

## FOREWORD

This edition of *Platinum Quarterly* presents platinum supply and demand developments for the third quarter of 2021, an updated outlook for 2021 and an initial forecast for 2022. It also includes the WPIC's views on issues and trends relevant to those investors considering exposure to platinum as an investment asset, 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 for the total of automotive, jewellery and industrial applications in the third quarter of 2021 continued the steady year-on-year quarterly recovery seen since the fourth quarter of 2020. However, this demand declined by 4% from the second quarter as semiconductor shortages reduced automotive demand, and weaker industrial demand was not offset by stronger jewellery demand. However, the greatest change in demand in quarter three was due to outflows from ETFs and stocks held by exchanges, resulting in total platinum demand pulling back 44% year-on-year. This, in combination with higher refined supply, up 13% year-on-year as accelerated processing of the 2020 semi-finished stock overhang continued to boost underlying South African mine supply, resulted in the quarterly surplus of 592 koz. These developments have contributed to the increase in the platinum surplus now forecast in 2021, up from 190 koz to 769 koz. Whilst this is a significant surplus, we note that China imports have run well ahead of demand, potentially absorbing much of the excess metal supply, and resulting in reduced metal availability in the market.

While many of the trends that have dominated 2021 are expected to continue into 2022, the degree of uncertainty associated with each varies. There is high confidence in both the expected growth of 1% in total mining supply for full year 2022 - which includes the boost from processing the final tranche of the stock overhang - and the expected reduction in industrial demand of 13% from the exceptional levels seen in 2021. Less certain, is the extent to which processing capacity limitations may curb the growth in autocatalyst recycling later in the year, and the extent to which vehicle sales and production will rebound as the semiconductor shortage is resolved. Similarly, growth from increased platinum loadings under tighter emissions regulations and the amount of platinum substituted for palladium may rise materially. Regarding investment demand, it is uncertain whether outflows from ETFs and exchange stocks will continue. Base-case forecasts for the areas of supply and demand uncertainty potentially err towards the conservative. They assume: the semiconductor shortage will continue to reduce vehicle production; automotive recycling supply will be sustained despite lower scrappage rates; relatively low rates of platinum substitution for palladium; low PGM loadings in China relative to other regions; and continued negative demand from both South African ETFs (rotating into PGM equities) and exchange stocks. This results in a projected surplus in 2022 of 637 koz platinum. While this is a significant figure, demand upside, where forecasts are less certain, could reduce it materially. In particular, cessation of the outflows from South African ETFs and Stocks Held by Exchanges would reduce the forecast surplus by 250 koz, and we estimate that each additional million vehicles produced above current estimates would reduce it by 35 koz.

### Platinum supply and demand – updating 2021 and introducing 2022 forecasts

For 2021 total platinum supply is now forecast to rise 19% year-on-year to 8,114 koz, still below the 2019 level despite the inclusion of the 380 koz contribution from the ACP inventory unwind. Demand is expected to fall 5% year-on-year, as significant outflows from ETFs and stocks held by exchanges exceed the collective year-on-year growth in automotive, jewellery and industrial demand. Consequently, our forecast surplus for 2021 has increased from 190 koz to 769 koz. Notably a 14% (+340 koz) growth in platinum automotive demand is anticipated despite the global semiconductor shortage limiting automotive production.

The dominant trends that influenced platinum supply and demand in 2021 are expected to continue into 2022, resulting in a projected surplus of 637 koz, although this is very dependent upon the pace of the recovery in automotive production, as well as changes in global ETF and exchange stock holdings.

### Q3 2021 surplus of 592 koz reflects significant ETF disinvestment and NYMEX stock outflows

Before reviewing the third quarter supply and demand it is important to note that investment demand in Q3'20 was extraordinary. As world economies bounced back from the first series of COVID-19 lockdowns, significant uncertainties prevailed in the sustainability of the recovery which led to near record ETF demand, boosted by 342 koz of exchange stock growth due to market-making banks moving existing metal holdings from non-visible to visible locations.

Third quarter refined platinum supply was 7% (+101 koz) higher than in Q3'20, with 13% growth in refined mine production more than offsetting a 9% decline in recycling. Total mining supply of 1,569 koz was supplemented with some 140 koz of platinum from the further unwinding of ACP semi-finished inventory. Although mine production stability in South Africa is significantly improved, underlying mine supply remained below the pre-pandemic Q3'19 level after stripping out the contribution from the ACP stock overhang. Recycling supply was 46 koz lower year-on-year on reduced jewellery trade-in rates in China and price-driven scrapyard stockpiling reducing autocatalyst recycling.

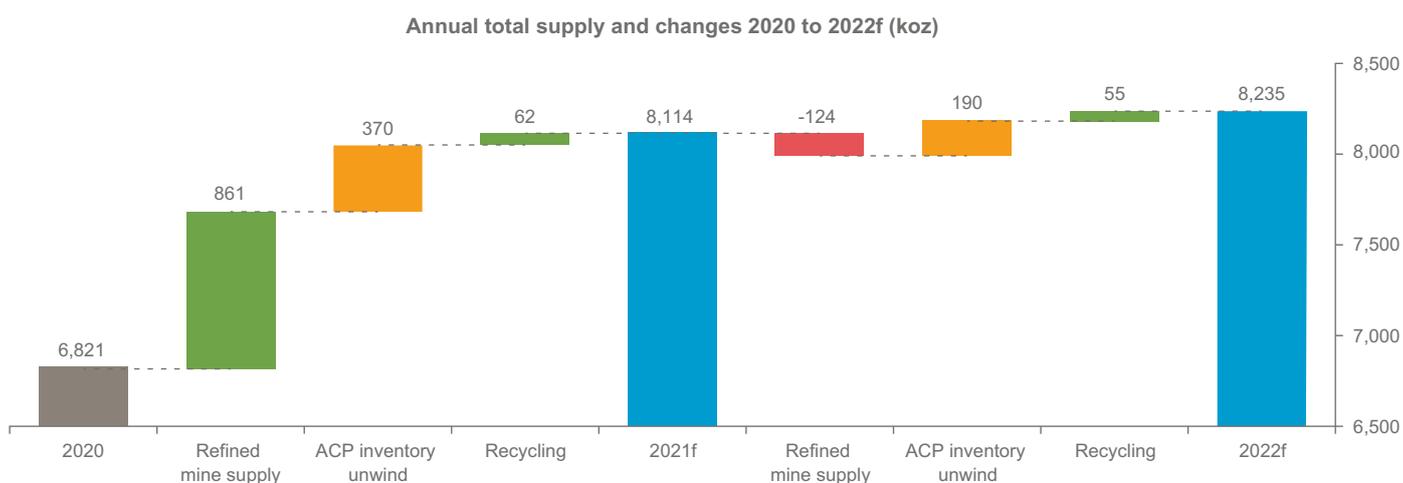
Automotive demand in Q3'21 of 617 koz was down 3% year-on-year, as higher loadings, particularly on heavy-duty vehicles in China, and increased platinum for palladium substitution substantially offset a 16% reduction in automotive production due to the ongoing global semiconductor shortage. Jewellery demand was down 5% year-on-year despite strong recoveries in Europe and North America, as this was more than offset by ongoing demand weakness in China and a COVID-related state of emergency in Japan limiting in-store purchases. Industrial demand of 603 koz was up 20% year-on-year, bolstered in particular by capacity additions in China's glass sector, and also because the COVID restrictions that impacted Q3'20, suppressed demand on an exceptional basis.

The biggest swing in year-on-year quarterly demand comes from investment demand, with Q3'21 1,208 koz lower than the record quarterly level in Q3'20. While bar and coin investment performed well, increasing 25% (+24 koz) over Q3'20, ETF disinvestment was 718 koz less than the exceptionally strong ETF inflows seen in Q3'20, and stock flow out of NYMEX similarly led to a -515 koz year-on-year swing.

Consequently, the market balance in Q3'21 shifted to a surplus of 592 koz in contrast to the deficit of 704 koz in Q3'20.

## 2021 - Surplus increased on constrained automotive production and negative investment demand

Many of the trends that influenced Q3'21, as well as the significant quarterly surplus, flow through to the full year outlook. Full year 2021 supply is forecast to rise by 19% year-on-year to 8,114 koz, as steadily recovering mine production supplemented by ACP inventory unwind, more than offsets weaker recycling supply. Total demand is down 5% year-on-year to 7,345 koz with the third quarter ETF disinvestment and NYMEX stock reductions leaving total investment down 86% year-on-year, more than offsetting strong year-on-year demand growth in automotive, jewellery and industrial applications despite significant headwinds for automotive production. The 2021 forecast annual surplus is now expected to reach 769 koz, heavily influenced by the changes that occurred in the third quarter and its 592 koz surplus.



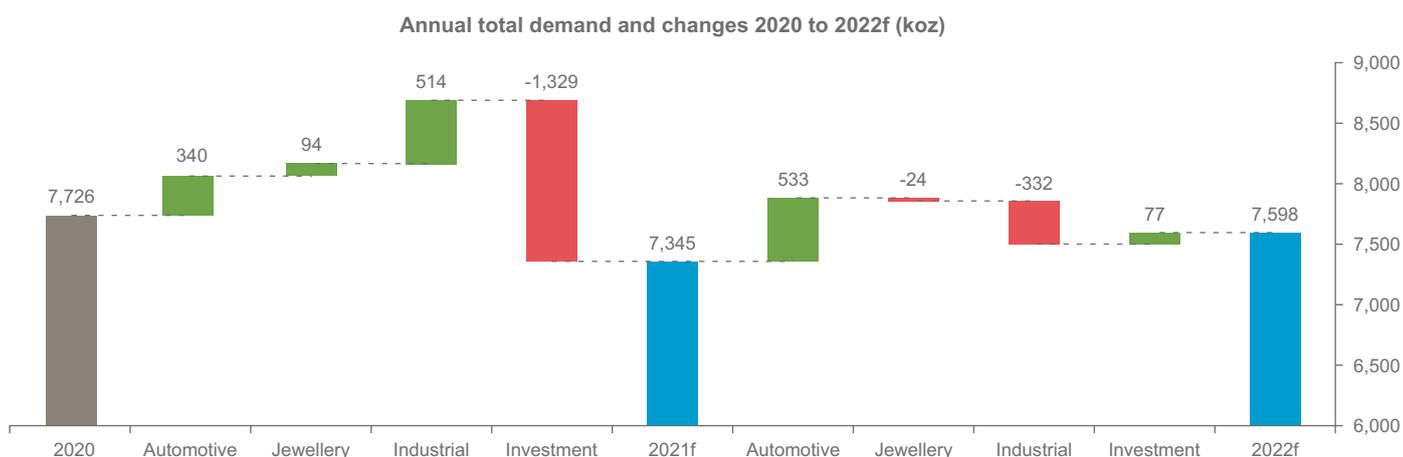
## 2022 – Continuing the trends from 2021

Many of the production and demand trends that have defined the second half of 2021 to date are expected to flow into 2022, albeit softening from current levels.

Refined mine supply is expected to remain on a par with 2021 at 6,203 koz (+1% year-on-year), with investment in production stability limiting downside risks in South Africa, although North American operations are exposed to an element of ramp-up risk. The final 190 koz of ACP inventory is expected to be unwound during the year. Recycling supply is expected to increase by a modest 1% to 2,032 koz, with a 4% rise in automotive recycling offsetting weaker jewellery recycling. While automotive recycling is expected to increase it could encounter process capacity limitations later in the year.

The continuing economic recovery and an easing of the semiconductor shortage is expected to support a 3% year-on-year increase in overall demand. Automotive demand is forecast to increase by 20% to 3,327 koz as capacity limitations are lifted, allowing for increased production to satisfy pent-up consumer demand. Industrial demand in 2022 is expected to decline by 13% to 2,169 koz, led by glass (-52%) due to significantly fewer capacity additions versus the record rate of expansion delivered in 2021. Investment demand is forecast to increase by 34% year-on-year to 302 koz, with continued strong demand for bars and coins (+10% year-on-year) and net ETF inflows (50 koz) partially offset by a continued reduction in mainly NYMEX stocks.

The net result is a surplus of 637 koz, 132 koz smaller than the 2021 surplus.



## The platinum investment case – near-term surplus but uncertainties abound

A number of factors have resulted in a substantial increase in the expected platinum surplus for 2021, with similar effects leading to a lower, but still significant, initial forecast of a surplus for 2022. While the headline figures may appear dramatic, there are areas where we believe the outlook to be sensibly conservative on both the supply and the demand side, with the potential for recycling supply to be more constrained than expected, automotive demand to come in above expectations and for more limited outflows from stocks held by exchanges, particularly moving into 2022. We of course have confidence in the forecasts we publish today, but the supply/demand outlook does not yet fully explain the above average imports into China, a rising platinum price and elevated platinum lease rates, all of which suggest that platinum is far less freely available than the surpluses might suggest.

*Key short-term factors behind the increase in forecast surpluses in 2021 and 2022 include:*

- Higher refined mine production from processing of semi-finished stock as well as reduced mine operational risks
- The impact of semiconductor shortages on automotive production
- The ongoing rotation from platinum ETFs into PGM mining equities
- Reductions in stocks held by exchanges

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### *Areas of potential upside not reflected in 2022 forecast:*

- Lower autocatalyst recycling supply, which could be hampered by capacity constraints and the supply of spent autocatalysts resulting from consumers running existing vehicles for longer
- Projected ETF demand of only 50 koz in 2022 is low relative to an average of 243 koz per annum since 2013, although this is highly dependent on the rotation into equities highlighted above
- Platinum loadings and platinum substitution for palladium could be running at levels higher than those captured in current forecasts

### **Unravelling the surplus**

#### **Strong Q3 refined production**

Total mining supply in Q3 was significantly above typical levels and historic averages due mainly to limited mining operational disruptions in South Africa and higher than expected supply from the processing of semi-finished stock accumulated in 2020 during the ACP outages. Producer margins are at elevated levels, supported by high palladium and rhodium prices, and this is allowing for increased investment in face length availability and non-critical maintenance. These efforts are expected to reduce outage risks resulting in 2022 refined mine production being broadly comparable to 2021, albeit remaining below pre-pandemic levels after stripping out the final contributions from the ACP inventory unwind. This is supported by higher production from North America in 2022 as Sibanye-Stillwater commissions its long-awaited Stillwater East extension (previously Blitz). Of course, although operational disruptions appear unlikely in 2022, political, labour and power disruptions cannot be ruled out, particularly in South Africa.

#### **Automotive production held back by global semiconductor shortage**

A key factor in the gradual downgrading of our demand outlook for 2021 has been the impact of the global semiconductor shortage on automotive demand, which has resulted in the estimate for global light vehicle production in 2021 being eroded from 87 million vehicles to 76 million vehicles. This has reduced projected automotive platinum demand from 2,996 koz, when we launched our 2021 outlook in Q3 last year, to 2,704 koz today, with the automotive production demand losses being partially offset in 2021 by 200 koz of platinum for palladium substitution.

Looking into 2022, automotive demand growth of 20% (+533 koz) to 3,237 koz is based upon production of 85 million light vehicles. This reflects a pick-up in production as the impact of the semiconductor shortage begins to ease, and automakers adjust product offerings to spread semiconductor supplies more broadly (by limiting optional extras etc.) to maximise vehicle production in the face of continuing strong consumer demand. At the same time, we note that the 2022 vehicle production outlook remains a long way below pre-COVID and pre-semiconductor shortage projections.

#### **Continued rotation from ETFs into PGM mining equities**

As we have previously reported there has been an ongoing rotation of capital out of the South African platinum ETFs into the platinum producer equities. This has allowed the South African investment funds to retain platinum exposure, while benefiting from the expected continuation of elevated dividends resulting from the ongoing high contribution by palladium and rhodium to earnings. The South African platinum ETF outflows peaked at -176 koz in Q3'21, versus inflows of 19 koz in Europe and outflows of -53 koz in North America. Looking at 2021 as a whole, the forecast net ETF demand of -40 koz, includes strong growth in Europe in particular offsetting the reductions in South Africa.

Looking into 2022 we expect the rotation trend to slow in South Africa, offset by inflows from the rest of the world resulting in a net inflow of 50 koz. While predicting the behaviour of South African funds is difficult, we note that the platinum miners are now making catch-up investment in maintenance and stope development and commencing some project expenditure, both of which could reduce dividend expectations and change investor behaviour.

#### **Outflows from Stocks Held by Exchanges Peaked in Q3**

The rapid and material growth in stocks held by exchanges in 2020 amounted to market-making banks moving invisible off-exchange collateralised inventory to visible on-exchange inventory in response to COVID-related logistical and risk management considerations. This included converting large c.6 kg bars into LPPM good delivery 50 oz bars, the only accepted form for physical delivery. This grew NYMEX inventories from ~150 koz pre-pandemic to a peak of over 700 koz in Q2'21. Despite COVID-related

logistics and bar availability abating, we think the risk management considerations remain a driver of higher stock levels, and so we believe that the -173 koz outflows seen over Q3'21 are more likely the result of a near-term shortage of freely available platinum pushing downstream consumers to utilise the futures market as a source of metal. Looking ahead to 2022, the forecast is that the declines in 2021 will continue, with stock reductions of -150 koz platinum. We believe that this may not occur should platinum lease rates weaken or if market-making banks' institutional risk appetite is increased regarding short positions not covered by locally vaulted metal.

### **Drivers of higher supply and reduced demand**

As evident from the above, the increase in the 2021 surplus and the initial 2022 surplus have linked causes and are a product of both higher supplies and reduced demand across the board. The net impact is a surplus of 769 koz platinum in 2021, up from 190 koz, which equates to 10% of projected demand. The maiden outlook for 2022 is for a surplus of 637 koz platinum, or 8% of global demand.

However, we do think there are areas where we have been sensibly conservative in our outlook, which could reduce the scale of the surpluses.

### **Potential drivers of a reduced surplus**

#### **Autocatalyst recycling could be reduced by consumers running existing vehicles for longer**

Our forecast of automotive recycling supply is for growth of 4% in both 2021 and 2022, however, we think the risks to these estimates are potentially biased to the downside. As we discussed in our October Platinum Perspectives, the shortage in new vehicle availability as a result of the semiconductor shortage, is forcing consumers to run existing vehicles for longer. This reduces scrappage rates, potentially limiting the supply of catalytic converters being sent to recyclers and curbing automotive recycling supply.

#### **Platinum loadings and platinum substitution for palladium could be higher than estimated**

One of the unexplained phenomena of recent times has been China's net platinum imports consistently exceeding the country's identifiable demand, a trend which has only accelerated in recent quarters, and which remains unexplained. Global import/export data should probably always be treated cautiously with regard to absolute accuracy, but the magnitude of the discrepancies in China cannot be accounted for in terms of inaccuracies alone. One possible reason could be that participants in China's hydrogen and fuel cell industries are building a strategic inventory of platinum (at attractive prices), but another could be that per vehicle platinum loadings are higher than estimated, which could certainly be true in the context of China VI loadings which appear significantly lighter than those of vehicles in regions meeting comparable emissions standards. For example, in the heavy-duty vehicle segment we estimate that platinum loadings in China could be less than 3g per vehicle in 2021, in comparison to an estimate of over 20g per vehicle in Europe (albeit that China VI was implemented only in July 2021).

While we can see from the data in 2021 that platinum imports are running ahead of demand projections, we can also see that palladium imports are running below demand expectations. It could be that China had previously built domestic stocks of palladium which are now being drawn upon for automotive use, or it could be that there is greater substitution ongoing within the automotive sector in China specifically. Based on one-for-one substitution with platinum, the 2021 palladium deficit of 1,069 koz, as estimated by Metals Focus in May this year, would be reduced by at least the forecast 200 koz of global platinum substitution.

More broadly, beyond China, it is also possible that the scale of platinum substitution for palladium is being underestimated. Forecast automotive platinum demand in 2021 includes 200 koz for palladium substitution, with a more than doubling of that in 2022. Despite the surpluses forecast in both years, exchange outflows, high lease rates and relative platinum price strength suggest the market is currently tighter than the forecast surpluses would suggest. As such, it is quite possible that higher than expected substitution rates in combination with high China imports could be keeping market availability of platinum low.

#### **Projected ETF inflows in 2022 are historically light**

Projected ETF demand in 2022 is only 50 koz, which is low in comparison to a five-year rolling average of 270 koz, although we recognise that inflows were exceptional in 2019 and 2020. The net inflow is a function of relatively high investment rates in North America and Europe, offset by the ongoing rotation into equities in South Africa. As discussed above, how sustained the rotation trade proves to be is difficult to predict, but it is certainly possible that increased production and maintenance spending by the producers could erode the relative attractiveness of the equities and draw capital back to the ETFs sooner than predicted.

### WPIC initiatives highlights

Heightened global risk, related to the severity of the ongoing impacts of the COVID-19 pandemic, continues to drive increased retail and institutional investor interest in hard assets, including commodities and platinum. As a result, our partners have seen increased interest in platinum from investors during 2021, enhanced by the growing visibility of platinum's role in global decarbonisation. We expect this momentum to continue for the remainder of the year and in 2022.

Increasing the number and impact of our product partnerships in our four key target markets, China, Japan, North America and Europe remains a key focus for us. We are working closely with our partners to strengthen their focus on platinum and to increase investor awareness of platinum.

Our partnerships have a dual benefit; not only do they continue to have a positive impact on investor choice and access by growing the number and type of platinum investment products available globally, they also increase our reach, providing us with the opportunity of presenting the investment case for platinum to our partners' clients and investor audiences.

The heightened investor interest in platinum experienced during this year has given additional impetus to our partnership initiatives and we are pleased with their progress in 2021. For example, in Q3 in North America, TD Securities, a subsidiary of Canada's The Toronto Dominion Bank, launched platinum bullion products as an addition to its precious metals offering in Canada. We were also pleased to be able to assist SD Bullion with the launch of the first two coins in its inaugural 'Platinum Truth' series, 'The Tree of Life' and 'The Roaring Lion'. We helped promote the Gibraltar Castle platinum coin manufactured by PAMP Suisse in Europe, distributed by our North American partner MTB Metals.

Despite lower volumes in July, demand for physical bars and coins increased strongly in August and September and we remain optimistic for Q4. WPIC will, of course, continue to work closely with its European and North American partners through various types of promotional campaigns to encourage increased platinum investment.

In China, while weak pricing in Q3 discouraged some investors, our partners still saw increasing sales in platinum bars, fuelled by a growing interest in platinum and concerns over inflation, with platinum viewed by investors as an asset offering some protection against expected inflation. Platinum-backed bank trading accounts are still under regulatory suspension, limiting product choice for platinum investors. The availability of Platinum Panda coins — the first since 2005 and part of a set of Panda precious metal coins issued in celebration of the iconic series' 40th anniversary — is expected to partially satisfy demand and increase the possibility of more platinum offerings in the future. The 2022 platinum bullion Panda coin, available in two sizes - 30g and 1g - was approved by The People's Bank of China and is produced by China Gold Coin Incorporation.

COVID-19 containment measures in China resulted in the deferral or cancellation of a number of platinum market development events, but we continued our webinars for investor development, which were well attended. Interest in platinum has increased significantly following the success of the inaugural Shanghai Platinum Week in June 2021, which we initiated and jointly hosted and will repeat in 2022.

In Japan, WPIC continues its support for physical platinum investment products, and we launched an additional partnership with an online coin retailer during the quarter. Our partners reported continued net investment inflows in Q3'21, offsetting the bulk of the outflows that occurred in the first half of the year. Interestingly, we saw robust sales of platinum Kihei Chain, a popular heavy, high purity chain for neck and wrist wear that combines the attributes of investment and jewellery in Japan. Our partnership with Japan Bullion Market Association (JBMA) continued to expand our footprint in Japan, building a stronger network with platinum investors and distributors.

In summary, we believe that our efforts to increase platinum investment product availability and attractiveness to more investors around the world are yielding results and that we are well positioned to support future investment demand growth.

**Paul Wilson, CEO**

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# PLATINUM QUARTERLY Q3 2021

**Table 1: Supply, demand and above ground stocks summary**

	2019	2020	2021f	2022f	2021f/2020 Growth %	2022f/2021f Growth %	Q2 2021	Q3 2021
<b>Platinum Supply-demand Balance (koz)</b>								
<b>SUPPLY</b>								
<b>Refined Production</b>	<b>6,100</b>	<b>4,989</b>	<b>6,187</b>	<b>6,203</b>	<b>24%</b>	<b>0%</b>	<b>1,568</b>	<b>1,597</b>
South Africa	4,399	3,298	4,552	4,514	38%	-1%	1,180	1,213
Zimbabwe	458	448	467	465	4%	-1%	125	111
North America	356	337	314	356	-7%	13%	75	73
Russia	716	704	644	666	-8%	3%	136	149
Other	170	202	209	202	3%	-3%	52	50
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+2</b>	<b>-84</b>	<b>-50</b>	<b>+0</b>	<b>N/A</b>	<b>N/A</b>	<b>+18</b>	<b>-28</b>
<b>Total Mining Supply</b>	<b>6,102</b>	<b>4,906</b>	<b>6,137</b>	<b>6,203</b>	<b>25%</b>	<b>1%</b>	<b>1,587</b>	<b>1,569</b>
<b>Recycling</b>	<b>2,117</b>	<b>1,916</b>	<b>1,977</b>	<b>2,032</b>	<b>3%</b>	<b>3%</b>	<b>494</b>	<b>480</b>
Autocatalyst	1,584	1,438	1,495	1,559	4%	4%	382	361
Jewellery	476	422	424	414	1%	-2%	98	104
Industrial	57	56	58	59	3%	1%	14	15
<b>Total Supply</b>	<b>8,219</b>	<b>6,821</b>	<b>8,114</b>	<b>8,235</b>	<b>19%</b>	<b>1%</b>	<b>2,081</b>	<b>2,049</b>
<b>DEMAND</b>								
<b>Automotive</b>	<b>2,836</b>	<b>2,365</b>	<b>2,704</b>	<b>3,237</b>	<b>14%</b>	<b>20%</b>	<b>653</b>	<b>617</b>
Autocatalyst	2,836	2,365	2,704	3,237	14%	20%	653	617
Non-road	†	†	†	†	†	†	†	†
<b>Jewellery</b>	<b>2,099</b>	<b>1,820</b>	<b>1,914</b>	<b>1,890</b>	<b>5%</b>	<b>-1%</b>	<b>461</b>	<b>483</b>
<b>Industrial</b>	<b>2,127</b>	<b>1,987</b>	<b>2,501</b>	<b>2,169</b>	<b>26%</b>	<b>-13%</b>	<b>664</b>	<b>603</b>
Chemical	694	585	649	608	11%	-6%	214	157
Petroleum	219	109	179	194	65%	8%	45	45
Electrical	144	130	138	138	6%	0%	35	36
Glass	236	423	726	348	72%	-52%	169	164
Medical and Biomedical	249	239	247	254	4%	3%	59	62
Other	585	501	561	627	12%	12%	141	139
<b>Investment</b>	<b>1,253</b>	<b>1,554</b>	<b>225</b>	<b>302</b>	<b>-86%</b>	<b>34%</b>	<b>189</b>	<b>-246</b>
Change in Bars, Coins	283	586	365	402	-38%	10%	109	122
Change in ETF Holdings	991	509	-40	50	N/A	N/A	31	-195
Change in Stocks Held by Exchanges	-20	458	-100	-150	N/A	N/A	49	-173
<b>Total Demand</b>	<b>8,315</b>	<b>7,726</b>	<b>7,345</b>	<b>7,598</b>	<b>-5%</b>	<b>3%</b>	<b>1,967</b>	<b>1,457</b>
<b>Balance</b>	<b>-96</b>	<b>-904</b>	<b>769</b>	<b>637</b>	<b>N/A</b>	<b>-17%</b>	<b>114</b>	<b>592</b>
<b>Above Ground Stocks</b>	<b>3,554**</b>	<b>2,650</b>	<b>3,419</b>	<b>4,056</b>	<b>29%</b>	<b>19%</b>		

Source: Metals Focus 2019 - 2022.

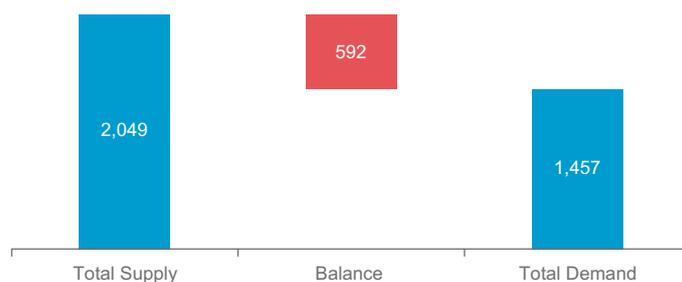
Notes:

1. \*\*Above Ground Stocks 3,650 koz as of 31 December 2018 (Metals Focus).
2. † Non-road automotive demand is included in autocatalyst demand.
3. All estimates are based on the latest available information, but they are subject to revision in subsequent quarterly reports.
4. The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q4 2017 are contained in previously published PQs which are freely available on the WPIC website. Quarterly estimates from Q3 2019 and half-yearly estimates from H1 2019 are included in Tables 3 and 4 respectively, on pages 22 and 23 (supply, demand and above ground stocks). Details of regional recycling supply in Table 6 on page 25 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 THIRD QUARTER PLATINUM MARKET REVIEW

During Q3'21 platinum demand struggled to maintain the momentum of the first half, as the increasing shortage of key components (including semi-conductors), together with constraints on some raw materials, saw dramatic downwards revisions in the automotive market. In addition, at times during the quarter the optimistic market tone subdued as the rise in COVID-19 cases prompted localised restrictions, serving as a reminder that economies remain fragile in this post-peak-pandemic era. The negative impact on investor sentiment due to lower autocatalyst demand, was compounded by contagion concerns following news that Evergrande might default on its debt obligations, as well as by growing expectations that interest rates would rise earlier than previously expected, to offset rising inflation. Changing forward market conditions, meanwhile, encouraged outflows of platinum from NYMEX depositories. All these factors resulted in hefty net disinvestment (-246 koz), in a marked contrast to the exceptionally strong positive investment figure (+962 koz) of Q3'20. Weaker recycling supply was offset by steadily improving mine supply, bolstered by accelerated inventory processing which saw total supply increase 7% (+138 koz) year-on-year to 2,049 koz. Consequently, the market balance shifted to a surplus of 592 koz in contrast to the deficit of 704 koz in Q3'20. A review of trade-flows and Metals Focus' field research suggests that a sizeable portion of this surplus has likely been absorbed by Chinese inventories, at least partly serving speculative purposes.

Chart 1: Supply-demand balance, koz, Q3 2021



Source: Metals Focus

### Supply

Refined production posted another quarter free from largescale disruption, increasing by 7% (+101 koz) year-on-year to 1,597 koz, as the processing of semi-processed inventory in South Africa accelerated, while the recovery from the extreme disruption of mining operations in 2020 continued.

South African refined production was boosted by the processing of around 140 koz of the semi-finished inventory, accumulated because of last year's Anglo American Platinum converter plant (ACP) shutdown. Output rose 151 koz, up 14% year-on-year to 1,213 koz. Mine sites achieved their planned production levels as they successfully navigated COVID-19 protocols and advanced vaccination efforts. The minor disruption of unprotected industrial action at Impala Rustenburg on the Western Limb and community unrest at Mototolo on the Eastern Limb did not materially impact refined volumes. However, Impala Platinum reported lower output as scheduled maintenance decreased processing infrastructure availability. Producers continued normalising refined inventory levels, adding 28 koz, with strengthened balance sheets have eased working capital constraints.

Zimbabwe continued its long-term undisrupted production performance in the quarter with output of 111 koz, a modest 4 koz year-on-year decline. Scheduled maintenance at several concentrators was in part offset by improved smelter output following a furnace reline.

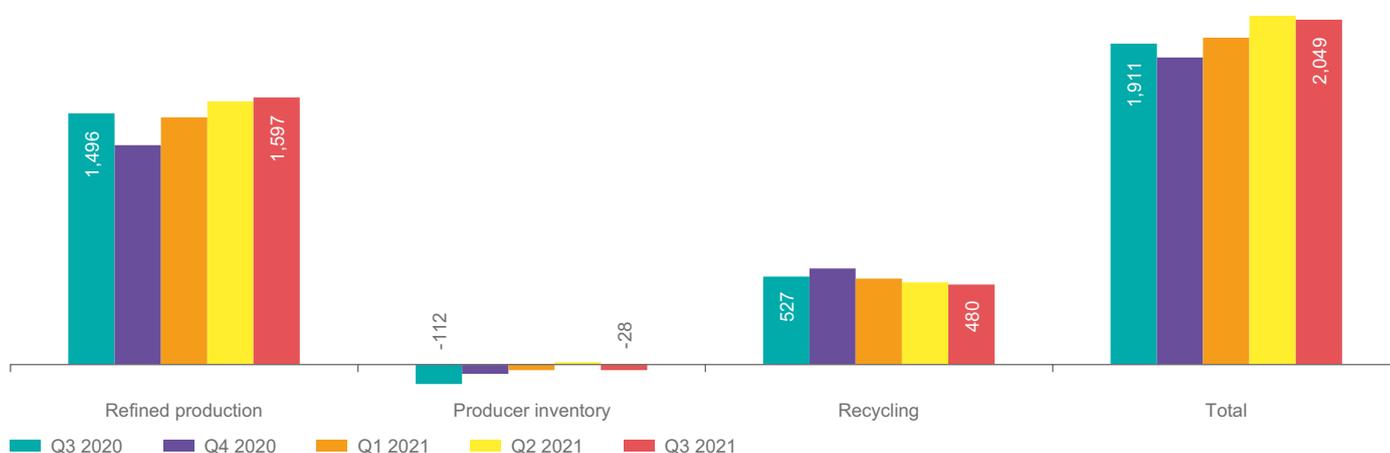
Russian supply fell by 24% (-47 koz) to 149 koz as the impact from the flooding of two mines and a concentrator building collapse in February continues. The long processing pipeline of PGMs deferred the impact from earlier in the year.

North American output remained virtually flat as disruption due to a strike at Vale's Sudbury operation and safety related operational restrictions at Sibanye Stillwater's mine in Montana matched COVID-related losses of the prior comparable period.

## Recycling

Global recycling fell short of Q3'20, declining 9% (-46 koz) to 480 koz. Platinum autocatalyst recycling dropped by 8% (-30 koz) to 361 koz. This owed much to the strength of Q3'20 when the market had emerged from lockdown restrictions. In addition, weaker quarter-on-quarter PGM prices encouraged some scrap yards to stockpile material while evaluating if the price dips signalled new price levels or were temporary. However, the impact of this was partially offset as smelters and refiners continued to use the opportunity provided by lower receipts to continue processing some of their backlog. Despite more favourable platinum prices (+13%) compared to Q3'20, jewellery recycling also declined in Q3'21 by 14% (-17 koz) to 104 koz. Given that around 40% of jewellery recycling comes from China, which is often the result of consumers trading older heavier pieces for new, more fashion forward, lighter pieces, lower jewellery demand directly impacted recycling. Platinum from electronic waste grew marginally by 2% (0.35 koz).

Chart 2: Platinum supply, koz

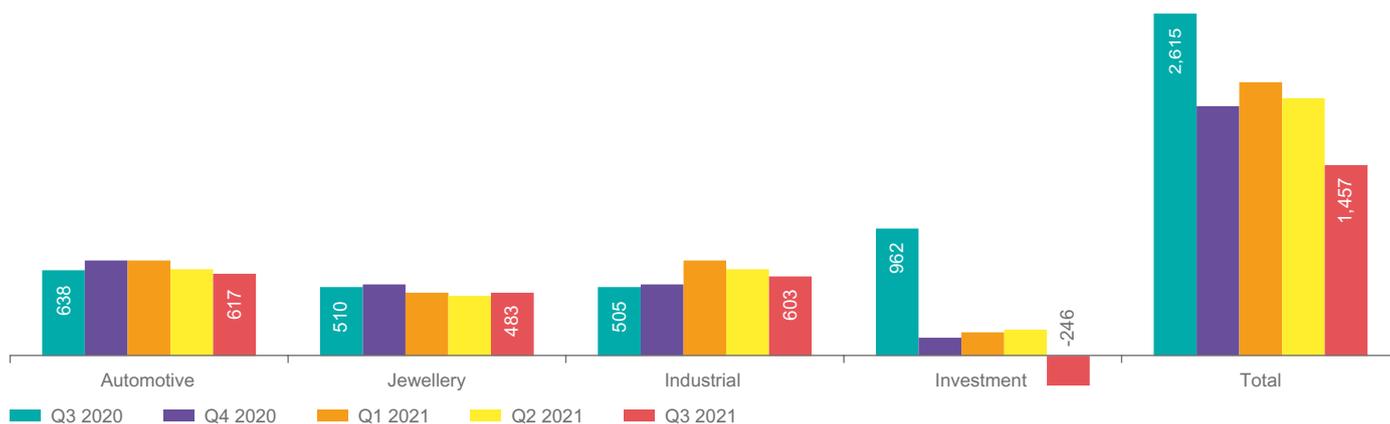


Source: Metals Focus

## Demand

Total demand in Q3'21 was 44% (-1,158 koz) lower than in Q3'20. This was mainly driven by the change in investment demand and in stark contrast to the all-time high investment demand in Q3'20. Net liquidations in ETF holdings of -195 koz and the drawdown of Nymex exchange stocks of -173 koz resulted in overall net disinvestment of -246 koz, compared to net investment demand of +962 koz in Q3'20. Meanwhile, the deepening semiconductor crisis resulted in severe automotive production cuts, which were not offset by increased loadings and platinum for palladium substitution, resulting in a 3% (-21 koz) decline in platinum automotive demand.

Chart 3: Platinum demand, koz



Source: Metals Focus

Jewellery demand, too, came under pressure, as a shifting preference for gold in China offset strong growth in Europe and North America, resulting in a 5% decline (-27 koz) for the global total during the quarter. In contrast, industrial demand jumped 20% (+98 koz), as glass, oil and chemical offtake grew strongly compared with the COVID-impacted Q3'20, despite raw material constraints in some sectors.

### Automotive demand

Despite a 16% cut in vehicle production during Q3'21, caused by the persistent semiconductor shortage and emerging supply tightness for other vehicle parts, demand for platinum declined by only 3% (-21 koz). Tighter emission legislation and platinum for palladium substitution in some regions softened the impact from the overall loss in vehicle numbers.

In Europe, overall light vehicle production dropped by 24%, resulting in platinum demand falling by 20% (-57 koz). Aside from the lower vehicle numbers, diesel's falling share of new car sales also contributed to the decline in platinum demand. LMC Automotive reports that, for September 2021, the diesel share stood at 17.4%, bringing the Q3'21 average share down to only 20%.

North American vehicle output, too, was hard hit in Q3'21, with light vehicle production down by 24% and heavy-duty vehicles declining more moderately by 3%. In spite of these results, three factors saw regional platinum demand remain at the same level as Q3'20. First, in response to the chip shortage and to protect margins, OEMs favoured the production of larger body types, such as SUVs ahead of more conventional models. (Larger vehicles typically require higher PGM loadings.) Second, some automakers and autocatalyst fabricators reported a moderate acceleration in substitution of platinum for palladium, in both gasoline passenger vehicles and diesel heavy-duty vehicles. Finally, within light-duty, diesels suffered a less dramatic decline than gasoline-powered vehicles (-13% vs -26%).

The impact of the now fully implemented China 6a for passenger vehicles and China VI for heavy-duty vehicles, combined with platinum for palladium substitution, resulted in overall platinum demand growth of 33% (+25 koz), despite a 16% decline in passenger car production and 62% drop in heavy-duty output (the latter albeit from a high base).

In the Rest of the World, demand grew by a modest 4% (+5 koz), as part-shortages had less of an impact on production compared to Europe and North America in particular.

### Jewellery demand

During Q3'21, global platinum jewellery demand grew compared to Q2'21 but contracted 5% (-27 koz) year-on-year to 483 koz, with divergent trends seen across different markets. European fabrication continued its recovery, with a 25% (+13 koz) year-on-year rise (+19% on pre-pandemic Q3'19), due to economies re-opening, weddings taking place and booming sales for high-end brands. North American demand surged by 64% (+41 koz) year-on-year and was up 28% on Q3'19, thanks to jewellery capturing a larger share of consumer expenditure, given still limited options for travel and other discretionary spending, retailers' enthusiasm in stocking the metal and the economic recovery.

Although somewhat better in Q3'21, Chinese platinum jewellery fabrication maintained the downward trend from the previous quarter, falling 30% (-76 koz) in Q3'21 as gold jewellery demand continued to enjoy both retail and consumer support.

In Japan, platinum jewellery also struggled, shedding 20% year-on-year (-19 koz), as for much of the quarter the country was in a state of emergency. Similar to China, a preference for yellow alloys displaced platinum. Anecdotal evidence suggests that demand at the retail end fared better than fabrication, suggesting inventory drawdowns over the period. TV and online shopping continued to perform extremely well, providing some offset to weak "bricks and mortar" sales.

Indian jewellery fabrication doubled to 17 koz in Q3.21. This strength was primarily due to positive consumer sentiment as COVID-19 caseloads declined and vaccination rates improved. This renewed optimism has led to re-stocking by retailers ahead of the festive season and inventory build-up for key jewellery shows. However, despite the impressive percentage growth, quarterly fabrication remains below 2019 levels.

### Industrial demand

Industrial demand softened by 9% (-61 koz) against Q2'21, but was up 20% (+98 koz) on Q3'20, which was suffering from the large-scale pandemic induced restrictions prevalent at the time.

### Petroleum

Demand remained steady at 45 koz on a quarter-on-quarter basis, although volumes were significantly higher than the COVID-affected low base in Q3'20. Despite firmer oil prices, the recovery in global oil refining output was slow, especially over July-August when ongoing COVID-related restrictions in emerging Asian countries and the impact elsewhere of adverse weather affected refinery operations. There have been signs of improvements since September, partly assisted by a switch to oil products, in response to a rapidly worsening energy crisis. Over the quarter, new capacity additions were muted, with China the only country that has continued to witness meaningful growth.

### Chemical

Platinum demand rose by 27% (+33 koz) year-on-year to 157 koz in Q3'21. In keeping with Q2'21, the ongoing expansion of the Chinese petrochemical sector continued to help lift platinum offtake. For example, in August, Ningxia Runfeng New Materials Technology started its 300,000t/year Propane Dehydrogenation (PDH) unit. Demand for platinum from the silicone industry also posted a major rebound year-on-year, as the global economy recovered from a COVID-disrupted low base. That said, this recovery faced increasing headwinds during Q3, after significantly higher costs for raw materials, especially silicon metal (which surged 300% within less than 2 months), undermined profitability. With regards to nitric acid, demand for platinum weakened, as much of the fertiliser industry effectively came to a halt amid soaring gas prices (nitric acid is largely used as a feedstock in the production of fertiliser).

### Medical and Biomedical

As higher vaccination rates globally alleviated the pressure on the medical care industry, most regions have reported normalisation of elective surgeries where platinum devices can be used. In addition, cancer detection and treatment programmes resumed, which include the use of platinum containing active pharmaceutical ingredients (APIs). Platinum use in the medical sector accordingly grew 4% (+2 koz) during Q3'21.

### Glass

New fibreglass and LCD tank capacity installations in China resulted in a 26% (+33 koz) growth in platinum demand year-on-year to 164 koz in Q3'21. The increase was partly due to pandemic-related constraints last year where most of the investments and start-ups of new plants were delayed. In this regard, platinum demand in the glass industry remains healthy, supported by strong demand for related end-products. Meanwhile, investment activity will continue to be focused on China for the remainder of the year.

### Electrical

In Q3'21, the growing adoption of a "living with COVID-19" approach by many governments has seen a greater number of the global workforce return to offices. As such, demand from the electrical segment rose by 9% (+3 koz) year-on-year as (hard disk drive (HDD) shipments exceeded expectations due to broad-based growth in mass-capacity end markets, as well as gains in semiconductor applications. Both the nearline and cloud storage markets performed well, driven by the resumption of business activities and improving enterprise spending, which offset the moderation in the consumer electronics sector.

### Other

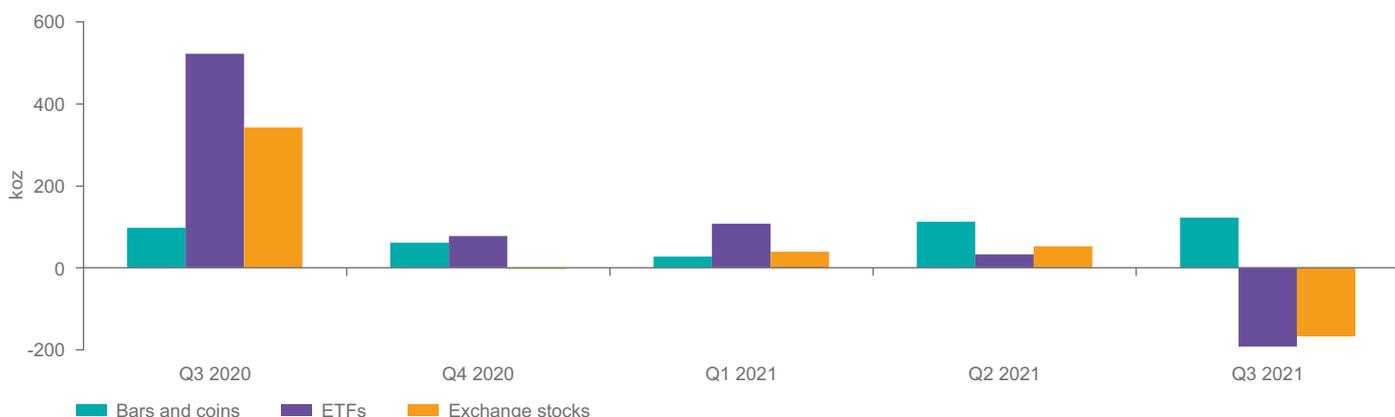
Demand from the Other industrial segment in Q3'21 increased by 2% (+2 koz) year-on-year. The growth in spark plugs and sensors demand remained affected by lower vehicle production, which was offset by healthy demand from the aftermarket as consumers invested in vehicle maintenance.

## Investment demand

Investment demand was -246 koz in Q3'21 as exchange warehouse stocks declined by 173 koz and ETF holdings contracted by 195 koz, which together offset a 25% (+24 koz) jump in bar and coin demand in Q3'21 which reached 122 koz. The percentage increase in bar and coin purchases was mainly due to Japan more than doubling from a low base in Q3'20, although absolute levels in the country were still below historical averages. By contrast, North American demand eased back by 7% year-on-year. Importantly, investor sentiment towards the wider precious metals complex remained positive during Q3'21, with little sign of any material selling back.

The contraction in ETF holdings, which started in the previous quarter, gathered pace in Q3'21, driven by South African funds. Elsewhere, outflows of Nymex exchange stocks saw these fall to 541 koz by the end of Q3'21, after peaking at around 718 koz in early July. During Q3'21, the factors that had previously supported higher stocks in Nymex depositories started to weaken. First and foremost, EFP arbitrage opportunities initially dwindled and eventually turned negative, encouraging the withdrawal of metal from New York vaults for delivery into London. In part, this related to the rise in lease rates over the quarter. In turn, this was probably due to persistently strong imports into China, where our field research suggests there is healthy quasi-speculative demand from local market participants. Second, with most of last year's severe bottlenecks gone, it seems that risk departments have relaxed some of the hedging and physical inventory requirements implemented last year, amid the heightened price volatility and severe logistical constraints seen at the time.

**Chart 4: Platinum Investment, koz**

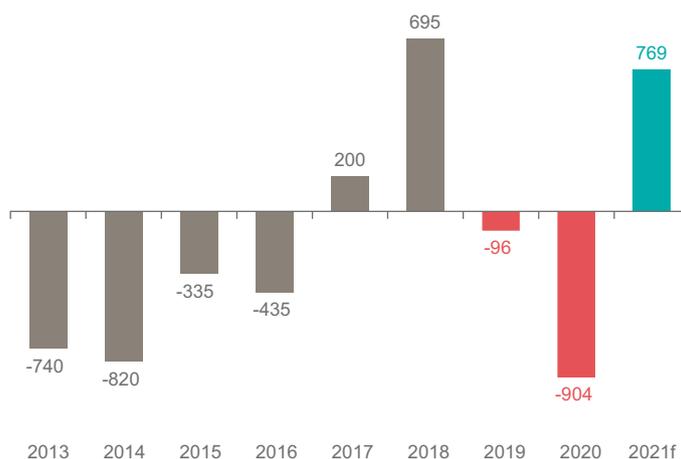


Source: Metals Focus

## 2021 OUTLOOK

The global economy continues to recover despite COVID-19 flare-ups, with the IMF projecting a growth rate of 5.9% in 2021. However, mismatches between supply and demand persist, which will limit the recovery in industrial production, as well as dampen investment in platinum. Total platinum demand is expected to contract by 5% (-381 koz). This is due to our expectation that investment demand will fall sharply, by 86%, from its exceptionally high base in 2020. Other demand categories, by contrast, are expected to see gains across the board. Automotive demand is forecast to grow 14% (+340 koz), despite anticipated dramatic cuts in production, while industrial demand is set to increase 26% (+514 koz). Jewellery demand is forecast to recover by a moderate 5% (+94 koz). In contrast, total supply will benefit from the strong recovery of +25% (+1,231 koz) in mine supply, as both pandemic and operational constraints experienced in 2020 have largely been overcome this year. Moderate gains (+62 koz) are expected for recycling, as lower vehicle scrappage rates are set to impact the last quarter. Total supply is therefore expected to increase by 19% (+1,292 koz). The combination of strong supply and falling demand will see the platinum market shift into a surplus of 769 koz, which compares with the deep deficit of 904 koz in 2020.

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



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

## Supply

We have revised our 2021 supply outlook higher as producers continue to successfully mitigate pandemic risks, while the speed of processing the circa 560 koz of semi-finished material, built up as a result of last year's ACP shutdown, continues to exceed expectations. Over the first 9 months of 2021, around 270 koz of this semi-finished stock was processed through the ACP Phase A following the rebuild that was completed in November 2020. Total mining supply is expected to reach 6,137 koz - up 25% year-on-year as recovering mine output, is boosted by processing of semi-finished stock.

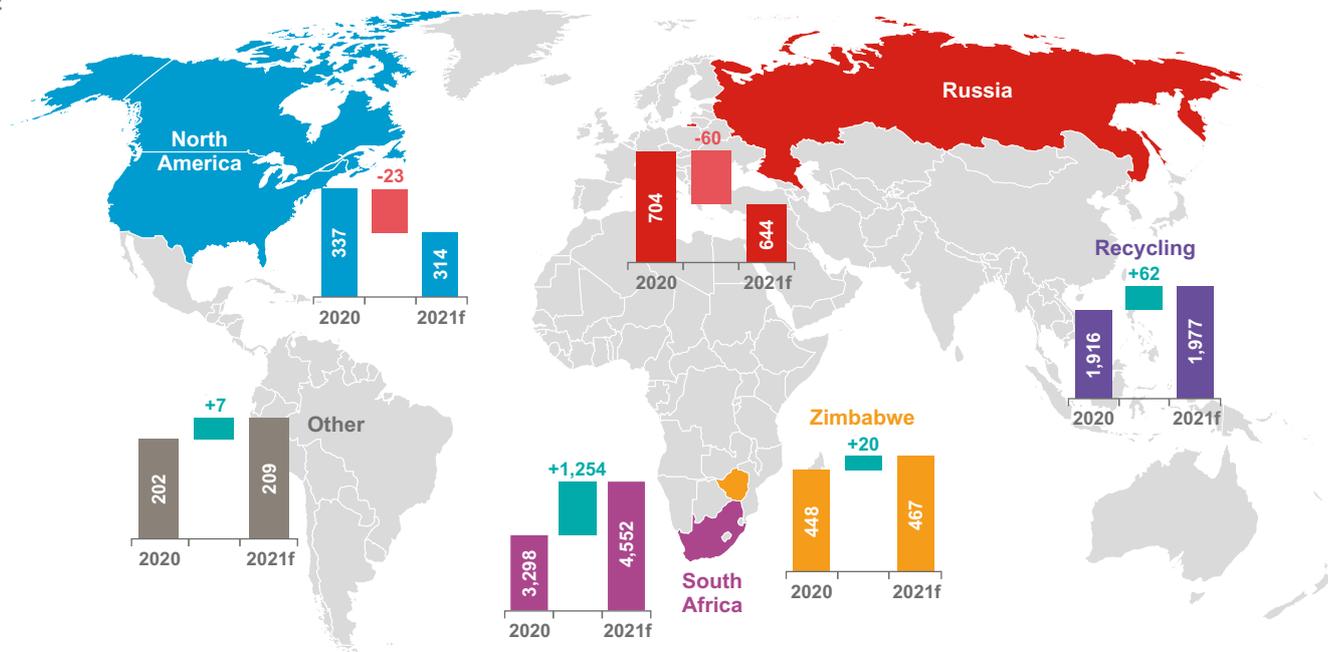
The South African platinum producers have posted a strong recovery from last year's Covid-related and processing disruptions, with output projected to increase by 38% (+1,254 koz) year-on-year to 4,552 koz a new high for the decade. Strong PGM basket prices have enabled increased working costs which has increased operational flexibility when dealing with typical mining production challenges. For example, miners have brought in contract labour to offset increased rates of pandemic related absenteeism. Additionally, increased sustaining capex budgets have led to increased spending on fleet replacement and mine development, aiding production stability.

Russian output is forecast to fall 60 koz, or 8%, year-on-year, as the in-process inventory release in Q1 will fail to mitigate the ongoing disruption caused by the February Nor Nickel mine flooding and concentrator building collapse. Remediation of the mines and concentrator is nearing completion, with a return to full capacity expected in December.

Expected growth from North American project development has failed to materialise, as a strike at Vale's Sudbury complex and safety related production restrictions at Sibanye Stillwater's Montana operation are expected to result in a 23 koz decline (-7%) in production.

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

koz



Source: Metals Focus

## Recycling

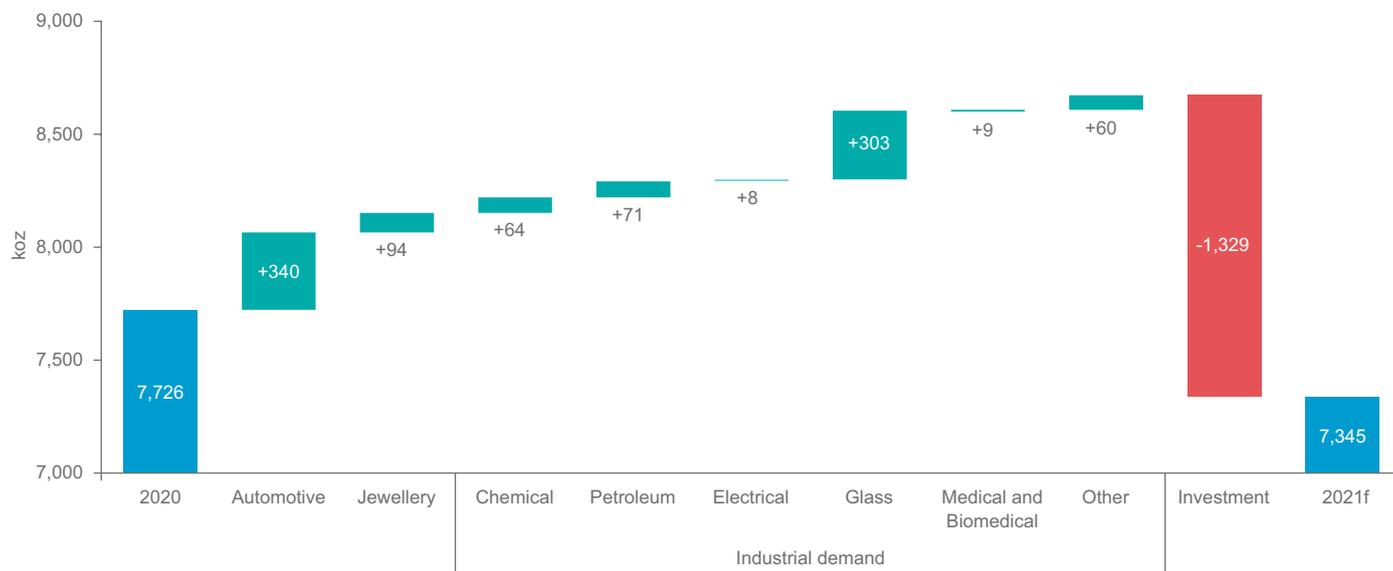
Total recycling of platinum is forecast to rise by 3% (+62 koz) in 2021 to 1,977 koz. Autocatalyst recycling is forecast to grow by 4% (+57 koz) to 1,495 koz. This reflects three broad issues. The first and most important is the impact of the historical use of platinum in after treatment systems during the early part of the previous decade. During this time, platinum autocatalyst demand strengthened in Europe, especially in the light-duty sector, as diesel passenger vehicle popularity grew and to meet tighter emissions legislation. The impact of higher platinum vehicle volumes and loadings at that time is now feeding through into higher levels of recycling. The second factor, affecting the amount of platinum collected from spent autocatalysts, was the strength of PGM prices during the first half of this year, which encouraged yards to de-stock any remaining inventory that had not already been attracted by the high PGM price levels in 2020. Finally, the supply chain has returned to more “normal” operations, with little sign of earlier lockdown restrictions affecting the collection or processing of spent autocatalysts.

Jewellery recycling in 2021 is set to grow by just 1% year-on-year (+2 koz), as the modest 2% rise in China is partly offset by lower recycling in Japan. Electronic recycling will also register a small increase of 3% (+2 koz), as supply chain bottlenecks continue to ease and as work from home prompts new technology sales adding to increased disposal of older devices.

## Demand

Total demand in 2021 is expected to contract by 5% (-381 koz) to 7,345 koz. Despite weak car production, autocatalyst demand is forecast to increase by 14% (+340 koz), while growing luxury consumption sees a modest rise in jewellery of 5% (+94 koz). In addition, we expect all industrial demand segments to grow compared to 2020, increasing by 514 koz overall to 2,169 koz. Lower investment demand, however, will offset these gains. Coin and bar purchases are expected to decline by 38% (-221 koz) from the previous year’s high of 586 koz, while declines in both ETF holdings (-549 koz) and exchange stock movements (-558 koz) will result in a year-on-year drop in investment demand of 1,329 koz.

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



Source: Metals Focus

## Automotive demand

Due to the record length of lead-times for the supply of chips, automotive manufacturers sharply revised production forecasts downwards in short succession during Q3'21, with the result that full year passenger car production is now forecast to be 77m, significantly down from the 87m forecast at the start of 2021 and a mere 3% up on the pandemic impacted 2020. Therefore, we have also lowered our platinum demand growth expectations for 2021. Automotive demand is now expected to grow by 14% (+340 koz), supported by tightening emissions legislation and the substitution of palladium by platinum, which is now estimated to be just over 200 koz this year.

In Europe, demand is now expected to be lower than pandemic--impacted 2020 and 26% below 2019 due to the declining share of diesel engines produced. Platinum demand will fall 1% (-7 koz) as the 1% growth in light vehicle production for the full year leans heavily towards battery electric vehicles, which are expected to grow by 69% in the region, while production of diesel passenger cars declines by 9%.

North American light-duty vehicle output will also post a modest growth of 3%, but platinum demand will jump by 31% (+92 koz) driven by significant growth in hybrid and mild hybrid vehicle production, along with strategies to help protect profit margins, favouring production of SUVs and pick-up trucks ahead of smaller passenger cars. In addition, demand was further supported by the increase in the average platinum ratio contained in gasoline and diesel automotive catalyst washcoats.

In China, automotive demand will grow by 42% (+118 koz) despite flat car production levels and a 15% decline in heavy-duty vehicle production numbers. The implementation of China 6a, along with the phase-in of China VIa for heavy-duty vehicles, have supported growth in platinum demand. Although significant pre-buying favoured China V trucks and certain regions still allowing the sale of China V vehicles in the second half of this year, around 37% of trucks and buses in 2021 will be produced with a China VI compliant after-treatment system. Substitution of platinum for palladium has also received growing interest in China.

Following the emergence out of lockdown in other regions, tighter emissions standards, along with the production of larger vehicles such as vans, pick ups and SUVs, will contribute to the expected 25% (+115 koz) increase in demand.

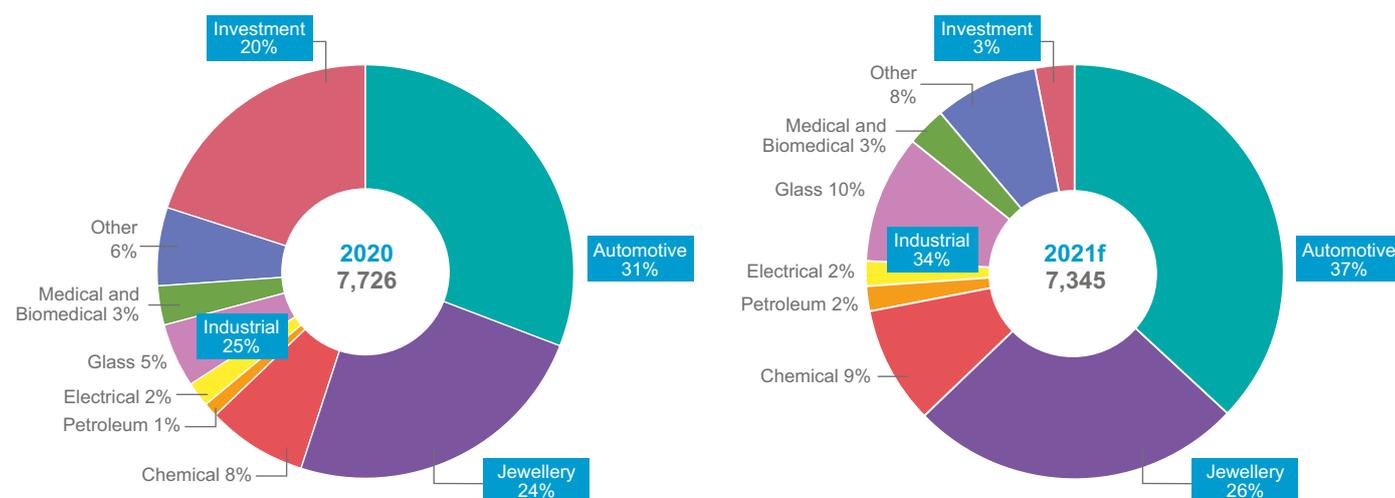
## Jewellery demand

This year global jewellery consumption is forecast to rise by 5% (+94 koz) to 1,914 koz. European 2021 demand growth is now put at 25% (+50 koz) thanks to economic recoveries, re-stocking and a possible record year for the high-end segment. North America is now expected to enjoy a 46% (+129 koz) year-on-year rise (up 19% on 2019), thanks to the economic recovery, the re-start of weddings and enthusiastic re-stocking. Japanese demand is also expected to increase overall, but remain short of pre-pandemic levels, largely reflecting the ongoing impact of COVID-19 over the first nine months of 2021 and in spite of a robust recovery expected late in the year. In contrast, Chinese platinum jewellery demand is forecast to fall by 14% (-119 koz) to 713 koz as retailer strategies currently favour gold. In India we believe that sales will remain robust during the festive and wedding season, resulting in 35% (+17 koz) growth this year.

## Industrial demand

The use of platinum in industrial applications is expected to increase by 26% (+514 koz) year-on-year and 18% (+374 koz) on 2019. Chemical demand is forecast to rise by 11% (+64 koz) year-on-year, while petroleum will surge by 65% (+71 koz). Plant expansions will see glass demand grow 72% (+303 koz). Other Industrial Demand, which includes non-automotive fuel cell applications, automotive sensors and spark plugs, will grow by 12% (+60 koz), while medical platinum demand is expected to rise by 4% (+9 koz).

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



Source: Metals Focus

## Petroleum

Following a temporary slowdown during Q3, the recovery in global oil demand has regained momentum in October. In addition to improving economic activity (following a relaxation of lockdown restrictions in the Asia Pacific region), surging gas prices and tighter coal supplies have also encouraged a switch to oil for power generation by some industries. For the full year, platinum offtake is expected to record a 65% (+71 koz) year-on-year rise to 179 koz, albeit against a COVID-disrupted low base.

## Chemical

Surging energy prices, significantly higher raw materials and supply chain disruptions are likely to continue weighing on platinum's use in some chemical applications during Q4'21. Faced with price spikes and tighter supplies of silicon metal, some silicone manufacturers recently announced a major rise in product prices while some declared force majeure on sales of certain silicone-based products. The nitric acid industry, too, is likely to remain under pressure, as energy prices remain elevated during the northern hemisphere winter season. Overall, these near-term headwinds will continue to weigh on platinum demand, with offtake forecast to remain broadly flat quarter-on-quarter in Q4. For the full year, a low COVID-disrupted base means that demand is still expected to rise by 11% year-on-year, though the projected 2021 total is now slightly lower than previously anticipated.

### **Glass**

Following exceptionally strong levels over the first nine months of the year, we expect glass demand to slow considerably in the final quarter. However, this will still see the full-year total increase by 72% (+303 koz), which reflects unprecedented demand for expansions of both LCD substrate and composite capacity.

### **Medical and Biomedical**

Despite the risk of resurgence of the pandemic, higher vaccination rates have seen improved medical care services. With elective procedures and cancer treatment regimes both resuming that include the administration of platinum containing APIs, we forecast a growth of 4% (+9 koz) for the full year.

### **Electrical**

The growing trend to support hybrid work structures will see electronics demand for platinum, mainly from HDD, increase by 6% (+8 koz) this year.

### **Other**

While the chip shortage continues to plague the second half of 2021, we expect an overall recovery of 12% (+60 koz) in 2021. Not only will we see demand for after-market parts, such as sparkplugs and sensors grow by 11%, as owners are forced to hold on to and maintain their vehicles for longer, but increased demand from the aerospace industry to accommodate new communication technologies and accelerated number of low-earth-orbiting satellites will also add to growth. The increased production of green hydrogen has also seen modest additions of PEM electrolyser capacity this year.

### **Investment demand**

Bar and coin investment this year is forecast to see a pronounced 38% decline (-221 koz) leaving the global total at 365 koz. Even so, in absolute terms, the total will still remain high by historical standards, thanks to a robust performance in North America, which is still seeing strong retail buying across all key precious metals. However, this outcome will be offset by a collapse in net demand in Japan, owing to the net disinvestment seen in the first quarter.

Following the liquidations in Q3'21 we expect global ETF holdings to contract 40 koz this year, as accumulations in Europe are not expected to offset the outflows from South African and North American funds.

At the end of October, Nymex approved exchanges held 522 koz, 110 koz below January 2021 levels. As outlined in our Q3'21 review, with little EFP benefit, as well as dissipating concerns from market-makers' risk departments, keeping metal in New York makes less sense. In addition, higher lease rates have incentivised some relocation of stock, while increased trade flows to China have also probably, at least indirectly, contributed to withdrawals. As we expect these drivers to remain unchanged for the rest of the year, we forecast an overall decline of 100 koz in exchange stocks.

### **ABOVE GROUND STOCKS**

Following the decline in investment demand we expect a substantial surplus of 769 koz in 2021, a 1.7 moz net change compared to 2020. This will result in above-ground stocks rising to 3,419 koz, covering 5.5 months' worth of demand.

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.

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### 2022 OUTLOOK

#### Supply

In 2022, total supply is forecast to increase by 1% (+121 koz) year-on-year to 8,235 koz. Mine supply is expected to grow 1% to 6,203 koz, while recycling will rise 3% (+55 koz), to 2,032 koz.

Several tailwinds that elevated mine supply this year will persist into 2022. Although diminished, the industry will enter next year with high levels of semi-finished inventory, the continued processing of which will again inflate South African refined production during 2022. Additionally, strong PGM prices and the resulting benefit to cashflow have deleveraged the industry, with many producers increasing operational expenditure to improve production stability and some have increased expenditure on growth projects.

Of the circa 560 koz of excess semi-finished inventory accumulated during the 2020 ACP shutdowns we estimate that around 190 koz will remain at the start of 2022. Other producers have also accumulated semi-finished inventory, arising from Northam's furnace rebuild and planned maintenance at Impala Refining Services. The processing of this semi-finished material will continue through 2022, albeit at a lower rate than in 2021, and boost South African refined platinum output, which is forecast to decline 1% (-38 koz) to 4,514 koz. The triennial wage negotiations for the three major producers are due to start in 2022, representing a risk to labour relations. However, if typical historical timelines are maintained, any risk of disruption are unlikely to materialise until 2023.

Underlying Zimbabwean mined output is expected to grow next year due to processing debottlenecking and mine development. However, the normalisation of semi-finished material through South African smelters and refineries is expected to result in Zimbabwean refined output remaining essentially unchanged at 465 koz.

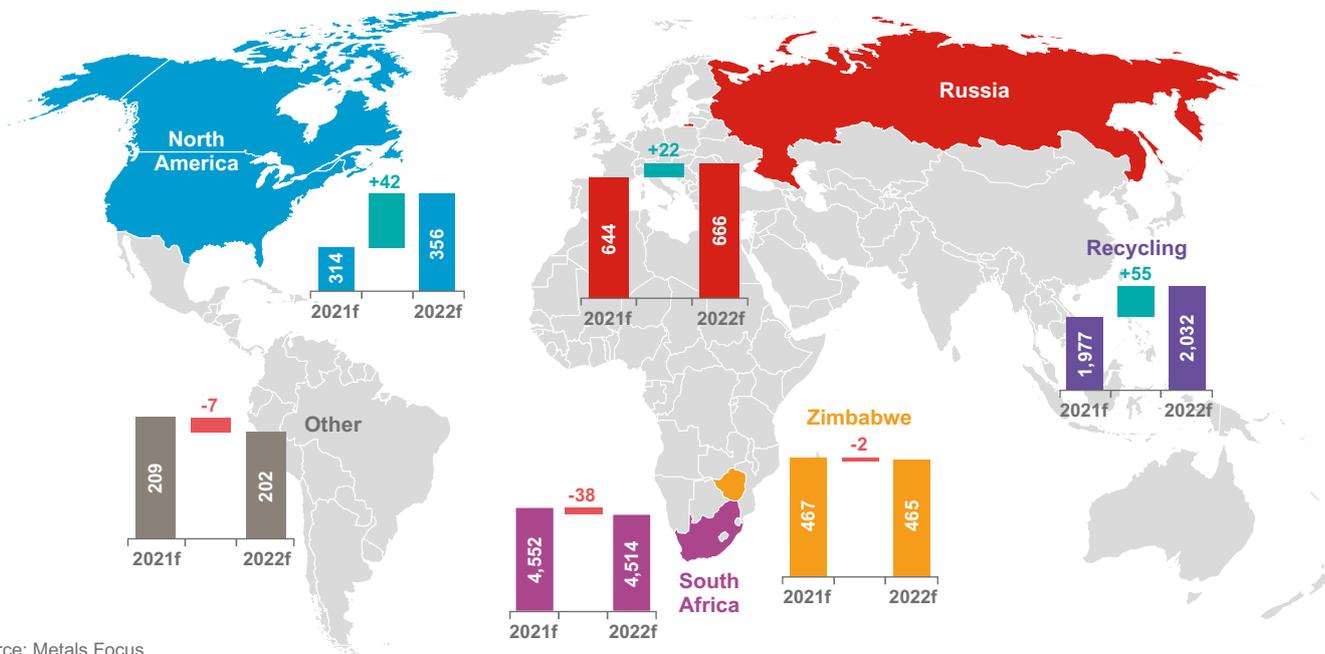
Output from Russia is forecast to increase 3% (+22 koz), recovering from the mine flooding and concentrator building disruptions of 2021. Volumes will however be limited by planned smelter maintenance.

North America is expected to add 42 koz (+13%) as disruption normalises and project development progresses. However, the ramp-up of new production areas brings inherent risks and regional labour shortages may hamper growth.

Next year, 4% growth (+64 koz) is expected for global platinum autocatalyst recycling, which will reach 1,559 koz. As noted above, the key driver will be the ongoing historical trend in platinum autocatalyst loadings. Two other factors are also worth highlighting. The first concerns the impact of stockpiling by scrap-yards during late-2021 and the extent to which this extends into early 2022. At some point next year, this is likely to result in fewer ounces being refined. However, the impact of this should be relatively short-lived, as scrapyards adjust their price expectations and eventually release cannisters into the market. Related to this will be the lack of smelting and refining capacity, which is expected to become more of an issue during the latter part of 2022; this could therefore weigh on the amount of PGMs that are processed. Jewellery recycling volumes in 2022 are forecast to decline by 2% (-10 koz), as jewellery sales strategies in China are not expected to incentivise the same rate of trading in of older for newer pieces.

**Chart 9: Changes in supply, 2021f vs. 2022f**

koz



Source: Metals Focus

## Demand

Continued economic recovery and easing supply-chain bottlenecks should see global demand for platinum increase in 2022. We forecast a 3% (+253 koz) rise to 7.6 moz, which will be a little shy of 2020 levels and still considerably short of its pre-pandemic 2019 total.

We forecast a 20% (+533 koz) increase in automotive demand for 2022. While previous light-duty production forecasts were estimated to be 93m units, the chip shortage and other raw material shortages such as magnesium, have resulted in a downward revision to 85m units, well below the 2019 level of 89m. While lower than 2019, this represents a healthy 11% growth on 2021 levels, while heavy-duty production is also expected to grow modestly by 1%. In addition to higher volumes, platinum for palladium substitution in 2022 is expected to more than double compared to 2021 which will offset the thrifing of overall PGM loadings, as auto makers look to lower costs while complying with stringent emission legislation.

Jewellery demand in 2022 is forecast to decline modestly by 1%, as we expect Chinese consumer preference for gold jewellery to persist. European fabrication in 2022 is projected to decline at the margin, as retailers' re-stocking ends and consumer expenditure switches to travel and other services. The weak start to 2021 and buoyant expectations for high-end jewellery and watch brands this year, however, mean a meaningful decline in 2022 should be avoided. North American fabrication may dip next year as re-stocking ends, pent-up demand fades and expenditure patterns normalise. However, a more solid economic backdrop, improved consumer sentiment and the enthusiasm for the metal shown by both consumers and retailers rule out a larger pullback and could easily mean offtake surprises to the upside.

Chemical demand is expected to fall by 6% (-41 koz) to 608 koz in 2022. However, it is worth stressing that volumes in absolute terms are still expected to remain high by historical standards. The projected decline is partly due to a slower pace of petrochemical capacity expansions in China, which accounted for the overwhelming majority of global new paraxylene (PX) and propane dehydrogenation (PDH) plants over 2020-21. As few units currently under construction are scheduled to be completed in 2022, this will reduce demand for platinum bearing catalysts. Elsewhere, high input costs are likely to affect nitric acid production, especially in Europe, which in turn will negatively affect platinum offtake. By contrast, platinum use in the silicone industry is expected to grow further, albeit by a slower pace next year. While high input costs also pose a near-term challenge to the industry, demand for silicone products is expected to continue strengthening on the back of improving economic conditions.

Platinum offtake from the oil industry is projected to continue improving in 2022, up by 8% (+15 koz) to 194 koz. The ongoing recovery in oil refining output remains the key driving force. Despite a slowing world economy in the near term, the International Energy Agency has upgraded its forecast for oil demand in 2022, as acute shortages of natural gas and coal will lead to a switch to oil products.

**Chart 10: Changes in demand by category, 2021f vs. 2022f**



Platinum demand will be further assisted by new refining capacity additions. Continuing the trend in recent years, China will account for a good portion of global new capacity. In late October, the country published a detailed plan to meet its carbon emission target by 2030. Within this, the government still expects to add oil refining capacity over the coming years, though annual capacity will be capped at 1 billion tonnes by 2025, compared to less than 900 million at present. Outside China, however, new refining capacity additions will be limited in 2022, which will restrain growth for platinum bearing catalysts. This in turn reflects heavy reductions in capital spending on capacity expansion by oil companies over 2020-21, after the industry was hit hard by the pandemic.

In the electrical segment, growing demand from the semiconductor industry looks promising with the growing adoption of energy-assisted magnetic recording drives expected to help platinum usage due to higher metal loadings per disk. However, given that the need for 'Work-From-Home' may gradually fade, and market share loss due to fierce competition from solid-state drive (SSD) in mass-storage applications, the HDD market is likely to return to its long-term secular decline resulting in platinum offtake being unchanged next year.

Medical demand is forecast to grow 3% (+6 koz) as demand for platinum-based cancer treatments increases and surgical procedures, involving the use of platinum containing devices, continue to rise.

Following exceptionally strong demand of 2021, a sharp decline in glass demand next year is expected. This is in line with past industry growth cycles, as it is often the case that capacity expansions/investments are concentrated to take advantage of economies of scale and are often followed by a sustained period of lower investment. We thus forecast that platinum demand from the glass industry will halve to 348 koz in 2022.

Next year, a 10% gain (+37 koz) is expected for global platinum bar and coin demand. Even though the projected 402 koz will still fall short of 2020's historically high 586 koz, it will remain elevated. Retail buying is forecast to increase in both North America and Japan, continuing the trend seen during much of 2021.

Following unprecedented ETF demand in 2019 and 2020, the slowdown in 2021 was anticipated and is expected to persist in 2022. In addition, given that exchange stocks remain historically high, and the market is forecast to be in surplus, a decline in stocks held at exchanges during 2022 seems likely.

## ABOVE GROUND STOCKS

While lower than 2021 by 132 koz, the market is expected to remain in a surplus of 637 koz in 2022, which will result in above-ground stocks increasing to 4,056 koz, just short of 6.5 months of demand cover.

The WPIC definition of above ground stock 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 Q3 2021

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

	2013	2014	2015	2016	2017	2018	2019	2020	2021f	2022f	2021f/2020 Growth %	2022f/2021f Growth %
<b>Platinum Supply-demand Balance (koz)</b>												
<b>SUPPLY</b>												
<b>Refined Production</b>	<b>6,070</b>	<b>4,875</b>	<b>6,160</b>	<b>6,045</b>	<b>6,130</b>	<b>6,125</b>	<b>6,100</b>	<b>4,989</b>	<b>6,187</b>	<b>6,203</b>	<b>24%</b>	<b>0%</b>
South Africa	4,355	3,135	4,480	4,265	4,385	4,470	4,399	3,298	4,552	4,514	38%	-1%
Zimbabwe	405	405	405	490	480	465	458	448	467	465	4%	-1%
North America	355	395	365	390	360	345	356	337	314	356	-7%	13%
Russia	740	740	710	715	720	665	716	704	644	666	-8%	3%
Other	215	200	200	185	185	180	170	202	209	202	3%	-3%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-215</b>	<b>+350</b>	<b>+30</b>	<b>+30</b>	<b>+30</b>	<b>+10</b>	<b>+2</b>	<b>-84</b>	<b>-50</b>	<b>+0</b>	<b>N/A</b>	<b>N/A</b>
<b>Total Mining Supply</b>	<b>5,855</b>	<b>5,225</b>	<b>6,190</b>	<b>6,075</b>	<b>6,160</b>	<b>6,135</b>	<b>6,102</b>	<b>4,906</b>	<b>6,137</b>	<b>6,203</b>	<b>25%</b>	<b>1%</b>
<b>Recycling</b>	<b>1,980</b>	<b>2,035</b>	<b>1,705</b>	<b>1,840</b>	<b>1,895</b>	<b>1,935</b>	<b>2,117</b>	<b>1,916</b>	<b>1,977</b>	<b>2,032</b>	<b>3%</b>	<b>3%</b>
Autocatalyst	1,120	1,255	1,185	1,210	1,325	1,420	1,584	1,438	1,495	1,559	4%	4%
Jewellery	855	775	515	625	560	505	476	422	424	414	1%	-2%
Industrial	5	5	5	5	10	10	57	56	58	59	3%	1%
<b>Total Supply</b>	<b>7,835</b>	<b>7,260</b>	<b>7,895</b>	<b>7,915</b>	<b>8,055</b>	<b>8,070</b>	<b>8,219</b>	<b>6,821</b>	<b>8,114</b>	<b>8,235</b>	<b>19%</b>	<b>1%</b>
<b>DEMAND</b>												
<b>Automotive</b>	<b>3,130</b>	<b>3,245</b>	<b>3,245</b>	<b>3,360</b>	<b>3,300</b>	<b>3,100</b>	<b>2,836</b>	<b>2,365</b>	<b>2,704</b>	<b>3,237</b>	<b>14%</b>	<b>20%</b>
Autocatalyst	2,990	3,095	3,105	3,225	3,160	2,955	2,836	2,365	2,704	3,237	14%	20%
Non-road	140	150	140	135	140	145	†	†	†	†	†	†
<b>Jewellery</b>	<b>2,945</b>	<b>3,000</b>	<b>2,840</b>	<b>2,505</b>	<b>2,460</b>	<b>2,245</b>	<b>2,099</b>	<b>1,820</b>	<b>1,914</b>	<b>1,890</b>	<b>5%</b>	<b>-1%</b>
<b>Industrial</b>	<b>1,565</b>	<b>1,685</b>	<b>1,840</b>	<b>1,950</b>	<b>1,820</b>	<b>2,015</b>	<b>2,127</b>	<b>1,987</b>	<b>2,501</b>	<b>2,169</b>	<b>26%</b>	<b>-13%</b>
Chemical	535	540	515	560	570	565	694	585	649	608	11%	-6%
Petroleum	50	60	205	220	100	235	219	109	179	194	65%	8%
Electrical	195	215	205	195	210	205	144	130	138	138	6%	0%
Glass	145	205	235	255	205	250	236	423	726	348	72%	-52%
Medical and Biomedical	220	225	240	235	235	235	249	239	247	254	4%	3%
Other	420	440	440	485	500	525	585	501	561	627	12%	12%
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>275</b>	<b>15</b>	<b>1,253</b>	<b>1,554</b>	<b>225</b>	<b>302</b>	<b>-86%</b>	<b>34%</b>
Change in Bars, Coins	-5	50	525	460	215	280	283	586	365	402	-38%	10%
Change in ETF Holdings	905	215	-240	-10	105	-245	991	509	-40	50	N/A	N/A
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20	-20	458	-100	-150	N/A	N/A
<b>Total Demand</b>	<b>8,575</b>	<b>8,080</b>	<b>8,230</b>	<b>8,350</b>	<b>7,855</b>	<b>7,375</b>	<b>8,315</b>	<b>7,726</b>	<b>7,345</b>	<b>7,598</b>	<b>-5%</b>	<b>3%</b>
<b>Balance</b>	<b>-740</b>	<b>-820</b>	<b>-335</b>	<b>-435</b>	<b>200</b>	<b>695</b>	<b>-96</b>	<b>-904</b>	<b>769</b>	<b>637</b>	<b>N/A</b>	<b>-17%</b>
<b>Above Ground Stocks</b>	<b>3,400*</b>	<b>2,580</b>	<b>2,245</b>	<b>1,810</b>	<b>2,010</b>	<b>2,705</b>	<b>3,554**</b>	<b>2,650</b>	<b>3,419</b>	<b>4,056</b>	<b>29%</b>	<b>19%</b>

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

Notes:

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

# PLATINUM QUARTERLY Q3 2021

**Table 3: Supply and demand summary – quarterly comparison**

	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q3'21/Q3'20 Growth %	Q3'21/Q2'21 Growth %
<b>Platinum Supply-demand Balance (koz)</b>											
<b>SUPPLY</b>											
<b>Refined Production</b>	<b>1,532</b>	<b>1,581</b>	<b>1,248</b>	<b>942</b>	<b>1,496</b>	<b>1,303</b>	<b>1,468</b>	<b>1,568</b>	<b>1,597</b>	<b>7%</b>	<b>2%</b>
South Africa	1,119	1,186	843	521	1,062	873	1,032	1,180	1,213	14%	3%
Zimbabwe	119	108	108	110	115	115	118	125	111	-4%	-11%
North America	79	94	98	87	71	82	83	75	73	3%	-3%
Russia	174	149	150	175	196	182	184	136	149	-24%	9%
Other	41	42	50	49	52	51	51	52	50	-3%	-3%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-29</b>	<b>+45</b>	<b>+54</b>	<b>+25</b>	<b>-112</b>	<b>-51</b>	<b>-29</b>	<b>+18</b>	<b>-28</b>	<b>N/A</b>	<b>N/A</b>
<b>Total Mining Supply</b>	<b>1,503</b>	<b>1,626</b>	<b>1,302</b>	<b>967</b>	<b>1,384</b>	<b>1,252</b>	<b>1,439</b>	<b>1,587</b>	<b>1,569</b>	<b>13%</b>	<b>-1%</b>
<b>Recycling</b>	<b>516</b>	<b>522</b>	<b>439</b>	<b>370</b>	<b>527</b>	<b>581</b>	<b>510</b>	<b>494</b>	<b>480</b>	<b>-9%</b>	<b>-3%</b>
Autocatalyst	386	387	355	259	391	432	378	382	361	-8%	-5%
Jewellery	116	121	70	97	121	134	118	98	104	-14%	7%
Industrial	14	15	13	13	14	15	14	14	15	2%	1%
<b>Total Supply</b>	<b>2,018</b>	<b>2,149</b>	<b>1,741</b>	<b>1,337</b>	<b>1,911</b>	<b>1,833</b>	<b>1,949</b>	<b>2,081</b>	<b>2,049</b>	<b>7%</b>	<b>-2%</b>
<b>DEMAND</b>											
<b>Automotive</b>	<b>668</b>	<b>680</b>	<b>637</b>	<b>381</b>	<b>638</b>	<b>709</b>	<b>725</b>	<b>653</b>	<b>617</b>	<b>-3%</b>	<b>-5%</b>
Autocatalyst	668	680	637	381	638	709	725	653	617	-3%	-5%
Non-road	†	†	†	†	†	†	†	†	†	†	†
<b>Jewellery</b>	<b>529</b>	<b>496</b>	<b>393</b>	<b>388</b>	<b>510</b>	<b>529</b>	<b>480</b>	<b>461</b>	<b>483</b>	<b>-5%</b>	<b>5%</b>
<b>Industrial</b>	<b>533</b>	<b>502</b>	<b>568</b>	<b>389</b>	<b>505</b>	<b>525</b>	<b>711</b>	<b>664</b>	<b>603</b>	<b>20%</b>	<b>-9%</b>
Chemical	162	190	176	112	124	174	119	214	157	27%	-27%
Petroleum	55	55	33	18	21	36	35	45	45	112%	0%
Electrical	37	36	32	29	33	36	33	35	36	9%	2%
Glass	71	12	150	66	131	77	318	169	164	26%	-3%
Medical and Biomedical	62	62	60	60	60	60	62	59	62	4%	5%
Other	145	147	118	104	137	143	144	141	139	2%	-2%
<b>Investment</b>	<b>251</b>	<b>82</b>	<b>71</b>	<b>385</b>	<b>962</b>	<b>136</b>	<b>162</b>	<b>189</b>	<b>-246</b>	<b>N/A</b>	<b>N/A</b>
Change in Bars, Coins	54	29	305	123	97	60	23	109	122	25%	11%
Change in ETF Holdings	207	47	-213	123	523	76	106	31	-195	N/A	N/A
Change in Stocks Held by Exchanges	-10	6	-20	138	342	-1	33	49	-173	N/A	N/A
<b>Total Demand</b>	<b>1,980</b>	<b>1,760</b>	<b>1,669</b>	<b>1,543</b>	<b>2,615</b>	<b>1,899</b>	<b>2,078</b>	<b>1,967</b>	<b>1,457</b>	<b>-44%</b>	<b>-26%</b>
<b>Balance</b>	<b>38</b>	<b>389</b>	<b>71</b>	<b>-206</b>	<b>-704</b>	<b>-66</b>	<b>-129</b>	<b>114</b>	<b>592</b>	<b>N/A</b>	<b>&gt;±300%</b>

Source: Metals Focus 2019 - 2021.

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.

# PLATINUM QUARTERLY Q3 2021

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

	H1 2019	H2 2019	H1 2020	H2 2020	H1 2021	H1'21/H1'20 Growth %	H1'21/H2'20 Growth %
<b>Platinum Supply-demand Balance (koz)</b>							
<b>SUPPLY</b>							
<b>Refined Production</b>	<b>2,988</b>	<b>3,113</b>	<b>2,191</b>	<b>2,799</b>	<b>3,036</b>	<b>39%</b>	<b>8%</b>
South Africa	2,094	2,305	1,364	1,934	2,212	62%	14%
Zimbabwe	230	228	218	230	243	12%	6%
North America	184	173	185	153	159	-14%	4%
Russia	393	324	325	379	320	-2%	-15%
Other	87	83	99	103	103	4%	0%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-14</b>	<b>+16</b>	<b>+79</b>	<b>-162</b>	<b>-11</b>	<b>N/A</b>	<b>N/A</b>
<b>Total Mining Supply</b>	<b>2,973</b>	<b>3,129</b>	<b>2,269</b>	<b>2,637</b>	<b>3,025</b>	<b>33%</b>	<b>15%</b>
<b>Recycling</b>	<b>1,079</b>	<b>1,038</b>	<b>808</b>	<b>1,108</b>	<b>1,005</b>	<b>24%</b>	<b>-9%</b>
Autocatalyst	811	772	615	823	761	24%	-8%
Jewellery	239	237	167	255	216	29%	-16%
Industrial	29	29	27	29	29	7%	-3%
<b>Total Supply</b>	<b>4,053</b>	<b>4,167</b>	<b>3,077</b>	<b>3,744</b>	<b>4,030</b>	<b>31%</b>	<b>8%</b>
<b>DEMAND</b>							
<b>Automotive</b>	<b>1,488</b>	<b>1,348</b>	<b>1,018</b>	<b>1,347</b>	<b>1,378</b>	<b>35%</b>	<b>2%</b>
Autocatalyst	1,488	1,348	1,018	1,347	1,378	35%	2%
Non-road	†	†	†	†	†	N/A	N/A
<b>Jewellery</b>	<b>1,074</b>	<b>1,025</b>	<b>780</b>	<b>1,039</b>	<b>941</b>	<b>21%</b>	<b>-9%</b>
<b>Industrial</b>	<b>1,093</b>	<b>1,034</b>	<b>957</b>	<b>1,030</b>	<b>1,374</b>	<b>44%</b>	<b>33%</b>
Chemical	343	351	287	298	333	16%	12%
Petroleum	109	109	51	57	80	56%	40%
Electrical	71	73	61	68	68	11%	0%
Glass	152	84	216	207	487	125%	135%
Medical and Biomedical	124	124	119	119	121	1%	1%
Other	293	292	222	279	285	28%	2%
<b>Investment</b>	<b>921</b>	<b>333</b>	<b>456</b>	<b>1,098</b>	<b>351</b>	<b>-23%</b>	<b>-68%</b>
Change in Bars, Coins	200	82	428	158	132	-69%	-16%
Change in ETF Holdings	737	254	-90	599	137	N/A	-77%
Change in Stocks Held by Exchanges	-17	-4	118	341	82	-30%	-76%
<b>Total Demand</b>	<b>4,575</b>	<b>3,740</b>	<b>3,212</b>	<b>4,514</b>	<b>4,044</b>	<b>26%</b>	<b>-10%</b>
<b>Balance</b>	<b>-523</b>	<b>427</b>	<b>-135</b>	<b>-770</b>	<b>-14</b>	<b>N/A</b>	<b>N/A</b>

Source: Metals Focus 2019 - 2021.

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.

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**Table 5: Regional demand – annual and quarterly comparison**

	2013	2014	2015	2016	2017	2018	2019	2020	2021f	2022f	2021f/2020 Growth %	2022f/2021f Growth %	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	
<b>Platinum gross demand (koz)</b>																		
<b>Automotive</b>	<b>3,130</b>	<b>3,240</b>	<b>3,250</b>	<b>3,360</b>	<b>3,295</b>	<b>3,105</b>	<b>2,836</b>	<b>2,365</b>	<b>2,704</b>	<b>3,237</b>	<b>14%</b>	<b>20%</b>	<b>638</b>	<b>709</b>	<b>725</b>	<b>653</b>	<b>617</b>	
North America	425	465	480	410	390	390	341	298	390									
Western Europe	1,350	1,395	1,450	1,640	1,550	1,330	1,445	1,078	1,072									
Japan	585	585	510	450	435	430	306	245	267									
China	130	125	145	195	230	220	185	280	398									
India	165	170	180	170	175	195	††	††	††									
Rest of the World	475	500	485	495	515	540	558	462	577									
<b>Jewellery</b>	<b>2,945</b>	<b>3,000</b>	<b>2,840</b>	<b>2,505</b>	<b>2,460</b>	<b>2,245</b>	<b>2,099</b>	<b>1,820</b>	<b>1,914</b>	<b>1,890</b>	<b>5%</b>	<b>-1%</b>	<b>510</b>	<b>529</b>	<b>480</b>	<b>461</b>	<b>483</b>	
North America	200	230	250	265	280	280	341	277	405									
Western Europe	220	220	235	240	250	255	237	196	246									
Japan	335	335	340	335	340	345	372	316	311									
China	1,990	1,975	1,765	1,450	1,340	1,095	871	832	713									
India	140	175	180	145	175	195	102	48	65									
Rest of the World	60	65	70	70	75	75	176	151	174									
<b>Chemical</b>	<b>535</b>	<b>540</b>	<b>515</b>	<b>560</b>	<b>570</b>	<b>565</b>	<b>694</b>	<b>585</b>	<b>649</b>	<b>608</b>	<b>11%</b>	<b>-6%</b>	<b>124</b>	<b>174</b>	<b>119</b>	<b>214</b>	<b>157</b>	
North America	55	55	55	50	50	50	77	90	100									
Western Europe	110	105	75	110	115	105	125	113	123									
Japan	10	10	10	15	15	15	66	62	65									
China	195	215	230	225	220	215	236	180	186									
Rest of the World	165	155	145	160	170	180	190	141	175									
<b>Petroleum</b>	<b>50</b>	<b>60</b>	<b>205</b>	<b>220</b>	<b>100</b>	<b>235</b>	<b>219</b>	<b>109</b>	<b>179</b>	<b>194</b>	<b>65%</b>	<b>8%</b>	<b>21</b>	<b>36</b>	<b>35</b>	<b>45</b>	<b>45</b>	
North America	40	25	-25	90	55	55	30	5	26									
Western Europe	-45	-20	70	10	5	20	14	11	15									
Japan	10	-35	5	0	-40	5	7	6	7									
China	80	-5	45	80	45	10	66	35	23									
Rest of the World	-35	95	110	40	35	145	103	52	109									
<b>Electrical</b>	<b>195</b>	<b>215</b>	<b>205</b>	<b>195</b>	<b>210</b>	<b>205</b>	<b>144</b>	<b>130</b>	<b>138</b>	<b>138</b>	<b>6%</b>	<b>0%</b>	<b>33</b>	<b>36</b>	<b>33</b>	<b>35</b>	<b>36</b>	
North America	10	15	15	10	15	15	38	35	36									
Western Europe	5	10	10	10	10	10	27	23	25									
Japan	15	15	15	15	15	15	20	16	18									
China	75	70	70	80	90	85	28	31	31									
Rest of the World	90	105	95	80	80	80	31	25	27									
<b>Glass</b>	<b>145</b>	<b>205</b>	<b>235</b>	<b>255</b>	<b>205</b>	<b>250</b>	<b>236</b>	<b>423</b>	<b>726</b>	<b>348</b>	<b>72%</b>	<b>-52%</b>	<b>131</b>	<b>77</b>	<b>318</b>	<b>169</b>	<b>164</b>	
North America	5	10	0	20	5	5	7	-20	17									
Western Europe	-10	15	10	5	5	35	59	25	5									
Japan	0	-25	-5	-10	-10	0	-40	-66	-22									
China	90	115	130	150	110	80	180	359	724									
Rest of the World	60	90	100	90	95	130	30	126	3									
<b>Medical and Biomedical</b>	<b>220</b>	<b>225</b>	<b>240</b>	<b>235</b>	<b>235</b>	<b>235</b>	<b>249</b>	<b>239</b>	<b>247</b>	<b>254</b>	<b>4%</b>	<b>3%</b>	<b>60</b>	<b>60</b>	<b>62</b>	<b>59</b>	<b>62</b>	
<b>Other industrial</b>	<b>420</b>	<b>440</b>	<b>440</b>	<b>485</b>	<b>500</b>	<b>525</b>	<b>585</b>	<b>501</b>	<b>561</b>	<b>627</b>	<b>12%</b>	<b>12%</b>	<b>137</b>	<b>143</b>	<b>144</b>	<b>141</b>	<b>139</b>	
<b>Bar &amp; Coin Investment</b>	<b>-5</b>	<b>50</b>	<b>525</b>	<b>460</b>	<b>215</b>	<b>280</b>	<b>283</b>	<b>586</b>	<b>365</b>	<b>402</b>	<b>-38%</b>	<b>10%</b>	<b>97</b>	<b>60</b>	<b>23</b>	<b>109</b>	<b>122</b>	
North America							159	242	260									
Western Europe							52	75	61									
Japan							46	240	11									
Rest of the World							25	29	32									
<b>ETF Investment</b>	<b>905</b>	<b>215</b>	<b>-240</b>	<b>-10</b>	<b>105</b>	<b>-245</b>	<b>991</b>	<b>509</b>	<b>-40</b>	<b>50</b>	<b>N/A</b>	<b>N/A</b>	<b>523</b>	<b>76</b>	<b>106</b>	<b>31</b>	<b>-195</b>	
North America							125	526	35									
Western Europe							509	237	200									
Japan							-13	58	-25									
Rest of the World							370	-312	-250									
<b>Change in Stocks Held by Exchanges</b>	<b>35</b>	<b>-115</b>	<b>20</b>	<b>85</b>	<b>-45</b>	<b>-20</b>	<b>-20</b>	<b>458</b>	<b>-100</b>	<b>-150</b>	<b>N/A</b>	<b>N/A</b>	<b>342</b>	<b>-1</b>	<b>33</b>	<b>49</b>	<b>-173</b>	
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>275</b>	<b>15</b>	<b>1,253</b>	<b>1,554</b>	<b>225</b>	<b>302</b>	<b>-86%</b>	<b>34%</b>	<b>962</b>	<b>136</b>	<b>162</b>	<b>189</b>	<b>-246</b>	
<b>Total Demand</b>	<b>8,575</b>	<b>8,075</b>	<b>8,235</b>	<b>8,350</b>	<b>7,850</b>	<b>7,380</b>	<b>8,315</b>	<b>7,726</b>	<b>7,345</b>	<b>7,598</b>	<b>-5%</b>	<b>3%</b>	<b>2,615</b>	<b>1,899</b>	<b>2,078</b>	<b>1,967</b>	<b>1,457</b>	

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

Notes:

- †† 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 Q3 2021

**Table 6: Regional recycling – annual and quarterly comparison**

	2013	2014	2015	2016	2017	2018	2019	2020	2021f	2022f	2021f/2020 Growth %	2022f/2021f Growth %	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	
<b>Platinum recycling supply (koz)</b>																		
<b>Automotive</b>	1,120	1,255	1,185	1,210	1,325	1,420	1,584	1,438	1,495	1,559	4%	4%	391	432	378	382	361	
North America							520	458	459									
Western Europe							802	738	792									
Japan							116	110	108									
China							36	36	37									
Rest of the World							110	96	99									
<b>Jewellery</b>	855	775	515	625	560	505	476	422	424	414	1%	-2%	121	134	118	98	104	
North America							3	3	3									
Western Europe							4	4	4									
Japan							187	162	160									
China							276	248	252									
Rest of the World							5	5	5									
<b>Industrial</b>	5	5	5	5	10	10	57	56	58	59	3%	1%	14	15	14	14	15	
North America							3	3	3									
Western Europe							11	10	11									
Japan							34	34	34									
China							7	7	8									
Rest of the World							2	2	2									

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

## GLOSSARY OF TERMS

### Above ground stocks

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

### ADH

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

### BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

### Bharat

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

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

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

### China Vehicle Emission Standards

China's vehicle emission standards are set nationally by the Ministry of Environmental Protection and are regionally and locally enforced by Environmental Protection Bureaus. A number of cities and provinces in China continue the historic practice of early introduction of new standards.

### China 6

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

### China VI

In June 2018, China finalized China VI standards that will apply to new heavy-duty diesel vehicles nationwide in two stages. The first stage, China VI-a, originally targeted to have become applicable by July 2020 for new models but has been delayed by 6 months to January 2021, and all new HDVs targeted for compliance in July 2021. The second stage, China VI-b will apply to gas engines nationwide starting in January 2021 and all new HDVs in July 2023.

### Compounds (Platinum based)

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

### Diesel oxidation catalyst (DOC)

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

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

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

### Electrolysis of water

Water electrolyzers are electrochemical devices used to split water molecules into hydrogen and oxygen. An electrical current is applied to the electrolyser cell, and water is split into oxygen and hydrogen. The electrolysis system comprises of the system, the stack and the cell.

### Emissions Legislation

Regulations that necessitate the fitment of autocatalyst systems dealing with the treatment of vehicle tailpipe emissions such as carbon monoxide (CO), particulate matter, hydrocarbons and oxides of nitrogen (NO<sub>x</sub>). 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<sub>2</sub>, the laboratory based WLTP and for NO<sub>x</sub> 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.

## 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<sub>x</sub> traps (LNT)

Platinum/rhodium-based, catalyses the chemical reduction of NO<sub>x</sub> 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<sub>x</sub>, 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<sub>x</sub>. 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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