

FOREWORD

This edition of *Platinum Quarterly* presents platinum supply and demand developments for the second quarter of 2024 and an updated forecast for full year 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 investor needs. The *Platinum Quarterly* data and commentary (starting on page 6) are prepared independently for WPIC by Metals Focus.

Platinum market deficit to grow from 2023 to 2024

- In the second quarter of 2024, the platinum market recorded a deficit of 464 koz. The deficit is forecast to be 1,028 koz for full year 2024, which follows a 731 koz deficit in 2023.
- Mine supply of 1,570 koz in the second quarter of 2024 reached its highest level since the fourth quarter of 2021. These gains were underpinned by South Africa (+7% year-on-year), in part due to the processing of semifinished inventory. However, supply risks remain a prominent theme for 2024. Given mine supply restructuring and uncertainty around the pace of the recovery in automotive recycling, our full year 2024 forecast for total supply was revised lower by 22 koz versus last quarter.
- Quarterly platinum demand reached an almost four-year high in Q2 2024 following significant investment inflows of ETF holdings (despite elevated interest rates). For the full year 2024, global platinum demand is forecast to increase by 3% year-on-year, with growth from all key end-market segments.
- A key addition has been made to the WPIC dataset, which now includes a separate line item for large Chinese platinum bar demand (≥500g), housed within the investment demand segment.

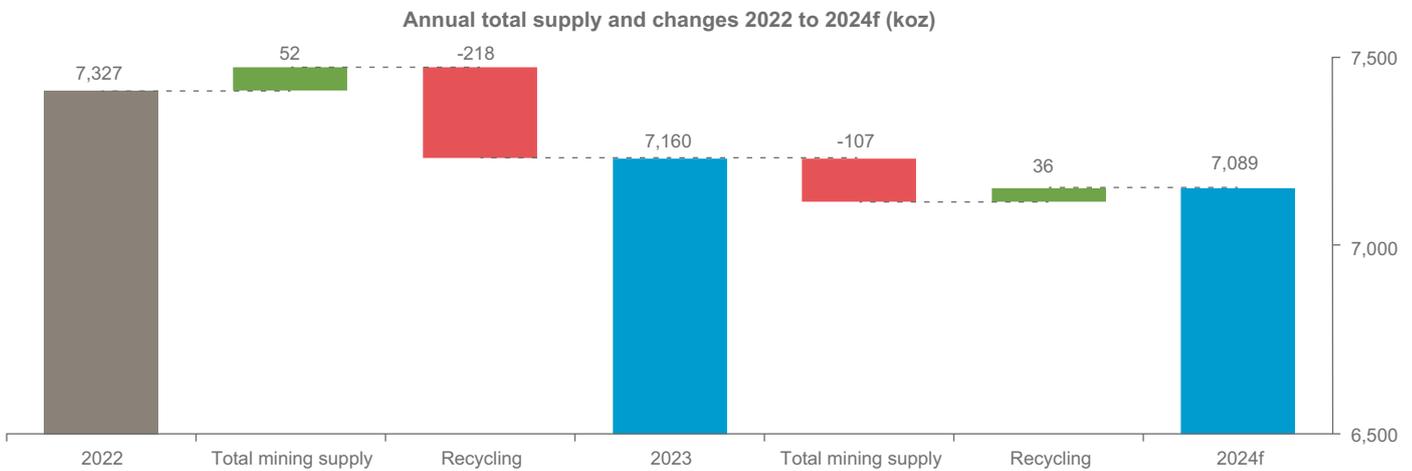
Platinum supply and demand – second quarter trends and updated 2024 outlook

Deficit of 464 koz in Q2 2024 as investment demand shines

The platinum market saw robust growth for both supply and demand in the second quarter of 2024. Mine supply increased by 5% year-on-year to 1,570 koz in Q2 2024, largely driven by South Africa. The country benefitted from a marked year-on-year reduction in load curtailment and improved smelter availability during the quarter. This more than offset lower Russian and North American production stemming from planned smelter maintenance. Recycling increased by 1% year-on-year to 388 koz in Q2 2024. Although automotive recycling supply increased by 2% year-on-year, scrap aggregators continue to highlight challenges securing sufficient feedstock, with lingering suggestions of hoarding by scrapyards. Total supply in Q2 2024 came to 1,958 koz, up 4% over last year and up 22% compared to the prior quarter, reflecting mine supply seasonality.

Quarterly demand of 2,421 koz in Q2 2024 reached a four-year high. Demand increased by 13% compared to a year earlier due to a sharp uptick in platinum ETF holdings (+444 koz). ETF investors were drawn to platinum due to its increasing discount to gold, expectations for interest rates easing, and platinum's strong underlying fundamentals, reflected in consensus forecasts for a market deficit in 2024. Elsewhere, platinum demand proved resilient during Q2 2024. Automotive demand was up 1% year-on-year as recent trends such as platinum for palladium substitution and higher-for-longer ICE-based vehicle demand persisted. Jewellery demand increased by 5% year-on-year, with only North America recording lower demand (-1% year-on-year), albeit off a high-base. Industrial platinum demand decreased by 4% year-on-year in Q2 2024, almost entirely due to weaker chemical demand (-48% year-on-year) following fewer plant commissionings as China moves beyond a period of elevated capacity investment.

The net impact was a significant quarterly market deficit of 464 koz in Q2 2024.



Source: Metals Focus

Updated 2024 outlook – platinum market deficit of 1,028 koz on suppressed supply and growing demand

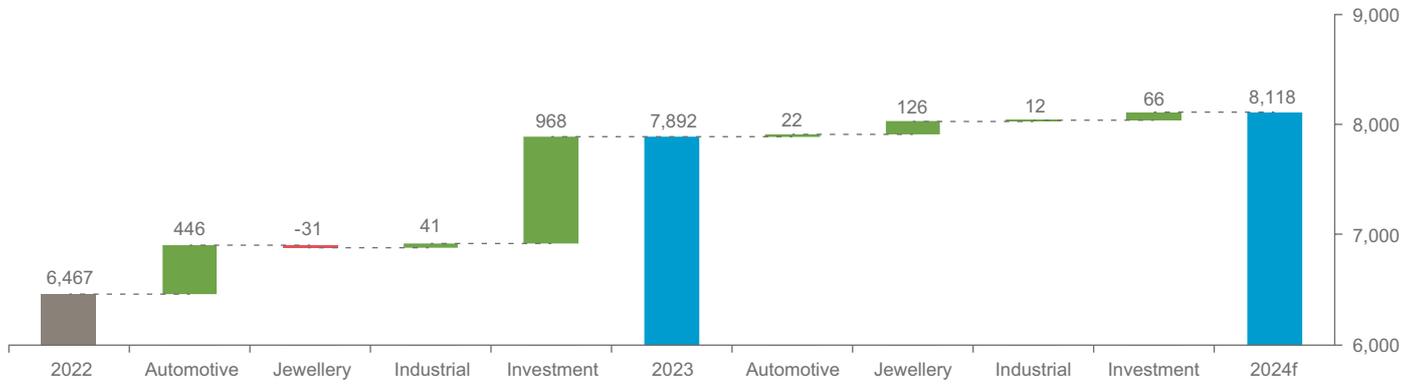
Total mine supply is forecast to decline by 2% year-on-year to 5,508 koz in 2024. Barring the one-off impacts from protracted strikes in 2014 and COVID in 2020, total mine supply in 2024 is expected to be at its lowest level within our time series dating back to 2013. Notably, refined production is expected to be lower across each of South Africa, Zimbabwe, Russia and North America. South African output will be negatively impacted by announced restructuring plans, shaft/section closures and slower than previously expected production ramp-ups. Although the Russian mine supply forecast has been revised up by 37 koz due to better-than-expected year-to-date performance, full year production at the upper end of Nornickel’s 2024 guidance will still be lower than output for 2023 due to planned smelter maintenance. Recycling supply is expected to remain constrained in 2024, albeit with a forecast year-on-year increase of 36 koz in 2024 (+2%). Automotive recycling continues to be impacted by a lack of quality feedstock due to sourcing headwinds and hoarding. The result is that total platinum supply for 2024 is forecast to decrease 1% versus 2023 (-71 koz) and at 7,089 koz will be 8% lower than average supply over the past ten years.

Investment demand has seen significant changes for the second consecutive quarter. Building on the inclusion of China bar and coin demand as a separate line item in our previous *Platinum Quarterly*, platinum investment demand now includes China demand for bars equal to or larger than 500g (previously captured by the balance and effectively treated as part of the inventory build/release), which is expected to total 188 koz in 2024. Elsewhere, the full year forecast for changes in platinum ETF holdings has been revised from a -120 koz outflow to a +150 koz inflow following a sharp uptick in holdings through the second quarter. Total platinum investment demand is forecast to reach 517 koz in 2024, up 15% year-on-year with ETF inflows and strong Chinese bar and coin demand offsetting weakness in bar and coin demand from other markets.

Having trended lower for many years, and therefore somewhat surprisingly, platinum jewellery underpins one of the largest absolute contributions to total platinum demand growth for 2024. Jewellery demand is forecast to increase by 126 koz or 7% year-on-year to 1,994 koz in 2024. Jewellery demand growth is expected to be geographically broad-based with the price differential to gold a supporting factor. While India is again forecast to record stand-out growth of 28% year-on-year, China is expected to buck a long-standing declining trend in its jewellery demand and deliver growth of 3% year-on-year. For 2024, automotive platinum demand is benefitting from ongoing platinum for palladium substitution, higher heavy-duty platinum demand and hybridisation trends, which are cumulatively offsetting a rising light-duty electric vehicle market share. Total industrial demand is forecast to grow by 1% year-on-year to 2,369 koz with fewer new plant commissionings in the chemical sector being offset by a larger number of new glass production facilities being brought online. However, headline industrial platinum demand in 2024 remains elevated versus pre-COVID levels. The net impact is for total platinum demand of 8,118 koz in 2024, up 3% versus 2023 and 4% higher than average platinum demand over the past ten years.

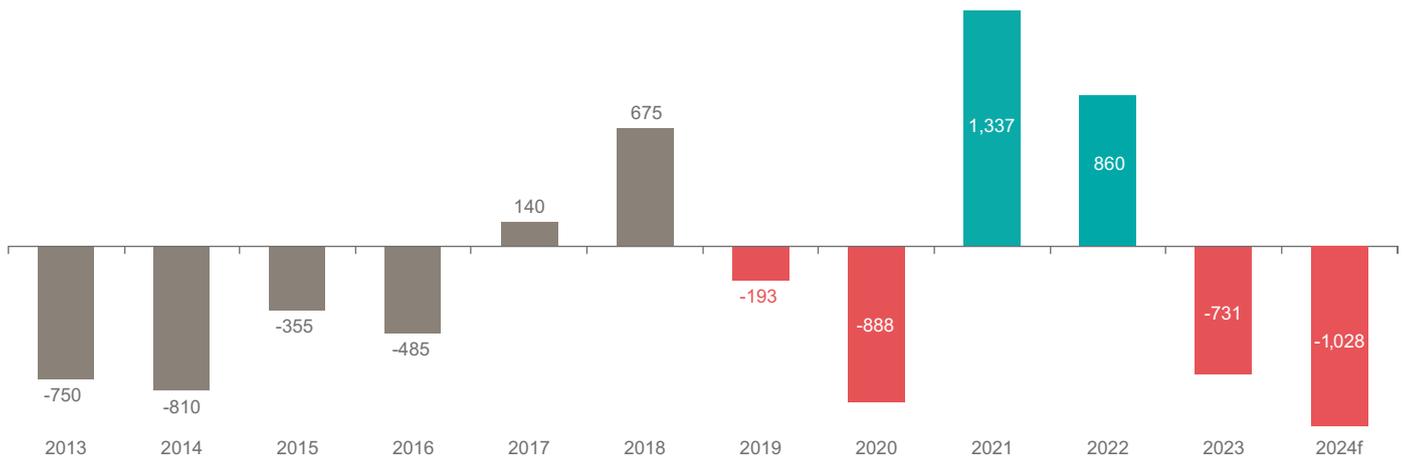
Combining the supply and demand outlook results in a projected platinum market deficit for 2024 of 1,028 koz which is 365 koz higher than our previous *Platinum Quarterly* deficit (after adjusting for the inclusion of Chinese demand for ≥500g platinum bars within this *Platinum Quarterly*). Notably, the 2024 market deficit is equivalent to 13% of annual platinum demand and reflects a second consecutive year of meaningful platinum market deficits.

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



Source: Metals Focus

Annual platinum supply/demand balances (koz)



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

The platinum investment case – entrenching market deficits

Platinum’s investment case is underpinned by a compelling mix of resilient demand and weak supply, which together result in persistent market deficits with ongoing drawdowns from rapidly depleting above ground stocks needed to balance the market.

The global economic overlay, as it pertains to platinum, may present mixed signals. Industrialised market central banks have, or are expected to, initiate interest rate cuts as inflation rates normalise amid growing economic uncertainty. Platinum investment demand should prove a beneficiary of declining rates as the opportunity cost of holding a non-yielding asset reduces. Furthermore, platinum prices have on balance yielded positive returns within twelve-months of the US Fed’s first cut in the cycle over the past four interest rate cycles. Within this context, one would expect sentiment to improve for physical platinum investment products.

Deteriorating economic growth can be another precursor for an interest rate cutting cycle. To this point, we note ongoing uncertainty around China’s economic outlook given weak consumer sentiment stemming from an indebted property sector and a volatile domestic stock market performance. Furthermore, European growth is lacklustre, weighed down somewhat by Germany. Conversely the US has, albeit with help from a rising fiscal deficit, delivered resilient economic growth through 2024. Against this mixed macroeconomic backdrop, platinum’s demand resilience could be, and often is, underappreciated, and we would note that demand growth rates would likely be higher in a normalised economic environment.

Looking at the automotive sector, platinum demand is forecast to increase by 1% year-on-year in 2024, reaching its highest level since 2017. Compared to expectations at the start of 2024, prevailing economic conditions have led to weaker heavy-duty vehicle

demand, however that has been offset by trends in the light-duty segment. Economic considerations may be magnifying battery electric vehicle (BEV) affordability barriers (alongside other concerns). Whilst BEV demand is still growing, market share gains have witnessed a marked slowdown. The BEV light-duty market share is now forecast to increase from 11% in 2023 to 13% in 2024 (compared to an initial 15% market share forecast). Notably, the weakness in BEV sales is not a function of broad market weakness but rather consumers turning to more affordable combustion engine or hybrid drivetrain options. The narrative of higher-for-longer PGM automotive demand is certainly entrenching itself within investor's considerations; each 1% change in light-vehicle market share for ICE-based drivetrains represents around 21 koz of platinum demand. Elsewhere, prior economic decisions to substitute platinum for palladium continue supporting incremental platinum demand (2024: 752 koz) despite the metals reaching price parity during Q1 2024. These designs (with higher platinum loadings) will likely be revisited only after at the end of production run of the current models.

Although its importance to the overall picture has shrunk over the past ten years, platinum jewellery still represents around 25% of total demand, despite which it is often underappreciated as a demand source. There are tentative signs that the market may be passing through this trough. Global platinum jewellery demand is forecast to increase by 7% year-on-year to 1,994 koz in 2024, which represents a five-year high, and is on the cusp of again breaching two-million ounces annually; jewellery's highwater-mark was three-million ounces in 2014. While India will be the largest incremental driver of jewellery demand growth, it is notable that all geographies are expected to experience demand growth in 2024, with a key theme being platinum's relative cost attractiveness compared to gold jewellery.

When considering industrial platinum demand, the key theme is again the reiteration of platinum's surprising demand resilience. Total industrial platinum demand is forecast to increase by a modest 1% year-on-year in 2024. Chemical demand (-244 koz year-on-year) is normalising after five years of aggressive capacity expansions in China, however, platinum's use in many sub-sectors is more than offsetting the slowdown in the chemical plant start-ups. Total industrial platinum demand remains 2% above the trailing five-year average and 17% higher than the pre-COVID five-year average.

Investment demand is an area that surprised to the upside in Q2, with exceptional ETF inflows totalling 437 koz over April and May. Although we have seen some unwinding of ETF positions over Q3 to-date, at the time of writing ETF holdings are up ~290 koz year-to-date (+9.6%). We do not have specific insights into what has driven these investment flows, but it seems likely that there has been an element of profit taking from gold (which has performed exceptionally strongly) and a rotation into a similar underlying asset with attractive underlying fundamentals. In terms of bar and coin demand, ongoing weakness in demand in Japan, where the forecast is for net disposals) and to a lesser extent North America, is being more than offset by continued growth in Chinese demand. This is in no large part due to the efforts of WPIC and our product partners in rapidly growing a new market. For the first time, the *Platinum Quarterly* dataset includes the sale of bars of 500g and larger in China; this is not 'new demand' per se, it is just moving from sitting within above ground stocks to above the line. However, the pace of growth in demand for these products is notable (+49% and +40% year-on-year in 2023 and 2024).

Turning to the other aspect of platinum's investment case, which is the uncertain supply outlook. There are two components to platinum supply uncertainty, namely, downside risks to mine supply and the timing of any recovery to recycling. Platinum miners have implemented restructuring efforts and capital deferral programs to ease margin pressure stemming from low PGM basket prices. Based on public announcements, we estimate that South Africa's PGM mining industry will have reduced its headcount by around 10,000 employees in 2024. This 6% headcount reduction is higher than our forecast that South African platinum production declines by 2% year-on-year in 2024. Although South African miners have met production guidance so far through 2024, when a shrinking workforce is considered in conjunction with lower capital expenditure, it increases the risk of production erosion in the future. It is worth noting that South African platinum production has declined by 1.7% CAGR since 2006 which is illustrative of the challenges facing primary platinum supply. Looking at recycling, as suggested above, the recovery appears to be a timing issue as challenges such as spent catalyst supply constraints, hoarding and regulatory hurdles are likely to be resolved. However, if these challenges are addressed, recycled platinum supply could to some extent help ease projected market deficits.

Overall for platinum, the market's sentiment toward attractive fundamentals appears to be gradually improving, although this has not been matched by a platinum price reaction. However, with time, market deficits stemming from higher-for-longer automotive demand and ongoing supply challenges will mean that above ground stocks are the supply of last resort. The depletion of above-ground stocks (-37% between 2022 to 2024) should tighten physical markets and will result in platinum's strong underlying fundamentals playing a more prominent role in establishing its market value.

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, our partners are operating in an environment of reduced net demand for gold as investors selling back gold products are meeting a large portion of gross demand. In addition, the rise in the gold price has increased funding costs and stretched retailer balance sheets. Consequently, bar and coin dealers are showing growing interest in platinum which has lower stock holding costs and provides investors selling back gold with an interesting precious metal alternative. Our efforts to help our partners increase their clients' insights into the investment case for platinum have been helpful in this regard. We have further increased partner salesforce and client training programmes, to enhance the awareness and understanding of platinum for gold investors.

In China, we observed strong demand for platinum investment during the second quarter, with 58 koz ounces in sales for year-over-year growth of over 100%. One of our partners introduced large-sized investment-grade platinum jewellery (Pt 9995), expanding strategically into investment products with a jewellery aesthetic. We helped our partners diversify their platinum product ranges with innovative designs, making them more competitive in the market and more appealing to consumers. We ran a successful marketing campaign with China Gold Coin Group for its 3-gram Platinum Panda for the third year in a row, which strengthened our partnership and resulted in a wider range of platinum offerings. The annual Shanghai Platinum Week in July was a tremendous success, attracting over 500 delegates from more than 300 organizations and significantly impacting the industry. Astonishingly, the livestream of the first day of the conference was watched by almost 500,000 people online!

We also organized a PGM session in collaboration with SBMA during the 7th Asia Pacific Precious Metal Conference, drawing over 500 delegates, which increased awareness of platinum and our visibility in the region. Our partner, Silver Bullion in Singapore, experienced growth in platinum sales despite facing challenges in the supply chain.

In the Japanese market, platinum price movements affected investor sentiment. There was a net outflow observed in Q2, coinciding with an increase in platinum prices in yen terms. However, a slight price downturn in June led to a noticeable rebound in sales, indicating that the 'buy-low and sell high' strategy is still strongly in place among investors in Japan. Additionally, we sponsored Rakuten's 25th anniversary event in July and delivered keynote speeches jointly with JBMA, which attracted more than 7,000 investors from across Japan.

Trevor Raymond, CEO

Contents

Foreword	1	Expanded Tables	18
Summary Table	6	Glossary of Terms	23
Second Quarter 2024 Review	7	Copyright and Disclaimer	27
2024 Outlook	12		

PLATINUM QUARTERLY Q2 2024

Table 1: Supply, demand and above ground stock summary

	2020	2021	2022	2023	2024f	2023/2022 Growth %	2024f/2023 Growth %	Q1 2024	Q2 2024
Platinum Supply-demand Balance (koz)									
SUPPLY									
Refined Production	4,988	6,295	5,520	5,604	5,508	2%	-2%	1,224	1,540
South Africa	3,298	4,678	3,915	3,957	3,883	1%	-2%	794	1,126
Zimbabwe	448	485	480	507	504	6%	-1%	132	125
North America	337	273	263	275	273	5%	-1%	71	61
Russia	704	652	663	674	646	2%	-4%	178	181
Other	200	206	200	190	203	-5%	7%	48	48
Increase (-)/Decrease (+) in Producer Inventory	-84	-93	+43	+11	+0	-74%	-100%	+9	+30
Total Mining Supply	4,904	6,202	5,563	5,615	5,508	1%	-2%	1,233	1,570
Recycling	1,996	2,107	1,764	1,545	1,581	-12%	2%	377	388
Autocatalyst	1,508	1,619	1,323	1,144	1,161	-14%	2%	275	297
Jewellery	422	422	372	331	344	-11%	4%	85	72
Industrial	66	67	69	71	76	3%	8%	17	19
Total Supply	6,900	8,309	7,327	7,160	7,089	-2%	-1%	1,610	1,958
DEMAND									
Automotive	2,275	2,492	2,769	3,215	3,237	16%	1%	822	820
Autocatalyst	2,275	2,492	2,769	3,215	3,237	16%	1%	822	820
Non-road	†	†	†	†	†	N/A	N/A	†	†
Jewellery	1,830	1,953	1,899	1,868	1,994	-2%	7%	484	501
Industrial	2,102	2,532	2,315	2,356	2,369	2%	1%	627	638
Chemical	633	663	673	786	542	17%	-31%	145	122
Petroleum	109	169	193	158	153	-18%	-3%	38	38
Electrical	130	135	106	89	90	-16%	1%	22	23
Glass	473	753	505	432	635	-14%	47%	195	216
Medical	256	267	278	292	303	5%	4%	72	77
Hydrogen Stationary and Other	28	17	12	29	64	133%	123%	12	14
Other	473	528	548	571	582	4%	2%	142	148
Investment	1,582	-3	-516	451	517	N/A	15%	117	462
Change in Bars, Coins	593	349	259	323	180	25%	-44%	64	17
China Bars ≥ 500g	23	27	90	134	188	49%	40%	53	41
Change in ETF Holdings	507	-241	-558	-20	150	N/A	N/A	11	444
Change in Stocks Held by Exchanges	458	-139	-307	14	0	N/A	-100%	-11	-40
Total Demand	7,789	6,972	6,467	7,892	8,118	22%	3%	2,051	2,421
Balance	-888	1,337	860	-731	-1,028	N/A	N/A	-441	-464
Above Ground Stocks	2,569**	3,906	4,765	4,034	3,006	-15%	-25%		

Source: Metals Focus 2020 - 2024.

Notes:

- **Above Ground Stocks 3,650 koz as of 31 December 2018 (Metals Focus).
- † Non-road automotive demand is included in autocatalyst demand.
- All estimates are based on the latest available information, but they are subject to revision in subsequent quarterly reports.
- The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q1 2021 are contained in previously published PQs which are freely available on the WPIC website.
- Quarterly estimates from Q2 2021 and half-yearly estimates from H2 2020 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 SECOND QUARTER PLATINUM MARKET REVIEW

The platinum market fell into a significant deficit in Q2'24. Investors increased their ETF holdings as soaring gold prices made platinum appear undervalued, especially given its strong long-term fundamentals. Investment demand jumped to its highest level since the peak of the pandemic in Q3'20, while quarterly jewellery demand breached 500 koz for the first time since Q4'21. Meanwhile, automotive demand and industrial demand remained steady. These factors resulted in total demand of 2,421 koz during Q2.24. Despite a strong quarter for mine production and stabilising secondary supply, at 1,958 koz global supply fell well short of demand, resulting in a 464 koz deficit.

Chart 1: Supply-demand balance, koz, Q2 2024



Supply

Refined mine supply experienced a 4% year-on-year increase to 1,540 koz, due to growth from South Africa, which offset declines from other regions. South Africa's output rose by 7% year-on-year to 1,126 koz, underpinned by higher refining volumes from Anglo American Platinum (Amplats) and Impala Platinum (Implats).

Amplats' production benefited from the processing of semi-finished inventory, with refined output surpassing underlying mine production. As part of its cost-saving initiatives, Amplats placed its Mortimer smelter on care and maintenance in April, leaving three smelters in operation. However, the company anticipates that the reconfiguration of its processing operations will have minimal impact on overall production. Implats' output was affected by the scheduled rebuild of Furnace No. 5 at the Impala Rustenburg facility, which was recommissioned in April. However, the absence of load curtailment, which had impacted Q2'23, resulted in an increase in output.

Zimbabwe's output remained stable year-on-year at 125 koz, as a decline at Zimplats was offset by growth at Unki. In Russia, production fell by 5% year-on-year to 181 koz, primarily due to lower platinum content in Nor Nickel's PGM ore sources. The company is currently undertaking maintenance on Furnace # 2 at the Nadezhda Metallurgical Plant, with the impact on platinum production expected to be reflected in the second half of the year.

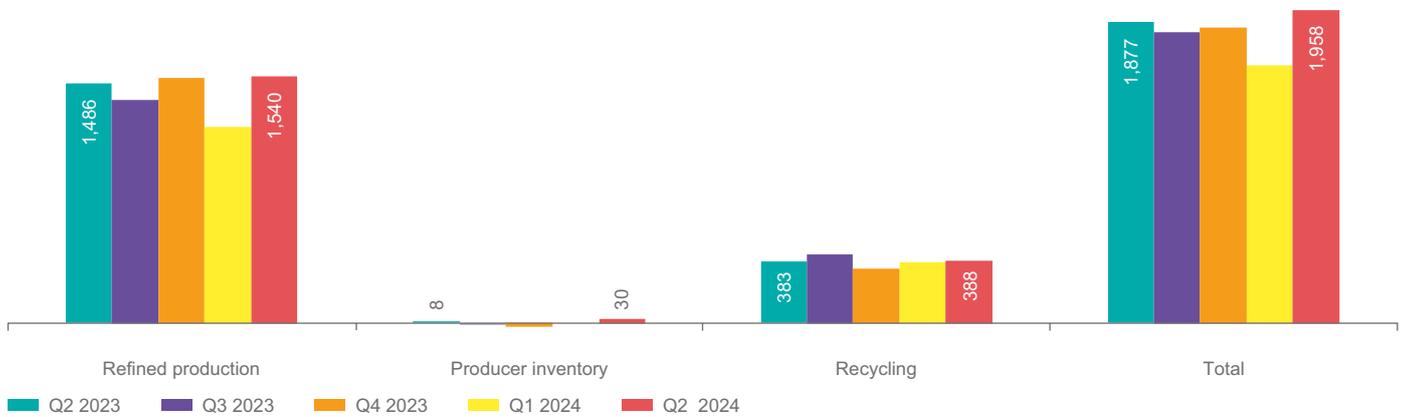
North American production declined by 17% year-on-year to 61 koz. This was primarily due to reduced output from Vale's by-product nickel mining, which in turn stemmed from planned maintenance of processing infrastructure. Sibanye-Stillwater announced on 11th July that a cyber-attack had impacted its global IT systems, delaying the release of operating results. While some disruption to US PGM operations was reported, the full impact on production volumes remains undetermined.

Recycling

During Q2'24, global recycling remained broadly steady compared to Q2'23, rising by just 1% year-on-year (+4 koz). This was driven by a slight increase in spent autocatalyst recycling, which helped offset declines in both jewellery and electronic scrap. With stable-to-marginal gains in collections across most regions and a gradual return to pre-government intervention levels in China, Q2'24 saw platinum supply from end-of-life vehicles increase by 2% year-on-year (+7 koz). In the US, high interest rates have encouraged consumers to hold on to their vehicles for longer, limiting the flow of older cars to scrapyards. Additionally, a cyber-attack on widely used sales and inventory management software in the US in June further disrupted the vehicle pipeline, affecting both new and

used car sales. The jewellery segment experienced a 5% decline in supply during Q2'24 (-4 koz), primarily due to reduced reselling activity in Japan. In contrast, Chinese platinum jewellery scrap remained stable year-on-year in Q2'24 although it was significantly lower than in Q1'24, when platinum was scrapped to release cash to bolster gold jewellery stocks during the Chinese New Year. Despite continued price weakness, an increase in product exchange activities (where heavier jewellery pieces are sold back in exchange for lighter, premium designs) provided some support to scrap levels. In the industrial waste segment, due to the upgrade of storage facilities by data centres in response to demands created by large language models (LLM), the recovery of platinum from hard disk drives and host equipment has increased.

Chart 2: Platinum supply, koz

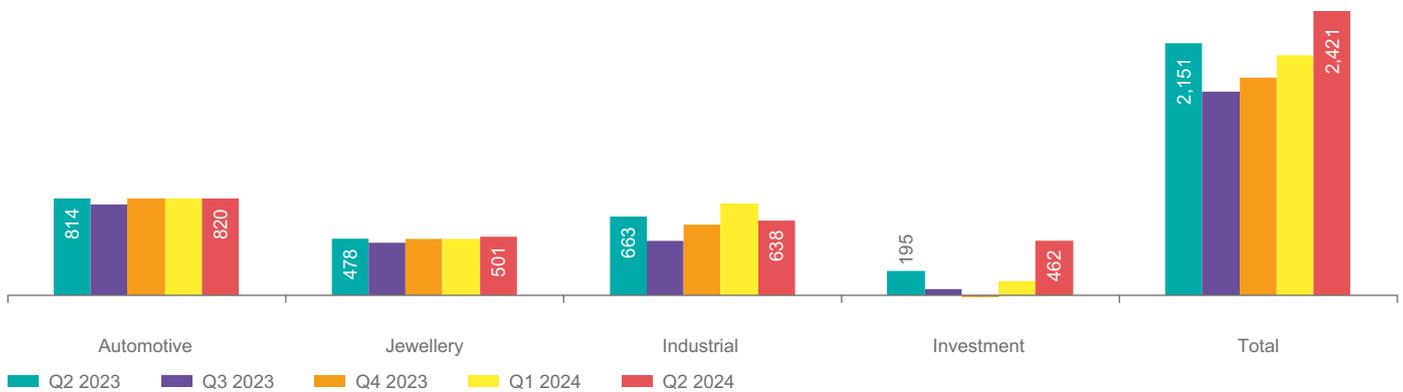


Source: Metals Focus

Demand

Global demand jumped 13% year-on-year in Q2'24 to 2,421 koz on the back of significantly higher ETF inflows as well as strong growth in large bars in China, a new segment now reflected from Q1'19. Meanwhile, all other demand categories also grew year-on-year, albeit more modestly compared to the investment category.

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

Global automotive platinum demand in Q2'24 grew by 1% year-on-year (+6 koz). Although multiple factors influence the consumption in the automotive sector, the increase was primarily driven by a higher share of hybrids in the light duty vehicle (LDV) powertrain mix and modest improvement in heavy duty vehicle (HDV) production.

In Europe, automotive platinum demand declined 12% year-on-year as the region grappled with high vehicle prices, which dampened new vehicle purchases and contributed to a decrease in passenger vehicle production. Additionally, high interest rates, rising energy costs and a shortage of drivers led to lower truck production in the region.

Despite nearly unchanged fossil-fuelled LDV production compared to Q2'23 and a 6% decline in HDV production, North American automotive demand for platinum increased during the quarter. This was primarily due to a 22% rise in hybrid vehicle production, which offset the decline in ICE vehicle production driven by the often higher loadings in hybrid vehicle systems. The adoption of trimetallic catalysts with a higher platinum ratio also contributed to the increase in demand. Similarly, in Japan, increased production of hybrids and fuel cell vehicles during Q2'24 supported higher platinum requirements, despite a decrease in HDV production.

China experienced double-digit growth in automotive demand for platinum in Q2'24. This was largely due to a scrappage scheme aimed at reducing pollution and promoting green consumption which benefited vehicle demand across all powertrains. More specifically, production of Extended Range Electric Vehicles (EREV) doubled, while that of other hybrid variants increased by as much as 73% year-on-year. HDV production also rose, with overall production up by 12%, although platinum-favouring diesel trucks and buses only saw a 4% increase.

In the Rest of the World, BEV production declined year-on-year in this quarter, but hybrid vehicle production increased by 31%, nearly offsetting the 2% contraction in ICE vehicle production. As a result, platinum demand rose, despite overall vehicle production remaining largely flat.

Jewellery demand

Global jewellery demand increased by 5% year-on-year to 501 koz in Q2'24 (+23 koz). European fabrication in Q2'24 rose 7% year-on-year. The very top-end brands continued to show gains while entry point ones saw losses; however, the former's skew to platinum meant overall growth. The mass market / bridal segment also grew thanks to favourable price differentials with gold and despite a soft overall jewellery market (typified by a 3% year-on-year decline for European gold jewellery consumption).

North American fabrication slipped 1% year-on-year in Q2'24 as a result of a high base and weak engagement numbers and despite favourable price differentials. However, sales to the final consumer inched up, with the difference to fabrication and a weaker import performance largely explained by retailer caution over building stocks.

In Japan the platinum jewellery market continues to grow, albeit at a slower pace (+8% year-on-year), partly due to a higher base from Q2'23, which was relatively strong. Growth is predominantly driven by daily wear jewellery, while the bridal segment continues to underperform with little sign of recovery. High-end jewellery performed well, supported by significant wealth in Japan. However, during our recent market visit, we observed that converting interest into purchases has become more challenging compared to a few months ago. This is attributed to concerns about the Japanese economy, inflation, and the yen's value, although these observations were made prior to the recent interest rate adjustment which sparked a wider economic response.

In China, platinum jewellery fabrication saw a turnaround, posting 5% year-on-year growth in Q2'24. April contributed most of the gains, while May and June recorded month-on-month declines. Since the consumer sentiment remained weak, the recovery was mainly fuelled by some retailers and showroom inventory restructuring (shifting some gold jewellery to platinum jewellery). While the gold price reached new highs, the weakness in platinum prices continued in April. This left the market seeing the white metal as undervalued as the spread between the two metals hit a historical high. This and rising financing costs drove a few jewellers to shift some gold inventory to platinum stocks.

Indian platinum jewellery fabrication jumped by 15% year-on-year in Q2'24 achieving the highest second-quarter figure in Metals Focus' series, starting in 2019. The growth was driven by the continued strength in exports, especially to the US, the UK and the UAE, with an almost fivefold increase compared to the same period last year. Furthermore, fabrication was also helped by the continued addition of new stores by organised retailers and a growing number of existing stores displaying platinum jewellery.

On the other hand, consumption in India declined by 12% year-on-year due to weak domestic sales. Discussions with fabricators during the recent PGI buyer-seller meet (BSM) and the India International Jewellery Show (IIJS) revealed demand remained subdued in the domestic market due to volatility in gold prices, which hampered footfall into jewellery showrooms. However, with the recent import duty cut for gold, silver and platinum, which led to a correction in domestic prices, a strong pickup is expected in Q3'24.

Industrial demand

Industrial demand shed 25 koz year-on-year in Q2'24 as glass capacity additions were more than offset by a lack of chemical plant expansions seen in previous quarters.

Chemical

Platinum chemical offtake nearly halved year-on-year (-111 koz) to 122 koz in Q2'24. On a quarter-on-quarter basis, volumes were also lower, albeit by a more restrained amount (-24 koz). This decline was almost entirely down to lower demand in China. Without new paraxylene (PX) and propane dehydrogenation (PDH) capacity additions in Q2'24, the use of platinum in the Chinese petrochemical industry was led by top-up demand during the maintenance change-outs of existing plants. By contrast, platinum demand from the silicone industry edged slightly higher year-on-year, with small gains in most end-use applications, such as home and personal care and consumer electronics. Nitric acid offtake remained broadly steady compared with the previous quarter.

Petroleum

Platinum demand remained steady quarter-on-quarter at 38 koz. On a year-on-year basis, volumes were down by a modest 5%. Despite an extension of voluntary production cuts by OPEC+ countries, global oil supply continued to strengthen, led by the US. This also explains why North America is the only region that posted higher platinum demand in Q2'24. Excluding North America, platinum offtake was lower across major markets, particularly in Europe and China where weak oil demand squeezed refinery margins and led to output cuts. In China, the slower expansion of petrochemical capacities also affected platinum demand, as many of the newly built petrochemical plants are integrated with crude oil refining units.

Medical

In Q2'24, platinum medical demand rose 7% (+5 koz) year-on-year to 77 koz. The use of platinum-containing medical devices and cancer therapies continues to grow, as access to healthcare improves and the global population ages, particularly as healthcare spending has increased significantly post-pandemic.

Glass

Platinum glass demand was up 48% year-on-year to 216 koz in Q2'24. Significant Chinese LCD capacity additions in Guangdong and Shaanxi provinces in the second quarter drove the increase. Conversely, fibreglass has seen a slowdown in Chinese, North American and Rest of the World capacity growth.

Electrical

Q2'24 demand remained flat year-on-year. Storage, analysis and training models that are essential for developing applications related to artificial intelligence (AI) led to an increased need for high-capacity drives within edge computing and near-line storage sectors. Growing demand for mass capacity products offset the decline in the legacy HDD applications which were encroached on by lower cost SSD solutions. Concurrently, the semiconductor industry's production capacity expansion, coupled with rising demand for platinum alloy targets used in chip manufacturing, further protected demand.

Hydrogen Stationary and Other

Demand for platinum, particularly in the proton exchange membrane (PEM) water electrolysis and stationary applications, grew year-on-year to 14 koz. This was substantially higher than in Q2'23 but remains a small contributor to overall platinum demand.

Other

Global other industrial demand grew by 2% (+3 koz) to 148 koz in Q2'24. In the automotive field, the market's renewed preference for hybrid vehicles has led to an increase in demand for sparkplugs and sensors. In addition, the steady expansion in the aftermarket sector due to aging vehicles in operation, further supported offtake.

Investment demand

Before discussing the individual components of investment demand, it is worth noting a change in the definition and scope of the investment figures presented in the *Platinum Quarterly*. From this edition of the *Platinum Quarterly* report onwards, in addition to bar & coin, ETFs and exchange warehouse stocks, the investment figures will also include purchases of larger bullion bars in China. Previously these have been captured by the balance and effectively treated as part of the inventory build/release in the country. Access to more granular data in the Chinese market makes it possible to expand the scope of the investment estimate to include such purchases.

During Q2'24, global bar and coin investment fell by 63% year-on-year (-29 koz) to just 17 koz, its lowest since Q4'22. This was driven by a return to net disinvestment in Japan for the first time since Q2'23 and sharply lower North American buying. Together, these offset firmer demand in China, although this was flattered by a weak Q2'23.

Retail activity in the US remained subdued, with an estimated 37% decline to its lowest quarterly total since Q2'20. Broadly, the Q1'24 trends continued to weigh on the market throughout April to June, with heightened liquidations dominating the gold market, combined with weak buying activity for gold, silver and platinum. Although there was little product melt, dealers remained cautious about building stock. The market also had to contend with the ongoing absence of a platinum Eagle bullion coin, the loss of which was only partially offset by other suppliers.

In Europe, retail investment edged higher, up by 15% year-on-year and 4% quarter-on-quarter to 8 koz. Much of this increase was led by bargain hunting, as some investors viewed platinum as increasingly undervalued in the wake of its widening discount to gold. That said, volumes in absolute terms remained subdued, as crisis fatigue and the continued cost-of-living issues continued to weigh on investor appetite for physical precious metals across the board.

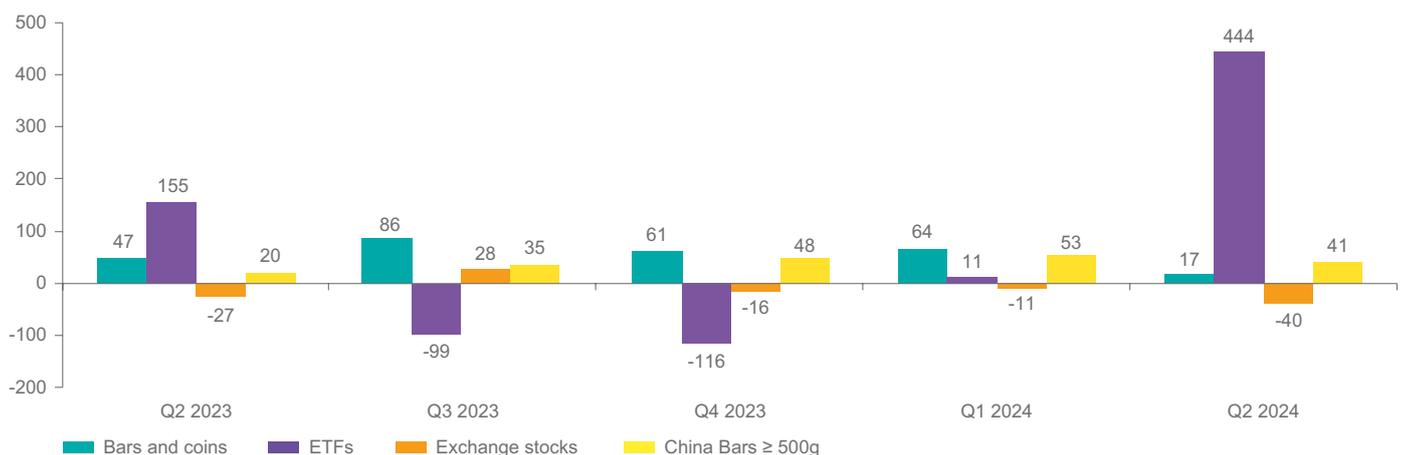
Japan shifted to net disinvestment in Q2'24, as investors sold into the April/May rally in the yen-denominated platinum price. Subdued gross buying throughout the period also contributed to the overall net negative figure. Platinum continues to struggle to get investor attention in Japan, as the break-neck rally in local gold prices seems to dominate the conversation when it comes to precious metals investments.

In China, retail investment enjoyed a 121% y/y rebound in Q2'24. In addition to the low base in Q2'23, the fact that investors saw platinum prices as undervalued (as the spread between gold and platinum hit a historic high) drove up demand in April. After that, demand cooled in May and June. High net worth purchases of larger bullion bars, meanwhile, were twice their Q2'23 levels at 41 koz, reflecting the secular growth of this market, which is still developing.

Holdings in platinum exchange-traded funds (ETFs) grew by 444 koz in Q2'24, the highest quarterly inflow since Q3'20, primarily due to a rise in European holdings of 427 koz. Platinum's relative underperformance versus gold (which reached record prices during the period), coupled with improving investor expectations for platinum owing to its strengthening fundamentals, resulted in this spike in investment. ETF activity in other regions remained subdued during the quarter.

NYMEX and TOCOM warehouse inventories declined 40 koz in Q2'24 to 174 koz, their lowest level since November 2022.

Chart 4: Platinum Investment, koz

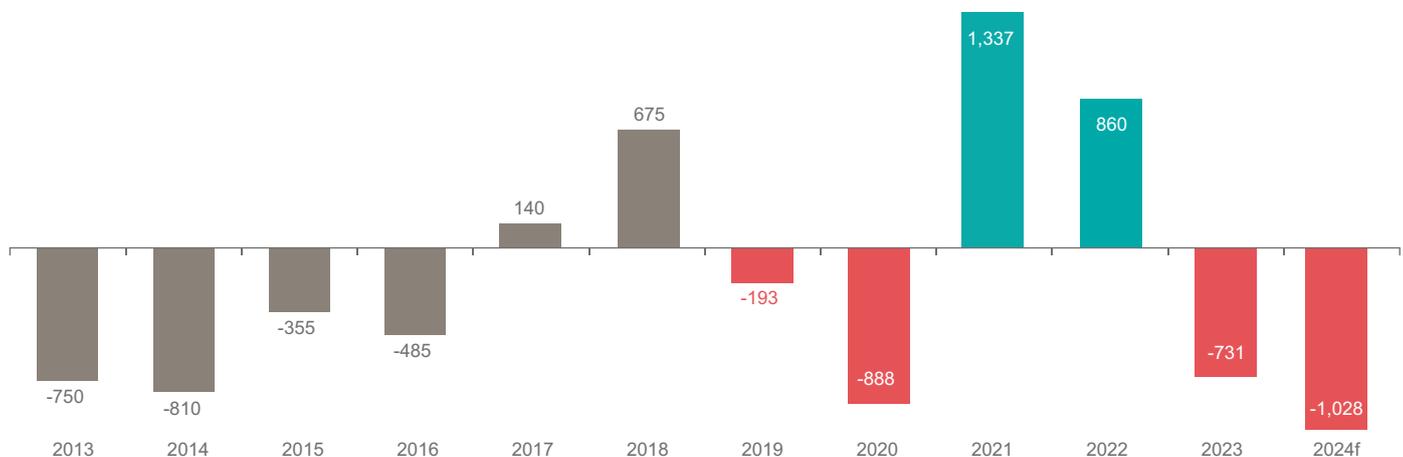


Source: Metals Focus

2024 OUTLOOK

The persistence of higher-for-longer interest rates, ongoing political uncertainty and ambiguity in regulation aimed at finding the most sustainable and economically viable pathways for energy transition are impacting both consumer sentiment and commodity markets. While the PGM basket price has settled somewhat, this low-price environment will continue to weigh on the mining industry. For the full year, we expect a 2% contraction in mine supply which will be partially offset by a weak but gradually recovering recycling sector. Global supply is expected to reach 7,089 koz, down 1% year-on-year (-71 koz). Platinum demand is set to grow by 3% year-on-year (+226 koz) to 8,118 koz, as we now expect ETF holdings to remain net positive while Chinese large bar sales will grow.

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



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

Supply

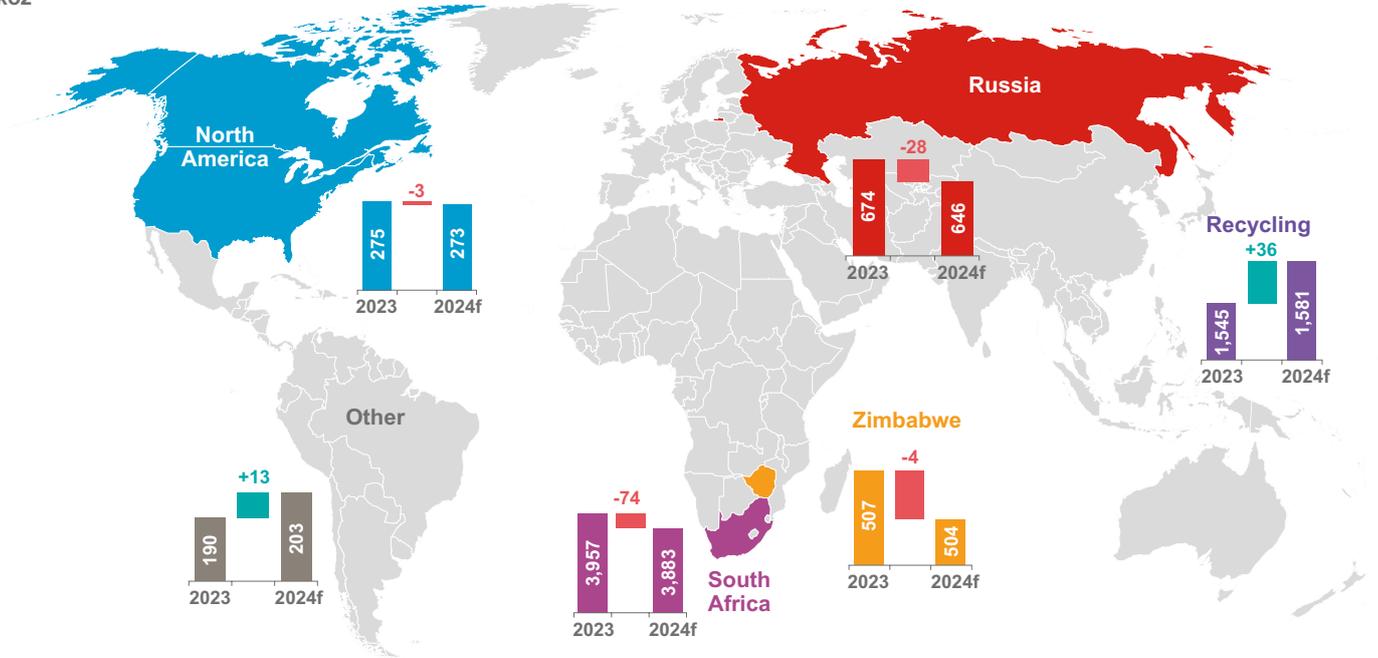
Total mined platinum supply is forecast to decrease 2% year-on-year to 5,508 koz, primarily due to anticipated declines in South Africa and Russia. South African supply is expected to fall by 2% to 3,883 koz, as cost-driven restructuring efforts offset growth from project ramp-ups.

The drop in PGM prices has exerted significant margin pressure across much of the South African cost curve. In response, producers have announced a series of cost-cutting measures for 2024, including workforce reductions, deferred project development, reduced capital expenditure and infrastructure closures. While the full impact of these actions on production volumes is likely to materialise post-2024, the South African supply forecast for this year is already approximately 0.5 Moz lower than pre-COVID levels. The marginal profitability of several operations at current PGM prices has introduced heightened price elasticity, with further declines in the basket price potentially prompting additional restructuring. This thereby poses downside risks to the 2024 forecast.

The major producers have announced plans to reduce their workforce by approximately 9,000 positions. The majority of these job reductions have already been implemented, with only minimal impact on 2024 production expected. South African platinum mining employment had increased over the past three years, peaking in 2023. The job cuts planned for 2024 are likely to return employee numbers closer to pre-COVID levels, with an anticipated increase in labour productivity expected to mitigate much of the impact on production volumes. Thus far in 2024, South African production has avoided significant large-scale disruptions. At the time of writing, all producers have maintained their 2024 production guidance, despite some unprotected strikes at Western Limb operations, which were limited in scope and quickly resolved.

Russian supply has outperformed expectations so far in 2024, with Nornickel's production on track to exceed guidance. Ongoing maintenance of Furnace # 2 at the Nadezhda Metallurgical Plant is expected to impact production in the second half of the year. However, the disruption may be less severe than anticipated, introducing upside risk to the forecast 646 koz output, which represents a 4% year-on-year decline.

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



Source: Metals Focus

North American supply is expected to remain flat, with modest growth anticipated from Sibanye-Stillwater’s US operations as it recovers from the 2023 shaft incident. This growth is expected to be offset by a decrease in by-product output from Canadian nickel mining. Output from Zimbabwe is forecast to remain stable this year.

Recycling

By the end of the first half of 2024, global recycling is estimated to have reached 765 koz, approximately 2% below H1’23. However, for the full year, recycling is projected to reach 1,581 koz, marking a 2% year-on-year increase. Specifically, for the spent autocatalyst market, after two years of steep declines, recycling this year appears to be stabilising slightly. Several factors that previously hindered the flow of materials from consumers to scrapyards and from scrapyards to refiners have improved or are dissipating.

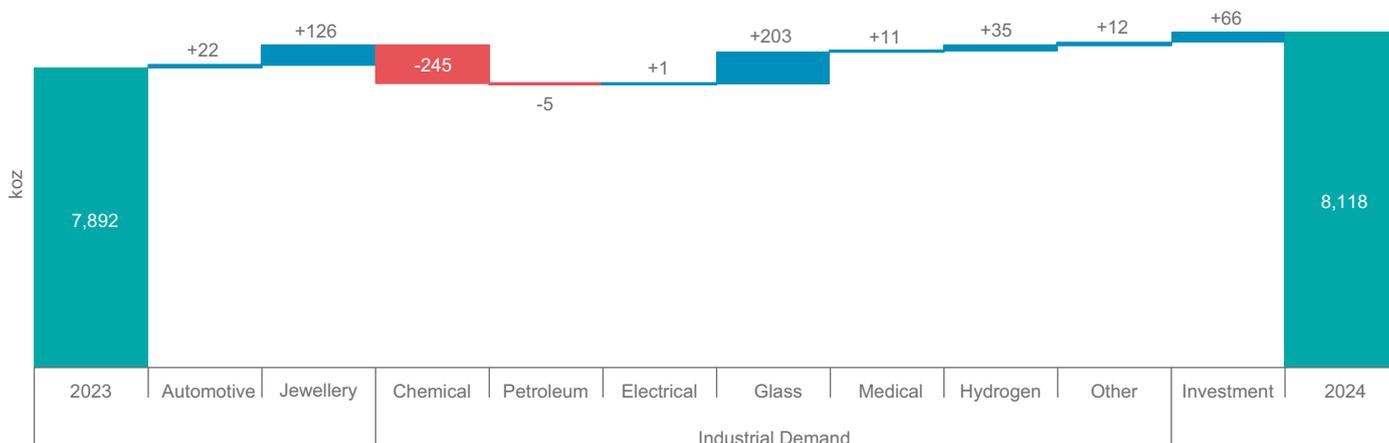
New vehicle inventory levels have increased, enabling consumers to replace their vehicles with ease and minimal wait times. Vehicle prices are decreasing and there is an expectation that interest rates, and consequently lease rates, will also decline. This should stimulate higher volumes of end-of-life vehicles entering the recycling pipeline. Additionally, since the start of this year, the price of a 3E basket of 1 gram of platinum, palladium, and rhodium has closed within a very narrow band (\$25), leading to less hoarding as hopes for higher prices diminish.

Jewellery scrap is also expected to contribute to the overall growth, with a projected 4% rebound in 2024 versus 2023, driven primarily by a modest recovery in jewellery demand which stimulates selling back of older pieces. The upgrade in data storage facilities to accommodate the requirements of AI could result in an 8% increase in platinum supply from e-waste this year.

Demand

Total platinum demand is expected to rise by 3% to 8,118 koz in 2024. This increase can be attributed mostly to the positive swing in ETF investment. Jewellery demand is also expected to grow while industrial and automotive demand will remain steady.

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 up. Since the Q1'24 *Platinum Quarterly*, global vehicle production forecast has been revised from 91.9 to 91.1 million units. However, this adjustment has had minimal impact on global automotive platinum demand, which is still expected to increase by 1% year-on-year to an estimated 3,237 koz. The revision stems from shifts in strategic direction by several OEMs, who are now focusing on introducing greater flexibility in their powertrain offerings. This includes the expansion of hybrid models and the decision to maintain production of some ICE and hybrid vehicle models for a longer period. Global HDV production is anticipated to decline by 1% in 2024, driven by reductions in truck and bus production across most regions, with the exception of China.

In Europe, platinum demand is forecast to decline by 10% year-on-year. Both LDV and HDV production are expected to be lower than in 2023. The high-interest rate environment has significantly impacted vehicle financing, particularly leases, which has dampened the appetite for new vehicles. Additionally, the decline in the production of diesel vehicles, which typically require higher platinum loadings, has further weighed on demand.

In North America, despite a strong labour market, the persistence of high interest rates has slowed the pace of growth in new vehicle purchases, similar to the trend in Europe. This has led to growing inventory levels, particularly of BEVs, which continue to be less popular with consumers when compared to hybrids and ICE vehicles. Consumer preferences have prompted OEMs to adjust their strategies, with some delaying their ambitious targets for exclusively hybrid and BEV sales by 2025 to better align with government proposals. Despite a 4% decline in ICE production, the 26% increase in hybrid production, combined with the continued use of platinum-rich trimetal catalysts in popular pickup models, is expected to drive a 6% increase in platinum demand in North America this year.

Despite an overall decline in vehicle production, Japan is expected to see a 5% increase in platinum demand. This growth is driven by the increasing share of hybrids (often with higher comparative Platinum Group Metals (PGM) loadings), which now account for 32% of total vehicle production. The growth in China's platinum demand can be largely attributed to the government's scrappage scheme, which encourages the disposal of older vehicles). Consequently, hybrid vehicle production is estimated to jump by 41% in 2024, while pure ICE production is expected to decline by 11%.

Vehicle production in the Rest of the World category is expected to remain flat year-on-year. However, due to increased hybridisation, platinum demand is projected to grow by 4% this year.

Globally, models fitted with trimetal catalysts are becoming increasingly popular. We estimate that platinum for palladium substitution in these models will continue to increase this year, reaching 752 koz.

Jewellery demand

Global jewellery demand is expected to rise by 7% (+126 koz) year-on-year to 1,994 koz in 2024.

European offtake is forecast to rise at a slightly faster rate than once expected, with growth of 4% to a record high. The luxury brands are confident of full-year gains (especially in watches), while the bridal / mass market sector has responded well to wider price differentials to white gold.

Demand in North America this year is forecast to rise by 3% to a record high through wider price differentials with gold, the hopes for rebirth of the engagement market, retailer stock caution fading (so resulting in firmer inventory build) and still falling diamond prices. This is despite uncertainty regarding the presidential election, recession threats and expenditure normalisation.

In Japan we are optimistic that the momentum we have seen during the first six months of the year will continue over the rest of 2024. In particular, we believe that the exceptionally high gold price will incentivise the supply chain to push platinum designs more aggressively, as they increasingly offer better margins in the current environment. With this in mind, we forecast an 8% increase for the year overall, to 365koz, the highest since 2019.

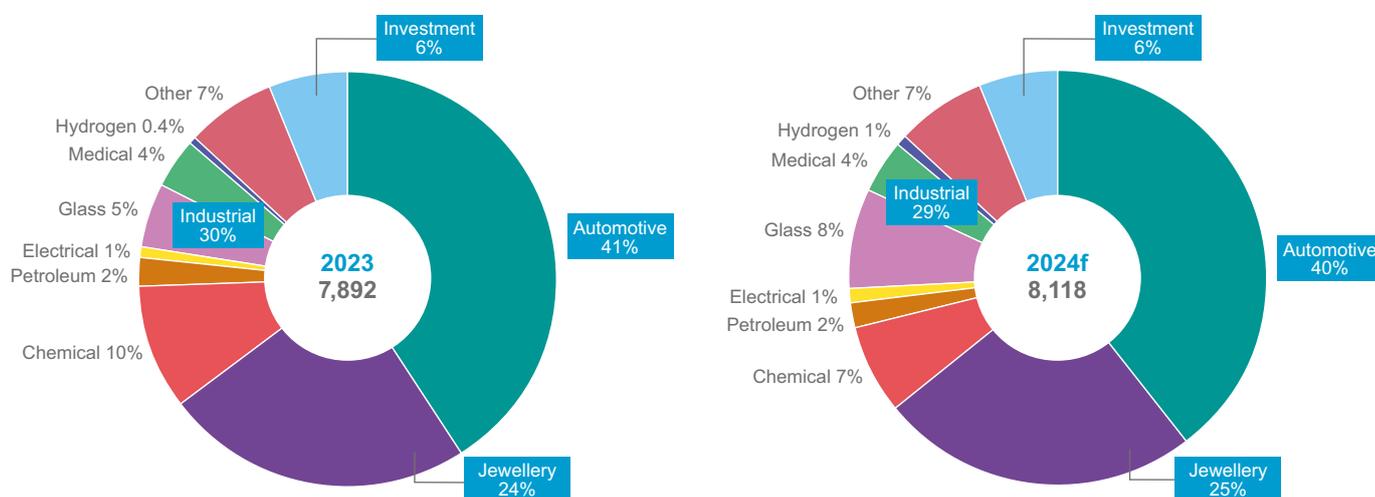
We expect platinum jewellery fabrication in China to grow by a modest 3% in 2024, primarily due to easing competition from the gold jewellery market and the supply chain's stock replenishment of platinum jewellery. In addition, healthy demand for men's jewellery and retailer promotions via live broadcasting platforms should support the total market.

For the full-year 2024, we expect Indian jewellery fabrication activity to remain strong with growth of 28% year-on-year. This will be the fourth consecutive year of record highs. This performance will largely be driven by growing exports, the aggressive expansion of retail stores and a revival in domestic sales. The reduction in domestic platinum prices due to the cut in import duty from 15.4% to 6.4% has also helped improve sentiment. This, combined with the ongoing popularity of men's jewellery and a growing number of existing stores displaying platinum jewellery (including bimetal jewellery which is displayed in the gold section), is likely to further boost demand. Additionally, with mid-sized jewellers increasingly embracing platinum jewellery to boost their profits with high-margin offerings, this is likely to attract a new set of customers which will help generate incremental demand.

Industrial demand

Industrial demand is forecast to reach 2,369 koz in 2024. Although still at historically elevated levels, this represents a slowdown in growth from 2023's +2% to just +0.5% this year, largely due to fewer chemical plants being brought online this year. Demand from stationary hydrogen applications and other areas is expected to improve, as the production of sensors and spark plugs get a second wind due to near-term BEV production faltering, benefiting hybrid and ICE vehicle production and parts demand.

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



Source: Metals Focus

Glass

We forecast a 47% increase year-on-year for platinum glass demand to 635 koz, its second highest level in our series (the peak being 753 koz in 2021). The bulk of this demand and the key driver for the increase is growth of Chinese LCD capacity in Guangdong, Sichuan and Shaanxi provinces. This is despite a return of the decommissioning of tanks in Japan to cut glass production costs as elevated energy prices squeeze margins. There was also decommissioning's in Taiwan and South Korea for similar reasons. Since our last report, we have now factored in the closure of fibreglass facilities in the Netherlands in 2023, resulting in a lower figure for that year due to closed-loop recycling. The closure was a result of continued unprofitability caused by soaring energy prices, labour costs and lacklustre demand. Additionally, some Chinese LCD capacity additions have been pushed back from end-2023 into 2024, lifting this year's figure at the expense of 2023. Elsewhere, we still see a slight decline year-on-year in fibreglass offtake as Chinese, North American and Rest of World capacity slows.

Medical

We forecast platinum medical demand will grow 4% (+11 koz) year-on-year to 303 koz. The bulk of the growth comes from emerging markets, due to growing cancer incident rates driving higher platinum cancer therapy offtake, and an ageing population with greater access to healthcare, driving medical device demand.

Chemical

Chemical demand is projected to decrease by 31% year-on-year (-245 koz) to a seven-year low of 542 koz in 2024. As discussed in previous Platinum Quarterlies, China's commitment to self-sufficiency in the petrochemical industry had led to sizeable investment in building new PX and PDH plants since the late 2010s, which in turn have provided a strong boost to demand for platinum-bearing catalysts. However, with capacities having already been significantly boosted and with the economy slowing, this growth started to slow in late 2023, a trend which has continued so far in 2024. The consequential fall in demand for platinum catalysts will contribute to the bulk of this year's lower demand for petrochemical applications. Weaker demand is also expected in the use of platinum in the nitric acid industry, as lower fertiliser prices and rising project costs have weakened the investment case to add new production facilities. This leaves silicone the only key industry that is expected to see higher platinum demand. Assuming that the global economy will only post a mild slowdown, still benign economic conditions should boost silicone consumption in 2024.

Petroleum

Petroleum demand is expected to fall by 3% (-5 koz) to a four-year low of 153 koz. North American offtake is forecast to rise this year, as the US remains the growth driver of global oil supply. These gains will be largely offset by weaker demand in China, as refining capacity expansions slows. The country's property sector is also likely to see ongoing struggles, and this will continue to weigh on oil consumption and hence restrain refining throughput. Losses are also expected in Europe and Japan where squeezed margins and declining fuel demand are likely to result in further run cuts and plant closures.

Electrical

The rapid advancement of AI has notably eased market pressures on HDDs, which were facing a downturn due to competition from solid-state drives (SSDs). HDD's have benefitted from AI largely due to HDDs' cost-effectiveness in large-scale storage solutions and this advantage is likely to continue for roughly the next two years, especially as suppliers progressively adopt energy-assisted magnetic recording technologies. Moreover, the semiconductor field is expected to continue to benefit from the establishment of new fabs (semiconductor fabrication facilities) and the expansion of advanced process (less than 10nm) production capacity for the foreseeable future. We have therefore raised our platinum offtake forecast compared with last PQ and now see this growing by a slight 1% (+1 koz) to 90 koz in 2024.

Hydrogen Stationary and Other

The deployment of hydrogen-based applications will cause demand for platinum to more than double this year. Had it not been for delays in deployment, due to higher capital costs and challenges with the implementation delays in government funding and subsidies, demand would have been even higher.

Other

Platinum demand from the other industrial segment is forecast to grow by 2% to 582 koz in 2024 as increased hybrid vehicle production and a strong aftermarket, along with higher car ownership and longer vehicle lifespans, support demand for spark plugs and sensors. Growing demand from the marine and aerospace industries is also helping to offset the decline in ICE vehicle production.

Investment demand

In 2024, global bar and coin investment (excluding larger bars in China) is forecast to drop by 44% (-143 koz) to a 10-year low of just 180 koz. This largely results from a return to net disinvestment in Japan and, to a lesser extent, weaker demand in North America, both of which will comfortably offset further growth in the Chinese market.

North American demand is expected to fall to a seven-year low in 2024, reflecting two key themes. First, the wider precious metals market is contending with marked selling back, specifically in the gold market, and only modest buying interest, across all three major precious metals. Although we expect to see improved retail buying towards year-end, this will not make up for a poor first half. Second, 2024 marks the first time since 2015 that a platinum Eagle bullion coin has not been made available, the minting of which peaked in 2022 at 80 koz. Although its production had fallen to less than 13koz last year, the absence of this coin still weighed on the market.

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

Japanese bar and coin demand will likely continue to struggle over the rest of the year, given local investor interest remains focused on gold, when it comes to precious metals, as well as global equity markets. Our forecast for 50 koz of net disinvestment for the full year implies net sales of around 10 koz over the second half.

We have revised our forecast for small bar and coin investment in China from the previous report's +15% to +20% year-on-year in 2024 to reflect the better-than-expected demand in Q2'24. The lack of alternative investment assets and investors' increasing awareness of platinum will remain the main drivers. Purchases of larger platinum bars in the country, meanwhile, remain in a secular growth trajectory, as this is still a relatively new market. We thus forecast a 40% year-on-year increase in their total, to 188 koz for the full year.

In 2024, we forecast platinum ETF holdings will increase by 150 koz for the full year, which is down from current levels. The platinum price is expected to increase but remain rangebound for the remainder of the year, limiting fresh investment into ETFs, while elevated interest rates maintain a high opportunity cost for holding non-yielding ETFs, leading to slight disinvestment.

ABOVE GROUND STOCKS

Due to a projected deficit of 1,028 koz in 2024, above ground stocks are expected to decline to 3,006 koz by year-end, resulting in just over four months' worth of demand cover.

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.

PLATINUM QUARTERLY Q2 2024

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	5,508	2%	-2%
South Africa	3,135	4,480	4,365	4,385	4,470	4,374	3,298	4,678	3,915	3,957	3,883	1%	-2%
Zimbabwe	405	405	490	480	465	458	448	485	480	507	504	6%	-1%
North America	395	365	390	360	345	356	337	273	263	275	273	5%	-1%
Russia	740	710	715	720	665	716	704	652	663	674	646	2%	-4%
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	-74%	-100%
Total Mining Supply	5,225	6,190	6,075	6,160	6,135	6,076	4,904	6,202	5,563	5,615	5,508	1%	-2%
Recycling	2,055	1,720	1,860	1,915	1,955	2,110	1,996	2,107	1,764	1,545	1,581	-12%	2%
Autocatalyst	1,255	1,185	1,210	1,325	1,430	1,565	1,508	1,619	1,323	1,144	1,161	-14%	2%
Jewellery	775	515	625	560	505	476	422	422	372	331	344	-11%	4%
Industrial	25	20	25	30	30	69	66	67	69	71	76	3%	8%
Total Supply	7,280	7,910	7,935	8,075	8,090	8,186	6,900	8,309	7,327	7,160	7,089	-2%	-1%
DEMAND													
Automotive	3,220	3,245	3,360	3,300	3,115	2,757	2,275	2,492	2,769	3,215	3,237	16%	1%
Autocatalyst	3,080	3,105	3,225	3,160	2,970	2,757	2,275	2,492	2,769	3,215	3,237	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	1,868	1,994	-2%	7%
Industrial	1,720	1,875	2,020	1,900	2,040	2,252	2,102	2,532	2,315	2,356	2,369	2%	1%
Chemical	540	515	560	570	565	798	633	663	673	786	542	17%	-31%
Petroleum	60	170	220	120	235	219	109	169	193	158	153	-18%	-3%
Electrical	215	205	195	210	205	144	130	135	106	89	90	-16%	1%
Glass	225	300	320	260	275	228	473	753	505	432	635	-14%	47%
Medical	225	240	235	235	235	277	256	267	278	292	303	5%	4%
Hydrogen Stationary and Other	†	†	†	†	†	29	28	17	12	29	64	133%	123%
Other	455	445	490	505	525	556	473	528	548	571	582	4%	2%
Investment	150	305	535	275	15	1,264	1,582	-3	-516	451	517	N/A	15%
Change in Bars, Coins	50	525	460	215	280	278	593	349	259	323	180	25%	-44%
China Bars ≥ 500g	†	†	†	†	†	16	23	27	90	134	188	49%	40%
Change in ETF Holdings	215	-240	-10	105	-245	991	507	-241	-558	-20	150	N/A	N/A
Change in Stocks Held by Exchanges	-115	20	85	-45	-20	-20	458	-139	-307	14	0	N/A	-100%
Total Demand	8,090	8,265	8,430	7,935	7,415	8,379	7,789	6,972	6,467	7,892	8,118	22%	3%
Balance	-810	-355	-485	140	675	-193	-888	1,337	860	-731	-1,028	N/A	N/A
Above Ground Stocks	2,580*	2,225	1,740	1,880	2,555	3,457	2,569**	3,906	4,765	4,034	3,006	-15%	-25%

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. † Estimates for this line item in this period are either negligible, or captured respectively in autocatalyst demand or other industrial 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.

PLATINUM QUARTERLY Q2 2024

Table 3: Supply and demand summary – quarterly comparison

	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q2'24/Q2'23 Growth %	Q2'24/Q1'24 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	1,529	1,390	1,328	1,192	1,486	1,393	1,532	1,224	1,540	4%	26%
South Africa	1,129	978	931	778	1,051	984	1,143	794	1,126	7%	42%
Zimbabwe	124	116	123	116	126	132	133	132	125	-1%	-5%
North America	64	67	65	71	73	60	72	71	61	-17%	-14%
Russia	161	179	160	180	190	168	136	178	181	-5%	1%
Other	51	51	49	48	46	48	48	48	48	3%	-1%
Increase (-)/Decrease (+) in Producer Inventory	-2	-2	+23	+33	+8	-6	-23	+9	+30	294%	220%
Total Mining Supply	1,527	1,387	1,351	1,226	1,494	1,387	1,509	1,233	1,570	5%	27%
Recycling	461	419	430	400	383	424	338	377	388	1%	3%
Autocatalyst	352	313	321	287	290	332	235	275	297	2%	8%
Jewellery	92	90	92	95	76	75	85	85	72	-5%	-15%
Industrial	17	17	17	17	17	17	18	17	19	7%	8%
Total Supply	1,988	1,807	1,781	1,626	1,877	1,811	1,847	1,610	1,958	4%	22%
DEMAND											
Automotive	673	673	720	813	814	772	816	822	820	1%	0%
Autocatalyst	673	673	720	813	814	772	816	822	820	1%	0%
Non-road	†	†	†	†	†	†	†	†	†	N/A	N/A
Jewellery	483	480	463	463	478	451	476	484	501	5%	4%
Industrial	642	561	546	631	663	468	594	627	638	-4%	2%
Chemical	150	128	265	295	233	127	132	145	122	-48%	-16%
Petroleum	48	49	52	41	40	38	38	38	38	-5%	0%
Electrical	27	26	24	23	23	22	22	22	23	2%	3%
Glass	202	151	2	56	146	64	167	195	216	48%	11%
Medical	68	69	69	76	72	71	72	72	77	7%	7%
Hydrogen Stationary and Other	3	3	3	4	5	7	12	12	14	186%	15%
Other	143	135	132	137	145	139	150	142	148	2%	4%
Investment	-128	-226	-30	229	195	50	-23	117	462	137%	294%
Change in Bars, Coins	84	103	2	128	47	86	61	64	17	-63%	-73%
China Bars ≥ 500g	23	23	23	31	20	35	48	53	41	103%	-24%
Change in ETF Holdings	-112	-217	-62	40	155	-99	-116	11	444	186%	>±300%
Change in Stocks Held by Exchanges	-123	-134	7	29	-27	28	-16	-11	-40	N/A	N/A
Total Demand	1,670	1,488	1,699	2,136	2,151	1,741	1,865	2,051	2,421	13%	18%
Balance	318	318	82	-511	-273	70	-18	-441	-464	N/A	N/A

Source: Metals Focus 2022 - 2024.

Note:

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

PLATINUM QUARTERLY Q2 2024

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

	H1 2022	H2 2022	H1 2023	H2 2023	H1 2024	H1'24/H1'23 Growth %	H1'24H2'23 Growth %
Platinum Supply-demand Balance (koz)							
SUPPLY							
Refined Production	2,802	2,718	2,679	2,925	2,763	3%	-6%
South Africa	2,007	1,908	1,829	2,127	1,920	5%	-10%
Zimbabwe	241	239	242	265	258	6%	-3%
North America	131	132	143	132	131	-8%	0%
Russia	324	339	370	304	359	-3%	18%
Other	100	100	94	96	96	2%	0%
Increase (-)/Decrease (+) in Producer Inventory	22	21	41	-30	39	-4%	N/A
Total Mining Supply	2,825	2,739	2,720	2,895	2,803	3%	-3%
Recycling	914	849	783	763	765	-2%	0%
Autocatalyst	689	634	577	567	573	-1%	1%
Jewellery	191	181	171	160	156	-9%	-2%
Industrial	34	34	35	36	36	4%	1%
Total Supply	3,739	3,588	3,503	3,658	3,568	2%	-2%
DEMAND							
Automotive	1,375	1,394	1,627	1,589	1,642	1%	3%
Autocatalyst	1,375	1,394	1,627	1,589	1,642	1%	3%
Non-road	†	†	†	†	†	N/A	N/A
Jewellery	956	943	941	927	985	5%	6%
Industrial	1,208	1,107	1,294	1,062	1,265	-2%	19%
Chemical	280	393	527	259	267	-49%	3%
Petroleum	92	101	81	76	76	-6%	0%
Electrical	57	49	45	44	45	0%	2%
Glass	353	153	201	231	412	104%	78%
Medical	139	138	149	144	149	0%	4%
Hydrogen Stationary and Other	6	6	9	20	26	189%	32%
Other	282	266	282	289	290	3%	0%
Investment	-260	-256	424	28	580	37%	>±300%
Change in Bars, Coins	154	105	175	147	82	-53%	-44%
China Bars ≥ 500g	45	45	51	83	94	85%	13%
Change in ETF Holdings	-278	-280	196	-215	455	133%	N/A
Change in Stocks Held by Exchanges	-181	-127	2	12	-51	N/A	N/A
Total Demand	3,279	3,188	4,287	3,605	4,472	4%	24%
Balance	459	400	-784	53	-904	N/A	N/A

Source: Metals Focus 2019 - 2024.

Notes:

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

PLATINUM QUARTERLY Q2 2024

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 %	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	
Platinum Gross Demand (koz)																			
Automotive	3,220	3,250	3,350	3,290	3,115	2,757	2,275	2,492	2,769	3,215	3,237	16%	1%	814	772	816	822	820	
North America	455	480	410	390	390	310	268	341	412	445									
Western Europe	1,395	1,450	1,630	1,545	1,340	1,412	1,044	952	978	1,109									
Japan	585	510	450	435	425	286	225	248	246	294									
China	125	145	195	230	220	182	276	371	442	611									
India	170	180	170	175	200	††	††	††	††	††									
Rest of the World	490	485	495	515	540	567	462	579	691	756									
Jewellery	3,000	2,840	2,505	2,460	2,245	2,106	1,830	1,953	1,899	1,868	1,994	-2%	7%	478	451	476	484	501	
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	542	17%	-31%	233	127	132	145	122	
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	153	-18%	-3%	40	38	38	38	38	
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	90	-16%	1%	23	22	22	22	23	
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	432	635	-14%	47%	146	64	167	195	216	
North America	5	0	10	5	5	-81	-25	17	27	43									
Western Europe	10	5	5	5	20	65	37	7	23	-83									
Japan	-10	0	-10	-10	0	-38	-63	7	-151	5									
China	175	195	225	165	120	175	385	758	524	482									
Rest of the World	45	100	90	95	130	107	139	-36	82	-14									
Medical	225	240	235	235	235	277	256	267	278	292	303	5%	4%	72	71	72	72	77	
Other industrial	455	445	490	505	525	556	473	528	548	571	582	4%	2%	145	139	150	142	148	
Hydrogen Stationary & Other	†	†	†	†	†	29	28	17	12	29	64	133%	123%	5	7	12	12	14	
Bar & Coin Investment	50	525	460	215	280	278	593	349	259	323	180	25%	-44%	47	86	61	64	17	
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									
China Bars ≥ 500g						16	23	27	90	134	188	49%	40%	20	35	48	53	41	
ETF Investment	215	-240	-10	105	-245	991	507	-241	-558	-20	150	N/A	N/A	155	-99	-116	11	444	
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	0	N/A	-100%	-27	28	-16	-11	-40	
Investment	150	305	535	275	15	1,264	1,582	-3	-516	451	517	N/A	15%	195	50	-23	117	462	
Total Demand	8,090	8,270	8,410	7,925	7,415	8,379	7,789	6,972	6,467	7,892	8,118	22%	3%	2,151	1,741	1,865	2,051	2,421	

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

Notes:

- † Hydrogen and Stationary Other demand is included in Other industrial demand prior to 2019.
- †† India automotive demand is included in Rest of the World.
- Data from Metals Focus and SFA (Oxford) may not have been prepared on the same or directly comparable basis.
- Prior to 2019 SFA data is independently rounded to the nearest 5 koz.

PLATINUM QUARTERLY Q2 2024

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 %	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	
Platinum recycling supply (koz)																			
Automotive	1,255	1,185	1,210	1,325	1,420	1,565	1,508	1,619	1,323	1,144	1,161	-14%	2%	290	332	235	275	297	
North America						520	458	504	395	351									
Western Europe						786	815	835	678	591									
Japan						116	109	117	85	73									
China						36	36	59	55	25									
Rest of the World						108	90	103	110	104									
Jewellery	775	515	625	560	505	476	422	422	372	331	344	-11%	4%	76	75	85	85	72	
North America						3	3	3	3	3									
Western Europe						4	4	3	4	4									
Japan						187	162	160	165	136									
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	76	3%	8%	17	17	18	17	19	
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.

BEV

A Battery Electric Vehicle uses an electric motor exclusively powered by rechargeable batteries for propulsion.

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 VI standard (BS-V, BS-VI)

Bharat Stage VI standard is the equivalent of Euro 6 and was rolled out in India between 2018 and 2020.

China Bars \geq 500g

Net China demand for platinum bars of 500g or larger in size, excluding bars identified as being sold to investors mostly associated with industrial companies.

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.

China VI

China VI standards have applied to all new heavy-duty diesel vehicles since 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 electrolyzers 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.

EREV

An Extended Range Electric Vehicle is a BEV with a gasoline ICE which cannot drive the wheels directly (unlike in a PHEV, for example), but acts as a generator to charge the battery giving a greater driving range.

HEV

A Hybrid Electric Vehicle has an internal combustion engine that can drive the wheels directly or act as a generator to charge the battery. Energy can also be recovered to the battery from regenerative braking. The electric only driving range is typically a few kilometres.

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.

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 VI emission standards

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

Euro 6 emission standards

EU emission standards for light-duty vehicles Euro 6 legislation was introduced 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 CO₂, the laboratory based WLTP and for NO_x RDE.

Euro 7 emission standards

Euro 7 regulations will keep the existing Euro 6 exhaust emission limits for LVs and LCVs but introduce stricter requirements for solid particles, as well as stricter lifetime requirements in terms of both mileage and lifetime. The new regulations are expected to be phased in from the start of 2027.

Euro VII emission standards

Euro VII regulations on HDVs imposes more stringent limits for various pollutants, including some that have not been regulated until now, such as nitrous oxide (N₂O), as well as stricter lifetime requirements. The new standards are expected to be phased in from the start of 2027.

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.

FCEV

Instead of batteries, Fuel Cell Electric Vehicles use hydrogen in a platinum containing fuel cell to generate electricity to drive electric motors.

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.

HDD

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

HDV

Heavy-duty vehicle.

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.

PHEV

Plug in Hybrid Electric Vehicles can be plugged in to a power supply to charge a medium sized battery but also contain an ICE that can drive the wheels directly or charge the battery. The electric only driving range is typically 30-80km.

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 ('PX') 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. Platinum for palladium substitution has seen some platinum incorporated into the largely palladium-based catalyst, 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.

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) in Europe 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.

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