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World Silver Survey 2022

The Silver Institute/ Metals Focus

# WORLD SILVER SURVEY 2022

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## 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

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

### Definitions

<b>Fabrication</b>	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).
<b>Consumption</b>	The sum of domestic jewelry fabrication plus imports, less exports, adjusted for changes in trade stocks.
<b>Recycling</b>	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.
<b>Mineral Resources</b>	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.
<b>Mineral Reserves</b>	The economically mineable part of a measured or indicated mineral resource demonstrated by at least a preliminary feasibility study.
<b>By-Product Costs</b>	Revenue generated from additional metals produced at a mine alongside the primary metal. This revenue is subtracted from costs as a by-product credit.
<b>Total Cash Cost</b>	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.
<b>Total Production Cost</b>	Total cash costs, plus depreciation, amortization and reclamation and closure cost obligations relating to each operating unit.
<b>All-In Sustaining Cost</b>	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.

# Metals Focus

## World Silver Survey 2022

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This is the thirty-second annual edition of the World Silver Survey produced for The Silver Institute. World Silver Survey 2022 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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Coeur Mining, Inc. is a U.S.-based, well-diversified, growing precious metals producer with four wholly-owned operations: the Palmarejo gold-silver complex in Mexico, the Rochester silver-gold mine in Nevada, the Kensington gold mine in Alaska and the Wharf gold mine in South Dakota. In addition, the Company wholly-owns the Silvertip silver-zinc-lead development project in British Columbia and has interests in several precious metals exploration projects throughout North America.

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### Fresnillo plc



Fresnillo plc is the world's largest primary silver producer and Mexico's largest gold producer, listed on the London and Mexican Stock Exchanges under the symbol FRES.

Fresnillo plc has seven operating mines, all of them in Mexico - Fresnillo, Saucito, Ciénega (including Las Casas Rosario & Cluster Cebollitas), Herradura, Soledad-Dipolos<sup>1</sup>, Noche Buena and San Julián (Veins and Disseminated Ore Body), two development projects - the Pyrites Plant at Fresnillo and Juanicipio, both of which have been completed but approvals to operate are pending, and three advanced exploration projects - Orisyvo, Rodeo and Guanajuato, 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.

<sup>1</sup> Operations at Soledad-Dipolos are currently suspended.

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### 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.



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## 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. Pan American Silver provides enhanced exposure to silver through a large base of silver reserves and resources, as well as major catalysts to grow silver production. We have a 28-year history of operating in Latin America, earning an industry-leading reputation for sustainability performance, operational excellence and prudent financial management. We are headquartered in Vancouver, B.C. and our shares trade on NASDAQ and the Toronto Stock Exchange under the symbol "PAAS".

In 2021, Pan American produced 19.2 million ounces of silver and 579,300 ounces of gold. As at June 30, 2021, proven and probable silver mineral reserves were approximately 529 million ounces and gold mineral reserves were approximately 4.2 million ounces.

PAAS: NASDAQ AND TSX  
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## Wheaton Precious Metals



Wheaton Precious Metals is the world's premier precious metals streaming company with the highest-quality portfolio of long-life, low-cost assets. Its business model offers investors commodity price leverage and exploration upside but with a much lower risk profile than a traditional mining company. Wheaton delivers amongst the highest cash operating margins in the mining industry, allowing it to pay a competitive dividend and continue to grow through accretive acquisitions. As a result, Wheaton has consistently outperformed gold and silver, as well as other mining investments. In addition, the company is committed to promoting responsible mining practices and giving back to the communities where Wheaton and its mining partners operate. Wheaton creates sustainable value through streaming.

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# Chapter 1

- Support from healthy physical investment and a high starting point saw the average silver price rise 22% y/y in 2021, at \$25.14.
- As mine production recovered from a COVID-disrupted 2020 and industrial recycling was also higher, global supply rose by 5% y/y.
- All areas of silver demand strengthened, boosted by a post-pandemic recovery in activity, secular factors driving industrial offtake and a surge in retail investor appetite for the metal.

## Summary

### Introduction

Contrasting forces dominated the silver market in 2021. On the one hand, the metal's fundamentals were in robust health; 2021 saw silver's first deficit since 2015 and its largest deficit by some margin since at least 2010 (when Metals Focus' estimates begin) and very possibly in over 20 years (looking at GFMS data prior to 2010). On the other hand, professional investors' appetite for futures and OTC positions in silver were limited and in fact the community were net sellers for much of the year. This limited the silver price's upside in the first half of the year and put it under pressure in the second.

As discussed later in this chapter and in more detail later in this report, the strength of silver's fundamentals was fueled by strong gains across all demand components. In turn, these were partly related to the post-pandemic recovery and partly secular factors, such as the proliferation of green technologies. Last year's deficit, meanwhile, came in spite of mine production recovering to levels not far off 2019, as COVID disruptions dissipated and recycling rose to an eight-year high.

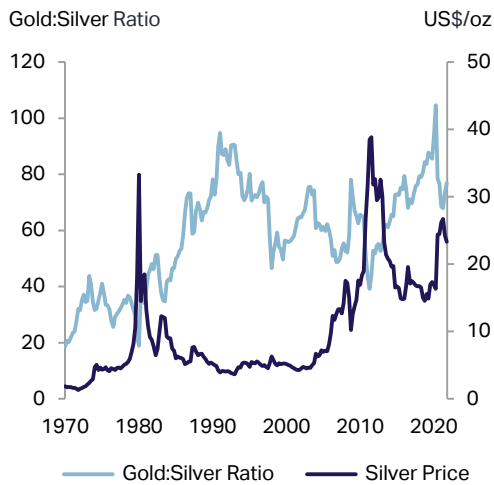
## Silver Supply and Demand

Million ounces											Year on Year	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022F	2021	2022F
<b>Supply</b>												
Mine Production	845.3	882.1	896.9	900.0	863.7	850.2	835.9	781.1	822.6	843.2	5%	2%
Recycling	180.3	161.3	147.3	145.9	147.2	148.6	147.7	162.2	173.0	180.5	7%	4%
Net Hedging Supply	-	10.7	2.2	-	-	-	15.2	8.5	-	5.0	na	na
Net Official Sector Sales	1.7	1.2	1.1	1.1	1.0	1.2	1.0	1.2	1.5	1.5	28%	1%
<b>Total Supply</b>	<b>1,027.3</b>	<b>1,055.3</b>	<b>1,047.4</b>	<b>1,046.9</b>	<b>1,011.9</b>	<b>1,000.0</b>	<b>999.8</b>	<b>953.0</b>	<b>997.2</b>	<b>1,030.3</b>	<b>5%</b>	<b>3%</b>
<b>Demand</b>												
Industrial	449.6	438.9	441.1	475.3	503.6	499.6	498.1	464.9	508.2	539.6	9%	6%
...of which photovoltaics	50.5	48.4	54.1	93.7	101.8	92.5	98.7	101.0	113.7	127.0	13%	12%
Photography	45.8	43.6	41.2	37.8	35.1	33.8	32.7	27.8	28.7	28.4	3%	-1%
Jewelry	186.9	192.9	201.7	188.4	195.2	201.9	200.3	149.8	181.4	201.8	21%	11%
Silverware	46.5	53.6	57.9	53.9	59.6	67.6	62.1	32.4	42.7	52.7	32%	23%
Net Physical Investment	300.6	283.1	310.4	212.0	155.7	165.2	186.8	205.0	278.7	279.2	36%	0%
Net Hedging Demand	29.3	-	-	12.0	2.1	7.7	-	-	9.4	-	na	na
<b>Total Demand</b>	<b>1,058.7</b>	<b>1,012.0</b>	<b>1,052.3</b>	<b>979.4</b>	<b>951.3</b>	<b>975.7</b>	<b>980.0</b>	<b>880.0</b>	<b>1,049.0</b>	<b>1,101.8</b>	<b>19%</b>	<b>5%</b>
<b>Market Balance</b>	<b>-31.4</b>	<b>43.2</b>	<b>-5.0</b>	<b>67.5</b>	<b>60.6</b>	<b>24.3</b>	<b>19.8</b>	<b>73.0</b>	<b>-51.8</b>	<b>-71.5</b>	<b>na</b>	<b>38%</b>
Net Investment in ETPs	4.7	-0.3	-17.1	53.9	7.2	-21.4	83.3	331.1	64.9	25.0	-80%	-62%
<b>Market Balance less ETPs</b>	<b>-36.2</b>	<b>43.5</b>	<b>12.1</b>	<b>13.6</b>	<b>53.5</b>	<b>45.7</b>	<b>-63.4</b>	<b>-258.1</b>	<b>-116.7</b>	<b>-96.5</b>	<b>-55%</b>	<b>-17%</b>
Silver Price (US\$/oz, London price)	23.79	19.08	15.68	17.14	17.05	15.71	16.21	20.55	25.14	23.90	22%	-5%

Source: Metals Focus



### Silver Prices & Gold:Silver Ratio\*



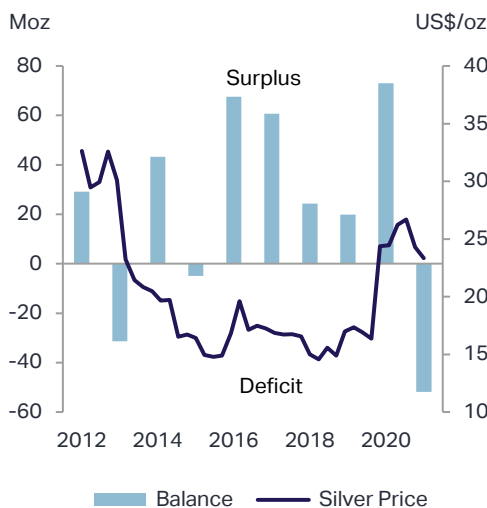
\* Monthly averages  
Source: Bloomberg

Among silver’s physical demand segments, special mention is due to physical investment, which rose by 36% in weight terms and even more so in value terms. While the social media fueled silver squeeze in the early part of the year no doubt contributed to these gains, it was by no means the only factor. Indeed, silver bar and coin demand proved robust even after that rush had dissipated, underpinned by retail investors’ concerns towards political and geopolitical developments, negative real interest rates, global market risks and the looming specter of inflation. This created tight conditions for silver investment products, which remain in place.

Professional investors, in contrast, were less keen on silver for most of the year. This attitude was not unique to silver - appetite for gold was similarly lukewarm. We believe that this was due to unfavorable expectations for key macroeconomic drivers, interest rates and yields in particular. As these were already extremely low, investors struggled to see them falling further. Crucially, from mid-year onwards, growing concerns about inflation and signals from the US Fed of a change in attitude fueled expectations of policy tightening, which further damaged appetite for precious metals. The effect of silver’s earlier success also did not help institutional investor appetite - silver’s price had after all staged a strong rally in 2020 and the boost from its “green credentials” started to appear a little overdone.

All this saw silver move from trading within a \$24-28 range for most of the first half of last year to fluctuating within a \$22-26 band during the second half. Still, the full-year 2021 average managed to achieve a 22% y/y increase to a nine-year high of \$25.14.

### Market Balance

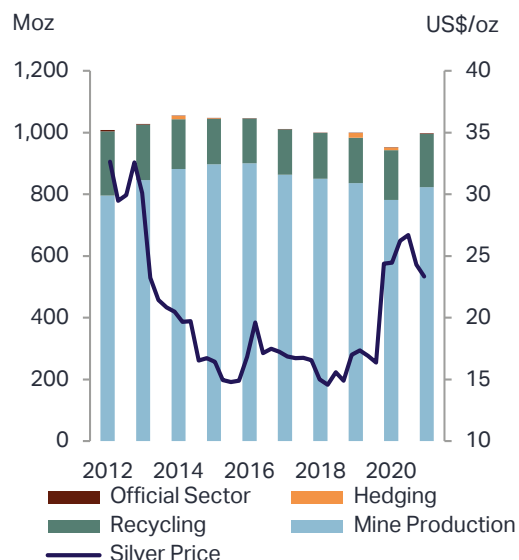


Source: Metals Focus, Bloomberg

Turning to 2022, since Russia’s invasion of Ukraine in late February, the conflict and its implications on trade and the world economy have become a principal driver of global market moves and silver has been no exception. The few weeks leading to end-March, when this report was being finalized, have seen wild fluctuations in silver’s price, strong inflows of speculative funds into futures positions (most likely tactical) and another explosion of retail investor interest in silver bars and coins.

Similar to past geopolitical events, Metals Focus believes that the boost to precious metals prices from the war will prove short-lived. Price moves over the past few weeks, the brief nature of the spike in particular, lend some support to our view. Once this support wanes, silver’s traditional macro drivers will once again take center stage. Among these, we believe that US monetary policy will dominate. Focusing on that, we believe that the current market expectations of as many as 8-9 hikes by year-end (based on the latest Fed funds futures prices) are far too aggressive. As these are adjusted, in the near to medium-term gold and silver should receive some support. Eventually though, as policy rates rise and the impact on real rates is amplified by inflation easing towards year-end, pressure on silver seems inevitable.

## Global Supply



Source: Metals Focus, Bloomberg

## Silver Supply in 2021

In 2021, global **mine production** increased by 5.3% y/y to 822.6Moz (25,587t). This was the biggest annual rise in silver output since 2013 and was largely the result of a recovery in production following significant disruption to mining from the COVID-19 pandemic in 2020. Output from primary silver mines increased by the most, up 10.2% y/y to 229.9Moz (7,152t), as these operations were disproportionately impacted by pandemic-related restrictions in the previous year. By-product silver output from lead-zinc and gold mines rose by 5.1% to 252.8Moz (7,862t) and 5.8% to 127.6Moz (3,967t), respectively. Meanwhile, silver production from copper mines grew by a more modest 0.7% to 208.2Moz (6,476t).

The largest gains at the country level emerged where mining was most heavily impacted by COVID-19 lockdowns in 2020, which subsequently led to a rebound in output last year. This was the main reason behind significant rises in Mexico (+16.5Moz, 514t), Bolivia (+11.6Moz, 359t) and Peru (+6.2Moz, 194t). However, production did fall in several countries, including Chile (-6.2Moz, 193t), Russia (-3.6Moz, 111t) and Kazakhstan (-2.0Moz, 63t).

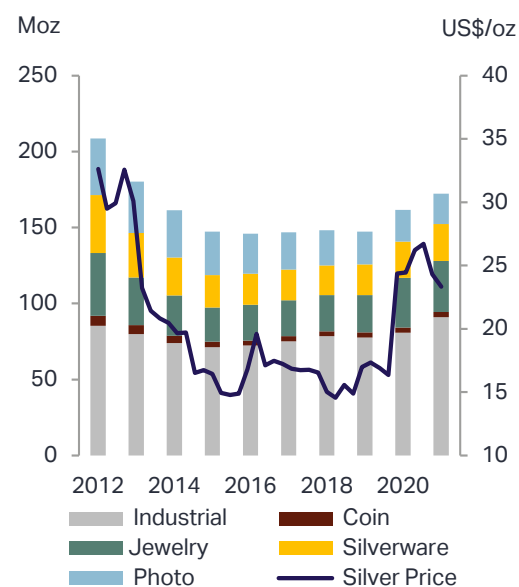
**Recycling** rose for a second year in a row, up 7% in 2021 to an eight-year high of 173.0Moz (5,382t). This was primarily driven by the jump in industrial scrap (the biggest source for silver recycling), which in turn reflected a quicker pace of change-outs of ethylene oxide (EO) plants, some of which had been postponed in 2020 because of the pandemic. Yet higher silver prices and consumers' ability and willingness to visit collectors aided modest growth in jewelry and silverware recycling. The normalization of collection activities however failed to counter structural losses for photographic scrap.

Net supply from the **official sector** rose by a substantial 28% last year to its highest since 2013, but remained trivial in absolute terms at just 1.5Moz (48t).

## Silver Demand in 2021

After a slump in 2020, global silver demand rose by a healthy 19% last year to 1.05Boz (32,627t), surpassing pre-pandemic volumes and achieving its highest level since 2015. All categories of demand saw gains, with the largest in volume terms being coin and bar purchases, followed by industrial demand. Despite logistical challenges, **industrial** fabrication rose by 9.3% to 508.2Moz (15,807t) in 2021, a record for our series back to 2010. This mainly reflected the effects of a resumption of industrial operations and the re-opening of businesses as economies began to recover from COVID. Other supportive factors included the demands of the home working economy, a boom for consumer electronics, 5G infrastructure investment, inventory build along the supply pipeline and rising end-use in the green economy, chiefly in photovoltaics. There was also limited pressure from substitution and thrifting, chiefly as prices were not deemed excessive and

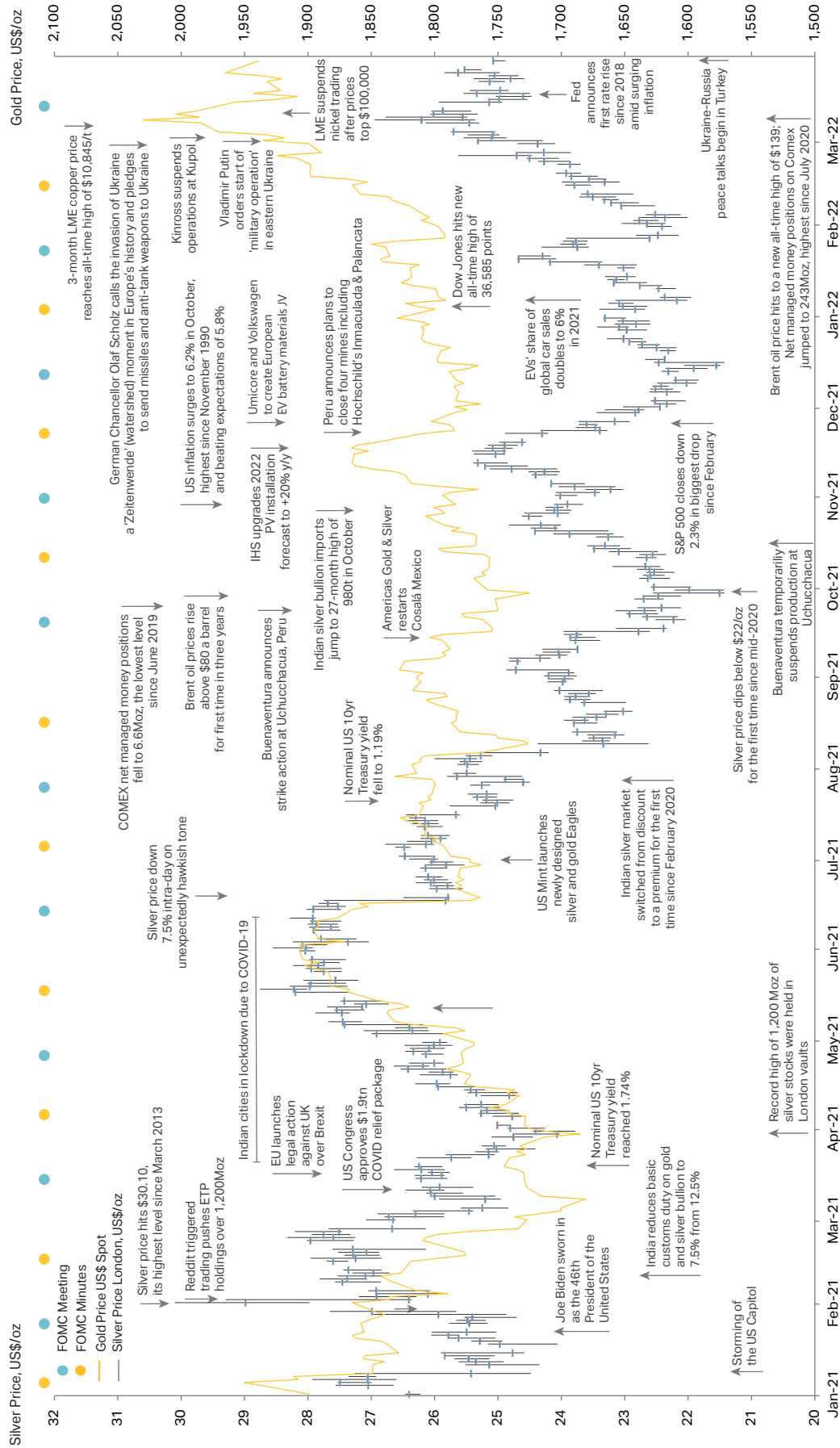
## Global Recycling, by Source



Source: Metals Focus, Bloomberg

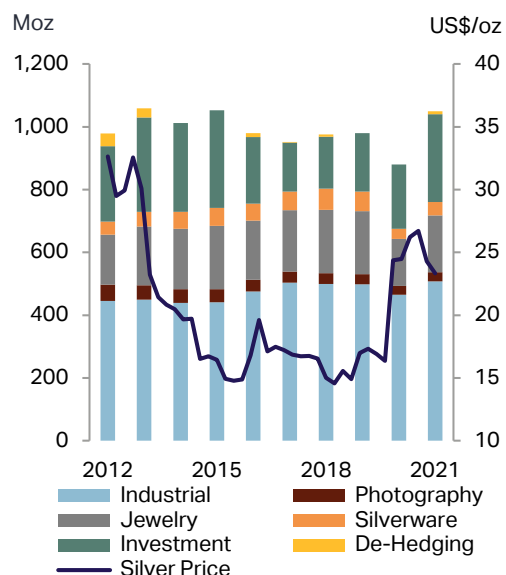


### Silver vs Gold Price (London, \$/oz) and Key Events in 2020 - 2021



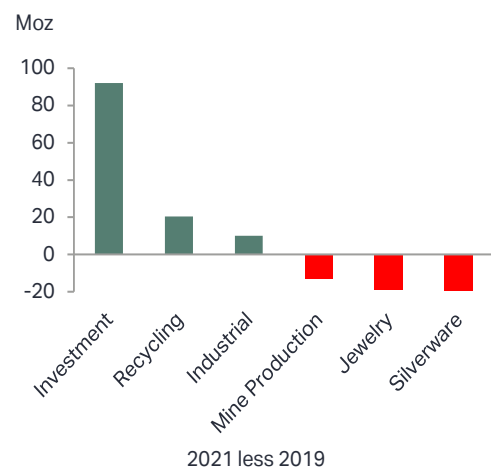
NB: Black line indicates daily trading range  
Source: Metals Focus, Bloomberg

## Global Demand



Source: Metals Focus, Bloomberg

## Supply/Demand Fundamentals: A Return to Pre-COVID Levels?



Source: Metals Focus

as management time was too frequently occupied by staffing and logistical issues. There was some divergence by region; Europe and North America saw solid double-digit gains, while East Asian demand rose by “only” 6%, a gap largely explained by Japan having actually seen growth in 2020.

Even if still facing a structural decline, **photographic** demand rose modestly last year, chiefly as the medical sector battled to work through the backlog of delayed x-rays. That said, at 28.7Moz (892t), offtake was still 12% down on a pre-pandemic 2019 and nearly 60% lower than in 2010.

Silver **jewelry** fabrication rebounded by a notable 21% in 2021 to 181.4Moz (5,641t) as economies re-opened and consumer sentiment began to improve. On top of surging consumption, fabricators also benefited from the rebuilding of stocks that had fallen notably during 2020. That said, offtake remained 9% down on 2019 or pre-pandemic levels, reflecting lingering COVID damage and elevated prices. More than half of all increases were due to top fabricator India where offtake benefited from the easing of lockdowns as this led to a jump in the number of weddings and other social events. The next largest rise took place in Italy as its exports boomed, especially to the US. The latter, the world’s second largest consuming market, saw a boom in sales due to additional factors such as the diversion of consumer expenditure from travel and government income support. Chinese fabrication also rose strongly due to a recovery from a pandemic-hit 2020 and as the structural transition away from plain heavier pieces to lighter design-focused ones slowed.

Outperforming the growth in jewelry, **silverware** fabrication rose by a robust 32% y/y in 2021, but output remained a third below 2019 levels. Much of the growth last year was driven by India (+40% y/y) thanks to economic recovery, pent-up wedding/festive demand and the ongoing gains for sterling silver. Excluding India, the rise in global fabrication was still a noteworthy 15%.

Yet greater gains were seen for net **physical investment** as this jumped by 36% to 278.7Moz (8,668t), its highest since 2015’s record level. With a backdrop of economic growth and inflation uncertainties, plus persistently negative real rates and still positive price expectations, retail investors in North America and Europe took advantage of low prices to purchase silver coins and bars, pushing combined sales in these two regions to the highest total in Metals Focus’ series. US sales were also boosted in early 2021 by a social media push. In India, sales of silver bars and coins more than tripled, with much of the growth taking place in the second half. However, this was from a very weak base in 2020, with volumes still well below pre-COVID levels.

The global delta-adjusted producer **hedge** book fell by 9.4Moz (292t) to 30.7Moz (954t) in 2021. An increase in forward contacts to 7.8Moz (243t) was outweighed by the fall in options to 22.9Moz (711t) as most producers reduced their exposure.



## Chapter 2

- Higher mine production, due to both project ramp-ups and some gains in established mines' output, coupled with a rise in industrial recycling, drive a 3% increase in global supply in 2022.
- Global demand is forecast to rise by 5%, thanks to structural gains in industrial fabrication and a continued post-pandemic recovery in jewelry and silverware.
- Rising US interest rates will put pressure on the silver price, but a number of supporting factors should limit the decline in its full year average to 5%.

# Market and Price Outlook

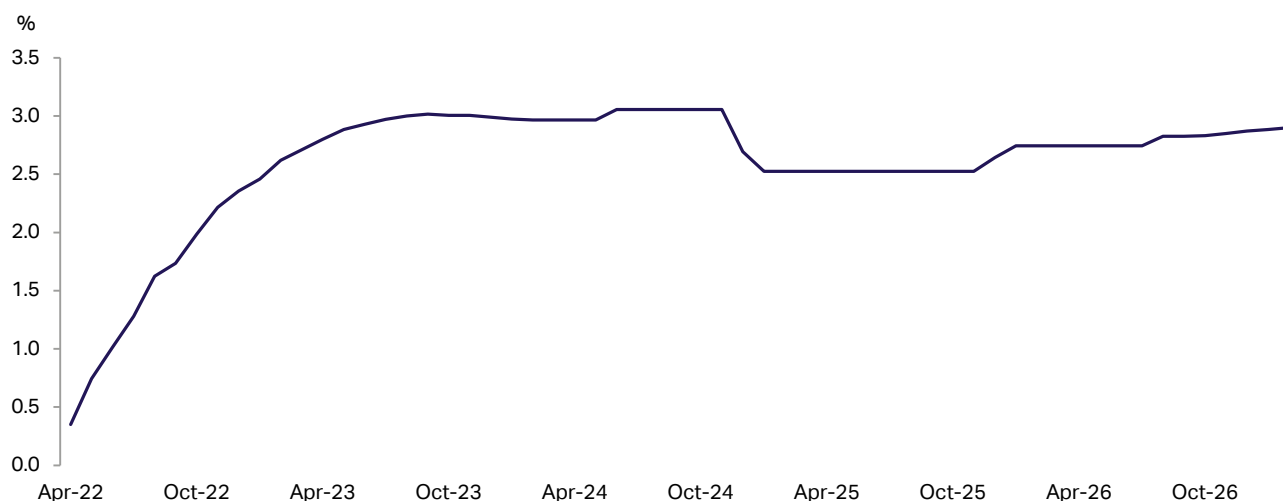
## Introduction

It is over a month since Russia invaded Ukraine and, as we finalize this report, there is still little clarity as to when and how the war will end. As such, it is impossible to predict how long the boost to the price of silver (and other precious metals) from the conflict will last. As noted in Chapter 1 and illustrated opposite, however, geopolitical crises' impact on precious metals tends to be short-lived. Indeed, some of the "Ukraine bid" for silver has already abated. Without an unexpected turn, with wide-ranging implications for global markets (such as the conflict spreading to other nations, NATO or EU members in particular), we expect silver investors' focus will, over time, shift elsewhere. Our view for the rest of 2022 therefore mainly rests on our take on the traditional macroeconomic factors driving silver prices.

Among these, we believe that nominal and real US interest rates will be key. The rate hiking cycle that the Fed started in March looks likely to continue through to the end of the year and into 2023. However, we are not convinced that the speed with which policy rates will rise will match current consensus expectations. Looking at Fed Funds Futures, these suggest an effective rate of nearly 2.5% by year-end. This in turn implies eight to nine 25 basis point hikes over the next nine months. We find this excessive, even taking into account recent comments by Jay Powell. If we are proven right, expectations sooner or later will be adjusted, which should offer silver some support.

Another, related, positive driver for silver investment and prices is the growing risk of a so-called "policy mistake"; the risk that the Fed tightens

### Implied Effective Federal Funds Rate (EFFR)\*



Source: Bloomberg. \* Inferred from Fed Funds Futures prices as of March 29th, 2022.

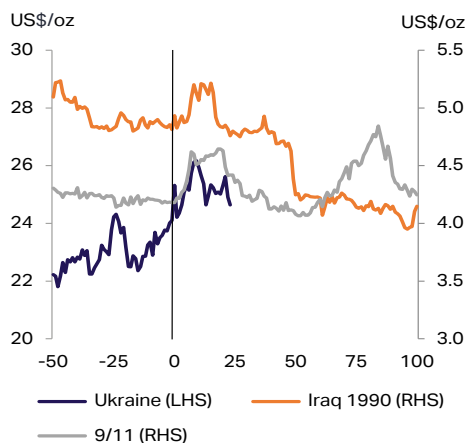
## Gold, Silver & Copper Prices

Index, 4th January 2021 =100



Source: Bloomberg, Metals Focus

## Price Reaction to Key Events\*



\*x axis is days before and after event (0)

Source: LBMA

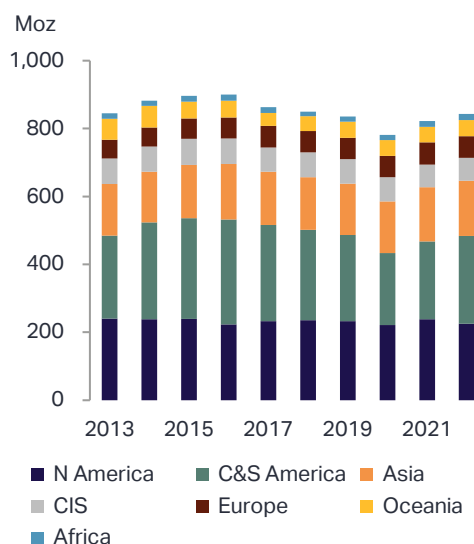
policy too aggressively, triggering a recession. This is amplified by at least part of the current inflationary pressures being related to rising input costs, rather than elevated levels of demand. As rate hikes fail to control that portion of inflation, economies could be hit hard by the dual impact of rising prices and borrowing costs. Finally, there is a risk that rate increases drive a correction in equity markets. As asset prices are a transmission mechanism for monetary policy, this could in turn also trigger a recession. The recent inversion of the US treasury yield curve is a reflection of all these concerns.

The recent rise in COVID cases in China and their follow-on restrictions have introduced uncertainty into prospects for the Chinese economy and, by extension, demand for industrial metals and supply chain solidity. Price weakness for the likes of copper would be a negative for silver. In contrast, added logistics frictions would add to inflationary pressures and the hit to equities, both in China and elsewhere, would boost the appeal of hard assets.

Inflation itself is another supportive factor for silver investment, principally among retail individuals buying bars and coins. In contrast, professional investors are less focused on this, as the consensus view among that community seems to be that any benefit to silver from rising prices will be offset by the impact of rate hikes on precious metals. Retail investment should also continue to enjoy support from politics in general. On top of the war in Ukraine, there are wider concerns about relations between the West and Russia and regarding relations with China. Also important are concerns about country-level politics, in particular growing distrust by many investors of their governments. Such feelings have been boosted by the most marked curtailment of individual freedoms in recent history, adopted during the pandemic and still in place to varying extents.

All these factors should provide silver with crucial support. As a result, we believe its price will keep to its recent trading range over the next few months, even after support from the Ukrainian conflict wanes. Later in the year, however, liquidations and price downside will be hard to avoid. Although our US rate outlook is less hawkish than the consensus, there is little doubt that US policy rates are heading higher and this is negative for silver. The rise for real rates will likely be amplified by an easing of inflation. In our view this is less likely to come from changing US policy than from exogenous factors. These include corrections in energy and industrial commodity prices and easing supply-chain frictions. Eventually, we should also see rising labor supply, as both borders re-open (making migration easier) and as some who left the labor market during the pandemic decide to re-enter it. Nevertheless, we expect silver's price downside will be limited. A number of the positives mentioned earlier will remain relevant for some time to come. In addition, even after their expected increases, rates will likely still be negative in real terms by year-end. Overall, we therefore forecast silver's price will average \$23.90 in 2022, a mere 5% y/y softer.

### Mine Production Forecast



Source: Metals Focus

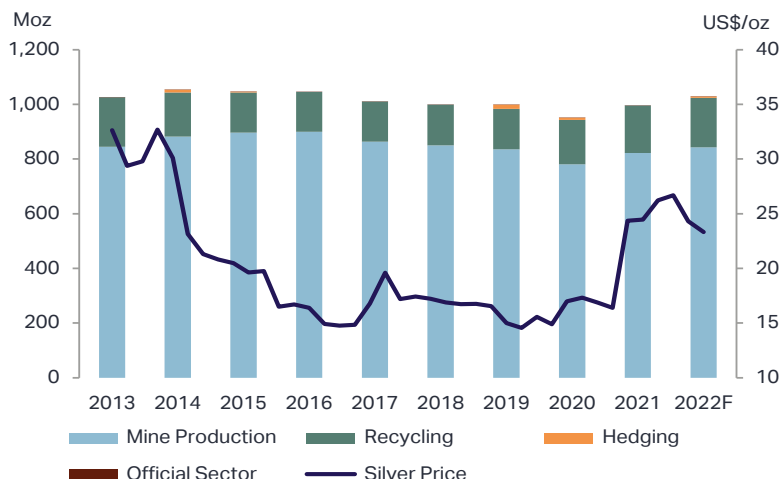
## Supply Outlook

Global silver **mine production** is expected to grow further in 2022, with output forecast to rise by 2.5% y/y to 843.2Moz (26,226t). The biggest increase is expected to come in Mexico (+15.9Moz, 495t), driven by the ramp-up of new and recently-commissioned projects, alongside rising production from several established mines. Output from Chile is also forecast to rise (+6.7Moz, 210t), primarily due to the La Coipa project which began commissioning in February 2022 and is expected to reach full capacity by mid-year. The Russia-Ukraine conflict led to Kinross suspending operations at its Kupol mine in early March, which produced 3.3Moz (104t) in 2021. However, this lost production is expected to be replaced by silver output from the Udokan copper project which is expected to commence operations later this year. This will result in flat silver production from Russia year-on-year. The biggest decline in output is forecast for Peru (-11.7Moz, 365t), largely due to the suspension of mining at Uchucchacua in Q4.21 to allow Buenaventura to undertake development work aimed at improving the economics of the mine.

We anticipate a return to net **hedging** in 2022. As the spot price is forecast to recede, it is likely producers will continue to protect cash flow, but with the emphasis on replacing expired contracts with only a few extra additions. Therefore, we expect a small rise in hedging activity of 5.0Moz (156t).

**Recycling** is set to increase for a third straight year in 2022 with a 4% gain forecast. This will again be led by the industrial sector where the drivers from last year (higher ethylene oxide, EO, change-outs and the normalization of collection and processing) will continue to aid volumes in 2022, albeit to a lesser extent than last year. Smaller contributions will also stem from the recovery of silver from old jewelry and silverware. In that regard, normalization in India plus distress selling in Russia lead us to forecast a rise for jewelry scrap.

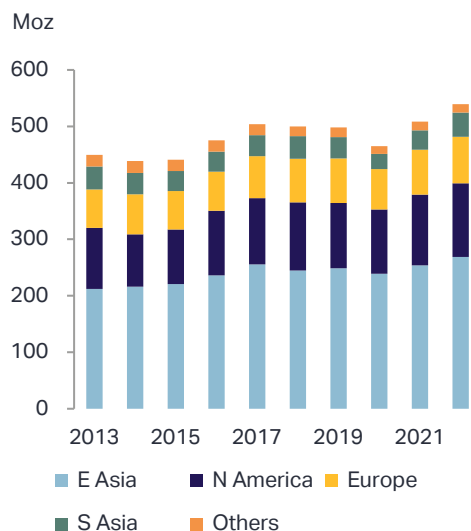
### Global Supply Forecast



Source: Metals Focus, Bloomberg



### Industrial Fabrication Forecast



Source: Metals Focus

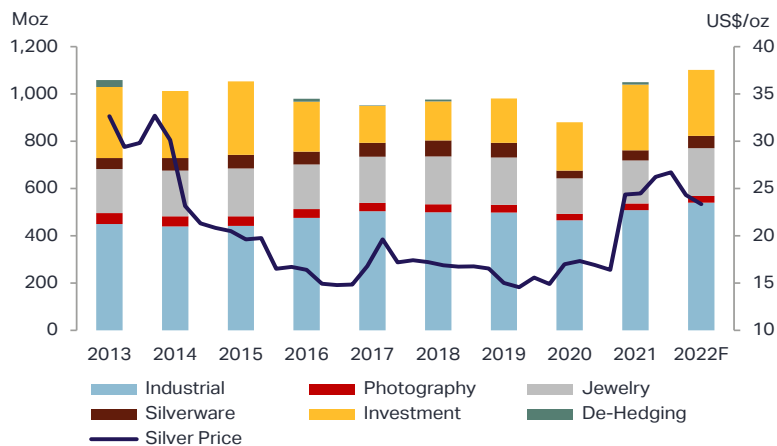
## Demand Outlook

**Industrial** demand is forecast to rise 6% to a new record high this year. On top of global GDP growth, end-use in the green economy will benefit from rising vehicle electrification and as the geopolitical conflict also boosts investment in renewables, especially photovoltaics. There should also be a notable rise in EO catalyst installations and generally limited pressure from thrifting. The Ukraine crisis, however, has hurt the recovery in vehicle output and introduced uncertainty, as has the recent rise in Chinese COVID infections. Last year's boost from inventory build will also be missing. After reversing its longer-term structural slide last year, **photographic** demand is set to fall again this year, albeit marginally as the x-ray backlog continues.

**Jewelry** fabrication is expected to rise again this year, by 11% and surpassing 2019 levels, due to a further recovery from COVID, plus a second half price retreat. India will underpin these gains, achieving a new high due to an improving economic backdrop and softer prices later. Chinese offtake is also expected to benefit from the supply chain's product innovation. Western fabrication in 2022 is only forecast to hold steady as economic recoveries are offset by an end to restocking and the normalization of expenditure patterns. **Silverware** demand is forecast to see another year of Indian-led recovery in 2022, although the 23% rise still leaves the total 15% down on 2019.

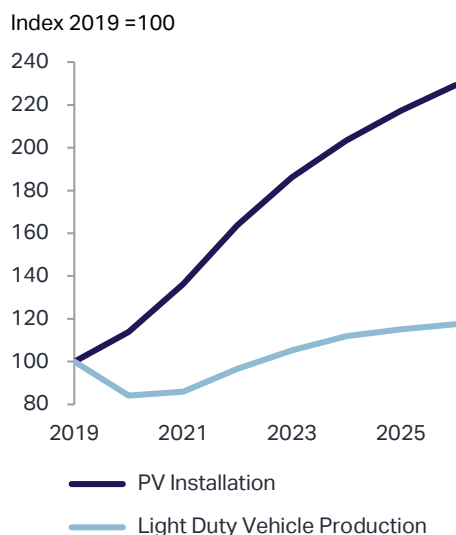
Net **physical investment** is likely to remain broadly flat in 2022, as a modest fall in western investment will be offset by further gains in India. In the US, we are likely to see a slight pullback in retail buying. While Russia's invasion of Ukraine has provided a fresh impetus to demand for hard assets in Europe, demand is likely to ease from last year's record. Indian investment is set to recover further, although remaining below 2019 levels. We also forecast a gain of 25Moz (778t) for ETPs, their fourth consecutive annual rise.

### Global Demand Forecast



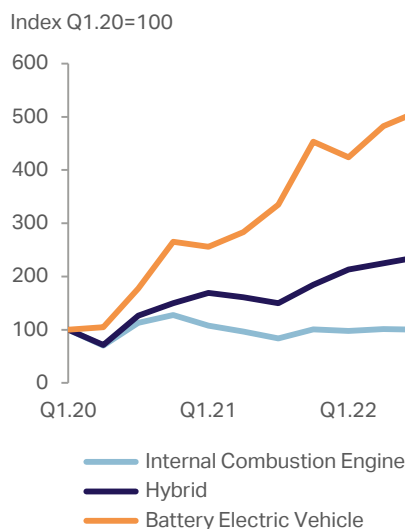
Source: Metals Focus, Bloomberg

## 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

Rising silver **mine production** this year is expected to be followed by continued growth over the medium term. This will primarily be driven by increased output from established primary silver mines alongside the ramp-up of major new projects. Russian output may begin to fall if sanctions remain in place as companies will struggle to finance projects and procure equipment required to sustain production levels. Over the longer-term, four to five years out, output will begin to decline unless sufficient investments are made to bring earlier stage projects on-line. A re-start of Pan American Silver's Escobal, which has been in care and maintenance since 2017, would have a meaningful impact on global output. However, consultations with the local community aimed at a potential re-start are still at an early stage.

**Recycling** looks set to swing to losses for the next year or two, chiefly on the back of price-led declines for jewelry and silverware plus ongoing structural losses for photographic scrap. Further ahead, modest gains should appear as the first two stabilize and through steady growth in industrial recycling.

Silver demand is forecast to post steady gains in the next few years to successive record highs. **Industrial** demand for instance is expected to see initial gains as economies continue to recover from the pandemic and through structural change. A good example of that is the electrification of vehicles; both hybrids and even more so battery electric vehicles have higher silver loadings than internal combustion engine equivalents and so this shift will drive rapid silver demand growth. Offtake in the current leader for green economy silver uses, photovoltaic demand, should also see modest gains in the next few years as capacity additions fueled by both CO<sub>2</sub> targets and a desire to boost energy independence counter ongoing thrifting. Overall, pressure from that and outright substitution however should stay modest due to prices not being seen as excessive and with the easy "wins" behind us.

**Jewelry** demand is expected to see yet faster growth. Much will come from the recovery from COVID, in particular the lift to consumer sentiment, and our forecast of initially softer prices. This should easily offset the negative of a swing in consumer expenditure to services, especially travel. Structural change in core markets such as India is also supportive. The impact of lower prices should be more keenly felt in **silverware** as Indian offtake booms, leading to double-digit gains for the global total. **Photographic** demand however is forecast to see still notable structural losses.

The outlook for **physical investment** is harder to call. On the one hand, Indian demand is forecast to respond strongly in the event of a pull back in prices. Western interest however could fade as bargain hunting proves modest in the face of interest rate rises and lessening geopolitical tensions. However, in the absence of triggers for heavy profit taking, net global demand is expected to hold comfortably north of 200Moz (6,200t) in the next few years.

# Chapter 3

- Silver investment was mixed last year, with physical investment hitting a six-year peak and ETP holdings achieving a record high.
- By contrast, after a strong start to last year institutional activity waned, being characterized by liquidations as investors rotated away from the silver market.
- As geopolitical tensions eventually ease and rate hikes begin in earnest, the investment case for holding zero-yielding assets, such as silver, will become challenging to institutional investors.

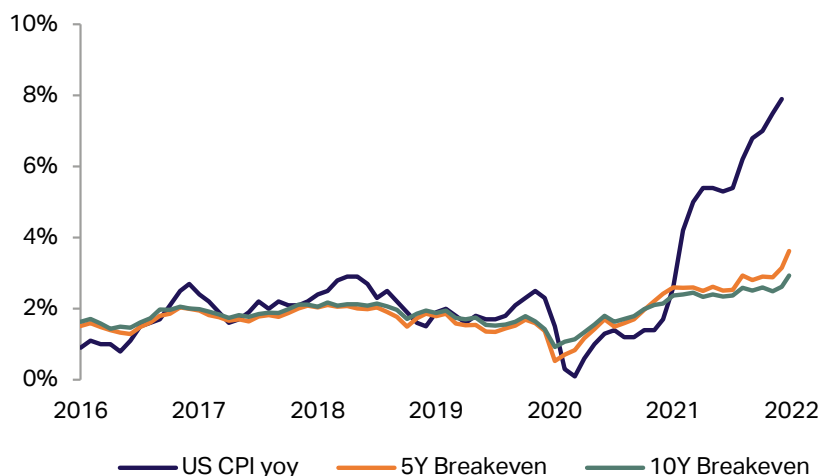
## Investment

### Introduction

Silver investment saw strongly divergent performances in 2021, both within categories and over the course of the year. The star of the show was physical silver coin and bar sales, which jumped by 36% to 278.7Moz (8,668t), the highest level since 2015 (which was a record high). Growth in ETP holdings also continued. Gains were seen early in the year, with holdings surging to record highs, but this was followed by liquidations later in 2021. As a result, net inflows stood at a noteworthy 65Moz (2,020t) last year, although this paled in comparison against the 331Moz (10,299t) seen in 2020. By contrast, institutional investment, a key driver for the silver price, was mixed. There were bursts of activity in the first half, due in part to the social media driven hype, but professional investors largely shunned silver in the second half, while retail investment demand remained strong. For 2021 as a whole, silver trading volumes on commodity exchanges and in the over-the-counter (OTC) market weakened.

In keeping with 2020, the economic backdrop was broadly supportive for silver. Although the catalyst early in 2021 was the Reddit/social media frenzy, the macro-economic backdrop also benefited silver as accommodative monetary and fiscal policies continued last year. These delivered nominal interest rates near zero and deeply negative real rates, with precious metals benefiting in general. Growing inflationary pressures, worries about potential stagflation and still positive price expectations also encouraged retail investors to buy hard assets including physical silver.

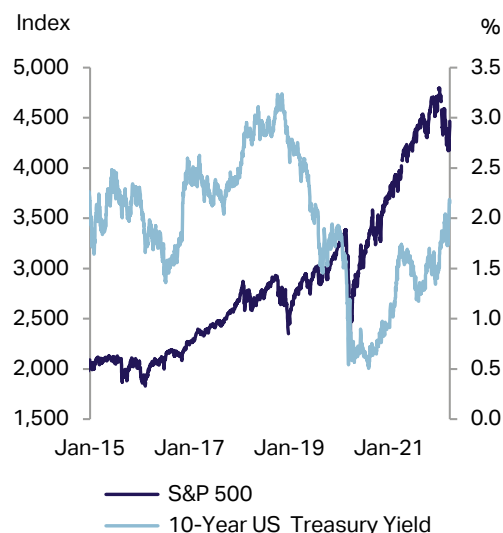
### US Actual Inflation & Forward Inflation Expectations



Source: Bloomberg

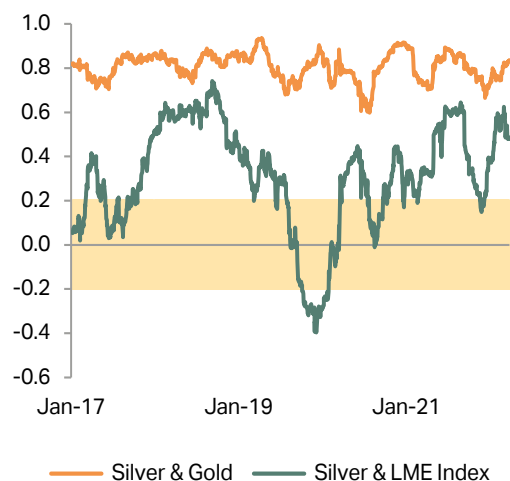


## S&P 500 and 10-Year US Treasury Yield



Source: Bloomberg

## Silver's Correlation with Gold and the LME Index\*



\*Rolling 60-day correlation coefficients between log-returns in the average silver price and changes in the average gold price and the LME Index. Observations within the yellow box are not statistically significant, at a 10% significance level.

Source: Metals Focus, Bloomberg

Early 2021 saw frenzied conditions in silver retail investment, driven in large part by social media. This helped silver outperform gold, with the ratio between the two falling to a seven-year low of 62:1. This followed a notable underperformance in 2020 when the ratio hit a record high of 127:1. That said, during the second half of 2021, as inflationary pressures intensified, the timing of Fed rate hikes began to dominate the narrative. Rising expectations that monetary tightening would start sooner than expected provided a major lift to the US dollar and Treasury yields, both of which raised the cost of holding precious metals for institutional investors. In addition, the risk to global growth, along with souring sentiment towards precious and industrial metals, saw silver struggle on both counts. This led to the white metal's relative underperformance, pushing the gold:silver ratio back to above 80.

Nevertheless, uncertainties over growth and inflation, persistently negative real rates, heightened distrust of governments (particularly in the face of persistent COVID-related restrictions) and still positive price expectations all underpinned retail interest. Investors, particularly in North America and Europe, took advantage of low prices to purchase silver coins and bars, pushing combined sales in these two regions to the highest total in Metals Focus' series. By contrast, even as Indian physical investment enjoyed a healthy recovery from 2020's extremely low base, demand was muted for much of last year, with most gains concentrated in the latter half of the year as the pandemic eased and the economy started to recover.

## Outlook

With no clear end to the Russia-Ukraine war, the near-term outlook remains uncertain. Meanwhile, the jump in energy prices, ongoing supply chain disruptions and the re-emergence of COVID cases in China all point to growing downside risks for the global economy. With an aggressive Fed rate hike cycle still factored in, the possibility that these expectations will be scaled back in the coming months remains high. All these factors, along with persistently high inflation, may well encourage further investment inflows into silver. Eventually though, as policy rate hikes gather momentum and their impact on real rates is potentially amplified by lower inflation, liquidations, particularly by professional investors, seem likely later in the year.

## Institutional Investor Activity

2021 witnessed a turnaround in investor sentiment towards silver. Early in the year, a generally supportive macroeconomic backdrop, a short-lived boost from the Reddit episode and enthusiasm over green technologies all bolstered silver investment. Later on, particularly from June onwards, as inflationary pressures intensified, growing expectations of faster monetary tightening weighed on investor confidence in all precious metals. Against this backdrop, silver trading volumes on commodity exchanges and in the OTC market weakened. ETP holdings, after peaking in February 2021, recorded outflows, though the global total by end-2021 remained elevated.

## Annual Turnover on Major Commodity Exchanges & LBMA<sup>1</sup>

Million ounces	2020	2021	Y/Y
SHFE <sup>2</sup>	172,279	111,623	-35%
COMEX <sup>3</sup>	130,633	98,348	-25%
LBMA	101,670	91,615	-10%
SGE T+D <sup>2</sup>	67,191	22,150	-67%
MCX	7,561	4,158	-45%
COMEX Micro <sup>3</sup>	2,450	2,197	-10%
Tocom/OSE	15	13	-8%

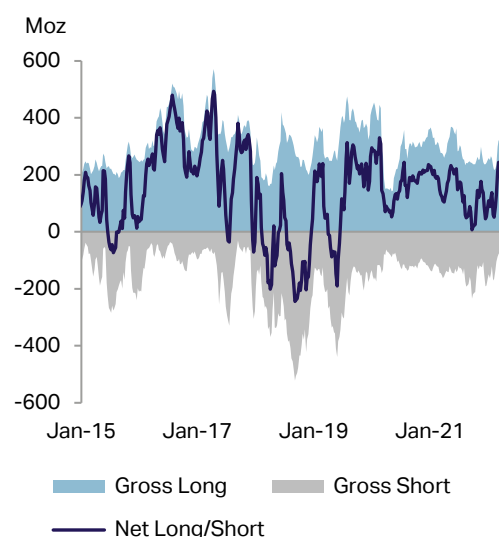
1. Turnover on all exchanges includes futures, spot or deferred contracts where applicable; turnover on LBMA includes spot, swap and forward.

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).

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

Source: Bloomberg, respective exchanges

## Investors' Positions on Comex\*



\*Managed money positions; Source: CFTC

## Commodity Exchanges

After achieving record-high turnover in the previous year, 2021 saw a sharp pullback in silver trading on all key exchanges. The **Shanghai Futures Exchange (SHFE)** retained its position of having the highest turnover.

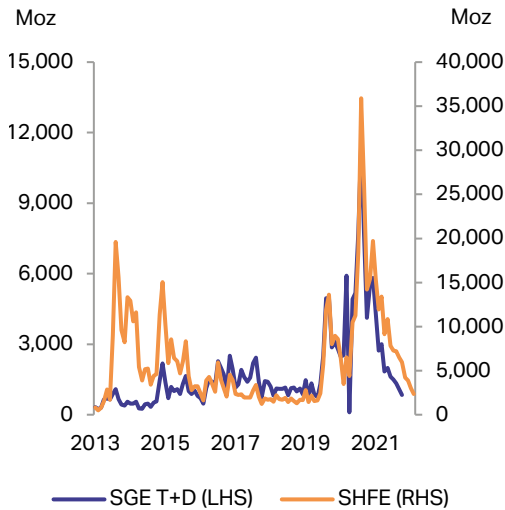
Annual turnover for the main **Comex** contract fell below 100bn oz (-25% y/y) for the first time since 2016, mainly due to weak retail interest amid less bullish price expectations and narrowing trading ranges. Investor activity on the exchange also reflected swings in market sentiment towards silver during the year. Following a decline to 11-month lows of 104Moz by end-March, net managed money positions improved briefly during Q2. This was soon followed by another round of net liquidations, led by rising caution towards the commodity complex on the back of hawkish Fed policy expectations. Investors net positions then dropped to a mere 6.6Moz by late September (their lowest since June 2019). Thereafter, with speculative inflows and short-covering, the net long returned to 87Moz by end-2021. More recently, the Russia-Ukraine crisis has fueled a surge in investor interest, with the net long in early March rising to 243Moz, a level last seen in February 2020.

Trading volumes saw more significant falls (albeit from an extremely high base) in China and India, where retail investors account for most speculative silver trading. Total turnover on the **SHFE** dropped by 35% y/y as retail investors' interest weakened due to a less exciting silver price later in the year. For better returns, some investment was diverted to base metals and other raw materials on the SHFE. On the **Shanghai Gold Exchange**, the hefty fall in silver T+D contract trading (a deferred contract and the most actively traded silver product on the SGE) came after rules on retail investor trading were tightened, aimed at preventing potentially dramatic losses in a volatile market. The **Multi Commodity Exchange of India (MCX)** also posted a sharp fall in turnover. Narrowing spot and futures spreads and the outperformance of Indian equities contributed to low investor interest in silver.

## Over-the-Counter Market (OTC)

Investor activity weakened during 2021, though the extent of the fall was more restrained compared to that seen in the futures market. Similar to other arenas of institutional investment, investor positioning recorded notable intra-year fluctuations in the OTC market. Early in the year, a continuation of ultra-loose monetary and fiscal stimuli, a greater focus on silver's applications in green energy technologies and optimism towards the global economy kept investor appetite for silver relatively high. While the social media-related buying was initially focused on retail investors, the price rally and the spike in volatility also attracted hefty institutional interest. To illustrate, LBMA trading volumes surged above 4bn oz in the first week of February, the highest since the start of the series in late 2018 and more than double the 2021 weekly average.

### SGE & SHFE Silver: Monthly Turnover



Source: Shanghai Gold Exchange, Shanghai Futures Exchange

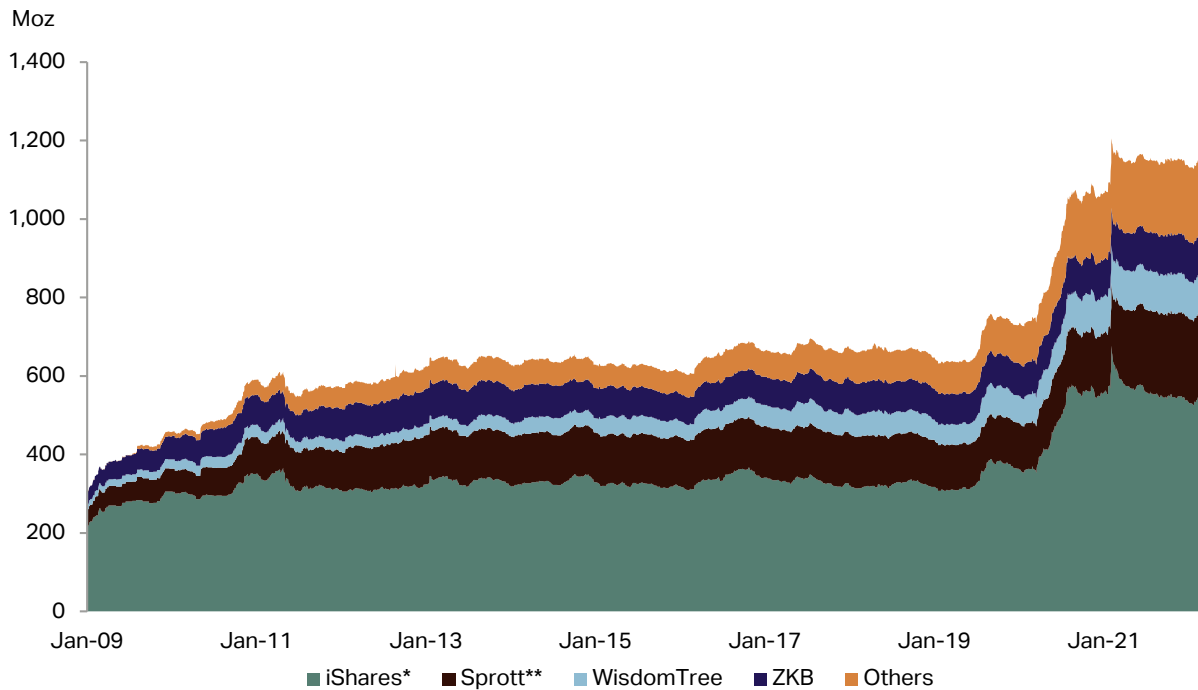
Investors' enthusiasm in silver soon abated amid a shift in expectations towards a quicker pace of monetary policy tightening, as inflationary pressure surged to multi-decade highs across western markets. Silver's high beta to gold also led to aggressive tactical shorting later in the year.

### Exchange-Traded Products (ETPs)

2021 was another year of net annual inflows into silver ETPs. With a rise of 65Moz (2,020t) or 6%, combined ETP holdings surged to another record high of 1.13bn oz (35,202t) at year-end.

Early 2021 saw aggressive inflows into silver ETPs, led by a surge in Reddit purchases. Within a few days, ETP holdings jumped by almost 120Moz (3,700t) to a new all-time high of 1.21bn oz (37,570t) on February 2nd. Leaving aside the short-lived surge, silver ETPs generally edged lower over most of the rest of last year. This reflected the uncertainty the silver price faced (typically in keeping with gold) due to the firming US dollar, rising Treasury yields, and pressure from Fed hawkish policy later in the year. That said, a growing belief in silver use in green energy applications and its industrial credentials provided some offsets at times.

### Silver ETP Holdings

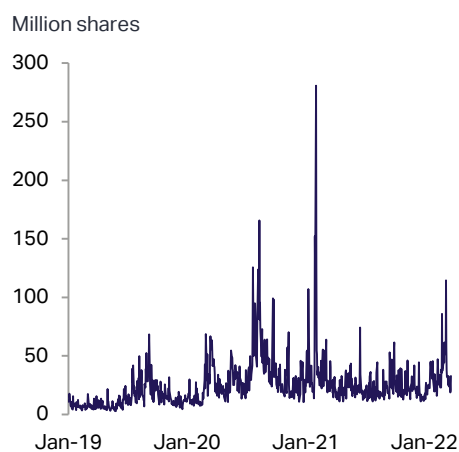


\*iShares Silver Trust; \*\*Combined holdings of Sprott Gold & Silver and Sprott Silver

Source: Bloomberg, respective issuers



## iShare Silver Trust Daily Turnover



Source: Bloomberg

Apart from the Reddit-driven inflows in February, strong inflows were also seen in May and September, at 19.6Moz (611t) and 8.6Moz (269t) for each month respectively. Interestingly (and unlike in February when the bulk of inflow was led by retail investor activity), the growth in May and September reflected buying from institutional investors. This was evident in the proportion of outstanding shares of iShares Silver Trust. The share held by institutions with reporting requirements surged above 25% in May and 30% in September, before pulling back later in the year. This reflected a drop of institutional interest in silver due to a growing expectation of faster Fed rate hikes and continuing equity market strength.

So far in 2022, ETP holdings have climbed again, as silver has benefited from rising safe-haven demand amid geopolitical turmoil and growing inflationary expectations. With retail investors still accounting for most of the total, the scale of liquidations has been modest, with global holdings remaining sticky and close to their record high.

## Physical Investment

Physical investment rose for the fourth consecutive year in 2021, up by 36% to a six-year high of 278.7Moz (8,668t). The US and Germany consolidated their positions as the world's two largest markets, as economic uncertainties rising inflationary worries in particular and growing mistrust of governments continued to raise silver's investment appeal. In India, sales of silver bars and coins more than tripled, albeit against a very weak base in 2020, with volumes still well below pre-COVID levels. The global total is projected to remain broadly flat in 2022, as a modest decline in western investment will be offset by further improvements in India.

By far the most impressive performance last year, in volume terms, was the 49% jump in **US** physical investment. This generated a six-year high of 118.4Moz (3,683t), falling only marginally short of 2015's record total. Given the strength of demand it is worth recalling that 2021 actually started off quite slowly, with retail investors initially focused on gold. This all changed when the social media storm burst onto the scene at the end of January. Following the success with GameStop, retail investors attempted to push the silver price dramatically higher.

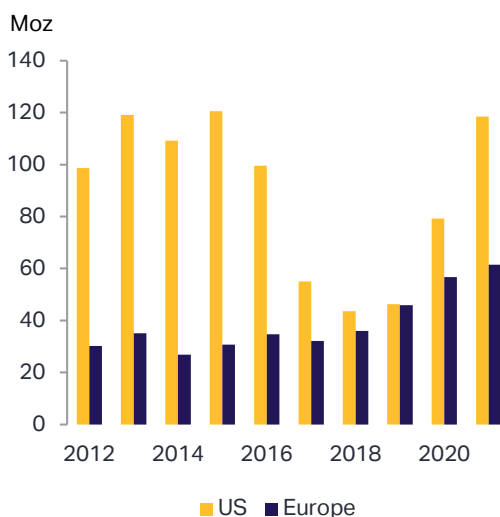
Although this strategy was unsuccessful, it was extremely successful in galvanizing investor interest in the silver market, to the benefit also of ETPs and mining equities. In the context of bar and coin demand, even though social media interest faded, physical investment remained exceptionally strong. Another important motive in the US revolved around growing fears about inflation. This was well before consumer prices actually surged and instead reflected concerns about the US administration's spending plans.

## Physical Investment Forecast

Million ounces	2021	2022F	Y/Y
Bars	124.6	123.5	-1%
Coins	154.0	155.7	1%
<b>Global Total</b>	<b>278.7</b>	<b>279.2</b>	<b>0%</b>

Source: Metals Focus

## US and Europe Retail Investment



Source: Metals Focus

The upshot of this was that many coin and bar suppliers often failed to keep pace with demand, resulting in near constant product shortages. Along with extended delivery lead times, retail premiums surged to unprecedented levels and retail liquidations were close to non-existent. The lack of product availability was exacerbated by the US Mint introducing new silver (and gold) Eagle bullion coins in July. To achieve this, in the run-up to the launch they switched production to the new Type II coins. The effective loss of the Type I Eagle benefited other coin and bar suppliers, but ultimately added to last year's supply/demand imbalance. One outcome therefore was a jump in bar imports from outside North America, notably from Turkey, Switzerland and Australia. Although difficult to estimate, this could have totaled some 17Moz (500t) last year.

For this year, we expect to see a slight pullback in US retail buying. In particular, it is difficult to see the market maintaining the same, almost relentless pace of demand which characterized 2021. Even so, the full year total will still remain historically high, signifying healthy retail interest in the silver market.

In **Europe**, sales of silver coins and bars rose by 9% to achieve a new record high of 61.9Moz (1,925t) on our data series. The surge in inflation to multi-

## Changing Landscape of Indian Investment

India is currently the world's third largest silver physical investment market after the US and Germany. The bar market in particular has been extremely successful, with around 500Moz (16,000t) bought cumulatively over the last 10 years. This partly reflects a lack of other silver investment vehicles, such as ETPs and digital products, both of which are available in the Indian gold market. For instance, digital gold was introduced in 2016, while mutual funds first launched gold ETPs in 2007. That said, the silver investment market is slowly changing, with digital silver and silver ETPs both launched last year.

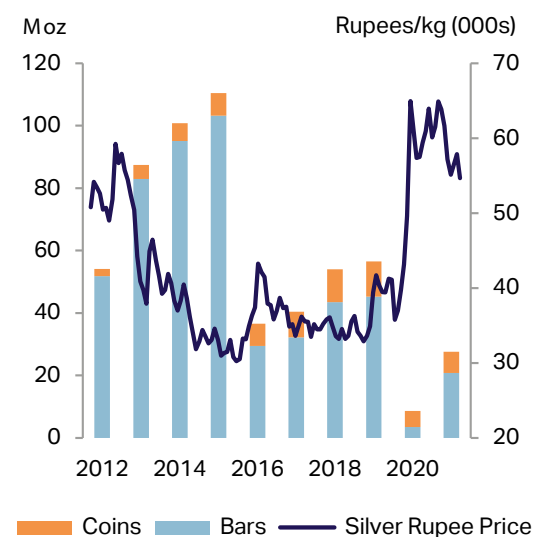
Looking at these themes in more detail, the growing popularity of e-commerce apps has meant that the likes of Amazon and Flipkart have been selling silver bars online, which can be physically delivered. However, holding physical silver comes with space constraints and security issues. To address these points, digital silver was launched by DIGIGOLD and Kredx; more will no doubt follow should their popularity grow. These allow silver to be bought online, and then have it stored in a vault. Once purchased, the silver can be sold directly for cash,

or redeemed in physical form. In addition, the ability to invest as little as one rupee, the ease of transacting, transparency, and the ability to buy/sell at any time make it an attractive product.

That apart, in 2021 the Securities and Exchange Board of India, the securities and commodities market regulator, allowed the launch of silver ETPs. Although several mutual funds issued silver ETPs, three are active, Aditya Birla Sun Life, Nippon India and ICICI Prudential, with a combined AUM of Rs 6.3bn (\$82m) as of February 2022. Silver ETP fund-of-funds (a fund that invests in its own ETP) were also launched by Nippon India and Aditya Birla Sun Life. Other asset management companies have also filed scheme information documents (SIDs) to launch ETPs.

Even though these products are relatively new, as retail investors become more comfortable with them and as financial literacy improves, we expect such products to become more popular. Although there will be some market share loss for bar demand (religious motives drive coin purchases), ultimately, we expect total Indian silver investment to grow.

## Indian Coin & Bar Demand



Source: Metals Focus, Bloomberg

decade highs, negative interest rates in both nominal and real terms in the Eurozone and new COVID variants continued to encourage investors to seek physical silver as a means of wealth preservation. These macroeconomic uncertainties also explained why profit taking remained muted among the general public. Despite improving product availability in 2021 (following COVID related disruptions in 2020), there were periods when dealers still reported product shortages and extended delivery times of certain bullion coins. Indeed, buoyant sales as well as low selling back kept wholesale and retail premiums well above pre-COVID levels last year. Turning to 2022-to-date, demand for physical silver has remained strong. Leaving aside elevated inflationary concerns, Russia's invasion of Ukraine has provided a fresh impetus to demand for hard assets.

**Indian** physical investment improved dramatically last year, rising by 219% to 27.6Moz (858t). However, this change owed much to 2020's depressed total which had been affected by widespread liquidations. Despite this, investment demand remained well below historic norms; in the 10 years to 2020, demand averaged about 60oz (1,860t) per annum, with Indians buying some 598Moz (18,591t) of silver over this period. This has resulted in a build-up of loosely held stocks, which at times has weighed on Indian demand over the last two years, as some investors' focus has gradually shifted towards liquidating their holdings when the silver price jumped.

The trends within 2021 can be divided into two distinctive halves. During the first six months, investment buying was negatively impacted by silver price volatility and the spread of the delta variant between March-June, which effectively brought new purchases to a standstill. In addition, the inability of silver to make new highs in rupee terms and the spread of the virus across much of rural India encouraged many investors to sell back and book profits. Furthermore, investors in urban India continued to invest in equities due to their robust performance. During the second half, as the

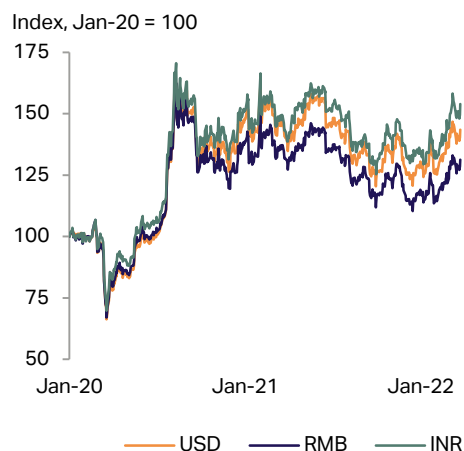
## Physical Investment

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
United States	98.6	119.1	109.2	120.5	99.6	55.0	43.6	46.2	79.3	118.4	49%
Germany	23.0	27.1	19.5	21.0	23.9	23.1	25.0	34.1	42.6	45.4	6%
India	54.1	87.4	100.8	110.4	36.5	40.5	54.0	56.5	8.7	27.6	219%
Canada	4.8	6.6	7.4	7.6	7.2	4.7	4.6	5.0	7.5	10.6	42%
China	22.9	21.2	11.7	11.5	11.1	7.7	6.8	6.2	6.9	6.2	-10%
Other Europe	7.2	7.9	7.3	9.7	10.8	9.1	10.9	11.7	14.0	16.5	19%
Others	30.0	31.2	27.2	29.6	22.8	15.7	20.3	26.9	46.2	54.0	17%
<b>Global Total</b>	<b>240.7</b>	<b>300.6</b>	<b>283.1</b>	<b>310.4</b>	<b>212.0</b>	<b>155.7</b>	<b>165.2</b>	<b>186.8</b>	<b>205.0</b>	<b>278.7</b>	<b>36%</b>

Source: Metals Focus



## Indexed Silver Prices



Source: Metals Focus, Bloomberg

number of cases subsided, the pace of vaccinations picked up and as silver prices eased, investment buying resumed. Another important reason for the lackluster investment demand was the at times modest level of jewelry and silverware offtake. Prior to this, strong demand for these products during 2013-19 encouraged many across the trade to take advantage of low prices during this period to stock up on silver that was to be fabricated later. However, volatile silver prices and concerns that demand would falter amid the pandemic meant that many fabricators became cautious about holding excess stock.

For 2022, we expect investment demand to continue its recovery although we do not expect it to surpass pre-pandemic levels as trade buying is likely to remain subdued.

Physical investment in **China** fell by 10% last year to 6.2Moz (192t), driven by losses in both the bar and coin markets. Due to silver's VAT treatment (13% is levied on the full value of silver products, whereas gold and platinum are exempt), silver bar and coin markets are dominated by gifting and collector demand. Last year, higher prices (average SGE daily silver price increased by 11% in 2021) and the slow-down that China's economy experienced over the course of the year undermined collectors' purchases.

Gifting demand also dropped with less visiting and corporate activities when new COVID-19 mini-outbreaks emerged regionally at times. Similarly, silver coin demand fell modestly, primarily driven by an overall decline in the mintage plan in 2021. In 2022, we expect physical silver investment to increase by a slight 1% y/y given signs of a modest improvement in China's growth and improving consumer sentiment.

## Coins & Medals Fabrication

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
Canada	18.6	29.3	30.8	35.4	33.6	18.9	18.4	23.0	28.8	37.1	29%
United States	36.1	45.8	46.4	49.1	39.4	19.3	17.1	20.5	32.7	32.2	-2%
Australia	10.5	8.6	8.5	12.7	13.2	10.7	10.4	12.7	17.3	20.0	16%
UK	0.7	2.5	2.2	3.5	3.5	3.1	3.5	3.2	9.7	15.7	62%
Austria	8.8	14.5	4.6	7.3	3.4	2.1	2.1	2.9	7.2	12.3	71%
South Africa	0.0	0.8	0.0	0.6	0.0	1.2	3.7	3.6	7.9	10.3	31%
China	12.0	12.0	11.7	11.5	11.4	8.0	7.5	7.0	7.7	6.9	-10%
India	2.3	4.5	5.7	7.2	7.1	8.3	10.5	11.3	5.2	6.7	30%
Germany	1.3	1.3	1.3	1.9	4.3	4.0	4.0	3.9	3.9	3.9	0%
Mexico	1.3	0.7	0.7	1.1	1.2	1.2	0.6	0.4	0.4	0.6	30%
Others	7.9	9.2	8.8	9.1	6.4	6.1	7.2	7.6	7.4	8.4	14%
<b>Global Total</b>	<b>99.5</b>	<b>129.3</b>	<b>120.7</b>	<b>139.3</b>	<b>123.4</b>	<b>82.8</b>	<b>85.1</b>	<b>96.0</b>	<b>128.1</b>	<b>154.0</b>	<b>20%</b>

Source: Metals Focus

## Above-Ground Silver Stocks

In 2021, the silver market registered a deficit of 51.8Moz (1,610t), following a pandemic-boosted surplus of 73.0Moz (2,270t). Looking beyond the simple y/y comparison, 2021 was a particularly interesting year, as according to Metals Focus' expectations it marks a shift in the silver market, from a structural surplus position to one of structural deficits. From 2010 through to 2020 inclusive, overall silver supplies tended to exceed demand, fueling a cumulative rise of 312.1Moz (9,709t) over the period. In contrast, combining last year's supply shortage with our forecasts suggests that over 2021-2026 silver inventories will decline by 296Moz (9,212t). As a reminder of our methodology and definitions, these figures exclude flows into retail investors' bar and coin holdings.

Returning to 2021, global identified/reported stocks fell by 35.4Moz (1,102t) during the year. This suggests there was an outflow of 16.4Moz (509t) from unreported silver inventories, calculated from the difference between the global market deficit and the change in identified inventories. Delving into these figures, LBMA data on London vault holdings shows inflows of 80.9Moz (2,517t) over the year. This broadly matches UK trade data as well as changes in ETP holdings for last year. "Feeding" these inflows, 2021 saw commodity exchange stocks fall sharply across the board. Inventories held at Comex-approved depositories fell by 40.8Moz (1,270t), as the EFP turned negative, which encouraged metal to move from

### London Vault Silver Inventories\*: Percent Held as ETPs



\*Includes silver stored at LBMA-member custodian vaults  
Source: Metals Focus, LBMA, Bloomberg

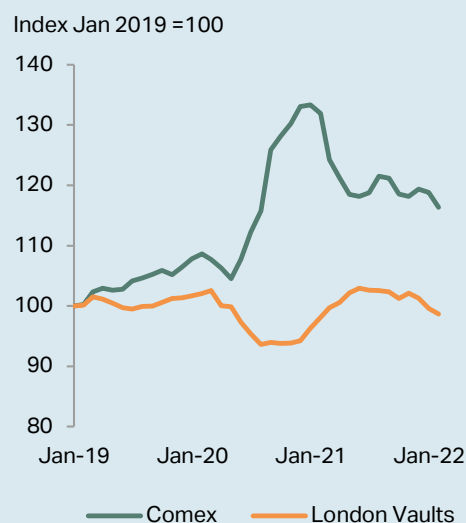
### Identifiable Silver Bullion Inventories\*

Million ounces	2019	2020	2021	Y/Y
London vaults	1,162.2	1,080.5	1,161.0	7%
Comex	317.2	396.5	355.7	-10%
SGE	108.2	130.0	73.9	-43%
SHFE	63.2	95.2	75.9	-20%
<b>Total</b>	<b>1,650.8</b>	<b>1,702.3</b>	<b>1,666.9</b>	<b>-2%</b>

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

New York to London. Chinese exchange stocks also fell over the course of the year, as the local price discount created arbitrage opportunities. SGE inventories fell by 56.2Moz (1,747t) and SHFE ones by 19.3Moz (601t). The downtrend in reported stocks has continued into 2022. In January and February alone, London vault stocks fell by 30.0Moz (934t) and those on Comex have fallen by roughly 15.5Moz (480t) during the year and through to late March. Chinese exchanges stocks are also down. This is not surprising and we expect it will likely continue over the rest of the year. Metals Focus forecasts a 71.5Moz (2,224t) deficit for 2022 and naturally this will need to be filled by the mobilization of above-ground inventories. Moreover, as a big portion of these inventories is not reported, it may well once again be the case that the decline in reported/identifiable stocks falls short of the global market deficit this year.

### Comex vs London\* Vault Inventories



\*Includes silver stored at LBMA-member custodian vaults  
Source: Metals Focus, LBMA, Comex

## Chapter 4

- Global silver mine supply rose by 5.3% y/y to 822.6Moz (25,587t) as output recovered from COVID-19 disruption in 2020.
- Higher by-product credits drove down costs at silver mines for the second consecutive year, with all-in sustaining costs falling by 3.2% y/y to \$10.88/oz.
- This year, mined production is expected to increase by 2.5% y/y to 843.2Moz (26,226t) with the biggest rise occurring in Mexico.

# Mine Supply

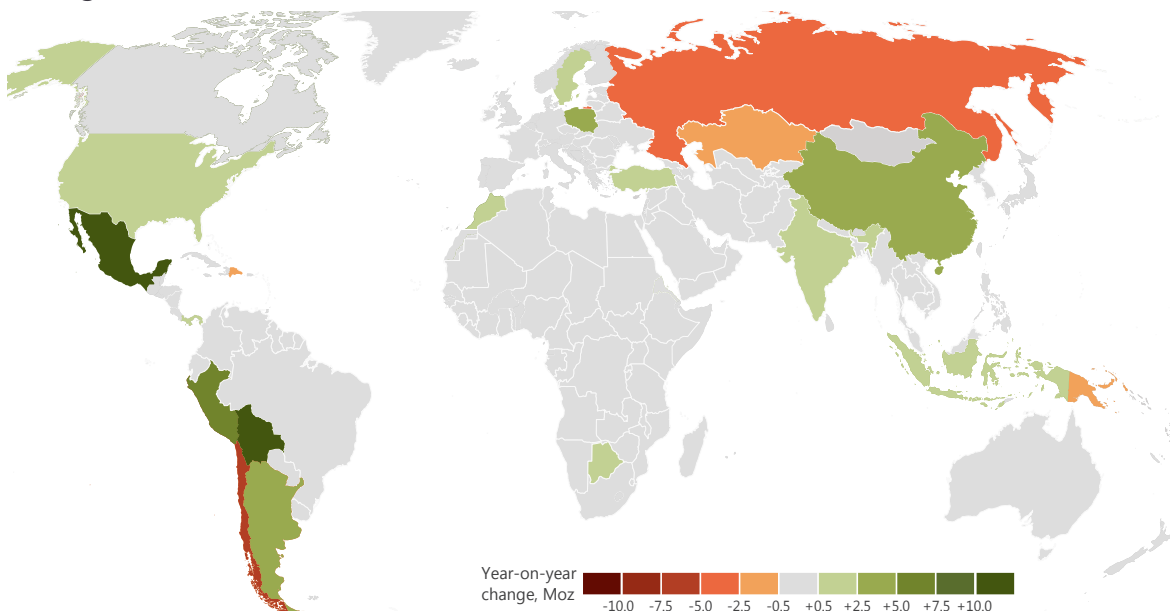
## Mine Production

Global mined silver production increased by 5.3% y/y in 2021, reaching 822.6Moz (25,587t). This was the biggest annual growth in mined silver supply since 2013 and was primarily driven by the recovery in output following COVID-19 related disruption in 2020. That said, production was 25.9Moz (805t) lower than our forecast in last year's World Silver Survey as several large mines struggled to meet production guidance and operations were unexpectedly suspended at Buenaventura's Uchucchacua mine in Peru.

Production from primary silver mines increased by the most (+10.2%) as they are concentrated in countries where mining was heavily impacted by COVID-19 restrictions in 2020. The recovery from pandemic related disruption also led to higher silver output from lead-zinc mines (+5.1%) and gold mines (+5.8%). A fall in Chilean output led to more modest growth from copper mines (+0.7%). On a country level, the greatest rises in silver output came in Mexico (+16.5Moz, 514t), Bolivia (+11.6Moz, 359t) and Peru (+6.2Moz, 194t). Mining in these countries was heavily impacted by pandemic related restrictions in the previous year. Meanwhile, the biggest falls came in Chile (-6.2Moz, 193t), Russia (-3.6Moz, 111t) and Kazakhstan (-2.0Moz, 63t).

This year we expect mined silver supply to rise again, increasing by 2.5% y/y to 843.2Moz (26,226t). This will largely be driven by higher output from mines in Mexico, alongside new silver producing projects coming on-line in countries such as Chile and Russia.

### Major Changes to Global Mine Production, 2021 versus 2020



Source: Metals Focus

## Top 20 Producing Countries

Million ounces	2020	2021	Y/Y
Mexico	180.2	196.7	9%
China	109.5	112.9	3%
Peru	101.6	107.9	6%
Australia	43.0	42.9	0%
Poland	39.4	42.0	7%
Bolivia	29.9	41.5	39%
Chile	47.4	41.2	-13%
Russia	42.5	39.0	-8%
United States	31.7	32.5	3%
Argentina	22.7	26.5	16%
India	21.6	22.2	3%
Kazakhstan	17.4	15.3	-12%
Sweden	13.4	13.9	4%
Indonesia	8.3	10.8	30%
Morocco	8.0	9.3	16%
Canada	9.4	9.0	-5%
Uzbekistan	6.3	6.8	9%
Turkey	4.0	5.5	38%
Dominican Republic	4.1	3.4	-18%
Portugal	3.1	3.1	2%
Others	37.5	40.4	8%
<b>Global Total</b>	<b>781.1</b>	<b>822.6</b>	<b>5%</b>

Source: Metals Focus

## North America

Silver mine production in North America rose by 7.6% y/y to 238.2Moz (7,409t). Increased output from Mexico (+16.5Moz, 514t) and the US (+0.8Moz, 25t) offset the decline in production from Canada (-0.4Moz, 14t).

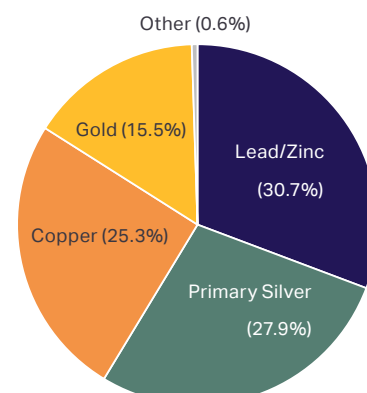
The 9.2% y/y growth in **Mexico** was driven by the ramp-up of new projects and a recovery from COVID-19 disruption in 2020, when many mines in the country were forced to temporarily cease operations. Production from Cerro Los Gatos, operated by Gatos Silver, rose by 3.4Moz (106t) as the mine operated at full capacity throughout the year having commenced production in 2020. At Peñoles' Capela mine, improved efficiency of the flotation circuit led to production growth of 1.1Moz (36t). Newmont's Peñasquito and First Majestic's San Dimas both increased output with a year-on-year rise of 3.4Moz (105t) and 1.2Moz (39t), respectively. Production from Fresnillo, the world's largest silver producer, declined marginally by 0.6% y/y (-0.3Moz, 10t). The company's operations were impacted by COVID-19 absenteeism and labor reforms, which came into effect in September, limiting the ability to use subcontractors. This resulted in lower output from Saucito (-3.1Moz, -96t) and Fresnillo (-1.1Moz, -33t). However, this was partially offset by increases at Juanicipio (+2.9Moz, 89t), as the project ramps-up towards commercial production, and at San Julian DOB (+3.3Moz, 102t), due to higher grades.

In the **US**, output rose by 2.6% y/y to 32.5Moz (1,011t). This was primarily due to higher silver production from Hecla's Lucky Friday (+1.5Moz, 48t) which resumed full production in early 2020 following a strike of almost three years by unionized workers. The mine is expected to continue increasing output moving forward, as higher grade ore is accessed at deeper levels, eventually achieving average annual production of around 5Moz (156t). Meanwhile, a 13.7% fall in silver head grade led to lower production at Hecla's other US operation, Greens Creek (-1.3Moz, 39t).

## Silver Mine Production, by Source Metal in 2021

Million ounces	Primary				
	Lead/Zinc	Silver	Copper	Gold	Other
North America	32.8	129.2	13.2	62.5	0.4
Central & South America	70.0	45.4	77.3	37.0	0.0
Europe	14.2	1.5	49.0	1.3	0.0
Africa	3.6	6.5	3.4	3.6	0.0
CIS	11.0	19.8	23.5	9.4	2.2
Asia	102.2	10.8	36.3	9.1	1.5
Oceania	19.0	16.7	5.5	4.7	0.0
<b>Total</b>	<b>252.8</b>	<b>229.9</b>	<b>208.2</b>	<b>127.6</b>	<b>4.2</b>

Source: Metals Focus



## Top 20 Producing Companies

Million ounces	2020	2021	Y/Y
Fresnillo <sup>1</sup>	50.3	50.0	-1%
KGHM Polska Miedz <sup>2</sup>	43.5	43.9	1%
Glencore	32.8	31.5	-4%
Newmont <sup>2</sup>	27.8	31.4	13%
Codelco <sup>2</sup>	24.6	23.6	-4%
Hindustan Zinc <sup>3,4,5</sup>	21.6	22.2	3%
Polymetal International	18.8	20.4	8%
Pan American Silver	17.3	19.2	11%
Southern Copper	21.5	19.0	-12%
Volcan Cia Minera	12.1	15.0	24%
Industrias Peñoles <sup>6</sup>	12.3	14.5	18%
South32 <sup>2</sup>	11.6	14.4	24%
Sumitomo Corporation	7.4	13.5	82%
Buenaventura <sup>7</sup>	12.5	13.1	4%
Hecla Mining Company	13.5	12.9	-5%
First Majestic Silver	11.6	12.8	11%
BHP <sup>2</sup>	12.0	12.5	4%
Hochschild Mining	9.8	12.2	24%
Boliden <sup>2</sup>	11.4	11.9	5%
Teck Resources <sup>8</sup>	10.1	10.6	5%

NB: 1 - Excludes Silverstream contract, 2 - Payable production, 3 - Hindustan Zinc is a Vedanta Group company, 4 - Production from integrated operations only, 5 - Refined Silver, 6 - Excludes 100% Fresnillo, 7 - Equity weighted production including silver from copper ore processed at El Brocal, 8 - Estimated attributable mined production  
Source: Company Reports, Metals Focus

## Mine Production Forecast, by Region

Million ounces	2021	2022	Y/Y
N America	238.2	258.1	8%
C&S America	229.7	225.5	-2%
Asia	159.9	162.7	2%
CIS	65.9	68.0	3%
Europe	65.9	63.5	-4%
Oceania	45.9	47.1	3%
Africa	17.1	18.3	7%
<b>Global Total</b>	<b>822.6</b>	<b>843.2</b>	<b>2%</b>

Source: Metals Focus

Silver production in **Canada** fell for the second consecutive year, dropping by 4.7% y/y to 9.0Moz (279t). The transitioning of Hudbay's Lalor mine to focus on gold production led to lower output of base metals and associated silver. Meanwhile, operations at Coeur's Silvertip remained suspended throughout the year after the mine was placed into care and maintenance due to market conditions in February 2020.

## Central & South America

Silver production in Central and South America rose by 8.1% y/y to 229.7Moz (7,144t) driven by increases in Bolivia (+11.6Moz, 359t), Peru (+6.2Moz, 194t) and Argentina (+3.7Moz, 155t), as mines were able to operate at full capacity throughout the year following COVID-19 shutdowns in 2020. However, pre-pandemic levels were not attained as many operations still faced COVID-19 related restrictions on workforce availability and shift rotations.

Silver production in **Bolivia** rose by 38.6% y/y to 41.5Moz (1,290t), reaching its highest point since 2016. This was largely due to a rebound from significant pandemic related disruption in 2020 alongside expansions at both large and small-scale operations. In **Peru**, silver production climbed by 6.1% y/y to 107.9Moz (3,355t) as operations recovered from COVID-19 disruption in the previous year. Improved grades and recoveries at Buenaventura's El Brocal and Hochschild Mining's Inmaculada led to respective year-on-year increases of 2.5Moz (77t) and 2.2Moz (68t). Output from Buenaventura's Uchucchacua fell by 25.4% to 3.7Moz (116t). Operations were suspended in Q4.21 as Buenaventura looks to improve the efficiency of the mine. In **Argentina** silver production rose by 16.3% to 26.5Moz (823t), largely driven by increased output at SSR Mining's Puna operations, up 43.5% to 8.0Moz (249t) and Hochschild Mining's San Jose mine, up 27.8% to 5.3Moz (163t). Output from both operations were impacted by COVID-19 in 2020.

Conversely, silver production in **Chile** fell by 6.2Moz (193t). At Codelco, lower production at the Chuquicamata, Salvador and Andina operations led to a 4.2% fall to 23.6Moz (735t). At Yamana's El Peñón lower grades resulted in a 27.0% drop in silver production to 3.6Moz (112t). Output at BHP's Escondida fell by 14.4% to 5.3Moz (165t) due to lower recoveries and ore throughput.

## Asia

Silver production in Asia rose by 5.1% y/y to 159.9Moz (4,974t). Most countries in the region achieved higher output with the largest increases from China (+3.3Moz, 103t) and Indonesia (+2.5Moz, 77t).

In **China**, production grew by 3.0% to 112.9Moz (3,510t) as output recovered following COVID-19 disruption in Q1.20. **Indonesian** production increased by 29.7% to 10.8Moz (336t) primarily driven by the continued ramp-up of underground mining at Grasberg. A significant increase in ore extracted from the mine pushed silver output up by 63.9% to 5.9Moz (184t).



## Mine Production

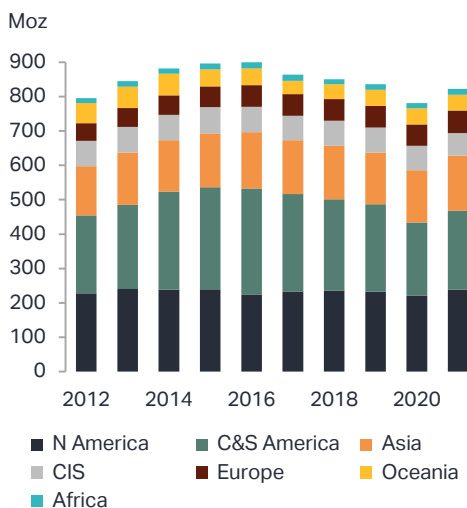
Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>North America</b>											
Mexico	172.3	187.1	185.4	192.1	174.3	187.0	194.5	187.8	180.2	196.7	9%
United States	34.1	33.6	37.9	35.0	37.0	33.2	29.8	31.4	31.7	32.5	3%
Canada	21.4	19.9	15.2	11.9	11.6	12.7	11.8	13.5	9.4	9.0	-5%
<b>Sub-total</b>	<b>227.8</b>	<b>240.7</b>	<b>238.5</b>	<b>239.0</b>	<b>222.8</b>	<b>232.8</b>	<b>236.1</b>	<b>232.6</b>	<b>221.3</b>	<b>238.2</b>	<b>8%</b>
<b>Central &amp; South America</b>											
Peru	113.6	123.0	126.0	135.6	152.3	155.0	146.5	135.1	101.6	107.9	6%
Bolivia	38.8	41.4	43.1	42.0	43.5	38.5	38.3	37.1	29.9	41.5	39%
Chile	38.3	37.6	50.2	48.1	46.6	40.4	40.0	38.2	47.4	41.2	-13%
Argentina	24.7	26.6	29.6	36.4	31.9	29.2	30.9	32.9	22.7	26.5	16%
Dominican Republic	0.9	2.6	4.4	3.1	3.9	4.9	5.1	4.5	4.1	3.4	-18%
Brazil	0.5	0.9	1.1	1.6	2.5	2.8	2.3	2.2	2.2	2.6	17%
Panama	0.1	0.1	0.0	-	-	-	-	0.9	1.6	2.5	58%
Guatemala	6.6	9.1	27.6	27.7	27.0	10.8	-	-	-	-	na
Others	3.4	3.3	3.4	2.6	2.0	2.0	2.5	3.0	2.9	4.2	47%
<b>Sub-total</b>	<b>226.8</b>	<b>244.6</b>	<b>285.3</b>	<b>297.1</b>	<b>309.8</b>	<b>283.5</b>	<b>265.5</b>	<b>253.9</b>	<b>212.5</b>	<b>229.7</b>	<b>8%</b>
<b>Europe</b>											
Poland	37.3	38.8	38.4	39.2	40.9	41.7	40.9	40.4	39.4	42.0	7%
Sweden	9.8	10.8	12.7	15.8	16.4	15.5	15.0	14.4	13.4	13.9	4%
Portugal	1.1	1.4	1.5	1.5	1.4	1.3	2.9	3.1	3.1	3.1	2%
Spain	1.1	1.2	1.1	1.4	1.5	1.9	2.1	2.1	2.5	2.7	6%
Finland	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.1	1.6	1.5	-8%
Others	2.2	2.6	2.5	2.4	2.3	2.4	2.0	2.0	2.3	2.7	16%
<b>Sub-total</b>	<b>51.5</b>	<b>55.0</b>	<b>56.4</b>	<b>60.3</b>	<b>62.6</b>	<b>62.9</b>	<b>63.0</b>	<b>63.0</b>	<b>62.3</b>	<b>65.9</b>	<b>6%</b>
<b>Africa</b>											
Morocco	7.1	7.4	7.8	9.0	10.0	10.3	7.8	9.1	8.0	9.3	16%
Eritrea	1.0	0.5	1.7	3.2	3.2	2.5	1.7	2.0	3.2	3.1	-2%
South Africa	2.8	2.4	1.8	1.9	2.0	2.2	1.6	2.0	1.3	1.6	24%
Botswana	0.4	0.8	0.8	0.1	0.1	0.0	0.0	-	-	0.6	na
Others	3.0	4.8	3.4	3.6	2.3	2.5	2.5	2.5	2.5	2.6	1%
<b>Sub-total</b>	<b>14.3</b>	<b>15.9</b>	<b>15.5</b>	<b>17.8</b>	<b>17.6</b>	<b>17.5</b>	<b>13.7</b>	<b>15.6</b>	<b>15.0</b>	<b>17.1</b>	<b>14%</b>
<b>Commonwealth of Independent States</b>											
Russia	45.4	44.4	46.1	51.1	46.6	42.0	43.1	44.7	42.5	39.0	-8%
Kazakhstan	20.5	21.3	18.1	16.1	17.4	18.9	19.8	17.0	17.4	15.3	-12%
Uzbekistan	4.8	5.9	5.9	5.9	5.9	5.9	5.9	6.1	6.3	6.8	9%
Armenia	2.1	2.3	2.4	2.5	2.4	2.6	2.0	2.4	2.6	2.6	-2%
Tajikistan	0.6	0.6	1.0	1.1	1.3	1.5	1.5	1.4	1.5	1.5	3%
Others	0.2	0.2	0.2	0.3	0.6	0.5	0.6	0.6	0.6	0.6	6%
<b>Sub-total</b>	<b>73.5</b>	<b>74.7</b>	<b>73.7</b>	<b>76.9</b>	<b>74.3</b>	<b>71.5</b>	<b>72.9</b>	<b>72.3</b>	<b>70.9</b>	<b>65.9</b>	<b>-7%</b>

## Mine Production

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Asia</b>											
China	112.6	118.1	119.0	119.1	121.3	116.4	110.6	111.5	109.5	112.9	3%
India	9.3	10.7	8.4	12.0	14.0	16.9	21.2	20.4	21.6	22.2	3%
Indonesia	6.2	7.8	7.0	9.9	10.8	10.0	10.1	7.3	8.3	10.8	30%
Turkey	7.1	6.5	6.4	6.6	6.7	4.9	4.7	3.2	4.0	5.5	38%
Iran	2.3	2.2	2.3	2.2	2.5	2.5	2.5	2.6	2.7	2.7	2%
Mongolia	0.8	1.3	1.7	2.0	2.2	1.8	1.7	1.6	1.7	1.8	6%
Laos	0.6	1.1	1.3	1.7	1.6	1.4	1.2	1.1	1.1	1.1	2%
Philippines	1.6	1.3	0.7	1.0	1.1	1.0	1.0	1.0	0.8	0.7	-6%
Thailand	1.1	1.2	1.1	0.8	1.3	0.1	0.1	0.1	0.1	0.1	0%
Others	1.6	1.8	1.8	1.6	2.1	1.9	2.3	2.2	2.4	2.1	-10%
<b>Sub-total</b>	<b>143.2</b>	<b>151.8</b>	<b>149.6</b>	<b>156.8</b>	<b>163.7</b>	<b>156.9</b>	<b>155.3</b>	<b>151.0</b>	<b>152.1</b>	<b>159.9</b>	<b>5%</b>
<b>Oceania</b>											
Australia	55.5	59.2	59.4	46.0	45.6	36.0	40.3	42.6	43.0	42.9	0%
Papua New Guinea	2.7	3.0	3.1	2.3	3.2	2.1	3.0	4.7	3.8	2.9	-24%
Others	0.4	0.5	0.6	0.6	0.4	0.4	0.3	0.1	0.1	0.1	52%
<b>Sub-total</b>	<b>58.6</b>	<b>62.6</b>	<b>63.1</b>	<b>48.9</b>	<b>49.2</b>	<b>38.6</b>	<b>43.6</b>	<b>47.4</b>	<b>46.9</b>	<b>45.9</b>	<b>-2%</b>
<b>Global Total</b>	<b>795.7</b>	<b>845.3</b>	<b>882.1</b>	<b>896.9</b>	<b>900.0</b>	<b>863.7</b>	<b>850.2</b>	<b>835.9</b>	<b>781.1</b>	<b>822.6</b>	<b>5%</b>

Source: Metals Focus

## Global Mine Production



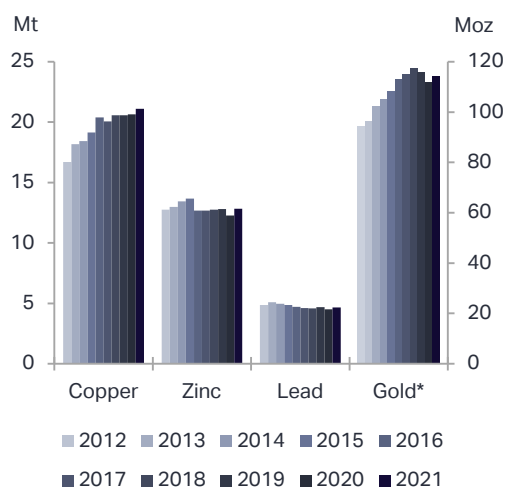
Source: Metals Focus

## Other Regions

In other regions, silver production in Oceania contracted by 2.1% y/y to 45.9Moz (1,428t) primarily due to a fall in output from **Papua New Guinea**. Production at Harmony's Hidden Valley fell by 29.2% to 1.9Moz (59t) as geotechnical issues in the open pit led to lower grade stockpiles being used to supplement plant feed. In **Australia**, production remained flat year-on-year despite a rise in head grades at South 32's Cannington, which pushed output up by 24.1% to 14.4Moz (447t).

In the CIS, silver production decreased by 7.1% y/y to 65.9Moz (2,050t). Lower grades and tonnages at Silver Bear Resources' Mangazeisky mine contributed to an 8.4% fall in production from **Russia** to 39.0Moz (1,212t). Silver production in Europe increased by 5.7% y/y to 65.9Moz (2,050t) as higher grades at KGHM's operations in **Poland** improved silver production in concentrate by 7.0% to 41.9Moz (1,303t). In **Sweden**, by-product output from base metal operations also increased, up 3.8% to 13.9Moz (432t). In Africa silver production rose by 13.9% y/y to 17.1Moz (532t), largely due to higher output from Aya Gold & Silver's Zgounder (+0.9Moz, 28t) in **Morocco**.

### Global By-Product Production



\*Gold in Moz, RHS  
Source: ICSG, ILZSG, Metals Focus

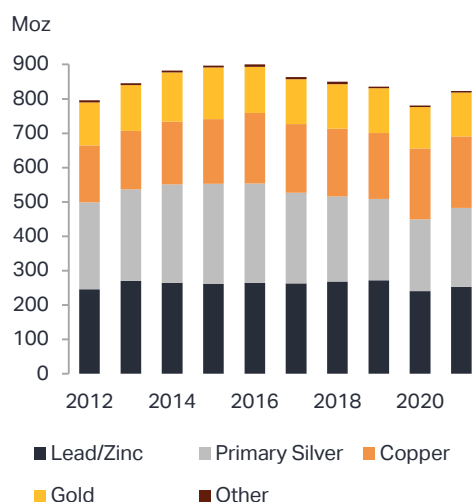
### By-Product Analysis

The majority of silver is produced as a by-product from mines targeting other metals. Last year 72% of mined silver production came from lead-zinc, copper and gold mines. The recovery from COVID-19 disruption to mining in 2020 was the primary driver behind rising global lead (+3.8%), zinc (+4.5%) and gold (+2.5%) production. Copper output also increased (+2.2%), but this was primarily due to higher production from several large projects.

**Lead-zinc** mines are the biggest contributor to global mined silver supply, producing 252.8Moz (7,862t) in 2021, 31% of the global total. China is the biggest producer of both lead and zinc, accounting for 43% and 32% of global mined output respectively. The COVID-19 pandemic led to temporary mine closures in China during early 2020 which lowered annual mined supply. In 2021 production from the country recovered year-on-year with lead and zinc output up by 1.1% and 1.9% respectively. Silver production from China followed a similar trend, rising by 3.0%. Globally, silver output from lead-zinc mines rose by 5.1%, largely due to the recovery from COVID-19 disruption in 2020, particularly in Central & South America and North America.

Global **copper** output in 2021 increased by 2.2% y/y to 21,096kt. The biggest growth in production came from Indonesia where copper output rose by 49% to 752kt. This was due to the ramp-up of underground mining at Grasberg with output expected to continue rising over the next few years as the mine progresses towards full capacity. Other notable increases came in the Democratic Republic of the Congo and Panama, driven by the Kamo-a-Kakula Project and Cobre Panama respectively. In contrast, copper output from the largest global producer, Chile, fell by 108kt. This was entirely due to lower production from BHP’s Escondida, the world’s largest copper mine. The rise in global copper output led to an associated rise in silver production from copper mines, which increased by 0.7% y/y to 208.2Moz (6,476t).

### Mine Production by Source Metal



Source: Metals Focus

The 2.5% y/y rise in global **gold** production was primarily due to the recovery from COVID-19 disruption in the previous year. The pandemic did continue to impact output, but disruption was limited to individual mines and there was not a return to mine shutdowns on a national or regional scale. The increase in output was countered by a 10% fall in gold production from China due to safety stoppages of mines in Shandong province, following two fatal accidents in January 2021, alongside unexpected operational issues at several major mines in North America and Australia. Silver output from gold mines increased by 5.8% y/y to 127.6Moz (3,967t).

By-product silver production is expected to increase most significantly from primary gold mines this year. This will be driven by higher output from several existing operations alongside the commissioning of the silver-rich La Coipa gold project in Chile. Meanwhile, silver production is forecast to rise modestly from copper mines and remain almost flat from lead-zinc operations.

# ESG in The Silver Mining Industry

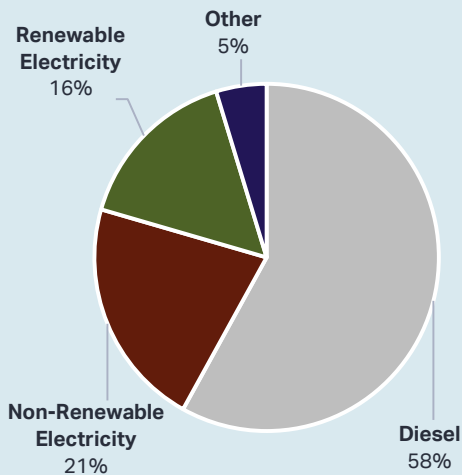
Environmental, social and governance (ESG) issues have been of high importance to mining companies for a long time. Failure to properly manage any of these three areas can lead to closure of operations and so they present a material risk to companies' cash-flows. However, over recent years the focus on ESG has intensified and many investors will no longer consider investing in companies with poor ESG credentials. This increased scrutiny has particularly been driven by growing concerns about human induced climate change and greenhouse gas (GHG) emissions. As a result GHG emissions have become a major focus for mining companies, including silver miners.

GHG emissions from mining companies are driven by two factors, energy consumption and the source of that energy. Energy consumption is dictated by the scale of operations alongside the type of mining and processing being undertaken. Reducing energy consumption can be achieved by adopting more energy efficient technologies and workflows. Producers are continually pursuing energy efficiency as this lowers associated costs as well as reducing GHG emissions. Meanwhile, the source of energy is something miners are increasingly targeting to reduce their GHG

emissions. Operations located in remote areas generally produce electricity using diesel generators when national grid connections are not possible. These sites are now progressively investing capital to build renewable sources of energy, such as solar plants and wind turbines, to supplement and replace fossil fuel sources. This is also being done where mines are sourcing electricity from national grids which use non-renewable sources. In 2020, silver miners sourced 16% of their energy from renewable sources which can be expected to grow moving forward. Diesel was the biggest source of energy for silver miners, accounting for 58% of consumption, largely from its use in mining equipment and on-site electricity generation.

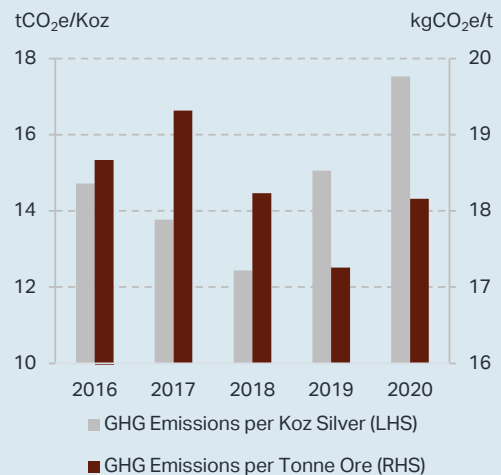
Between 2016 and 2020, the GHG intensity per unit of silver output from major producers increased by 19%. However, over the same period GHG intensity per ton of ore processed fell by 3%. This is reflective of falling silver grades driving the rise in GHG intensity of mined silver production rather than an increase in emissions. Rising investment in renewable energy sources should reduce absolute GHG emissions for silver miners moving forward. However, ore body characteristics, particularly grade, will continue to influence GHG intensity per unit of silver.

## Silver Miners' Energy Sources



2020 average from Fresnillo, Pan American Silver, Hecla, Coeur, Fortuna Silver Mines, Endeavour Silver.  
Source: Metals Focus, Company Reports

## GHG Intensity for Silver Miners



Combined average for Fresnillo, Pan American Silver, Hochschild, Coeur, Fortuna Silver Mines. CO<sub>2</sub>e = Carbon Dioxide Equivalent.  
Source: Metals Focus, Company reports

## Primary Silver Production Costs

US\$/oz (by-product*)	2020	2021	Y/Y
<b>North America</b>			
Total Cash	3.66	4.38	20%
All-In Sustaining	11.01	12.82	16%
<b>Central &amp; South America</b>			
Total Cash	9.29	6.85	-26%
All-In Sustaining	15.85	13.17	-17%
<b>CIS</b>			
Total Cash	7.64	5.71	-25%
All-In Sustaining	9.81	8.93	-9%
<b>Asia</b>			
Total Cash	-0.35	0.43	na
All-In Sustaining	6.23	6.90	11%
<b>Oceania</b>			
Total Cash	1.20	-7.64	na
All-In Sustaining	7.70	-4.32	na
<b>Global Total</b>			
<b>Total Cash</b>	<b>4.76</b>	<b>3.88</b>	<b>-18%</b>
<b>All-In Sustaining</b>	<b>11.24</b>	<b>10.88</b>	<b>-3%</b>

\* Costs shown on a by-product accounting basis.

Source: Metals Focus Silver Mine Cost Service

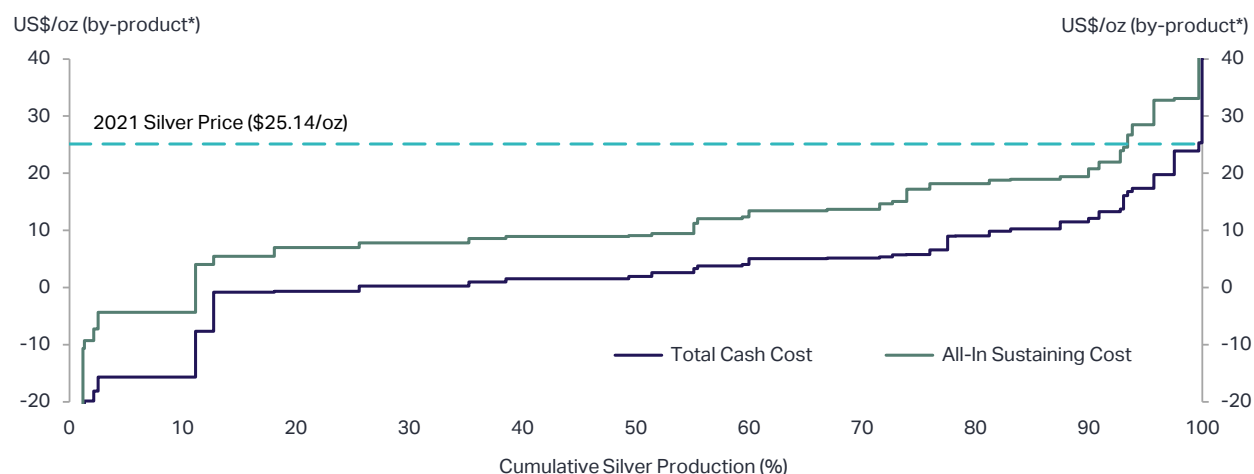
## Primary Silver Production Costs

Primary silver mining total cash costs (TCC) and all-in sustaining costs (AISC) fell for the second consecutive year due to 23% y/y growth in by-product credits. TCC dropped by 18.5% y/y to \$3.88/oz, while AISC fell by 3.2% y/y to \$10.88/oz. The following cost analysis covers roughly 75% of primary silver mine supply. These operations derive most of their revenue from silver over the life-of-mine.

Most silver mines are polymetallic in nature and produce significant amounts of lead, zinc, gold and/or other metals. Revenue generated from these metals lowers cash costs as by-product credits. In 2021, the increases in on-site cost and sustaining capital expenditure were offset by zinc, lead, and copper revenues as prices grew year-on-year by 32.4%, 20.6% and 50.7% respectively. In addition, zinc and lead revenues improved due to lower treatment charges (TCs), which is the cost charged by a smelter to recover metal from a concentrate. Benchmark zinc and lead TCs decreased by 46.1% and 30.6% y/y. As zinc and lead revenues grew, gold's share of by-product credits diminished from 54% to 39%.

Before by-product credits, on-site costs increased by 18.1% y/y due to local cost inflation in countries with primary silver operations and a stronger Mexican peso against the US dollar. Inflationary pressures to mine site costs were associated with the continuing disruptions in global supply chains, which increased the price of consumables such as reagents, explosives and tires, alongside a tight employment market leading to a higher cost of labor. In addition, the increase in global oil prices fed through to higher on-site diesel

## Global Primary Silver Mine Production Costs in 2021

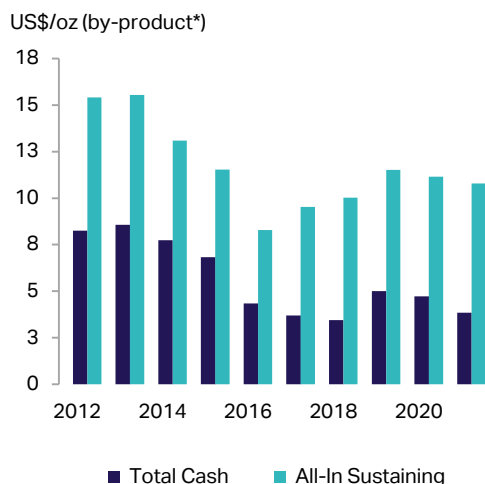


\* Cost shown on a by-product accounting basis.

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

costs. Meanwhile, sustaining capital expenditure also rose which added additional upward pressure to AISC. However, industry AISC margins reached a nine-year high of \$14.25/oz as increased by-product credits and a high silver price offset rising costs.

Looking ahead to this year, inflationary pressures will continue to push costs upward, while rising oil and gas prices, resulting from the Russia-Ukraine conflict, will push diesel and energy prices up. These inflationary cost pressures will be mitigated by rising by-product credits, as gold, lead, zinc and copper prices have increased year-to-date. A stronger US dollar against local producer currencies will also help alleviate inflationary cost pressure. Meanwhile, high margins will encourage greater discretionary sustaining capital expenditure which will add to AISC. Should the current strength in by-product metal prices remain throughout the year then costs for primary silver mines can be expected to fall again this year. However, a weakening of these prices over the remainder of the year would likely lead to rising costs.

## Regional Performances

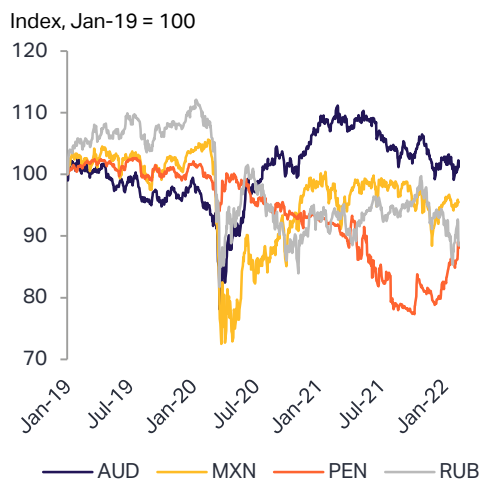
Average TCC and AISC of primary silver mines operating in North America increased to \$4.38/oz (+19.5%) and \$12.82/oz (+16.4%) respectively. This was primarily driven by higher cost inflation in Mexico and a stronger Mexican peso against the US dollar, which made local costs more expensive in US dollar terms. By-product credits in the region increased from the rise in lead and zinc revenues but were not enough to offset cost inflation.

In Mexico, TCC averaged \$4.22/oz (+43.9%) and AISC averaged \$12.51/oz (+23.7%) as annual inflation reached its highest level since 2000 and the Mexican peso strengthened by 5.6% y/y to the US dollar. In addition, several operations increased sustaining capital and near-mine exploration expenditure. This contributed to higher AISC at Palmarejo (\$12.07/oz, +127%), La Colorada (\$17.51/oz, +62%) and Guanacevi (\$19.46/oz, +14%). Meanwhile, the labor reforms that came into effect in September, which limit the use of subcontractors, contributed to the increase in Fresnillo's on-site costs.

In the US, costs at Hecla's Greens Creek mine fell. TCC dropped from \$4.88/oz in 2020 to -\$0.65/oz and AISC declined to \$3.19/oz (-60.0%). This was driven by higher lead and zinc prices and lower treatment costs, which increased by-product revenues. Lucky Friday, also owned by Hecla, followed the same trend reporting a drop in TCC to \$6.60/oz (-29.3%) and AISC to \$14.34/oz (-21.3%). In Canada, Alexco's Keno Hill started commissioning in December 2020 and continued its ramp-up towards full capacity in 2021. Its life-of-mine average AISC is expected to be \$11.59/oz.

In Central & South America, average TCC and AISC dropped to \$6.85/oz (-26.3%) and \$13.17/oz (-16.9%) respectively. This was largely the result of a 50.3% climb in by-product credits as metal prices and by-product production

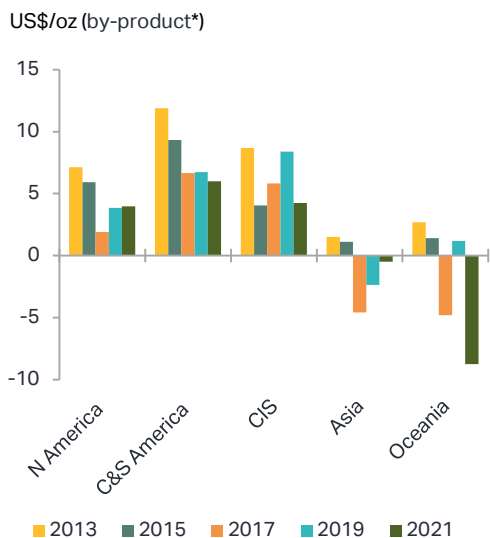
## Exchange Rates to US dollar



AUD - Australian dollar, MXN - Mexican peso, PEN - Peruvian sol, RUB - Russian ruble

Source: Bloomberg, Metals Focus

## Regional Total Cash Costs



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

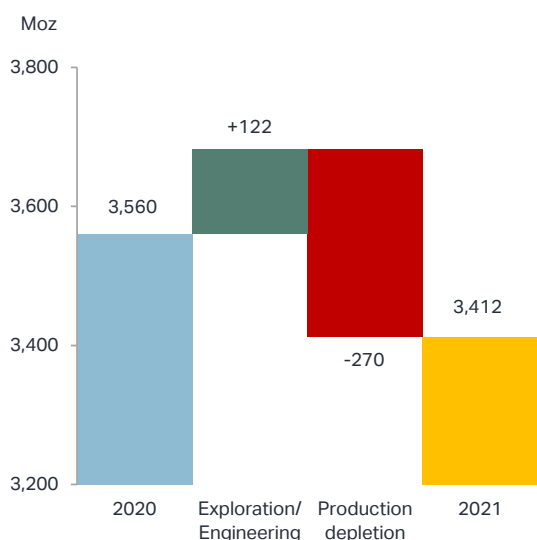
increased. The weakening of the Peruvian sol and Argentine peso against the US dollar also contributed to the downward trend in the region’s costs.

In Peru, costs at Pan American Silver’s Morococha fell, with TCC and AISC dropping to \$9.63/oz (-15.5%) and \$13.49/oz (-26.6%) respectively. This was the result of lower sustaining capital expenditure and higher by-product revenues from increased by-product prices, lower treatment charges and higher by-product production. In Argentina, SSR Mining reported a 33.2% drop in AISC to \$12.40/oz at its Puna operations. This was due to significantly reduced disruption from COVID-19 and a weaker Argentine peso to the US dollar. These factors offset local annual inflation of 50.9%.

In the CIS, Polymetal’s Dukat achieved lower TCC and AISC, which fell to \$5.71/oz (-25.3%) and \$8.93/oz (-9.0%) respectively. Dukat processed larger volumes of lower grade ore and sustaining capital expenditure increased. However, this was offset by higher recovery rates, increased by-product credits and a 1.9% weakening of the Russian ruble to the US dollar.

At South32’s Cannington, in Australia, TCC fell to -\$7.64/oz from \$1.20/oz, while AISC decreased to -\$4.32/oz from \$7.70/oz. This was the result of higher lead and zinc sales alongside a weaker Australian dollar, despite an increase in price-linked royalties and local cost inflation.

## Reserve Replacement – Primary Silver



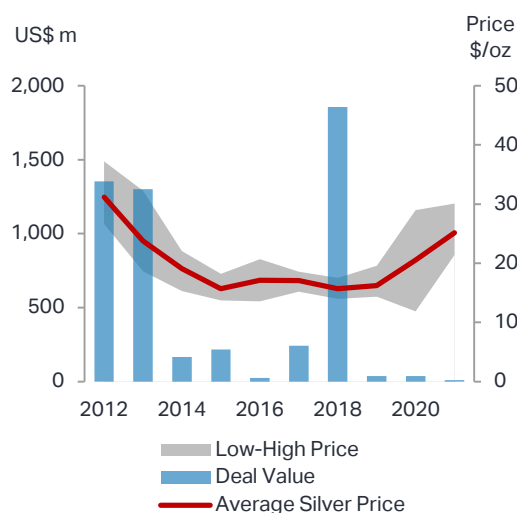
Source: Metals Focus

## Reserves & Resources

Global reserves at primary silver mines and projects totaled 3,412Moz (106,136t) in 2021. The 4.2%, or 148Moz (4,597t), year-on-year decline in reserves was driven by mining depletion alongside reserve revaluation. Total identified resources excluding reserves stood at 7,606Moz (236,584t), a modest increase of 1.0% y/y resulting from near-mine expansions and newly discovered resources.

At Fresnillo, silver reserves decreased by 38Moz (1,172t) due to depletion at Saucito (-15Moz, 456t) and San Julian DOB (-10Moz, 305t) alongside below expected infill drilling results at Fresnillo (-31Moz, 979t). Polymetal’s Prognoz ore reserves fell by 18Moz (546t) as estimates were revised based on the performance of the Nezhda processing facility. However, exploration works at the adjacent mineralized zones may add to the project’s reserves in the future. Reserves at Cerro Los Gatos were 10Moz (309t) lower in 2021 due to mining extraction. Production reconciliation highlighted overestimation errors in the existing resource model and an updated reserve and resource estimate will be published by Gatos Silver in the second half of 2022. These declines were partly offset by reserve upgrades elsewhere. Exploration work at Fresnillo’s San Julian Veins increased reserves by 19Moz (584t), conversion of resources at Hecla’s Greens Creek pushed reserves up 14Moz (430t) and a successful optimization study and drilling campaign led to an 11Moz (333t) upgrade in reserves at Endeavour Silver’s Terronera.

## Value of Completed Deals



Values aggregated in year deals are announced  
Source: Bloomberg

## Corporate Activity

In 2021 merger and acquisition activity in the primary silver sector reached its lowest point, in value terms, since 2006. Eight deals were completed during the year but these were of relatively low value, totaling \$11m. The largest deal was Equus Mining's purchase of the Cerro Bayo mine in Chile, via a stock issue valued at \$4m. GR Silver Mining closed the acquisition of the San Marcial Silver project in Mexico after fulfilling the final conditions of its option agreement with SSR Mining. This deal was valued at \$3m.

While activity in the primary silver sector was subdued, there were a few deals in which silver miners diversified their portfolios. The most notable of these was Fortuna Silver's acquisition of Roxgold through a cash and shares offer valued at \$759m. Following the completion of this deal, Fortuna Silver now has a footprint in West Africa in addition to its operations in Central and South America. Although the company's focus has shifted more towards gold, silver will remain a significant contributor to revenue.

In Canada, Dolly Varden Silver acquired Homestake Resource Corporation in a cash and stock deal valued at \$40m in order to consolidate the Homestake Ridge gold and silver project with their 100% owned Dolly Varden project. The indicated and inferred mineral resource of the consolidated property is 64Moz (1,991t) of silver and just under 1Moz (31t) of gold. Hecla, who own the Kinsuch property in the same area, maintained their 10% shareholding in Dolly Varden Silver following the deal. Denarius Silver purchased the Lomero-Poyatos polymetallic deposit in Spain in a cash and stock deal worth \$7m. A historical resource estimate for the deposit indicates an inferred mineral resource of 42Moz (1,306t) of silver. To reflect the shift in the company's focus to include other metals, the company name was subsequently changed to Denarius Metals.

## Hedge Book Composition\*

Million ounces	2020	2021	Y/Y
Forwards	5.8	7.8	34%
Options	34.2	22.9	-33%
<b>Total</b>	<b>40.0</b>	<b>30.7</b>	<b>-23%</b>

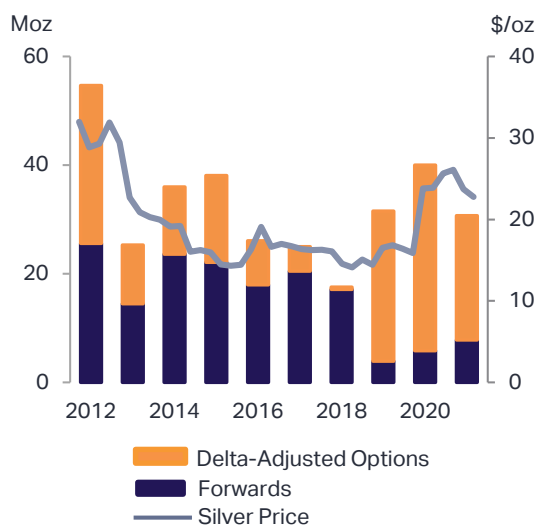
\* Delta-adjusted positions at year-end  
Source: Metals Focus

## Producer Hedging

In contrast to 2020, last year was characterized by net de-hedging. The global delta-adjusted producer hedge book contracted by 23% y/y to 30.7Moz (954t). Forward contracts increased by 34% to 7.8Moz (243t), but options fell by 33% to 22.9Moz (711t). The volume of net de-hedging would have been far greater without sizable additions by Hochschild Mining and Peñoles, coupled with a change in the options delta in Q3.21.

An addition of 3.5Moz (109t) in Q4.21 took Peñoles' year-end position to 20.6Moz (639t) of options, with average strike prices of \$21.9/oz and \$30.4/oz for the put and calls respectively. They also took on 0.7Moz (21t) of forward sale contracts with a strike price of \$23.0/oz and forward buy contracts for 0.2Moz (5t) with a strike price of \$22.8/oz. Minera Frisco held 0.1Moz (4t) of collars outstanding at year-end with average put and call strike prices at \$22.0/oz and \$37.5/oz respectively and a fair value of 2.3m Mexican pesos.

### Hedge Book Evolution\*



\* Delta adjusted position at year-end

Source: Metals Focus

Harmony’s hedge book contracted in 2021 reaching a year-end position of 1.4Moz (42t) of zero cost collars. These cover 18% of Hidden Valley’s forecast output in 2022 and 2023 and have average floor and ceiling prices of \$23.1/oz and \$25.6/oz. The hedge book made a gain of 71m South African rand in 2021. In order to protect cash flow at Pallancata, Hochschild entered into forwards contracts in Q1.21. Its outstanding position at year-end was 7.3Moz (227t) at an average strike price of \$25.0/oz covering 2022 and 2023 production.

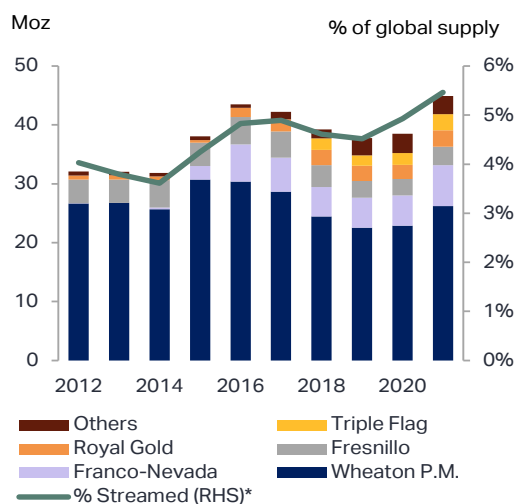
KGHM Polska Miedź restructured their hedge book in Q2.21 buying back some put and call options embedded in its seagull contracts, raising the exercise price of the sold call options for 2022 to \$55.0/oz. At year-end the company had outstanding positions for 14.4Moz (448t) with average strike prices of \$16.0/oz for the sold puts, \$26.3/oz for the bought puts and \$48.5/oz for the sold calls.

### Silver Streaming

Silver production covered by streaming and royalty contracts reached a new high of 44.9Moz (1,398t) in 2021 jumping 17% y/y and building on the modest growth of 2020. Volumes from all the major streaming and royalty companies increased as operations recovered from COVID-19 disruption, key projects ramped-up and portfolio additions outpaced reserve exhaustion.

Increased output attributable to Wheaton Precious Metals accounted for around half of global growth adding 3.3Moz (104t). This stabilized the company’s market share which has fallen to 58%, from over 80% in 2015, indicative of greater competition in the sector. Wheaton’s growth was due to higher throughput, as mines recovered from COVID-19 restrictions, and the realization of additional ounces from Cozamin and Marmato mines, which were added to the portfolio in 2020. Franco-Nevada and Triple Flag accounted for much of the remaining growth, adding 1.8Moz (57t) and 0.8Moz (24t) respectively. Again, the recovery from pandemic related disruption drove much of the rise. In addition, Franco-Nevada benefited from the ramp-up of Cobre Panama alongside full-year output from Condestable, which was added to their portfolio in 2020. Meanwhile, Triple Flag gained production from the ramp-up of Buriticá and the 2020 addition of Northparkes.

### Silver Royalty and Streaming



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

Source: Metals Focus

Most recent streaming and royalty deals have been aimed at project development. Key examples being Wheaton’s \$141m payment for a share of silver from the Blackwater Project, Royal Gold’s \$165m payment for a 1.0% royalty from exploration areas of the Red Chris mine and Franco-Nevada’s \$165m stream on a share of precious metal production from the Condestable project. That said, high commodity prices have strengthened producer balance sheets lessening the need for financing through streaming and royalties. However, rising interest rates and inflationary pressure on capital costs will mean producers continue to look to streaming and royalty deals as part of their project financing mix moving forward.

# Chapter 5

- Silver recycling grew by 7% in 2021 to 173.0Moz (5,382t), its highest since 2013.
- Key to this improvement was a much firmer level of industrial scrap supply, which in turn reflected a higher rate of recovery from spent EO catalysts.
- Global recycling is forecast to rise by over 4% in 2022 to 180.5Moz (5,616t), led once again by gains in industrial scrap supply.
- Although the growth rate will be more modest than during the past two years, 2022 will still represent a 10-year high.

## Recycling

### Introduction

Global silver recycling rose by almost 7% in 2021, to an eight-year high of 173.0Moz (5,382t). The most important driver was the jump in industrial scrap supply. This reflected a quicker pace of change-outs last year of ethylene oxide (EO) plants, some of which had been postponed in 2020 because of the pandemic (although EO scrap still grew that year). The recovery of silver from end-of-life consumer products also rose, helped by a firmer gold price, which made this activity more profitable. Finally, higher silver prices benefited jewelry and silverware recycling in 2021, but only modestly.

This year, we expect to see a 4% gain for total silver scrap supply. This will again be led by the industrial sector, with smaller contributions stemming from the recovery of silver from old jewelry and silverware.

### Industrial

Last year's jump in industrial recycling was largely due to an increase in the recovery of silver from spent ethylene oxide (EO) catalysts. This in turn reflected two themes, first of which was an increase in the number of EO plants that were changed-out as a number of these had been delayed in 2020 due to the pandemic and also because of the growing pool of EO plants globally. To put this into perspective, global EO capacity exceeded 41,000 tons last year, compared with around 26,000 tons a decade ago. The second reason for the growth in global industrial scrap supply in 2021 was the rise in electronics scrap supply. Once again, this partly reflected the lifting of COVID-related restrictions in many locations which made it easier to process end-of-life products. Higher gold prices (often a far more important determinant than the silver price) also improved the economics of this trade. Looking ahead, in 2022 these factors will contribute to further, robust growth in industrial recycling, albeit with a single-digit percentage rise against the double-digit gain realized last year.

### Jewelry

Jewelry recycling in 2021 rose by a slight 3% and so much more slowly than 2020's 34% leap. However, last year's level of 34.4Moz (1,069t) was still a nine-year high. Almost all regions saw gains in 2021, with the 22% rise in the silver price being important in emerging markets. A greater driver in western countries was the easing of COVID restrictions which rebooted the recycling chain (the West was the only area to see losses in 2020 due chiefly to difficulties in selling back old pieces, and low distress selling). The main exception to gains in 2021 was South Asia, whose jewelry recycling fell steeply (if we exclude that region, the rest of the world saw an 11% y/y jump). These losses were mainly due to India, where distress selling fell thanks to lockdowns being less severe and through governmental financial support.

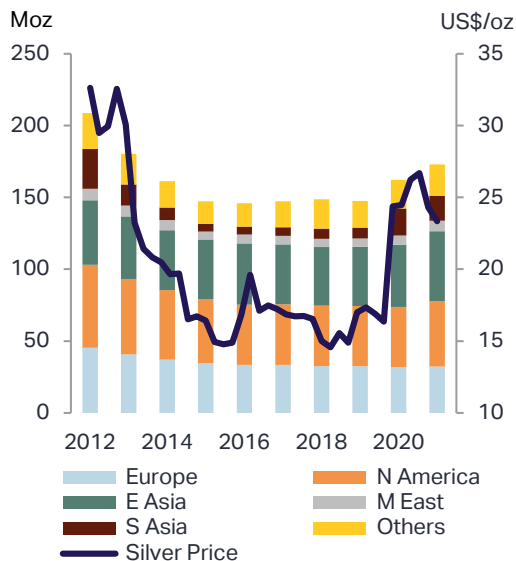
### Global Recycling Forecast, by Region

Million ounces	2021	2022F	Y/Y
Europe	32.4	32.3	-0.3%
North America	45.3	46.7	3%
Middle East	7.3	6.8	-7%
South Asia	17.3	18.0	4%
East Asia	48.9	52.6	7%
CIS	12.5	13.7	10%
Other	9.4	10.5	12%
<b>Global Total</b>	<b>173.0</b>	<b>180.5</b>	<b>4%</b>

Source: Metals Focus



## Global Recycling



Source: Metals Focus, Bloomberg

Normalization in India plus distress selling in Russia lead us to forecast a global 3% rise in 2022 as these gains counter losses elsewhere as a result of lower prices and, mainly in the Middle East, a reluctance to sell hard assets.

### Silverware

In a manner similar to jewelry, the recycling of old silverware rose modestly last year (up 2% in comparison to 2020's +18%), while the level attained, 24.3Moz (755t), was a seven-year high. One of the reasons that the increase was modest was a sluggish response in the West (which accounted for half the global total). Here, industry sources were unanimous in finding this scrap source weak, with prices deemed insufficient to motivate selling by consumers who had mostly emerged from COVID in good financial shape. As with jewelry, scrap actually fell in India due to less severe COVID restrictions last year compared to 2020 and to financial support from the government. Even with prices expected to be notably lower in the second half, volumes in 2022 are forecast to rise by 6%, in part as the recycling chain faces fewer impediments and also through a jump in Russian distress selling.

### Photography

The only sector to see a fall last year was photography with its 5% decline to 20Moz (621t). This was led by further losses due to the historic shift from silver halide to digital technologies. In fact, far from slowing as this long-run process continues, most contacts saw losses accelerate. This was due to flows from the dominant source, old x-rays, now reflecting the period over a decade ago when medical facilities were rapidly shifting to digital. This structural decline easily offset the benefits from higher silver prices and a freeing up of the recycling chain as many COVID-related restrictions were lifted. There were also further losses in the minor areas of consumer film and motion pictures, while the contribution from non-destructive testing was stable. Steady volumes for the latter should continue looking ahead but, due to ongoing losses for x-rays, we still forecast, a further fall, of 6%, for total photographic scrap this year. That would cut photography's share of all recycling to just 10% compared to 21% back in 2010.

## Recycling, by Source

Million ounces	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022F	Year on Year	
											2021	2022F
Industrial	79.9	74.0	71.3	72.3	75.0	78.5	77.5	80.8	90.9	97.1	13%	7%
Photographic	33.9	31.0	28.6	26.4	24.5	23.1	21.6	21.0	20.0	18.9	-5%	-6%
Jewelry	31.4	26.5	22.6	23.5	23.9	24.1	24.9	33.2	34.4	35.5	3%	3%
Silverware	29.4	25.1	21.3	20.4	20.2	19.6	20.2	23.8	24.3	25.6	2%	6%
Coin	5.8	4.8	3.5	3.3	3.6	3.3	3.4	3.4	3.5	3.4	4%	-3%
<b>Global Total</b>	<b>180.3</b>	<b>161.3</b>	<b>147.3</b>	<b>145.9</b>	<b>147.2</b>	<b>148.6</b>	<b>147.7</b>	<b>162.2</b>	<b>173.0</b>	<b>180.5</b>	<b>7%</b>	<b>4%</b>

Source: Metals Focus

## Recycling

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Germany	11.7	10.6	10.2	9.9	9.7	9.4	9.8	9.9	9.6	9.7	2%
Italy	10.1	8.1	6.6	5.8	5.5	5.2	5.0	5.1	4.8	4.8	0%
UK	6.5	6.2	5.8	5.6	5.4	5.3	5.1	5.0	4.8	4.5	-5%
France	5.7	5.0	4.3	3.8	3.4	3.2	3.1	3.1	3.1	3.3	7%
Others	11.3	10.8	10.2	9.4	9.4	10.3	9.4	9.5	9.5	10.0	5%
<b>Sub-total</b>	<b>45.3</b>	<b>40.6</b>	<b>37.2</b>	<b>34.5</b>	<b>33.4</b>	<b>33.4</b>	<b>32.5</b>	<b>32.6</b>	<b>31.7</b>	<b>32.4</b>	<b>2%</b>
<b>CIS</b>											
Russia	11.5	9.9	8.0	6.7	6.5	7.9	10.0	8.5	9.3	10.3	10%
Others	3.1	2.3	1.8	1.4	1.4	1.7	1.9	1.8	2.0	2.2	10%
<b>Sub-total</b>	<b>14.6</b>	<b>12.2</b>	<b>9.8</b>	<b>8.1</b>	<b>8.0</b>	<b>9.6</b>	<b>11.9</b>	<b>10.3</b>	<b>11.3</b>	<b>12.5</b>	<b>10%</b>
<b>North America</b>											
United States	51.2	47.0	43.6	40.6	38.0	38.2	38.2	37.9	37.9	41.0	8%
Others	6.6	5.6	4.7	4.1	4.1	4.0	4.0	4.0	4.1	4.3	3%
<b>Sub-total</b>	<b>57.8</b>	<b>52.6</b>	<b>48.3</b>	<b>44.7</b>	<b>42.1</b>	<b>42.3</b>	<b>42.2</b>	<b>41.9</b>	<b>42.0</b>	<b>45.3</b>	<b>8%</b>
<b>Middle East</b>											
Turkey	4.1	3.7	3.4	2.5	2.5	2.5	2.7	2.7	2.5	2.7	9%
Others	4.0	3.8	3.7	3.0	3.5	3.5	3.0	3.2	3.8	4.6	21%
<b>Sub-total</b>	<b>8.1</b>	<b>7.4</b>	<b>7.1</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>	<b>5.7</b>	<b>5.9</b>	<b>6.3</b>	<b>7.3</b>	<b>16%</b>
<b>South Asia</b>											
India	23.0	12.3	7.5	4.6	4.9	5.4	6.3	6.6	15.9	14.7	-8%
Others	4.6	2.3	1.3	0.7	0.7	0.8	0.9	0.9	2.9	2.6	-10%
<b>Sub-total</b>	<b>27.7</b>	<b>14.6</b>	<b>8.8</b>	<b>5.3</b>	<b>5.7</b>	<b>6.1</b>	<b>7.2</b>	<b>7.5</b>	<b>18.9</b>	<b>17.3</b>	<b>-8%</b>
<b>East Asia</b>											
China	23.2	22.3	22.3	23.2	23.0	22.6	22.7	22.9	25.1	30.4	21%
Japan	11.2	11.4	11.0	11.0	11.4	11.4	10.9	10.5	10.0	9.5	-4%
Taiwan	4.1	3.5	3.3	2.6	3.0	2.8	2.6	2.9	2.9	3.0	2%
Others	6.2	6.4	5.2	4.6	5.3	4.7	4.7	4.9	5.4	6.0	11%
<b>Sub-total</b>	<b>44.8</b>	<b>43.6</b>	<b>41.8</b>	<b>41.4</b>	<b>42.6</b>	<b>41.5</b>	<b>40.9</b>	<b>41.1</b>	<b>43.4</b>	<b>48.9</b>	<b>13%</b>
<b>Other Regions</b>											
C&S America	4.8	4.0	3.5	3.1	3.4	3.5	3.6	3.6	3.8	4.2	9%
Africa	3.3	3.0	3.0	2.8	2.8	2.9	2.8	2.9	3.0	3.6	18%
Oceania	2.4	2.3	2.1	2.0	2.0	1.9	1.9	1.9	1.7	1.6	-6%
<b>Sub-total</b>	<b>11.6</b>	<b>10.0</b>	<b>9.0</b>	<b>8.2</b>	<b>7.9</b>	<b>8.2</b>	<b>8.3</b>	<b>8.3</b>	<b>8.3</b>	<b>9.0</b>	<b>8%</b>
<b>Global Total</b>	<b>208.7</b>	<b>180.3</b>	<b>161.3</b>	<b>147.3</b>	<b>145.9</b>	<b>147.2</b>	<b>148.6</b>	<b>147.7</b>	<b>162.2</b>	<b>173.0</b>	<b>7%</b>

Source: Metals Focus

# Chapter 6

- The recovery from the pandemic and rising investment drove many key changes in silver trade flows last year.
- UK imports rose by 78% as shipments from Hong Kong surged, itself partly the result of an initial slump in exports to India.
- With no repeat of 2020's EFP crisis, US imports fell back, but remained supported by strong bar, coin and industrial demand.
- Chinese exports reached a record high last year as a local market discount to London encouraged shipments.

## Bullion Trade

### Introduction

Many of the key changes last year in the global silver bullion trade relate to the post-COVID recovery or developments in investment demand. This helps explain how India transitioned from importing just 5.9Moz (182t) over the first eight months, when the market was hit by investor liquidations, to a record high of 40.2Moz (1,250t) in October, as pandemic restrictions were lifted and investor expectations recovered. The investor-related Reddit squeeze in February also left its mark. This, along with Indian demand initially collapsing, was partly responsible for the surge in UK imports from Hong Kong, which hit a record high of 115.7Moz (3,599t). There was also a jump in investor demand in the US, which because of product shortages, saw higher small bar imports from various markets, including Switzerland and Turkey. At the same time, deliveries into Comex vaults returned to more normal levels, following 2020's exchange-for-physical (EFP) crisis. This resulted in lower imports from the likes of Canada, South Korea and the UK.

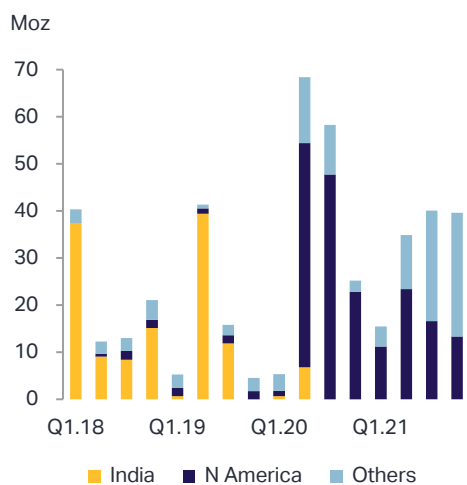
### Europe

London holds a pivotal role in the silver market, being home to the world's largest identifiable stock of silver (1,161Moz/36,125t at end-2021 according to LBMA data). UK trade data can therefore reflect key market trends. Looking first at imports, in 2021 these reached a nine-year high of 202.7Moz (6,304t). This was led by the surge in shipments from Hong Kong, which helped boost London stocks when there were growing concerns about the availability of unallocated metal, as exchange-traded product (ETP) demand surged. Elsewhere, deliveries from India rose to 15.3Moz (475t), a reversal of the usual flow from the UK to South Asia and an indication of how weak demand was there during early 2021. By contrast, robust US physical investment meant there was less need for Switzerland and Germany to deliver into London, resulting in combined imports to the UK from these two of just 1.8Moz (56t).

In contrast, UK exports fell by 17% y/y to 130.0Moz (4,043t). However, the 2020 total was a 12-year high and so last year's level was still noteworthy. The drop owed much to almost no metal being shipped to the US, in contrast to 2020's EFP crisis. Flows into Canada eased back, but were still historically high at 60.3Moz (1,874t), a reflection of the country's strong investment needs. Partially offsetting these losses was a jump in exports to India, which were concentrated in September and October when the market burst into life. The recovery in shipments to India, along with strong US demand, saw conditions in Europe tighten considerably. This saw premiums on both 999s and 9999s purity silver rise, with supplies of both at times running short.

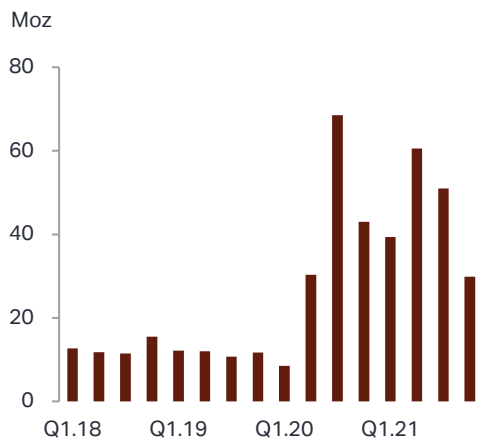
Given the war in Ukraine, it is worth looking at CIS silver bullion exports. In 2021, the region mined 65.9Moz (2,050t) of silver, led by Russia (59%),

### UK Bullion Exports\*



Source: Metals Focus, S&P Global; \*Gross weight

### North American Bullion Imports\*



Source: Metals Focus, S&P Global; \*Gross weight

Kazakhstan (23%) and Uzbekistan (10%). With the exception of Russia, regional demand is trivial and so much of this silver is exported, typically into London, given that each of the above countries have LBMA-accredited refineries (although those in Russia have now been suspended). In 2021, combined exports for these three rose 17% y/y to 67.8Moz (2,110t), which was surprising, given that mine production fell by 7%.

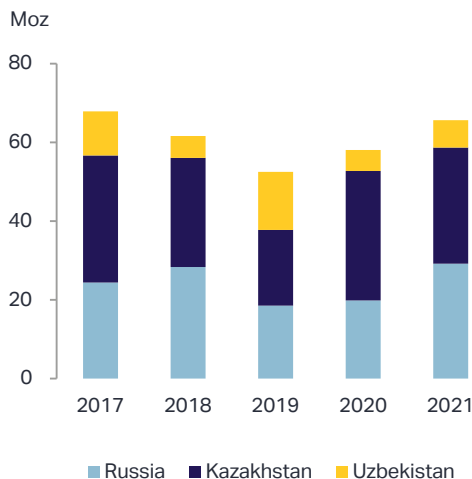
### North America

Much of the analysis of US imports has been covered elsewhere in this chapter. In essence, silver bullion imports last year fell by 9% y/y to 210.4Moz (6,543t) on a gross, rather than a fine silver, basis. The total remained healthy and followed 2020's record high (232.2Moz/7,221t), which resulted from massive inflows in response to the EFP crisis on Comex. Although inflows into Comex vaults were much less prevalent in 2021, high levels of US physical investment, which led to local product shortages and elevated premiums, attracted imports of retail investment products, notably from Switzerland, Turkey and Australia. US industrial demand also rose last year, which led to higher imports from the likes of Poland and Russia.

### Middle East

Middle East bullion exports rose by 70% in 2021 to 16.3Moz (507t), having already doubled the previous year. This was almost entirely due to a 160% rise in Turkish exports to 12.7Moz (394t), much of which were destined for the US. This reflected shortages of physical investment products there, which attracted imports from non-traditional suppliers. Middle East bullion imports also grew, driven by robust Turkish inflows of 21.3Moz (664t), up 3% y/y. As for 2022, we forecast a slight fall in both trade flows, due to expectations of lower US bar and coin demand and the potential for weaker Russian imports.

### CIS Bullion Exports: Top Three Countries\*



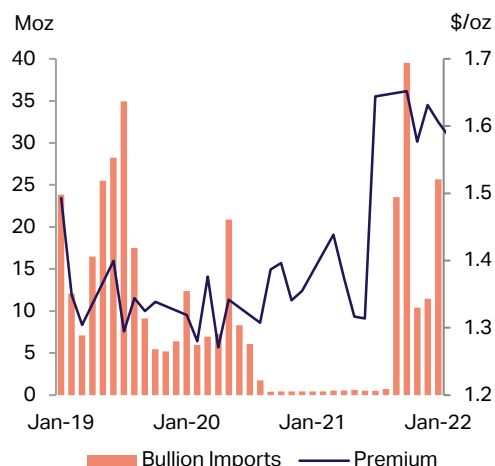
Source: Metals Focus, S&P Global; \*Gross weight

### South Asia

Following a hefty drop in 2020, Indian silver imports jumped by 25% y/y, albeit from a low base, to 89.2Moz (2,773t). Even so, imports were still nearly 50% below the 10-year average. Apart from the pandemic-driven slowdown in demand, this mainly reflects a stock overhang, with both investors and the trade having stockpiled a large volume of silver over the last decade due to positive price expectations. As a result, with the silver price rising in the last two years, some of this had been sold back and so undermined imports.

However, the inventory overhang had fallen sharply by the second half as demand picked up. Interestingly, there was no silver available during this period in the free trade and warehousing zones (FTWZs). This, combined with logistical issues with sea freight, pushed local silver premiums notably higher. To put this into context, at the end of 2020, we estimated that some 42-51Moz (1,300-1,600t) of stock was held in the FTWZs, commodity exchanges and vaults across the country, a large part of which was then shipped out of the FTWZs in early 2021 as demand remained exceptionally weak.

## Indian Silver Bullion Imports\*



Source: Metals Focus, S&P Global; \*Gross weight

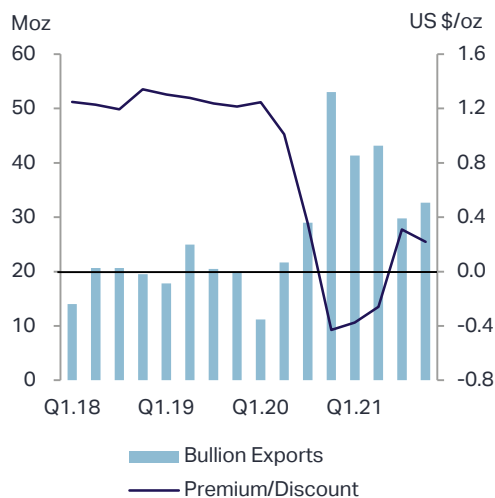
In the second half as demand recovered, high local premiums encouraged the use of air freight. Only around 45% was delivered into the Sri City and Kandla FTWZs in 2021, compared to 93% in 2020, as more deliveries via air (around 50% of the total) meant silver often landed at airports outside the FTWZs, rather than in these zones where it typically arrives by sea.

## East Asia

China has traditionally been a net exporter of silver due to the structural oversupply of silver in the local market. In part, this is fueled by the large volumes of refined silver produced both from the processing of imported base metal concentrates and from domestic mines, whose silver output ranks second globally. Last year, silver bullion exports saw further year-on-year growth, mainly driven by rallying base metal prices and the local silver price's discount to loco-London.

Bullion exports from mainland China rose by 28% y/y in 2021 to 146.9Moz (4,570t), a reporting high. Outflows were concentrated in the first seven months and later in November, when Shanghai Gold Exchange (SGE) silver prices traded at a notable discount to loco-London. Traditionally, domestic silver prices trade at a premium, as they include 13% VAT. Such a shift was also seen in August 2020, back then driven by the growth in Chinese silver stocks and an abundance of local refined silver supply. Returning to 2021, the sizable price discount encouraged the release of previously stockpiled inventory in the Chinese market. In addition, strong loco-London investment demand and a rebound in Indian imports later in the year encouraged shipments from China. This was reflected in inventory declines for the two key Chinese exchanges: combined stocks held by the SGE and Shanghai Futures Exchange (SHFE) fell by 34% y/y, or 75.5Moz (2,348t), by end-2021.

## Chinese Bullion Exports\*



Source: Metals Focus, S&P Global; \*Gross weight

Mainland China's silver bullion imports (adjusted to exclude certain reported flows we believe are redundant) rose by 24% y/y to 7.6Moz (237t). The percentage growth was exaggerated by the relatively low base in 2020. In tonnage terms, bullion imports last year returned to pre-pandemic levels, partly reflecting the post-virus recovery in the industrial sector.

Hong Kong bullion imports and exports recorded significant gains, up by 98% y/y to 109.8Moz (3,415t) and 92% y/y to 259.6Moz (8,074t), respectively. Mainland China remained the largest bullion supplier to the Hong Kong market, with imports from there jumping by 165% to 92.2Moz (2,867t), fueled by the discount in the Chinese market. This created arbitrage opportunities among bullion banks and traders. As mentioned above, the UK became the largest export destination for Hong Kong, up by 186% at 121.1Moz (3,768t), as major bullion banks sent good delivery bars to London when demand from India was lackluster in the first half of the year. However, shipments to the UK declined in the last quarter, when Indian demand resumed, resulting in overall annual exports to India increasing by 28% at 41.4Moz (1,289t).



# Chapter 7

- Industrial silver demand last year increased by 9% to 508.2Moz (15,807t), a record high for our series back to 2010.
- The broad economic recovery from COVID explained much of the rise, although other factors such as limited pressure from thrifting and structural gains for green economy uses also helped.
- Offtake in 2022 is forecast to rise by 6% to a fresh high, driven by both ongoing GDP growth and silver-specific structural gains.

## Industrial & Photography

### Industrial Demand

#### Introduction

Industrial silver demand rose by 9.3% to 508.2Moz (15,807t) in 2021. This represents a high for our series back to 2010 and reflects the combined effects of a re-opening of both industrial operations and businesses as economies began to recover from COVID. Limited pressure from substitution and thrifting, inventory rebuild by end-users and structural gains for silver's green economy applications also helped. The latter (which includes photovoltaic, PV, offtake) helped to drive the 9% rise for electronics & electrical demand, a sector that was further boosted by the demands of the stay-at-home economy. Silver demand for ethylene oxide (EO) catalysts also enjoyed solid gains, fueled by capacity expansion and previously postponed change-outs. All this helps explain why industrial fabrication growth was faster than the 5.5% rise in global GDP. Strength was apparent for all the major fabricating countries; those that missed out on double-digit gains (such as Japan) often only did so as demand had been resilient in 2020.

We forecast a 6% rise this year for industrial demand to a new high. On top of global GDP growth, end-use in the green economy will benefit from rising vehicle electrification and geopolitical conflict also boosts investment in renewables. The Ukraine crisis, however, has hurt the recovery in vehicle output and introduced uncertainty, as has the recent rise in Chinese COVID infections. Last year's boost from inventory build will also be missing.

#### Europe

Industrial demand in Europe in 2021 rose by a solid 12% y/y to 79.5Moz (2,472t), or 1% higher than in 2019. Key here was electronics & electrical offtake, which grew 12% y/y, partly through robust end-use in the residential sector due to the rise in home working. The commercial buildings sector also performed better than expected, with both segments lifting silver end-use in HVAC (heating, ventilation and air-conditioning). Also strong were industrial switchgear and end-use in green energy solutions. Offtake further benefited from the virtual absence of substitution and very limited thrifting; OEMs were seen as far too busy managing logistical challenges to worry about minimizing silver use, especially when prices were not viewed as excessive. Merely securing enough 9999s silver was often a far greater priority for management. Lastly, demand was boosted by notable inventory build throughout the supply chain after buffer stocks had been depleted in 2020.

Growth would have been stronger last year without lingering damage from COVID (especially in early 2021). However, logistics were not entirely negative as some fabricators saw less competition from Asian suppliers who faced

### Global Industrial Demand Forecast

Million ounces	2021	2022F	Y/Y
Europe	79.5	82.0	3%
North America	125.2	130.3	4%
South Asia	34.2	42.8	25%
East Asia	253.8	269.1	6%
Others	15.5	15.4	-1%
<b>Global Total</b>	<b>508.2</b>	<b>539.6</b>	<b>6%</b>

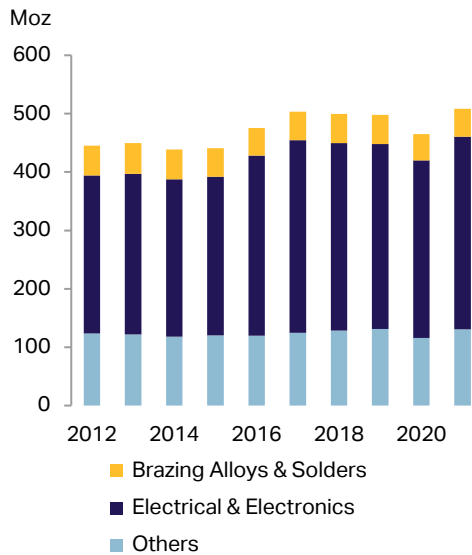
Source: Metals Focus

## Industrial Demand

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Germany	24.4	24.4	24.8	24.0	24.2	25.0	25.9	25.4	23.2	25.8	11%
United Kingdom	13.8	13.9	16.1	14.8	15.8	19.1	20.2	22.3	20.3	22.4	10%
France	9.5	9.5	9.1	8.6	8.4	8.7	9.1	9.3	8.5	9.6	14%
Italy	8.4	8.3	8.5	8.5	8.4	8.7	9.1	9.2	7.8	9.2	17%
Others	11.8	12.3	12.1	11.8	11.9	12.3	12.6	12.6	11.3	12.4	10%
<b>Sub-total</b>	<b>67.9</b>	<b>68.3</b>	<b>70.6</b>	<b>67.7</b>	<b>68.7</b>	<b>73.8</b>	<b>76.8</b>	<b>78.7</b>	<b>71.1</b>	<b>79.5</b>	<b>12%</b>
<b>North America</b>											
United States	113.7	102.0	88.3	90.8	108.8	111.8	115.0	109.6	109.3	119.7	10%
Others	5.7	5.8	4.6	5.7	6.0	5.6	5.7	5.9	5.0	5.4	9%
<b>Sub-total</b>	<b>119.3</b>	<b>107.7</b>	<b>92.8</b>	<b>96.5</b>	<b>114.8</b>	<b>117.5</b>	<b>120.7</b>	<b>115.5</b>	<b>114.2</b>	<b>125.2</b>	<b>10%</b>
<b>South Asia</b>											
India	44.0	40.3	37.9	35.7	35.9	37.3	40.2	37.8	26.7	34.2	28%
<b>Sub-total</b>	<b>44.0</b>	<b>40.3</b>	<b>37.9</b>	<b>35.7</b>	<b>35.9</b>	<b>37.3</b>	<b>40.2</b>	<b>37.8</b>	<b>26.7</b>	<b>34.2</b>	<b>28%</b>
<b>East Asia</b>											
China	85.6	92.3	97.3	100.2	102.1	117.4	121.3	121.3	111.4	120.6	8%
Japan	73.4	86.7	87.0	90.5	104.6	108.7	93.6	99.1	99.9	103.6	4%
South Korea	21.9	22.2	20.2	19.0	18.0	19.1	19.1	18.4	17.4	18.7	8%
Taiwan	11.1	10.5	10.5	10.2	10.0	9.4	9.7	8.8	9.0	9.6	7%
Others	0.8	0.7	1.0	1.2	1.3	1.2	1.2	1.3	1.1	1.2	9%
<b>Sub-total</b>	<b>192.9</b>	<b>212.4</b>	<b>216.1</b>	<b>221.0</b>	<b>236.0</b>	<b>255.7</b>	<b>245.0</b>	<b>248.9</b>	<b>238.9</b>	<b>253.8</b>	<b>6%</b>
<b>Other Regions</b>											
C&S America	6.6	6.7	7.0	6.9	7.2	6.5	3.9	4.3	3.1	3.4	12%
Middle East	5.6	6.0	6.9	6.4	5.8	6.0	6.0	5.7	4.9	5.2	7%
Oceania	4.6	4.4	4.4	4.3	4.4	4.2	4.4	4.5	3.6	4.2	18%
CIS	3.0	2.4	1.9	1.5	1.6	1.6	1.7	1.8	1.5	1.8	15%
Africa	1.2	1.4	1.3	1.0	0.9	0.9	1.0	1.0	0.9	0.9	2%
<b>Sub-total</b>	<b>21.0</b>	<b>20.8</b>	<b>21.5</b>	<b>20.1</b>	<b>19.9</b>	<b>19.3</b>	<b>16.9</b>	<b>17.2</b>	<b>13.9</b>	<b>15.5</b>	<b>11%</b>
<b>Global Total</b>	<b>445.2</b>	<b>449.6</b>	<b>438.9</b>	<b>441.1</b>	<b>475.3</b>	<b>503.6</b>	<b>499.6</b>	<b>498.1</b>	<b>464.9</b>	<b>508.2</b>	<b>9%</b>

Source: Metals Focus

## Global Industrial Demand



Source: Metals Focus

yet greater shipping challenges. Also of significance were the disappointing results for the automotive sector. With its output down 4% y/y (mainly due to the chip shortage), silver end-use here struggled, even with the benefits of rising vehicle sophistication and electrification.

We currently forecast demand growth of 3% this year as the post-COVID recovery continues and vehicle output rises, even if the Ukraine conflict introduces great uncertainty. Some fabricators are still making good on backlogs from last year's sales rebound, but any rebuild of stocks this year will be a fraction of 2021's, which helps explain this year's lower growth rate.

### North America

Industrial fabrication in North America in 2021 surged by 10% to a 10-year high of 125.2Moz (3,893t). While there was some inventory build early in the year as the various tiers of silver end-users made good any logistical shortfalls from 2020, growth in 2021 was far from just a post-COVID bounce; demand in 2020 had only fallen by 1% and last year was up a solid 8% on 2019. Much of this growth came from the PV and EO sectors, but offtake excluding those two was still up a noteworthy 6% y/y.

Last year's gains in PV reflected a jump in global installations. The upside had actually first emerged during mid-2020, following a weak start to that year, and this positive momentum carried over into 2021. Importantly, the gains enjoyed by US powder manufacturers continued for much of last year, resulting in an estimated 10% lift for the full year. The EO sector also enjoyed a good performance in 2021. This was due to a combination of new EO capacity coming online (up some 12% y/y) and also a higher rate of EO plants' catalysts being recycled, some of which had been postponed from 2020.

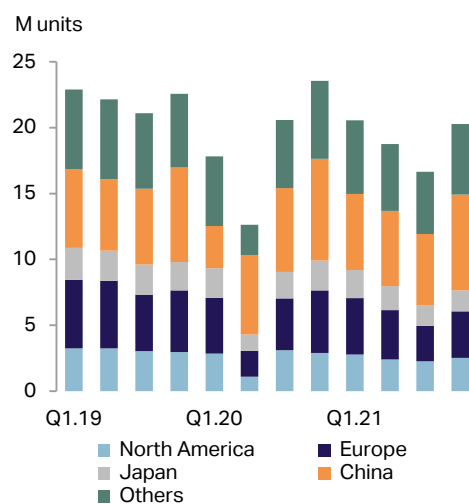
Outside of PV, other areas of electronics & electrical demand saw strong end-use emerge as a result of the rise in home working. This boosted

## Electrical & Electronics Demand

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
China/Hong Kong	56.9	61.2	65.2	67.2	70.3	85.2	88.7	88.1	80.8	90.0	11%
Japan	59.8	72.2	73.6	75.8	91.0	94.6	79.3	84.7	86.9	89.0	2%
United States	65.6	56.0	44.2	46.9	65.0	66.9	68.7	62.4	63.4	67.6	7%
Germany	17.7	17.7	18.2	17.3	17.7	18.3	19.0	18.5	16.6	18.6	12%
India	16.1	14.9	14.3	13.6	13.8	14.3	15.3	13.6	11.7	14.9	27%
South Korea	8.4	8.7	9.3	8.5	8.3	8.6	8.4	7.9	7.4	7.9	8%
Others	46.5	44.7	45.1	42.9	42.9	42.3	42.0	41.5	37.2	41.8	12%
<b>Global Total</b>	<b>270.9</b>	<b>275.4</b>	<b>269.8</b>	<b>272.3</b>	<b>308.9</b>	<b>330.1</b>	<b>321.4</b>	<b>316.6</b>	<b>304.1</b>	<b>330.0</b>	<b>9%</b>

Source: Metals Focus

## Global Light Duty Vehicle Quarterly Production



Source: LMC Automotive

demand linked with residential remodeling and from household appliances, and was mostly reflected in rising sales of silver-bearing contact material. The installation of 5G infrastructure (alongside any bonus from sales of 5G-enabled devices) also boosted this category. Last year also saw rising end-use in the defense and aerospace sectors. As in Europe, offtake saw further benefits from limited thrifting as meeting the order book was a greater priority and with contacts saying that interest in trimming silver use might not emerge unless prices hit \$27 or even \$28/oz. In contrast to Europe, vehicle production in North America was flat y/y in 2021 and, within that, battery electric vehicle (BEV) output rose by 34% to over 0.5m units. On top of the positives from these new vehicles, silver end-use has started to benefit from technological change; new generation powders are allowing for the printing of silver-bearing inks, displacing copper wiring in some places.

Support from the automotive sector and the benefits of greater home working also applied to the brazing alloys segment, where offtake rose by 10% in 2021. Limited substitution and thrifting supported demand too (the structural shift to aluminum in HVAC appears to have run its course), while rising sales to the extractive industries also helped.

For 2022, we forecast further growth, with a 4% lift to over 130Moz (4,000t). The factors behind this increase are similar to last year's, although there should be a greater emphasis on the automotive sector (total output is forecast to rise by 18% and BEVs by over 50%). Politics is seen as posing little threat here, with contacts not unduly concerned about the Ukraine crisis, nor seeing the passage of the US Administration's infrastructure bill as a prerequisite for demand growth this year.

### South Asia

Industrial offtake in **India** rebounded by 28% last year to 34.2Moz (1,065t) from 2020's low base as economic activity improved. That said, demand was still 9% lower than in 2019 and still nearly 30% below 2011's record high.

## Brazing Alloys & Solder Demand

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
China	21.8	24.0	25.0	25.5	24.1	24.5	24.8	25.1	22.5	22.1	-2%
United States	6.4	6.1	6.0	5.7	5.9	6.2	6.4	6.5	6.0	6.5	9%
India	2.6	2.4	2.3	2.1	2.2	2.2	2.3	2.2	1.7	2.7	57%
South Korea	3.2	3.0	2.7	2.6	2.3	2.4	2.4	2.3	2.1	2.2	6%
Japan	2.0	2.0	1.9	1.8	1.8	2.0	2.1	2.1	1.9	2.1	12%
Germany	2.6	2.5	2.4	2.3	2.2	2.2	2.2	2.1	1.8	2.1	14%
Italy	1.8	1.8	1.7	1.6	1.6	1.7	1.8	1.8	1.5	1.8	18%
Others	10.7	10.7	9.1	7.3	7.0	7.6	7.9	8.3	7.3	8.1	11%
<b>Global Total</b>	<b>51.1</b>	<b>52.4</b>	<b>51.0</b>	<b>48.8</b>	<b>46.9</b>	<b>48.7</b>	<b>49.8</b>	<b>50.3</b>	<b>44.9</b>	<b>47.7</b>	<b>6%</b>

Source: Metals Focus

# Logistical Bottlenecks: A Big Challenge to Silver

In 2021, global silver industrial offtake rose 9% to a new record high in our data series. As positive as that appears, results could have been yet more impressive were it not for severe supply chain disruptions which created major headwinds to the global economic recovery as COVID fades. Key to this supply chain crisis is massive disruption to logistics.

Since the pandemic, lockdowns and stricter border controls have led to a sharp fall in the movement of goods in international markets, leading to major delays and greater workloads. Even with the vaccine roll-out, the logistics industry is still struggling with different vaccination rates and regions being in varying phases of the pandemic. Strict quarantine rules in some areas (East Asia for instance) at times closed important ports, causing major transport delays. As in many sectors, the logistics industry is also dealing with a labor shortage and rising costs. As a result, shipping costs, especially from the main Asian ports to the US and Europe, skyrocketed last year. This is highlighted by a sharp rally in the Baltic Dry Index, an indicator of the cost of shipping dry bulk, which hit an 11-year high in 2021.

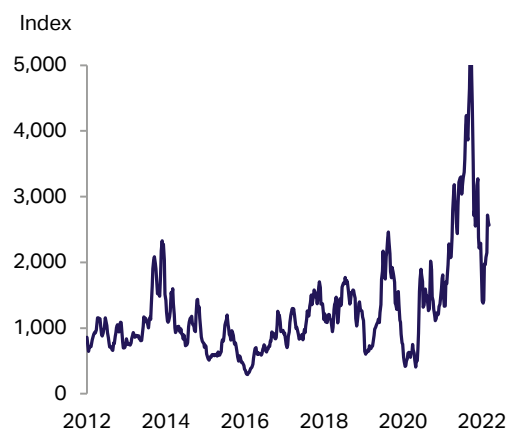
The consequences of all this are far-reaching and range from rising costs of goods and services to delayed delivery times and supply

chain bottlenecks. The lengthening of suppliers' delivery times is the most obvious manifestation of strains in supply chains. As shown on page 50, PMI suppliers' delivery times, which quantifies developments in the time needed for the delivery of inputs to firms, hit new highs in late 2021 and have since stayed high.

Turning to 2022, prior to the Ukraine crisis, there were signs of some easing in logistics constraints. Since the start of the war, however, airspace closures have added additional complexity as well as freight costs for the air cargo sector. Transport between Europe and East Asia has become particularly problematic, and the knock-on effects on global trade mean that air cargo transport elsewhere could also see new disruptions and higher costs.

Furthermore, the rapid spread of omicron in China (where recent infections hit their highest level since early 2020) has provided a timely reminder of the unpredictability of the pandemic. In this context, China's continuing zero-COVID strategy, with its tight border restrictions and tough lockdown measures, could create additional headwinds. Against this backdrop, logistical constraints and its impact on the global supply chain are likely to persist for longer this year, which in turn will restrain growth in silver's industrial use.

## Baltic Dry Index\*



\* The Baltic Dry Index is a shipping and trade index created by the London-based Baltic Exchange. It is reported as a proxy for the cost of transporting raw materials by sea.

Source: Bloomberg

The electronics & electrical sector recovered by 27% to 14.9Moz (464t) last year and, importantly, surpassed 2019 levels. Within the electrical segment, notable growth was seen in both the high voltage and low voltage (LV) switchgear markets. The former outpaced the latter due to higher demand from state utilities and Central Public Sector Undertakings (CPSUs), which related to expanding their sub-station network after a slowdown last year amid nationwide lockdowns. The easing of the pandemic also meant that LV switchgear installations benefited from rising demand from the real estate and manufacturing sectors. The market for consumer electronics and white goods also surpassed pre-pandemic levels. India is now the world's second largest cell phone manufacturer, with more than 250 manufacturing units, up from just two in 2014. Apple and Samsung alone are expected to produce \$5bn worth of cell phones this financial year (April 2021-March 2022).

Demand in the "other industrial" category grew by 25% y/y to 16.6Moz (516t), although fabrication in this sector was still 25% below pre-pandemic levels. Much of this is due to the largely informal nature of most areas of manufacturing, making them more vulnerable to economic slowdowns and high silver prices. Food industry usage, for example, remained weak due to high prices and a general cutback in purchases of silver-coated sweets due



# Silver's Exciting Potential in Green Energy

Investment in decarbonization and electrification has continued to grow in strength to the extent that the green economy has become a mainstream part of business activity. This matters for silver as it plays a critical role in many green technologies and so recent changes in the energy and automotive industries have contributed significantly to industrial silver demand, changing it structurally.

Among the renewable energy solutions, photovoltaic (PV) power still reigns supreme. The broad consensus for a need to move towards carbon neutrality for sustainable development has led to the PV market continuing to expand and to spread geographically; there were 20 countries that achieved 1GW last year. Those record high PV installations helped silver offtake in this segment to reach 113.7Moz (3,536t) in 2021, close to 11% of total demand.

It is of note that this occurred despite a large reduction in silver loadings per cell (over 80%) in the past decade through improving metalization processes and shrinking conductive lines. More recently, the cost pressure to thrift on silver use has been mitigated in the short-term by the surplus of PERC (passivated emitter and rear contacts) solar cells, the need for efficiency upgrades, the transition to TOPCon (tunnel oxide passivating contact) and the ongoing adoption of HJT (heterojunction) cells, which require 30-80% more silver than current panels. As such, it is forecast that PV silver demand will stay healthy as growing capacity additions counter the negative of the finger width being expected to drop a further 30% to 25 $\mu$ m by 2025. ("Finger width" is the width of the lines of silver paste that are printed onto the front and rear of panels to collect and then deliver the generated DC current.)

The green revolution has also deeply affected silver demand in the automotive industry since this metal is extensively used as contacts and circuitry throughout the vehicle's electrical and electronic systems. An increasing number of advanced electronic control units (ECUs) and complex devices have been introduced in the last few years to control a wide variety of features. Many relate to safety and entertainment systems, but some also concern fuel efficiency gains. All these devices utilize a multitude of contacts, wires and various electronic components and so underpin much of the growth in automotive silver demand.

Additional demand is being created by the move to electric vehicles (EVs), especially as energy management systems become ever more critical and sophisticated. Silver is largely consumed here in

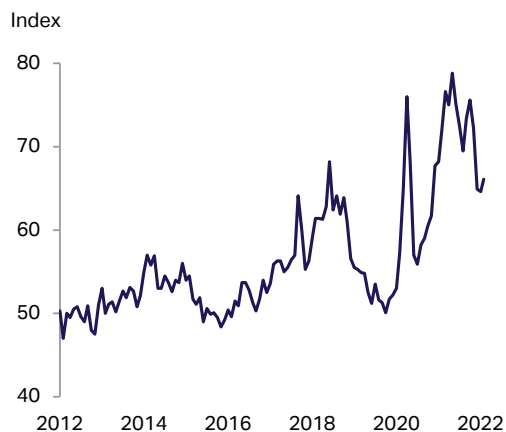
the main electrical connector material in the battery packs, in the surrounding control modules and as the most efficient and reliable material for cables in onboard charging equipment. The shift to EVs has also arguably pushed investment in autonomous driving. This includes network infrastructure and all the required devices, such as cameras, sensors, LiDAR and GPS. This has resulted in growing demand for silver-coated or silver-alloy wires as they provide excellent solutions for the high frequency transmission of big data due to its low surface impedance properties.

A further boost for silver from the growth of EVs is its spur to demand for ancillary equipment, especially in-house chargers and curb-side charging stations. EV manufacturers are keen to raise charging speeds and can do so through higher voltages and currents. However, wire resistance then becomes more important as the creation of heat will result in energy waste and efficiency losses. This problem becomes more serious with wireless charging as it generates much more heat and could damage systems. As a result, silver's low resistance properties allows for additional growth potential in EV infrastructure deployment. As a result of all the above, total silver consumption in automotive is expected to rise at a faster pace than mere vehicle production numbers.

Finally, energy storage is an indispensable segment of the green economy as a result of the need to overcome the problem of renewables' intermittent power generation and so offer a more reliable and efficient power source. While we do not envisage silver being used within batteries for energy storage, silver will still benefit from any cabling and contacts used here. In addition, surging battery demand from the automotive sector is still outstripping supply capabilities and creating challenges to secure various raw materials. This matters as it has helped boost clean hydrogen as an effective alternative to diversify energy sources. At least 26 countries have announced a hydrogen strategic roadmap and the ultimate goal of these is to supply 15-20% of the world's energy needs. Similar to batteries, there is little direct benefit for silver from hydrogen generation and fuel cells, but silver remains indispensable to all grid connections.

When hydrogen generated by renewables (so called green hydrogen) becomes competitive, the wide-scale adoption of these systems is expected to boost the installation of renewables (including PV). This will further benefit silver offtake in the green economy ecosystems in the years to come.

### PMI Supplier Delivery Time Index\*



\* Captures the extent of supply chain delays, which in turn can act as a barometer of capacity constraints.  
Source: Bloomberg

to concerns over quality. The zari industry continued to see thriving, even though a greater number of weddings and social events meant that sales of this thread rose year-on-year. Offtake from the glass industry also recovered due to rising demand from the construction and automotive sectors. Within the industrial segment, the strongest rebound was seen in brazing alloys, which jumped by 57% y/y to 2.7Moz (85t), the highest since 2011 and only just short of the record 2.9Moz (89t) recorded that year. This largely reflected increased export demand as international companies looked to reduce their heavy dependency on China and so diversify their supply chains.

Looking ahead, we expect strong growth to continue in 2022, with gains expected in most sectors as economic growth momentum improves further. Government measures, such as the Production Linked Incentive (PLI) scheme, should also boost fabrication in the electronics and PV spaces.

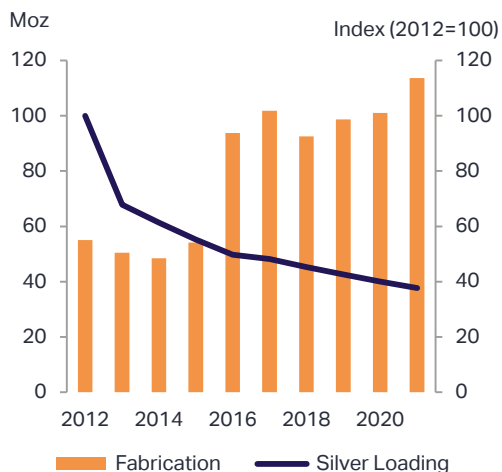
### East Asia

East Asian industrial silver demand rose by 6% to 253.8Moz (7,894t) in 2021, largely reflecting the healthy recovery of the region’s major industrial countries after the pandemic-hit 2020. The rise in stocks of key components to avoid supply chain disruptions and raw material cost inflation also helped.

**Chinese** industrial silver demand rebounded by 8% y/y to 120.6Moz (3,753t) last year. This was primarily due to growth in the PV sector (both local and abroad), consumer electronics, 5G infrastructure and overseas power grid investment. Overall, export demand outperformed expectations, due to the recovery in major economies and robust demand from emerging markets. This offset the turbulent backdrop of persistent trade frictions, supply chain challenges, pressure from slowing domestic economic growth over the course of the year and the weakness in infrastructure and real estate investment. The introduction of the “Double Carbon” target and “Dual Control” policy had led to a nationwide power crunch and forced certain industrial sectors to shut operations temporarily at the end of Q3. Fortunately, electricity supply returned to normal gradually by early Q4, and so the impact on the industry was minimized. In addition, China accelerated localization in the context of trade disputes. This helped industrial demand through market share gains by local suppliers.

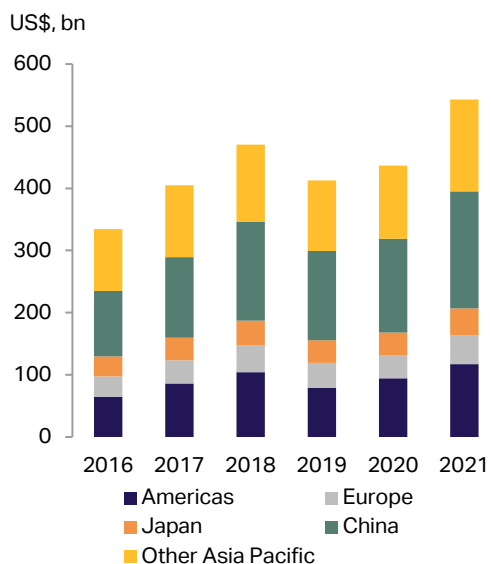
On the PV front, progress in installations in the first half was greatly behind schedule due to extreme price fluctuations of upstream raw materials. However, as 2021 was the final year of the subsidy program, a surge in installations later still pushed capacity additions to 54.9GW, a 14% rise. Also, with the rapid development of solar projects in overseas markets, China’s exports of PV modules were boosted to a record high of 88.8GW last year. With panel makers increasingly prepared to use local powder manufacturers’ products, domestic silver powder output has grown in tandem with higher solar cell output. Looking ahead, we expect demand growth for renewables

### PV Silver Demand & Cell Loadings\*



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

## Global Semiconductor Billings



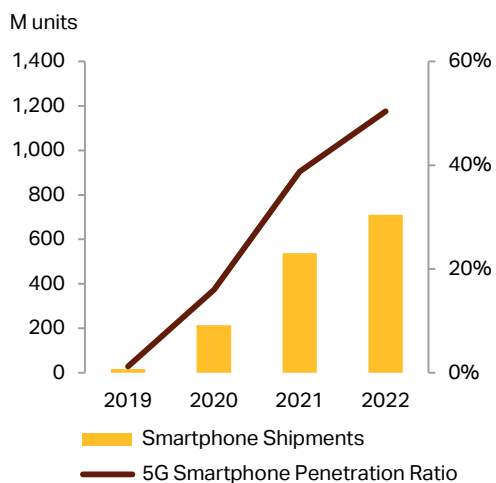
Source: Semiconductor Industry Association

will remain robust thanks to greater stabilization in the raw materials supply chain and bold targets for net-zero carbon emissions (global PV installations may exceed 200GW for the first time this year). China will greatly benefit here, as it accounts for around 80% of PV panel output, while domestic silver powder fabricators continue to expand their local market share.

Offtake for consumer electronics grew notably, helped by ongoing interest in remote working globally as the pandemic had no clear end in sight. Notebook PCs led the way with double-digit growth in shipments to the highest volume in a decade. Smartphone sales also rose for the first time in five years, although their volume failed to return to pre-COVID levels. For the electrical sector, government crackdowns on the overheated property market, and falling investment in power grid infrastructure weighed on both low-voltage and high-voltage apparatus sales in the domestic market. However, robust demand from emerging markets provided enough impetus for overall demand growth. There was also support from 5G network infrastructure as Chinese telecom suppliers continued their push for full 5G coverage by deploying more than 600,000 base stations in the country last year. Auto-related applications however recovered more slowly than expected.

Prospects for electrical and electronics remains healthy this year, as China is set to raise infrastructure investment to stimulate its economy. However, the chip shortage has spread from the automotive industry to consumer electronics. That said, its impact should be lessened by most manufacturers having lifted inventories in advance. Uncertainties remain around the economic impact of China's zero-COVID policy through its tough restrictions and the stability of raw materials supply amid geopolitical conflicts.

## 5G Smartphone Ratio



Source: IDC, Metals Focus

Brazing alloys demand fell to 22.1Moz (689t) in 2021. Offtake in HVAC applications was impacted by the turmoil in the domestic real estate market. The third consecutive annual decline in railway construction also hit demand. However, gains in the automotive and aerospace industries partially offset these losses. In 2022, this demand segment is expected to grow slightly in line with the expected rise in fixed asset investment and GDP growth.

**Japanese** industrial fabrication rose by nearly 4% last year, the smallest increase within the region. To put this underperformance into context, it is worth remembering that Japan was one of only two countries that actually enjoyed gains in industrial demand during the pandemic-hit 2020. All industrial demand segments enjoyed gains last year, underpinned by similar factors to those mentioned earlier. In spite of local powder makers' market share gains, Chinese PV demand continues to benefit Japanese silver fabrication, as does the ever growing number of electronics components used in vehicles, whether using electrified or conventional powertrains. These factors, coupled with the continued post-pandemic recovery, are expected to fuel an acceleration of demand growth in 2022.

# Silver's New and Emerging Uses

There are many new and emerging uses for silver, some of which we cover elsewhere in this Survey (for example in the green economy focus box on page 48). However, here we focus on the potential for nanoparticles (NPs).

NPs have a wide range of applications due to their size and structure. These confer a large surface area, high thermal stability and often novel physical and chemical properties, which often cannot be achieved by bulk materials. Silver nanoparticles (AgNPs) are of particular interest in the field of nanotechnology, thanks to silver's unique properties such as its high conductivity, resistance to oxidation and anti-microbial nature.

Silver's anti-microbial properties are long and well-documented. An area of huge potential demand for AgNPs is the food industry, where waste is an enormous environmental and economic problem. With regards to food safety concerns, AgNPs can play a role across much of the food chain, from packaging that improves shelf-life, thanks to anti-microbial coatings (which inhibit pathogens and microbes), to quality monitoring. Quality monitoring can be performed by gas sensors, which in essence allow electronic devices to 'smell' their environments. One such way that silver can indicate the presence or concentration of a gas is through oxidization; upon interaction with the gas that needs to be detected, silver oxidizes to alter current flow, which can be measured by an electronic device. Nanosilver is of particular value here due to its extreme sensitivity, given the particles' large surface area. The presence of organic gases, such as methane or ethanol, can be measured to indicate spoiling in food, or ethylene to indicate ripeness. This information can then determine when and food should be shipped.

Gas sensors can also be used to monitor pollutants. In agricultural settings, for example, monitoring the concentration of ammonia, produced by deteriorating food, is extremely important due to its toxicity. Other pollutants in the environment, such as formaldehyde (often found in paint), could also be monitored in both industrial and domestic settings.

In the medical sector, gas sensors could be used in breath analysis to detect diseases such as cancer and diabetes. The non-invasive nature of the analysis is highly attractive to both patients and medical practitioners, meaning that this area has huge potential. AgNPs can also be used in anti-bacterial coatings in medical dressings. They may also have an interesting

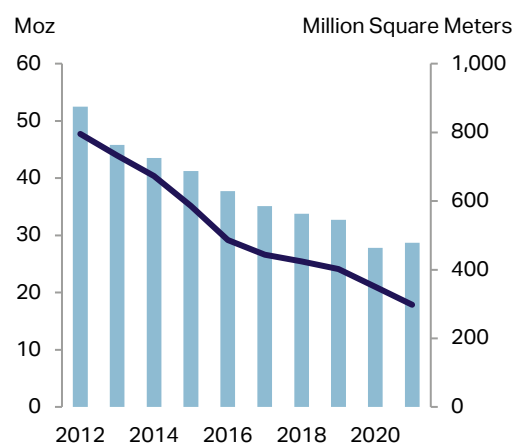
application in restorative dentistry, as they have been found to enhance bond strength of composites used in fillings, as well as offering anti-microbial benefits. Other uses for AgNPs in the medical sector take the form of wearable devices. Electronic skin patches, for example, can be used to monitor a range of conditions, such as glucose levels, cardiovascular activity and temperature. Smart e-textiles can also be used for biometric monitoring.

In electronics, smart screens, that currently use indium tin oxide (ITO) for transparent conductive films, are another area in which printed nanosilver may find new markets. While ITO offers high conductivity and optical transparency, it is also costly and fragile. Nanosilver, meanwhile, has excellent deformability, giving it the potential to become the technology of choice for next-generation electronics products such as foldable smartphones.

The automotive industry is an area of significant demand for silver in flexible electronics, both in nano and conventional forms. In terms of in-car heating, the existing approach of generating hot air is highly inefficient; printed electronics, however, mean that conductors can be applied to surfaces, such as leather, to directly heat points of contact. While heated car seats are by no means new, this method of heating is set to become increasingly standard (and more widely used within the car, such as in the steering wheel and rear seats). Although there has been a migration from pure silver lines to silver:graphite powders in the conducting lines, the loss should be somewhat offset by the increase in overall heating uses. Furthermore, increased vehicle automation will boost demand for new applications such as sensors and cameras, to both monitor and communicate with the environment and other vehicles. In-mold electronics (IME), meanwhile, integrate electronics with plastic panels to reduce weight, complexity and assembly costs, which will revolutionize the look and capabilities of dashboards.

The proliferation of EVs also means that there will be greater demand for silver in control units and battery power management systems in the form of wiring and contacts (these will likely be conventional, rather than nano-form). In the short-to-medium term, we may see a transitional period with hybrid electronic systems in place due to the high capex of implementing new manufacturing methods. Further research and development is also needed to make nanosilver technology more widespread, particularly with regard to its environmental impact (as modest as that may be). However, the potential for nanosilver in its existing end-uses means that prospects for demand growth are already robust.

## Photographic Demand & Paper Production



Source: Metals Focus, Photofinishing Newsletter

**South Korean** industrial offtake rose by 8% last year, largely due to higher shipments of semiconductors and consumer electronics components. Despite a dip in car production, the use of silver in the automotive sector also rose significantly due to greater electrification. Global manufacturers' building of stockpiles due to the chip shortage further boosted silver demand. The latter also helped **Taiwan**, whose industrial offtake grew by 7%. The country also continued to benefit from the supply chain's restructuring, particularly in semiconductors and other electronics components.

## Photographic Demand

Silver demand in photographic applications nudged upwards by 3% last year, bucking the long-term trend of decline. Rather than representing a meaningful gain, however, this indicates the depth of the COVID-related slump in 2020, with fabrication in 2021 down a full 12% on 2019. Some of the recovery in demand last year came from the medical sector, which battled to work through the backlog of delayed x-rays that had built up when hospitals were overwhelmed by COVID. Sales of instant films also recovered from the pandemic-related hiccup to almost entirely recoup their losses.

However, total demand for consumer and professional film and paper fell again last year, as travel still proved extremely difficult. The motion picture industry also posted another year of decline. Although this is now a niche part of the overall motion picture market, its adherents are staunchly committed and form a strong core of demand. Demand for non-destructive testing (NDT) x-rays saw relatively light losses last year, despite ongoing disruption from the global pandemic. The main end-users (namely those in oil and gas, automotive, aerospace and public infrastructure) are expected to maintain a core level of demand, as not only is x-ray's technical performance still valued, but its analog nature also means that it cannot be manipulated, which is of value for some where hard proof is required.

We forecast only a 1% dip for 2022, in part as the x-ray backlog continues. Further out, demand for silver halide from medical x-rays looks set to continue to fall. However, a bedrock of demand should remain in the form of smaller medical service providers, such as dental laboratories, for whom switching to digital is viewed as too expensive.

## Photographic Demand

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
Europe & N America	38.0	34.8	32.5	30.3	27.3	25.1	23.8	22.6	21.3	21.4	0%
East Asia	12.8	9.8	9.8	9.6	9.0	8.7	8.4	8.3	6.5	7.3	12%
Others	1.7	1.2	1.3	1.3	1.4	1.4	1.6	1.8	0.0	0.0	15%
<b>Global Total</b>	<b>52.5</b>	<b>45.8</b>	<b>43.6</b>	<b>41.2</b>	<b>37.8</b>	<b>35.1</b>	<b>33.8</b>	<b>32.7</b>	<b>27.8</b>	<b>28.7</b>	<b>3%</b>

Source: Metals Focus



# Chapter 8

- Global silver jewelry demand rose by a strong 21% in 2021 as economies and sentiment began to recover from COVID (although offtake was 9% down on 2019).
- India drove much of the 2021 increase with its 18.2Moz (567t) y/y recovery.
- Global demand is forecast to grow by a further 11% in 2022.
- Silverware demand rose by 32% in 2021 and is forecast to grow by 23% this year, with India largely behind these gains.

## Jewelry & Silverware

### Jewelry

#### Introduction

Global silver jewelry fabrication rebounded by 21% in 2021 to 181.4Moz (5,641t) as economies re-opened and consumer sentiment began to improve. On top of surging consumption, fabricators also benefited from the rebuilding of stocks that had fallen notably during 2020. Just over half of all gains were due to the world's largest fabricator, India, where offtake benefited from the easing of lockdowns as this led to a jump in the number of weddings and other social events. The next largest increase took place in Italy as its exports boomed, especially to the world's second largest consuming market, the US. Offtake in 2021 however remained 9% down on 2019, reflecting lingering COVID damage (for example in Indonesia) and high silver prices. A further recovery from COVID, plus a second half price retreat, lead us to forecast a 11% rise in demand this year to levels 1% up on 2019.

#### Europe

Silver jewelry **fabrication** in Europe in 2021 rebounded by 23% to 30.3Moz (943t), taking demand 1% ahead of 2019 levels and achieving an 11-year high. This recovery was largely based on a jump in exports plus restocking by regional retailers and a recovery in local consumption. Output for the branded segment was also reported to have grown notably.

The growth in exports was mainly driven by Italy, whose official shipments in fine weight terms we calculate to have risen by 42% y/y (up 15% on 2019), with re-exports excluded. This in turn was primarily due to the 80% leap in shipments to the US as that market's consumption boomed and its retailers rebuilt inventory levels in the wake of 2020's heavy de-stocking. Italy also enjoyed market share gain as logistical challenges and sometimes duty changes hampered East Asian suppliers. There was also a rise of around 20% y/y in exports to the rest of Europe, taking volumes a fraction higher than in 2019, again on the back of consumption recovering and restocking. The only key markets to see disappointing results were the export hubs of the United Arab Emirates (UAE) and Hong Kong; shipments to the UAE and Hong Kong only rose by around 10% and were well down on 2019. This reflects travel restrictions stopping regional wholesalers from visiting these hubs. The heavy monitoring of borders generally under COVID is said to have led to a greater fall in unofficial shipments, potentially boosting official export figures.

Fabrication in 2022 is forecast to hold steady as the potential for higher local consumption and the re-opening of export hubs are offset by an end to restocking and lower shipments to the US. At present, the Ukraine crisis and volatile silver prices are seen as only minor negatives.

### Global Jewelry Fabrication Forecast

Million ounces	2021	2022F	Y/Y
Europe	30.3	30.4	0%
North America	19.1	18.9	-1%
Middle East	9.7	9.2	-6%
South Asia	59.9	78.0	30%
East Asia	54.7	59.2	8%
CIS	3.9	1.9	-51%
Others	3.7	4.1	12%
<b>Global Total</b>	<b>181.4</b>	<b>201.8</b>	<b>11%</b>

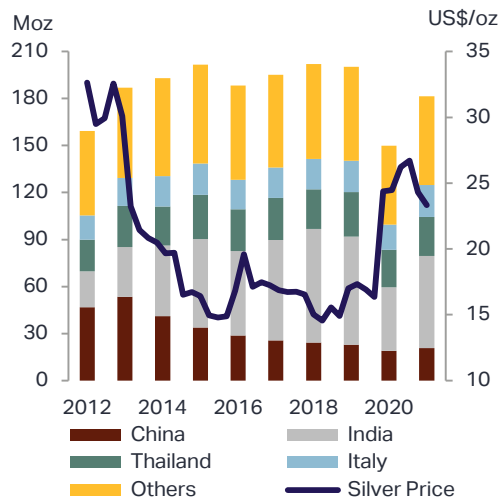
Source: Metals Focus

## Jewelry Fabrication

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Italy	15.4	17.9	19.5	20.0	18.8	19.5	19.3	19.9	16.2	20.4	26%
Germany	3.4	3.5	3.4	3.5	3.4	3.4	3.5	3.5	3.1	3.6	18%
France	2.0	2.0	1.9	2.0	2.0	1.9	1.9	1.8	1.6	1.7	8%
Others	4.2	4.6	4.7	4.7	4.6	4.7	4.6	4.7	3.8	4.5	18%
<b>Sub-total</b>	<b>24.9</b>	<b>27.9</b>	<b>29.6</b>	<b>30.2</b>	<b>28.7</b>	<b>29.5</b>	<b>29.3</b>	<b>29.9</b>	<b>24.7</b>	<b>30.3</b>	<b>23%</b>
<b>North America</b>											
United States	11.7	12.3	13.0	13.6	12.9	13.2	13.0	12.9	11.5	13.2	15%
Canada	3.5	3.7	3.9	3.5	3.6	3.4	3.2	3.2	2.7	3.7	39%
Mexico	5.0	4.5	5.4	5.7	5.8	4.9	5.0	4.5	3.1	2.2	-30%
<b>Sub-total</b>	<b>20.2</b>	<b>20.6</b>	<b>22.3</b>	<b>22.9</b>	<b>22.3</b>	<b>21.5</b>	<b>21.2</b>	<b>20.6</b>	<b>17.3</b>	<b>19.1</b>	<b>10%</b>
<b>Middle East</b>											
Turkey	4.0	4.9	6.3	6.7	4.9	4.9	5.9	6.0	4.4	6.9	56%
Others	2.4	2.5	2.6	3.1	3.0	2.8	3.4	3.0	2.3	2.8	21%
<b>Sub-total</b>	<b>6.4</b>	<b>7.4</b>	<b>8.9</b>	<b>9.8</b>	<b>7.8</b>	<b>7.7</b>	<b>9.3</b>	<b>9.0</b>	<b>6.8</b>	<b>9.7</b>	<b>44%</b>
<b>South Asia</b>											
India	22.8	31.8	45.1	56.6	53.9	64.2	72.5	69.0	40.5	58.7	45%
Others	0.9	1.0	1.1	1.2	1.2	1.4	1.5	1.5	0.9	1.1	29%
<b>Sub-total</b>	<b>23.7</b>	<b>32.8</b>	<b>46.2</b>	<b>57.8</b>	<b>55.1</b>	<b>65.5</b>	<b>74.1</b>	<b>70.5</b>	<b>41.4</b>	<b>59.9</b>	<b>45%</b>
<b>East Asia</b>											
Thailand	20.3	26.1	24.7	28.2	26.6	26.9	25.2	28.5	23.9	24.8	4%
China	46.9	53.4	41.1	33.8	28.7	25.5	24.3	22.8	18.9	20.8	10%
Indonesia	3.0	4.1	6.1	4.9	5.2	5.1	5.3	5.6	4.8	3.8	-20%
South Korea	2.7	3.3	2.9	3.1	2.7	2.7	2.5	2.5	2.0	2.3	11%
Japan	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.5	1.4	-5%
Others	1.7	1.7	1.6	1.5	1.5	1.6	1.7	1.8	1.5	1.6	7%
<b>Sub-total</b>	<b>75.7</b>	<b>89.9</b>	<b>77.8</b>	<b>72.9</b>	<b>66.2</b>	<b>63.3</b>	<b>60.5</b>	<b>62.8</b>	<b>52.7</b>	<b>54.7</b>	<b>4%</b>
<b>Other Regions</b>											
CIS	4.5	4.4	4.0	4.5	4.3	4.1	3.7	3.5	3.7	3.9	5%
C&S America	2.0	2.1	2.2	2.0	2.0	1.9	2.0	2.1	1.8	2.1	15%
Africa	1.1	1.2	1.2	1.1	1.0	1.0	1.1	1.1	0.9	1.0	10%
Oceania	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.5	0.6	15%
<b>Sub-total</b>	<b>8.2</b>	<b>8.3</b>	<b>8.1</b>	<b>8.1</b>	<b>8.1</b>	<b>7.8</b>	<b>7.5</b>	<b>7.5</b>	<b>7.0</b>	<b>7.6</b>	<b>9%</b>
<b>Global Total</b>	<b>159.2</b>	<b>186.9</b>	<b>192.9</b>	<b>201.7</b>	<b>188.4</b>	<b>195.2</b>	<b>201.9</b>	<b>200.3</b>	<b>149.8</b>	<b>181.4</b>	<b>21%</b>

Source: Metals Focus

## Global Jewelry Fabrication



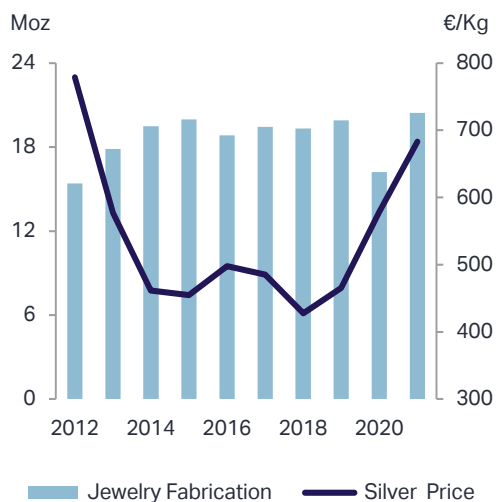
Source: Metals Focus, Bloomberg

Jewelry **consumption** also recovered in 2021, mainly as COVID restrictions eased in Europe during the year. One example of this intra-year improvement lies in the UK hallmarking statistics; Q1.21 was down 42% on Q1.19, but Q4.21 was up 40% on Q4.19. The diversion of consumer expenditure from services (in particular travel) to goods was also important. As for rivals within jewelry, there was strong ongoing competition from costume jewelry (such as plated brass), while gold jewelry typically outperformed silver. Performances varied notably between countries, with the UK and Italy doing better than France and Germany. For example, Pandora's sales in Italy were up 21%, whereas those in France were down 3% in 2021. Further growth in consumption is forecast for 2022 due to a probable full year of almost unrestricted retailing and economic growth, while sizable inbound tourism blunts the impact of a shift to expenditure on travel in many European markets.

## North America

**US** silver jewelry fabrication rose by 15% last year, surpassing pre-pandemic levels. The chief driver was a rebound for jewelry consumption but fabrication was also supported by restocking of a depleted pipeline as retailers, having been unable or unwilling to replace items sold during 2020, rebuilt inventories last year. In addition, previous concerns that the new world of omni-channel sales might mean that the overall market could operate with reduced inventories proved unfounded. Instead, the lower level of stocks that some retailers now carry is felt to have been matched by higher inventory at their suppliers. This has come about as the latter are ever more likely to ship direct to a consumer, even if the order were placed with a retailer. Some sources also feel that some retailers may have raised stocks above normal to avoid the previous pain in not having enough of the right pieces to meet orders.

## Italian Jewelry Fabrication

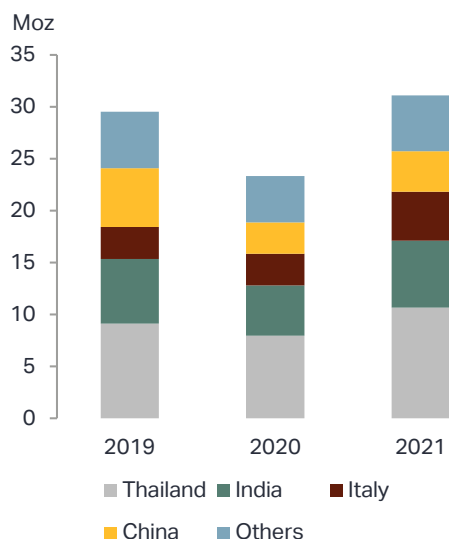


Source: Metals Focus, Bloomberg

Logistics problems did not disappear in 2021, but this often worked to the advantage of local fabricators as more marked challenges with imports (especially from East Asia) meant some US manufacturers could enjoy market share gains. Imports were still up a marked 33% y/y (+5% versus 2019), but it was Italy that saw the greatest gains of the major suppliers; compared to 2019, inflows from there were up 54%, whereas those direct from China were down 31%. The other origins in the top four, Thailand and India, saw US inflows rise respectively by 17% and 3% in comparison to 2019.

As noted above, US jewelry consumption grew strongly in 2021, up by around 15% to a three-year high. This was mainly due to the economy coming back to life as COVID damage faded and as consumers became more able and willing to visit bricks and mortar stores; online sales may have boomed and retailers may have done a great job in upgrading the e-commerce experience, but many contacts feel that the "touch experience" for jewelry matters. Silver, with its lower ticket price, can also often benefit from impulse purchases. In addition, more of the events associated with jewelry buying (such as Mothers' Day in May) occurred in much less restricted times than in 2020.

## US Jewelry Imports



Source: Metals Focus

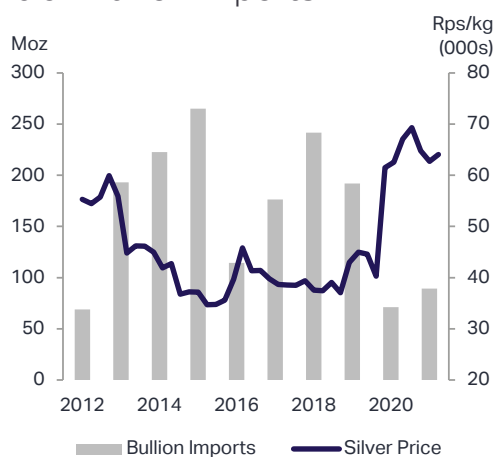
Another critical reason behind the jump in consumption was expenditure diversion from services (such as travel and restaurants) to physical goods, with jewelry a frequent winner here. However, high levels of unspent incomes and a reported desire to buy something of long lasting value for loved ones (rather than self-purchase of an item for a fashion season) meant gold and platinum are thought to have performed yet better. Their outperformance (we estimate that gold jewelry consumption in 2021 rose by 26%) was also based on a jump in the number of weddings, a change of only marginal significance for silver jewelry. The popularity of the “yellow look” was also unhelpful, although sales of gold-plated silver took some of the sting out of that fashion trend. A final factor of note was successful promotion of silver by a handful of retail brands.

There is little agreement among industry contacts over prospects for 2022. The year has begun well and some feel this buoyancy can continue as the economy continues to improve and thanks to still high savings. However, others fear damage to consumer sentiment from high inflation and the normalization of expenditure patterns over the summer as the vacation season gets underway. We still feel a slight lift in consumption is possible, although, with an end to restocking, fabrication might dip a fraction.

## Middle East

Jewelry demand in the Middle East jumped by 44% in 2021 to 9.7Moz (303t). Turkey, the largest fabricator, saw a rise of 56% which was driven by a surge in exports. By contrast, local sales improved by a far more modest 10% as the economy struggled to recover from the pandemic. For this year, we forecast a 6% decline in regional offtake as export growth slows markedly. This is mainly due to pent-up demand in key consuming countries being expected to fade as they start to normalize after the pandemic.

## Indian Bullion Imports



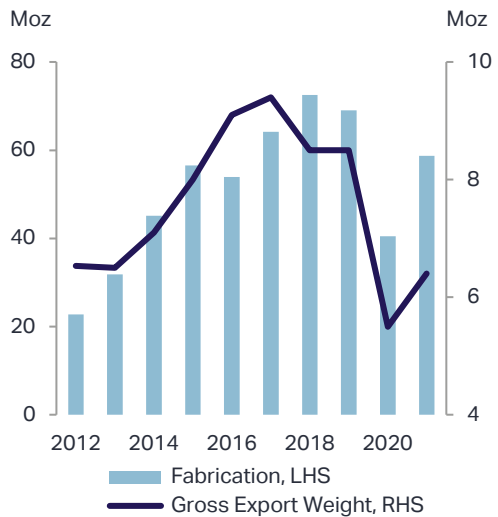
Source: Metals Focus, S&P Global, Bloomberg

## South Asia

Activity in the world’s largest silver jewelry fabricator **India** jumped by 45% y/y to 58.7Moz (1,827t) last year, the highest annual growth rate since the start of our series in 2010. As the country returned to a more normal footing, the entire precious metals jewelry market (covering silver, gold and platinum) enjoyed a strong recovery. However, this growth was concentrated in the second half as India saw a massive surge in COVID infections between March-April, with cases only starting to recede sharply from June.

Several factors contributed to the overall strong performance, a rapid economic recovery, easing of COVID restrictions and strong wedding demand. Expanding on these themes, the Indian jewelry market is dominated by traditional jewelry items like payals, toe rings and nose rings. Much of this demand comes from rural India. In that regard, unlike the first wave of COVID infections, which was concentrated in urban locations, the second round also hit rural communities and this weighed on demand in the first half.

## Indian Jewelry Fabrication



Source: Metals Focus, S&P Global

However, as the pace of vaccinations picked up and the number of cases fell, the government swiftly eased restrictions which in turn benefited economic activity across much of the country. This, along with a good monsoon, aided the rural economy which supported demand for traditional low-ticket items.

That apart, the last few years have also seen strong growth of 925 lightweight fashion jewelry and gold-plated silver jewelry. The former is mainly bought by the young demographic who prefer pairing silver jewelry with western clothing, whereas the latter is tied closely to wedding demand. As the economy has recovered, demand for both these segments has therefore improved, led by the gold-plated silver jewelry segment.

Looking at some of the other key trends in the market, our research has revealed a growing presence of silver fashion jewelry, the average weight of which is between 5g-20g; most is sold on fixed price basis. This is unlike gold jewelry which is often sold combining the current gold price and a making charge. Interestingly, a large part of silver fashion jewelry is sold online, where competition is becoming more intense. Despite the pandemic and the earlier economic slowdown, many stand-alone silver jewelry shops have opened in the last two years which is testament to the growing market and higher margins that silver jewelry attracts compared to gold. In addition, chain stores continue to expand their silver jewelry offerings by adding fashion jewelry and gold-plated silver jewelry.

For 2022, we expect demand to continue improving at a rapid if slower pace, with growth forecast at 30%, taking fabrication to a record 76.4Moz (2,375t).

## Changing Landscape of Retailing in India

From a product standpoint, the Indian silver market is extremely traditional. Historically, silver jewelry and silverware articles were sold in small stand-alone shops and there were very few large, organized retailers selling silver. Even if they did, it was limited to a small counter selling payals (leg chains) or silver utensils.

Over the last decade (particularly during 2013-19), the massive increase in demand for silverware and jewelry prompted many to look at silver retailing from a new perspective. This, along with the attraction of high retail margins compared to gold, has seen the retail landscape evolve, with many large gold players opening showrooms dedicated to silver. In addition, all major chain stores, national and regional, now showcase prominent counters with these items. In addition, they aggressively market silver products and sell only 925 products, thus lifting awareness of sterling silver.

In terms of retail channels, silver products are no longer just sold in store. There has been a notable rise in online retailers focusing on silver jewelry over the last five years and especially with the boost to online retailing from the pandemic. Many of these (such as CaratLane, Candere and GIVA) focus on the daily wear fashion segment, and most products sold on these platforms are 925 purity. The growth of online sales is almost entirely driven by the younger generation. Another group of retailers that have emerged over the last few years focus on selling gold-plated silver jewelry or imitation jewelry with silver plating.

At this stage, the changing retail landscape has only emerged in metros and large cities. However, a growing awareness of sterling silver and the aggressive marketing of new products on social media will eventually generate growth in Tier 2 and Tier 3 cities.



## Chinese Jewelry Fabrication



Source: Metals Focus, Bloomberg

Demand for silver jewelry will benefit from an improving economic backdrop and, if as forecast, silver prices ease later this year this should help demand, especially in rural areas. Further market share gains for 925 purity and silver daily wear fashion jewelry will also benefit demand in urban communities.

## East Asia

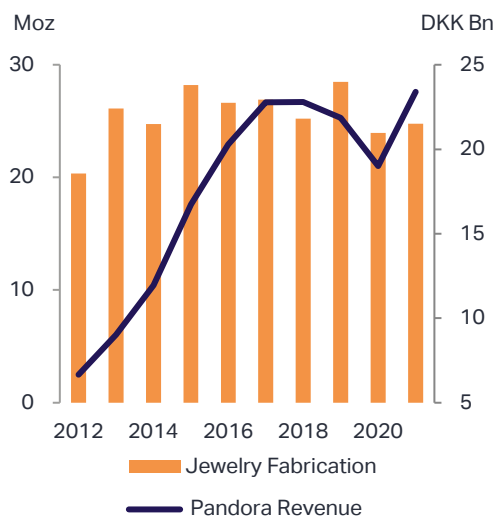
**Chinese** silver jewelry fabrication rose by 10% in 2021 to 20.8Moz (648t) as the market recovered from a pandemic-hit 2020, failing however to return to pre-virus levels. Early in the year, demand fared well, as consumer sentiment in general was improving. However, confidence was shaken and demand softened in the second half due to turmoil in various industries in China (notably property developers) and a series mini-outbreaks of COVID. One supporting factor was a slower structural transition away from plain heavier pieces to lighter and design-focused ones. This was due to slower urbanization among 3rd and 4th tier cities, caused by the aforementioned economic headwinds. In addition, manufacturers' ongoing product innovation efforts helped retailers expand the young consumer segment and online livestream sales enjoyed steady growth, lending support to demand. Lastly, silver jewelry exports enjoyed moderate gains.

Regarding product development, manufacturers focused on better integration of different materials (such as enamel and synthetic stones) within contemporary designs. Efforts to improve packaging were also seen to help lift the perceived image and ultimately added value of silver jewelry collections. Online livestream channels continued to be successful and this attracted some major local brands to participate in this new sales vehicle, ultimately further drawing consumers' attention towards silver jewelry and helping sales. Some silver jewelry wholesalers withdrew from the market though, as fierce competition put pressure on profit margins. In the medium-term, this is probably a healthy development for the overall silver jewelry market in China, as it will help ease the price competition of recent years, creating a more sustainable environment for those producers that survive.

During the 2022 Chinese New Year holidays, silver jewelry demand remained flat y/y as consumer attention was often drawn towards gold. A widespread COVID outbreak emerged across the country after the holidays and the government imposed tight controls and lockdowns in various cities and provinces. This will certainly hinder economic growth and hurt silver jewelry demand in the coming months. As such, we have kept a conservative forecast for silver jewelry demand in 2022 and expect a moderate y/y rise of 6%. This should return offtake to near 2019 pre-virus levels and will be supported by the supply chain's ongoing effort in product innovation, the expansion in the young consumer segment and rising export demand.

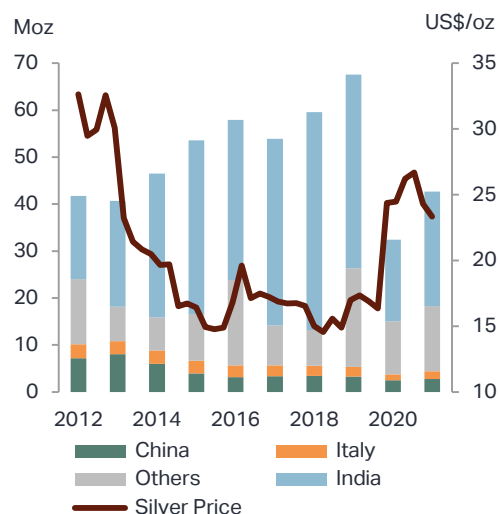
**Thai** jewelry fabrication rose by 4% in 2021 to 24.8Moz (771t) as the negative impact from COVID the year before waned, with most factories resuming

## Thai Jewelry Fabrication



Source: Metals Focus, Pandora A/S

## Global Silverware Fabrication



Source: Metals Focus, Bloomberg

normal operations and export orders picking up. This is reflected in Pandora's sales as much of their production is based in Thailand. In contrast to 2020, the Thai government allowed manufacturing units to operate normally, albeit with social distancing and health precautions. Discussions with the trade revealed strong export orders from the US and UK as buyers looked to de-risk themselves from being so dependent on China. Contacts also noted that some importers had relocated from India to Thailand as many Indian companies could not fulfill orders due to the restrictions imposed there during COVID's Delta wave. However, the domestic market continued to underperform as Thai consumers remained cautious towards discretionary purchases. This year, we expect fabrication to increase once more, primarily due to further gains in export orders. That said, the local market is still expected to underperform as consumer sentiment remains uncertain.

**Indonesian** jewelry demand fell for the second consecutive year, by 20% to 3.8Moz (119t), a nine-year low. While exports improved due to strong orders from the US and Singapore, the domestic market continued to struggle as Indonesia faced a large wave of infections, especially during May to July.

## Silverware

Global silverware offtake rose by a seemingly robust 32% y/y in 2021, but output remained 31% below levels in 2019. Much of these swings were due to India and were COVID-related, with the price trend secondary. The rebound in the rest of the world was +22% y/y, which left its offtake 12% down on 2019. Global demand is forecast to see another year of Indian-led recovery in 2022, although the 23% rise still leaves levels 15% down on 2019.

After falling to the lowest level in our series in 2020, **Indian** silverware fabrication rose by 40% to 24.4Moz (758t) last year. The jump in demand reflected three main factors: an improving economic recovery as the pandemic eased; pent-up wedding/festive demand, and the return of corporate orders as business activity normalized. It is important to note that the bulk of the recovery last year was mainly a story of the second half of the year as the first half saw a severe second wave of COVID infections.

Looking at each theme, as the number of COVID cases fell and the pace of vaccinations quickened, the government eased restrictions which precipitated a strong economic recovery. This also meant social events, especially weddings, resumed without restrictions, resulting in strong demand for wedding-related items. That said, our research revealed that impulse purchases remained subdued despite the fall in silver prices. Consumers were also still cautious about making high-value purchases, especially in the first half of 2021. Lastly, corporate buying returned, albeit at a much slower pace, as business activity slowly recovered.

## Global Silverware Fabrication Forecast

Million ounces	2021	2022F	Y/Y
Europe	3.5	3.6	5%
North America	1.6	1.7	3%
Middle East	2.8	2.7	-2%
South Asia	29.3	39.3	34%
East Asia	4.1	4.4	6%
CIS	1.0	0.5	-51%
Others	0.4	0.5	8%
<b>Global Total</b>	<b>42.7</b>	<b>52.7</b>	<b>23%</b>

Source: Metals Focus

## Examples of Indian Silverware



Photograph courtesy of Silver Emporium

Sterling silverware continued to take market share, driven by large chain stores and growing consumer awareness of the 925 purity. In addition, a new segment of 999s silverware gained some traction, particularly for home utensils. The high end silverware segment also saw strong demand due to such factors as more architects using large-scale silverware as items of furniture. This year, we forecast silverware demand to rise by 35% to over 30Moz (1,000t). Despite this, offtake is still expected to remain below pre-pandemic levels. Along with the negative impact of silver price volatility, the ongoing weakness in India's rural economy is likely to weigh on demand.

Silverware demand in **Nepal** rebounded by 45% in 2021 to 4.8Moz (148t). Much of this was driven by wedding demand, where silverware is used for gifting and during the ceremony as per tradition. We expect to see a further recovery in 2022, with growth of 30% to above pre-pandemic levels.

**Chinese** demand saw growth of 10% in 2021 to 2.7Moz (85t), mainly driven by improving consumer sentiment and the recovery from the pandemic. As with jewelry, online livestream sales also lent support. Daily use products accounted for most of the demand by weight, but gifting and limited edition items remained important financially for the industry. For 2022, we expect a 7% rise in demand through steady GDP growth and improving sentiment.

In the **Middle East**, silverware fabrication rose by 36% in 2021 to 2.8Moz (86t) due to recovering local sales (especially in Israel), plus a significant rise in Turkish exports to the US and Israel. The recovery in **European** demand may seem strong at +26% y/y in 2021 but that just reflects the depth of 2020's slump and last year was 13% down on 2019. The chief reason for this was a reluctance by retailers to restock items sold in the last two years due to ongoing structural losses. Exports were also weak, with Italian shipments for instance down over a third on 2019. **US** demand however fared better, achieving another year of stability as a result of income diversion to goods from services and the greater resilience of sales for religious purposes.

## Silverware Fabrication

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
India	17.7	22.6	30.6	37.0	34.1	39.7	46.4	41.2	17.4	24.4	40%
Nepal	2.6	3.0	3.7	3.9	4.4	4.8	5.9	5.6	3.3	4.8	45%
China	7.2	8.0	6.0	3.9	3.1	3.4	3.5	3.3	2.5	2.7	10%
Italy	3.0	2.8	2.8	2.7	2.5	2.3	2.2	2.0	1.3	1.7	35%
United States	1.3	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	3%
Others	9.0	8.9	9.2	9.0	8.5	8.2	8.4	8.7	6.7	7.8	16%
<b>Global Total</b>	<b>40.7</b>	<b>46.5</b>	<b>53.6</b>	<b>57.9</b>	<b>53.9</b>	<b>59.6</b>	<b>67.6</b>	<b>62.1</b>	<b>32.4</b>	<b>42.7</b>	<b>32%</b>

Source: Metals Focus

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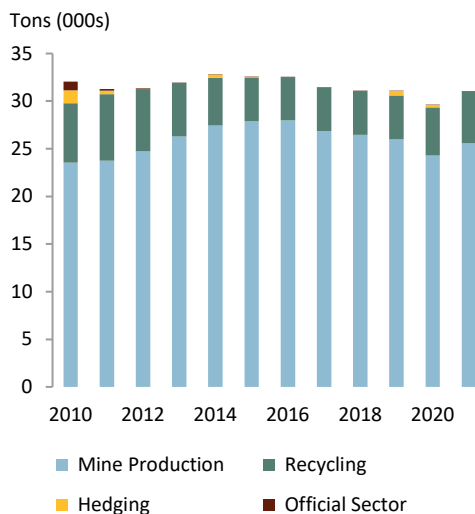
## Appendix 1 - Silver Supply and Demand

Tons											Year on Year	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022F	2021	2022F
<b>Supply</b>												
Mine Production	26,293	27,437	27,896	27,992	26,863	26,445	26,000	24,295	25,587	26,226	5%	2%
Recycling	5,609	5,018	4,581	4,537	4,580	4,622	4,593	5,044	5,382	5,616	7%	4%
Net Hedging Supply	-	332	67	-	-	-	473	264	-	156	na	na
Net Official Sector Sales	52	36	33	33	33	37	32	37	48	48	28%	1%
<b>Total Supply</b>	<b>31,954</b>	<b>32,822</b>	<b>32,577</b>	<b>32,562</b>	<b>31,475</b>	<b>31,104</b>	<b>31,097</b>	<b>29,640</b>	<b>31,017</b>	<b>32,045</b>	<b>5%</b>	<b>3%</b>
<b>Demand</b>												
Industrial	13,983	13,650	13,720	14,785	15,663	15,539	15,492	14,459	15,807	16,783	9%	6%
...of which photovoltaics	1,571	1,507	1,684	2,915	3,166	2,877	3,069	3,142	3,536	3,950	13%	12%
Photography	1,424	1,355	1,282	1,174	1,092	1,051	1,018	865	892	885	3%	-1%
Jewelry	5,813	6,000	6,273	5,859	6,072	6,280	6,229	4,660	5,641	6,278	21%	11%
Silverware	1,447	1,666	1,802	1,677	1,853	2,102	1,931	1,009	1,327	1,639	32%	23%
Net Physical Investment	9,351	8,806	9,654	6,594	4,843	5,139	5,809	6,377	8,668	8,686	36%	0%
Net Hedging Demand	913	-	-	374	66	239	-	-	292	-	na	na
<b>Total Demand</b>	<b>32,930</b>	<b>31,478</b>	<b>32,731</b>	<b>30,463</b>	<b>29,590</b>	<b>30,348</b>	<b>30,480</b>	<b>27,370</b>	<b>32,627</b>	<b>34,270</b>	<b>19%</b>	<b>5%</b>
<b>Market Balance</b>	<b>-977</b>	<b>1,344</b>	<b>-155</b>	<b>2,099</b>	<b>1,885</b>	<b>755</b>	<b>617</b>	<b>2,270</b>	<b>-1,610</b>	<b>-2,224</b>	<b>na</b>	<b>38%</b>
Change in ETP Holdings	148	-9	-532	1,676	223	-666	2,590	10,299	2,020	778	-80%	-62%
<b>Market Balance less ETPs</b>	<b>-1,124</b>	<b>1,353</b>	<b>377</b>	<b>423</b>	<b>1,663</b>	<b>1,421</b>	<b>-1,972</b>	<b>-8,029</b>	<b>-3,630</b>	<b>-3,002</b>	<b>-55%</b>	<b>-17%</b>
Silver Price (US\$/oz)*	23.79	19.08	15.68	17.14	17.05	15.71	16.21	20.55	25.14	23.90	22%	-5%

\*London Price

Source: Metals Focus

## Global Supply



Source: Metals Focus

## Global Demand



Source: Metals Focus

## Appendix 2 - Mine Production

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>North America</b>											
Mexico	5,358	5,821	5,767	5,975	5,421	5,815	6,049	5,840	5,605	6,118	9%
United States	1,060	1,046	1,180	1,090	1,150	1,031	926	976	986	1,011	3%
Canada	666	618	472	369	361	393	368	419	293	279	-5%
<b>Sub-total</b>	<b>7,084</b>	<b>7,485</b>	<b>7,419</b>	<b>7,433</b>	<b>6,931</b>	<b>7,240</b>	<b>7,344</b>	<b>7,235</b>	<b>6,884</b>	<b>7,409</b>	<b>8%</b>
<b>Central &amp; South America</b>											
Peru	3,533	3,827	3,918	4,218	4,737	4,820	4,556	4,202	3,160	3,355	6%
Bolivia	1,206	1,287	1,340	1,306	1,353	1,196	1,192	1,153	930	1,290	39%
Chile	1,191	1,169	1,562	1,496	1,448	1,257	1,243	1,189	1,474	1,281	-13%
Argentina	768	827	920	1,133	993	908	960	1,025	707	823	16%
Dominican Republic	27	82	136	95	122	152	159	141	129	106	-18%
Brazil	17	27	35	49	77	87	71	69	69	80	17%
Panama	3	2	0	-	-	-	-	27	50	78	58%
Guatemala	205	283	858	863	840	337	-	-	-	-	na
Others	105	103	106	80	64	62	77	92	89	131	47%
<b>Sub-total</b>	<b>7,055</b>	<b>7,607</b>	<b>8,875</b>	<b>9,241</b>	<b>9,635</b>	<b>8,819</b>	<b>8,258</b>	<b>7,898</b>	<b>6,608</b>	<b>7,144</b>	<b>8%</b>
<b>Europe</b>											
Poland	1,159	1,208	1,195	1,218	1,272	1,297	1,272	1,257	1,226	1,307	7%
Sweden	306	337	396	492	511	484	467	446	417	432	4%
Portugal	34	45	47	46	43	40	91	95	96	98	2%
Spain	34	36	35	44	46	59	66	65	78	82	6%
Finland	2	2	2	3	3	3	2	33	50	46	-8%
Others	68	82	79	74	71	74	62	62	72	84	16%
<b>Sub-total</b>	<b>1,602</b>	<b>1,711</b>	<b>1,755</b>	<b>1,876</b>	<b>1,946</b>	<b>1,957</b>	<b>1,959</b>	<b>1,958</b>	<b>1,939</b>	<b>2,050</b>	<b>6%</b>
<b>Africa</b>											
Morocco	220	230	244	281	311	319	243	284	249	288	16%
Eritrea	30	16	53	98	98	79	54	61	99	97	-2%
South Africa	88	75	55	59	61	69	51	62	39	49	24%
Botswana	12	26	26	4	4	0	0	-	-	18	na
Others	94	148	105	112	72	77	79	79	79	80	1%
<b>Sub-total</b>	<b>444</b>	<b>495</b>	<b>482</b>	<b>554</b>	<b>547</b>	<b>544</b>	<b>428</b>	<b>486</b>	<b>467</b>	<b>532</b>	<b>14%</b>
<b>Commonwealth of Independent States</b>											
Russia	1,411	1,381	1,434	1,588	1,450	1,305	1,341	1,391	1,323	1,212	-8%
Kazakhstan	638	663	562	500	542	589	615	530	541	477	-12%
Uzbekistan	149	182	182	182	185	185	185	189	195	212	9%
Armenia	64	72	75	77	74	82	63	75	82	81	-2%
Tajikistan	19	18	31	35	40	47	46	45	47	48	3%
Others	5	7	7	11	20	15	18	20	18	19	6%
<b>Sub-total</b>	<b>2,286</b>	<b>2,324</b>	<b>2,291</b>	<b>2,392</b>	<b>2,311</b>	<b>2,223</b>	<b>2,268</b>	<b>2,250</b>	<b>2,206</b>	<b>2,050</b>	<b>-7%</b>

Source: Metals Focus

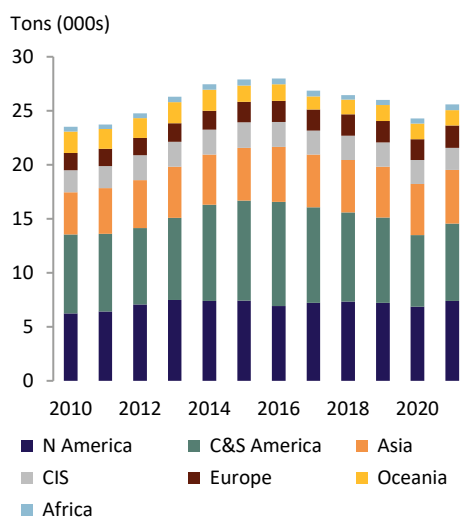


## Appendix 2 - Mine Production (continued)

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Asia</b>											
China	3,503	3,674	3,701	3,705	3,774	3,620	3,439	3,468	3,407	3,510	3%
India	289	333	261	374	436	526	658	633	671	689	3%
Indonesia	192	244	219	308	335	311	314	226	259	336	30%
Turkey	221	201	199	205	209	152	147	99	123	170	38%
Iran	71	67	70	67	77	79	79	82	84	85	2%
Mongolia	24	39	52	62	68	54	53	51	51	55	6%
Laos	19	33	40	52	51	43	37	34	35	35	2%
Philippines	49	40	23	30	35	32	30	31	24	23	-6%
Thailand	35	36	34	24	39	4	4	4	4	4	0%
Others	51	55	55	51	67	61	71	69	74	67	-10%
<b>Sub-total</b>	<b>4,455</b>	<b>4,722</b>	<b>4,654</b>	<b>4,878</b>	<b>5,091</b>	<b>4,881</b>	<b>4,832</b>	<b>4,698</b>	<b>4,732</b>	<b>4,974</b>	<b>5%</b>
<b>Oceania</b>											
Australia	1,727	1,840	1,847	1,430	1,418	1,120	1,254	1,325	1,337	1,334	-0.3%
Papua New Guinea	84	92	95	72	100	66	93	146	119	91	-24%
Others	11	16	20	17	13	13	9	5	2	3	52%
<b>Sub-total</b>	<b>1,822</b>	<b>1,948</b>	<b>1,962</b>	<b>1,520</b>	<b>1,531</b>	<b>1,199</b>	<b>1,356</b>	<b>1,476</b>	<b>1,459</b>	<b>1,428</b>	<b>-2%</b>
<b>Global Total</b>	<b>24,748</b>	<b>26,293</b>	<b>27,437</b>	<b>27,896</b>	<b>27,992</b>	<b>26,863</b>	<b>26,445</b>	<b>26,000</b>	<b>24,295</b>	<b>25,587</b>	<b>5%</b>

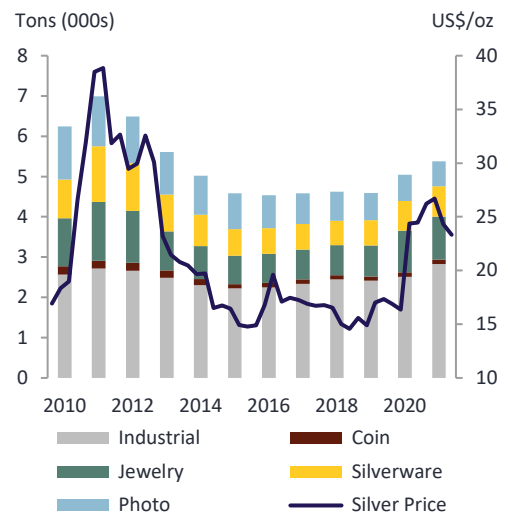
Source: Metals Focus

### Mine Supply by Region



Source: Metals Focus

### Recycling by Source



Source: Metals Focus, Bloomberg

## Appendix 3 - Recycling

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Germany	363	330	318	307	303	291	306	307	297	302	2%
Italy	315	252	206	182	171	163	156	158	150	149	-0.3%
UK	203	192	182	174	168	163	159	156	148	141	-5%
France	179	156	134	118	106	101	98	97	97	104	7%
Other	351	334	317	293	291	321	291	295	294	310	5%
<b>Sub-total</b>	<b>1,410</b>	<b>1,264</b>	<b>1,156</b>	<b>1,073</b>	<b>1,038</b>	<b>1,039</b>	<b>1,011</b>	<b>1,013</b>	<b>987</b>	<b>1,007</b>	<b>2%</b>
<b>CIS</b>											
Russia	358	307	249	208	203	246	310	264	290	319	10%
Others	95	71	55	43	45	54	59	57	63	69	10%
<b>Sub-total</b>	<b>453</b>	<b>378</b>	<b>304</b>	<b>251</b>	<b>247</b>	<b>300</b>	<b>369</b>	<b>321</b>	<b>353</b>	<b>388</b>	<b>10%</b>
<b>North America</b>											
United States	1,592	1,462	1,356	1,263	1,181	1,189	1,188	1,179	1,179	1,277	8%
Others	206	176	146	127	127	126	125	125	129	132	3%
<b>Sub-total</b>	<b>1,799</b>	<b>1,637</b>	<b>1,502</b>	<b>1,390</b>	<b>1,309</b>	<b>1,314</b>	<b>1,313</b>	<b>1,304</b>	<b>1,307</b>	<b>1,409</b>	<b>8%</b>
<b>Middle East</b>											
Turkey	128	114	104	77	78	78	83	83	77	84	9%
Others	124	118	116	94	109	108	95	100	119	144	21%
<b>Sub-total</b>	<b>252</b>	<b>232</b>	<b>220</b>	<b>171</b>	<b>187</b>	<b>185</b>	<b>177</b>	<b>183</b>	<b>197</b>	<b>228</b>	<b>16%</b>
<b>South Asia</b>											
India	716	384	232	144	153	167	196	205	495	457	-8%
Others	144	72	40	21	23	24	27	28	91	82	-10%
<b>Sub-total</b>	<b>860</b>	<b>455</b>	<b>272</b>	<b>165</b>	<b>176</b>	<b>191</b>	<b>223</b>	<b>233</b>	<b>586</b>	<b>538</b>	<b>-8%</b>
<b>East Asia</b>											
China	722	693	693	721	714	704	705	712	780	945	21%
Japan	349	354	342	343	354	354	340	326	310	296	-4%
Taiwan	128	110	101	81	93	88	81	89	91	93	2%
Others	193	198	163	143	163	146	146	152	168	187	11%
<b>Sub-total</b>	<b>1,392</b>	<b>1,355</b>	<b>1,299</b>	<b>1,289</b>	<b>1,325</b>	<b>1,292</b>	<b>1,271</b>	<b>1,279</b>	<b>1,349</b>	<b>1,521</b>	<b>13%</b>
<b>Other Regions</b>											
C&S America	149	123	108	95	105	109	110	112	119	129	9%
Africa	102	94	92	86	89	90	89	89	95	112	18%
Oceania	73	70	64	61	61	60	60	58	53	49	-6%
<b>Sub-total</b>	<b>324</b>	<b>287</b>	<b>265</b>	<b>242</b>	<b>255</b>	<b>258</b>	<b>259</b>	<b>260</b>	<b>266</b>	<b>291</b>	<b>9%</b>
<b>Global Total</b>	<b>6,491</b>	<b>5,609</b>	<b>5,018</b>	<b>4,581</b>	<b>4,537</b>	<b>4,580</b>	<b>4,622</b>	<b>4,593</b>	<b>5,044</b>	<b>5,382</b>	<b>7%</b>

Source: Metals Focus

## Appendix 4 - Industrial Demand

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Germany	758	759	772	746	753	777	805	789	721	803	11%
United Kingdom	430	431	501	461	492	595	627	692	632	697	10%
France	296	294	283	269	262	270	283	290	263	300	14%
Italy	262	259	264	264	261	271	282	286	243	285	17%
Others	367	383	376	367	370	383	393	391	352	387	10%
<b>Sub-total</b>	<b>2,113</b>	<b>2,126</b>	<b>2,196</b>	<b>2,106</b>	<b>2,138</b>	<b>2,296</b>	<b>2,390</b>	<b>2,448</b>	<b>2,211</b>	<b>2,472</b>	<b>12%</b>
<b>North America</b>											
United States	3,536	3,172	2,745	2,823	3,385	3,478	3,576	3,408	3,399	3,724	10%
Others	176	179	142	178	187	175	177	184	155	169	9%
<b>Sub-total</b>	<b>3,712</b>	<b>3,351</b>	<b>2,887</b>	<b>3,002</b>	<b>3,572</b>	<b>3,654</b>	<b>3,753</b>	<b>3,592</b>	<b>3,553</b>	<b>3,893</b>	<b>10%</b>
<b>East Asia</b>											
China	2,663	2,872	3,027	3,117	3,175	3,650	3,774	3,773	3,466	3,753	8%
Japan	2,284	2,696	2,707	2,814	3,255	3,381	2,911	3,081	3,107	3,221	4%
South Korea	682	689	629	590	561	593	595	571	541	582	8%
Taiwan	346	327	328	318	310	292	302	275	281	299	7%
Others	24	23	30	37	39	37	39	40	36	39	9%
<b>Sub-total</b>	<b>5,999</b>	<b>6,606</b>	<b>6,721</b>	<b>6,875</b>	<b>7,340</b>	<b>7,953</b>	<b>7,621</b>	<b>7,741</b>	<b>7,430</b>	<b>7,894</b>	<b>6%</b>
<b>Other Regions</b>											
South Asia	1,369	1,254	1,178	1,110	1,116	1,162	1,250	1,175	832	1,065	28%
Middle East	173	187	213	200	181	187	186	176	151	161	7%
Oceania	143	136	137	133	136	132	136	139	111	131	18%
C&S America	207	208	219	215	223	201	121	133	96	107	12%
CIS	92	74	59	47	50	51	53	56	48	55	15%
Africa	39	42	40	31	29	29	30	32	27	28	2%
<b>Sub-total</b>	<b>2,023</b>	<b>1,900</b>	<b>1,846</b>	<b>1,737</b>	<b>1,735</b>	<b>1,761</b>	<b>1,775</b>	<b>1,711</b>	<b>1,265</b>	<b>1,547</b>	<b>22%</b>
<b>Global Total</b>	<b>13,848</b>	<b>13,983</b>	<b>13,650</b>	<b>13,720</b>	<b>14,785</b>	<b>15,663</b>	<b>15,539</b>	<b>15,492</b>	<b>14,459</b>	<b>15,807</b>	<b>9%</b>

## Appendix 5 - Electrical & Electronics Demand

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
China/Hong Kong	1,769	1,905	2,027	2,092	2,187	2,649	2,759	2,741	2,514	2,801	11%
Japan	1,859	2,245	2,290	2,358	2,830	2,941	2,465	2,634	2,704	2,767	2%
United States	2,040	1,742	1,373	1,460	2,021	2,080	2,136	1,939	1,972	2,103	7%
Germany	552	551	568	539	550	569	592	574	517	580	12%
India	499	462	444	424	428	444	475	422	365	464	27%
South Korea	260	270	290	265	259	268	262	246	229	247	8%
Others	1,447	1,390	1,402	1,333	1,335	1,315	1,306	1,292	1,157	1,301	12%
<b>Global Total</b>	<b>8,426</b>	<b>8,566</b>	<b>8,393</b>	<b>8,470</b>	<b>9,609</b>	<b>10,266</b>	<b>9,996</b>	<b>9,849</b>	<b>9,457</b>	<b>10,263</b>	<b>9%</b>

Source: Metals Focus

## Appendix 6 - Brazing Alloys & Solder Demand

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
China	679	746	776	792	749	761	772	781	701	689	-2%
United States	200	190	187	177	182	192	198	202	186	203	9%
India	80	73	70	66	67	69	71	68	54	85	57%
South Korea	99	93	84	80	70	75	74	71	66	70	6%
Japan	61	61	58	56	56	64	67	65	59	66	12%
Germany	80	78	74	70	68	68	67	65	57	65	14%
Others	389	388	337	278	266	288	301	313	274	307	12%
<b>Global Total</b>	<b>1,589</b>	<b>1,630</b>	<b>1,586</b>	<b>1,519</b>	<b>1,460</b>	<b>1,515</b>	<b>1,550</b>	<b>1,565</b>	<b>1,397</b>	<b>1,485</b>	<b>6%</b>

## Appendix 7 - Photographic Demand

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
Europe & N. America	1,183	1,082	1,009	942	850	780	740	703	663	665	0%
East Asia	399	304	304	299	280	270	262	259	202	226	12%
Others	52	39	41	41	45	42	49	56	1	1	15%
<b>Global Total</b>	<b>1,634</b>	<b>1,424</b>	<b>1,355</b>	<b>1,282</b>	<b>1,174</b>	<b>1,092</b>	<b>1,051</b>	<b>1,018</b>	<b>865</b>	<b>892</b>	<b>3%</b>

## Appendix 8a - Physical Investment

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
United States	3,068	3,706	3,397	3,748	3,098	1,712	1,357	1,438	2,465	3,683	49%
Germany	715	844	608	654	743	718	778	1,061	1,326	1,411	6%
India	1,682	2,719	3,136	3,435	1,136	1,259	1,680	1,757	269	858	219%
Canada	150	206	230	237	225	147	142	156	232	329	42%
China	713	660	364	357	346	238	210	193	214	192	-10%
Other Europe	225	246	226	302	337	282	340	364	434	515	19%
Others	935	970	845	920	709	488	630	839	1,435	1,680	17%
<b>Global Total</b>	<b>7,488</b>	<b>9,351</b>	<b>8,806</b>	<b>9,654</b>	<b>6,594</b>	<b>4,843</b>	<b>5,139</b>	<b>5,809</b>	<b>6,376</b>	<b>8,668</b>	<b>36%</b>

## Appendix 8b - Coins & Medals Fabrication

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
Canada	578	913	959	1,102	1,045	588	572	715	897	1,155	29%
United States	1,123	1,425	1,444	1,527	1,225	601	532	637	1,018	1,001	-2%
Australia	328	267	266	394	409	333	325	394	537	622	16%
UK	23	78	67	109	109	96	109	99	302	489	62%
Austria	274	451	144	227	107	64	65	90	224	382	71%
South Africa	0	26	0	18	0	36	116	112	244	320	31%
China	373	373	362	359	355	248	233	217	238	215	-10%
India	70	140	176	224	220	257	328	351	161	210	30%
Germany	40	40	40	60	135	125	125	120	120	120	0%
Mexico	40	21	22	33	36	38	19	12	14	18	30%
Others	245	286	272	283	198	189	223	238	230	261	14%
<b>Global Total</b>	<b>3,094</b>	<b>4,021</b>	<b>3,754</b>	<b>4,334</b>	<b>3,839</b>	<b>2,574</b>	<b>2,647</b>	<b>2,986</b>	<b>3,985</b>	<b>4,791</b>	<b>20%</b>

Source: Metals Focus

## Appendix 9 - Jewelry Demand

Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
<b>Europe</b>											
Italy	479	556	606	622	586	605	601	619	504	636	26%
Germany	105	109	105	108	104	107	108	109	95	112	18%
Others	192	204	208	209	204	205	203	203	169	195	15%
<b>Sub-total</b>	<b>775</b>	<b>869</b>	<b>919</b>	<b>938</b>	<b>894</b>	<b>917</b>	<b>912</b>	<b>931</b>	<b>768</b>	<b>943</b>	<b>23%</b>
<b>North America</b>											
United States	365	384	404	425	403	410	404	402	359	412	15%
Canada	110	115	121	110	112	105	101	101	83	115	39%
Mexico	155	141	168	177	180	153	155	139	97	68	-30%
<b>Sub-total</b>	<b>629</b>	<b>640</b>	<b>693</b>	<b>711</b>	<b>695</b>	<b>668</b>	<b>659</b>	<b>642</b>	<b>539</b>	<b>595</b>	<b>10%</b>
<b>Middle East</b>											
Turkey	125	151	195	208	152	153	184	186	138	215	56%
Others	75	78	82	97	92	87	107	93	73	88	21%
<b>Sub-total</b>	<b>200</b>	<b>230</b>	<b>277</b>	<b>305</b>	<b>244</b>	<b>240</b>	<b>291</b>	<b>279</b>	<b>210</b>	<b>303</b>	<b>44%</b>
<b>South Asia</b>											
India	708	990	1,404	1,760	1,677	1,995	2,256	2,148	1,260	1,827	45%
Others	28	30	35	38	37	42	47	45	27	34	29%
<b>Sub-total</b>	<b>736</b>	<b>1,020</b>	<b>1,438</b>	<b>1,799</b>	<b>1,715</b>	<b>2,038</b>	<b>2,303</b>	<b>2,193</b>	<b>1,287</b>	<b>1,862</b>	<b>45%</b>
<b>East Asia</b>											
Thailand	632	812	769	877	828	837	785	886	745	771	4%
China	1,458	1,662	1,280	1,050	893	794	755	709	589	648	10%
Indonesia	92	128	191	152	163	157	163	175	149	119	-20%
Others	173	194	182	187	177	179	179	183	157	165	5%
<b>Sub-total</b>	<b>2,355</b>	<b>2,797</b>	<b>2,421</b>	<b>2,267</b>	<b>2,060</b>	<b>1,967</b>	<b>1,881</b>	<b>1,953</b>	<b>1,639</b>	<b>1,702</b>	<b>4%</b>
<b>Other Regions</b>	<b>256</b>	<b>257</b>	<b>251</b>	<b>253</b>	<b>251</b>	<b>243</b>	<b>234</b>	<b>232</b>	<b>216</b>	<b>236</b>	<b>9%</b>
<b>Global Total</b>	<b>4,952</b>	<b>5,813</b>	<b>6,000</b>	<b>6,273</b>	<b>5,859</b>	<b>6,072</b>	<b>6,280</b>	<b>6,229</b>	<b>4,660</b>	<b>5,641</b>	<b>21%</b>

## Appendix 10 - Silverware Demand

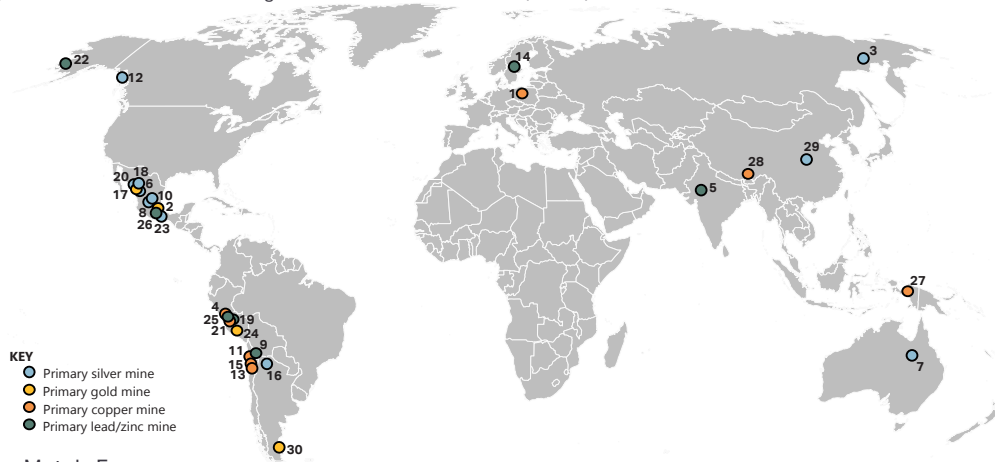
Tons	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Y/Y
India	549	702	952	1,151	1,061	1,236	1,442	1,282	541	758	40%
Nepal	82	92	114	123	136	148	183	174	102	148	45%
China	223	250	188	122	98	105	107	103	77	85	10%
Italy	92	87	88	86	78	71	68	63	39	53	35%
United States	41	39	40	40	40	40	39	39	40	41	3%
Others	279	277	285	281	264	254	262	269	209	243	16%
<b>Global Total</b>	<b>1,266</b>	<b>1,447</b>	<b>1,666</b>	<b>1,802</b>	<b>1,677</b>	<b>1,853</b>	<b>2,102</b>	<b>1,931</b>	<b>1,009</b>	<b>1,327</b>	<b>32%</b>

Source: Metals Focus

## Appendix 11 - Top 30 Silver Producing Mines

Rank	Mine	Country	Ownership	Million ounces		
				2020	2021	Y/Y
1	KGHM Polska Miedz	Poland	KGHM Polska Miedz (100%)	39.2	41.9	7%
2	Peñasquito	Mexico	Newmont (100%)	30.9	34.2	11%
3	Dukat	Russia	Polymetal International (100%)	18.2	18.8	3%
4	Antamina	Peru	Glencore (33.75%) / BHP (33.75%)/Teck Resources (22.5%)	16.4	18.2	11%
5	Sindesar Khurd <sup>2,3</sup>	India	Hindustan Zinc (100%)	17.3	17.7	3%
6	San Julian	Mexico	Fresnillo (100%)	13.3	16.8	26%
7	Cannington <sup>1</sup>	Australia	South32 (100%)	11.6	14.4	24%
8	Saucito	Mexico	Fresnillo (100%)	15.5	12.4	-20%
9	San Cristobal <sup>2</sup>	Bolivia	Sumitomo Corporation (100%)	5.4	12.1	124%
10	Fresnillo	Mexico	Fresnillo (100%)	13.1	12.0	-8%
11	Collahuasi	Chile	Glencore (44%) / Anglo American (44%) / Mitsui & Co (12%)	9.0	9.6	7%
12	Greens Creek	United States	Hecla Mining Company (100%)	10.5	9.2	-12%
13	Ministro Hales <sup>1</sup>	Chile	Codelco (100%)	8.4	9.1	9%
14	Garpenberg	Sweden	Boliden (100%)	7.9	8.8	12%
15	Chuquicamata <sup>1</sup>	Chile	Codelco (100%)	10.0	8.5	-14%
16	Puna	Argentina	SSR Mining Inc. (100%)	5.6	8.0	44%
17	San Dimas	Mexico	First Majestic Silver (100%)	6.4	7.6	19%
18	Cerro Los Gatos	Mexico	Gatos Silver (70%) / Dowa Metals & Mining Co. (30%)	4.2	7.6	81%
19	Yauli	Peru	Volcan Compañia Minera (100%)	5.3	7.4	40%
20	Palmarejo	Mexico	Coeur Mining (100%)	6.3	6.8	9%
21	Toromocho	Peru	Chinalco (100%)	5.7	6.7	17%
22	Red Dog <sup>2</sup>	United States	Teck Resources (100%)	6.5	6.6	2%
23	San Jose	Mexico	Fortuna Silver Mines (100%)	6.2	6.4	4%
24	Inmaculada	Peru	Hochschild Mining (100%)	4.0	6.2	55%
25	El Brocal	Peru	Buenaventura (61.43%) / Private & Other (38.57%)	3.7	6.2	67%
26	Tizapa	Mexico	Industrias Peñoles (51%) / Dowa Mining Corporation (39%) <sup>5</sup>	6.0	6.0	0%
27	Grasberg <sup>4</sup>	Indonesia	Government of Indonesia (51.2%) / Freeport McMoRan (48.8%)	3.6	5.9	64%
28	Jiama <sup>2</sup>	China	China Gold International Resource (100%)	7.3	5.7	-22%
29	Ying	China	Silvercorp Metals (77.5%) <sup>6</sup>	5.2	5.7	8%
30	Cerro Moro	Argentina	Yamana Gold (100%)	5.4	5.6	2%

NB: All numbers are silver contained in concentrate or doré unless stated otherwise, 1: Payable metal, 2: Estimate, 3: Refined silver, 4: Silver sold, 5: Sumitomo Metal Mining Company (10%), 6: Henan Non-Ferrous Geological & Mineral Resources Co (22.5%)



Source: Company Reports, Metals Focus



## Appendix 12a - Top 20 Producing Companies

Tons	2020	2021	Y/Y
Fresnillo <sup>1</sup>	1,564	1,554	-1%
KGHM Polska Miedz <sup>2</sup>	1,353	1,366	1%
Glencore	1,019	980	-4%
Newmont <sup>2</sup>	865	976	13%
Codelco <sup>2</sup>	767	735	-4%
Hindustan Zinc <sup>3,4,5</sup>	671	689	3%
Polymetal International	586	636	8%
Pan American Silver	538	596	11%
Southern Copper	670	590	-12%
Volcan Cia Minera	376	467	24%
Industrias Peñoles <sup>6</sup>	382	450	18%
South32 <sup>2</sup>	361	447	24%
Sumitomo Corporation	230	420	82%
Buenaventura <sup>7</sup>	390	406	4%
Hecla Mining Company	421	401	-5%
First Majestic Silver	361	399	11%
BHP <sup>2</sup>	374	388	4%
Hochschild Mining	305	379	24%
Boliden <sup>2</sup>	354	371	5%
Teck Resources <sup>8</sup>	316	331	5%

NB: 1 - Excludes Silverstream contract, 2 - Payable production, 3 - Hindustan Zinc is a Vedanta Group company, 4 - Production from integrated operations only, 5 - Refined Silver, 6 - Excludes 100% Fresnillo, 7 - Equity weighted production including silver from copper ore processed at El Brocal, 8 - Estimated attributable mined production

Source: Company Reports, Metals Focus

## Appendix 12b - Top 20 Producing Countries

Tons	2020	2021	Y/Y
Mexico	5,605	6,118	9%
China	3,407	3,510	3%
Peru	3,160	3,355	6%
Australia	1,337	1,334	-0.3%
Poland	1,226	1,307	7%
Bolivia	930	1,290	39%
Chile	1,474	1,281	-13%
Russia	1,323	1,212	-8%
United States	986	1,011	3%
Argentina	707	823	16%
India	671	689	3%
Kazakhstan	541	477	-12%
Sweden	417	432	4%
Indonesia	259	336	30%
Morocco	249	288	16%
Canada	293	279	-5%
Uzbekistan	195	212	9%
Turkey	123	170	38%
Dominican Republic	129	106	-18%
Portugal	96	98	2%
Others	1,165	1,257	8%
<b>Global Total</b>	<b>24,295</b>	<b>25,587</b>	<b>5%</b>

Source: Metals Focus

## Appendix 12c - Mine Production Forecast by Region

Tons	2021	2022F	Y/Y
N America	7,409	8,028	8%
C&S America	7,144	7,013	-2%
Asia	4,974	5,059	2%
CIS	2,050	2,115	3%
Europe	2,050	1,976	-4%
Oceania	1,428	1,466	3%
Africa	532	570	7%
<b>Global Total</b>	<b>25,587</b>	<b>26,226</b>	<b>2%</b>

Source: Metals Focus

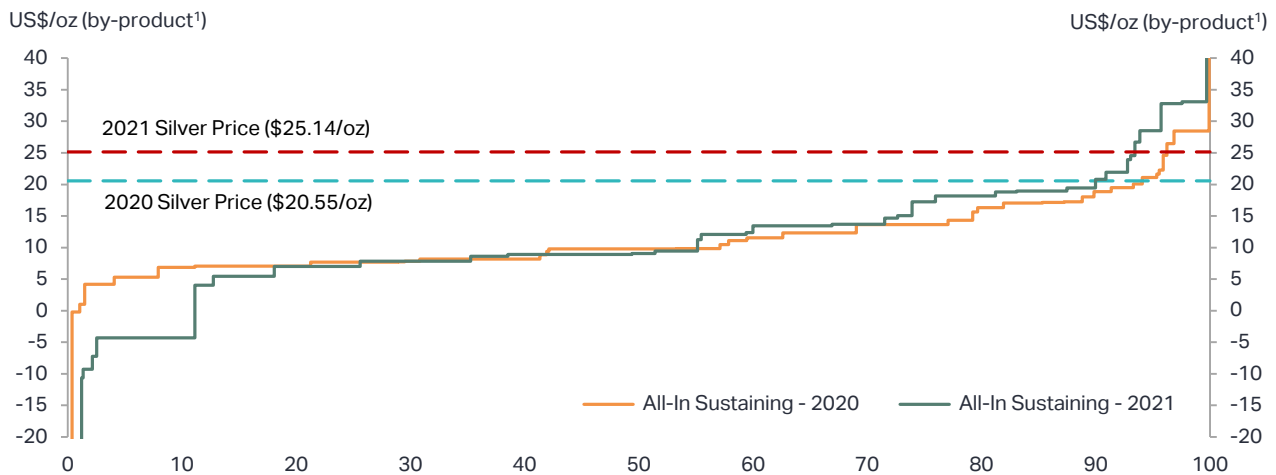
Appendix 13 - Primary Silver Production Costs (by-product<sup>1</sup>)

Year on Year

US\$/oz (by-product)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2020	2021
<b>North America</b>												
Total Cash Cost	5.42	7.94	7.50	6.43	3.47	2.17	2.64	4.13	3.66	4.38	-11%	20%
Total Production Cost	11.80	14.28	13.43	11.66	8.63	8.20	8.48	10.53	10.01	10.27	-5%	3%
All-In Sustaining Cost	14.14	15.66	14.49	12.59	8.54	9.19	10.53	11.97	11.01	12.82	-8%	16%
<b>Central &amp; South America</b>												
Total Cash Cost	14.25	12.43	10.65	9.75	7.43	7.41	5.74	7.37	9.29	6.85	26%	-26%
Total Production Cost	19.10	17.95	14.68	14.07	10.35	10.36	8.97	11.28	14.41	11.07	28%	-23%
All-In Sustaining Cost	21.87	19.36	15.51	13.92	10.77	12.36	11.70	13.06	15.85	13.17	21%	-17%
<b>CIS</b>												
Total Cash Cost	10.18	10.27	7.21	4.99	4.35	6.98	7.60	9.12	7.64	5.71	-16%	-25%
Total Production Cost	11.83	13.02	9.43	6.39	5.81	9.19	10.28	10.91	9.31	7.38	-15%	-21%
All-In Sustaining Cost	13.43	13.90	9.32	6.41	5.85	9.46	9.76	11.86	9.81	8.93	-17%	-9%
<b>Asia</b>												
Total Cash Cost	-1.94	1.52	1.03	1.11	-2.02	-4.58	-4.42	-2.36	-0.35	0.43	na	na
Total Production Cost	-0.43	4.00	4.58	4.92	0.88	-1.84	-1.29	0.84	3.30	4.34	294%	31%
All-In Sustaining Cost	18.63	37.81	8.89	9.59	3.53	3.61	1.42	3.68	6.23	6.90	69%	11%
<b>Oceania</b>												
Total Cash Cost	5.86	3.55	1.99	2.16	-1.90	-3.72	-0.47	2.02	1.20	-7.64	-41%	na
Total Production Cost	7.34	5.15	4.21	4.59	1.22	0.60	3.21	7.22	15.80	11.41	119%	-28%
All-In Sustaining Cost	8.81	6.93	5.41	5.67	1.08	1.02	5.51	7.85	7.70	-4.32	-2%	na
<b>Global Total</b>												
Total Cash Cost	8.32	8.63	7.79	6.88	4.38	3.73	3.48	5.04	4.76	3.88	-6%	-18%
Total Production Cost	12.89	13.61	12.23	11.06	8.13	8.24	8.12	10.16	10.89	10.02	7%	-8%
All-In Sustaining Cost	15.53	15.67	13.20	11.62	8.35	9.61	10.11	11.61	11.24	10.88	-3%	-3%

Source: Metals Focus

## Global Primary Silver Mine Production Costs in 2021 (by-product)



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

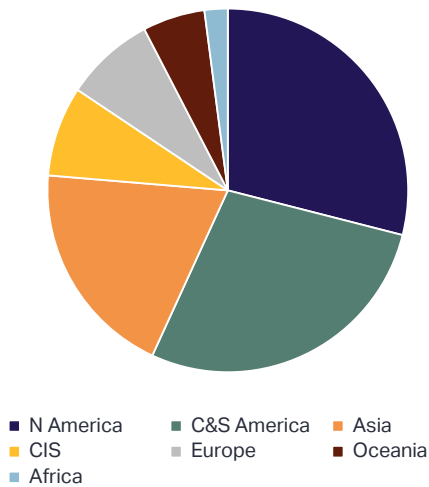
### Appendix 14 - Mine Production by Region & Primary Metal

Year on Year

Million ounces	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2020	2021
<b>Regional Breakdown</b>												
North America	227.8	240.7	238.5	239.0	222.8	232.8	236.1	232.6	221.3	238.2	-5%	8%
C&S America	226.8	244.6	285.3	297.1	309.8	283.5	265.5	253.9	212.5	229.7	-16%	8%
Asia	143.2	151.8	149.6	156.8	163.7	156.9	155.3	151.0	152.1	159.9	1%	5%
CIS	73.5	74.7	73.7	76.9	74.3	71.5	72.9	72.3	70.9	65.9	-2%	-7%
Europe	51.5	55.0	56.4	60.3	62.6	62.9	63.0	63.0	62.3	65.9	-1%	6%
Oceania	58.6	62.6	63.1	48.9	49.2	38.6	43.6	47.4	46.9	45.9	-1%	-2%
Africa	14.3	15.9	15.5	17.8	17.6	17.5	13.7	15.6	15.0	17.1	-4%	14%
<b>Global Total</b>	<b>795.7</b>	<b>845.3</b>	<b>882.1</b>	<b>896.9</b>	<b>900.0</b>	<b>863.7</b>	<b>850.2</b>	<b>835.9</b>	<b>781.1</b>	<b>822.6</b>	<b>-7%</b>	<b>5%</b>
<b>Global Breakdown</b>												
Primary Silver	252.7	266.4	285.9	290.9	288.4	263.6	247.0	236.1	208.6	229.9	-12%	10%
Gold	125.5	132.9	142.6	150.1	134.4	130.4	130.4	130.1	120.5	127.6	-7%	6%
Copper	165.3	170.4	182.7	188.9	205.5	199.6	197.0	192.2	206.7	208.2	8%	1%
Lead/Zinc	246.4	270.0	265.3	261.6	265.1	263.3	268.7	272.4	240.5	252.8	-12%	5%
Other	5.7	5.7	5.5	5.3	6.5	6.7	7.0	5.1	4.8	4.2	-6%	-12%
<b>Global Total</b>	<b>795.7</b>	<b>845.3</b>	<b>882.1</b>	<b>896.9</b>	<b>900.0</b>	<b>863.7</b>	<b>850.2</b>	<b>835.9</b>	<b>781.1</b>	<b>822.6</b>	<b>-7%</b>	<b>5%</b>
<b>Global Breakdown (Percentage)</b>												
Primary Silver	31.8%	31.5%	32.4%	32.4%	32.0%	30.5%	29.1%	28.2%	26.7%	27.9%		
Gold	15.8%	15.7%	16.2%	16.7%	14.9%	15.1%	15.3%	15.6%	15.4%	15.5%		
Copper	20.8%	20.2%	20.7%	21.1%	22.8%	23.1%	23.2%	23.0%	26.5%	25.3%		
Lead/Zinc	31.0%	31.9%	30.1%	29.2%	29.5%	30.5%	31.6%	32.6%	30.8%	30.7%		
Other	0.7%	0.7%	0.6%	0.6%	0.7%	0.8%	0.8%	0.6%	0.6%	0.5%		

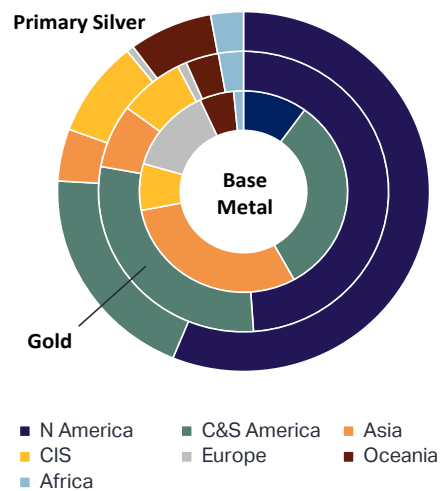
Source: Metals Focus

Mine Production by Region in 2021



Source: Metals Focus

Mine Production by Source Metal in 2021



Source: Metals Focus

## Appendix 15 - Nominal Silver Prices

Year	Average <sup>1</sup> US\$/oz	Low <sup>2</sup> US\$/oz	High <sup>2</sup> US\$/oz	€/kg <sup>3</sup>	CNY/kg <sup>4</sup>	INR/kg	JPY/g	A\$/oz	MXN/oz	PEN/oz
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	14.66	30.95	489.62	3,920.91	29,632	56.54	21.93	255.04	57.03
2011	35.12	26.09	49.80	809.49	6,496.25	52,523	89.92	34.00	437.00	96.70
2012	31.15	26.15	37.48	778.30	5,532.74	53,380	79.93	30.07	409.80	82.17
2013	23.79	18.22	32.46	576.50	4,132.84	44,480	74.25	24.58	303.63	64.32
2014	19.08	14.42	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	18.65	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
2021	25.14	21.42	30.10	682.61	4,608.13	59,729	88.66	33.46	509.90	97.66

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 <sup>1</sup> US\$/oz	Low <sup>2</sup> US\$/oz	High <sup>2</sup> US\$/oz	€/kg <sup>3</sup>	CNY/kg <sup>4</sup>	INR/kg <sup>5</sup>	JPY/g	A\$/oz	MXN/oz	PEN/oz
1990	10.07	8.23	11.15	227.04	2,379.63	22,643	24.83	12.70	166.68	n/a
1991	8.20	7.30	9.24	186.00	2,155.64	21,764	18.81	10.54	125.44	n/a
1992	7.75	7.17	8.52	165.40	2,040.98	23,363	17.04	10.83	111.79	n/a
1993	8.25	6.81	10.52	193.40	2,033.51	26,725	16.09	12.57	113.84	n/a
1994	9.84	8.46	11.08	226.66	2,990.31	29,840	18.08	13.94	141.62	30.69
1995	9.44	7.85	11.17	196.25	2,435.93	27,498	16.43	12.89	173.83	28.05
1996	9.14	7.03	10.34	197.86	2,240.98	27,551	18.88	12.02	161.07	27.21
1997	8.46	6.70	11.06	209.83	2,047.24	24,881	19.49	11.96	136.64	26.18
1998	9.42	7.48	13.49	239.88	2,330.10	28,096	23.66	15.74	150.59	30.85
1999	8.65	8.01	9.62	231.46	2,227.57	26,493	19.58	14.19	131.89	32.31
2000	7.94	6.46	9.61	247.59	2,105.22	25,207	17.69	14.13	113.73	30.48
2001	6.90	6.26	7.77	220.49	1,844.62	22,509	17.79	13.58	94.89	27.08
2002	7.09	6.52	7.93	215.34	1,956.83	23,398	19.35	13.22	97.80	28.14
2003	7.38	6.58	9.09	186.75	2,050.56	22,882	19.05	11.40	111.40	28.81
2004	9.75	7.99	12.38	226.50	2,694.19	29,304	24.24	13.45	151.20	37.27
2005	10.36	8.96	13.13	244.04	2,875.34	30,096	27.34	13.88	155.06	38.97
2006	15.96	11.80	21.03	372.71	4,548.90	46,135	45.29	21.47	235.65	60.44
2007	17.77	14.68	21.53	385.04	4,254.52	45,813	52.80	21.72	263.73	64.40
2008	19.88	11.22	28.32	391.38	3,997.37	49,106	52.09	23.10	283.13	63.19
2009	18.95	13.34	25.13	402.83	3,753.12	48,835	46.47	23.80	323.78	63.55
2010	25.69	18.65	39.36	572.69	5,069.42	56,752	59.89	27.45	399.20	80.39
2011	43.39	32.23	61.53	921.44	7,969.52	92,408	95.45	41.33	658.90	130.12
2012	37.82	31.76	45.51	866.73	6,615.37	85,916	85.03	35.77	596.61	107.72
2013	28.46	21.80	38.83	636.60	4,816.10	64,460	77.75	28.45	425.31	81.97
2014	22.65	17.13	26.34	509.79	3,909.40	50,827	66.10	24.06	341.69	66.88
2015	18.48	16.09	21.79	501.18	3,288.39	41,823	62.24	23.33	328.03	59.07
2016	19.79	15.87	24.41	543.07	3,604.12	45,671	60.59	25.40	408.16	66.25
2017	19.28	17.18	21.10	524.00	3,649.41	42,641	61.90	24.06	384.94	62.83
2018	17.43	15.42	19.65	453.18	3,295.33	39,600	55.95	22.33	343.90	57.09
2019	17.59	15.51	21.32	487.63	3,535.86	40,679	56.54	24.33	345.53	58.69
2020	21.99	12.46	31.96	603.57	4,194.10	50,816	70.90	30.77	473.94	76.44
2021	25.14	21.42	30.10	682.61	4,608.13	59,729	88.66	33.46	509.90	97.66

Based on respective countries' CPI. €/kg based on Eurozone CPI Index (Values until 1996 calculated using the Harmonized 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 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.

5: Indian prices were calculated based on the average CPI in the first nine months in 2021.

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 &amp; Comex Silver Prices

US\$/oz	LBMA <sup>1</sup>			Comex <sup>2</sup>		
	Year/Month	Low	High	Average	Low	High
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
2021	21.53	29.59	25.14	21.49	29.42	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
Mar-21	24.00	26.89	25.61	24.14	26.88	25.71
Apr-21	24.32	26.30	25.64	24.78	26.61	25.70
May-21	26.30	28.48	27.46	26.52	28.33	27.59
Jun-21	25.77	28.21	26.98	25.86	28.20	27.08
Jul-21	24.80	26.61	25.75	24.65	26.50	25.72
Aug-21	23.21	25.67	24.02	23.12	25.58	24.00
Sep-21	21.53	24.71	23.31	21.49	24.80	23.22
Oct-21	22.10	24.38	23.30	22.51	24.59	23.43
Nov-21	22.87	25.27	24.20	22.82	25.35	24.22
Dec-21	21.81	23.09	22.47	21.55	23.35	22.52
Jan-22	22.24	24.32	23.13	22.19	24.72	23.19
Feb-22	22.36	25.32	23.47	22.38	24.71	23.56

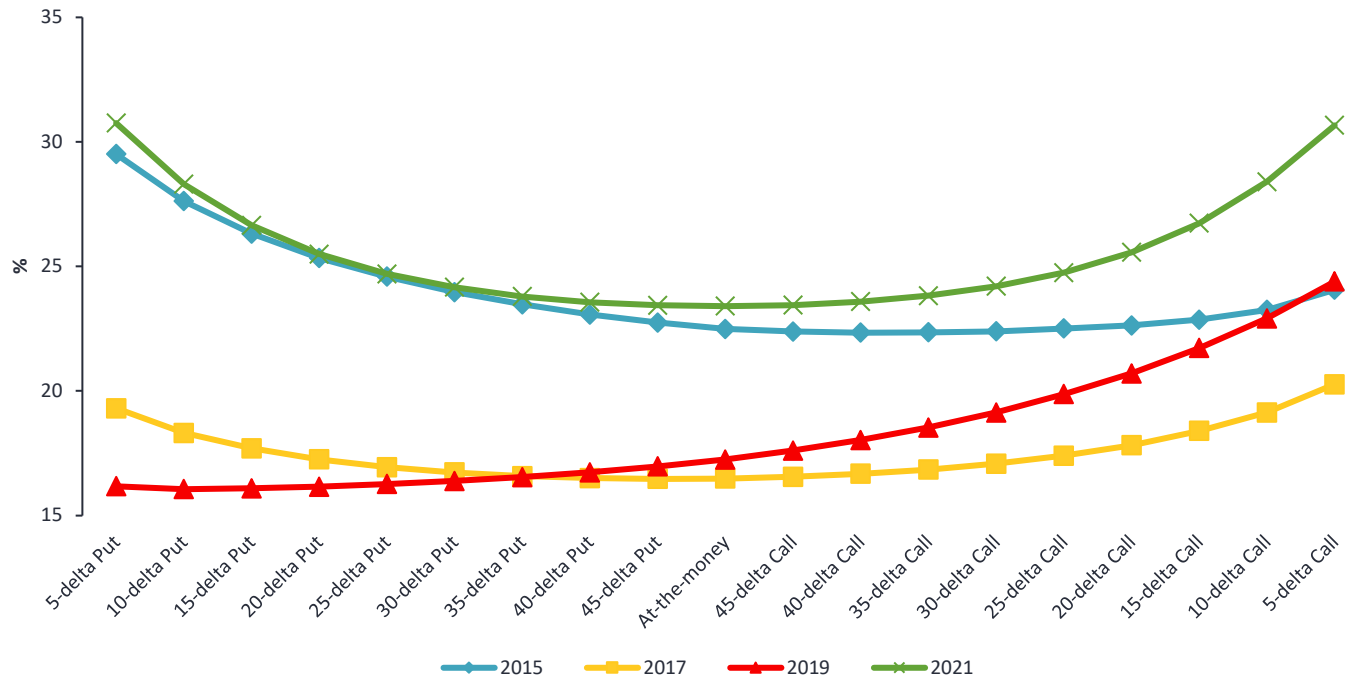
1: Prices are based on the daily London Silver Fixing and (since 08/15/2014) the daily LBMA Silver Price.

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

Source: LBMA, CME Group, Bloomberg



## Appendix 18 - - Year-End One-Month Silver Option Volatility Skew



Source: Bloomberg

## Appendix 19 - Comex Activity &amp; Inventories

Year/Month	Futures		Managed Money Positions in Comex Futures				Comex Inventories <sup>2</sup>
	Volume <sup>1</sup>	Open Interest <sup>2</sup>	Long <sup>2</sup>	Short <sup>2</sup>	Net <sup>2</sup>	Net Change <sup>3</sup>	
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
2021	98,348	701	252	165	87	-143	356
Jul-21	6,362	725	254	150	105	-60	354
Aug-21	8,469	705	245	184	61	-43	362
Sep-21	5,718	702	237	220	18	-44	361
Oct-21	5,922	710	263	118	146	128	353
Nov-21	9,404	690	244	107	138	-8	352
Dec-21	5,041	701	252	165	87	-50	356
Jan-22	6,446	753	258	121	137	50	354
Feb-22	8,008	753	234	105	128	-9	347

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 20 - LBMA Monthly Silver Trading Volumes

Moz	Spot	Swap & Forward	Option	Loan, Lease & Deposit	Total
<b>Month</b>					
Jan-21	6,150	3,210	578	304	10,241
Feb-21	6,805	3,173	342	351	10,672
Mar-21	6,221	2,746	215	381	9,561
Apr-21	4,550	2,041	155	310	7,056
May-21	6,562	2,697	584	384	10,228
Jun-21	4,992	2,494	761	349	8,596
Jul-21	4,788	2,237	222	331	7,578
Aug-21	5,181	2,784	602	438	9,004
Sep-21	4,167	1,672	214	388	6,441
Oct-21	4,191	2,012	221	420	6,844
Nov-21	5,160	2,500	305	534	8,498
Dec-21	3,685	1,598	91	338	5,711
Jan-22	4,824	2,846	295	542	8,508
Feb-22	3,032	1,708	137	371	5,247

Source: LBMA, Nasdaq, Bloomberg

## Appendix 21 - Chinese Silver Exchanges' Activity

Moz	Shanghai Gold Exchange		Shanghai Futures Exchange		
Year/Month	Ag (T +D) Volume <sup>1</sup>	Ag99.99 Volume <sup>1</sup>	Futures Volume <sup>1</sup>	Futures Open Interest <sup>2</sup>	SHFE Inventories <sup>2</sup>
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
2021	22,150	4.3	111,623	321	76
Jul-21	1,496	0.2	7,285	266	66
Aug-21	1,332	0.2	7,224	283	65
Sep-21	1,090	0.3	6,506	297	68
Oct-21	838	0.9	5,980	310	72
Nov-21	1,133	1.0	8,402	337	75
Dec-21	796	0.4	7,788	321	76
Jan-22	712	0.5	6,032	305	75
Feb-22	565	0.0	4,702	308	73

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

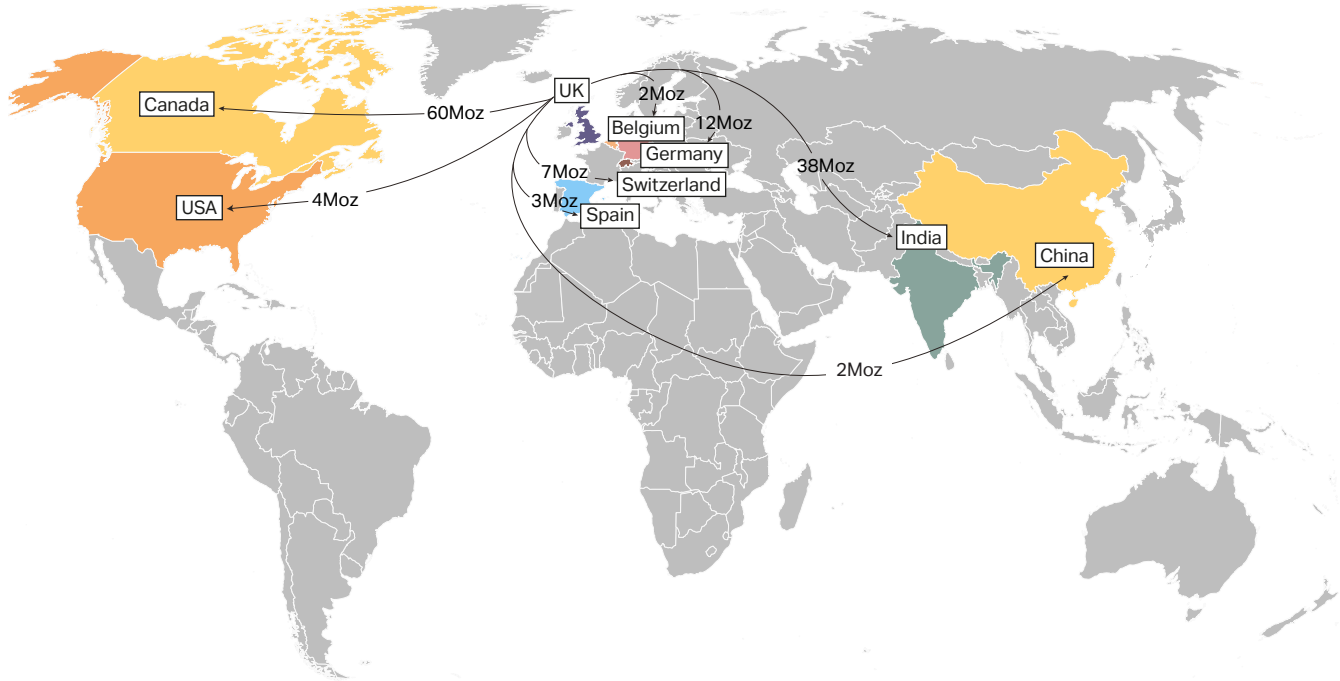
## Appendix 22 - Physically Backed Silver Exchange-Traded Product Holdings\*

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
2021	531	100	95	154	60	191	1,132	26,127
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
Mar-21	575	95	101	131	60	181	1,144	27,457
Apr-21	567	97	100	139	60	179	1,143	29,567
May-21	577	98	101	146	60	181	1,162	32,115
Jun-21	558	98	101	150	60	183	1,150	29,625
Jul-21	553	99	101	151	60	184	1,149	29,288
Aug-21	551	100	99	151	60	184	1,144	27,512
Sep-21	549	100	100	152	60	191	1,153	24,815
Oct-21	547	101	101	153	60	190	1,152	27,657
Nov-21	549	100	100	154	60	189	1,153	26,363
Dec-21	531	100	95	154	60	191	1,132	26,127
Jan-22	534	100	98	154	60	191	1,137	25,571
Feb-22	546	100	101	154	60	188	1,148	27,959

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

Source: Respective ETP providers, Bloomberg

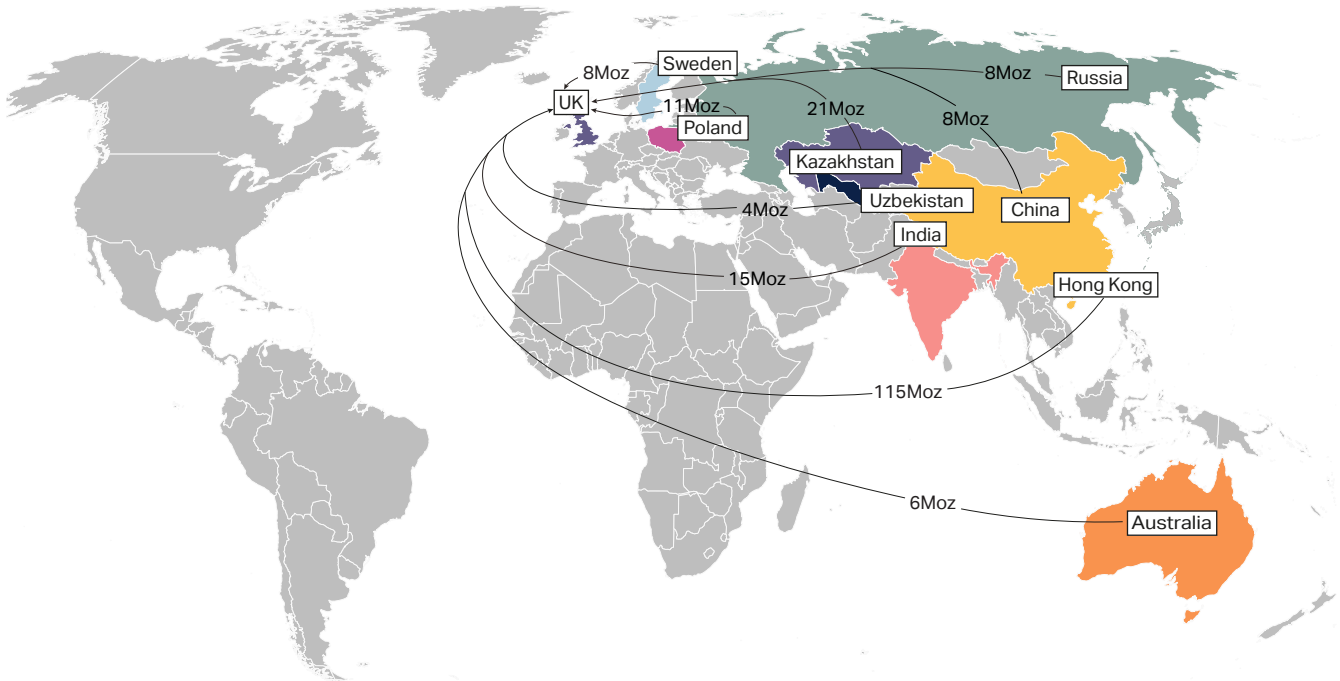
Appendix 23a - Selected United Kingdom Silver Bullion Exports in 2021



NB: In gross weight terms, exports shown account for 99% of total UK silver bullion exports in 2021

Source: HM Customs & Excise, Metals Focus

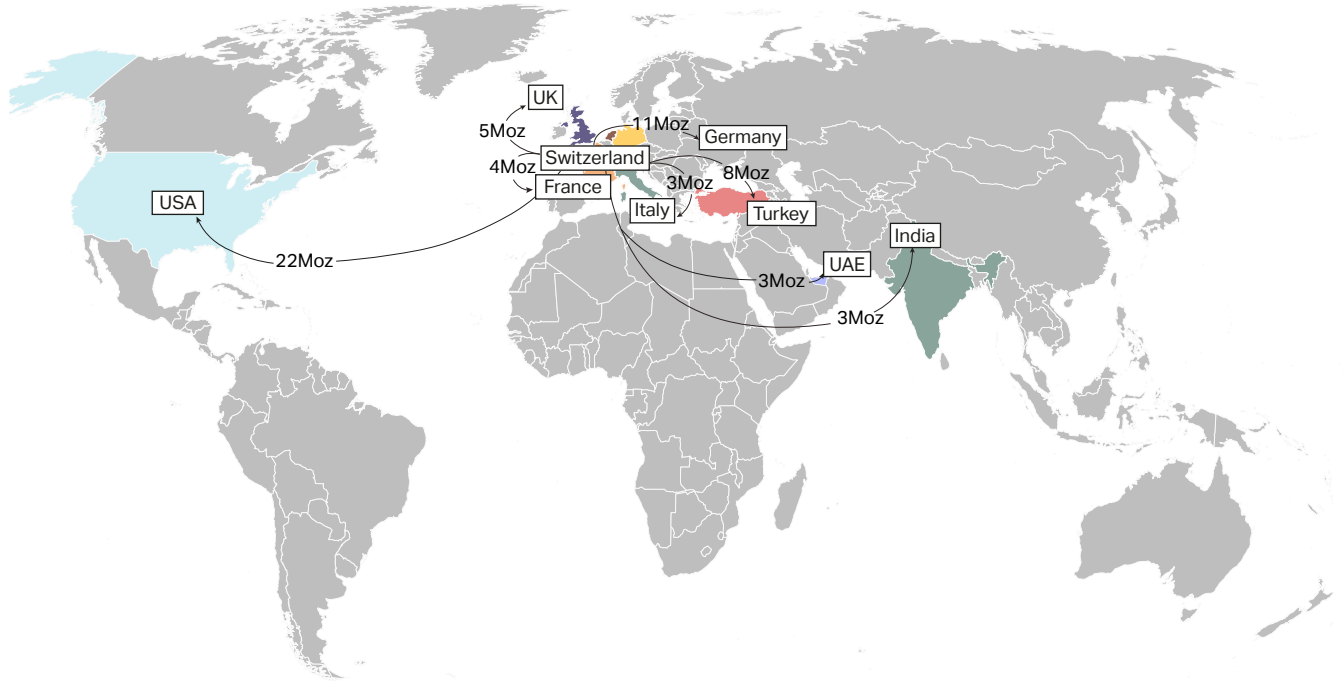
Appendix 23b - Selected United Kingdom Silver Bullion Imports in 2021



NB: In gross weight terms, imports shown account for 95% of total UK silver bullion imports in 2021

Source: HM Customs & Excise, Metals Focus

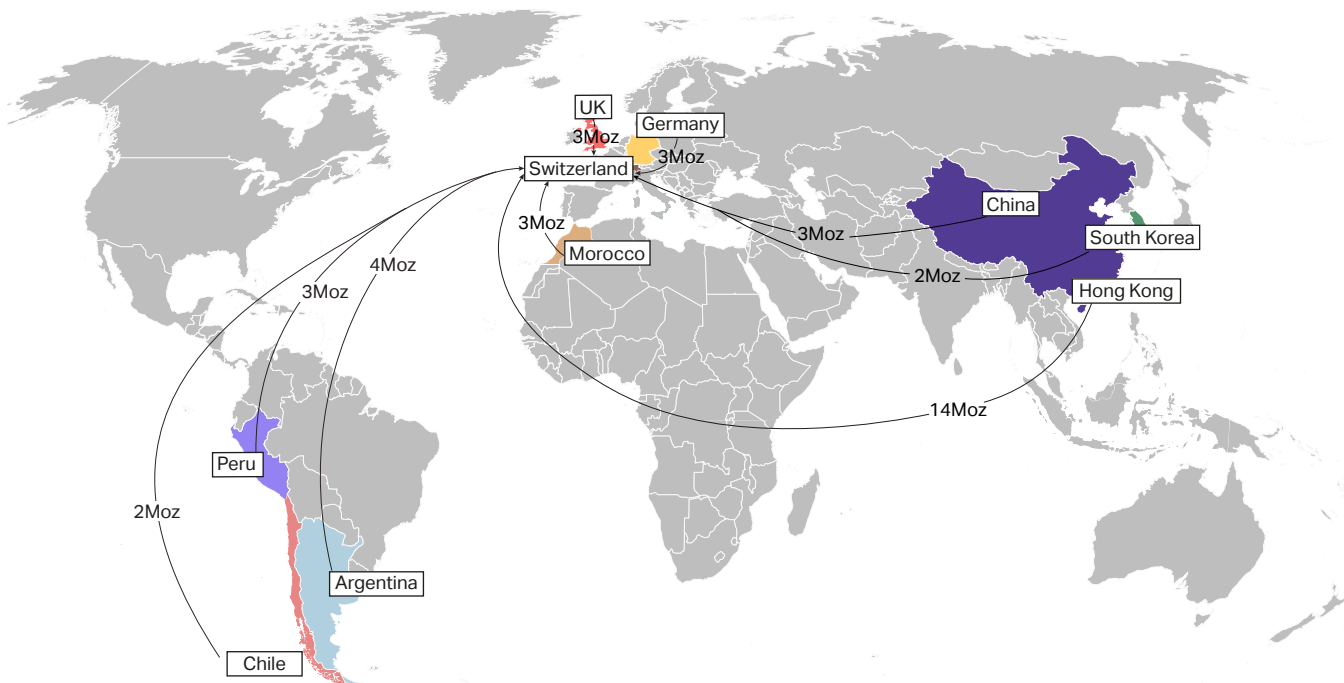
Appendix 24a - Selected Swiss Silver Bullion Exports in 2021



NB: In gross weight terms, exports shown account for 80% of total Swiss silver bullion exports in 2021

Source: Swiss Customs Administration, Metals Focus

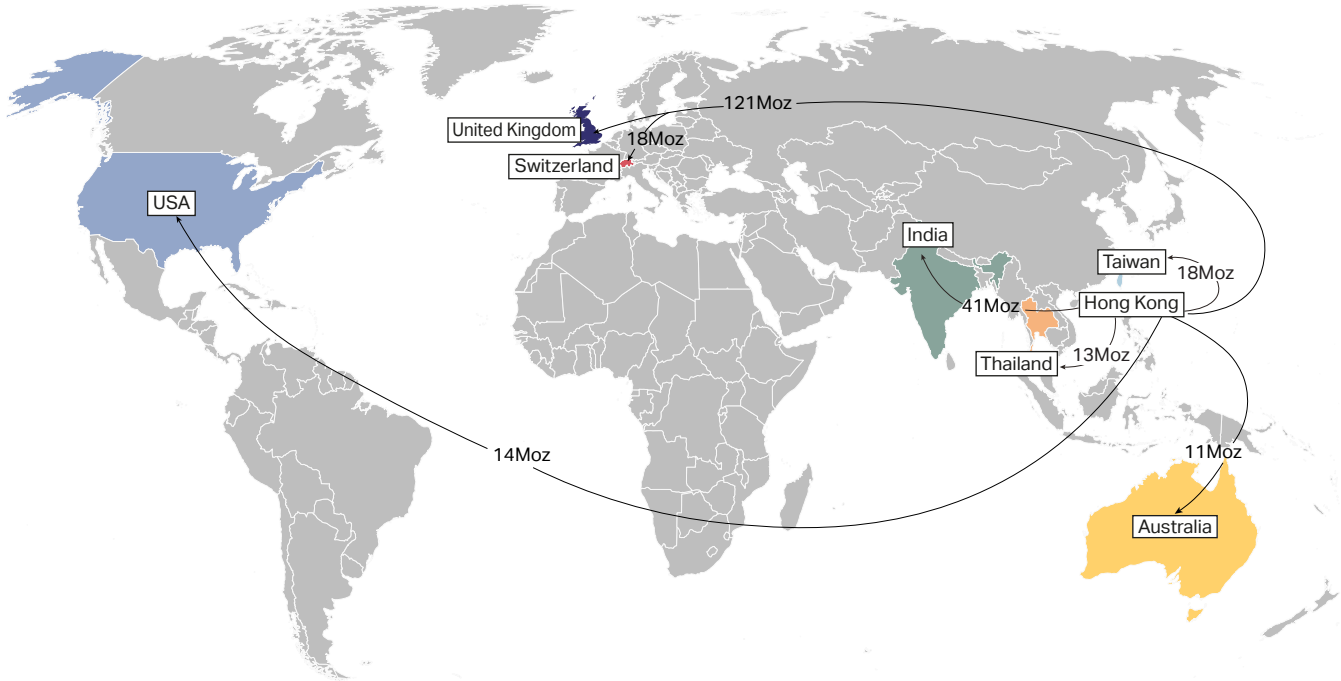
Appendix 24b - Selected Swiss Silver Bullion Imports in 2021



NB: In gross weight terms, imports shown account for 81% of total Swiss silver bullion imports in 2021

Source: Swiss Customs Administration, Metals Focus

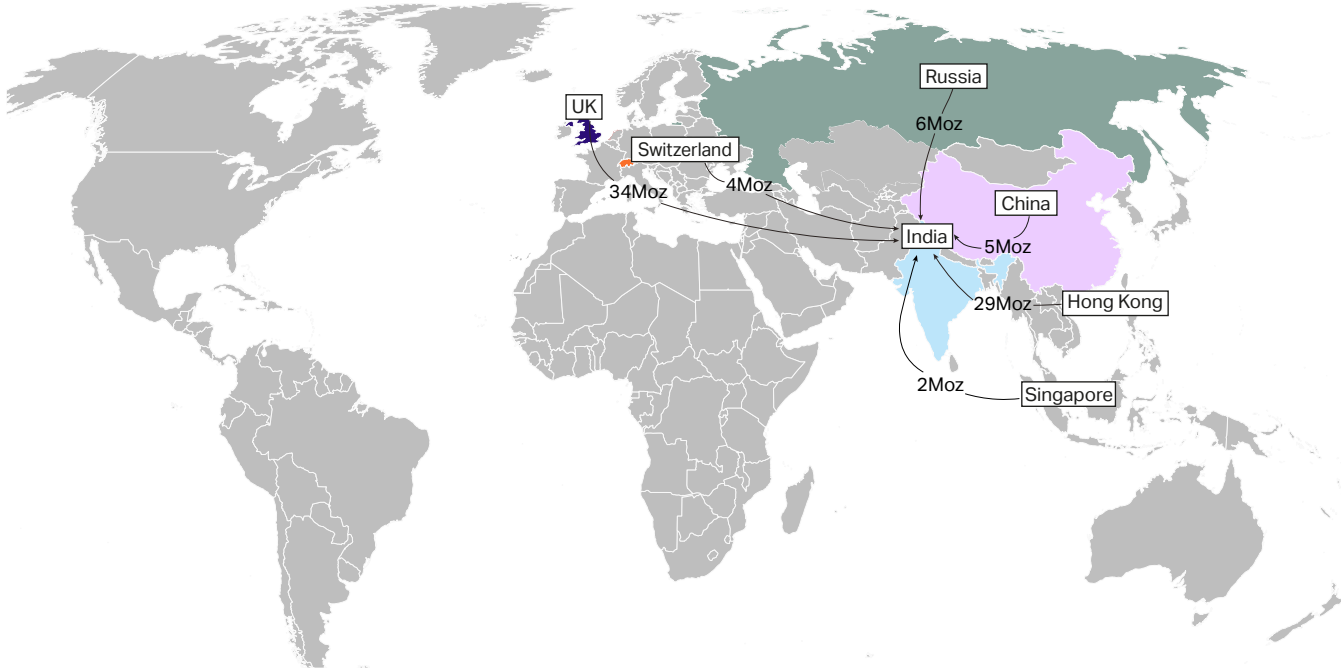
### Appendix 25 - Selected Hong Kong Silver Bullion Exports in 2021



NB: In gross weight terms, exports shown account for 92% of total Hong Kong silver bullion exports in 2021

Source: Hong Kong Census & Statistics Department, Metals Focus

### Appendix 26 - Selected Indian Silver Bullion Imports in 2021

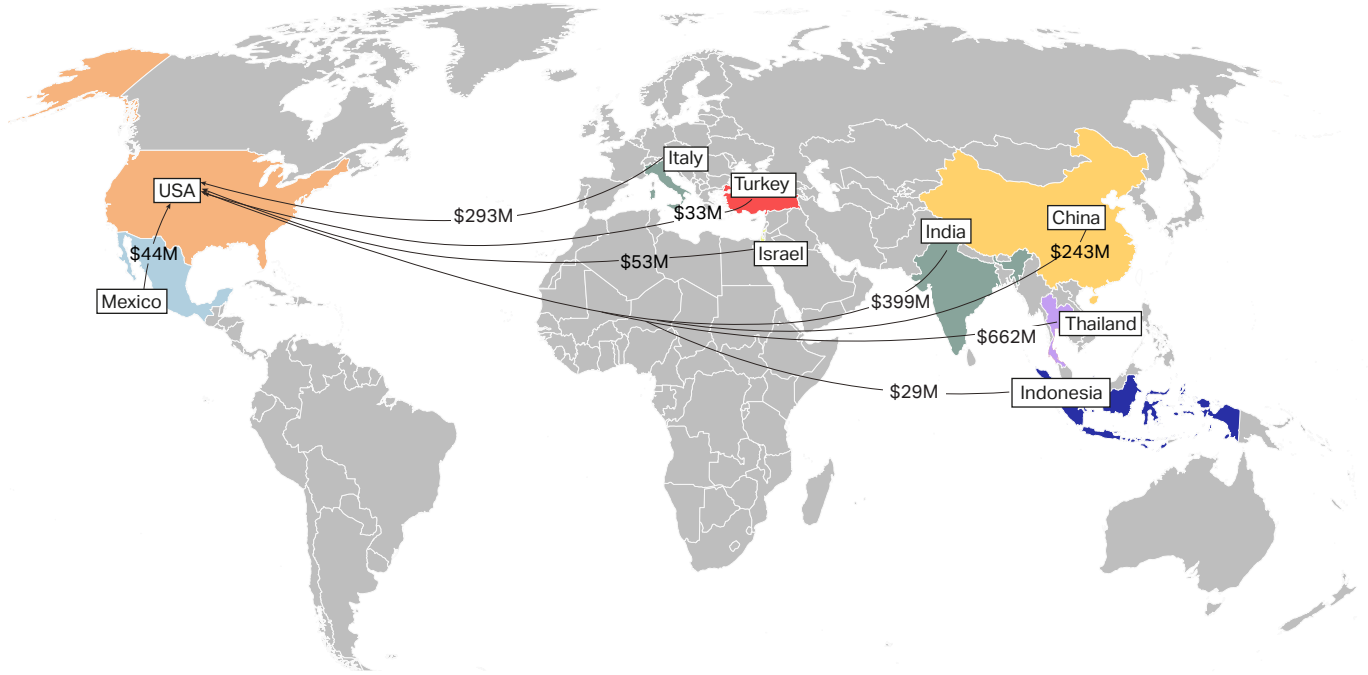


NB: In gross weight terms, imports shown account for 90% of total Indian silver bullion imports in 2021

Source: Ministry of Commerce, Metals Focus



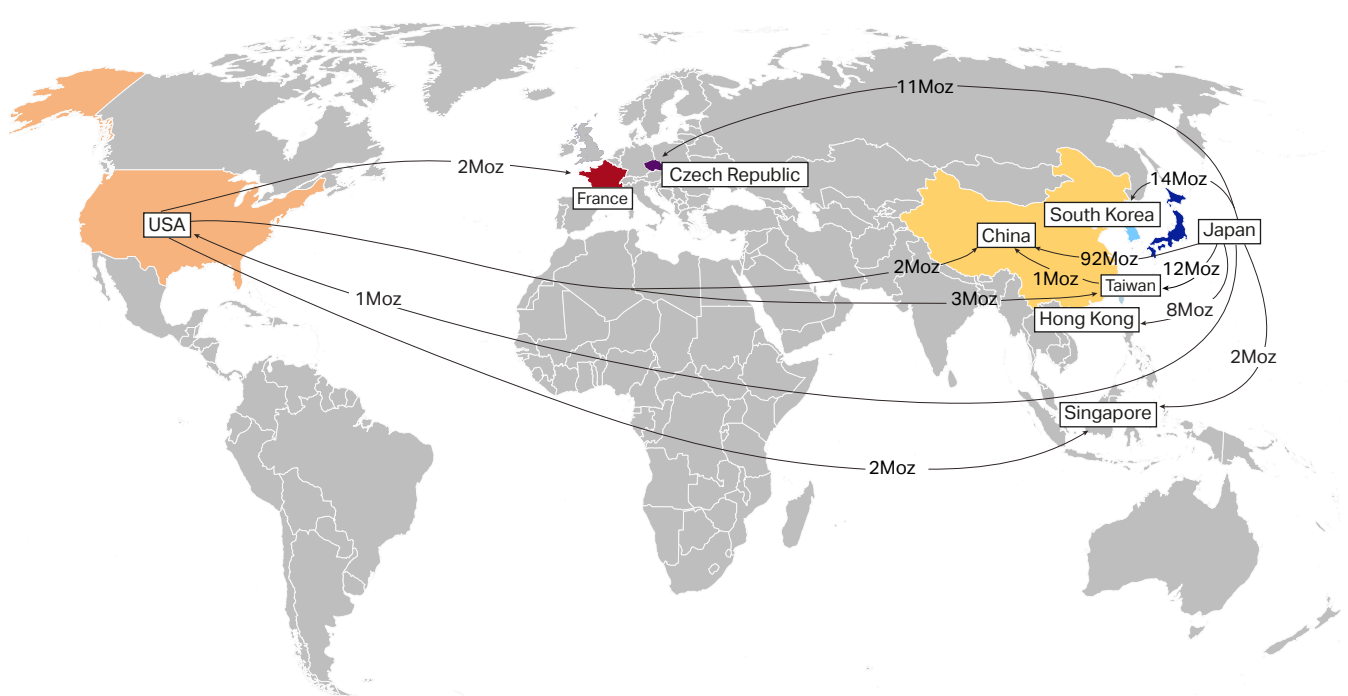
Appendix 27 - Value of Selected US Silver Jewelry Imports in 2021



NB: Imports shown represent around 91% of the total value of US silver jewelry imports in 2021

Source: Various

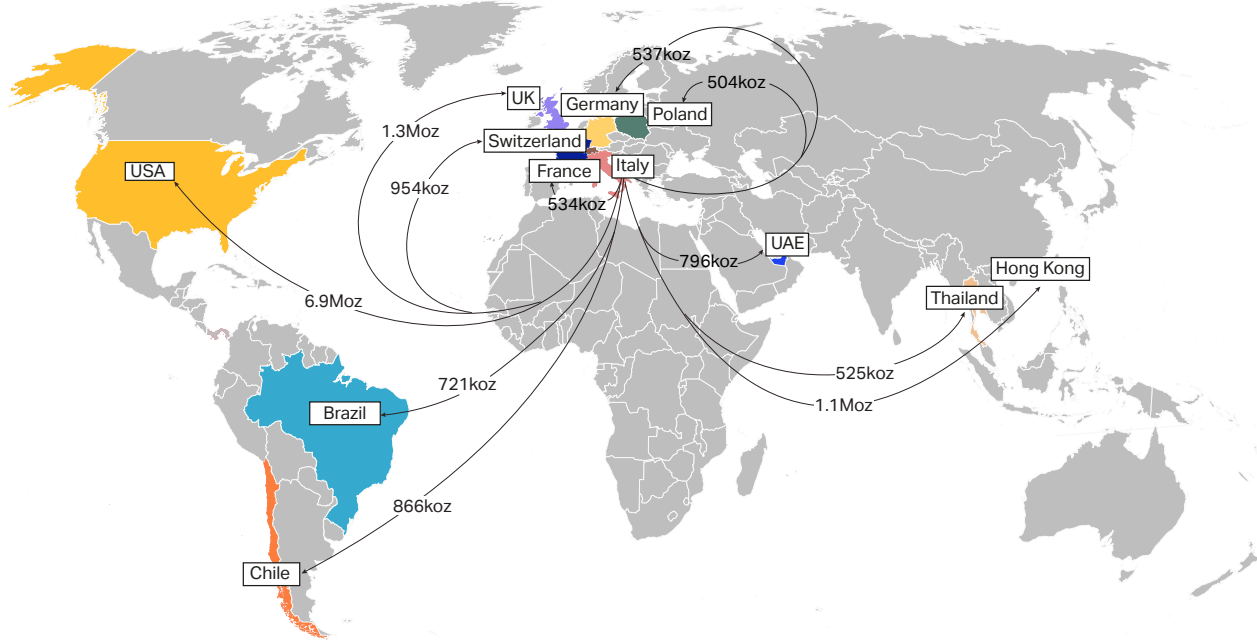
Appendix 28 - Selected Silver Powder Trade Flows in 2021



NB: Figures stated represent reported gross volumes of material shipped

Source: Various, Metals Focus

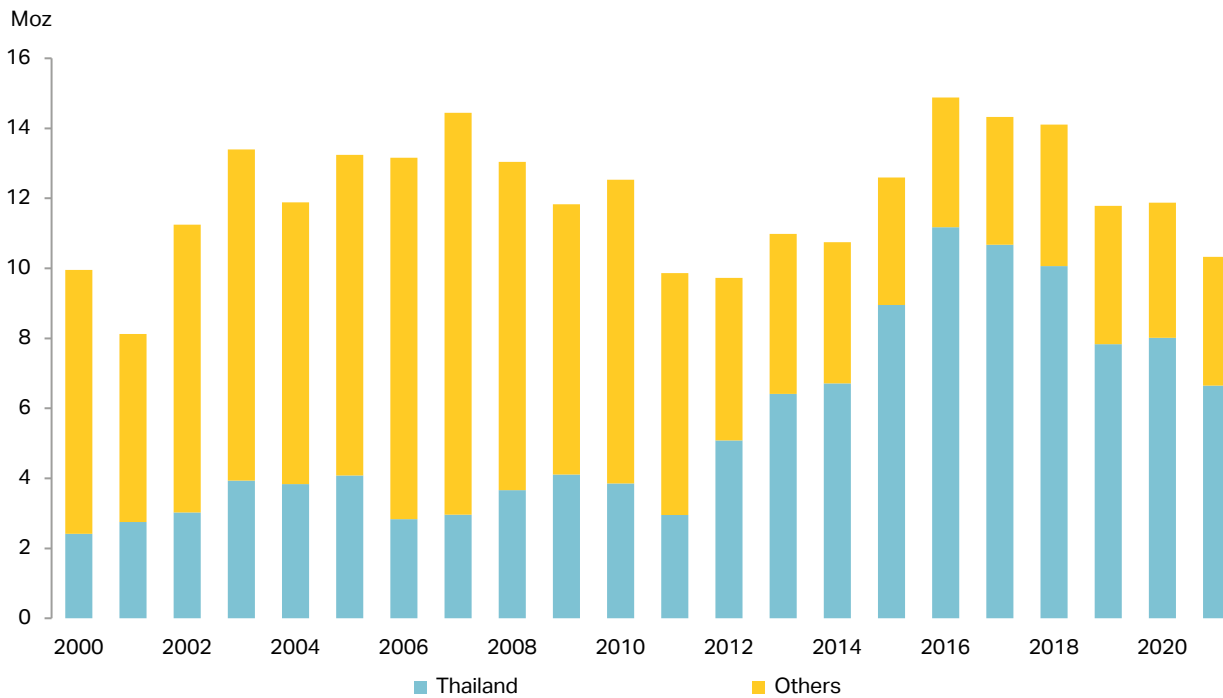
### Appendix 29 - Selected Italian Silver Jewelry Exports in 2021



NB: In gross weight terms, excluding re-exports. Shipments shown account for 76% of total Italian silver jewelry exports in 2021.

Source: Metals Focus, S&P Global

### Appendix 30 - German Silver Jewelry Imports



NB: In gross weight terms

Source: Metals Focus, S&P Global