PLATINUM QUARTERLY

Q1 2024

13th May 2024

World Platinum Investment Council

FOREWORD

This edition of *Platinum Quarterly* presents platinum supply and demand developments for the first quarter of 2024 and an updated forecast for 2024 as a whole. 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.

Platinum market enters its second year of substantial deficit

- In the first quarter of 2024, the platinum market recorded a deficit of 369 koz, while for the full year a 476 koz deficit is forecast, which follows an 851 koz deficit in 2023.
- Supply risks remain a prominent theme in 2024. Continuing a multi-year trend, total mine supply is forecast to decrease by 3% year-on-year, underpinned by lower output from South Africa and Russia. Recycling supply in Q1 2024 was stable versus a year earlier, potentially indicating the first green shoots of the recovery forecast through 2024, although there are risks to the pace of the recovery.
- Despite the strongest automotive demand since 2017, total platinum demand moderated in Q1 2024, in line with expectations for the full year 2024. Although total demand is expected to decline 5% in 2024, that is following a record year for industrial demand in 2023 and is also the result of a weaker investment outlook for bars and coins in the US and Japan and expected ETF disinvestment in a higher-for-longer interest rate environment.
- Key additions have been made to the WPIC dataset. Demand data now includes a separate line item for the hydrogen-related platinum demand (excluding fuel cell electric vehicles), housed within the industrial demand segment. Additionally, bar and coin data now includes separate detail for China demand, reflecting robust growth there in response to low prices and market development activities.

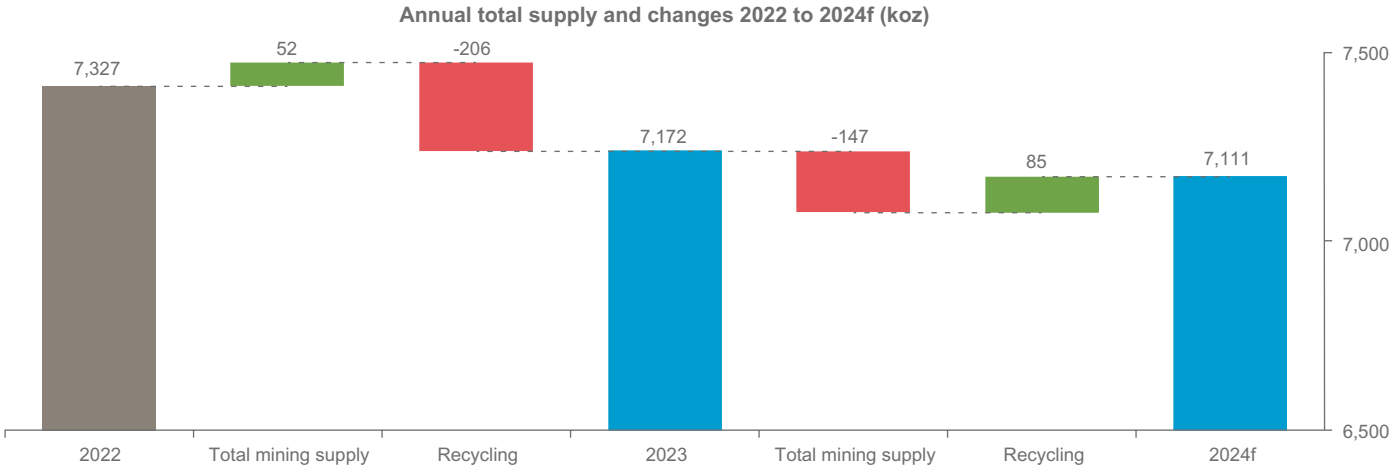
Platinum supply and demand – first quarter trends and updated 2024 outlook

Deficit of 369 koz in Q1 2024 as supply remains suppressed

There were several market developments during the first quarter of 2024 which limited supply growth. In South Africa, mine supply benefitted from a marked reduction in load curtailment relative to Q1 2023. However, this was partially offset by operational setbacks on the Western Limb and some supply curtailments via shaft and section closures following a protracted downturn in PGM prices. Russian mine supply was stable year-on-year, ahead of planned maintenance scheduled for later in the year. Elsewhere, Zimbabwean and North American mine supply increased marginally. The net impact was a 1% year-on-year increase in total mine supply to 1,235 koz. Recycling supply decreased by 2% year-on-year to 390 koz in Q1 2024. Automotive scrap supply remains constrained with an uptick in reports of hoarding by scrapyards. This was partially offset by rising jewellery sellbacks in China. Total supply in Q1 2024 came to 1,625 koz, stable versus last year but down 12% on the prior quarter reflecting mine supply seasonality.

Demand of 1,994 koz in Q1 2024 was resilient, albeit 6% lower compared to a year earlier. Lower demand was primarily underpinned by a 68% year-on-year decline (-134 koz) in investment demand as Japanese retail investment slowed and higher interest rates weighed on ETF demand. Elsewhere, industrial demand decreased by 7% year-on-year in Q1 2024 on weaker chemical demand, with fewer plant commissioning's as China moves beyond a period of elevated capacity investment. On the positive side, automotive platinum demand increased by 3% and jewellery demand rose 5% year-on-year in the first quarter. Automotive demand benefitted from rising vehicle production of both light and heavy-duty vehicles, drivetrain hybridisation and some ongoing platinum for palladium substitution. Jewellery demand reported broad-based global growth, except for China where jewellery decreased by 10 koz.

The net impact was a significant quarterly deficit of 369 koz in Q1 2024.



Source: Metals Focus

Updated 2024 outlook – platinum market deficit of 476 koz on suppressed supply and resilient demand

The forecast deficit for 2024 (-476 koz) is 58 koz deeper than the projections in our Q4 2023 *Platinum Quarterly*, published in March 2024.

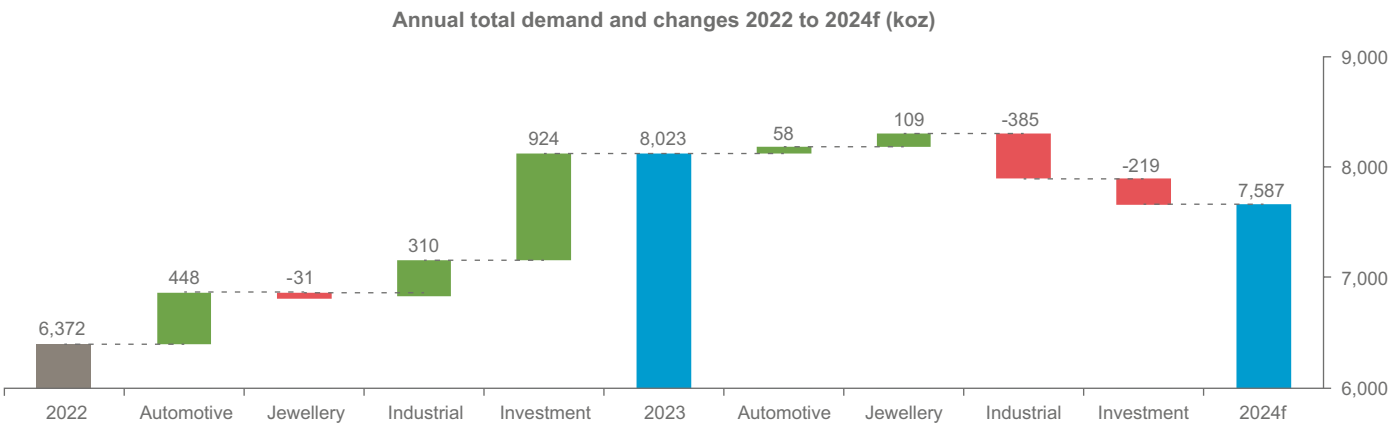
The full year 2024 outlook for total mine supply is 20 koz lower than the outlook included in the last *Platinum Quarterly*. This reduced forecast is primarily attributable to South Africa, despite the region witnessing a marked reduction in load-shedding. Refined production is expected to decline by 2% year-on-year in South Africa due to 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. Recycling supply is expected to remain constrained, albeit with a forecast increase by 85 koz in 2024. Automotive recycling continues to be impacted by low pipeline supply, sourcing headwinds and hoarding. The result is that total supply for 2024 is forecast to decrease 1% versus 2023 (-62 koz).

Automotive platinum demand is benefitting from ongoing platinum for palladium substitution, higher light- and heavy-duty production volumes and hybridisation trends which cumulatively are offsetting increased light-duty electric vehicle market share. For 2024, light-vehicle BEV market share is expected to reach 14% from 11% in 2023, however, this is slower than prior forecasts for its market share to grow to 15% by year-end. Jewellery demand is expected to recover off a low base and increase by 109 koz in 2024. Jewellery demand growth is broad-based, with India again expected to record stand-out growth while China stages a mild recovery. Total industrial demand is forecast at 2,242 koz, down 15% year-on-year. This should be viewed in the context of record demand levels in 2023, where 2024 is impacted by fewer plant commissioning's in the chemicals and glass subsectors. Industrial demand now includes a separate line item for the hydrogen economy (75 koz, +128% year-on-year) which accounts for electrolysis, midstream, stationary power, and non-automotive fuel cell mobility.

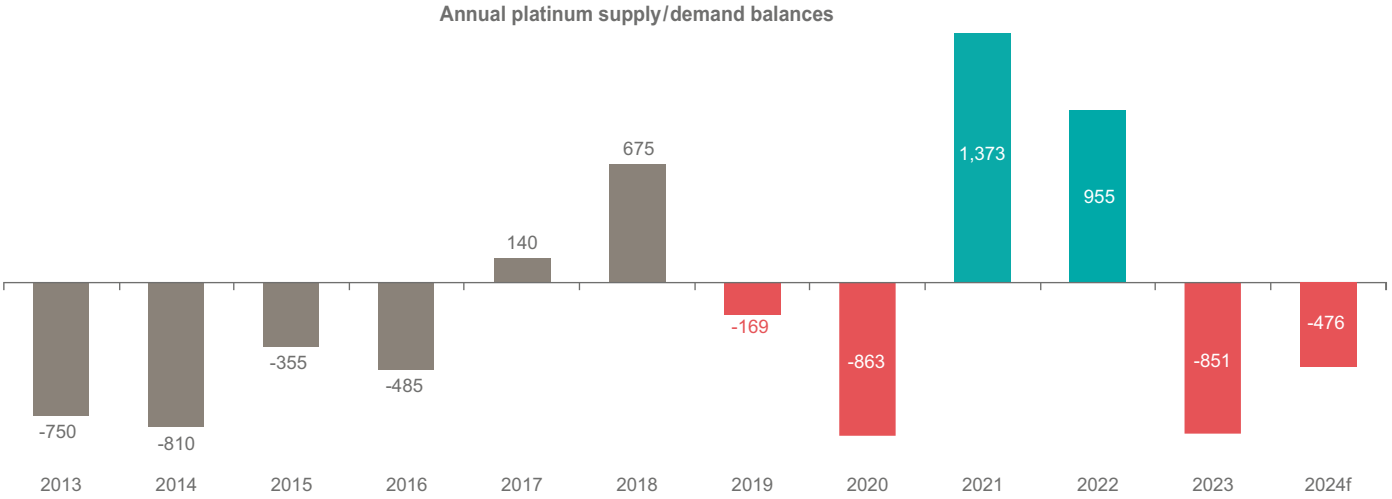
Investment demand has seen significant changes versus the last *Platinum Quarterly* outlook. Although demand is expected to decline by two thirds in 2024, due to ETF outflows of 120 koz, the investment demand outlook for 2024 has increased by 46 koz to 99 koz. This stems from the inclusion of higher Chinese bar and coin demand. In addition to the China bar and coin demand included in the *Platinum Quarterly* time series, Metals Focus indicate that they have identified ongoing additional sales of larger bars (+500g), which appears to have totalled more than 100 koz in 2023.

The net impact is for total demand of 7,587 koz in 2024, down 5% versus 2023.

Combining the supply and demand outlook results in a projected deficit for 2024 of 476 koz, equivalent to 6% of annual platinum demand. Furthermore, this is the second consecutive year of platinum market deficits.



Source: Metals Focus



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

The platinum investment case – underappreciation of supply risks and demand resilience

Platinum's investment case continues to be compelling despite economic headwinds; material deficits as a result of resilient demand, protected from weak economic growth, and weak mine and recycling supply.

The global economic overlay as it pertains to platinum demand expectations, remains complex with the global disinflation trend seen as being desynchronised with inflation remaining stubbornly elevated despite the higher interest rate environment. A strong US economy is leading to stubbornly higher-for-longer inflation, resulting in market consensus pushing back expectations for the first Fed rate cut from the second quarter to at least the final quarter of 2024. In contrast, Europe and the UK appear more likely to cut rates sooner, although these risk devaluing the euro and sterling. Meanwhile, China's economic growth recovery continues to look uncertain, largely due to its overly indebted housing developers and mixed stock market performance, although a steady unwinding of house purchase restrictions may provide some respite. Notably, however, the IMF did raise its expectations for global GDP growth to 3.2% in 2024, giving rise to some semblance of a soft landing that may provide some upside to platinum demand. However, sustained geopolitical risk may yet negatively impact global growth and supply chains with escalating hostilities in the Middle East and increased tensions elsewhere. Politics are a central theme to 2024. The South African national election is taking place on 29 May 2024, but this has done little to prevent a slew of restructuring announcements and associated job losses by domestic PGM miners. This may suggest a unified acknowledgement from the various stakeholders of the challenges caused by low PGM basket

prices. In the US, a Trump-Biden repeat is on the cards where a Republican win could see a watering down of green legislation potentially impacting the pace of development within the hydrogen economy, although our forecasts are that China and Europe will continue to be the main drivers of hydrogen demand, regardless of the US election result.

Some highlights from this *Platinum Quarterly* data set that support platinum's investment case: Total supply is continuing a multi-year downward trend, with 2024 expected to be the weakest year in our time series from 2013. Automotive demand is underpinned by a higher-for-longer ICE theme, with 2024 projected to be the strongest year for automotive demand for platinum since 2017. Jewellery demand, boosted by India and the Middle East is showing its first growth momentum since 2021. Industrial demand is down year-on-year as expected, but remains elevated versus historical levels, with stationary and other hydrogen demand a growing component (+128% year-on-year). The current projection for investment demand in 2024 is relatively muted, but within the data there is rapid growth in bar and coin demand in China. Collectively combined demand growth and weak supply results in a second consecutive deficit in 2024 of almost 500 koz, and current indications suggest that deficits will continue in 2025 and beyond.

The main current challenge for platinum investment is therefore not the underlying fundamentals, which look the strongest they have for years, but rather one of sentiment. So what is affecting this?

Firstly and most prominently, the market remains fixated on continued drivetrain electrification eroding ICE market share at the expense of automotive PGM demand. However, the growth in BEV market share from 11% in 2023 to ~30% by 2030 is not solely cannibalisation of ICE/hybrid units. In fact, the majority of BEV's gains come from BEV making up all the growth in global light-duty vehicle production numbers (from 90m to 100m units in 2030), with only a limited decline in absolute ICE/hybrid vehicle production numbers by 2030 (~9m to 71m units on WPIC numbers). Including the positive impact of higher PGM loadings on hybrid vehicles and resilient heavy-duty markets (with nascent FCEV development), shows automotive PGM demand erosion is negligible through 2030 (-1% CAGR).

Secondly, low PGM basket prices, and the rapid rate at which they reduced, has resulted in platinum miners implementing numerous measures to reduce operational costs, including deferment of capital expenditure and where unavoidable, employee redundancies. These measures have not yet been reflected in reduced production guidance, as might have been expected by the market. However, the scale of the announced cost saving measures suggest that maintaining current production levels and indeed maintaining the ability to increase production to meet increased demand or respond to higher prices has been reduced. Equally, whilst the challenges facing recycling supply are likely to be resolved, the pace at which they are overcome could mean that the recovery is dragged out for a number of years, further straining supply.

Thirdly, sentiment towards platinum has not been helped by its contrasting price performance with gold. Gold has performed significantly better than might have been expected in a high interest rate environment (based upon historical correlations) with central bank and retail buying helping to offset disposals from ETFs. However, both gold and platinum investment demand struggled in the first quarter, thus resulting in some confusion as to why platinum has not tracked gold in the same way that it has in the past. The explanation may lie in OTC and futures markets where gold's net speculative positions are skewed long, while platinum has oscillated between long and short repeatedly, with positioning tracking the rangebound price performance platinum has exhibited since 2021, and exacerbated by price sensitive buying in the spot market by Chinese automakers.

Overall for platinum, however, the market's lack of conviction will in time be addressed by higher-for-longer automotive demand and ongoing supply challenges. These fundamentals mean above ground stocks will continue to be the supply of last resort, albeit at higher price levels. Their rapid depletion (-25% between 2022 to 2024) and them heading towards unsustainable levels, should tighten physical markets and arguably support upward price pressure.

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.

In Europe and North America, we continue to increase efforts to assist our partners to provide their existing and prospective clients with greater insight into the investment case for platinum. We have also increased partner salesforce and client training programmes, with more frequent engagement. This has led to greater understanding of and elevated interest in owning platinum, particularly by gold and silver investors.

In China, the continued low price of platinum and WPIC investor development efforts again boosted quarterly platinum sales by our partners to another record high. We are pleased that the ongoing exceptional growth in platinum investment products in China is now, in-part, captured in our *Platinum Quarterly* data series. Bar & Coin investment in China is now presented as a separate category and only includes sales of coins and smaller bars. This totalled 52 koz in 2023 and in Q1'24 sales of 13,000 oz were at the same average quarterly rate as in 2023. As highlighted in the commentary, we supported additional product partnership sales of larger bars and coins, which exceeded 100 koz in addition to the 52 koz included in the *Platinum Quarterly* data series for 2023.

Our work with Chinese partners to expand their platinum product range with a focus on smaller sizes with a low entry price to appeal to young investors, has worked well. However, the majority of sales came from larger-size bars (e.g. 500g and above), as they carry lower fabrication costs attractive to serious investors. China Gold Coin's 10g dragon platinum bars were enthusiastically received by investors, encouraging its launch of an additional size of 100g in Q1'24. Our shared physical liaison office in Shuibei, Shenzhen has strengthened WPIC's branding and increased engagements with additional companies considering initiating platinum investment products.

Silver Bullion, our first product partner in Singapore, added platinum to its 'S.T.A.R Grams' programme, where investors can own vaulted platinum from as little as 0.1 g, priced at 3.5% over spot but buy back at spot.

In Japan, our marketing campaign with Rakuten achieved very positive effects, sparking a broader industrial interest in platinum business and/or partnerships with WPIC. Several potential partners and marketing initiatives are under discussion.

Trevor Raymond, CEO

Contents

Table 1: Supply, demand and above ground stock summary

	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %	Q4 2023	Q1 2024
Platinum Supply-demand Balance (koz)									
SUPPLY									
Refined Production	**4,988**	**6,295**	**5,520**	**5,604**	**5,468**	**2%**	**-2%**	**1,532**	**1,235**
South Africa	3,298	4,678	3,915	3,956	3,871	1%	-2%	1,143	816
Zimbabwe	448	485	480	507	502	6%	-1%	133	121
North America	337	273	263	276	276	5%	0%	72	72
Russia	704	652	663	674	616	2%	-9%	136	178
Other	200	206	200	190	203	-5%	7%	48	48
Increase (-)/Decrease (+) in Producer Inventory	-84	-93	+43	+11	+0	-1%	-100%	-23	+0
Total Mining Supply	**4,904**	**6,202**	**5,563**	**5,615**	**5,468**	**1%**	**-3%**	**1,509**	**1,235**
Recycling	**1,996**	**2,108**	**1,764**	**1,557**	**1,642**	**-12%**	**5%**	**338**	**390**
Autocatalyst	1,508	1,619	1,323	1,138	1,201	-14%	6%	235	275
Jewellery	422	422	372	349	366	-6%	5%	85	98
Industrial	66	67	69	71	75	3%	7%	18	17
Total Supply	**6,900**	**8,309**	**7,327**	**7,172**	**7,111**	**-2%**	**-1%**	**1,847**	**1,625**
DEMAND									
Automotive	**2,274**	**2,483**	**2,763**	**3,211**	**3,269**	**16%**	**2%**	**816**	**832**
Autocatalyst	2,274	2,483	2,763	3,211	3,269	16%	2%	816	832
Non-road	†	†	†	†	†	N/A	N/A	†	†
Jewellery	**1,830**	**1,953**	**1,899**	**1,868**	**1,978**	**-2%**	**6%**	**476**	**486**
Industrial	**2,100**	**2,531**	**2,316**	**2,626**	**2,242**	**13%**	**-15%**	**737**	**612**
Chemical	633	663	673	786	529	17%	-33%	132	142
Petroleum	109	169	193	158	156	-18%	-1%	38	39
Electrical	130	135	106	89	88	-16%	-1%	22	22
Glass	473	753	505	701	524	39%	-25%	310	175
Medical	254	265	275	289	299	5%	3%	71	78
Hydrogen Stationary and Other	28	18	15	33	75	114%	128%	13	14
Other	473	528	548	571	571	4%	0%	150	142
Investment	**1,559**	**-30**	**-606**	**318**	**99**	**N/A**	**-69%**	**-71**	**64**
Change in Bars, Coins	593	349	259	323	199	25%	-38%	61	64
Change in ETF Holdings	507	-241	-558	-20	-120	N/A	N/A	-116	11
Change in Stocks Held by Exchanges	458	-139	-307	14	20	N/A	38%	-16	-11
Total Demand	**7,763**	**6,936**	**6,372**	**8,023**	**7,587**	**26%**	**-5%**	**1,959**	**1,994**
Balance	**-863**	**1,373**	**955**	**-851**	**-476**	**N/A**	**N/A**	**-112**	**-369**
Above Ground Stocks	**2,619****	**3,992**	**4,947**	**4,097**	**3,620**	**-17%**	**-12%**		

Source: Metals Focus 2019 - 2024.

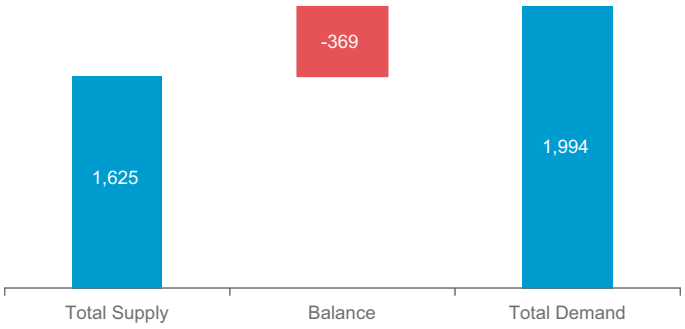
Notes:

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 2021 are contained in previously published PQs which are freely available on the WPIC website.
5. Quarterly estimates from Q1 2022 and half-yearly estimates from H1 2021 are included in Tables 3 and 4 respectively, on pages 19 and 20 (supply, demand and above ground stocks). Details of regional recycling supply in Table 6 on page 22 are only published from 2019.

2024 FIRST QUARTER PLATINUM MARKET REVIEW

Q1'24 saw surprisingly steady economic growth, fluctuating inflation, and strategic central bank policies shifting towards rate cuts later than previously thought, while gold prices registered new highs. This trend could not be replicated by platinum prices, despite encouraging fundamentals. Even though the quarter recorded sound automotive demand and improved jewellery demand, softer investment and industrial demand led to an overall 6% year-on-year decline in demand, to a total of 1,994 koz. However, given that the first quarter is traditionally weaker in terms of mine supply, and considering that recycling remained historically weak, total supply reached 1,625 koz, resulting in a deficit of 369 koz.

Chart 1: Supply-demand balance, koz, Q1 2024



Source: Metals Focus

Supply

Refined mine supply increased 4% year-on-year (+43 koz) to 1,235 koz primarily due to growth from South Africa.

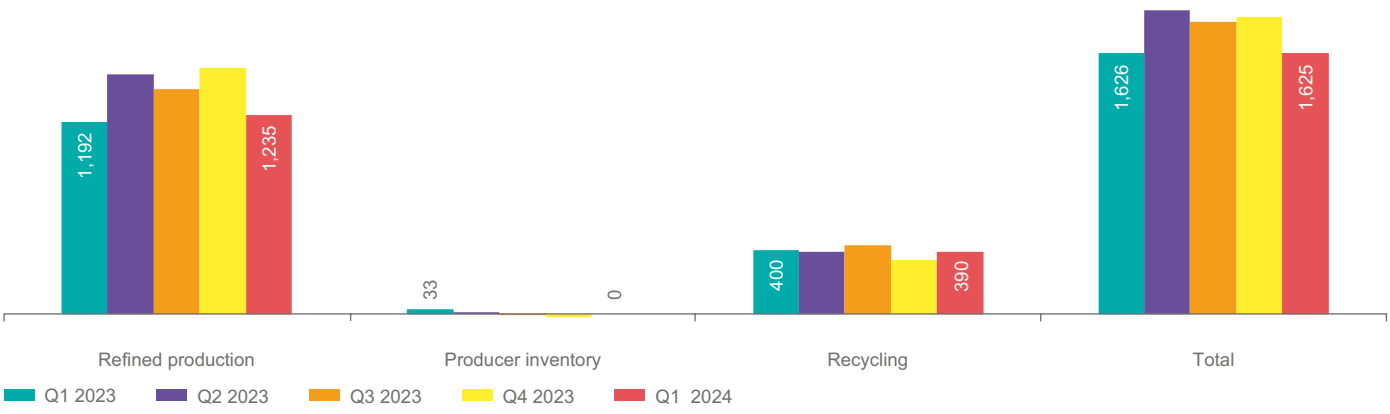
First quarter South African production is seasonally weak due to workers returning from the holiday season, planned maintenance of processing infrastructure and the annual stock count at Anglo American Platinum. No impact from Eskom load curtailment was reported for the quarter. However, output from Implats was affected by the scheduled rebuild of their Number 5 furnace, with the return to service planned for April 2024. In contrast, Amplats' total refined platinum, inclusive of toll treated material, increased as output recovered from the Polokwane smelter rebuild that impacted Q1'23. As a result, South African refined mine supply increased 5% year-on-year to 816 koz.

Russian output remained stable, decreasing 1% year-on-year to 178 koz. Nornickel, the country's dominant producer, reported its programme of replacing Western equipment suppliers was continuing, with the commissioning of new equipment last year enabling increased ore production for the quarter. Refined mine supply from North America saw a modest 1% year-on-year increase to 72 koz, while Zimbabwean output grew 5% year-on-year to 121 koz.

Recycling

While global recycling improved compared to Q4'23, it remained historically weak, and so broadly in-line with Q1'23 at 390 koz. Although there have been improvements in jewellery recycling, driven primarily by the liquidation of platinum jewellery stocks, weakness prevailed in both the automotive recycling and electronics sectors. However, a shift in perspective is emerging, suggesting that the reduction in autocatalyst scrap supply may be more attributable to stockpiling by scrap yards rather than a shortage of spent catalysts. That said, the supply pipeline is still considered low compared to historical standards. Older catalysts with lower PGM content are being processed, and stricter regulations are inducing structural changes. For instance, in North America, new authorisation requirements in some US States and stringent legal action have led some participants to exit the market. Meanwhile in China, the increased regulatory oversight to tighten the movement, monitoring and recycling of autocatalyst scrap may limit the number of participants in this sector. Nevertheless, unlike in the second half of 2023, there has been a recovery in catalyst processing in China.

Chart 2: Platinum supply, koz

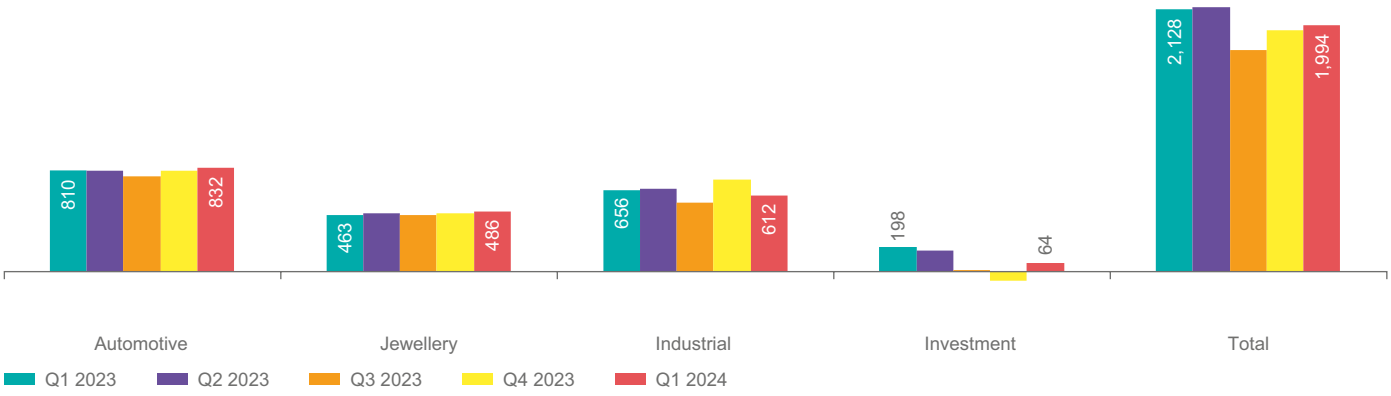


Source: Metals Focus

Demand

Global demand contracted 6% year-on-year to 1,994 koz in Q1'24. While automotive demand remained broadly steady increasing 3% (+21 koz) year-on-year and jewellery demand grew 5% (+22 koz), industrial demand contracted by 7% (-44 koz), and a combination of weaker retail investment and exchange stock outflows saw investment demand slide by 68% (-134 koz).

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

Q1'24 platinum automotive demand remained largely flat compared to Q1'23. Demand of 832 koz was 2% (+16 koz) up on the previous quarter and 3% (+21 koz) up on Q1'23. Despite the muted light-duty vehicle (LDV) production of 21.8M units (+1% year-on year) platinum demand in absolute terms remained solid, recording the strongest quarter since 2017. LDV production in China, India and North America improved, while that in Europe, Japan and other regions declined as backorders were fulfilled, with inventory levels mostly replenished, and consumer buying softening. Meanwhile, heavy-duty vehicle (HDV) production improved 2% to 891,000 units overall, but production in Europe, with typically higher platinum loadings, declined 13%. HDV production in India also declined by 15% which countered the healthy 18% growth in truck and bus production in China. In addition, non-road vehicle production declined year-on-year.

Despite a slower growth in LDV production, platinum demand was supported by the more platinum-rich trimetallic catalysts and growth in hybridisation. In North America, platinum demand for the quarter was 13% higher year-on-year supported by substitution and a 33% year-on-year increase in hybrid vehicle production. In China, LDV production improved 6%, with hybrid vehicle production increasing 42% year-on-year, more than off-setting a 6% fall in pure ICE vehicle production. Together with increased heavy-duty production (and China 6b compliant loadings) this resulted in an 13% increase in platinum demand in China. Europe was the only region where platinum demand contracted, as diesel passenger cars continued to lose market share. That said, the region remains the largest user of platinum within the automotive sector, accounting for 33% of automotive demand in Q1'24. In our Rest of World category, we noted a similar shift towards higher hybridisation, but results here are mixed, for example the growth in India saw both ICE and hybrid vehicle production improve in the quarter, while in South Korea, the growth in hybridisation could not offset the overall ICE production decline. That said, BEV production also declined year-on-year as new BEV sales growth slowed.

Jewellery demand

Global jewellery demand increased by 5% to 486 koz (+22 koz) on the back of strong demand in India, along with improvements in most regions barring China.

European demand in Q1'24 grew by 3% year-on-year in part as price differentials enabled the mass market/bridal segment to counter a shaky economic backdrop. In addition, high-end jewellery offtake continued to grow. End-use in watches, however, fell, but by less than the -31% decline seen in Swiss platinum watch hallmarking.

North American fabrication rose 1% (1 koz) in Q1'24, chiefly thanks to re-stocking after a surprisingly buoyant end to 2023, supported by the wide price differential to gold and more retailers stocking platinum. Growth was curtailed, however, by signs that total jewellery sales fell for all metals? as general expenditure normalises and consumer wariness of the potential for weaker economic conditions grows.

Japanese jewellery demand had a strong first quarter, rising by 10% year-on-year to 92 koz. Interestingly this came in spite of feedback from our contacts suggesting bridal demand remains lacklustre. Instead it seems that the gains we saw during the period seem to have mainly come from kihei, neck-chains, pendants and other non-bridal designs. Anecdotal evidence points to some boost to demand due to the higher gold price pushing consumers/retail channels towards platinum.

In China, platinum jewellery fabrication continued its downward trend in Q1'24, falling by another 9% (-10 koz) from last year's already low base. Competition from gold jewellery remained the most significant headwind. In addition to seasonal factors (Chinese New Year is traditionally a peak season for gold jewellery), the consistent increase in the gold price and growing awareness of gold as a value-preservation asset all fuelled consumers' growing preference for gold jewellery. This encouraged the supply chain to focus its product development and marketing activities more on gold rather than platinum jewellery, which weighed on the local platinum jewellery industry.

Indian platinum jewellery fabrication jumped by 53% year-on-year to 59 koz (1.82t) in Q1'24. The remarkable growth was primarily driven by record-high exports to the United States and the United Arab Emirates with a total of 29 koz (a nine-fold jump year-on-year) exported to these two nations. This growth was fuelled by PGI India's initiative to market platinum jewellery in the Middle East. Furthermore, fabrication was also helped by the addition of new stores by organised retailers and a growing number of existing stores displaying platinum jewellery. Domestic demand, on the other hand, remained flat due to volatility in gold prices, which hampered footfalls to jewellery showrooms.

Industrial demand

Industrial demand softened to 612 koz, shedding 44 koz in Q1'24 as China's chemical plant expansion cycle comes to an end. The drop in petroleum and electronics demand was offset by growth from the glass sector, demand from hydrogen-based applications as well as increased medical and other industrial applications requirements.

Chemical

Platinum chemical offtake rose by 7% (+10 koz) quarter-on-quarter to 142 koz. On a year-on-year basis, however, volumes were less than half of that seen in Q1'23, a reflection of significantly lower demand from the Chinese petrochemical industry. Following several years of rapid expansions in paraxylene (PX) and propane dehydrogenation (PDH) plants, capacity growth in China slowed in H2'23, a situation that continued into Q1'24. As such, the use of platinum in the petrochemical industry was led by top-up demand during the change-out of existing plants globally. By contrast, following a challenging 2023, platinum demand from the silicone industry started to improve in Q1'24, thanks to a resilient global economy, and in the US in particular. Moreover, excessive inventories were reduced during 2023, providing an additional lift to platinum. Following a recovery in 2023, demand from nitric acid offtake stayed broadly flat year-on-year.

Petroleum

Platinum demand rose slightly quarter-on-quarter, by 2% (+1 koz) to 39 koz in Q1'24. Despite escalating Middle East tensions, attacks on Russian refineries and an extension of OPEC+ output cuts, global oil supply improved in Q1'24. On a regional level, North America is the only location that posted growth, as platinum demand benefited from the continued rise in oil supply. By contrast, slightly lower Chinese demand, a reflection of slowing capacity addition, was the key driver behind the 5% year-on-year drop in global platinum offtake.

Medical

Platinum medical demand grew 3% (+3 koz) year-on-year in Q1'24 to 78 koz, a post-pandemic quarterly high. Healthcare spending across most regions has increased significantly post pandemic, leading to higher growth rates in the use of medicines globally, including platinum-using medical devices and cancer treatments.

Glass

Platinum glass demand more than doubled year-on-year in Q1'24 to 175 koz. Most gains were due to Chinese LCD tank installations, coupled with a slowdown in LCD tank consolidations in Japan. However, the year-on-year improvements to LCD capacity were somewhat tempered by slower fibreglass capacity expansions in China.

Electrical

Demand from the electrical segment in Q1'24 fell by 1% year-on-year. Thanks to the rapid development of artificial intelligence and its widespread applications, the cloud computing and near-line storage markets have continued to rebound, triggering a surge in demand for mass-capacity drive and temporarily easing the downward pace of HDD shipments. However, HDD manufacturers conservatively responded to the storage market that was still threatened by SSDs, maintaining the strategy of controlling output to help stabilise profits. Even so, the growing proportion of high-capacity drives also helped in part to slow down the decline by increasing the number of disks and metal loading per unit. As for semiconductors, with countries committed to developing chip sovereignty, a number of new fabrication plants started production this year, underpinning metal offtake in this segment.

Hydrogen Stationary and Other

Given the considerable and diverse expansion within the hydrogen sector, and the fact that a significant proportion of these applications utilise some platinum, the volumes justify its separation from our "Other Industrial" category. As electrolyser and stationary fuel cell manufacturers work through backlog orders, platinum demand increased markedly compared to Q1'23, albeit to just 14 koz.

Other

Other industrial demand grew by 3% (+5 koz) to 142 koz in Q1'24. Similar to the autocatalyst market, spark plug and sensor demand benefitted from growth in output, albeit modest, while second hand vehicle sales also remained firm. In the aerospace sector, platinum saw some support from an increase in launches and air travel.

Investment demand

Global bar and coin investment demand halved (-50%) to 64 koz (-64 koz) in Q1'24, representing the largest year-on-year decline since Q4'22. Overall, the decline in the global total was driven by far weaker Japanese and, to a lesser extent, North American purchases, which offset gains in Europe and China.

Before looking at the detail, it is important to note that Metals Focus has revised the retail investment series up. We have seen new information and done field research recently, all of which have made clear that our previous estimates for Chinese bar and coin demand in recent years were too low. Attractive platinum prices, growing product availability and aggressive promotional activities all have culminated in a dramatic growth of Chinese demand, which reached 52 koz in 2023 and will likely grow further this year. Having undertaken this research, we are also now showing China separately in the PQ. Although usually falling outside of the scope of our retail investment series, we have also seen strong growth in demand for locally manufactured 500g and 1kg platinum bars from high-net-worth and other market players. In 2023 these purchases seem to have been well above 100 koz. All these volumes would have in the past been misidentified as speculative inventory build of imported bars sold on the SGE. As our research into these segments is ongoing and new information is collected, we may need to revise these estimates in the near future.

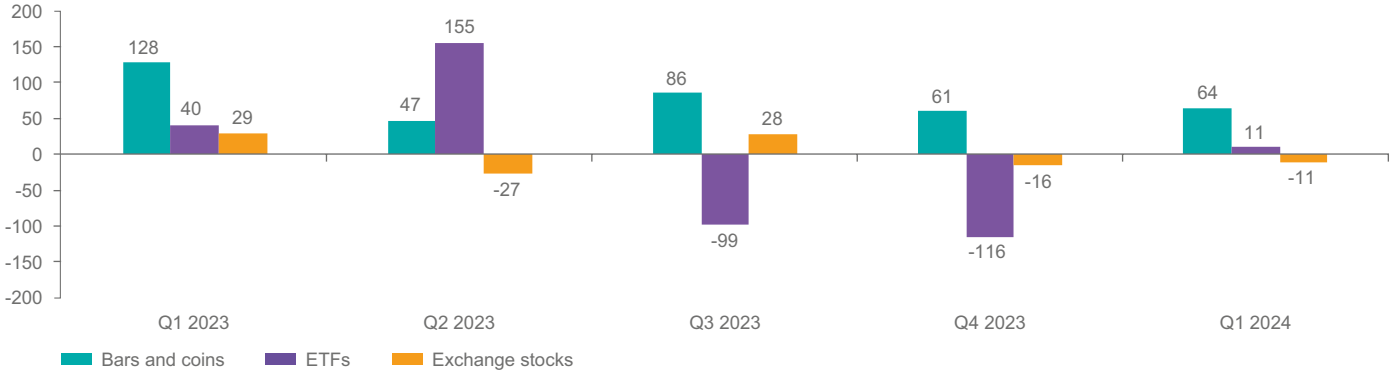
In Europe, retail investment jumped by 50% (+3 koz) year-on-year to 8 koz, as lower prices in early 2024 stimulated fresh interest. That said, this growth came from a low base in 2023 when annual volumes had fallen to a six-year low. Even following this rebound, overall volumes in Q1'24 remained subdued, a reflection of weak appetite for physical bars and coins across gold, silver and platinum.

Platinum retail investment demand in Japan was disappointing in Q1'24. Turnover was low across both gross purchases and sales. While the market overall was in net investment, at 2 koz this was tiny. The problem platinum continues to face in the country is gold's much publicised relentless rally, which continues to attract investors to that metal, ultimately at the expense of platinum. Of course, platinum's own lack of price volatility has also not helped.

In China, bar and coin investment enjoyed year-on-year growth in Q1'24 as investors saw the platinum price as undervalued (while gold hit record highs). Importantly, some platinum jewellery showrooms started selling platinum bars.

Platinum exchange-traded fund (ETF) holdings increased 11 koz in Q1'24 to 3,077 koz, 49 koz lower than at the end of Q1'23. The gains were led by Western-held funds, with those listed in European and North America growing by 11 koz and 18 koz respectively, which were offset by declines in South Africa at 17 koz. Platinum's low price throughout the quarter presented a window for opportunistic buying, albeit modestly. This was particularly true in North America which saw a significant -0.7 correlation between volumes and prices (buying at lower prices) throughout the quarter. Combined Nymex and TOCOM stocks fell 11 koz in Q1'24.

Chart 4: Platinum Investment, koz

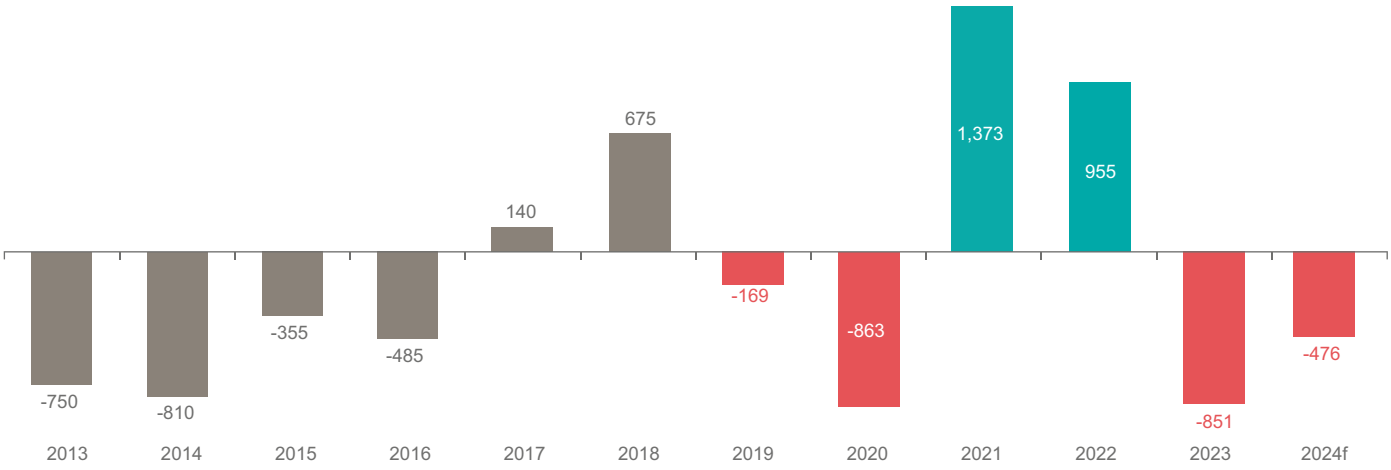


Source: Metals Focus

2024 OUTLOOK

In their most recent World Economic Outlook the IMF refers to the economic outlook for 2024 as expected to be steady but slow at 3.2%. That said, high inflation, interest rates remaining higher for longer and political uncertainty will weigh on commodity markets and platinum prices. The lower price environment, along with other factors, will continue to weigh on platinum supply during this year. For the full year, we forecast a 3% contraction in mine supply which will be mostly offset by a weak but improving recycling sector. Global supply is expected to reach 7,111 koz down 1% (-62 koz) year-on-year. After a much improved 2023, platinum demand will contract by 5% (-436 koz) to 7,587 koz in 2024, mainly due to softer industrial demand, with fewer glass and chemical plant expansions forecast for this year.

Chart 5: Supply-demand balance, koz, 2013-2024f



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

Supply

Total mined platinum supply is forecast to decline 3% to 5,468 koz as result of losses from South Africa and Russia.

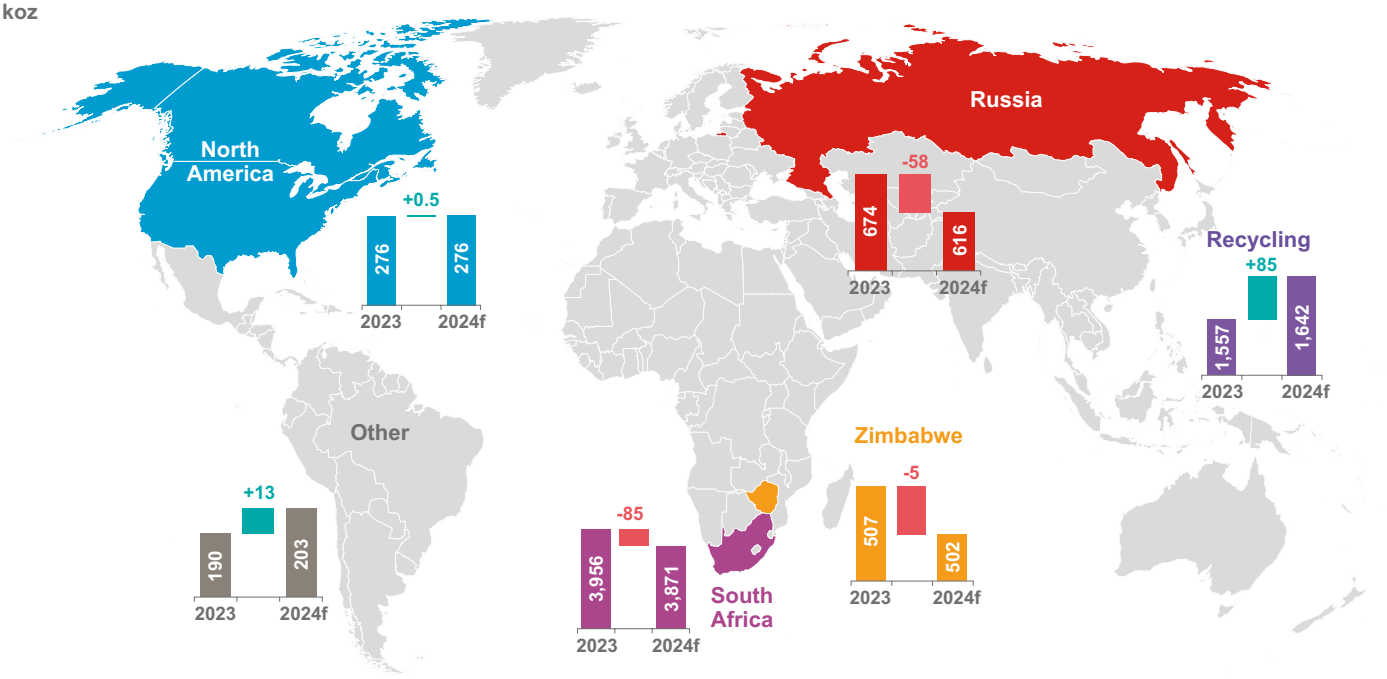
South African supply is projected to fall 2% to 3,871 koz as cost driven infrastructure closures offset increases from some expansion projects. Producers, responding to margin pressure from declining basket prices, are implementing cost-cutting measures, including deferring development projects and reducing capital expenditure. These actions will likely impact longer-term platinum mine supply. Additionally, the closure of some high-cost production, such as Sibanye-Stillwater's 4B Marikana shaft, has been announced in 2024. The 2024 supply outlook for South Africa is expected to be finely balanced between the pace of cost driven production losses and ongoing project ramp-ups. Given the marginal profitability of several operations at current prices, there is heightened price elasticity. Further declines in the basket price may prompt producers to undertake additional restructuring, posing downside risks to the 2024 forecast. For example, the recent initiation of Section 189s—a legal mechanism designed to streamline workforce numbers—may jeopardise production adaptability and hamper the ability to deliver against production plans.

While energy security remains a persistent risk for South African mine supply, it is not anticipated to be the primary factor for 2024, with load curtailment expected to cause only minimal disruption. Recent data from Eskom shows a continued long-term decline in power generation due to the reduced availability of the utility's aging fleet of coal fired power stations. However, lower electricity demand from the grid as a result of the installation of small-scale embedded generation, such as rooftop solar, combined with the country's economic challenges, is currently outpacing the decline in generation capacity. Nonetheless, if the decline in Eskom's fleet availability accelerates and large-scale power generation units fail, significant load curtailment and disruption could occur.

Russian supply is forecast to decrease by 9% to 616 koz, a multi-decade low. This decline is primarily due to repairs on furnace #2 at the Nadezhda Metallurgical Plant, limiting processing capacity. In addition, western sanctions are causing ongoing issues with sales, procurement, and access to banking facilities.

Chart 6: Changes in supply, 2023 vs. 2024f

koz



Source: Metals Focus

North American supply is expected to remain flat. Modest growth from Sibanye-Stillwater's US operation, recovering from the 2023 shaft incident, is anticipated. However, this growth is expected to be offset by a slight decrease in by-product output from Canadian nickel mining. Output from Zimbabwe is forecast to remain stable, with minimal year-on-year changes.

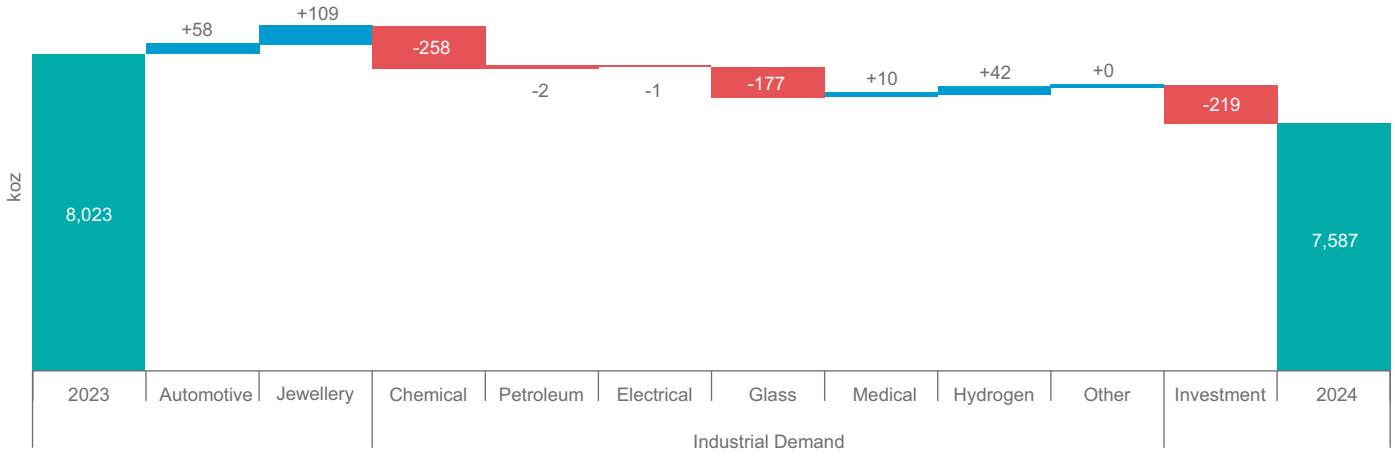
Recycling

Total global recycling is forecast to improve 5% (+85 koz) to reach 1,642 koz in 2024. With indications that some of the disruptions, which plagued the industry, are moving to resolution and, despite hoarding still being cited as a contributing factor to lower volumes participants are gradually adjusting to the lower price environment, and we expect auto catalyst recycling to improve 6% on 2023, reaching 1,201 koz. Due to the modest recovery in jewellery demand forecast in China, we anticipate seeing increased product exchange activities (often involving the selling back of heavier jewellery pieces for lighter premium designs), which accordingly finds its way to the recycling chain. Electronic scrap too will benefit from improved regulatory requirements and a third consecutive quarter of growth in smartphone shipments, a good barometer for both electronic demand and increased recycling potential.

Demand

Total platinum demand is expected to decline this year to 7,587 koz as automotive demand remains steady despite lower Internal Combustion Engine (ICE) production. Industrial demand will contract compared to record highs in the previous year as we do not see a repeat of the glass and chemical plant expansions. We also forecast an outflow of ETFs.

Chart 7: Changes in demand by category, 2023 vs. 2024f



Source: Metals Focus

Automotive demand

As back orders are filled and the supply constraints of the past three years have largely disappeared, vehicle production rates are slower and platinum demand growth also slows. Light vehicle output is projected to rise by 1% to 91.9M units, while heavy-duty units should grow by 2% to 3.5M units this year. For 2024, we expect the pure Internal Combustion Engine's (ICE) market share to continue to decline from 71% in 2023 to 64%. That said, we forecast platinum demand to remain steady at 3,269 koz supported by the growth in hybridisation on ongoing platinum substitution for palladium in gasoline vehicles.

In Europe, we forecast an 9% decline in platinum demand as the production of BEVs are expected to increase, encroaching on ICE vehicle production. That said, with consumer interest in EVs faltering, the rate of growth has slowed more than OEMs had previously anticipated. This year BEV production is forecast to grow 27% in Europe compared to 42% CAGR over the past two years.

The modest improvement in North American production (which is increasingly leaning towards hybrids) supports the 4% increase in platinum demand slated for this year. We expect to see further upgrades in hybridisation from this region in future as EPA emission regulations now give auto manufacturers the option to select the technology mix as opposed to the previous proposal which stipulated the share of BEVs required.

In China, we expect automotive platinum demand to grow by 15% this year on the back of higher HDV production (+12%), a higher share of non-road vehicles being fitted with PGM loaded aftertreatment systems and light vehicle production which, despite seeing a 10% decline in ICE vehicles, will see hybrid vehicle production increase by 24%, largely offsetting the decline in ICE vehicles.

As the platinum price approaches or even surpasses that of palladium, there is growing concern that the trend of substituting platinum for palladium could slow. However, changes in aftertreatment technologies in industries such as automotive manufacturing are an inherently slow process, typically aligned with the introduction of new models. Consequently, any significant shift back to palladium may only be a gradual process and over several years. Consequently, we estimate that platinum substitution for palladium will continue to increase this year reaching 756 koz.

Jewellery demand

Global jewellery demand is expected to improve by 6% (+109 koz) to reach 1,978 koz in 2024. The biggest contributing factor is the growth in India with demand increasing by as much as the increase in demand from Europe, North American and China combined.

Demand in Europe is projected to grow by 2% to a record high. Total bridal sales might ease but platinum's share should rise due to favourable pricing. The ongoing success of the high-end and capacity investments should see this sector grow, although its preference for white gold seems undiminished.

North American offtake is now forecast to grow by 2% (previously -2%) thanks to wider price differentials to gold, more retailers stocking platinum, the diamond market calming down and the US escaping recession. Election nerves, expenditure shifts and cost of living issues however should keep levels down on the 2022 peak.

The strong first quarter result for Japanese jewellery fabrication gives confidence to our earlier forecast for an overall increase in 2024. For now, we have maintained a conservative outlook for the year, showing an increase of only 4%. This reflects our research contacts' cautious outlook for bridal demand, which remains an important component of the Japanese platinum jewellery market. Aside from this headwind, there are plenty of positives for the industry this year, including continued gains in tourist arrivals and the scope for high gold prices to push more demand to platinum. With this in mind, we would note that the risks to our forecast seem skewed to the upside.

We saw some positive signs for Chinese platinum jewellery demand in March. After the gold price hit historical highs and staged 10% intra-month gains, local gold jewellery demand slumped due to the market's fears of price corrections. Additionally, confronted with rising financing costs (as a result of the surging gold prices) and lacklustre business, some retailers started to restructure their inventory, shifting some gold jewellery to platinum jewellery. This has been more obvious in the gem-sets segment, where the retailers scrap 18K gold gem-sets and replace the stock with platinum gem-sets.

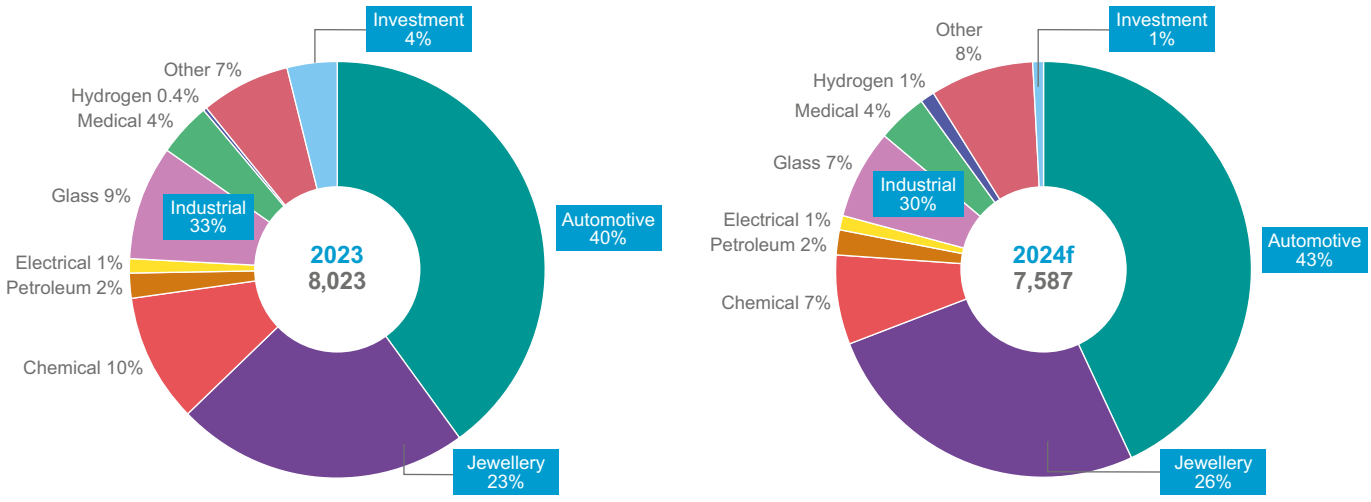
We expect platinum jewellery fabrication in China to grow modestly by 5% in 2024 to 428 koz, mostly due to easing competition from the gold jewellery market and the supply chain's stock replenishment of platinum jewellery. In addition, healthy demand for menswear and retail promotions via live broadcasting platforms should support platinum demand.

We expect Indian fabrication to remain strong in 2024, at around 260 koz (+57 koz) on the back of growing exports and store expansion by retailers both existing and new ones coming on board. The demand in 2024 is also likely to be aided by ongoing popularity of men's jewellery and growing penetration of the bimetal platinum jewellery which has emerged as one of the fastest growing segments in India.

Industrial demand

We forecast a 15% decline in industrial demand to 2,242 koz as fewer chemical plants and glass plants are brought on line this year. Stationary hydrogen application is expected to improve while production of sensors, spark plugs and the aerospace industry will remain flat on this year.

Chart 8: Demand end-use shares, 2024f vs. 2023



Source: Metals Focus

Glass

We forecast a 25% year-on-year decrease in platinum demand in the glass industry, dropping to 524 koz in 2024, down from 2023's high of 701 koz. Most of this decline will originate from China, due to reduced LCD capacity installations and a slowdown in fibreglass capacity growth, driven by weakened fibreglass demand and lower prices. In Japan, LCD tank decommissioning will resume, driven by cost pressures in a challenging economic environment. In contrast, South Korea, which saw a reduction in capacity last year due to tank decommissioning, is not expected to see further closures this year, leading to a return to net positive demand in our Rest of World category.

Medical

We project a 3% (+10 koz) growth of platinum medical demand to 299 koz in 2024. In relative terms, platinum's use in cancer treatment drugs will see the most significant growth, driven by double-digit increases in oncology investment, outpacing other medical fields. Meanwhile, the use of platinum in medical devices by comparison to APIs will grow more slowly, as populations age and access to healthcare improves in emerging markets. Conversely, platinum's use in restorative dentistry is waning as the dental industry is shifting towards cheaper, established and more natural-looking alternatives, and platinum dentistry now constitute less than 5% of overall platinum medical demand.

Chemical

Chemical demand is expected to drop by a third year-on-year (-258 koz) to a seven-year low of 529 koz in 2024. Much of the decline is down to weaker demand from the Chinese petrochemical industry, as the expansion of PX and PDH capacities slows this year. In terms of the nitric acid industry, demand for platinum is also expected to ease slightly, as lower fertilizer prices and rising project costs have weakened the investment case to add new plants. By contrast, the use of platinum in silicone is expected to recover in 2024, thanks to a resilient world economy and trade stocks returning to more normal levels by end-2024.

Petroleum

Petroleum demand is forecast to stabilise in 2024 (-2 koz). Despite sustained output curbs by the OPEC+ alliance, this will be offset by higher output from non-OPEC producers. Growth in North America will be most notable, as the US will be largest growth contributor to the world's oil supply in both 2024 and 2025. Partly offsetting this will be weaker Chinese demand, reflecting a slowdown in refining capacity expansion. Finally, it is worth stressing that our forecast does not foresee current geopolitical events leading to meaningful disruptions to the oil industry.

Electrical

As artificial intelligence applications require high-performance, scalable storage solutions to effectively process large amounts of data, this has pushed cloud storage and edge computing service providers to accelerate the upgrade of facilities, creating impetus for the mass-storage market. Given SSDs have an absolute advantage in terms of access performance compared with HDDs, unit costs will be the key factor in determining market dominance. In the semiconductor industry, the addition of 58 new fabrication plants (fabs) by 2030 is expected to bolster capacity globally. This increase should partially offset losses in the storage market. Meanwhile, NAND memory manufacturers are adopting cautious production plans to safeguard their profits. As a result of these strategies, HDDs (hard disk drives) are likely to maintain their relevance and continue in use for at least the next two years. Therefore, we maintain our view that platinum offtake will edge only marginally lower, falling by 1% (-1 koz) to 88 koz in 2024.

Hydrogen Stationary and Other

With the increase in deployment of PEM electrolysers, as well as growth in stationary applications, plus increased deployment of pilot scale of Liquid Organic Hydrogen Carrier (LOHC) storage solutions, we expect platinum demand from this segment to almost double this year. As a reminder, fuel cell electric vehicle demand for platinum sits within the automotive demand number.

Other

Platinum demand from the other industrial segment is forecast to remain flat at 571 koz in 2024. A solid aftermarket business, due to higher vehicle parcs amid longer car lifespans, coupled with rising demand for marine and aerospace, should be sufficient to offset the losses due to a slight decline in ICE vehicle production in the spark plug segment.

Investment demand

Metals Focus forecasts higher platinum prices, albeit modestly, over the rest of 2024, supported by the metal's healthy fundamentals and the strong gold price. We expect this will result in some opportunistic selling from Japanese retail investors, some of whom are sitting on mark-to-market losses and are looking for a better exit level. In contrast, given gold's popularity, it is unlikely that gross purchases rise much.

With regards to North America, the US Mint continues to appear unlikely to strike a 2024-dated platinum bullion Eagle coin, typically released in Q1 each year. The loss of Eagle sales is likely to be only partially offset by higher sales of other bar and coin investment products. The other challenge remains the underlying health of the market, especially in the US, and whether precious metals sales as a whole will recover, following a difficult start to the year. Metals Focus does expect a relatively strong finish to 2024, but not to the extent that it will offset the weakness that has so far characterised the market.

In China we forecast local retail investment to increase by 15% year on year in 2024 to 60 koz, driven by the local investors' view that platinum is undervalued compared to historically high gold prices and the lack of alternative investment assets.

In Europe, in keeping with 2023, high interest rates, platinum's rangebound prices and limited disposable incomes to invest (caused by an ongoing cost of living crisis) will continue to weigh on investor appetite. Physical investment therefore is expected to remain broadly flat near multi-year lows.

In 2024, we expect platinum ETF holdings will decrease by 120 koz to 2,946 koz. Ongoing, elevated interest rates will maintain a headwind for non-yielding assets, as it did for European and North American funds throughout much of 2023. Additionally, we do not expect a repeat of investors rotating into South African funds, as was the case in early 2023.

ABOVE GROUND STOCKS

Due to a projected deficit of 476 koz in 2024, above-ground stocks are expected to decline to 3,620 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**	**6,145**	**6,130**	**6,125**	**6,074**	**4,988**	**6,295**	**5,520**	**5,604**	**5,468**	**2%**	**-2%**
South Africa	3,135	4,480	4,365	4,385	4,470	4,374	3,298	4,678	3,915	3,956	3,871	1%	-2%
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	276	5%	0%
Russia	740	710	715	720	665	716	704	652	663	674	616	2%	-9%
Other	200	200	185	185	180	169	200	206	200	190	203	-5%	7%
Increase (-)/Decrease (+) in Producer Inventory	+350	+30	+30	+30	+10	+2	-84	-93	+43	+11	+0	-1%	-100%
Total Mining Supply	**5,225**	**6,190**	**6,075**	**6,160**	**6,135**	**6,076**	**4,904**	**6,202**	**5,563**	**5,615**	**5,468**	**1%**	**-3%**
Recycling	**2,055**	**1,720**	**1,860**	**1,915**	**1,955**	**2,110**	**1,996**	**2,108**	**1,764**	**1,557**	**1,642**	**-12%**	**5%**
Autocatalyst	1,255	1,185	1,210	1,325	1,430	1,565	1,508	1,619	1,323	1,138	1,201	-14%	6%
Jewellery	775	515	625	560	505	476	422	422	372	349	366	-6%	5%
Industrial	25	20	25	30	30	69	66	67	69	71	75	3%	7%
Total Supply	**7,280**	**7,910**	**7,935**	**8,075**	**8,090**	**8,186**	**6,900**	**8,309**	**7,327**	**7,172**	**7,111**	**-2%**	**-1%**
DEMAND													
Automotive	**3,220**	**3,245**	**3,360**	**3,300**	**3,115**	**2,750**	**2,274**	**2,483**	**2,763**	**3,211**	**3,269**	**16%**	**2%**
Autocatalyst	3,080	3,105	3,225	3,160	2,970	2,750	2,274	2,483	2,763	3,211	3,269	16%	2%
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**	**1,868**	**1,978**	**-2%**	**6%**
Industrial	**1,720**	**1,875**	**2,020**	**1,900**	**2,040**	**2,252**	**2,100**	**2,531**	**2,316**	**2,626**	**2,242**	**13%**	**-15%**
Chemical	540	515	560	570	565	798	633	663	673	786	529	17%	-33%
Petroleum	60	170	220	120	235	219	109	169	193	158	156	-18%	-1%
Electrical	215	205	195	210	205	144	130	135	106	89	88	-16%	-1%
Glass	225	300	320	260	275	228	473	753	505	701	524	39%	-25%
Medical	225	240	235	235	235	277	254	265	275	289	299	5%	3%
Hydrogen Stationary and Other	†	†	†	†	†	29	28	18	15	33	75	114%	128%
Other	455	445	490	505	525	556	473	528	548	571	571	4%	0%
Investment	**150**	**305**	**535**	**275**	**15**	**1,248**	**1,559**	**-30**	**-606**	**318**	**99**	**N/A**	**-69%**
Change in Bars, Coins	50	525	460	215	280	278	593	349	259	323	199	25%	-38%
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**	**8,430**	**7,935**	**7,415**	**8,355**	**7,763**	**6,936**	**6,372**	**8,023**	**7,587**	**26%**	**-5%**
Balance	**-810**	**-355**	**-485**	**140**	**675**	**-169**	**-863**	**1,373**	**955**	**-851**	**-476**	**N/A**	**N/A**
Above Ground Stocks	**2,580***	**2,225**	**1,740**	**1,880**	**2,555**	**3,481**	**2,619****	**3,992**	**4,947**	**4,097**	**3,620**	**-17%**	**-12%**

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

	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q1'24/Q1'23 Growth %	Q1'24/Q4'23 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	**1,273**	**1,529**	**1,390**	**1,328**	**1,192**	**1,486**	**1,393**	**1,532**	**1,235**	**4%**	**-19%**
South Africa	878	1,129	978	931	778	1,051	984	1,143	816	5%	-29%
Zimbabwe	117	124	116	123	116	126	132	133	121	5%	-9%
North America	66	64	67	65	71	73	60	72	72	1%	0%
Russia	163	161	179	160	180	190	168	136	178	-1%	31%
Other	49	51	51	49	48	46	48	48	48	1%	1%
Increase (-)/Decrease (+) in Producer Inventory	+24	-2	-2	+23	+33	+8	-6	-23	+0	-100%	N/A
Total Mining Supply	**1,297**	**1,527**	**1,387**	**1,351**	**1,226**	**1,494**	**1,387**	**1,509**	**1,235**	**1%**	**-18%**
Recycling	**453**	**461**	**419**	**430**	**400**	**391**	**428**	**338**	**390**	**-2%**	**15%**
Autocatalyst	338	352	313	321	287	290	326	235	275	-4%	17%
Jewellery	98	92	90	92	95	84	85	85	98	2%	15%
Industrial	17	17	17	17	17	17	17	18	17	-1%	-6%
Total Supply	**1,751**	**1,988**	**1,807**	**1,781**	**1,626**	**1,885**	**1,815**	**1,847**	**1,625**	**0%**	**-12%**
DEMAND											
Automotive	**702**	**671**	**672**	**718**	**810**	**814**	**771**	**816**	**832**	**3%**	**2%**
Autocatalyst	702	671	672	718	810	814	771	816	832	3%	2%
Non-road	†	†	†	†	†	†	†	†	†	N/A	N/A
Jewellery	**472**	**483**	**480**	**463**	**463**	**478**	**451**	**476**	**486**	**5%**	**2%**
Industrial	**567**	**642**	**561**	**547**	**656**	**679**	**554**	**737**	**612**	**-7%**	**-17%**
Chemical	130	150	128	265	295	233	127	132	142	-52%	7%
Petroleum	44	48	49	52	41	40	38	38	39	-5%	2%
Electrical	30	27	26	24	23	23	22	22	22	-1%	0%
Glass	150	202	151	2	80	161	149	310	175	117%	-44%
Medical	71	68	69	69	75	71	70	71	78	3%	9%
Hydrogen Stationary and Other	4	4	4	4	5	6	8	13	14	181%	9%
Other	139	143	135	132	137	145	139	150	142	3%	-5%
Investment	**-155**	**-150**	**-249**	**-53**	**198**	**175**	**15**	**-71**	**64**	**-68%**	**N/A**
Change in Bars, Coins	69	84	103	2	128	47	86	61	64	-50%	5%
Change in ETF Holdings	-166	-112	-217	-62	40	155	-99	-116	11	-73%	N/A
Change in Stocks Held by Exchanges	-58	-123	-134	7	29	-27	28	-16	-11	N/A	N/A
Total Demand	**1,586**	**1,646**	**1,465**	**1,675**	**2,128**	**2,146**	**1,791**	**1,959**	**1,994**	**-6%**	**2%**
Balance	**165**	**342**	**342**	**106**	**-502**	**-260**	**24**	**-112**	**-369**	**N/A**	**N/A**

Source: Metals Focus 2021 - 2023.

Note:

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	**3,265**	**2,802**	**2,718**	**2,679**	**2,925**	**8%**	**9%**
South Africa	2,475	2,007	1,908	1,829	2,127	11%	16%
Zimbabwe	242	241	239	242	265	11%	10%
North America	115	131	132	143	132	0%	-8%
Russia	331	324	339	370	304	-10%	-18%
Other	102	100	100	94	96	-4%	2%
Increase (-)/Decrease (+) in Producer Inventory	-82	22	21	41	-30	N/A	N/A
Total Mining Supply	**3,183**	**2,825**	**2,739**	**2,720**	**2,895**	**6%**	**6%**
Recycling	**1,048**	**914**	**849**	**791**	**767**	**-10%**	**-3%**
Autocatalyst	808	689	634	577	561	-12%	-3%
Jewellery	206	191	181	179	170	-6%	-5%
Industrial	34	34	34	35	36	4%	3%
Total Supply	**4,232**	**3,739**	**3,588**	**3,511**	**3,662**	**2%**	**4%**
DEMAND							
Automotive	**1,178**	**1,373**	**1,390**	**1,624**	**1,587**	**14%**	**-2%**
Autocatalyst	1,178	1,373	1,390	1,624	1,587	14%	-2%
Non-road	†	†	†	†	†	N/A	N/A
Jewellery	**995**	**956**	**943**	**941**	**927**	**-2%**	**-2%**
Industrial	**1,262**	**1,208**	**1,107**	**1,336**	**1,291**	**17%**	**-3%**
Chemical	412	280	393	527	259	-34%	-51%
Petroleum	95	92	101	81	76	-24%	-6%
Electrical	67	57	49	45	44	-10%	-2%
Glass	278	353	153	242	459	201%	90%
Medical	134	138	137	147	142	4%	-3%
Hydrogen Stationary and Other	11	7	8	11	22		
Other	266	282	267	282	289	8%	2%
Investment	**-385**	**-305**	**-301**	**373**	**-55**	**N/A**	**N/A**
Change in Bars, Coins	211	154	105	175	147	40%	-16%
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	**3,051**	**3,232**	**3,140**	**4,274**	**3,750**	**19%**	**-12%**
Balance	**1,181**	**507**	**448**	**-763**	**-88**	**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 %	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024
Platinum Gross Demand (koz)																		
Automotive	**3,220**	**3,250**	**3,350**	**3,290**	**3,115**	**2,750**	**2,274**	**2,483**	**2,763**	**3,211**	**3,269**	**16%**	**2%**	**810**	**814**	**771**	**816**	**832**
North America	455	480	410	390	390	310	268	340	411	444								
Western Europe	1,395	1,450	1,630	1,545	1,340	1,412	1,047	952	980	1,110								
Japan	585	510	450	435	425	283	224	244	243	290								
China	125	145	195	230	220	182	276	373	443	613								
India	170	180	170	175	200	††	††	††	††	††								
Rest of the World	490	485	495	515	540	562	458	574	685	753								
Jewellery	**3,000**	**2,840**	**2,505**	**2,460**	**2,245**	**2,106**	**1,830**	**1,953**	**1,899**	**1,868**	**1,978**	**-2%**	**6%**	**463**	**478**	**451**	**476**	**486**
North America	230	250	265	280	280	341	277	409	448	438								
Western Europe	220	235	240	250	255	237	196	260	301	319								
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	163								
Chemical	**540**	**515**	**560**	**570**	**565**	**798**	**633**	**663**	**673**	**786**	**529**	**17%**	**-33%**	**295**	**233**	**127**	**132**	**142**
North America	55	55	50	50	50	82	103	109	111	137								
Western Europe	105	75	110	115	105	124	112	115	106	115								
Japan	10	10	15	15	15	66	62	65	66	61								
China	215	230	225	220	215	311	215	221	219	271								
Rest of the World	155	145	160	170	180	215	141	152	171	203								
Petroleum	**60**	**170**	**220**	**120**	**235**	**219**	**109**	**169**	**193**	**158**	**156**	**-18%**	**-1%**	**41**	**40**	**38**	**38**	**39**
North America	25	-25	90	55	55	30	5	32	44	44								
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**	**88**	**-16%**	**-1%**	**23**	**23**	**22**	**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**	**524**	**39%**	**-25%**	**80**	**161**	**149**	**310**	**175**
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**	**275**	**289**	**299**	**5%**	**3%**	**75**	**71**	**70**	**71**	**78**
Other industrial	**455**	**445**	**490**	**505**	**525**	**556**	**473**	**528**	**548**	**571**	**571**	**4%**	**0%**	**137**	**145**	**139**	**150**	**142**
Hydrogen Stationary & Other	**†**	**†**	**†**	**†**	**†**	**29**	**28**	**18**	**15**	**33**	**75**	**114%**	**128%**	**5**	**6**	**8**	**13**	**14**
Bar & Coin Investment	**50**	**525**	**460**	**215**	**280**	**278**	**593**	**349**	**259**	**323**	**199**	**25%**	**-38%**	**128**	**47**	**86**	**61**	**64**
North America						155	234	256	258	169								
Western Europe						52	75	61	44	24								
Japan						46	240	-26	-114	54								
China						15	23	26	38	52								
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**	**40**	**155**	**-99**	**-116**	**11**
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%**	**29**	**-27**	**28**	**-16**	**-11**
Investment	**150**	**305**	**535**	**275**	**15**	**1,248**	**1,559**	**-30**	**-606**	**318**	**99**	**N/A**	**-69%**	**198**	**175**	**15**	**-71**	**64**
Total Demand	**8,090**	**8,270**	**8,410**	**7,925**	**7,415**	**8,355**	**7,763**	**6,936**	**6,372**	**8,023**	**7,587**	**26%**	**-5%**	**2128**	**2146**	**1791**	**1959**	**1994**

Source: Metals Focus 2019 - 2024f, SFA (Oxford) 2014 - 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 %	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024
Platinum recycling supply (koz)																		
Automotive	**1,255**	**1,185**	**1,210**	**1,325**	**1,420**	**1,565**	**1,508**	**1,619**	**1,323**	**1,138**	**1,201**	**-14%**	**6%**	**287**	**290**	**326**	**235**	**275**
North America						520	458	504	395	351								
Western Europe						786	815	836	678	591								
Japan						116	109	117	85	73								
China						36	36	59	55	25								
Rest of the World						108	90	103	110	98								
Jewellery	**775**	**515**	**625**	**560**	**505**	**476**	**422**	**422**	**372**	**349**	**366**	**-6%**	**5%**	**95**	**84**	**85**	**85**	**98**
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%**	**7%**	**17**	**17**	**17**	**18**	**17**
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 2019 - 2024, SFA (Oxford) 2014 - 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 was realised despite lockdown.

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 was delayed by 6 months to January 2021, and all new HDVs targeted for compliance in July 2021. The second stage, China VI-b applied 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 are more stringent progressively including Euro 6 a, b, c, d, and Euro 6d and e. 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 platters.

HDV

Heavy-duty vehicle.

Hydrogen Stationary and Other

The hydrogen economy category includes platinum demand in the production of hydrogen through electrolysis, demand in the storage of hydrogen as well as alternative transport applications such as aviation and marine applications.

Hydrogen Production Methods

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. 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.