saw a drop of 26% due to weak local sales and exports (the latter fell 37% due to the pandemic). We forecast a 10% rise in regional offtake in 2021 due to an expected improvement in exports, pent-up demand and high gold prices nudging consumers towards silver.

South Asia

Offtake for the largest jewelry fabricator globally, **India**, fell for the second year in a row, by 41% to 40.5Moz (1,260t), its lowest level since 2013. This is also the steepest fall in demand in our series back to 2010. That said, it is worth noting that fabrication in 2019 was the second-highest this decade. As elsewhere, demand was hit hard by the pandemic's lockdowns and cutbacks in discretionary spending but rising silver prices were also critical here.

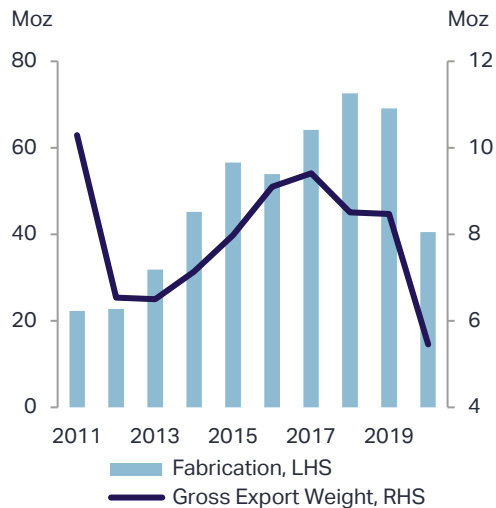
The lockdown announced in March 2020 had a severe impact on an already slowing economy and it is now estimated that in the 2021 financial year (April 2020 to March 2021), the Indian economy will have contracted by 7%. While lockdowns hit purchases from as early as March, the rising silver price later on saw consumers delay making their purchases. To put this into context, silver prices in the domestic market surged to record levels during 2020, more than doubling between March and August. The impact of this and the economic slowdown were particularly felt in rural India where consumers often tend to be highly price-sensitive due to limited incomes. That aside, a general cutback in discretionary spending meant that both urban and rural consumption suffered during the year.

Indian Silver Bullion Imports



Source: Metals Focus, IHS Markit

Indian Jewelry Fabrication



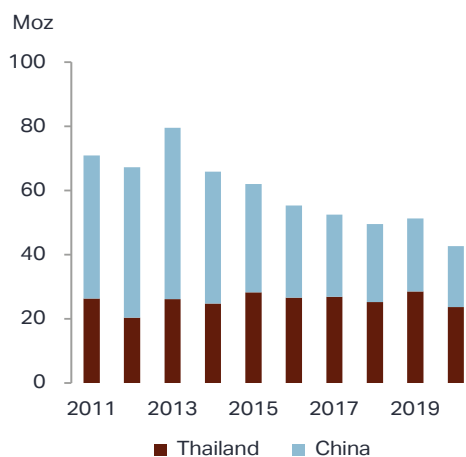
Source: Metals Focus, IHS Markit

From a product standpoint, demand for both traditional and fashion jewelry fell. Payals (traditional leg-chains) account for up to half of the country's total fabrication and are usually bought during the wedding and festive period. With restrictions on marriages and the number of people attending weddings and subdued festivities, jewelry demand consequently suffered. Sales of fashion jewelry were in turn negatively impacted as people shifted to work from home, while educational institutes were also closed. (It is worth highlighting that fashion jewelry is primarily bought by the youth to pair with western and office wear.)

A third negative factor, revealed through trade discussions, was that wholesalers and retailers reduced inventory last year as many were holding large stocks and, with sales deteriorating amid the economic slowdown, they focused on scaling down inventory. Lastly, exports fell by more than 30% in volume terms (although they rose on a value basis due to an increase in silver prices). Shipments to the US and UK were particularly impacted by the spread of the pandemic in those countries.

For 2021, we expect demand to recover by 50%, mainly through the resumption of economic activity and the low base effect. That said, after a brief pick-up in demand early this year, the market has started to slow as a second wave of the virus spreads across many states. However, we expect the situation to normalize by July as vaccinations pick-up, ahead of the festive and wedding season. Interestingly, the increase in demand over the last few years has brought new retailers into the market. Our market intelligence suggests that many gold jewelry retailers are now looking to also showcase silver jewelry in gold shops. More organized retailers offering silver jewelry will also mean that the 925 sterling silver market will also see a boost.

Chinese & Thai Jewelry Fabrication



Source: Metals Focus

East Asia

Chinese fabrication fell for the seventh year in 2020, by 17% to 18.9Moz (589t). Such a marked drop was not surprising, given the direct impact of COVID-19 on business in the first quarter (traditionally a peak-season for jewelry) and weak consumer sentiment for most of the year. Chinese silver jewelry consumption is concentrated in the 3rd and 4th tier cities and towns, which were strongly impacted by the COVID-related economic slowdown. In addition, the ongoing structural change, of a shift from conventional plain jewelry to pieces with fashionable designs, also weighed on the fine weight sold, albeit less so than in previous years. That said, the supply chain's ongoing efforts concerning product innovation lent some support to demand. The main areas of development are the better integration with pearls, enamel and zircon, layered collections and "antique-crafted silver". In addition, online sales enjoyed a robust increase, fueled by successful marketing campaigns through social media and e-commerce mobile apps. However, the virus outbreak in the US and escalating political tensions hurt China's exports, as silver jewelry deliveries to the US fell by 40%.

Global Silverware Fabrication Forecast

Million ounces	2020	2021F	Y/Y
Europe	2.7	3.6	30%
North America	1.5	1.5	-1%
Middle East	2.0	2.1	1%
South Asia	21.2	30.4	44%
East Asia	3.7	4.2	13%
CIS	1.0	0.9	-5%
Others	0.4	0.4	-5%
Global Total	32.6	43.1	32%

Source: Metals Focus

Silver jewelry demand during the 2021 Chinese New Year Holiday enjoyed a healthy rebound. We now expect a modest recovery of 13% for the full year; most gains are likely to have occurred in the first quarter and we remain conservative towards the rest of 2021 on a year-on-year basis because of the fading post-virus recovery. We should also remember that the direct impact of virus-related disruption to business in China started to ease last April.

Thai jewelry fabrication fell by 17% in 2020 to an eight-year low of 23.7Moz (736t), chiefly reflecting the negative impact of COVID-19 on the global market. Exports initially benefited from the US:China trade war, but the virus' global spread in March then affected US and European orders. That said, the easing of lockdowns and purchases for the holiday season saw export demand return to more normal levels in Q4.20. In contrast to exports, domestic sales during the year remained relatively strong, benefiting from rising gold prices. Our discussions revealed that many young Thai consumers shifted from gold to silver jewelry and this prompted many wholesalers and retailers to start displaying silver jewelry in their stores. Turning to this year, we expect fabrication activity to pick-up again as economies re-open.

Indonesian jewelry fabrication fell by 15% last year to 4.8Moz (149t), its lowest since 2013, as domestic sales and key export markets were impacted by COVID. More recently, orders from the US and Europe have seen a strong recovery but East Asia, especially Singapore, continues to struggle.

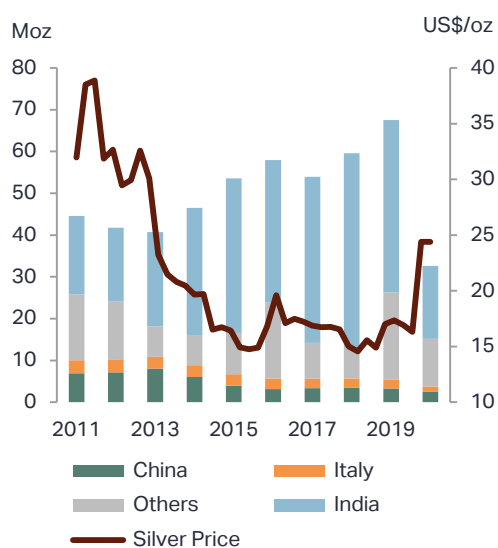
Silverware

Introduction

Global silverware fabrication in 2020 fell by a sizable 48% to a low for our series going back to 2010 of 32.6Moz (1,014t). The majority of these losses was the 58% or 23.8Moz (741t) drop in India. The decline outside of South Asia was a less steep 23%. A global recovery of a healthy 32% is forecast for 2021, although demand would still then be 31% down on 2019.

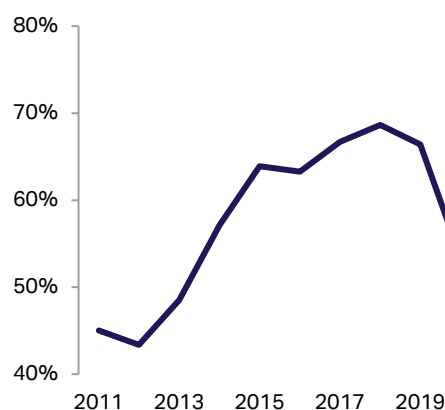
Indian silverware fabrication fell by a severe 58% to 17.4Moz (541t), its lowest level and steepest fall in our series since 2010. This reflected three main factors. The first was the direct impact of COVID-19; to control the pandemic, the government announced a hard lockdown starting end-March. This led to cancellations of weddings and social events, hitting offtake as the majority of silverware demand is for gifting purposes. Second, the lockdown severely harmed business activity, with India's economy suffering its worst performance in four decades. Buying from the corporate sector (who often use silverware as gifts for clients and distributors) was also hit as most opted to work from home. Third and of critical importance for consumer sales was record local silver prices and volatility (the rupee price more than doubled mid-year).

Global Silverware Fabrication



Source: Metals Focus, Bloomberg

Indian Share of Global Silverware Fabrication



Source: Metals Focus

As for key consumption trends, sterling silverware continued to take market share, and large retailers are now only asking for this purity of silver. In addition, the mass market struggled in 2020, but high-end silverware continued to see strong demand due to such factors as more architects using large-scale silverware as pieces of furniture.

This year, we forecast silverware demand to rise by 50%, primarily due to the low base effect, an economic recovery and the resumption of weddings. In addition, many gold retailers now plan to add dedicated silverware space in their showrooms, as they look to diversify and as silverware usually enjoys higher margins (previously, gold retailers did not show case silverware).

Chinese silverware fabrication suffered a sizable decline of 25% in 2020 to 2.5Moz (77t). In addition to the virus-related business disruption in the first quarter, this also reflected a marked deterioration in consumer sentiment. This matters as daily use products, including tea and liqueur sets and tableware, account for the bulk of sales. Looking ahead, we expect demand to enjoy a 15% post-virus recovery in 2021.

Silverware fabrication in **Europe** fell by a notable 31% to 2.7Moz (85t) in 2020. That this was far steeper than the average drop of 5% over the five prior years illustrates the scale of the damage done by COVID (and to a degree high prices) on top of ongoing structural changes. One key way in which this occurred was stores within Europe failing to replace items that had been sold. Exports were similarly weak, although shipments to the **US** fared somewhat better in part as its retailers were hit less hard by lockdowns. This helps explain why US fabrication fell by a less marked 17% last year.

In the **Middle East**, silverware fabrication dropped by 16% in 2020 to 2.0Moz (64t) due to weak local sales (especially in Iran), plus lower exports by Turkey and Israel. A slight 1% increase is expected in 2021 as the broader economic recovery and improving consumer sentiment lift the region's exports.

Silverware Fabrication

Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
India	18.8	17.7	22.6	30.6	37.0	34.1	39.7	46.4	41.2	17.4	-58%
Nepal	2.6	2.6	3.0	3.7	3.9	4.4	4.8	5.9	5.6	3.6	-35%
China	6.9	7.2	8.0	6.0	3.9	3.1	3.4	3.5	3.3	2.5	-25%
Italy	3.1	3.0	2.8	2.8	2.7	2.5	2.3	2.2	2.0	1.3	-38%
United States	1.4	1.3	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.0	-17%
Others	9.0	9.0	8.9	9.2	9.0	8.5	8.1	8.4	8.6	6.8	-27%
Global Total	41.7	40.7	46.5	53.6	57.9	53.9	59.6	67.6	62.1	32.6	-48%

Source: Metals Focus

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Appendix 1 - Silver Supply and Demand

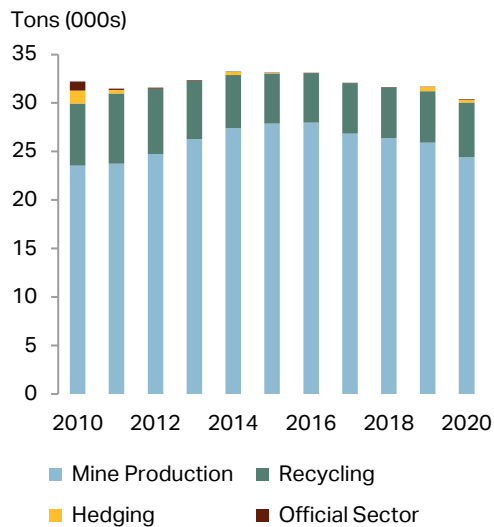
Year on Year

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021F	2020	2021F
Supply												
Mine Production	24,755	26,293	27,429	27,881	27,975	26,839	26,387	25,916	24,399	26,392	-6%	8%
Recycling	6,718	5,995	5,444	5,180	5,116	5,218	5,218	5,304	5,665	6,103	7%	8%
Net Hedging Supply	-	-	332	67	-	-	-	434	264	311	-39%	18%
Net Official Sector Sales	114	52	36	33	33	33	37	32	37	48	18%	27%
Total Supply	31,586	32,340	33,240	33,161	33,124	32,089	31,643	31,685	30,365	32,854	-4%	8%
Demand												
Industrial	14,013	14,331	13,997	14,214	15,287	16,134	15,968	16,007	15,142	16,299	-5%	8%
...of which photovoltaics	1,711	1,571	1,507	1,684	2,915	3,166	2,877	3,069	3,142	3,267	2%	4%
Photography	1,634	1,424	1,355	1,282	1,174	1,092	1,051	1,018	859	895	-16%	4%
Jewelry	4,946	5,812	5,998	6,272	5,859	6,074	6,283	6,229	4,622	5,734	-26%	24%
Silverware	1,266	1,447	1,666	1,802	1,677	1,853	2,101	1,931	1,014	1,340	-48%	32%
Net Physical Investment	7,525	9,391	8,853	9,723	6,645	4,858	5,152	5,776	6,236	7,862	8%	26%
Net Hedging Demand	1,255	913	-	-	374	35	230	-	-	-	na	na
Total Demand	30,639	33,318	31,869	33,293	31,016	30,046	30,785	30,960	27,872	32,130	-10%	15%
Market Balance	947	-978	1,371	-132	2,108	2,044	858	725	2,493	724	244%	-71%
Change in ETP Holdings	1,668	148	-9	-532	1,676	223	-666	2,590	10,299	4,666	298%	-55%
Market Balance less ETPs	-720	-1,126	1,379	400	432	1,821	1,523	-1,865	-7,806	-3,941	319%	-50%
Silver Price (US\$/oz)*	31.15	23.79	19.08	15.68	17.14	17.05	15.71	16.21	20.55	27.30	27%	33%

*London Price

Source: Metals Focus

Global Supply



Source: Metals Focus

Global Demand



Source: Metals Focus

Appendix 2 - Mine Production

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
North America											
Mexico	4,778	5,358	5,821	5,767	5,975	5,421	5,815	6,049	5,840	5,541	-5%
United States	1,120	1,060	1,046	1,180	1,090	1,150	1,031	926	976	986	1%
Canada	533	666	618	472	369	361	393	368	419	290	-31%
Sub-total	6,431	7,084	7,485	7,419	7,433	6,931	7,240	7,344	7,235	6,817	-6%
Central & South America											
Peru	3,550	3,548	3,843	3,934	4,236	4,757	4,840	4,575	4,221	3,411	-19%
Chile	1,290	1,191	1,169	1,562	1,496	1,448	1,257	1,243	1,189	1,474	24%
Bolivia	1,214	1,206	1,287	1,340	1,306	1,353	1,196	1,192	1,153	930	-19%
Argentina	733	768	827	920	1,133	993	908	960	1,025	714	-30%
Dominican Republic	18	27	82	136	95	122	152	159	141	119	-15%
Brazil	14	17	27	35	49	77	87	71	66	68	3%
Honduras	48	52	52	58	35	19	23	32	45	37	-18%
Guatemala	273	205	283	858	863	840	337	-	-	-	na
Others	52	48	43	38	36	36	33	39	67	95	40%
Sub-total	7,193	7,062	7,613	8,880	9,250	9,645	8,833	8,271	7,907	6,846	-13%
Europe											
Poland	1,178	1,159	1,208	1,195	1,218	1,272	1,297	1,272	1,257	1,225	-2%
Sweden	283	306	337	396	492	511	484	467	446	417	-7%
Spain	31	34	36	35	44	46	59	66	65	78	20%
Portugal	31	34	45	47	46	43	40	56	53	48	-9%
Greece	28	26	37	34	26	25	29	19	19	30	55%
Others	34	43	47	47	50	49	47	45	76	94	24%
Sub-total	1,585	1,602	1,711	1,755	1,876	1,946	1,957	1,924	1,916	1,892	-1%
Africa											
Morocco	243	220	230	240	272	295	306	230	251	261	4%
Eritrea	4	30	16	53	98	98	79	54	67	84	26%
South Africa	97	88	75	55	59	61	69	51	62	39	-37%
DR Congo	22	28	81	32	27	2	2	2	2	2	-1%
Others	60	78	93	98	89	74	74	73	74	73	-2%
Sub-total	426	443	494	478	544	530	529	410	456	460	1%
Commonwealth of Independent States											
Russia	1,221	1,411	1,381	1,434	1,588	1,450	1,305	1,341	1,391	1,323	-5%
Kazakhstan	617	642	661	570	506	550	583	612	530	539	2%
Uzbekistan	147	149	183	183	183	186	186	187	191	195	2%
Armenia	57	64	72	75	77	74	82	63	75	83	10%
Tajikistan	4	19	18	31	35	40	47	46	45	47	5%
Others	13	5	7	7	11	20	15	18	20	18	-10%
Sub-total	2,059	2,290	2,322	2,300	2,399	2,320	2,219	2,267	2,252	2,205	-2%

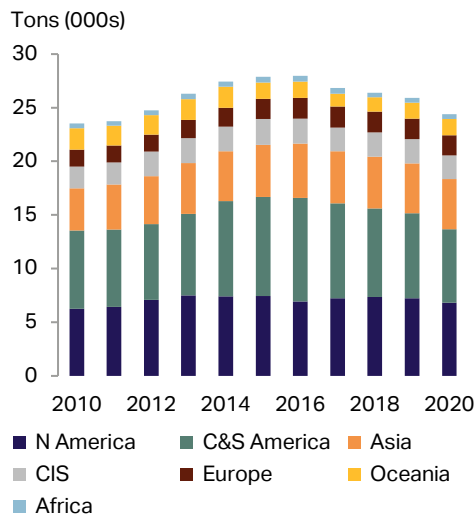
Source: Metals Focus

Appendix 2 - Mine Production (continued)

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Asia											
China	3,293	3,503	3,674	3,684	3,685	3,754	3,601	3,422	3,444	3,377	-2%
India	204	289	333	261	374	436	526	658	633	671	6%
Indonesia	215	192	244	219	308	335	311	314	225	258	14%
Turkey	278	221	201	199	205	209	152	147	99	111	11%
Iran	65	71	67	70	67	77	79	79	82	84	3%
Mongolia	24	24	39	52	62	68	54	53	51	51	1%
Laos	16	19	33	40	52	51	43	37	34	35	1%
Philippines	46	49	40	23	30	35	32	30	31	24	-23%
Thailand	23	35	36	34	24	39	4	4	4	4	0%
Others	47	51	55	55	51	67	61	71	69	68	-2%
Sub-total	4,211	4,455	4,722	4,636	4,859	5,072	4,862	4,815	4,674	4,683	0%
Oceania											
Australia	1,725	1,727	1,840	1,847	1,430	1,418	1,120	1,254	1,325	1,362	3%
Papua New Guinea	90	82	89	95	72	100	66	93	147	132	-10%
Others	27	11	16	20	17	13	13	9	5	2	-59%
Sub-total	1,843	1,820	1,945	1,961	1,520	1,531	1,199	1,356	1,476	1,496	1%
Global Total	23,748	24,755	26,293	27,429	27,881	27,975	26,839	26,387	25,916	24,399	-6%

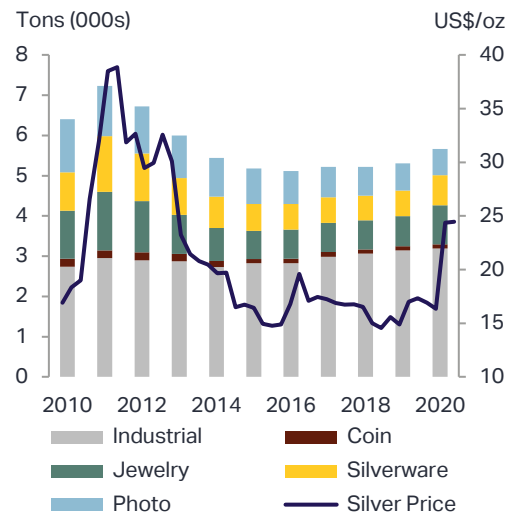
Source: Metals Focus

Mine Supply by Region



Source: Metals Focus

Recycling by Sector



Source: Metals Focus, Bloomberg

Appendix 3 - Recycling

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Germany	552	493	462	452	446	446	443	461	470	476	1%
UK	234	215	215	207	216	220	246	236	261	240	-8%
Italy	278	315	252	206	182	171	163	156	158	150	-5%
France	152	179	156	134	118	106	101	98	97	98	1%
Others	381	365	350	332	311	311	344	314	321	321	0%
Sub-total	1,598	1,567	1,435	1,332	1,272	1,253	1,297	1,265	1,308	1,285	-2%
CIS											
Russia	364	358	307	249	208	203	246	310	264	290	10%
Others	97	95	71	55	43	45	44	45	46	45	-2%
Sub-total	461	453	378	304	251	247	291	355	310	335	8%
North America											
United States	1,944	1,650	1,658	1,599	1,654	1,551	1,602	1,600	1,661	1,759	6%
Others	248	206	176	146	127	127	126	125	125	127	2%
Sub-total	2,191	1,856	1,834	1,744	1,781	1,678	1,728	1,725	1,786	1,886	6%
Middle East											
Turkey	141	128	114	104	77	78	78	83	83	77	-7%
Others	136	124	118	116	94	109	108	95	100	119	20%
Sub-total	277	252	232	220	171	187	185	177	183	197	7%
South Asia											
India	587	674	337	185	97	106	112	124	129	316	144%
Others	125	144	72	40	21	23	24	27	28	70	152%
Sub-total	711	818	408	226	118	129	136	151	157	385	145%
East Asia											
China	887	777	759	747	778	756	735	721	734	740	1%
Japan	374	349	354	342	343	354	354	340	326	310	-5%
Taiwan	150	128	110	101	81	93	88	81	89	91	2%
Others	207	193	198	163	143	163	146	146	152	168	11%
Sub-total	1,618	1,447	1,421	1,354	1,345	1,367	1,323	1,286	1,300	1,310	1%
Other Regions											
C&S America	184	149	123	108	95	105	109	110	112	119	6%
Africa	112	102	94	92	86	89	90	89	89	95	6%
Oceania	77	73	70	64	61	61	60	60	58	53	-10%
Sub-total	373	324	287	265	242	255	258	259	260	266	2%
Global Total	7,229	6,718	5,995	5,444	5,180	5,116	5,218	5,218	5,304	5,665	7%

Source: Metals Focus

Appendix 4 - Industrial Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Germany	994	891	900	915	900	906	935	969	963	908	-6%
United Kingdom	397	430	431	451	396	412	515	517	592	552	-7%
France	323	296	294	283	269	262	270	283	290	263	-9%
Italy	274	262	259	264	264	261	271	282	286	246	-14%
Others	395	374	390	381	372	373	387	395	394	355	-10%
Sub-total	2,383	2,253	2,274	2,294	2,200	2,214	2,378	2,447	2,526	2,325	-8%
North America											
United States	4,685	3,555	3,354	2,993	3,205	3,718	3,864	3,942	3,825	3,925	3%
Others	177	176	179	142	178	187	175	177	184	155	-16%
Sub-total	4,862	3,731	3,533	3,135	3,384	3,904	4,040	4,119	4,008	4,079	2%
East Asia											
China	2,657	2,663	2,872	3,027	3,117	3,265	3,650	3,774	3,773	3,466	-8%
Japan	2,632	2,284	2,696	2,707	2,814	3,255	3,381	2,911	3,081	3,107	1%
South Korea	640	682	689	629	590	561	593	595	571	541	-5%
Taiwan	379	346	327	328	318	310	292	302	275	281	2%
Others	30	30	40	31	55	42	39	45	61	69	13%
Sub-total	6,337	6,005	6,624	6,722	6,893	7,433	7,955	7,628	7,761	7,463	-4%
Other Regions											
South Asia	1,501	1,369	1,254	1,178	1,110	1,116	1,162	1,250	1,175	832	-29%
Middle East	190	173	187	213	200	181	187	186	176	161	-9%
Oceania	139	143	136	137	133	136	132	136	139	111	-20%
C&S America	241	207	208	219	215	223	201	121	133	96	-28%
CIS	115	92	74	59	47	50	51	53	56	48	-15%
Africa	34	39	42	40	31	29	29	30	32	27	-15%
Sub-total	2,221	2,023	1,900	1,846	1,737	1,735	1,761	1,775	1,711	1,275	-26%
Global Total	15,802	14,013	14,331	13,997	14,214	15,287	16,134	15,968	16,007	15,142	-5%

Appendix 5 - Electrical & Electronics Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Japan	2,212	1,859	2,245	2,290	2,358	2,830	2,941	2,465	2,634	2,704	3%
China/Hong Kong	1,795	1,769	1,905	2,027	2,091	2,277	2,649	2,759	2,741	2,514	-8%
United States	3,090	2,040	1,742	1,373	1,460	2,021	2,080	2,136	1,939	1,972	2%
Germany	645	552	551	568	539	550	569	592	574	517	-10%
South Korea	263	260	270	290	265	259	268	262	246	229	-7%
Taiwan	282	251	238	243	234	226	204	212	188	195	4%
Others	1,795	1,696	1,614	1,602	1,522	1,537	1,555	1,570	1,526	1,335	-13%
Global Total	10,081	8,426	8,566	8,393	8,470	9,699	10,266	9,996	9,849	9,465	-4%

Source: Metals Focus

Appendix 6 - Brazing Alloys & Solder Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
China	646	679	746	776	792	749	761	772	781	701	-10%
United States	210	200	190	187	177	182	192	198	202	186	-8%
South Korea	106	99	93	84	80	70	75	74	71	66	-8%
Japan	76	61	61	58	56	56	64	67	65	59	-10%
Germany	85	80	78	74	70	68	68	67	65	57	-12%
India	89	80	73	70	66	67	69	71	68	54	-21%
Others	410	389	388	337	278	266	288	301	313	274	-12%
Global Total	1,622	1,589	1,630	1,586	1,519	1,460	1,515	1,550	1,565	1,397	-11%

Appendix 7 - Photographic Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe & N. America	1,303	1,183	1,082	1,009	942	850	780	740	703	657	-7%
East Asia	559	399	304	304	299	280	270	262	259	202	-22%
Others	55	52	39	41	41	45	42	49	56	1	-99%
Global Total	1,917	1,634	1,424	1,355	1,282	1,174	1,092	1,051	1,018	859	-16%

Appendix 8a - Physical Investment

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
United States	3,644	3,068	3,706	3,397	3,748	3,098	1,712	1,357	1,438	2,433	69%
Germany	1,108	715	844	608	654	743	718	778	1,061	1,326	25%
India	1,517	1,682	2,719	3,136	3,435	1,136	1,259	1,680	1,757	269	-85%
Canada	149	150	206	230	237	225	147	142	156	245	57%
China	651	713	660	364	357	346	238	210	193	214	11%
Other Europe	342	225	246	226	302	337	282	340	364	420	15%
Others	1,083	972	1,010	892	989	760	502	644	804	1,328	65%
Global Total	8,493	7,525	9,391	8,853	9,723	6,645	4,858	5,152	5,776	6,236	8%

Appendix 8b - Coins & Medals Fabrication

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Canada	748	615	953	1,007	1,171	1,125	655	653	803	1,035	29%
United States	1,412	1,123	1,425	1,444	1,527	1,225	601	532	637	1,018	60%
Australia	346	328	267	266	394	409	333	325	394	533	35%
UK	26	23	78	67	109	109	96	109	99	302	205%
China	364	373	373	362	359	355	248	233	217	238	10%
Austria	557	274	451	144	227	107	64	65	90	224	148%
India	50	70	140	176	224	220	257	328	351	161	-54%
South Africa	0	0	26	0	18	0	36	116	112	121	8%
Germany	125	40	40	40	60	135	125	125	120	120	0%
Mexico	52	40	21	22	33	36	38	19	12	14	14%
Others	241	245	286	272	282	198	188	223	237	230	-3%
Global Total	3,921	3,131	4,061	3,801	4,403	3,918	2,641	2,728	3,073	3,995	30%

Source: Metals Focus

Appendix 9 - Jewelry Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
Europe											
Italy	534	479	556	606	622	586	605	601	619	504	-19%
Germany	107	105	109	105	108	104	107	108	109	95	-13%
Others	197	192	204	208	209	204	205	203	203	167	-18%
Sub-total	838	775	869	919	938	894	917	912	931	765	-18%
North America											
United States	347	365	384	404	425	403	410	404	402	334	-17%
Mexico	146	155	141	168	177	180	153	155	139	97	-30%
Canada	104	102	113	117	108	111	106	102	101	83	-18%
Sub-total	596	622	638	690	709	694	669	661	642	514	-20%
Middle East											
Turkey	112	125	151	195	208	152	153	184	186	138	-26%
Others	68	77	80	84	98	93	88	108	93	70	-24%
Sub-total	180	202	231	279	306	245	241	292	279	208	-25%
South Asia											
India	693	708	990	1,404	1,760	1,677	1,995	2,256	2,148	1,260	-41%
Others	30	28	30	35	38	37	42	47	45	27	-41%
Sub-total	723	736	1,020	1,438	1,799	1,715	2,038	2,303	2,193	1,287	-41%
East Asia											
Thailand	818	632	812	769	877	828	837	785	886	736	-17%
China	1,389	1,458	1,662	1,280	1,050	893	794	755	709	589	-17%
Indonesia	82	92	128	191	152	163	157	163	175	149	-15%
Others	166	173	194	182	187	177	179	179	183	157	-14%
Sub-total	2,455	2,355	2,797	2,421	2,267	2,060	1,967	1,881	1,953	1,631	-16%
Other Regions	245	256	257	251	253	251	243	234	232	216	-7%
Global Total	5,037	4,946	5,812	5,998	6,272	5,859	6,074	6,283	6,229	4,622	-26%

Appendix 10 - Silverware Demand

Tons	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Y/Y
India	584	549	702	952	1,151	1,061	1,236	1,442	1,282	541	-58%
Nepal	80	82	92	114	123	136	148	183	174	113	-35%
China	215	223	250	188	122	98	105	107	103	77	-25%
Italy	97	92	87	88	86	78	71	68	63	39	-38%
United States	43	41	39	40	40	40	40	39	39	33	-17%
Others	279	279	278	285	281	264	253	262	269	211	-22%
Global Total	1,298	1,266	1,447	1,666	1,802	1,677	1,853	2,101	1,931	1,014	-48%

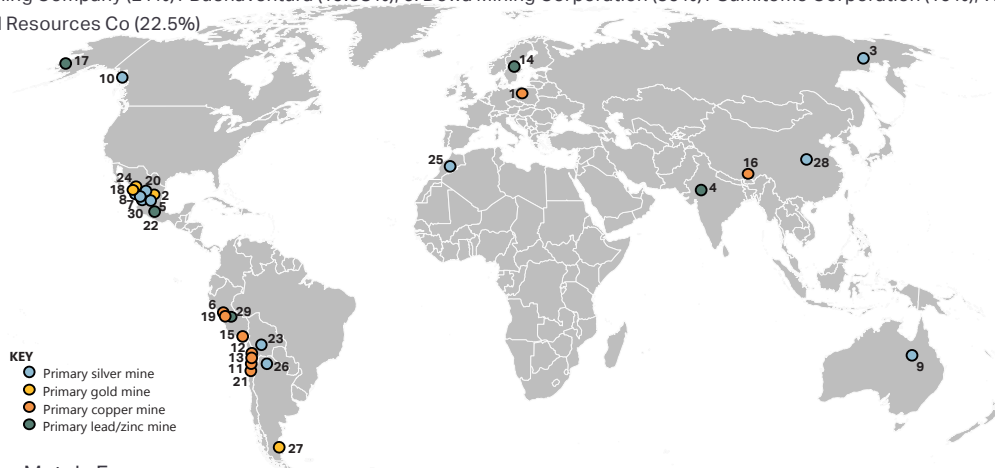
Source: Metals Focus

Appendix 11 - Top 30 Silver Producing Mines

Million ounces

Rank	Mine	Country	Ownership	2019	2020	Y/Y
1	KGHM Polska Miedź	Poland	KGHM Polska Miedź (100%)	40.2	39.2	-2%
2	Peñasquito	Mexico	Newmont Corp. (100%)	24.7	30.9	25%
3	Dukat	Russia	Polymetal International (100%)	19.3	18.2	-6%
4	Sindesar Khurd ^{1,2}	India	Hindustan Zinc (100%)	16.3	17.3	6%
5	Saucito	Mexico	Fresnillo (100%)	18.3	16.5	-10%
6	Antamina ³	Peru	BHP Billiton (33.75%) / Glencore (33.75%)	15.0	16.4	10%
7	San Julian	Mexico	Fresnillo (100%)	13.0	13.3	2%
8	Fresnillo	Mexico	Fresnillo (100%)	13.0	13.1	0%
9	Cannington ¹	Australia	South32 (100%)	12.3	11.6	-6%
10	Greens Creek	United States	Hecla Mining Company (100%)	9.9	10.5	6%
11	Chuquicamata ¹	Chile	Codelco (100%)	6.6	10.0	51%
12	Collahuasi ⁴	Chile	Anglo American (44%) / Glencore (44%)	6.5	9.0	38%
13	Ministro Hales ¹	Chile	Codelco (100%)	1.6	8.4	441%
14	Garpenberg	Sweden	Boliden (100%)	8.2	7.9	-5%
15	Cerro Verde ⁵	Peru	Freeport McMoRan Copper & Gold (53.56%)	5.6	7.7	37%
16	Jiama	China	China Gold International Resource (100%)	3.8	7.3	92%
17	Red Dog ²	United States	Teck Resources (100%)	7.1	6.5	-9%
18	San Dimas	Mexico	First Majestic Silver (100%)	6.3	6.4	1%
19	Toromocho	Peru	Chinalco (100%)	6.6	6.3	-5%
20	Palmarejo	Mexico	Coeur Mining (100%)	6.8	6.3	-7%
21	Escondida ¹	Chile	BHP Billiton (57.5%) / Rio Tinto (30%) / JECO (10%)	7.7	6.2	-19%
22	Tizapa ⁶	Mexico	Industrias Peñoles (51%)	5.8	6.0	3%
23	San Bartolome ²	Bolivia	Ag-Mining Investments (100%)	5.3	5.8	9%
24	Ciénega	Mexico	Fresnillo (100%)	5.8	5.8	-1%
25	Imiter ²	Morocco	Managem (80.26%) / Private & Other (19.74%)	5.2	5.7	9%
26	Puna	Argentina	SSR Mining Inc. (100%)	7.7	5.6	-27%
27	Cerro Moro	Argentina	Yamana Gold (100%)	6.3	5.4	-14%
28	Ying ⁷	China	Silvercorp Metals (77.5%)	6.2	5.2	-15%
29	Yauli	Peru	Volcan Compañía Minera S.A.A (100%)	7.0	5.2	-26%
30	La Colorada	Mexico	Pan American Silver (100%)	8.2	5.0	-39%

NB: All numbers are silver contained in concentrate or doré unless stated otherwise, 1: Payable metal, 2: Estimate, 3: Teck Resources (22.5%), 4: Mitsui & Co (12%), 5: Sumitomo Metal Mining Company (21%) / Buenaventura (19.58%), 6: Dow Mining Corporation (39%) / Sumitomo Corporation (10%), 7: Henan Non-Ferrous Geological & Mineral Resources Co (22.5%)



Source: Company Reports, Metals Focus

Appendix 12a - Top 20 Producing Companies

Tons	2019	2020	Y/Y
Fresnillo ¹	1,610	1,564	-3%
KGHM Polska Miedz ²	1,417	1,353	-5%
Glencore	996	1,019	2%
Newmont	493	865	75%
CODELCO	485	767	58%
Hindustan Zinc Ltd. ^{3,4}	633	671	6%
Southern Copper Corp.	631	670	6%
Polymetal Intl. plc	671	586	-13%
Pan American Silver Corp.	805	538	-33%
Hecla Mining Company	392	421	7%
Buenaventura ⁵	625	387	-38%
Industrias Peñoles ⁶	328	382	16%
Volcan Cia Minera S.A.A.	485	376	-22%
BHP ²	410	374	-9%
South32 Ltd. ²	383	361	-6%
First Majestic Silver	412	361	-12%
Boliden A.B. ⁷	372	354	-5%
Yamana Gold Inc.	331	322	-3%
Teck Resources Inc. ⁸	325	316	-3%
Hochschild Mining plc ⁹	523	305	-42%

NB: 1 - Excludes Silverstream contract, 2 - Payable silver production, 3 - Hindustan Zinc is a Vedanta Group company, 4 - Production from integrated operations only, 5 - Includes production from associated companies, 6 - Excludes 100% Fresnillo plc., 7 - Silver in concentrate, 8 - Estimated attributable mined production, 9 - Attributable production
Source: Company Reports, Metals Focus

Appendix 12b - Top 20 Producing Countries

Tons	2019	2020	Y/Y
Mexico	5,840	5,541	-5%
Peru	4,221	3,411	-19%
China	3,444	3,377	-2%
Chile	1,189	1,474	24%
Australia	1,325	1,362	3%
Russia	1,391	1,323	-5%
Poland	1,257	1,225	-2%
United States	976	986	1%
Bolivia	1,153	930	-19%
Argentina	1,025	714	-30%
India	633	671	6%
Kazakhstan	530	539	2%
Sweden	446	417	-7%
Canada	419	290	-31%
Morocco	251	261	4%
Indonesia	225	258	14%
Uzbekistan	191	195	2%
Papua New Guinea	147	132	-10%
Dominican Republic	141	119	-15%
Turkey	99	111	11%
Others	1,012	1,063	5%
Global Total	25,916	24,399	-6%

Source: Metals Focus

Appendix 12c - Mine Production Forecast by Region

Tons	2020	2021	Y/Y
C&S America	6,846	7,672	12%
N America	6,817	7,633	12%
Asia	4,683	4,866	4%
CIS	2,205	2,249	2%
Europe	1,892	1,935	2%
Oceania	1,496	1,572	5%
Africa	460	466	1%
Global Total	24,399	26,392	8%

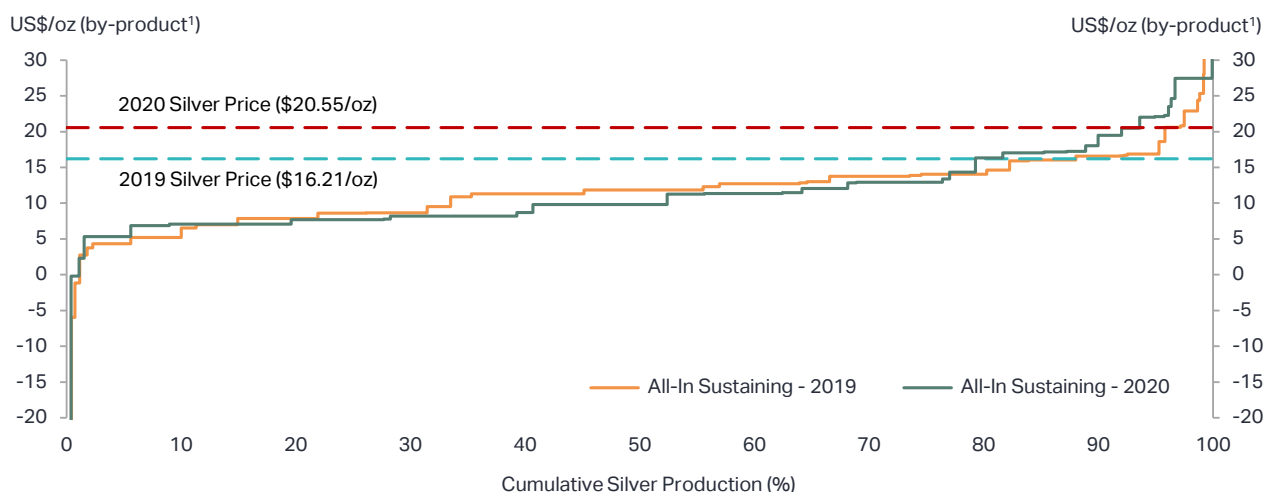
Source: Metals Focus

Appendix 13 - Primary Silver Production Costs (by-product¹)

											Year on Year	
US\$/oz (by-product)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2019	2020
North America												
Total Cash Cost	5.55	5.88	8.17	7.71	6.42	3.47	2.17	2.63	4.03	3.57	53%	-12%
Total Production Cost	10.19	11.88	13.66	13.35	11.44	8.63	8.20	8.35	10.45	9.94	25%	-5%
All-In Sustaining Cost ²	na	14.66	15.49	14.49	12.31	8.77	9.23	10.47	11.93	10.85	14%	-9%
Central & South America												
Total Cash Cost	12.29	13.90	12.10	10.03	9.41	7.42	7.01	5.72	7.52	9.42	31%	25%
Total Production Cost	16.33	18.77	17.58	13.89	13.62	10.41	10.03	9.04	11.53	14.51	28%	26%
All-In Sustaining Cost ²	na	21.09	18.71	15.31	13.82	10.79	11.70	11.30	13.13	16.14	16%	23%
CIS												
Total Cash Cost	14.00	10.18	10.27	7.21	4.99	4.35	6.98	7.60	9.12	7.64	20%	-16%
Total Production Cost	15.33	11.83	13.02	9.43	6.39	5.81	9.19	10.28	10.91	9.31	6%	-15%
All-In Sustaining Cost ²	na	13.43	13.90	9.42	6.41	5.85	9.46	9.76	11.86	9.81	22%	-17%
Asia												
Total Cash Cost	-5.66	-1.94	1.52	1.01	1.13	-2.02	-4.58	-4.40	-2.36	-0.17	na	na
Total Production Cost	-3.96	-0.43	4.00	4.64	4.88	0.87	-1.83	-1.30	0.89	3.11	na	249%
All-In Sustaining Cost ²	na	18.63	17.73	8.53	9.44	3.53	1.90	1.42	3.68	6.37	159%	73%
Oceania												
Total Cash Cost	-0.24	5.86	3.55	1.99	2.16	-1.90	-3.72	-0.47	2.02	1.20	na	-41%
Total Production Cost	1.35	7.34	5.15	4.21	4.59	1.22	0.60	3.21	7.22	15.80	125%	119%
All-In Sustaining Cost ²	na	8.81	6.93	5.41	5.67	1.08	1.02	5.51	7.85	5.30	42%	-32%
Global Total												
Total Cash Cost	6.56	8.49	8.72	7.86	6.88	4.44	3.70	3.47	5.02	4.73	45%	-6%
Total Production Cost	10.10	12.90	13.30	12.18	11.00	8.23	8.23	8.06	10.17	10.87	26%	7%
All-In Sustaining Cost ²	na	15.59	15.51	13.18	11.54	8.47	9.54	9.96	11.61	11.17	16%	-4%

Source: Metals Focus

Global Primary Silver Mine Production Costs in 2020 (by-product)



1: Costs shown on a by-product accounting basis 2: All-In Sustaining Cost figures not reported prior to 2012

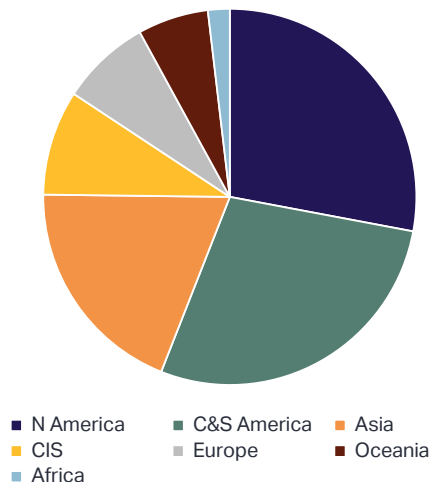
Source: Metals Focus Silver Mine Cost Service

Appendix 14 - Mine Production by Region & Primary Metal

											Year on Year	
Million ounces	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2019	2020
Regional Breakdown												
C&S America	231.3	227.0	244.8	285.5	297.4	310.1	284.0	265.9	254.2	219.2	-1%	-6%
North America	206.7	227.8	240.7	238.5	239.0	222.8	232.8	236.1	232.6	220.1	-4%	-13%
Asia	135.4	143.2	151.8	149.1	156.2	163.1	156.3	154.8	150.3	150.6	-3%	0%
CIS	66.2	73.6	74.7	73.9	77.1	74.6	71.3	72.9	72.4	70.9	-1%	-2%
Europe	51.0	51.5	55.0	56.4	60.3	62.6	62.9	61.9	61.6	60.8	0%	-1%
Oceania	59.3	58.5	62.5	63.1	48.9	49.2	38.6	43.6	47.5	48.1	9%	1%
Africa	13.7	14.2	15.9	15.4	17.5	17.1	17.0	13.2	14.7	14.8	11%	1%
Global Total	763.5	795.9	845.3	881.9	896.4	899.4	862.9	848.4	833.2	784.4	-2%	-6%
Global Breakdown												
Primary Silver	248.6	254.5	266.7	287.3	292.1	289.5	264.7	248.1	237.7	209.4	-4%	-12%
Gold	125.6	126.8	134.0	144.4	151.8	136.3	131.9	131.8	130.7	123.3	-1%	-6%
Copper	161.2	166.3	171.4	183.9	190.0	206.7	200.7	197.0	191.7	198.3	-3%	3%
Lead/Zinc	221.8	242.5	267.5	260.7	257.2	260.5	258.9	264.4	268.1	248.3	1%	-7%
Other	6.4	5.7	5.7	5.5	5.3	6.5	6.7	7.0	5.0	5.1	-29%	2%
Global Total	763.5	795.9	845.3	881.9	896.4	899.4	862.9	848.4	833.2	784.4	-2%	-6%
Global Breakdown (Percentage)												
Primary Silver	32.6%	32.0%	31.6%	32.6%	32.6%	32.2%	30.7%	29.2%	28.5%	26.7%		
Gold	16.5%	15.9%	15.9%	16.4%	16.9%	15.2%	15.3%	15.5%	15.7%	15.7%		
Copper	21.1%	20.9%	20.3%	20.9%	21.2%	23.0%	23.3%	23.2%	23.0%	25.3%		
Lead/Zinc	29.0%	30.5%	31.6%	29.6%	28.7%	29.0%	30.0%	31.2%	32.2%	31.7%		
Other	0.8%	0.7%	0.7%	0.6%	0.6%	0.7%	0.8%	0.8%	0.6%	0.6%		

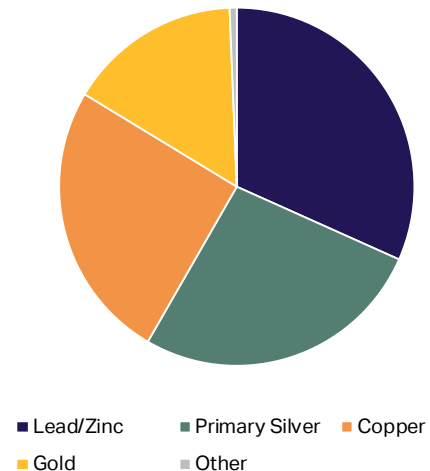
Source: Metals Focus

Mine Production by Region in 2020



Source: Metals Focus

Mine Production by Source Metal in 2020



Source: Metals Focus

Appendix 15 - Nominal Silver Prices

Year	Average ¹ US\$/oz	Low ² US\$/oz	High ² US\$/oz	€/kg ³	CNY/kg ⁴	INR/kg	JPY/g	A\$/oz	MXN/oz	PEN/oz
1988	6.53	6.05	7.82	177.21	783.68	2,918	26.95	8.33	14.83	n/a
1989	5.50	5.05	6.21	158.50	665.43	2,861	24.36	6.94	13.74	n/a
1990	4.83	3.95	5.35	120.24	742.93	2,713	22.57	6.18	13.69	n/a
1991	4.06	3.61	4.57	103.83	696.01	2,970	17.55	5.20	12.24	n/a
1992	3.95	3.65	4.34	96.01	701.10	3,563	16.08	5.37	12.21	5.95
1993	4.31	3.56	5.50	116.86	801.22	4,334	15.33	6.34	13.43	8.60
1994	5.28	4.54	5.95	141.23	1,462.51	5,335	17.36	7.22	17.90	11.61
1995	5.20	4.32	6.15	125.98	1,394.85	5,419	15.71	7.01	33.34	11.71
1996	5.20	4.68	5.88	129.41	1,389.91	5,917	18.16	6.64	39.48	12.69
1997	4.90	4.18	6.40	139.28	1,305.19	5,726	19.09	6.59	38.78	13.01
1998	5.54	4.60	7.93	160.42	1,473.76	7,322	23.31	8.80	50.66	16.21
1999	5.22	4.84	5.81	157.47	1,388.99	7,227	19.08	8.09	49.85	17.65
2000	4.95	4.56	5.56	172.64	1,318.16	7,152	17.16	8.51	46.85	17.28
2001	4.37	4.04	4.86	156.90	1,162.98	6,628	17.06	8.44	40.79	15.33
2002	4.60	4.23	5.15	156.79	1,223.84	7,185	18.50	8.45	44.46	16.17
2003	4.88	4.34	6.01	138.66	1,297.84	7,294	18.14	7.47	52.65	16.96
2004	6.66	5.46	8.45	172.08	1,771.68	9,693	23.12	9.03	75.16	22.71
2005	7.31	6.33	9.27	189.58	1,924.82	10,378	25.97	9.59	79.63	24.10
2006	11.55	8.69	15.22	295.04	3,091.08	16,831	43.17	15.33	125.96	37.81
2007	13.38	11.06	16.22	314.15	3,029.76	17,779	50.64	15.95	146.26	41.87
2008	14.99	8.46	21.36	324.36	3,014.45	20,648	50.16	17.59	167.31	43.81
2009	14.67	10.35	19.46	336.95	2,810.23	22,768	44.01	18.50	198.11	44.16
2010	20.19	14.64	30.94	489.62	3,920.91	29,632	56.54	21.93	255.04	57.03
2011	35.12	26.07	49.79	809.49	6,496.25	52,523	89.92	34.00	437.00	96.70
2012	31.15	26.16	37.48	778.30	5,532.74	53,380	79.93	30.07	409.80	82.17
2013	23.79	18.23	32.48	576.50	4,132.84	44,480	74.25	24.58	303.63	64.32
2014	19.08	14.29	22.18	460.87	3,421.89	37,405	64.64	21.14	254.00	54.17
2015	15.68	13.65	18.49	454.23	2,918.65	32,289	61.00	20.84	249.01	49.95
2016	17.14	13.75	21.14	497.60	3,262.84	37,004	59.56	23.03	320.28	57.83
2017	17.05	15.19	18.66	486.59	3,356.49	35,700	61.46	22.23	322.44	55.59
2018	15.71	13.90	17.70	427.23	3,094.63	34,462	55.73	21.01	302.06	51.63
2019	16.21	14.29	19.65	465.80	3,416.90	36,719	56.77	23.31	311.99	54.08
2020	20.55	11.64	29.86	575.02	4,149.86	48,907	70.33	29.73	441.46	71.82

1: Average US\$ prices are based on the daily London Silver Fixing and (since 08/15/2014) the daily LBMA Silver Price. Unless otherwise specified, these US\$ prices in conjunction with Bloomberg Closing exchange rates have been used to illustrate annual average prices in other currencies.

2: High and low derived from intra-day spot prices

3: Euro price based on euro-quoted LBMA PM Fix from 1999 onwards and the dollar price converted into euros using Bloomberg synthetic exchange rates prior to that time

4: CNY price is the SGE AG (T+D) from 2006 onwards and based on London Silver Fixing converted into renminbi using Bloomberg exchange rates prior to that time. VAT has been subtracted from the quoted price.

Currency key: € - Euro, CNY - Chinese Yuan, INR - Indian Rupee, JPY - Japanese Yen, AUD - Australian dollar, MXN - Mexican peso, PEN - Peruvian nuevo sol

Source: Metals Focus, Bloomberg

Appendix 16 - Real Silver Prices (Inflation Adjusted)

Year	Average ¹ US\$/oz	Low ² US\$/oz	High ² US\$/oz	€/kg ³	CNY/kg ⁴	INR/kg ⁵	JPY/g	A\$/oz	MXN/oz	PEN/oz
1988	14.12	13.08	16.91	351.71	3,036.80	28,007	31.32	19.06	261.54	n/a
1989	11.36	10.42	12.83	299.76	2,185.47	25,643	27.58	14.72	202.37	n/a
1990	9.41	7.69	10.42	216.30	2,366.72	22,319	24.64	12.27	155.26	n/a
1991	7.66	6.82	8.63	177.20	2,143.94	21,452	18.66	10.18	116.85	n/a
1992	7.24	6.70	7.96	157.57	2,029.90	23,028	16.90	10.47	104.14	n/a
1993	7.71	6.36	9.83	184.25	2,022.48	26,342	15.95	12.14	106.04	n/a
1994	9.20	7.90	10.35	215.94	2,974.09	29,412	17.94	13.47	131.92	29
1995	8.82	7.33	10.44	186.97	2,422.71	27,104	16.30	12.45	161.92	26.35
1996	8.54	6.57	9.66	188.50	2,228.82	27,156	18.73	11.62	150.03	25.56
1997	7.91	6.26	10.33	199.91	2,036.13	24,524	19.33	11.55	127.27	24.59
1998	8.80	6.98	12.60	228.54	2,317.46	27,693	23.47	15.21	140.27	28.99
1999	8.08	7.48	8.99	220.51	2,215.48	26,113	19.42	13.71	122.86	30.36
2000	7.41	6.03	8.97	235.88	2,093.79	24,846	17.54	13.65	105.94	28.64
2001	6.44	5.85	7.26	210.06	1,834.61	22,187	17.65	13.12	88.39	25.44
2002	6.62	6.09	7.41	205.15	1,946.22	23,063	19.20	12.77	91.10	26.44
2003	6.89	6.15	8.49	177.92	2,039.44	22,554	18.90	11.01	103.76	27.07
2004	9.11	7.47	11.57	215.79	2,679.57	28,884	24.05	12.99	140.84	35.02
2005	9.68	8.37	12.27	232.50	2,859.74	29,664	27.13	13.41	144.43	36.61
2006	14.91	11.03	19.65	355.08	4,524.22	45,474	44.94	20.74	219.50	56.79
2007	16.60	13.72	20.12	366.83	4,231.44	45,156	52.34	20.99	245.66	60.51
2008	18.57	10.48	26.46	372.87	3,975.68	48,403	51.64	22.31	263.73	59.37
2009	17.70	12.46	23.48	383.78	3,732.76	48,135	46.10	22.99	301.60	59.71
2010	24.00	17.42	36.78	545.61	5,041.92	55,939	59.42	26.53	371.85	75.53
2011	40.54	30.11	57.48	877.86	7,926.28	91,084	94.70	39.93	613.76	122.26
2012	35.34	29.67	42.52	825.73	6,579.48	84,684	84.35	34.56	555.73	101.22
2013	26.59	20.36	36.28	606.49	4,789.97	63,625	77.07	27.49	396.17	77.02
2014	21.16	16.00	24.60	485.68	3,888.19	50,309	65.55	23.25	318.28	62.84
2015	17.27	15.03	20.36	477.48	3,270.55	41,019	61.79	22.54	305.56	55.50
2016	18.49	14.83	22.80	517.38	3,584.57	44,796	60.15	24.54	380.20	62.25
2017	18.01	16.05	19.71	499.22	3,629.61	42,166	61.40	23.25	358.56	59.03
2018	16.28	14.41	18.35	431.75	3,277.45	38,817	55.51	21.58	320.34	53.64
2019	16.43	14.49	19.92	464.57	3,516.68	38,417	56.10	23.51	321.86	55.15
2020	20.55	11.64	29.86	575.02	4,149.86	48,907	70.33	29.73	441.46	71.82

Based on respective countries' CPI. €/kg based on Eurozone CPI Index (Values until 1996 calculated using the Harmonised Index of Consumer Prices).

1: Average US\$ prices are based on the daily London Silver Fixing and (since 08/15/2014) the daily LBMA Silver Price. Unless otherwise specified, these US\$ prices in conjunction with Bloomberg Closing exchange rates have been used to illustrate annual average prices in other currencies.

2: High and low derived from intra-day spot prices

3: Euro price based on euro-quoted LBMA PM Fix from 1999 onwards and the 100000dollar price converted into euros using Bloomberg synthetic exchange rates prior to that time.

4: CNY price is the SGE AG (T+D) from 2006 onwards and based on London Silver Fixing converted into renminbi using Bloomberg exchange rates prior to that time. VAT has been subtracted from the quoted price.

5: Indian prices were calculated based on the average CPI in the first nine months in 2020.

Currency key: € - Euro, CNY - Chinese Yuan, INR - Indian Rupee, JPY - Japanese Yen, AUD - Australian dollar, MXN - Mexican peso, PEN - Peruvian nuevo sol

Source: Metals Focus, Bloomberg

Appendix 17 - LBMA & Comex Silver Prices

US\$/oz	LBMA ¹			Comex ²		
Year/Month	Low	High	Average	Low	High	Average
2001	4.07	4.82	4.37	4.03	4.83	4.38
2002	4.24	5.10	4.60	4.22	5.13	4.61
2003	4.37	5.97	4.88	4.35	5.99	4.90
2004	5.50	8.29	6.66	5.52	8.22	6.70
2005	6.39	9.23	7.31	6.45	9.10	7.36
2006	8.83	14.94	11.55	8.87	14.94	11.62
2007	11.67	15.82	13.38	11.50	15.55	13.47
2008	8.88	20.92	14.99	8.79	20.79	15.00
2009	10.51	19.18	14.67	10.44	19.33	14.71
2010	15.14	30.70	20.19	14.83	30.94	20.26
2011	26.16	48.70	35.12	26.81	48.60	35.27
2012	26.67	37.23	31.15	26.29	37.21	31.19
2013	18.61	32.23	23.79	18.55	32.44	23.78
2014	15.28	22.05	19.08	15.41	22.09	19.07
2015	13.71	18.23	15.68	13.70	18.36	15.68
2016	13.58	20.71	17.14	13.75	20.70	17.18
2017	15.22	18.56	17.05	15.43	18.51	17.08
2018	13.97	17.52	15.71	13.98	17.62	15.72
2019	14.38	19.31	16.21	14.32	19.55	16.24
2020	12.01	28.89	20.55	11.77	29.26	20.72
Jan-20	17.47	18.44	17.97	17.46	18.39	17.97
Feb-20	17.19	18.78	17.92	16.46	18.96	17.86
Mar-20	12.01	17.48	14.92	11.77	17.39	14.94
Apr-20	14.02	15.57	15.03	13.98	16.34	15.35
May-20	14.75	17.59	16.23	14.80	18.50	16.59
Jun-20	17.09	18.27	17.72	17.40	18.83	17.96
Jul-20	17.93	24.38	20.41	18.22	24.50	20.95
Aug-20	24.23	28.33	26.89	24.42	29.26	27.18
Sep-20	22.22	28.89	25.89	23.09	28.65	25.92
Oct-20	23.02	25.06	24.25	23.36	25.27	24.35
Nov-20	22.15	25.78	24.04	22.59	25.66	24.16
Dec-20	23.54	26.49	24.89	23.99	26.57	25.17
Jan-21	24.87	27.53	25.90	24.64	27.64	25.93
Feb-21	26.40	29.59	27.35	26.23	29.42	27.34

1: Prices are based on the daily London Silver Fixing and (since 08/15/2014) the daily LBMA Silver Price.

2: Prices are based on the generic 1st futures contract.

Source: LBMA, CME Group, Bloomberg

Appendix 18 - Comex Activity & Inventories

Moz		Managed Money Positions in Comex Futures					
		Futures					Comex Inventories ²
Year/Month	Volume ¹	Open Interest ²	Long ²	Short ²	Net ²	Net Change ³	
2012	66,563	707	138	23	115	91	148
2013	72,378	662	159	120	39	-76	174
2014	68,485	756	201	105	97	58	176
2015	67,263	841	246	211	36	-61	161
2016	91,094	824	291	95	196	160	183
2017	115,175	966	242	278	-36	-232	243
2018	119,935	881	267	223	44	80	294
2019	120,746	1,149	429	135	294	250	317
2020	130,633	857	361	131	230	-64	397
Jan-19	7,631	1,017	330	131	200	156	298
Feb-19	8,918	983	363	125	239	39	299
Mar-19	7,093	979	263	201	62	-177	305
Apr-19	9,602	983	261	330	-69	-130	307
May-19	7,381	1,050	250	440	-190	-121	306
Jun-19	13,256	1,092	400	283	116	306	306
Jul-19	10,435	1,181	474	162	313	197	310
Aug-19	15,093	1,094	423	144	279	-34	312
Sep-19	12,899	1,066	384	139	245	-34	314
Oct-19	9,053	1,125	390	152	238	-7	316
Nov-19	11,671	1,023	380	139	241	3	313
Dec-19	7,714	1,149	429	135	294	54	317
Jan-20	10,063	1,147	414	174	240	-55	321
Feb-20	12,577	1,004	434	126	308	69	324
Mar-20	11,376	696	152	62	90	-219	321
Apr-20	6,789	673	155	82	72	-17	317
May-20	6,054	832	204	73	131	58	312
Jun-20	9,233	847	300	124	176	45	321
Jul-20	13,118	967	290	126	164	-12	335
Aug-20	23,169	828	309	119	190	27	345
Sep-20	10,917	774	296	117	178	-12	375
Oct-20	8,228	771	315	107	208	30	382
Nov-20	10,698	763	314	106	208	0	388
Dec-20	8,410	857	361	131	230	22	397
Jan-21	10,142	896	331	116	215	-15	397
Feb-21	12,980	805	311	123	188	-27	393

1: Aggregate volume over the period, 2: Position at end-period, 3: Net change versus previous end-period

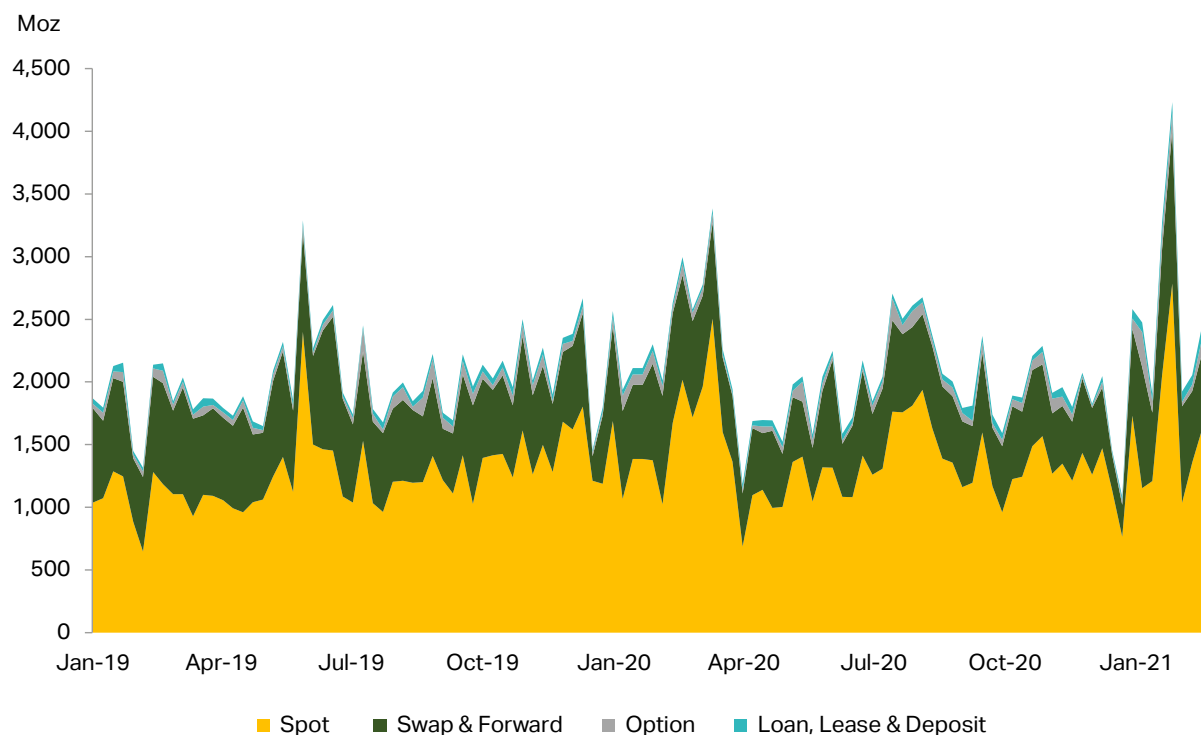
Source: Comex - CME Group, CFTC, Bloomberg

Appendix 19a - LBMA Monthly Silver Trading Volumes

Moz	Spot	Swap & Forward	Option	Loan, Lease & Deposit	Total
Month					
Jan-20	6,120	2,917	366	219	9,623
Feb-20	6,089	3,347	322	179	9,937
Mar-20	8,329	3,063	234	152	11,779
Apr-20	4,537	2,219	144	189	7,088
May-20	5,016	1,929	332	187	7,464
Jun-20	5,366	2,729	160	205	8,459
Jul-20	6,937	2,879	386	196	10,399
Aug-20	7,036	2,568	346	173	10,123
Sep-20	5,742	2,315	274	285	8,616
Oct-20	5,383	2,421	269	189	8,261
Nov-20	5,678	2,107	355	230	8,371
Dec-20	5,628	1,977	121	121	7,847
Jan-21	6,150	3,210	578	304	10,241
Feb-21	6,805	3,173	342	351	10,672

Source: LBMA, Nasdaq

Appendix 19b - LBMA Weekly Silver Trading Volumes



Source: LBMA, Nasdaq

Appendix 20 - Chinese Silver Exchanges' Activity

Moz	Shanghai Gold Exchange		Shanghai Futures Exchange		
Year/Month	Ag (T +D) Volume ¹	Ag99.99 Volume ¹	Futures Volume ¹	Futures Open Interest ²	SHFE Inventories ²
2013	6,912	8.1	83,538	162	14
2014	8,024	14.0	93,758	98	4
2015	12,935	17.8	69,825	125	17
2016	17,954	10.9	41,765	179	60
2017	18,564	7.5	25,670	145	43
2018	12,596	6.1	20,428	174	36
2019	27,824	3.7	68,878	370	63
2020	67,191	5.7	172,279	349	95
Jan-19	1,467	0.4	2,792	190	39
Feb-19	764	0.1	1,441	198	41
Mar-19	1,330	0.1	2,193	205	39
Apr-19	868	0.4	1,570	204	35
May-19	751	0.1	1,629	180	36
Jun-19	1,312	0.0	2,433	205	41
Jul-19	2,517	0.1	5,727	315	44
Aug-19	4,955	0.0	11,900	418	46
Sep-19	5,109	0.2	13,627	294	46
Oct-19	2,861	0.7	8,007	359	46
Nov-19	3,095	1.1	8,971	290	55
Dec-19	2,795	0.5	8,588	370	63
Jan-20	2,470	0.3	6,404	346	73
Feb-20	2,535	0.0	3,481	322	77
Mar-20	5,916	1.2	6,512	332	73
Apr-20	3,717	0.2	4,397	259	68
May-20	4,922	0.1	10,473	324	66
Jun-20	5,171	0.2	11,235	280	67
Jul-20	7,729	0.4	18,427	352	69
Aug-20	11,547	0.5	35,906	371	71
Sep-20	7,676	0.7	26,085	371	76
Oct-20	4,130	0.6	14,199	376	75
Nov-20	5,562	0.7	15,436	352	78
Dec-20	5,816	0.9	19,724	349	95
Jan-21	4,278	0.2	15,295	323	91
Feb-21	2,727	0.1	11,933	289	91

1: Aggregate volume over the period, 2: Position at end-period;

N.B. Both the SGE and SHFE record each transaction twice, from the point of view of the buyer and also the seller. However, to compare these volumes with other exchanges, such as the Comex, the figures in the table have been halved (as shown above). From 2020 onward, SHFE has been reporting the trading volume and open interest single-sided.

Source: SGE, SHFE, Bloomberg

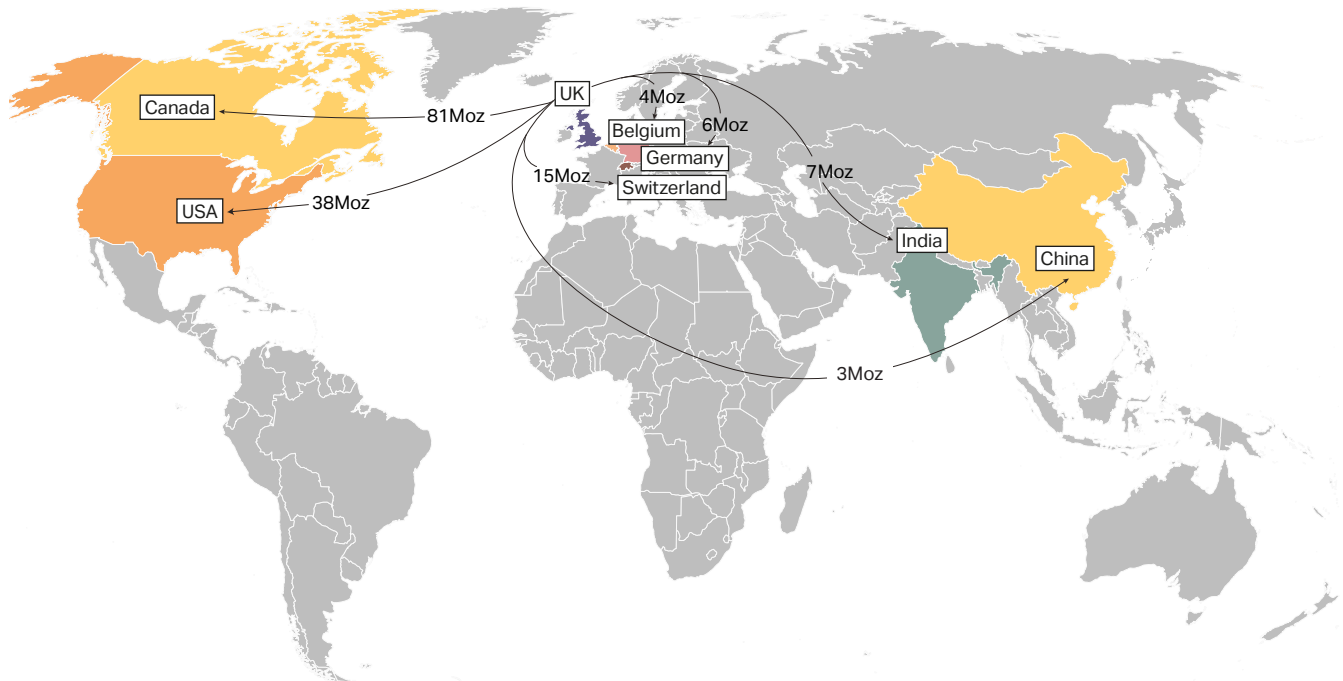
Appendix 21 - Physically Backed Silver Exchange-Traded Product Holdings*

Moz	iShares Silver Trust	ZKB	WisdomTree	Sprott Silver	Sprott Gold & Silver	Others	Total Holdings (Moz)	Total Value (\$M)
Year/Month								
2012	324	90	29	49	76	57	625	18,732
2013	320	85	35	49	77	63	630	12,288
2014	330	77	37	49	77	59	629	10,060
2015	318	69	41	49	77	58	612	8,469
2016	341	72	53	56	76	65	663	10,827
2017	321	80	60	56	75	78	670	11,364
2018	317	79	52	56	64	78	647	10,090
2019	363	83	69	60	58	96	729	13,276
2020	559	93	94	91	60	170	1,067	28,255
Jan-19	311	78	52	56	61	79	637	10,339
Feb-19	309	78	52	56	60	83	638	10,180
Mar-19	309	78	52	56	59	82	636	9,698
Apr-19	312	78	51	56	59	81	637	9,629
May-19	312	78	51	56	58	81	636	9,301
Jun-19	323	78	56	56	58	82	653	10,029
Jul-19	357	80	75	56	57	92	717	11,925
Aug-19	388	81	79	57	57	94	758	14,046
Sep-19	384	82	75	59	57	93	751	13,054
Oct-19	377	82	75	60	57	95	746	13,573
Nov-19	370	82	69	60	58	96	735	12,574
Dec-19	363	83	69	60	58	96	729	13,276
Jan-20	362	84	70	61	57	96	729	13,178
Feb-20	368	84	74	61	57	98	742	12,888
Mar-20	395	86	72	65	59	109	786	10,956
Apr-20	413	88	75	71	59	113	819	12,553
May-20	463	92	77	76	60	121	890	15,662
Jun-20	498	93	80	78	60	143	952	16,991
Jul-20	568	94	93	86	60	151	1,052	25,310
Aug-20	574	91	93	90	60	165	1,074	29,365
Sep-20	549	91	92	90	60	163	1,044	24,778
Oct-20	560	93	96	91	60	165	1,064	25,145
Nov-20	544	94	94	91	60	168	1,051	23,290
Dec-20	559	93	94	91	60	170	1,067	28,255
Jan-21	602	94	97	93	60	176	1,123	30,783
Feb-21	616	95	98	123	60	183	1,176	31,378

*Holdings at end-period; value calculated basis end-period price.

Source: Respective ETP providers, Bloomberg

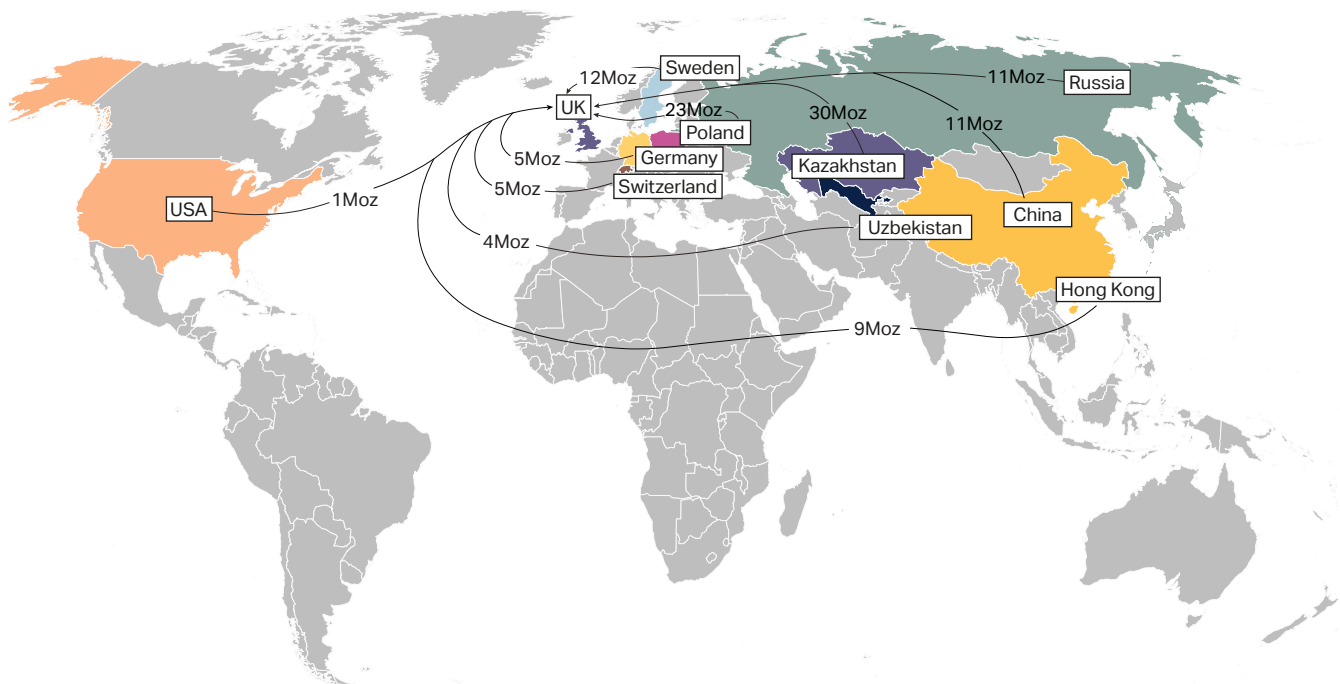
Appendix 22a - Selected United Kingdom Silver Bullion Exports in 2020



NB: In gross weight terms, exports shown account for 75% of total UK silver bullion exports in 2020

Source: HM Customs & Excise, Metals Focus

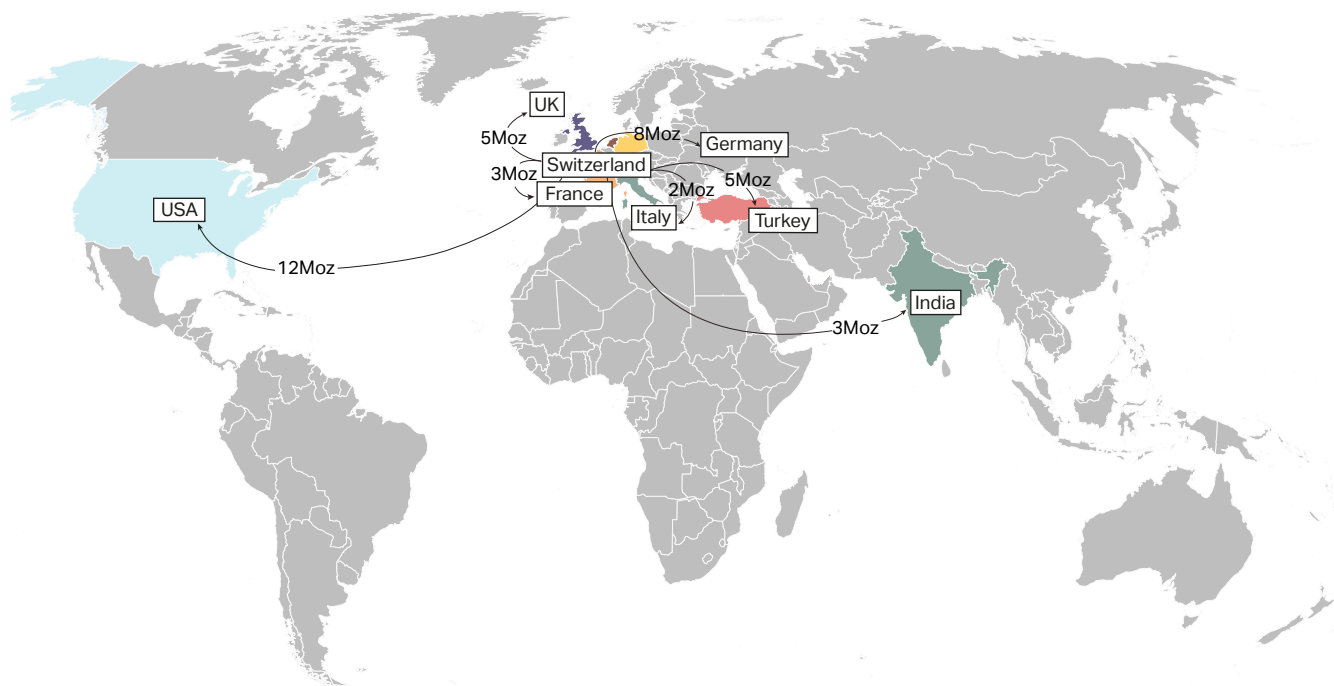
Appendix 22b - Selected United Kingdom Silver Bullion Imports in 2020



NB: In gross weight terms, imports shown account for 99% of total UK silver bullion imports in 2020

Source: HM Customs & Excise, Metals Focus

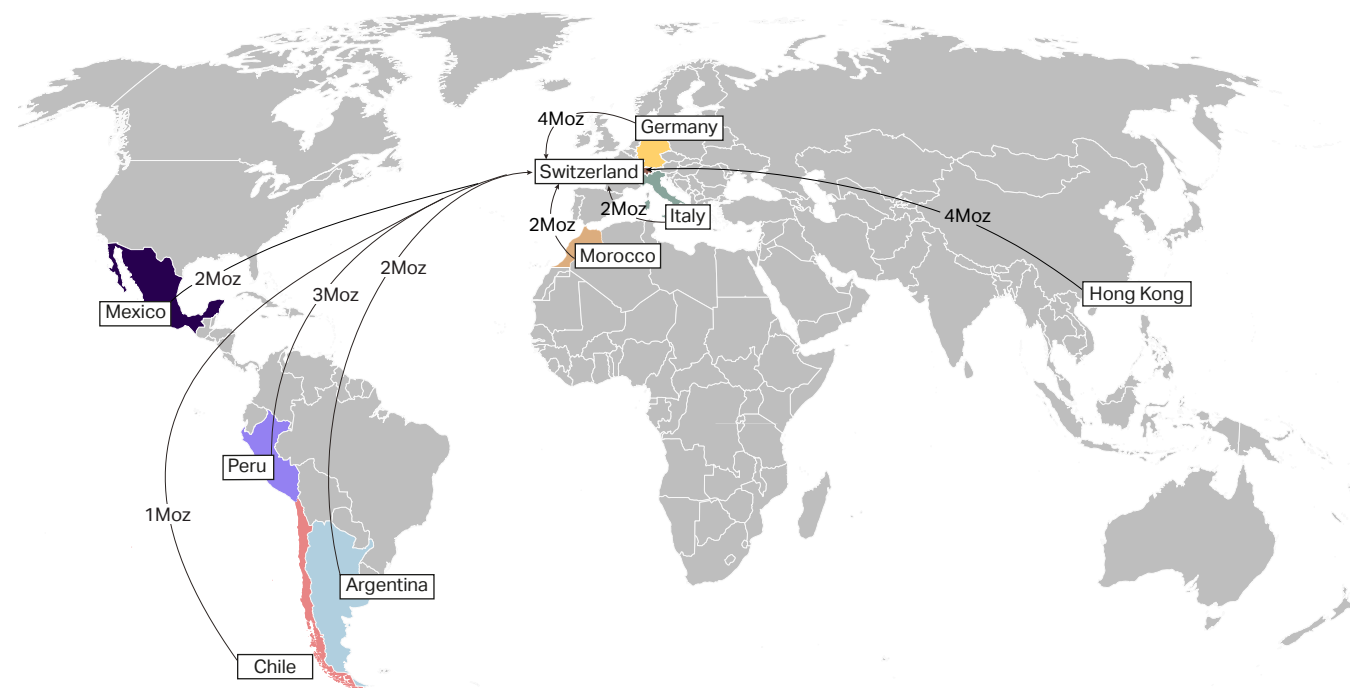
Appendix 23a - Selected Swiss Silver Bullion Exports in 2020



NB: In gross weight terms, exports shown account for 88% of total Swiss silver bullion exports in 2020

Source: Swiss Customs Administration, Metals Focus

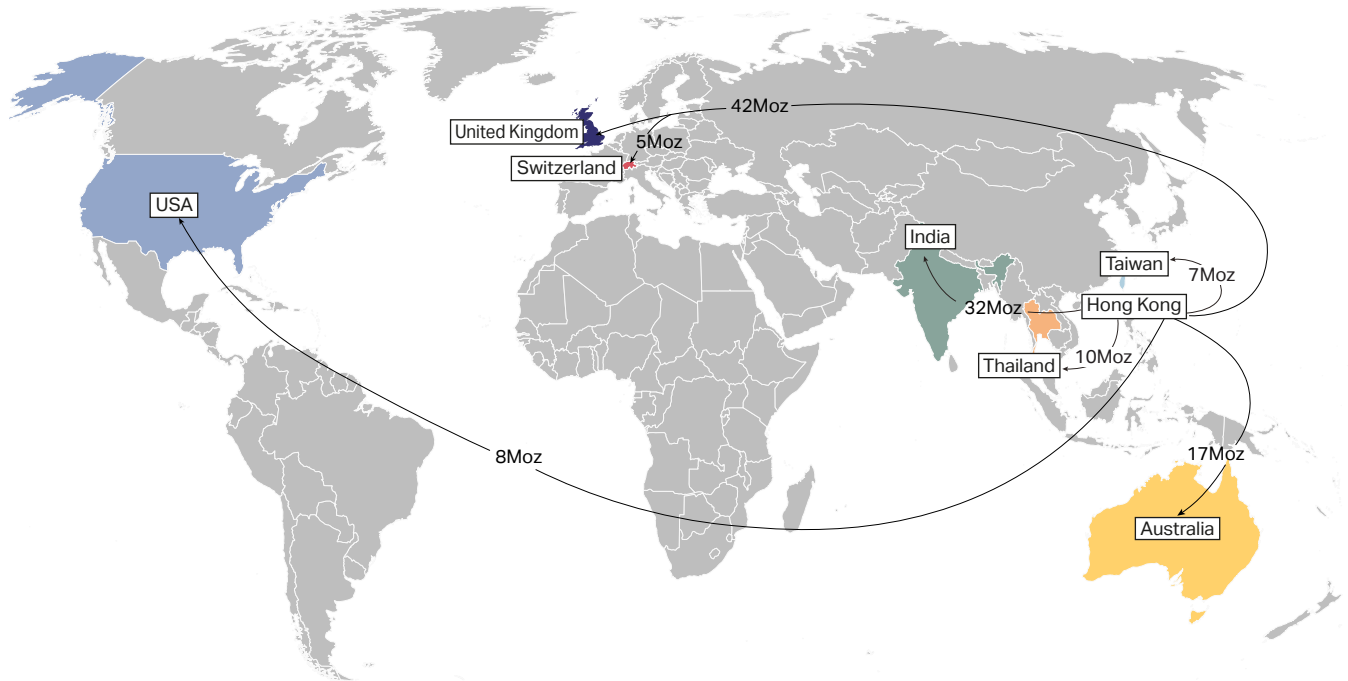
Appendix 23b - Selected Swiss Silver Bullion Imports in 2020



NB: In gross weight terms, imports shown account for 86% of total Swiss silver bullion imports in 2020

Source: Swiss Customs Administration, Metals Focus

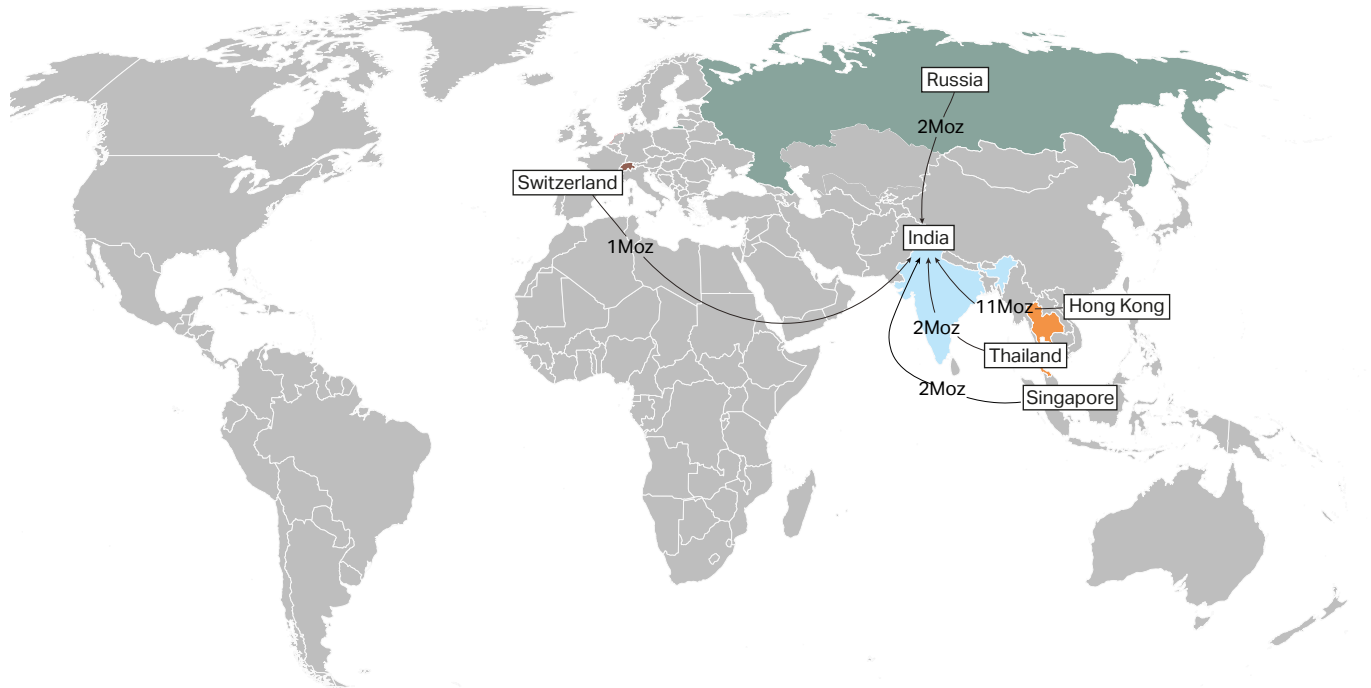
Appendix 24 - Selected Hong Kong Silver Bullion Exports in 2020



NB: In gross weight terms, exports shown account for 90% of total Hong Kong silver bullion exports in 2020

Source: Hong Kong Census & Statistics Department, Metals Focus

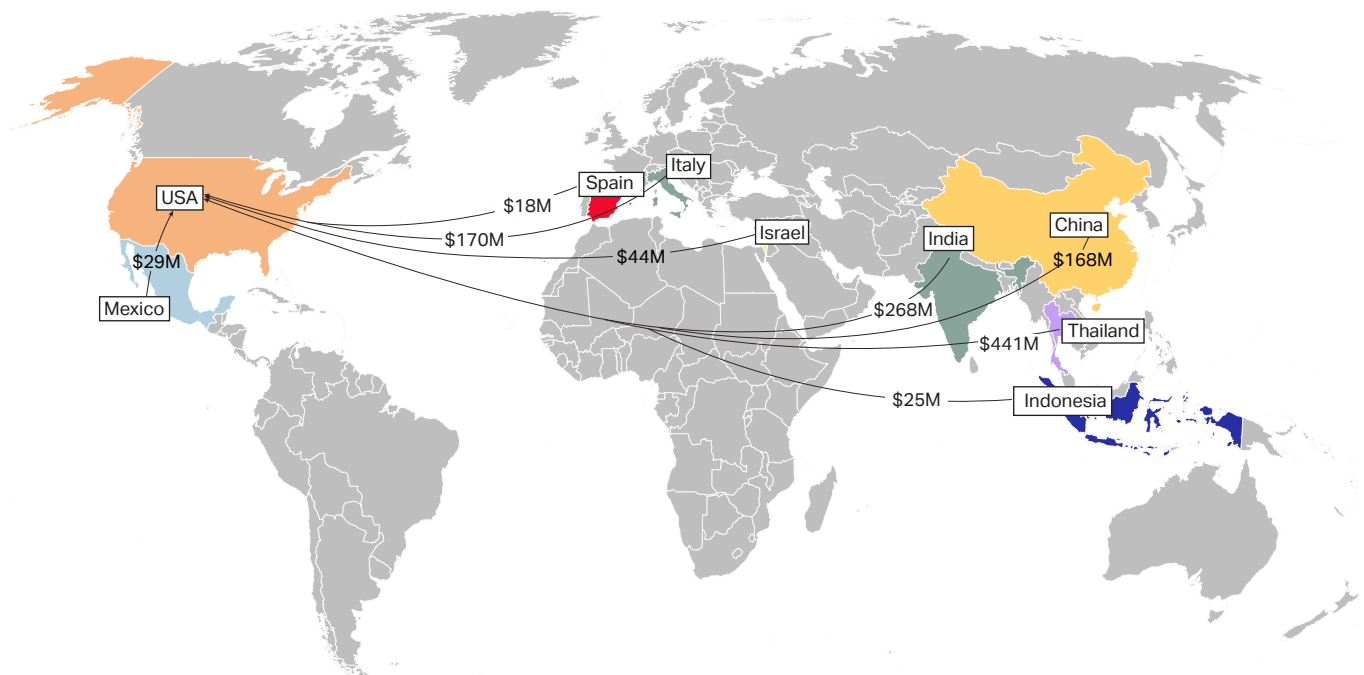
Appendix 25 - Selected Indian Silver Bullion Imports in 2020



NB: In gross weight terms, imports shown account for 86% of total Indian silver bullion imports in 2020

Source: Ministry of Commerce, Metals Focus

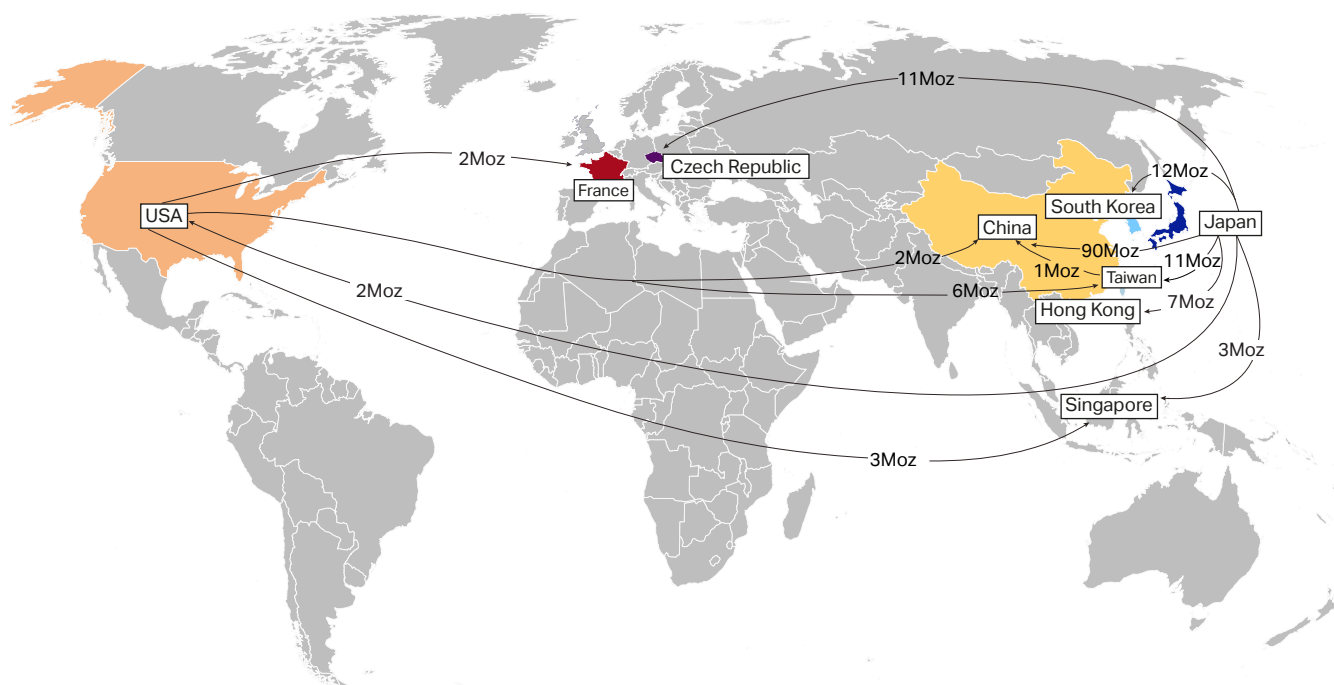
Appendix 26 - Value of Selected US Silver Jewelry Imports in 2020



NB: Imports shown represent around 90% of the total value of US silver jewelry imports in 2020

Source: Various

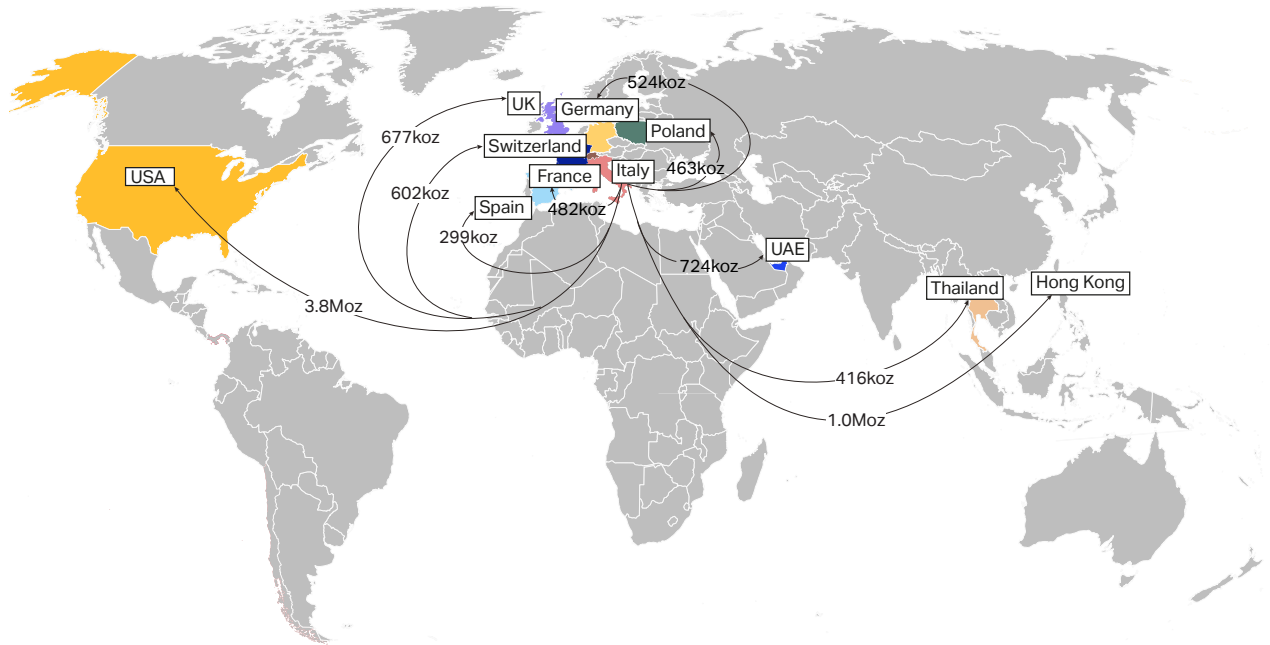
Appendix 27 - Selected Silver Powder Trade Flows in 2020



NB: Figures stated represent reported gross volumes of material shipped

Source: Various, Metals Focus

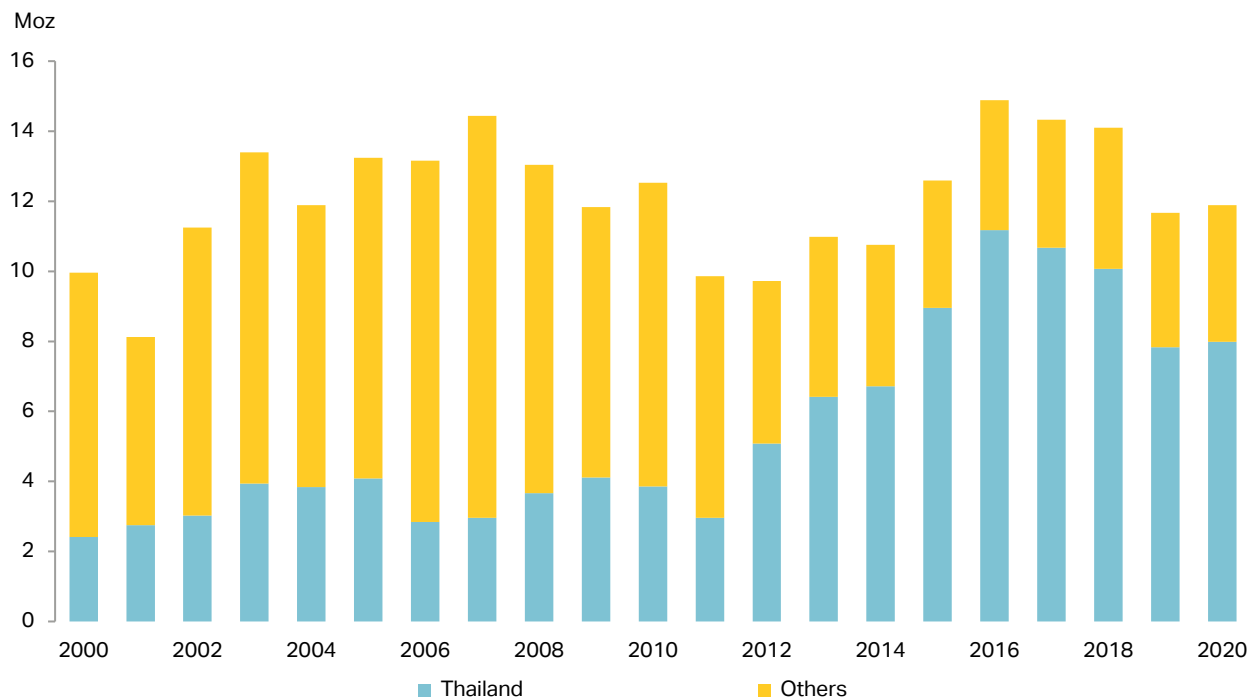
Appendix 28 - Selected Italian Silver Jewelry Exports in 2020



NB: In gross weight terms, excluding re-exports. Shipments shown account for 67% of total Italian silver jewelry exports in 2020.

Source: Istat, Metals Focus

Appendix 29 - German Silver Jewelry Imports



NB: In gross weight terms

Source: Eurostat, Metals Focus

Notes & Definitions

Notes

Throughout the tables, totals may not add up due to independent rounding.

What one country reports as an export to another may be different to the imports reported by the receiving country for a variety of reasons, including conflicting rules of origin, classifications and timing. As a result, similar flows on different maps and/or tables may not be reciprocal due to reporting variations. The tonnage figures shown are fine weights calculated by Metals Focus from the data provided by each origin for exports and by each destination for imports.

Units

Troy ounce (oz)	One troy ounce - 31.103 grams
Ton (t)	One metric ton - 1,000 kilograms (kg) or 32,151 troy ounces
Grade (g/t)	Grams per metric ton of rock
Dollar (\$)	US dollar unless otherwise stated

Definitions

Fabrication	Captured in the country where the first transformation of silver bullion or grain into semi-finished and/or finished products takes place (such as silver nitrate or silver oxide).
Consumption	The sum of domestic jewelry fabrication plus imports, less exports, adjusted for changes in trade stocks.
Recycling	Covers the recovery of silver from fabricated products, including unused trade stocks. Excludes scrap generated during manufacturing (known as production or process scrap). The recycling is captured in the country where the scrap is generated, which may differ from where it is refined. The one exception to this is ethylene oxide, where the recycling of silver is measured at the point where it is recovered.
Mineral Resources	A concentration of material in, or on, the earth's crust of such grade or quantity where there is a reasonable prospect for economic extraction.
Mineral Reserves	The economically mineable part of a measured or indicated mineral resource demonstrated by at least a preliminary feasibility study.
By-Product Costs	Revenue generated from additional metals produced at a mine alongside the primary metal. This revenue is subtracted from costs as a by-product credit.
Total Cash Cost	Includes all direct and indirect mine site cash costs related directly to the physical activities of producing metals, including mining, ore processing on-site general and administrative costs, third-party refining expenses, royalties and production taxes, net of by-product revenues.
Total Production Cost	Total cash costs, plus depreciation, amortization and reclamation and closure cost obligations relating to each operating unit.
All-In Sustaining Cost	The sum of total cash costs plus community costs, sustaining capital expenses, corporate, general and administrative expenses (net of stock option expenses) and exploration expenses.