PLATINUM ESSENTIALS

Sep'24, 2-5 year platinum supply/demand outlook: Robust demand and limited supply drive larger market deficits

Our Platinum Quarterly Q2'24 market outlook for 2024 incorporated data from the first six months of the year and this Platinum Essentials similarly leverages market developments seen throughout this year into our two- to five-year forecasts. The platinum investment case remains compelling, with the overriding feature the substantial market deficits of 2023 and 2024f expected to persist throughout our forecast period to 2028f. We expect annual platinum deficits to average 769 koz from 2025f to 2028f, or 9% of average demand.

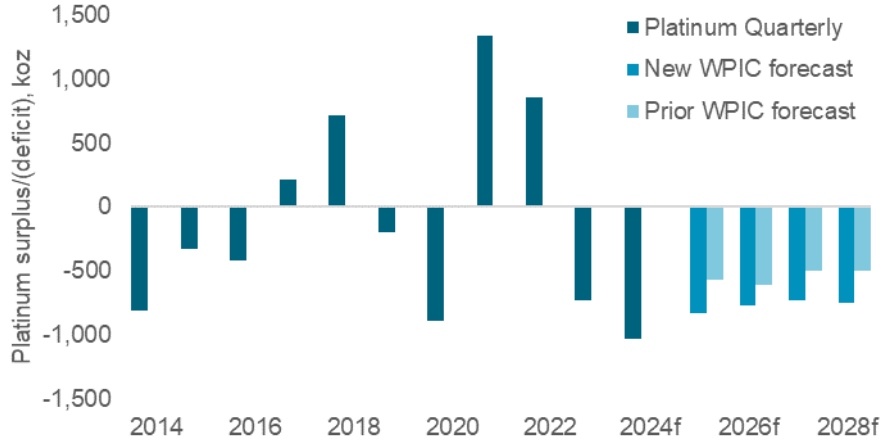
Compared to our January 2024 forecast, changes to three market segments are material enough to warrant us updating our longer-term forecasts. Firstly, 2024 has seen actions taken by the South African platinum group metal (PGM) miners in response to the low PGM basket price, with more restructuring initiatives announced, most recently during their financial results briefings. Plans include slowing ramp-up schedules, project deferrals and mines/shafts being closed or placed on care and maintenance. The aggregated mid-point of producer guidance has reduced by 5% between 2025f and 2028f.

Secondly, we have made a one-off downward revision to our platinum loadings forecasts to address trends in thrifting, vehicle mix and stagnating emission legislation. Despite us reducing our average 2025f to 2028f platinum automotive demand forecasts by 5%, the overarching automotive narrative is that of resilience. We only expect platinum automotive demand erosion of -1% CAGR from 2023 to 2028f which is a far cry from the sentiment of the last three years where many market participants had expected sharp demand destruction due to drivetrain electrification. Instead, battery electric vehicle (BEV) sales growth has slowed drastically in 2024 whilst hybrid internal combustion engine (ICE) demand has proven robust.

The final notable update to our revised outlook is the inclusion of Chinese platinum bar and coin demand data; new line items in our *Platinum Quarterly.* Our two- to five-year outlook includes the impact of the additional China investment ounces, with total platinum investment demand now expected to average 558 koz per annum from 2025f to 2028f.

All estimates in this report are based upon publicly available information and WPIC in-house analysis*.

Figure 1. Consecutive platinum markets deficits are expected from 2023



Source: SFA (Oxford) from 2014 to 2018, Metals Focus from 2019 to 2024f, Company guidance, WPIC Research from 2025f

**WPIC in-house supply data is based solely on publicly published supply data, including forward looking guidance, with any adjustments noted. It does not represent the views of any WPIC members or those of Metals Focus which independently prepare our Platinum Quarterly reports. Demand data is based on public data but includes WPIC in-house analysis.*

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Figure 2. Supply/demand summary table – See previous forecast from January 2024 in Appendix III

	PUBLISHED PLATINUM				WPIC ESTIMATES‡			
	2021	2022	2023	2024f	2025f	2026f	2027f	2028f
PLATINUM SUPPLY								
					Production at mid-point of aggregate guidance ranges			
Refined mine production								
- South Africa	4,678	3,915	3,957	3,883	4,067	3,955	3,863	3,821
- Zimbabwe	485	480	507	504	523	577	600	600
- North America	273	263	275	273	228	226	218	210
- Russia	652	663	674	646	663	663	663	663
- Other	206	200	190	203	199	199	199	199
- Producer inventory movement	-93	43	11	0	0	0	0	0
Total mining supply	**6,202**	**5,563**	**5,615**	**5,508**	**5,680**	**5,621**	**5,543**	**5,494**
Recycling								
- Autocatalyst	1,619	1,323	1,144	1,161	1,278	1,349	1,383	1,502
- Jewellery	422	372	331	344	323	299	302	307
- Industrial	67	69	71	76	81	97	106	115
Total recycling	**2,107**	**1,764**	**1,545**	**1,581**	**1,681**	**1,745**	**1,791**	**1,923**
Total supply	**8,309**	**7,327**	**7,160**	**7,089**	**7,362**	**7,366**	**7,334**	**7,417**
PLATINUM DEMAND								
Automotive	**2,492**	**2,769**	**3,215**	**3,237**	**3,260**	**3,174**	**3,108**	**3,052**
Jewellery	**1,953**	**1,899**	**1,868**	**1,994**	**1,988**	**1,999**	**2,019**	**2,040**
Industrial	**2,532**	**2,315**	**2,356**	**2,369**	**2,387**	**2,405**	**2,375**	**2,519**
Total investment	**-3**	**-516**	**451**	**517**	**558**	**558**	**558**	**558**
- Bar and coin	349	259	323	180	330	330	330	330
- China bars ≥500g	27	90	134	188	188	188	188	188
- ETF	-241	-558	-20	150	40	40	40	40
- Stocks held by exchanges	-139	-307	14	0	0	0	0	0
Total demand	**6,972**	**6,467**	**7,892**	**8,118**	**8,192**	**8,135**	**8,060**	**8,168**
Supply/demand balance	**1,337**	**860**	**-731**	**-1,028**	**-831**	**-770**	**-726**	**-751**

†The Platinum Quarterly report and data are prepared independently for the WPIC by Metals Focus

‡WPIC estimates and analysis are based upon publically available information

Source: Metals Focus from 2021 to 2024f, Company guidance, WPIC Research from 2025f

Introduction

The WPIC's two- to five-year platinum supply and demand projections are intended to complement the estimates and forecasts published in our *Platinum Quarterly*, but they look further into the future and allow for longer-term scenario analysis. The *Platinum Quarterly* report and data are prepared independently for the WPIC by Metals Focus, with Metals Focus's estimates provided on a one year forward basis (currently 2024). For the avoidance of doubt, all estimates for 2025f to 2028f included in this report are WPIC forecasts, with the exception of mine supply which is based solely upon publicly published company guidance. Specifically, WPIC has made no use of any data or views included in Metals Focus's separate five-year forecast available to its clients, that provides an outlook for all the major PGMs.

WPIC's base case published supply/demand projections for 2025f to 2028f provide the ability to run scenario analysis on different parts of the supply/demand landscape.

The WPIC has not attempted to develop further in-country and in-industry relationships to obtain fresh/incremental data, and the information and sources used to develop our supply/demand model are all in the public domain.

Please see the appendix for a complete description of the methodologies we have used to develop each model and section of this report as well as a risk analysis for our forecasts.

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Key projections

Our revised outlook is compared to the supply/demand *Platinum Essentials* two-to-five year outlook published in *January 2024 (link)*. Since then, inflation has continued to trend lower with major central banks commencing interest rate cuts. Regionally, the US continues to borrow, expanding its fiscal deficit to promote economic growth, which, thus far, has supported a soft landing. In Europe, a weak German economy has weighed on the bloc as a whole. While in China activity remains muted with slowing growth, an anaemic property sector and volatile equities; all of which have steered wary consumers towards buying gold and platinum (albeit on a smaller scale versus gold).

Over and above the mixed macroeconomic environment, geopolitical considerations remain front of mind, especially in the context of the drawn-out Russia/Ukraine and Isreal/Hamas wars as well as the upcoming US election. As it stands, the Democrats have closed polling deficits following President Biden's withdrawal from the race, but as always, the election will be decided by a handful of swing states. A Republican victory would likely be negative for the US's current plans to develop its hydrogen economy but would conversely potentially be positive for continued demand for catalytic converters (higher for longer ICE) and for petroleum refinery catalysts. On balance a republican win would probably be slightly more favourable for the demand for palladium versus platinum as palladium stands to gain more from stronger ICE in the US and platinum potentially loses more from a downgrading of the US's plans for green hydrogen. That said, on a global basis, our forecasts are for China to lead the way in terms of green hydrogen with the US not expected to be a major source of demand growth in comparison.

Platinum market deficits from 2025f to 2028f are expected to be larger than previously forecast.

For the period 2025-2028, we have made the following key revisions to our projections (relative to our last 2-5 year supply/demand outlook):

The key trends that we are seeing which have a material bearing on this updated supply demand outlook are a) ongoing mine supply restructuring in response to low margins, b) lower loadings expectations offsetting higher-for-longer automotive ICE production, and c) strength in investment demand underpinned by Chinese market development activities.

1. **Mine supply** has been reduced by 5% (281 koz platinum p.a.) as a, now protracted, downturn in PGM prices has led to some mining projects being slowed or deferred and some mines placed on care and maintenance or closed.
2. **Automotive demand** over the forecast period is 5% lower, attributable to downward revisions in average loadings which have more than offset higher absolute ICE-based vehicle production forecasts.
3. **Investment demand, always measured on a net basis,** is forecast to be 128 koz higher per annum, based on the inclusion of Chinese bar and coin demand. Higher demand is partially offset by an 80 koz reduction to our ETF demand forecasts as the 10-year trailing average now excludes 2013 where demand was exceptionally high (905 koz).

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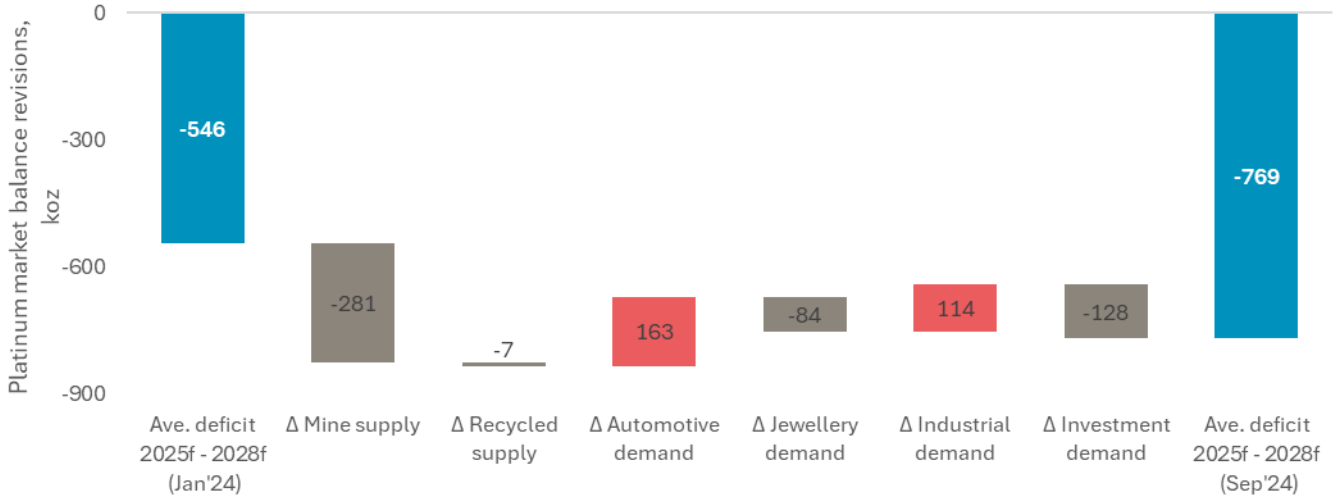
Figure 3. Our average platinum market balance per annum is now projected to be 223 koz deeper than our previous forecasts



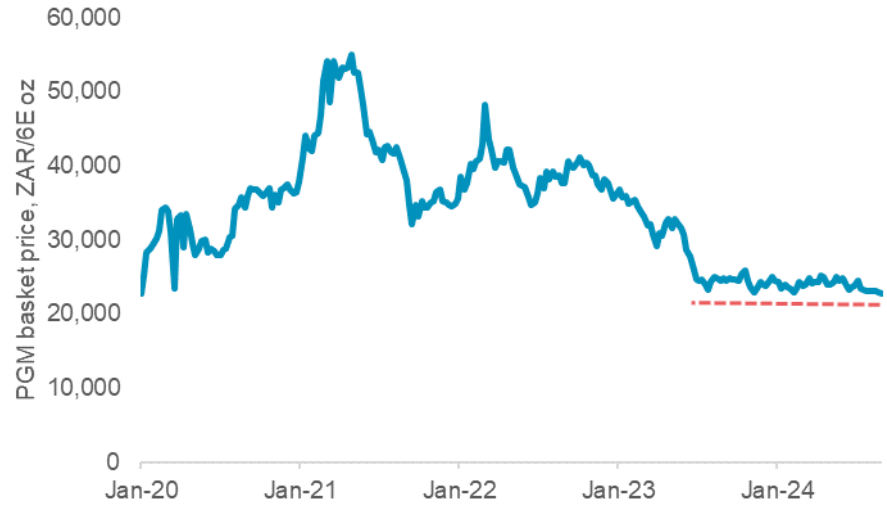
Source: WPIC Research

1. Miners slowing down to preserve margins

We do not forecast mine supply, but instead use the mid-point of aggregate public guidance ranges issued by the PGM mining companies. Longer term guidance is typically only updated one to two times per year, either alongside results announcements or at an investor day. Consequently, longer-term guidance can lag shorter-term changes and challenges faced by miners.

Low PGM prices and resulting margin pressure has dominated producers' commentary for more than the past year. Since our last update in January 2024, PGM miners have provided one to two longer-term updates at results presentations in Feb/Mar and more recently in Aug/Sep. Accordingly, we have greater clarity on PGM miners' plans to manage their operations through a period of depressed prices (Fig. 4).

Figure 4. PGM basket prices have found support between R22,500 to R25,000 per 6E oz over the past 15-months



Source: Bloomberg, WPIC Research

The stabilisation of PGM prices in ZAR-terms gives miners a "target" level in order to achieve sustainable financial performance.

Mining companies are primarily realigning their cost structures through headcount reductions and capex rescheduling which are aimed at preserving margins. We estimate that labour is broadly the largest component of a mine's costs, accounting for between 40% to 60% of operating costs depending on the mining method.

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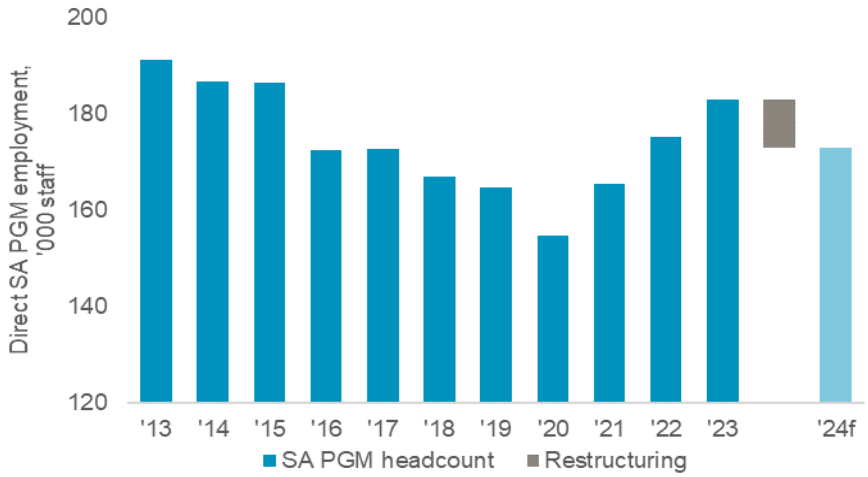
Based on public announcements, South African PGM miners will reduce their staff compliment by approximately 10,000 between 2023 and 2024 (Fig. 5).

Figure 5. SA PGM employment reductions due to a quarter of mined supply generating negative margins at spot PGM prices



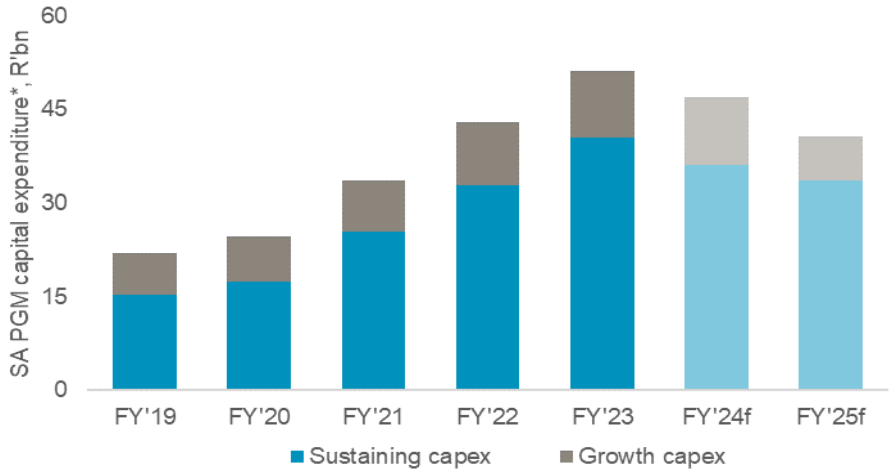
Source: Company data, Minerals Council of South Africa, WPIC Research

PGM mines in South Africa and North America have required restructuring within the current price environment whereas Zimbabwean and Russian mines have not.

Despite reducing their workforces by ~6%, SA's miners have made negligible revisions to their 2024f production guidance. Retaining production guidance whilst decreasing headcount is made possible by the fact that SA's PGM labour complement should remain ~4% higher than pre-COVID levels (173k vs. 166k). Moreover, when we compare 2024f platinum production to pre-COVID production, SA's platinum output is forecast to be around 500 koz lower in 2024f which suggests weaker labour productivity (i.e. on platinum oz per head basis). Whilst lower productivity is not a good thing, it is worth noting that this is in part a reflection of the best resources having been mined, mining moving into deeper and more technically challenging reserves, and a greater focus on safety.

In our view, the impact of declining employment is likely to be seen over the medium-term. PGM miners have rescheduled their capex outlooks with South Africa's PGM miners guiding to an 8% year-on-year reduction in FY 2024 capex and around a further 13% reduction in FY 2025 capex (Fig. 6).

Figure 6. Capital expenditure is forecast to decline by 20% between FY'23 and FY'25 on lower replacement and growth spending



*Source: WPIC Research, *Published data for Amplats, Impala, Northam and Sibanye-Stillwater*

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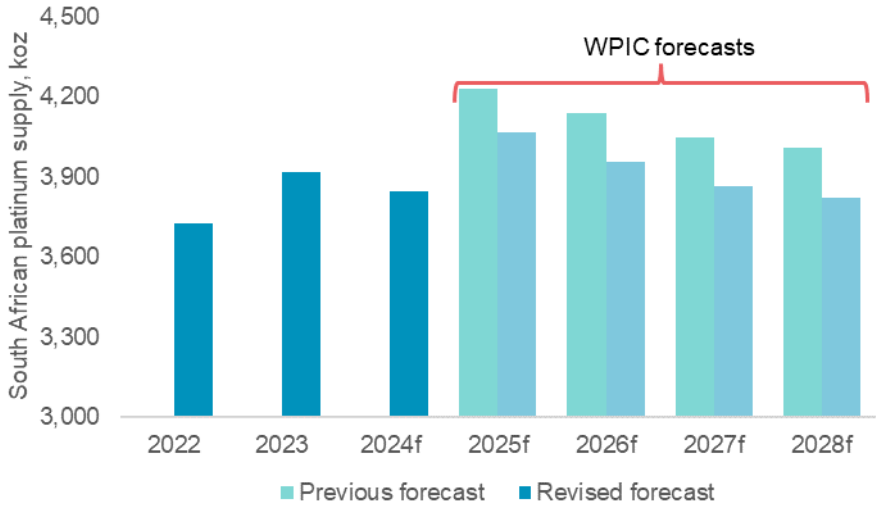
Much of the reduction in capex stems from reduced replacement spend (captured in sustaining capex) where we believe the number of development teams has been scaled back. Scaling back mine development can allow for production to be maintained, however, mining flexibility can reduce and therefore the risks of missing production guidance can increase.

Whilst the WPIC does not comment on its members' production guidance, there have nonetheless been publicly announced revisions to production plans from 2025f and beyond. Following company guidance, we have reduced average projected SA platinum production by 179 koz between 2025f and 2028f (Fig. 7) given the following:

- **Care and maintenance:** the Two Rivers Merensky mine has been placed into care and maintenance. African Rainbow Minerals previously expected Two Rivers to reach its 180 koz (6E) nameplate during 2025f.
- **Closure:** Marikana's 4B shaft was unable to meet profit targets set during labour consultations in Q4 2023. Accordingly, Sibanye-Stillwater announced the shaft's closure in Q2 2024.
- **Slowing growth:** The ramp-up timeline of Impala's Bafokeng Styldrift mine has been revised to take 18-months longer than previously expected due to operational constraints. The complex is now forecast to reach its 650 koz (6E) nameplate in 2027f. Similarly, the Bokoni mine has slowed its production ramp-up where it was previously expected to reach 150 koz (6E) by 2027f.
- **Third-party readthrough:** The mine to market producers have trimmed their expectations for third party concentrate supplies. This suggests that smaller non-integrated miners (where production performance is less visible) are similarly tapering some marginal ounces.

Our average platinum mine supply forecast has been revised 4% lower between 2025f and 2028f.

Figure 7. South African average platinum production forecasts have been reduced by 4% as margin pressure disincentivises new growth



Source: Metals Focus 2022 to 2024f, Company data, WPIC 2025f and after

In general, market consensus mine supply projections are for a broad reduction in South African production from 2025f to 2028f of -2% CAGR. However, based upon the aggregated mid-point of producer guidance, we highlight an uptick in average South African platinum production of 6% between 2024 and 2025f (180 koz p.a.). We expect three broad categories; ramp-up, operational recovery and pipeline processing; to support South African platinum production growth in 2025f.

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- **Ramp-up:** The Bafokeng and Eland operations are guided to increase production through 2025f with each complex slated to reach design capacity during 2027f and 2028f respectively. Elsewhere, Marikana's K4 shaft is sequentially increasing output, albeit these incremental ounces are likely to be short-term as older sections of the complex reach to the end of their economical lives.
- **Operational recovery:** In Rustenburg, operational setbacks at Impala's 11 Shaft and Sibanye-Stillwater's Siphumelele Shaft represented once-off impacts in 2024. These shafts should record normalised production from 2025f.
- **Work-in-process release:** Impala and Northam hold excess inventory of 390 koz and 100 koz respectively. Both management teams expect to work through these stocks over the next three years which implies around 80-90 koz of platinum per annum.

In North America, we have reduced our average platinum production forecasts by 109 koz or 33% from 2025f to 2028f. Platinum production is expected to be lower than previously estimated due to:

- A reduction in the life of mine of Impala Canada from >2030 to around 2027f. The company has had to prioritise operations to the lowest cost sections of the mine to mitigate declining palladium prices.
- A restructuring at the Stillwater mine in the United States. To preserve cash, Sibanye-Stillwater initially announced plans in March 2024 to maintain production at 450 koz (2E), instead of growing to 650 koz by 2027f. In September, Sibanye-Stillwater further revised the outlook at Stillwater, cutting the production outlook to only 260 koz (2E) per annum in an effort to target an AISC of US$1,000 per 2E oz.

On a net basis, our average total platinum mine supply forecasts from 2025f to 2028f have been reduced by 281 koz p.a. since our last outlook in January 2024.

2. Platinum demand outlook remains sensitive to the, stronger-for-longer, automotive sector

The prominent narrative from 2024 has been slowing battery electric vehicle (BEV) demand growth, which is understandably positive for PGM sentiment. However, less discussed trends in the automotive sector have been average loadings trends where we have come to the conclusion that our 2025f to 2028f required a small one-off reduction or 'reset' to address thrifting, vehicle mix and stagnant legislative tightening. The net impact on our outlook is that we expect average platinum automotive demand to be 164 koz lower from 2025f to 2028f.

BEV demand growth has drastically slowed as the next cohort of consumers appear less willing to compromise on price and functionality.

Addressing each of these factors in turn and starting with the evolution of the drivetrain.

BEV demand growth has slowed from +30% year-on-year in 2023 to mid-single digit growth in 2024 year-to-date. Softening BEV demand growth is primarily attributable to consumer reluctance to adopt full battery electrification in the face of slow progress in reducing BEV prices, the lagging rollout of public charging infrastructure and tapering of government subsidies for BEVs.

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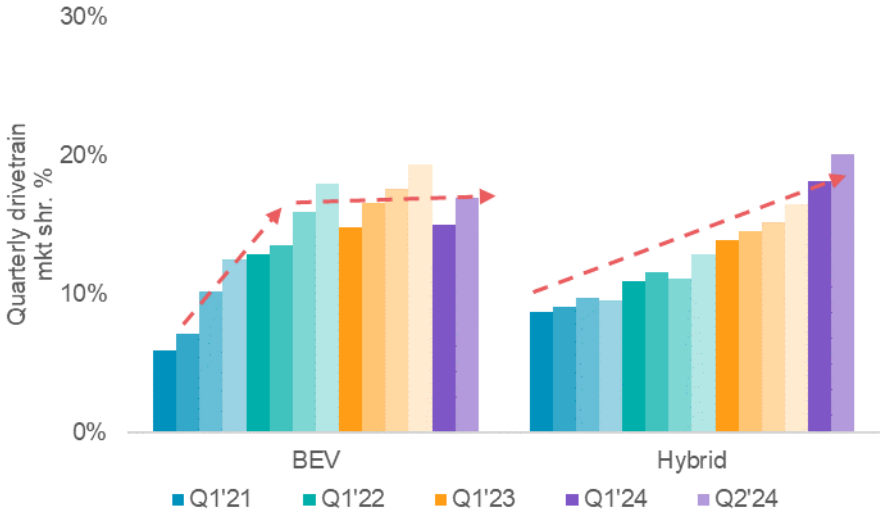
In contrast to slowing BEV demand growth, PGM-containing ICE-hybrid vehicle demand has continued to exhibit robust growth (Fig. 8). In the context of PGM demand, growth in hybrids is expected to offset declining pure-ICE demand resulting in stable combustion engine-based production of around 80M light-duty vehicles during 2024f.

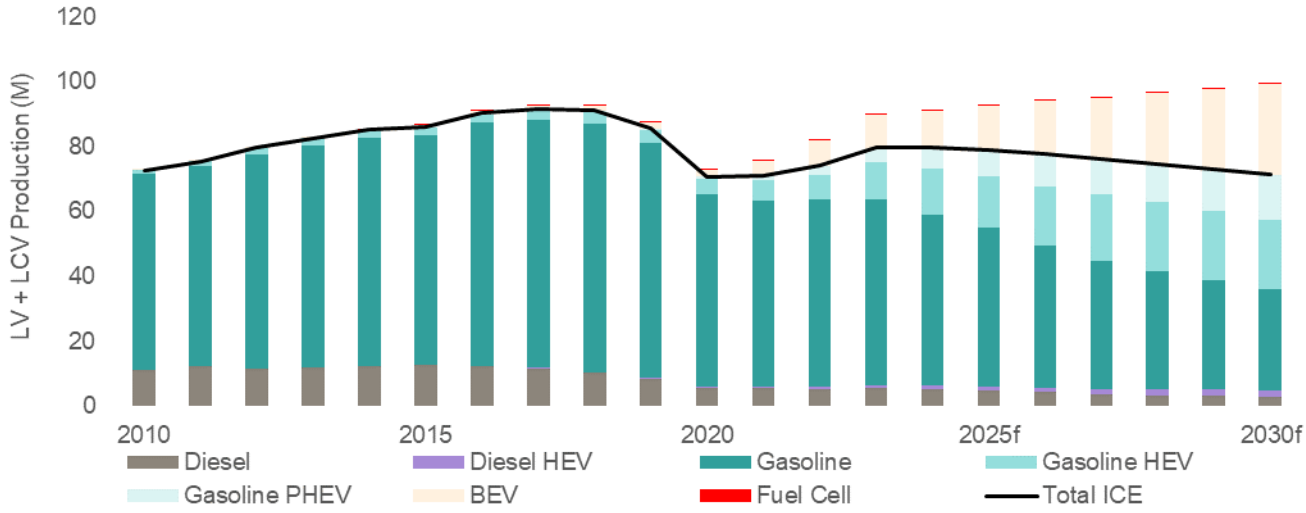
Figure 8. A clear contrast has emerged between BEV and hybrid market growth trends across China, the US and Europe



Source: CAAM, ACEA, Bloomberg, Kelly Blue Book, WPIC Research

We have reduced our BEV market share forecasts for 2024f to 13% from 14% on slowing demand growth while simultaneously making longer-term market share downgrades out to 2030f (28% versus >30% previously, Fig. 9). Given moderating BEV penetration, we have increased our LV production forecasts for combustion engine-containing vehicles (pure ICE and hybrids) by an average of 3.2M units p.a. or 4% between 2025f and 2028f. The gross impact of higher average ICE-based production is an incremental 79 koz of annual platinum demand.

Figure 9. After factoring in growth in the overall vehicle market to more than 100 million units by 2030 (LV+LCV+HD), even a 27% market share for BEVs by 2030 leads to only a modest erosion of ICE containing vehicles in terms of the number of units.



Source: OICA, Automotive industry bodies (various), WPIC Research

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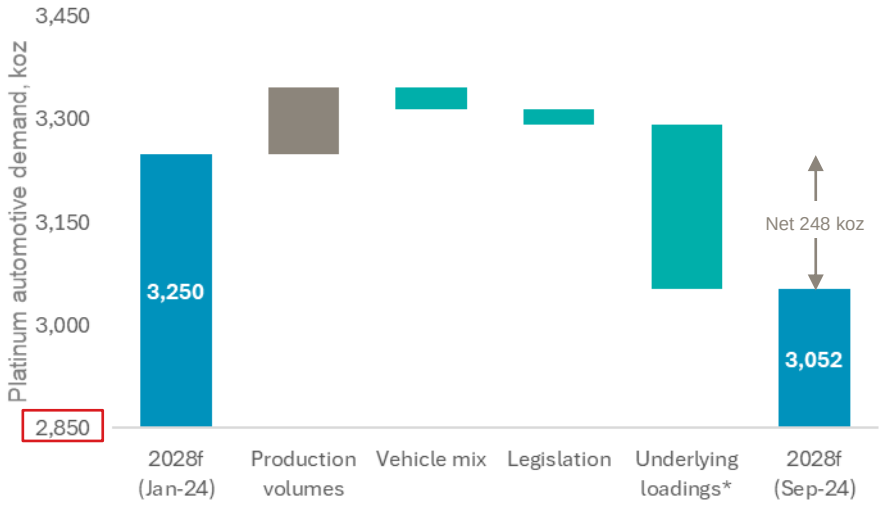
Notwithstanding the clearly supportive narrative of higher-for-longer ICE-based vehicle demand; we have come to believe that less obvious trends of slower enactment or dilution of emission legislation in combination with reduced underlying loadings are net headwinds to platinum automotive demand (Fig. 10).

The largest component of downward platinum automotive demand revisions lie within our **underlying loadings** forecasts where we have accelerated a) thrifting and b) shrinking engine capacities.

Figure 10. Several factors have underpinned revisions to our automotive platinum demand forecasts



*Source: WPIC Research, *Underlying loadings comprises the impacts of thrifting, Pd:Pt substitution and regional end-markets*

Our 2025f to 2028f platinum automotive demand required a small reset to address thrifting, vehicle mix and stagnant legislative tightening.

LV emission legislation in key regions has been largely unchanged for several years. With legislative requirements well understood, autocatalyst OEMs are well placed to reduce average PGM loadings through thrifting. Public reports from Western autocatalyst producers have shown substantial reductions in PGM loadings between China 6a and China 6b. Moreover, anecdotal reports are that China's domestic catalyst OEMs are thrifting more than Western peers.

Our previous loadings forecasts had minimal PGM thrifting because we expected tightening conformity factors would prohibit some reductions to PGM loadings. Furthermore, we felt that in prioritising the BEV transition and platinum for palladium substitution, PGM thrifting would be less than in previous iterations of emission legislation as R&D expenditure would be focused elsewhere. Now that BEV market share growth is slowing, we would expect a greater effort to thrift PGM loadings in hybrid vehicles.

A likely hybrid where thrifting seems probable would be extended range electric vehicles (EREV). EREVs are China's fastest growing vehicle segment, with production more than doubling year-to-date and on track to breach 1M units in 2024. EREVs currently use similar PGM loadings to pure ICE vehicles. However, with the engine serving as a generator, it does not face variable operating conditions and therefore could seemingly be optimised to improve emission performance (assuming reduced cold start-ups also contribute to thrifting).

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A second key consideration for greater than expected hybrid market share is that average engine capacity sizes will be lower than expected. Average engine displacements have been declining for many years due to engine technology improvements. However, hybrid vehicles will likely accelerate declining engine sizes since batteries can greatly enhance a vehicle's performance. In our view, smaller engine hybrids will on average reduce loadings despite hybrids requiring higher like-for-like PGM loadings (~+10%) versus a pure-ICE.

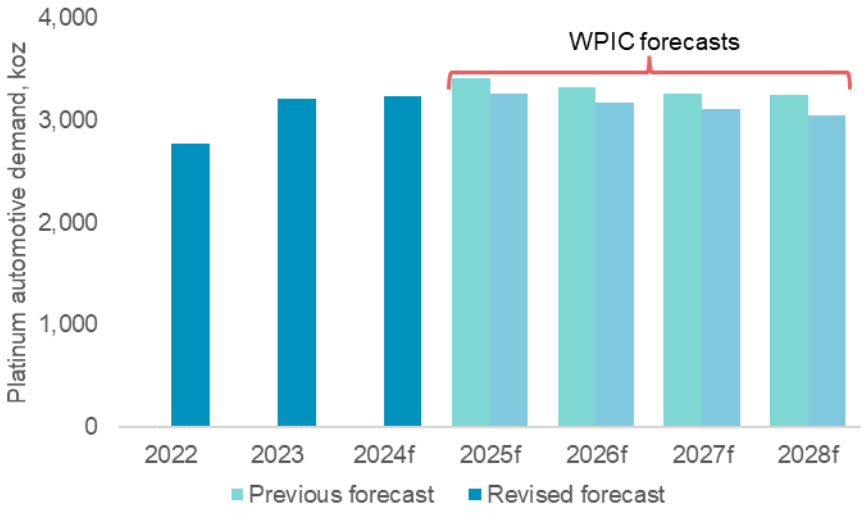
In parallel to loadings revisions, we updated our forecasts for the global light-duty vehicle mix and diluted legislation to 2028f which reduces our platinum demand forecasts by 32koz and 23koz respectively in 2028f (Fig. 10).

- **Production mix:** We have increased the proportion of light passenger vehicles as a share of the globe's combined light passenger plus light commercial vehicle production output. Our rationale is some down trading due to higher for longer interest rates, legislation calls to limit large vehicles (incl. SUVs) in major cities and declining engine sizes which results in more vehicles being classified within the passenger car segment.
- **Emissions legislation:** As focus has shifted to electrifying the drivetrain, the pace of new emission legislation has slowed more than previously expected, largely due to lobbying from traditional automakers and national governments of counties with ICE manufacturing industries. Without newer emission standards, we have reduced some regional loading's requirements. Looking forward, it is worth noting that a renewed focus on tighter emission legislation could transpire if consumers continue to resist BEV uptake by highlighting their preference for hybrid vehicles.

Higher-for-longer automotive platinum demand is driving investor interest in platinum as the negative impact of BEVs is expected to be less prominent than previously thought.

To summarise revisions to our platinum automotive demand forecasts, the reset to our loading's expectations should be considered once-off whilst the slowdown in BEV uptake is a larger and evolving trend. Accordingly, the pessimism surrounding the drivetrain transition should be viewed in the context of automotive platinum demand reaching a seven-year high in 2024f (3,237 koz) and that medium-term demand will only record modest erosion of -1% CAGR between 2023 and 2028f (Fig. 11).

Figure 11. Automotive platinum demand should prove broadly resilient over our forecast period of 2025f to 2028f



Source: Metals Focus (2022 to 2024f), WPIC Research thereafter

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3. Platinum investment demand benefitting from market development in China

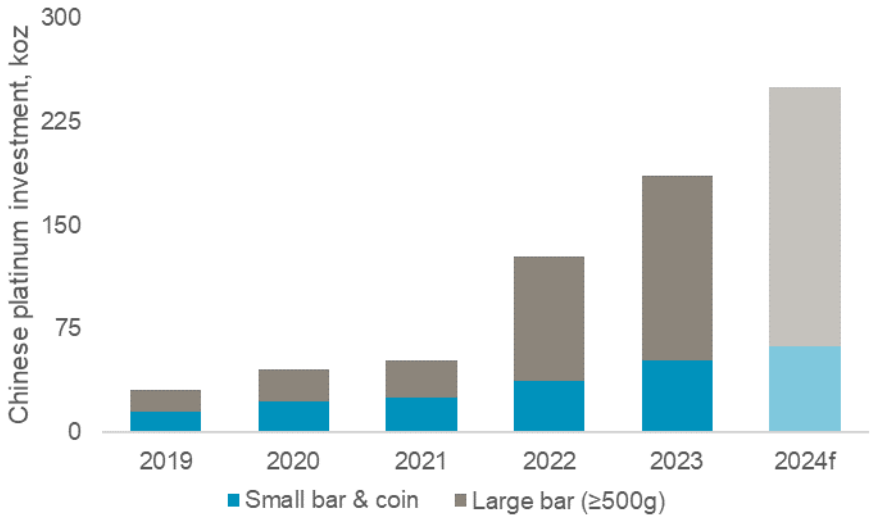
Since May 2024, our *Platinum Quarterly* reports have revised bar and coin disclosure to include previously unidentified Chinese demand dating back to 2019. Metals Focus, which independently prepares the *Platinum Quarterly* noted that the inclusion of Chinese data stems from "new field research". Chinese investment demand is categorised into two segments.

Market development activities have helped to grow China's platinum investment demand to >250 koz in 2024f.

- Bar and coin: Where demand is forecast at 63 koz in 2024f, and,
- Large bar (≥ 500g): Where demand is forecast at 188 koz in 2024f.

Between 2019 and 2024f, Chinese bar and coin demand is expected to increase by 33% CAGR for small bars and coins and by 63% CAGR for large bars (Fig. 12). China's strong platinum bar and coin demand can be attributed to platinum's compelling price point relative to gold but also WPIC's market development efforts. WPIC's domestic product partnerships have increased from seven to thirteen relationships over the past five years which has led to greater consumer awareness and product variation and availability.

Figure 12. China's total platinum bar and coin demand has increased eightfold over five years



Source: Metals Focus

Since Chinese investment ounces were previously unidentified, we have made upward revisions to our platinum investment demand forecasts to correspond with *Platinum Quarterly* reporting conventions. Our long-standing forecasting methodology for investment ounces has been to use the trailing average of ten-year demand. In doing so, WPIC avoids presenting any market sensitive information of our product partners and smooths the volatility typically found within ETF demand. We have retained our forecasting methodology for China's small bar and coin demand where the net impact is that average total bar and coin demand increases by 20 koz to 330 koz p.a. between 2025f and 2028f.

We have opted not to use China's ≥ 500g bar average demand for forecasting purposes in our two- to five-year outlook. Within our time series, China's average ≥ 500g bar demand is 80 koz which we believe is inconsistent with the strong growth exhibited since 2019 and the current 2024f forecast demand of 188 koz. To better approximate future large bar demand and balance the rapid growth with an element of conservatism, given how new the market in China is, we believe it is prudent for our two- to five-year outlook to match the one-year demand outlook from the *Platinum Quarterly* report (i.e. 188 koz).

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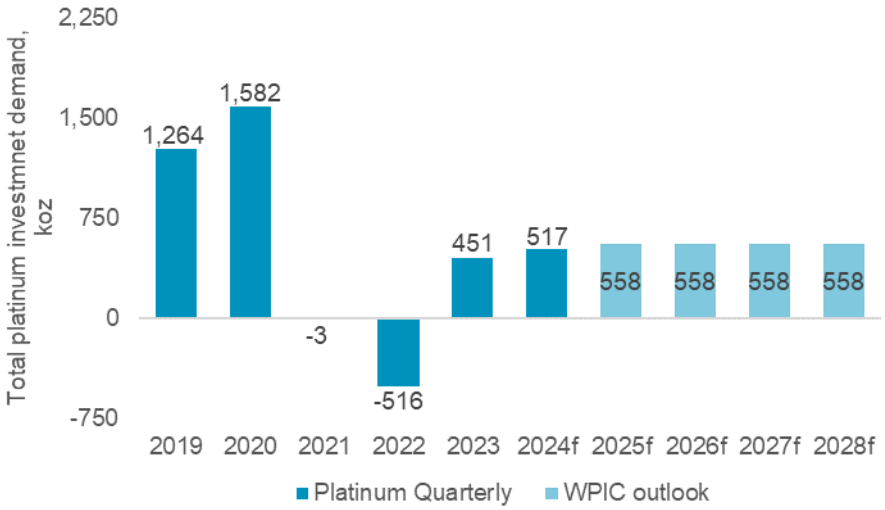
In summary, the inclusion of Chinese bar and coin demand supports an upward revision of total platinum investment demand to 558 koz from 430 koz from 2025f to 2028f (Fig. 13).

Figure 13. Platinum investment demand is forecast to exceed half a million ounces in our outlook period



Source: Metals Focus (2019 to 2024f), WPIC Research thereafter

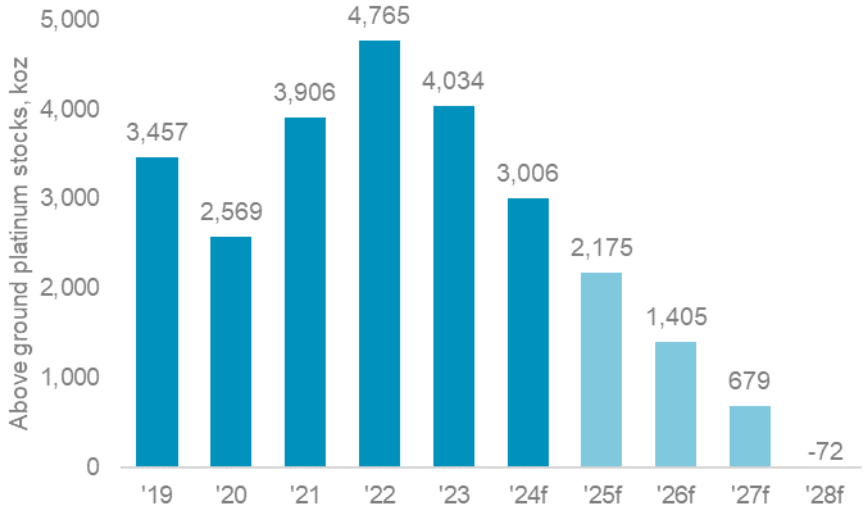
Above ground stocks

China's previously unidentified platinum bar and coin demand is not new ounces but would have previously been captured in the market balance as an inventory build.

In our latest Platinum Quarterly, above ground stocks are forecast to decline to 3,006 koz by the end of 2024f given two years of substantial deficits. It is worth highlighting that our above ground stocks forecast is 614 koz lower than previously published due to the inclusion of historic Chinese platinum bar and coin demand dating back to 2019. Whilst these ounces were previously unidentified, it is worth noting they were captured by the market balance and effectively treated as part of the inventory build/release.

Looking forward, we expect the platinum market's ongoing deficits to require the market to continue drawing heavily from above ground stocks to meet demand requirements. We estimate that above ground stocks will be depleted by the end of 2028f. This leaves the question of whether the current platinum price is sufficient to stimulate new supply or weigh on demand?

Figure 14. Above ground stocks will decrease on platinum market deficits



Source: Metals Focus 2019-2024f, WPIC research 2025f onwards

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Conclusion - supply/demand balances for 2025-2028

Having updated our supply/demand outlook for 2025f to 2028f, we highlight three conclusions:

Firstly, automotive demand for platinum is resilient. Despite rising BEV market share, automotive platinum demand has a long tail with erosion of only -1% CAGR from 2023 to 2028f due to increasingly prominent hybrid vehicle demand. Elsewhere, industrial platinum demand is forecast to remain robust whereby consumption benefits from platinum's use in multiple end markets. Notably, platinum jewellery demand looks to have turned a corner. Jewellery demand is expected to grow in 2024 and this trend should persist through our outlook period to 2028f given demand is now less reliant on China and more geographically diversified.

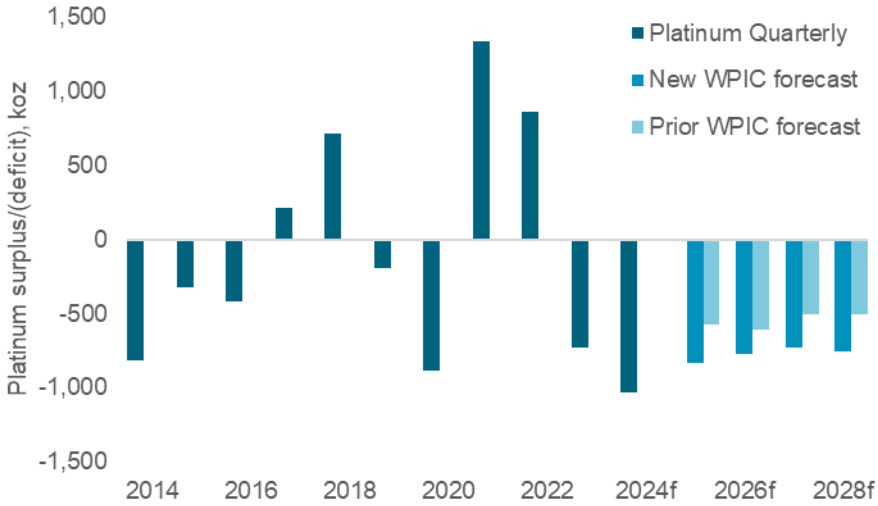
Secondly, platinum's relatively inelastic demand, will require the market to draw down above ground stocks to fulfil multi-year market deficits from 2025f to 2028f. It is not known what platinum price will be necessary to attract the portion of above ground stocks required to meet the supply shortfall, nor what impact having a large portion of above ground stocks located in China, and effectively unavailable (China has continued to import platinum in volumes that are significantly in excess of identified demand), will have on metal flows and price.

Finally, sustained weakness in PGM prices is causing miners to announce restructuring initiatives to remain financially sustainable. We have seen several public supply side announcements for mine/shaft closures and care and maintenance, ramp-up delays and future growth project deferrals. These have led to downgrades in our mine supply forecasts and the risks of additional supply side adjustments only increases the longer prices remain depressed considering cost inflation continues to be an industry wide headwind.

All told, the compelling elements of resilient demand, supply side risks and a depleting stockpile combine to underpin platinum's attractive investment case.

Platinum is forecast to record average supply deficits of 769 koz between 2025 and 2028 with supply risks having the potential to exacerbate the deficits.

Figure 15. Supply/demand balances at the mid and lower points of aggregate guidance



Source: Metals Focus 2019-2024f, SFA (Oxford) 2014-2018, Published company guidance, WPIC Research 2025f – 2028f

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WPIC aims to increase investment in platinum

World Platinum Investment Council - WPIC- was established by the leading South African PGM miners in 2014 to increase investment ownership in platinum. This is done through both actionable insights and targeted development. We provide investors with information to support informed decisions e.g. through *Platinum Quarterly, Platinum Perspectives* (monthly) and *Platinum Essentials* (now monthly). We also analyse the platinum investment value chain by investor, product, channel and geography and work with partners to enhance market efficiency and increase the range of cost-effective products available to investors of all types.

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Appendix I – Risks to forecasts

- Small changes can have significant impacts on supply/demand balances. For example a 5% change in total mine supply moves the supply/demand balance by an average of 293 koz p.a. over the years 2025-2028.
- The most significant risks to our outlook derive from macroeconomic factors which would similarly impact the demand for all commodities. Principally the risks that the combination of slowing economic growth and inflation bring to bear on consumer demand for goods that either contain platinum or for which the manufacturing process uses platinum.
- The evolution of the drivetrain in transport remains uncertain. Accelerating battery vehicle market share gains would negatively impact platinum demand. We think battery vehicle market share gains will decelerate versus the period between 2020 to 2023 given base effects and headwinds such as costs, slow charging infrastructure rollouts and a lack of feature parity (e.g. range).
- The impact of a recessionary environment on industrial and jewellery demand could be more severe than we have allowed for.
- Investment demand is potentially where the greatest risks lie. We are most confident in our projections for bar and coin demand and exchange stocks, but the risk of a continuation of the momentum behind ETF disinvestment is potentially significant. However, a clear shift in supply/demand balances into deficits should act to discourage further “net” selling.

Appendix II – WPIC outlook methodologies

Preamble

The WPIC’s platinum supply and demand model is intended to complement the one year out forecast published in our *Platinum Quarterly*, but to look further into the future to provide the basis for longer-term scenario analysis of particular aspects of supply and demand. The *Platinum Quarterly* report and data are prepared independently for the WPIC by Metals Focus.

The WPIC has not attempted to develop in-country and in-industry relationships to obtain data and the information and sources used to develop the underpinnings of WPIC’s supply/demand model are all in the public domain.

Despite us having granular views of each demand segment, we have chosen, to use a simplified and conservative approach to forecasting. This provides us with our best current base case to allow scenario analysis while we increase modelling detail and publish more granular results in future reports.

Different methodologies in different segments

The WPIC’s platinum supply/demand methodology is built up as follows for the years 2025-2028:

Refined mining supply: Our refined mining supply outlook is strictly based on each company’s public guidance for future production. This applies for WPIC members and non-members alike.

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Companies typically only change longer-term guidance once a year, usually with their financial year end, or during annual investors days (often in December). We use the aggregate of the mid-point of public published company guidance for setting our supply outlook, however, the infrequency with which longer-term guidance is updated means that the longer-term outlook may not reflect more recent events. For example, coming into the end of 2023, a number of companies have reacted to falling palladium and rhodium prices by suspending operations and development projects but longer-term guidance may not yet have been updated.

The guidance published by the PGM mining companies is typically provided for the combination of PGMs contained in the ore bodies mined by the respective companies, and expressed on a six-, four-, or two-element basis (6E, 4E or 2E respectively) including either: platinum, palladium, rhodium, ruthenium, iridium and gold; platinum, palladium, rhodium and gold; or platinum and palladium. Where guidance excludes specific reference to platinum, we have calculated refined platinum guidance by using the historical production ratios of these metals as published by the specific company. Where individual PGM mining companies do not provide refined mine supply guidance or where such guidance does not cover the period to 2026, we forecast that platinum mining supply remains at the level of the final year for which guidance, or production, is available. We have remained impartial to: the extent of mineral reserves and resources, the ability to extend mine lives, any potential smelter, precious or base metal refinery capacity constraints, the technical hurdles or timelines to complete capital projects, and the impact a change in PGM prices might have on mined supply.

Recycling supply: Automotive recycling can be determined by purchasing consecutive annual global vehicle registration data and determining detailed regional scrappage rates to apply to average vehicle platinum loadings, when manufactured, per region. We have not chosen to fund this high-cost exercise and have used a simplified approach using the published average vehicle life across all regions and determining the portion of annual platinum demand in the year of manufacture that reflects as recycled supply at the end of that average life. We use the average of this ratio over the past 20 years to calculate our forecast. Jewellery and industrial recycling rates are projections based upon historical ten-year trends.

Automotive demand: Automotive demand projections are a function of the WPIC's drivetrain outlook in combination with estimated autocatalyst platinum loadings and engine sizes for different vehicle categories in different geographies. Automotive production and the drivetrain estimates are based upon historical production numbers and trends as well as announced future regulations and WPIC's view of the pace of electrification and the phasing out of internal combustion engines. Future platinum loadings in autocatalysts are based upon historical loadings that are available in the public domain or can be calculated from published data, adjusted for WPIC's estimates of the impact of regulatory changes in different geographies, such as tightening emissions standards, as well as the rate of substitution of platinum for palladium in gasoline engines. FCEV demand for platinum has been added to the automotive demand outlook as a separate demand component.

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Jewellery demand: The outlook for jewellery is predicated on recent historical trends by geography, projected into the future, with some allowance for a slowing of the trend away from platinum jewellery in China, and a return to modest growth in India.

Industrial demand: Industrial demand projections are based upon historical trends within each sub-category. This results in relatively steady trend projections, whereas in practice industrial demand is more volatile, depending upon the timing of capacity additions. Nonetheless, while industrial demand can be volatile, the multi-year trends have been very consistent and do provide a good guide to the future, added to which the annual volatility seen within each industrial sub-category tends to even each other out when totalled up. Platinum industrial demand is the demand segment most closely correlated to global economic growth over the long term. Despite the compound annual growth of platinum industrial demand over the past 30 years significantly exceeding global growth, our forecast, based on more recent historical trends, is closer to forecast global growth. Projected stationary fuel cell and electrolyser demand have been included in the other industrial category.

Investment demand: While we have granular insight into investment demand due to the views of our many product partners around the world and our regular interaction with investors, we have chosen to use a ten-year historic average of investment demand as the basis for our forecasts. This is to reduce the dramatic positive impact of extremely strong global ETF demand in 2019 and 2020 and similarly strong bar and coin demand in 2020 and 2021.

An exception to our investment demand forecasting methodology is China large bar demand (≥ 500g). The nascent segment is expected to record demand growth of 63% CAGR between 2019 to 2024f. Accordingly, using average demand, presents an unrealistic forecast for a demand segment which has delivered consistent growth. Until a longer time-series is established or demand stabilises, we believe it is prudent for our two- to five-year outlook to match the one-year demand outlook from the *Platinum Quarterly* report.

Elsewhere, we have not included the likely impact on investment demand of any material changes in price. For example, if the market is seen with successive, and increasing deficits as we are projecting, then it is likely that investors might expect the platinum price to move higher to reflect the shortage of metal available to the market and consequently increase their exposure by purchasing platinum metal or ETFs. This would in turn accentuate future deficits. We do not attempt to capture this iterative process and rather choose to maintain future investment demand at a level based on a ten-year historic average. We have assumed a net change in stocks held by exchanges of zero each year over the forecast period as those flows are typically short-term in nature to address atypical developments in the physical market and furthermore, primarily reflect the movement of metal between visible and non-visible inventories.

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