PLATINUM QUARTERLY

Q1 2021

17th May 2021

World Platinum Investment Council

FOREWORD

This edition of *Platinum Quarterly* considers platinum supply and demand developments for the first quarter of 2021 and gives an updated forecast for 2021. It also provides the 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 7) are prepared independently for the WPIC by Metals Focus.

Platinum demand in the first quarter of 2021 continued the very positive growth trends of the preceding two quarters, as global vaccination programmes, plus government stimulus measures, sustained the pace of economic resurgence. Supply also saw a strong recovery, with mines able to operate fully under COVID protocols, whilst the Anglo American Platinum ACP converter plant ran at capacity through the quarter. However, the strength of the demand recovery across all end-use sectors including investment ensured a fourth consecutive quarterly platinum deficit in quarter one of -19 koz. The platinum market is expected to remain in deficit for the third consecutive year in 2021, and, at -158 koz, a moderately deeper shortfall than previously projected.

Platinum supply and demand – updating 2021 forecasts

For 2021 total platinum supply is now forecast to rise 16% year-on-year to 7,883 koz. However, it will remain below pre-pandemic 2019 levels, while total platinum demand is expected to rise by 5% year-on-year to 8,041 koz. As a result, the platinum market is forecast to remain in deficit in 2021, for the third consecutive year, with the shortfall expected to deepen to -158 koz from our previous projection of -60 koz.

The revised forecast of total platinum supply in 2021, 16% higher than in 2020, reflects an expected 20% (+988 koz) recovery in refined production but only a 3% (+64 koz) pick up in recycling supply.

The rise in total platinum demand in 2021, 5% (+378 koz) up on 2020 levels, is due to higher demand in the automotive (+557 koz), jewellery (+158 koz), and industrial (+486 koz) segments countering lower investment demand (-823 koz). Despite forecast total investment demand in 2021 being 53% lower than the record levels in 2020, bar and coin demand and ETF demand are expected to remain robust at 436 koz and 250 koz respectively. The accelerating global economic recovery from the negative impacts of the COVID-19 pandemic in 2020, combined with platinum's compelling demand outlook, is expected to provide a strong incentive for investors to continue to expand platinum exposure.

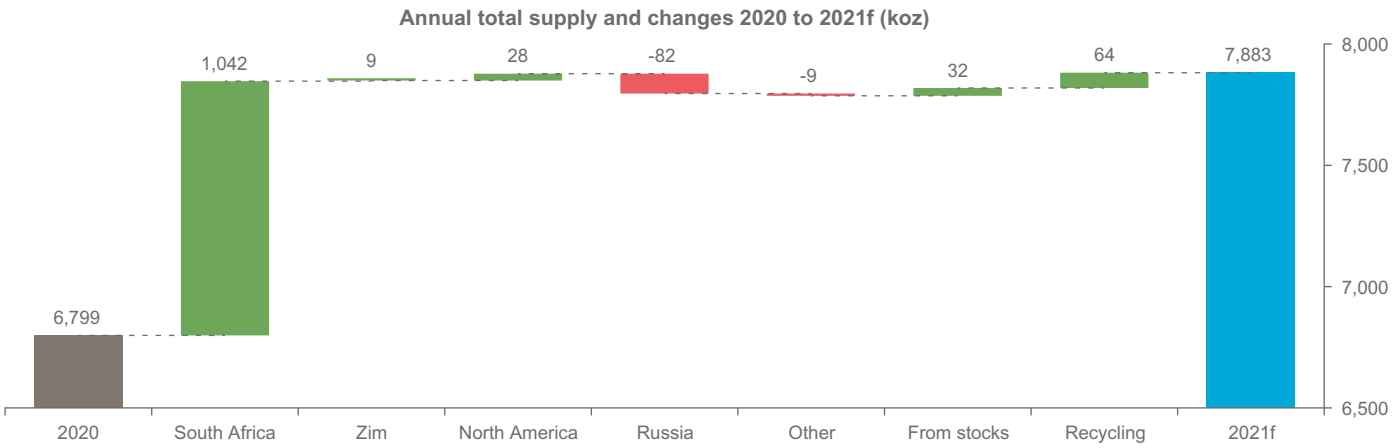
Q1 2021 deficit of -19 koz on accelerating economic recovery from the COVID-19 pandemic

Supply in the first quarter of 2021 was 7% higher than in first quarter of 2020. The Anglo American Platinum converter plant that returned to operation in early December 2020, ran throughout the first quarter of this year, while platinum mines in South Africa operated without any of the shutdowns to prevent the spread of COVID-19 experienced in Q1 2020. Nornickel lost production due to mine flooding, but this was largely offset by a one-off release of platinum from pipeline material as a new processing plant was commissioned. First quarter recycling supply was 18% higher year-on-year, mainly on price driven higher jewellery recycling.

Demand in the first quarter jumped by 26% (+405 koz) year-on-year to 1,969 koz on a continued demand recovery across all end-use sectors. Platinum industrial demand, up 44%, automotive demand, up 8% and jewellery demand, up 22%, all benefitted from Government stimulus measures and pent-up demand as lock down measures continued to be rolled back in many economies. Indeed, growing confidence in the sustainability of the global recovery supported platinum investment in the first quarter, with total investment demand up 96% (+69 koz) year-on-year, largely driven by positive ETF demand in the North American and European markets.

2021 Supply – higher mine supply on ACP restart and lack of COVID-19 mine operation losses

For 2021 total platinum supply is now forecast to rise 16% above 2020 levels, to 7,883 koz, with refined production rising by 20% (+988 koz) and recycling supply by 3% (+64 koz). South Africa is expected to account for the majority of the forecast refined production recovery as mines return to full operational capacity after 2020's COVID-19 driven shutdowns, while the early December 2020 recommissioning of the ACP Phase A unit will see the plant operate at capacity through the year. Russian supply is expected to fall by 12% (-82 koz) due to the combined effect of a concentrator shutdown and mine flooding impacting production during the second and third quarters of the year. In contrast to the refined supply recovery, recycling supply is expected to grow by only 3% (64 koz) versus 2020 levels due to autocatalyst processing bottlenecks and difficulty in financing higher value material stocks limiting growth.



2021 Demand – strong automotive and industrial demand plus jewellery recovery counters lower investment demand

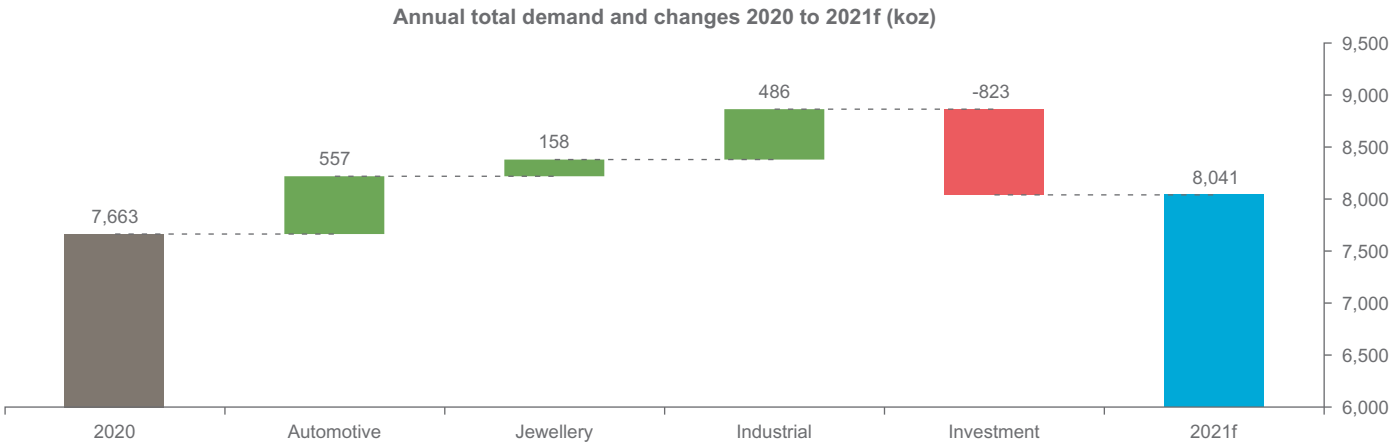
Demand in 2021 is forecast to grow by 5% (+378 koz), as notably strong growth from automotive and industrial end-use sectors and recovery in jewellery offsets reduced, albeit still strong, investor demand. Forecast investment demand in 2021 of 726 koz is lower than the record 1.5 moz in 2020, mainly due to metal flows into stocks held by exchanges being forecast to return to normalised levels. However, with bar and coin demand forecast to be 436 koz, and ETF demand of 250 koz, this still strong level of investment demand is expected as investors continue to be attracted by platinum's very positive demand potential, driven in the short-to-medium term by emissions regulation-driven catalyst loadings growth, platinum for palladium substitution in catalysts, and the longer-term hydrogen economy prospects.

Automotive demand in 2021 is expected to recover by 24% (+557 koz) above the 2020 levels, mainly as global light-duty and heavy-duty vehicle production levels are forecast to rise by 16% and 3% respectively above 2020 levels. This is lower than previously forecast as microchip shortages are expected to reduce global light vehicle production by c1.1 million. Automotive platinum demand is up more than vehicle production as the full implementation of tighter emissions regulations in Europe and China, in the form of Euro 6d and China 6 for light-duty vehicles, and China VI for heavy-duty vehicles, is driving higher catalyst loadings. Demand is expected to receive a further boost from platinum for palladium substitution in catalysts in all three major auto markets of China, North America and Europe.

Platinum demand in industrial applications is expected to increase 25% (+486 koz) above 2020 levels, boosted by the overall improvement in economic activity and specifically glass demand, expected to increase by 70% (+260 koz). Glass demand is growing due to strong LCD panel demand and growing demand for composites from all key end-uses, including construction and green energy.

In 2021, platinum jewellery demand is expected to recover, growing 9% (+158 koz). Strong year-on-year increases in the first quarter suggest improvements in 2021 will be driven by higher demand in the North American, European, and Indian markets.

The third consecutive annual market deficit of -158 koz in 2021 is mainly due to the strong automotive and industrial demand countering the lower forecast investment demand.



The platinum investment case – economic recovery, sustained higher pricing and deficits support investment demand

The pace of global economic activity accelerated sharply in the first quarter of 2021, with factory orders globally near ten-year highs in March, as the roll out of COVID-19 vaccines gained traction, while the US government's $2 trillion infrastructure investment programme provided confidence in the sustainability of the global recovery. Investor interest in commodities and industrial metals increased with this pick-up in economic activity, which also strengthened investor risk appetite. Platinum benefited in part from this investor interest, which was enhanced by sustained higher platinum prices and consecutive deficits.

Indeed, platinum prices averaged $1,162/oz during the first quarter, up 29% year-on-year, and 23% quarter-on-quarter, representing the highest quarterly average price since Q1 2015. The three consecutive quarterly deficits in 2020 continued to a fourth, with Q1 2021 also ending in deficit. The forecast third consecutive annual deficit for full-year 2021 has increased from -60 koz to -158 koz. However, despite significantly increased investor interest and higher price levels, platinum remains significantly undervalued compared to precious peer gold and palladium – platinum's one to one substitute metal in gasoline catalysts – with the platinum price not yet fully reflecting platinum's strong demand growth potential and constrained supply.

In the short-to-medium-term, we believe that platinum's demand growth is driven by strongly increasing, yet still under-reported, platinum substitution for palladium in gasoline catalysts, and higher loadings to meet tightening emissions regulations being rolled out in key global auto markets. Investment demand appears likely to exceed our published forecast for 2021, as well as remain strong in 2022, as more investors are attracted by platinum's demand growth potential. This is enhanced by wider investor awareness of platinum's strategic role in the hydrogen economy, especially as hydrogen policy frameworks develop and committed funding balloons.

Constrained mined platinum supply makes the investment case for platinum even more compelling in the face of demand growth, as this combination supports the continuation of the consecutive deficits in 2019 and 2020 into the forecast for 2021. The recent increase in the platinum price, combined with the already exceptionally high prices of palladium and rhodium (the latter two having experienced material price escalation since 2018) have sustained PGM mining companies' elevated earnings and free cash flow into 2021. Consequently, the three largest platinum producers have started to announce new mining projects that, collectively, could increase platinum supply materially, albeit with production only starting in three or four years. These producers have confirmed that despite high prices now, their output will remain flat for at least the next three years.

The outages at Anglo American Platinum's ACP converter plant in 2020 severely reduced refined platinum production and c.500 koz of platinum in smelter output material was accumulated. There is concern from some investors that this material could be processed quickly through the concentrator in 2021 and result in a supply glut that could weaken price. This is not in fact the case, and Anglo American Platinum has confirmed in public statements in February and April that the processing of the platinum in material built up ahead of the ACP in 2020 will be processed over the course of both 2021 and 2022. In the forecast for South Africa refined production, we publish today of 4,340 koz, c.200 koz from the processing of the built-up ACP input material is included, with the remaining c.300 koz expected to be processed in 2022.

Demand growth potential – substitution, loadings and hybridisation drive automotive demand growth, with investor interest boosted by increased confidence in the hydrogen economy

Global vehicle production in 2021 remains uncertain with concerns that ongoing COVID-19 infection waves and microchip shortages may reduce the forecast level of vehicle production and sales. However, we believe strongly that there is potential for automotive demand in 2021 to significantly exceed our current published forecast if, as we believe, current public information does not provide full insight into the amount of platinum replacing palladium in gasoline autocatalysts and the amount of additional platinum per vehicle required to meet Euro 6d. We also believe that these two upside-risk demand driver trends will continue into 2022 and will be bolstered by gasoline hybrid and diesel hybrid vehicles gaining further market share.

Discussion and analysis of substitution by some fabricators and automakers to date has almost exclusively focussed on the replacement of palladium with platinum in catalysts of vehicles already in production and on sale. The focus on this type of substitution has led many market commentators and analysts to expect that the rate of platinum substitution for palladium will be slow, contributing minimal volume to current platinum demand. Recent public statements suggest some catalyst fabricators expect platinum demand from substitution in vehicles already in production, prior to any recent change in emissions level, to be c.150 koz this year, rising to over 1.5 moz by 2024. However, we believe this narrow definition of substitution underplays the true extent of the amount of platinum currently replacing palladium, and indeed the amount that may already have been replaced. In Europe and China new lower emissions levels, to achieve compliance with Euro 6d, China 6a and in some cases China 6b, had to be implemented by January 2021, meaning all car models sold in these two markets this year will have had their emissions systems redeveloped in the preceding three years. The implication of this is that platinum could have been used in place of palladium in the c.31m gasoline light vehicles expected to be produced in China and Europe this year, with almost no additional engineering, testing or certification costs and achieved with no public disclosure, given the proprietary and confidential nature of such developments. The WPIC's scenario analysis suggests that if only 20-30% of pre-launch new vehicles in these two markets had 30% of their catalyst palladium content replaced with platinum, this could add between c.285 koz and c.428 koz of platinum demand in 2021. This would be in addition to the 'substitution' on vehicles already in production prior to a change in emissions level, and could significantly boost platinum demand. This additional potential platinum demand is not included in the 2021 automotive platinum demand forecast we publish today.

The pressure for automotive OEMs to substitute platinum for palladium will have been exacerbated by the loadings impact of tightening emissions legislation. In Europe, we estimate that average gasoline light vehicle palladium loadings increased by between 30% and 45% to meet Euro 6d in 2020, while those for China rose by c.50% ahead of the full national implementation of China 6a from January 2021. Such loadings trends have been part of the reason for sustained palladium market deficits, intensifying palladium price pressure, and acting to further accelerate platinum for palladium substitution in gasoline and gasoline hybrid applications. For diesel in Europe, the extreme technical challenge of reducing on-road test nitrogen oxide (NO_x) emissions levels from c.800 mg/km to below the 80 mg/km required under Euro 6d regulations will also have boosted automotive platinum demand via significantly higher platinum loadings. In fact, most new diesel vehicles that comply with Euro 6d now emit on-road levels of c.20mg/km with this significant over-achievement highlighting the reputational concerns of automakers and the degree to which they have ensured compliance. Bearing in mind the requirement to reduce NO_x emissions by the unprecedented and massive amount of over 700 mg/km, and despite European diesel emissions controls moving almost entirely to Selective Catalytic Reduction (SCR), a system that uses less platinum than a non-SCR system, we believe that at least 20% - 40% more platinum was required per SCR DOC (Diesel Oxidation Catalyst) unit to convert more NO to NO_2, to react with the increased urea dosing necessary. However, as with gasoline palladium loadings, these higher diesel platinum loadings, potentially present from 2020, have remained confidential to automakers and catalyst fabricators. The pandemic-related fall in vehicle sales in 2020, plus the impact of platinum for palladium substitution in gasoline catalysts, has obscured European diesel vehicle loadings trends. The full effect of higher loadings per European diesel car could add over 100 koz of additional platinum demand from 2021 onwards. Again, this additional potential platinum demand is not included in the 2021 automotive platinum demand forecast we publish today.

An important second order market impact of increased Chinese platinum automotive demand, both from higher heavy duty (HD) diesel loadings to meet China VI (HD) emissions regulations and from platinum for palladium substitution in gasoline light vehicles, is the increase in spot physical metal buying by Chinese automakers. Chinese OEMs do not run forward hedge books like their Western OEM counterparts, meaning they are reliant on physical spot metal purchases for their catalyst requirements. We have previously highlighted that the impact of Chinese automakers' physical metal buying on spot markets has already been observable in the palladium market, where such purchases were key to the metal's price surge in 2019, and rapid recovery from the impact of the COVID-19 pandemic in 2020. We believe this effect has already been material in supporting platinum prices in the $1,100 - $1,200/oz range seen for much of the year-to-date as changes in futures positioning had less of a price impact than is typical.

Hybridisation continues to represent the dominant element of most automakers' strategies to reduce fleet emissions. In Europe during the first quarter of this year, European Automobile Manufacturers Association (ACEA) statistics revealed that the ratio of hybrid sales to those of battery electric vehicles (BEVs) jumped to 4:1 from 3:1 in Q1 2020, with hybrid cars accounting for 27% of the 3 million passenger cars sold across Europe, compared to 7% for BEVs. Instructively, this has occurred despite many European Governments continuing to offer substantial BEV purchase incentive grants. The need to continue to expand hybrid sales penetration is seen as necessary by many OEMs to achieve fleet CO_2 emissions compliance due to the relatively slow pace of investment in both clean electricity generation and rapid charging infrastructure limiting the rate of BEV uptake. Should infrastructure not meet the growth in BEV sales, we believe hybrid gasoline and hybrid diesel will be the most likely alternative and may well sustain the use of the internal combustion engine (ICE) significantly beyond currently discussed bans on ICE/hybrid sales by 2030/2035.

The ongoing roll-out of policy frameworks for the development of a global hydrogen economy, plus the acceleration of hydrogen project funding commitments, has been key to driving greater investor confidence in the development of the hydrogen economy, in turn providing increased certainty of the associated long-term platinum demand growth. China's 14th Five Year Energy Plan, released in March this year, listed for the first time the development of a domestic hydrogen economy as a key strategic goal. Currently, China's hydrogen economy development strategy has been devolved to China's provincial governments, with 11 of the largest provinces committing to significant investment in green hydrogen generation capacity, hydrogen fuel cell refuelling infrastructure and fuel cell vehicle penetration rates over the next five years. In China, the transition from framework policy objectives to firm investment commitments has traditionally led to rapid development of the sector in question. In the energy sector, for example, this has most noticeably occurred in wind and solar electricity generation, where China has become the largest renewable technology provider. Hydrogen funding commitments are not limited to China, as the US has pledged to develop green hydrogen in plans outlined in April's Leaders Summit on Climate, as well as cutting the cost of green energy technologies and consequently cutting the cost of green hydrogen production.

Platinum's demand growth potential has become increasingly compelling in the short, medium and long term. The long-term demand potential for platinum in green hydrogen production and FCEV applications continues to increase the number and range of investors that consider platinum as an investment asset. These investors soon come to appreciate the significant shorter-term platinum automotive demand growth from substitution, higher loadings and more hybrid vehicles in the context of constrained supply. We believe this continues to provide all investors with a strong incentive to build platinum exposure from current levels.

WPIC initiatives highlights

Q1 2021 has been a period of continued positive progress for WPIC. Physical platinum investment markets around the world are, overall, strong although more moderate than in 2020 and there are significant regional differences. Institutional investment demand for platinum is strong again this year; global ETF holdings at the end of Q1'21 were 90koz ahead of 2020. Regionally, the US and Europe were strong, Asia was neutral and South Africa had seen reductions. On another note, we are also delighted to welcome Tharisa as a new member of our Council. Phoevos Pouroulis, Tharisa's Chief Executive, joins our board.

We continue to focus on increasing the number and impact of our product partnerships in our four key target markets, China, Japan North America and Europe.

In North America we strengthened our group of partners through the addition of SD Bullion, one of the largest precious metal dealers in the United States. WPIC will help develop new products that will assist in enhancing investor platinum awareness and investment choices, thus supporting the distribution of investment platinum in 2021 and beyond. Despite the rise in price, the North American and European markets continued to show healthy demand for platinum and market sentiment remains bullish. Platinum bar and coin availability has improved; however sales volumes seem to have slowed down towards the tail end of the quarter and into Q2. We will continue to work closely with our partners to increase the awareness of platinum investment products available to investors worldwide and support a strong level of marketing activities.

In China, platinum-backed bank trading accounts are still under regulatory suspension. However, this suspension has served to stimulate the investor demand for physical bars, as confirmed by the levels of growth reported by our Chinese partners. In addition, there has been renewed interest from gold product fabricators and wholesalers in manufacturing and selling platinum bars as an investment alternative to trading accounts. WPIC China established a product partnership with the Metalor Precious Metals Suzhou Company with the aim of offering platinum bars through Chinese banks in the future. China's commitment to carbon neutrality has enhanced platinum's appeal to Chinese investors as an investment asset. The WPIC China team continues to leverage social media to develop platinum investment interest, and work closely with local partners to expand distribution through banks.

In Japan, during the first quarter of this year we established a new partnership with Rakuten Securities, one of the largest securities houses in Japan, that is now offering platinum investment products. Rakuten Securities believe WPIC research and insights are supportive in promoting its platinum accumulation plan. Our partners in Japan reported softer sales of platinum bars and coins in the first quarter largely as a result of some profit taking as platinum prices rallied above the key ¥4,000/g level in February. However, we still observe growing coverage of platinum by the Japanese media highlighting its key role in the hydrogen economy and inherent value for investment.

As the global economy continues to recover from the ravages of the COVID-19 pandemic, supported by large scale government stimulus funding, more investors are considering an increased need for commodities, and are considering platinum. This attraction to platinum is enhanced as more investors become aware of platinum's key role in the increasingly certain hydrogen economy. Platinum's constrained supply and significant demand growth potential increases the likelihood of new and existing investors increasing their holdings. We believe this is likely to drive increased investment demand through 2021 and beyond.

Paul Wilson, CEO

Contents

Table 1: Supply, demand and above ground stocks summary

	2018	2019	2020	2021f	2020/2019 Growth %	2021f/2020 Growth %	Q4 2020	Q1 2021
Platinum Supply-demand Balance (koz)								
SUPPLY								
Refined Production	**6,125**	**6,095**	**4,970**	**5,957**	**-18%**	**20%**	**1,299**	**1,412**
South Africa	4,470	4,400	3,298	4,340	-25%	32%	873	971
Zimbabwe	465	458	448	457	-2%	2%	115	120
North America	345	356	337	365	-5%	8%	82	94
Russia	665	716	704	621	-2%	-12%	182	184
Other	180	165	183	174	11%	-5%	47	43
Increase (-)/Decrease (+) in Producer Inventory	+10	+2	-82	-50	N/A	N/A	-45	-23
Total Mining Supply	**6,135**	**6,097**	**4,888**	**5,907**	**-20%**	**21%**	**1,254**	**1,389**
Recycling	**1,935**	**2,121**	**1,912**	**1,975**	**-10%**	**3%**	**576**	**561**
Autocatalyst	1,420	1,587	1,433	1,462	-10%	2%	427	429
Jewellery	505	476	422	455	-11%	8%	134	118
Industrial	10	57	56	58	-2%	3%	15	14
Total Supply	**8,070**	**8,219**	**6,799**	**7,883**	**-17%**	**16%**	**1,830**	**1,950**
DEMAND								
Automotive	**3,075**	**2,839**	**2,368**	**2,925**	**-17%**	**24%**	**710**	**689**
Autocatalyst	2,930	2,839	2,368	2,925	-17%	24%	710	689
Non-road	145	†	†	†	†	†	†	†
Jewellery	**2,245**	**2,099**	**1,820**	**1,978**	**-13%**	**9%**	**529**	**478**
Industrial	**1,935**	**2,130**	**1,926**	**2,412**	**-10%**	**25%**	**589**	**662**
Chemical	570	694	585	647	-16%	11%	171	119
Petroleum	235	219	109	179	-50%	65%	36	27
Electrical	205	145	130	127	-10%	-2%	35	32
Glass	245	236	370	629	57%	70%	146	279
Medical and Biomedical	240	249	235	247	-5%	5%	59	62
Other	440	587	497	582	-15%	17%	142	144
Investment	**15**	**1,253**	**1,549**	**726**	**24%**	**-53%**	**133**	**140**
Change in Bars, Coins	280	283	586	436	107%	-26%	60	17
Change in ETF Holdings	-245	991	504	250	-49%	-50%	74	90
Change in Stocks Held by Exchanges	-20	-20	458	40	N/A	-91%	-1	33
Total Demand	**7,270**	**8,321**	**7,663**	**8,041**	**-8%**	**5%**	**1,961**	**1,969**
Balance	**800**	**-102**	**-863**	**-158**	**N/A**	**N/A**	**-132**	**-19**
Above Ground Stocks	**3,410**	**3,548****	**2,684**	**2,526**	**-24%**	**-6%**		

Source: Metals Focus 2019 - 2021, SFA (Oxford) 2018.

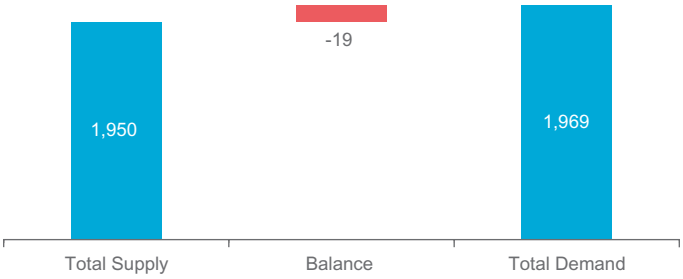
Notes:

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. Quarterly estimates from Q2 2018 and half-yearly estimates from H1 2018 are included in Tables 3 and 4 respectively, on pages 20 and 21 (supply, demand and above ground stocks). Details of regional recycling supply in Table 6 on page 23 are only published from 2019.
5. Data from Metals Focus and SFA (Oxford) may not have been prepared on the same or directly comparable basis.
6. Prior to 2019 SFA data is independently rounded to the nearest 5 koz.

2021 FIRST QUARTER PLATINUM MARKET REVIEW

During Q1'21, the global economy continued to recover, underpinned by widespread stimulus measures. Scarcely a year on since the World Health Organisation declared COVID-19 a pandemic, the extent of the recovery in some areas has been surprising as pent-up consumer demand drove economic revival. However, in the automotive sector, supply chain difficulties became increasingly apparent, hampering the sector's recovery. Against this backdrop, Q1'21 platinum demand increased 26% (+405 koz) year-on-year to 1,969 koz while total supply grew 11% (+187 koz) to 1,950 koz. Overall, this resulted in a modest deficit of -19 koz, compared to the Q1'20 surplus of 199 koz.

Chart 1: Supply-demand balance, koz, Q1 2021



Source: Metals Focus

Supply

Global refined mine production increased by 14% (+169 koz) year-on-year to 1,412 koz in the first quarter, primarily due to greater output from South Africa alongside an increase from Russia.

South African mine supply rose 15% (+128 koz) as Anglo-American Platinum's processing plant achieved normal operating capacity for the quarter following the completion of the rebuild of the ACP Phase A in November 2020. In the same period last year, 26 days of refined production were lost due to the total closure of the ACP. The country's second wave of COVID-19, which peaked in mid-January, resulted in some further disruption to mining. In order to maintain effective COVID-19 protocols this year, producers delayed some employees' return to work, following the December break. The impact for the quarter was however much reduced relative to the losses last year when most of the industry was shut for 6 days in the quarter at the time of the H1'20 national lockdown.

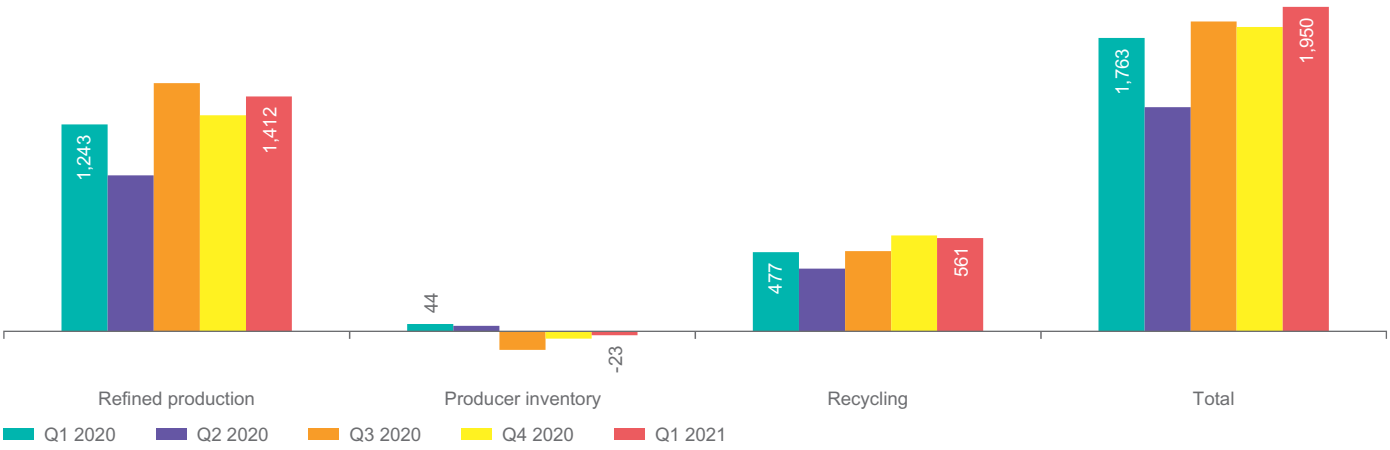
Despite two major incidents, a structural failure at a concentrator plant and the suspension of operations at two mines following groundwater inflow, Russian production grew 23% (+34 koz) year-on-year. The ramp-up of a new precious metal production line allowed for a one-time drawdown in work-in-progress inventory, which buoyed refined output. Elsewhere platinum supply was little changed with no significant disruption for the period.

Producers continued to build refined inventory, totalling 23 koz for the quarter. As such, these inventories returned to more normalised levels following a drawdown to support sales in response to the disruption of H1 2020. Additionally, record PGM basket prices and the growth in margins have eased pressure on revenues, resulting in less focus on releasing working capital.

Recycling

Global recycling rose by 18% (+85 koz) year-on-year during Q1'21 to 561 koz, driven by higher autocatalyst and jewellery feeds. The recovery of platinum from spent autocatalysts rose by 9% (+36 koz) to 429 koz. However, the growth rate was flattered by a slightly weaker Q1'20, as the impact of the pandemic had started to impact the sector. It is therefore more revealing to look at the quarter-on-quarter growth of just 1%. Jewellery recycling in Q1'21 rose by a hefty 69% (+48 koz). Almost all of the gains came from China and were in response to higher prices, fewer COVID restrictions and some retailers' recycling unsold inventory to assist cashflows. While the rise was large, total jewellery recycling in Q1'21 was down on the prior two quarters despite higher prices.

Chart 2: Platinum supply, koz

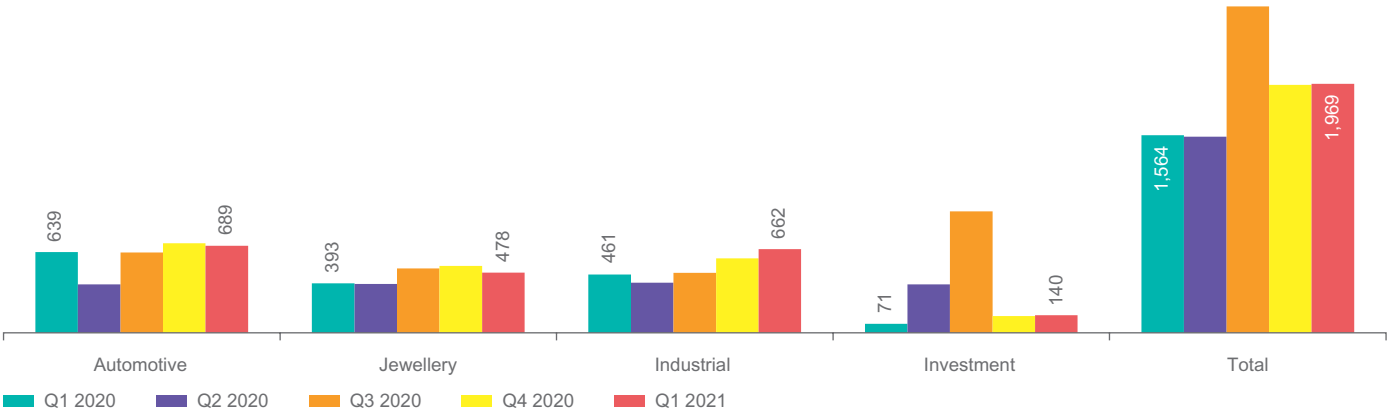


Source: Metals Focus

Demand

Overall platinum demand rose by 26% (+405 koz) in Q1'21, with a significant portion of this growth driven by a downward revision to glass demand in Q1'20. The positive Q1'21 consisted of a 201 koz year-on-year increase in industrial demand and a 69 koz year-on-year rise in investment demand. Growth in both automotive and jewellery demand added 50 koz and 85 koz respectively. However, the quarter-on-quarter trend shows that global demand was effectively unchanged on Q4'20 as, in particular, both the chemical and petroleum sectors remained weakened by the effects of the pandemic.

Chart 3: Platinum demand, koz



Source: Metals Focus

Automotive demand

Automotive demand increased 8% (+50 koz) in Q1'21 despite production being undermined by semi-conductor shortages and a tightening of lockdown measures, as vaccine programmes stuttered and virus case numbers rose in some regions. For the quarter, Europe's platinum demand declined 8% (-25 koz) as it was not only severely impacted by chip-shortage related production cuts of around 270k units, but diesel light vehicle production declined by 13% while battery electric vehicle production grew 121% and gasoline mild hybrids by 109%. The year-to-date Western Europe diesel passenger car market share is now 26% compared to 29% for the same period last year.

North America has also been plagued by a deluge of disruptive forces. Besides the chip shortages, the region was also impacted by severe weather that took many US Gulf chemical plants offline. As a major consumer of petrochemicals for, among other products, foam for vehicle seats, this led to further disruption. In contrast to Europe, and despite the disruptions, platinum demand in North America region was up 12% (+10 koz) for the quarter as electrification lagged other regions, diesel and gasoline light-duty production grew and Q1'20 was already showing some pandemic impact, all of which resulted in increased year-on-year platinum demand.

In China, the light vehicle market had shown remarkable resilience in 2020, but Q1'21 has not gone unscathed from the semi-conductor supply chain challenge with "lost" production estimated at 600k units. However, burgeoning vehicle ownership aspirations and the continued implementation of more stringent emissions legislation, China 6 for light-duty vehicles and China VI for heavy-duty, drove platinum demand in the region to 85 koz, almost double that of the prior year. It should also be noted that in Q1'20, production in China was severely curtailed by measures to curb the pandemic.

In the 'Rest of the Word', the emergence out of lockdown measures and the resumption of economic activity lent further support to platinum demand growth in the quarter. In India, heavy-duty production grew by 10% as 85% of all vehicles produced during this quarter were fitted with both a DOC and DPF in adherence with Bharat VI requirements. Sadly, given the current state of the pandemic, production is likely to take a hit in Q2.

Jewellery demand

Following a very weak Q1'20, jewellery demand recovered by 22% (+85 koz) but fell short of the strong activity seen in Q4'20. European fabrication in Q1'21 rose by 5% (+3 koz) thanks to strong demand from the export-oriented, high-end watch and jewellery brands. However, volumes were still down 2% on Q1'19 because of the continued COVID-driven weakness in bridal-centred local sales, especially in the UK, and despite some retailers re-stocking.

Jewellery fabrication in North America during Q1'21 rebounded by a healthy 14% (+11 koz) and was 2% above Q1'19. This was due to a mix of the price differential to gold, the diversion of consumer expenditure from services, retailers' inventory build, an improving economy and government income support measures.

China's platinum jewellery fabrication in Q1'21 recorded a 55% (+70 koz) increase to 197 koz year-on-year following a weak prior year quarter when virus-related disruption had a severe impact on the jewellery sector. Notwithstanding this healthy recovery, the total was still 15% below the equivalent pre-virus level of 232 koz in Q1'19. In contrast, gold jewellery fabrication in Q1'21 was 6% higher than the level seen in the corresponding period in 2019 and the highest Q1 performance since 2015. Local jewellery wholesalers and retailers suggest that the fierce competition from the gold jewellery market presented a significant headwind for platinum jewellery this past quarter. As the gold price dropped and the platinum price increased, gold appeared a more attractive option, even if it remained more expensive than platinum in absolute terms throughout the quarter. In addition, with the Chinese New Year holiday being a traditionally gold gifting season, manufacturers and retailers stepped up their gold promotional activities. The heightened local market interest in gold resulted in retailers shifting towards a reallocation of inventory to gold jewellery products at the expense of platinum.

In India, platinum jewellery fabrication rose by 35% (+6 koz) to 21 koz. Pent-up demand, weddings, festive purchases, and marketing campaigns for Valentine's day drove strong demand growth. Jewellery fabrication outperformed consumption as retailers focussed on replenishing inventory in anticipation of further demand recovery in Q2'21.

Industrial demand

Industrial demand in Q1'21 was 44% (+201 koz) higher than in Q1'20. A significant driver of the year-on-year growth was the revision and reallocation between quarters of glass demand, which skews the underlying dynamics for glass and all industrial demand. In terms of the key segments, both chemical and petroleum demand came in lower than Q1'20 as the recovery in oil consumption in H2'20 stalled. In contrast demand from the electronics, medical and other industrial sectors grew in Q1'21, as the success of the vaccine programmes continue to support economic recovery.

Petroleum

Platinum demand remained weak in Q1'21, with volumes down by 19% (-6 koz) year-on-year. China accounted for the bulk of the decline, though this reflects a higher base in Q1'20 when demand was boosted by the start-up of a major integrated oil-to-petrochemical unit.[1] Outside of China, demand remained below pre-pandemic levels, as measures to control the spread of COVID-19 continued to weigh on global oil consumption. However, there have been some signs of improvements, notably in the US where faster vaccine rollout and improving economic activity has led to a steady normalisation of refinery runs in the quarter.

Chemical

Platinum chemical offtake slipped both on a year-on-year (-57 koz) and quarter-on-quarter (-52 koz) basis to 119 koz in Q1'21. Weaker demand from the petrochemical sector contributed to almost all of the losses in Q1'21, given an absence of new capacity additions and also the high base in Q1'20 which had benefited from sizeable investment in China. As such, demand during Q1'21 was entirely driven by top-up requirements during catalyst change-outs. By contrast, platinum's use in silicone continued to recover, with volumes back to pre-COVID levels. As was the case in the previous quarters, demand from medical, health and hygiene applications benefited from the ongoing pandemic. A major rebound in areas such as construction, on the back of large-scale government fiscal stimuli, also underpinned silicone volumes. Turning to platinum offtake related to the production of nitric acid, volumes remained broadly steady compared to the previous quarter. Even though many emerging countries faced a sharp rise in COVID infections in Q1'21, the agricultural sector (including fertiliser production) was designated as essential and therefore exempt from business closures and restrictions on movement.

Medical

Following the fall in COVID-19 case rates in many countries on the back of lock-down strategies and increasing vaccination campaigns, several medical technology companies have reported a return to more normalised hospital conditions late into the quarter which have seen their sales of medical devices containing platinum, recover compared to Q1'20. In addition, the US and Europe also reported resumptions of in-hospital cancer therapy, including platinum containing cancer treatments. Platinum use in the medical sector increased 5% (+3 koz), but still remains just below 2019 levels.

Glass

Downward revisions to LCD tank capacity installations in Q1'20, coupled with a surge of these in the latest quarter, resulted in the six-fold increase in platinum demand year-on-year to 279 koz in Q1'21. As is typically the case, most new investments were made in China and were notably plants that, had it not been for last year's crisis, might have come on-stream some months ago. Slower than originally planned capacity expansions, production disruptions in recent months and still strong demand for LCD panels are creating tight conditions in the market for glass substrates, reflected in higher substrate prices.

Electrical

Demand from the electrical segment increased marginally by 1% (+0.2 koz) year-on-year. The gains in semiconductor applications countered the fall in HDDs in consumer electronics. In addition, demand from the nearline storage and cloud services segments provided some benefit to platinum demand as increasing platinum loadings in the high-capacity drives partially offset the decline of HDD shipments. In the enterprise and surveillance segments too, HDD use remained low in the face of COVID-19 turbulence, and rising adoption of SSDs in emerging applications, such as entertainment (including game consoles and automotive infotainment

[1] Integrated capacity "captures" demand across both petroleum and chemical segments.

systems) and aerospace. It is worth noting that the recent "crypto craze" has led to the mass purchasing of high-capacity HDDs for 'mining' of storage-based cryptocurrency. This has caused a short-term shortage of HDDs in the retail market and is likely to provide some support for these devices over next few months.

Other

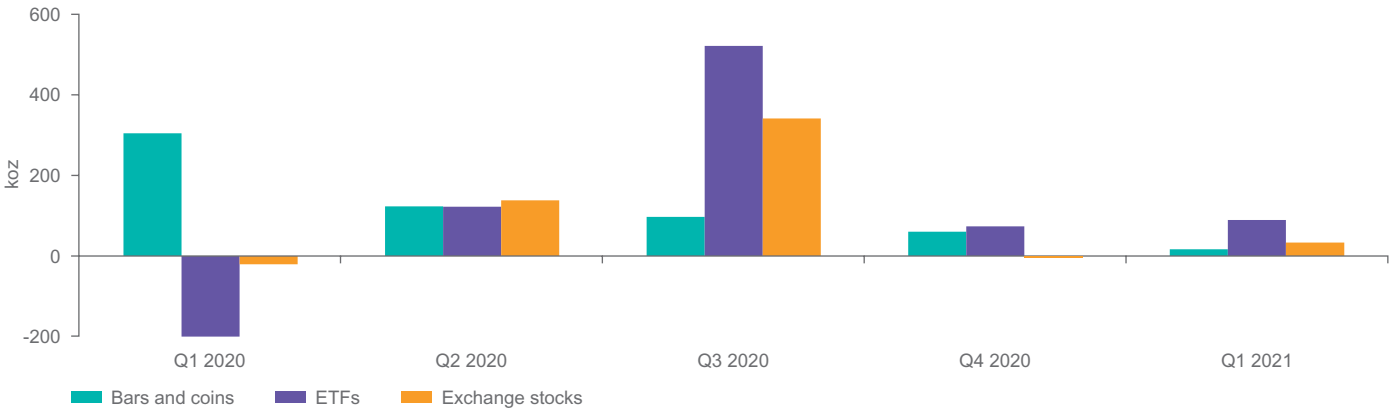
Demand from the Other industrial segment in Q1'21 surged by 23% (+27 koz), chiefly reflecting the lower base last year. Spark plugs and sensors performed well due to broad-based recovery of vehicle production and the vehicle aftermarket business. However, certain auto chip manufacturers halted production due to power outages caused by extreme weather conditions in Texas and a fire at a Japanese semiconductor factory in Q1'21, which has led to an unprecedented shortage of chips, forcing automakers to reduce output towards the end of the quarter. This delayed vehicle production is likely to weigh on platinum's demand in spark plugs and sensors well in to Q2'21.

Investment demand

During Q1'21, platinum bar and coin demand collapsed by 94% (-288 koz) year-on-year to just 17 koz, its lowest total since Q3'14 (the beginning of the WPIC *Platinum Quarterly* series). This was almost entirely due to Japanese investors capitalising on platinum price strength and selling back to the market. Japanese net bar and coin disinvestment totalled -107 koz during the first quarter, compared with just -16 koz of net disinvestment during Q4'20. These recent trends contrast sharply with the historically high level of net buying in Japan during Q1'20. North American platinum bar and coin demand moderately weakened during Q1'21, falling by 21% (-26 koz) year-on-year to 94 koz, largely because the US Mint issued fewer platinum coins this year. However, the quarterly level was still nearly double the quarterly average over the past two years as the shortage of bars experienced during 2020 was alleviated and consumer interest in hard assets and precious metals remains elevated. In Europe, sales of coins and small bars jumped by 46% on the previous quarter to just 6% (-1 koz) below Q1'20, thanks to positive price expectations and a growing availability of bullion products.

ETF holdings grew for the fourth consecutive quarter in Q1'21. Global holdings achieved a series of all-time highs reaching 3,971 koz at the end of the quarter. European and North American listed funds accounted for the overwhelming majority of gains. To a large extent, the significant gains reflect growing optimism over platinum's demand prospects, particularly the anticipated substitution gains in autocatalysts and the use in hydrogen technology. Part of these gains, however, were offset by modest profit taking in ETFs listed in South Africa and Japan.

Chart 4: Platinum Investment, koz

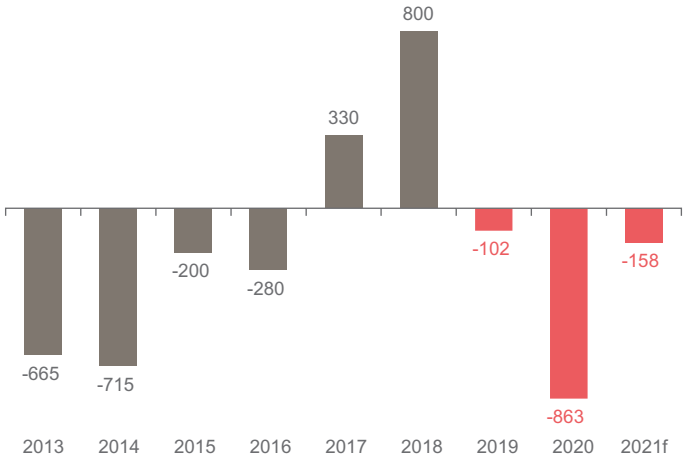


Source: Metals Focus

2021 OUTLOOK

With more than a billion people vaccinated globally, the prospect of economic recovery is being met with increasing optimism. While some consequences of the severe economic haemorrhage of the prior year may still be unclear, the aggressive monetary and fiscal stimuli introduced by many governments and the release of pent-up consumer demand, support a rapid return of industrial and economic activity. In addition to stimulus packages, many governments are designing strategies to align more with the climate action agenda, adding further impetus to the attraction of green technology metals such as platinum, albeit over the longer-term. For this year, both platinum demand and supply sectors are poised to benefit from rapid recovery from the effects of COVID-19. Buoyant industrial activity will see manufacturing sectors increase platinum consumption while higher prices and optimism towards future demand growth will stimulate investment demand. Overall, we forecast 2021 demand increase by 5% (+378 koz) to 8,041 koz, although this will still remain below 2019's pre-pandemic level of 8,321 koz. Supply is forecast to rise by 16% (+1,083 koz) to 7,883 koz, a reflection of the severe impact on supply in 2020 of COVID-19 related curtailment of operations and processing plant shutdowns unrelated to the pandemic. As result, 2021 is forecast to generate a modest deficit of -158 koz.

Chart 5: Supply-demand balance, koz, 2013-2021f



Source: Metals Focus 2019-2021, SFA (Oxford) 2013-2018

Supply

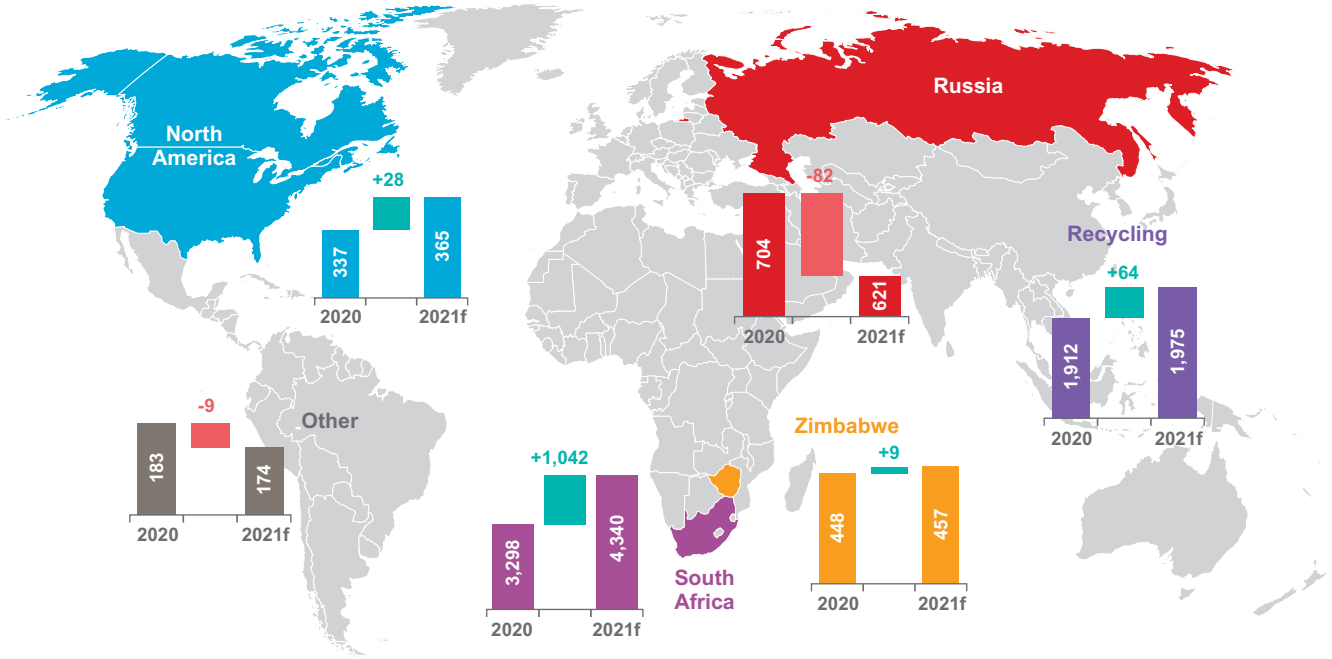
In 2021, mine supply is forecast to rebound, rising by 20% (+988 koz) year-on-year to 5,957 koz following the disruptions of 2020. South African production is expected to grow by 32% (+1,042 koz) as output from the ACP returns to full capacity for the year and COVID-19 mining disruptions ease. The ACP Phase A unit continues to achieve designed capacity and is expected to supplement refined output by processing 200 koz of the 500 koz, semi-processed inventory that built up in 2020. The rebuild of the full throughput standby alternate Phase B unit is scheduled to be finalised in H2'21 and once complete will reduce the risk of any further outages. It is expected that the remaining 300 koz of inventory will be processed during 2022.

The management of COVID-19 protocols at South African platinum mines is exceeding expectations with mining productivity at many operations surpassing plans. The sustained high basket price continues to provide healthy cash flows and incentivise project development. Most recently announced growth projects however, will only increase supply in the long term but the reinstatement of existing projects alongside the successful management of COVID-19 protocols have led to some producers increasing 2021 guidance and thus we have raised our outlook for South Africa by 3% (+142 koz) compared to our previous forecast in March 2021.

Output from Russia has experienced two significant disruptions thus far in 2021. On 12th February, groundwater inflow at the Oktyabrsky and Taimyrsky mines suspended production, while on 19th February, a building collapsed at the Norilsk Concentrator temporarily closing the plant. Restoring full operations at these facilities is ongoing, with remediation of the flooding exceeding initial timelines. The net effect is a 69 koz reduction in Nornickel's forecast production, with country output now expected to fall 12% (-82 koz) year-on-year. Elsewhere, North American production is expected to grow 8% (+28 koz), primarily due to the successful ramp-up of a project in Montana while in other regions production is expected to be relatively flat.

Chart 6: Changes in supply, 2020 vs. 2021f

koz



Source: Metals Focus

Recycling

This year, total recycling is forecast to rise by 3% (+64 koz) to 1,975 koz. This reflects an expected recovery in both autocatalyst and jewellery scrap supply when compared to 2020, yet both remain below pre-pandemic 2019 levels.

Autocatalyst recycling supply is projected to grow by 2% (+29 koz) to 1,462 koz, remaining below pre-pandemic levels. Due to a lack of smelting and/or refining capacity, growth potential is highly constrained given the industry is already expected to be operating at close to full capacity. The lack of capacity in turn reflects two factors, an increase in the volume of spent autocatalysts and growing supplies of diesel particulate filters (DPF), especially in Europe, many of which contain silicon carbide, thus adding to processing complexity and time. These were first introduced in 2006 in some larger diesel engines to comply with Euro 4, but fitment became effectively compulsory in 2009 in order to meet the requirements of the Euro 5 regulations. As more end-of-life vehicles have a DPF, it is becoming an increasingly important factor in the autocatalyst recycling industry.

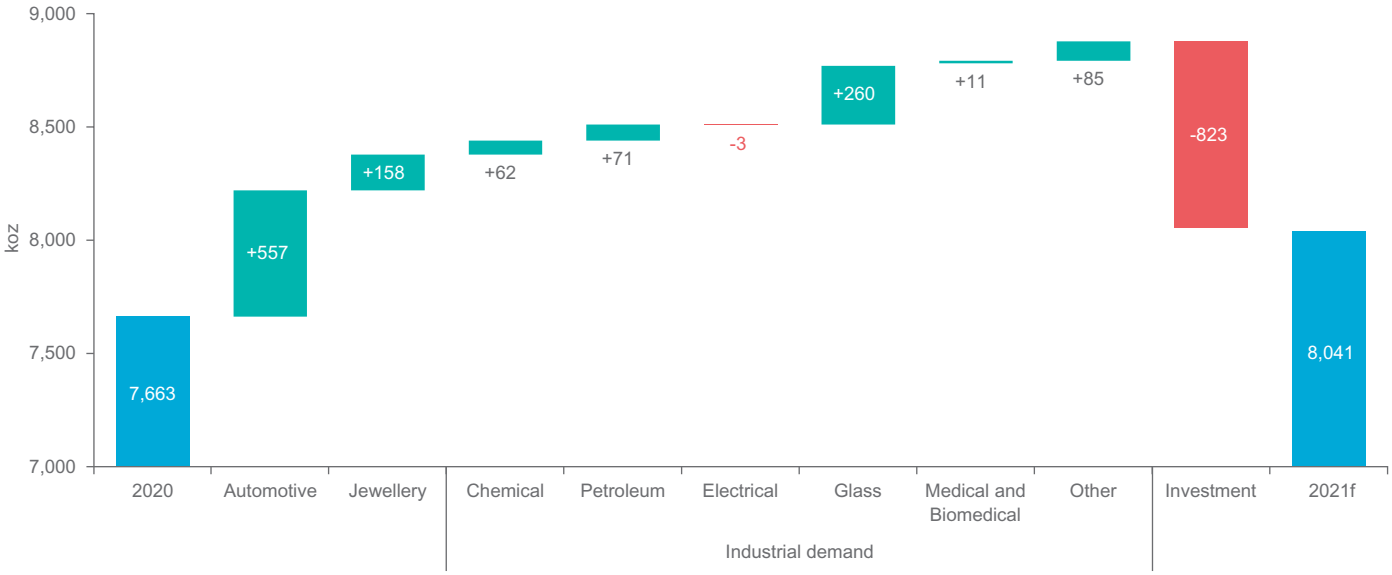
Furthermore, elevated rhodium and palladium prices, together with improved platinum prices, are making it more difficult for some parts of the industry to finance the purchase of spent catalysts. In some markets, this is leading to a build-up of unprocessed material at salvage yards. This in turn will affect the sector's ability to recover platinum in 2021, explaining the limited rise this year for the global total.

Jewellery recycling this year is forecast to recover by 8% (+33 koz) to 455 koz, although the total will still remain below pre-pandemic levels. The expected gains reflect the noticeable easing of lockdown restrictions, combined with the impact of gains in the platinum price. Japan only sees a modest recovery, due to low near-market stocks.

Demand

We forecast demand in 2021 to grow by 5% (+378 koz) to 8,041 koz, driven by a recovery in automotive, jewellery and industrial demand. Investment demand continues to be driven by demand growth potential and constrained supply in the short-term with the longer-term prospects for platinum attracting more investors. We forecast a growth of 250 koz in ETF holdings. In addition, we expect the higher platinum price to attract new retail investment, but also result in increased selling back as some investors book profits. Overall, therefore, coin and bar demand is forecast to drop by 26% (-150 koz) to 436 koz, although this will still be high by historical standards. For the investment segment as a whole, we forecast 2021 demand to be 726 koz, a decrease of 53% (-823 koz) compared to the record year for platinum investment demand in 2020.

Chart 7: Changes in demand by category, 2020 vs. 2021f



Source: Metals Focus

Automotive demand

Just when vehicle manufacturing seemed set to deliver output close to 2019 levels, a shortage of semiconductors used in vehicles has escalated to the point where the outlook has now been downgraded against earlier optimism. The issue, which first started to emerge in late November, is expected to most severely impact the automotive sector in the first half of this year, with lingering consequences in the second half. Despite this challenge, vehicle production forecasts still see a healthy year-on-year recovery, especially for the light-duty segment. We should note however that such projections remain vulnerable to the unforeseen consequences of the pandemic and possible resurgence of the virus in some regions. For 2021, global light-duty production is expected to be 86.5m units, 16% higher than 2020, while heavy-duty output is forecast to improve by 3%. This will result in an increase in platinum demand of 24% (+557 koz) to 2,925 koz and exceeding the pre-pandemic 2019 level. The healthy recovery in platinum demand across the markets is driven by both higher vehicle numbers and the implementation of more stringent emissions regulations, especially in the heavy-duty sector.

In Europe, demand is expected to recover to well above 2020 levels, but still falls short of 2019, as incentives and government policies promote the adoption of battery electric vehicles and the electrified powertrain (especially in passenger cars), with Western Europe's diesel market share forecast to decline to 25%, declining from a share of more than 50% over the past five years. However, the more stringent compliance requirements and test procedures, as well as higher palladium prices, have supported rising platinum loadings.

North American platinum demand is also set to increase and even surpass 2019 levels during this year, driven by the strong recovery in passenger vehicle demand, especially for larger vehicles. In this region, some gasoline vehicles will now also contain a higher ratio of platinum in the aftertreatment system.

In China, platinum demand is forecast to increase ahead of most other regions as a growing number of vehicles, especially heavy-duty trucks and buses, are fitted with China VI compliant aftertreatment systems which include the addition of a DPF in adherence to stricter particulate matter regulations. Some use of platinum in place of palladium in light-duty vehicles is also expected to contribute to higher platinum demand.

In other regions, the demand for platinum is also expected to increase following higher production volumes and emissions compliance requirements. The ambitious step change in India, to skip BSV and legislate BSVI compliance from April 2020 for both light and heavy-duty vehicles, will see platinum demand from this country grow by more than 50%. However, there is already an increasing risk to the forecast recovery for the Rest of the World region, given new waves of the virus which have taken hold, especially in India.

Jewellery demand

In 2021, platinum jewellery demand is expected to recover, growing 9% (+158 koz) above the prior year to 1,978 koz. Even so, the global total is still forecast to remain below 2019's 2,099 koz.

North American offtake is expected to enjoy a robust rise this year on the back of price differentials to gold, inventory build, an improving economic backdrop, and the arrival of postponed weddings. However, second-half growth may slow due to a recovery in spending on travel and other services.

European fabrication in 2021 is forecast to rebound, due mainly to further gains for the high-end brands, some of which are enjoying record sales through robust exports to East Asia. A more modest recovery in local mass market sales, however, means offtake falls just shy of pre-COVID levels.

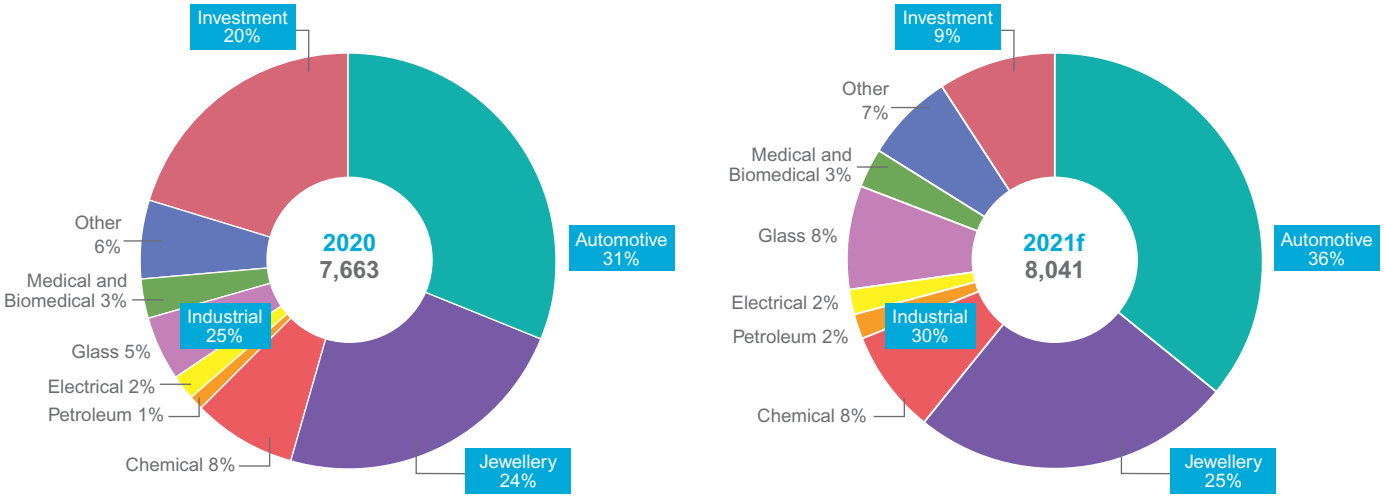
Following a weaker than expected Q1'21, platinum jewellery demand in China is expected to be lacklustre for the rest of the year. Rising competition from the gold market, and our forecast of higher prices for platinum this year have dampened prospects. In addition, the extraordinarily high stock build during H2'20 is likely to weigh on fabrication activity this year.

In India, following the positive growth in Q1'21 we expect demand will stay robust. There are, however, real risks to the outlook as uncertainty lingers following a renewed wave of infections and struggling medical infrastructure, which may suppress consumer sentiment and hinder the recovery in demand.

Industrial demand

The improvement in economic activity will see demand for platinum in industrial applications increase by 25% (+486 koz). Chemical demand is forecast to rise by 11% (+62 koz), while petroleum will rebound by 65% (+71 koz). Given that delays and changes in plans for plant expansions have led to some significant adjustments to glass demand this segment is expected in increase by 70% (+260 koz), while the medical sector is expected to grow 5% (+11 koz). Supported by automotive growth, increased stationary fuel cell deployment and the green hydrogen agenda the other industrial segment is expected to grow 17% (+85 koz). The electronics sector, despite growth in consumer electronic products, is forecast to show a modest decline of 2% (-3 koz).

Chart 8: Demand end-use shares, 2020 vs. 2021f



Source: Metals Focus

Petroleum

Petroleum offtake is expected to jump by 65% (+71 koz) year-on-year to 179 koz this year. This growth is partly premised on an eventual rebound in refinery throughputs, especially in the second half of the year, as the global economy continues to improve. Due to the pandemic, last year saw some refineries postpone their planned turnaround (when catalysts will be replaced) until this year or 2022. As such, platinum demand from process losses and top-ups during turnarounds was negatively affected in 2020. As 2021 will see some of the postponed turnarounds start, this will benefit platinum demand this year. Finally, ongoing capacity additions in China, as well as new units elsewhere (where construction was affected by the COVID-19 crisis), will provide an additional boost to platinum volumes.

Chemical

Demand is expected to rise by 11% (+62 koz) to 647 koz, with gains projected in all key applications. Starting with the petrochemical sector, another massive integrated refining and chemical plant is expected to come on stream in China around mid-2021, as the country seeks petrochemical self-sufficiency. Elsewhere, Saudi Aramco is expected to start a new PX unit in Saudi Arabia later this year. Demand for silicone production will also post a healthy recovery, as the global economy continues to improve. A small increase is also expected for nitric acid production on the back of a slight pick-up in capacity additions.

Glass

Although the strong volumes recorded in the first three months of the year will be hard to beat, we expect platinum offtake will remain healthy over the rest of 2021. This is primarily due to existing capacity expansion or installation plans being implemented, against the backdrop of strong LCD panel as well as healthy and growing demand for composites from all key end-uses, including construction and green energy. Although this does not get captured by our demand figures, there may be an additional, short-term, draw on platinum liquidity from the industry, namely some borrowing of metal, worth keeping in mind, owing to some LCD furnace disruptions in China and Korea requiring cold repairs. Overall, we forecast demand will rise to 629 koz in 2021, a 70% increase year-on-year.

Electrical

Electrical demand is forecast to decline by 2% (-3 koz) to 127 koz in 2021, impacted by the drop in global HDD shipments. Despite the solid recovery in the consumer electronics market, SSDs' high-performance characteristics and increasingly affordable price points have resulted in HDDs losing further ground to SSDs in PCs and entertainment applications. However, with the commercialisation of energy-assisted magnetic recording drives, HDD is likely to maintain its cost advantage, securing its position in the data central and nearline storage fields. As such, we expect to see a slower rate of decline of platinum offtake in the electrical segment.

Other

The use of sensor components and spark plugs will remain strong in 2021 as the automotive industry continues to recover. Platinum demand will grow as higher vehicle numbers, despite constraints caused by semiconductor shortages, stimulate increased demand. In the aerospace sector, the number of participants involved in the deployment of Low Earth Orbit Satellites will see an addition of 1,585 satellites, from one participant alone, orbiting the earth by 2022. Platinum use in the aerospace sector will see more the 25% growth this year. Finally, the growing adoption of PEM electrolysis and PEM fuel cell technology in the switch towards green hydrogen production and hydrogen use in the energy sector, will also add further to demand, albeit this is still modest. Overall, we forecast a 17% (+85 koz) increase in demand from these sectors.

Investment demand

This year, global platinum bar and coin demand is forecast to fall by 26% (-150 koz) compared to the record volumes in 2020, to a still healthy 436 koz. This reflects weaker buying in every key region on a net basis. Although some retail investors will be attracted by the price upside, others will take this opportunity to book profits. As such, we expect to see selling back rise in 2021, partly offsetting still healthy gross purchases we expect will be seen over the year.

Enthusiasm for platinum's demand fundamentals will continue to prompt fresh investment inflows into ETFs for the remainder of 2021. As sentiment towards gold is expected to improve among institutional investors later this year, platinum may also benefit from positive spill-overs. Talk of a new commodity super cycle should also benefit platinum investment. On the other hand, though, a firmer platinum price does raise the risk of profit taking. However, barring a dramatic worsening of the pandemic or some unexpected shock to the financial market, confidence in platinum's future consumption should limit the scale of such liquidation. Overall, we expect global ETF holdings to rise by 250 koz this year, a three-year low, following record inflows in 2019, and elevated investment last year.

ABOVE GROUND STOCKS

The market is expected to record a deficit of -158 koz in 2021, compared with last year's far more sizeable deficit of -863 koz. Overall, this will result in above-ground stocks falling to 2,526 koz. The end-2021 total for these stocks will be equivalent to four months of demand cover compared with closer to five months' cover at the end of last year.

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.

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

	2013	2014	2015	2016	2017	2018	2019	2020	2021f	2020/2019 Growth %	2021f/2020 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	**6,070**	**4,875**	**6,160**	**6,045**	**6,130**	**6,125**	**6,095**	**4,970**	**5,957**	**-18%**	**20%**
South Africa	4,355	3,135	4,480	4,265	4,385	4,470	4,400	3,298	4,340	-25%	32%
Zimbabwe	405	405	405	490	480	465	458	448	457	-2%	2%
North America	355	395	365	390	360	345	356	337	365	-5%	8%
Russia	740	740	710	715	720	665	716	704	621	-2%	-12%
Other	215	200	200	185	185	180	165	183	174	11%	-5%
Increase (-)/Decrease (+) in Producer Inventory	-215	+350	+30	+30	+30	+10	+2	-82	-50	N/A	N/A
Total Mining Supply	**5,855**	**5,225**	**6,190**	**6,075**	**6,160**	**6,135**	**6,097**	**4,888**	**5,907**	**-20%**	**21%**
Recycling	**1,980**	**2,035**	**1,705**	**1,840**	**1,895**	**1,935**	**2,121**	**1,912**	**1,975**	**-10%**	**3%**
Autocatalyst	1,120	1,255	1,185	1,210	1,325	1,420	1,587	1,433	1,462	-10%	2%
Jewellery	855	775	515	625	560	505	476	422	455	-11%	8%
Industrial	5	5	5	5	10	10	57	56	58	-2%	3%
Total Supply	**7,835**	**7,260**	**7,895**	**7,915**	**8,055**	**8,070**	**8,219**	**6,799**	**7,883**	**-17%**	**16%**
DEMAND											
Automotive	**3,130**	**3,245**	**3,245**	**3,350**	**3,290**	**3,075**	**2,839**	**2,368**	**2,925**	**-17%**	**24%**
Autocatalyst	2,990	3,095	3,105	3,215	3,150	2,930	2,839	2,368	2,925	-17%	24%
Non-road	140	150	140	135	140	145	†	†	†	†	†
Jewellery	**2,945**	**3,000**	**2,840**	**2,505**	**2,460**	**2,245**	**2,099**	**1,820**	**1,978**	**-13%**	**9%**
Industrial	**1,490**	**1,580**	**1,705**	**1,805**	**1,700**	**1,935**	**2,130**	**1,926**	**2,412**	**-10%**	**25%**
Chemical	535	540	510	560	565	570	694	585	647	-16%	11%
Petroleum	50	60	205	215	100	235	219	109	179	-50%	65%
Electrical	195	215	205	195	210	205	145	130	127	-10%	-2%
Glass	145	175	200	205	180	245	236	370	629	57%	70%
Medical and Biomedical	220	220	225	230	235	240	249	235	247	-5%	5%
Other	345	370	360	400	410	440	587	497	582	-15%	17%
Investment	**935**	**150**	**305**	**535**	**275**	**15**	**1,253**	**1,549**	**726**	**24%**	**-53%**
Change in Bars, Coins	-5	50	525	460	215	280	283	586	436	107%	-26%
Change in ETF Holdings	905	215	-240	-10	105	-245	991	504	250	-49%	-50%
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20	-20	458	40	N/A	-91%
Total Demand	**8,500**	**7,975**	**8,095**	**8,195**	**7,725**	**7,270**	**8,321**	**7,663**	**8,041**	**-8%**	**5%**
Balance	**-665**	**-715**	**-200**	**-280**	**330**	**800**	**-102**	**-863**	**-158**	**N/A**	**N/A**
Above Ground Stocks	**3,475***	**2,760**	**2,560**	**2,280**	**2,610**	**3,410**	**3,548****	**2,684**	**2,526**	**-24%**	**-6%**

Source: Metals Focus 2019 - 2021, 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.

Table 3: Supply and demand summary – quarterly comparison

	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q1'21/Q1'20 Growth %	Q1'21/Q4'20 Growth %
Platinum Supply-demand Balance (koz)											
SUPPLY											
Refined Production	**1,320**	**1,665**	**1,531**	**1,580**	**1,243**	**937**	**1,491**	**1,299**	**1,412**	**14%**	**9%**
South Africa	875	1,219	1,119	1,186	843	521	1,062	873	971	15%	11%
Zimbabwe	111	119	119	108	108	110	115	115	120	11%	4%
North America	85	99	79	94	98	87	71	82	94	-4%	15%
Russia	204	189	174	149	150	175	197	182	184	23%	1%
Other	44	40	40	41	45	44	47	47	43	-4%	-8%
Increase (-)/Decrease (+) in Producer Inventory	+12	-28	-30	+48	+44	+34	-111	-45	-23	N/A	N/A
Total Mining Supply	**1,332**	**1,637**	**1,501**	**1,627**	**1,287**	**971**	**1,380**	**1,254**	**1,389**	**8%**	**11%**
Recycling	**538**	**509**	**543**	**531**	**476**	**377**	**482**	**576**	**561**	**18%**	**-3%**
Autocatalyst	403	377	413	395	393	267	347	427	429	9%	1%
Jewellery	120	119	116	121	70	97	121	134	118	69%	-12%
Industrial	15	14	14	15	13	13	14	15	14	6%	-6%
Total Supply	**1,870**	**2,147**	**2,044**	**2,158**	**1,763**	**1,348**	**1,862**	**1,830**	**1,950**	**11%**	**7%**
DEMAND											
Automotive	**752**	**733**	**666**	**687**	**639**	**384**	**636**	**710**	**689**	**8%**	**-3%**
Autocatalyst	752	733	666	687	639	384	636	710	689	8%	-3%
Non-road	†	†	†	†	†	†	†	†	†	†	†
Jewellery	**539**	**535**	**529**	**497**	**393**	**388**	**510**	**529**	**478**	**22%**	**-10%**
Industrial	**557**	**537**	**533**	**502**	**461**	**396**	**475**	**589**	**662**	**44%**	**12%**
Chemical	138	205	162	190	176	112	122	171	119	-32%	-31%
Petroleum	55	55	55	55	33	18	21	36	27	-19%	-26%
Electrical	35	36	38	36	32	29	33	35	32	1%	-9%
Glass	120	32	71	12	45	75	104	146	279	>±300%	92%
Medical and Biomedical	62	62	62	62	59	59	59	59	62	5%	5%
Other	147	147	146	147	117	103	135	142	144	23%	1%
Investment	**794**	**126**	**251**	**82**	**71**	**384**	**960**	**133**	**140**	**96%**	**5%**
Change in Bars, Coins	111	89	54	29	305	123	97	60	17	-94%	-72%
Change in ETF Holdings	687	50	207	47	-213	122	522	74	90	N/A	22%
Change in Stocks Held by Exchanges	-4	-13	-10	6	-20	138	342	-1	33	N/A	N/A
Total Demand	**2,643**	**1,931**	**1,979**	**1,769**	**1,564**	**1,552**	**2,582**	**1,961**	**1,969**	**26%**	**0%**
Balance	**-773**	**216**	**65**	**389**	**199**	**-204**	**-719**	**-132**	**-19**	**N/A**	**N/A**

Source: Metals Focus 2019 - 2021, SFA (Oxford) 2018.

Notes:

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

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

	H1 2018	H2 2018	H1 2019	H2 2019	H1 2020	H2 2020	H2'20/H2'19 Growth %	H2'20/H1'20 Growth %
Platinum Supply-demand Balance (koz)								
SUPPLY								
Refined Production	**2,905**	**3,230**	**2,985**	**3,110**	**2,180**	**2,790**	**-10%**	**28%**
South Africa	2,075	2,400	2,094	2,305	1,364	1,934	-16%	42%
Zimbabwe	230	240	230	228	218	230	1%	6%
North America	175	180	184	173	185	153	-12%	-17%
Russia	340	325	393	324	325	379	17%	16%
Other	85	85	84	81	89	94	16%	5%
Increase (-)/Decrease (+) in Producer Inventory	+50	-40	-15	+18	+77	-156	N/A	N/A
Total Mining Supply	**2,955**	**3,190**	**2,970**	**3,128**	**2,258**	**2,634**	**-16%**	**17%**
Recycling	**940**	**985**	**1,047**	**1,074**	**853**	**1,058**	**-1%**	**24%**
Autocatalyst	675	745	779	808	660	773	-4%	17%
Jewellery	265	240	239	237	167	255	8%	53%
Industrial	0	0	29	29	27	29	3%	10%
Total Supply	**3,895**	**4,175**	**4,017**	**4,202**	**3,111**	**3,692**	**-12%**	**19%**
DEMAND								
Automotive	**1,585**	**1,480**	**1,485**	**1,353**	**1,023**	**1,345**	**-1%**	**32%**
Autocatalyst	1,510	1,405	1,485	1,353	1,023	1,345	-1%	32%
Non-road	75	75	†	†	†	†	N/A	N/A
Jewellery	**1,150**	**1,110**	**1,074**	**1,026**	**780**	**1,039**	**1%**	**33%**
Industrial	**960**	**970**	**1,094**	**1,035**	**857**	**1,064**	**3%**	**24%**
Chemical	280	290	343	351	287	294	-16%	2%
Petroleum	110	110	109	109	51	57	-48%	12%
Electrical	105	105	71	74	61	69	-7%	12%
Glass	120	130	152	84	120	250	199%	108%
Medical and Biomedical	125	115	124	124	118	118	-5%	0%
Other	220	220	294	293	220	277	-5%	26%
Investment	**5**	**0**	**921**	**333**	**455**	**1,094**	**229%**	**140%**
Change in Bars, Coins	155	120	200	82	428	158	92%	-63%
Change in ETF Holdings	-140	-110	737	254	-91	595	134%	N/A
Change in Stocks Held by Exchanges	-10	-10	-17	-4	118	341	N/A	189%
Total Demand	**3,700**	**3,560**	**4,574**	**3,747**	**3,116**	**4,543**	**21%**	**46%**
Balance	**195**	**615**	**-557**	**454**	**-5**	**-851**	**N/A**	**N/A**

Source: Metals Focus 2019 - 2021, SFA (Oxford) 2018.

Notes:

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

Table 5: Regional demand – annual and quarterly comparison

	2013	2014	2015	2016	2017	2018	2019	2020	2021f	2020/2019 Growth %	2021f/2020 Growth %	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021
Platinum gross demand (koz)																
Automotive	**3,135**	**3,240**	**3,250**	**3,345**	**3,280**	**3,065**	**2,839**	**2,368**	**2,925**	**-17%**	**24%**	**639**	**384**	**636**	**710**	**689**
North America	425	465	480	410	375	355	336	295								
Western Europe	1,350	1,395	1,450	1,635	1,550	1,330	1,442	1,079								
Japan	585	585	510	450	435	430	306	243								
China	130	125	145	195	230	220	191	285								
India	165	170	180	170	175	195	††	††								
Rest of the World	480	500	485	485	515	535	564	467								
Jewellery	**2,945**	**3,000**	**2,840**	**2,505**	**2,460**	**2,245**	**2,099**	**1,820**	**1,978**	**-13%**	**9%**	**393**	**388**	**510**	**529**	**478**
North America	200	230	250	265	280	280	341	277								
Western Europe	220	220	235	240	250	255	237	196								
Japan	335	335	340	335	340	345	372	316								
China	1,990	1,975	1,765	1,450	1,340	1,095	871	832								
India	140	175	180	145	175	195	102	48								
Rest of the World	60	65	70	70	75	75	176	151								
Chemical	**535**	**540**	**510**	**560**	**565**	**570**	**694**	**585**	**647**	**-16%**	**11%**	**176**	**112**	**122**	**171**	**119**
North America	55	55	50	50	50	50	77	90								
Western Europe	110	105	75	110	115	110	125	113								
Japan	10	10	10	15	15	15	66	62								
China	195	215	230	225	215	215	236	180								
Rest of the World	165	155	145	160	170	180	190	141								
Petroleum	**50**	**60**	**205**	**215**	**100**	**235**	**219**	**109**	**179**	**-50%**	**65%**	**33**	**18**	**21**	**36**	**27**
North America	40	25	-25	90	55	55	30	5								
Western Europe	-45	-20	70	10	5	20	14	11								
Japan	10	-35	5	0	-40	5	7	6								
China	80	-5	45	80	45	10	66	35								
Rest of the World	-35	95	110	35	35	145	103	52								
Electrical	**195**	**215**	**205**	**195**	**210**	**205**	**145**	**130**	**127**	**-10%**	**-2%**	**32**	**29**	**33**	**35**	**32**
North America	10	15	15	10	15	15	38	35								
Western Europe	5	10	10	10	10	10	27	23								
Japan	15	15	15	15	15	15	20	16								
China	75	70	70	80	90	85	28	31								
Rest of the World	90	105	95	80	80	80	31	25								
Glass	**145**	**175**	**200**	**205**	**180**	**245**	**236**	**370**	**629**	**57%**	**70%**	**45**	**75**	**104**	**146**	**279**
North America	5	10	0	20	5	5	7	-20								
Western Europe	-10	15	10	5	5	35	59	25								
Japan	0	-25	-5	-10	-10	0	-40	-88								
China	90	85	95	100	85	75	180	344								
Rest of the World	60	90	100	90	95	130	30	109								
Medical	**220**	**220**	**225**	**230**	**235**	**240**	**249**	**235**	**247**	**-5%**	**5%**	**59**	**59**	**59**	**59**	**62**
Other industrial	**345**	**370**	**360**	**400**	**410**	**440**	**587**	**497**	**582**	**-15%**	**17%**	**117**	**103**	**135**	**142**	**144**
Bar & Coin Investment	**-5**	**50**	**525**	**460**	**215**	**280**	**283**	**586**	**436**	**107%**	**-26%**	**305**	**123**	**97**	**60**	**17**
North America							159	242								
Western Europe							52	75								
Japan							46	240								
Rest of the World							25	29								
ETF Investment	**905**	**215**	**-240**	**-10**	**105**	**-245**	**991**	**504**	**250**	**-49%**	**-50%**	**-213**	**122**	**522**	**74**	**90**
North America							125	526								
Western Europe							509	232								
Japan							-13	58								
Rest of the World							370	-312								
Change in Stocks Held by Exchanges	**35**	**-115**	**20**	**85**	**-45**	**-20**	**-20**	**458**	**40**	**N/A**	**-91%**	**-20**	**138**	**342**	**-1**	**33**
Investment	**935**	**150**	**305**	**535**	**275**	**15**	**1,253**	**1,549**	**726**	**24%**	**-53%**	**71**	**384**	**960**	**133**	**140**
Total Demand	**8,505**	**7,970**	**8,095**	**8,190**	**7,715**	**7,265**	**8,321**	**7,663**	**8,041**	**-8%**	**5%**	**1,564**	**1,552**	**2,582**	**1,961**	**1,969**

Source: Metals Focus 2019 - 2021, SFA (Oxford) 2013 - 2018.

Notes:

1. †† India automotive demand is included in Rest of the World.
2. Data from Metals Focus and SFA (Oxford) may not have been prepared on the same or directly comparable basis.
3. 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	2021f	2020/2019 Growth %	2021f/2020 Growth %	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021
Platinum recycling supply (koz)																
Automotive	**1,120**	**1,255**	**1,185**	**1,210**	**1,325**	**1,420**	**1,587**	**1,433**	**1,462**	**-10%**	**2%**	**393**	**267**	**347**	**427**	**429**
North America							520	458								
Western Europe							806	744								
Japan							116	103								
China							36	33								
Rest of the World							110	96								
Jewellery	**855**	**775**	**515**	**625**	**560**	**505**	**476**	**422**	**455**	**-11%**	**8%**	**70**	**97**	**121**	**134**	**118**
North America							3	3								
Western Europe							4	4								
Japan							187	162								
China							276	248								
Rest of the World							5	5								
Industrial	**5**	**5**	**5**	**5**	**10**	**10**	**57**	**56**	**58**	**-2%**	**3%**	**13**	**13**	**14**	**15**	**14**
North America							3	3								
Western Europe							11	10								
Japan							34	34								
China							7	7								
Rest of the World							2	2								

Source: Metals Focus 2019 - 2021, 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 electrolysers 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 CO_2, 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 platers.

HDV

Heavy-duty vehicle.

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) 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.

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.

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The World Platinum Investment Council.

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