

FOREWORD

This edition of *Platinum Quarterly* presents platinum supply and demand developments for the first quarter of 2023, as well as an updated outlook for 2023. It also provides WPIC's views on issues and trends relevant to investors considering exposure to platinum as an investment asset, plus an update on how our product partnerships continue to meet investors' needs. The *Platinum Quarterly* data and commentary (starting on page 6) are prepared independently for the WPIC by Metals Focus.

2023 forecast deficit increases to 983 koz, equivalent to 12% of projected annual demand

- Updating the outlook for 2023, the platinum deficit is now projected to total 983 koz, 77% higher than the deficit presented in the last *Platinum Quarterly*. The updated deficit equates to a material 12% of projected full-year demand in 2023.
- Mine supply remains highly challenged and has been downgraded to 5,511 koz, which is 6% below the average production level since 2013. Secondary supply has been downgraded by 9% due to continuing scrap supply constraints for the automotive recyclers. Total supply is now forecast to total 7,193 koz (-1% year-on-year).
- In contrast, demand in 2023 is expected to total 8,176 koz (+28% year-on-year), with automotive demand up 357 koz, industrial demand up 382 koz, and investment demand improving from net negative to positive 433 koz on strong bar and coin demand and a return to positive ETF investment flows. The jewellery outlook remains muted again this year, down 38 koz year-on-year.

Platinum supply and demand – Q1 results and the read-throughs for the updated outlook for 2023

Q1 2023 deficit of 392 koz on strong automotive, industrial and investment demand

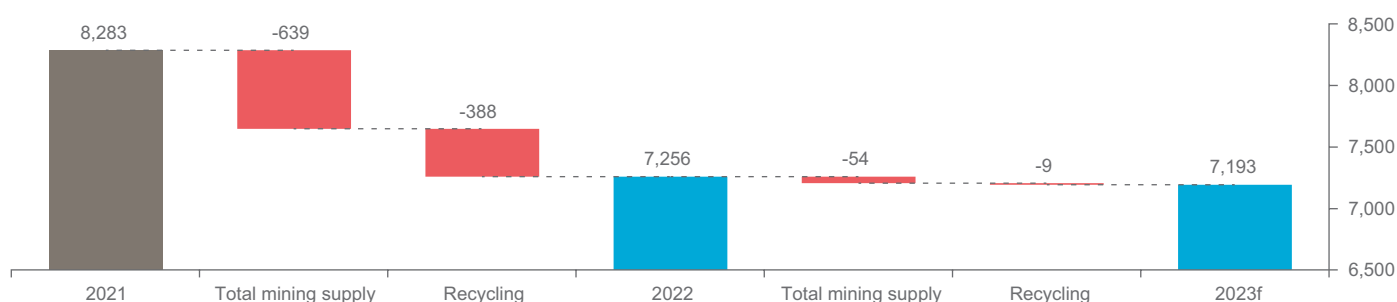
There were a number of market developments during the first quarter of 2023 that in aggregate had a significant impact on market balances and provide read-throughs to the outlook for the year as a whole.

Starting with supply, mine supply was significantly curtailed in South Africa by the worsening electricity shortage there. This led to increased work-in-progress concentrate at the major producers, the unwinding of which is uncertain from a timing perspective as utilising excess smelting capacity is dependent upon the availability of electricity. On the other hand, Russian mine supply increased on the release of some work in progress inventory. The net impact was a 7% year-on-year decline in total mine supply to 1,201 koz. Recycling supply also struggled, down 12% year-on-year at 413 koz, due to an ongoing shortage of automotive scrap availability as users are forced to run older vehicles for longer, while jewellery recycling was impacted by lower new jewellery sales in China. Total supply in Q1'23 came to 1,614 koz, down 9% year-on-year and 8% quarter-on-quarter.

Demand, meanwhile, remained robust at 2,006 koz, up 28% year-on-year due to continued strength in demand from the automotive and industrial sectors (+112 koz year-on-year) and a 340 koz improvement in quarterly investment demand year-on-year. Automotive demand in Q1'23 increased by 9% year-on-year on increasing platinum for palladium substitution, growing vehicle numbers and higher platinum group metal loadings due to tighter emissions legislation. Industrial demand rose by 8% with a number of capacity additions in the chemicals industry offsetting weaker to stable demand elsewhere, while jewellery demand fell 2% year-on-year mainly due to ongoing weakness in China. Bar and coin investment demand of 102 koz in Q1'23 was complemented by a move from significant ETF and exchange stock outflows in Q1'21 (-224 koz) moving to net positive demand in Q1'22 (+73 koz).

The net impact was a significant quarterly deficit of 392 koz in Q1'23, which represents the first substantial quarterly deficit since Q3'20.

Annual total supply and changes 2021 to 2023f (koz)



Source: Metals Focus

Updated 2023 outlook – platinum market deficit of 983 koz on stronger demand and weaker supply

The forecast deficit for 2023 (-983 koz) is 77% deeper than projected in the Q4'22 *Platinum Quarterly* in March 2023, and reflects a 1% decline in total supply and a 28% increase in demand versus 2022.

The full year 2023 outlook for total mine supply is 62 koz lower than the outlook included in the last *Platinum Quarterly*. This reduced forecast could be further restricted by electricity shortages in South Africa and, potentially, sanctions-related operational challenges in Russia. The electricity crisis in South Africa will, at best, keep output constrained to 2022 levels, which was itself down 6% versus the average production level since 2013. Similarly, in Russia, operational challenges are projected to cap production at 8% below average production rates over the same time period. Whilst operating challenges are factored into the outlook on a global basis, mine supply risks are biased to the downside. Recycling supply chain constraints experienced in 2022 are continuing into 2023, causing more disruption than originally anticipated. In aggregate, recycling supply is down by 174 koz versus previous expectations. Consequently, total supply for 2023 is 236 koz lower than previously forecast at 7,193 koz, down 1% versus 2022.

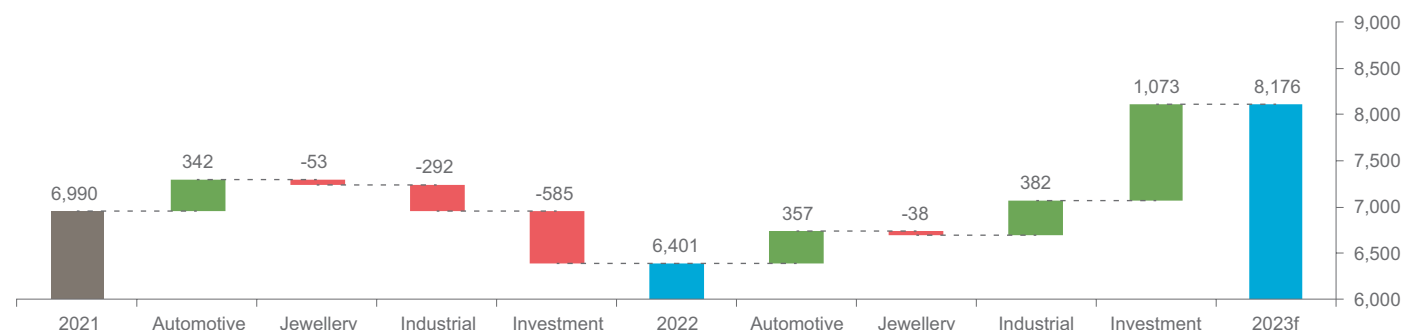
Automotive demand is expected to total 3,255 koz, up 12% on 2022 and 9 koz up versus previous estimates due to ongoing strong substitution of platinum for palladium in gasoline vehicles as well as higher overall loadings, particularly in the heavy duty and non-road vehicle categories. Jewellery demand continues to face headwinds (China revised lower) and is expected to be down 2% year-on-year at 1,861 koz. Total industrial demand is forecast at 2,628 koz, up 17% year-on-year, which means 2023 is on-track to be the strongest year for industrial demand on record. Glass capacity additions and to a lesser extent chemical capacity additions are the big drivers of the year-on-year growth of total industrial demand, offsetting slightly weaker year-on-year demand from the petroleum and electrical segments.

Investment demand has seen significant changes versus the last *Platinum Quarterly* outlook. Total investment demand for 2023 is expected to come to 433 koz, which is up 135 koz versus last quarter's outlook. Within this increase, however, is a 48 koz reduction to bar and coin demand after a challenging start to 2023, although this is now showing signs of improvement. Bar and coin weakness is more than offset by a 162 koz improvement in the outlook for ETF flows for the year and a 20 koz increase in exchange stock flows. Previously expected to be negative in 2023, ETF flows are now projected to creep into positive territory (+30 koz), while exchange stocks are expected to remain flat on 2022.

The net impact is for total demand of 8,176 koz in 2023, up 192 koz from our last update.

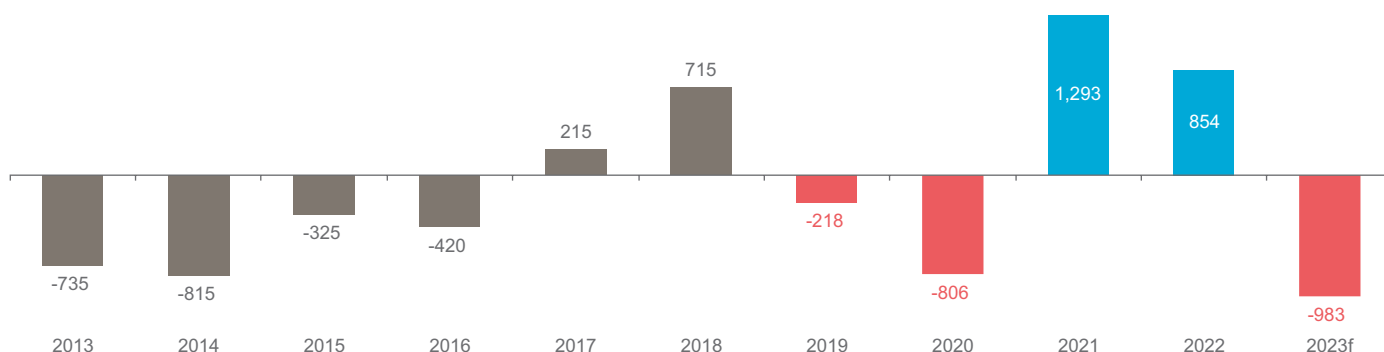
Combining the weaker supply outlook and strong demand projections results in the projected deficit for 2023 increasing from 556 koz (per the previous *Platinum Quarterly*) to a more significant deficit of 983 koz. This would be the deepest deficit in the current time-series going back to 2013.

Annual total demand and changes 2021 to 2023f (koz)



Source: Metals Focus

Annual platinum supply/demand balances (koz)



Source: Metals Focus 2019-2023, SFA (Oxford) 2014-2018

The platinum investment case – supply challenges and strong demand underline risk of metal shortages

There have been limited changes to the economic outlook since the last *Platinum Quarterly* in March. In general, we continue to see significant market vacillations regarding the pace and direction of central bank rate moves through the rest of the year. This is fuelled by uncertain messaging from central banks, who are clearly struggling with the same challenges as the rest of the market, in particular how to time monetary policy decisions to manage strong inflation. This is illustrated by ongoing stubborn strength in Core CPI (although headline CPI has been falling on declining energy prices) and continued strong employment. Despite the uncertainties, recessionary risks as estimated by a survey of economists, appear to be receding.

Despite the economic uncertainties and relatively high interest rates, we believe that most platinum demand is well protected against downside risks, which is somewhat illustrated by the continued upward revisions to demand forecasts.

Industrial users of platinum are continuing to invest through the cycle, which is supporting the record level of industrial demand projected for 2023. Of course, with interest rate increases having only really commenced in early 2022, it may be that financings for current capacity additions were agreed before funding costs became too onerous, which may have implications for industrial demand in 2024 and beyond unless interest rates start to fall. That said, most capacity additions have been in China, where financing is generally more freely available at attractive rates. In addition, ongoing capacity additions in the chemicals segment (9% of total demand), appear in-part to relate to energy majors diversifying further into petrochemicals to help mitigate the risks of the energy transition weighing on underlying crude oil and gas demand, which seems likely to continue. We are also seeing increasing deployment of liquid organic hydrogen carrier technologies (LOHC), which reflects the need to transport green hydrogen from production centres to end users and signifies that the hydrogen economy is beginning to build some momentum. Platinum and palladium catalysts used in hydrogenation and dehydrogenation of LOHCs could become important contributors to growing demand in due course, whilst demand for the platinum needed for the production and use of green hydrogen is already gaining momentum. Reflecting this, electrolyser capacity is expected to increase to 5.5 GW this year, with a 25% increase in the deployment of stationary fuel cells this year to 566 MW, resulting in a 24% increase in hydrogen demand for platinum in electrolysers and stationary applications.

Automotive demand for platinum continues to be mainly driven by increasing substitution of platinum for palladium in gasoline engine vehicle autocatalysts, as well as increased platinum loadings to meet tighter emissions standards, which includes the increasing penetration of platinum-based exhaust treatment systems in the Chinese heavy-duty market. Although these factors are the bigger drivers, light vehicle production is still forecast to reach 86 million vehicles in 2023, 4% higher than 2022, and substantially greater than the COVID impacted years of 2020/21 but still below pre COVID levels.

In terms of investment, despite the weak bar and coin demand in late 2022 flowing through to the beginning of 2023 (albeit recovering in March), investment demand as a whole is looking significantly healthier than in recent years, led mostly by strong interest in ETFs for platinum exposure in South Africa. This reflects the attractive investment outlook of a market entering a substantial deficit this year, with deficits likely to be sustained for several years unless there is a substantial increase in supply or significant demand destruction, both seeming unlikely. It is quite possible that this interest in platinum investment could spread to other geographies as well, and of course, the more broad-based the investment thesis is acted upon, the more self-fulfilling the result.

Finally, there is a downside risk which is jewellery demand, which has continued to decline over many years (-5% CAGR since 2014). The current forecast is for jewellery demand to be broadly flat year-on-year (down 2%), which reflects an expected slower pace of decline in Chinese demand as it emerges from COVID, as well as ongoing strength in demand from the US and India. Nonetheless, the risks to jewellery largely remain to the downside, despite some benefit to platinum jewellery while the price of platinum is significantly below that of gold.

In conclusion, while platinum demand looks on the whole to be in robust shape with strong year-on-year growth in demand, supply-side challenges heighten the markets' attractiveness to investors noting the material deficit emerging this year as well as the potential for further risks to supply exacerbating the deficit. The market will need to rely upon above-ground stocks to meet the shortfall, but as we have commented previously, it is not clear how freely available they are likely to be at current prices, particularly as a sizeable portion of above-ground stocks appear to be held in China.

Longer term, the miners are rolling out their own renewable power generating capacity, which meets several de-risking motives. Notably self-owned renewable generation may help ease the impact of electricity shortages, but it also supports emission reduction targets and provides more predictable cost visibility. However, with the completion timetable for renewable power projects biased to late 2024 and beyond, the benefits in terms of more stable electricity availability will take some time to materialise. Such uncertainty is likely to have a bearing on the timing of go-ahead decisions for new production.

The platinum market is in a unique position amongst most commodities in having a new emergent end source of demand in the form of the hydrogen industry, which is expected to become a material driver of demand moving into the 2030's. Whilst demand for platinum for catalytic converters will gradually decline with increasing fleet electrification, a portion of that electrification is expected to be from FCEVs, and including non-transport related hydrogen demand, total demand for platinum is likely to increase significantly. Ensuring the hydrogen economy and hydrogens essential role in global decarbonisation remains on-track will most likely require significant additional platinum production, but the substantial capital commitments and long lead-times for new mine development suggests that strong global policy certainty on decarbonisation might well be a necessary precursor.

WPIC initiatives highlights

We continue to grow the number and geographic coverage of our product partnerships which, in addition to increasing choices for investors, provides us with the ability to identify market developments and appropriate strategies to increase investment in platinum. We had identified some softening of bar and coin sales during Q4'22 which continued at the start of 2023. In collaboration with our product partners, we increased marketing efforts and the distribution of information and insights needed to make informed platinum investment decisions. These efforts, in combination with the banking crisis in the US, produced results, with bar and coin demand picking up markedly towards the end of Q1'23.

It is clear that continued economic uncertainty is still supporting retail investor interest in Q2. Added to which, as seen in ETF flows year-to-date, institutional investors are acting on the platinum market entering a deep deficit in 2023. The awareness of this deficit, and that it is likely to be the first of several, should spread more broadly, motivating increased retail investment in platinum bars and coins as the year unfolds. To this end, we have several initiatives planned in Q2 to assist product partners in educating their client base on the outlook for platinum.

WPIC product partnerships in Europe and North America, reacted effectively to softer demand for physical platinum early in 2023, with Mints, refiners, wholesalers and retailers continuing to develop and launch new products and working to position platinum to capture a greater share of physical investment options.

In China, despite limited business activities during the lunar new year holiday and a rising platinum price over Q1'23, bargain-seeking investors continued to add exposure to platinum, encouraged by the price of platinum being well below the price of gold, heightened demand for physical assets and the positive outlook for platinum. Our partners reported strong growth in overall sales, albeit still off a low base. Our partner initiatives will continue to grow during the rest of 2023. We added a new partner in Q1'23 with specialist capabilities in platinum fabrication and a strong wholesale distribution network across China.

In Japan, the efforts of our partners contributed to the turnaround from net negative investment seen in 2022 to net positive in Q1'23. We continue to expand our partnership portfolio in Japan and to support our partner efforts to attract new investors, including the effective collaboration with the Japan Bullion Market Association (JBMA). Good progress has also been made in the Korean market, where we expect to establish an inaugural Korean product partner in 2023.

Trevor Raymond, CEO

Contents

Foreword	P1	Expanded Tables	P18
Summary Table	P6	Glossary of Terms	P23
First Quarter 2023 Review	P7	Copyright and Disclaimer	P27
2023 Outlook	P12		

PLATINUM QUARTERLY Q1 2023

Table 1: Supply, demand and above ground stocks summary

	2019	2020	2021	2022	2023f	2022/2021 Growth %	2023f/2022 Growth %	Q4 2022	Q1 2023
Platinum Supply-demand Balance (koz)									
SUPPLY									
Refined Production	6,075	4,989	6,297	5,522	5,511	-12%	0%	1,329	1,178
South Africa	4,374	3,298	4,678	3,915	3,873	-16%	-1%	931	759
Zimbabwe	458	448	485	480	502	-1%	5%	123	121
North America	356	337	273	263	284	-4%	8%	65	69
Russia	716	704	652	663	647	2%	-2%	160	180
Other	170	202	208	201	205	-3%	2%	49	48
Increase (-)/Decrease (+) in Producer Inventory	+2	-84	-93	+43	+0	N/A	-100%	+23	+24
Total Mining Supply	6,077	4,906	6,204	5,565	5,511	-10%	-1%	1,352	1,201
Recycling	2,112	1,997	2,079	1,691	1,682	-19%	-1%	408	413
Autocatalyst	1,567	1,509	1,591	1,250	1,243	-21%	-1%	299	301
Jewellery	476	422	422	372	370	-12%	-1%	92	95
Industrial	69	66	67	68	69	3%	2%	17	17
Total Supply	8,189	6,903	8,283	7,256	7,193	-12%	-1%	1,759	1,614
DEMAND									
Automotive	2,811	2,324	2,555	2,897	3,255	13%	12%	757	806
Autocatalyst	2,811	2,324	2,555	2,897	3,255	13%	12%	757	806
Non-road	†	†	†	†	†	N/A	N/A	†	†
Jewellery	2,106	1,830	1,953	1,899	1,861	-3%	-2%	457	455
Industrial	2,257	2,018	2,538	2,245	2,628	-12%	17%	531	570
Chemical	797	621	715	684	749	-4%	9%	273	236
Petroleum	219	109	169	193	171	14%	-11%	52	42
Electrical	144	130	135	106	97	-21%	-8%	24	23
Glass	233	402	705	414	730	-41%	76%	-21	56
Medical and Biomedical	277	256	269	278	287	3%	3%	69	71
Other	586	501	546	570	594	5%	4%	134	143
Investment	1,233	1,536	-56	-640	433	N/A	N/A	-54	175
Change in Bars, Coins	263	571	324	225	403	-31%	79%	1	102
Change in ETF Holdings	991	507	-241	-558	30	N/A	N/A	-62	43
Change in Stocks Held by Exchanges	-20	458	-139	-307	0	N/A	N/A	7	30
Total Demand	8,407	7,709	6,990	6,401	8,176	-8%	28%	1,691	2,006
Balance	-218	-806	1,293	854	-983	-34%	N/A	68	-392
Above Ground Stocks	3,432**	2,626	3,919	4,774	3,790	22%	-21%		

Source: Metals Focus 2019 - 2023.

Notes:

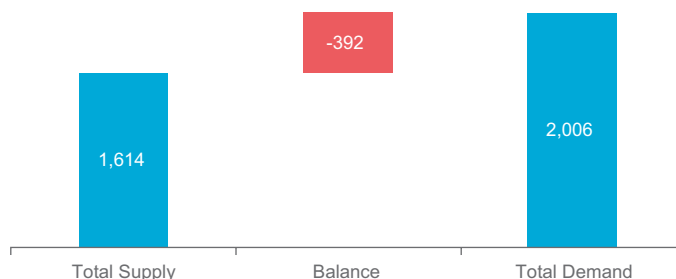
- **Above Ground Stocks 3,650 koz as of 31 December 2018 (Metals Focus).
- † Non-road automotive demand is included in autocatalyst demand.
- All estimates are based on the latest available information, but they are subject to revision in subsequent quarterly reports.
- The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q4 2017 are contained in previously published PQs which are freely available on the WPIC website.
- Quarterly estimates from Q1 2021 and half-yearly estimates from H2 2020 are included in Tables 3 and 4 respectively, on pages 19 and 20 (supply, demand and above ground stocks). Details of regional recycling supply in Table 6 on page 22 are only published from 2019.

2023 FIRST QUARTER PLATINUM MARKET REVIEW

There was reason for some optimism at the start of the year, as China fully reopened and inflationary pressures began to ease in many countries. By March, however, turmoil in the banking sector emerged. In the US, a handful of banks faced challenges, with some even failing. Crucially, the systemically important Credit Suisse had to be rescued, through a take-over by UBS. The turmoil underpinned the heightened uncertainty of the macro environment that investors were trying to navigate during the quarter. This offered platinum some support. Perhaps more importantly, optimism towards the metal's fundamentals, concerns about impact of South Africa's primary electricity shortages provider, Eskom, and the subsequent impact on mine production and strong demand growth supported platinum investment demand. In addition, the trend in 2022 where investors favoured mining equities for strong yield, appears to have reversed with strong growth in South African platinum ETFs sector. After six quarters of net disinvestment, platinum ETF holdings saw net investment of 43 koz, and bar and coin investment improved by 71% (+42 koz) compared to Q1'22. In addition, the gradual recovery in new vehicle production, tighter emissions regulation and higher platinum ratios supported the automotive sector, up 9% year-on-year (+69 koz) to 806 koz. Industrial demand (excluding automotive) was up 8% (+43 koz) to 570 koz, further supporting platinum demand, resulting in a 28% (+441 koz) year-on-year increase in total demand to 2,006 koz.

Refined mine production declined 8% (-96 koz) compared to Q1'22 and declined 11% (-151 koz) against Q4'22. With increasing vehicle production and sales, we had expected an easing of the pipeline constraints the recycling market faced. However, recyclers and refiners continued to see low availability of spent autocatalysts, resulting in a 15% (-52 koz) year-on-year decline to 301 koz for the period January to March. Weaker jewellery sales in China are largely to blame for the lower jewellery recycling numbers for the quarter. Overall, total platinum supply declined 9% (-152 koz) to 1,614 koz. The improvement in demand, combined with softer primary and secondary supply, has led to a market deficit for the first time since Q2'21, with demand outstripping supply by 392 koz.

Chart 1: Supply-demand balance, koz, Q1 2023



Source: Metals Focus

Supply

Refined platinum production experienced an 8% decline (-96 koz) year-on-year, totalling 1,178 koz, as gains from Russia failed to offset decreases from South Africa.

South African output fell by 14% (-119 koz) year-on-year due to ongoing processing constraints that limited refined production. The impact on the quarter was in part due to Anglo American Platinum's Polokwane smelter not having returned to full capacity, following last year's rebuild, and maintenance operations at the Waterval smelter. In addition, the scheduled rebuild of Implats' Number 4 furnace impacted the company's output. As per the trend from the previous year, underlying mine production exceeded refined output, resulting in a further accumulation of semi-finished inventory. This trend was aggravated by the deteriorating energy crisis in South Africa, which affected smelter availability as the frequency and magnitude of load curtailment continued to increase. For the quarter, Eskom's power supply deficit reached 5.8 terawatt-hours, which was a 46% increase from Q4'22, which at the time was the worst deficit on record. While the proportion of platinum in total PGMs has remained consistent for mined output, processing asset maintenance has had a disproportionate impact on different ore sources. This creates variations in the relative PGM content in semi-finished inventory stockpiles and introduces volatility in refined platinum production relative to other PGMs. This effect was evident in the quarter, as refined platinum output saw a sharper decline than total PGM output. Once smelter maintenance is completed and the semi-finished inventory has been run down, the relative proportion of PGMs is expected to normalise.

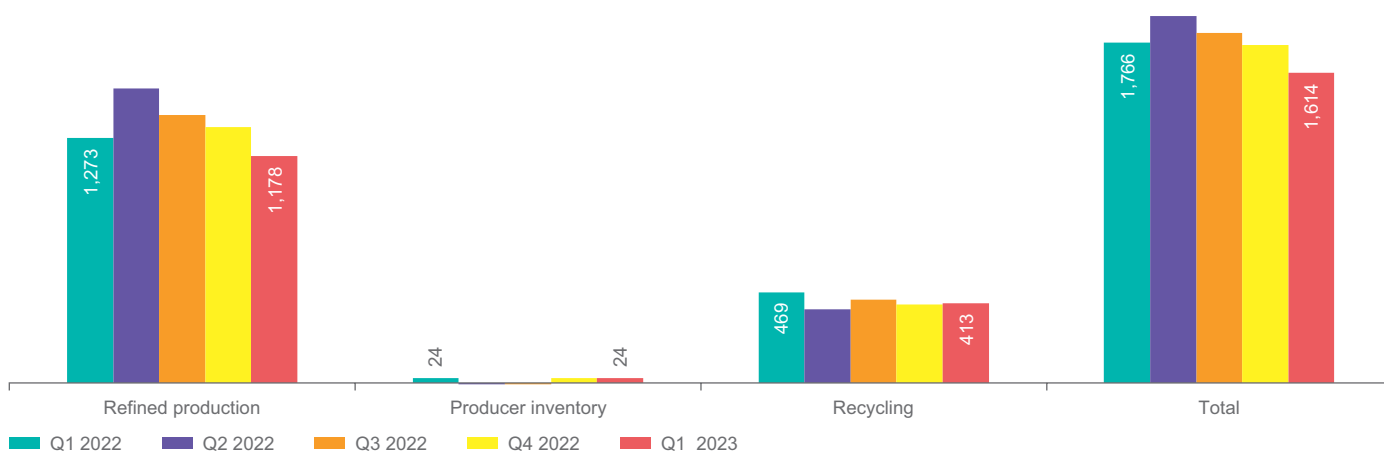
Russian production increased 10% (+17 koz) year-on-year, attributed to the release of semi-finished inventory and the normalisation of throughput at the Norilsk Concentrator after the 2021 building collapse. North American output remained virtually unchanged year-on-year, with a slight 5% increase (+3 koz). Sibanye-Stillwater’s US operations continued to face disruptions, with an estimated 30 koz loss in PGM production in March due to shaft damage. However, these losses were offset by an improved performance at Vale’s Canadian operations.

Recycling

Global recycling of platinum remained sluggish in the first quarter of 2023, falling 12% (-56 koz) year-on-year to 413 koz. This was despite a slight improvement from the particularly weak Q4’22. Low availability in the supply of end-of-life vehicles persisted, as high new vehicle prices and elevated vehicle financing costs discouraged consumers from parting with their existing vehicles. Moreover, some consumers are also feeling the pinch of a higher cost of living and are deferring high value goods purchases, such as a new car. Meanwhile the regulatory environment in North America aimed at curbing autocatalyst theft, along with weaker metal prices, also stemmed the flow of recycling.

Platinum jewellery scrap declined 3% (-3 koz) year-on-year in Q1’23. With platinum jewellery losing out to gold for some time now in China, this was in part to be expected. The wide gap between buying and selling platinum prices at jewellery retailers in the country has been another headwind. Electronic recycling was essentially unchanged compared to Q1’22.

Chart 2: Platinum supply, koz

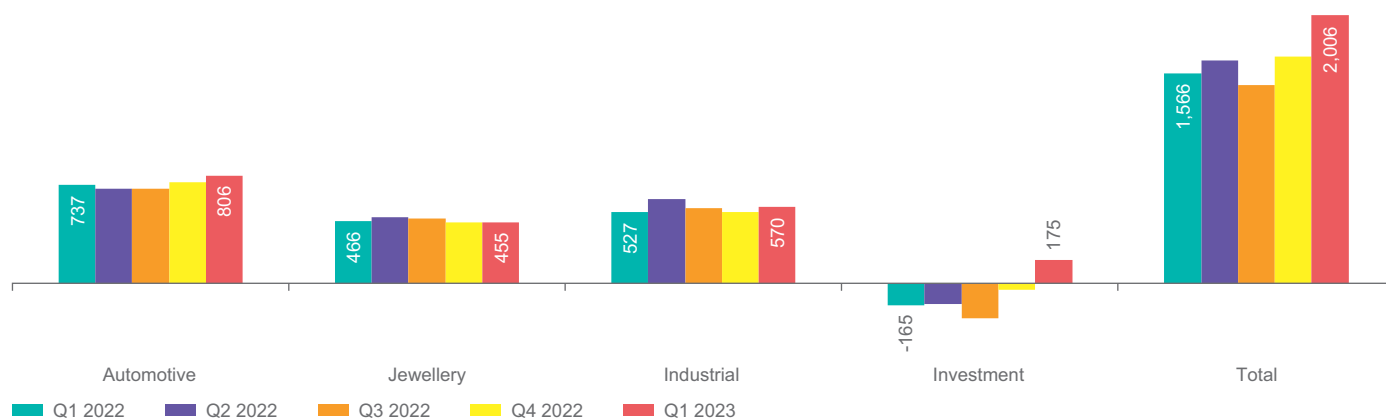


Source: Metals Focus

Demand

Global platinum demand jumped 28% year-on-year (+441 koz) to just over 2,000 koz in the first quarter of 2023, as automotive and industrial demand improved, and investment demand turned positive for the first time in seven quarters. Automotive demand rose 9% (+69 koz) to 806 koz as the global chip shortage eased (the impact in Q1’23 was contained to an estimated 1M fewer units compared to 2.5M fewer units in Q1’22), enabling stronger inventory replenishment. Industrial demand increased 8% year-on-year (+43 koz) to 570 koz, mainly due to chemical plant expansions offsetting declines in other industrial sectors. Investment demand turned positive in Q1’23, with net inflows of 43 koz into exchange-traded funds (ETFs). Bar and coin investment was also higher than in Q1’22, up 71% (+42 koz) to 102 koz. Jewellery demand contracted in the quarter, falling 2% (-11 koz) to 455 koz. This was due to lower demand in China, where interest in gold jewellery continued to outpace that of platinum.

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

The availability of semiconductor chips for the automotive sector steadily improved during the quarter, but light-duty vehicle (LDV) production was up only 1% on Q1'22. Growth in Europe, North America and India was dragged down by particularly weak production in China. Meanwhile the heavy-duty vehicle (HDV) sector suffered an even worse fate in the quarter. Due to the relative size of Chinese and Indian HDV manufacturing, the decline of 11% in both countries resulted in a fall of global HDV production, down 3%, as production elsewhere failed to make up for the shortfall. Despite the modest lift in total vehicle production, platinum demand grew 9% (+69 koz) to 806 koz in Q1'23, driven by the increased use of PGM-based catalysts and richer platinum ratios.

In China, despite car production falling to 5.5M units, 10% lower than Q1'22, and HDV production lower by 11%, platinum demand increased by more than 10%. This increase has a lot to do with China VIa, which is now applicable to all HDV types, as well as China VIb, which is applicable to new gas-powered HDVs. In addition, a larger share of non-road vehicles (NRV) are being fitted with PGM-coated catalysts, as China IV emissions standards are phased in this year. Outside of China, platinum demand was further supported by the ongoing deployment of tri-metal catalyst technology globally in many gasoline passenger cars. Some palladium in the catalyst has successfully been displaced by platinum, largely driven by the cost advantages automakers enjoy as the palladium price remains persistently higher than platinum.

While vehicle production in Europe increased by 15%, the demand for platinum rose more modestly as battery electric vehicle (BEV) supply grew 85% year-on-year, in contrast to that of internal combustion engine (ICE), whose production rose by 10%. The increase in North American platinum demand stems from a combined gain in ICE production, higher rate of hybridisation and greater volumes of tri-metal catalysts fitted. After achieving record light-duty vehicle sales in 2022, India has continued to enjoy growth in 2023, reflected in the improved production in Q1'23, up 10% year-on-year. This aided platinum demand in the "Rest of World" segment which grew by 12%.

Jewellery demand

The global platinum jewellery market contracted by 2% (-11 koz) year-on-year to 455 koz in Q1'23, although performances varied by region. In Europe, demand increased by 5%, as above-expectation gains for high-end jewellery offset a weaker bridal market. North American demand eased by 4% (-5 koz) in Q1'23, as the number of weddings normalised and consumer expenditure shifted to services. That said, offtake in North America remained a full 26% up on Q1'19. Consumer offerings continued to grow as price differentials versus white gold allow retailers to earn decent margins on platinum.

In China, although consumer sentiment improved notably in Q1'23, platinum demand fell by 14% (-18 koz) year-on-year. The unexpected lack of post-COVID rebound was primarily due to fierce competition from gold. Rising confidence in gold prices was driven by seasonal festival demand over the Chinese New Year and safe-haven purchases on the back of global economic uncertainties. The fact that the People's Bank of China (PBoC) increased gold reserves for a third consecutive month further boosted

local consumers' interest in gold jewellery. Some manufacturers and showrooms continued to allocate more funds towards inventory in gold as they enjoyed higher turnover and profits. In some instances, manufacturers have suspended their platinum jewellery offerings completely.

In Japan, the market for platinum jewellery was disappointing during the first quarter. A lacklustre bridal segment, weaker TV shopping channel sales (not surprising given an ease in COVID concerns, which is reducing consumer screen time) and some inventory adjustments all put pressure on local jewellery manufacturing. Indeed, were it not for rising exports, we might have seen an overall decline year-on-year during Q1'23. Indian platinum jewellery fabrication rose by 10% year-on-year to a first quarter record of 38 koz. Compared to higher gold price volatility, platinum prices have remained relatively stable, which has attracted consumers in India to the metal. This was reflected in relatively strong demand compared to other precious metals. Additionally, fabrication was helped by growth in new stores and a greater number of existing retailers displaying platinum jewellery.

Industrial demand

Industrial platinum demand grew 8% (+43 koz) in Q1'23. The addition of paraxylene capacity in China lifted demand in the chemical sector. This was offset by a contraction in the glass and electronics sectors, where LCD plant decommissioning in Japan continued and the global data centre market slowed.

Chemical

Platinum chemical demand increased by 108% (+123 koz) year-on-year to 236 koz in Q1'23. The majority of the increase stems from greater paraxylene offtake. In China, capacity additions in Guangdong significantly contributed to total Q1'23 demand. In addition, there have been improvements year-on-year for propane dehydrogenation (PDH) platinum demand. New PDH capacity additions took place in Belgium and China, jointly contributing almost 50 koz of demand. On the other hand, nitric acid and silicone offtake have decreased marginally year-on-year as both industries were impacted following the Russia-Ukraine war. For nitric acid, disrupted supply chains and high energy prices drove production lower, while silicon production also remains impacted by elevated costs, particularly in Europe, with both industries still shy of pre-war levels.

Petroleum

Platinum petroleum demand fell by 4% (-2 koz) year-on-year in Q1'23, mostly attributable to gas-to-liquid catalyst changeouts taking place in Q1'22 that were not repeated in Q1'23. Similarly, demand fell 19% (-10 koz) quarter-on-quarter, owing to cold weather induced power outages in North America in January reducing production, while China's change in COVID policy, leading to outbreaks, led to lower oil demand and decreased production requirements.

Medical

Platinum medical demand climbed 5% (+3 koz) year-on-year in Q1'23 to 71 koz, less affected by seasonal staff shortages in key regions (North America and Europe) that had caused elective procedures to be cancelled in Q1'22. Additionally, a return to natural growth led to a 2% (+2 koz) quarter-on-quarter increase in demand.

Glass

Decommissioning of remaining Japanese LCD tanks, as a result of high power costs, continued in Q1'23, resulting in a 56% year-on-year decline to 56 koz in platinum demand from the glass industry. The installation of new LCD tanks in China did not help mitigate this decline.

Electrical

Demand from the electrical segment in Q1'23 plummeted by 24% (-7 koz) year-on-year as hard disk drive (HDD) shipments fell by 35% year-on-year. There was reduced demand from enterprises, as they continue to shift to solid-state drives (SSDs). Another contributing factor has been delays in data centre construction, as businesses are reluctant to invest in the current economic climate. Semiconductor sales also fell by 15% year-on-year in Q1'23, on the back of weak demand from the consumer electronics market, as consumers hold back on purchases due to rising inflation. This has led to low capacity utilisation rates at semiconductor factories (tooled to produce higher-profit yielding chips employed in the electronics good sector) and the suspension of, or only partial project expansions as chipmakers reassess their investment plans.

Other

Global other industrial demand declined by 2% (-3 koz) to 143 koz in Q1'23. In the automotive segment, despite improved chip supplies, automotive production saw modest LDV growth and contraction in HDV production. Accordingly, modest new vehicle production and inventory replenishment limited the recovery in spark plugs and oxygen sensor production. Overall, demand was further dragged down by a decline in the automotive aftermarket, which suffered its first decline since Q1'20.

Investment demand

Bar and coin investment jumped by 71% year-on-year (+42 koz) to 102 koz, its highest total since Q3'21. This was driven by a marked recovery in Japan where buying was its strongest since Q2'20 as consumers have adjusted to higher platinum prices in yen terms. In sharp contrast, North America (-60 koz, -66%) and Europe (-5 koz, -44%) recorded sizeable losses. In the former, a jump in gold and silver buying, in response to the local banking crisis, meant that less capacity could be devoted to platinum investment products. There was also a marked drop in US Eagle bullion coin purchases. In Europe, the upside and increased volatility in euro gold prices meant that investor activity was concentrated in the gold market, which saw its highest two-way activity since before the pandemic. Platinum ETF holdings grew for the first time in seven quarters. While the European and North American funds were still liquidating, those in South Africa have seen substantial growth, as the deterioration in the local operating environment (constrained power supply) for miners, combined with the improved outlook for the metal's fundamentals, stimulated investor interest. NYMEX and TOCOM warehouse stocks increased by 30 koz due to slower physical demand, especially in China, which has fuelled a positive exchange of futures for physical (EFP) and brought metal back onto the exchange. Warehouse stocks have now returned to historical norms, following a COVID-induced movement of metal onto the exchange in 2020, following the constraints in transport of process metals from place of production to place of fabrication.

Chart 4: Platinum Investment, koz

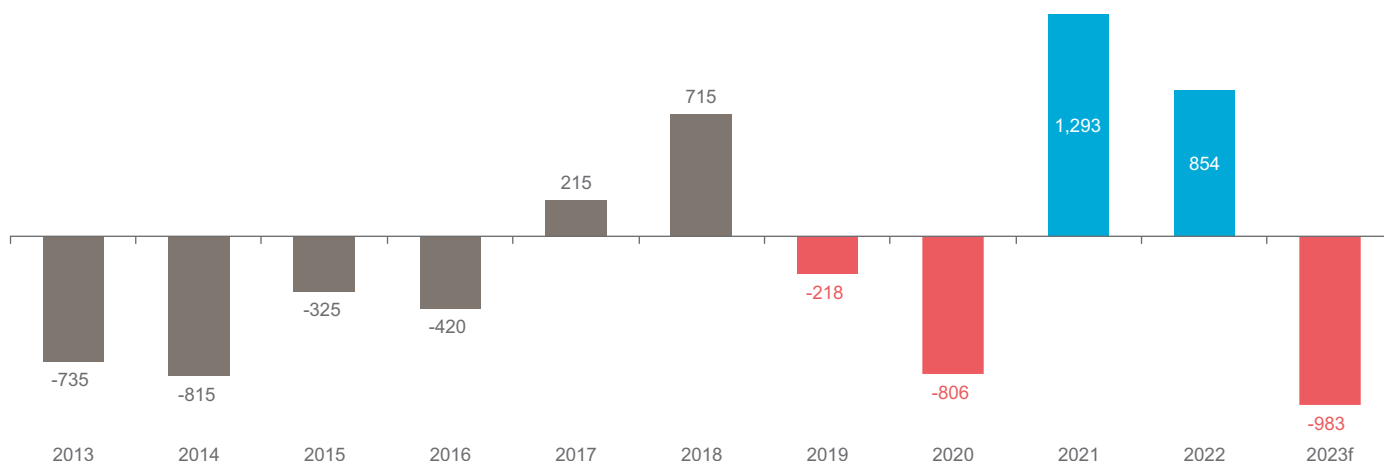


Source: Metals Focus

2023 OUTLOOK

The macroeconomic recovery in 2023 is expected to remain tentative as persistently high inflation, higher interest rates and continued policy intervention by central banks all weigh on growth. The IMF expects global GDP growth to slow to 2.8% from the 3.4% seen in 2022. Despite this subdued outlook, we forecast that the platinum market will swing from a significant surplus in 2022 to an equally significant deficit this year as supply declines by 1% and demand increases by 28%. In addition to both automotive and industrial sectors growing well ahead of the GDP growth outlook (a combined swing of 740 koz), strong investment demand and almost flat supply result in the market deficit. As South African ETF holdings increase, eclipsing the liquidations expected in other regions, and bar and coin demand improves by 79%, net investment is expected to increase to 433 koz (a swing of 1,073 koz on 2022). With no growth expected from either mine supply or secondary supply, we forecast the platinum market to be in a 983 koz deficit this year.

Chart 5: Supply-demand balance, koz, 2013-2023f



Source: Metals Focus 2019-2023, SFA (Oxford) 2014-2018

Supply

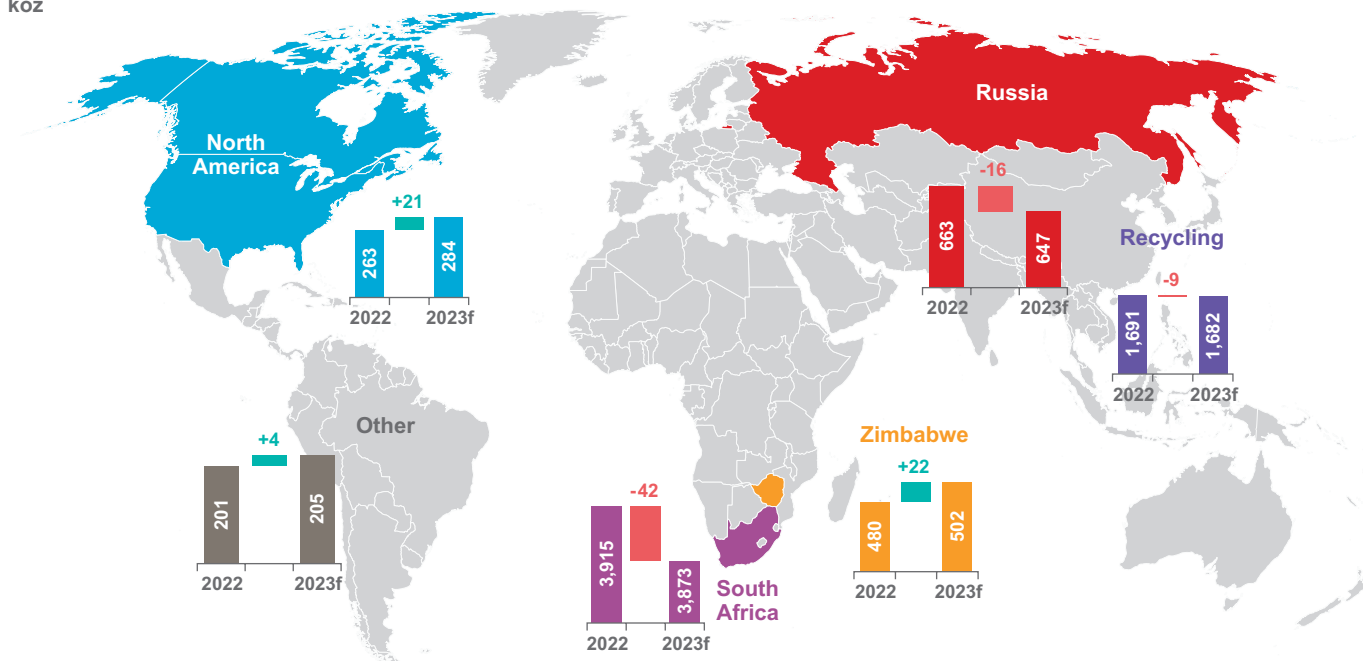
Total mined platinum supply is forecast to remain flat, with estimated production of 5,511 koz. While losses in South Africa will be offset by gains in Zimbabwe and North America, there are significant uncertainties surrounding South African platinum supply for the upcoming year.

The extensive smelter maintenance programs conducted last year have resulted in a significant build-up of semi-finished inventory, which may potentially buoy 2023 output. However, ongoing constrained processing capacity in Q1'23, a low grade mix of inventory, and the expected worsening domestic energy crisis are likely to put further pressure on capacity, limiting producers' ability to release inventory. The impact of the domestic energy crisis has so far been less significant than previous disruptions that South African mining faced in recent years, but as the severity and frequency of load curtailment increases, disruptions are likely to grow. It remains challenging to quantify the second-order effects and broader challenges facing the South African economy and safety and security situation. However, it is expected that South African supply will decrease by 1% (-42 koz) year-on-year, as the easing of smelter maintenance is offset by lower grades at key mines, Eskom load curtailment, and some infrastructure closures.

Despite a lift in Q1'23 output, Russian production is expected to decline a modest 2% (-16 koz) year-on-year in 2023 as smelter repairs impact production. Delays in the smelter maintenance presents some downside risk, although Nor Nickel remains confident that its initiatives are sufficient to mitigate the logistical and procurement challenges associated with sanctions imposed as a result of Russia's invasion of Ukraine.

Ongoing disruptions at Sibanye-Stillwater's US operations continue to pose downside risks to North American production but growth from by-product Canadian nickel mining is expected to drive regional growth. Output from Zimbabwe is also expected to continue incremental growth as additional volumes from expansion projects are realised.

Chart 6: Changes in supply, 2022 vs. 2023f
koz



Source: Metals Focus

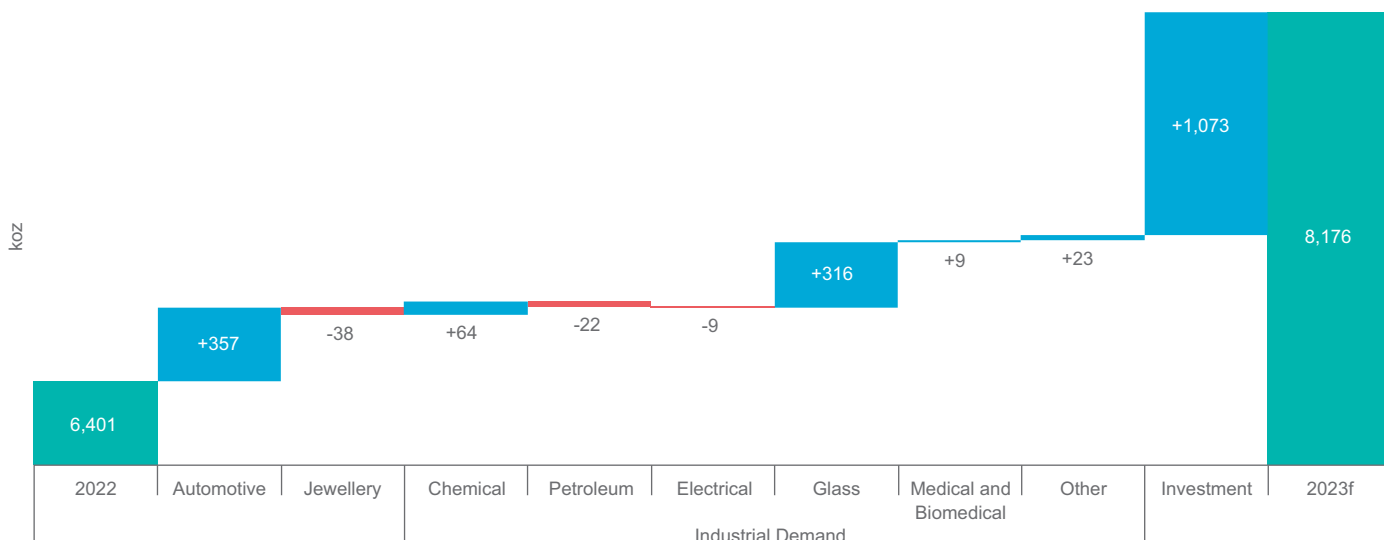
Recycling

We have revised our previous global recycling number down to 1,682 koz for the full year, meaning that supply from secondary sources will remain almost flat on 2022. While the expected growth in new vehicle production and sales should intuitively lead to a normalisation of end-of-life scrappage rates, and thus benefit the spent autocatalyst market, recyclers and refiners are grappling with several systemic issues that are hindering a commensurate recovery. Firstly, scrap yards are earning healthy margins due to higher second-hand parts sales, which allows them to hold spent autocatalyst materials back, waiting for higher precious metals prices. Secondly, remote work and online shopping, now entrenched behaviour, are resulting in cars being driven less intensively and so retained by consumers for longer. Thirdly, in North America specifically, the regulatory framework is changing and requires state-level licensing to curb autocatalyst theft, despite catalyst theft constituting a very small percentage of overall spent catalyst supply. This is impeding the flow of spent catalysts through the value chain. As a consequence, supply from spent catalyst processing is expected to be 1,243 koz, 8 koz lower than in 2022. Platinum jewellery scrap will follow the trend in jewellery sales and, given the lower expectations here, we expect only a marginal decrease of 1% (-2 koz). Finally, we also expect modest growth of 2% year-on-year in electronic recycling.

Demand

Platinum demand is expected to grow by 28% (+1,775 koz) year-on-year to 8,176 koz in 2023. The key driver will be a shift from disinvestment to investment. Global ETF holdings, which saw outflows of nearly 800 koz over the past two years, are expected to increase modestly in 2023 (+30 koz). Bar and coin demand is expected to nearly double in 2023, up 79% (+178 koz) year-on-year. The recovery in automotive production, combined with tighter emissions legislation and substitution, will lift automotive demand by 12% (+357 koz) to 3,255 koz. Capacity expansion plans in China will boost glass industry platinum demand by 76% (+316 koz) underpinning record annual industrial demand of 2,628 koz.

Chart 7: Changes in demand by category, 2022 vs. 2023f



Source: Metals Focus

Automotive demand

Global automotive demand is expected to increase by 12% in 2023 to 3,255 koz (+357 koz year-on-year). This growth will be driven by a number of factors. Firstly, HDV production is forecast to grow by 6% in 2023, with output in China jumping by as much as 26%, notwithstanding Q1'23 weakness. Secondly, we will see tighter Chinese emissions standards for both HDV and non-road vehicles (NRVs). China's VIb emissions regulations, which will be applicable to all powertrain types from July 2023, will also require all HDVs to be fitted with a compliant aftertreatment system. In 2020, the Ministry of Ecology and Environment of China updated non-road tailpipe emission standards (China IV), which were scheduled to phase in from December 2022. This means that the global share of NRVs without aftertreatment systems will decline from 63% in 2022 to 47% this year. In addition, the standards set new requirements for a lower particle number limit, which will result in a 2.4x increase in the fitment of DPFs (diesel particulate filters).

Finally, growing substitution of palladium with platinum in gasoline aftertreatment systems will further boost platinum consumption. Tri-metal catalyst technology is being used in an increasing number of gasoline cars. This shift could see platinum displace as much as 615 koz of what could have otherwise been palladium demand in 2023.

In the Rest of the World, growth in vehicle production and tighter legislation in countries such as India, Brazil and Mexico will also result in double-digit growth in automotive demand for platinum. In Japan, despite vehicle production remaining at similar levels to 2022, platinum demand is set to grow, driven by the increase in the number of hybrid and FCEV vehicles produced. European and North American demand growth for platinum remains positive but soft. Automakers are focussed on BEV production in Europe while, the introduction of the Inflation Reduction Act in North America offers several incentives for new energy vehicles and will stimulate the BEV adoption which has lagged both Asian and European countries for some time. BEV production will breach 1M units in North America, up 69% on 2022.

Jewellery demand

Global demand for jewellery is expected to contract by 2% (-38 koz) year-on-year to 1,861 koz in 2023.

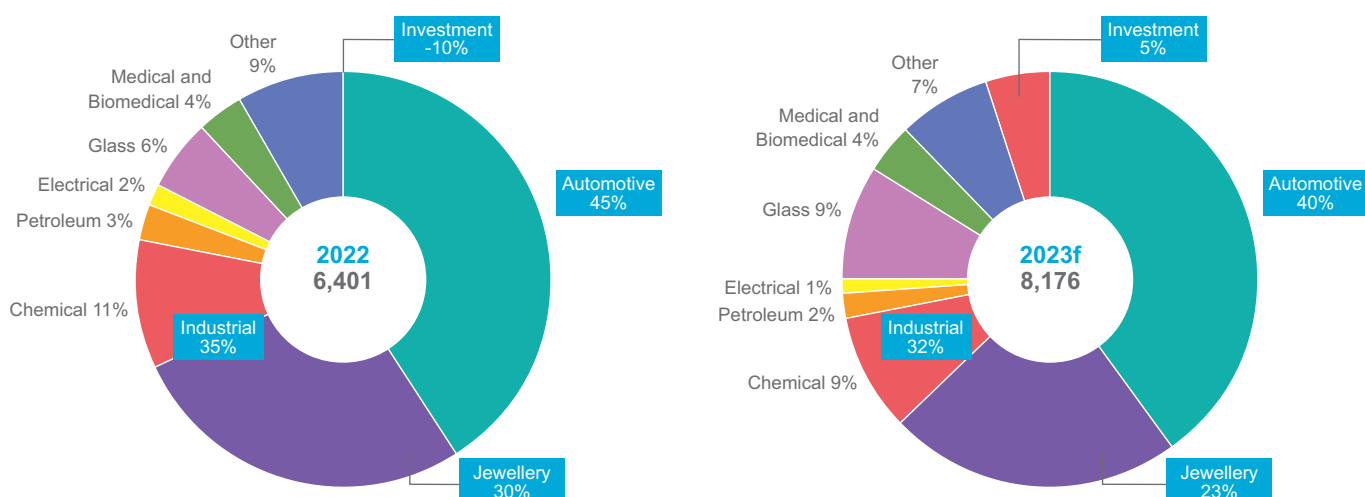
European demand is still forecast to decline by 7%, due to a deterioration in mass market segments linked to weaker consumer sentiment, expenditure shifts, and fewer weddings. However, projected gains for high-end jewellery and watches have been raised, largely due to Q1'23 beating expectations, along with forecasts of booming inbound tourist numbers. North American demand is still forecast to fall by 10%, due to fewer weddings after the post-COVID surge from postponements, a consumer expenditure shift to services, and less re-stocking. However, demand is still 18% up on 2019 due to wide price differentials to gold and palladium, a still broadening retailer base, and a marginal contribution from structural changes.

As mentioned in our review of Q1'23, despite improved economic conditions in China this year, worse than expected demand has dampened full-year expectations. We have revised our Chinese platinum jewellery demand forecast for 2023 from a 15% recovery to a 1% decline to 479 koz. While consumer preferences lean towards gold, fabricator and retailer capital investment and product development will be channelled towards this metal. In spite of the disappointing performance of Japanese jewellery demand in Q1'23, we maintain our projection for an 8% increase for full-year demand in this market. We are expecting that bridal sales will improve later in the year. Demand should also benefit from tourist arrivals continuing to recover (in January and February they were already over 50% of the 2019 peak). Decent exports should also help, particularly with the Hong Kong jewellery shows now back on. In India, while we expect the strength in demand to continue, the momentum is likely to slow, given the high base effect and inevitable fulfilment of previously higher pent-up demand.

Industrial demand

Industrial demand in 2023 is forecast to improve by 17% year-on-year (+382 koz) to 2,628 koz, putting the segment on course to record its strongest year on record. Growth is driven by considerable glass and chemical capacity expansions in China which will offset declines forecast for the petroleum and electronics sectors.

Chart 8: Demand end-use shares, 2022 vs. 2023f



Source: Metals Focus

Petroleum

Petroleum demand is expected to decline 11% (-22 koz) year-on-year to 171 koz in 2023 due to a decline in catalyst changeouts at Rest of World gas-to-liquid plants. Offsetting this decline, crude oil production is expected to climb, continuing to recover post-COVID, coupled with natural growth. The ongoing recovery in North American reforming and isomerisation capacity, as well as growth in the Middle East, will offset a decline in European and Japanese production, and a slowdown in Chinese expansion. Russian production is expected to decline year-on-year owing to the pressure of sanctions, weighing on international demand for Russian oil.

Chemical

Platinum chemicals demand is set to total 749 koz in 2023, up 9% (+64 koz) on 2022. The majority of the year-on-year increase stems from paraxylene capacity expansions in Guangdong and Zhejiang, China, partially offset by a wind down of Indonesian paraxylene capacity in 2022. Platinum demand for catalysts in propane dehydrogenation (PDH) will also rise year-on-year, benefiting from capacity expansions taking place in Poland, Belgium, the US and China. We expect to see a small recovery in silicone and nitric acid demand, benefiting platinum offtake, with both industries adversely effected by weaker European demand in 2022. This was, in part, due to the invasion of Ukraine driving energy prices higher (making some production uneconomic), economic uncertainty (weighing on consumption, impacting silicone offtake), as well as restricting fertiliser output from the region.

Glass

Platinum demand in the glass industry is expected to increase by 76% to 730 koz in 2023. This would make 2023 the strongest year on record for this market. Most of this growth will come from China, where capacity expansions and new investment are anticipated. This growth will be driven by the installation of LCD tanks, with platinum demand in China expected to more than double in 2023. This is in line with past industry growth cycles, where capacity expansions tend to be concentrated to take advantage of economies of scale. Additionally, the construction of new fiberglass plants from China's project pipeline will continue as the country's COVID-19 restrictions ease. The shift to a higher platinum ratio in the platinum-rhodium alloy used in bushing has, as evidenced by bulky rhodium sales by China Jushi and Shandong, will continue to benefit platinum demand ahead of rhodium.

Medical

Platinum medical demand is expected to climb 3% (+9 koz) year-on-year in 2023 to 287 koz. As the medical industry becomes unshackled from COVID constraints, we expect growth to be led by greater funding and access to healthcare, population growth and an aging demographic.

Electrical

Due to the growing popularity of solid-state drives (SSDs), the pace at which HDD manufacturers were able to sell their inventory was slower than anticipated in Q1'23. As a result, most key manufacturers have announced production cuts of between 10–30% whilst hoping for a return to growth in the second half of the year. While we still believe that the market will improve over time, the pace of recovery may be slightly slower than previously expected. Moreover, given the oversupply of NAND memory, the price has dropped sharply. As a result, SSDs have become the primary choice in both industrial and consumer markets. Therefore, shipments of HDDs in mainstream applications are likely to continue to decline, and this will put pressure on the use of precious metals. Overall, platinum offtake is expected to fall by around 8% (-9 koz) to 97 koz this year.

Other

Platinum demand from the other industrial segment is forecast to grow by 4% year-on-year (+23 koz) to 594 koz in 2023. Spark plug and sensor demand is forecast to improve, along with the increase in vehicle production compounded by an increase in the use of sensors. However, these gains will be partially offset by the slow aftermarket activity amid the subdued economic environment. According to the Automotive Aftermarket Industry Association (AAIA), the automotive aftermarket is expected to contract by 2.5% in 2023. In contrast, private sector investment in space exploration has led to increased development in rocket engines and spacecraft, where platinum is used in the combustion chambers and fuel nozzles. Finally, electrolyser capacity is estimated to increase to 5.5 GW this year and stationary fuel cell deployment is set to increase by 25% to 566 MW, resulting in 24% growth in platinum demand from stationary hydrogen fuelled or production applications.

Investment demand

This year, bar and coin investment is forecast to rise by 79% (+178 koz) to a three-year high of 403 koz. In keeping with Q1'23, this will be driven by a recovery in Japan where net demand will also post a three-year peak. In contrast, North American demand is on course for a 9% drop (-24 koz). This marks a downward revision from the last PQ and partly reflects much stronger than expected gold and silver buying, which looks set to continue for the foreseeable future. This is partly due to ongoing banking issues in the US, with the jump in gold and silver demand resulting in less production capacity being set aside for platinum investment products. In addition, the US Mint is expected to sell 40 koz of platinum Eagle bullion coins this year, against 80 koz in 2022.

Metals Focus' house view is that US rates will not fall this year informing our view of further ETF disinvestment from the North American markets. However, given the growing challenges faced in the South African operating environment, strong forecast demand growth in automotive and ongoing deficits likely South African funds have rapidly increased ETF holdings this year so far; with no near-term solution for the power shortages there, we expect that the current level in investment will be maintained throughout the year. As such, on a global basis we forecast a slight inflow (+30 koz) for the full-year.

In the near-term, positive EFPs (futures trading at premium to spot) will encourage metal back into warehouse inventories, however, a potential return of strong physical demand in the form of inflows into China and Hong Kong could result in a negative EFP and further drawdowns, as we saw during much of 2022. For the full-year, we therefore expect Exchange Warehouse stocks to remain flat.

ABOVE GROUND STOCKS

As the market returns to a deficit, reaching 983 koz in 2023, we will see above-ground stocks decline to 3,790 koz by year-end. This means that, at current monthly average demand levels, the market has visibility of only five months of demand requirements.

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 Q1 2023

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

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f	2022/2021 Growth %	2023f/2022 Growth %
Platinum Supply-demand Balance (koz)												
SUPPLY												
Refined Production	4,875	6,160	6,045	6,130	6,125	6,075	4,989	6,297	5,522	5,511	-12%	0%
South Africa	3,135	4,480	4,265	4,385	4,470	4,374	3,298	4,678	3,915	3,873	-16%	-1%
Zimbabwe	405	405	490	480	465	458	448	485	480	502	-1%	5%
North America	395	365	390	360	345	356	337	273	263	284	-4%	8%
Russia	740	710	715	720	665	716	704	652	663	647	2%	-2%
Other	200	200	185	185	180	170	202	208	201	205	-3%	2%
Increase (-)/Decrease (+) in Producer Inventory	+350	+30	+30	+30	+10	+2	-84	-93	+43	+0	N/A	-100%
Total Mining Supply	5,225	6,190	6,075	6,160	6,135	6,077	4,906	6,204	5,565	5,511	-10%	-1%
Recycling	2,055	1,720	1,860	1,915	1,955	2,112	1,997	2,079	1,691	1,682	-19%	-1%
Autocatalyst	1,255	1,185	1,210	1,325	1,420	1,567	1,509	1,591	1,250	1,243	-21%	-1%
Jewellery	775	515	625	560	505	476	422	422	372	370	-12%	-1%
Industrial	25	20	25	30	30	69	66	67	68	69	3%	2%
Total Supply	7,280	7,910	7,935	8,075	8,090	8,189	6,903	8,283	7,256	7,193	-12%	-1%
DEMAND												
Automotive	3,245	3,245	3,360	3,300	3,100	2,811	2,324	2,555	2,897	3,255	13%	12%
Autocatalyst	3,095	3,105	3,225	3,160	2,955	2,811	2,324	2,555	2,897	3,255	13%	12%
Non-road	150	140	135	140	145	†	†	†	†	†	N/A	N/A
Jewellery	3,000	2,840	2,505	2,460	2,245	2,106	1,830	1,953	1,899	1,861	-3%	-2%
Industrial	1,700	1,845	1,955	1,825	2,015	2,257	2,018	2,538	2,245	2,628	-12%	17%
Chemical	540	515	560	570	565	797	621	715	684	749	-4%	9%
Petroleum	60	205	220	100	235	219	109	169	193	171	14%	-11%
Electrical	215	205	195	210	205	144	130	135	106	97	-21%	-8%
Glass	205	235	255	205	250	233	402	705	414	730	-41%	76%
Medical and Biomedical	225	240	235	235	235	277	256	269	278	287	3%	3%
Other	455	445	490	505	525	586	501	546	570	594	5%	4%
Investment	150	305	535	275	15	1,233	1,536	-56	-640	433	N/A	N/A
Change in Bars, Coins	50	525	460	215	280	263	571	324	225	403	-31%	79%
Change in ETF Holdings	215	-240	-10	105	-245	991	507	-241	-558	30	N/A	N/A
Change in Stocks Held by Exchanges	-115	20	85	-45	-20	-20	458	-139	-307	0	N/A	N/A
Total Demand	8,095	8,235	8,355	7,860	7,375	8,407	7,709	6,990	6,401	8,176	-8%	28%
Balance	-815	-325	-420	215	715	-218	-806	1,293	854	-983	-34%	N/A
Above Ground Stocks	2,590*	2,265	1,845	2,060	2,775	3,432**	2,626	3,919	4,774	3,790	22%	-21%

Source: Metals Focus 2019 - 2023, SFA (Oxford) 2014 - 2018.

Notes:

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

PLATINUM QUARTERLY Q1 2023

Table 3: Supply and demand summary – quarterly comparison

	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q1'23/Q1'22 Growth %	Q1'23/Q4'22 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	1,465	1,566	1,571	1,695	1,273	1,530	1,390	1,329	1,178	-8%	-11%
South Africa	1,028	1,175	1,201	1,274	878	1,129	977	931	759	-14%	-18%
Zimbabwe	118	125	116	127	117	124	116	123	121	3%	-2%
North America	83	75	51	64	66	64	67	65	69	5%	6%
Russia	184	137	153	178	163	161	179	160	180	10%	12%
Other	52	53	51	52	49	52	52	49	48	-2%	-2%
Increase (-)/Decrease (+) in Producer Inventory	-29	+18	-43	-39	+24	-2	-2	+23	+24	-2%	3%
Total Mining Supply	1,435	1,584	1,529	1,656	1,298	1,528	1,388	1,352	1,201	-7%	-11%
Recycling	526	473	534	545	469	381	433	408	413	-12%	1%
Autocatalyst	392	359	413	426	353	272	326	299	301	-15%	1%
Jewellery	118	98	104	102	98	92	90	92	95	-3%	4%
Industrial	16	16	17	17	17	17	17	17	17	-1%	-1%
Total Supply	1,962	2,057	2,063	2,201	1,766	1,909	1,821	1,759	1,614	-9%	-8%
DEMAND											
Automotive	701	638	558	659	737	703	701	757	806	9%	6%
Autocatalyst	701	638	558	659	737	703	701	757	806	9%	6%
Non-road	†	†	†	†	†	†	†	†	†	N/A	N/A
Jewellery	487	470	485	511	466	495	480	457	455	-2%	0%
Industrial	494	777	703	564	527	628	559	531	570	8%	7%
Chemical	129	146	305	135	113	154	144	273	236	108%	-13%
Petroleum	36	38	38	56	44	48	49	52	42	-4%	-19%
Electrical	33	35	35	32	30	27	26	24	23	-24%	-5%
Glass	90	361	126	128	127	179	128	-21	56	-56%	N/A
Medical and Biomedical	66	67	69	67	68	70	71	69	71	5%	2%
Other	141	130	130	145	145	150	141	134	143	-2%	6%
Investment	153	187	-278	-118	-165	-162	-260	-54	175	N/A	N/A
Change in Bars, Coins	19	104	109	92	59	72	92	1	102	71%	>±300%
Change in ETF Holdings	100	34	-213	-162	-166	-112	-217	-62	43	N/A	N/A
Change in Stocks Held by Exchanges	33	49	-173	-48	-58	-123	-134	7	30	N/A	>±300%
Total Demand	1,836	2,072	1,468	1,615	1,566	1,664	1,481	1,691	2,006	28%	19%
Balance	126	-15	595	586	201	246	340	68	-392	N/A	N/A

Source: Metals Focus 2021 - 2023.

Notes:

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

PLATINUM QUARTERLY Q1 2023

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

	H2 2020	H1 2021	H2 2021	H1 2022	H2 2022	H2'22/H2'21 Growth %	H2'22/H1'22 Growth %
Platinum Supply-demand Balance (koz)							
SUPPLY							
Refined Production	2,799	3,030	3,266	2,803	2,719	-17%	-3%
South Africa	1,934	2,203	2,475	2,007	1,908	-23%	-5%
Zimbabwe	230	243	242	241	239	-1%	-1%
North America	153	159	115	131	132	15%	1%
Russia	379	321	331	324	339	2%	5%
Other	103	105	103	101	101	-3%	0%
Increase (-)/Decrease (+) in Producer Inventory	-162	-11	-82	22	21	N/A	-8%
Total Mining Supply	2,637	3,019	3,184	2,825	2,740	-14%	-3%
Recycling	1,149	1,000	1,080	850	841	-22%	-1%
Autocatalyst	860	752	839	625	625	-26%	0%
Jewellery	255	215	206	191	181	-12%	-5%
Industrial	34	33	34	34	34	1%	1%
Total Supply	3,786	4,019	4,264	3,675	3,580	-16%	-3%
DEMAND							
Automotive	1,328	1,339	1,217	1,439	1,458	20%	1%
Autocatalyst	1,328	1,339	1,217	1,439	1,458	20%	1%
Non-road	†	†	†	†	†	N/A	N/A
Jewellery	1,045	957	995	962	937	-6%	-3%
Industrial	1,068	1,272	1,266	1,155	1,090	-14%	-6%
Chemical	287	275	440	267	417	-5%	56%
Petroleum	57	74	95	92	101	6%	9%
Electrical	68	68	67	57	49	-26%	-13%
Glass	249	451	254	307	107	-58%	-65%
Medical and Biomedical	128	132	136	138	140	3%	2%
Other	279	271	275	295	276	0%	-7%
Investment	1,091	340	-396	-327	-313	N/A	N/A
Change in Bars, Coins	151	123	201	132	93	-54%	-29%
Change in ETF Holdings	599	134	-375	-278	-280	N/A	N/A
Change in Stocks Held by Exchanges	341	82	-221	-181	-127	N/A	N/A
Total Demand	4,533	3,908	3,082	3,229	3,172	3%	-2%
Balance	-747	111	1,182	446	408	-65%	-9%

Source: Metals Focus 2019 - 2022.

Notes:

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

PLATINUM QUARTERLY Q1 2023

Table 5: Regional demand – annual and quarterly comparison

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f	2022/2021 Growth %	2023f/2022 Growth %	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	
Platinum gross demand (koz)																		
Automotive	3,240	3,250	3,350	3,290	3,090	2,811	2,324	2,555	2,897	3,255	13%	12%	737	703	701	757	806	
North America	465	480	410	390	390	327	280	358	433									
Western Europe	1,395	1,450	1,630	1,545	1,325	1,432	1,062	965	1,008									
Japan	585	510	450	435	425	295	232	257	254									
China	125	145	195	230	220	183	279	380	491									
India	170	180	170	175	195	††	††	††	††									
Rest of the World	500	485	495	515	535	574	470	594	711									
Jewellery	3,000	2,840	2,505	2,460	2,245	2,106	1,830	1,953	1,899	1,861	-3%	-2%	466	495	480	457	455	
North America	230	250	265	280	280	341	277	409	448									
Western Europe	220	235	240	250	255	237	196	260	301									
Japan	335	340	335	340	345	372	316	298	333									
China	1,975	1,765	1,450	1,340	1,095	871	832	703	484									
India	175	180	145	175	195	109	59	123	171									
Rest of the World	65	70	70	75	75	176	151	159	163									
Chemical	540	515	560	570	565	797	621	715	684	749	-4%	9%	113	154	144	273	236	
North America	55	55	50	50	50	96	102	110	124									
Western Europe	105	75	110	115	105	120	111	118	113									
Japan	10	10	15	15	15	66	62	65	66									
China	215	230	225	220	215	310	214	243	221									
Rest of the World	155	145	160	170	180	206	130	179	161									
Petroleum	60	205	220	100	235	219	109	169	193	171	14%	-11%	44	48	49	52	42	
North America	25	-25	90	55	55	30	5	32	44									
Western Europe	-20	70	10	5	20	14	11	18	30									
Japan	-35	5	0	-40	5	7	6	12	7									
China	-5	45	80	45	10	66	35	39	26									
Rest of the World	95	110	40	35	145	103	52	67	86									
Electrical	215	205	195	210	205	144	130	135	106	97	-21%	-8%	30	27	26	24	23	
North America	15	15	10	15	15	38	35	35	28									
Western Europe	10	10	10	10	10	27	23	25	20									
Japan	15	15	15	15	15	20	16	17	14									
China	70	70	80	90	85	28	31	31	23									
Rest of the World	105	95	80	80	80	31	25	26	22									
Glass	205	235	255	205	250	233	402	705	414	730	-41%	76%	127	179	128	-21	56	
North America	10	0	20	5	5	-72	-37	16	17									
Western Europe	15	10	5	5	35	59	25	5	9									
Japan	-25	-5	-10	-10	0	-37	-65	7	-152									
China	115	130	150	110	80	177	354	714	475									
Rest of the World	90	100	90	95	130	107	124	-38	65									
Medical	225	240	235	235	235	277	256	269	278	287	3%	3%	68	70	71	69	71	
Other industrial	455	445	490	505	525	586	501	546	570	594	5%	4%	145	150	141	134	143	
Bar & Coin Investment	50	525	460	215	280	263	571	324	225	403	-31%	79%	59	72	92	1	102	
North America						155	234	256	258									
Western Europe						52	75	61	44									
Japan						46	240	-26	-114									
Rest of the World						9	21	33	36									
ETF Investment	215	-240	-10	105	-245	991	507	-241	-558	30	N/A	N/A	-166	-112	-217	-62	43	
North America						125	524	-6	-102									
Western Europe						508	237	56	-313									
Japan						-13	58	-23	-28									
Rest of the World						370	-312	-268	-116									
Change in Stocks Held by																		
Exchanges	-115	20	85	-45	-20	-20	458	-139	-307	0	N/A	N/A	-58	-123	-134	7	30	
Investment	150	305	535	275	15	1,233	1,536	-56	-640	433	N/A	N/A	-165	-162	-260	-54	175	
Total Demand	8,090	8,240	8,345	7,850	7,365	8,407	7,709	6,990	6,401	8,176	-8%	28%	1,566	1,664	1,481	1,691	2,006	

Source: Metals Focus 2019 - 2023, SFA (Oxford) 2014 - 2018.

Notes:

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

PLATINUM QUARTERLY Q1 2023

Table 6: Regional recycling – annual and quarterly comparison

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f	Q1'23/Q1'22 Growth %	Q1'23/Q4'22 Growth %	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023
Platinum recycling supply (koz)																	
Automotive	1,255	1,185	1,210	1,325	1,420	1,567	1,509	1,591	1,250	1,243	-21%	-1%	353	272	326	299	301
North America						520	458	504	368								
Western Europe						785	815	835	662								
Japan						116	110	117	110								
China						36	36	41	34								
Rest of the World						110	90	93	76								
Jewellery	775	515	625	560	505	476	422	422	372	370	-12%	-1%	98	92	90	92	95
North America						3	3	3	3								
Western Europe						4	4	3	4								
Japan						187	162	160	165								
China						276	248	250	195								
Rest of the World						5	5	5	6								
Industrial	25	20	25	30	30	69	66	67	68	69	3%	2%	17	17	17	17	17
North America						15	12	12	13								
Western Europe						11	10	11	11								
Japan						34	34	34	34								
China						7	7	8	9								
Rest of the World						2	2	2	2								

Source: Metals Focus 2019 - 2023, SFA (Oxford) 2014 - 2018.

GLOSSARY OF TERMS

Above ground stocks

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

ADH

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

BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

Bharat

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

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

Early in 2016 the Indian government announced the intention to 'leapfrog' Bharat Stage V and move directly to Bharat Stage VI, equivalent to Euro 6, in 2020. This intention, 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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