

# World Silver Survey 2024



  
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With a global footprint and over 60 years of experience in the precious metals industry, MKS PAMP – part of the MKS PAMP Group – is dedicated to creating a sustainable future with precious metals products and services. The company provides financial and physical trading services and operates a state-of-the-art precious metals refinery and mint in Switzerland. As an industry leader, MKS PAMP offers the world's most extensive range of durable, innovative and responsibly sourced precious metal products and services. The company builds on leading artisan savoir-faire and Swiss engineering to manufacture a wide range of products in all four precious metals and in various forms, and provides precious metals services such as trading, refining, vaulting and storage, treasury and mine financing.

Still managed by the founding family, MKS PAMP is an advocate for long-term thinking, responsible sourcing, sustainability and ethics, working closely with its stakeholders to set the highest codes of conduct in the industry. MKS PAMP developed Provenance, a traceability solution that utilizes blockchain to trace precious metals along the supply chain and guarantee responsible sourcing globally. To further its long-term commitment to environmental sustainability, MKS PAMP announced its SBTi-validated targets for 2030, for scope 1, 2 and 3. MKS PAMP aims to create value by leveraging its technical expertise, innovations and global infrastructure to be an indispensable global partner and the most sustainable organization in the industry.



# MKS PAMP

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Dear Reader,

The Silver Institute has published the World Silver Survey since 1990. The purpose then, as now, is to provide market participants and observers a comprehensive look at the global silver market during the preceding year, with an in-depth look at the various components of silver demand and the areas that contribute to supplying the market with the white metal. Over the past 34 years, the World Silver Survey has been a trusted source of information about the broader silver market, widely quoted and referenced by industry, governments, media, and others.

Undertaking research and producing a report of this caliber takes a skilled and experienced team of professionals. Metals Focus, a leading precious metals consultancy, independently researched and produced this year's edition of the World Silver Survey; this is the fifth edition Metals Focus has produced for us. Metals Focus has over 30 staff and consultants in eight locations worldwide and has high-level contacts in virtually all aspects of the silver industry. Their team's breadth and depth make them uniquely qualified to produce this report.

This is my second stint as Chair of the Silver Institute. I pursued a second term for four reasons: First, I strongly believe in the Silver Institute's mission of providing reliable information on the silver market with not only this World Silver Survey, but also our Silver News, Market Trend Reports, which are in-depth reports on subjects about silver, and presentations at conferences around the world.

Second, silver is an essential and critical metal for the future, especially in green energy applications. Globally, solar is the fastest growing of all sources of renewable energy with about 440 GW installed in 2023. Because silver is a key component in a photovoltaic cell, this is one of the fastest growing uses of silver.

Third, when I was last chair of the Silver Institute, investors had limited interest in silver. Since then, investment demand has grown multifold to all-time highs with investors around the world recognizing the unique value of silver, not just as an essential metal, but as a safe haven and a store of value.

Fourth, given the supply-demand fundamentals, I believe that the silver price has a strong base and over time will be higher, probably significantly higher.

I want to thank all our member companies and sponsors of the 2024 edition of the World Silver Survey for their financial support, which made this publication possible. We are grateful for your generosity and leadership.

We hope that you find this report both interesting and beneficial.

A handwritten signature in blue ink, appearing to read 'P. Baker', with a long horizontal line extending to the right.

Phillips S. Baker Jr.  
Chair of the Silver Institute  
President and CEO of Hecla Mining Company

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## Coeur Mining, Inc.



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 exploration project in British Columbia.

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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 eight operating mines, all of them in Mexico - Fresnillo, Saucito, Juanicipio, Ciénega, Herradura, Soledad-Dipolos<sup>1</sup>, Noche Buena and San Julián (Veins and Disseminated Ore Body) and four advanced exploration projects - Orisyvo, Rodeo, Guanajuato and Tajitos as well as a number of other long term exploration prospects. Fresnillo plc has mining concessions and exploration projects in Mexico, Peru and Chile. Fresnillo plc'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 is a leading producer of silver and gold in the Americas, operating mines in Canada, Mexico, Peru, Brazil, Bolivia, Chile and Argentina. We also own the Escobal mine in Guatemala that is currently not operating, and we hold interests in exploration and development projects. We have been operating in the Americas for three decades, 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 the New York Stock Exchange and the Toronto Stock Exchange under the symbol "PAAS".

In 2023, Pan American produced 20.4 million ounces of silver and 882.9 thousand ounces of gold. As at June 30, 2023, proven and probable silver mineral reserves were approximately 486.8 million ounces and proven and probable gold mineral reserves were approximately 7.7 million ounces.

Learn more at [panamericansilver.com](https://panamericansilver.com).

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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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This is the thirty-fourth annual edition of the World Silver Survey produced for The Silver Institute. World Silver Survey 2024 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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# Chapter 1

- The silver market in 2023 saw a deficit for a third year in a row and, while down 30%, it was still large at 184.3Moz (5,732t).
- The ongoing deficit conditions was a product of subdued supply plus robust industrial offtake, which helped offset losses in other demand areas.
- Despite that, prices were rangebound for much of 2023 and, even if the annual average was up 7%, silver underperformed gold. The latter benefited from clearer safe haven interest while silver was hurt by broader industrial metal weakness.

## Summary

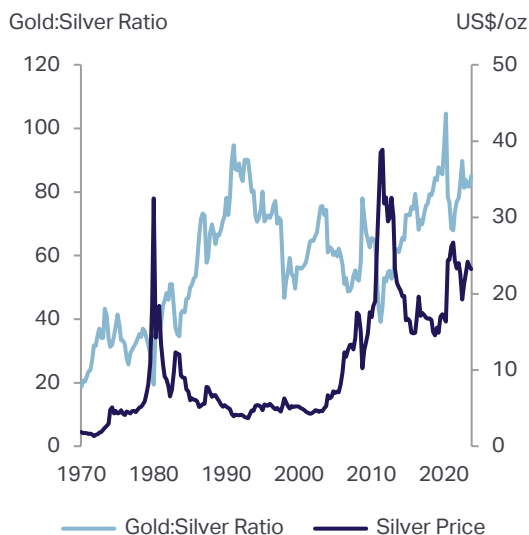
### Introduction

For yet another year and the third in a row now, silver demand massively exceeded supply in 2023. While the global market deficit fell by 30% y/y from last year's likely all-time-high, at 184.3Moz (5,732t) it was still one of the largest figures on record. Crucially, last year's deficit coincided with a year in which we experienced sharp declines in bar and coin investment, jewelry and silverware demand that meant global silver offtake fell overall year-on-year. The silver market's deficit conditions have so far been resilient to pressures from the weaker price elastic elements of demand.

Underpinning silver's fundamentals is robust demand from industrial applications. These continued to push higher last year, reaching a new all-time record, fueled by the remarkable rise in solar demand and in spite of stagnation in some other sectors. Sluggish silver supply, owing to the slight decline in global mine production, was another factor contributing to silver's deficit conditions last year.

Importantly, we remain confident that such deficit conditions will remain in place for the foreseeable future. As we discuss in detail in Chapter 2, our projections for 2024 see the gap between supply and demand grow by 17%, thanks to ongoing growth in industrial demand, a recovery in jewelry and silverware and still stagnant supply from both mine production and recycling. With further gains in industrial demand likely in the medium term and no obvious sources of supply growth, we believe the status quo will continue.

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



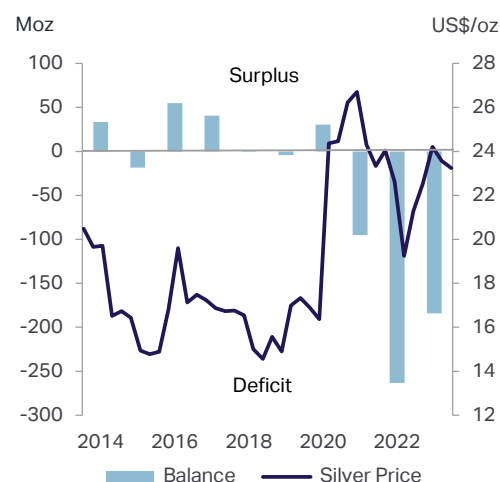
\* Quarterly averages  
Source: Bloomberg

So far, silver's strong physical market conditions have done little to support its price. Although the average rose by 7% y/y in 2023, the price moved sideways in general over the year. It has also been arguably disappointing that silver has failed to outperform gold during the recent rallies in the latter metal through to all-time highs. After all silver has often been seen as a high beta version of gold. Yet as the yellow metal rallied by over 20% from its October trough through to end-March, the gold:silver ratio in fact inched up and was trading at a historically high level around 90:1.

In our view, the key challenge silver has been facing are still high above-ground inventories. As the data in the last focus box of Chapter 3 shows, stocks held in London and exchange-registered vaults amounted to nearly 15 months of global supply at end-2023 and there are bullion inventories also held elsewhere. This has prevented a physical squeeze from emerging in the market, in spite of the robust supply-demand conditions discussed above.

In turn, this has continued to place the fate of the silver price in the hands of institutional investors. While the macroeconomic backdrop has turned

## Market Balance



Source: Metals Focus, Bloomberg

positive for precious metals, the focus has centered on gold, owing to its clearer quasi-monetary attributes, wider acceptance as a safe haven and central banks' strong interest in the metal. Furthermore, even if silver's actual industrial demand is robust, investor enthusiasm in the broader industrial metals complex has been cooled by a sputtering Chinese economy. Lastly, rangebound silver prices have encouraged more speculative investors to seek out buoyant alternatives, such as certain tech stocks and bitcoin.

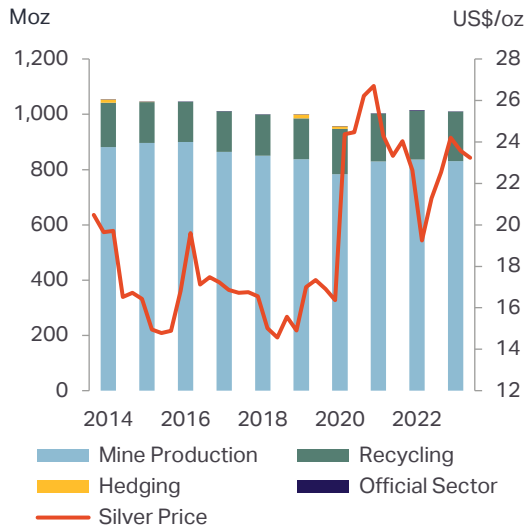
Still, stocks for the time being may seem plentiful but inventories are by definition finite. In time, the continued deficits will see them get drawn down and eventually the market will tighten. Already this is starting to happen in specific markets to an extent. This is most notable in China where in recent years we have typically seen massive local oversupply, huge exports and local silver prices trading at a deep discount to London. Since late 2023, we have seen discounts ease and most recently turn into small premiums, and exports come under pressure. While it may not happen immediately, silver prices will thus sooner or later have their time to shine.

## Silver Supply and Demand

Million ounces	Year on Year											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024F	2023	2024F
<b>Supply</b>												
Mine Production	896.8	899.8	863.6	850.6	837.2	783.4	829.0	836.7	830.5	823.5	-1%	-1%
Recycling	147.0	145.7	147.2	148.7	148.2	164.3	173.7	176.9	178.6	178.9	1%	0%
Net Hedging Supply	2.2	0.0	0.0	0.0	13.9	8.5	0.0	0.0	0.0	0.0	na	na
Net Official Sector Sales	1.1	1.1	1.0	1.2	1.0	1.2	1.5	1.7	1.6	1.5	-6%	-9%
<b>Total Supply</b>	<b>1,047.0</b>	<b>1,046.5</b>	<b>1,011.8</b>	<b>1,000.5</b>	<b>1,000.3</b>	<b>957.4</b>	<b>1,004.3</b>	<b>1,015.4</b>	<b>1,010.7</b>	<b>1,003.8</b>	<b>-0.5%</b>	<b>-1%</b>
<b>Demand</b>												
Industrial (total)	457.1	489.5	526.4	524.2	523.5	509.7	561.3	588.3	654.4	710.9	11%	9%
Electrical & Electronics	272.3	308.9	339.7	331.0	327.3	322.0	351.2	371.3	445.1	485.6	20%	9%
...of which photovoltaics	59.6	81.6	99.3	87.0	74.9	82.8	88.9	118.1	193.5	232.0	64%	20%
Brazing Alloys & Solders	51.1	49.1	50.9	52.0	52.4	47.5	50.5	49.2	50.2	51.8	2%	3%
Other Industrial	133.7	131.5	135.8	141.2	143.8	140.2	159.6	167.8	159.0	173.5	-5%	9%
Photography	38.2	34.7	32.4	31.4	30.7	26.9	27.7	27.5	27.0	26.1	-2%	-3%
Jewelry	202.5	189.1	196.2	203.2	201.6	150.9	182.0	234.5	203.1	211.3	-13%	4%
Silverware	58.3	53.5	59.4	67.1	61.3	31.2	40.7	73.5	55.2	58.8	-25%	7%
Net Physical Investment	309.3	212.9	155.8	165.9	187.4	208.1	284.3	337.1	243.1	212.0	-28%	-13%
Net Hedging Demand	0.0	12.0	1.1	7.4	0.0	0.0	3.5	17.9	12.2	0.0	-32%	na
<b>Total Demand</b>	<b>1,065.4</b>	<b>991.8</b>	<b>971.3</b>	<b>999.2</b>	<b>1,004.4</b>	<b>926.8</b>	<b>1,099.6</b>	<b>1,278.9</b>	<b>1,195.0</b>	<b>1,219.1</b>	<b>-7%</b>	<b>2%</b>
<b>Market Balance</b>												
Net Investment in ETPs	-17.1	53.9	7.2	-21.4	83.3	331.1	64.9	-125.8	-42.1	50.0	-67%	na
<b>Market Balance less ETPs</b>	<b>-1.3</b>	<b>0.8</b>	<b>33.3</b>	<b>22.7</b>	<b>-87.4</b>	<b>-300.5</b>	<b>-160.3</b>	<b>-137.7</b>	<b>-142.2</b>	<b>-265.3</b>	<b>3%</b>	<b>87%</b>
Silver Price (US\$/oz, London price)	15.68	17.14	17.05	15.71	16.21	20.55	25.14	21.73	23.35	-	7%	na

Source: Metals Focus

## Global Supply



Source: Metals Focus, Bloomberg

## Silver Supply in 2023

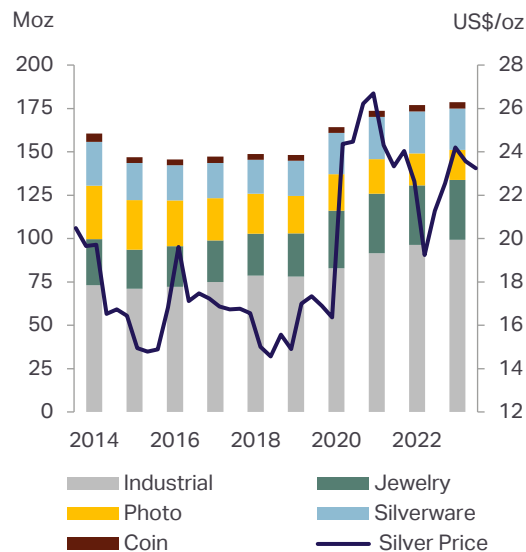
Global **mine production** fell by 1% y/y to 830.5Moz (25,830t) in 2023. Output was significantly affected by the four month suspension of operations at Newmont’s Peñasquito in Mexico following strike action. This was compounded by a drop in production from Argentina due to the processing of lower ore grades at some mines and the closure of Pan American Silver’s Manantial Espejo mine. Primary silver production slipped to 235.2Moz (7,316t) last year. Supply from lead/zinc and copper mines rose by 1.0% to 255.8Moz (7,957t) and 3.9% to 221.4Moz (6,885t) respectively. Output from gold mines dropped by 12.2% in 2023 to 113.8Moz (3,540t) following the Peñasquito suspension.

The strike action at Peñasquito underpinned the first drop in Mexico’s output since 2020, which fell by 5% y/y to 202.2Moz (6,290t). In addition, lower ore grades and some mine closures negatively impacted production in Argentina (-4.9Moz, 152t), Australia (-3.1Moz, 95t) and Russia (-1.4Moz, 43t). However, these losses were somewhat mitigated by increased supply from Chile (+10.1Moz, 314t) as Kinross’ La Coipa continues to ramp-up and output from lead/zinc operations in Bolivia rose (+3.8Moz, 119t).

If only by a marginal 1%, 2023 saw **recycling** grow for a fourth consecutive year to a 10-year high of 178.6Moz (5,556t). Much like 2022, the industrial sector was the primary driver of volumes, which in turn was due to growth in the recycling of ethylene oxide (EO) catalysts. Jewelry scrap also rose, mainly due to record high silver prices in India. Similarly, the niche of coin scrap grew (by 3%). In contrast, photographic recycling saw its structural losses extend for another year (-7%) while silverware scrap contracted by 2%.

After a healthy rise in 2022, net supply from the **official sector** fell by 6% in 2023. Nonetheless, absolute volumes remained trivial at just 1.6Moz (51t).

## Global Recycling, by Source



Source: Metals Focus, Bloomberg

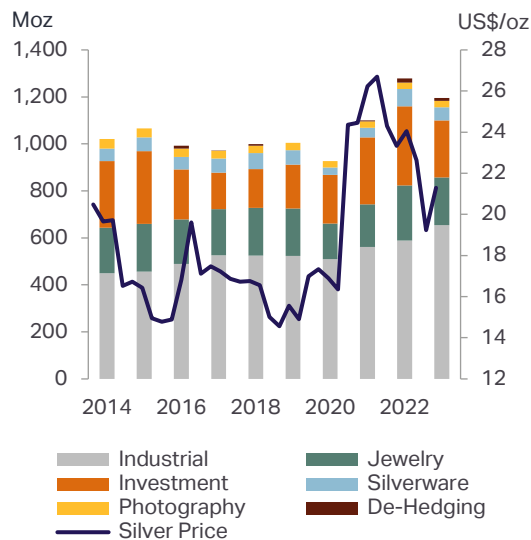
## Silver Demand in 2023

Following a record 2022, total demand saw a fall in 2023 of 7% to 1,195Moz (37,169t). This was still 9% up on the next highest total in our series. The drop was mainly led by the price sensitive sectors of physical investment, jewelry and silverware while photography saw further structural losses. In sharp contrast, the industrial sector posted another record high.

Offtake from the **industrial** sector achieved a record high last year, rising 11% to 654.4Moz (20,353t). Much like 2022, ongoing structural gains from green economy applications underpinned these gains, mainly the photovoltaic (PV) sector. Higher than expected PV capacity additions, combined with a faster adoption of new generation cells, raised electronics & electrical demand by a significant 20%. While other green-related applications, including power grid construction and automotive electrification also contributed, some



## Global Demand



Source: Metals Focus, Bloomberg

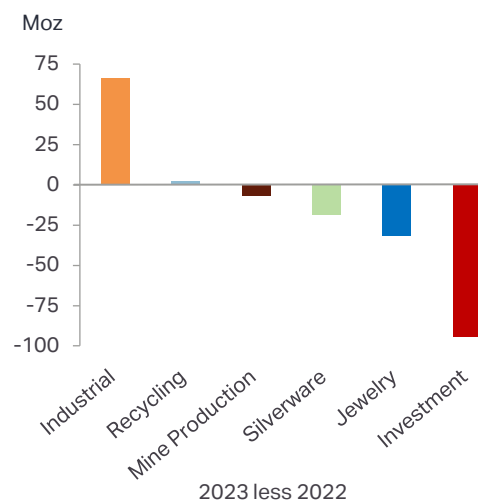
fields, such as consumer electronics, were weighed down by macroeconomic challenges and elevated inventories. Demand for silver in our other industrial category also remained healthy due mainly to capacity expansions in the EO sector, while growth in brazing alloys was marginal at best. The overall total was also helped by limited thrifting and substitution as silver remains irreplaceable in many end-uses. The biggest increase during 2023 was in China (+44%), which raised the East Asian total by 25%. Some of this was offset by one-off negatives in Europe and by Indian losses.

**Photographic** demand’s structural decline continued last year, leaving offtake at just 27.0Moz (840t). The main driver was the impact of digitization on emerging market medical demand. The slide for the total, however, slowed to just 2%, chiefly as consumer film sales rose (if from a low base).

After a record high in 2022, silver **jewelry** fabrication fell by 13% in 2023 to 203.1Moz (6,318t). The losses were concentrated in India where demand eased after reaching its highest ever total in 2022. On top of destocking, this reflected the impact of record high rupee prices on consumer buying due to the bullion import duty hike and currency depreciation. Excluding India, losses were far more modest at just 3%. This in turn was mainly down to the weakness of US and European jewelry consumption (due to such drivers as cost-of-living issues) plus destocking by retailers. This also hurt fabrication by exporters in East Asia (such as Thailand). Lastly, Chinese demand was hit by poor consumer sentiment and competition from gold jewelry.

Witnessing a far bigger decline than jewelry, **silverware** demand in 2023 fell by 25% to 55.2Moz (1,717t). This was mostly a reflection of an elevated base in 2022 when fabrication achieved a record high. As with jewelry, losses here were almost entirely due to South Asia, particularly India owing to high local silver prices.

## Supply/Demand Swings by Sector



Source: Metals Focus

After five consecutive annual gains, **physical investment** fell by almost a third last year to a three-year low of 243.1Moz (7,562t). While all major markets saw losses, the decline was particularly acute in Germany (-73%) following the VAT increase at the start of 2023. Most other western markets also saw steep declines due to such factors as cost-of-living issues and rangebound prices. However, one partial exception was the US where losses were smaller at 13% due in part to Q1’s local bank failures. This kept the US total at the sixth highest on record. Elsewhere, physical investment in India was down a hefty 38% as record high rupee silver prices led to profit-taking, while fresh investors had only limited windows for bargain hunting. The growing popularity of ETPs also undermined physical investment in the country.

The global delta-adjusted producer **hedge** book fell by 12.2Moz (379t) y/y to a multi-decade low of 8.0Moz (250t). Only two producers added to their hedge books during the year, with others preferring not to replace expired contracts.

# Chapter 2

- The likely easing of US monetary policy is expected to drive a notable rally in precious metal prices, although short-term downside risks persist.
- Silver will benefit from this, but major price gains and a narrowing of the gold:silver ratio may have to wait until tightness in physical silver markets develop.
- Silver’s market deficit is expected to grow by 17% in 2024 as supply stagnates and industrial demand posts another record. Deficits should also continue, depleting currently ample inventories.

## Market Outlook

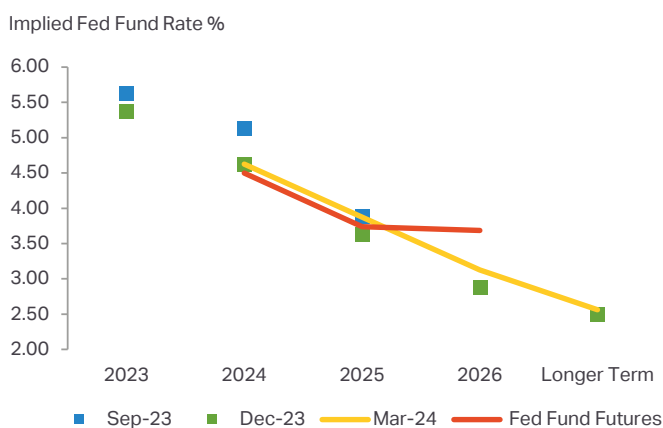
### Introduction

In contrast to China (whose prospects still unnerve many investors) and Germany (which slipped into recession last year), the past few months have been extremely positive for the US economy and its equity markets. Inflation has been tapering, albeit slowly, unemployment has kept to low levels, job creation has been robust and economic data prints more generally have been painting a picture of a booming economy. Meanwhile, equities have been rallying at a breath-taking pace. The S&P 500 has broken through a series of all-time highs, boosted by euphoria towards the tech sector, decent Q4 earnings and optimism towards the economy.

Expectations of US interest rate cuts have also been supportive. After undertaking the most aggressive rate hiking cycle in recent history in both speed and magnitude in 2022 and 2023, the Fed has kept policy interest rates unchanged since last July. At the time of writing in late March, consensus expectations (for instance rates implied by Fed Funds Futures) are almost perfectly aligned with FOMC guidance (based on the latest “dot plot” and Fed officials’ comments). They all point to three interest rate cuts in the second half of the year, with a target upper bound rate of 4.75%.

All this matters for silver and the wider precious metals complex. The above conditions have fueled an impressive rally in the gold price, through a series of all-time highs, that has also boosted silver. Diversification flows, the kindling of speculative interest in the space and a starting point of light

### Interest Rate Expectations & the Fed’s Dot Plot



N.B. The red line denotes rates for each year-end as implied by Fed fund futures on March 22nd 2024. The squares and the gold line denote expectations of median interest rates for each year-end basis the Fed dot plot from the meeting held in each listed month.

Source: Bloomberg



## Gold, Silver & Copper Prices



Source: Bloomberg, Metals Focus

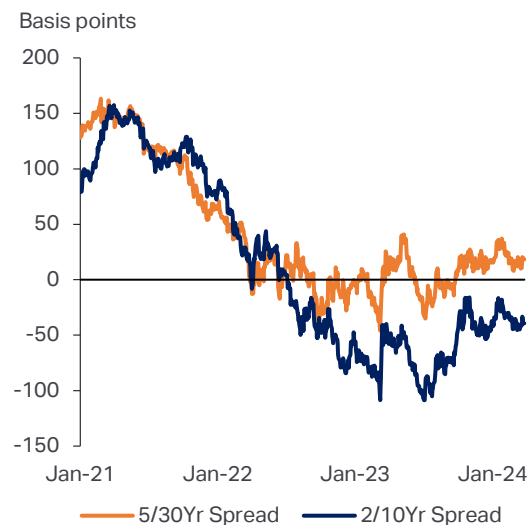
positioning (as hedge fund and CTA involvement had been limited until very recently) have all been supportive of precious metals in recent months.

While silver's absolute performance has been decent, it has been arguably disappointing relative to gold. With speculators coming back into the sector, we had expected that the white metal would outperform. After all, its smaller overall size does often see silver move in a far more volatile manner than gold. However at the time of writing, the gold:silver ratio has failed to break below 85:1 since the start of the year.

In part, this reflects the support that gold has been enjoying in general from official sector buying and from safe haven purchases by high-net-worth investors (linked to both geopolitical and macroeconomic concerns), which silver has not benefited from. A weak bar and coin market, due to market saturation, the cost of living crisis and many retail investors focusing on other, "hotter" asset classes, has also taken some toll on the silver price. That said, fears that Indian investors might liquidate large portions of their recently acquired holdings have for the moment yet to be realized. Finally, the boost silver received from a recent recovery in base metals prices, copper in particular, proved to be short-lived, as concerns towards that sector in the face of a weak Chinese economy persist.

Looking ahead, the recent speculative inflows into gold do create some downside risks for precious metals in general, and this would include silver. However, we would expect any such price weakness to be short-lived. Given the high likelihood of looser US monetary policy, we expect precious metals investor interest will be healthy in the second half of the year and that this will ultimately be positive for the silver price.

## US Yield Curves

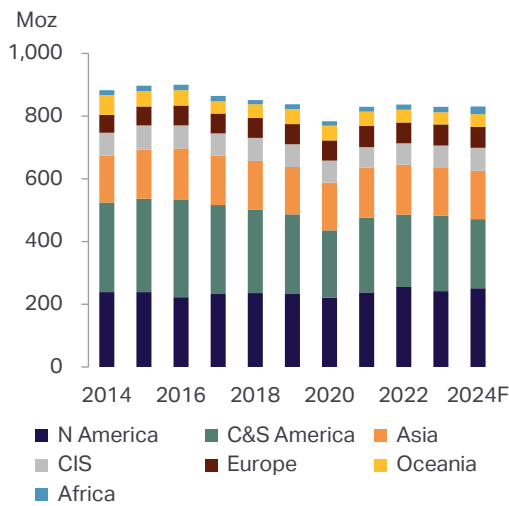


Source: Bloomberg, Metals Focus

Silver's supply-demand conditions, meanwhile, are expected to have another very strong year in 2024. Robust gains from photovoltaic applications and decent performances in other segments are expected to see industrial demand reach a new all-time record. An uptick in discretionary spending and restocking should boost jewelry and silverware demand, driving y/y rebounds in both demand segments. All this should more than offset the declines we expect in bar and coin investment, for reasons touched on above. Crucially, supply will continue to stagnate, with a marginal decline forecast for the year. This will drive the market deficit up by 17%, to 215.3Moz (6,695t) for the year.

As per our earlier comments in Chapter 1, as well as our analysis in the relevant focus box in Chapter 3, there remain ample above-ground silver inventories in the market. This overhang will likely prevent physical tightness emerging in the near-term for silver, in spite of such continued deficit conditions. We do, however, expect that the metal's strong fundamentals will support its price. This in large part also underpins our expectation that silver will outperform gold in the second half of 2024 and into next year.

### Mine Production Forecast



Source: Metals Focus

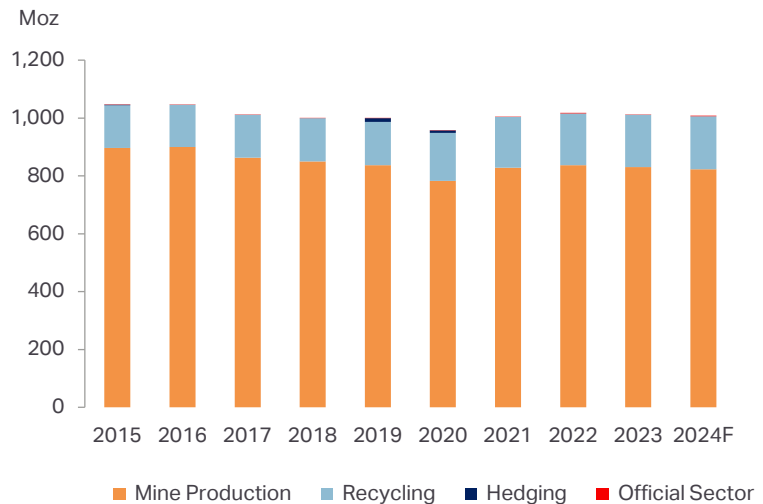
## Supply Outlook

Global silver **mine production** is anticipated to fall by a marginal 0.8% to 823.5Moz (25,613t) in 2024. Our forecast assumes output from Mexico will recover (+5.6Moz, 173t) as Peñasquito returns to optimal production after the strike action of 2023. We also expect supply from the US to increase (+3.5Moz, 110t) as Coeur Mining’s Rochester expansion continues to ramp up, Hecla’s Lucky Friday resumes full production following its temporary closure in 2023 (following a shaft fire) and the Manh Choh project comes online at Kinross’ Fort Knox. Elsewhere, in Morocco, the expansion at Aya Gold and Silver’s Zgounder mine is forecast to come on-stream, underpinning a rise 5.5Moz (171t). Construction is 83% complete and on track for Q2.24 commissioning.

Offsetting these increases will be a significant drop in Peru of 17.9Moz (556t). Hochschild Mining is awaiting permits for the new resource at Royropata and has placed Pallancata into care and maintenance in the interim. Lower supply is also expected from Buenaventura’s El Brocal as the Tajo Norte mine is suspended. Similar to 2023, output from China is forecast to decline (-3.7Moz, 115t) as silver by-product supply will fall in line with the ongoing drop in lead/ zinc production.

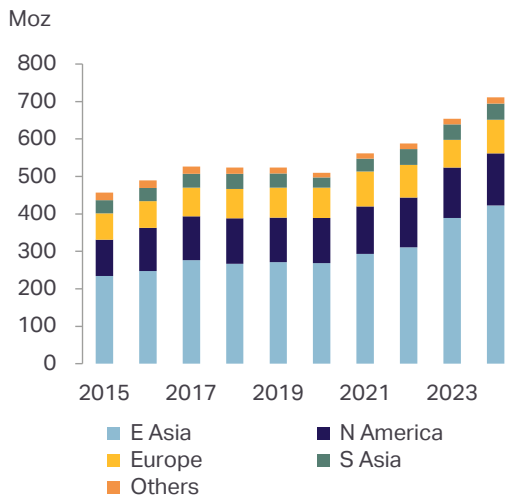
After a marginal increase last year, **recycling** is set to be virtually flat y/y in 2024, but it will still be the highest since 2012. Only industrial scrap is expected to grow due to ongoing drivers such as higher EO receipts. These gains will almost entirely be offset by losses in all other segments, such as jewelry and silverware scrap, due in part to limited economic distress. A further structural drop is also expected for photographic scrap.

### Global Supply Forecast



Source: Metals Focus

## Industrial Fabrication Forecast



Source: Metals Focus

## Demand Outlook

**Industrial** demand is forecast to rise by 9% this year to a new record high. Modest growth in the global economy will fuel gains across all segments of demand. As with the last two years, end-uses in the green economy will remain the main drivers of demand along with a resurgence in consumer electronics. That said, as new installations plateau, the notable gains in PV of the last two years may be difficult to replicate. That aside, geopolitics and trade disputes have the potential to disrupt our forecast. The structural decline in photographic demand is also likely to continue in 2024.

**Jewelry** fabrication is expected to recover in 2024 by a modest 4%. India is expected to be the biggest contributor, in part as restocking by retailers resumes. A slight rise is also forecast for the West thanks to growth in discretionary spending and restocking. That also benefits East Asian exporters, but the regional total is curbed by losses in China due to such challenges as consumers' preference for gold. We also forecast **silverware** demand to rise by 7% this year, again mostly due to India on the back of ongoing economic strength and rising disposable incomes.

**Net physical investment** looks set to fall again in 2024 to its lowest since 2020. The biggest drop is likely to be in the US, partly as volumes normalize. By contrast, Europe could see a partial recovery due to rate cuts by the ECB, while China should see gains from commemorative coins. Yet healthier gains are forecast for India as price expectations remain positive. After two years of outflows, we expect a modest rise of 50Moz (1,555t) for ETPs.

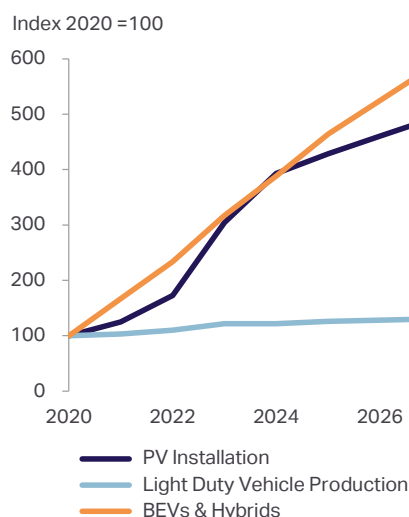
Fewer projects coming on-stream in the near future help lead us to expect relatively neutral **hedging** activity in 2024.

## Global Demand Forecast



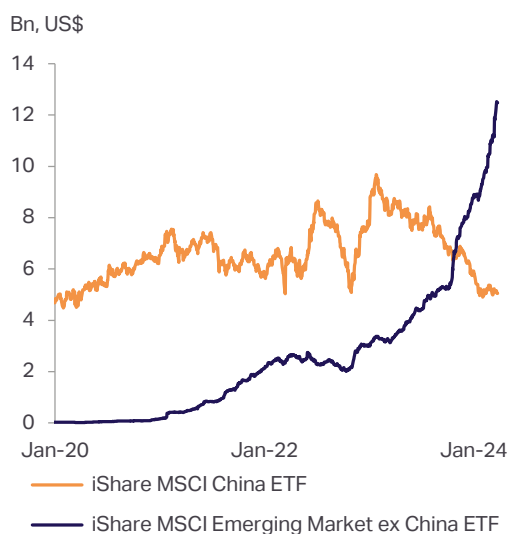
Source: Metals Focus

## Longer-Term Industrial Demand Indicators



Source: GTM, Metals Focus, LMC Automotive, A GlobalData Company

## Portfolio Shifts in Emerging Market ETFs



Source: Bloomberg

## The Longer-Term Outlook for Silver

Silver **mine production** looks set to rise from 2025, chiefly as projects come on-line, taking the global total to its highest since 2016. Much of these early gains are expected to come from primary mines (such as Rochester, Uchucchacua, and Zgounder) and from gold operations (for example, Peñasquito and Salares Norte). Further out, production looks likely to fall as the depletion of reserves outweighs supply from new projects. However, levels should comfortably hold above this year's output for some time. This is helped by the swing from short-term losses to medium term gains for silver output as a by-product of copper mining and a similar if smaller shift for supply from lead / zinc mines. The largest production gains over the next five years are expected to come from Canada, Peru, Russia and the US.

**Recycling** should broadly see notable gains in the next few years. Much comes from jewelry and silverware due to our forecast of higher prices. The latter also benefits industrial scrap, which will be further lifted by structural gains. Photography should supply less as its structural slide continues.

Total demand should grow notably in the next couple of years, with most of the gains coming from industrial offtake. Total demand may well then pull back to around last year's levels a few years later as our forecast rally hits the price sensitive areas. The growth expected for **industrial** fabrication is partly based on cyclical factors such as overall global GDP growth and gains for the sectors of specific relevance to silver such as construction and consumer electronics. Further increases should flow through from structural changes such as the shift within vehicle production from ICE to BEVs and from ongoing decarbonization efforts (such as PV panel installations). There are also several new uses in the pipeline with good potential. This latter grouping explains why we initially expect industrial demand to initially grow faster than global GDP, although the gap between the two could narrow, should thriving and substitution eventually become more pronounced.

**Jewelry** demand could hold steady in the medium-term as structural change in India and an improving global economy counter the modest price gains expected. However, as the rally gathers force later on, demand is likely to weaken notably, especially in India. **Silverware** is expected to behave similarly but the later fall will be steeper due to greater exposure to the price-sensitive Indian market. **Photographic** demand is forecast to continue its slide although stability for consumer film should help slow future losses.

**Retail investment** is harder to call. On the one hand, we could see buying into the later rally. On the other, we may see heavy profit taking, noting the stock of bars and coins built up in the last few years. That said, net demand should remain safely above the lows of the 2010's as investors with a longer-term horizon are mindful of prices being below all-time highs and as the structural deficit (which we see continuing for several years yet) underpins confidence.

# Chapter 3

- The Fed's aggressive monetary tightening and a prolonged downturn in the Chinese property sector weighed on confidence in silver among institutional investors, despite its sizable structural deficit.
- Retail sales of physical bars and coins also slipped, led by heavy losses in Germany and India.
- With the Fed expected to stay on course for rate cuts later this year, silver investment is forecast to recover.

## Investment

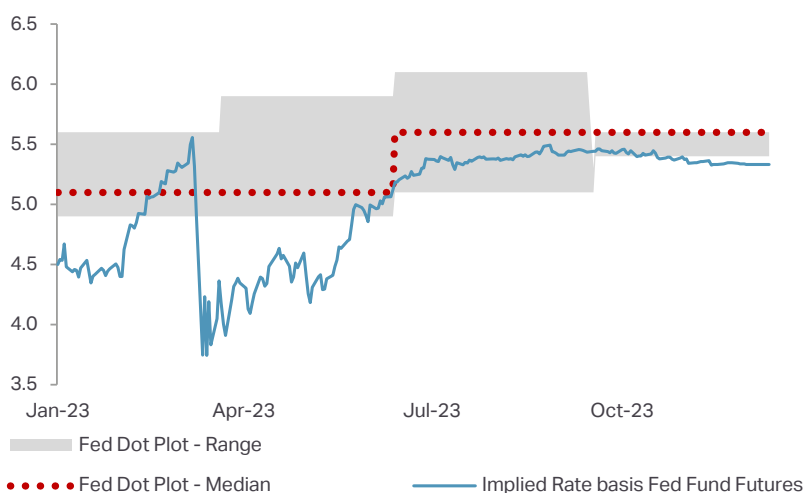
### Introduction

Silver investment weakened across different market segments among both institutional and retail investors in 2023. In the futures market, a lack of investor conviction was highlighted by considerable fluctuations in managed money positions, which at times moved into net short territory. Over-the-counter (OTC) buying was also notably weaker, compounded by a pick-up in liquidations later in the year. ETP holdings recorded net outflows for the second year in a row, albeit at a lower pace. Lastly, silver bar and coin sales experienced their first annual decline since 2018, slipping to a three-year low.

Institutional investors showed little interest in silver's fundamentals (see Focus Box across). Instead, sentiment was dominated by macroeconomic conditions. High US rates boosted the dollar and the opportunity cost of holding non-yielding assets, hurting investor interest in silver, even though rate cut expectations did at times help. Concerns about China's economy and their impact on base metals also weighed on silver investment.

As illustrated in the chart below, investors and Fed officials were at odds over the path of US interest rates, leading to a wide, often volatile, gap between official projections and market expectations. This at times created extraordinary volatility in financial markets. Just as rate cut expectations helped silver and gold's appeal to investors in H1.23, the shift in the consensus that interest rates would remain "higher for longer" had the opposite effect over the summer, until the outbreak of the Israel-Hamas war.

### Fed Rate expectations (for end-2023)



Source: Bloomberg

Given its industrial attributes, it was difficult for silver to escape from an increasingly pessimistic view of China's economy. Once the key GDP growth driver, the real estate sector has been a major drag on the country's economy since 2021. With its heavy exposure to the housing market, base metals came under sustained downward pressure in 2023, which spilled over into silver.

On top of a challenging macroeconomic backdrop, silver's rangebound behavior became a self-fulfilling prophecy with investors. It is worth highlighting that silver tends to attract more speculative investors than gold, thanks to its higher volatility. A narrowing price range encouraged range-trading activity among such tactical players and limited commitment to long positions. This was particularly noticeable in the latter part of the year when

## Silver's Only Limited Response to Record Deficits

One theme running through this World Silver Survey is the underlying health of the global silver market, reflected in the size of the physical deficit. Last year, this reached the second highest on record, eclipsed only by 2022.

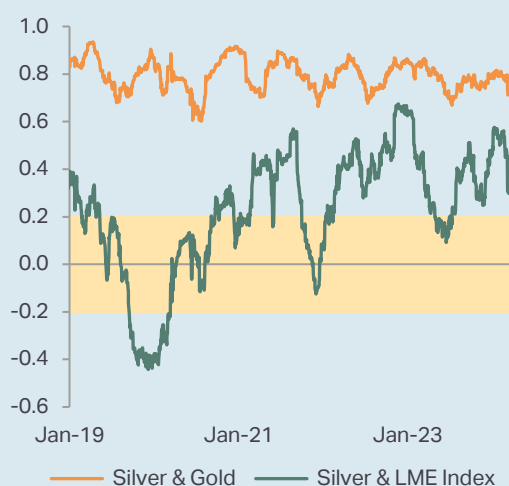
Against this increasingly supportive backdrop, stronger price gains in the silver market might have been expected, especially with gold rising by 18% since the start of last year to a series of all-time highs. The traditional view is that silver will outperform gold in a bull market, but so far this has been muted. By contrast, silver prices have met strong resistance near \$25 since 2023. The result has seen the gold:silver ratio on occasion surpass 90, its highest level since late 2022.

Three factors contributing to this are worth highlighting. The first is that gold has benefited from broad safe-haven buying and reserve/portfolio diversification among central banks and investors with a longer-term horizon. This is something that silver has not enjoyed to anywhere near the same extent.

The second concerns the fall-out from China's real estate crisis, its impact on the local economy in the longer term and how this has weighed on base metals' demand outlook and prices. Even though gold comfortably retains the highest correlation with silver, the latter's link with industrial commodities is also noteworthy and has grown. From an average of 0.41 in 2021, the 60-day rolling correlation between silver and the LME Index rose to 0.46 last year before edging higher to 0.50 in 2024. By way of comparison, the correlation with gold in 2023 averaged 0.78, but this year has slipped to 0.75.

Finally, silver's deficits seem well supplied by ample above-ground bullion stocks, discussed in the focus box on page 26. This is also evident by a sharp fall in 49s premiums in the US in early 2024, compared to the previous two to three years. (We should note though that they remain above long-term historical levels.) Moreover, although London silver stocks reached a reporting record low in February (mainly due a surge in Indian imports), the impact on forward rates has been limited.

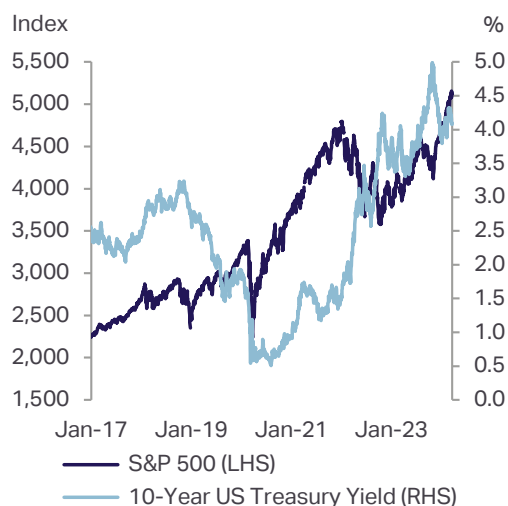
### Silver's Correlation with Gold & LME Index\*



\*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

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



Source: Bloomberg

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

Million ounces	2022	2023	Y/Y
SHFE <sup>2</sup>	91,037	115,394	27%
LBMA	91,815	97,332	6%
CME	85,383	90,648	6%
MCX	4,347	4,899	13%
CME Micro <sup>3</sup>	2,000	2,680	34%
SGE T+D <sup>2</sup>	5,872	2,429	-59%

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

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 the CME, 5,000oz for its standard futures contract & 1,000oz for micro futures contract

Source: Bloomberg, Respective Exchanges

sharp gains in other assets (most notably US equities) dominated investors' focus. Not only did fresh speculative buying ease but profit taking also picked up, as investors exited silver long positions and rotated into risky assets with stronger expected price upside.

Retail sales of silver bars and coins also eased in 2023, although this should be viewed in the context of their stunning growth over 2020-22. With physical investment nearly doubling within three years to an all-time high in 2022, growth had become difficult to sustain, and a decline was hardly surprising. Unfavorable country-specific factors also came into play. For instance, losses were particularly pronounced in Germany where investor interest in silver collapsed following the VAT hike on some silver coins in January. As for India, much of its weakness reflected record high local prices and weak rural incomes. By contrast, the fall in the US was more modest, as silver benefited from healthy safe-haven buying in response to the regional banking crisis.

## Outlook

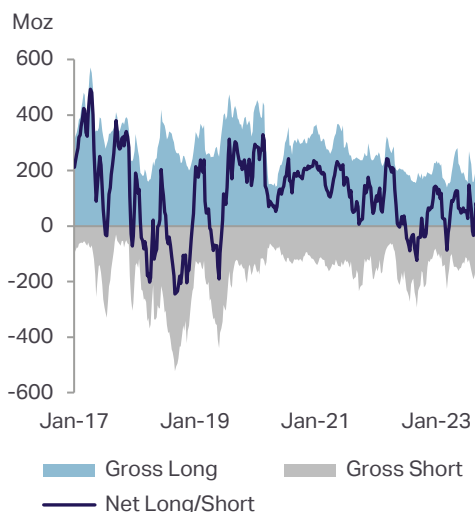
Even though stubbornly high inflation and solid economic data have dashed hopes of an early shift to monetary easing, investor interest in silver improved in Q1.24, particularly from March onwards. In part, this reflected optimism that the start of a rate cutting cycle is now in sight, a message reaffirmed by the Fed after its March meeting. With fresh record high gold prices, speculative inflows into silver picked up rapidly on expectations that the white metal would play catch-up. A rebound in base metal prices also provided an additional boost in sentiment towards silver.

Assuming inflation will continue easing, we expect the Fed will make three 25bps policy rate cuts this year, the first one likely to occur mid-year, and signal a generally dovish outlook for 2025. The subsequent fall in yields, especially in real terms, should favor precious metal investment as we progress into H2.24. Even with the recent retreat, a still high gold:silver ratio will also attract some investors who view silver as undervalued over the long-term, perhaps also as its strong fundamentals gain attention. The extent of its recovery, however, may be restrained by a weak Chinese property sector.

## Institutional Investor Activity

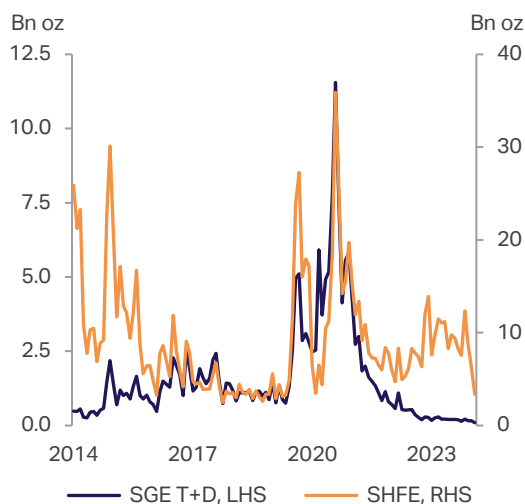
Similar to 2022, institutional investors were largely indifferent towards silver over much of 2023. Although silver trading volumes on commodity exchanges posted modest gains in 2023, this seems to have been led by a pick-up in short-term tactical trading. This is highlighted by wild fluctuations in investor positions in CME Group's futures, which at times dipped into net short territory. Fresh buying in the OTC market was also notably weaker, and liquidations by high-net-worth investors and family offices also grew towards end-2023.

## Investor Positions on the CME\*



\*Managed money positions; Source: CFTC

## SGE & SHFE Silver: Monthly Turnover



Source: Shanghai Gold Exchange, Shanghai Futures Exchange

## Commodity Exchanges

2023 saw silver trading increase on most major exchanges, albeit from a relatively low base. For all the exchanges listed overleaf, last year's turnover was still down by at least 30% on 2020 volumes. At the regional level, trading in China and India reported significantly higher growth, reflecting the outperformance of silver prices in local currencies relative to the dollar price.

Starting with the **CME Group**, turnover of its 5,000oz futures contract rose by 6% y/y. However, this growth came from a low base in 2022, with the 2023 total still the second lowest since 2017. This partial recovery was mostly led by improving investor interest in gold (futures turnover for gold rose by 4% in 2023) as silver is often viewed as a leveraged play on the yellow metal.

However, gold saw investors stay net long (albeit with volatile changes in positions) for most of the year, while silver investors were more active on the short side. In part this reflected the fact that safe-haven purchases tend to center on gold. Moreover, China's faltering growth and real estate problems also weighed on the outlook for industrial metals and, by extension, for silver. Silver's repeated failure to break out higher also encouraged some investors to build sizable tactical shorts at times when industrial metals came under pressure. Against this backdrop, managed money positions recorded dramatic swings over the year, moving into negative territory at times, something that has persisted in 2024-to-date.

In China, a 27% rise in aggregate volumes meant the **Shanghai Future Exchange's** silver futures remained the most traded silver contract globally for the fourth year. Interest was lifted by healthy gains in local silver prices, itself due to a weakening yuan against the dollar. Growing caution towards base metal prices and the slump in local equity markets also encouraged investors to rotate into silver (and gold). By contrast, T+D contract turnover on the **Shanghai Gold Exchange** more than halved to a 13-year low, as a result of tightening trading rules on retail investor activity that started in late 2020. On the **Multi Commodity Exchange of India**, futures turnover rose by 13% and options trading jumped by more than five-fold. Investor interest was boosted by the rally in the local silver price to record highs last year.

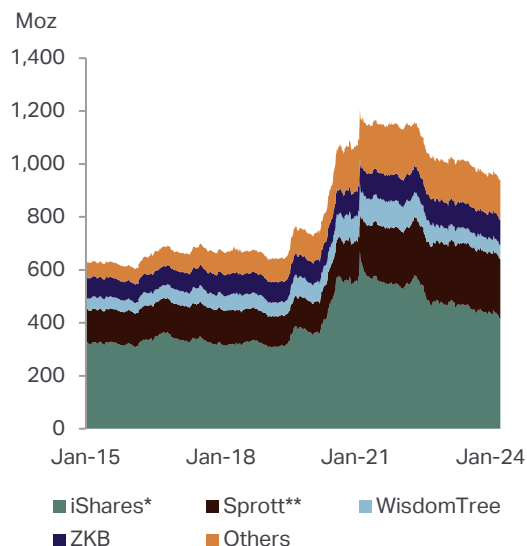
## Over-the-Counter Market (OTC)

LBMA trading volumes, a proxy for OTC activity, edged up slightly in 2023. These gains were led by higher activity over February-July when the lifting of lockdown restrictions in China raised investor sentiment towards industrial commodities. The US regional banking crisis and its potential implications for the Fed's rate decisions also generated fresh interest in precious metals.

Investor interest then waned over the rest of the year, with LBMA monthly turnover falling to a three-year low in December. As discussed earlier, a hawkish Fed and growing pessimism on China curtailed silver's investment



## Silver ETP Holdings



\*iShares Silver Trust; \*\*Combined holdings of the Sprott Gold & Silver and Sprott Silver  
Source: Bloomberg, Respective Issuers

appeal. Investor interest was also undermined by silver's rangebound prices. Anecdotal evidence suggest that some high-net-worth investors, mostly in North America, decided to take profits in silver and rotate into riskier assets (such as US equities) that posted sharper gains. Such a lack of investor conviction continued in early 2024 before sentiment started to improve in March, in response to an upside breakout in both gold and copper prices.

## Exchange-Traded Products (ETPs)

Silver ETPs witnessed annual outflows for the second year in a row in 2023. Combined holdings fell by 4% or 42Moz (1,310t) over the year to 964Moz (29,980t) by end-2023, down by 20% from their 2021 all-time high and taking holdings to their lowest level since July 2020.

During H1.23, global holdings actually remained broadly steady at just above 1,000Moz (31,000t), as growing expectations of faster rate cuts and the US regional banking crisis underpinned silver's investment appeal. The bulk of outflows occurred in H2.23, with these starting to pick up from July onwards. In part, this was led by a shift in investor rate expectations concerning the Fed's guidance and increasing pessimism towards China's economy. Investor fatigue about silver prices also grew, in the wake of its struggle to break out higher during 2022-23. All these factors encouraged some investors to liquidate their ETP holdings and switch in favor of risky assets that had showed more pronounced gains during 2023.

ETP holdings continued to drift lower in early 2024, falling by another 2% through to mid-March. Since then, these outflows have been entirely reversed, as UK-listed funds witnessed significant inflows which is likely to have been driven by institutional investors. This recovery is expected to continue for the rest of 2024, as the start of the rate cutting cycle generates more interest in silver.

## Physical Investment Forecast

Million ounces	2023	2024F	Y/Y
Bars	116.2	100.8	-13%
Coins	126.9	111.2	-12%
<b>Global Total</b>	<b>243.1</b>	<b>212.0</b>	<b>-13%</b>

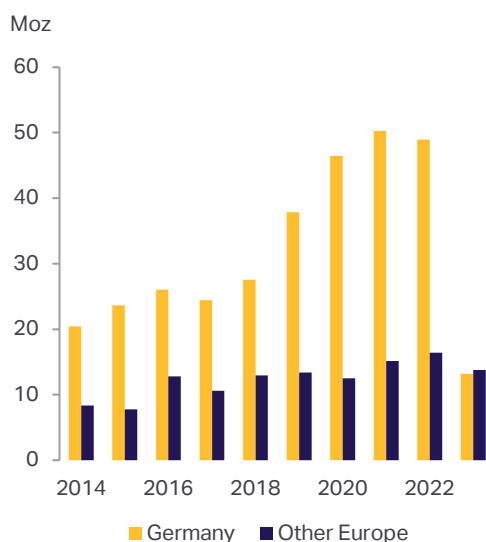
Source: Metals Focus

## Physical Investment

After hitting an all-time high in 2022, physical investment fell by 28% y/y in 2023 to a three-year low. Most key markets recorded weaker volumes last year. Losses were particularly acute in Germany where sales collapsed following the VAT change at the start of 2023. India and Australia also recorded heavy losses of over 30%. The drop in the US was far more restrained at 13%, and absolute volumes remained historically high.

In **Europe**, physical investment fell by 59% in 2023 to its lowest level since the 2008 financial crisis. Germany, with a share of over 70% in the region, posted a 73% drop and accounted for the bulk of losses. Excluding this country, the decrease in Europe came in at a far smaller 16%. Looking at Germany in detail, a VAT hike to some silver products was undoubtedly the trigger. Over

## German and Other European Physical Investment



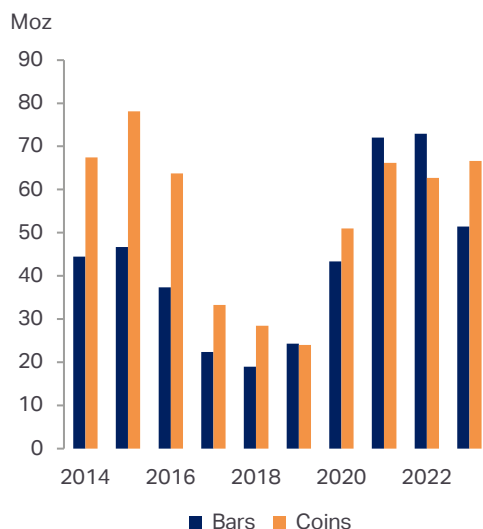
Source: Metals Focus

2014-22, non-EU silver coins were subject to 7% VAT on the full value of the coin plus a 19% VAT on dealers' margins. Other silver bullion products, by contrast, were subject to 19% VAT on the full product value. This favorable tax treatment was abruptly removed by the government from the start of 2023. Coin sales effectively collapsed following the change, and feedback from key market participants suggest that more time is still needed for the public to accept the new fiscal regime.

Other factors also undermined investor interest. In the wake of the Eurozone's fastest interest rate hiking cycle in history, the growing appeal of traditional savings products diverted retail investors from physical silver (and gold). The ongoing cost of living crisis also encouraged retail investors to hold more cash and to become cautious about making new investments. Lastly, easing demand for safe haven products and a lack of clear direction in silver prices did not help. Physical investment has remained subdued 2024-to-date, as many of these headwinds have remained in place. Once the ECB starts to cut interest rates, this may help generate some fresh interest, with full-year sales expected to recover by a modest 7%.

Taken at face value, the 13% drop last year for **US** physical investment contrasts sharply with the collapse in Germany. The headline total for the US, of 118.1Moz (3,673t), was still exceptionally high, realizing the fifth highest total on record. As such, despite seeing a year-on-year fall, the US still offered a crucial outlet for some mints and refiners looking for a home for their investment products that normally would have been bought in Germany. That said, the relatively upbeat total for the US hides a mixed intra-year performance. Late 2022 had already seen the market starting to soften, albeit modestly and that weaker tone continued into early 2023. Although this was masked by healthy sales of newly dated coins, it still helped drive a 10% y/y rise in Q1 sales (source: Metals Focus' Bullion Coin Survey).

## US Physical Investment

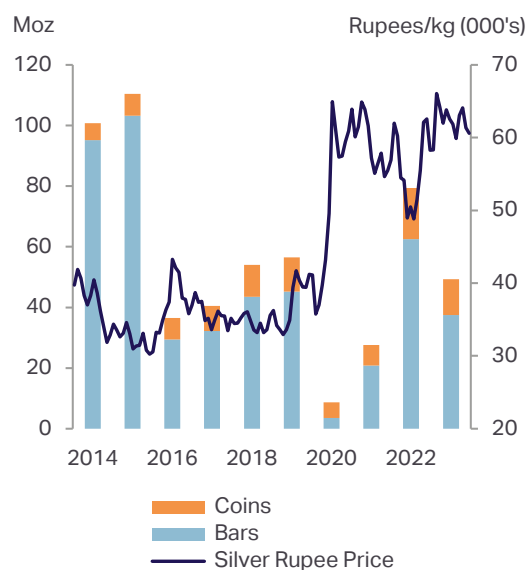


Source: Metals Focus

However, the market burst into life in March, with the collapse first of Silicon Valley Bank and then Signature Bank, the former representing the largest US banking failure since 2008/09. For some dealers, that led to record sales with echoes of 2020-22, and so also marked the return of massively high premiums. The surge in activity lasted through until mid-May. From this point on, the market started to soften, but it was only in November, as prices jumped, that a sharper downturn emerged. This carried over into early 2024, resulting in higher dealer stock levels, which was compounded by the release of newly dated bullion coins. The combination of elevated dealer inventories and weaker demand also hit those delivering 100oz, 1oz rounds and other bar products into the US, generating sizable double-digit year-on-year losses.

**Australian** silver bar and coin demand fell by 38% in 2023 to 12.2Moz (380t). The year started on a positive note, but gross sales declined and dealers' buy-backs increased as the year progressed. In part, this was due to

## Indian Physical Investment



Source: Metals Focus, Bloomberg

investors' disappointment in silver's price performance. A strong Australian real estate market was another headwind for precious metals investment in general. Moreover, the cost of living crisis, caused by inflation and rising mortgage payments, due to higher interest rates, limited disposable incomes to invest in silver and fueled some distress selling. Finally, market saturation, following two exceptionally strong years, did not help. Demand is likely to fall further in 2024, judging by the very quiet first few months of the year.

**Indian** physical investment fell by a sharp 38% to 49.3Moz (1,534t) in 2023. While the fall appears notable, part of it reflects the high base in 2022 when bar and coin demand surged by 188% to 79.4Moz (2,470t), the highest since 2015. Notwithstanding this and pandemic-driven swings since 2020, silver investment was still weak (-13%) compared to pre-pandemic levels in 2019.

Turning to last year's drivers, demand was undermined by high local silver prices. While international prices fell 1% intra-year, rupee depreciation saw domestic prices rise by 7%. Indian silver demand has always been price sensitive and therefore the price achieving new highs last year and holding at higher levels (above Rs 70,000/kg) for several months encouraged investors to take profits while fresh investors had little opportunity for bargain hunting except for during September and October when the price corrected. Moreover, arbitrage opportunities (where investors buy physical and sell on exchange to earn a yield) were absent for much of 2023. This hit demand from high-net-worth individuals who tend to dominate this trade.

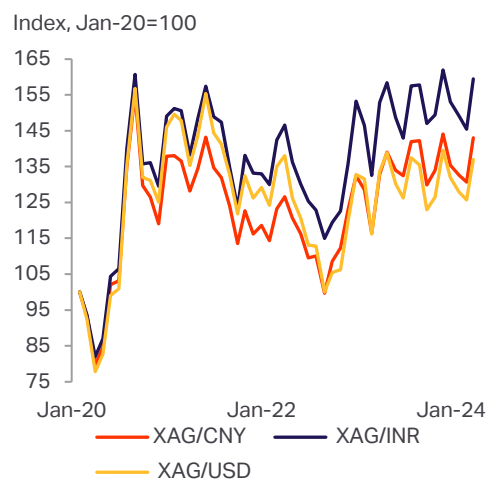
That aside, physical investment has also faced rising competition from ETPs, which have grown in popularity. By end-February 2024, their holdings had doubled y/y, surpassing 16Moz (500t). High prices also impacted gifting demand, which in turn affected silver coin purchases. A large share of that is driven by gifting during occasions such as weddings and the birth of a child.

## Physical Investment

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
United States	111.9	124.8	101.1	55.7	47.4	48.2	94.3	138.2	135.6	118.1	-13%
India	100.8	110.4	36.5	40.5	54.0	56.5	8.7	27.6	79.4	49.3	-38%
Germany	20.4	23.6	26.1	24.4	27.6	37.8	46.5	50.3	48.9	13.2	-73%
Australia	4.3	4.3	5.1	3.3	3.6	3.5	11.4	16.0	19.6	12.2	-38%
Canada	7.4	7.6	7.2	4.7	4.6	5.0	7.5	10.6	12.0	7.9	-35%
China	14.8	13.9	13.8	9.4	9.0	7.9	8.7	7.8	7.4	7.8	7%
Other Europe	8.4	7.8	12.8	10.6	12.9	13.4	12.5	15.1	16.4	13.8	-16%
Other East Asia	8.5	7.8	8.4	6.6	6.9	13.2	13.2	12.6	11.4	9.5	-17%
Others	6.4	9.0	1.9	0.5	-0.1	1.8	5.5	6.3	6.4	11.4	78%
<b>Global Total</b>	<b>283.0</b>	<b>309.3</b>	<b>212.9</b>	<b>155.8</b>	<b>165.9</b>	<b>187.4</b>	<b>208.1</b>	<b>284.3</b>	<b>337.1</b>	<b>243.1</b>	<b>-28%</b>

Source: Metals Focus

## Indexed Silver Prices



Source: Metals Focus, Bloomberg

Investment in India is also influenced by the jewelry and silverware market. Typically, individuals involved in these segments are also big investors, often buying silver during low-price periods to be fabricated later. With the price rise leading to a slowdown in consumer demand, buying from these investors also fell, with many using the high price as an opportunity to divest silver.

After the drop in demand in 2023, we believe this year's Indian investment could see a strong increase as the price has held above Rs.70,000/kg which in turn has led to price expectations turning more positive. That said, Indian investors have bought upwards of 563Moz (17,500t) of bars and coins in the last ten years and there remains a risk of large-scale liquidations if prices surge in a short period and reach levels close to Rs.100,000/kg.

Physical investment in **China** rebounded by 7% to 7.8Moz (244t), driven by modest gains in both bar and coin markets. Due to silver's VAT treatment (13% is levied on the total value of silver products, whereas gold and platinum are exempt), these silver markets are dominated by gifting and collector demand. The recovery last year was mainly due to a relatively low base in 2022 when COVID measures severely affected business activity.

It is worth remembering that silver physical investment recorded a dramatic slump in 2017 (falling by 32% to 9.4Moz or 292t) as investor confidence in silver was impaired and the market seemed saturated following sizable purchases over the previous years. Physical investment last year was 16% lower than in 2017, reflecting the pressure from the economic slowdown and weaker consumer sentiment on the country's gifting and collector market. In 2024, we expect physical silver investment to increase by a modest 4% to 8.1Moz (253t), driven by support from market promotions, online sales channels and attractive themes covered by commemorative coins.

## Coins & Medals Fabrication

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
United States	46.4	49.1	39.4	19.3	17.1	20.5	32.7	32.2	21.1	29.1	38%
Canada	30.8	35.4	33.6	18.9	18.4	23.0	28.8	36.4	35.8	23.4	-35%
Australia	8.5	12.7	13.2	10.7	10.4	12.7	17.3	20.0	24.1	15.4	-36%
UK	2.2	3.5	3.5	3.1	3.5	3.2	9.7	15.7	19.9	14.7	-26%
India	5.7	7.2	7.1	8.3	10.5	11.3	5.2	6.7	16.9	11.8	-30%
Austria	4.6	7.3	3.4	2.1	2.1	2.9	7.2	12.3	12.2	10.0	-18%
China	13.7	13.7	12.9	8.6	8.6	7.3	8.1	7.3	7.1	7.4	5%
South Africa	0.0	0.6	0.0	1.2	3.7	3.6	7.9	10.3	7.7	3.4	-56%
Germany	1.3	1.9	4.3	4.0	4.0	3.9	3.9	3.9	3.9	2.9	-25%
Others	7.3	7.8	6.9	6.7	6.9	7.9	7.6	8.7	9.4	8.8	-6%
<b>Global Total</b>	<b>120.6</b>	<b>139.2</b>	<b>124.3</b>	<b>82.8</b>	<b>85.4</b>	<b>96.2</b>	<b>128.3</b>	<b>153.5</b>	<b>158.1</b>	<b>126.9</b>	<b>-20%</b>

Source: Metals Focus

## Above-Ground Silver Stocks

Global silver supplies once again fell short of demand last year. While the market deficit fell by 30% to 184.3Moz (5,732t), it was still one of the largest on record and amounted to a sizable 15% of global demand. Over the past three years of deficits, above-ground silver bullion inventories have declined by a cumulative 543.1Moz (16,892t), equivalent to nearly two-thirds of average annual silver mine production in recent years.

Last year's deficit was very much reflected in reported silver inventory trends. Over the course of the year, stocks held in London vaults, as well as the various commodity exchange depositories that we track, fell by 62.6Moz (1,947t) to end the year at 1,229.9Moz (38,036t). This implies there were draw-downs of 121.7Moz (3,785t) from other, unreported silver inventories.

Much of the drop in reported stocks took place in China. Combined stocks held in Shanghai Gold Exchange (SGE) and Shanghai Futures Exchange (SHFE) vaults fell by 39% y/y, or 53.5Moz (1,664t), to a six-year low of 84.7Moz (2,634t) by the end of 2023. Chinese exchange stocks have fallen further this year-to-date. China has historically been a surplus silver market, due to the sizable production of silver from imported base metals concentrates. However, the breakneck rise in local industrial demand is changing the local supply/demand and inventory

### Identifiable Silver Bullion Inventories\*

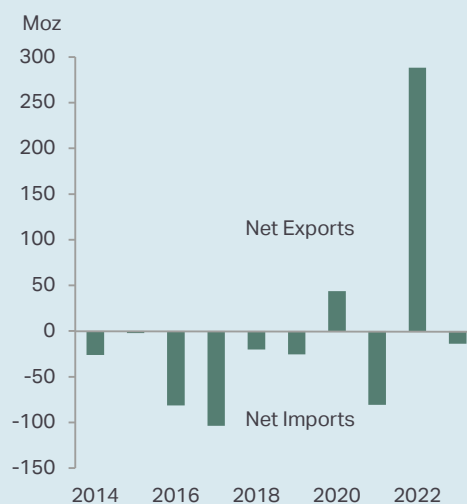
Million ounces	2021	2022	2023	Y/Y
London vaults	1,161.5	840.9	856.2	2%
CME	355.7	299.0	277.9	-7%
SGE	73.9	69.0	46.5	-33%
SHFE	75.9	69.2	38.2	-45%
Other	2.7	7.4	4.1	-44%
<b>Total</b>	<b>1,666.9</b>	<b>1,285.5</b>	<b>1,229.9</b>	<b>-5%</b>

\*Year-end; Source: Metals Focus, LBMA, CME, SGE, SHFE, MCX & OSE.

dynamics. Outside China, CME stocks were down by 21.1Moz (657t) last year, while inventories held in London vaults were in fact up slightly.

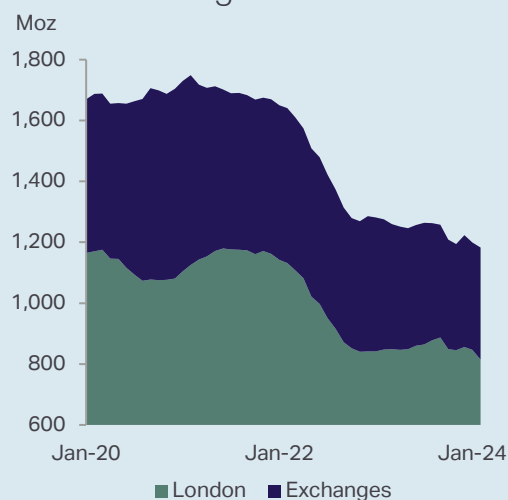
There is no doubt that we are in a period of structural deficits for silver. For now, there remains enough silver inventories to fill these gaps. Reported stocks of the metal, namely those in London vaults as well as exchange-registered depositories, amounted to 1.2 billion ounces (around 38,000t) at end-2023 and we understand there remain bullion inventories held elsewhere. Stockpiles are finite, however, and eventually this draw-down will create tight physical market conditions and ultimately fuel price rallies.

### UK Silver Bullion Trade Balance



Source: S&P Global

### London & Exchange\* Vault Inventories



\*London stocks include silver stored at LBMA-member custodian vaults; Exchanges stocks include silver stored at the CME Group, the SHFE, the SGE, the Tocom/OSE and MCX

Source: Metals Focus, LBMA, Respective Exchanges

## Chapter 4

- Global mined silver supply fell by 1% y/y to 830.5Moz (25,830t) in 2023, largely due to the temporary suspension of Peñasquito.
- Primary silver miners' all-in sustaining costs increased by 25% y/y as key input costs rose and fewer silver ounces were produced.
- Mined production is expected to fall to 823.5Moz (25,613t) in 2024 as Peruvian output is forecast to drop.

# Mine Supply

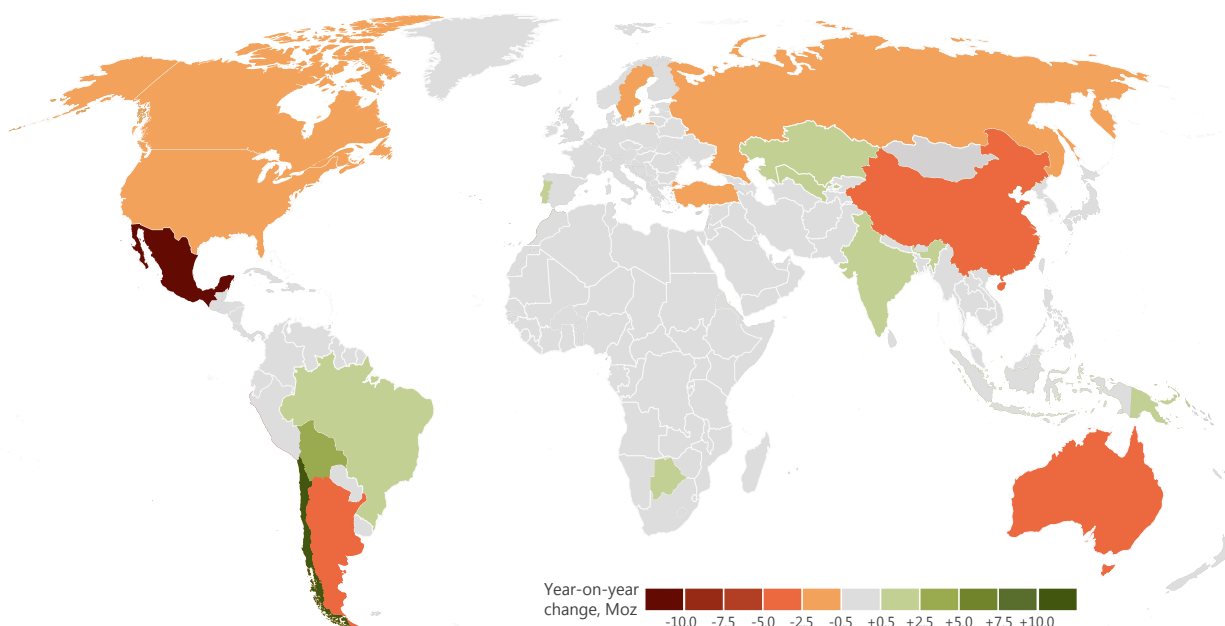
## Mine Production

In 2023, global mined silver production fell by 1% y/y, to 830.5Moz (25,830t), 11.6Moz (362t) lower than our forecast in last year's World Silver Survey, Weaker output in Mexico owing to the temporary suspension of Newmont's Peñasquito in Q2 and Q3.23 following union strike action and the processing of lower grade ore at some mines in Argentina were key drivers of this fall.

Production from primary silver mines fell marginally in 2023, down 0.6% y/y. In contrast, silver by-product output from lead-zinc operations rose by 1% y/y despite the suspension of some mines in response to low base metal prices. Silver derived from copper operations also increased, up 3.9% y/y driven by productivity gains and the ramp up of new operations. Output from primary gold mines dropped by 12.2% y/y, influenced by the loss of production at Peñasquito. On a country level, lower production from Mexico (-10.9Moz, 340t), Argentina (-4.9Moz, 152t), Australia (-3.1Moz, 95t) and China (-2.5Moz, 78t) was partially offset by higher production in Bolivia (-3.8Moz, 119t) and Chile (+10.1Moz, 314t).

This year, we anticipate mined silver supply will fall further, to 823.5Moz (25,613t) influenced by a fall in Peruvian output following the temporary closure of some mines. Mexico's production will likely recover and output from the US will rise as Coeur Mining's Rochester expansion continues to ramp up and Hecla's Lucky Friday returns to full production.

## Major Changes to Global Mine Production, 2023 versus 2022



Source: Metals Focus

## Top 20 Producing Countries

Million ounces	2022	2023	Y/Y
Mexico	213.2	202.2	-5%
China	111.8	109.3	-2%
Peru	107.0	107.1	0%
Chile	41.9	52.0	24%
Bolivia	38.8	42.6	10%
Poland	42.4	42.5	0%
Russia	41.1	39.8	-3%
Australia	37.5	34.4	-8%
United States	33.2	32.0	-3%
Argentina	30.8	26.0	-16%
India	22.3	23.8	6%
Kazakhstan	15.4	16.6	8%
Sweden	14.6	12.6	-14%
Indonesia	10.3	10.3	-1%
Morocco	8.7	8.8	1%
Uzbekistan	7.0	7.7	9%
Canada	8.7	7.1	-18%
Papua New Guinea	3.0	4.3	42%
Spain	3.5	3.7	6%
Brazil	2.4	3.3	36%
Others	42.9	44.4	3%
<b>Total</b>	<b>836.7</b>	<b>830.5</b>	<b>-1%</b>

Source: Metals Focus

## North America

Silver output from North American mines fell by 5.3% y/y to 241.4Moz (7,508t). All countries in the region recorded lower output; Mexico (-10.9Moz, 340t), Canada (-1.5Moz, 48t) and the US (-1.2Moz, 36t).

**Mexico's** silver production fell by 5.1% y/y to 202.2Moz (6,290t). Primary gold operations produced less silver during the year, offsetting the 2.1% y/y rise in primary silver mine output. Newmont's Peñasquito (-12.0Moz, 373t) was suspended from June 7th to October 13th due to union strike action. Production growth from other primary silver mines mitigated the impact of this suspension, most notably from newer operations, particularly Fresnillo and MAG Silver's Juanicipio (+7.6Moz, 235t) and SilverCrest Metals' Las Chispas (+6.2Moz, 192t).

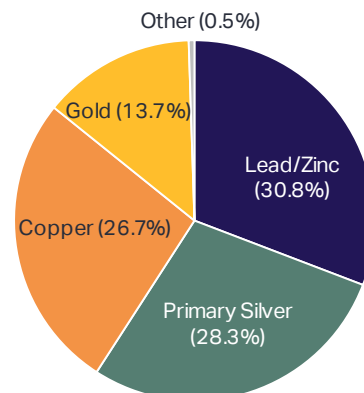
In the **US**, silver production dropped by 3.5% y/y to 32.0Moz (996t) following lower output from primary silver mines. Increases in silver production from primary silver operations, such as Americas Gold and Silver's Galena (+0.4Moz, 14t) and Coeur's Rochester (+0.3Moz, 10t), were offset by the lower production at Hecla's Lucky Friday (-1.3Moz, 41t) as a result of the fall-of-ground and fire incident that occurred on August 21st; operations at the mine resumed on January 9th this year.

**Canadian** silver output fell for the fourth consecutive year, by 17.8% y/y to 7.1Moz (221t). This was the result of fewer silver ounces produced as a by-product of base metal mines. Trevali's Caribou zinc mine (-0.6Moz, 19t) was placed on care and maintenance after the company decided to indefinitely suspend operations due to financial and operational challenges. In contrast, silver output from silver and gold operations increased due to the production ramp-up at Hecla's Keno Hill (+0.8Moz, 26t) and higher feed grades at Hudbay's Snow Lake (+0.3Moz, 9t).

## Silver Mine Production by Source Metal in 2023

Million ounces	Primary				
	Lead/Zinc	Silver	Copper	Gold	Other
North America	38.9	147.0	12.4	42.8	0.3
Central & South America	73.6	41.4	85.8	39.7	0.0
Europe	12.4	1.5	51.1	1.7	0.0
Africa	3.4	6.8	4.7	3.1	0.0
CIS	11.2	16.5	28.1	11.2	2.4
Asia	102.2	7.6	35.0	9.1	1.5
Oceania	14.1	14.4	4.3	6.1	0.0
<b>Total</b>	<b>255.8</b>	<b>235.2</b>	<b>221.4</b>	<b>113.8</b>	<b>4.2</b>

Source: Metals Focus



## Top 20 Producing Companies

Million ounces	2022	2023	Y/Y
Fresnillo <sup>1</sup>	51.1	53.5	5%
KGHM Polska Miedź <sup>2</sup>	42.7	45.9	8%
Hindustan Zinc Ltd. <sup>3,4,5</sup>	22.3	23.8	6%
Pan American Silver	18.5	20.4	11%
Glencore	23.8	20.0	-16%
CODELCO <sup>8</sup>	20.9	19.2	-8%
Industrias Peñoles <sup>6</sup>	15.9	18.9	19%
Southern Copper	18.6	18.4	-1%
Newmont	29.7	18.0	-39%
Polymetal Intl.	21.0	17.7	-16%
Volcan Cia Minera	14.3	15.2	6%
Hecla Mining	14.2	14.3	1%
South32 <sup>7</sup>	12.3	13.0	6%
BHP <sup>7</sup>	11.7	11.8	1%
Boliden <sup>7</sup>	12.1	10.4	-15%
Nexa Resources	10.0	10.3	3%
Coeur Mining	9.8	10.3	4%
First Majestic Silver	10.5	10.3	-3%
SSR Mining	8.4	9.7	15%
Hochschild Mining	11.0	9.5	-14%

NB: 1 - Excludes Silverstream contract, 2 - Payable production, 3 - KGHM Group figures including Polish and international operations, 4 - Hindustan Zinc is a Vedanta Group company, 5 - Production from integrated operations only, 6 - Refined Silver, 7 - Excludes 100% Fresnillo, 8 - Estimate

Source: Company Reports, Metals Focus

## Mine Production Forecast by Region

Million ounces	2023	2024F	Y/Y
N America	241.4	251.0	4%
C&S America	240.6	218.9	-9%
Asia	155.4	152.9	-2%
CIS	69.5	71.7	3%
Europe	66.7	65.4	-2%
Oceania	38.8	39.8	2%
Africa	18.1	23.7	31%
<b>Global Total</b>	<b>830.5</b>	<b>823.5</b>	<b>-1%</b>

Source: Metals Focus

## Central & South America

In Central and South America, silver mine supply increased by 4.2% y/y to 240.6 Moz (7,483t). This was largely due to higher output in Chile (+10.1Moz, 314t) and Bolivia (+3.8Moz, 119t), which more than offset a slight decline in Argentina (-4.9Moz, 152t). Total, combined production throughout the region was at its highest since 2020.

In **Chile**, Kinross Gold's La Coipa mine has continued to ramp-up its production after achieving first gold pour in Q1.22. The mine accounts for a significant portion (+3.1Moz, 97t) of the country's additional output. Pan American Silver's El Peñón mine, which was acquired from Yamana Gold in Q1.23 and has been in operation since 1999, achieved higher production (+1.0Moz, 32t), further contributing to Chile's increased output. Production at Lundin Mining's Candelaria operation rose (+0.4Moz, 13t), largely on account of higher silver grades being mined, with mill throughput remaining steady. The ongoing debottlenecking of the ball mill at Anglo American's Collahuasi mine continued to benefit output (+0.4Moz, 13t), with further production increases anticipated in 2024.

**Bolivian** silver production climbed (+3.8Moz, 119t) to the highest level since 2017, largely because of more ounces being produced from lead and zinc operations. Pan American Silver's San Vicente operation produced more silver y/y (+0.5Moz, 15t) reflecting enhancements to mine dilution controls and improved infrastructure on site.

In **Argentina**, output fell as some mines processed lower grade ore. In addition, Pan American Silver's Manantial Espejo mine (-3.3Moz, 102t) was put into care and maintenance in Q4.22, as ore reserves and stockpiles had been depleted. There was residual production in 2023.

## Asia

Silver output from Asia declined by 2% y/y to 155.4Moz (4,834t) in 2023, as gains from India were offset by losses from China and Turkey. Indian production increased 6% y/y due to higher ore production and improved grades from Hindustan Zinc. However, the growth momentum from Indonesia, which had been a key driver in the region, tapered off in 2023, as the ramp-up of underground mining at Grasberg was largely completed.

China, the region's dominant producer, experienced a 2% drop in silver production, falling to a decade-low of 109.3Moz (3,399t). This was primarily due to lower by-product output from copper mining. Two major mines, Jiama and Julong, faced temporary closures. Jiama, which produced 3.2Moz (99t) in 2022, suspended operations following a tailings facility overflow in March. Additionally, production at Julong was impacted by a temporary suspension due to a safety incident in May.



## Mine Production

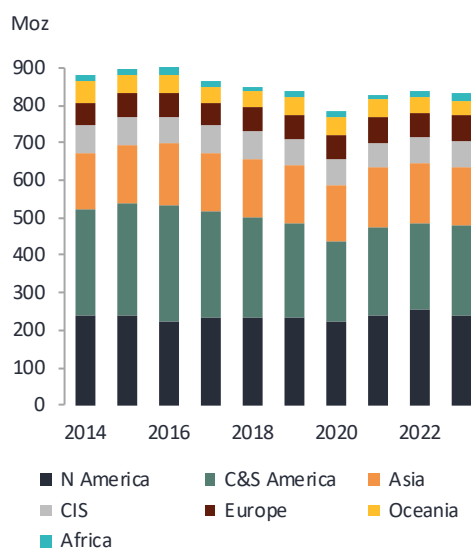
Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>North America</b>											
Mexico	185.4	192.1	174.3	187.0	194.5	187.8	180.2	196.0	213.2	202.2	-5%
United States	37.9	35.0	37.0	33.2	29.8	31.4	31.7	32.5	33.2	32.0	-3%
Canada	15.2	11.9	11.6	12.7	11.8	13.5	9.4	9.1	8.7	7.1	-18%
<b>Sub-total</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>237.7</b>	<b>255.0</b>	<b>241.4</b>	<b>-5%</b>
<b>Central &amp; South America</b>											
Peru	126.0	135.6	152.3	155.0	146.5	135.1	101.6	115.5	107.0	107.1	0%
Chile	50.2	48.1	46.6	40.4	40.0	38.2	47.4	41.2	41.9	52.0	24%
Bolivia	43.1	42.0	43.5	38.5	38.3	37.1	29.9	41.5	38.8	42.6	10%
Argentina	29.6	36.4	31.9	29.2	30.9	32.9	24.0	27.9	30.8	26.0	-16%
Brazil	1.1	1.6	2.5	2.8	2.3	2.2	2.2	2.3	2.4	3.3	36%
Panama	0.0	-	-	-	-	0.9	1.6	2.5	2.8	2.7	-3%
Dominican Republic	4.4	3.1	3.9	4.9	5.1	4.5	4.1	3.4	2.9	2.4	-16%
Guatemala	27.6	27.7	27.0	10.8	-	-	-	-	-	-	na
Others	3.4	2.6	2.0	2.0	2.5	3.0	3.0	4.2	4.3	4.5	5%
<b>Sub-total</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>213.9</b>	<b>238.6</b>	<b>231.0</b>	<b>240.6</b>	<b>4%</b>
<b>Europe</b>											
Poland	38.4	39.2	40.9	41.7	40.9	40.4	39.4	42.0	42.4	42.5	0%
Sweden	12.7	15.8	16.4	15.5	15.0	14.4	13.4	13.9	14.6	12.6	-14%
Spain	1.1	1.4	1.5	1.9	2.4	2.7	3.4	3.9	3.5	3.7	6%
Portugal	1.5	1.5	1.4	1.3	2.9	3.1	3.1	3.1	2.5	3.2	26%
Finland	0.1	0.1	0.1	0.1	0.1	1.1	1.6	1.5	1.5	1.5	-0.3%
Others	2.5	2.4	2.3	2.4	2.0	2.7	3.1	2.7	2.3	3.2	37%
<b>Sub-total</b>	<b>56.4</b>	<b>60.3</b>	<b>62.6</b>	<b>62.9</b>	<b>63.3</b>	<b>64.3</b>	<b>64.0</b>	<b>67.2</b>	<b>66.9</b>	<b>66.7</b>	<b>-0.3%</b>
<b>Africa</b>											
Morocco	7.8	9.0	10.0	10.3	7.8	9.1	8.0	8.0	8.7	8.8	1%
Botswana	0.8	0.1	0.1	0.0	0.0	0.0	0.0	0.6	1.7	2.4	42%
Eritrea	1.7	3.2	3.2	2.5	1.7	1.6	2.3	2.4	1.8	2.1	19%
South Africa	1.8	1.9	1.9	2.2	1.6	2.0	1.3	1.3	1.7	1.9	13%
Others	3.3	3.5	2.2	2.4	2.4	2.5	2.5	2.6	2.8	2.9	4%
<b>Sub-total</b>	<b>15.4</b>	<b>17.7</b>	<b>17.5</b>	<b>17.4</b>	<b>13.6</b>	<b>15.2</b>	<b>14.1</b>	<b>14.9</b>	<b>16.6</b>	<b>18.1</b>	<b>9%</b>
<b>Commonwealth of Independent States</b>											
Russia	46.1	51.1	46.6	42.0	43.1	44.7	42.1	39.0	41.1	39.8	-3%
Kazakhstan	18.1	16.1	17.4	18.9	19.8	17.0	17.4	15.0	15.4	16.6	8%
Uzbekistan	5.9	5.9	5.9	5.9	5.9	6.1	6.3	6.8	7.0	7.7	9%
Armenia	2.4	2.5	2.4	2.6	2.0	2.4	2.6	2.5	2.5	2.3	-9%
Tajikistan	1.0	1.1	1.3	1.5	1.5	1.4	1.5	1.5	1.5	1.2	-19%
Others	0.2	0.3	0.6	0.5	0.6	0.6	0.6	0.6	0.6	2.0	201%
<b>Sub-total</b>	<b>73.6</b>	<b>77.0</b>	<b>74.3</b>	<b>71.5</b>	<b>72.9</b>	<b>72.3</b>	<b>70.5</b>	<b>65.5</b>	<b>68.2</b>	<b>69.5</b>	<b>2%</b>

## Mine Production

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Asia</b>											
China	119.0	119.1	121.3	116.4	110.6	111.5	109.5	112.9	111.8	109.3	-2%
India	8.4	12.0	14.0	16.9	21.2	20.4	21.6	22.2	22.3	23.8	6%
Indonesia	7.0	9.9	10.8	10.0	10.3	7.6	9.1	10.2	10.3	10.3	-1%
Turkey	6.4	6.6	6.7	4.9	4.7	3.2	4.0	5.5	4.7	2.9	-38%
Iran	2.3	2.2	2.5	2.5	2.5	2.6	2.7	2.7	2.8	2.8	3%
Mongolia	1.7	2.0	2.2	1.8	1.7	1.6	1.7	1.8	1.6	1.9	13%
Philippines	0.7	1.0	1.1	1.0	1.0	1.0	0.8	1.0	1.8	1.6	-13%
Laos	1.3	1.7	1.6	1.4	1.2	1.1	0.9	1.0	0.8	0.7	-18%
Myanmar	0.3	0.3	0.3	0.4	0.7	0.8	0.8	0.6	0.5	0.5	2%
Others	2.5	2.2	3.1	1.7	1.7	1.6	1.7	1.7	1.7	1.7	0.3%
<b>Sub-total</b>	<b>149.6</b>	<b>156.8</b>	<b>163.7</b>	<b>157.0</b>	<b>155.6</b>	<b>151.3</b>	<b>152.7</b>	<b>159.4</b>	<b>158.4</b>	<b>155.4</b>	<b>-2%</b>
<b>Oceania</b>											
Australia	59.4	46.0	45.6	36.0	40.3	42.6	43.0	42.8	37.5	34.4	-8%
Papua New Guinea	3.1	2.3	3.2	2.1	3.0	4.7	3.8	2.9	3.0	4.3	42%
Others	0.6	0.6	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.1	-22%
<b>Sub-total</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>45.8</b>	<b>40.7</b>	<b>38.8</b>	<b>-4%</b>
<b>Global Total</b>	<b>882.0</b>	<b>896.8</b>	<b>899.8</b>	<b>863.6</b>	<b>850.6</b>	<b>837.2</b>	<b>783.4</b>	<b>829.0</b>	<b>836.7</b>	<b>830.5</b>	<b>-1%</b>

Source: Metals Focus

## Global Mine Production



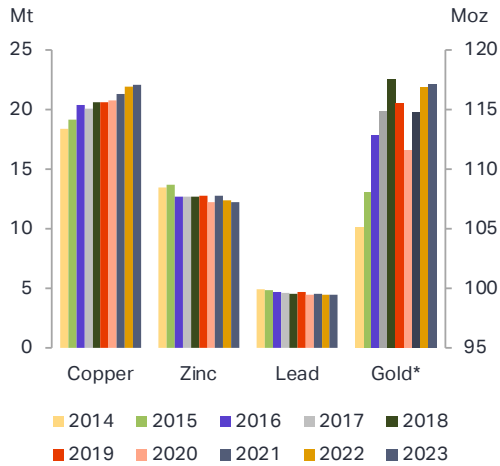
Source: Metals Focus

## Other Regions

Silver production in Oceania continued to decline, falling by 4.5% y/y to 38.8Moz (1,208t) in 2023. Output in **Australia** dropped by 8.1% y/y to 34.4Moz (1,071t) as operations, such as Aeris Mining's Jaguar and Aurelia Metals' Hera, were placed into care and maintenance. This was partly offset by far higher output in **Papua New Guinea**, up 42.2% y/y to 4.3Moz (134t), as Harmony's Hidden Valley processed increased volumes of high-grade ore in-line with the improved reliability of the overland conveyor belt.

In the CIS, silver output rose by 1.8% y/y to 69.5Moz (2,161t) as **Kazakhstan's** production experienced steady growth. Kazinc produced higher silver concentrates as Zhairam's ramp-up outweighed the delayed processing at Glencore's smelter facility. African silver output increased by 8.9% y/y to 18.1Moz (562t), as MMG's Khoemacau in **Botswana** successfully ramped-up to full production. In contrast, European silver produced fell marginally to 66.7Moz (2,074t) despite higher output in **Portugal** and steady-state production in **Poland**. Reduced output in **Sweden** was due to both lower ore milled and grade at Lundin's Zinkgruvan.

## Global By-Product Production



\*Gold in Moz, RHS

Source: ICSG, ILZSG, Metals Focus

## By-Product Analysis

A total of 71.7% of annual silver mine supply was produced as a by-product in 2023. While the share of silver produced from gold mines declined y/y, from 15.5% to 13.7%, the contribution from copper and lead/zinc operations rose, from 25.5% to 26.7% and from 30.3% to 30.8% respectively. The share of production from primary silver mines was unchanged year-on-year, accounting for 28.3% of mine output in 2023.

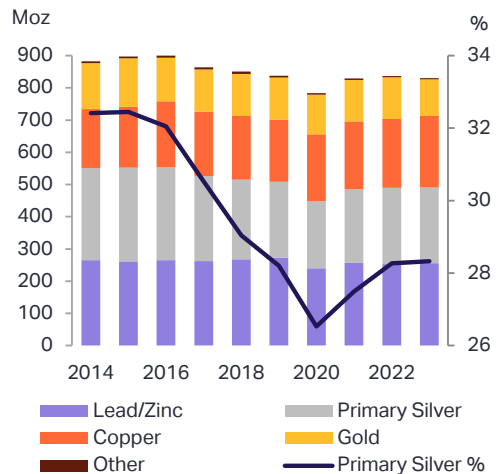
Lead/zinc operations remained the largest source of silver mine supply in 2023, producing 255.8Moz (7,957t). Overall, gains in Bolivia (3.3Moz, 103t), Peru (2.6Moz, 81t) and India (1.4Moz, 44t) exceeded falls in production in Australia (-2.2 Moz, 69t), Sweden (-1.9Moz, 60t) and Canada (-1.4Moz, 45t). While global output of lead/zinc metal production fell, the silver supplied from these base metal operations rose by 1.0% y/y. Australia experienced the largest fall in zinc output (-141kt, -11%) as a number of mines suspended operations due to low zinc prices, including Aurora Metals' Mungana, King Vol mines and Aeris Resources' Jaguar mine. Ireland saw the largest percentage decline (-50kt, -48%) of any producing country, as Boliden's Tara mine went into temporary care and maintenance.

Silver production from copper assets totaled 221.4Moz (6,885t) in 2023, accounting for 26.7% of total silver supply. Globally, copper output rose 0.5% y/y, while silver produced from copper mines grew 3.9%. Peruvian copper output rose (310kt, 12.7%) as Anglo American's Quellaveco has now fully ramped up production. Copper production in the Democratic Republic of Congo increased y/y (133kt, 4.9%), mostly due to Ivanhoe Mines' Kamoakakula operation making further productivity gains.

Gold mines accounted for 113.8Moz (3,540t), or 13.7%, of global silver production, down from 15.5% in 2022, while worldwide gold production itself increased by a slight 0.3% y/y. Russian gold production grew 2% y/y, largely on account of Polyus' Olimpiada operation extracting higher grade material which boosted the company's gold production by 0.23Moz (7t). Silver production as a by-product from gold mining increased by 6.5% y/y in Russia.

Silver produced as a by-product is forecast to see its share drop to 71.3% of the global total in 2024, to 586.9Moz (18,254t). The share of silver produced from primary gold assets is expected to increase to 15.5%. Production at Kinross' La Coipa mine in Chile continues to ramp up and Gold Fields' Salares Norte is expected to start producing in Q2.24 following delays. Production from copper and lead/zinc mines is expected to decline by 3.9% and 5.3% y/y respectively. First Quantum's Cobre Panama has been put into care and maintenance following the Supreme Court's ruling that the concession contract was unconstitutional. Silver production is also expected to be lower at Buenaventura's El Brocal due to the temporary suspension of the Tajo Norte mine.

## Mine Production by Source Metal



Source: Metals Focus

# The Changing Structure of Silver Mine Supply

Over the last half-decade, the global silver mining industry has encountered significant disruptions. As documented in previous editions of the World Silver Survey, annual mine supply worldwide is often influenced by unforeseen events. The emergence of the COVID-19 pandemic directly resulted in a production loss of 53.8Moz (1,673t) in 2020. However, when considering indirect consequences, such as strained supply chains and substantial inflation in input costs, the cumulative impact over recent years has been even more pronounced.

Additionally, social unrest in Peru during 2022 saw the country slip to third in the global ranking of silver mining countries, with China now the second-largest silver producer, a position that Peru is not expected to regain for several years. Despite these challenges, global silver supply has only marginally fallen over the past five years, by 2% or approximately 20.1Moz (626t). However, this relatively stable total hides some significant changes in the composition of that supply.

The majority of the world's silver originates from mines primarily focused on base metals, with silver being a by-product of their operations. Primary silver mines, where silver revenues dictate economic viability, accounted for only 28.3% of global supply in 2023. In recent years, the decline in output from primary silver mines has persisted, reflecting and extending a longer-term trend. Various factors have driven this decline, with regional dynamics playing a pivotal role.

Among the major producing countries, most have either increased silver production or maintained a stable output. However, Peru stands out as an exception, with a significant decline of 39.4Moz (1,225t) over the past five years, representing a 27% decrease. This decline was mostly driven by reduced output from the country's primary silver mines, which experienced several key operations being suspended or placed on care and maintenance due to factors such as community protests, supply chain challenges, social unrest, and operational issues. Elsewhere, in Russia, its invasion of Ukraine has posed various challenges. However, it was the decline in ore grade at Dukat, the largest primary silver mine in recent years, that largely contributed to the reduction in domestic production.

While silver output from primary silver, gold and lead-zinc mines, has declined, increased production from copper mines has offset much of this decrease. The International Copper Study Group has calculated that copper mine supply has risen by 7% over the past five years. Silver production from copper mining has outpaced that increase partly due to the ramp-up or expansion of several key copper mines with significant by-product silver production. These operations include Cobre Panama in Panama, Toromochu in Peru, Khoemacau in Botswana and Grasberg in Indonesia. Collectively these four copper mines have added around 8Moz of silver production over the past five years.

The rise of by-product silver from copper mining introduces a critical dynamic to silver supply, characterized by its insensitivity to changes in the silver market. While silver revenues can be meaningful for many copper mines they do not dictate the economics of the operation. The capital expenditure and production plans of these mines are instead dependent on the copper market.

This feature is further accentuated by the prevalence of silver streaming deals for several by-product silver produced from copper mines. For example, both Cobre Panama's and Khoemacau's entire silver production is captured under streaming agreements. Producers tend to enter these deals as silver is not dictating the mine economics, allowing them to forgo silver revenues in an effort to lower the company's cost of capital. These streaming and royalty deals represent now around 4% of total supply and can further dissociate silver by-product production (especially some of the key copper mines mentioned) from silver market fundamentals.

This dynamic has implications for a market experiencing structural deficits amid rising demand from sectors like the photovoltaics and automotive industries. Given that currently around 71.7% of global silver mine supply is largely price inelastic, any supply response to market deficits is expected to stem predominantly from primary silver mines, many of which are located in the Americas.

## Primary Silver Production Costs

US\$/oz (by-product*)	2022	2023	Y/Y
<b>North America</b>			
Total Cash	5.28	9.14	73%
All-In Sustaining	15.52	19.44	25%
<b>Central &amp; South America</b>			
Total Cash	7.46	7.11	-5%
All-In Sustaining	14.28	14.55	2%
<b>CIS</b>			
Total Cash	9.10	12.93	42%
All-In Sustaining	12.88	17.05	32%
<b>Asia</b>			
Total Cash	0.14	0.56	309%
All-In Sustaining	7.49	8.91	19%
<b>Oceania</b>			
Total Cash	-5.12	3.34	na
All-In Sustaining	1.45	9.81	577%
<b>Global Total</b>			
<b>Total Cash</b>	<b>5.19</b>	<b>8.38</b>	<b>61%</b>
<b>All-In Sustaining</b>	<b>13.76</b>	<b>17.18</b>	<b>25%</b>

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

Source: Metals Focus Silver Mine Cost Service

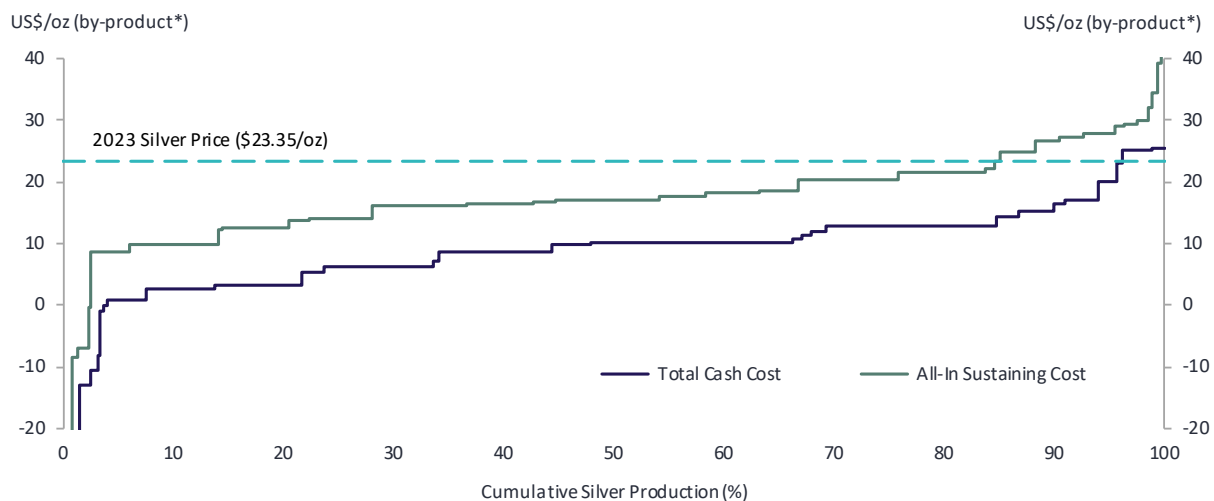
## Primary Silver Production Costs

Primary silver mining total cash costs (TCC) and all-in sustaining costs (AISC) increased significantly in 2023 as spending on key input costs rose and fewer silver ounces were produced. TCC rose by 61% to a 10-year high of \$8.38/oz, while AISC was up by 25% to \$17.18/oz (to the highest in our dataset which starts in 2010). The following cost analysis considers approximately 75% of primary silver mine supply. These operations derive the majority of their revenue from silver over the life-of-mine.

Key mining input costs continued to exert inflationary pressure last year. A tight labor market prevailed in many regions, affecting the availability of skilled workers. Companies had to offer higher wages and incentives to attract and retain workers, driving up labor costs. Prices of essential raw materials, such as explosives, also contributed to higher costs as supply chain disruption continued. In contrast, the cost of cyanide eased due to increased inventories in North America, a key supplier to Mexico and South America. Oil and gas prices, although still high compared to two years ago, were lower year-on-year. Cost improvements were offset by the weakening of the US dollar against local currencies, particularly in Mexico and Peru which together account for 62% of primary silver production. These factors impacted both operating costs and capital expenditure last year, with on-site costs up 15% y/y and sustaining capital expenditure up 3% y/y.

Many silver mines are polymetallic in nature and output includes significant amounts of lead, zinc, gold and/or other metals. Revenue created from these metals reduces cash costs as by-product credits. Gold had the largest

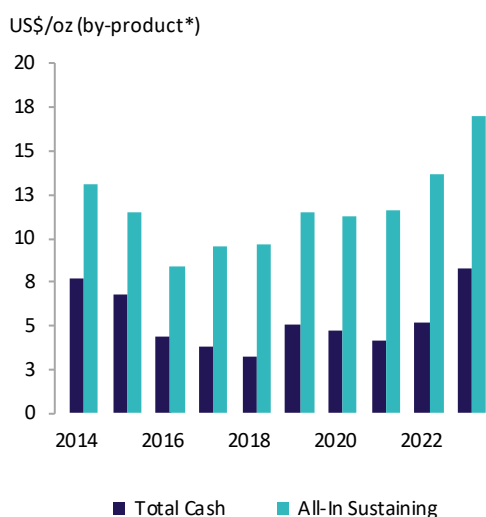
## Global Primary Silver Mine Production Costs in 2023



\* 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

contribution to by-product credits due to higher gold sales and prices. Lead and zinc by-product credits fell noticeably after a 24% y/y drop in the zinc price and fewer lead tons sold at silver mines. The gold price fully offset the decrease in lead and zinc revenues, resulting in a marginal increase in by-product credits. As a result, the global average AISC margin declined by 22% y/y to \$6.21/oz.

This year, inflationary pressure is expected to ease further as tight central bank monetary policies remain broadly in place. This will help alleviate AISC to some degree. However, this year-to-date the Brent crude oil price has already increased by 13%, which will contribute to higher diesel and energy costs and so keep on-site costs relatively high. By-product credits can be expected to trend lower in 2024 as the zinc price continues to weaken. Primary silver miners will rely more on gold by-product credits to lessen the impact of higher costs on margins. Taken together, these factors are expected to result in a higher AISC for primary silver miners in 2024.

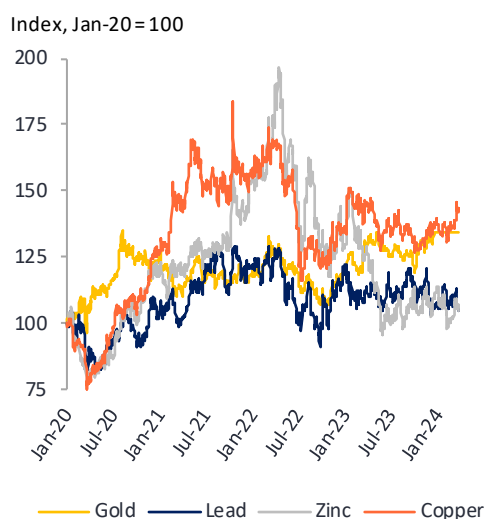
## Regional Performances

In 2023, the average TCC and AISC of operating primary silver mines in North America rose for the fourth consecutive year respectively to \$9.14/oz and \$19.44/oz. This increase was underpinned by the appreciation of the Mexican peso against the US dollar which led to more expensive local costs in US dollar terms.

In Mexico, average TCC and AISC stood at \$9.59/oz (+91% y/y) and \$19.65/oz (+30% y/y) correspondingly. Annual local inflation fell by 2.4 percentage points to 5.5%, but any beneficial effect was offset by the strengthening of the Mexican peso as it reached its lowest point against the US dollar since 2016. In addition, smaller lead and zinc by-product credits and higher sustaining capital expenditures at some operations also contributed to the higher AISC. At Saucito, Fresnillo reported that its AISC had risen to \$21.60/oz (+29% y/y) citing all the aforementioned reasons as well as the increased cost of infrastructure contractors. At Coeur Mining's Palmarejo, AISC rose to \$17.77/oz (+14% y/y) affected by lower silver and gold production and the impact of the stronger peso on electricity and employee-related costs.

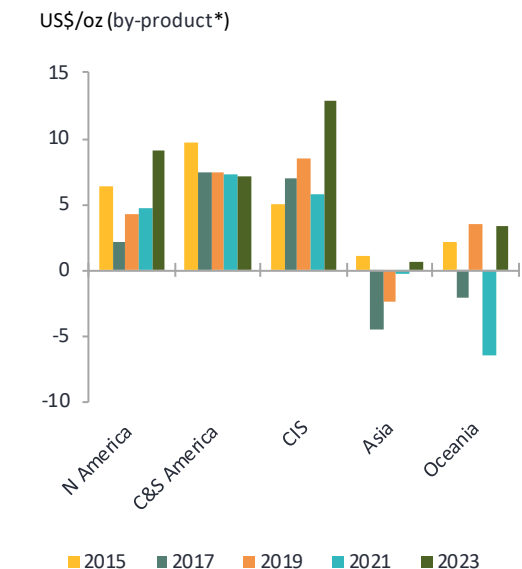
In the US, local inflation eased to 4.1% and by-product credits increased due to a 50% jump in gold revenues. Despite this, both TCC and AISC continued to rise, to \$7.02/oz (+21% y/y) and \$17.76/oz (+7% y/y) respectively. A combination of lower output, higher labor, maintenance and consumable costs underpinned the gains in TCC and AISC at Hecla Mining's Greens Creek. TCC climbed to \$2.53/oz (+261% y/y) and AISC to \$11.23/oz (+22% y/y). Also in the US, Coeur Mining benefited from its Rochester Expansion project as higher gold and silver output helped lower TCC and AISC to \$17.01/oz (-5% y/y) and \$26.50/oz (-13% y/y). The rise in gold by-product credits and silver revenue offset higher maintenance and employee-related costs.

## By-Product Metal Prices



Source: Bloomberg, Metals Focus

## Regional Total Cash Costs



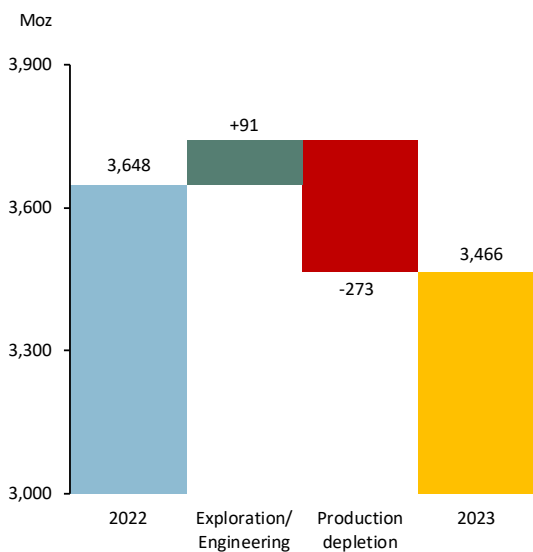
\* Cost shown on a by-product accounting basis.

Source: Metals Focus Silver Mine Cost Service

In Central and South America, TCC fell to \$7.11/oz (-5% y/y), but AISC rose to \$14.55/oz (+2% y/y). In Peru, there was a slight easing of inflation year-on-year, but the Peruvian sol also strengthened against the US dollar. At Pan American Silver’s Huaron mine, TCC and AISC rose to \$8.62/oz (+70% y/y) and \$18.46/oz (+47% y/y) as a result of lower lead and zinc by-product credits and higher sustaining capital expenditures related to underground development. In Argentina, inflation continued to rise and the peso weakened against the US dollar. Consequently, SSR Mining reported a negative impact on its Argentinian peso-denominated Puna operation. TCC increased to \$12.95/oz (+5% y/y) despite record silver production, but AISC fell slightly to \$16.53/oz (-2% y/y) on the back of higher silver sales.

In Australia, there was a slight easing of inflation coupled with a weakening in the exchange rate against the US dollar. At South32’s Cannington, TCC moved into positive territory for the first time since 2020 at \$3.54/oz. AISC also rose, up to \$9.81/oz (+577% y/y), as the benefits of higher silver production and the weaker dollar were offset by higher natural gas and labor costs in addition to lower lead and zinc by-product revenues.

## Reserve Replacement – Primary Silver Mines and Projects



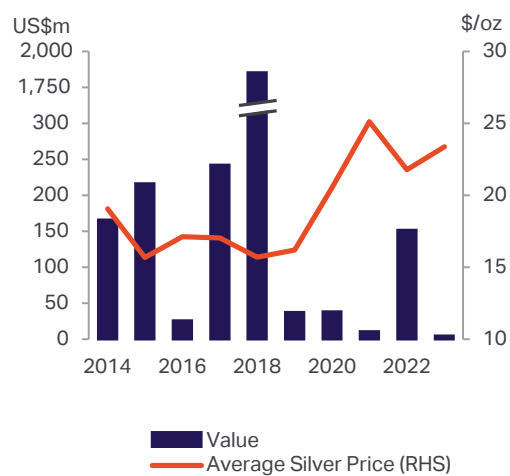
Source: Metals Focus

## Reserves & Resources

Global reserves at primary silver mines and projects totaled 3,466Moz (107,812t) in 2023. This was a decline of 5.0% y/y or -182Moz (-5,658t), as mining depletion, coupled with refined economic assumptions surpassed resource conversions into reserves. Total identified resources, excluding reserves, stood at 7,589Moz (236,048t). The 4.3% y/y resource increase resulted from successful exploration and expansion studies.

At Fresnillo, primary silver mine reserves were reduced by 29.8Moz (-927t) on an attributable basis. This was mainly due to mining extraction combined with higher operating costs and cut-off grades at San Julian (-17.1Moz, -532t) and Juanicipio (-14.9Moz, -463t). Likewise, reserves at SSR’s Pirquitas fell (-12.4Moz, -387t) due to depletion and an adjustment of economic parameters. Pan American’s ore production at La Colorado lowered its reserve estimates by 15.1Moz (-469.7t). Coeur have increased their reserves every year since 2018. However, by the end of 2023, silver reserves fell as ore replacements were outpaced by higher-grade ore mining at Palmarejo (-14.8Moz, -459t). Meanwhile, significant expansion at Rochester lifted its mine reserves by 12.9Moz (+402t). With the inclusion of the Yumpag stope operations, Buenaventura’s Uchucchacua reserves rose notably by 16.7Moz (+519t). Gatos Silver reported an 8.6Moz (+267t) growth in reserves at Cerros Los Gatos through resource upgrades from its drilling campaigns. Lastly, positive exploration results at Fresnillo’s namesake mine converted mineral resources into ore reserves which raised them by 7.2Moz (+222t).

## Value of Completed Deals\*



\* Values aggregated in the year deals are announced.

Source: Bloomberg

## Corporate Activity

Last year, corporate activity in the primary silver sector was subdued. The value of mergers and acquisitions fell to just \$5m, its lowest level since our dataset began in 2006.

The largest deal announced and completed was Aya Gold and Silver's acquisition of the Tirzzit Project to expand the company's portfolio in Morocco. Tirzzit operated as a copper mine for 12 years before its closure in 2012. Historical drilling intercepted the project's near-surface silver and copper mineralization potential with a trucking distance of 15.5 miles (25km) to Zgounder. In Q4.23, several exploration activities were conducted, such as stream sediment mapping and a high-resolution area survey. The remaining deals related to a minority investment in a silver company and a small acquisition were sold at an undisclosed value.

A total of \$117m worth of deals in cash and shares announced in 2022 were also completed during 2023. This included First Majestic's divestment of the La Parrilla Mine Complex to Golden Tag Resources (subsequently renamed Silver Storm Mining) for \$22m. Upon completion of the acquisition in August 2023, estimated silver resources at La Parrilla stood at 11.2Moz (349t). Technical studies and mine plans for the eventual restart of mining and processing is anticipated in Q4.24. In addition, Metals Acquisition purchased \$90m worth of silver streams in Australia from Osisko Gold.

## Producer Hedging

In 2023, the global delta-adjusted producer hedge book fell for the fourth consecutive year, to an estimated 8.0Moz (250t), down by 12.2Moz (379t) y/y. Forward contracts fell by 36% y/y to 5.7Moz (178t) as all producers except for Coeur Mining, Harmony and Peñoles reduced their hedge books. Options contracts dropped by 80% y/y to 2.3Moz (72t).

Coeur Mining, Harmony, Minera Frisco and Peñoles were the only companies with open positions at year-end. Notably, the majority of outstanding hedges at the end of Q4.23 covered just 12 months of production, falling back from the more typical 18-24 months. Harmony was the exception, with options covering production at Hidden Valley out to Q2.25.

Only Coeur Mining and Harmony increased their hedge positions during the year. During Q4.23, Coeur added 3.1Moz (96t) of forward contracts to protect cash flow during the ramp-up of the Rochester expansion. These contracts will be settled monthly throughout H1.24 and have a weighted average strike price of \$25.16/oz. At year-end, Coeur recorded these contracts as an asset with a fair value of \$3.3m. Harmony's hedge book stood at 1.2Moz (36t) at the end of Q4.23, up 97% y/y. These hedges protect cash flow while the Stage 8 cut-back is underway at Hidden Valley.

## Hedge Book Composition\*

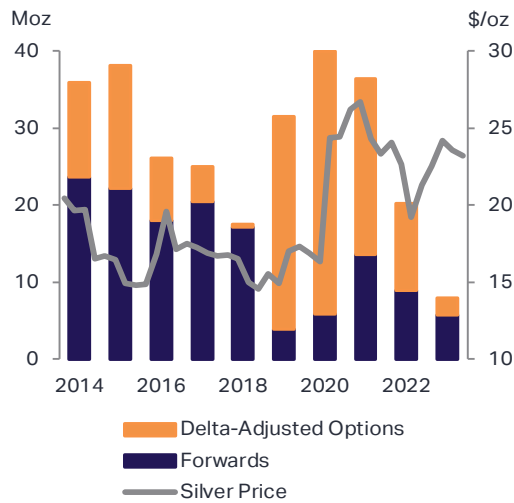
Million ounces	2022	2023	Y/Y
Forwards	9.0	5.7	-36%
Options	11.3	2.3	-80%
<b>Total</b>	<b>20.2</b>	<b>8.0</b>	<b>-58%</b>

\*Estimated delta-adjusted positions at year-end

Source: Metals Focus



## Hedge Book Evolution\*



\* Estimated delta adjusted position at year-end  
Source: Metals Focus

Peñoles further reduced their hedge book in 2023. By end-Q4.23, the company’s outstanding hedge position was 4.1Moz (128t), down 72% y/y. Of this, 1.4Moz (45t) were in option contracts with prices of \$21.70/oz and \$32.23/oz for its puts and calls respectively. Outstanding bought forwards stood at 0.2Moz (5t) and sold forwards at 2.5Moz (79t). These contracts had average strike prices of \$24.13/oz and \$24.36/oz respectively. Minera Frisco had outstanding options of 2.5Moz (90t), down 14% y/y. Average prices for the puts and calls were \$20.36/oz and \$32.53/oz respectively and the company reported a negative fair value of 3.7m Mexican pesos at year-end.

## Silver Streaming

Silver production covered under streaming and royalty contracts declined by 16% y/y to 35.1Moz (1,091t). Consequently, the proportion of mine supply covered by these contracts fell to 4.2%, marking its lowest level since 2014.

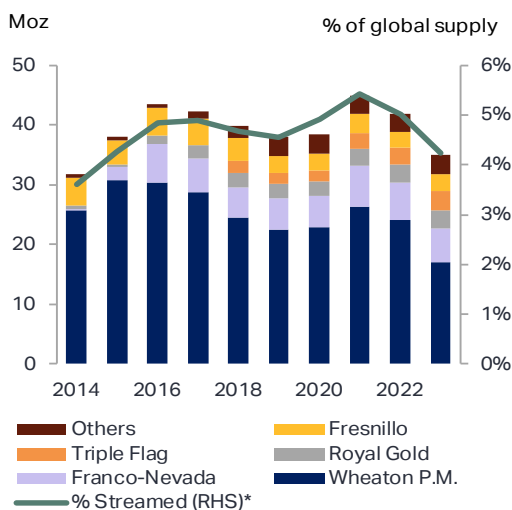
This was driven by reduced volumes from two pivotal mines, Peñasquito and Antamina. Over the past five years, these mines have accounted for more than one-third of all streaming and royalty volumes. Consequently, the 40% decline in production from Peñasquito and the 23% drop from Antamina had a substantial impact on overall volumes. Antamina’s production was hampered by lower grades and disruption caused by Cyclone Yaku, while Peñasquito was temporarily suspended due to a four month long strike.

Both Peñasquito and Antamina are integral components of Wheaton Precious Metals’ silver portfolio. Consequently, lower output from these mines led to company volumes declining by 6.9Moz (214t) y/y. This caused Wheaton Precious Metals’ market share, which represented around 75% of the market over 2010-2020, to fall below 50%. Franco-Nevada, the second largest producer, also saw output fall by 0.9Moz (28.2t) y/y, largely due to a 22.5% silver stream from Antamina. Conversely, most other companies increased output. Triple Flag, for instance, saw a 0.4Moz (13t) y/y increase, mostly due to the realization of volumes from their 2022 Maverix Metals acquisition. This growth propelled Triple Flag to become the third-largest silver royalty and streaming company by volume.

New agreements inked in during 2023 include Wheaton Precious Metals’ stream for the life-of-mine silver production from Waterton Copper Corp’s Mineral Park project, for \$115m. Elsewhere, Osisko increased its share of silver from Taseko’s Gibraltar mine, purchased under the stream, to 87.5%, at a cost of \$10.25m.

This year, the anticipated recovery of production at Peñasquito, following last year’s strike, is expected to drive growth in streaming and royalty volumes.

## Silver Royalty and Streaming



\*Percentage of global mine supply covered by royalty and streaming agreements.  
Source: Metals Focus

# Chapter 5

- Silver recycling grew by just 1% to a 10-year high of 178.6Moz (5,556t) in 2023.
- Industrial scrap rose by 3% thanks largely to higher receipts from spent EO catalysts.
- Jewelry recycling rose by just 1%, while silverware fell by 2% despite India's gains.
- Photographic recycling's losses continued last year with a fall of 7%.
- Scrap in 2024 is forecast to be stable as industrial gains offset losses elsewhere.

## Recycling

### Introduction

Total recycling in 2023 inched up by 1% to a 10-year high of 178.6Moz (5,556t). As in 2022, this increase was primarily driven by industrial scrap, itself largely due to growth in the recycling of ethylene oxide (EO) catalysts. There was also a rise for jewelry scrap, but only by 1% as price-led gains in India were countered by sluggish volumes in many other countries. India also saw growth in silverware scrap, but losses elsewhere and depleted near-market western stocks meant a 2% drop for the global total for scrapped silverware. Photographic recycling saw further structural losses (of 7%), while coin scrap (chiefly the remelt of unsold commemorative coins) saw European-centered growth of 3%. That sector plus jewelry and silverware are all expected to see losses in 2024 due to such drivers as limited economic distress. Photographic scrap should also see a further structural fall. It is only industrial recycling that will grow (again mainly due to higher EO receipts), but that should only lift the total for all recycling by a trivial 0.1%.

### Industrial

Industrial silver recycling rose last year, up 3% to a record high of 99.4Moz (3,090t). As was the case in 2022, much of this was due to greater recovery from spent EO catalysts. This in turn largely reflects regular changeouts in a field that has seen robust capacity growth (this capacity is now estimated to total almost 51,000t versus only just over 25,000t in 2010).

Other industrial areas saw gains due to long standing drivers such as a growing pool of product and better enforced or stricter environmental controls. However, the rise was small, partly due to the limited boost from prices in price-sensitive areas. The first two drivers above look to have led to notable gains in the gross volume of electronic scrap being processed by the formal sector. However, much of this was outweighed by a large fall in yields as the newer generation of PCBs coming through for recycling have a much lower silver content than before. The pool of end-of-life photovoltaic panels is also becoming more visible. However, our sources report that silver recovery from this sector remains slight. This is due to processing of these panels usually remaining uneconomic, despite various developments that have reduced energy and chemical use in the recycling process.

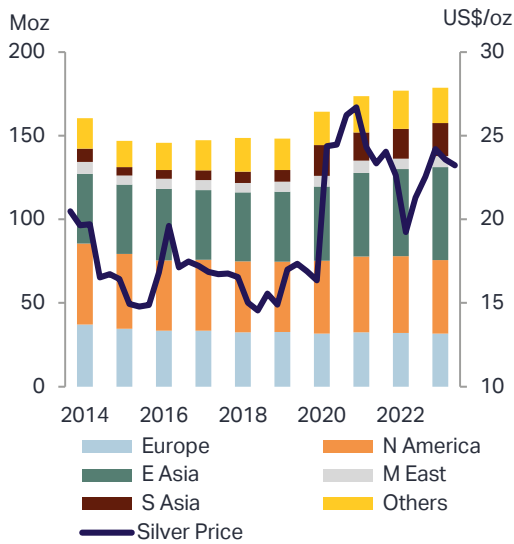
For 2024, we are expecting another year of 3% growth for industrial scrap to a new high that accounts for 57% of total recycling compared to a low of 38% in 2011. Much is again due to higher receipts from spent EO catalysts. One area of concern is that the drop in e-scrap's silver yields is also being seen for gold and it is the latter that drives the profitability of this sector. That, however, may not materially limit e-scrap volumes this year and, either way, e-scrap's contribution to total industrial recycling is modest.

### Global Recycling Forecast by Region

Million ounces	2023	2024F	Y/Y
Europe	31.7	31.0	-2%
North America	44.0	44.6	1%
Middle East	6.6	6.2	-6%
South Asia	19.6	19.8	1%
East Asia	55.6	56.3	1%
CIS	12.3	12.6	2%
Other	8.8	8.3	-5%
<b>Global Total</b>	<b>178.6</b>	<b>178.9</b>	<b>0%</b>

Source: Metals Focus

## Global Recycling



Source: Metals Focus, Bloomberg

## Jewelry

Jewelry scrap in 2023 rose by just 1% to 34.5Moz (1,074t), although that still meant an 11-year high. The only growth of note came from India, where volumes reacted to high local prices and some economic distress in rural areas. Most countries in contrast saw stagnant volumes as prices were seen as uninteresting and in the broad absence of economic hardship. The latter also meant few examples of remelt of unsold pieces coming in from manufacturers and distributors. In the absence of economic crises developing in the major economies and unless silver prices rally very steeply, we expect global jewelry scrap this year to dip by 3% to a four-year low.

## Silverware

Despite the 7% rise in US\$ prices, global silverware recycling fell by 2% to a three-year low of 23.8Moz (742t). Western volumes were broadly stable, although feedback was very mixed. Some refiners saw growth, mainly towards year-end, due to cost of living problems and during price rallies. Others saw sluggish volumes, a situation blamed on depleted near-market stocks. The only rise of note was in India thanks to robust local prices and pockets of rural hardship. We currently forecast the global figure to fall by 3% in 2024, an outcome partly premised on India seeing a normal harvest.

## Photography

Photographic recycling continued its relentless slide in 2023, falling 7% to a record low (basis our series) of 17.2Moz (536t). That put the sector's share of the global total fell below 10% for the first time (compared to 21% in 2010). This retreat remains chiefly due to lower receipts of old medical x-rays as the digitization of archives is now slowing and fewer analog x-rays are being taken. In contrast, industrial x-ray scrap was stable as this sector resists digitization. Silver recovered from consumer film and processing liquids was also flat y/y as this field has now stabilized (see chapter 8). This broad story is expected to be repeated in 2024, with the total again down 7% to another low.

## Recycling by Source

Million ounces	Year on Year											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024F	2023	2024F
Industrial	71.0	72.1	75.0	78.6	78.0	82.9	91.5	96.4	99.4	102.6	3%	3%
Photographic	28.6	26.4	24.5	23.1	21.6	21.0	20.0	18.5	17.2	16.1	-7%	-7%
Jewelry	22.6	23.5	23.9	24.1	24.9	33.2	34.4	34.2	34.5	33.6	1%	-3%
Silverware	21.3	20.4	20.2	19.6	20.2	23.8	24.3	24.2	23.8	23.1	-2%	-3%
Coin	3.5	3.3	3.6	3.3	3.4	3.4	3.5	3.6	3.7	3.4	3%	-8%
<b>Global Total</b>	<b>147.0</b>	<b>145.7</b>	<b>147.2</b>	<b>148.7</b>	<b>148.2</b>	<b>164.3</b>	<b>173.7</b>	<b>176.9</b>	<b>178.6</b>	<b>178.9</b>	<b>1%</b>	<b>0.1%</b>

Source: Metals Focus

## Recycling

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Germany	10.2	9.9	9.7	9.4	9.8	9.9	9.6	9.7	9.8	10.3	5%
Italy	6.6	5.8	5.5	5.2	5.0	5.1	4.8	4.8	4.6	4.6	1%
UK	5.8	5.6	5.4	5.3	5.1	5.0	4.8	4.5	4.3	4.1	-5%
France	4.3	3.8	3.4	3.2	3.1	3.1	3.1	3.3	3.2	3.2	-1%
Others	10.2	9.4	9.4	10.3	9.4	9.5	9.5	10.0	10.3	9.5	-8%
<b>Sub-total</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>32.1</b>	<b>31.7</b>	<b>-1%</b>
<b>CIS</b>											
Russia	8.0	6.7	6.5	7.9	10.0	8.5	9.3	10.3	11.3	10.2	-10%
Others	1.8	1.4	1.4	1.7	1.9	1.8	2.0	2.2	2.4	2.2	-10%
<b>Sub-total</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>13.7</b>	<b>12.3</b>	<b>-10%</b>
<b>North America</b>											
United States	43.6	40.7	38.1	38.4	38.4	38.1	39.3	41.2	41.4	39.9	-4%
Others	4.7	4.1	4.1	4.0	4.0	4.0	4.1	4.3	4.4	4.1	-6%
<b>Sub-total</b>	<b>48.3</b>	<b>44.8</b>	<b>42.1</b>	<b>42.4</b>	<b>42.4</b>	<b>42.1</b>	<b>43.5</b>	<b>45.4</b>	<b>45.8</b>	<b>44.0</b>	<b>-4%</b>
<b>Middle East</b>											
Turkey	3.4	2.5	2.5	2.5	2.7	2.7	2.5	2.7	2.2	2.3	5%
Others	3.7	3.0	3.5	3.5	3.0	3.2	3.8	4.6	4.0	4.3	7%
<b>Sub-total</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>6.2</b>	<b>6.6</b>	<b>6%</b>
<b>South Asia</b>											
India	7.5	4.6	4.9	5.4	6.3	6.6	15.9	14.7	15.4	17.0	10%
Others	0.5	0.3	0.3	0.4	0.5	0.5	2.6	2.2	2.3	2.6	11%
<b>Sub-total</b>	<b>7.9</b>	<b>5.0</b>	<b>5.2</b>	<b>5.8</b>	<b>6.8</b>	<b>7.1</b>	<b>18.5</b>	<b>16.9</b>	<b>17.8</b>	<b>19.6</b>	<b>10%</b>
<b>East Asia</b>											
China	22.3	23.2	23.1	22.8	23.0	23.7	26.1	31.4	34.8	39.3	13%
Japan	11.0	11.0	11.4	11.4	10.9	10.5	10.0	9.5	9.1	8.7	-4%
Taiwan	3.3	2.6	3.0	2.8	2.6	2.9	2.9	3.0	2.7	2.3	-14%
Others	5.2	4.6	5.3	4.7	4.7	4.9	5.4	6.0	5.6	5.4	-5%
<b>Sub-total</b>	<b>41.8</b>	<b>41.4</b>	<b>42.7</b>	<b>41.7</b>	<b>41.2</b>	<b>41.9</b>	<b>44.4</b>	<b>49.9</b>	<b>52.2</b>	<b>55.6</b>	<b>7%</b>
<b>Other Regions</b>											
C&S America	3.5	3.1	3.4	3.5	3.5	3.6	3.8	4.2	4.4	4.0	-9%
Africa	3.0	2.8	2.8	2.9	2.8	2.9	3.0	3.6	3.2	3.3	3%
Oceania	2.1	2.0	2.0	1.9	1.9	1.9	1.7	1.6	1.6	1.5	-5%
<b>Sub-total</b>	<b>8.5</b>	<b>7.8</b>	<b>8.2</b>	<b>8.3</b>	<b>8.3</b>	<b>8.3</b>	<b>8.6</b>	<b>9.3</b>	<b>9.2</b>	<b>8.8</b>	<b>-4%</b>
<b>Global Total</b>	<b>160.5</b>	<b>147.0</b>	<b>145.7</b>	<b>147.2</b>	<b>148.7</b>	<b>148.2</b>	<b>164.3</b>	<b>173.7</b>	<b>176.9</b>	<b>178.6</b>	<b>1%</b>

Source: Metals Focus

## Chapter 6

- Although Indian imports collapsed by 63% to 111.7Moz (3,475t) in 2023, this represented just a two-year low.
- UK exports suffered a similar decline last year, with the 68% drop to 118.0Moz (3,671t) also its lowest since 2019.
- Despite weaker retail investment, US imports rose by 7% to 169.8Moz (5,280t).
- Exports from mainland China achieved the second highest total on record, rising by 4% to 131.3Moz (4,083t).

## Bullion Trade

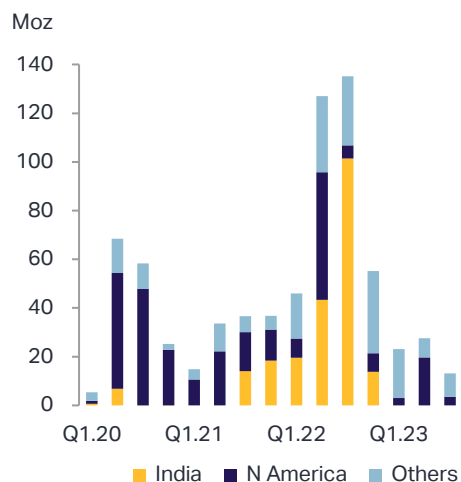
### Introduction

Last year saw the return of somewhat more normal bullion trade flows in several key silver consuming and fabricating markets, which for some meant sharp year-on-year changes. One of the highest profile examples was in India where bullion imports returned to a more recognizable 111.7Moz (3,475t), following 2022's record high of 303.8Moz (9,450t). Looking below the headline figures, it was also revealing to see the UAE become the third largest supplier to India last year, a reflection of the recently agreed Comprehensive Economic Partnership Agreement (CEPA) between the two countries. This could quickly see the UAE rival the UK and Hong Kong as the foremost source of silver for India (see the Focus Box on page 45). The sharp drop in Indian imports, and the gains made by the UAE, had a noticeable effect on UK exports, which also returned to more normal levels after 2022's record level.

The decline in UK exports last year also reflected a slightly more subdued physical investment market (covering coin and bar demand) in the US. This helps explain the drop in shipments to Canada, Switzerland and Turkey, with each either delivering bullion to be fabricated in the US, or an investment product for its retail investment market. Looking at US bullion imports reveals a broadly similar picture, with weaker deliveries from Turkey and Switzerland last year also being quite noticeable.

From an industrial demand standpoint, the drop in Japanese bullion imports to a multi-decade low in 2023 of 44.5Moz (1,385t) was also noteworthy. This may surprise, as East Asian silver industrial offtake rose by 25% last year. However, it was telling that Chinese offtake surged by 44%, while Japanese demand was unchanged, a reflection of ongoing market share gains in favor of mainland China.

### UK Bullion Exports\*



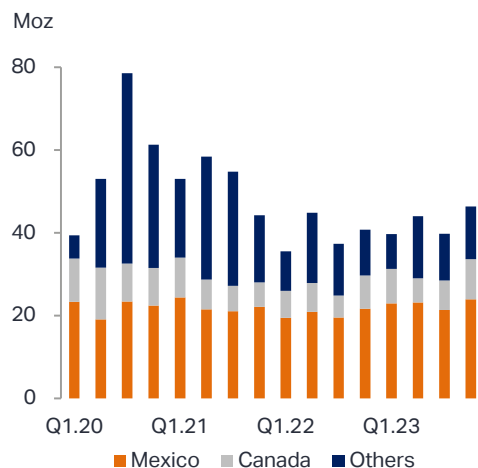
Source: Metals Focus, S&P Global; \*Gross weight

### Europe

Following the sharp drawdown in LBMA silver vault stocks in 2022, last year saw a slight rise through to September. This owed much to developments in India, which in 2022 had taken massive quantities from London (and entirely by air freight, itself almost unheard of). By contrast, last year saw this outflow return to more normal levels until October that is, when the Indian market burst into life resulting in a then record import total. The overall weakness in India last year also contributed to a massive jump in Chinese deliveries into London, which appeared to have touched a record high in 2023. Overall, there was therefore only a slight rise in London stocks, which at end-2023 stood at 856.2Moz (26,631t), compared with 840.9Moz (26,155t) the year before.

The other driver of changes in LBMA silver holdings last year and, by extension, UK trade flows, were weaker physical investment markets in the

## US Bullion Imports\*



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

US and Europe. With regards to the latter, Germany switched from being a net importer of large bars from the UK in 2023 (to convert into investment products) to a net supplier to London for the first time since 2019. Overall UK exports in 2023 fell 68% to 118.0Moz (3,671t), to a four year low. The 75% jump in UK bullion imports to 131.8Moz (4,098t) represented a two-year high.

The impact of softer US retail bar and coin demand resonated far more in Switzerland and Turkey (two fairly new bullion suppliers to the US) rather than with those in North America. This helps explain why UK exports to Switzerland returned to more levels last year, after the massive surge to a 14-year high in 2022. In terms of UK-Turkey bullion flows, 2022 had seen the first ever, sizable import of metal from London, to service the US retail market. However, these also fell sharply in 2023 as US demand for Turkish bar products eased. That said, this also reflected market share changes, with Turkish bullion imports from Switzerland reaching a new high in 2023.

A jump in exports to Switzerland was seen for Italy, this being the largest element in the latter's increase in bullion exports of 65% in 2023 to 23.6Moz (773t). Italian imports also rose, but by a more modest 12% to 33.7Moz (1,047t), meaning net imports fell by 36%.

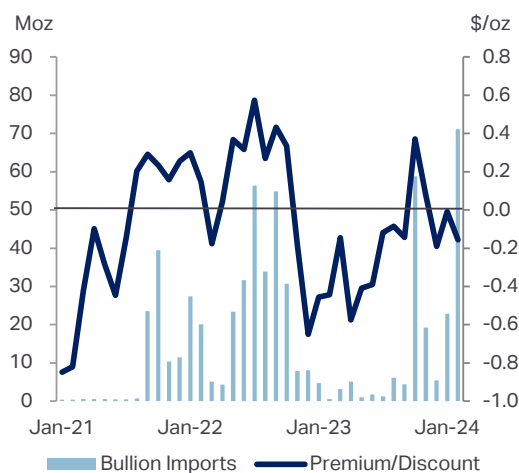
## North America

Last year, the trend in US bullion imports largely reflected developments in the country's physical investment returning to more normal levels. Even though total imports rose 7% to 169.8Moz (5,280t), two of the more noteworthy changes were the 39% and 34% declines for imports from Turkey (to 8.1Moz/252t) and from Switzerland (to 2.3Moz/70t). During the recent jump in US coin and bar demand, both countries had emerged as key suppliers of investment bars, having had little previous involvement in the US. However, as investment weakened last year, there was less need to bring in Turkish or Swiss products. In contrast, Mexican exports to the US recovered last year, by around 12%. This was the main reason for the rise in total US imports in 2023.

## Middle East

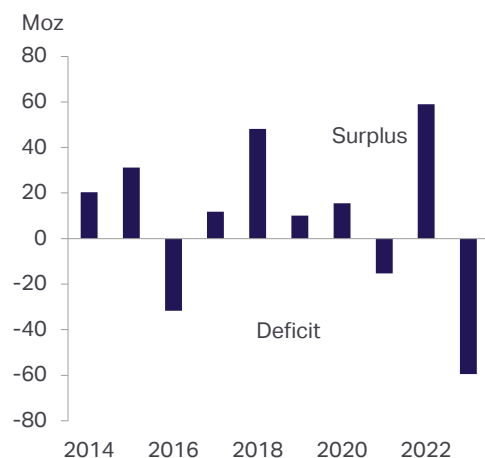
Middle East bullion exports rose by 76% in 2023 to 57.9Moz (1,800t), having already increased 135% the previous year. This was mostly due to an eightfold increase in exports from the UAE, mainly due to India, thanks to the Comprehensive Economic Partnership Agreement (CEPA) deal between the two countries. In contrast, Turkish exports declined by 4% (with falling shipments to the US) but they remained elevated at 28.3Moz (880t). The region's bullion imports remained robust in absolute terms but declined slightly by 2% to 64.8Moz (2,014t), with the drop in Turkish inflows met by an increase in UAE demand. The CEPA is expected to be the main driver of bullion flows in 2024.

## Indian Silver Bullion Imports\*



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

### Indian Silver Net Balance\*



\*Balance = net bullion imports + scrap + mine production – all fabrication – physical investment  
 Source: Metals Focus

### South Asia

From a record high of 303.8Moz (9,450t) in 2022, Indian silver bullion imports slumped by 63% to 111.7Moz (3,475t) in 2023. More normal levels of demand and high prices underpinned the decline. India also increased the duty on silver bars from 10.75% to 15% and the duty on silver doré from 9.21% to 14.35%, which contributed to the surge in domestic (landed) prices. Another key factor that impacted imports was the high carryover stock from the previous year. Metals Focus estimates that some 800-1,000t was lying in vaults at the end of 2022. As a result, bullion imports in H1.23 remained subdued and only picked up during the festive period in H2.23. Almost half (58.8Moz/1,829t) of the imports were brought in during October (a record high at the time) as demand started to recover.

Silver imports were unexpectedly dominated by three suppliers last year, the UK (42%), Hong Kong (27%) and the UAE (12%). The UAE’s surprise market share was entirely because of the recently agreed India-UAE CEPA. Due to the concessional duty structure that applies under the agreement, the dynamics of the Indian bullion trade are changing rapidly. Apart from the UAE becoming a bigger supplier to India, silver grain is also gaining share in the overall import mix due to value addition norms under the CEPA (see the Focus Box below).

## India-UAE CEPA and its Impact on the Silver Import Landscape

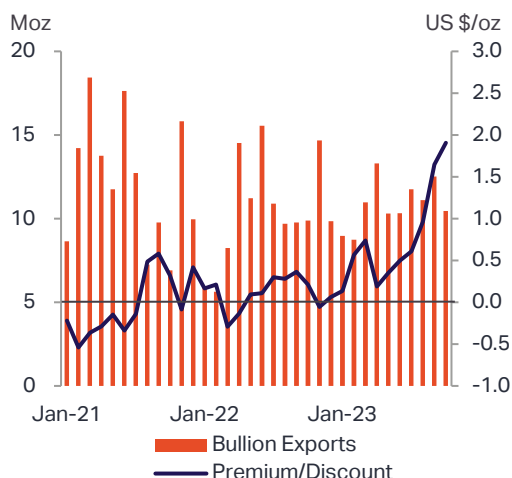
The India-UAE Comprehensive Economic Partnership Agreement (CEPA) signed in 2022 has significantly changed India’s import landscape. Under this agreement, the import duty on silver bullion from the UAE will fall by 1% each year, until it reaches zero in 2031. However, to qualify under the CEPA, the silver requires a Certificate of Origin (COO) and a 3% Value Addition (VA). To fulfill this, the importer must provide documents to prove that the silver has been refined in the UAE and that it has undergone this VA. As the UAE does not mine silver, local refineries are converting bars into grain, processing the metal to ensure it meets the 3% VA.

While the CEPA came into effect in 2022, imports under this deal only started to ramp-up last year. To provide context, given the 3% VA, silver imports from the UAE into India were unviable unless the duty differential between regular Indian imports and CEPA exceeded 3%. This was not the case in 2022, as duty outside the CEPA was 10.75% whereas the duty under the trade deal was 10%. However, the Indian government’s decision to raise the import duty (outside CEPA) to 15% in February 2023

made the UAE-India route profitable. In other words, while those delivering silver to India outside the CEPA faced the new 15% duty, imports under CEPA attracted a 9% duty in the second year of the agreement. With the duty differential now at 6%, imports under CEPA became far more attractive. As a result, 13.6Moz (422t) of silver was imported into India in 2023. The momentum has continued in 2024, with the first two months witnessing inflows of nearly 42Moz (1,300t).

Looking ahead, the duty under CEPA will fall to 8% starting April 2024 and so the duty differential will continue to widen. In the absence of any policy change or a reduction in Indian import duties for the rest of the world, the UAE is expected to remain the biggest supplier of silver to India in the coming years. Within the import mix, grain will dominate, gaining market share from London Good Delivery bars. That said, while this will not affect the overall total it will impact where the metal comes from as silver that used to come to India from the UK, and Hong Kong now makes its way into the country after undergoing VA in the UAE for importers to benefit from the duty differential.

## Chinese Bullion Exports\*



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

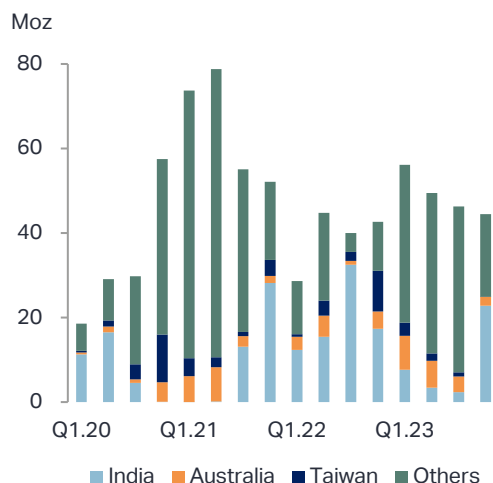
Turning to this year, India has already imported 94Moz (2,921t) of silver in the first two months, with the rupee price easing. February's Inflows reached a new high of 71Moz (2,211t), beating the October 2023 record.

## East Asia

China has traditionally been a net exporter of silver due to the metal's structural oversupply in the local market. This is fueled by large volumes of refined silver produced from imported base metal concentrates and from domestic mines, whose output ranks second globally.

Bullion exports from mainland China increased by 4% in 2023 to 131.3Moz (4,083t), the second highest on record. This partially reflected a post-COVID rebound, when refining had been affected by the disease's outbreak and pandemic prevention measures in Q1.22. In addition, falling lead and zinc concentrate processing fees meant refineries switched to importing silver concentrates to buoy profits. This business is often conducted via 'processing trades', from which refineries can benefit from import VAT of zero on the silver content as long as they re-export the refined silver bullion (otherwise, 13% import VAT is levied on the total value of the silver content). The high production of refined silver bullion and weak demand from India saw UK bullion imports from mainland China hit a record high of 50.8Moz (1,581t) last year. It is worth noting that even though the local premium spiked in mid-September, exports in Q4.23 remained solid due to the sharp recovery in Indian imports. The strong outflows were reflected in stock declines at the Shanghai Gold Exchange and Shanghai Futures Exchange where inventories fell by 39% y/y, or 53.5Moz (1,664t), to a six-year low of 84.7Moz (2,634t) by end-2023.

## Hong Kong Bullion Exports\*



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

Metals Focus' estimates of bullion imports into mainland China (which includes adjustments to certain reported flows) surged by 49% to 9.4Moz (291t). The percentage growth was flattered by the low base in 2022. In volume terms, bullion imports last year were close to pre-pandemic levels, partly reflecting the post-COVID recovery in the industrial sector.

Hong Kong bullion imports rose by a further 8% to a record high of 118.3Moz (3,679t). Mainland China remained the largest bullion supplier to the Hong Kong market, even though shipments from there fell by 11% or 10.7Moz (332t) to 83.9Moz (2,611t). These losses were more than offset by the rebound in shipments from Taiwan and Russia. Bullion exports also recorded notable growth of 26% to 196.3Moz (6,106t). The UK became the largest export destination for Hong Kong, up by 319% to 65.7Moz (2,044t), as major bullion banks sent good delivery bars to London when demand from India was lackluster in the first three quarters of the year. However, shipments to the UK slid in the last quarter when Indian demand resumed. That said, overall annual exports to India still recorded a dramatic decline of 53% to 36.2Moz (1,127t).



# Chapter 7

- Industrial demand rose 11% in 2023 to another record high of 654.4Moz (20,353t).
- Electronics & electrical demand grew by 20% thanks to green-related applications, steady gains in its core end-uses and limited thrifting. Brazing alloys rose by 2%, while Other Industrial offtake fell by 5% as gains from EO capacity expansions were dragged down by lower changeouts.
- Offtake is expected to grow by a further 9% to another high in 2024, thanks to such drivers as rising PV end-use and a recovery in consumer electronics.

## Industrial & Photography

### Industrial Demand

#### Introduction

Industrial silver demand rose by 11% to 654.4Moz (20,353t) in 2023, posting another record high. This was mainly due to the structural gains from green economy applications, particularly in the photovoltaic (PV) sector. It was PV's capacity additions, well above expectations and accelerated adoption of new generation cells, that helped drive the significant growth of 20% for electronics & electrical demand. Strength in other green-related applications, including power grid constructions and the automotive sector, also assisted here. However, consumer electronics faced a lackluster performance as it had to cope with the macroeconomic challenges and elevated inventory issues. Silver demand for ethylene oxide (EO) catalysts remained robust as a result of solid gains from the capacity expansion. Brazing alloys rose by 2% thanks to gains in mainstream end-uses including automotive, aerospace and shipbuilding in most major industrial countries.

Underpinning these overall gains was the limited scale of thrifting and substitution as silver remains irreplaceable in many applications and due to relatively rangebound prices. Indeed, there are examples where silver use per unit rose, most obviously in the above-noted new generation PV solar cells.

We forecast industrial demand gains of 9% this year to another record high. All market segments are expected to see increases as the global economy continues to enjoy modest growth, but gains will be primarily driven by end-use in the green economy, and also helped by a resurgence in consumer electronics. However, the strong gains in PV over the past two years may be hard to sustain as installations start to plateau, while geopolitics and trade disputes have the potential to disrupt our forecast.

#### Europe

Industrial demand in Europe fell by a steep 15% in 2023 to a seven-year low of 74.0Moz (2,302t). However, that was mostly caused by one-off losses in the UK. If we exclude that country, demand elsewhere in the region rose by 1%.

One of the key drivers of non-UK results was overall stability in silver's end-use in electrical applications. On the positive side was a good year for commercial construction, ongoing decarbonization (PV panel installations and retooling of factories for battery electric vehicle production) and solid gains for circuit breakers going into data centers. There were also gains in the automotive industry - light vehicle output rose by 14%, while the production of silver-hungry BEVs jumped by 45%. However, sources feel that gains accruing to European fabricators were lower than these headline

### Global Industrial Demand Forecast

Million ounces	2023	2024F	Y/Y
Europe	74.0	90.2	22%
North America	134.2	138.9	3%
South Asia	41.4	43.0	4%
East Asia	389.5	422.7	9%
Others	15.3	16.1	5%
<b>Global Total</b>	<b>654.4</b>	<b>710.9</b>	<b>9%</b>

Source: Metals Focus

## Industrial Demand

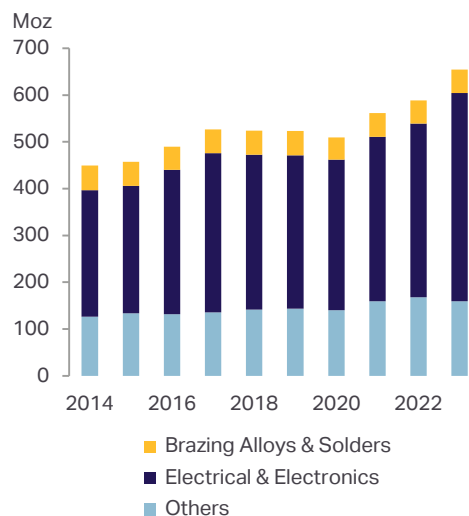
Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Germany	27.1	26.1	26.3	27.0	27.9	26.0	30.5	35.5	30.9	31.2	1%
France	9.1	8.6	8.4	8.7	9.1	9.3	8.5	9.6	10.3	10.9	6%
Italy	8.5	8.5	8.4	8.7	9.1	9.2	7.8	9.2	9.6	9.6	0%
United Kingdom	16.1	14.8	15.8	19.1	20.1	22.2	23.2	25.6	23.2	9.5	-59%
Others	12.2	11.9	12.0	12.4	12.7	12.6	11.6	12.9	13.1	12.8	-2%
<b>Sub-total</b>	<b>73.0</b>	<b>70.0</b>	<b>70.9</b>	<b>76.0</b>	<b>78.9</b>	<b>79.4</b>	<b>81.5</b>	<b>92.8</b>	<b>87.1</b>	<b>74.0</b>	<b>-15%</b>
<b>North America</b>											
United States	88.2	90.9	108.9	112.0	115.1	112.9	115.5	121.8	127.0	128.1	1%
Others	4.6	5.7	6.0	5.6	5.7	5.9	5.0	5.4	5.7	6.1	5%
<b>Sub-total</b>	<b>92.7</b>	<b>96.6</b>	<b>114.9</b>	<b>117.6</b>	<b>120.8</b>	<b>118.8</b>	<b>120.4</b>	<b>127.3</b>	<b>130.5</b>	<b>134.2</b>	<b>1%</b>
<b>South Asia</b>											
India	37.9	35.7	35.9	37.3	40.2	37.8	26.7	34.2	42.6	41.4	-3%
<b>Sub-total</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>42.6</b>	<b>41.4</b>	<b>-3%</b>
<b>East Asia</b>											
China	106.0	113.8	114.0	128.2	133.8	134.4	131.4	150.3	181.4	261.2	44%
Japan	87.0	90.5	104.6	118.3	103.2	108.7	109.5	113.2	98.3	98.0	0%
South Korea	20.2	19.0	18.0	19.1	19.1	18.4	17.4	18.7	20.2	19.5	-3%
Taiwan	10.5	10.2	10.0	9.4	9.7	8.8	9.0	9.5	9.9	9.4	-5%
Others	1.0	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.4	6%
<b>Sub-total</b>	<b>224.7</b>	<b>234.7</b>	<b>247.9</b>	<b>276.2</b>	<b>267.1</b>	<b>271.6</b>	<b>268.5</b>	<b>293.0</b>	<b>311.1</b>	<b>389.5</b>	<b>25%</b>
<b>Other Regions</b>											
C&S America	7.0	6.9	7.2	6.5	4.1	2.8	1.7	1.9	2.0	2.0	-2%
Middle East	6.9	6.4	5.8	6.0	6.0	5.7	4.9	5.2	5.9	6.4	9%
Oceania	4.4	4.3	4.4	4.2	4.4	4.5	3.6	4.2	4.5	4.4	-3%
CIS	1.9	1.5	1.6	1.6	1.7	1.8	1.5	1.8	1.5	1.6	5%
Africa	1.3	1.0	0.9	0.9	1.0	1.0	0.9	0.9	1.0	0.9	-3%
<b>Sub-total</b>	<b>21.5</b>	<b>20.1</b>	<b>19.9</b>	<b>19.3</b>	<b>17.1</b>	<b>15.8</b>	<b>12.5</b>	<b>14.0</b>	<b>14.9</b>	<b>15.3</b>	<b>3%</b>
<b>Global Total</b>	<b>449.8</b>	<b>457.1</b>	<b>489.5</b>	<b>526.4</b>	<b>524.2</b>	<b>523.5</b>	<b>509.7</b>	<b>561.3</b>	<b>586.0</b>	<b>654.4</b>	<b>11%</b>

## Breakdown of Industrial Demand by Sector

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
Electrical/Electronics	269.8	272.3	308.9	339.7	331.0	327.3	322.0	351.2	371.3	445.1	20%
Brazing Alloys	53.4	51.1	49.1	50.9	52.0	52.4	47.5	50.5	49.2	50.2	2%
Other Industrial	126.6	133.7	131.5	135.8	141.2	143.8	140.2	159.6	167.8	159.0	-5%

Source: Metals Focus

## Global Industrial Demand



Source: Metals Focus

numbers due to such factors as Germany's high energy costs and imported components taking market share. Also on the negative side was weakness in residential construction and associated losses in domestic white goods. All this was exacerbated by the running down of excess inventories, a process that contributed to notable weakness in the second half of 2023.

Non-photographic nitrates saw gains last year through rising end-use in such diverse areas as defense and mirrors (an area where sources have seen a move back to silver as aluminum alternatives proved disappointing). Some contacts also report notable gains in new areas such as printing onto stretchable or moldable surfaces, although their contribution in weight terms at present remains modest. In contrast, brazing alloy fabrication fell notably last year due to such drivers as the running down of buffer stocks and lower exports of silver-bearing equipment into the Middle East.

The one-off swings noted earlier for the UK largely relate to a sharp fall in export-related orders last year. A reversal for the UK largely explains why we currently forecast a bounce back of a robust 22% this year for European offtake (to the second highest level in our series). A more representative figure (growth excluding the UK) stands at 3%. This is better than last year as the one-off of supply chain destocking should not get repeated and the key German economy is forecast to swing from contraction to slight growth.

## North America

Industrial fabrication in North America last year grew by just 1% but in doing so reached a 12-year high of 134.2Moz (4,174t). Most segments saw modest gains, with the exception of powders for the PV industry and the production of EO catalysts, both of which saw small losses.

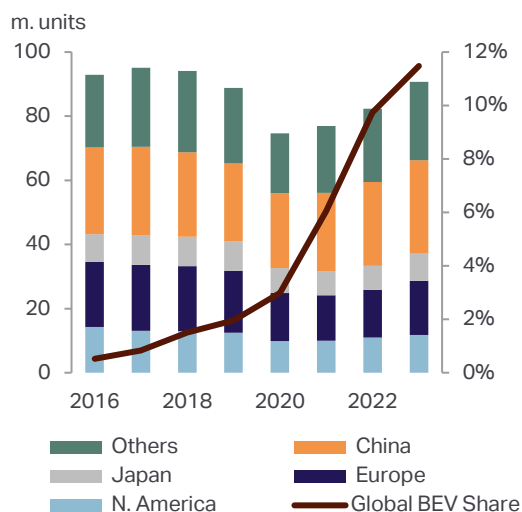
The largest segment, electronics and electrical demand, rose by 2% in 2023. Much was due to ongoing gains for core sectors such as contacts thanks to

## Electrical & Electronics Demand

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
China/Hong Kong	65.2	67.2	70.3	85.2	88.7	88.1	80.8	90.0	124.4	195.6	57%
Japan	73.6	75.8	91.0	104.2	88.9	94.3	96.6	98.6	83.2	82.5	-1%
United States	44.2	46.9	65.0	66.9	68.7	65.6	66.6	70.8	73.9	75.6	2%
Germany	18.2	17.3	17.7	18.3	19.0	17.1	21.4	25.7	20.6	20.9	2%
India	14.3	13.6	13.8	14.3	15.3	13.6	11.7	14.9	17.2	18.2	6%
South Korea	9.3	8.5	8.3	8.6	8.4	7.9	7.4	7.9	8.7	8.6	-1%
Others	45.1	42.9	42.9	42.3	42.0	40.7	37.4	43.2	43.3	43.8	1%
<b>Global Total</b>	<b>269.8</b>	<b>272.3</b>	<b>308.9</b>	<b>339.7</b>	<b>331.0</b>	<b>327.3</b>	<b>322.0</b>	<b>351.2</b>	<b>371.3</b>	<b>445.1</b>	<b>20%</b>
of which Photovoltaics	52.0	59.6	81.6	99.3	87.0	74.9	82.8	88.9	118.1	193.5	64%

Source: Metals Focus

## Global Light Duty Vehicle Production & BEV share



Source: LMC Automotive, a GlobalData Company

a still robust economy and a good year for the construction industry. Another sector of importance to silver, the automotive industry, also saw a rise in light vehicle output of 10%. End-use within the sector had the potential for yet faster gains thanks to rising vehicle sophistication. This includes features such as heated seats, front windshield defogging or heads-up displays, all of which need silver. Of particular help was the 42% rise in BEV output as these vehicles need much more silver than ICE equivalents. The green economy further benefited silver by the linked investment in power distribution for vehicle charging, solar panel installations and so forth. End-use in 5G equipment also rose while newer areas such as wearable applications saw gains, although their contribution in weight terms remains modest at the moment. Lastly, non-photographic nitrates output held up well.

Not all was positive as consumer electronics were lackluster and PV-related powder demand fell. Also, improved logistics in the first half of the year meant the supply chain tended to run down safe-guarding inventories, while stocks look to have been further trimmed in the second half due to recession fears.

Brazing alloy and solder demand grew by a modest 2% thanks to higher end-use in the PV sector, aerospace / defense and the automotive industry (especially in BEVs). In contrast, our category of other industrial fabrication saw a dip of 1%. This was mainly due to EO and a return to more normal change-out levels last year following a post-COVID lift in 2022.

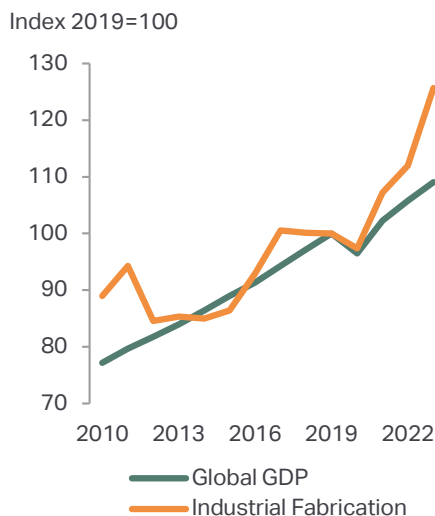
A key contributor to demand solidity last year was the limited scale of thrifting and / or substitution. Firstly, many established areas are already operating with the lowest silver use possible or have already switched. One example of the latter is the move within HVAC (heating, ventilation and air-conditioning) to aluminum-based systems that do not use brazing alloys. In the next layer up where a shift away from silver might be technically possible, losses were slight as sources feel that silver prices over \$25 if not into the high \$20s are needed to motivate change. Newer uses are more vulnerable

## Brazing Alloys & Solder Demand

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
China	25.0	25.5	24.1	24.5	24.8	25.1	22.5	22.1	19.5	20.4	5%
United States	6.0	5.7	5.9	6.2	6.4	6.5	6.0	6.5	6.8	6.9	2%
Germany	4.6	4.4	4.3	4.2	4.2	4.1	4.3	4.7	5.0	5.1	1%
India	2.3	2.1	2.2	2.2	2.3	2.2	1.7	2.7	3.0	3.1	2%
South Korea	2.7	2.6	2.3	2.4	2.4	2.3	2.1	2.2	2.3	2.4	5%
Japan	1.9	1.8	1.8	2.0	2.1	2.1	1.9	2.1	2.2	2.2	2%
Others	10.9	9.0	8.7	9.3	9.8	10.1	8.9	10.0	10.4	10.1	-3%
<b>Global Total</b>	<b>53.4</b>	<b>51.1</b>	<b>49.1</b>	<b>50.9</b>	<b>52.0</b>	<b>52.4</b>	<b>47.5</b>	<b>50.5</b>	<b>49.2</b>	<b>50.2</b>	<b>2%</b>

Source: Metals Focus

## Industrial Silver Fabrication versus Global GDP



Source: IMF, Metals Focus

but restrained prices and a focus on more critical areas (such as battery design in BEVs) mean this was more a potential than an actual issue. Lastly, research into new generation powders (such as silver-copper) is ongoing but end-use remains slight due to poor resilience in real world conditions.

With a recession avoided and the above structural forces intact, we forecast modest ongoing gains for most segments within North American industrial offtake this year. However, growth picks up to 3%, chiefly as a result of a swing to gains for EO fabrication.

### South Asia

After two consecutive years of gains, industrial demand in **India** fell 3% last year to 41.1Moz (1,288t). However, this was from a high base as 2022 saw offtake jump 24%. The decline last year therefore mainly reflected a return to normality. Importantly, the drop was mainly within the other industrial category, as sectors such as electronics and brazing alloys grew.

Electrical & electronics demand continued to achieve new records, rising 6% to 18.2Moz (566t) last year. Growth in electrical contacts was underpinned by the continued strength in India's real estate market since the country emerged from the pandemic. Strong growth at the luxury end of real estate also boosted demand for premium products, which in turn had a positive bearing on typical silver loadings. On top of the benefits from robust economic growth, electronics & electrical's gains were export-driven, which in turn were led by the ongoing capacity shift from China as companies try to diversify supply chains. For instance, India's cell phone production is estimated to have touched \$50bn in the 2024 financial year (April 2023 - March 2024) of which \$15bn was exported, making it the second largest manufacturer globally. In the domestic market, the high levels of investment in infrastructure including roads, railways, power distribution also helped. The switchgear industry continued to see strong growth, with the medium and high voltage switchgear segment outperforming the low voltage market.

Even as growth in the brazing alloys & solders segment was marginal, 2023 saw another record high for this area, touching 3.1Moz (96t). Much like the electrical & electronics industry, this area benefited from rising exports as companies looked to reduce their dependence on China. Moreover, exports of brazing alloys continued to enjoy support from growth in oil drilling.

Gains in the aforementioned sectors were offset by a 10% drop in the other industrial segment, with demand here falling 10% y/y to 20.1Moz (627t). With the local silver price generally higher, thrifting in some of the segments like zari (silver thread) and varakh (silver foil on sweets) continued. More importantly, these two areas are likely to see a structural decline with varakh use suffering due to stricter food regulations and rising awareness among consumers that the widely used silver foil may be of spurious quality due the

## 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

# Artificial Intelligence: Its Direct and Indirect Potential Benefits For Silver

Artificial Intelligence (AI) already colors many aspects of our lives and is set to proliferate yet further. How this affects silver demand, however, is not obvious. Much of the immediate uplift is likely to boost platinum and gold, which are essential in manufacturing AI hardware, such as graphics processing units (GPUs), tensor processing units (TPUs) and neural processing units (NPU). Look beyond this, however, and it becomes clear that silver will be an indispensable material for the rise of AI. Demand will come not only from the growth in end-uses with AI capabilities, but also from the increase in facilities required to run AI programs. Another potential source of offtake is from developments in biotechnology, where the use of silver nanowires in neuromorphic engineering may come to surpass current hardware technology.

There are several end-uses that will see a marked increase in the use of AI. The transport sector, for example, will see growth in sensors and cameras linked to vehicles' improving self-driving capabilities. These will all require silver in various forms, including in semiconductors, harnesses, controls, fuses, switches, electronic control units, infrared radars, laser radar (LIDAR), motion sensors and displays. Thrifting and substitution are less likely to have an impact in these uses than in consumer electronics, as concerns over safety and reliability outweigh cost considerations.

Healthcare is another new end-use of silver in AI. Wearable devices, such as electronic skin patches, are likely to become a vital healthcare tool. Not only can AI algorithms be used to encourage healthy behavior by providing reminders, incentives and feedback, but they can also predict health outcomes by measuring an individual's activity level, sleep patterns, glucose levels, temperature and heart rate, enabling healthcare providers and individuals to take proactive measures before a problem becomes intractable. Silver nanoparticles are used in such patches for both their excellent deformability and high conductivity.

In addition to the end-uses that will require more silver, the huge increase in energy demand from AI devices will also result in a boost for the white metal. Compared to traditional data centers, AI-hosting facilities require immense amounts of power when executing algorithms and consume additional energy to keep cool. The International Energy Agency (IEA) recently forecast that data centers' total electricity consumption could double by 2026,

roughly equivalent to Japan's electricity consumption. Existing power grids will thus need to expand and upgrade to ensure sufficient capacity. As a result, silver demand will benefit from the resultant lift in components used in power distribution and transmission systems, such as electrical contacts in switches, transformers, relays and capacitors. Growth in energy offtake will also propel upwards momentum for the silver-reliant solar industry.

The rapidly evolving computing capabilities brought about by AI may also create opportunities for silver. Conventional chip processing capacity doubles roughly every 18 months (known as Moore's Law), but this cycle has been significantly shortened by the emergence of AI, which is doubling around every 3.5 months. This means that GPUs, TPUs and NPUs (the common types of hardware that currently drive AI) are rapidly testing the limits of their capabilities. Neuromorphic engineering, however, takes a different approach, seeking to mimic biological nervous systems in creating computing hardware. It is an analog approach, rather than digital. It is in this field that the use of silver nanowires may triumph as the technology to achieve superior processing power.

Recent research showed that silver nanowires randomly self-assembled to form a network of crossing strands. These networks responded to a continuous stream of data by learning and adapting in real time, much like the biological synapses in a human brain. Compared to batch-based learning in conventional machine learning, silver nanowire networks processed information much faster, at the speed of light rather than electricity. Furthermore, they consume far less power than GPUs and other chips, as silver is highly conductive and operates at low voltages. Their small size also means that they could be integrated into wearables and other compact devices, such as smartphones and watches.

There are still, however, barriers to the widespread implementation of silver nanowires as an alternative to today's computer hardware. They are still at a pre-commercialization stage of development and there are difficulties in implementing a new technology into existing hardware infrastructure. The advantages conferred, however, mean that they may well become the technology of choice in future. Overall, therefore, the breakthrough of AI is a transformative milestone in machine learning and silver demand is poised to benefit, directly or indirectly, from its growing presence.

# Power Generation - A Key Component of Electrical/Electronics Silver Demand

In the electrical/electronics industry, much is written about the two largest areas of silver demand, photovoltaics and the automotive industry, and with good reason. However, it is important not to lose sight of other key end uses, one of which is in power generation and process controls, with the silver ultimately being consumed in breakers, contactors and fuses (contactors are essentially switches for larger equipment).

Pure silver contacts are limited to use in low-current applications because they are softer and prone to material transfer at high currents. As a result, alloys, or composite contacts containing silver and other metals. As the melting points of different elements can vary greatly, powder metallurgy is the preferred option in the manufacturing process. The powder, typically a blend of silver and other metal powders, is "sintered", or compressed and heated but not melted, into a solid mass. Powders can be sintered into finished or semi-finished shapes or into rods extruded into other shapes, with possible further processing.

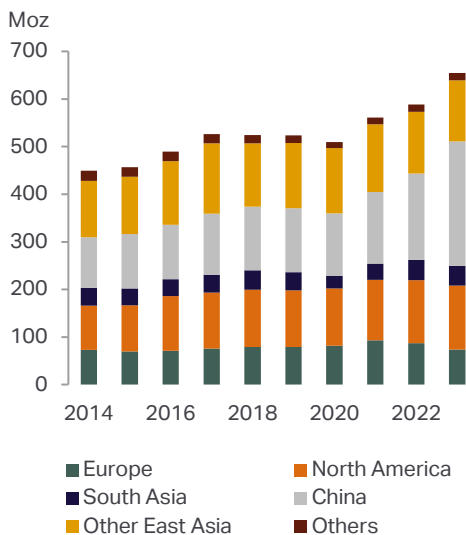
Over the long-term, this represents a growth area for industrial silver demand, underpinned by the infrastructure and electrical

switch gear industries. Our information suggests that close to 3,000t (over 90Moz) of silver has been consumed annually in these applications in recent years, with modest but steady annual growth being the norm.

In 2023 however, the sector saw mixed performances as strength in a number of key markets was undermined by weakness in China. In the latter, there was some stock build-up during 2022 (which boosted silver demand that year) and, in the face of the growing property market crisis, the supply chain wound down inventories, putting pressure on fabrication. In contrast, power generation silver demand elsewhere was robust, especially in the likes of India where there is a growing focus on infrastructure investment.

From a silver manufacturing standpoint, there are similarities with photovoltaics. Historically, China was the largest fabricator of power distribution components, but an important share of the semi-finished silver was imported. However, Chinese manufacturers now assemble much of what was once imported, to the extent that the country is becoming a net exporter of these products.

## Industrial Demand by Region



Source: Metals Focus

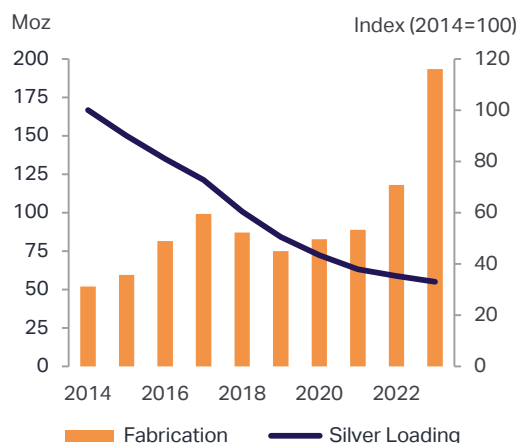
unorganized nature of the industry. Plating demand also fell after two strong years of growth as demand for gifting and decorative articles normalized. Offtake was flat in the pharma/chemical industry, while demand from the glass sector improved on the back of a robust real estate market.

We expect total industrial demand to rise by 4% this year as broader economic growth continues. With incentives announced for semiconductor manufacturing and the first semiconductor fabrication starting this year, demand from electronics is expected to grow further. That said, the full benefit of this might not be visible in 2024 and will only emerge further out.

### East Asia

East Asian industrial silver demand rose by 25% to 389.5Moz (12,113t) in 2023. The performance of each market segment varied greatly, resulting in a noticeable gap between major industrial producing countries. The main area of growth was the green economy, including booming PV installations, broader investment in power grids and rapid vehicle electrification. This countered weakness in consumer electronics and China's housing market. Despite the latter, regional growth was dominated by China (chiefly due to

### PV Silver Demand & Cell Loadings\*



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

soaring PV demand) and, in fact, regional demand excluding China dipped by 1% last year.

**Chinese** industrial demand rose by a remarkable 44% to 261.2Moz (8,124t) in 2023. The scale of that jump in part just reflects a low base as 2022 was hit by strict lockdowns. That said, there was still strong growth for green applications, with PV installations globally growing much faster than expected. Chinese demand was also boosted by localization as protection against trade disputes. In contrast and counter to initial expectations, offtake was hit by weakness in domestic real estate, which also led to low consumer confidence and so dragged down both the electrical and electronics sectors.

China’s rapid expansion of PV production capacity means its total capacity is more than twice demand and, as the country accounts for over 90% of global panel shipments, it was little surprise that 2023 saw a sharp fall in module prices. This prompted an acceleration in the deployment of solar power. In 2023, China’s newly added installations for example hit an astonishing record of 216GW. This was up over 140% y/y, which also lifted global capacity additions above 400GW. Moreover, the industry saw a migration from P-type cells (PERC) to N-type cells (TOPCon and HJT) with higher silver loadings. Although the industry actively improved the manufacturing process for thrifting and substitution, the substantial increase in installations and the rising share of N-type cells still meant a notable jump in silver demand.

In addition, technological breakthroughs have helped raise the market share of local raw material supplies. Currently, the powders for P-type cell paste are almost entirely made locally and producers are now capable of replacing imported powders for high-end N-type cell pastes. This has lifted the powder localization ratio in this segment to more than 70%. In 2024, global capacity additions are forecast in the range of 550-600GW, and so the prospects for PV remain bright, even if the growth rate slows.

### Consumer Electronics



Source: Canalys, SEMI, Metals Focus

Offtake for consumer electronics remained sluggish, partly as high inflation squeezed consumer budgets. Enterprise spending also slowed and the entire supply chain saw destocking last year. In terms of products, notebook/PC shipments suffered double-digit declines for the second consecutive year, and smartphone deliveries fell to their lowest in a decade. In contrast, there was growth in electronics for automotive applications. The electrical sector benefited from the ramping-up investment in power grids and 5G networks, but weakness in the real estate market continued to weigh heavily on high and low voltage apparatus sales. This year, the consumer electronics market has shown signs of stabilization and should then recover, as inventory is no longer a problem and as emerging AI-related applications flood into the market. Given the promising outlook for PV and the solid gains from power grids and 5G/6G networks, total demand in the electrical and electronics segment is expected to enjoy double-digit growth in 2024.



# Understanding Other Industrial Demand

Metals Focus' analysis of silver industrial demand is captured in three areas: electrical/electronics, solders/brazing alloys and other industrial demand, with a focus typically on the largest end-uses. For other industrial demand, ethylene oxide (EO) dominates, but it is worth looking at other areas, even though most will consume modest quantities of silver. It is also worth stressing that what follows covers some key areas of demand and is by no means exhaustive, given how broad Other Industrial demand is.

The use of silver oxide goes beyond EO and into the **battery** market, which extends from consumer products to the defense industry, including batteries used in a range of propulsion and guidance systems. (It is worth noting that much of the silver demand from the defense industry is captured in electrical/electronics.)

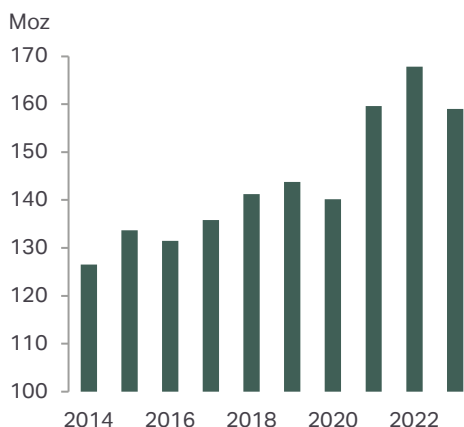
Elsewhere, the **nuclear** industry uses silver for control rods, which can contain around 80% silver. These rods are embedded within reactors and tend to have a 10-15 year shelf life. However, the level of contamination means that when these rods are changed the silver cannot be recovered.

The use of silver nitrate in the **mirror** industry is also multi-faceted and includes a small, but growing, demand for flat and parabolic photovoltaics mirrors (which tend to be double coated with silver for durability). **Decorative** plating can also be substantial in some countries, with photoframes and cutlery being two examples of items consuming silver here.

Silver's usage in the Other Industrial demand in India is quite unique. Aside from plating, it is used to manufacture **zari** and **varakh**. Zari is a fine gold or silver thread embroidered onto fabrics such as silk or cotton, especially saris to create intricate patterns and designs. Varakh is a thin edible silver foil made by hammering pure silver into thin sheets. These foils are then used to coat sweets, betel nuts or cardamom seeds.

The use of silver in **medical** devices represents another growth area. Silver nitrate will be used in catheters and heart batteries. Silver's anti-bacterial properties is increasingly being used in serious wound dressing where anti-bacterial drugs may not work quickly enough. The anti-microbial theme also extends to **wearable materials**, where chemically plated clothing is finding favor with some athletic and camping brands.

## Other Industrial Demand



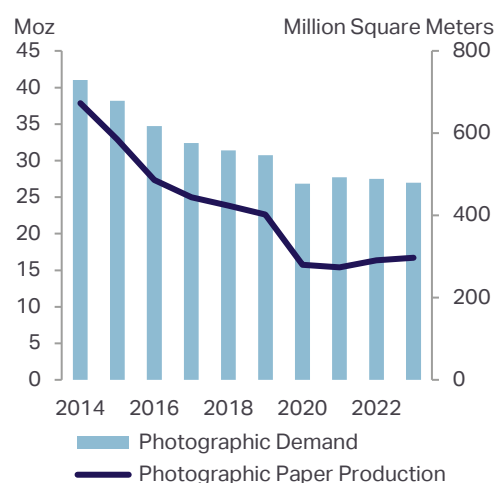
Source: Metals Focus

Brazing alloy demand rose 5% to 20.4Moz (635t) in 2023. Although offtake in HVAC was hit by a weak housing market, overall demand was resilient thanks to investment in rail networks, growth in the automotive industry, the shipbuilding industry's record number of vessel completions and gains in aerospace. In 2024, this demand segment is expected to grow modestly, driven by auto-related applications and shipbuilding end-uses, as well as rising strategic fixed asset investments to boost the domestic economy.

Fierce competition from Chinese fabricators continued to put pressure on **Japanese** silver industrial demand in 2023. As a result, the country's silver industrial offtake underperformed and was virtually flat y/y at 98.0Moz (3,048t). In addition to the total being lower in absolute terms than in 2020 and 2021, such anemic growth compares with an 11% increase in the global total and 44% in China. This was due to the lackluster performance of electrical and electronic applications, which account for the overwhelming bulk of industrial demand in the country.

In 2024, we expect Japanese demand will recover by 13%. This is based on our strong solar demand growth forecast and an assumption that technology shifts, as well as higher Chinese silver prices, will help Japan reclaim a small part of the market share it has lost.

## Photographic Demand & Paper Production



Source: Metals Focus, Photofinishing Newsletter

**South Korean** industrial offtake fell by 3% last year due to lower exports of semiconductors and consumer electronics as a result of subdued economic conditions in its major trading partners. There was however some offset from rising vehicle production and growing electrification in this area. **Taiwanese** industrial offtake declined by 5% as weaker than expected end-product sales and destocking activities resulted in lower factory utilization rates. Industrial demand growth in these two countries is expected to resume this year, aided by a modest rebound in semiconductors and consumer electronics.

## Photographic Demand

Silver fabrication in photographic applications slipped by 2% to 27.0Moz (840t) in 2023. Much was due to offtake by the medical sector continuing to drift lower. With the industrialized world having almost entirely shifted to digital, this decline was dominated by emerging markets, such as India, where digitization continued. Chinese demand for analog x-ray films remained broadly steady. However, the shift by the government to centralize procurement on drugs and medical equipment led to growing market share for local manufacturers. In the medium term, modernization and digitization have become key themes in the country's health system upgrades and this could start to weigh on the use of traditional x-ray films.

In contrast, demand for consumer and professional rolls rose by 3%, and sales of color negative paper were up by 2%, though all remained historically low. The increase in silver fabrication, however, was curbed by unsold inventories being taken and repackaged for sale. The recovery was led by western countries, mostly in Europe, as younger generations showed interest in exploring artistic photography or old techniques. As many universities now offer photography courses, this has generated decent demand for silver halide printing. The recovery in post-COVID travel also gave a boost to photo taking. In professional film and paper, demand remained broadly stable. Offtake for non-destructive testing (NDT) x-rays also remained stable, as radiographic testing is still the preferred method for equipment inspections. Lastly, demand from the motion picture industry held steady (at very low levels) as some directors continued to value the artistic merits of analog film.

## Photographic Demand

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
Europe & N America	29.9	27.2	24.3	22.4	21.4	20.6	20.4	20.4	19.8	19.6	-1%
East Asia	9.8	9.6	9.0	8.7	8.4	8.3	6.5	7.3	7.7	7.4	-3%
Others	1.3	1.3	1.4	1.4	1.6	1.8	-	-	-	-	n/a
<b>Global Total</b>	<b>41.0</b>	<b>38.2</b>	<b>34.7</b>	<b>32.4</b>	<b>31.4</b>	<b>30.7</b>	<b>26.9</b>	<b>27.7</b>	<b>27.5</b>	<b>27.0</b>	<b>-2%</b>

Source: Metals Focus

# Chapter 8

- Jewelry fabrication in 2023 stood at 203.1Moz (6,318t), down a steep 13% from 2022's record high.
- India's 25% slump due to price damage, import competition and limited stock build was mostly responsible, as demand outside of India only fell by 3%.
- Jewelry demand in 2024 is forecast up 4%, with most countries seeing slight gains.
- Silverware demand fell by a steep 25% to 55.2Moz (1,717t) last year from 2022's record high (again due mainly to India) but is forecast to grow by 8% this year.

## Jewelry & Silverware

### Jewelry

#### Introduction

Global jewelry fabrication in 2023 fell by 13% to 203.1Moz (6,318t). Though the decline was steep, that largely just reflects the record high in 2022, with volumes last year still up on 2019 despite the 44% jump in the annual average silver price since that year. The vast bulk of 2023's drop was due to India where high local prices, limited stock replenishment and competition from imports cut fabrication by 25% (27.9Moz / 868t). However, that fall was from a record high and offtake was still the second highest on record thanks to a booming economy. Outside of India, offtake only fell a modest 3% in 2023. Much of that was due to weak consumption in North America and Europe plus destocking by retailers, both of which also hit suppliers in East Asia. Chinese demand also eased due to poor consumer sentiment and competition from gold jewelry. Global demand in 2024 is forecast to rise by 4%, chiefly due to sales gains and restocking in India, although any periods of unexpected price strength and market share losses to Thailand could easily curb its growth. Consumption growth and restocking is also expected in the West.

#### Europe

European silver jewelry **fabrication** fell by 2% in 2023 to 31.3Moz (974t). Results were quite varied at the country level however with some (such as France) enjoying gains, while others (most importantly Italy) saw losses. The decline of 3% for the main fabricator, Italy, was chiefly due to lower exports. This may seem to contradict the 3% rise in export value but, once inflation's impact on costs and the rise in the silver price are taken into account, it is easy to see how the fine weight could fall. Indeed, sources typically report a gap of at least 5% points between weight and value. Our estimation of lower exports of Italian-fabricated jewelry might also appear to contradict customs data showing a rise of 8% in exports' gross weight. Any discrepancy from the conversion of gross into fine weights is relatively small here. Instead, the main problem is the re-export from Italy of silver jewelry fabricated in other countries plus likely distortions from the trade in semi-manufactured items.

Industry sources certainly report weakness in exports to the US, Italy's largest market and US customs statistics imply a drop of 2% in fine weight for imports from Italy. Our sources view that as too optimistic due to the impact of destocking by retailers and the damage to US consumption from such factors as cost of living concerns. For similar reasons, Italian exports to their second largest destination, the rest of the EU, also fell, and by at least 7% in fine weight. One interesting change was the slump in shipments to Russia from 0.4Moz (13t) in 2019 to just 4koz (121kg) last year, while exports to Turkey jumped from under 0.4Moz (12t) to over 0.6Moz (20t) in those years.

### Global Jewelry Fabrication Forecast

Million ounces	2023	2024F	Y/Y
Europe	31.3	32.0	2%
North America	17.7	18.4	4%
Middle East	11.0	11.5	5%
South Asia	87.0	91.4	5%
East Asia	48.3	49.6	3%
CIS	3.7	4.1	10%
Others	4.0	4.2	6%
<b>Global Total</b>	<b>203.1</b>	<b>211.3</b>	<b>4%</b>

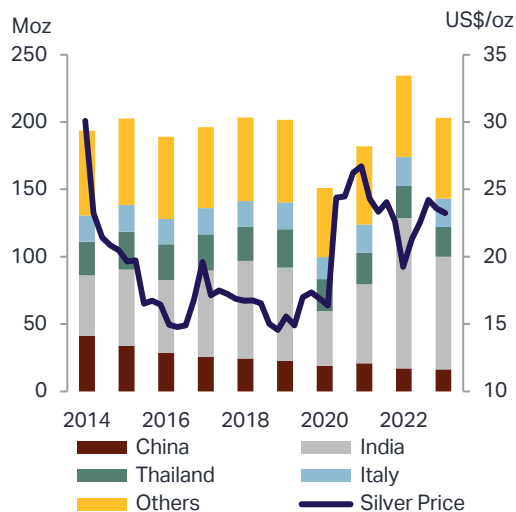
Source: Metals Focus

## Jewelry Fabrication

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Italy	19.5	20.0	18.8	19.5	19.3	19.9	16.2	21.1	21.8	21.1	-3%
Germany	3.4	3.5	3.4	3.4	3.5	3.5	3.1	3.6	3.4	3.3	-5%
France	1.9	2.0	2.0	1.9	1.9	1.8	1.6	1.7	1.9	2.0	7%
Others	4.7	4.7	4.6	4.7	4.6	4.7	3.8	4.6	4.9	5.0	2%
<b>Sub-total</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>31.0</b>	<b>32.0</b>	<b>31.3</b>	<b>-2%</b>
<b>North America</b>											
United States	13.0	13.6	12.9	13.2	13.0	12.9	11.5	13.2	12.8	11.2	-13%
Canada	3.9	3.5	3.6	3.4	3.2	3.2	2.7	3.7	3.7	4.1	11%
Mexico	5.4	5.7	5.8	4.9	5.0	4.5	3.1	2.2	2.3	2.5	6%
<b>Sub-total</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>18.8</b>	<b>17.7</b>	<b>-6%</b>
<b>Middle East</b>											
Turkey	6.3	6.7	4.9	4.9	5.9	6.0	4.4	6.9	7.2	6.9	-5%
Others	2.6	3.1	3.0	2.8	3.6	3.2	2.8	3.3	3.9	4.1	6%
<b>Sub-total</b>	<b>8.9</b>	<b>9.8</b>	<b>7.8</b>	<b>7.7</b>	<b>9.5</b>	<b>9.2</b>	<b>7.2</b>	<b>10.2</b>	<b>11.2</b>	<b>11.0</b>	<b>-1%</b>
<b>South Asia</b>											
India	45.1	56.6	53.9	64.2	72.5	69.0	40.5	58.7	111.6	83.7	-25%
Others	1.7	2.1	2.0	2.4	2.7	2.5	1.5	2.1	3.4	3.3	-4%
<b>Sub-total</b>	<b>46.8</b>	<b>58.7</b>	<b>55.9</b>	<b>66.5</b>	<b>75.2</b>	<b>71.6</b>	<b>42.0</b>	<b>60.8</b>	<b>115.1</b>	<b>87.0</b>	<b>-24%</b>
<b>East Asia</b>											
Thailand	24.7	28.2	26.6	26.9	25.2	28.5	23.9	23.4	23.7	22.2	-6%
China	41.1	33.8	28.7	25.5	24.3	22.8	18.9	20.8	17.1	16.2	-5%
Indonesia	6.1	4.9	5.2	5.1	5.3	5.6	4.8	3.7	4.1	4.7	13%
South Korea	2.9	3.1	2.7	2.7	2.5	2.5	2.0	2.3	2.2	2.1	-7%
Japan	1.3	1.4	1.4	1.5	1.6	1.7	1.5	1.4	1.3	1.3	0%
Others	1.6	1.5	1.5	1.6	1.7	1.8	1.5	1.6	1.8	1.9	5%
<b>Sub-total</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>53.2</b>	<b>50.2</b>	<b>48.3</b>	<b>-4%</b>
<b>Other Regions</b>											
CIS	4.0	4.5	4.3	4.1	3.7	3.5	3.7	3.9	3.4	3.7	10%
C&S America	2.2	2.0	2.0	1.9	2.0	2.1	1.8	2.1	2.2	2.3	5%
Africa	1.2	1.1	1.0	1.0	1.1	1.1	0.9	1.0	1.0	1.0	-2%
Oceania	0.6	0.6	0.6	0.7	0.7	0.7	0.5	0.6	0.7	0.7	-3%
<b>Sub-total</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>7.3</b>	<b>7.7</b>	<b>5%</b>
<b>Global Total</b>	<b>193.5</b>	<b>202.5</b>	<b>189.1</b>	<b>196.2</b>	<b>203.2</b>	<b>201.6</b>	<b>150.9</b>	<b>182.0</b>	<b>234.5</b>	<b>203.1</b>	<b>-13%</b>

Source: Metals Focus

### Global Jewelry Fabrication



Source: Metals Focus, Bloomberg

European demand in 2024 is expected to rise by 2%, chiefly due to growth in Italian exports. Bullion suppliers to fabricators noted good results of late and the mood at January’s Vicenza jewelry fair was positive. Demand should also benefit from restocking by retailers and higher regional consumption.

European jewelry **consumption** was sluggish in 2023. Many countries in the first half saw a continuation of 2022’s post-COVID recovery but sales tended to weaken in H2.23 due to cost of living issues, depleted savings and recession fears. The value of sales again outperformed the fine weight. This means for example that the rise of only a few percent for jewelry sales by value in France, basis figures from Francéclat, was probably insufficient to lift the fine weight bought. One driver of this gap was a shift from generic to higher margin branded silver pieces, a clear trend on view at Germany’s Inhorgenta jewelry fair. Destocking by retailers was also felt to have been a feature last year. UK silver hallmarking for instance was down a hefty 22%, but we would be surprised if sales to the consumer were that weak. Provided Europe manages to escape a recession, we expect the region’s consumption to grow slightly this year, with suppliers also benefiting from restocking.

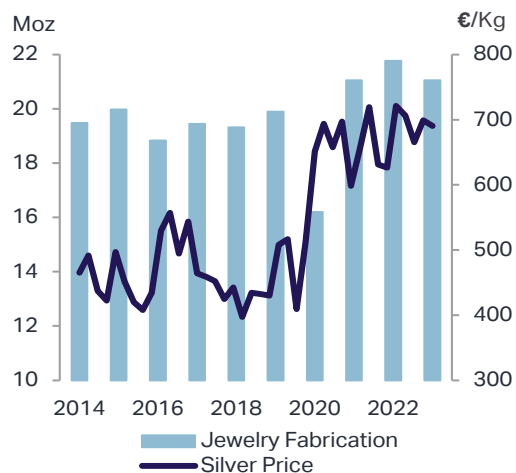
### North America

**US** silver jewelry fabrication fell by a notable 13% last year, chiefly due to the drop in local consumption. This was magnified through heavy destocking by domestic retailers and a fall in exports, cutting demand to below 2019 levels.

We estimate consumption fell by a more modest 8% and so held just above 2019 in fine weight terms. This drop was partly due to a repeat of some of the factors driving 2022’s decline, chiefly a shift in expenditure from goods to services (in particular a full year of normalized travel). However, the drop in 2023 was steeper, a change which we see as being due to cost of living pressures and concerns that a recession was imminent. This is evident in that sales slowed markedly after the summer as these fears and pressures built. That said, a surprisingly strong holiday period meant fourth quarter sales were above initial expectations. Trade sources feel this was a result of these fears easing and doing so fortuitously at a time when gifting is required.

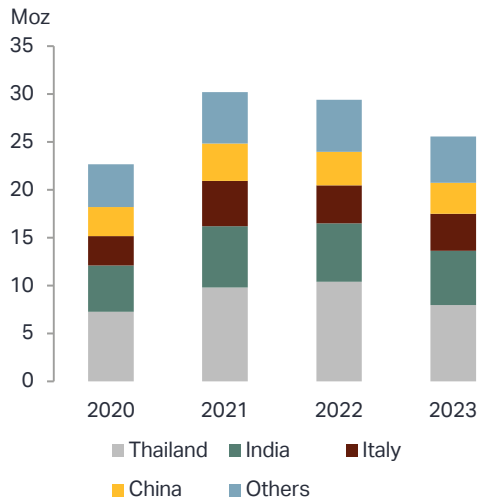
Silver also performed less well than gold jewelry, whose consumption we estimate as down 5% in 2023. This gap highlights how little migration there was from silver to gold by those consumers feeling income pressures. This did not surprise as contacts see the two metals as appealing to two different consumer groups, motivated by different factors. Silver is typically seen as a lifestyle / fashion choice dominated by self-purchase, while gold can benefit from quasi-investment beliefs and from the popularity of demonstrative pieces, often buying into heavy, rapper styles. Silver’s fine weight was also under pressure from average margins moving higher as branded silver outperformed generic and as pieces incorporating stones and other non-metal elements showed no sign of weakness. We therefore see it as perfectly

### Italian Jewelry Fabrication



Source: Metals Focus, Bloomberg

## US Jewelry Imports



Source: Metals Focus

possible for the 2% rise in (like-for-like) sales last year for leading retailer, Pandora, to sit along side our estimate of an 8% drop in fine weight terms.

The heavy destocking by retailers noted earlier was largely the product of many having started the year with excess stocks and then concerns building after the summer that a sharp slowdown in sales was likely. Rising interest rates also increased finance costs, while some independent retailers were finally felt to have improved their stock management practices. Silver at least avoided the stock disruption that hit gold through the shift from mined to lab' grown diamonds as a result of prices of larger stones slumping - the price of the tiny diamonds that silver often carries was little affected.

Lower consumption and destocking hit imports too, which we estimate to have fallen by over 10%. Thailand bore the brunt of this, with the other three main origins (Italy, China and India) only seeing single-digit losses. Customs data states a 1% fall in US silver jewelry exports for gross weight and a 2% fall for value, but our analysis suggests a fall of over 5% in fine weight terms.

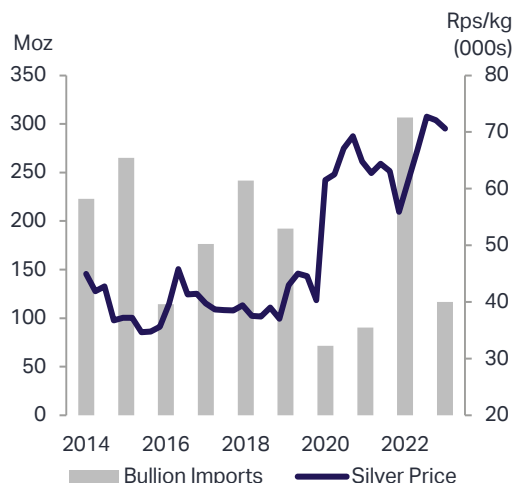
We forecast a modest rise in US consumption this year as discretionary spending rises, even with a potentially dramatic political backdrop. Restocking (especially after the bumper Christmas) should then allow for a slightly larger rise for local fabrication and jewelry imports.

## Contrasting Styles of Jewelry in the West and India



Clockwise from bottom left: 925 silver bracelet with cubic zirconia by UNOAERRE; pendants, charms and earrings with enamel and turquoise by James Avery Artisan Jewelry; pendant by Silver Emporium India and traditional payal (ankle bracelet).

### Indian Bullion Imports



Source: Metals Focus, S&P Global, Bloomberg

### Middle East

Jewelry demand in the **Middle East** fell by 1% in 2023 to 11.0Moz (342t). Turkey, the largest fabricator, saw a decline of 5% which was driven by a 2% fall in exports after a record 2022 and by higher jewelry imports. Local sales, however, rose by 9% as consumers were not deterred by exceptionally high inflation and purchased ahead to preserve some buying power. For 2024, we forecast a 5% rise in regional offtake as export growth is forecast to pick up.

### South Asia

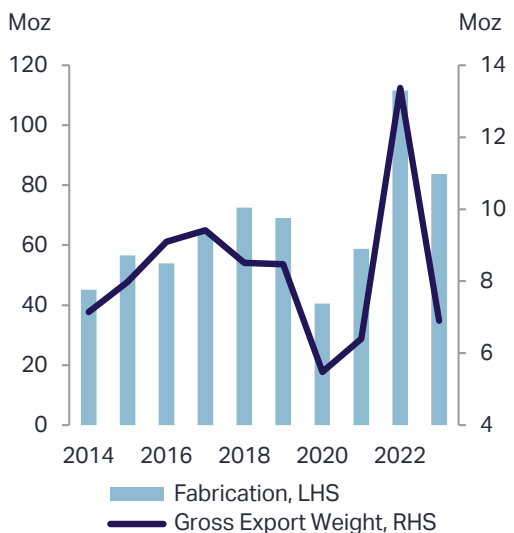
Fabrication in the world’s largest silver jewelry market, **India**, fell by 25% to 83.8Moz (2,604t) last year. This comes against a background of record high fabrication of 111.6Moz (3,472t) the previous year, primarily driven by restocking and pent-up demand from COVID-affected 2020 and 2021. Notwithstanding the year-on-year drop in 2023, it was still the second-highest total on record and nearly 40% above the average of the last ten years. This in turn reflects a growing economy, rising disposable incomes and improving purities due to the growing popularity of sterling silver jewelry.

Focusing on 2023, several factors contributed to the decline, including: lower consumer demand due to high prices; a lack of stock replenishment by the trade, and increased jewelry imports from Thailand. Taking each in turn, domestic silver prices rose by 16% in 2023 and achieved a new high, in part due to the hike in the bullion import duty, which was increased from 10.75% to 15%. This in turn weighed on consumer purchases. The Indian consumer is highly price-sensitive, especially in rural communities where payals (anklets) are popular and in fact account for around half of overall jewelry demand. Another factor that undermined fabrication activity was destocking activity by retailers. In 2022, much of the trade took the opportunity of lower prices to build inventory in anticipation of another strong year of demand. However, lower consumer buying, and price gains meant that many retailers chose to instead run down inventory in 2023 and wait for lower prices to restock.

Another interesting trend that impacted fabrication was the rise in jewelry imports from Thailand. India signed a Free Trade Agreement (FTA) with ASEAN countries in 2003, under which, India can import silver jewelry from Thailand at a 1% duty compared to paying 15% on silver bullion and then fabricating jewelry domestically. This duty advantage meant that India imported more than 180t of silver jewelry. Last year, these jewelry imports were dominated by a few companies but our recent visit to Thailand revealed that there have been increased inquiries from Indian companies to import jewelry. Thus, the volume of imports is likely to increase further this year, negatively impacting fabrication.

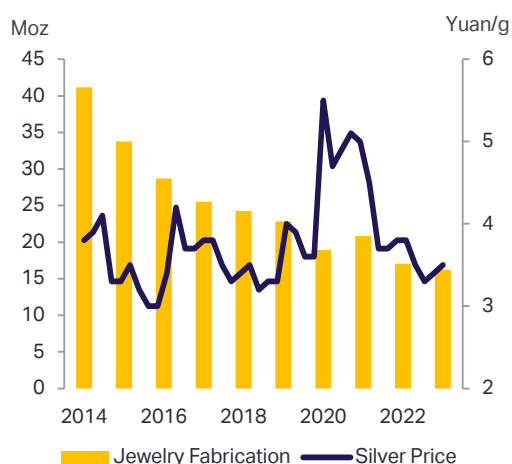
Higher prices have also impacted the weight of jewelry sold in the market. The average weight of payals has come down by at least 10-20%. Some of the positive trends of the last few years, however, continued. On top of

### Indian Jewelry Fabrication



Source: Metals Focus, S&P Global

## Chinese Jewelry Fabrication



Source: Metals Focus, Bloomberg

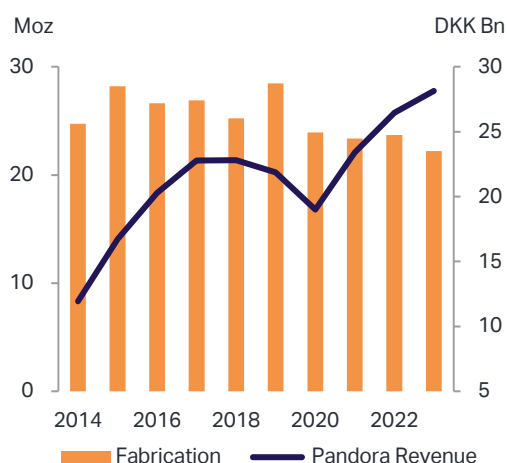
rising purities, tech based jewelry startups selling silver jewelry online have continued to perform well. These typically sell daily wear fashion jewelry targeting the young urban consumer. Although not rising at the same pace as daily wear fashion jewelry, demand for gold-plated silver jewelry also remained strong, a trend which we expect to continue given the surge in gold prices and the improved design offerings in this segment.

For this year, we expect fabrication to recover by a modest 5% to 87.9Moz (2,734t), the second-highest total. After a cautious 2023, restocking by retailers is also likely to resume. However, Indian demand remains vulnerable to any substantial price rally were that to occur, and a second risk is the potential for a significant jump in imports from Thailand.

## East Asia

**Chinese** silver jewelry fabrication did not see a post-COVID recovery last year, but instead fell by another 5% in 2023 to 16.2Moz (504t). That said, early 2023 saw the market rebound due to pent-up demand from Q4.22, higher footfall in shopping malls after the infection peak and improving consumer sentiment. However, the gains were limited as consumer attention increasingly centered on gold during the Chinese New Year holiday. After that, demand lost momentum due to a deteriorating economic outlook and poor consumer sentiment. Interestingly, sales lacked support in tourist areas, although visitors' footfall strongly rebounded. This reflected consumers' cautious spending on non-essential items. The growing popularity of yellow metal jewelry also continued to weigh heavily on silver jewelry demand, while silver jewelry exports recorded a notable decline.

## Thai Jewelry Fabrication



Source: Metals Focus, Pandora A/S

Like previous years, the divergence in performance between retail shops and online channels continued in 2023, driven by the latter's price advantages and the growing popularity of livestream sales. Retail stores suffered from fierce price competition, leading to many being closed. In addition, an increasing number of local branded silver jewelry stores on the main shopping streets started to sell some gold products to help curb shrinking profit margins associated with silver jewelry. Regarding product assortments, bangles for babies and children, stylish layered collections, and designs with pearls and zircon outperformed other areas.

China's National Bureau of Statistics noted that gold and silver jewelry retail sales over the 2024 Chinese New Year holiday rose by 23.8% y/y in value terms. However, based on our field research, silver jewelry demand remained flat year-on-year during the period and most of the gains were attributed to gold jewelry. It is important to remember that the 2023 Chinese New Year period had already seen strong gold jewelry sales. For 2024, we now expect another 3% decline in silver jewelry demand due to consumers' ongoing focus on gold, the supply chain's lower investment in marketing and product development, and a slowdown in the economy.



## Global Silverware Fabrication Forecast

Million ounces	2023	2024F	Y/Y
Europe	3.4	3.3	-2%
North America	1.7	1.8	2%
Middle East	3.1	3.2	4%
South Asia	42.1	45.8	9%
East Asia	3.6	3.6	0%
CIS	0.8	0.7	-10%
Others	0.5	0.5	6%
<b>Global Total</b>	<b>55.2</b>	<b>58.8</b>	<b>7%</b>

Source: Metals Focus

**Indonesian** jewelry fabrication rose for the second consecutive year, by 13% to 4.7Moz (145t). Despite this, it remains below pre-pandemic levels. In 2023, fabrication benefited from improvements in domestic and export markets. The latter reflected firmer demand from the US and India.

After rising for two years, jewelry fabrication in **Thailand** fell by 6% to 22.2Moz (691t), its lowest level since 2012. Competition from Chinese and Indian exports in certain jewelry markets and a shift towards lightweight jewelry have continued to impact fabrication.

The drop in offtake also resulted from a new driver, weak export demand in Western markets, including the US, Germany, and the UK. On top of the economic slowdown in Europe, retailers in the US were cautious in building fresh stocks and preferred to run down existing inventory. While these traditional export markets have been weak, Thai exports to India more than doubled, with gross exports surpassing 5.8Moz (180t) in 2023 from about 1.3Moz (40t) in 2019, a reflection of the ASEAN Free Trade Agreement. By comparison, domestic demand has been fairly robust driven by household incomes returning to more normal levels as tourism and the economy picks up. This year, we forecast a 5% increase in fabrication driven by further gains in India and improving Western demand.

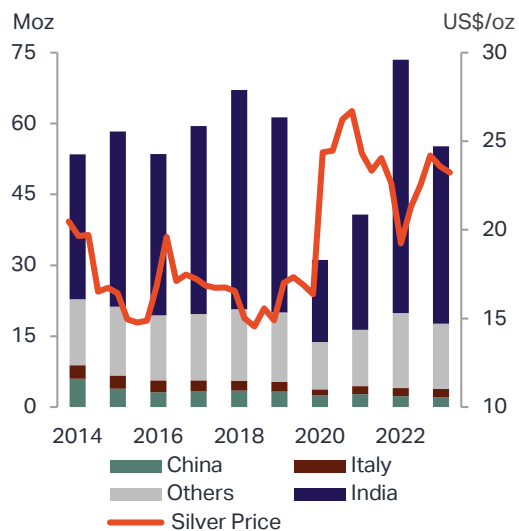
## Silverware

Global silverware fabrication fell by a notable 25% in 2023 to 55.2Moz (1,717t). The extent of the drop was largely the product of 2022 having achieved a record high, with last year's volumes still 5% higher than the 2010-19 average. The vast bulk of last year's retreat was due to India and then Nepal; outside of South Asia, demand fell by just 2%. With regards to 2024, we forecast a rise of 7% for global silverware demand, albeit to just a two-year high.

After doubling in 2022, **Indian** silverware fabrication fell 30% y/y to 37.5Moz (1,167t) in 2023. Apart from the normalization after an exceptional year of demand, the key factor that undermined offtake last year was the record-high local silver price. Even so, demand in 2023 was still 8% higher than the average of the past decade. Much of this has to do with the improvement in purities driven by increased penetration of sterling silver.

Focusing on 2023, gifting demand suffered due to elevated rupee prices. High prices also led to a reduction in overall product weights, with manufacturers pointing to a 5-10% drop to help offset the impact of the price rise. Importantly, our research suggests that some consumers also shifted to items with less than 80% silver, especially in smaller towns and rural locations which are far more price sensitive. By contrast, the penetration of sterling silver gathered pace in urban centers. Furthermore, high-end silverware furniture and decorative pieces are gaining prominence among the upper

## Global Silverware Fabrication



Source: Metals Focus, Bloomberg

## Examples of Indian Silverware



Top left courtesy of Argentum Arts, bottom right courtesy of Silver Emporium India

middle class. As a result, several standalone silverware shops have opened in the last few years. This has also helped to partially offset the reduction in demand from rural India.

This year, we forecast demand to grow by 8% to 40.5Moz (1,260t), driven by the ongoing strength in the economy and rising disposable incomes. Moreover, any periods of price weakness should benefit demand. The early months of 2024 have already seen this play out, with the price drop during January leading to a surge in bullion imports.

After more than doubling in 2022, **Nepal's** fabrication fell by 30% in 2023 to 4.3Moz (135t). Aside from reflecting a return to more normal levels after an exceptionally strong 2022, the drop in 2023 was also due to high local silver prices. We expect demand to partially recover this year by around 13%.

**Chinese** demand fell by 10% in 2023 to 2.1Moz (65t) due to impaired consumer sentiment and a weak gifting market. This was despite online livestream sales continuing to improve. Daily-use products, including tea and liqueur sets and tableware, outperformed others on the back of marketing activities centered on silver's antibacterial characteristics. For 2024, we expect another 5% decline in demand due to the slowdown in the country's economy and consumers' declining spending on non-essential items. In the **Middle East**, silverware fabrication increased slightly by 2% in 2023 to 3.1Moz (96t) due to a noteworthy rise in Turkish exports of around 8% almost solely to Israel and the US.

**European** demand in 2023 fell by 2% to a three-year low, chiefly as mass market sales continued to slide. **Italy**, however, saw growth of 3% due to gains for the high end brands and religious items, as reflected in a slight lift in exports. Italian shipments to the **US** rose but we feel that the rise of 9% for all silverware imports (as implied by US customs data) overstates the strength of the US market and stability for US demand instead seems more likely.

## Silverware Fabrication

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
India	30.6	37.0	34.1	39.7	46.4	41.2	17.4	24.4	53.6	37.5	-30%
Nepal	3.6	4.3	4.0	4.6	5.4	4.8	2.0	2.8	6.2	4.4	-30%
China	6.0	3.9	3.1	3.4	3.5	3.3	2.5	2.7	2.3	2.1	-10%
Italy	2.8	2.7	2.5	2.3	2.2	2.0	1.3	1.7	1.7	1.8	3%
United States	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	-0.1%
Others	9.2	9.0	8.5	8.2	8.4	8.7	6.7	7.8	8.3	8.1	-2%
<b>Global Total</b>	<b>53.5</b>	<b>58.3</b>	<b>53.5</b>	<b>59.4</b>	<b>67.1</b>	<b>61.3</b>	<b>31.2</b>	<b>40.7</b>	<b>73.5</b>	<b>55.2</b>	<b>-25%</b>

Source: Metals Focus

# Appendices

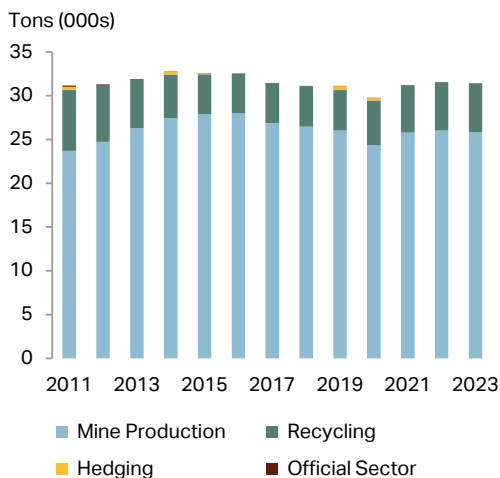
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## Appendix 1 - Silver Supply and Demand

Tons											Year on Year	
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024F	2023	2024F
<b>Supply</b>												
Mine Production	27,894	27,987	26,861	26,456	26,039	24,366	25,786	26,025	25,830	25,613	-1%	-1%
Recycling	4,572	4,531	4,578	4,626	4,609	5,111	5,403	5,504	5,556	5,563	1%	0.1%
Net Hedging Supply	67	-	-	-	434	264	-	-	-	-	na	na
Net Official Sector Sales	33	33	33	37	32	37	48	54	51	46	-6%	-9%
<b>Total Supply</b>	<b>32,566</b>	<b>32,551</b>	<b>31,471</b>	<b>31,120</b>	<b>31,113</b>	<b>29,778</b>	<b>31,237</b>	<b>31,583</b>	<b>31,437</b>	<b>31,222</b>	<b>0%</b>	<b>-1%</b>
<b>Demand</b>												
Industrial (total)	14,218	15,227	16,372	16,305	16,281	15,853	17,459	18,298	20,353	22,110	11%	9%
Electrical & Electronics	8,470	9,609	10,566	10,296	10,180	10,014	10,924	11,548	13,846	15,102	20%	9%
...of which photovoltaics	1,852	2,537	3,088	2,706	2,330	2,575	2,766	3,672	6,017	7,217	64%	20%
Brazing Alloys & Solders	1,589	1,527	1,582	1,617	1,629	1,479	1,570	1,529	1,561	1,612	2%	3%
Other Industrial	4,158	4,090	4,224	4,393	4,472	4,360	4,965	5,221	4,946	5,396	-5%	9%
Photography	1,188	1,080	1,009	977	956	836	862	855	840	812	-2%	-3%
Jewelry	6,300	5,883	6,103	6,322	6,270	4,694	5,661	7,295	6,318	6,572	-13%	4%
Silverware	1,813	1,664	1,848	2,086	1,906	969	1,267	2,286	1,717	1,830	-25%	7%
Net Physical Investment	9,621	6,621	4,844	5,160	5,828	6,474	8,844	10,486	7,562	6,593	-28%	-13%
Net Hedging Demand	-	374	35	230	-	-	110	557	379	-	-32%	na
<b>Total Demand</b>	<b>33,139</b>	<b>30,849</b>	<b>30,212</b>	<b>31,079</b>	<b>31,241</b>	<b>28,827</b>	<b>34,203</b>	<b>39,778</b>	<b>37,169</b>	<b>37,918</b>	<b>-7%</b>	<b>2%</b>
<b>Market Balance</b>	<b>-573</b>	<b>1,702</b>	<b>1,260</b>	<b>41</b>	<b>-128</b>	<b>951</b>	<b>-2,966</b>	<b>-8,195</b>	<b>-5,732</b>	<b>-6,695</b>	<b>-30%</b>	<b>17%</b>
Change in ETP Holdings	-532	1,676	223	-666	2,590	10,299	2,020	-3,912	-1,310	1,555	-67%	na
<b>Market Balance less ETPs</b>	<b>-41</b>	<b>26</b>	<b>1,037</b>	<b>706</b>	<b>-2,718</b>	<b>-9,348</b>	<b>-4,986</b>	<b>-4,283</b>	<b>-4,422</b>	<b>-8,250</b>	<b>3%</b>	<b>87%</b>
Silver Price (US\$/oz)*	15.68	17.14	17.05	15.71	16.21	20.55	25.14	21.73	23.35	-	7%	na

\*London Price. Source: Metals Focus

## Global Supply



Source: Metals Focus

## Global Demand



Source: Metals Focus

## Appendix 2 - Mine Production

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>North America</b>											
Mexico	5,767	5,975	5,421	5,815	6,049	5,840	5,605	6,097	6,630	6,290	-5%
United States	1,180	1,090	1,150	1,031	926	976	986	1,012	1,032	996	-3%
Canada	472	369	361	393	368	419	293	284	269	221	-18%
<b>Sub-total</b>	<b>7,418</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>7,392</b>	<b>7,932</b>	<b>7,508</b>	<b>-5%</b>
<b>Central &amp; South America</b>											
Peru	3,918	4,218	4,737	4,820	4,556	4,202	3,160	3,593	3,330	3,331	0%
Chile	1,562	1,496	1,448	1,257	1,243	1,189	1,474	1,281	1,302	1,617	24%
Bolivia	1,340	1,306	1,353	1,196	1,192	1,153	930	1,292	1,207	1,326	10%
Argentina	920	1,133	993	908	960	1,025	748	868	959	808	-16%
Brazil	35	49	77	86	71	69	69	73	76	103	36%
Panama	0	-	-	-	-	27	50	78	87	85	-3%
Dominican Republic	136	95	122	152	159	141	129	106	89	75	-16%
Guatemala	858	863	840	337	-	-	-	-	-	-	na
Others	106	80	64	62	77	92	93	129	133	139	5%
<b>Sub-total</b>	<b>8,875</b>	<b>9,241</b>	<b>9,635</b>	<b>8,818</b>	<b>8,258</b>	<b>7,898</b>	<b>6,652</b>	<b>7,420</b>	<b>7,184</b>	<b>7,483</b>	<b>4%</b>
<b>Europe</b>											
Poland	1,195	1,218	1,272	1,297	1,272	1,257	1,226	1,307	1,319	1,323	0%
Sweden	396	492	511	484	467	446	417	432	456	392	-14%
Spain	35	44	46	59	75	84	107	123	108	114	6%
Portugal	47	46	43	40	91	95	96	98	79	99	26%
Finland	2	3	3	3	2	33	50	46	46	46	-0.3%
Others	79	74	71	74	62	85	95	84	73	99	37%
<b>Sub-total</b>	<b>1,755</b>	<b>1,876</b>	<b>1,946</b>	<b>1,957</b>	<b>1,969</b>	<b>2,000</b>	<b>1,990</b>	<b>2,090</b>	<b>2,081</b>	<b>2,074</b>	<b>-0.3%</b>
<b>Africa</b>											
Morocco	244	281	311	319	243	284	249	248	271	275	1%
Botswana	26	4	4	0	0	0	0	20	51	73	42%
Eritrea	53	98	98	79	54	50	72	75	55	66	19%
South Africa	55	58	60	68	51	62	39	41	52	59	13%
Others	102	109	69	74	75	78	78	81	86	89	4%
<b>Sub-total</b>	<b>479</b>	<b>551</b>	<b>543</b>	<b>540</b>	<b>424</b>	<b>474</b>	<b>438</b>	<b>465</b>	<b>516</b>	<b>562</b>	<b>9%</b>
<b>Commonwealth of Independent States</b>											
Russia	1,434	1,590	1,450	1,305	1,341	1,391	1,309	1,212	1,280	1,236	-3%
Kazakhstan	562	500	542	589	615	530	541	466	479	516	8%
Uzbekistan	182	182	185	185	185	189	195	212	219	239	9%
Armenia	75	77	74	82	63	75	82	79	78	71	-9%
Tajikistan	31	35	40	47	46	45	47	48	46	37	-19%
Others	7	11	20	15	18	20	18	19	20	61	201%
<b>Sub-total</b>	<b>2,290</b>	<b>2,395</b>	<b>2,311</b>	<b>2,223</b>	<b>2,268</b>	<b>2,249</b>	<b>2,192</b>	<b>2,037</b>	<b>2,122</b>	<b>2,161</b>	<b>2%</b>

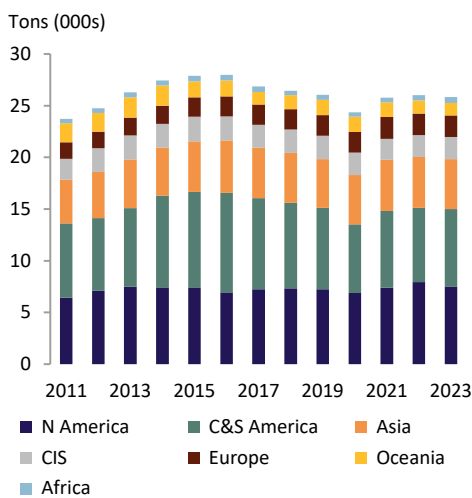
Source: Metals Focus

## Appendix 2 - Mine Production (continued)

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Asia</b>											
China	3,701	3,705	3,774	3,620	3,439	3,468	3,407	3,511	3,478	3,399	-2%
India	261	374	436	526	658	633	671	689	694	739	6%
Indonesia	219	308	335	313	320	235	283	317	321	319	-1%
Turkey	199	205	209	152	147	99	123	170	146	91	-38%
Iran	70	67	77	79	79	82	84	85	86	89	3%
Mongolia	52	62	68	54	53	51	51	55	51	58	13%
Philippines	23	30	35	32	30	31	24	31	56	49	-13%
Laos	40	52	51	43	37	34	29	30	26	21	-18%
Myanmar	11	8	9	12	21	24	25	18	16	16	2%
Others	79	67	97	52	54	49	52	52	53	53	0%
<b>Sub-total</b>	<b>4,654</b>	<b>4,878</b>	<b>5,091</b>	<b>4,883</b>	<b>4,838</b>	<b>4,707</b>	<b>4,750</b>	<b>4,958</b>	<b>4,926</b>	<b>4,834</b>	<b>-2%</b>
<b>Oceania</b>											
Australia	1,847	1,430	1,418	1,120	1,254	1,325	1,337	1,330	1,166	1,071	-8%
Papua New Guinea	95	72	100	66	93	146	119	91	94	134	42%
Others	20	17	13	13	9	5	2	3	4	3	-22%
<b>Sub-total</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>1,424</b>	<b>1,264</b>	<b>1,208</b>	<b>-4%</b>
<b>Global Total</b>	<b>27,433</b>	<b>27,894</b>	<b>27,988</b>	<b>26,861</b>	<b>26,457</b>	<b>26,039</b>	<b>24,365</b>	<b>25,785</b>	<b>26,025</b>	<b>25,830</b>	<b>-1%</b>

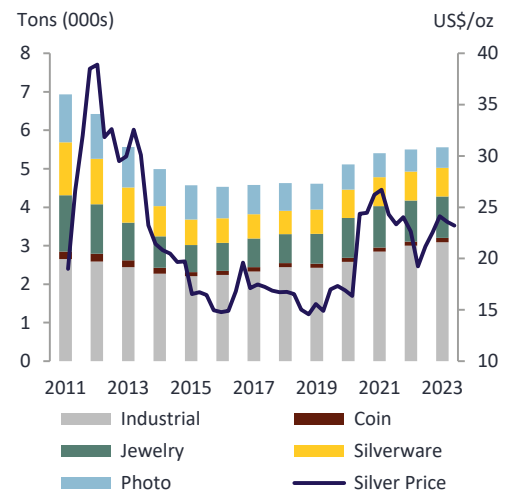
Source: Metals Focus

### Mine Supply by Region



Source: Metals Focus

### Recycling by Source



Source: Metals Focus, Bloomberg

## Appendix 3 - Recycling

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Germany	318	307	303	291	306	307	297	302	304	321	5%
Italy	206	182	171	163	156	158	150	149	142	143	1%
UK	182	174	168	163	159	156	148	141	135	127	-5%
France	134	118	106	101	98	97	97	104	99	98	-1%
Other	317	293	291	321	291	295	294	310	319	295	-8%
<b>Sub-total</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>999</b>	<b>985</b>	<b>-1%</b>
<b>CIS</b>											
Russia	249	208	203	246	310	264	290	319	351	316	-10%
Others	55	43	45	54	59	57	63	69	75	68	-10%
<b>Sub-total</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>426</b>	<b>384</b>	<b>-10%</b>
<b>North America</b>											
United States	1,355	1,265	1,184	1,193	1,193	1,184	1,223	1,280	1,287	1,241	-4%
Others	146	127	127	126	125	125	129	132	136	128	-6%
<b>Sub-total</b>	<b>1,501</b>	<b>1,392</b>	<b>1,311</b>	<b>1,319</b>	<b>1,318</b>	<b>1,309</b>	<b>1,352</b>	<b>1,413</b>	<b>1,423</b>	<b>1,370</b>	<b>-4%</b>
<b>Middle East</b>											
Turkey	104	77	78	78	83	83	77	84	67	71	5%
Others	116	94	109	108	95	100	119	144	126	135	7%
<b>Sub-total</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>193</b>	<b>205</b>	<b>6%</b>
<b>South Asia</b>											
India	232	144	153	167	196	205	495	457	480	529	10%
Others	15	10	10	13	14	15	80	69	73	81	11%
<b>Sub-total</b>	<b>247</b>	<b>154</b>	<b>163</b>	<b>180</b>	<b>210</b>	<b>220</b>	<b>576</b>	<b>526</b>	<b>553</b>	<b>610</b>	<b>10%</b>
<b>East Asia</b>											
China	693	721	718	709	717	738	813	975	1,081	1,221	13%
Japan	342	343	354	354	340	326	310	296	282	269	-4%
Taiwan	101	81	93	88	81	89	91	93	84	72	-14%
Others	163	143	163	146	146	152	168	187	176	167	-5%
<b>Sub-total</b>	<b>1,299</b>	<b>1,289</b>	<b>1,329</b>	<b>1,297</b>	<b>1,283</b>	<b>1,304</b>	<b>1,381</b>	<b>1,551</b>	<b>1,622</b>	<b>1,729</b>	<b>7%</b>
<b>Other Regions</b>											
C&S America	108	95	105	109	110	112	118	129	136	123	-9%
Africa	92	86	89	90	89	89	95	112	101	104	3%
Oceania	64	61	61	60	60	58	53	49	49	47	-5%
<b>Sub-total</b>	<b>264</b>	<b>242</b>	<b>254</b>	<b>258</b>	<b>258</b>	<b>260</b>	<b>266</b>	<b>291</b>	<b>286</b>	<b>273</b>	<b>-4%</b>
<b>Global Total</b>	<b>4,991</b>	<b>4,572</b>	<b>4,531</b>	<b>4,578</b>	<b>4,626</b>	<b>4,609</b>	<b>5,111</b>	<b>5,403</b>	<b>5,504</b>	<b>5,556</b>	<b>1%</b>

Source: Metals Focus

## Appendix 4 - Industrial Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Germany	842	812	818	841	868	809	948	1,104	962	972	1%
France	283	269	262	270	283	290	263	300	319	338	6%
Italy	264	264	261	271	282	286	242	286	299	299	-0.1%
United Kingdom	501	461	492	595	626	692	721	797	722	295	-59%
Others	379	370	373	386	396	393	360	401	407	398	-2%
<b>Sub-total</b>	<b>2,270</b>	<b>2,176</b>	<b>2,206</b>	<b>2,363</b>	<b>2,456</b>	<b>2,470</b>	<b>2,535</b>	<b>2,887</b>	<b>2,708</b>	<b>2,302</b>	<b>-15%</b>
<b>North America</b>											
United States	2,742	2,828	3,388	3,483	3,581	3,511	3,592	3,790	3,950	3,986	1%
Others	142	178	187	175	177	184	155	169	179	188	5%
<b>Sub-total</b>	<b>2,885</b>	<b>3,006</b>	<b>3,575</b>	<b>3,658</b>	<b>3,757</b>	<b>3,695</b>	<b>3,746</b>	<b>3,959</b>	<b>4,128</b>	<b>4,174</b>	<b>1%</b>
<b>East Asia</b>											
China	3,295	3,541	3,545	3,988	4,161	4,182	4,087	4,676	5,642	8,124	44%
Japan	2,707	2,814	3,255	3,681	3,211	3,381	3,407	3,521	3,056	3,048	-0.3%
South Korea	629	590	561	593	595	571	541	582	629	607	-3%
Taiwan	328	318	310	292	302	275	281	295	308	292	-5%
Others	30	37	39	36	39	40	36	39	41	43	6%
<b>Sub-total</b>	<b>6,989</b>	<b>7,299</b>	<b>7,710</b>	<b>8,591</b>	<b>8,309</b>	<b>8,449</b>	<b>8,351</b>	<b>9,113</b>	<b>9,675</b>	<b>12,113</b>	<b>25%</b>
<b>Other Regions</b>											
South Asia	1,178	1,110	1,116	1,162	1,250	1,175	832	1,065	1,324	1,288	-3%
Middle East	213	200	181	187	186	176	151	161	184	200	9%
Oceania	137	133	136	132	136	139	111	131	140	137	-3%
C&S America	219	215	223	201	129	88	52	60	62	61	-2%
CIS	59	47	50	51	53	56	48	55	46	49	5%
Africa	40	31	29	29	30	32	27	28	30	29	-3%
<b>Sub-total</b>	<b>1,846</b>	<b>1,737</b>	<b>1,735</b>	<b>1,761</b>	<b>1,783</b>	<b>1,667</b>	<b>1,221</b>	<b>1,500</b>	<b>1,787</b>	<b>1,764</b>	<b>-1%</b>
<b>Global Total</b>	<b>13,989</b>	<b>14,218</b>	<b>15,227</b>	<b>16,372</b>	<b>16,305</b>	<b>16,281</b>	<b>15,853</b>	<b>17,459</b>	<b>18,298</b>	<b>20,353</b>	<b>11%</b>

## Appendix 5 - Electrical & Electronics Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
China/Hong Kong	2,027	2,092	2,187	2,649	2,759	2,741	2,514	2,801	3,868	6,084	57%
Japan	2,290	2,358	2,830	3,241	2,765	2,934	3,004	3,067	2,589	2,567	-1%
United States	1,373	1,460	2,021	2,080	2,136	2,040	2,072	2,203	2,300	2,350	2%
Germany	568	539	550	569	592	533	666	799	639	649	1%
India	444	424	428	444	475	422	365	464	534	566	6%
South Korea	290	265	259	268	262	246	229	247	270	267	-1%
Others	1,402	1,333	1,335	1,315	1,306	1,264	1,164	1,343	1,348	1,362	1%
<b>Global Total</b>	<b>8,393</b>	<b>8,470</b>	<b>9,609</b>	<b>10,566</b>	<b>10,296</b>	<b>10,180</b>	<b>10,014</b>	<b>10,924</b>	<b>11,548</b>	<b>13,846</b>	<b>20%</b>

Source: Metals Focus



## Appendix 6 - Brazing Alloys & Solder Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
China	776	792	749	761	772	781	701	689	606	635	5%
United States	187	177	182	192	198	202	186	203	210	215	2%
Germany	144	137	133	132	130	126	135	146	156	158	1%
India	70	66	67	69	71	68	54	85	94	96	2%
South Korea	84	80	70	75	74	71	66	70	72	76	5%
Others	399	337	325	355	371	381	336	377	391	382	-2%
<b>Global Total</b>	<b>1,660</b>	<b>1,589</b>	<b>1,527</b>	<b>1,582</b>	<b>1,617</b>	<b>1,629</b>	<b>1,479</b>	<b>1,570</b>	<b>1,529</b>	<b>1,561</b>	<b>2%</b>

## Appendix 7 - Photographic Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
Europe & N. America	931	847	755	696	666	641	634	636	617	609	-1%
East Asia	304	299	280	270	262	259	202	226	238	230	-3%
Others	41	41	45	42	49	56	-	-	-	-	na
<b>Global Total</b>	<b>1,276</b>	<b>1,188</b>	<b>1,080</b>	<b>1,009</b>	<b>977</b>	<b>956</b>	<b>836</b>	<b>862</b>	<b>855</b>	<b>840</b>	<b>-2%</b>

## Appendix 8a - Physical Investment

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
United States	3,482	3,882	3,144	1,732	1,475	1,501	2,933	4,297	4,218	3,673	-13%
India	3,136	3,435	1,136	1,259	1,680	1,757	269	858	2,470	1,534	-38%
Germany	635	735	810	760	857	1,177	1,445	1,564	1,522	410	-73%
Australia	135	133	158	104	111	109	354	497	609	380	-38%
Canada	230	237	225	147	142	156	232	329	374	244	-35%
China	459	434	429	292	280	245	269	243	229	244	7%
Other Europe	260	242	398	330	402	416	389	471	510	428	-16%
Other Asia	279	258	269	214	227	423	415	397	374	310	-17%
Others	187	266	52	7	-15	43	167	188	181	338	87%
<b>Global Total</b>	<b>8,803</b>	<b>9,621</b>	<b>6,621</b>	<b>4,844</b>	<b>5,160</b>	<b>5,828</b>	<b>6,474</b>	<b>8,844</b>	<b>10,486</b>	<b>7,562</b>	<b>-28%</b>

## Appendix 8b - Coins & Medals Fabrication

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
United States	1,444	1,527	1,225	601	532	637	1,018	1,001	656	905	38%
Canada	959	1,102	1,045	588	572	716	897	1,132	1,114	728	-35%
Australia	266	394	409	333	325	394	537	622	751	478	-36%
UK	67	109	109	96	109	99	302	489	620	458	-26%
India	176	224	220	257	328	351	161	210	524	367	-30%
Austria	144	227	107	64	65	90	224	382	381	311	-18%
China	426	426	400	268	269	226	251	227	219	230	5%
South Africa	0	18	0	36	116	112	244	320	238	105	-56%
Germany	40	60	135	125	125	120	120	120	120	90	-25%
Others	227	243	216	207	216	247	237	272	293	274	-6%
<b>Global Total</b>	<b>3,750</b>	<b>4,328</b>	<b>3,867</b>	<b>2,575</b>	<b>2,656</b>	<b>2,993</b>	<b>3,991</b>	<b>4,774</b>	<b>4,918</b>	<b>3,947</b>	<b>-20%</b>

Source: Metals Focus

## Appendix 9 - Jewelry Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
<b>Europe</b>											
Italy	606	622	586	605	601	619	504	655	677	655	-3%
Germany	105	108	104	107	108	109	95	112	107	101	-5%
Others	208	209	204	205	203	203	169	197	211	218	3%
<b>Sub-total</b>	<b>919</b>	<b>938</b>	<b>894</b>	<b>917</b>	<b>912</b>	<b>931</b>	<b>768</b>	<b>964</b>	<b>995</b>	<b>974</b>	<b>-2%</b>
<b>North America</b>											
United States	404	425	403	410	404	402	359	412	398	348	-13%
Canada	121	110	112	105	101	101	83	115	114	127	11%
Mexico	168	177	180	153	155	139	97	68	72	77	6%
<b>Sub-total</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>584</b>	<b>552</b>	<b>-6%</b>
<b>Middle East</b>											
Turkey	195	208	152	153	184	186	138	215	225	214	-5%
Others	82	97	92	87	112	100	87	104	122	128	6%
<b>Sub-total</b>	<b>277</b>	<b>305</b>	<b>244</b>	<b>240</b>	<b>296</b>	<b>286</b>	<b>225</b>	<b>318</b>	<b>347</b>	<b>342</b>	<b>-1%</b>
<b>South Asia</b>											
India	1,404	1,760	1,677	1,995	2,256	2,148	1,260	1,827	3,472	2,604	-25%
Others	52	65	62	73	83	79	46	65	107	102	-4%
<b>Sub-total</b>	<b>1,455</b>	<b>1,825</b>	<b>1,739</b>	<b>2,069</b>	<b>2,339</b>	<b>2,227</b>	<b>1,307</b>	<b>1,892</b>	<b>3,579</b>	<b>2,706</b>	<b>-24%</b>
<b>East Asia</b>											
Thailand	769	877	828	837	785	886	745	726	737	691	-6%
China	1,280	1,050	893	794	755	709	589	648	531	504	-5%
Indonesia	191	152	163	157	163	175	149	117	128	145	13%
Others	182	187	177	179	179	183	157	165	166	164	-1%
<b>Sub-total</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>1,656</b>	<b>1,562</b>	<b>1,504</b>	<b>-4%</b>
<b>Other Regions</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>227</b>	<b>240</b>	<b>5%</b>
<b>Global Total</b>	<b>6,018</b>	<b>6,300</b>	<b>5,883</b>	<b>6,103</b>	<b>6,322</b>	<b>6,270</b>	<b>4,694</b>	<b>5,661</b>	<b>7,295</b>	<b>6,318</b>	<b>-13%</b>

## Appendix 10 - Silverware Demand

Tons	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Y/Y
India	952	1,151	1,061	1,236	1,442	1,282	541	758	1,667	1,167	-30%
Nepal	110	134	123	143	167	149	63	88	193	135	-30%
China	188	122	98	105	107	103	77	85	72	65	-10%
Italy	88	86	78	71	68	63	39	53	54	56	3%
Turkey	20	19	17	17	22	29	26	39	47	50	8%
United States	40	40	40	40	39	39	40	41	43	43	-0.1%
Others	265	262	248	236	241	240	183	204	211	201	-5%
<b>Global Total</b>	<b>1,663</b>	<b>1,813</b>	<b>1,664</b>	<b>1,848</b>	<b>2,086</b>	<b>1,906</b>	<b>969</b>	<b>1,267</b>	<b>2,286</b>	<b>1,717</b>	<b>-25%</b>

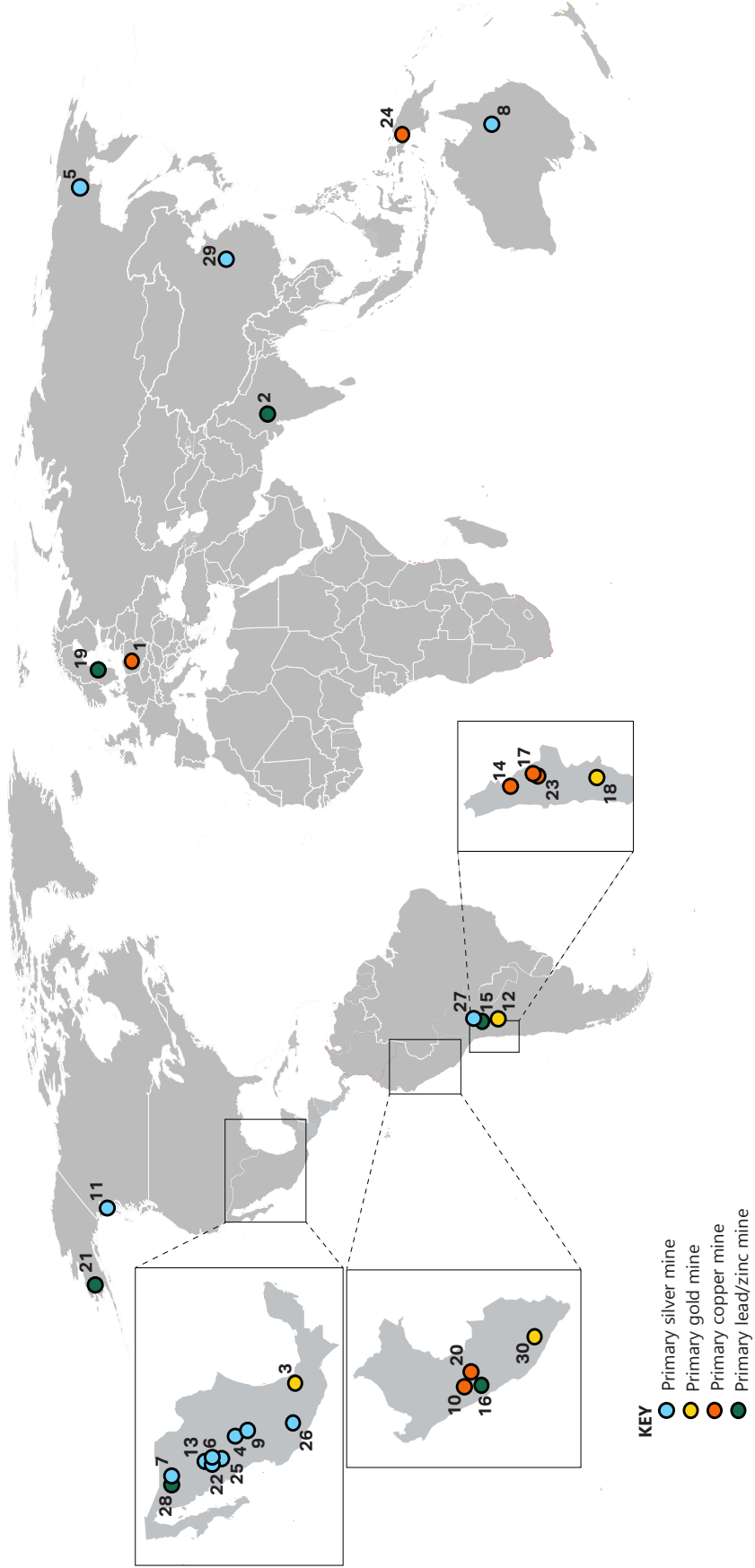
Source: Metals Focus

## Appendix 11 - Top 30 Silver Producing Mines

				Million ounces		
	Mine	Country	Ownership	2022	2023	Y/Y
1	KGHM Polska Miedź <sup>1</sup>	Poland	KGHM Polska Miedz (100%)	40.9	41.1	0%
2	Sindesar Khurd <sup>2, 3</sup>	India	Hindustan Zinc Ltd.(100%)	17.9	19.0	6%
3	Peñasquito	Mexico	Newmont (100%)	30.0	18.0	-40%
4	Juanicipio	Mexico	Fresnillo (56%) / MAG Silver (44%)	9.2	16.8	82%
5	Dukat	Russia	Polymetal International (100%)	18.3	14.9	-19%
6	San Julian	Mexico	Fresnillo (100%)	14.3	13.4	-6%
7	Fresnillo	Mexico	Fresnillo (100%)	13.6	12.8	-6%
8	Cannington <sup>1</sup>	Australia	South32 (100%)	11.7	12.4	6%
9	Saucito	Mexico	Fresnillo (100%)	12.0	12.1	1%
10	Antamina	Peru	Glencore (33.75%) / BHP (33.75%) / Teck Metals Corp. (22.5%)	14.7	11.6	-21%
11	Greens Creek	United States	Hecla Mining Company (100%)	9.7	9.7	0%
12	Puna	Argentina	SSR Mining Inc. (100%)	8.4	9.7	15%
13	Cerro Los Gatos	Mexico	Gatos Silver Inc. (70%) / Dowa Metals and Mining Co. Ltd. (30%)	10.3	9.2	-11%
14	Collahuasi	Chile	Glencore (44%) / Anglo American (44%) / Mitsui & Co (12%)	7.6	9.2	20%
15	San Cristobal <sup>2</sup>	Bolivia	Minera San Cristobal (100%)	7.6	8.1	7%
16	Yauli	Peru	Volcan Compañía Minera (100%)	6.7	7.8	16%
17	Chuquicamata <sup>1,2</sup>	Chile	Codelco (100%)	8.5	7.8	-8%
18	La Coipa	Chile	Kinross Gold (100%)	4.2	7.7	83%
19	Garpenberg	Sweden	Boliden (100%)	8.8	7.4	-16%
20	Toromocho	Peru	Chinalco (100%)	6.5	7.1	9%
21	Red Dog <sup>2</sup>	United States	Teck Metals Corp. (100%)	6.5	6.7	4%
22	Palmarejo	Mexico	Coeur Mining (100%)	6.7	6.6	-2%
23	Ministro Hales <sup>1, 2</sup>	Chile	Codelco (100%)	7.6	6.5	-14%
24	Grasberg <sup>4</sup>	Indonesia	Government of Indonesia (51.2%) / Freeport McMoRan (48.8%)	6.3	6.0	-5%
25	Guanacevi	Mexico	Endeavour Silver (100%)	5.6	6.0	6%
26	Tizapa	Mexico	Industrias Peñoles (51%) / Dowa Mining Corporation (39%) <sup>5</sup>	5.8	5.8	1%
27	San Bartolome <sup>2</sup>	Bolivia	Andean Precious Metals Corp. (100%)	5.7	5.7	-0.3%
28	Las Chispas	Mexico	SilverCrest Metals (100%)	1.2	5.7	371%
29	Ying	China	Silvercorp Metals (77.5%) <sup>6</sup>	6.1	5.6	-8%
30	Inmaculada	Peru	Hochschild Mining (100%)	5.9	5.5	-7%

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 Corporation (10%), 6: Henan Non-Ferrous Geological & Mineral Resources Co (22.5%).

# Appendix 11 - Top 30 Silver Producing Mines



Source: Company Reports, Metals Focus

## Appendix 12a - Top 20 Producing Companies

Tons	2022	2023	Y/Y
Fresnillo <sup>1</sup>	1,588	1,663	5%
KGHM Polska Miedź <sup>2,3</sup>	1,327	1,428	8%
Hindustan Zinc Ltd. <sup>4,5</sup>	694	739	6%
Pan American Silver	574	636	11%
Glencore	739	622	-16%
CODELCO <sup>6</sup>	649	596	-8%
Industrias Peñoles <sup>7</sup>	495	589	19%
Southern Copper	577	573	-1%
Newmont	923	560	-39%
Polymetal Intl.	653	551	-16%
Volcan Cia Minera	445	473	6%
Hecla Mining	441	446	1%
South32 <sup>8</sup>	383	404	6%
BHP <sup>8</sup>	364	368	1%
Boliden <sup>8</sup>	377	322	-15%
Nexa Resources	310	320	3%
Coeur Mining	305	319	4%
First Majestic Silver	327	319	-3%
SSR Mining	261	301	15%
Hochschild Mining	342	296	-14%

NB: 1 - Excludes Silverstream contract, 2 - Reported metallic production, 3 - KGHM Group figures including Polish and international operations, 4 - Hindustan Zinc is a Vedanta Group company, 5 - Production from integrated operations only, 6 - Estimate, 7 - Excludes 100% Fresnillo, 8 - Payable production.  
Source: Company Reports, Metals Focus

## Appendix 12b - Top 20 Producing Countries

Tons	2022	2023	Y/Y
Mexico	6,630	6,290	-5%
China	3,478	3,399	-2%
Peru	3,330	3,331	0%
Chile	1,302	1,617	24%
Bolivia	1,207	1,326	10%
Poland	1,319	1,323	0%
Russia	1,280	1,236	-3%
Australia	1,166	1,071	-8%
United States	1,032	996	-3%
Argentina	959	808	-16%
India	694	739	6%
Kazakhstan	479	516	8%
Sweden	456	392	-14%
Indonesia	321	319	-1%
Morocco	271	275	1%
Uzbekistan	219	239	9%
Canada	269	221	-18%
Papua New Guinea	94	134	42%
Spain	108	114	6%
Brazil	76	103	36%
Others	1,334	1,380	3%
<b>Global Total</b>	<b>26,025</b>	<b>25,830</b>	<b>-1%</b>

Source: Metals Focus

## Appendix 12c - Mine Production Forecast by Region

Tons	2023	2024F	Y/Y
N America	7,508	7,808	4%
C&S America	7,483	6,808	-9%
Asia	4,834	4,756	-2%
CIS	2,161	2,230	3%
Europe	2,074	2,034	-2%
Oceania	1,208	1,238	2%
Africa	562	739	31%
<b>Global Total</b>	<b>25,830</b>	<b>25,613</b>	<b>-1%</b>

Source: Metals Focus

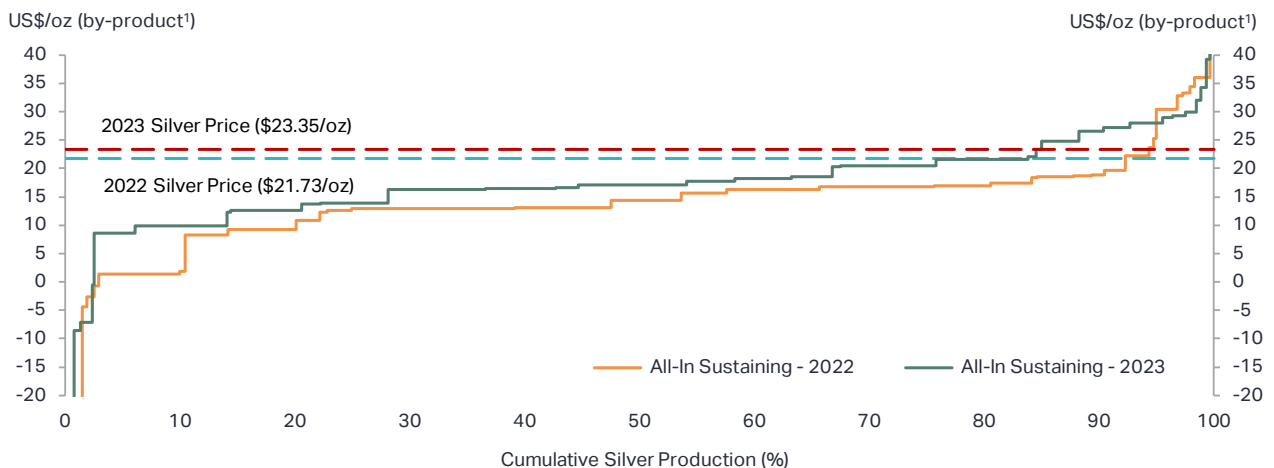
Appendix 13 - Primary Silver Production Costs (by-product<sup>1</sup>)

Year on Year

US\$/oz (by-product)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2022	2023
<b>North America</b>												
Total Cash Cost	7.50	6.43	3.47	2.17	2.64	4.27	3.88	4.72	5.28	9.14	12%	73%
Total Production Cost	13.43	11.66	8.56	8.09	8.44	10.73	10.34	11.20	11.76	16.18	5%	38%
All-In Sustaining Cost	14.61	12.55	8.51	9.20	10.53	12.17	11.28	14.09	15.52	19.44	10%	25%
<b>Central &amp; South America</b>												
Total Cash Cost	10.48	9.66	7.53	7.48	5.74	7.37	9.29	7.27	7.46	7.11	3%	-5%
Total Production Cost	14.55	14.05	10.56	10.46	8.97	11.28	14.41	11.45	11.12	11.95	-3%	7%
All-In Sustaining Cost	15.36	13.76	11.12	12.12	11.03	12.26	16.10	13.07	14.28	14.55	9%	2%
<b>CIS</b>												
Total Cash Cost	7.21	4.99	4.35	6.98	7.60	8.54	7.64	5.71	9.10	12.93	59%	42%
Total Production Cost	9.43	6.39	5.81	9.19	10.28	10.34	9.31	7.88	12.09	15.92	53%	32%
All-In Sustaining Cost	9.32	6.41	5.85	9.46	9.76	11.28	9.81	8.93	12.88	17.05	44%	32%
<b>Asia</b>												
Total Cash Cost	1.03	1.11	-2.02	-4.58	-4.42	-2.36	-0.99	-0.32	0.14	0.56	na	309%
Total Production Cost	4.58	4.92	0.88	-1.84	-1.29	0.84	2.66	3.72	3.40	3.82	-9%	12%
All-In Sustaining Cost	8.89	9.59	3.53	3.61	1.51	3.65	5.60	6.09	7.49	8.91	23%	19%
<b>Oceania</b>												
Total Cash Cost	1.99	2.16	-1.90	-2.12	-3.12	3.46	0.24	-6.52	-5.12	3.34	na	na
Total Production Cost	4.21	4.59	1.22	2.19	0.55	8.66	14.84	12.53	5.48	9.30	-56%	70%
All-In Sustaining Cost	5.27	5.52	1.22	2.83	2.66	9.14	6.71	-2.90	1.45	9.81	na	577%
<b>Global Total</b>												
Total Cash Cost	7.77	6.88	4.44	3.86	3.30	5.14	4.79	4.23	5.19	8.38	23%	61%
Total Production Cost	12.22	11.09	8.19	8.31	7.91	10.31	11.00	10.74	10.96	14.36	2%	31%
All-In Sustaining Cost	13.22	11.56	8.50	9.65	9.75	11.56	11.34	11.67	13.76	17.18	18%	25%

Source: Metals Focus

## Global Primary Silver Mine Production Costs in 2023 (by-product)



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

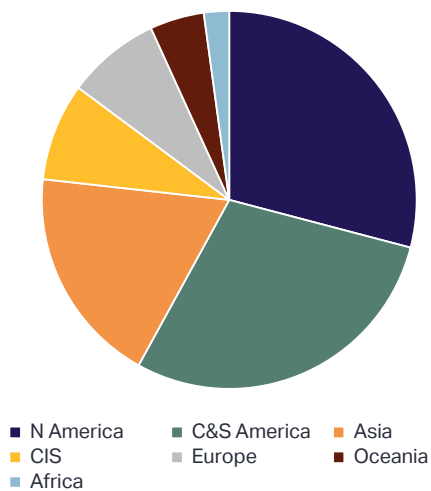
## Appendix 14 - Mine Production by Region & Primary Metal

Year on Year

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2022	2023
<b>Regional Breakdown</b>												
North America	238.5	239.0	222.8	232.8	236.1	232.6	221.3	237.7	255.0	241.4	7%	-5%
C&S America	285.3	297.1	309.8	283.5	265.5	253.9	213.9	238.6	231.0	240.6	-3%	4%
Asia	149.6	156.8	163.7	157.0	155.6	151.3	152.7	159.4	158.4	155.4	-1%	-2%
CIS	73.6	77.0	74.3	71.5	72.9	72.3	70.5	65.5	68.2	69.5	4%	2%
Europe	56.4	60.3	62.6	62.9	63.3	64.3	64.0	67.2	66.9	66.7	-0.4%	-0.3%
Oceania	63.1	48.9	49.2	38.6	43.6	47.4	46.9	45.8	40.7	38.8	-11%	-4%
Africa	15.4	17.7	17.5	17.4	13.6	15.2	14.1	14.9	16.6	18.1	11%	9%
<b>Global Total</b>	<b>882.0</b>	<b>896.8</b>	<b>899.8</b>	<b>863.6</b>	<b>850.6</b>	<b>837.2</b>	<b>783.4</b>	<b>829.0</b>	<b>836.7</b>	<b>830.5</b>	<b>1%</b>	<b>-1%</b>
<b>Global Breakdown</b>												
Primary Silver	285.9	291.0	288.4	263.6	247.0	236.1	207.8	227.9	236.5	235.2	4%	-1%
Gold	142.7	150.3	134.7	130.8	131.2	130.7	123.0	129.1	129.6	113.8	0.4%	-12%
Copper	182.7	188.9	205.5	199.6	197.3	192.8	207.6	210.7	213.1	221.4	1%	4%
Lead/Zinc	265.1	261.3	264.7	262.8	268.0	272.5	240.2	257.2	253.3	255.8	-2%	1%
Other	5.5	5.3	6.5	6.7	7.0	5.1	4.8	4.2	4.2	4.3	-0.3%	2%
<b>Global Total</b>	<b>882.0</b>	<b>896.8</b>	<b>899.8</b>	<b>863.6</b>	<b>850.6</b>	<b>837.2</b>	<b>783.4</b>	<b>829.0</b>	<b>836.7</b>	<b>830.5</b>	<b>1%</b>	<b>-0.7%</b>
<b>Global Breakdown (Percentage)</b>												
Primary Silver	32.4%	32.4%	32.1%	30.5%	29.0%	28.2%	26.5%	27.5%	28.3%	28.3%		
Gold	16.2%	16.8%	15.0%	15.2%	15.4%	15.6%	15.7%	15.6%	15.5%	13.7%		
Copper	20.7%	21.1%	22.8%	23.1%	23.2%	23.0%	26.5%	25.4%	25.5%	26.7%		
Lead/Zinc	30.1%	29.1%	29.4%	30.4%	31.5%	32.5%	30.7%	31.0%	30.3%	30.8%		
Other	0.6%	0.6%	0.7%	0.8%	0.8%	0.6%	0.6%	0.5%	0.5%	0.5%		

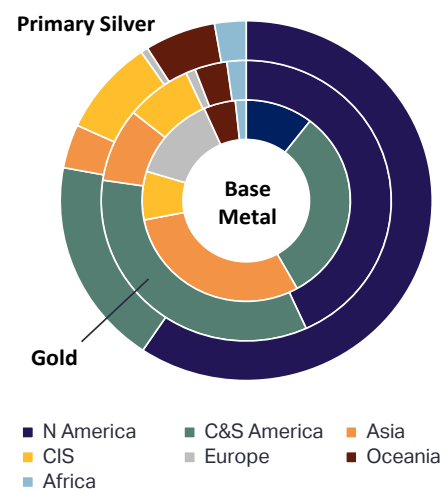
Source: Metals Focus

### Mine Production by Region in 2023



Source: Metals Focus

### Mine Production by Source Metal in 2023



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
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	6496.25	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
2022	21.73	17.56	26.94	662.22	4,176.88	54,813	91.33	31.28	437.06	83.34
2023	23.35	19.90	26.14	694.09	4,919.81	61,981	105.56	35.14	414.20	87.40

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
1993	9.07	7.49	11.57	217.37	2,086.66	30,124	17.17	14.10	128.46	n/a
1994	10.83	9.30	12.19	254.75	3,068.46	33,634	19.29	15.64	159.81	34.36
1995	10.39	8.63	12.29	220.58	2,499.59	30,994	17.53	14.46	196.15	31.40
1996	10.06	7.74	11.37	222.38	2,299.55	31,055	20.14	13.49	181.75	30.47
1997	9.31	7.37	12.17	235.84	2,100.74	28,045	20.80	13.42	154.18	29.31
1998	10.36	8.23	14.84	269.61	2,391.00	31,669	25.25	17.66	169.92	34.54
1999	9.51	8.81	10.59	260.15	2,285.78	29,861	20.89	15.93	148.83	36.18
2000	8.73	7.10	10.57	278.28	2,160.23	28,413	18.88	15.85	128.34	34.13
2001	7.59	6.89	8.55	247.82	1,892.83	25,372	18.98	15.24	107.08	30.32
2002	7.80	7.17	8.72	242.03	2,007.97	26,374	20.64	14.83	110.36	31.51
2003	8.12	7.24	10.00	209.90	2,104.15	25,792	20.32	12.79	125.70	32.26
2004	10.73	8.79	13.62	254.58	2,764.60	33,031	25.86	15.09	170.62	41.74
2005	11.40	9.86	14.45	274.29	2,950.49	33,922	29.17	15.58	174.97	43.63
2006	17.56	12.99	23.14	418.90	4,667.78	52,002	48.32	24.09	265.91	67.67
2007	19.55	16.15	23.69	432.76	4,365.71	51,638	56.33	24.37	297.60	72.11
2008	21.87	12.34	31.16	439.89	4,101.83	55,351	55.57	25.91	319.49	70.75
2009	20.84	14.68	27.65	452.76	3,851.20	55,045	49.58	26.70	365.36	71.15
2010	28.26	20.52	43.31	643.68	5,201.91	63,969	63.90	30.80	450.46	90.01
2011	47.74	35.46	67.70	1,035.65	8,177.79	104,108	101.84	46.37	743.52	145.70
2012	41.62	34.94	50.07	974.15	6,788.26	96,645	90.72	40.13	673.23	120.62
2013	31.32	23.98	42.72	715.50	4,941.96	73,199	82.95	31.92	479.93	91.79
2014	24.92	18.84	28.98	572.97	4,011.57	57,709	70.52	26.99	385.57	74.89
2015	20.34	17.70	23.97	563.30	3,374.33	47,486	66.41	26.17	370.16	66.14
2016	21.77	17.46	26.86	610.38	3,698.31	51,855	64.64	28.50	460.58	74.19
2017	21.21	18.90	23.21	588.95	3,744.78	48,415	66.04	27.00	434.37	70.35
2018	19.18	16.97	21.62	509.35	3,381.49	44,965	59.70	25.05	388.07	63.93
2019	19.35	17.06	23.46	548.07	3,630.93	46,188	60.33	27.30	389.91	65.72
2020	24.19	13.71	35.16	678.38	4,299.47	57,697	75.64	34.52	534.80	85.59
2021	27.65	23.57	33.12	767.22	4,731.53	67,025	94.6	37.54	575.38	109.35
2022	22.46	18.15	27.85	681.62	4,204.36	57,647	93.7	32.55	457.43	86.04
2023	23.35	19.90	26.14	694.09	4,919.81	61,981	105.56	35.14	414.20	87.40

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 ten months in 2023.

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; CME Silver Prices

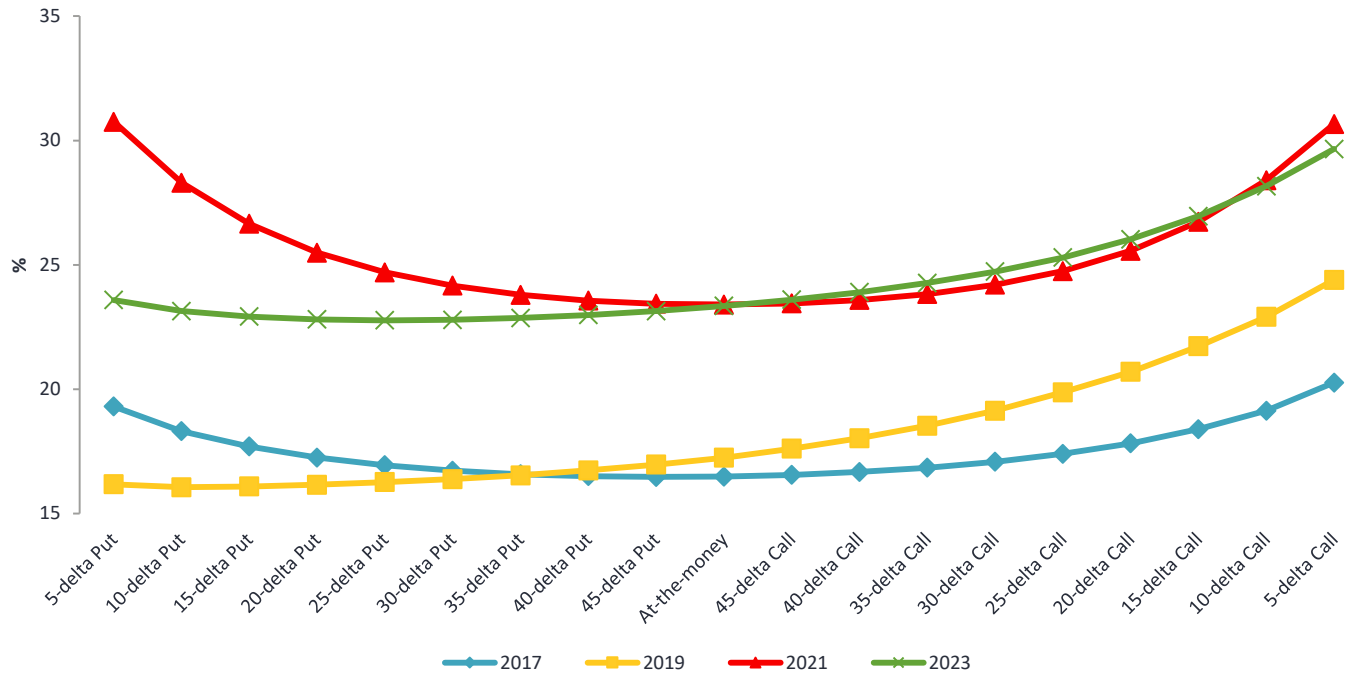
US\$/oz	LBMA <sup>1</sup>			CME <sup>2</sup>		
Year/Month	Low	High	Average	Low	High	Average
2006	8.83	14.94	11.55	8.87	14.94	11.62
2007	11.67	15.82	13.38	11.50	15.55	13.47
2008	8.88	20.92	14.99	8.79	20.79	15.00
2009	10.51	19.18	14.67	10.44	19.33	14.71
2010	15.14	30.70	20.19	14.83	30.94	20.26
2011	26.16	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
2022	17.77	26.18	21.73	17.67	26.90	21.82
2023	20.09	26.03	23.35	20.15	26.23	23.58
Jan-23	23.00	24.30	23.75	23.42	24.37	23.85
Feb-23	20.53	24.44	22.01	20.79	23.62	21.99
Mar-23	20.09	23.89	21.92	20.15	24.16	22.09
Apr-23	23.93	26.03	25.00	24.02	25.93	25.22
May-23	23.01	25.84	24.15	22.91	26.23	24.47
Jun-23	22.34	24.32	23.41	22.55	24.41	23.55
Jul-23	22.72	25.18	24.04	22.89	25.39	24.37
Aug-23	22.41	24.62	23.44	22.73	25.14	23.73
Sep-23	22.55	24.65	23.24	22.45	24.56	23.38
Oct-23	21.06	23.22	22.32	21.02	23.50	22.48
Nov-23	22.08	25.02	23.39	22.28	25.66	23.74
Dec-23	22.73	25.17	23.99	22.92	25.86	24.21
Jan-24	22.20	23.95	22.95	22.30	23.95	23.02
Feb-24	22.09	23.23	22.68	22.15	23.48	22.80

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 - CME Activity & Inventories

Moz	Futures		Managed Money Positions in CME Futures				CME 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>	
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
2022	85,383	649	225	81	144	57	299
2023	90,648	671	183	99	84	-60	278
Jul-23	5,950	724	241	143	98	43	282
Aug-23	9,347	654	217	135	82	-16	278
Sep-23	6,467	639	164	137	26	-56	270
Oct-23	7,195	633	140	117	23	-3	268
Nov-23	8,938	714	228	109	119	96	266
Dec-23	6,286	671	183	99	84	-35	278
Jan-24	6,544	682	164	143	22	-62	275
Feb-24	8,869	714	166	187	-20	-42	282

1: Aggregate volume over the period, 2: Position at end-period, 3: Net change versus previous end-period  
 Source: CME Group, CFTC, Bloomberg

## Appendix 20 - LBMA Silver Trading Volumes

Moz	Spot	Swap & Forward	Option	Loan, Lease & Deposit	Total
<b>Year/Month</b>					
2019	65,355	34,670	3,235	2,271	105,530
2020	70,002	29,794	3,207	2,266	105,269
2021	62,451	29,164	4,288	4,526	100,430
2022	62,291	29,524	2,661	8,981	68,341
2023	66,352	30,980	2,607	6,910	68,960
Oct-23	5,896	2,569	270	550	6,165
Nov-23	4,604	2,044	245	471	4,849
Dec-23	3,781	1,760	126	397	3,908
Jan-24	5,451	2,982	263	835	5,714
Feb-24	3,531	1,489	95	456	3,626

Source: LBMA, Nasdaq, Bloomberg

## Appendix 21 - Chinese Silver Exchanges' Activity

Moz	Shanghai Gold Exchange		Shanghai Futures Exchange		
	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>
<b>Year/Month</b>					
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
2022	5,872	3.1	91,037	464	69
2023	2,429	3.0	115,394	433	38
Jul-23	197	0.2	9,782	449	51
Aug-23	207	0.2	9,380	418	43
Sep-23	191	0.1	8,256	407	40
Oct-23	139	0.7	7,582	459	35
Nov-23	209	0.6	12,352	494	33
Dec-23	160	0.3	8,772	433	38
Jan-24	163	0.3	6,410	419	29
Feb-24	94	0.1	3,363	417	32

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 CME, 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

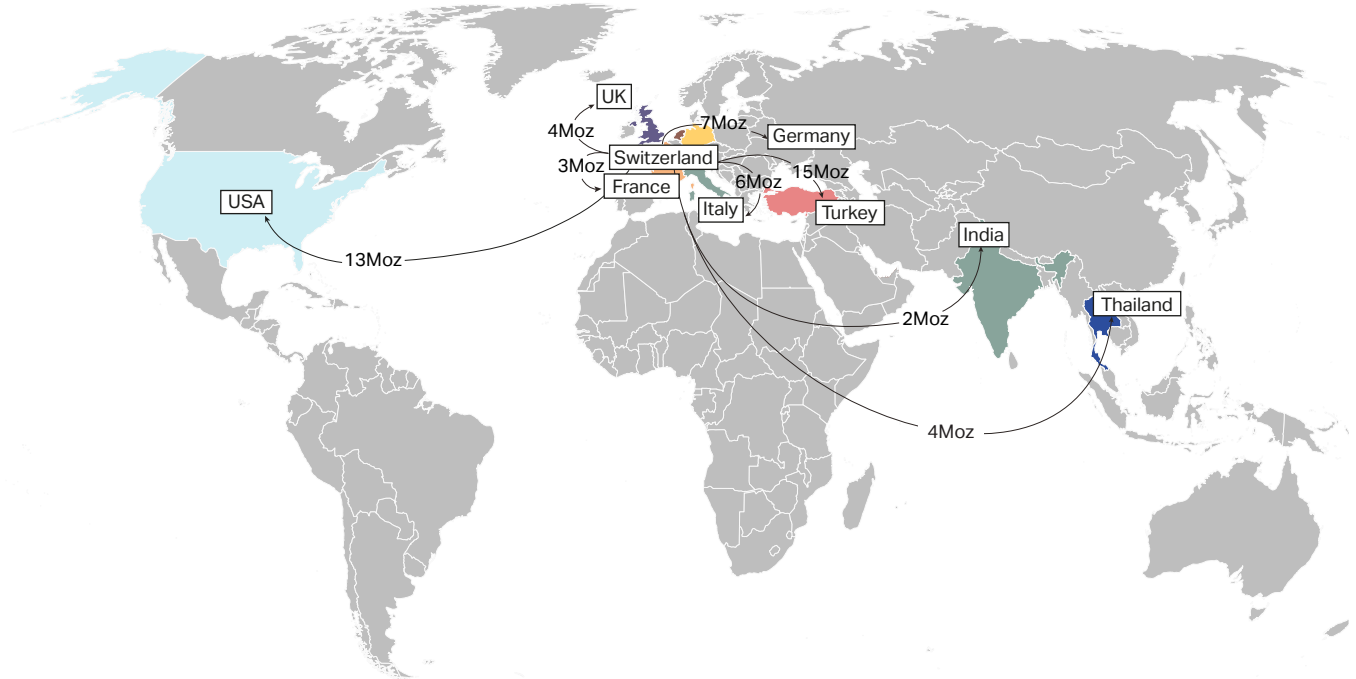
## Appendix 22 - Physically Backed Silver Exchange-Traded Product Holdings\*

Moz	iShares Silver Trust	ZKB	WisdomTree	Sprott Silver	Sprott Gold & Silver	Others	Total Holdings (Moz)	Total Value (\$M)
Year/Month								
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
2022	467	96	61	171	58	153	1,006	24,089
2023	437	100	53	171	57	146	964	23,790
Jan-22	534	100	98	154	60	191	1,137	25,571
Feb-22	546	100	101	154	60	188	1,148	27,959
Mar-22	559	99	96	159	59	172	1,144	28,388
Apr-22	575	98	94	161	59	163	1,151	26,989
May-22	556	99	94	161	59	160	1,129	24,581
Jun-22	541	98	82	161	59	157	1,099	22,433
Jul-22	484	98	82	161	59	156	1,039	20,852
Aug-22	466	98	81	161	59	155	1,020	18,308
Sep-22	481	98	61	164	59	154	1,017	19,346
Oct-22	483	97	60	167	59	153	1,019	19,533
Nov-22	479	98	62	170	58	152	1,018	21,952
Dec-22	467	96	61	171	58	153	1,006	24,089
Jan-23	478	96	60	171	58	156	1,018	22,995
Feb-23	479	95	57	171	58	157	1,017	20,525
Mar-23	465	97	59	173	58	156	1,009	23,885
Apr-23	468	96	59	175	58	158	1,014	24,765
May-23	468	96	57	175	58	160	1,013	23,255
Jun-23	468	96	55	175	58	159	1,011	22,470
Jul-23	452	96	56	175	58	156	993	24,355
Aug-23	439	95	55	176	58	153	977	24,535
Sep-23	442	94	54	172	58	151	972	23,075
Oct-23	442	94	54	172	58	148	968	23,200
Nov-23	434	94	53	171	58	145	955	25,020
Dec-23	437	100	53	171	57	146	964	23,790
Jan-24	439	99	53	171	57	147	966	23,090
Feb-24	431	98	51	171	56	147	954	22,340

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

Source: Respective ETP providers, Bloomberg

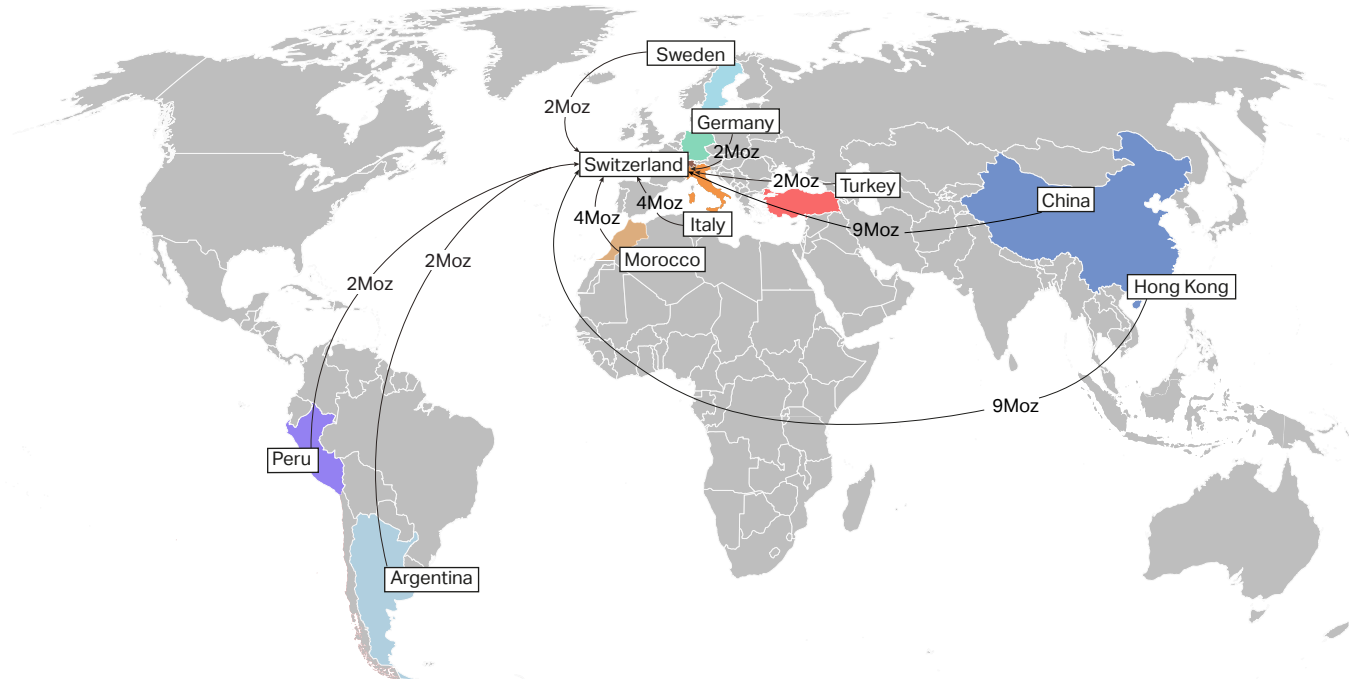
Appendix 23a - Selected Swiss Silver Bullion Exports in 2023



NB: In gross weight terms, exports shown account for 82% of total Swiss silver bullion exports in 2023.

Source: Swiss Customs Administration, Metals Focus

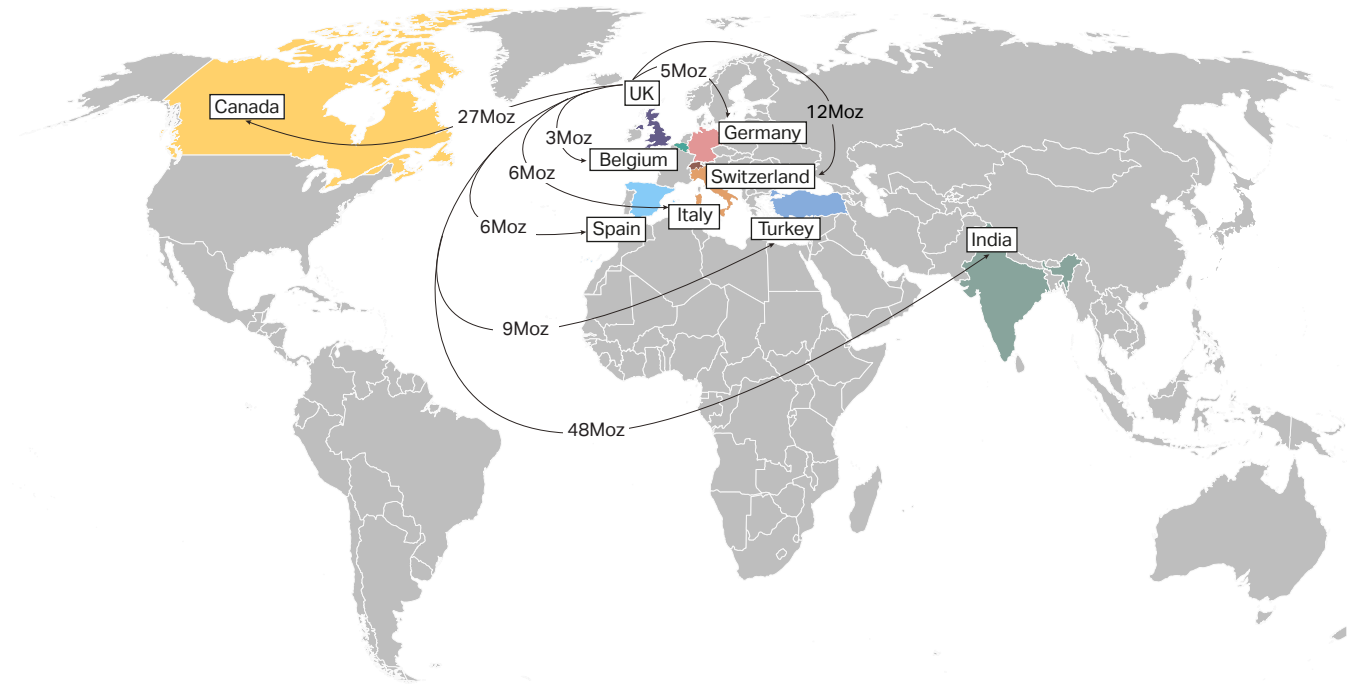
Appendix 23b - Selected Swiss Silver Bullion Imports in 2023



NB: In gross weight terms, imports shown account for 80% of total Swiss silver bullion imports in 2023.

Source: Swiss Customs Administration, Metals Focus

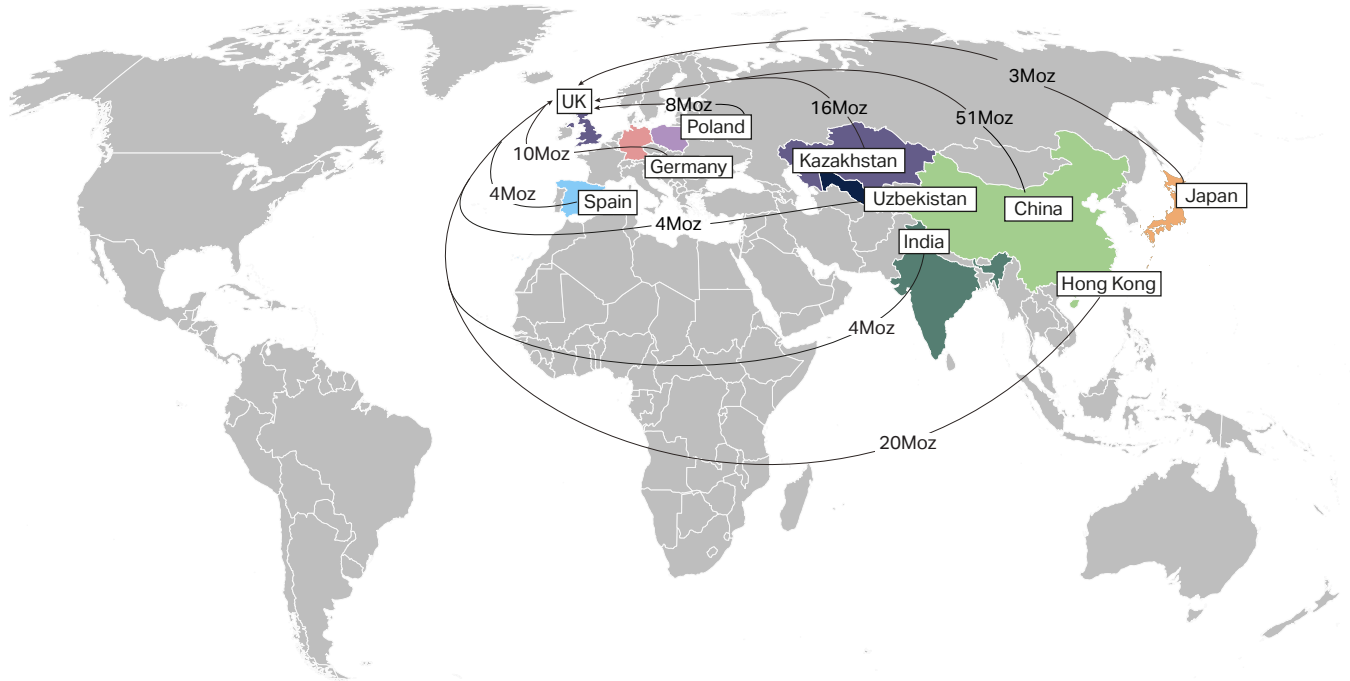
### Appendix 24a - Selected United Kingdom Silver Bullion Exports in 2023



NB: In gross weight terms, exports shown account for 98% of total UK silver bullion exports in 2023

Source: HM Customs & Excise, Metals Focus

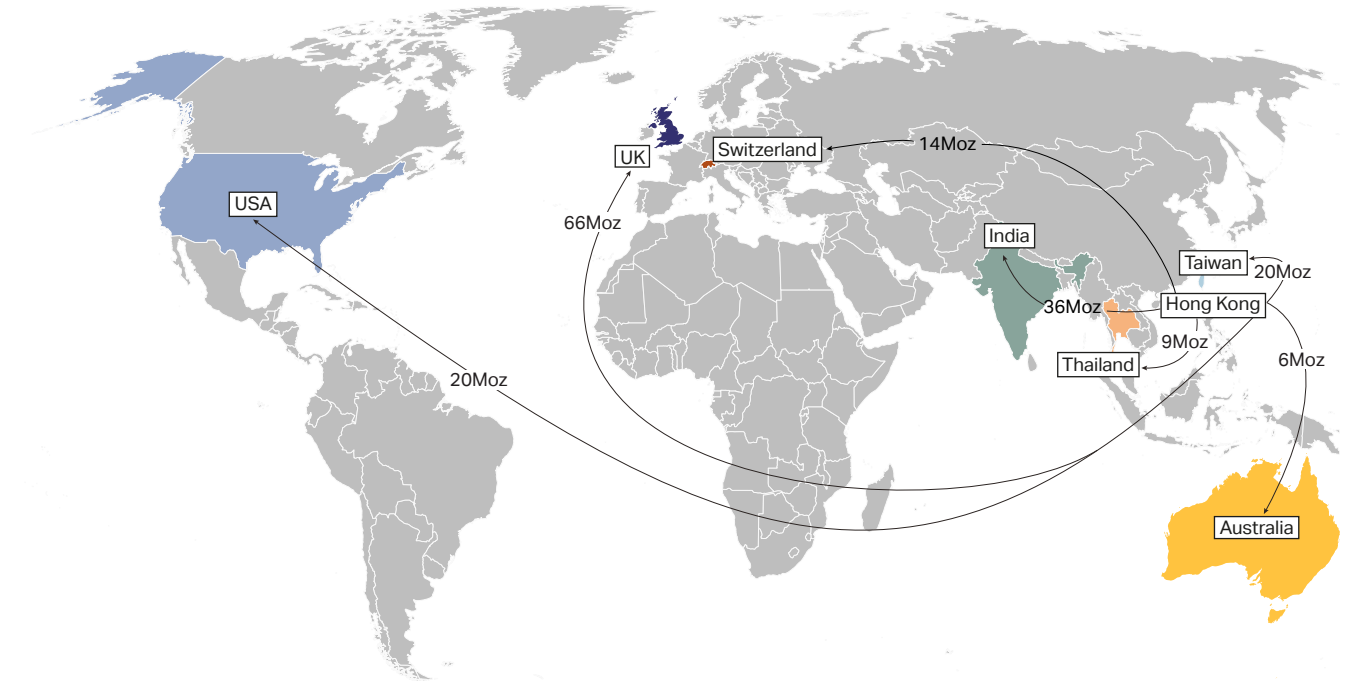
### Appendix 24b - Selected United Kingdom Silver Bullion Imports in 2023



NB: In gross weight terms, imports shown account for 91% of total UK silver bullion imports in 2023

Source: HM Customs & Excise, Metals Focus

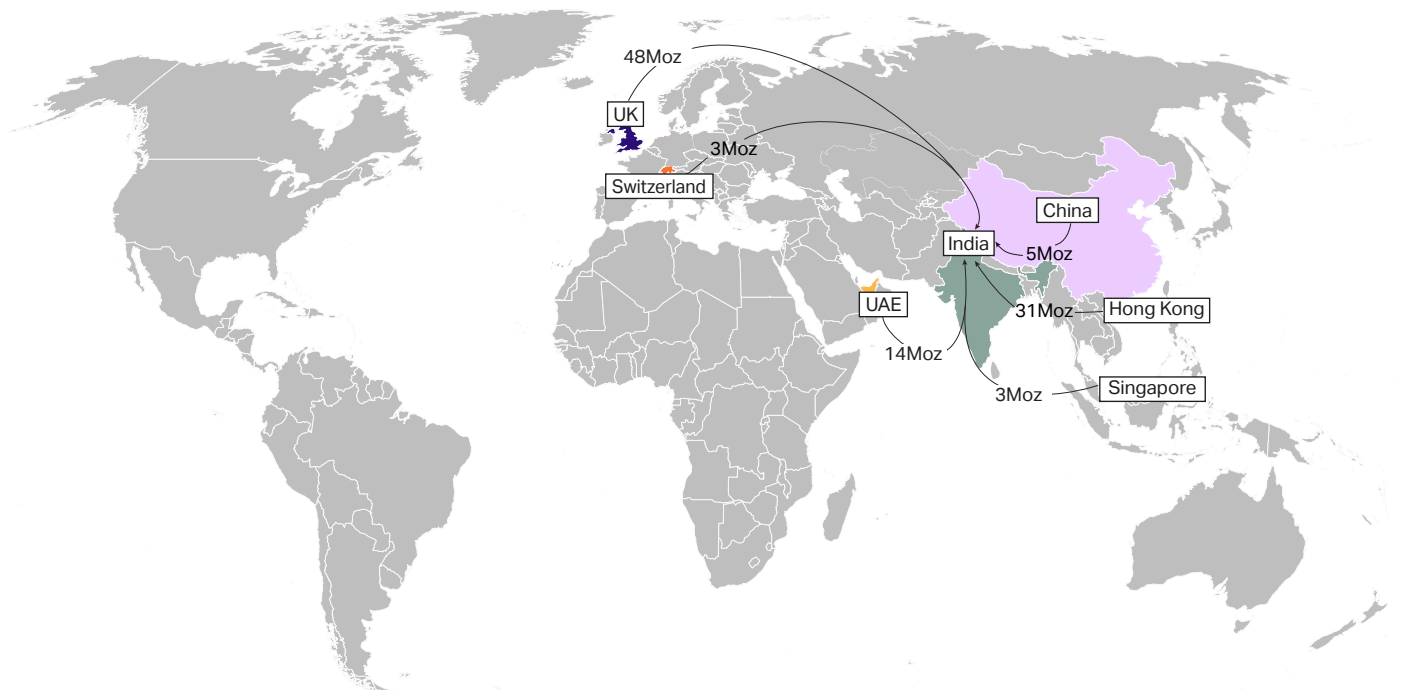
Appendix 25 - Selected Hong Kong Silver Bullion Exports in 2023



NB: In gross weight terms, exports shown account for 87% of total Hong Kong silver bullion exports in 2023

Source: Hong Kong Census & Statistics Department, Metals Focus

Appendix 26 - Selected Indian Silver Bullion Imports in 2023

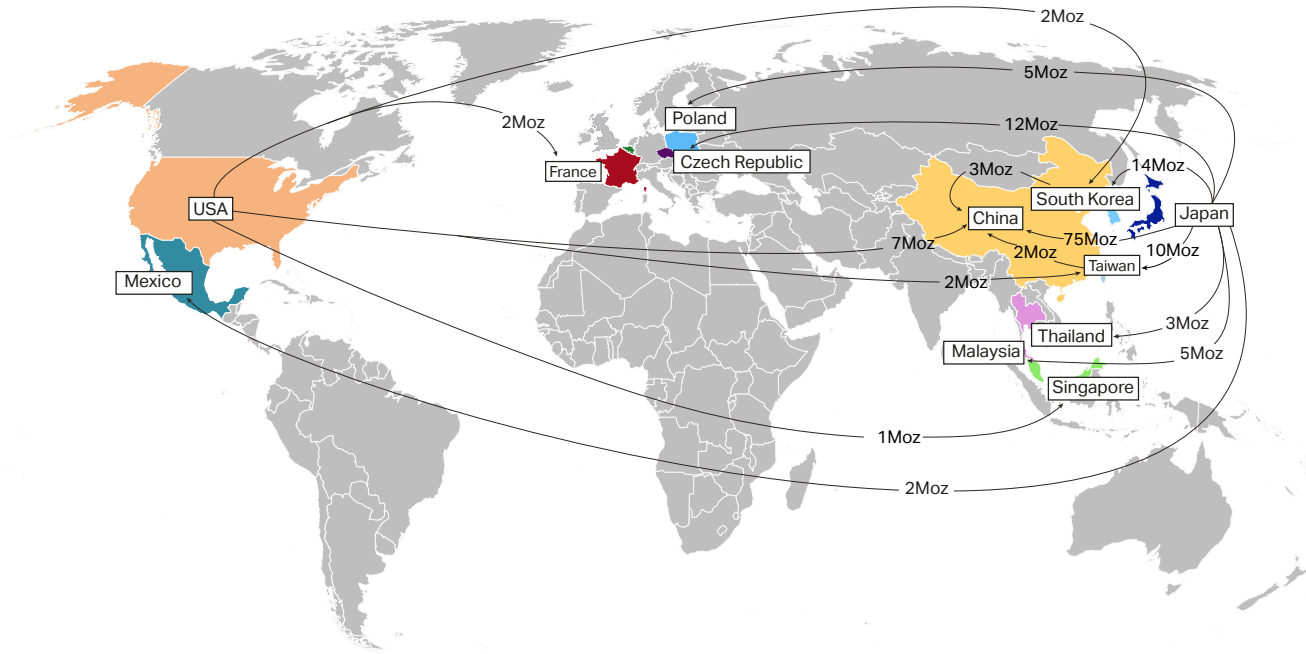


NB: In gross weight terms, imports shown account for 90% of total Indian silver bullion imports in 2023

Source: Indian Ministry of Commerce, Metals Focus



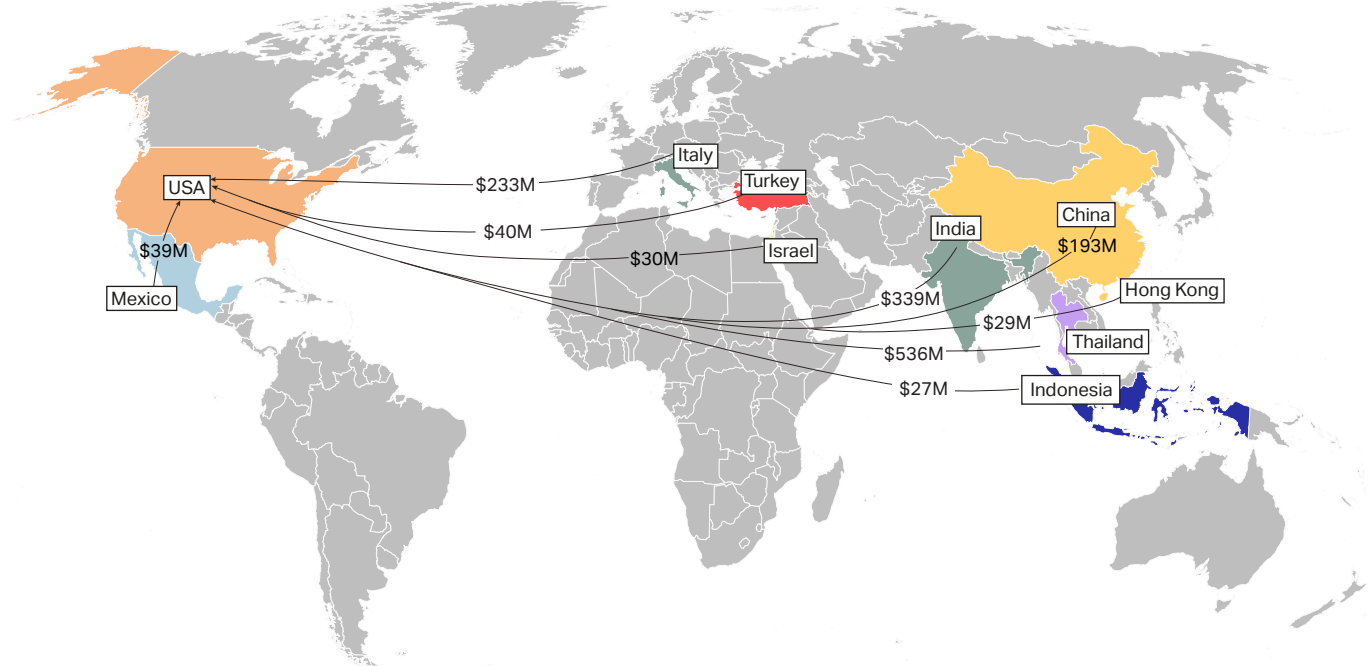
Appendix 27 - Selected Silver Powder Trade Flows in 2023



NB: Figures stated represent reported gross volumes of material shipped

Source: Various, Metals Focus

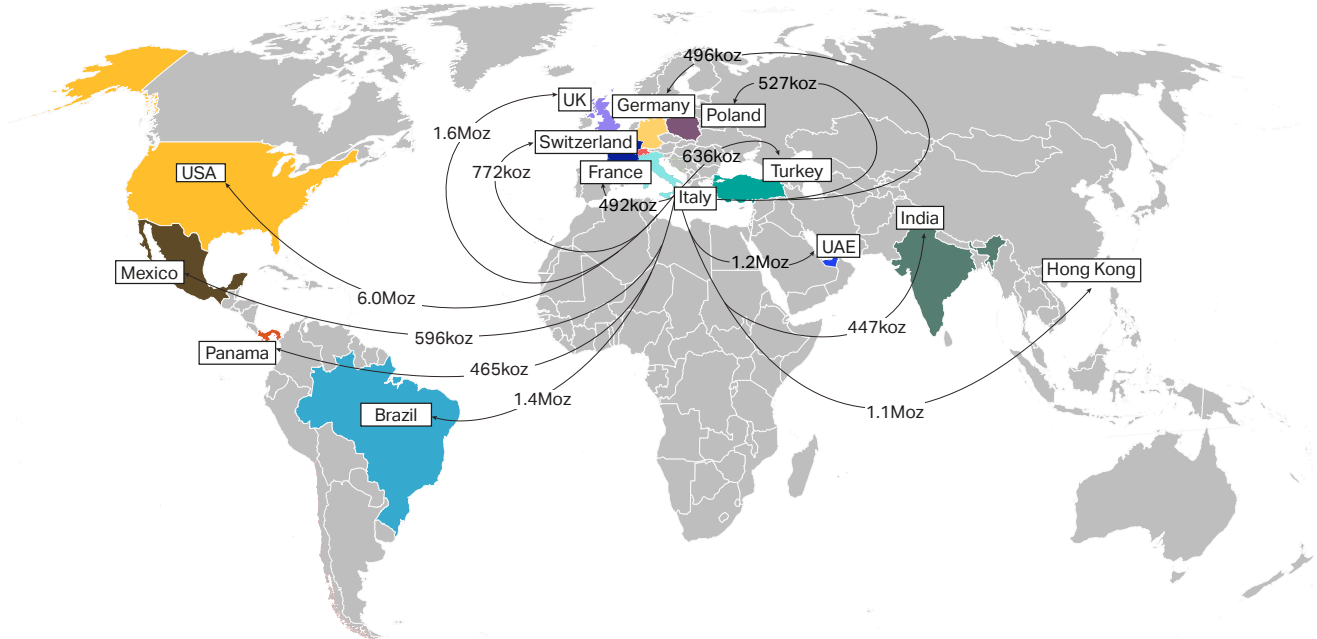
Appendix 28 - Value of Selected US Silver Jewelry Imports in 2023



NB: Imports shown represent around 92% of the total value of US silver jewelry imports in 2023

Source: Various

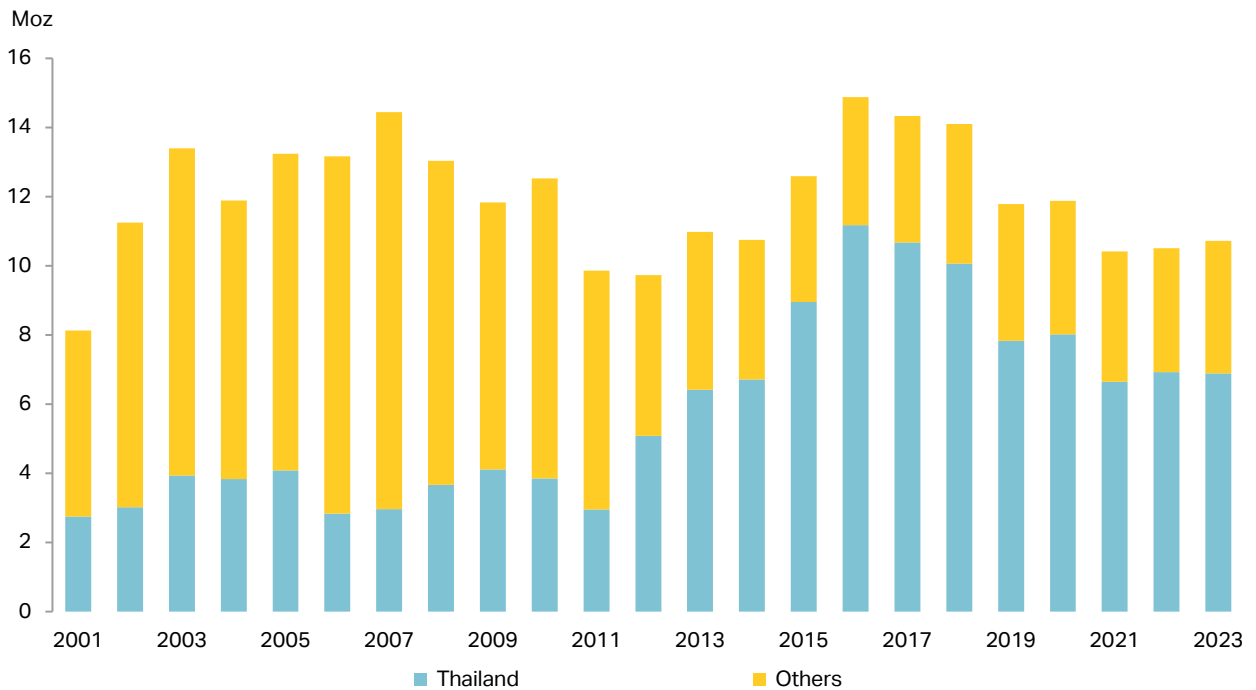
### Appendix 29 - Selected Italian Silver Jewelry Exports in 2023



NB: In gross weight terms, excluding re-exports. Shipments shown account for 66% of total Italian silver jewelry exports in 2023.

Source: Metals Focus, S&P Global

### Appendix 30 - German Silver Jewelry Imports



NB: In gross weight terms. Source: Metals Focus, S&P Global

## 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.

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