PLATINUM ESSENTIALS

Updating WPIC's two- to five-year supply/demand outlook: Deeper deficits despite recessionary risks

This report presents updated estimates for platinum supply/demand balances in the years 2023-2026. A weakening economic environment negatively impacting the outlook for platinum demand is more than offset by cuts to mine production guidance and recycling expectations, resulting in deeper platinum market deficits than in our previous forecasts. This report complements, but is entirely separate from, the one year forward outlook we publish in our Platinum Quarterly (PQ), which is prepared independently for us by Metals Focus.

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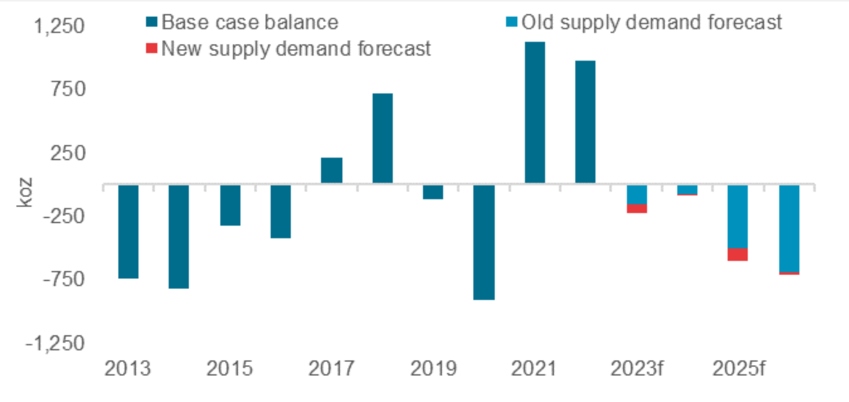
This report contains our updated outlook for platinum supply and demand for the years 2023-2026 as well as an updated automotive drivetrain outlook to 2040. All estimates in this report are based upon publicly available information and WPIC in-house analysis*. We have factored in estimates of the impact of slowing economic growth and increased inflation, which are negatively impacting demand in the industrial and jewellery segments. We have reduced net new ETF investment in 2023 but otherwise left the investment outlook unchanged. We continue to see automotive production as being constrained to limits below recessionary levels of consumer demand but have trimmed expectations in Europe due to regional headwinds. However, whilst demand is weaker than in our previous forecasts, this is more than offset by cuts to mine supply guidance as well as a weaker outlook for recycling supply as the scrapping of end-of-life vehicles is postponed. In our initial supply/demand forecast for 2023-2026, we projected the platinum market to enter modest deficits in 2023 and 2024, which then deepened through to 2026. In this update, the reductions to supply outweigh the reduced demand outlook and the forecast deficits are deeper on average over the four years by ~50 koz p.a.

Figure 1. WPIC projects platinum deficits from 2023 deepening to 2026



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

As before, our supply/demand outlook does not include China's platinum imports in excess of identified demand, which continue to run well above identified demand. If China's imports continue at their current pace, then the deficits we are forecasting would increase by about 1 Moz a year. Under this scenario and even assuming that platinum ETF disinvestment continues at its current rate, the deficits would still deepen to almost 800 koz in 2023, 650 koz in 2024 and over 1 Moz in 2025 and 2026.

**WPIC in-house supply research is based solely on 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.*

Contents

Figure 2. Supply/demand summary table

	PUBLISHED PLATINUM QUARTERLY ESTIMATES†				WPIC ESTIMATES‡			
	2019	2020	2021	2022f	2023f	2024f	2025f	2026f
PLATINUM SUPPLY								
Refined mine production								
- South Africa	4,374	3,298	4,678	4,203	4,415	4,833	4,692	4,653
- Zimbabwe	458	448	485	465	474	510	534	534
- North America	356	337	273	275	289	302	309	325
- Russia	716	704	652	646	607	607	607	607
- Other	170	202	208	205	182	183	184	185
- Producer inventory movement	2	-84	-93	0	0	0	0	0
Total mining supply	**6,077**	**4,906**	**6,204**	**5,794**	**5,968**	**6,435**	**6,326**	**6,304**
Total recycling	**2,136**	**1,930**	**1,953**	**1,720**	**1,852**	**1,890**	**1,848**	**1,885**
Total supply	**8,213**	**6,836**	**8,156**	**7,514**	**7,820**	**8,325**	**8,174**	**8,189**
PLATINUM DEMAND								
Automotive	**2,869**	**2,402**	**2,643**	**3,015**	**3,533**	**3,712**	**3,946**	**4,028**
Jewellery	**2,099**	**1,820**	**1,923**	**1,959**	**1,908**	**1,824**	**1,853**	**1,869**
Industrial	**2,127**	**1,978**	**2,508**	**2,132**	**2,168**	**2,309**	**2,412**	**2,444**
Total investment	**1,237**	**1,544**	**-45**	**-565**	**430**	**560**	**560**	**560**
- Bar and coin	266	578	332	285	310	310	310	310
- ETF	991	507	-238	-550	120	250	250	250
- Stocks held by exchanges	-20	458	-139	-300	0	0	0	0
Total demand	**8,331**	**7,743**	**7,029**	**6,540**	**8,039**	**8,405**	**8,770**	**8,901**
Supply/demand balance	**-119**	**-908**	**1,128**	**974**	**-219**	**-80**	**-597**	**-712**

†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 2019 to 2022f, WPIC Research from 2023f

Introduction

The WPIC's 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. For the avoidance of doubt, all estimates for 2023 to 2026 included in this report are WPIC forecasts, with the exception of mine supply which is based upon public 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 customers, that provides an outlook for all PGMs.

WPIC's base case published supply/demand projections for 2023 to 2026 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.

Key projections

Our revised outlook is compared to the supply/demand edition published in June. Although there were uncertainties in the outlook for the global economy, we previously compared our supply/demand forecasts to pre-COVID levels of supply and demand as on balance we were more inclined to expect a gradual normalisation of market conditions. It is now clear that this is highly unlikely. As discussed in the next section, the macro-overlay has deteriorated and likely will further.

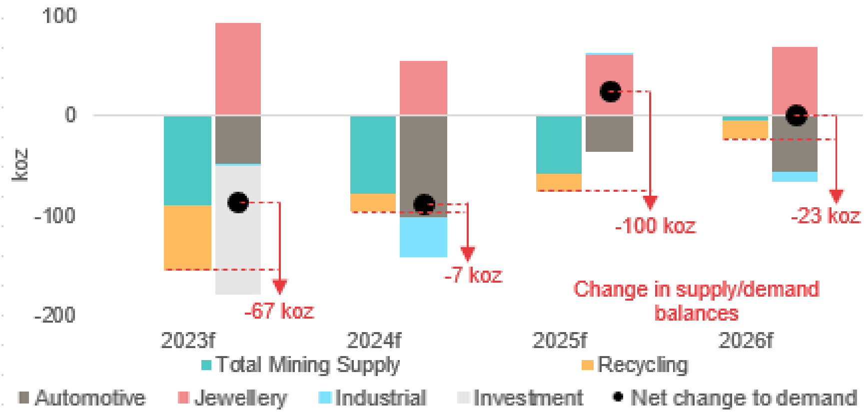
Our key projections for the period 2023-2026 are as follows:

- **Total mining supply** is down by an average of 1% (-59 koz platinum) from our last forecasts on reduced guidance from most of the producers with non-December year ends. The producers with December year ends have mostly cut 2022 production guidance, with longer-term revisions not expected until December.
- **Recycling supply** is reduced by an average of 1.5% (29 koz) on reduced scrap availability due to vehicles being run for longer.
- **Automotive demand** for platinum is down by an average of 1.6%, but still expected to grow by 8% p.a. through to the end of 2026, supported by increased substitution for palladium in gasoline engines, as well as higher diesel loadings.
- **Jewellery demand** is up by an average of 4%, even after building in a recessionary factor, due to ongoing strong demand from North America.
- **Industrial demand** for platinum is down by 1% versus previous estimates but is still expected to grow by 3% p.a. through to the end 2026.
- **Investment demand** for platinum is unchanged since our previous outlook, with the exception of a 52% cut to ETF demand in 2023 as the current disinvestment trend is expected to take time to abate.

Mine and recycling supply projections are down by 1% and 1.5% on average for 2023-2026.

Total demand has reduced by an average of 0.5%.

Figure 3. Near-term reductions in platinum supply forecasts more than offset the weaker demand outlooks in 2023 and 2024



Source: WPIC Research

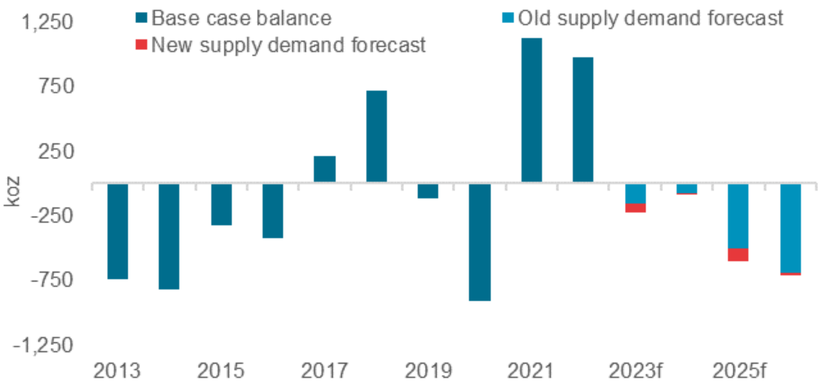
The reductions to supply are more significant than the reductions in demand.

Conclusion – modestly deeper deficits

As shown below, the net impact of the changes to our forecasts is to modestly deepen the projected platinum market deficits from 2023-2026 by an average of ~50 koz p.a.

Of the years within our projections, 2024 remains close to being in balance, but this is before any updates to mine supply guidance, which is expected in late November early December. Furthermore, as discussed on the front page, our outlook assumes China's platinum imports match identified demand, whereas they have averaged 1 Moz p.a. more than identified demand since 2018.

Figure 4. Platinum is expected to be in modest deficits in 2023 and 2024, moving to deepening deficits in 2025 and 2026



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Deficits are increased by an average of ~50 koz p.a. from 2023-2026.

Macroeconomic uncertainty influencing market behaviour despite strong platinum fundamentals

The current environment is characterised by high geopolitical tension, which combined with concerns of slowing or even negative economic growth and high inflation has led to extreme macro uncertainty and increased volatility.

There are a number of impacts that this can have on the platinum industry and markets. Firstly, in terms of supply, the uncertain economic outlook and the impact of inflation on costs are likely to result in mining companies postponing significant capital investment decisions. As a consequence, the outlook for mine supply is more likely to be one without meaningful growth, despite our forecasts showing that mine supply growth will be needed to meet growing demand. Delivering growth even as soon as the late 2020's requires new projects or expansions to be sanctioned now given the long lead times. Furthermore, whilst we believe that the near-term production of new vehicles remains below recessionary demand levels, significant loss of real income coupled with inflation could result in a further cut to scrap autocatalyst supply if consumers are forced to keep older vehicles running for longer over the medium to longer-term.

Significant macro uncertainties abound.

On the demand side, we do not see significant risks to near-term automotive demand, but as mentioned, there could be risks to demand over the medium to longer-term if the economic downturn and inflation prove sustained. Jewellery demand certainly faces risks from an erosion of household disposable income, but the bridal market, which makes up a sizeable portion of the total platinum jewellery market (particularly in the West), is typically less cyclical and provides a buffer to these risks. Indeed, studies conducted by De Beers have suggested that marriage rates tend to rise during recessionary periods. Industrial demand is probably the area that faces the most significant risks from a sustained economic downturn in combination with inflation. Of the major markets, we think the risks to industrial demand are greatest in Europe, where the energy crisis is arguably the most acute due to the significant reduction in Russian energy supplies to the region (both voluntary and involuntary). Even though platinum is a well-established bullion metal, where we continue to expect robust demand, ETF investment demand is an area of significant risks to the downside due to the recessionary environment. The macro asset allocation reasons behind this are discussed in more detail in the investment section, but suffice to say that we think the recent outflows should slow as the market continues to tighten.

We see the greatest risks to regional demand being in Europe.

Platinum ETF disinvestment is expected to slow then reverse. We think exchange stocks will have been drawn to minimum sustainable levels by year-end, eliminating this source of supply.

Where we see significant economic and inflationary risks to demand, we have used the following estimated changes to real consumer purchasing power to flex our demand estimates.

Figure 5. Estimated changes to real consumer purchasing power

	2023	2024
North America	-2.9%	-0.8%
Western Europe	-4.1%	-0.2%
Japan	0.2%	0.4%
China	2.9%	2.9%
Rest of the World	-2.1%	-0.3%

Source: Bloomberg, WPIC Research

Recessionary factors have been applied to reforecast specific demand estimates.

Platinum mine supply outlook

Total mine supply is based upon published mining company public guidance

Reminder: Please see the appendix for fuller descriptions of our methodologies.

A general theme for 2022 has been a continual erosion of PGM mining company public production guidance for this year, but also longer-term production expectations for companies that have mid-year financial year ends. Longer-term guidance is usually only updated once a year and we are expecting those companies that have December year ends to provide revised outlooks with their investor updates around early December. The changes year to date have reflected ongoing challenges in South Africa in terms of power supply irregularities and downstream processing issues, as well as geotechnical and weather-related problems in North America.

One region where guidance has remained unchanged, but which faces risks to sustaining supply, is Russia. Nornickel has so far maintained its guidance, but it has cautioned that sanctions have restricted its access to Western mining and capital equipment as well as spares, which may result in production challenges from later this year. Sadly, there may also be a risk of personnel shortages if Nornickel's workforce is impacted by the recently announced partial mobilisation to bolster Russia's troop numbers in Ukraine.

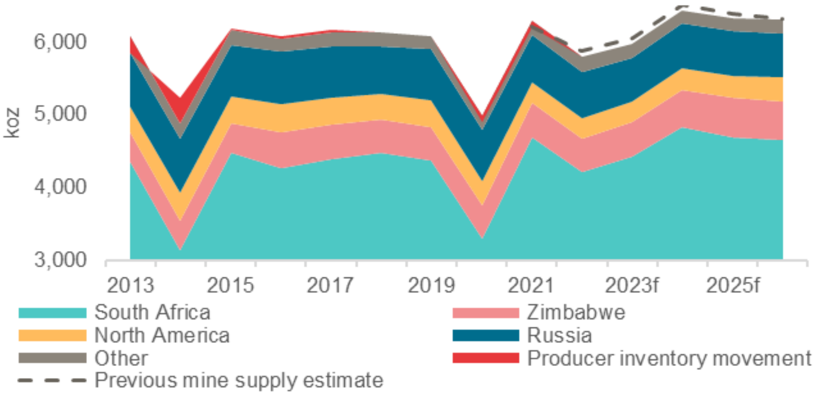
We continue to use producer guidance for the mine supply outlook but see further risks to the downside, even after continued cuts to guidance.

We also note that economic and inflationary pressures are likely to increase unit production costs for the mining industry, and that caution around the macroeconomic outlook could delay go-ahead decisions for capital projects. Reflecting these factors, as well as the ongoing cuts to near-term guidance pointing to a risk that medium to longer-term guidance could also be trimmed, we have continued to use the bottom end of the public production guidance ranges for our mining supply projections.

Using the bottom end of producer guidance, total mining supply peaks at 6,435 koz platinum in 2024, 79 koz lower than on our previous estimates but 640 koz higher than the forecast for 2022. Despite being lower than our previous estimates, this would still be the highest production level since 2011, and 10% higher than the average of mine production since then, despite only very limited capital investments in the intervening years. After 2024, available company guidance suggests that production should gradually decline toward typical long-run levels.

We have not allowed for any major disruptions, such as strike action or infrastructure failure, as these events are unpredictable by nature. We also note that multi-year employee wage agreements announced year to date significantly reduce the chances of wage-related labour unrest in the timeframe we are examining, although they do not rule out broader unrest, especially if inflation begins to impact real earnings.

Figure 6. Ongoing mine supply guidance has continued to be trimmed during the course of 2022, but further updates to medium to longer-term guidance are expected in November/December



Source: Johnson Matthey from 2000 to 2012, SFA Oxford from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023, Company reports

Total mining supply is down by an average of 1% or -59 koz p.a. for the period 2023-2024

Platinum recycling supply outlook

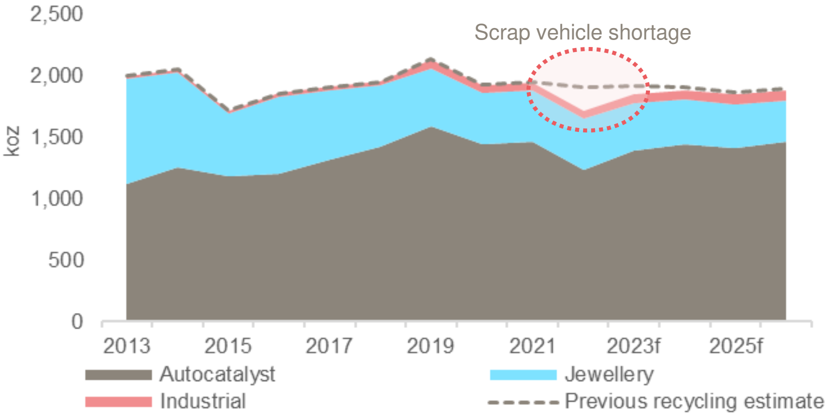
Recycling outlook based upon historical recycling rates but flexed in the near-term by the current shortage of scrap supply

In general, we are expecting a relatively flat outlook for recycling, using historical recycling rates in combination with average vehicle lives and expected jewellery sell-backs as a guide to the future.

Delayed vehicle scrappage is expected to weigh on recycling volumes.

The exception is 2022, where Metals Focus have cut automotive recycling expectations due to the ongoing production challenges limiting new vehicle output and thereby forcing consumers to run existing vehicles for longer and in turn limiting the supply of scrap autocatalysts. We have carried some of this through to 2023 and 2024 but expect the situation to ease as automotive supply chain challenges abate and the supply of new vehicles increases.

Figure 7. Recycling supply is expected to be broadly flat going forwards



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Forecast recycling volumes are reduced in 2023 and 2024 but are expected to normalise thereafter.

Automotive demand for platinum

Automotive production remains below recessionary levels of consumer demand, but Europe trimmed on production headwinds

At around 40% of demand, the automotive outlook is key to the supply/demand fundamentals of platinum. It is also critical to investor sentiment towards platinum, given some commentators predict that the demise of the internal combustion engine is imminent and therefore automotive platinum demand is likely to decline precipitously going forwards. In fact, although we believe that 2017 will have been the peak volume year for internal combustion engine (ICE) vehicles, our analysis strongly suggests the automotive platinum demand will continue to grow due to higher loadings and increased platinum for palladium substitution in gasoline engines. Given the importance of the drivetrain outlook to that of overall platinum demand, our drivetrain estimates run to 2040, well beyond our supply/demand projections, which run to 2026.

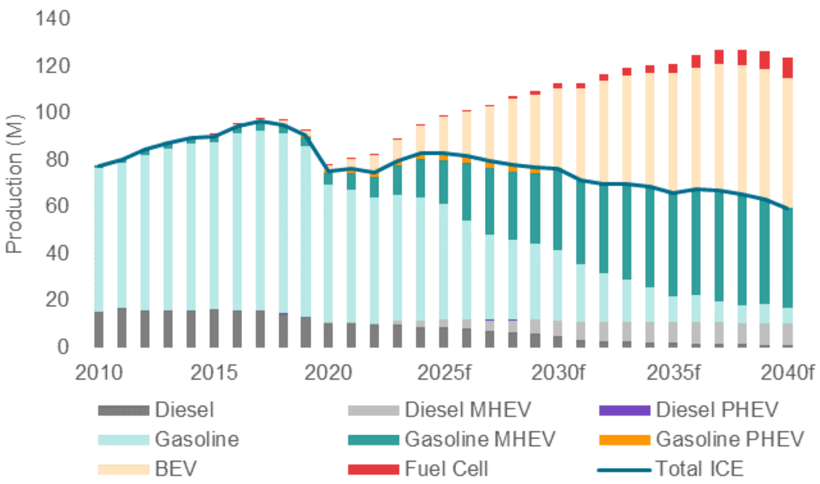
Automotive changes versus our previous outlook are reasonably modest in the near-term. We estimate that supply chain constrained automotive production volumes remain below recessionary consumer demand levels. Added to which, we note that there is pent-up demand from the production challenges through 2021 and 2022, partially compensated for by lower vehicle mileages during COVID lockdowns. However, production challenges in Europe, linked to regional factors such as the high cost of energy, potential energy shortages over the winter, and transport disruption during the 2022 summer drought, have led us to trim near term production estimates in Europe, with the majority of the reductions being in ICE vehicle categories.

We estimate that automotive production volumes are constrained at below recessionary levels of consumer demand, but there are risks over the medium term if the economic contraction is prolonged.

Longer-term, we continue to see challenges with Europe banning all ICE vehicles by 2035 as not all roles can be electrified with current battery technology. Consequently, in our forecasts, ICE remains a small albeit diminishing part of the European drivetrain mix beyond this date. One area we have made longer-term adjustments to is total LV production in China in the 2030's, which on reflection was too ambitious; we now expect per-capita private car ownership rates to remain well below those in the West.

We have reduced our longer-term outlook for vehicle ownership in China.

Figure 8. Combined automotive drivetrain production outlook for light vehicles, light commercial vehicles and heavy-duty vehicles



Source: OICA, ACEA, Bloomberg, WPIC Research

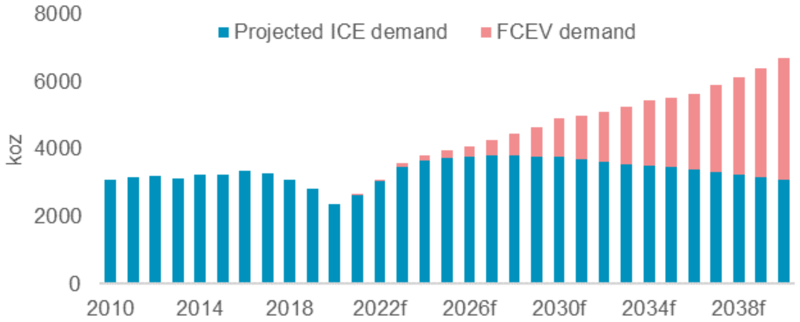
While ICE vehicle production is expected to decline from 2024 onwards, the outlook for automotive platinum demand is, perhaps surprisingly to many, one of positive growth. This is driven primarily by platinum substitution for palladium in the catalytic converters for gasoline vehicles as well as by higher loadings to meet tighter emission standards. We continue to be conservative on the volume of platinum for palladium substitution, and note that our estimate for 2024 is around half that of other industry participants (such as Sibanye-Stillwater). Matching their numbers would add 750 koz to our demand forecasts in that year.

Substitution in combination with tighter emissions standards are expected to continue to drive ICE demand for platinum higher, peaking in 2028.

In addition to the growth in demand from ICE catalytic converters, we also forecast increasing FCEV penetration into the vehicle roles that are hard to electrify with existing battery technologies. Starting from a very low base, we expect FCEV demand for platinum to more than offset declining ICE demand after 2028 with significant growth in the 2030's.

To conclude the automotive demand for platinum outlook, we forecast catalytic converter demand for platinum to reach 3,745 koz in 2026, vs the 3,015 koz expected in 2022. When adding the platinum demand from the slowly growing FCEV volumes to this, we expect automotive demand for platinum to exceed 4,028 koz in 2026, 34% higher than forecast automotive platinum demand in 2022.

Figure 9. Total ICE demand for platinum peaks in 2028 with FCEV demand driving growth thereafter



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

FCEV demand for platinum more than offsets declining ICE demand after 2028.

Jewellery demand for platinum

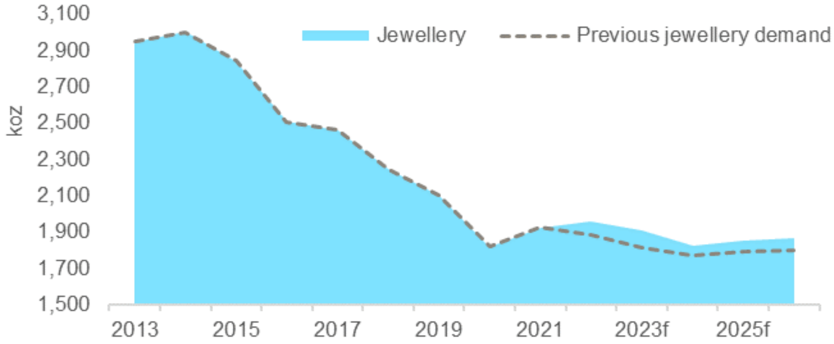
Less weak than previously projected

Jewellery demand for platinum in 2022 has remained more robust than previously assumed, and that is despite the continued impact of China's zero COVID strategy, which had not been fully factored into forecasts earlier in the year. The US and India have proven to be particularly strong markets. This strength in demand has led to an increase in forecast demand for 2022.

Jewellery demand has proven to be stronger than expected in 2022.

Our previous 2023-2026 outlook assumed continued weakness in jewellery demand going forwards. The stronger than expected demand in 2022 has resulted in us upgrading our outlook, even after accounting for the projected changes in real consumer spending power. However, the outlook is still one of a gradual decline in demand, just at a slower pace than on our previous projections.

Figure 10.We expect the gradual decline in jewellery demand for platinum to continue, albeit at a slower rate than previously expected



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Forecast jewellery demand is higher than on previous estimates, even after factoring in recessionary headwinds.

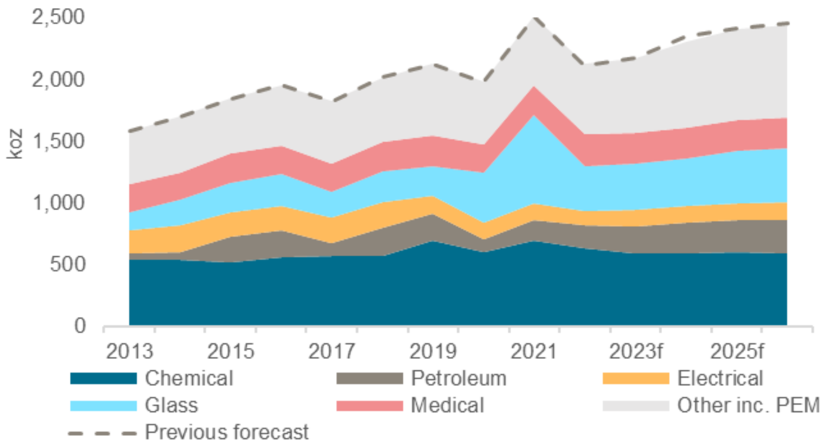
Industrial demand for platinum

Industrial demand growth continues despite factoring in recessionary risks

There are a lot of changes in the details for our projection of industrial demand for 2023-2026, but the net impact at the gross level is extremely limited. The flow through of an increase in demand expectations for 2022 is offset by the inclusion of recessionary factors in some of the chemical and electrical sub-sectors, whereas petroleum is expected to remain strong, and we have made no change to the glass outlook as capacity additions are already expected to step down on a cyclical basis.

The biggest risk to this outlook is probably in the European chemicals industry due to the particularly high gas prices in Europe eroding margins in the fertiliser industry.

Figure 11. Historical trends point to continued growth in industrial demand for platinum, underpinned by its catalytic properties



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Although there are a lot of changes in the detail, the net changes to industrial demand are limited.

Investment demand for platinum

We expect ETF outflows to gradually slow then reverse in 2023

Although there is a high level of investor interest in platinum, the small scale of the platinum market relative to other sectors where investors have far more meaningful levels of AUM deployed is leaving them with little time to allocate to value decisions and positioning in platinum. In general, investment flows are predominantly being determined by macro-asset allocation decisions agnostic of the underlying fundamentals. This has resulted in large scale disinvestment from precious metal ETFs and a flight to the dollar. Corresponding dollar strength has resulted in the majority of metals experiencing weaker prices in dollar terms, although platinum has performed well on a relative basis and on an absolute basis in local currencies. In contrast, bar and coin demand remains robust as investors are looking for stores of value for capital preservation.

Macro-asset allocation decisions are driving investment flows.

Bar and coin demand is expected to remain robust as investors look to platinum as a store of value.

Despite the challenging investment environment, platinum fundamentals for 2023 and beyond are perhaps the strongest in years. Mine and recycling supply appear more constrained and demand from the automotive and industrial segments remain robust, despite the weaking economic outlook. Added to the traditional end demand sectors, demand from the hydrogen economy is expected to grow meaningfully through this decade. Investors are particularly interested in the hydrogen market, especially given the strong governmental support emerging around the world, its green credentials, and the energy security it offers. However, there are limited investment opportunities for exposure to hydrogen and this presents an excellent opportunity for platinum to be seen as a proxy hydrogen investment over the medium to longer-term. Nonetheless, it seems that the momentum behind the current selling and the recognition of platinum's positive outlook are likely to take time to shift.

Investor interest in hydrogen is drawing attention to platinum as proxy for exposure.

Breaking down the outlook for the investment demand sub-sectors

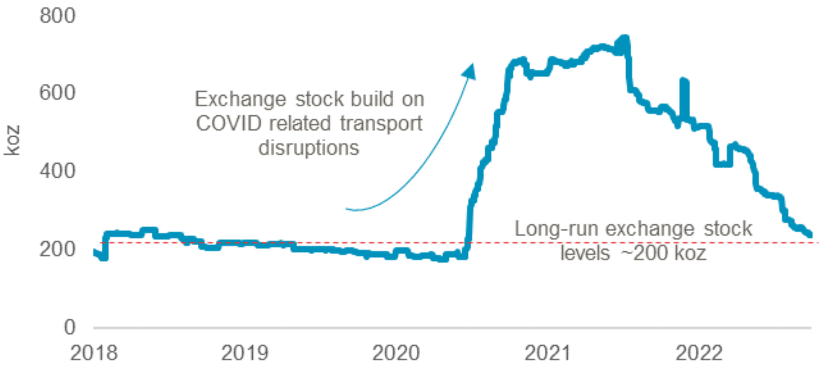
Bar and coin demand is expected to remain robust. We continue to forecast annual demand of 310 koz, which is aligned with average demand from 2013 but down slightly on recent levels.

Stocks held by exchanges have seen significant outflows since the second quarter of 2021 (~460 koz), as tight physical market conditions have supported elevated lease rates and by extension negative EFP rates that have encouraged the movement of material out of exchange stocks. Our view remains that the tight market conditions reflect China's ongoing demand for platinum, well in excess of identified demand, which has effectively resulted in a flow of metal from the US and Europe to China. However, we are also of the opinion that exchange stock outflows are going to slow and most likely stop by the end of this year.

Risks of further exchange stock outflows are limited.

As shown in figure 12, the historical long-run level of exchange stocks was ~200 koz across NYMEX and TOCOM, a level which we expect to be reached around the end of 2022. We think it is unlikely that stock levels will fall below historical levels, and there are even arguments that the recent memory of the logistical challenges experienced during COVID could result in stocks remaining higher than historical levels for risk management purposes. As such, we are forecasting no further exchange stock outflows from 2023 onwards.

Figure 12. Platinum stocks held on exchange have seen significant outflows since the beginning of 2021 but are almost back at historical long-run levels – we see limited risk of further outflows



Source: Bloomberg, WPIC Research

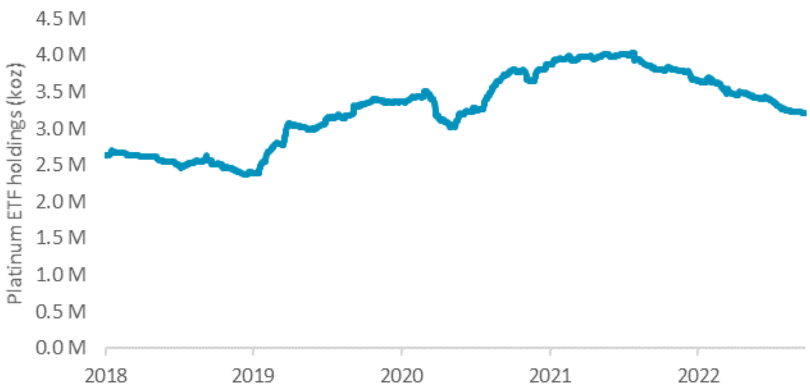
We do not expect exchange stocks to fall below historically established long-run levels.

Future ETF flows are more difficult to forecast. Platinum ETF disinvestment has been significant since the middle of 2021 (~770 koz), which as stated above we have ascribed to macro-asset allocation decisions, agnostic to underlying fundamentals. However, we think that residual holders are likely to have longer-term outlooks, to be better versed in platinum's underlying fundamentals, and to have higher value expectations. This, in combination with expected platinum deficits from 2023 and increasing investor interest in hydrogen, is expected to result in ETF disinvestment slowing and then reversing in 2023.

Residual ETF holders are thought to have long-term outlooks and higher platinum value expectations.

Nonetheless, we have reduced forecast ETF investment demand for platinum in 2023 from 250 koz to 120 koz platinum, but we have left 2024 and beyond flat at 250 koz p.a.

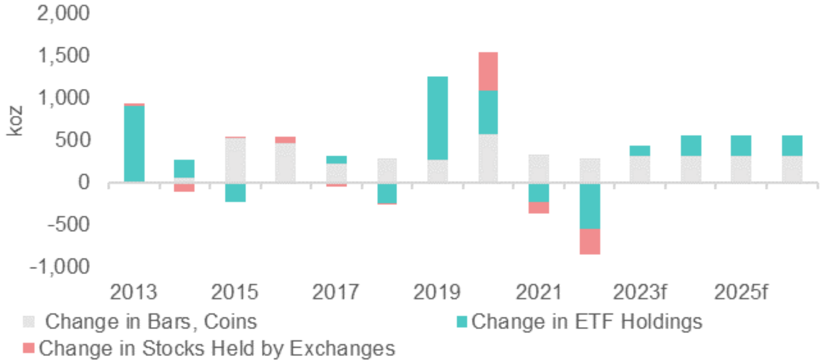
Figure 13. We have taken a conservative view on the outlook for platinum ETF investment demand versus historical ETF demand



Source: Bloomberg, WPIC Research

We expect tighter physical market fundamentals to slow and then reverse platinum ETF disinvestment.

Figure 14. We think that ETF disinvestment will slow going forwards and return to positive investment flows in 2023



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Longer-term investment flows are aligned with historical averages.

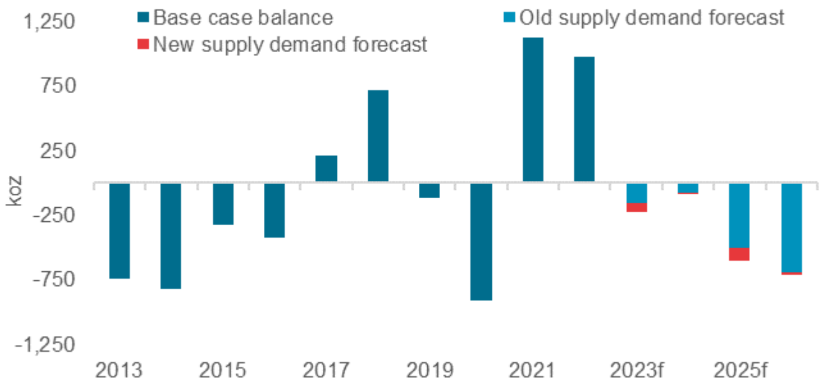
The net impact is that we expect investment demand for platinum to total 430 koz in 2023 and 560 koz p.a. thereafter.

Supply/demand balances for 2023-2026

Slightly deeper deficits

In summary, the impact of the changes to our 2023-2026 outlook is that cuts to platinum supply are slightly greater than the reduced demand outlook, which has resulted in the deficits we were forecasting for 2023-2026 deepening slightly versus our previous assumptions. The deficits have deepened by ~50 koz on average in each year. All of the years show pretty substantial deficits except for 2024 which remains the closest to being in balance, but we think there are risks to the downside in terms of mining and recycling supply.

Figure 15. Platinum is expected to be in modest deficits in 2023 and 2024, moving to deepening deficits in 2025 and 2026



Source: SFA (Oxford) from 2013 to 2018, Metals Focus from 2019 to 2022, WPIC Research from 2023

Despite a recessionary overlay, forecast platinum deficits have deepened by an average of ~50 koz p.a. for the years 2023-2026.

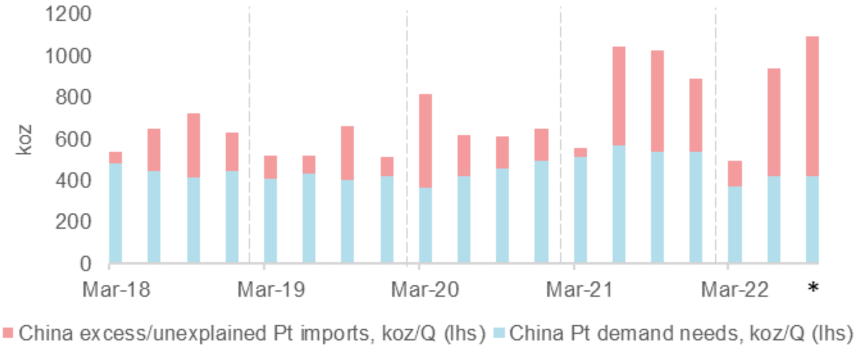
What if China's excess demand continues apace?

Potential for even deeper deficits than projected

Since the beginning of 2018, China has imported almost 5 Moz more than its identified demand at a pace of ~1 Moz p.a. Even after allowing for some likely inaccuracies in the customs data, excess imports are still expected to be significant. The excess imports are largely believed to be quasi-speculative in nature and predicated in part on expected future demand from the hydrogen industry.

During 2021 and 2022 China's demand has been satisfied in a large part with the outflows from stocks held by exchanges and ETF disinvestment. As we have discussed earlier in this report, we think there are good reasons to expect a cessation in exchange stock outflows and a slowing and then a reversal of ETF disinvestment.

Figure 16. Platinum's expected deficits from 2023 to 2026 could be significantly deepened by continued excess imports into China



*Source: Bloomberg, WPIC Research, *Q3'22 imports projected through dividing the sum of July and August's imports by two and multiplying by three*

Our projections for 2023-2026 assume that China's demand for platinum is aligned with identified demand, i.e. significantly below ongoing levels of imports into the country. If China's imports continue at their current pace, then the deficits we are forecasting would increase by about 1 Moz a year. Under this scenario and even if platinum ETF disinvestment continued at its current rate, the deficits would still deepen to almost 800 koz in 2023, 650 koz in 2024 and over 1 Moz in 2025 and 2026.

If China's excess imports continue in future years, the deficits would be >1 Moz p.a. greater.

On the other hand, a doubling or more in the platinum price, as seen with palladium in the 2010's, could result in any quasi-speculative platinum holdings in China being gradually released and thereby reduce or potentially eliminate the forecast deficits. Importantly, national regulations mean that this platinum is captive in China and not available in the rest of the world, which could still experience a shortage of readily available metal.

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 the information to support informed decisions e.g. the *Platinum Quarterly* and monthly *Platinum Perspectives* and *Platinum Essentials*. 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.

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 313 koz p.a. over the years 2023-2026. Given the momentum of negative adjustments to mine production guidance, we think that further downward adjustments of the medium to longer-term outlooks are possible with the annual investor updates in November/December.
- 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.
- We think automotive production levels remains constrained below the level of consumer recessionary demand, but a worsening of the outlook could prove our estimates to be optimistic. Potentially balancing this risk, we have taken a conservative view on the levels of platinum for palladium substitution in gasoline vehicles.
- 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 (which are expected to end 2022 as long run minimum levels), 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 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, for this inaugural report, 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 2023-2026:

Refined mining supply: The WPIC was established by several PGM mining companies, and consequently we do not attempt to forecast future mined supply of platinum. To be able to present a supply/demand forecast to assist investors in making more informed investment decisions 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.

We have seen a number of PGM mining companies make significant downgrades to public production guidance for 2022 due to ongoing production challenges in South Africa. Equally, while Nornickel in Russia has kept guidance unchanged for the time being, it has flagged that sanctions are limiting its ability to import new mining equipment and spares, which could negatively impact its ability to sustain production rates in the future. Companies typically only change longer-term guidance once a year, usually around year end, so although we have seen guidance adjustments being made for 2022 the longer-term guidance ranges have not been adjusted. Given the operational challenges in both South Africa and Russia, we have elected to use the bottom end of the public production guidance ranges for our mining supply projections, which feed into our overall supply/demand forecasts.

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 attempted 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.

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, in practice 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. Furthermore, 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. Consequently, we include bar and coin investment demand of 310 koz p.a., and ETF demand of 250 koz p.a. 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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