PLATINUM QUARTERLY

Q4 2023

6th March 2024

World Platinum Investment Council

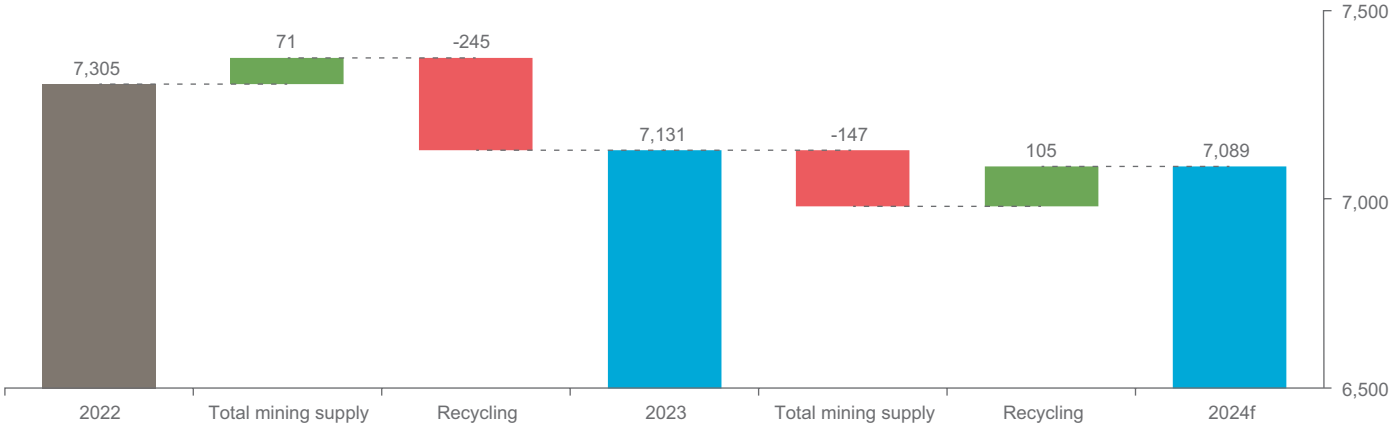
FOREWORD

This edition of *Platinum Quarterly* presents platinum supply and demand developments for the fourth quarter of 2023, for the full year of 2023 and an updated forecast for 2024. It also provides WPIC's views on relevant issues and trends for investors considering exposure to platinum as an investment asset, plus an update on how our product partnerships continue to meet investors' needs. The *Platinum Quarterly* data and commentary (starting on page 6) are prepared independently for WPIC by Metals Focus.

2024 forecast for a second consecutive and substantial platinum market deficit

- The platinum market recorded a deficit of 878 koz in 2023, the largest within WPIC's data series. A market deficit is expected to continue through 2024, at 418 koz, with several of the ongoing market themes persisting. Notably, total platinum supply decreased by 2% in 2023 and is forecast to decrease by another 1% in 2024, leaving 2024 supply 6% below the average annual supply over the previous five years.
- Supply risks are highly likely to remain in focus during 2024. The significant decline in the PGM basket price has eroded profitability at a number of operations and all of the major producers have announced plans to restructure their operations, the full implications of which are not yet clear. Indeed, there is even the potential for additional announcements to be made between the production and publication of this report. Recycling supply is also a focus, Q4'23 was the weakest quarter in our time series, 2023 recycling was 25% below the preceding five-year average, and although a 7% recovery is expected in 2024, there are a number of risks to that outlook.
- Demand, on the other hand, remains robust. Although total demand is expected to decline 6% in 2024, that is coming off the back of a record year for industrial demand in 2023, and is also the result of a weaker investment outlook for bar and coin in the US and Japan and expected ETF disinvestment due to the higher-for-longer interest rate environment. Despite 2023 likely being the post-COVID peak for internal combustion engine (ICE) vehicle production, we are seeing a trend towards increased hybridisation, which is more PGM intensive and likely to support automotive demand well into the future.

Annual total supply and changes 2022 to 2024f (koz)



Source: Metals Focus

2023 summary – platinum market deficit of 878 koz on stronger demand and weaker supply

The final quarter of 2023 saw the consolidation of several demand themes across the platinum market. Demand growth from the automotive and industrial sectors led to a fourth consecutive quarterly platinum market deficit, consistent with previously discussed trends. Notably, this is only the second time within WPIC's quarterly time series dating back to Q3 2014 where four consecutive quarterly market deficits have been recorded. Mine supply finished the year on a seasonally strong note, but recycling posted the weakest quarterly output in our time series, reflecting the challenges facing the industry. A negative for the quarter was the weak investment environment with particularly significant ETF outflows.

Bringing fourth quarter data into the full year results, the platinum market deficit decreased by 193 koz to 878 koz versus the Q3 2023 *Platinum Quarterly* published in November 2023, with the difference mostly due to ETF outflows in Q4. The 2023 deficit reflects a 2% decline in total supply and a 25% increase in demand versus 2022.

Mine supply increased by 1% year-on-year in 2023 to 5,636 koz. All major producing regions increased mined supply, led by South Africa and Zimbabwe, up 1% and 6% year-on-year respectively. Against this backdrop, mine supply remained depressed versus historical levels, as miners faced processing constraints (planned and unplanned) and other headwinds such as ongoing electricity supply shortages in South Africa, strikes, planned closures and safety stoppages. Recycling supply remained challenged, falling to its lowest annual level in our time series, with autocatalyst recycling declining by 17% year-on-year in 2023 on low end-of-life vehicle availability. Total supply last year of 7,131 koz, was 2% lower versus 2022.

Total platinum demand for 2023 which has been revised down since our last *Platinum Quarterly* by 141 koz to 8,009 koz, was still up 25% year-on-year. The downward revision is primarily attributable to lower investment demand, which was 265 koz in 2023 (385 koz previously). However, this still represents a substantial improvement versus 2022 on reduced ETF disinvestment (-20 koz versus -558 koz in 2022), higher bar and coin demand (+49 koz year-on-year) and a minor build in stocks held by exchanges.

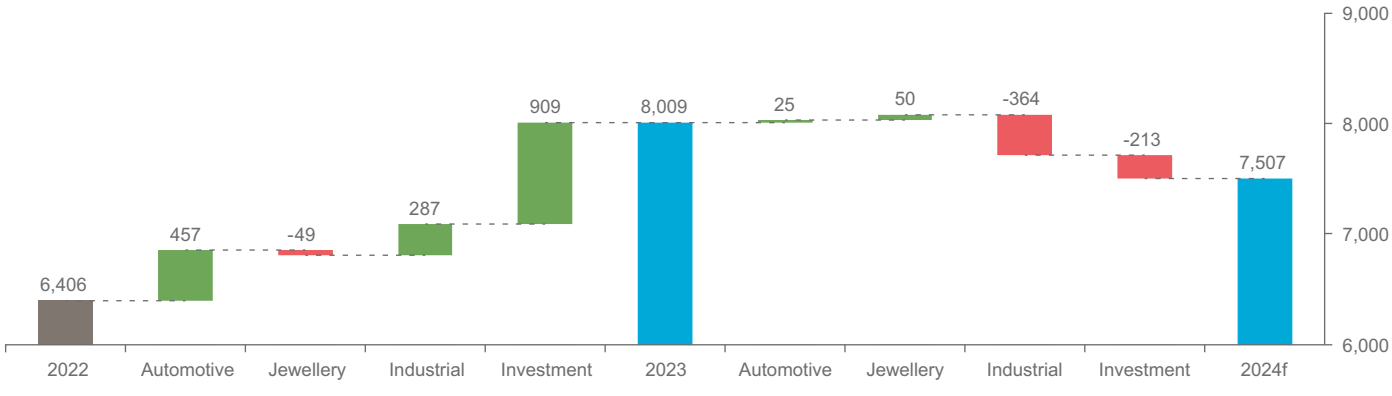
Automotive demand totalled 3,272 koz in 2023, up 16% on 2022. This growth reflects ongoing themes of higher-than-expected vehicle sales alongside substitution of platinum for palladium in gasoline vehicles and higher overall loadings, particularly in the heavy-duty and off-road vehicle categories. Automotive demand was revised 10 koz higher than the previous estimate due to battery electric vehicle market share being lower than expected (albeit still growing). Jewellery demand declined 3% year-on-year to 1,850 koz in 2023 as growth in Japan, Western Europe and India was offset by weaker North American and Chinese demand. China was no longer the largest platinum jewellery market, falling to second place behind North America. Total industrial demand reached 2,622 koz, up 12% year-on-year, meeting expectations that 2023 would be the strongest year for industrial demand on record. Glass capacity additions (+39% year-on-year) and, to a lesser extent, chemical capacity additions were the big drivers of the year-on-year growth of total industrial demand, offsetting the weaker petroleum and electrical sectors during 2023.

Combining lower supply and strong demand growth results in the platinum market deficit for 2023 reaching 878 koz, or 11% of total demand, the deepest deficit in our time-series going back to 2013.

Updated 2024 forecasts – platinum markets to remain in deficit, further depleting above ground stocks

Some themes that have characterised the past couple of years are expected to continue into 2024. Supply will remain subdued in 2024, with another year-on-year decline. Automotive demand growth should continue, as platinum for palladium substitution growth offsets a decline in production of vehicles containing an autocatalyst. Markets will remain challenging for investment demand within the prevailing higher-for-longer interest rate environment. A modest 3% jewellery demand recovery is forecast. The largest shift in 2024 demand will be underpinned by a pullback in industrial demand after a record 2023 with fewer new chemical and glass plant commissionings. Combining lower supply and demand reduces the market deficit from 878 koz in 2023 to 418 koz in 2024, or 6% of total demand.

Annual total demand and changes 2022 to 2024f (koz)



Source: Metals Focus

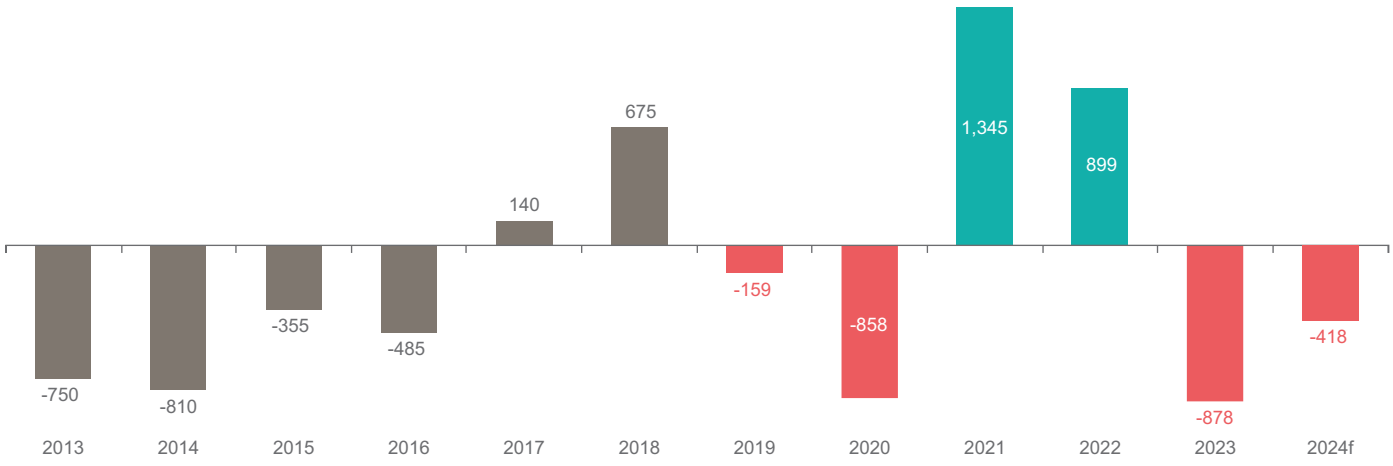
During 2024, mined platinum supply is expected to decline by 3% year-on-year with lower output from South Africa (-54 koz) and Russia (-58 koz). Although South Africa faces less smelter downtime, and load-shedding is seemingly improving, production has been revised lower by 212 koz to 3,887 koz since our previous *Platinum Quarterly*. This stems from announced restructuring plans, shaft/section closures and slower than previously expected production ramp-ups. Russian supply is expected to be impacted by planned smelter maintenance in 2024. In North America, headcount reductions will hinder the return of production to pre-2020 levels. It is worth noting that this is a dynamically evolving environment, and there is the potential for additional restructuring announcements between the preparation and publication of this report, leading to some downside risks to the outlook.

Secondary supply is forecast to increase by 7% year-on-year in 2024, on the back of a recovery in end-of-life scrap vehicle availability, but remains constrained versus historical recycling rates. Combined, total platinum supply of 7,089 koz is 6% lower than the average of the past five years.

Platinum demand is forecast to decrease by 6% year-on-year in 2024. Growth in demand from the automotive and jewellery markets is expected to be offset by lower industrial and investment demand. In the light-duty vehicle (LDV) automotive market, ICE vehicle production numbers are expected to fall from 80 to 77 million units, reflecting the continued growth of battery electric vehicles (BEV). Despite this, automotive demand for platinum is expected to grow by 1% (+25 koz) year-on-year, on ongoing platinum for palladium substitution and the growing market share of hybrid vehicles, increased production of heavy-duty vehicles and stricter emissions regulation now capturing a broader segment of non-road vehicles. The jewellery market will benefit from demand growth in India and Japan, and a partial recovery in China. Industrial platinum demand is forecast to decrease 364 koz versus 2023. This should be viewed in the context of record demand levels in 2023, global macro-economic headwinds and bearing in mind that 2024 will still be the fourth strongest year for industrial demand on record, which maintains an annualised demand growth rate of 3.1% CAGR since 2013. Investment demand of 52 koz in 2024 is negatively impacted by a projection for 120 koz of ETF disinvestment in 2024, as well as a weaker outlook for bar and coin, partially offset by inflows of 20 koz into exchange stocks.

All combined, the platinum market will record a second year of deficit at 418 koz representing a continuation of compelling market fundamentals.

Annual platinum supply/demand balances



Source: SFA (Oxford) 2013 - 2018, Metals Focus 2019 - 2024f

The platinum investment case – resilient demand and supply challenges

Simply put, platinum's investment case highlights a market that is facing material near-term deficits as a result of resilient demand, protected from weak economic growth, and constrained, or even at-risk, mine and recycling supply. Further-out platinum demand will gain from its key role in the hydrogen enhanced energy transition.

Starting with economics, the global outlook remains complex. Major central banks have called peak interest rates and signalled cuts for later in 2024 as inflation has trended lower. Interest rate cuts will be supportive of consumer demand, particularly in the automotive sector. Sustained geopolitical risk was exacerbated again in late 2023 with escalating hostilities in the Middle East. The associated threats to shipping may increase energy prices and shipping costs as well as disrupt supply chains with longer shipping times. Heading

into 2024, politics will take centre stage. A repeat of the Trump-Biden race of 2020 looks distinctly possible and a Republican victory in 2024 could potentially see a rowing back from the Biden administration's groundbreaking IRA carbon reduction legislation, with knock-on consequences for the US's developing hydrogen economy. Elsewhere, South Africa's miners will pay close attention to the national election and the uncertain impact of the outcome (scheduled for 29th May).

As already highlighted above, a key investor focus in 2024 is likely to be the risks facing supply, both mining and recycling. The challenge with forecasting output at present is that all the major producers have announced restructuring plans, but as yet made limited changes to guidance. Whilst it may be the case that headcount can be downsized without curtailing production, there are certainly increased uncertainties in the sustainability of mine supply. Equally, the challenges that resulted in 2023 being the weakest year for recycling supply in our time series have not gone away. Whilst the assumption is that the recycling headwinds begin to abate during 2024, there are downside risks to this outlook as well.

In contrast, whilst platinum demand was revised lower than in our previous forecast for 2023 and demand is forecast to decline modestly in 2024, platinum is well protected against most of the downside risks of the broader economic outlook. Platinum automotive demand is still growing, and passenger vehicle production has recovered to pre-COVID levels of above 90 million units. This increase is biased to BEVs, although projected BEV market share gains have been paired back marginally as automakers see hesitancy amongst the next wave of consumers to make the switch from ICE and hybrids. This represents a retracing of the previously unabated, continual upward revisions to BEV market share. The response from automakers has been to "follow the consumer" leading to more emphasis on hybridisation which typically comes with higher PGM loading requirements than conventional ICE vehicles. Platinum for palladium automotive substitution will continue in 2024, and despite the pair of metals broadly trading at close to parity, once platinum substitution for palladium is embedded, the associated platinum demand is unlikely to be reversed during the 7-year vehicle platform life, even if palladium were to trade below the platinum price on a sustained basis.

Industrial demand is multifaceted, and the impact of economic headwinds, and coming off record demand in 2023, means 2024 is lower, particularly in glass and chemicals. However, the versatility of platinum shows up within the "Other" sub-sector of industrial demand. "Other" demand houses non-road hydrogen fuel cells, electrolysis, and non-emission control automotive components such as spark plugs and sensors. This sub-segment is forecast to grow at 7% year-on-year and accounts for the largest component of industrial demand at 29% in 2024. In contrast, the demand areas at most downside risk from consumer sentiment are the jewellery and investment segments. Current projections are for a small increase in jewellery demand in 2024. Indian demand growth is expected to slow, but off a larger base which leads to its strongest year on record, while Chinese demand may benefit from government efforts to ease domestic economic growth concerns and, in particular, the debt-laden property sector. In terms of investment, net disinvestment in Japan is still a risk due to ongoing yen weakness, and whilst higher-for-longer interest rates would suggest non-yielding ETF disposals, holdings held up reasonably well through 2023 despite the high rate environment.

Central to the outlook for platinum is the global energy transition. As the interest rate cycle turns, we think governments will look to reinvigorate stagnating growth by promoting green technologies which facilitate the energy transition. This is already evident in China's focus on its "new three" exports (BEVs, lithium-ion batteries and solar cells) and the US's IRA legislation. Platinum stands to be a significant beneficiary, with demand pull from the growth in renewable energy generation and hydrogen production and use. Indeed, hydrogen related demand for platinum is expected to double year-on-year in 2024, albeit off a small base.

While the energy transition and green hydrogen momentum builds, one should not overlook what may be a bumpy journey. As noted, the US's IRA may fall prey to politics, while in the UK, the Labour party has reduced its flagship £28bn per annum green spending plan by half. Despite the fluctuating political landscape, the environmental importance of platinum is already well established. In industrial applications, platinum-based catalysts are key to facilitating chemical reactions, reducing energy requirements, and increasing yield, thereby also reducing carbon emissions. Glass fibre produced using platinum alloy bushings is critical for the wind turbine industry, displacing fossil fuel power generation (global installed wind capacity is projected to double between now and 2030), as well as for vehicle lightweighting. Within the automotive industry, platinum is essential for the reduction of harmful emissions from internal combustion engines, including in hybrid vehicles, and will be increasingly critical in the deployment of fuel cell electric vehicles.

The platinum price does not yet reflect a market entering a second year of material deficits which cumulatively will reduce above-ground stocks by a quarter between 2022 and 2024. The lack of a price response appears to reflect broad destocking across the automotive industry. These elevated stocks arose as a result of contractual delivery commitments in combination with the underproduction of vehicles versus plan due to the impacts of COVID and the semiconductor shortage, over 2020-2022. In addition, demand from China has been highly price sensitive, with volumes picking up at prices approaching or below US$900/oz but softening at prices above US$1,000/oz.

Entering 2024, there are indications that automakers may be nearing the end of the PGM inventory rightsizing process. This should tighten physical markets and support demand-led upward pressure on platinum prices. Since our last *Platinum Quarterly*, around 50 koz per annum of platinum production has or will exit the market as a result of mines being suspended due to eroded profitability as a result of the decline in PGM prices during 2023. Supply-linked upward price pressure may materialise if we see further producer responses to uneconomic mine supply.

WPIC initiatives highlights

We continue to grow the number and geographic coverage of our product partnerships which, in addition to increasing choices for investors, provides us with the ability to identify market developments and appropriate strategies to increase investment in platinum. This proved particularly helpful during 2023 as the headwinds of high interest rates were opposed by increased global uncertainty.

Whilst retail bar and coin demand is below the exceptional levels seen over the past three years as demand for precious metals followed global economic turmoil, current demand is still above historical pre-COVID levels. Our efforts in Europe and North America to tailor promotional programmes to specific audiences and train partner salesforces gained traction. Our partners in North America reported higher demand for platinum bars and coins than had been anticipated.

In China, the low price of platinum and WPIC investor development efforts helped boost the quarterly sales at our partners to a record high. We worked with Chinese partners to expand their offering range with a focus on small-sized products (e.g. 1g bar, 1g bean, and 1g card in Pt), appealing to young investors at affordable prices. China Gold Coin resumed its zodiac series of platinum coins for 2024, for the first time in 24 years, with inaugural platinum dragon bars being offered in two sizes, 10g and 100g.

In the rest of Asia, we onboarded two new partners in Q4, Ishifuku, a leading Japanese fabricator, and Silver Bullion, a renowned bar and coin retailer in Singapore. In coordination with JBMA, WPIC sponsored an investment forum, strengthening our footprint in Japan and refreshing the awareness of platinum investment. In South Korea, we supported our new partner Korea Gold Exchange Inc. with its first Platinum Investment Guide for distribution via its physical outlets.

Trevor Raymond, CEO

Contents

Table 1: Supply, demand and above ground stock summary

	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %	Q3 2023	Q4 2023
Platinum Supply-demand Balance (koz)									
SUPPLY									
Refined Production	**4,989**	**6,297**	**5,522**	**5,590**	**5,489**	**1%**	**-2%**	**1,394**	**1,516**
South Africa	3,298	4,678	3,915	3,941	3,887	1%	-1%	985	1,127
Zimbabwe	448	485	480	507	502	6%	-1%	132	133
North America	337	273	263	276	279	5%	1%	60	72
Russia	704	652	663	674	616	2%	-9%	168	136
Other	202	208	201	192	205	-5%	7%	49	48
Increase (-)/Decrease (+) in Producer Inventory	-84	-93	+43	+46	+0	7%	-100%	+16	-11
Total Mining Supply	**4,906**	**6,204**	**5,565**	**5,636**	**5,489**	**1%**	**-3%**	**1,410**	**1,505**
Recycling	**1,997**	**2,096**	**1,740**	**1,495**	**1,600**	**-14%**	**7%**	**357**	**346**
Autocatalyst	1,509	1,608	1,299	1,076	1,167	-17%	9%	254	244
Jewellery	422	422	372	349	358	-6%	3%	85	84
Industrial	66	67	69	71	75	3%	6%	17	18
Total Supply	**6,903**	**8,300**	**7,305**	**7,131**	**7,089**	**-2%**	**-1%**	**1,767**	**1,852**
DEMAND									
Automotive	**2,300**	**2,521**	**2,815**	**3,272**	**3,297**	**16%**	**1%**	**791**	**824**
Autocatalyst	2,300	2,521	2,815	3,272	3,297	16%	1%	791	824
Non-road	†	†	†	†	†	N/A	N/A	†	†
Jewellery	**1,830**	**1,953**	**1,899**	**1,850**	**1,900**	**-3%**	**3%**	**450**	**462**
Industrial	**2,094**	**2,538**	**2,336**	**2,622**	**2,258**	**12%**	**-14%**	**552**	**730**
Chemical	627	670	685	771	543	13%	-30%	123	128
Petroleum	109	169	193	170	156	-12%	-8%	41	41
Electrical	130	135	106	89	87	-16%	-3%	22	22
Glass	473	753	505	701	530	39%	-24%	149	310
Medical and Biomedical	254	265	273	285	295	4%	3%	70	70
Other	501	546	574	606	647	5%	7%	148	158
Investment	**1,536**	**-56**	**-644**	**265**	**52**	**N/A**	**-80%**	**2**	**-90**
Change in Bars, Coins	571	324	221	270	152	22%	-44%	73	42
Change in ETF Holdings	507	-241	-558	-20	-120	N/A	N/A	-99	-116
Change in Stocks Held by Exchanges	458	-139	-307	14	20	N/A	38%	28	-16
Total Demand	**7,760**	**6,955**	**6,406**	**8,009**	**7,507**	**25%**	**-6%**	**1,795**	**1,926**
Balance	**-858**	**1,345**	**899**	**-878**	**-418**	**N/A**	**N/A**	**-29**	**-74**
Above Ground Stocks	**2,634****	**3,979**	**4,878**	**4,000**	**3,581**	**-18%**	**-10%**		

Source: Metals Focus 2019 - 2024f.

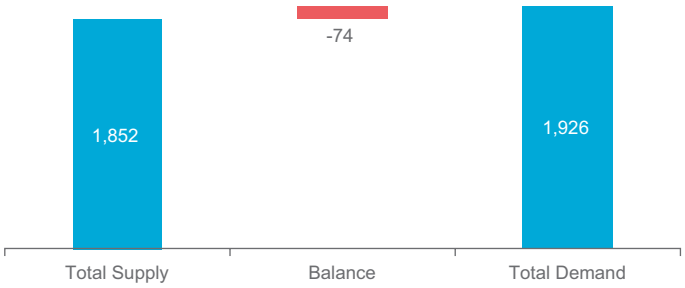
Notes:

1. **Above Ground Stocks 3,650 koz as of 31 December 2018 (Metals Focus).
2. † Non-road automotive demand is included in autocatalyst demand.
3. All estimates are based on the latest available information, but they are subject to revision in subsequent quarterly reports.
4. The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014 to Q4 2017 are contained in previously published PQs which are freely available on the WPIC website.
5. Quarterly estimates from Q4 2021 and half-yearly estimates from H1 2021 are included in Tables 3 and 4 respectively, on pages 23 and 24 (supply, demand and above ground stocks). Details of regional recycling supply in Table 6 on page 26 are only published from 2019.

2023 FOURTH QUARTER PLATINUM MARKET REVIEW

During the fourth quarter of 2023, the macroeconomic backdrop remained volatile. In October, tensions in the Middle East escalated, following the Hamas attack on Israel and Israel's response, giving rise to increased geopolitical risk which impacted investor sentiment towards commodities. That said, platinum demand remained strong. In the final quarter of 2023, demand for platinum exceeded supply, registering the fourth successive quarterly deficit. A combination of healthy demand in the automotive sector, as well as substantial glass plant expansions, saw total demand grow 14% (+240 koz) year-on-year to 1,926 koz and exceed supply, which rose by 5% (+95 koz) year-on-year to 1,852 koz as mine production improved, while secondary supply remained constrained.

Chart 1: Supply-demand balance, koz, Q4 2023



Source: Metals Focus

Supply

Refined mine supply increased by 14% (+188 koz) year-on-year, totalling 1,516 koz. The growth was driven by increased production from most regions, with South Africa being the primary contributor, increasing a notable 21% (+196 koz) year-on-year to a two-year high of 1,127 koz. All South African refineries increased production during the quarter. The fourth quarter (traditionally strong) marked the highest national output since Q4'21, when a release of semi-finished inventory gave a substantial boost to the country's total.

Anglo American Platinum reported the largest jump in refined production as volumes benefited from a release in semi-finished inventory, in addition to Polokwane smelter maintenance of Q4'22 impacting the comparable period. Metal in concentrate production from Anglo's mining operations, however, fell slightly, with higher output from Unki and Mogalakwena being offset by a decline from Amandelbult. The other major driver of refined volumes was an increase from Northam as the Booysendal and Eland mines continued to ramp-up.

A serious multi-fatality safety incident at Impala Rustenburg's 11 Shaft in November impacted Impala's platinum production by around 15 koz. In addition, the scheduled rebuild of Number 5 furnace initiated in December further impacted volumes. Implats' refined production benefited from the inclusion of the acquisition of RB Plats, however on a like-for-like basis their South African production remained virtually flat.

Despite a slight decline in Eskom power generation quarter-on-quarter, national power demand experienced a more significant fall as the number of private renewable energy projects rapidly increased, replacing need for grid power, leading to the lowest quarterly power shortfall since Q2'22. Consequently, the impact of load curtailment on production volumes was minimal.

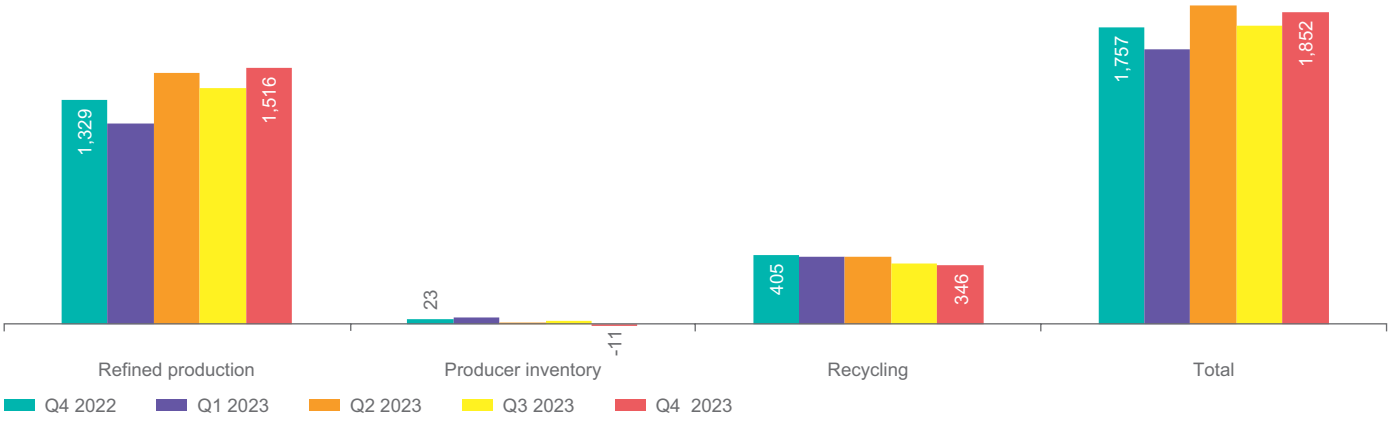
Zimbabwe's quarterly production rose by an estimated 8% year-on-year, reaching an all-time high of 133 koz. All three of the country's operations demonstrated year-on-year growth, with Unki accounting for the bulk of this through increased throughput and head grade.

In contrast, Russian output declined 15% year-on-year to 136 koz, the lowest level in the *Platinum Quarterly* time series running back to 2013, due to refined metal production being negatively impacted by constrained ore production earlier in the year.

Recycling

Global recycling declined 14% (-59 koz) year-on-year to the lowest quarterly level in WPIC's timeseries going back to Q3'14. This was driven by persistently low supply sources for both scrap autocatalysts and jewellery. Autocatalyst scrap supply remained weak due to some consolidation and closure of collection businesses and scrapyards, leading to a smaller supply network. Although vehicle sales improved, the availability of end-of-life vehicles (ELVs) remained low. Additionally, stock that is available is more frequently from older vehicles with lower loadings or on difficult to smelt substrates. Stricter regulations in North America (to combat catalyst theft which impacted most of 2022 and the first half of 2023) continued to have an impact, but participants appeared to have adapted better during the second half of last year. Overall, the recovery of spent catalyst material was down by 18% (-52 koz). Meanwhile, in China, restrictions on autocatalyst recycling remain in force, with hopes for a resolution in 2024. Additionally, Chinese platinum jewellery scrap dropped by 10%, driven by price weakness and lacklustre demand for jewellery.

Chart 2: Platinum supply, koz

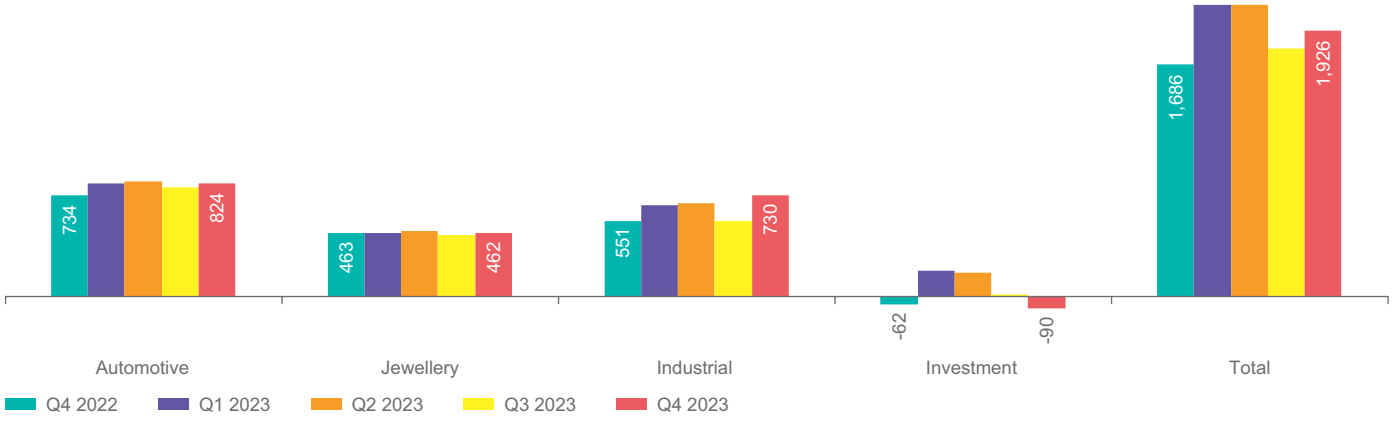


Source: Metals Focus

Demand

Global demand improved to 1,926 koz in Q4'23, up 14% (+240 koz) year-on-year as automotive demand increased 12% (+90 koz) and industrial demand, boosted by glass capacity expansions, jumped 33% (+179 koz). However, the quarter recorded net disinvestment of 90 koz, as ETF holdings shed -116 koz and exchange stocks eased by 16 koz, both of which offset slightly firmer retail investment.

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

In Q4'23, platinum demand for autocatalyst production improved by 12% year-on-year, reaching 824 koz, as both light and heavy-duty vehicle production saw improvements compared to Q4'22. Light vehicle production saw an 11% rise, while heavy-duty production increased by 6%. Within the light-duty vehicle category, the 42% growth in hybrid vehicles and 3% lift in pure internal combustion engine vehicles bolstered the overall total. In the heavy-duty segment, both diesel and gasoline-powered vehicle production experienced year-on-year gains. While the overall Battery Electric Vehicle (BEV) production increased by 21% in Q4'23, this fell short of previous expectations of a 26% increase.

In North America, while overall light and heavy-duty vehicle production during the quarter increased 2% and 4% respectively, light-duty vehicle internal combustion engine production was down 4% year-on-year and that of the larger bodied vehicles, such as pick-up trucks with higher PGM loadings, were down by as much as 11%. Despite the decline in these key segments, growth in hybrid vehicle production and substitution of palladium resulted in platinum demand being flat year-on-year. In Europe, demand improved by 4% (+11 koz) compared to Q4'22, despite a decline in quarterly vehicle production. This increase was largely attributed to the rise in production of hybrid vehicles, which typically have higher PGM loadings.

Following a lacklustre 2022, vehicle production in China showed steady improvement throughout 2023, with a significant jump in the last quarter. Production of light-duty vehicles increased by 22%, while heavy-duty vehicle production improved by 50%. This growth propelled platinum demand by 58% (+62 koz) during the quarter. In Japan, platinum demand also saw a healthy increase of 32% (+21 koz), thanks to the improvement in light vehicle production. In the "Rest of the World," the slight improvement in light vehicle production could not offset the decline in the heavy-duty sector, which was down by almost a quarter, resulting in a 2% decrease in platinum demand (-3 koz).

Jewellery demand

Global jewellery demand was flat year-on-year at 462 koz.

European demand in Q4'23 was flat year-on-year, partly as ongoing strong growth for the very top-end jewellery and watch producers was offset by a stagnant upper-mid market. Restocking for the mass market also countered still weak underlying sales in the bridal segment and fewer engagements.

North American offtake dipped by 3% year-on-year in Q4'23. Much remained due to normalisation in wedding numbers. In addition, research contacts observed a more noticeable decline in engagements which they associated with the lingering social impacts of the pandemic. Results, however, were stronger than expected as consumer sentiment improved and the trade grew more confident about inventory build.

In China, platinum jewellery fabrication in Q4'23 fell by 12% year-on-year from last year's low base. Concerns about the country's economic slowdown and sharp corrections in the local equity market led to deteriorating consumer sentiment. In addition, retailers' product restructuring, shifting away from high-value-added products (including diamond, K-gold, platinum, and gem-set) to 24K gold products, also weighed on platinum jewellery offtake.

Japanese demand fell by 5% year-on-year, a result that was short of Metals Focus' expectations, given a relatively healthy overall jewellery market in Japan. Our field research suggests that a weak bridal sector continues to put pressure on platinum jewellery. Another headwind for the metal was perhaps stronger appetite for "asset jewellery" within the Japanese market, namely pieces that have lower mark-ups and therefore a higher perceived inherent value, where gold has a solid stronghold, Kihei chains and coin pendants being prime examples of such products.

Indian platinum jewellery fabrication jumped by 28% year-on-year and more than doubled quarter-on-quarter to the record level of 84 koz, taking the full-year total to 203 koz (19% year-on-year). The sharp jump was primarily driven by the record-high exports from India. PGI India's initiative to promote platinum jewellery in the Middle East has resulted in increased manufacturing in India, resulting in the country exporting a record 18 koz (+450% year-on-year) of platinum jewellery, mainly to the UAE. At the same time, domestic demand was also buoyant in the last quarter driven by weddings and the festive season and with the urban economy outperforming the rural in many areas, consumer sentiment remained upbeat.

Industrial demand

Industrial platinum demand jumped to 730 koz in Q4'23 (the highest levels since Q2'21), 33% (+179 koz) higher than Q4'22. This increase was almost entirely due to expansions in the glass industry in Q4'23 which countered heavy consolidations in Japanese LCD glass manufacturing facilities seen last year, which reduced net demand in the comparable quarter. Chemical, petroleum and electronics demand were softer while other industrial demand, which includes sensors and spark plugs, saw an uplift as vehicle production increased in Q4'23.

Chemical

Platinum chemical offtake rose by a slight 4% (+5 koz) quarter-on-quarter to 128 koz, as demand in all key segments held broadly steady. On a year-on-year basis, however, volumes were 52% (-139 koz) lower, reflecting significantly fewer new capacity additions than the same period the year before. As highlighted in the previous *Platinum Quarterly*, the overwhelming majority of 2023's new capacity additions in paraxylene (PX) and propane dehydrogenation (PDH) plants took place in the first half of the year. Meanwhile, demand for platinum from the silicone industry remained soft in Q4'23, as a slowing global economy continued to affect silicone sales in most key segments. Following a recovery in early 2023, nitric acid offtake remained broadly steady in Q4'23 compared with the previous quarter.

Petroleum

Following a slowdown in Q3'23, platinum demand remained steady quarter-on-quarter at 41 koz in Q4'23. On a year-on-year basis, however, volumes were down by 20%. Slower oil supply growth, due to supply cuts by OPEC+ countries, underpinned this year-on-year weakness, while an absence of the boost from gas-to-liquid catalyst changeouts in 2023 also contributed to the decline. In China, platinum demand was affected by fewer expansions in the petrochemical sector. North America was the only region that recorded growth in Q4'23, as record high oil supply in the US helped to lift demand.

Medical

Platinum medical demand improved by 3% year-on-year in Q4'23 to 70 koz (+2 koz). The industry continues to grow due to increased medical spending, greater access to healthcare, an ageing and growing global population, and, in part, from some COVID-induced backlogs still being worked through.

Glass

Platinum demand from the glass industry in Q4'23 jumped to 310 koz from a very low base of 2 koz in Q4'22 (the result of large consolidation of LCD tanks in Japan). Platinum demand also grew significantly on a quarterly basis from 149 koz in Q3'23 due to new LCD tank installations in China.

Electrical

Electrical demand in Q4'23 fell by 6% (-1 koz) year-on-year to 22 koz as hard-disk drive (HDD) shipments continued to decline, mainly due to the erosion in the PC and consumer devices market and sluggish demand in the surveillance sector. However, a rebound in the cloud computing and near-line (backup/archive) storage markets (driven by artificial intelligence applications that require large amounts of data storage and analysis) has temporarily halted consecutive quarterly declines in HDD shipments.

Other

Global other industrial demand grew by 15% (+20 koz) to 158 koz in Q4'23. In the automotive field, a stronger-than-expected increase in vehicle production, coupled with a solid aftermarket business and suppliers rebuilding buffer inventories, provided robust momentum for the spark plug and sensor segment. Production within the defence and aerospace industry has also seen marked improvements, lifting demand for platinum. Finally, as electrolyser capacity and the related segments of the hydrogen value chain continued to ramp-up in Q4'23, there was a healthy increase in platinum demand from this subcategory.

Investment demand

During Q4'23, global retail investment showed improvement, albeit modest, growing 49 koz year-on-year to 42 koz. That said, this compares with an exceptionally weak Q4'22, when the overall total had recorded net disinvestment for the first time on record, albeit of just 7 koz. However, in absolute terms, Q4'23 was also subdued, mostly due to the Japanese market which registered net buying of just 1 koz.

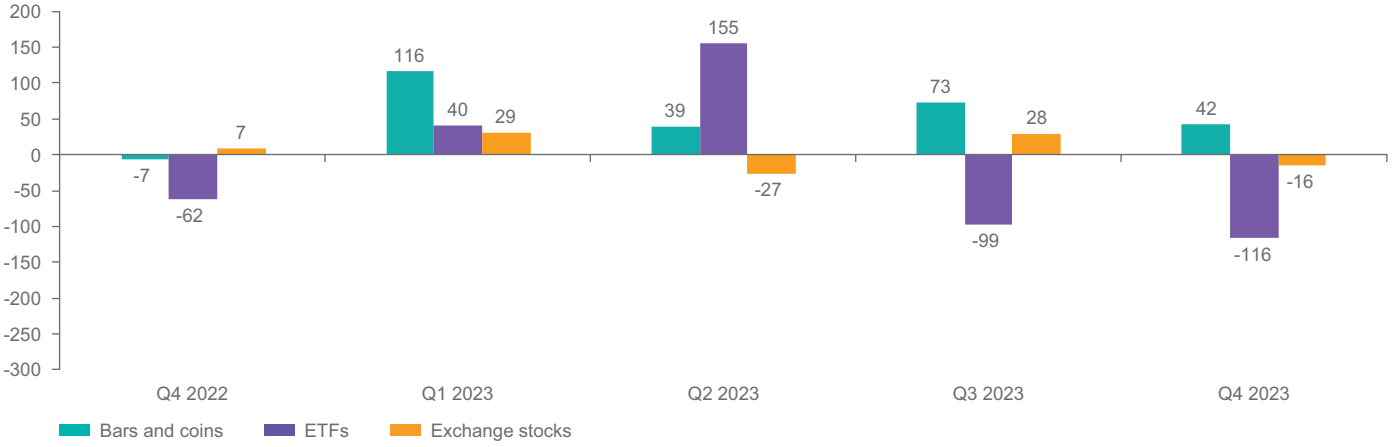
In keeping with Japan, North American demand also eased, by 10% year-on-year to 31 koz (-3 koz). This contrasted sharply with Q1–Q3'23, each of which saw heavy year-on-year declines, the result mostly of far weaker US Mint Eagle sales of just 12.7 koz, against Q1–Q3'22 sales of 80 koz. However, the US Mint traditionally does not sell platinum Eagles in Q4, so there was effectively no year-on-year impact on Q4'23. The fourth quarter also saw gold and silver retail demand weaken, especially towards year-end, resulting in a jump in dealer stocks. The impact this had on dealer balance sheets also deterred the trade from buying newly struck platinum coins and bars, even though selling back had been overwhelmingly of gold and silver.

In Europe, retail investment remained subdued in Q4'23, down by 34% (-2 koz) quarter-on-quarter to 5 koz. As was the case for the previous quarters, high interest rates and the ongoing cost-of-living crisis were the key factors behind this weaker investor interest in bars and coins across gold, silver and platinum.

The Japanese bar and coin market was virtually balanced during the quarter, with a net investment of just 1 koz. Volumes were subdued overall and market feedback suggested that any rise in activity (whether buying or selling back) fuelled by events or price moves tended to be short lived. This was perhaps due to the local price moving generally sideways during the quarter. Competition from gold investment products also did not help, as investors' appetite for these was boosted by local prices breaking through a series of all-time highs and, as a result, receiving coverage in the local news regularly.

Platinum exchange-traded fund (ETF) holdings decreased 116 koz in Q4'23, continuing the trend from Q3'23. The drop was mainly due to a reduction in South African holdings (-150 koz), which continued to fall from their May 2023 high of 897 koz, previously boosted by Eskom-related inflows. However, this trend of outflows seems to have run its course, with December and January seeing consecutive inflows. In contrast, Western-held funds grew slightly, with some opportunistic buying on price dips. Elsewhere, combined Nymex and TOCOM stocks fell by 16 koz in Q4'23.

Chart 4: Platinum Investment, koz



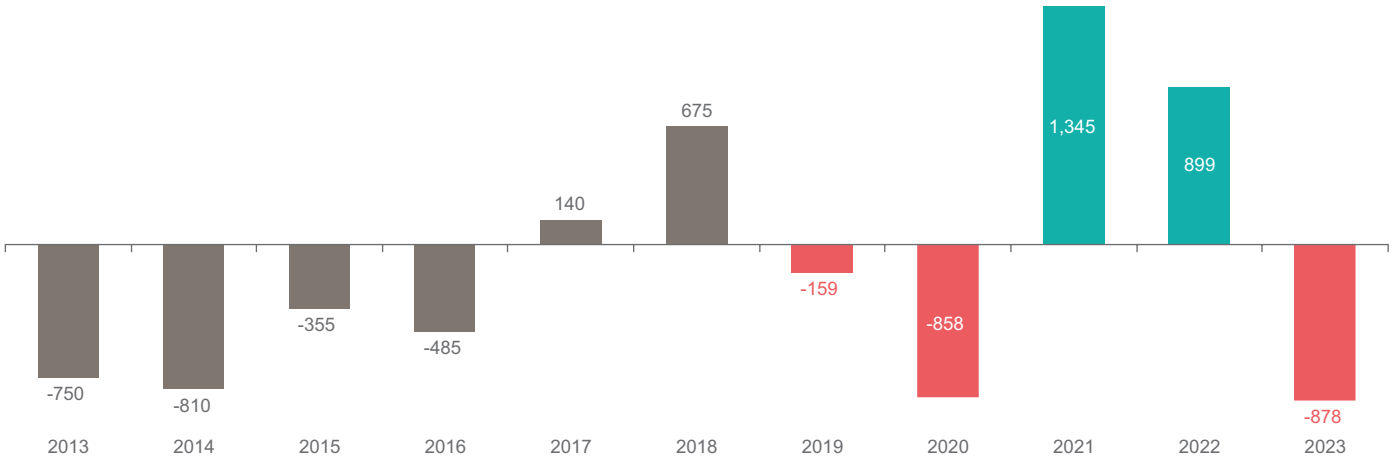
Source: Metals Focus

2023 REVIEW

Following two years of sizeable surplus, 2023 saw the platinum market shift into a significant deficit of 878 koz, as demand surged upwards and supply faltered. Demand of 8,009 koz was driven by a recovery in the automotive sector, as well as chemical and glass plant expansions, with demand from these three sectors up by 740 koz. Furthermore, investment flows improved markedly in 2023, recording net investment of 265 koz for the full year, as ETF outflows were a modest -20 koz (compared to 558 koz in 2022), and exchange stocks increased by 14 koz, while bar and coin investment registered a 49 koz rise year-on-year.

In contrast, despite a modest recovery in mine supply, which rose by 2%, the persistent weakness in the secondary market saw total supply soften to 7,131 koz, 2% (-174 koz) lower than in 2022.

Chart 5: Supply-demand balance, koz, 2013-2023



Source: SFA (Oxford) 2013 - 2018, Metals Focus 2019 - 2024

Supply

After three volatile years in platinum mine supply marked by disruptions, processing infrastructure maintenance, and significant movements of semi-processed inventory, 2023 witnessed a return to stability. Refined mine production is anticipated to have increased by 1% (+68 koz) to 5,590 koz, aligning closely with the forecast presented in the Q4'22 *Platinum Quarterly*. Despite encountering some headwinds and disruptions, most producers successfully met their FY2023 guidance set at the beginning of the year.

The deteriorating South African energy crisis in late 2022 led to a doubling of Eskom power generation shortfall year-on-year in 2023, leaving approximately 8% of national demand unfulfilled. Despite this, South African platinum miners largely managed the impact on their operations effectively. The return of smelters following maintenance allowed increased flexibility in handling power curtailment, thereby minimising lost production. Although Eskom's generation capacity continued to decline in Q4'23, lower consumer electricity consumption, referred to as demand destruction, in the quarter allowed for an easing of the crisis, resulting in a minimal impact on PGM miners in the final three months.

That said, the significant drop in the PGM basket price has impacted profitability, prompting some producers to reassess their production plans and restructure operations during the second half of 2023. However, the impact of this is deferred until 2024 and beyond.

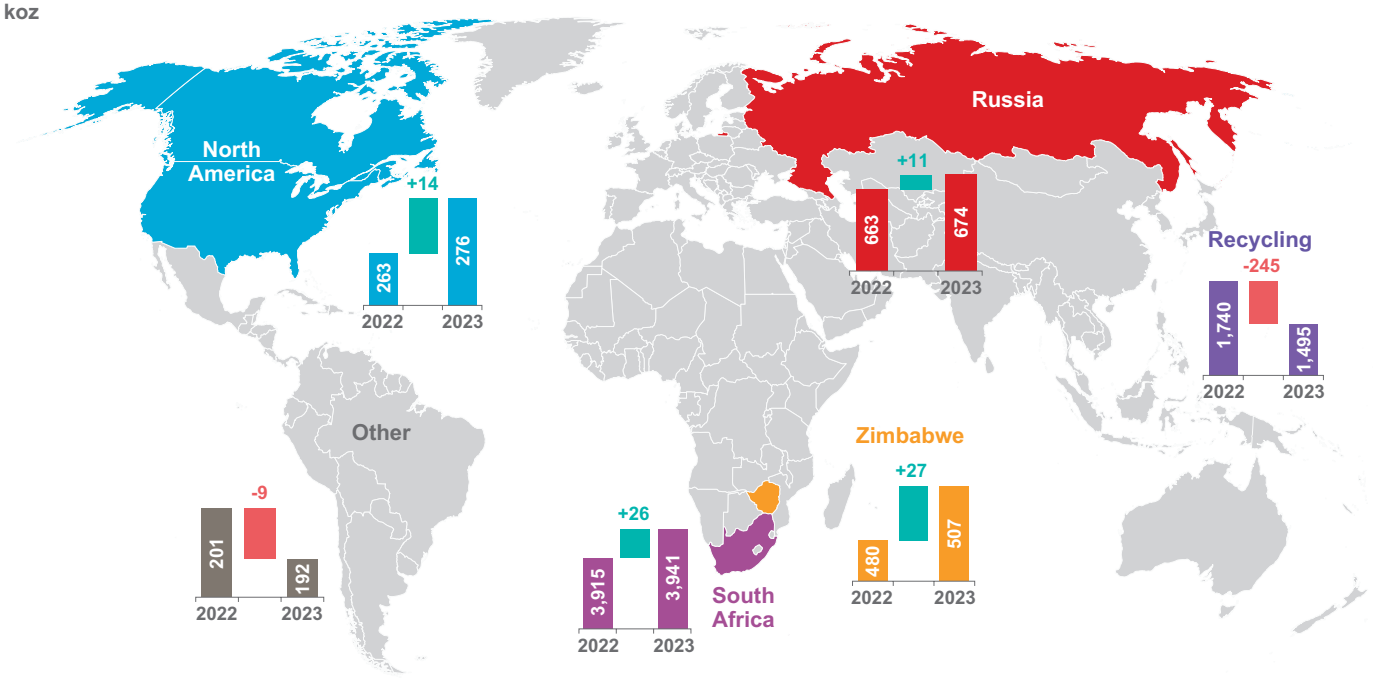
South Africa accounted for the bulk of the global increase in ounce terms, with mine production edging 1% higher (+26 koz) year-on-year to 3,941 koz. Slight declines in output from Amplats and Implats were offset from growth from Northam. However, for the second consecutive year, South African production appears to have fallen short of 4,000 koz, a benchmark figure commonly used as a metric of the industry's health, remaining significantly below pre-COVID levels.

Zimbabwe's production continued its steady increase, surpassing the 500 koz milestone for the first time. The country benefits from operational stability, mechanised mining methods, resulting in fewer safety stoppages, and stable workplace relations. The realisation of volumes from the commissioning of the third concentrator at Zimplats and the Unki concentrator debottlenecking project contributed to the record production.

Nornickel, the major Russian producer, reported a year-on-year decline in all key metals, aside from platinum. Lower grades, processing infrastructure maintenance and the replacement of mining equipment impacted its operations. However, a higher platinum ratio resulted in Russian volumes marginally increasing 2% year-on-year.

Chart 6: Changes in supply, 2022 vs. 2023

koz



Source: Metals Focus

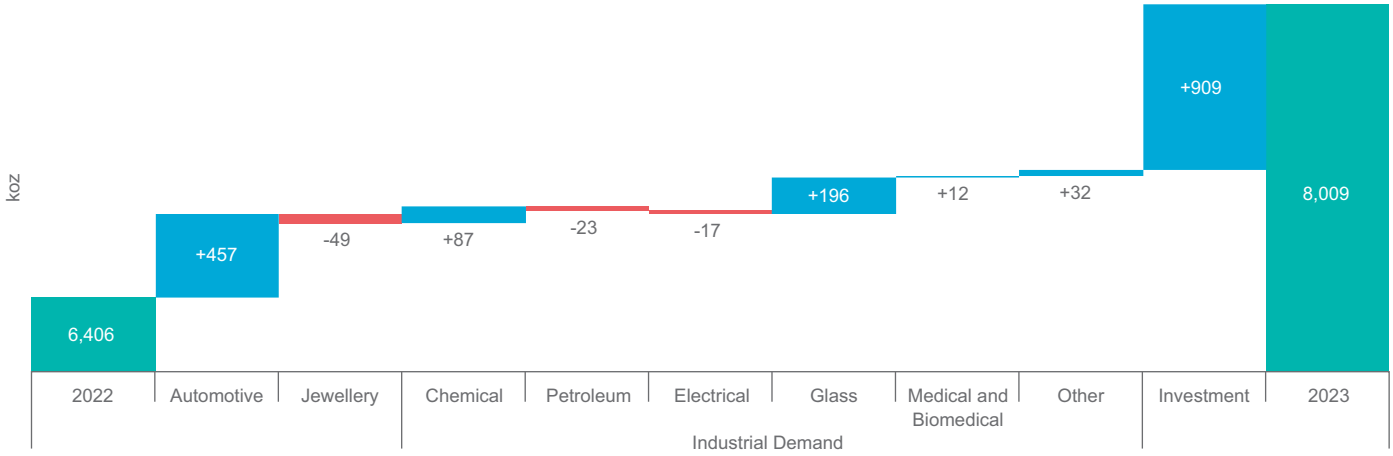
Recycling

Global recycling declined by 14% (-245 koz) in 2023, falling to the lowest annual level in WPIC's time series from 2013, weighed down by a second year of depressed supply from the autocatalyst recycling market. Weaker palladium and rhodium prices have resulted in collectors reducing their efforts to get materials from the market and some scrap yards have been holding back stock, in hopes of a price recovery. Furthermore, changes in consumer driving and vehicle ownership patterns, as well as the introduction of regulations to contain growing concerns of catalyst thefts, contributed to significant disruption in the flow of spent autocatalyst material. These constraints have resulted in a decline of 17% (-223 koz) in platinum recovered from spent autocatalysts. Turning to supply from scrap jewellery sources, the price weakness and lacklustre jewellery demand that prevailed in China throughout last year, drove supply down by 6% (-12 koz).

Demand

Platinum demand grew by 25% (+1,603 koz) year-on-year to 8,009 koz in 2023. After two years of disinvestment, a swing back to positive net investment took place in 2023. This totalled 265 koz and represented a 909 koz swing from a substantial 644 koz of disinvestment in 2022. Improved automotive production, tighter emissions legislation and substitution all contributed to a 16% rise in automotive demand (+457 koz) to 3,272 koz. Platinum demand in the industrial sector benefited from paraxylene (PX), propane dehydrogenation (PDH) and glass capacity expansions, lifting demand by 12% (+287 koz).

Chart 7: Changes in demand by category, 2022 vs. 2023



Source: Metals Focus

Automotive demand

As the grip of semiconductor and other parts shortages over the past two years loosened on the automotive sector, vehicle production surpassed pre-pandemic levels for the first time, reaching 90.7M units, a 10% increase from 2022. While the production of pure internal combustion engine (ICE) vehicles fell, the production of hybrids more than compensated for this, resulting in the number of vehicles that require platinum group metal (PGM) containing aftertreatment systems increasing by 8%. The heavy-duty sector also improved, with output increasing by 12%. The combination of higher vehicle numbers and increased platinum loadings due to hybridisation, substitution, and stricter emission regulations supported growth of 16% (+457 koz) in platinum demand for the full year.

In North America, vehicle production increased 8%. A 6% growth in gasoline-powered vehicle production, combined with growth in hybrid vehicles, underpinned the 7% (+30 koz) lift in regional platinum demand.

In Europe, the vehicle market bounced back in 2023 with output growing 13%, resulting in platinum demand also increasing 13% (+126 koz). Improvements in production were recorded across all fuel types, with diesel vehicle production (despite its share of sales declining to 16%) increasing by 6%, and gasoline vehicle production improving 11%.

In Japan, after a particularly weak 2022, a year plagued with parts shortages and the lowest vehicle sales since 1977, 2023 showed a marked improvement. Light vehicle production improved by 15% and platinum demand grew by 22% (+55 koz).

Full implementation of China 6b for light vehicles and China VIb for heavy-duty vehicles during 2023, along with growth in production in both light and heavy-duty vehicles, saw platinum demand in China increase 41% (+183 koz). In the “Rest of the World”, light vehicle production increased 7%, but heavy-duty vehicle production slipped 15%, resulting in overall demand improving 9% (+63 koz).

For the full year, we estimate that around 669 koz of palladium was substituted by platinum due to trimetal catalyst aftertreatment installations, slightly higher than was previously estimated (620 koz), on the back of better-than-expected production of vehicles fitted with these catalysts.

Jewellery demand

Global jewellery demand contracted by 3% (-49 koz) in 2023, to 1,850 koz.

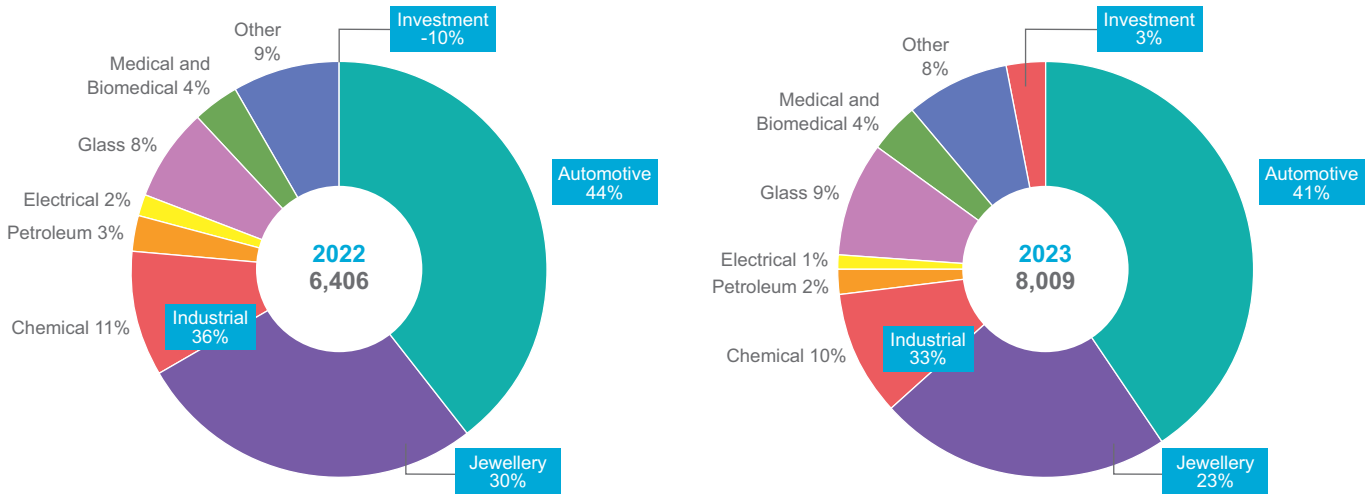
European fabrication is estimated to have grown by 2% in 2023, chiefly through strength in the demand for top-end jewellery and watches (Swiss platinum watch hallmarking was up 3%). In contrast, the mass market was down due to a post-COVID normalisation in wedding numbers and fewer engagements (UK platinum hallmarking was down 8%).

Demand in North America fell by 3% last year thanks to consumer expenditure shifts, the normalisation of wedding numbers and patchy inventory building by retailers. Levels, however, were still 27% up on 2019, due mainly to price differentials versus white gold and retailers' enthusiasm for platinum given the margins now possible.

2023 was a year of two very different halves for Japanese platinum jewellery. The first six months saw the post-pandemic recovery continue, resulting in healthy year-on-year gains. It stalled in the second half, however, due to weak bridal demand, reflecting a decline in marriages, and coupled with an already higher base in 2022, which saw the period suffer a small decline. Overall, demand was up by 2% year-on-year, a little less than we had previously forecast.

In India, we estimate that fabrication activity grew in double digits in 2023, at 12% to 227koz. Consumer awareness regarding platinum jewellery and ongoing strength in the economy are helping to generate new demand in this segment.

Chart 8: Demand end-use shares, 2023 vs. 2022



Source: Metals Focus

Industrial demand

Industrial demand in 2023 improved by 12% year-on-year (+287 koz) to 2,622 koz, the highest on record for WPIC's timeseries. Capacity expansions in the glass and chemical industries more than offset lower offtake from the electrical and petroleum markets.

Petroleum

Petroleum demand dropped 12% (-23 koz) year-on-year in 2023 to 170 koz. The decrease largely reflected gas-to-liquid (GTL) catalyst changeouts that benefited platinum offtake in 2022 but were not repeated in 2023. Excluding the impact of GTL plants, the use of platinum in catalytic reforming and isomerisation units in fact posted a small rise to a four-year high in 2023, as global oil supply continued to rise. Despite extended OPEC+ output cuts throughout the year, this was more than offset by higher output elsewhere, particularly led by record-breaking supply from the US, Brazil and Guyana. In China, platinum offtake in the petroleum industry also held broadly steady, thanks to the continued expansion in the petrochemical sector, which saw major integrated crude-to-petrochemical units coming on-stream in 2023.

Chemical

The use of platinum by the chemical industry rose 13% to 771 koz in 2023, almost matching the 2019 total which was the highest in WPIC's data series. The petrochemical industry accounted for most of these gains in 2023, as a faster pace of capacity expansions led to higher demand for platinum bearing catalysts. For instance, global PX capacity rose by 10% in 2023, compared to 7% the previous year. The expansion in PDH capacity was yet faster at 26% in 2023, significantly higher than the 6% seen in 2022 and making it the highest growth rate in eight years. In keeping with previous years, China continued to dominate growth, contributing

86% and 70% of new PX and PDH units respectively in 2023. Outside China, a small number of new plants also came on-stream, but mostly with a smaller scale than those seen in China.

Nitric acid, a key component of fertiliser manufacturing, also recorded higher demand for platinum in 2023. That said, this came from a low base in 2022 when surging manufacturing costs (as a result of soaring natural gas prices), trade barriers and the Ukraine-Russia war resulted in severe supply disruptions to the fertiliser industry. As conditions started to normalise in 2023, this also translated into a recovery in platinum demand.

Some of these gains were offset by lower demand for platinum from the silicone industry. With a wide range of end uses, ranging from construction to consumer products, silicone manufacturing tends to be cyclical. As such, weaker economic prospects, particularly the slower-than-expected recovery in China, weighed on silicone demand, with the decline further exacerbated by high inventories held by the supply chain.

Glass

We have reduced our 2023 estimate for platinum demand in the glass industry by 55 koz to 701 koz after a downward revision to fibreglass capacities. The China Fibreglass Industry Association reported fewer large-scale tanks being commissioned in H2'23. Some smaller fibreglass plants were decommissioned, while the start-up of some projects was delayed in response to lower fibreglass demand and products. We also note that several fibreglass companies in China are implementing large-scale cold repairs to manage production while prices are low. Due to this revision, 2021 remains the strongest year on record for platinum's global glass offtake. Most year-on-year growth in 2023 came from the ramp-up of single feeder LCD glass tanks in Japan to replace decommissioned multi-feeder tanks, combined with capacity expansions and new investment anticipated in China. Platinum demand from the installation of LCD tanks in China is estimated to have doubled in 2023. This aligns with past industry growth cycles, where capacity expansions tend to be concentrated to take advantage of economies of scale. The shift to a higher platinum ratio in platinum-rhodium alloys used in fibreglass bushings, will also continue to benefit platinum demand.

Medical

Platinum medical demand is estimated to have grown 4%, an increase of 12 koz to 285 koz. The impact of COVID, particularly from cancelled elective procedures, was no longer a factor in 2023. Growth was instead driven by increased healthcare spending, expanding access to healthcare in emerging markets and an ageing global population.

Electrical

For the full year, electrical demand declined 16% (-17 koz) This was driven largely by the HDD industry that saw a 33% downturn in sales and revenue. The decline was brought about by shifts in both consumer and business electronics requirements and purchasing behaviour. The narrowing of the cost differential between SSD and HDD technologies also weighed on HDD demand. That said, HDD remained more cost-efficient and better suited for large storage capacities and long-term storage. The increasing demands for storage in AI applications, combined with storage hardware innovations, tempered the decline seen in the previous quarters.

Other

Platinum demand from other industrial applications grew by 5% year-on-year (+32 koz) to 606 koz in 2023. Spark plug and sensor manufacturers reported a strong recovery in demand last year on the back of firmer vehicle production and a stronger aftermarket segment. Regulation mandating the monitoring and reporting of Carbon Intensity (CI) by ships further supported demand for sensors. In the aerospace industry, there was a notable resurgence in commercial aviation, approaching pre-pandemic levels, resulting in higher aircraft production levels and also increased aftermarket, repair and overhaul activity. While still from a low base, we continue to see growing demand in PEM electrolysis (up 121% year-on-year) and related hydrogen segments.

Investment demand

Last year, retail demand for platinum bars and coins rose by 22% year-on-year to 270 koz (+49 koz) with the annual rise flattered by a subdued 2022 performance. That said, on a regional basis, there were marked differences, with a return to net investment in Japan being comfortably outweighed by a one-third decline in North America.

Looking first at North America, the 34% year-on-year fall to 169 koz (-89 koz) represented a four-year low. This owed much to a slump in US Eagle bullion coin sales to just 12.7 koz, against 80 koz in 2022, their lowest outturn since 2015 (when no platinum bullion coins were struck by the US Mint).

European investment more than halved year-on-year (-21 koz) to an eight-year low of 24 koz. Platinum was not the only metal that suffered in 2023, net sales of gold and silver bars and coins also plunged to multi-year lows in the region. A return to positive interest rates on savings accounts undermined investor interest in other assets such as precious metals. Worsening economic conditions and rising living costs also meant significantly lower investable liquidity for retail investors.

In Japan, retail investment swung from a negative 114 koz in 2022 to positive 54 koz last year. The yen-denominated platinum price moved generally sideways over the period and while there were a number of price rallies, their impact on gross selling tended to be short-lived.

Platinum exchange-traded fund holdings increased by 10% (from end-December 2022 levels) to peak at 3.40 Moz in May 2023, but ended the year down by 20 koz (-1%), at 3.07 Moz. The decrease was mainly seen in European and North American funds, where holdings fell by 3% and 5% respectively, as elevated interest rates increased the opportunity cost for holding non-yielding ETFs. In contrast, South African-held funds grew by 74 koz, benefiting from load-shedding-related rotations into platinum ETFs, despite having fallen 40% from their May peak.

Nymex and TOCOM stocks grew by 14 koz in 2023, encouraged by persistent positive futures prices over spot.

Net cumulative imports into China and Hong Kong totalled 2.32 Moz in 2023, down 8% on 2022's noteworthy total. Considering the first half of last year saw exceptionally low imports, as well as the first recorded net monthly outflow in May (-76 koz), this total could be seen as surprising. However, monthly imports into China and Hong Kong in the second half of 2023 outpaced the near-record total of 2021, with platinum's lower price encouraging opportunistic buying, this ultimately also helping to support the price.

ABOVE-GROUND STOCKS

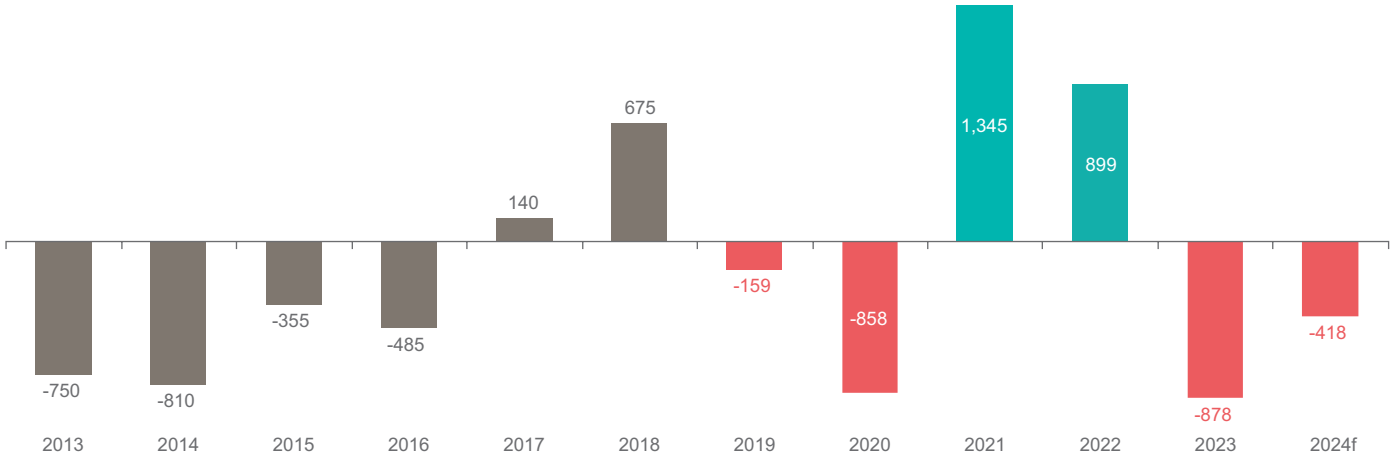
The deficit of 878 koz in 2023, has resulted in above-ground stocks declining to 4,000 koz by year-end, representing demand cover of six months, down from nine months in 2022.

The WPIC definition of above-ground stocks is the year-end estimate of the cumulative platinum holdings not associated with exchange-traded funds, metal held by exchanges or working inventories of mining producers, refiners, fabricators, or end-users.

2024 OUTLOOK

Slower economic growth and elevated geopolitical tensions will all weigh on economic growth in 2024, which is forecast to be flat on 2023. Against this backdrop, we expect the platinum market to remain in a deficit of 418 koz, but much reduced on 2023 due to weaker industrial demand and lower investment. Based on current automotive production forecasts, 2023 was likely the post-COVID peak for production of vehicles that need an autocatalyst, and as such we forecast just 1% year-on-year growth for platinum demand in the automotive sector. In addition, we expect to see fewer plant expansions in the glass and chemical sectors compared with 2023. Consequently, global platinum demand is expected to contract by 502 koz. As supply trends reverse, we expect mine production to decline by 3%, compared to secondary supply which is expected to increase 7%, resulting in global supply remaining flat year-on-year.

Chart 9: Supply-demand balance, koz, 2013-2024f



Source: SFA (Oxford) 2013-2018, Metals Focus 2019-2024f

Supply

In 2024, we expect a 2% decrease (equivalent to -101 koz) in mining supply, bringing it down to 5,489 koz. This decline is primarily due to reduced output from South Africa and Russia. Although the potential impact of several restructuring efforts announced by various mining companies have been considered, the possibility of additional announcements introduces a downside risk to the forecast.

In South Africa, the decline in PGM prices has led to producers announcing a series of business restructuring efforts. Companies have disclosed plans for both voluntary and non-voluntary labour retrenchments. While still in the early stages of cost-cutting, the complete impact on production volumes remains uncertain. Smelter maintenance will remain a determinant of supply in 2024. The rebuild of Number 5 furnace at Impala Rustenburg, initiated in mid-December 2023 is anticipated to continue until April 2024.

The operating environment in South Africa remains challenging. A reduction in power demand did contribute to a partial alleviation of the energy crisis in the latter half of 2023. However, the performance of the aging coal-fired power stations continues to decline. Significant power generation failures could necessitate a return to widespread load curtailment, impacting the global platinum mine supply.

As a result of all the above, production from South Africa is forecast to decline 1% year-on-year to 3,887 koz.

In Russia, Nornickel anticipates reduced production due to the ongoing geopolitical challenges and uncertain economic climate which is expected to persist and affect operations. Furthermore, the scheduled repairs of furnace #2 at Nadezhda Metallurgical Plant will contribute to a decline in volumes. Consequently, production is forecasted to decrease by 9% (-58 koz) year-on-year, to 616 koz, a multi-decade low. Zimbabwe's production is anticipated to maintain its long-term stability, with minimal changes expected on a year-on-year basis.

Recycling

Total global recycling is forecast to improve 7% year-on-year (+105 koz) to reach 1,600 koz in 2024. After two years of steep declines, due to significant disruption in vehicle sales, price volatility-induced hoarding and destocking by scrap yards, supply from spent autocatalysts is expected to grow 9% (+91 koz) to 1,167 koz. Even so, this will still remain over 440 koz below 2021's record high, and with the expected recovery skewed towards the end of the year, there are risks to this outlook. In the jewellery scrap market, we forecast a modest 3% (+10 koz) increase. This is mainly due to the expected impact of a higher price and the positive effect of the recovery in jewellery demand. As we note the growing attention in governance and policy formulation for the recycling of e-waste, we forecast a 4% (+3 koz) increase in the recycling of electronic scrap for this year.

Demand

Automotive demand

Amid prevailing inflationary conditions and high lease rates, we anticipate a moderation in vehicle production growth in 2024. Light vehicle output is projected to inch up to 91M units, while heavy-duty units are expected to rise modestly. Despite robust growth in hybridisation this year, the anticipated decline in the production of ICE vehicles (due to their market share of total production falling to 64% form 70% last year) will exert downward pressure on platinum demand. Nevertheless, we foresee a modest increase of 1% (+25 koz) for the full year, bringing the total to 3,297 koz.

The European car market is forecast to exert the biggest drag on automotive platinum demand. While light vehicle production is expected to remain flat, the growth in BEV production is expected to come at the expense of ICE vehicles. Platinum requirements are expected to decline by 10% in 2024.

In North America, despite healthy growth in hybridisation, the decline in ICE vehicle production overall will result in platinum demand remaining flat year-on-year. Meanwhile, after a bumper 2023, light vehicle production in China is set to ease by 1%. That said, the impressive 21% increase in hybrid vehicle production and the 13% rise in heavy-duty output should see overall Chinese platinum demand rise by 15%. In Japan, light vehicle production is also expected to decline, mainly in the pure ICE-powered vehicle category. Consequently, the modest 1% lift in platinum demand expected here stems largely from growth in the heavy-duty sector. In the "Rest of the World", production of hybrid vehicles, despite lower pure ICE vehicles will see platinum demand grow by 6%.

As the platinum price shifts toward a parity or premium to palladium, there is growing risk that the substitution rate of platinum for palladium could stall. However, given that changing of aftertreatment technology is a lengthy process, the switch generally occurs when starting a new model and so the process of reverse substitution towards palladium could play out over a multi-year period. As such, we estimate that for this year substitution of palladium by platinum should reach 742 koz.

Jewellery demand

Global jewellery demand is expected to improve by 3% (+50 koz) in 2024. Demand in Europe is forecast to grow by 1% this year, although there are noteworthy uncertainties over this outlook. This stems chiefly from feedback on the high-end segment; some fabricators already have capacity fully booked for months, while others expect losses as pandemic era savings have been run down and economic gloom lingers.

North American offtake is expected to dip by 2% this year, primarily due to fewer engagements and a normalisation in the number of weddings after the post-COVID surge, as well as consumer expenditure shifts. The slide in diamond prices, however, is seen as a clear positive as it liberates budget for larger pieces, and bigger stones mean larger mounts.

Our forecast for Japanese jewellery demand sees a 4% increase this year. While the lacklustre prospects for bridal jewellery will continue to limit demand upside, we believe there is scope for other areas to pick up the slack and we do not believe the post-pandemic recovery has fully run its course in this market. The continued efforts of Japanese jewellery manufacturers to boost their export volumes should also help demand.

In China, we expect platinum jewellery fabrication to post a modest 5% recovery in 2024, rising to 428 koz, mostly driven by the easing of competition from the gold jewellery market (most jewellery retailers claim that gold jewellery accounts for over 80% of total turnover, while some local brands even claim a share of over 90%). However, after the associated radical product restructuring process in 2023, the destocking of platinum jewellery and gem sets by manufacturers and retailers will abate in 2024. Positively,

healthy demand for menswear and retailers' promotions via live broadcasting platforms should lend some support to platinum. Finally, after years of consolidation in the supply chain, existing manufacturers have stopped suffering from fierce price competition and could develop more attractive collections for clients with encouraging profit margins.

Turning to India, fabrication activity is expected to grow in double digits at 12% to 227 koz. Consumer awareness regarding platinum jewellery and ongoing strength in the economy will help generate new demand in this segment. Moreover, the continued addition of new stores by retail chains and the promotion of men's jewellery (which has higher weights) would lead to strong manufacturing activity this year.

Industrial demand

Glass

Platinum demand in the glass industry is forecast to decrease by 24% year-on-year to 530 koz in 2024, following extremely strong demand in 2023. The fibreglass industry will drive this trend, fewer installation projects are expected to advance through the pipeline in China while companies wait for improvements in fibreglass demand. Decommissioning of LCD tanks in Japan will continue due to the prevailing challenge of higher costs. That said, platinum demand from the global LCD market will only decline slightly this year due to the top-up of platinum during the change-out of existing tanks globally. We also anticipate the preference for a higher platinum ratio in platinum-rhodium alloys, particularly in fibreglass bushings, to continue in 2024.

Medical

We expect platinum medical demand will grow 3% (+9 koz) in 2024 to 295 koz. Global spending on medicines is expected to exceed pre-pandemic levels, with the investment and number of cancer treatments forecast to grow faster than the rest of the medical sector. Regionally, industrialised markets – North America, Europe and Japan – will see more modest growth, owing to their already higher per capita use, compared with many emerging markets.

Chemical

From near record demand in 2023, chemical demand is expected to fall by 30% year-on-year (-229 koz) to a seven-year low of 543 koz in 2024. A much slower pace of new capacity additions in the petrochemical industry will account for almost all of the decline this year. During 2019 –23, global PX and PDH capacity jumped by 52% and 79% respectively, a rate of growth unlikely to reoccur in the coming years. By contrast, following a challenging year in 2023, demand for silicone products is expected to post a modest recovery, as economic conditions gradually stabilise. The drag from high inventories is also expected to ease as we progress into 2024, providing an additional boost to new silicone demand. In terms of nitric acid, demand for platinum is expected to maintain growth, albeit modestly, as a rise in new fertiliser plants remains slow.

Petroleum

Petroleum demand is forecast to decline by 8% (-13 koz) year-on-year to 156 koz. According to The International Energy Agency, although global oil supply is forecast to hit a record high in 2024, this year's expansion in demand will be slower than in 2023. A weaker macroeconomic backdrop, energy efficiency improvements and ongoing electrification of the vehicle fleet will all weigh on oil consumption this year. In China, as discussed earlier, platinum offtake has benefited from a rapid expansion of the petrochemical sector in recent years. As the pace of petrochemical capacity additions slows domestically, so will demand for platinum from the petroleum industry. Finally, it is worth stressing that our forecast does not foresee current geopolitical events leading to meaningful disruptions to the oil industry, which may present a downside risk to the outlook.

Electrical

AI processing functions require considerable data storage and will create additional demand for the mass-storage market. In the past few years, the difference in storage cost between SSD and HDD has narrowed due to the sharp drop in NAND flash prices. However, given dwindling interest and shortages in master control ICs which impaired SSD production, it will be difficult for SSD suppliers to reduce prices significantly in the short term. In addition, HDD manufacturers have successfully commercialized thermal-assisted magnetic recording technologies to further reduce storage costs by improving areal density. We expect storage costs

between SSD and HDD are likely to maintain a sizeable gap in the next few years. This will help enhance the competitiveness of HDDs in the cost-sensitive mass storage market and slow the downward pressure on shipments. Elsewhere, platinum demand in semiconductors is expected to grow moderately, helped by a more stable consumer electronics market and the newly invested capacity, partially offsetting losses in the storage market. As a result, we forecast platinum electrical offtake to slow its decline, falling by just 3% (-3 koz) to 87 koz in 2024.

Other

Platinum demand from the other industrial segment is forecast to grow by 7% year-on-year (+42 koz) to 647 koz in 2024. Given the comparative deceleration in electric vehicles sales, most spark plug and sensors manufacturers maintain cautiously optimistic forecasts for this year. By contrast, marine and aerospace expect higher growth, driven by the additional impetus from the requirements to monitor and report carbon intensity (CI). The hydrogen economy too is expected to continue to grow in 2024, with hydrogen-related demand for platinum expected to double compared to 2023.

Investment demand

This year, global retail investment is set to fall sharply, by 44% to just 152 koz (-118 koz), which would represent a 10-year low. While North America is expected to see a modest decline, the main reason for the far weaker outcome is the forecast return to net disinvestment in Japan.

We forecast a return to net sales of Japanese bars and coins in 2024, although at 50 koz we expect the extent of this to be limited. Our projections are entirely premised on our (Metals Focus') bullish outlook for platinum prices over the year, that should entice some investors to take profits. With regards to North America, demand is projected to ease by 9% this year. This reflects two key points. First, the US Mint appears unlikely to strike a 2024-dated platinum bullion Eagle coin, which has typically dominated North American buying. That said, we do expect other coin and bar manufacturers to satisfy much of this shortfall. Second, although we are forecasting a firmer platinum price towards year-end, the upside will be limited, which will encourage retail liquidations of platinum investment products in the North American market.

In Europe, factors that undermined retail investment in 2023 are expected to remain in place for 2024. However, with demand having already posted a hefty drop, volumes are likely to stabilise near multi-low years this year.

In 2024, we forecast a 120 koz decline in platinum ETFs. Despite an expectation that interest rates will fall during the year, we still envisage European and North American funds will face pressure from higher rates, given the opportunity cost for holding non-yielding ETFs.

ABOVE GROUND STOCKS

Due to a projected deficit of 418 koz in 2024, above-ground stocks are expected to decline to 3,581 koz by year-end, a four-year low.

The WPIC definition of above-ground stocks is the year-end estimate of the cumulative platinum holdings not associated with exchange-traded funds, metal held by exchanges or working inventories of mining producers, refiners, fabricators, or end-users.

Table 2: Supply, demand and above ground stock summary – annual comparison

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %
Platinum Supply-demand Balance (koz)													
SUPPLY													
Refined Production	**4,875**	**6,160**	**6,045**	**6,130**	**6,125**	**6,075**	**4,989**	**6,297**	**5,522**	**5,590**	**5,489**	**1%**	**-2%**
South Africa	3,135	4,480	4,265	4,385	4,470	4,374	3,298	4,678	3,915	3,941	3,887	1%	-1%
Zimbabwe	405	405	490	480	465	458	448	485	480	507	502	6%	-1%
North America	395	365	390	360	345	356	337	273	263	276	279	5%	1%
Russia	740	710	715	720	665	716	704	652	663	674	616	2%	-9%
Other	200	200	185	185	180	170	202	208	201	192	205	-5%	7%
Increase (-)/Decrease (+) in Producer Inventory	+350	+30	+30	+30	+10	+2	-84	-93	+43	+46	+0	+0%	-100%
Total Mining Supply	**5,225**	**6,190**	**6,075**	**6,160**	**6,135**	**6,077**	**4,906**	**6,204**	**5,565**	**5,636**	**5,489**	**1%**	**-3%**
Recycling	**2,055**	**1,720**	**1,860**	**1,915**	**1,955**	**2,112**	**1,997**	**2,096**	**1,740**	**1,495**	**1,600**	**-14%**	**7%**
Autocatalyst	1,255	1,185	1,210	1,325	1,420	1,566	1,509	1,608	1,299	1,076	1,167	-17%	9%
Jewellery	775	515	625	560	505	476	422	422	372	349	358	-6%	3%
Industrial	25	20	25	30	30	69	66	67	69	71	75	3%	6%
Total Supply	**7,280**	**7,910**	**7,935**	**8,075**	**8,090**	**8,189**	**6,903**	**8,300**	**7,305**	**7,131**	**7,089**	**-2%**	**-1%**
DEMAND													
Automotive	**3,220**	**3,245**	**3,360**	**3,300**	**3,115**	**2,776**	**2,300**	**2,521**	**2,815**	**3,272**	**3,297**	**16%**	**1%**
Autocatalyst	3,080	3,105	3,225	3,160	2,970	2,776	2,300	2,521	2,815	3,272	3,297	16%	1%
Non-road	140	140	135	140	145	†	†	†	†	†	†	N/A	N/A
Jewellery	**3,000**	**2,840**	**2,505**	**2,460**	**2,245**	**2,106**	**1,830**	**1,953**	**1,899**	**1,850**	**1,900**	**-3%**	**3%**
Industrial	**1,720**	**1,875**	**2,020**	**1,900**	**2,040**	**2,233**	**2,094**	**2,538**	**2,336**	**2,622**	**2,258**	**12%**	**-14%**
Chemical	540	515	560	570	565	779	627	670	685	771	543	13%	-30%
Petroleum	60	170	220	120	235	219	109	169	193	170	156	-12%	-8%
Electrical	215	205	195	210	205	144	130	135	106	89	87	-16%	-3%
Glass	225	300	320	260	275	228	473	753	505	701	530	39%	-24%
Medical and Biomedical	225	240	235	235	235	277	254	265	273	285	295	4%	3%
Other	455	445	490	505	525	585	501	546	574	606	647	5%	7%
Investment	**150**	**305**	**535**	**275**	**15**	**1,233**	**1,536**	**-56**	**-644**	**265**	**52**	**N/A**	**-80%**
Change in Bars, Coins	50	525	460	215	280	263	571	324	221	270	152	22%	-44%
Change in ETF Holdings	215	-240	-10	105	-245	991	507	-241	-558	-20	-120	N/A	N/A
Change in Stocks Held by Exchanges	-115	20	85	-45	-20	-20	458	-139	-307	14	20	N/A	38%
Total Demand	**8,090**	**8,265**	**8,420**	**7,935**	**7,415**	**8,348**	**7,760**	**6,955**	**6,406**	**8,009**	**7,507**	**25%**	**-6%**
Balance	**-810**	**-355**	**-485**	**140**	**675**	**-159**	**-858**	**1,345**	**899**	**-878**	**-418**	**N/A**	**N/A**
Above Ground Stocks	**2,580***	**2,225**	**1,740**	**1,880**	**2,555**	**3,491**	**2,634****	**3,979**	**4,878**	**4,000**	**3,581**	**-18%**	**-10%**

Source: Metals Focus 2019 - 2024, SFA (Oxford) 2014 - 2018.

Notes:

1. Above Ground Stocks: *4,140 koz as of 31st December 2012 (SFA (Oxford)). **3,650 koz as of 31 December 2018 (Metals Focus).
2. † Non-road automotive demand is included in autocatalyst demand.
3. Data from Metals Focus and SFA (Oxford) may not have been prepared on the same or directly comparable basis.
4. Prior to 2019 SFA data is independently rounded to the nearest 5 koz.

Table 3: Supply and demand summary – quarterly comparison

	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q4'23/Q4'22 Growth %	Q4'23/Q3'23 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	**1,695**	**1,273**	**1,530**	**1,390**	**1,329**	**1,193**	**1,487**	**1,394**	**1,516**	**14%**	**9%**
South Africa	1,274	878	1,129	977	931	778	1,051	985	1,127	21%	14%
Zimbabwe	127	117	124	116	123	116	126	132	133	8%	0%
North America	64	66	64	67	65	71	73	60	72	11%	20%
Russia	178	163	161	179	160	180	190	168	136	-15%	-19%
Other	52	49	52	52	49	48	47	49	48	-2%	-1%
Increase (-)/Decrease (+) in Producer Inventory	-39	+24	-2	-2	+23	+33	+8	+16	-11	N/A	N/A
Total Mining Supply	**1,656**	**1,298**	**1,528**	**1,388**	**1,352**	**1,226**	**1,494**	**1,410**	**1,505**	**11%**	**7%**
Recycling	**524**	**454**	**461**	**420**	**405**	**400**	**392**	**357**	**346**	**-14%**	**-3%**
Autocatalyst	405	338	352	313	296	287	291	254	244	-18%	-4%
Jewellery	102	98	92	90	92	95	84	85	84	-8%	-1%
Industrial	17	17	17	17	17	17	17	17	18	6%	5%
Total Supply	**2,180**	**1,751**	**1,989**	**1,808**	**1,757**	**1,626**	**1,886**	**1,767**	**1,852**	**5%**	**5%**
DEMAND											
Automotive	**648**	**713**	**684**	**684**	**734**	**827**	**830**	**791**	**824**	**12%**	**4%**
Autocatalyst	648	713	684	684	734	827	830	791	824	12%	4%
Non-road	†	†	†	†	†	†	†	†	†	N/A	N/A
Jewellery	**511**	**472**	**483**	**480**	**463**	**462**	**477**	**450**	**462**	**0%**	**3%**
Industrial	**543**	**573**	**647**	**565**	**551**	**659**	**680**	**552**	**730**	**33%**	**32%**
Chemical	103	133	153	131	268	292	229	123	128	-52%	4%
Petroleum	56	44	48	49	52	44	43	41	41	-20%	1%
Electrical	32	30	27	26	24	23	23	22	22	-6%	1%
Glass	140	150	202	151	2	80	161	149	310	>±300%	108%
Medical and Biomedical	66	71	68	67	68	75	71	70	70	3%	0%
Other	145	145	150	141	138	146	153	148	158	15%	7%
Investment	**-120**	**-164**	**-160**	**-258**	**-62**	**186**	**167**	**2**	**-90**	**N/A**	**N/A**
Change in Bars, Coins	90	60	75	93	-7	116	39	73	42	N/A	-42%
Change in ETF Holdings	-162	-166	-112	-217	-62	40	155	-99	-116	N/A	N/A
Change in Stocks Held by Exchanges	-48	-58	-123	-134	7	29	-27	28	-16	N/A	N/A
Total Demand	**1,581**	**1,594**	**1,655**	**1,472**	**1,686**	**2,134**	**2,154**	**1,795**	**1,926**	**14%**	**7%**
Balance	**599**	**158**	**334**	**336**	**71**	**-508**	**-268**	**-29**	**-74**	**N/A**	**N/A**

Source: Metals Focus 2021 - 2023.

Notes:

1. † Non-road automotive demand is included in autocatalyst demand.

Table 4: Supply and demand summary – half-yearly comparison

	H2 2021	H1 2022	H2 2022	H1 2023	H2 2023	H2'23/H2'22 Growth %	H2'23/H1'23 Growth %
Platinum Supply-demand Balance (koz)							
SUPPLY							
Refined Production	**3,266**	**2,803**	**2,719**	**2,680**	**2,911**	**7%**	**9%**
South Africa	2,475	2,007	1,908	1,829	2,112	11%	15%
Zimbabwe	242	241	239	242	265	11%	10%
North America	115	131	132	143	133	1%	-7%
Russia	331	324	339	370	304	-10%	-18%
Other	103	101	101	95	97	-4%	2%
Increase (-)/Decrease (+) in Producer Inventory	-82	22	21	41	5	-77%	-88%
Total Mining Supply	**3,184**	**2,825**	**2,740**	**2,720**	**2,915**	**6%**	**7%**
Recycling	**1,036**	**915**	**825**	**792**	**703**	**-15%**	**-11%**
Autocatalyst	796	690	609	578	498	-18%	-14%
Jewellery	206	191	181	179	170	-6%	-5%
Industrial	34	34	34	35	36	4%	3%
Total Supply	**4,221**	**3,740**	**3,564**	**3,512**	**3,618**	**2%**	**3%**
DEMAND							
Automotive	**1,197**	**1,397**	**1,418**	**1,657**	**1,615**	**14%**	**-3%**
Autocatalyst	1,197	1,397	1,418	1,657	1,615	14%	-3%
Non-road	†	†	†	†		N/A	N/A
Jewellery	**995**	**956**	**943**	**938**	**912**	**-3%**	**-3%**
Industrial	**1,267**	**1,220**	**1,116**	**1,340**	**1,283**	**15%**	**-4%**
Chemical	418	286	399	520	251	-37%	-52%
Petroleum	95	92	101	87	82	-18%	-6%
Electrical	67	57	49	45	44	-10%	-2%
Glass	278	353	153	242	459	201%	90%
Medical and Biomedical	134	138	135	146	140	3%	-4%
Other	275	295	279	299	306	10%	2%
Investment	**-398**	**-324**	**-320**	**353**	**-88**	**N/A**	**N/A**
Change in Bars, Coins	198	135	86	155	115	33%	-26%
Change in ETF Holdings	-375	-278	-280	196	-215	N/A	N/A
Change in Stocks Held by Exchanges	-221	-181	-127	2	12	N/A	>±300%
Total Demand	**3,061**	**3,249**	**3,157**	**4,288**	**3,721**	**18%**	**-13%**
Balance	**1,160**	**492**	**407**	**-776**	**-103**	**N/A**	**N/A**

Source: Metals Focus 2021 - 2023.

Notes:

1. † Non-road automotive demand is included in autocatalyst demand.

Table 5: Regional demand – annual and quarterly comparison

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
Platinum gross demand (koz)																		
Automotive	**3,220**	**3,250**	**3,350**	**3,290**	**3,115**	**2,776**	**2,300**	**2,521**	**2,815**	**3,272**	**3,297**	**16%**	**1%**	**734**	**827**	**830**	**791**	**824**
North America	455	480	410	390	390	316	274	350	422	453								
Western Europe	1,395	1,450	1,630	1,545	1,340	1,417	1,053	955	989	1,115								
Japan	585	510	450	435	425	292	230	255	252	307								
China	125	145	195	230	220	183	278	375	449	632								
India	170	180	170	175	200	††	††	††	††	††								
Rest of the World	490	485	495	515	540	569	465	586	702	765								
Jewellery	**3,000**	**2,840**	**2,505**	**2,460**	**2,245**	**2,106**	**1,830**	**1,953**	**1,899**	**1,850**	**1,900**	**-3%**	**3%**	**463**	**462**	**477**	**450**	**462**
North America	230	250	265	280	280	341	277	409	448	433								
Western Europe	220	235	240	250	255	237	196	260	301	307								
Japan	335	340	335	340	345	372	316	298	333	338								
China	1,975	1,765	1,450	1,340	1,095	871	832	703	484	408								
India	175	180	145	175	195	109	59	123	171	203								
Rest of the World	65	70	70	75	75	176	151	159	163	161								
Chemical	**540**	**515**	**560**	**570**	**565**	**779**	**627**	**670**	**685**	**771**	**543**	**13%**	**-30%**	**268**	**292**	**229**	**123**	**128**
North America	55	55	50	50	50	79	103	110	112	134								
Western Europe	105	75	110	115	105	120	111	118	113	116								
Japan	10	10	15	15	15	66	62	65	66	60								
China	215	230	225	220	215	310	214	222	219	270								
Rest of the World	155	145	160	170	180	204	136	154	175	191								
Petroleum	**60**	**170**	**220**	**120**	**235**	**219**	**109**	**169**	**193**	**170**	**156**	**-12%**	**-8%**	**52**	**44**	**43**	**41**	**41**
North America	25	-25	90	55	55	30	5	32	44	56								
Western Europe	-20	35	10	5	20	14	11	18	30	22								
Japan	-35	5	0	-20	5	7	6	12	7	4								
China	-5	45	80	45	10	66	35	39	26	24								
Rest of the World	95	110	40	35	145	103	52	67	86	64								
Electrical	**215**	**205**	**195**	**210**	**205**	**144**	**130**	**135**	**106**	**89**	**87**	**-16%**	**-3%**	**24**	**23**	**23**	**22**	**22**
North America	15	15	10	15	15	38	35	35	28	24								
Western Europe	10	10	10	10	10	27	23	25	20	16								
Japan	15	15	15	15	15	20	16	17	14	12								
China	70	70	80	90	85	28	31	31	23	19								
Rest of the World	105	95	80	80	80	31	25	26	22	18								
Glass	**225**	**300**	**320**	**260**	**275**	**228**	**473**	**753**	**505**	**701**	**530**	**39%**	**-24%**	**2**	**80**	**161**	**149**	**310**
North America	5	0	10	5	5	-81	-24	17	27	43								
Western Europe	10	5	5	5	20	65	36	6	22	16								
Japan	-10	0	-10	-10	0	-38	-63	7	-151	5								
China	175	195	225	165	120	176	385	758	524	651								
Rest of the World	45	100	90	95	130	107	139	-36	82	-14								
Medical	**225**	**240**	**235**	**235**	**235**	**277**	**254**	**265**	**273**	**285**	**295**	**4%**	**3%**	**68**	**75**	**71**	**70**	**70**
Other industrial	**455**	**445**	**490**	**505**	**525**	**585**	**501**	**546**	**574**	**606**	**647**	**5%**	**7%**	**138**	**146**	**153**	**148**	**158**
Bar & Coin Investment	**50**	**525**	**460**	**215**	**280**	**263**	**571**	**324**	**221**	**270**	**152**	**22%**	**-44%**	**-7**	**116**	**39**	**73**	**42**
North America						155	234	256	258	169								
Western Europe						52	75	61	44	24								
Japan						46	240	-26	-114	54								
Rest of the World						9	21	33	33	23								
ETF Investment	**215**	**-240**	**-10**	**105**	**-245**	**991**	**507**	**-241**	**-558**	**-20**	**-120**	**N/A**	**N/A**	**-62**	**40**	**155**	**-99**	**-116**
North America						125	524	-6	-102	-61								
Western Europe						508	237	56	-313	-44								
Japan						-13	58	-23	-28	12								
Rest of the World						370	-312	-268	-116	74								
Change in Stocks Held by Exchanges	**-115**	**20**	**85**	**-45**	**-20**	**-20**	**458**	**-139**	**-307**	**14**	**20**	**N/A**	**38%**	**7**	**29**	**-27**	**28**	**-16**
Investment	**150**	**305**	**535**	**275**	**15**	**1,233**	**1,536**	**-56**	**-644**	**265**	**52**	**N/A**	**-80%**	**-62**	**186**	**167**	**2**	**-90**
Total Demand	**8,090**	**8,270**	**8,410**	**7,925**	**7,415**	**8,348**	**7,760**	**6,955**	**6,406**	**8,009**	**7,507**	**25%**	**-6%**	**1,686**	**2,134**	**2,154**	**1,795**	**1,926**

Source: Metals Focus 2014 - 2024f, SFA (Oxford) 2013 - 2018.

Notes:

1. † Non-road automotive demand is included in autocatalyst demand.
2. †† India automotive demand is included in Rest of the World.
3. Data from Metals Focus and SFA (Oxford) may not have been prepared on the same or directly comparable basis.
4. Prior to 2019 SFA data is independently rounded to the nearest 5 koz.

Table 6: Regional recycling – annual and quarterly comparison

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
Platinum recycling supply (koz)																		
Automotive	**1,255**	**1,185**	**1,210**	**1,325**	**1,420**	**1,566**	**1,509**	**1,608**	**1,299**	**1,076**	**1,167**	**-17%**	**9%**	**296**	**287**	**291**	**254**	**244**
North America						520	458	504	396	351								
Western Europe						785	815	835	677	566								
Japan						116	109	117	85	73								
China						36	36	59	55	25								
Rest of the World						110	91	93	86	60								
Jewellery	**775**	**515**	**625**	**560**	**505**	**476**	**422**	**422**	**372**	**349**	**358**	**-6%**	**3%**	**92**	**95**	**84**	**85**	**84**
North America						3	3	3	3	3								
Western Europe						4	4	3	4	4								
Japan						187	162	160	165	154								
China						276	248	250	195	183								
Rest of the World						5	5	5	6	5								
Industrial	**25**	**20**	**25**	**30**	**30**	**69**	**66**	**67**	**69**	**71**	**75**	**3%**	**6%**	**17**	**17**	**17**	**17**	**18**
North America						15	12	12	13	12								
Western Europe						11	10	11	11	13								
Japan						34	34	34	34	34								
China						7	7	8	9	9								
Rest of the World						2	2	2	2	2								

Source: Metals Focus 2014 - 2024f, SFA (Oxford) 2013 - 2018.

GLOSSARY OF TERMS

Above ground stocks

The year-end estimate of the cumulative platinum holdings not associated with exchange-traded funds; metal held by exchanges or working inventories of mining producers, refiners, fabricators, or end-users. Typically, unpublished vaulted metal holdings from which a supply-demand shortfall can be readily supplied or to which a supply-demand surplus can readily flow.

ADH

Alkane dehydrogenation: catalytic conversion of alkanes to alkenes. Broad term encompassing BDH and PDH.

BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

Bharat

The Government of India introduced Bharat emission standards (BSES) to reduce and regulate the output of air pollutants from internal combustion and spark-ignition engine equipment, including motor vehicles.

Bharat Stage V/VI standards (BS-V, BS-VI)

Early in 2016 the Indian government announced the intention to 'leapfrog' Bharat Stage V and move directly to Bharat Stage VI, equivalent to Euro 6, in 2020.This intention, despite lockdown, has not been altered.

China Vehicle Emission Standards

China's vehicle emission standards are set nationally by the Ministry of Environmental Protection and are regionally and locally enforced by Environmental Protection Bureaus.

A number of cities and provinces in China continue the historic practice of early introduction of new standards.

China 6

As of December 2016, China adopted China 6 standards that apply nationwide to light-duty passenger vehicles from July 2020 (China 6a) and July 2023 (China 6b). These standards incorporate elements of Euro 6 and U.S. Tier 2 regulations for tailpipe and evaporative emissions. China 6b includes mandatory on-road emissions testing modelled after the EU RDE regulation (also known as Euro 6d TEMP) with a few enhancements and modifications. A number of cities and provinces adopted China 6b in July 2019 and many automakers have proceeded to adopt China 6b early for all their production.

China VI

In June 2018, China finalized China VI standards that will apply to new heavy-duty diesel vehicles nationwide in two stages.

The first stage, China VI-a, originally targeted to have become applicable by July 2020 for new models but has been delayed by 6 months to January 2021, and all new HDVs targeted for compliance in July 2021. The second stage, China VI-b will apply to gas engines nationwide starting in January 2021 and all new HDVs in July 2023.

Compounds (Platinum based)

Platinum combines with other elements to form chemical mixtures that are used as catalysts in chemical processes as well as in plating, metal deposition and other industrial processes.

Diesel oxidation catalyst (DOC)

A DOC oxidises harmful carbon monoxide and unburnt hydrocarbons, produced by incomplete combustion of diesel fuel, to non-toxic carbon dioxide and water.

Diesel particulate filter (DPF) and catalysed diesel particulate filter (CDPF)

A DPF physically filters particulates (soot) from diesel exhaust. A CDPF adds a PGM catalyst coating to facilitate oxidation and removal of the soot. The terms are often used interchangeably.

Electrolysis of water

Water electrolysers are electrochemical devices used to split water molecules into hydrogen and oxygen. An electrical current is applied to the electrolyser cell, and water is split into oxygen and hydrogen. The electrolysis system comprises of the system, the stack, and the cell.

Emissions Legislation

Regulations that necessitate the fitment of autocatalyst systems dealing with the treatment of vehicle tailpipe emissions such as carbon monoxide (CO), particulate matter, hydrocarbons, and oxides of nitrogen (NO_x). There are a range of standards specific to various regions and countries with varying minimum emissions targets and deadlines for compliance.

EPA

Environmental Protection Agency regulating the US vehicle and engine emission standards for pollutants.

ETF

Exchange-traded fund. A security that tracks an index, commodity, or basket of assets. Platinum ETFs included in demand are backed by physical metal (LPPM good delivery bars stored in a secure vault approved by the listing exchange).

Euro V/VI emission standards

EU emission standards for heavy-duty vehicles. Euro V legislation was introduced in 2008-09 and Euro VI in 2013/2014; similar standards have later been adopted in some other countries.

Euro 5/6 emission standards

EU emission standards for light-duty vehicles. Euro 5 legislation was introduced in 2009-11 and Euro 6 in 2014/2015. The limits set in Euro 6 have remained unchanged, but the measuring methods have become more stringent progressively including Euro 6 a, b, c, d, and Euro 6d-Temp, now in place. For CO_2, the laboratory based WLTP and for NO_x RDE.

FCM

Fuel Consumption Monitoring describes the recording of actual consumption during the life of the vehicle. Applicable under Euro 6d to all new vehicles from 1/01/2020 and all new registrations from 1/01/2021.

Forward prices

The price of a commodity at a future point in time. Typically comprises of the spot price as well as the risk-free interest rate and cost of carry.

GTL

Gas-to-liquids is a process that converts natural gas to liquid hydrocarbons such as gasoline or diesel fuel.

HAMR

Heat-Assisted Magnetic Recording. A magnetic recording technology which involves spot-heating the drive platters with laser be.

HDD

Hard disk drive. Data storage device that stores digital data by magnetic platers.

HDV

Heavy-duty vehicle.

Hydrogen Production Methods

In recent years, colours have been used to refer to different hydrogen production routes. There is no international agreement on the use of these terms as yet, nor have their meanings in this context been clearly defined but the following colour key provides a guideline of most widely use reference to the various production methods

white – naturally occurring or produced as industrial by-product

black or brown – coal gasification

grey – steam methane reforming

turquoise – methane pyrolysis

blue – steam methane reforming plus carbon capture

green – water electrolysis with renewable energy sources

pink – nuclear power

yellow – solar power or mix of multiple sources.

ICE

Internal combustion engine.

IoT

Internet of Things. Networking system that allows data to be sent to and received from objects and devices through internet.

ISC

In Service Conformity which requires vehicles to not only conform with exhaust emission standards when they are new but also while in use.

Jewellery alloys

The purity of platinum jewellery is invariably expressed in parts per 1,000. For example, the most common variant, pt950, is 95% fine platinum, with the rest of the jewellery alloy made up of other metals such as cobalt or copper. Different markets would typically prescribe the purity levels for qualification and hallmarking of the jewellery as platinum jewellery.

Jewellery demand

Captures the first transformation of unwrought platinum into a semi-finished or finished jewellery product.

Koz

Thousand ounces.

LCD

Liquid-crystal display used for video display.

LCV

Light commercial vehicle.

Lean NO_x traps (LNT)

Platinum/rhodium-based, catalyses the chemical reduction of NO_x in diesel engine exhaust to harmless nitrogen.

Lease rates

The lease rate is defined as the rate at which the owner of the commodity lends or sells it and buys it back from the borrower in the market. LPPM.

The London Platinum and Palladium Market (LPPM)

It is a trade association representing the interests of the platinum and palladium market. It provides guidance and benchmarks on the form and governance of platinum and palladium delivered to the market and publishes a list of the companies that comply with the guidelines and purity. This list is known as the Good Delivery List. As at May 2020 the Good Delivery Lists consists of 31 platinum refiners, 28 palladium refiners, 15 full members, 41 associate members, 45 affiliate members and 2 affiliated exchange members.

MAMR

Microwave-Assisted Magnetic Recording. A magnetic recording technology by writing in the drive platters with a microwave field.

Metal-in-concentrate

PGMs contained in the concentrate produced after the crushing, milling and froth flotation processes in the concentrator. It is a measure of a mine's output before the smelting and refining stages.

MLCC

Multi-layer ceramic capacitors. A number of individual thin film capacitors stacked as a whole.

Moz

Million ounces.

NAND flash Memory

NAND flash memory is a type of non-volatile storage technology that does not require power in order to retain data. It uses floating-gate transistors that are connected in a way that the resulting connection resembles a NAND gate, where several transistors are series connected and a bit line is pulled low only when all word lines are at a high state.

NEDC

New European Driving Cycle vehicle emissions test set out in United Nations Vehicle Regulation 101 maintained by the United Nations Economic Commission for Europe and updated and reviewed from time to time. The WLTP is aimed to significantly enhance and replace this regulation.

Net demand

A measure of the requirement for new metal, i.e., net of recycling.

Non-road engines

Non-road engines are diesel engines used, for example, in construction, agricultural and mining equipment, often using engine and emissions technology similar to on-road heavy-duty diesel vehicles.

Ounce conversion

One metric tonne = 1,000 kilogrammes (kg) or 32,151 troy ounces.

oz

A unit of weight commonly used for precious metals. 1 troy oz = 31.103 grams.

PDH

Propane dehydrogenation, where propane is converted to propylene.

PEM Electrolyser Technology

One of four key water electrolyser technologies. The electrode on oxygen side (anode) contains iridium oxide while the electrode on hydrogen side (cathode) typically contains platinum. Transport layers are platinum-coated sintered porous titanium, and the bipolar plates would typically have platinum on with other metals.

PGMs

Platinum group metals.

PMR

Precious metals refinery.

Pricing benchmarks

A price for a commodity that is traded on a liquid market that is used as a reference for buyers and sellers. In the case of platinum, the most commonly referenced benchmark is the LBMA Platinum Price, which is administered and distributed by the London Metals Exchange. The LBMA Platinum Price is discovered through an auction process.

Producer inventory

As used in the supply-demand balance, the change in producer inventory is the difference between reported refined production and metal sales.

PX

Paraxylene is a chemical produced from petroleum naphtha extracted from crude oil using a platinum catalyst. This is used in the production of terephthalic acid which is used to manufacture polyester.

Refined production

Processed platinum output from refineries typically of a minimum 99.95% purity in the form of ingot, sponge, or grain.

RDE

The Real Driving Emissions (RDE) test measures the pollutants such as NO_x, emitted by cars while driven on the road. It is in addition to laboratory tests. RDE testing was implemented in September 2017 for new types of cars and has applied to all registrations from September 2019.

Secondary supply

Covers the recovery of platinum from fabricated products, including unused trade stocks. Excludes scrap generated during manufacturing (known as production or process scrap). Autocatalyst and jewellery recycling are shown in the country where the scrap is generated, which may differ from where it is refined.

Selective catalytic reduction (SCR)

Selective Catalytic Reduction (SCR) is an emissions control technology system that injects a liquid-reductant agent (urea) into the outlet stream of a diesel engine. The automotive-grade urea, known by the trade name AdBlue. The system typically requires a platinum bearing DOC ahead of the SCR unit.

SGE

Shanghai Gold Exchange.

SSD

Solid-state drive. Data storage device that uses memory chips to store data, typically using flash memory.

Stage 4 regulations

Non-road mobile machinery (NRMM) is regulated by increasingly stringent regulations set out in tiers from Stage 1 to 5. This was last reviewed in May 2018 with deadlines set for 2020 and 2021. A submission by industry bodies requesting a delay in implementation as yet to be ruled on.

Three-way catalyst

Used in gasoline cars to remove hydrocarbons, carbon monoxide and NO_x. Largely palladium-based now, they also include some rhodium.

US Vehicle Emission Standards

US vehicle and engine emission standards for pollutants, are established by the US Environmental Protection Agency (EPA) based on the Clean Air Act (CAA). The State of California has the right to introduce its own emission regulations. Engine and vehicle emission regulations are adopted by the California Air Resources Board (CARB), a regulatory body within the California EPA. Vehicles can in every year be certified in different emission classes, called “bins.” The fleet average emissions over all “bins” are then regulated and reduced from year to year. To achieve the required fleet average, every year more vehicles have to be registered in the lower bins.

Tier 3

Emission regulation issued by EPA. The regulation defines common targets until 2025 in the USA.

Tier 4 stage

Non-road mobile machinery (NRMM) is regulated by increasingly stringent regulations set out in tiers from Stage 1 to 5. This was last reviewed in May 2018 with deadlines set for 2020 and 2021. A submission by industry bodies requesting a delay in implementation yet to be ruled on.

Washcoat

The layer that contains the active catalytic materials, such as PGMs, that is applied on the inactive, often ceramic, substrate within an autocatalyst block or component.

WIP

Work in progress.

WLTP

Worldwide Harmonised Light Vehicle Test Procedure is a laboratory test to measure pollutant emissions and fuel consumption. WLTP replaces the New European Driving Cycle (NEDC). It became applicable to new car types from September 2017 and new registrations from September 2018.

WPIC

The World Platinum Investment Council.