

FOREWORD

This edition of *Platinum Quarterly* presents second quarter platinum supply and demand data and updated annual forecasts for 2022. It also includes the WPIC's views on issues and trends relevant to those investors considering exposure to platinum as an investment asset during this time of significant economic and geopolitical uncertainty. We also provide an update on how our product partnerships continue to meet investors' needs and increase platinum investment, recognising that inflationary concerns are shared by many at this current time. The *Platinum Quarterly* report and data (starting on page 7) are prepared independently for the WPIC by Metals Focus.

The second quarter was characterised by significant concerns around slowing economic growth combined with inflation, compounded by ongoing geopolitical tensions and continued supply chain disruptions. Despite the economic and supply chain challenges, demand for platinum from automotive, jewellery and industrial end uses remained robust, with ongoing tightness in the platinum market illustrated by continued elevated lease rates, which were accentuated by ongoing high levels of excess imports into China. However, investment demand was negative overall, with ongoing strong demand for bar and coin offset by significant negative demand for ETFs and exchange stock outflows. Year-on-year quarterly supply and demand were down 7% and 13%, at 1,961 koz and 1,612 koz respectively, leading to a market surplus of 349 koz in the second quarter. For the full year of 2022, we forecast 8% and 7% declines in global supply and demand respectively. This will result in the global market surplus falling by 10% year-on-year to 974 koz.

2022 supply/demand summary and security of supply concerns:

- The forecast 2022 platinum surplus has increased since our last forecast, driven by negative investment demand, despite weaker supply and robust automotive, jewellery and industrial demand.
- There have been significant downward revisions to 2022 supply expectations, driven by operational constraints in South African and North American mining operations and delayed end-of-life vehicle scrappage hampering recycling supply.
- The current drivers behind the three categories of platinum investment demand differ significantly. Bar and coin demand remains elevated as overall retail investor appetite for hard assets offsets some regional profit taking. Significant continued negative ETF demand has been in the face of US dollar strength and interest rate increases, with precious metals potentially being used as a source of liquidity amidst high global uncertainty. The reduction in stocks held by exchanges has been caused by continued tightness in the physical market, largely the result of ongoing elevated imports into China. We believe that there are limits to how much further exchange stock holdings, already close to the pre-Covid 10-year average, are likely to fall.
- Security-of-supply concerns appear to have eased for the time being as Russia, contributing 11% of global platinum mine supply, still seems to be able to deliver to international customers, albeit by indirect routes. However, concerns may re-emerge as supply contracts come up for renewal if companies look to self-sanction and avoid Russian-origin material. This could push end users towards the spot market, drawing on above ground inventories if supply cannot be secured from non-Russian producers.
- China is continuing to import platinum at rates that are well in excess of its identified demand. If this rate continues through the second half of 2022, it would more than absorb the forecast full-year surplus.

Platinum supply and demand – quarter two and updating 2022 forecasts

Q2 2022 surplus of 349 koz primarily due to negative investment demand and exchange stock outflows

Total platinum demand declined 13% (-248 koz) year-on-year in Q2'22, with stronger industrial and jewellery demand offset by slightly weaker automotive demand, and significantly weaker investment demand (-329 koz).

Whilst automotive demand was slightly weaker at 708 koz (-5% quarter-on-quarter), it actually represents a strong result considering the supply-chain challenges the industry has been grappling with as a result of the semiconductor shortage as well as disruption due to Russia's invasion of Ukraine, and especially the severe lockdowns in China. This reflects the significant increase in loadings to ensure compliance with China VIa as well as continued substitution for palladium in gasoline vehicles more than offsetting market share lost to battery electric vehicles (BEV). Jewellery demand improved to 496 koz (+5% year-on-year), though still remaining below pre-COVID levels, with strength in all regions, particularly the US and India, partly offset by the zero-COVID policy related lockdowns in China. Meanwhile, industrial demand was flat year on year at 551 koz with stronger demand from petroleum, glass, medical and other demand offsetting weaker chemical and electrical demand.

The dominant demand factor during Q2'22 was continued negative investment demand and exchange stock outflows which totalled 142 koz, with ETF selling of 89 koz and exchange stock outflows of 123 koz partially offset by positive demand for bar and coin of 70 koz. The exchange stock outflows reflect tight physical market conditions contributing to elevated lease rates and negative exchange of futures for physical (EFP) rates that are drawing material off-exchange to feed China's seemingly insatiable appetite for platinum, which continues to run well above identified demand.

Platinum supply was also weaker at 1,961 koz (-7%) year-on-year, albeit not by enough to offset lower demand. Mine supply from South Africa was down 3% year-on-year due to power outages, adverse weather conditions and operational challenges, whilst North American production was down 13% due to a mine flood and processing maintenance in Montana and Sudbury respectively. Whilst Russian production was up 18% year-on-year, there are potential risks to output in the second half due to the unavailability of replacement mining equipment from Western suppliers as a result of sanctions. Meanwhile, recycling was down 16% year-on-year at 437 koz due to reduced vehicle scrappage rates impacting the supply of raw material.

The net result was a quarterly surplus of 349 koz, more than twice the surplus reported for Q1'22.

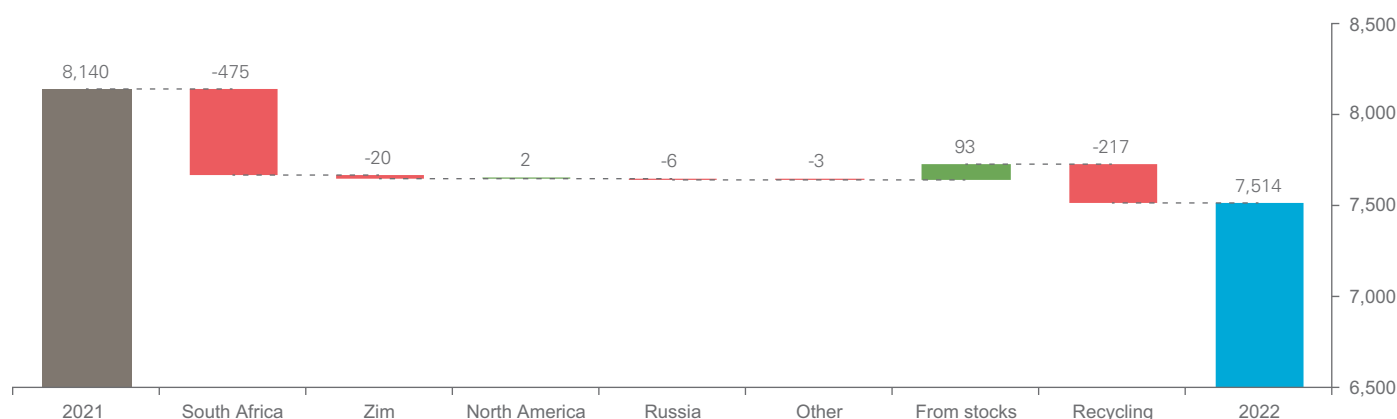
Updating 2022 forecasts – forecast platinum surplus increased

Looking at 2022 as a whole, mine supply challenges are expected to continue, with particular risks to Russian production in the second half, and scrapped vehicle availability for recycling is expected to remain constrained, despite an improving outlook for automotive production. Quarterly jewellery and industrial demand are forecast to remain broadly at H1'22 levels, but investment demand and exchange stock outflows are expected to remain negative in aggregate.

Compared to the previous forecast, production expectations have been downgraded by 77 koz in terms of total mining supply and 190 koz in terms of recycling. Total mine supply has been impacted by production downgrades in South Africa and North America due to power shortages and other operational challenges in South Africa and floods and operational challenges impacting Sibanye-Stillwater's mine in the US. Recycling has been downgraded due to a lack of availability of new vehicles pushing consumers to run vehicles for longer.

The net impact is a reduction in forecast 2022 total mining supply to 5,794 koz, down 7% (-409 koz) year-on-year and 77 koz lower than Q1 expectations and 325 koz lower than expected at the beginning of the year. Recycling supply expectations have been cut more significantly and now stand at 1,720 koz, down 190 koz from Q1, and representing an 11% decline year-on-year.

Annual total supply and changes 2021 to 2022f (koz)



Source: Metals Focus

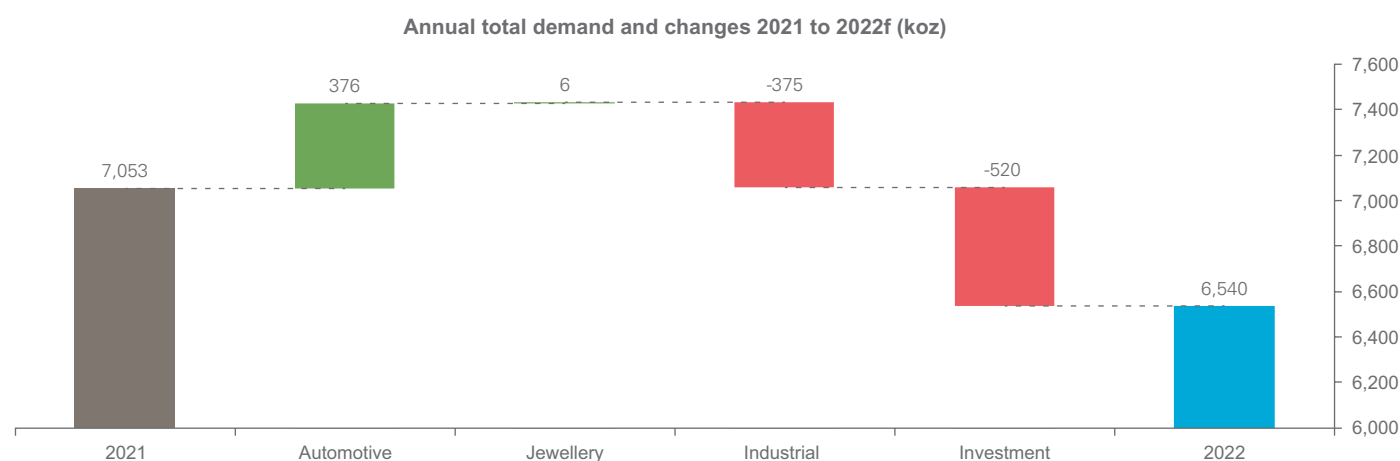
Despite growing economic uncertainty and inflation risks, automotive demand is projected to be up 14% year-on-year due to higher internal combustion engine (ICE) vehicle production (+3% year-on-year) as ongoing supply chain challenges show signs of easing and, more significantly, higher platinum loadings due to tighter heavy-duty emissions legislation and platinum for palladium substitutions in gasoline vehicles increases further. Automotive demand is now forecast to total 3,015 koz in 2022, +14% (376 koz) year-on-year.

Jewellery demand is expected to remain flat year-on-year at 1,959 koz (+6 koz) versus a Q1 forecast for a 2% decline. The improved outlook is driven by stronger demand from the US and India in particular, with consumer demand in India supported by increased promotion of platinum goods by jewellers.

Industrial demand for platinum is expected to decline 15% year-on-year (-375 koz) to 2,132 koz. Although down from the record levels of demand seen in 2021, this is up slightly from Q1 expectations, with 2022 close to being the second strongest demand year in our series, supported by a small, but growing, demand from the production and use of green hydrogen in electrolyzers and fuel cells respectively, amongst other factors.

The weak investment environment continued in Q2'22 and is expected to continue through the rest of 2022. Bar and coin investment is forecast to drop by 14% (-47 koz) to a three-year low of 285 koz with record demand in the US offset by 100 koz of net sellbacks in Japan and 10% weaker demand year-on-year in Europe. However, the worsening economic outlook and ongoing geopolitical uncertainties could result in platinum benefitting from a flight to hard assets for wealth preservation over the rest of the year. ETF disinvestment has continued and been largely price agnostic. This is expected to continue through the balance of the year, resulting in net ETF selling growing from 395 koz in mid-August to 550 koz by year end. Continued tightness in the physical market, due to the significant platinum imports into China, has maintained elevated lease rates and negative EFP rates, which are expected to be sustained for the balance of the year, resulting in continued outflows from exchange stocks, which is expected to result in a full year decline of 300 koz. In aggregate, negative investment demand is expected to total -565 koz, making up almost 60% of the forecast 2022 surplus.

The net impact is a projected 2022 surplus of 974 koz, up from the previous estimate of 627 koz as supply continues to outstrip demand, even with the reduced supply projections, accentuated by significant negative investment demand.



Source: Metals Focus

The platinum investment case – well protected in an uncertain world

Before discussing the investment case for platinum, it is worth highlighting some of the macro fundamentals currently at play, many of which appear quite contradictory in terms of the drivers behind them and their impacts. The most significant of which is a slowing global economy, which would normally result in governments and central banks pulling fiscal levers intended to accelerate money supply and stimulate economies. Instead, we are seeing central banks increasing rates in response to dramatically increasing inflation. Inflation is being driven by a number of factors, such as rising wages, but principally by increasing energy costs exacerbated by Russia's war in Ukraine. The energy crisis in this context is unsurprising, but wages rising despite slowing economic growth is unusual. Simply put, employment rates remain elevated resulting in a tight labour market, particularly for unskilled and low-skilled labour. Added to all of this is the drive to decarbonise the world to limit global warming. Decarbonising efforts are being supported by government programmes to accelerate the development of low carbon power generation, which is positive for employment and also positive for the demand for 'transition' commodities, those that are essential to decarbonisation efforts, which includes platinum.

Turning to platinum, while our estimates show a significant increase in the forecast 2022 platinum market surplus to almost 1 Moz, we note that China's excess imports, above identified demand, will more than absorb this surplus if they continue at the rate seen during the first half of the year (1.3 Moz annualised, based upon Bloomberg reported data). Indeed, China's apparently insatiable appetite for platinum is helping sustain the tight physical market, which is keeping lease rates elevated, driving the negative EFP rates, and drawing material away from exchange held stocks. The negative ETF investment demand likely reflects ongoing US dollar strength leading to concerns of general commodity price weakness as well as investor demands for yield returns in an environment of rising interest rates. Furthermore, institutional investors may also be concerned about the potential impact that slowing economic growth in combination with inflation could have on demand for platinum. As we will elaborate on later, we think that platinum demand is relatively well protected from downside risks. First, automotive production has been unable to keep up with consumer demand due to the semiconductor and supply chain challenges, and is below our estimate of where consumer demand would sit in a recessionary environment. Second, bridal jewellery demand is relatively recession proof. And third, industrial demand is likely to be well supported by government incentives, such as the Inflation Reduction Act in the US, as platinum is a critical metal for global decarbonisation initiatives. In addition, platinum bar and coin demand remains strong as investors look to hard asset holdings for capital protection amid rising inflation concerns.

The scale of the excess imports into China, over and above identified demand, raises a question as to why the platinum price has not responded positively to the significant level of demand into China and the tight market conditions revealed by significantly elevated platinum lease rates. We believe the answer to be that the material levels of negative ETF demand and exchange stock outflows have been sufficient to meet China's import demands and prevent price appreciation, although we note that platinum has relatively outperformed most other metals on a percentage basis since Russia's invasion of Ukraine. As a continuation of this, it is worth considering whether there are limits to how much further exchange stocks can be drawn down, and for how long negative ETF demand can be sustained. If both ease or cease this could result in physical metal shortages that could prompt platinum price appreciation.

Addressing exchange stocks, pre-COVID NYMEX stocks averaged around 175 koz, 85 koz lower than today versus a peak of 718 koz in 2020. We think the post-COVID level will likely be higher due to lower risk tolerances around being able to make delivery during periods of global disruption necessitating higher than historical stock levels; exactly where that comfort level stands remains to be determined.

In terms of ETF holdings, at 3.2 Moz this presents a sizeable pool of potential liquidity. However, we believe that sensitivity to price will increase as ETF holdings fall, as residual holders will typically have longer term outlooks and higher value expectations. Value expectations are likely to be supported by knowledge of continued elevated levels of excess platinum imports into China, increasing platinum for palladium substitution in gasoline vehicles, and platinum's strategic role in global decarbonisation and energy security. Investors are increasingly aware of platinum's critical importance to the production and use of green hydrogen and its role as an energy reducing and yield increasing catalyst in industrial applications.

Quantifying the potential impact platinum could have in just one area of global decarbonisation, we estimate that displacing natural gas with the green hydrogen expected to be produced from platinum containing PEM electrolyser projects, in combination with fuel cell electric vehicles displacing ICE vehicles, could deliver 11% of the Paris Agreement's targeted CO₂ emissions reductions by 2030. Using the IEA global database of planned electrolyser projects, we estimate PEM electrolyzers operating on renewable energy could generate between 9 Mt and 29 Mt of green hydrogen per annum by 2030, dependent on the PEM portion (31%-96%) of all installations. If this green hydrogen is all used to displace natural gas, cumulative CO₂ savings are between 0.18 Gt and 0.58 Gt by 2030. Whilst displacing natural gas for heating and industrial uses is likely to occur quickly, the potential CO₂ savings are greater from displacing ICE vehicles with FCEVs thereby avoiding the CO₂ emissions from gasoline or diesel. If c.40% of total forecast green hydrogen production is used to fuel FCEVs between now and 2030, as per our base case scenario, cumulative CO₂ savings are increased to between 0.24 Gt and 0.63 Gt, or 1% to 11% of the savings needed to meet the Paris Agreement's targets of limiting warming to 1.5°C or 2°C respectively. Annual platinum demand in 2030 from FCEVs and electrolyzers, dependent on the PEM portion, would be between 1.6 Moz and 2.4 Moz.

The potential role that green hydrogen, and by extension platinum, will play in global decarbonisation is recognised by governments around the world. As we have discussed in the Q1'22 *Platinum Quarterly*, the EU is implementing its RePowerEU initiative to displace Russian gas with green hydrogen, which has as much to do with energy security as it does with decarbonisation. Most recently, the US has passed its US\$700B 'Inflation Reduction Act'. Despite the name, more than 50% of the funds within the Inflation Reduction

Act are allocated to climate action, including subsidies for fuel cell electric vehicles and for the construction of hydrogen refuelling stations. Whilst these sorts of government initiatives are not expected to have a material impact on the current demand for platinum, the future potential is material and we estimate that FCEV demand alone could outstrip current automotive demand between 2030 and 2040. We believe this, together with platinum's status as a green transition metal (from an ESG perspective), are key supporting features of platinum demand, including increased platinum investment.

Of course, the flip side of the global energy transition is a belief amongst investors that the internal combustion engine will be rapidly phased out in favour of battery electric vehicles, removing over a third of platinum demand. We are of the view that not all vehicle roles or geographies are suited to battery electrification. Consequently, we expect that internal combustion engines will remain a significant, if declining, part of the drivetrain mix through the 2030s. Whilst the absolute number of internal combustion engine vehicles is expected to decline, increased platinum for palladium substitution in gasoline vehicles and higher loadings from tightened emission standards results in catalytic converter-related automotive demand for platinum increasing by 25% from current levels to a peak in 2028, with further significant growth thereafter in automotive demand for platinum due to FCEVs.

In the near term, there are also concerns that economic- and inflation-linked factors could erode consumer demand for new vehicles and thereby automotive demand for platinum and this perspective may be influencing investor ETF demand for platinum. We have examined this in detail and concluded that the downside risk to automotive production and demand in 2022 is dominated by supply-chain risks rather than consumer demand, as automaker production capacities are below projected recessionary levels of consumer demand.

In summary, there are currently a number of conflicting factors impacting global markets and platinum. Positively, automotive, jewellery and industrial demand for platinum remains robust, despite the slowing economic outlook and inflationary risks. There are also a number of factors that are highly supportive of future platinum demand, foremost of which are continued imports into China in excess of identified demand, followed by platinum for palladium substitution in gasoline vehicles, and, longer-term, platinum's key role in global decarbonisation and the hydrogen economy.

WPIC initiatives highlights

Platinum's role as a metal critical to the transition to net-zero for its use in the production and use of green hydrogen, in combination with supportive government programmes around the world, provides it with significant demand support during a period of uncertainty regarding the health of the global economy. We believe that this will ensure that platinum remains a key holding for many investors looking for a hard asset that acts as a store of value, but also offers exposure to both the growing hydrogen economy and a future economic recovery and increasing industrial demand. This outlook reinforces our focus on increasing the number and impact of our product partnerships in our four key target markets, China, Japan, North America and Europe. We continue to work closely with our partners to increase the awareness of platinum investment products available to investors worldwide and support ongoing marketing initiatives and investor awareness.

During Q2'22, North American and European incremental investment demand started off slowly, similar to Q1'22. However, demand quickly picked up towards the tail end of the quarter due to the platinum price dropping below \$1,000/oz supporting opportunistic value-linked purchases, as well as the second-highest recorded production volumes of 1oz Platinum Eagles by the US Mint – 80,000 ounces. There was also a high availability of investment bars that prompted good levels of physical investment.

In China, our product partners recorded robust sales in Q2'22 as the resilient platinum price in renminbi terms attracted retail investors to bigger size bars. We are delighted to have established a new partnership in Shenzhen during the quarter, with a Shanghai Gold Exchange-certified gold fabricator. The new partner plans to launch an online retail business and will add platinum offerings to improve its business diversity. Chinese banks continue reducing the number and scope of financial offerings in precious metals, which is pushing investor demand towards physical products.

Japan saw a net inflow from our product partners as a profit-taking continued to drive investors to sell back their holdings in platinum accumulation plans, especially during June when a depreciation of the Yen pushed local platinum prices to a recent record high. WPIC continued expanding its footprint and identified two new potential partners in Japan during the quarter.

In addition to our product partnerships, we sponsored the Asia Pacific Precious Metal Conference held by the SBMA in June in Singapore, with an aim to strengthen WPIC's research distribution and platinum awareness in the ASEAN market. We are also exploring the potential for platinum investment in the South Korean market and are now distributing WPIC content in the local language.

Shanghai Platinum Week 2022 – a forum for international communication and collaboration in the platinum group metals market and related technologies, investments and businesses co-founded last year by the WPIC – is currently underway, finishing on 9 September. Building on its previous success, the event has grown in scale and scope, with an engaging 5-day programme that has attracted speakers from across the globe who are experts and leaders in their fields.

Paul Wilson, CEO

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PLATINUM QUARTERLY Q2 2022

Table 1: Supply, demand and above ground stocks summary

	2019	2020	2021	2022f	2021/2020 Growth %	2022f/2021 Growth %	Q1 2022	Q2 2022
Platinum Supply-demand Balance (koz)								
SUPPLY								
Refined Production	6,075	4,989	6,297	5,794	26%	-8%	1,269	1,546
South Africa	4,374	3,298	4,678	4,203	42%	-10%	873	1,144
Zimbabwe	458	448	485	465	8%	-4%	117	124
North America	356	337	273	275	-19%	1%	66	65
Russia	716	704	652	646	-7%	-1%	163	161
Other	170	202	208	205	3%	-1%	49	52
Increase (-)/Decrease (+) in Producer Inventory	+2	-84	-93	+0	N/A	N/A	-26	-21
Total Mining Supply	6,077	4,906	6,204	5,794	26%	-7%	1,243	1,525
Recycling	2,137	1,929	1,936	1,720	0%	-11%	445	437
Autocatalyst	1,589	1,440	1,448	1,238	1%	-15%	329	327
Jewellery	476	422	422	412	0%	-2%	98	92
Industrial	72	67	67	70	0%	4%	17	17
Total Supply	8,214	6,834	8,140	7,514	19%	-8%	1,688	1,961
DEMAND								
Automotive	2,867	2,401	2,638	3,015	10%	14%	744	708
Autocatalyst	2,867	2,401	2,638	3,015	10%	14%	744	708
Non-road	†	†	†	†	†	†	†	†
Jewellery	2,106	1,830	1,953	1,959	7%	0%	469	496
Industrial	2,144	2,018	2,507	2,132	24%	-15%	510	551
Chemical	695	626	651	632	4%	-3%	114	158
Petroleum	219	109	172	184	58%	7%	42	46
Electrical	144	130	135	119	4%	-12%	30	27
Glass	236	407	744	359	83%	-52%	109	100
Medical and Biomedical	266	246	256	265	4%	4%	68	68
Other	584	501	551	572	10%	4%	147	152
Investment	1,237	1,544	-45	-565	N/A	N/A	-165	-142
Change in Bars, Coins	266	578	332	285	-43%	-14%	61	70
Change in ETF Holdings	991	507	-238	-550	N/A	N/A	-169	-89
Change in Stocks Held by Exchanges	-20	458	-139	-300	N/A	N/A	-58	-123
Total Demand	8,353	7,794	7,053	6,540	-9%	-7%	1,558	1,612
Balance	-139	-959	1,087	974	N/A	-10%	130	349
Above Ground Stocks	3,511**	2,552	3,638	4,612	43%	27%		

Source: Metals Focus 2019 - 2022.

Notes:

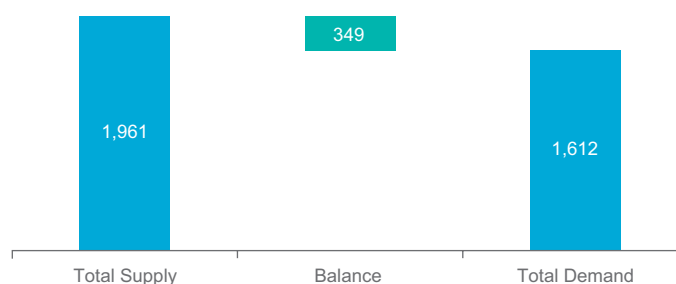
1. **Above Ground Stocks 3,650 koz as of 31 December 2018 (Metals Focus).
2. † Non-road automotive demand is included in autocatalyst demand.
3. All estimates are based on the latest available information, but they are subject to revision in subsequent quarterly reports.
4. The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q4 2017 are contained in previously published PQs which are freely available on the WPIC website.

2022 SECOND QUARTER PLATINUM MARKET REVIEW

According to the IMF, global real GDP contracted during Q2'22 for the first time since 2020. The ongoing Russia-Ukraine conflict, the impact of COVID-related restrictions of movement in China, during the first half of the year, and growing concerns of a global energy crisis which has given rise to higher inflation, spurring a slew of monetary tightening measures, have all weighed on growth and consumer sentiment and point to a global economic slowdown. Against this backdrop, industrial platinum applications and jewellery fabrication demonstrated some resilience, albeit in comparison to a severely supply chain impaired Q2'21. Automotive demand grew 8% (+50 koz), while industrial demand edged higher by 1% (+5 koz), and jewellery demand improved by 5% (+26 koz). In response to rising interest rates and weaker commodity prices we saw disinvestment of 142 koz. ETF holdings contracted by 89 koz, while 123 koz flowed out of exchange warehouses. Bar and coin investment was 34% (-37 koz) weaker, with higher buy-back activity partially offsetting the need for newly minted pieces. Global supply struggled, reaching 1,961 koz (-7%; -145 koz) as operational challenges, severe weather conditions and modest inventory increases saw mine supply decline by 4% (-59 koz), while secondary supply contracted by 16% (-86 koz) as weak vehicle production constrained the availability of autocatalyst scrap. Imports into China, above identified demand, which are not captured by our supply and demand data, remained at elevated levels during the quarter, creating market tightness that has incentivised the movement of material off exchange. In turn, this is captured as disinvestment.

Despite lower supply and the growth in automotive and jewellery demand, disinvestment weighed on the platinum market and resulted in a market surplus of 349 koz. It is important to note, however, that the quarter saw the resurgence of exceptionally strong import volumes into China. Our field research continues to suggest this was fuelled by speculative purchases of physical metal within the country, which were in turn often triggered by attractive local platinum prices. Indeed, during Q2'22, we believe that there were sizeable flows of platinum inventories, from Western vaults to Chinese ones. The outflows from NYMEX inventories, captured as disinvestment in the supply-demand tables featured in this report, were, at the very least indirectly, linked to this trend. This was a strong theme in the market during much of 2021, but had dissipated in Q1'22, likely due to the rising platinum price during that quarter. Judging by the strong volumes going through the Shanghai Gold Exchange in July, we think that this will remain a theme during Q3'22. As platinum inventories located in China are not available to the leasing market, this flow is perpetuating the backwardation seen in the platinum forward market.

Chart 1: Supply-demand balance, koz, Q2 2022



Source: Metals Focus

Supply

Refined platinum production declined a modest 1% (-20 koz) year-on-year to 1,546 koz as lower output from most producing countries were largely offset by growth from Russia.

Production in South Africa was relatively stable, declining 3% (-31 koz) year-on-year. Anglo American Platinum's output fell quarter-on-quarter due to the exceptional impact of the release of semi-finished inventory (accumulated due to the ACP shutdown) in the same period last year, which was not repeated in Q2'22. The company's mined output fell as operations halted as an area of cultural significance was identified, which necessitated a reconfiguration of Mogalakwena. Elsewhere, Impala Platinum's production declined due to a smelter rebuild. While the state electricity supplier Eskom implemented a level of load shedding not experienced since 2019, the timing in late June means the impact of this will be mostly felt in the third quarter with only a modest effect on Q2.

Output from Zimbabwe was stable at 124 koz, benefiting from increased concentrator capacity at Unki. This offset declines at Mimosa and Zimplats, which fell due to a semi-finished inventory release last year. North American output continued its multi-year decline, with Q2 representing the ninth consecutive quarter of year-on-year falls. A flood at Sibanye-Stillwater's US operations and processing maintenance at Vale's Sudbury operations were responsible for this quarter's slump of 13% (-10 koz).

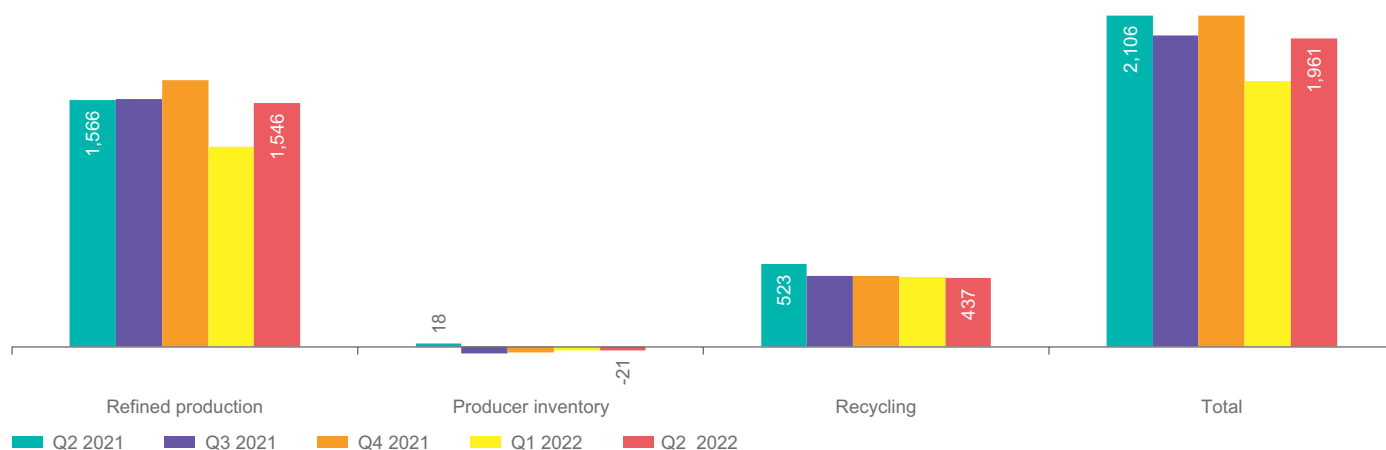
Russian production rose 18% for the quarter, offsetting much of the losses from other regions as Nor Nickel's output recovered from the mine flooding of 2021.

While there was a modest destocking of producer refined inventory in South Africa to support sales during a period of furnace maintenance, this was more than offset by a build of producer inventory in Russia.

Recycling

The recovery of platinum from spent autocatalysts fell by a noteworthy 20% year-on-year (-82 koz) to a two-year low of 327 koz. The most important driver was the ongoing and pronounced chip shortage and its impact on new car sales. There appears to be an extended lag between the chip shortage first emerging, and eventually leading to a marked drop in the availability of end-of-life vehicles. Another factor was the escalating Russia-Ukraine war and how this affected consumer sentiment, especially in Europe, which also weighed on new vehicle sales. By contrast, it seems that the generally weaker tone in PGM prices during Q2'22 had only a minimal impact, with little sign of scrap yards stocking up on spent canisters rather than delivering these to smelters. In North America, the constraints caused by the flood at Sibanye-Stillwater's Montana facilities exacerbated the availability of supply from the metallurgical complex. Secondary supply here is dependent on the availability of mine feed to be ensure optimal efficiencies. Platinum jewellery scrap fell by 5% year-on-year (-5 koz) in Q2'22 as COVID-related disruptions in China and platinum price weakness prevailed during the quarter. Electronic waste processing remained mostly flat, although there are increasing government initiatives which stimulated some growth, while the COVID-induced logistical challenges previously experienced started to ease.

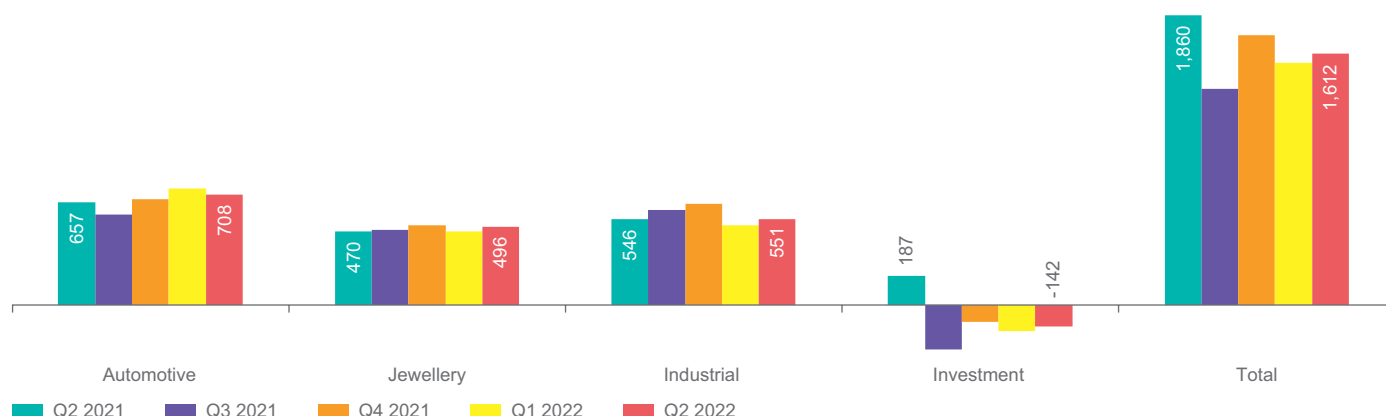
Chart 2: Platinum supply, koz



Demand

Total demand in Q2'22 declined 13% (-248 koz) year-on-year to 1,612 koz but was up 3% (54 koz) quarter-on-quarter. ETF liquidations and exchange stock outflows saw net disinvestment of 142 koz; a reversal of 329 koz compared to Q2'21. Industrial demand grew by a modest 1% (+5 koz). Jewellery demand increased 5% (+26 koz), while automotive demand was 50 koz (+8%) higher, flattered by Q2'21 weakness.

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

Total automotive platinum demand in Q2'22 remained resilient despite weak vehicle production results. Platinum demand grew 8% (+50 koz) despite a 4% year-on-year decline for internal combustion engine (ICE) light-duty vehicle (LDVs) and a significant 31% decline in heavy-duty vehicle (HDV) production. LDV production continued to be plagued by persisting semiconductor shortages. HDV production was impacted by lower demand due to the zero-COVID movement restrictions, chip, and other part shortages and also by the significantly higher vehicle purchase rate in Q2'21 ahead of the implementation deadline of China VI regulations in July 2021. Over the quarter, the rising cost of living sparked fears of contraction in vehicle purchases. However, parts shortages exerted a far more significant influence on the production outcome. Indeed, car manufacturers and dealerships continued to operate on extremely low inventory levels.

The lion's share of the 8% (+50 koz) year-on-year increase in automotive demand during Q2'22 can be attributed to higher demand within on-road HDV aftertreatment systems. This was in turn dominated by China, where in spite of a sharp decline in the number of trucks and busses produced, even sharper gains in loadings drove total offtake higher. Turning to the LDV segment, demand was only marginally higher year-on-year. Despite the Russia-Ukraine war, the key Western European automotive markets such as Germany, France, Italy, and Spain saw improvements in vehicle production against a weak Q2'21. This growth in European output, however, was weighted towards battery electric vehicles (BEVs). Indeed, ICE vehicle units produced in the region were down at the margin. In terms of platinum demand, this was partly offset by higher production in larger passenger cars compared to smaller cars and the increased use of platinum in place of palladium in gasoline vehicles. In North America, the combination of higher gasoline LDV production and increased platinum substitution resulted in higher platinum demand. Similarly, Japan and India also saw improvements in gasoline vehicle production, buoying platinum demand. In China, however, the strict lockdowns that endured during roughly the first six weeks of the quarter weighed on vehicle production. Despite the 50% tax cut announced at the end of May, full-quarter production could not recover to prior year levels. After several years of increased loadings, we have also noted some thrifting of PGM loadings from the country.

Jewellery demand

Platinum jewellery demand rose 5% year-on-year (+26 koz) in Q2'22 as most markets aside from China continued to grow, outstripping demand from a COVID-impaired China.

Platinum jewellery demand in China fell to second place in market share, dropping below North America for the first time in our quarterly series. In April, nearly a third of the Chinese population was subjected to tight pandemic controls. A gradual recovery in sales started in mid-May, and as controls eased, June reflected a further mild improvement supported by favourable platinum prices. Retailers were also more cautious about replenishing stock as weaker consumer sentiment and COVID-related disruption anxieties prevailed. During the quarter, promotional activities favoured gold jewellery, and so manufacturers focused their efforts accordingly.

European fabrication rose, supported by continuing robust sales achieved by high-end brands. Platinum demand in the wedding segment was also boosted by a jump in the number of ceremonies and favourable price differentials (UK hallmarking was up 26% year-on-year). As platinum benefited from these two segments, it outperformed gold jewellery, which was more severely hit by cost-of-living concerns.

North American demand also proved surprisingly strong in Q2'22. The June JCK jewellery show displayed remarkable optimism, and attendance exceeded pre-pandemic 2019 numbers. While sales by retail jewellers varied widely, the overall market reported substantial gains due to more weddings, price differentials to gold, some retailer restocking and ongoing preference to purchase jewellery in place of travelling.

Japanese jewellery demand experienced healthy year-on-year gains, on the back of reduced COVID restrictions, healthy sales through TV channels and e-commerce and some inventory build from the supply chain. In addition, there was also some pre-emptive buying as consumers anticipated re-pricing in the face of a rising yen platinum price and other inputs. In spite of a 10% gain year-on-year, jewellery fabrication in the country remains lower than pre-pandemic norms, although the gap is closing.

Indian platinum jewellery fabrication continued to surpass pre-pandemic levels, jumping by 80% (+16 koz) year-on-year, although the scale of the increase is primarily due to the low base in Q2'21. The economic recovery (GDP growth of around 8.1% in Q2'22) and growing penetration of platinum jewellery bolstered demand. As consumers have responded favourably to platinum, retailers in turn increased showcase inventory, further spurring fabrication activity.

Industrial demand

Industrial demand saw a 1% (+5 koz) increase year-on-year as the large-scale capacity expansions in the glass and chemical sectors in Q2'21 were not repeated this year, while demand for consumer and commercial electronic goods retreated on the back of a weaker economy and growing cost of living concerns.

Petroleum

Platinum demand rose 17% (+7 koz) year-on-year to 46 koz in Q2'22. Higher oil prices and growing recession fears, especially amid widespread COVID lockdowns in China, weighed on the growth prospects for oil demand. However, the recovery in refining (outside China) continued during the quarter on the back of sharp gains in refining margins, itself a result of depleted oil inventories and constrained spare capacity. Platinum demand also benefited from new capacity additions. In June, Kuwait Integrated Petroleum Industries Company began test runs on one of three crude distillation units (CDUs) at its giant Al-Zour refinery, with the second and third CDUs expected to reach commercial operations later this year.

Chemical

Platinum chemical offtake rose by 39% (+45 koz) quarter-on-quarter to 158 koz in Q2'22. However, on a year-on-year basis, demand was still down by 19%, albeit against an exceptionally high base in 2021. New capacity additions in China contributed to the bulk of quarter-on-quarter growth in Q2. Sinopec Jiujiang Petrochemical completed the construction of a new paraxylene (PX) plant. Shandong Ruize Chemical Technology also commissioned a new propane dehydrogenation (PDH) unit at its refining complex in June. Platinum demand from the silicone industry remained strong. As for the nitric acid industry (this being a critical chemical input for manufacturing fertiliser), results were mixed. Elevated natural gas prices continued to push European manufacturing costs higher, resulting in significant curtailments. By contrast, high gas costs did not have the same impact in North America where some fertiliser manufacturers have benefited from improving margins this year. The tight supply-demand balance (amid the Russia-Ukraine war and the ban on fertilisers shipments from some countries such as China) aided North American margins and therefore supported platinum demand.

Medical

Higher vaccination rates, better day-to-day management in operating with the disease and, in some regions, a concerted effort to tackle COVID-induced backlogs, resulted in additional elective procedures conducted in H1'22. Additionally, as public anxiety about the pandemic lessens, more people are making appointments which increases the number of diagnoses and requirement for cancer treatment drugs. Lastly, in some areas, we have also seen some over purchasing of medical products in anticipation of a sharp recovery in demand. Overall, platinum demand rose by 8% (+5 koz) in Q2'22 compared to Q2'21.

Glass

The 21% year-on-year increase in platinum demand from the glass industry was mainly a reflection of the low base of Q2'21, which was in turn merely due to the timing of investments in new capacity. The general thesis of demand remaining historically low throughout 2022, following last year's overinvestments remains in place – at 100 koz demand in Q2'22 was a little over half of last year's quarterly average.

Electrical

Electrical platinum demand fell sharply, by 23% (-8 koz) year-on-year, reflecting a slump in HDD shipments due to much lower-than-expected demand in the consumer electronics market. A deteriorating economic outlook, fading pandemic-driven surges, and rising inflation have led to falling purchasing power and tighter enterprise spending, which hit sales significantly in both PC and smartphone segments. The pronounced drop in NAND-flash prices has further driven the shift to SSD storage solutions. In semiconductors, capacity utilization also fell in the second quarter due to consumer electronics orders declining. However, demand still grew steadily due to further expansion of new production capacity.

Other

Platinum from other industrial segments increased by 16% year-on-year (+21 koz) in Q2'22 hitting a record high in the quarterly time series. In the spark plugs and sensors segment, demand was fuelled by robust aftermarket business and the increasing usage of sensors in new vehicles. While off a low base, demand for platinum in electrolysis and fuel cells was also boosted by energy security concerns and the increased scale of capacity expansions reported in China.

Investment demand

Global bar and coin demand improved quarter-on-quarter to 70 koz but was still 34% (-37 koz) weaker year-on-year. Losses were concentrated in Japan, which recorded net disinvestment for the second quarter in a row, albeit not as marked as during Q1'22. In North America, a weaker Q2 outcome owed much to the variation in Eagle coin sales. Last year, this was relatively evenly split between Q1 and Q2, whereas this year, Q2 sales were much lower, a portion of which was issued in Q3'22. Another theme in the US was the weaker tone across all precious metals retail investment, as selling back edged higher, which reduced the need to purchase newly minted pieces.

In Europe, although the absolute levels were still low relative to North America and Japan, bar and coin investment picked up in Q2'22, rising by 15% quarter-on-quarter. This was partly due to a major price pull-back over the quarter, which prompted some bargain hunting. Improved availability of platinum bullion products also helped, after gold and silver physical investment slowed in the latter part of Q2'22. It is worth remembering that exceptionally strong demand for physical gold and silver bullion products earlier in the year, in response to the Ukrainian crisis, meant that much of the available bullion products capacity was taken up by these two metals, which in turn limited platinum products output.

PLATINUM QUARTERLY Q2 2022

The Japanese market remained in net disinvestment during the quarter, however at 22 koz this was markedly lower than both Q1'22 and our earlier expectations for Q2'22. In spite of the weak yen resulting in a higher local platinum price, there were three factors that we believe prevented larger liquidations. First, although there was considerable volatility, there were just as many periods of corrections as rallies and in general the price moved sideways during the quarter. Second, although higher than in recent months, the price remained lower than historical highs and even last year's peak levels – a stark contrast with gold reaching all-time records. Third, we continue to see a new class of, mostly younger, precious metals investors emerging in Japan, whose buying partially offset liquidations.

NYMEX and TOCOM warehouse stocks fell by a combined 123 koz over the quarter. Sustained Exchange for Physical (EFP) discounts to the OTC market, perpetuated by ongoing flows of platinum from Western to Chinese vaults, continued to incentivise drawdowns. In April, NYMEX and TOCOM stopped accepting Krastsvetmet and Prioksky branded bars produced after 8th April, in line with the LPPM removing them from the London Good Delivery standard.

Chart 4: Platinum Investment, koz

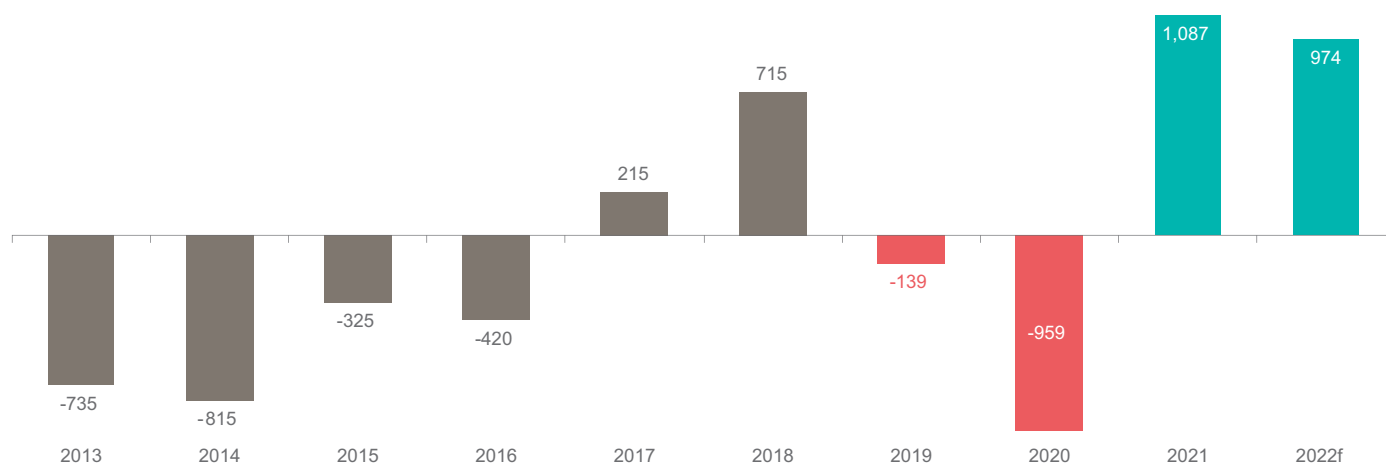


Source: Metals Focus

2022 OUTLOOK

Since our previous report, the IMF has further downgraded its global economic growth forecast to 3.2% this year (from 3.6% previously). Economic prospects for the rest of 2022 have been depicted as increasingly pessimistic and uncertain, and the risk to the outlook is leaning towards the downside. In spite of these headwinds, as we explain in detail below, we expect fabrication demand (auto, jewellery and industrial) will consolidate at 7.1 Moz, this being similar to last year and also in line with pre-pandemic 2019 levels. However, as we expect disinvestment of -565 koz, we forecast a contraction in overall platinum demand of 7% (-513 koz) to 6,540 koz. ETF holdings are expected to reduce by 550 koz and inventory held at exchange warehouses is slated to decline by 300 koz, with bar and coin demand of 285 koz representing the balancing investment item. Platinum supply, too, is forecast to contract this year to 7,514 koz (-8%, -626 koz) as South African mine supply returns to normal levels following inventory drawdowns last year and other operational challenges. Secondary supply will also contribute to this decline as weak vehicle sales lower feedstock availability. The market balance in 2022 is expected to be a surplus of 974 koz; this being 10% smaller than the surplus in 2021. Moreover, similar to last year, we see platinum inventories shifting from Western vaults to Chinese ones, as speculators in that country buy into the metal's future demand prospects.

Chart 5: Supply-demand balance, koz, 2013-2022f



Source: Metals Focus

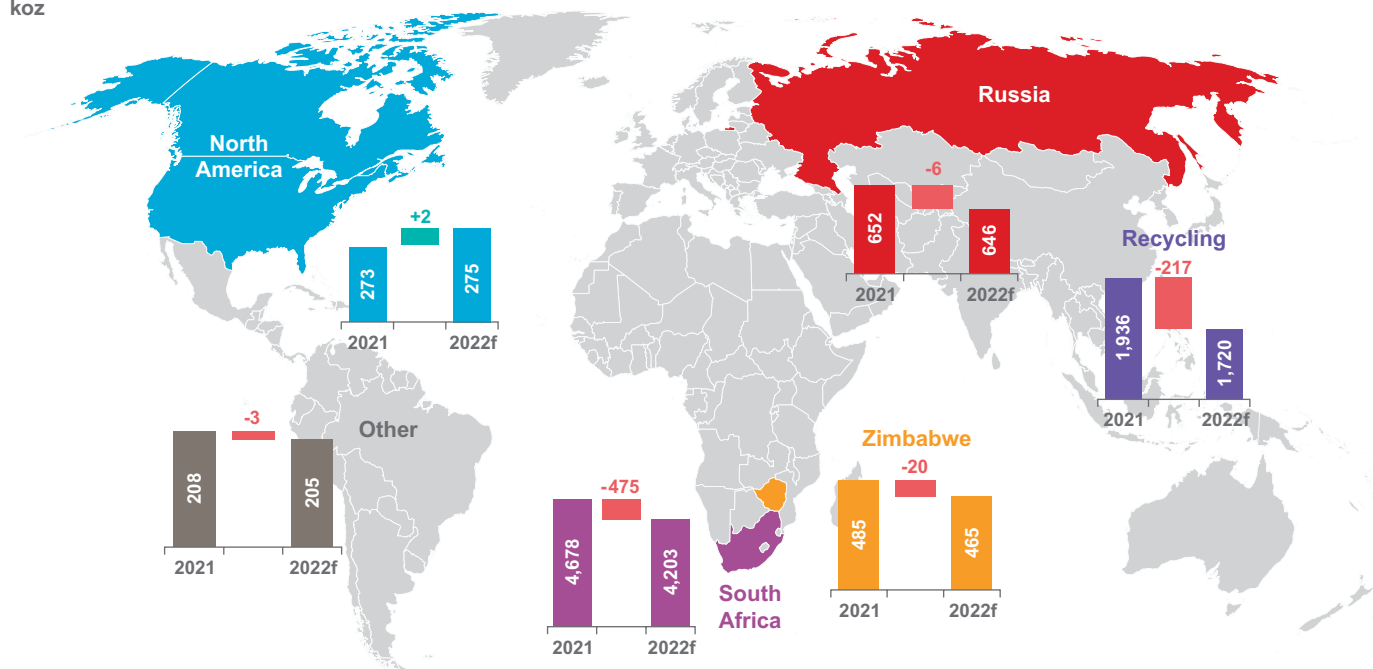
Supply

South African producers continue to report a challenging operating environment, supply chain constraints, safety stoppages, Eskom load shedding and lawlessness such as copper cable theft all weighing on output. July saw a magnitude of national load shedding not experienced since 2019 and year-to-date total energy curtailed has far exceeded 2021, the previous worst year. Despite these headwinds, at the half-year, miners broadly maintained production guidance a consequence of the significant downgrades made earlier in the year and reflected in the previous Platinum Quarterly. Consumable shortages continue to impact PGM processing and refining with indications that some refining capacity will be constrained in the second half presenting a risk to the forecast.

In North America a flood at Sibanye-Stillwater's US operations and ongoing operational challenges have led to a 25 koz downward revision of guidance, while the full impact of an ongoing strike at a Glencore mine in Canada is yet to be determined. As a result, the North American outlook is expected to be flat against previous expectations of growth. While Nor Nickel remains on track to achieve guided output, procurement challenges as Western suppliers withdraw from Russia presents some downside risk for the second half.

Global platinum mine supply in 2022 is therefore forecast to decline 7% (-409 koz) year-on-year to 5,794 koz, primarily due to the depletion of Anglo-American Platinum semi-finished inventory that boosted refined volumes in 2021 and constrained smelter availability due to planned rebuilds. South Africa will account for the bulk of the fall, with a forecast decline of 10% (-475 koz) to 4,203 koz, while other producing countries are expected to remain broadly in line with 2021 output.

Chart 6: Changes in supply, 2021 vs. 2022f
koz



Source: Metals Focus

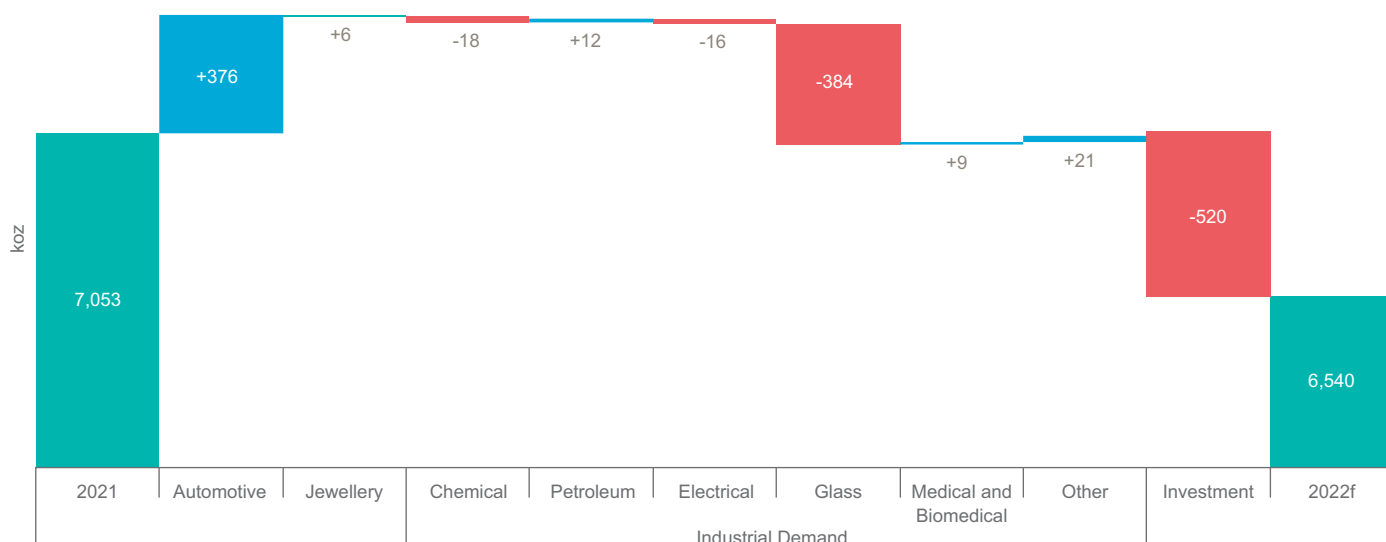
Recycling

This year is forecast to see the second largest drop in autocatalyst platinum scrap supply on record, of -210 koz or 15%, leaving the global total at a six-year low of 1,238 koz. The most crucial driver underpinning this is the shortage of new vehicles which hampers the flow of older vehicles that are now being held on to for longer. Even though new vehicle sales are set to improve in the coming months, it will be some time before this feeds through into improved supplies of end-of-life vehicles. Furthermore, the ongoing cost of living crisis, its impact on disposable incomes and, by extension, consumer sentiment, especially in Europe and North America, will also weigh on new registrations as individuals delay buying a new car.

Demand

Largely due to the net disinvestment of 565 koz total demand is forecast to contract by 7% (-513 koz) this year. Within this, industrial demand is set to decline by 15% (-375 koz) as capacity expansions seen in 2021 in the glass and chemical sectors are not repeated this year. Jewellery demand remains essentially flat, and automotive demand is forecast to grow 14% (+376 koz) as emissions legislation tightens and platinum substitution increases.

Chart 7: Changes in demand by category, 2021 vs. 2022f



Source: Metals Focus

Automotive demand

Platinum automotive demand is expected to increase by 14% (+376 koz) to 3,015 koz in 2022, despite vehicle production still being hampered by persisting but easing supply shortages. Cost of living concerns and the impact of the global energy crisis will weigh on automotive sales prospects, but production is expected to continue rising as inventories remain at record low levels. LMC Automotive, a GlobalData Company, now forecast LDV production to increase by 6% to 81.5M units in 2022. The ICE share of production will decline from 94% in 2021 to 91% this year (meaning ICE growth is capped at 3%) as BEV production reaches a record 7M units. In addition, Western European diesel passenger car sales will continue to edge lower, with its share falling to 19%. With China gradually returning to more typical economic activity, HDV production should recover over the rest of the year, stemming the decline of H1'22 (-29%) to 11% for the full year. This still means 400k fewer heavy and medium trucks will be produced in 2022.

Aside from production growth, two key factors continue to buoy platinum demand from this sector: the broader deployment of PGM-bearing catalysts and substitution. Globally, over 80% of HDVs will be fitted with a PGM-based after-treatment solution in 2022, compared with only 56% in 2021. The improvement is being driven by the implementation of China VI regulations and further regulatory tightening in other regions. In India, all HDVs are required to comply with Bharat VI and Brazil's Proconve 8, and in Europe, Euro VIe is now fully implemented. In the context of platinum, HDV platinum demand is expected to jump by 41% on 2021. The higher platinum ratio in gasoline passenger vehicles is the second factor supporting platinum demand. Incentivised by cost savings, platinum ratios in gasoline catalysts have increased in all regions and while platinum loadings have risen in some locations (such as China) by more than 40%, this is generally from a very low base.

Jewellery demand

Global jewellery demand is expected to remain flat compared to 2021, remaining at 1,959 koz. While the metal has had varied success across regions, it has failed to recover above 2,000 koz since 2020.

In China, platinum jewellery demand is forecast to drop by 22% year-on-year due to ongoing weak consumer sentiment and the economic slowdown. Europe should see slower growth in H2'22 as the boost from the brands fades, consumer expenditure shifts back to services and mass market sales are hit by falling disposable incomes and recession fears. However, robust gains in H1'22 and resilience in the bridal segment should mean growth for the entire year.

North America may also see softer demand in H2'22 as consumer expenditure normalises, we pass the peak wedding season, and savings fall and finally as consumer sentiment suffers from talk of recession in the face of high inflation. Growth in H1'22, however, should still be enough for a double-digit increase in the calendar year.

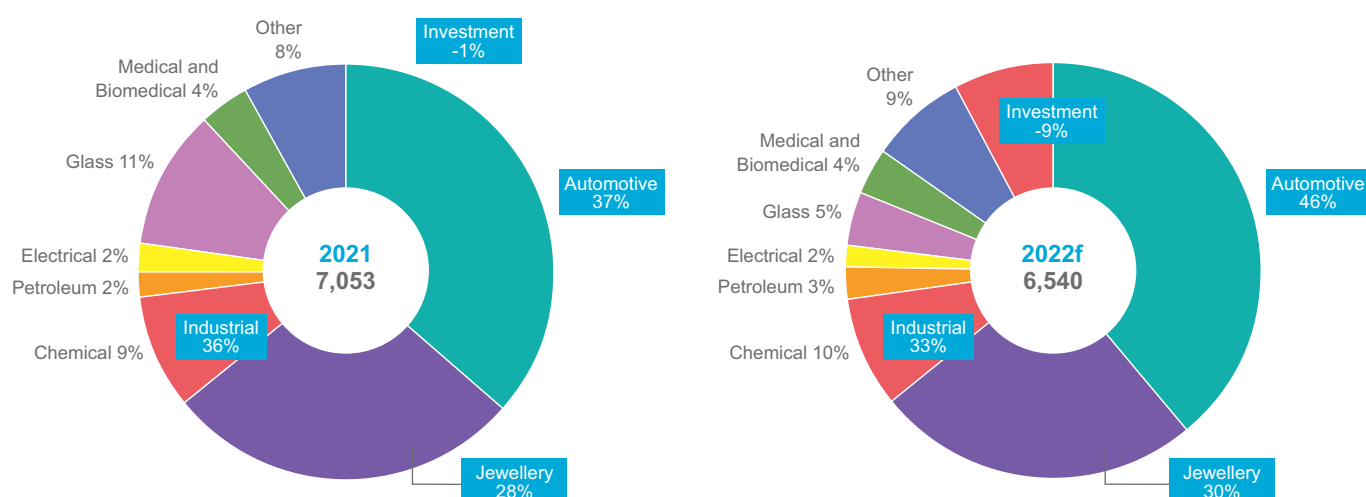
The healthy gains seen during the first half of 2022 and optimism among our contacts within the local jewellery industry have given us confidence to revise our 2022 forecast for Japanese jewellery demand upwards somewhat to 340 koz, a 14% increase year-on-year. In addition to decent sales at the retail end, an increase in the average platinum purity is also offering some support. Demand would have been even higher, in our view, if borders were to open to tourists, something that points to further gains in the foreseeable future.

In India, we expect fabrication to increase in the coming quarters, driven by increased discretionary spending, growing awareness of men's platinum jewellery collections, and innovation with platinum bi-metal jewellery products. That said, inflation, recessionary conditions and high energy costs may curb some of this exuberance.

Industrial demand

Following a record 2021 boosted by capacity expansions, industrial demand in 2022 will shed 375 koz (-15%), as growth in the petroleum, medical, and hydrogen economy sectors cannot offset the glass industry's lower requirements.

Chart 8: Demand end-use shares, 2021 vs. 2022f



Source: Metals Focus

Petroleum

Petroleum demand is expected to rise 7% (+12 koz) year-on-year in 2022 to 184 koz. Leaving aside a low base effect, this year's growth is underpinned by new capacity additions. On the basis of the latest IEA report, unlike the last couple of years when China almost exclusively drove new refining units, new capacity is also expected to be built in the Middle East, in 2022 and into 2023. Over the period, with major improvements in refining margins and tighter spare capacity (outside China) this year, a repeat of plant closures (as seen over 2020-21) seems unlikely, which should also favour platinum demand.

Chemical

Demand is projected to fall by a modest 3% (-18 koz) in 2022 to 632 koz. A slight drop for platinum-bearing catalysts from the Chinese petrochemical sector will contribute to this year's lower volumes, as the current project pipeline does point to lower new capacity expansion. However, it is worth stressing that this drop comes from an elevated base in 2021. Efforts to achieve supply self-sufficiency in key petrochemicals continue to underpin new projects this year and beyond 2022. Even with significantly higher fertilizer prices, the outlook for the industry remains challenging this year in the wake of the ongoing Russia-Ukraine war. By contrast, the use of platinum in silicone products is expected to strengthen, thanks to healthy demand for high-performance specialty silicones in a wide range of products, such as automotive, construction, electronics, and medical technology.

Glass

Our forecast for glass demand in 2022 remains largely unchanged compared to the previous *Platinum Quarterly*. Specifically, following exceptionally high levels of capacity investment last year, a slowdown is inevitable and with it a decline in demand for PGMs used in glass equipment has to follow. We forecast global demand in 2022 will halve to 359 koz. One positive development in recent months are indications that the pandemic has not impacted capacity installations much. Given also that the worst of it seems to be behind us, we no longer feel this is a material risk to 2022 offtake.

Medical

Platinum medical demand during H2'22 is expected to be slightly slower than the first half. As people return from holiday travel, social mixing moves back indoors, and cold weather in the northern hemisphere sets in, COVID cases are expected to rebound. This may limit hospital capacity, although to a lesser extent than in recent years, and could discourage potential patients from attending medical facilities. We forecast a year-on-year gain for 2022, against a COVID-impacted 2021, of 4% (+9 koz), roughly level with 2019's pre-pandemic number.

Electrical

Given that inventory levels across supply chains continued to rise and have become a risk due to slow destocking, major manufacturers have lowered their shipment targets for consumer electronics this year (as a guide, the industry tends to allow one or two quarters to deplete excess inventory before starting a rebuild). Consumer electronics and smartphone makers have also decided to extend their production cuts until August and defer plans to ramp up output for the festive season by a month as demand remains subdued. For high-capacity drives, while the big data storage market remained healthy due to substantial investment in cloud services, gains in HDD shipments are overshadowed by the increasing penetration of SSDs, affording lower storage costs and much faster access. A weak market outlook for H2'22 will likely weigh on metal offtake. Elsewhere, despite the near-term turbulence of declining utilisation, semiconductor demand is expected to grow steadily due to the successive addition of new production lines. However, this will not make up for the loss from the HDD market. Platinum demand is accordingly forecast to decline by 12% (-16 koz) in 2022.

Other

Given aggressive capacity expansions and the slowdown in the consumer electronics market, semiconductor supply to the automotive industry is expected to normalise from Q3'22 onwards which supports stronger automotive vehicle production and in turn, higher demand for platinum in automotive sparkplugs, sensors and other parts. In addition, the ongoing Russia-Ukraine conflict and increasing geopolitical tensions globally have seen a step-up in demand from the military and aerospace industries. Platinum offtake for spark plugs and sensors is also set to increase in line with rising vehicle production in the second half. While energy supply concerns have certainly favoured existing fossil fuel operations in the near term, it has also intensified the drive toward a green energy transition. We have seen platinum demand for electrolyzers increase sevenfold this year, while demand from stationary fuel cell applications increased by 34%. Even though absolute platinum demand is small due to the extremely low base, it signals platinum's growing contribution to the hydrogen economy. Overall, other industrial demand is therefore set to grow 4% (+21 koz) to 572 koz in 2022.

Investment demand

The full year total coin and bar investment is forecast to drop by 14% (-47 koz) to a three-year low of 285 koz. This reflects contrasting performances in Japan and North America. In the former, we expect to see the weakest outcome in Metals Focus' dataset, with forecast net disinvestment of -100 koz. This compares with -26 koz of net selling back in 2021, a figure which is in line with both the first six months of the year performance and our general expectations for the market given the elevated local platinum price. In sharp contrast, North American demand of 292 koz is set to post a new high. This reflects a strong showing across a range of platinum bars and coins, especially during the first half with a slightly weaker tone expected towards year end as retail investor liquidations edge higher. European investment is forecast to post a 10% decline in 2022, though the total remains well above pre-COVID levels. With a worsening economic outlook and ongoing geopolitical uncertainties, platinum investment will continue to benefit from buoyant interest in hard assets for wealth preservation for the rest of the year. However, with platinum prices remaining largely rangebound and tracking the gold price we believe any price recovery may weigh on bargain hunting.

Since their H2'21 peak at 4.04Moz, ETF liquidations have been largely price agnostic as holdings have continued to trend lower. Outflows so far this year, as of mid-August, have totalled 395 koz with 3.25Moz currently held; while the rate may slow somewhat based on Metals Focus' higher price outlook in H2'22, led by recovering automotive demand, we expect the trend to continue, amounting to a 550 koz decline for 2022.

Inventories for NYMEX and TOCOM are down 241 koz so far this year as physical market tightness has driven sustained negative EFPs, other than for a short spell in March/April, which have encouraged a drawdown. As the market tightness for platinum persists, with lease rates currently around 6% and peaking above 10% in May, we expect negative EFPs for the remainder of the year, leading to a full year drop of 300 koz in exchange inventories. Nymex warehouse inventories currently total 259 koz which is 64% down on their peak of 718 koz in July 2021.

ABOVE GROUND STOCKS

The contraction in demand this year (due mainly to net disinvestment) will only be partly offset by lower supply from mining and recycling. As a result, we anticipate a surplus this year of 974 koz (10% lower than in 2021), that will cause above-ground stocks to rise to 4,612 koz.

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 2022

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

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022f	2021/2020 Growth %	2022f/2021 Growth %
Platinum Supply-demand Balance (koz)												
SUPPLY												
Refined Production	6,070	4,875	6,160	6,045	6,130	6,125	6,075	4,989	6,297	5,794	26%	-8%
South Africa	4,355	3,135	4,480	4,265	4,385	4,470	4,374	3,298	4,678	4,203	42%	-10%
Zimbabwe	405	405	405	490	480	465	458	448	485	465	8%	-4%
North America	355	395	365	390	360	345	356	337	273	275	-19%	1%
Russia	740	740	710	715	720	665	716	704	652	646	-7%	-1%
Other	215	200	200	185	185	180	170	202	208	205	3%	-1%
Increase (-)/Decrease (+) in Producer Inventory	-215	+350	+30	+30	+30	+10	+2	-84	-93	+0	N/A	N/A
Total Mining Supply	5,855	5,225	6,190	6,075	6,160	6,135	6,077	4,906	6,204	5,794	26%	-7%
Recycling	2,000	2,055	1,720	1,860	1,915	1,955	2,137	1,929	1,936	1,720	0%	-11%
Autocatalyst	1,120	1,255	1,185	1,210	1,325	1,420	1,589	1,440	1,448	1,238	1%	-15%
Jewellery	855	775	515	625	560	505	476	422	422	412	0%	-2%
Industrial	25	25	20	25	30	30	72	67	67	70	0%	4%
Total Supply	7,855	7,280	7,910	7,935	8,075	8,090	8,214	6,834	8,140	7,514	19%	-8%
DEMAND												
Automotive	3,130	3,245	3,245	3,360	3,300	3,100	2,867	2,401	2,638	3,015	10%	14%
Autocatalyst	2,990	3,095	3,105	3,225	3,160	2,955	2,867	2,401	2,638	3,015	10%	14%
Non-road	140	150	140	135	140	145	†	†	†	†	†	†
Jewellery	2,945	3,000	2,840	2,505	2,460	2,245	2,106	1,830	1,953	1,959	7%	0%
Industrial	1,580	1,700	1,845	1,955	1,825	2,015	2,144	2,018	2,507	2,132	24%	-15%
Chemical	535	540	515	560	570	565	695	626	651	632	4%	-3%
Petroleum	50	60	205	220	100	235	219	109	172	184	58%	7%
Electrical	195	215	205	195	210	205	144	130	135	119	4%	-12%
Glass	145	205	235	255	205	250	236	407	744	359	83%	-52%
Medical and Biomedical	220	225	240	235	235	235	266	246	256	265	4%	4%
Other	435	455	445	490	505	525	584	501	551	572	10%	4%
Investment	935	150	305	535	275	15	1,237	1,544	-45	-565	N/A	N/A
Change in Bars, Coins	-5	50	525	460	215	280	266	578	332	285	-43%	-14%
Change in ETF Holdings	905	215	-240	-10	105	-245	991	507	-238	-550	N/A	N/A
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20	-20	458	-139	-300	N/A	N/A
Total Demand	8,590	8,095	8,235	8,355	7,860	7,375	8,353	7,794	7,053	6,540	-9%	-7%
Balance	-735	-815	-325	-420	215	715	-139	-959	1,087	974	N/A	-10%
Above Ground Stocks	3,405*	2,590	2,265	1,845	2,060	2,775	3,511**	2,552	3,638	4,612	43%	27%

Source: Metals Focus 2019 - 2022, SFA (Oxford) 2013 - 2018.

Notes:

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

PLATINUM QUARTERLY Q2 2022

Table 3: Supply and demand summary – quarterly comparison

		Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q2'22/Q2'21 Growth %	Q2'22/Q1'22 Growth %
Platinum Supply-demand Balance (koz)												
SUPPLY												
Refined Production		942	1,496	1,303	1,465	1,566	1,571	1,695	1,269	1,546	-1%	22%
	South Africa	521	1,062	873	1,028	1,175	1,201	1,274	873	1,144	-3%	31%
	Zimbabwe	110	115	115	118	125	116	127	117	124	-1%	6%
	North America	87	71	82	83	75	51	64	66	65	-13%	-2%
	Russia	175	196	182	184	137	153	178	163	161	18%	-1%
	Other	49	52	51	52	53	51	52	49	52	-3%	4%
Increase (-)/Decrease (+) in Producer Inventory		+25	-112	-51	-29	+18	-43	-39	-26	-21	N/A	N/A
Total Mining Supply		967	1,384	1,252	1,435	1,584	1,529	1,656	1,243	1,525	-4%	23%
Recycling		375	532	582	513	523	452	449	445	437	-16%	-2%
	Autocatalyst	263	394	422	379	409	330	329	329	327	-20%	-1%
	Jewellery	97	121	134	118	98	104	102	98	92	-5%	-6%
	Industrial	15	17	26	16	17	17	17	17	17	6%	0%
Total Supply		1,342	1,917	1,835	1,949	2,106	1,980	2,105	1,688	1,961	-7%	16%
DEMAND												
Automotive		391	648	720	723	657	580	680	744	708	8%	-5%
	Autocatalyst	391	648	720	723	657	580	680	744	708	8%	-5%
	Non-road	†	†	†	†	†	†	†	†	†	N/A	N/A
Jewellery		389	511	534	487	470	485	511	469	496	5%	6%
Industrial		335	562	539	709	546	607	645	510	551	1%	8%
	Chemical	114	131	190	119	195	146	190	114	158	-19%	39%
	Petroleum	18	21	36	37	39	39	57	42	46	17%	9%
	Electrical	29	33	36	33	35	35	32	30	27	-23%	-9%
	Glass	9	180	73	318	83	193	151	109	100	21%	-8%
	Medical and Biomedical	61	61	61	60	62	64	70	68	68	8%	0%
	Other	104	136	143	142	131	131	146	147	152	16%	3%
Investment		383	960	135	159	187	-282	-108	-165	-142	N/A	N/A
	Change in Bars, Coins	122	97	60	21	107	110	95	61	70	-34%	14%
	Change in ETF Holdings	123	522	76	105	31	-219	-155	-169	-89	N/A	N/A
	Change in Stocks Held by Exchanges	138	342	-1	33	49	-173	-48	-58	-123	N/A	N/A
Total Demand		1,498	2,681	1,928	2,078	1,860	1,389	1,728	1,558	1,612	-13%	3%
Balance		-155	-764	-93	-129	247	591	377	130	349	42%	168%

Source: Metals Focus 2020 - 2022.

Notes:

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

PLATINUM QUARTERLY Q2 2022

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

	H1 2020	H2 2020	H1 2021	H2 2021	H2 2022	H1'22/H1'21 Growth %	H1'22/H2'21 Growth %
Platinum Supply-demand Balance (koz)							
SUPPLY							
Refined Production	2,191	2,799	3,030	3,266	2,814	-7%	-14%
South Africa	1,364	1,934	2,203	2,475	2,017	-8%	-19%
Zimbabwe	218	230	243	242	241	-1%	-1%
North America	185	153	159	115	131	-17%	15%
Russia	325	379	321	331	324	1%	-2%
Other	99	103	105	103	101	-3%	-2%
Increase (-)/Decrease (+) in Producer Inventory	+79	-162	-11	-82	-47	N/A	N/A
Total Mining Supply	2,269	2,637	3,019	3,184	2,767	-8%	-13%
Recycling	823	1,115	1,036	900	882	-15%	-2%
Autocatalyst	624	816	788	660	656	-17%	-1%
Jewellery	167	255	215	206	191	-12%	-8%
Industrial	32	43	33	34	35	7%	2%
Total Supply	3,092	3,751	4,055	4,085	3,649	-10%	-11%
DEMAND							
Automotive	1,034	1,368	1,380	1,260	1,452	5%	15%
Autocatalyst	1,034	1,368	1,380	1,260	1,452	5%	15%
Non-road	†	†	†	†	†	N/A	N/A
Jewellery	785	1,045	957	995	965	1%	-3%
Industrial	915	1,101	1,255	1,253	1,061	-15%	-15%
Chemical	303	321	315	336	272	-14%	-19%
Petroleum	51	57	76	96	88	17%	-8%
Electrical	61	68	68	67	57	-17%	-15%
Glass	155	253	400	343	210	-48%	-39%
Medical and Biomedical	123	123	122	133	135	10%	1%
Other	222	279	273	277	299	9%	8%
Investment	449	1,094	345	-390	-307	N/A	N/A
Change in Bars, Coins	422	156	127	205	131	3%	-36%
Change in ETF Holdings	-90	597	136	-374	-258	N/A	N/A
Change in Stocks Held by Exchanges	118	341	82	-221	-181	N/A	N/A
Total Demand	3,184	4,609	3,938	3,117	3,169	-20%	2%
Balance	-92	-858	117	968	480	>±300%	-50%

Source: Metals Focus 2019 - 2022.

Notes:

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

PLATINUM QUARTERLY Q2 2022

Table 5: Regional demand – annual and quarterly comparison

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022f	2021/2020 Growth %	2022f/2021 Growth %	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022
Platinum gross demand (koz)																	
Automotive	3,130	3,240	3,250	3,350	3,290	3,090	2,867	2,401	2,638	3,015	10%	14%	657	580	680	744	708
North America	425	465	480	410	390	390	342	299	381								
Western Europe	1,350	1,395	1,450	1,630	1,545	1,325	1,457	1,099	1,001								
Japan	585	585	510	450	435	425	308	247	264								
China	130	125	145	195	230	220	185	281	384								
India	165	170	180	170	175	195	††	††	††								
Rest of the World	475	500	485	495	515	535	574	475	608								
Jewellery	2,945	3,000	2,840	2,505	2,460	2,245	2,106	1,830	1,953	1,959	7%	0%	470	485	511	469	496
North America	200	230	250	265	280	280	341	277	409								
Western Europe	220	220	235	240	250	255	237	196	260								
Japan	335	335	340	335	340	345	372	316	298								
China	1,990	1,975	1,765	1,450	1,340	1,095	871	832	703								
India	140	175	180	145	175	195	109	59	123								
Rest of the World	60	65	70	70	75	75	176	151	159								
Chemical	535	540	515	560	570	565	695	626	651	632	4%	-3%	195	146	190	114	158
North America	55	55	55	50	50	50	77	91	98								
Western Europe	110	105	75	110	115	105	126	118	121								
Japan	10	10	10	15	15	15	66	62	65								
China	195	215	230	225	220	215	236	196	210								
Rest of the World	165	155	145	160	170	180	190	160	157								
Petroleum	50	60	205	220	100	235	219	109	172	184	58%	7%	39	39	57	42	46
North America	40	25	-25	90	55	55	30	5	32								
Western Europe	-45	-20	70	10	5	20	14	11	18								
Japan	10	-35	5	0	-40	5	7	6	12								
China	80	-5	45	80	45	10	66	35	42								
Rest of the World	-35	95	110	40	35	145	103	52	67								
Electrical	195	215	205	195	210	205	144	130	135	119	4%	-12%	35	35	32	30	27
North America	10	15	15	10	15	15	38	35	35								
Western Europe	5	10	10	10	10	10	27	23	25								
Japan	15	15	15	15	15	15	20	16	17								
China	75	70	70	80	90	85	28	31	31								
Rest of the World	90	105	95	80	80	80	31	25	26								
Glass	145	205	235	255	205	250	236	407	744	359	83%	-52%	83	193	151	109	100
North America	5	10	0	20	5	5	7	-37	17								
Western Europe	-10	15	10	5	5	35	59	25	5								
Japan	0	-25	-5	-10	-10	0	-40	-66	7								
China	90	115	130	150	110	80	180	360	713								
Rest of the World	60	90	100	90	95	130	30	126	3								
Medical	220	225	240	235	235	235	266	246	256	265	4%	4%	62	64	70	68	68
Other industrial	435	455	445	490	505	525	584	501	551	572	10%	4%	131	131	146	147	152
Bar & Coin Investment	-5	50	525	460	215	280	266	578	332	285	-43%	-14%	107	110	95	61	70
North America							159	242	264								
Western Europe							52	75	61								
Japan							46	240	-26								
Rest of the World							9	21	33								
ETF Investment	905	215	-240	-10	105	-245	991	507	-238	-440	N/A	N/A	31	-219	-155	-169	-89
North America							125	524	-6								
Western Europe							509	237	59								
Japan							-13	58	-23								
Rest of the World							370	-312	-268								
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20	-20	458	-139	-300	N/A	N/A	49	-173	-48	-58	-123
Investment	935	150	305	535	275	15	1,237	1,544	-45	-455	N/A	N/A	187	-282	-108	-165	-142
Total Demand	8,590	8,090	8,240	8,345	7,850	7,365	8,353	7,794	7,053	6,650	-9%	-6%	1,860	1,389	1,728	1,558	1,612

Source: Metals Focus 2019 - 2022, SFA (Oxford) 2013 - 2018.

Notes:

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

Table 6: Regional recycling – annual and quarterly comparison

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022f	2021/2020 Growth %	2022f/2021 Growth %	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022
Platinum recycling supply (koz)																	
Automotive	1,120	1,255	1,185	1,210	1,325	1,420	1,589	1,440	1,448	1,238	1%	-15%	409	330	329	329	327
North America							520	458	459								
Western Europe							808	747	767								
Japan							116	110	108								
China							34	34	33								
Rest of the World							110	90	81								
Jewellery	855	775	515	625	560	505	476	422	422	412	0%	-2%	98	104	102	98	92
North America							3	3	3								
Western Europe							4	4	3								
Japan							187	162	160								
China							276	248	250								
Rest of the World							5	5	5								
Industrial	25	25	20	25	30	30	72	67	67	70	0%	4%	17	17	17	17	17
North America							15	12	12								
Western Europe							11	10	11								
Japan							37	34	34								
China							7	7	8								
Rest of the World							2	2	2								

Source: Metals Focus 2019 - 2022, SFA (Oxford) 2013 – 2018.

GLOSSARY OF TERMS

Above ground stocks

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

ADH

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

BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

Bharat

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

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

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

China Vehicle Emission Standards

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

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

China 6

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

China VI

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

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

Compounds (Platinum based)

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

Diesel oxidation catalyst (DOC)

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

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

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

Electrolysis of water

Water 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.

ETF

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

Euro V/VI emission standards

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

Euro 5/6 emission standards

EU emission standards for light-duty vehicles. Euro 5 legislation was introduced in 2009-11 and Euro 6 in 2014/2015. The limits set in Euro 6 have remained unchanged, but the measuring methods have become more stringent progressively including Euro 6 a, b, c, d, and Euro 6d-Temp, now in place. For CO₂, the laboratory based WLTP and for NO_x RDE.

FCM

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

Forward prices

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

GTL

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

HAMR

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

HDD

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

HDV

Heavy-duty vehicle.

Hydrogen Production Methods

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

white – naturally occurring or produced as industrial by-product

black or brown – coal gasification

grey – steam methane reforming

turquoise – methane pyrolysis

blue – steam methane reforming plus carbon capture

green – water electrolysis with renewable energy sources

pink – nuclear power

yellow – solar power or mix of multiple sources.

ICE

Internal combustion engine.

IoT

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

ISC

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

Jewellery alloys

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

Jewellery demand

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

Koz

Thousand ounces.

LCD

Liquid-crystal display used for video display.

LCV

Light commercial vehicle.

Lean NO_x traps (LNT)

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

Lease rates

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

The London Platinum and Palladium Market (LPPM)

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

MAMR

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

Metal-in-concentrate

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

MLCC

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

moz

Million ounces.

NAND flash Memory

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

NEDC

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

Net demand

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

Non-road engines

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

Ounce conversion

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

oz

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

PDH

Propane dehydrogenation, where propane is converted to propylene.

PEM Electrolyser Technology

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

PGMs

Platinum group metals.

PMR

Precious metals refinery.

Pricing benchmarks

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

Producer inventory

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

PX

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

Refined production

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

RDE

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

Secondary supply

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

Selective catalytic reduction (SCR)

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

SGE

Shanghai Gold Exchange.

SSD

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

Stage 4 regulations

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

Three-way catalyst

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

US Vehicle Emission Standards

US vehicle and engine emission standards for pollutants, are established by the US Environmental Protection Agency (EPA) based on the Clean Air Act (CAA). The State of California has the right to introduce its own emission regulations. Engine and vehicle emission regulations are adopted by the California

Air Resources Board (CARB), a regulatory body within the California EPA. Vehicles can in every year be certified in different emission classes, called "bins." The fleet average emissions over all "bins" are then regulated and reduced from year to year. To achieve the required fleet average, every year more vehicles have to be registered in the lower bins.

Tier 3

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

Tier 4 stage

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

Washcoat

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

WIP

Work in progress.

WLTP

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

WPIC

The World Platinum Investment Council.

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