

## FOREWORD

This edition of *Platinum Quarterly* considers the platinum supply and demand developments for the fourth quarter of 2018 and provides an updated outlook for 2019. We also provide our views on issues and trends relevant to investors considering exposure to platinum as an investment asset and update you on how our product partnerships continue to meet investors' needs.

### Platinum supply and demand – 2018 and 2019

The 2019 forecast now foresees a 680 koz surplus versus the prior estimate of 455 koz, due to temporary higher refined production in South Africa and supply growth elsewhere more than offsetting increased demand in 2019. Total demand in 2019 is forecast to rise 5% compared to 2018. Retail investment in bars and coins should continue to be solid in 2019 and the significant increase in ETF holdings already in 2019 supports the investment demand forecast of 530 koz. Automotive, jewellery and industrial demand for 2019 are forecast to decline slightly compared to 2018. Supply is forecast to increase by 6% over 2018, mainly due to a one-off release of work in progress material in 2019 from several major producers in South Africa following refinery plant installation and maintenance in 2018. Without the one-off events in South Africa, we estimate that supply growth would have been closer to 2%, mainly driven by a project ramp-up in North America.

Several aspects of 2019 are difficult to predict yet enhance platinum's investment case. The top three, in our view, are: 1) potential supply disruptions in South Africa in 2019 as power outages and industrial action continue to present significant concerns and could reduce mine supply; 2) recovering Western Europe diesel market share, which has risen from a low of 33.4% in September 2018 to 35.2% in January 2019 (source: LMC), could increase auto demand; 3) the significant increase in the palladium price makes the use of platinum as a replacement for palladium in gasoline cars more likely and some increased platinum demand may be identified in 2019. In addition, the 2019 forecast recognises the increase in platinum ETF holdings of over 400 koz since the end of 2018. This represents both downside and upside risk to the platinum demand outlook.

### Q4 2018 brings some positives, though with a larger surplus

The fourth quarter 2018 platinum supply and demand data brought a somewhat larger surplus for 2018, of 645 koz, versus the prior estimate of 525 koz. This was due to continued decline in jewellery (Q4 18 down 12% y-y) and investment (a net reduction of 65 koz in Q4 18). Q4, however, also revealed some positive data points in steadying automotive (up 10% in Q4 18 from the prior quarter, Q3 18) and further industrial demand growth (up 7% in Q4 18 vs Q4 17 and up 11% for 2018 vs 2017). The *Platinum Quarterly* data and report (starting on page 5) are, as always, prepared independently for WPIC by SFA (Oxford).

### Supply – moderate decline in Q4 2018 year-on-year, a meaningful but temporary increase in 2019

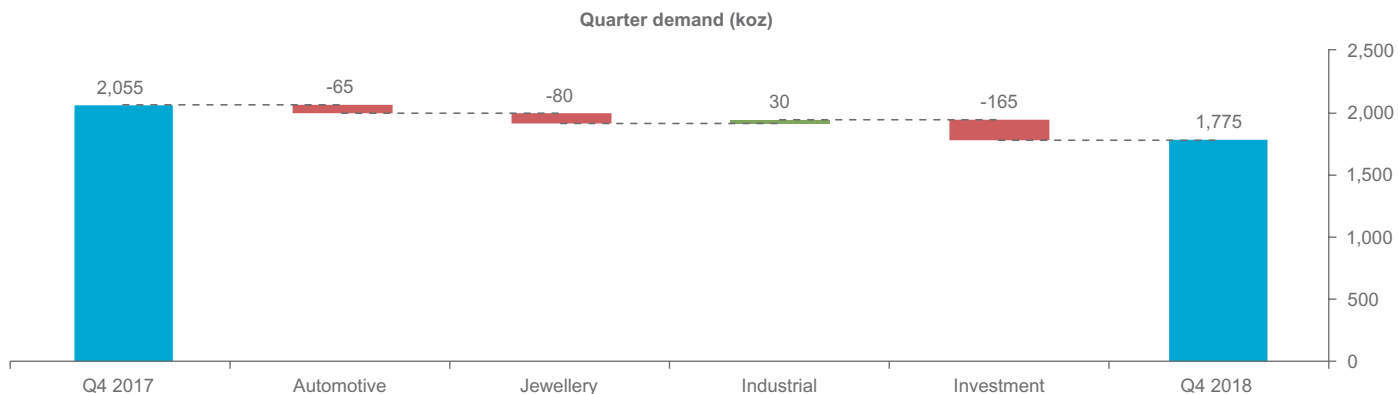
Q4 18 refined production declined by 3% due to year-on-year double-digit decreases in Zimbabwe and Russia, partly offset by growth in North America. For 2018, refined production declined 1% from 2017 to 6,085 koz, with notable decreases in Zimbabwe and Russia. South African production rose 1% year on year due to a low level of disruptions.

For 2019, refined production is expected to grow 6%, primarily due to a one-off release of work in progress material in South Africa. Consequently, we expect 2020 refined production should be significantly below 2019. The 2019 forecast allows for similar operational disruptions in South Africa to those experienced in 2018. Consequently, potential power disruption and industrial action represent risks that could materially reduce actual 2019 supply.

Recycling was up 1% to 1,910 koz in 2018 and is forecast to grow 3% in 2019.

### Demand – Q4 2018 declines in jewellery and auto demand partly offset by industrial, improvement in 2019

Q4 18 demand declined 14% year-on-year as jewellery, investment and automotive all fell. Industrial, up 7% year-on-year, compensated somewhat. Annual demand growth from 2018 to 2019 of 5% is driven by expected growth in investment demand, which has increased by over 400 koz already in 2019.



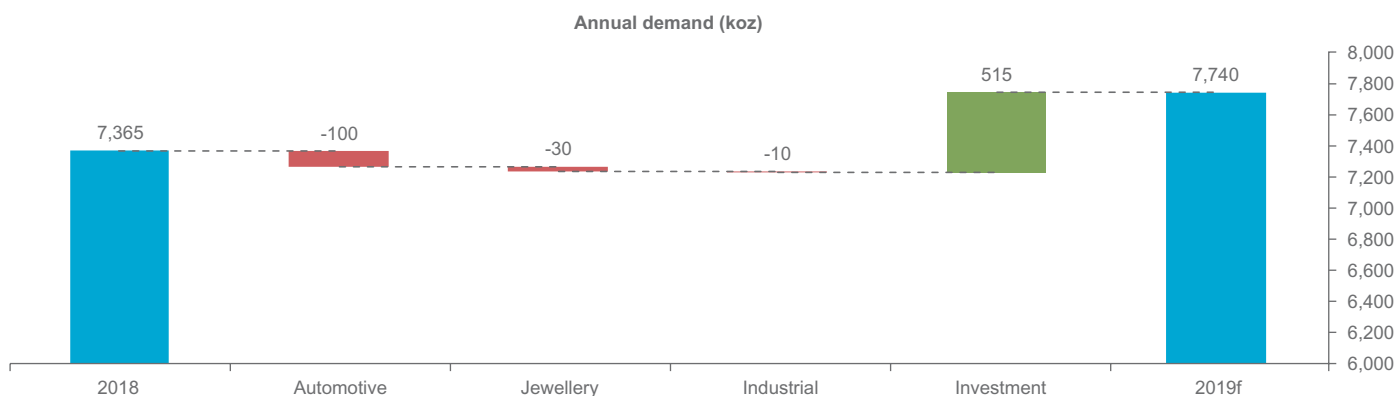
**Strengths:**

- Industrial overall showed good strength in the quarter, +7% year-on-year to 460 koz.
- Japan Q4 18 jewellery demand performed well on low price, outperforming gold sales.

**Challenges:**

- Q4 18 automotive demand dropped 8% year-on-year with weakness concentrated in Western Europe. However, we see signs that the trend has stabilised with Western Europe diesel sales share improving in the most recent months.
- Jewellery remained soft, declining 12% in the quarter year-over-year, to 600 koz, due to lower fabricator demand in China.
- Investment demand in Q4 18 was -65 koz on ETF selling. For 2019, however, we have already seen significant improvement in ETF flows, with roughly 300 koz being added YTD.

For 2019, demand is forecast to grow by 5%, improving to 7,740 koz:



**Strengths:**

- Investment demand has had a strong start for the year and is projected to reach 530 koz (from 15 koz) driven by a turnaround in ETF demand.
- Industrial demand is set to remain relatively solid after a year of double-digit growth, albeit declining slightly (-1%) in 2019 vs 2018 as glass demand normalises, partially offset by additional growth in chemical which is mainly driven by silicones.

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### Challenges:

- Autocatalysts are forecast to fall by -3% for 2019, a more modest decline than in 2018; this could be a conservative outlook as there are indications that the diesel share of auto sales in Western Europe has stabilised.
- Jewellery demand is expected to remain soft, with a decline of -1% but with the decline in China at a slower rate than in 2018.
- We assume current platinum ETF ounces will remain relatively flat for the rest of the year.

### The platinum investment case – continued impetus for substitution of palladium

Looking forward, we see the following demand growth drivers:

- In 2019, new coin and bar launches from partners such as the SA Mint and Royal Mint are likely to increase retail investment demand.
- We also see stabilisation in the diesel share of Western European car sales as German regulatory initiatives address city access restrictions and consumer concerns. This has been enhanced as automakers increasingly present on-road emissions to consumers in an attempt to address car buyer concerns.
- Substitution of palladium by platinum in gasoline autocatalysts should deliver future demand growth. Substitution has become more likely due to the continued rise in the palladium price, increased palladium demand from the introduction of more stringent emissions limits in China and limited short-term palladium supply growth.
- Further into the future we see greater acceptance and interest in the development of fuel cell electric vehicles as part of a multi-drivetrain solution to achieve zero emissions, with heavy duty applications likely to lead light duty.

### WPIC initiatives highlights

Since our last quarterly update, we have added two new partnerships to our product portfolio. We have partnered with Bank of China (BoC) to promote its domestic platinum trading accounts, with excellent early results, rising account balances, being seen. Market participants may not be aware that BoC platinum trading accounts are backed by physical platinum vaulted in London. Our partnership has allowed us to expand the market appeal of this platinum product in China, capturing the associated platinum investment demand. We have also partnered with Dillon Gage, one of the world's largest precious metals trading firms to promote platinum investment through both their wholesale and retail distribution channels in the US.

**Paul Wilson, CEO**

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# PLATINUM QUARTERLY Q4 2018

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

	2017	2018	2019f	2018/2017 Growth %	2019f/2018 Growth %	Q3 2018	Q4 2018
<b>Platinum Supply-demand Balance (koz)</b>							
<b>SUPPLY</b>							
<b>Refined Production</b>	<b>6,125</b>	<b>6,085</b>	<b>6,460</b>	<b>-1%</b>	<b>6%</b>	<b>1,680</b>	<b>1,535</b>
South Africa	4,380	4,410	4,725	1%	7%	1,240	1,130
Zimbabwe	480	470	470	-2%	0%	120	120
North America	365	360	410	-1%	14%	90	100
Russia	720	675	675	-6%	0%	185	145
Other	180	170	180	-6%	6%	45	40
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+30</b>	<b>+15</b>	<b>+0</b>	<b>-50%</b>	<b>-100%</b>	<b>-20</b>	<b>-5</b>
<b>Total Mining Supply</b>	<b>6,155</b>	<b>6,100</b>	<b>6,460</b>	<b>-1%</b>	<b>6%</b>	<b>1,660</b>	<b>1,530</b>
<b>Recycling</b>	<b>1,890</b>	<b>1,910</b>	<b>1,960</b>	<b>1%</b>	<b>3%</b>	<b>485</b>	<b>490</b>
Autocatalyst	1,325	1,420	1,495	7%	5%	365	380
Jewellery	560	485	460	-13%	-5%	120	110
Industrial	5	5	5	0%	0%	0	0
<b>Total Supply</b>	<b>8,045</b>	<b>8,010</b>	<b>8,420</b>	<b>0%</b>	<b>5%</b>	<b>2,145</b>	<b>2,020</b>
<b>DEMAND</b>							
<b>Automotive</b>	<b>3,325</b>	<b>3,100</b>	<b>3,000</b>	<b>-7%</b>	<b>-3%</b>	<b>710</b>	<b>780</b>
Autocatalyst	3,180	2,960	2,850	-7%	-4%	675	740
Non-road	140	145	150	4%	3%	35	40
<b>Jewellery</b>	<b>2,460</b>	<b>2,355</b>	<b>2,325</b>	<b>-4%</b>	<b>-1%</b>	<b>575</b>	<b>600</b>
<b>Industrial</b>	<b>1,700</b>	<b>1,895</b>	<b>1,885</b>	<b>11%</b>	<b>-1%</b>	<b>475</b>	<b>460</b>
Chemical	590	575	610	-3%	6%	160	135
Petroleum	100	240	240	140%	0%	55	55
Electrical	195	190	190	-3%	0%	50	50
Glass	185	235	210	27%	-11%	70	40
Medical and Biomedical	235	240	240	2%	0%	45	70
Other	395	415	395	5%	-5%	95	110
<b>Investment</b>	<b>275</b>	<b>15</b>	<b>530</b>	<b>-95%</b>	<b>N/M</b>	<b>65</b>	<b>-65</b>
Change in Bars, Coins	215	280		30%		70	50
Change in ETF Holdings	105	-245		N/M		5	-115
Change in Stocks Held by Exchanges	-45	-20		-56%		-10	0
<b>Total Demand</b>	<b>7,760</b>	<b>7,365</b>	<b>7,740</b>	<b>-5%</b>	<b>5%</b>	<b>1,825</b>	<b>1,775</b>
<b>Balance</b>	<b>285</b>	<b>645</b>	<b>680</b>	<b>126%</b>	<b>5%</b>	<b>320</b>	<b>245</b>
<b>Above Ground Stocks</b>	<b>4,140*</b>	<b>2,170</b>	<b>3,495</b>	<b>30%</b>	<b>24%</b>		

Source: SFA (Oxford). \*As of 31st December 2012. NB: Numbers have been independently rounded.

Notes:

- All estimates are based on the latest available information. They are subject to revision in our subsequent quarterly reports in the event that additional information is identified.
- The WPIC did not publish quarterly estimates for 2013 or the first two quarters of 2014. However, quarterly estimates from Q3 2014, to Q4 2016 are contained in previously published PQs which are freely available on the WPIC website. Quarterly estimates from Q1 2017 and half-yearly estimates from H1 2017 are included in Tables 3 and 4 respectively, on pages 19-20 (supply, demand and above ground stocks).
- The 2019 forecasts are based on historical data and trends as well as modelling, with varying degrees of accuracy depending upon the supply or demand category. Investment demand is expected to be the least predictable segment. Some historical views are based on data and modelling that pre-date WPIC publication of PQ.

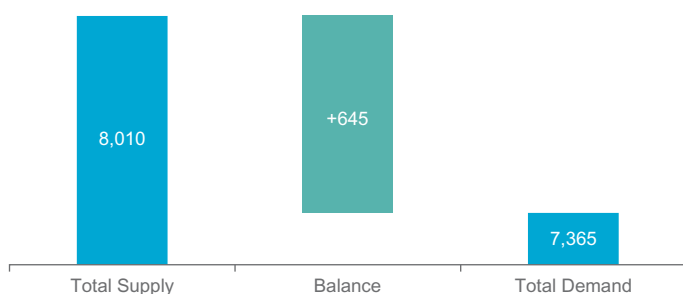
## 2018 FULL YEAR REVIEW

Total platinum supply fell marginally to 8,010 koz in 2018 owing to lower mining supply, as recycled platinum increased modestly. Refined production slipped 1% to 6,085 koz following lower output from Zimbabwe (-10 koz), Russia (-45 koz), and North America (-5 koz), while production was marginally higher in South Africa (+10 koz). Secondary supply rose by 20 koz to 1,910 koz as a 7% increase in autocatalyst recycling (+95 koz) was mostly offset by a 13% decline in jewellery recycling (-75 koz) owing to the weaker price environment.

Global platinum demand dropped by 5% last year to 7,365 koz, as declines in automotive, jewellery and investment demand outweighed improved industrial demand. Automotive demand fell by 7% to 3,100 koz owing to the ongoing contraction in the Western European diesel market. Jewellery consumption was down 4% to 2,355 koz as Chinese jewellery demand continued to fall and this outweighed gains in other regions. Overall investment demand was very weak in 2018 at 15 koz, as net sales from platinum ETFs mostly offset increased purchases of bars and coins. Industrial usage advanced by 11% to 1,895 koz as net petroleum demand recovered from a weak 2017 and more new capacity installations boosted glass demand.

In 2018, platinum demand contracted more than supply, resulting in a market surplus of 645 koz (Chart 1).

**Chart 1: Supply-demand balance, koz, 2018**



Source: SFA (Oxford)

## Mine supply

Global refined production fell by 1% year-on-year (-40 koz) to 6,085 koz in 2018. South African production was up 1% to 4,410 koz year-on-year (+30 koz). Smelter outages locked up material in the processing pipeline and shaft closures in 2017 negatively impacted the amount of refined production. However, this was offset by improved production performances on the Eastern Bushveld, where community disruption and a tailings dam failure had lowered output in 2017, at newer shafts in ramp-up, and due to fewer operational disruptions from much improved safety performance overall.

Supply from Russia decreased by 6% (-45 koz) to 675 koz owing to a small pipeline lock-up. Output from Zimbabwe fell by 2% (-10 koz) to 470 koz because of work-in-progress (WIP) material processing in 2017. North American production was slightly lower at 360 koz, (-5 koz) and supply from other regions fell marginally (-10 koz) to 170 koz. There was a net 15 koz reduction in producer inventories for the year, with a minor restock taking place in Q4'18. This gives total mining supply of 6,100 koz for 2018, down 1% year-on-year (-55 koz).

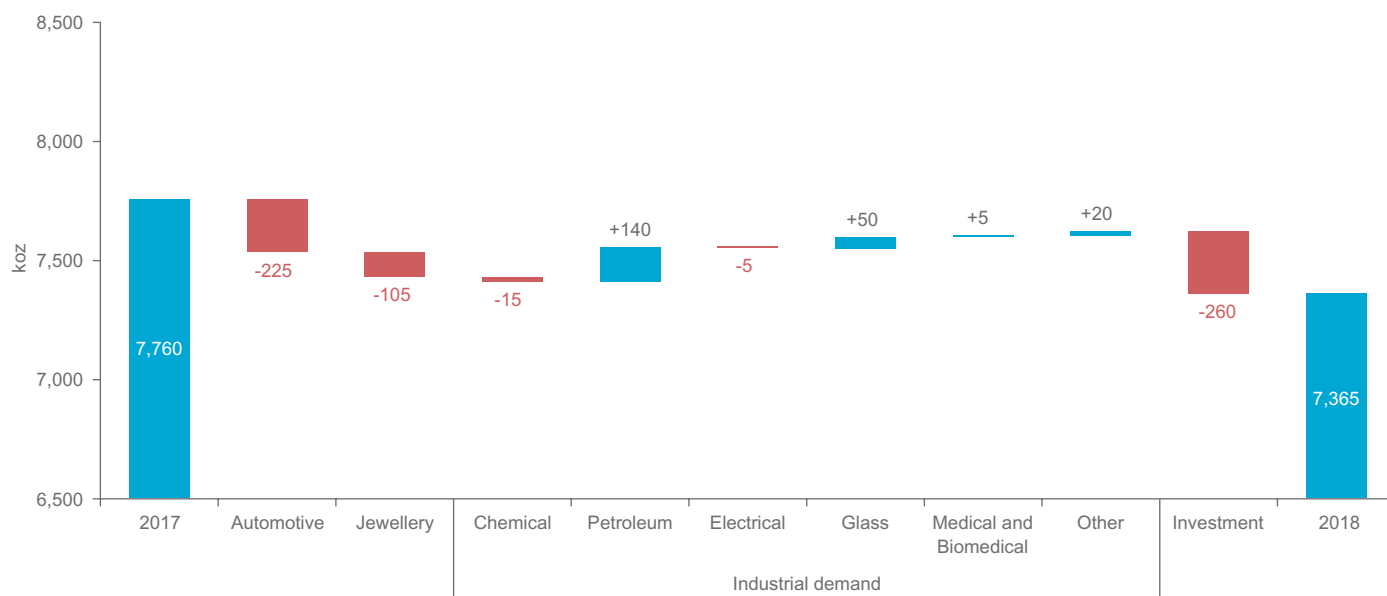
## Recycling

Total platinum recycling grew to 1,910 koz in 2018, an increase of 20 koz (+1%) on 2017. Substantial growth in autocatalyst recycling was largely offset by a decline in jewellery recycling.

Autocatalyst recycling supplied the market with 1,420 koz of platinum in 2018, up by 95 koz (+7%) compared to the previous year. Both the key markets of Europe and North America saw high single-digit growth with additional gains also seen in the majority of other regions. There was a widespread increase in the volumes of autocatalysts being collected. The high palladium and rhodium prices provided a strong incentive to move catalysts down the supply chain. Platinum benefitted from this as spent catalysts contain a mixture of all three PGMs. A higher scrap steel price increased the number of scrapped end of life vehicles increasing the number of catalysts collected and processed.

Platinum jewellery recycling fell by 75 koz (-13%) to 485 koz in 2018. The platinum price was weak, particularly in the second half of the year, and this reduced the amount of jewellery returned by consumers. This was the primary cause of the decline in Japan, but in China the effect was compounded by another year of lower platinum jewellery sales which meant that less jewellery was returned to part fund new purchases.

**Chart 2: Changes in demand by category, 2018 vs. 2017**



Source: SFA (Oxford)

## Automotive demand

Automotive platinum demand fell to 3,100 koz in 2018, down 7% year-on-year from 3,325 koz in 2017 and continuing the decline from the peak of 3,465 koz in 2016.

Western Europe led the decline in 2018; it is still the largest market, but diesel's share of the passenger car market fell from 44.8% in 2017 to 36.5% in 2018 (source: ACEA). Light-vehicle sales started the year strongly, but in H2'18 sales weakened, from a combination of factors led by the disruption to car sales caused by the introduction of WLTP emissions testing, but also including a slowing Italian economy, cost of living protests in France and the ongoing uncertainty (not just in the UK) over Brexit and its impact on the European automotive industry.

The introduction of the new WLTP and RDE emissions testing protocol on 1 September 2018 severely disrupted light-duty sales volumes and timings through the year. WLTP is more representative of real-world driving than the outgoing NEDC test, but still not fully realistic. Measured CO<sub>2</sub> emissions will be higher under WLTP, which may give some respite to diesel models compared to their gasoline equivalents, though highly efficient and cost-effective gasoline hybrids may benefit too. Pre-buying was seen in H1'18, with high sales of models not homologated to the new test being offered at discounts, or self-registered by the trade. Lower sales of certain models were also seen, where automakers temporarily took some models out of production if they were likely to perform poorly in testing.

India saw growth in platinum demand as vehicle sales recovered somewhat after economic-related disruptions in the previous year, though loadings under BS IV emissions legislation and overall sales remain well below European levels.

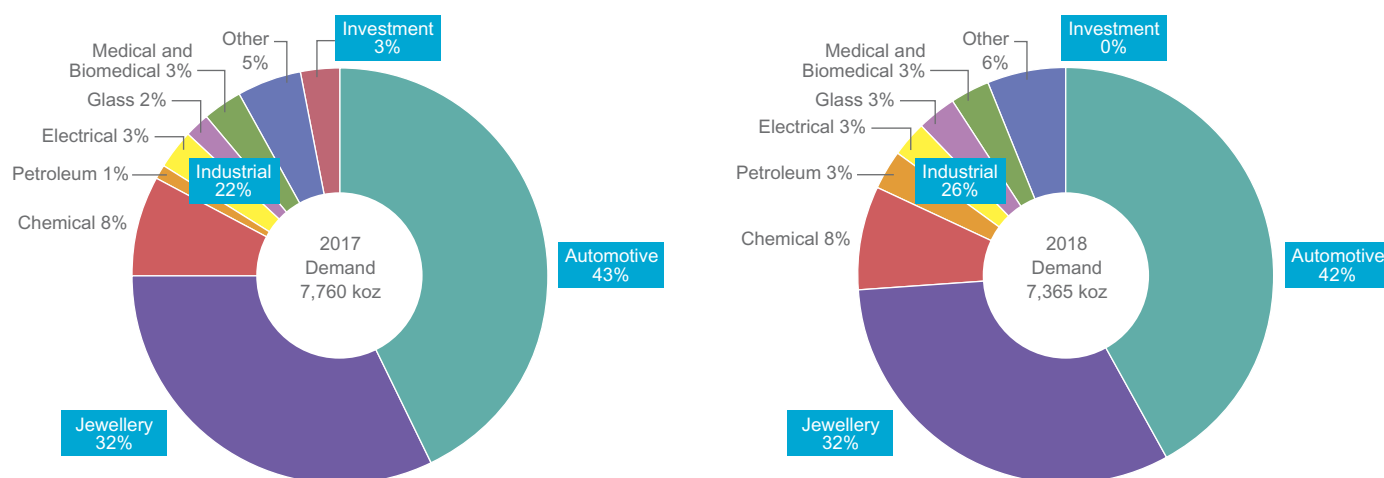
Demand for platinum in heavy-duty autocatalysts grew modestly in 2018, particularly from China and India, where loadings increased. In China, infrastructure investment has boosted sales of vehicles for the construction and associated industries.

## Jewellery demand

Platinum jewellery demand contracted by 105 koz (-4%) in 2018 to 2,355 koz. Chinese jewellery consumption continued its decline from 2013, dropping 165 koz (-12%) to 1,175 koz and reducing China's share of demand from 54% in 2017 to 50% in 2018. All other regions grew or were flat and added a combined 60 koz. At the beginning of 2018 the Chinese jewellery retail market appeared to be picking up as retail sales growth improved and the major Hong Kong jewellers reported some reasonable same-store sales growth. However, platinum did not benefit as it underperformed segments such as gold and coloured gold. Consumers in the region have been shifting their purchasing preferences, looking for unique designs that have greater personal meaning. Platinum's smaller store presence and high working costs have acted against it, as product variety becomes increasingly important. The overall jewellery market also underperformed in Q4'18, affecting full-year platinum demand.

The low platinum price supported growth in other regions of the market, particularly in the US and Japan. The US also benefitted from tax cuts in 2018 which helped to boost the economy and increase spending. Platinum Guild International (PGI) USA has reported that its campaign to encourage the use of platinum settings for gems on gold jewellery has been successful. India is the other principal region of growth, adding 25 koz (+14%) in 2018 to reach 175 koz. The region experienced a year of relative calm as retailers have adjusted to the Goods and Services Tax that was introduced in 2017. Retailers have been adopting platinum based on its ability to offer higher margins, and PGI has been active in the region.

**Chart 3: Demand end-use shares, 2018 vs. 2017**



Source: SFA (Oxford)

## Industrial demand

Industrial use of platinum increased by 11% year-on-year (+195 koz) to 1,895 koz in 2018, following a recovery in net petroleum requirements (+140 koz) from a weak 2017 plus growth in glass fabrication (+50 koz), medical applications (+5 koz) and other end-uses (+20 koz). However, chemical (-15 koz) and electrical (-5 koz) demand both decreased last year, slightly denting overall growth.

## Chemical

Chemical demand declined by 3% to 575 koz last year, as lower usage in China, Western Europe and North America collectively outweighed growth in the RoW. Lower nitric acid production, as a result of a weaker ammonium nitrate market, reduced catalyst gauze requirements in almost all regions in 2018, particularly Western Europe, whilst fewer new, platinum-catalysed alkane dehydrogenation (ADH) facilities also decreased demand in China compared to 2017. However, new propane dehydrogenation (PDH) capacity in Western Asia plus greater silicone production elsewhere in Asia raised new metal requirements in the RoW, partially offsetting losses in the other regions.

### **Petroleum**

Net petroleum usage rebounded by 140 koz to 240 koz in 2018, following growth in the RoW plus recoveries in Japan and Western Europe. New reforming and isomerisation capacity in India and Turkey boosted catalyst requirements in the RoW last year (vs. no expansion in 2017), with refinery upgrades in India enabling the production of cleaner, Bharat Stage (BS) VI-compliant fuels. The scale of expansion in the RoW was higher than anticipated in the previous *Platinum Quarterly* report, resulting in an upward revision to the region's demand of 45 koz for the year. In Japan and Western Europe, refining capacity was unchanged year-on-year, allowing domestic platinum demand to recover from 2017, when widespread capacity cuts returned metal to market and reduced Japanese usage to net negative levels.

### **Electrical**

Electrical requirements declined by 3% to 190 koz last year owing to lower demand in China, while platinum use in all other regions remained relatively stable. Although hard disk drive (HDD) shipments fell by 7% year-on-year to 374 million units, the total number of platters contained within these drives was essentially flat compared to 2017 (more platters per drive), helped by growth in the high-capacity enterprise market. As a result, the quantity of platinum consumed in HDDs was largely unchanged from the year before. However, non-HDD electrical requirements were down slightly last year following a jump in platinum imports by Chinese electrical component manufacturers in 2017, reducing overall demand in the country and worldwide.

### **Glass**

Platinum use in the glass industry increased by 50 koz to 235 koz in 2018, strengthened mainly by growth in Western Europe and the RoW, as well as by a recovery in Japan. New glass fibre fabrication facilities and expansions in France and the Netherlands helped to boost demand in Europe, along with other glass capacity growth in Spain and Germany, while new glass fibre capacity in Turkey and solar glass plant expansions in Southeast Asia lifted new metal requirements throughout the RoW region. In Japan, a comparative lack of plant closures helped demand recover from net negative levels in 2017, when platinum equipment was returned to market following the shutdown of liquid-crystal display (LCD) substrate facilities in the country.

### **Other**

Other industrial end-use consumption grew by 5% to 415 koz last year, predominantly owing to growth in the fuel cell sector, while demand in other segments remained fairly flat year-on-year. An increase in platinum-based fuel cell stack production boosted requirements in 2018, particularly in Japan, the US and South Korea (RoW), supported by growing fuel cell adoption in transport and stationary applications throughout Asia, Europe and North America. Platinum demand for automotive sensors also increased marginally in the RoW, as vehicle production in the region grew by 4%.

### **Investment demand**

Total investment was 15 koz in 2018, as solid bar and coin demand (+280 koz) was mostly offset by declines in ETF holdings (-245 koz) and stocks held by exchanges (-20 koz).

Global ETF holdings contracted by 245 koz last year, declining during three of the four quarters with only the third quarter showing a slight increase (+5 koz). After reducing their holdings in the first half of the year, investors in the US shifted to making net purchases in the third and fourth quarters which resulted in the US being the only region to have net purchases in 2018, albeit of only 20 koz. Investors in the UK increased their holdings by 18 koz in Q1'18, but then became net sellers with ETF holdings falling by a total of 102 koz over the course of the year. South African ETFs saw the largest outflows of any region last year. Similarly to the UK, the first quarter saw modest growth in holdings of 25 koz, but sales in the following three quarters resulted in holdings shrinking by 127 koz overall. Investors in Swiss ETFs were consistent, if small sellers reducing their ETF holdings by 37 koz over the course of the year.

Bar and coin demand was 280 koz last year, an improvement over the 215 koz seen in 2017. Coin purchases picked up as the US Mint increased the mintage of platinum American Eagle coins by 10,000 ounces to 30,000 and the Royal Mint introduced a platinum Britannia coin. Bar demand was higher than in 2018 as Japanese investors, who are the largest purchasers of bars, took advantage of the continued decline in the platinum price to add to their investments.



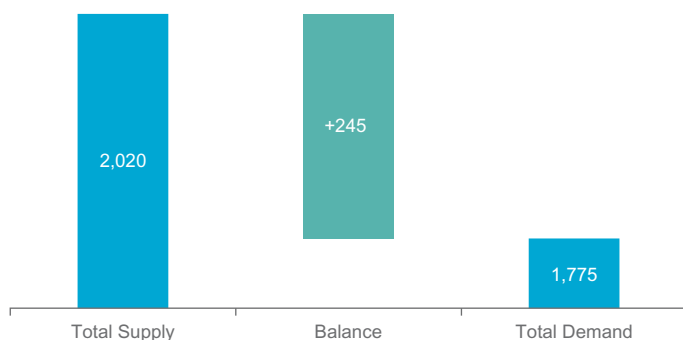
## 2018 FOURTH QUARTER PLATINUM MARKET REVIEW

Although total platinum supply was 5% lower year-on-year (-100 koz) at 2,020 koz in the fourth quarter, platinum demand fell by 14% (-280 koz) to 1,775 koz, resulting in a market surplus of 245 koz (Chart 4).

Industrial demand was the only demand segment to see growth in Q4'18, gaining 30 koz (+7% year-on-year) to 460 koz, mostly owing to a recovery in petroleum requirements. Automotive demand declined by 8% year-on-year to 780 koz (-65 koz) owing to the ongoing decline in the Western European diesel car market. Jewellery demand shrank by 12% to 600 koz as the Chinese market continued to see weak fabricator demand amid poor retail sales. Net investment demand was negative as net sales of 115 koz from ETFs overwhelmed 50 koz of bar and coin purchases.

Refined platinum production fell 3% year-on-year (-55 koz) in Q4'18 to 1,535 koz following a decline in Russian output (-45 koz) caused by a build-up of material in the processing pipeline, and lower output in Zimbabwe (-20 koz) as production returned to a steady state. South African production was 10 koz higher, year-on-year, while North American production edged up 5 koz. Recycling dipped by 3% to 490 koz (-15 koz) as lower jewellery recycling outweighed an increase in metal recovered from spent autocatalysts.

**Chart 4: Supply-demand balance, koz, Q4 2018**



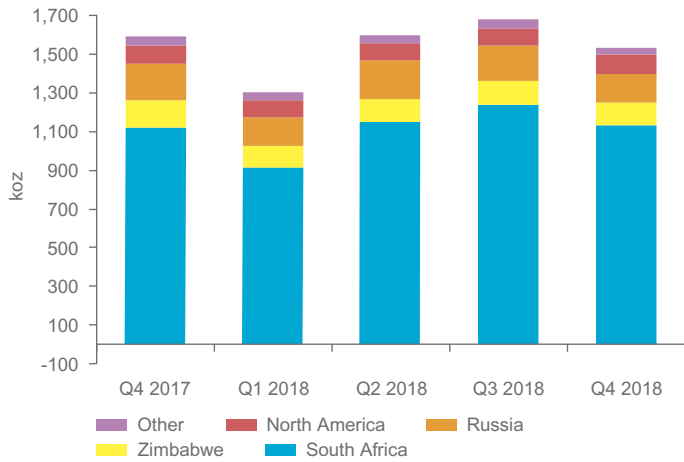
Source: SFA (Oxford)

### Supply

Refined production fell by 3% year-on-year (-55 koz) to 1,535 koz in the fourth quarter of 2018 (Chart 5). Production grew marginally (+10 koz) in South Africa, with a mixture of performances across the Bushveld. Lower ore grades and crusher maintenance work adversely affected production on the Northern Bushveld, while challenging ground conditions and safety issues reduced output from the Western Bushveld. Overall, the number of fatal accidents decreased by almost three-quarters year-on-year in Q4'18, but those that did occur affected key production shafts.

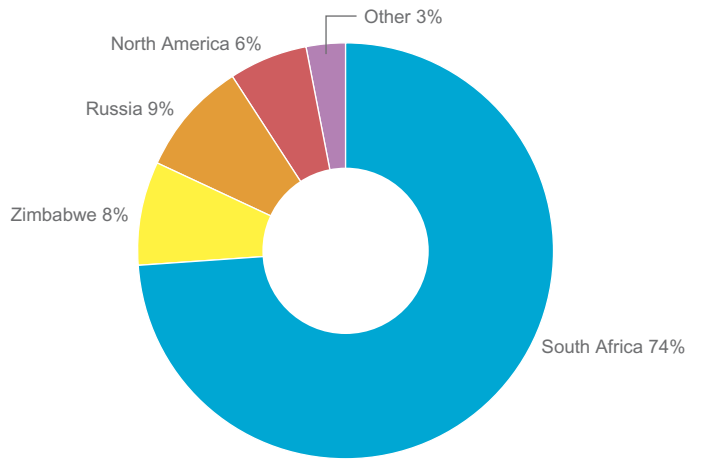
Supply from Zimbabwe fell by 14% year-on-year (-20 koz) to 120 koz, with the prior year period boosted by processing of WIP material. Output from North America grew by 5% year-on-year (+5 koz) to 100 koz, with an expansion project in ramp-up phase in the US. Russian supply dropped by 24% year-on-year (-45 koz), with a build-up of WIP material at the precious metals refinery during the quarter. Production from other regions remained stable at 45 koz. There was a net 5 koz increase in producer inventory during the quarter, and total mining supply therefore fell by 5% year-on-year to 1,530 koz.

Chart 5: Global refined production



Source: SFA (Oxford)

Chart 6: Refined production, Q4'18

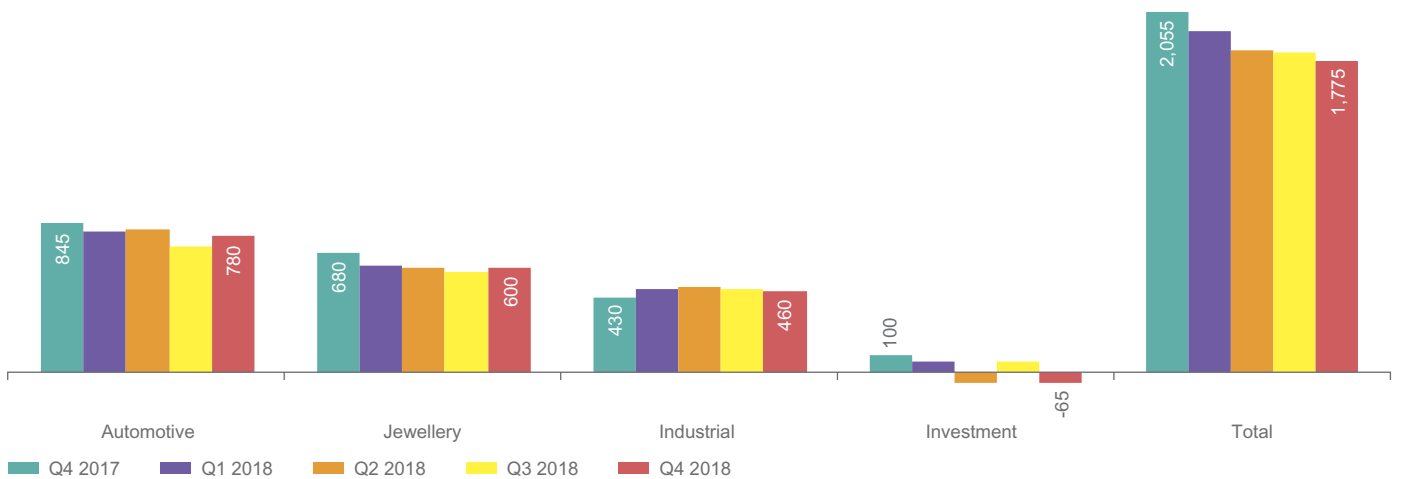


Source: SFA (Oxford)

Recycling provided 490 koz of platinum in Q4'18 as autocatalyst recycling posted the best quarter since *Platinum Quarterly* began, while jewellery recycling was the second lowest. The number of catalysts being processed was high in both North America and Europe in what is already a typically strong quarter for the industry. However, jewellery recycling was low as demand for jewellery in China weakened, reducing the amount of jewellery returned by consumers. Additionally, the platinum price remained subdued, further impacting jewellery recycling in China and Japan.

Demand

Chart 7: Platinum demand, koz



Source: SFA (Oxford)

Automotive demand

Automotive demand in the fourth quarter reached 780 koz, down 8% year-on-year from 845 koz in Q4'17 but up 10% from a very weak 710 koz in Q3'18. Auto sales in Q3'18 were much lower than the normal seasonal pattern, as Q1'18 and Q2'18 saw purchases pulled forward ahead of the WLTP introduction.

The backlog in testing led to over a third of cars still not being WLTP-tested in early November, so limiting consumer choice and slowing sales. Diesel versions of many models were not tested by September, with some automakers withdrawing diesel variants from sale until they could be modified to ensure compliance, thereby further reducing diesel's share of the market. Several automakers expect sales disruption to continue into Q2'19 at least.

### **Jewellery demand**

Jewellery demand was 600 koz in Q4'18, an 80 koz (-12%) drop year-on-year. Chinese jewellery consumption was especially weak for the quarter. Purchasing of platinum by jewellery fabricators from the Shanghai Gold Exchange was very poor in Q4'18 and trade data also showed only small amounts of metal flowing into the country. Hong Kong platinum imports, a potential channel for unofficial sourcing of metal, also dropped markedly in Q4'18. National retail sales growth of jewellery weakened, averaging 4.3% year-on-year for the quarter, the lowest since 2016. Hong Kong jewellers showed poor performance for the quarter: same-store sales growth for all jewellery types at Chow Tai Fook fell -7% and -6% for mainland China and Hong Kong, respectively, down from +6% and +23% in Q3'18. Luk Fook reported a similar negative turnaround in performance for the quarter. The trade war and difficult economic conditions appear to be biting in China – GDP growth fell to 6.4% for Q4'18, matching growth in the worst quarter of the 2008 financial crisis.

The Japanese market performed reasonably well for the quarter. The low platinum price encouraged more platinum jewellery purchases and the metal outperformed gold. National retail sales posted another three months of growth although the consumer confidence index has been slipping, averaging 42.9 in Q4'18 from a high of 44.5 in Q4'17. Jewellery demand from the US was disappointing for Q4'18, with Signet reporting a dip in same-store sales of 1.3% for the “holiday season”. Additionally, a survey by INSTORE Magazine indicated that more US jewellers thought the season had been “disappointing” than “better than expected”, and 50% said customer traffic was down compared to just over 15% who said it was up. In Europe, Richemont reported an impact on sales due to the cost of living protests in France which reduced footfall and resulted in some temporary store closures.

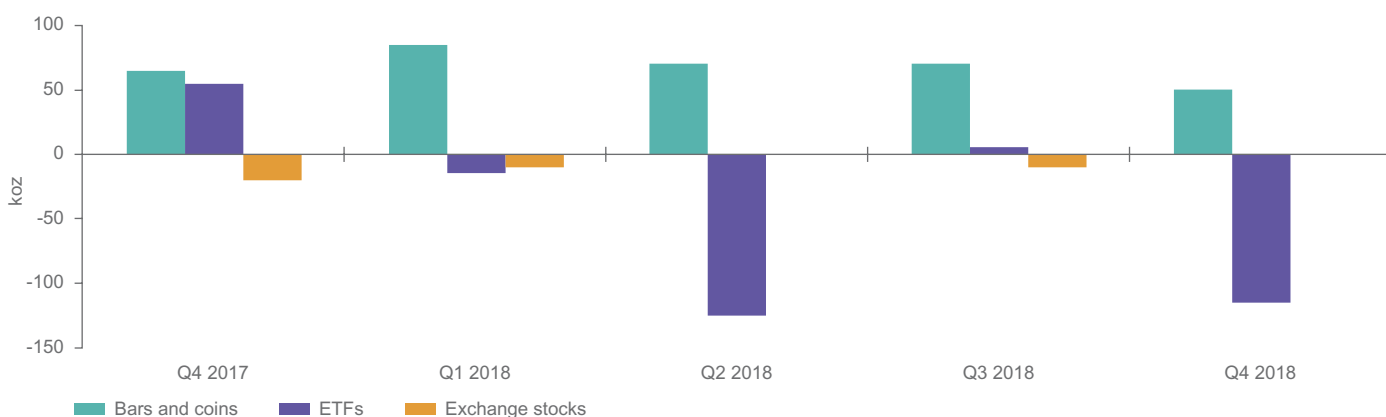
### **Industrial demand**

Fourth quarter industrial demand increased by 7% year-on-year to 460 koz (down -3% from Q3'18), primarily owing to growth in petroleum refining which, together with slightly higher demand for glass fabrication and other end-uses, outweighed a drop in electrical sector requirements. Refining capacity growth in late 2018 and early 2019 lifted platinum purchases during the final quarter of last year, particularly for expansions in the RoW region. Demand in Q4'17 was weakened by metal being returned to market from curtailed refining capacity in Japan, and this benefitted net requirements in Q4'18 versus the year before. In the glass sector, platinum buying for new and expanding fabrication facilities increased in the RoW and Western Europe, but this was mostly offset by lower purchases by Chinese fabricators, while platinum imports by Chinese electrical component manufacturers also declined year-on-year from a robust Q4'17.

## Investment demand

Investment demand in Q4'18 fell by 65 koz owing to a sizeable reduction in metal held in ETFs (Chart 8). Bar and coin demand was 50 koz, somewhat lower than in the previous quarter, as Japanese investors slowed their purchasing of platinum bars despite the platinum price in yen remaining low. ETFs saw net sales of 115 koz, with the US being the only region to have an increase in holdings (+19 koz). The largest net sale of metal was by South African investors who reduced their ETF holdings by 89 koz. UK investors sold 37 koz, while Swiss ETF holdings dipped by 4 koz.

**Chart 8: Platinum investment**



Source: SFA (Oxford)

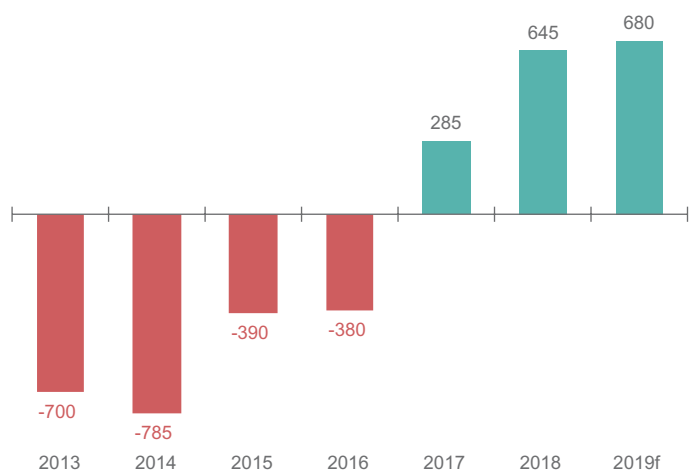
## 2019 FORECAST

Total platinum supply is forecast to increase by 5% to 8,420 koz in 2019, as both primary and secondary supply are expected to grow (Chart 10). Global refined production is forecast to expand by 6% to 6,460 koz (+375 koz) this year, mostly owing to higher production in South Africa (+315 koz), where material held up in the processing pipeline during 2018 will be refined, and North America (+50 koz). Recycling is projected to increase by 3% to 1,960 koz as growth in autocatalyst recycling (+75 koz) outweighs a drop in jewellery recycling (-25 koz).

Platinum demand is projected to rise by 5% to 7,740 koz this year owing to a large increase in ETF investment demand which more than offsets contractions in the other three main end-use segments. Automotive demand is forecast to fall again in 2019, but at a slower rate than last year, declining 3% to 3,000 koz (-100 koz) as the slide in the diesel car market share in Western Europe slows. The drop in jewellery demand is expected to continue, but not as rapidly as in 2018, slipping 1% to 2,325 koz owing to an easing of the decline in Chinese demand mostly being offset by growth in other regions. Industrial demand is expected to be 1,885 koz (-10 koz), close to the high level seen in 2018, as a gain in chemical usage (+35 koz) is offset by declines in glass (-25 koz) and other (-20 koz) demand.

With total demand rebounding by 5% this year and supply rising by 6%, the market surplus is projected to expand modestly to 680 koz (Chart 9).

**Chart 9: Supply-demand balance, koz, 2013-2019f**



Source: SFA (Oxford)

## Mine supply

Global refined production is forecast to grow by 6% (+370 koz) to 6,460 koz in 2019. The majority of this supply increase is a one-off boost from significant work-in-progress pipeline build-ups in 2018. This build-up is attributable to both planned and unplanned maintenance work at two smelters and other processing assets, while WIP stocks also built up ahead of new processing capacity being installed and commissioned during the year. Around 90 koz of the supply growth is organic growth from mine expansion projects in ramp-up phase. The WIP stocks are expected to be processed throughout 2019, lifting South African supply temporarily to 4,725 koz. Expansion at a mine in the US helps to lift North American supply by 50 koz to 410 koz. Output from Zimbabwe and Russia is expected to remain stable at 470 koz and 675 koz respectively.

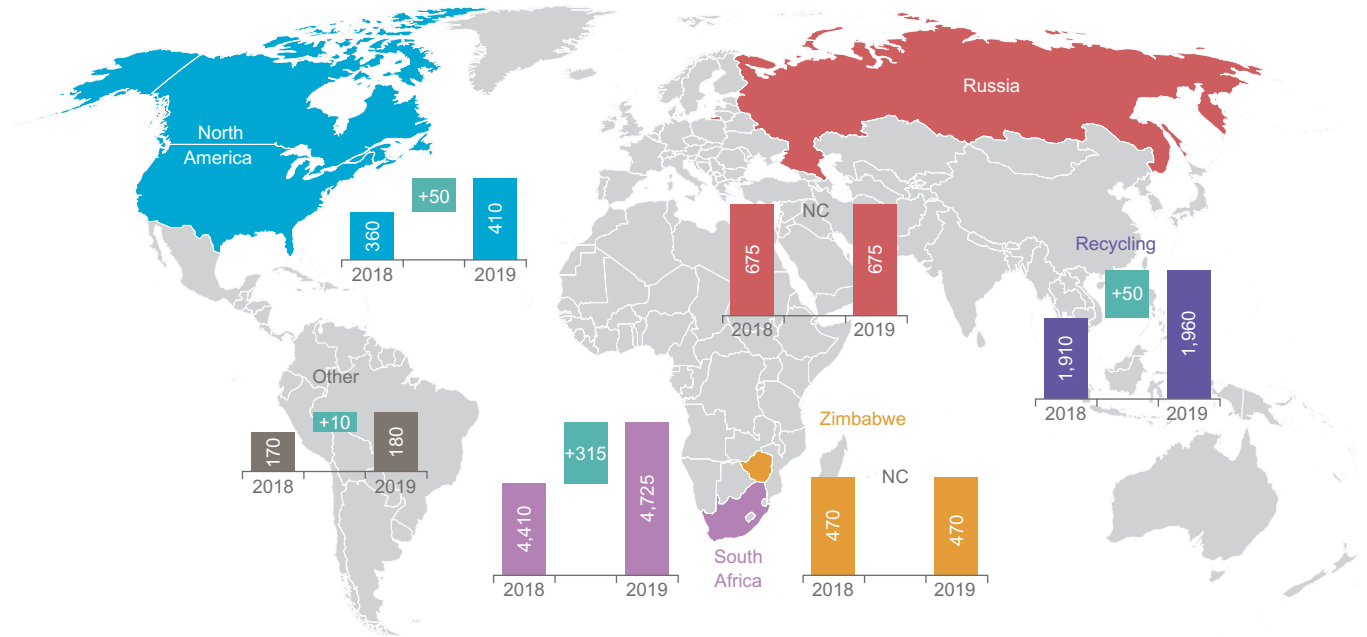
## Recycling

Secondary supply of platinum is expected to rise by 50 koz (+3%) to 1,960 koz in 2019, up from the 20 koz increase in 2018. Autocatalyst recycling growth is anticipated to ease slightly, with low growth in the US but an acceleration in Europe, and jewellery recycling is forecast to see only a small dip in 2019.

Autocatalyst recycling is estimated to reach 1,495 koz in 2019, 75 koz (+5%) higher than in 2018. The palladium price is very high going into 2019 and should maintain the current high volumes of catalysts flowing to smelters. Consequently, platinum volumes are expected to continue to rise in 2019. The US recycling industry is seeing the PGM content in recycled material continue to shift from platinum to palladium, limiting further growth. In Europe, diesel particulate filters are increasing their presence in the recycling mix. This is an issue as the silicon carbide base material can cause difficulties at the smelting stage, and only a limited number of smelters can process the material. However, platinum loadings are continuing to rise in Western European scrapped autocatalysts, and the number of end-of-life vehicles is expected to increase as higher new vehicle sales bolster the flow of vehicles to scrapyards. In contrast, the number of cars being scrapped in North America is forecast to decline as sales drop.

Jewellery recycling is expected to fall again in 2019 but by the smaller amount of 25 koz (-5%) to 460 koz. The continued weakness in the platinum price will restrict jewellery returns. Additionally, the forecast of flat platinum jewellery demand in Japan and another decline in China are not supportive of further recycling this year.

Chart 10: Changes in supply, koz, 2019f vs. 2018



Source: SFA (Oxford), NB: NC means no change.

Automotive demand

The slowdown in platinum automotive demand is expected to ease slightly in 2019, slipping 3% year-on-year to 3,000 koz from 3,100 koz in 2018.

Western Europe’s rate of decline is set to moderate as the availability of WLTP-compliant cars starts to increase again, especially in Germany. The Spanish government’s budget proposed a hike in the tax rate on diesel fuel, to remove the previously favourable tax treatment of diesel compared to gasoline fuel. Distortions to sales from the introduction of WLTP are likely to continue into 2019, as many countries have yet to finalise CO<sub>2</sub> emissions tax bands; for many vehicles, the measured CO<sub>2</sub> emissions change between the NEDC and WLTP testing regimes.

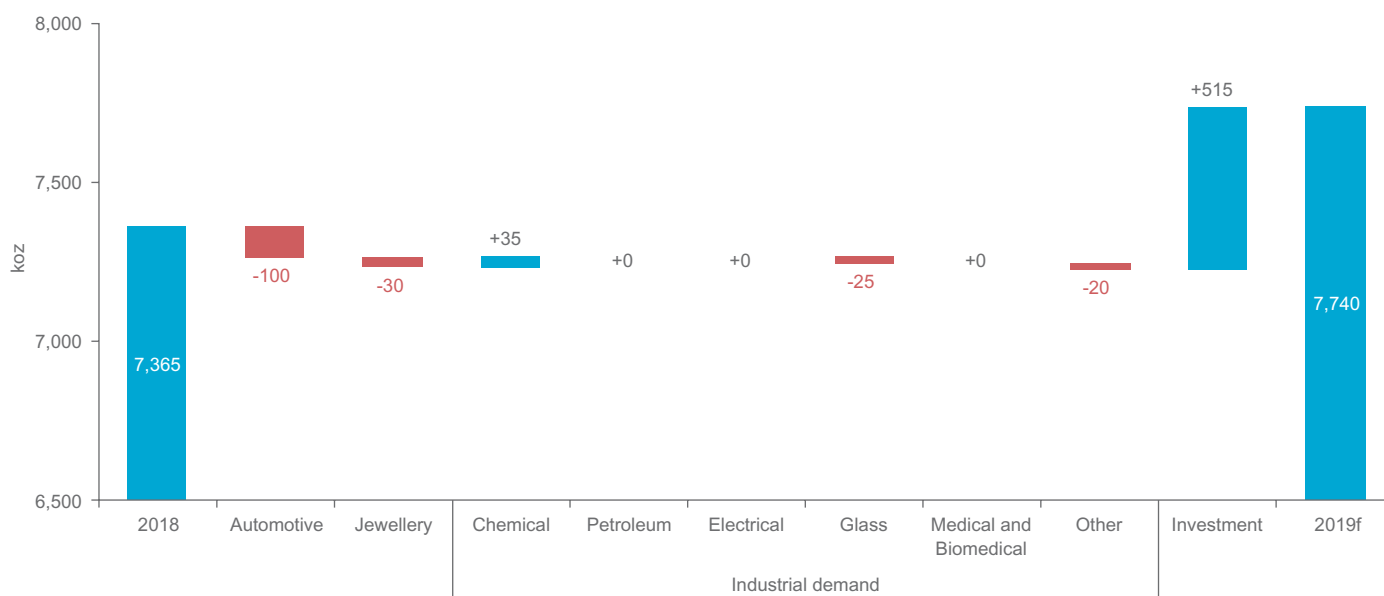
Indian demand in light-duty autocatalysts is expected to stabilise, though some pre-buying of BS 4 vehicles is likely through 2019, ahead of the introduction of BS VI legislation in April 2020, which will add platinum and hence cost to new diesel light vehicles. Suzuki has already announced it will cease production of BS IV vehicles by December 2019.

There is likely to be some continued reduction in platinum loadings for passenger cars in Europe. Euro 6d-TEMP will apply from September 2019; consolidation of NO<sub>x</sub> treatment to no-PGM SCR technology, and SCR on filters partially displacing platinum-containing DPFs, will continue.

Automakers continue to innovate in all aspects of aftertreatment and powertrain technology to meet ever more stringent emissions legislation targets. Ongoing platinum use in diesel autocatalysts will be supported by Mercedes-Benz which has announced the first four-cylinder diesel engine able to comply with Euro 6d, which takes effect in 2020 for new models. While the required NO<sub>x</sub> reduction is achieved via no-PGM SCR catalysis, the platinum content elsewhere in the aftertreatment is retained. Honda, on the other hand, will no longer include a diesel engine option in its CR-V crossover, but instead is pitching a gasoline hybrid as offering comparable torque, fuel economy and range as those previously offered in the diesel version.

While diesel remains the dominant powertrain for heavy-duty vehicles, sustaining platinum demand in autocatalysts, especially in emerging markets with tightening emissions legislation, the various modes of electrification (including fuel cells) are slowly being introduced to heavy vehicles where appropriate, to mitigate CO<sub>2</sub> emissions.

**Chart 11: Changes in demand by category, 2019f vs. 2018**



Source: SFA (Oxford)

## Jewellery demand

Jewellery demand in 2019 is forecast to fall to 2,325 koz, a 30 koz (-1%) drop, as a decline Chinese jewellery demand more than offsets gains in other regions. Following a weak Q4'18 performance in China expectations of platinum jewellery demand in 2019 have been lowered. Demand in the region is forecast to decline for a sixth consecutive year, although the rate of decline is expected to ease. The ongoing shift in consumer tastes is expected to hamper platinum jewellery sales in 2019. Marketing efforts are likely to be crucial in order to promote platinum products and attract younger and more discerning customers. PGI is promoting platinum jewellery in the region and the challenge it is facing is substantial. Bridal demand in Tier 3 and 4 cities is a potential growth area that PGI is targeting, but the demographic is changing as the number of marriages is falling year-on-year as the population of marrying age shrinks.

Reasonable demand growth is projected in the US in 2019 but slightly slower than the rate seen in 2018. The fiscal stimulus provided to the US economy in 2018 is expected to have largely subsided, while retail sales and consumer confidence fell at the end of the year. However, the platinum price is at a sizeable discount to gold following gold's rally over the last few months and this should increase platinum's appeal in the US, Japan and Europe. The recent downturn in economic expectations for 2019, such as the European Commission's euro area GDP growth forecast revision to +1.3% from +1.9%, mean sales could struggle more than currently anticipated in those regions. Platinum jewellery sales in India are predicted to see double-digit growth again in 2019 as gold is trading around its all-time high in local currency and margins on platinum are higher. Demographics are also supportive owing to a growing population and an expanding middle class.

### **Industrial demand**

Industrial platinum demand is projected to slip by 1% year-on-year (-10 koz) to 1,885 koz in 2019, as greater usage in chemical catalysis (+35 koz) is more than offset by lower requirements for glass fabrication (-25 koz) and other end-uses (-20 koz). Elsewhere, demand for petroleum processes, electrical components and medical applications are predicted to remain flat this year.

### **Chemical**

Platinum use in chemical catalysis is forecast to rise by 6% to 610 koz this year, predominantly to meet higher demand in China as well as minor growth in Western Europe and North America. New PDH and paraxylene capacity should boost new metal requirements in China during 2019, along with an increase in platinum-cured silicone production, while a slight rebound in nitric acid consumption is set to lift platinum demand marginally in most regions. In the RoW, greater nitric acid use plus rising silicone production are likely to be offset by a decline in platinum demand for new PDH and paraxylene plants, as capacity growth in these sectors slows.

### **Petroleum**

Net petroleum requirements are predicted to remain at 240 koz in 2019, as growth in China and North America is matched by a fall in RoW demand following a reasonably robust 2018. The rate of refining capacity expansion is set to increase in both China and the US this year, lifting new catalyst demand locally, with some Chinese upgrades planned to ensure gasoline fuel production complies with upcoming China 6 standards. However, the rate of capacity growth is expected to ease somewhat in the RoW, offsetting increases in platinum use elsewhere, although the region's demand should remain relatively high as capacity expands in areas such as India, Russia, Western Asia and Southeast Asia.

### **Electrical**

Electrical demand is also expected to stay fairly flat at 190 koz this year, with only negligible variations anticipated in the HDD and other electrical end-use markets. HDD shipments are forecast to fall by a further 8% to 346 million units in 2019, but the total number of platters shipped is set to climb slightly (+1%) as the high-capacity enterprise segment steadily increases its share of overall HDD sales, resulting in minor platinum demand growth in China and the RoW.

### **Glass**

Platinum requirements for glass fabrication are forecast to fall by 11% to 210 koz in 2019, largely owing to declining demand in the RoW which, along with slightly lower usage in China and Western Europe, should more than offset growth elsewhere. Despite decreasing as a result of less capacity expansion versus last year, RoW demand should remain relatively high as glass fibre capacity continues to expand in the region this year, including in India and South Korea. Comparatively fewer new plants and expansions in China and Western Europe should reduce platinum requirements in these regions, although growing fabrication capacity in the US is likely to lift demand slightly in North America.

### **Other**

Platinum consumed in other industrial end-uses is projected to decline by 5% back to 395 koz this year, primarily owing to a dip in fuel cell requirements, while demand in most other sectors again remains relatively stable. Despite further growth in unit volumes, thrifting is predicted to reduce platinum use in fuel cell stacks, temporarily lowering consumption in major manufacturing areas such as Japan and the US. Meanwhile, further growth in vehicle production should again slightly increase automotive sensor demand in China and the RoW in 2019.



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### Investment demand

Total investment in 2019 is forecast to be 530 koz, with strong growth in ETF holdings more than offsetting slightly lower bar and coin demand.

ETFs have had a marked change in fortunes so far this year: holdings fell across all regions in 2018, but in the first few weeks of 2019 investors rapidly increased their holdings, with UK and South African investors leading the way. While the rate of increase is likely to ease, ETF holdings are expected to rise substantially year-on-year.

Bar and coin investment is estimated to be slightly lower this year than in 2018 owing to weaker bar purchases in Japan, the largest market. Japanese investors seem to have become accustomed to the low platinum price. When the price first fell below ¥4,000/g in 2015 there was a surge in buying, but over the last couple of years investors' bar purchases have eased even though the price has continued to fall. As a result, Japanese bar purchases are projected to be moderately lower than in 2018. Coin sales are expected to be similar to last year. The US Mint released both the bullion and proof versions of the platinum American Eagle coin in January; sales have been good and both mintages look likely to sell out again.

### ABOVE GROUND STOCKS

The market had a surplus of 645 koz last year which increased above ground stocks to 2,815 koz by the end of the year. With a surplus of 680 koz forecast for 2019, this will result in above ground stocks reaching 3,495 koz at the end of 2019 and exceeding 3 moz for the first time since 2013.

The WPIC definition of above ground stocks is: the year-end estimate of the cumulative platinum holdings not associated with exchange-traded funds, metal held by exchanges or working inventories of mining producers, refiners, fabricators or end-users.

# PLATINUM QUARTERLY Q4 2018

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

	2013	2014	2015	2016	2017	2018	2019f	2018/2017 Growth %	2019f/2018 Growth %
<b>Platinum Supply-demand Balance (koz)</b>									
<b>SUPPLY</b>									
<b>Refined Production</b>	<b>6,070</b>	<b>4,855</b>	<b>6,160</b>	<b>6,035</b>	<b>6,125</b>	<b>6,085</b>	<b>6,460</b>	<b>-1%</b>	<b>6%</b>
South Africa	4,355	3,115	4,480	4,255	4,380	4,410	4,725	1%	7%
Zimbabwe	405	405	405	490	480	470	470	-2%	0%
North America	355	400	385	395	365	360	410	-1%	14%
Russia	740	740	710	715	720	675	675	-6%	0%
Other	215	195	180	180	180	170	180	-6%	6%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-215</b>	<b>+350</b>	<b>+30</b>	<b>+30</b>	<b>+30</b>	<b>+15</b>	<b>+0</b>	<b>-50%</b>	<b>-100%</b>
<b>Total Mining Supply</b>	<b>5,855</b>	<b>5,205</b>	<b>6,190</b>	<b>6,065</b>	<b>6,155</b>	<b>6,100</b>	<b>6,460</b>	<b>-1%</b>	<b>6%</b>
<b>Recycling</b>	<b>1,980</b>	<b>2,035</b>	<b>1,705</b>	<b>1,840</b>	<b>1,890</b>	<b>1,910</b>	<b>1,960</b>	<b>1%</b>	<b>3%</b>
Autocatalyst	1,120	1,255	1,185	1,210	1,325	1,420	1,495	7%	5%
Jewellery	855	775	515	625	560	485	460	-13%	-5%
Industrial	5	5	5	5	5	5	5	0%	0%
<b>Total Supply</b>	<b>7,835</b>	<b>7,240</b>	<b>7,895</b>	<b>7,905</b>	<b>8,045</b>	<b>8,010</b>	<b>8,420</b>	<b>0%</b>	<b>5%</b>
<b>DEMAND</b>									
<b>Automotive</b>	<b>3,170</b>	<b>3,310</b>	<b>3,380</b>	<b>3,465</b>	<b>3,325</b>	<b>3,100</b>	<b>3,000</b>	<b>-7%</b>	<b>-3%</b>
Autocatalyst	3,025	3,165	3,240	3,320	3,180	2,960	2,850	-7%	-4%
Non-road	140	150	140	135	140	145	150	4%	3%
<b>Jewellery</b>	<b>2,945</b>	<b>3,000</b>	<b>2,840</b>	<b>2,505</b>	<b>2,460</b>	<b>2,355</b>	<b>2,325</b>	<b>-4%</b>	<b>-1%</b>
<b>Industrial</b>	<b>1,485</b>	<b>1,565</b>	<b>1,760</b>	<b>1,780</b>	<b>1,700</b>	<b>1,895</b>	<b>1,885</b>	<b>11%</b>	<b>-1%</b>
Chemical	535	540	595	560	590	575	610	-3%	6%
Petroleum	50	65	205	215	100	240	240	140%	0%
Electrical	195	205	190	185	195	190	190	-3%	0%
Glass	145	175	200	205	185	235	210	27%	-11%
Medical and Biomedical	220	220	225	230	235	240	240	2%	0%
Other	340	360	345	385	395	415	395	5%	-5%
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>275</b>	<b>15</b>	<b>530</b>	<b>-95%</b>	<b>N/M</b>
Change in Bars, Coins	-5	50	525	460	215	280		30%	
Change in ETF Holdings	905	215	-240	-10	105	-245		N/M	
Change in Stocks Held by Exchanges	35	-115	20	85	-45	-20		-56%	
<b>Total Demand</b>	<b>8,535</b>	<b>8,025</b>	<b>8,285</b>	<b>8,285</b>	<b>7,760</b>	<b>7,365</b>	<b>7,740</b>	<b>-5%</b>	<b>5%</b>
<b>Balance</b>	<b>-700</b>	<b>-785</b>	<b>-390</b>	<b>-380</b>	<b>285</b>	<b>645</b>	<b>680</b>	<b>126%</b>	<b>5%</b>
<b>Above Ground Stocks</b>	<b>4,140*</b>	<b>3,440</b>	<b>2,655</b>	<b>2,265</b>	<b>1,885</b>	<b>2,170</b>	<b>3,495</b>	<b>30%</b>	<b>24%</b>

Source: SFA (Oxford). \*As of 31st December 2012. NB: Numbers have been independently rounded.

# PLATINUM QUARTERLY Q4 2018

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

	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q4'18/Q4'17 Growth %	Q4'18/Q3'18 Growth %
<b>Platinum Supply-demand Balance (koz)</b>										
<b>SUPPLY</b>										
<b>Refined Production</b>	<b>1,415</b>	<b>1,550</b>	<b>1,580</b>	<b>1,590</b>	<b>1,300</b>	<b>1,600</b>	<b>1,680</b>	<b>1,535</b>	<b>-3%</b>	<b>-9%</b>
South Africa	1,020	1,090	1,155	1,120	910	1,150	1,240	1,130	1%	-9%
Zimbabwe	115	125	100	140	115	115	120	120	-14%	0%
North America	95	85	95	95	90	85	90	100	5%	11%
Russia	140	205	185	190	145	205	185	145	-24%	-22%
Other	45	45	45	45	40	45	45	40	-11%	-11%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-60</b>	<b>+75</b>	<b>-10</b>	<b>+25</b>	<b>-10</b>	<b>+55</b>	<b>-20</b>	<b>-5</b>	<b>N/M</b>	<b>-75%</b>
<b>Total Mining Supply</b>	<b>1,355</b>	<b>1,625</b>	<b>1,570</b>	<b>1,615</b>	<b>1,290</b>	<b>1,655</b>	<b>1,660</b>	<b>1,530</b>	<b>-5%</b>	<b>-8%</b>
<b>Recycling</b>	<b>420</b>	<b>480</b>	<b>480</b>	<b>505</b>	<b>450</b>	<b>475</b>	<b>485</b>	<b>490</b>	<b>-3%</b>	<b>1%</b>
Autocatalyst	300	330	330	365	330	345	365	380	4%	4%
Jewellery	120	150	150	140	120	130	120	110	-21%	-8%
Industrial	0	0	0	0	0	0	0	0	N/M	N/M
<b>Total Supply</b>	<b>1,775</b>	<b>2,105</b>	<b>2,050</b>	<b>2,120</b>	<b>1,740</b>	<b>2,130</b>	<b>2,145</b>	<b>2,020</b>	<b>-5%</b>	<b>-6%</b>
<b>DEMAND</b>										
<b>Automotive</b>	<b>860</b>	<b>835</b>	<b>785</b>	<b>845</b>	<b>805</b>	<b>810</b>	<b>710</b>	<b>780</b>	<b>-8%</b>	<b>10%</b>
Autocatalyst	820	800	750	810	770	775	675	740	-9%	10%
Non-road	35	35	35	35	35	40	35	40	14%	14%
<b>Jewellery</b>	<b>610</b>	<b>590</b>	<b>580</b>	<b>680</b>	<b>605</b>	<b>590</b>	<b>575</b>	<b>600</b>	<b>-12%</b>	<b>4%</b>
<b>Industrial</b>	<b>435</b>	<b>415</b>	<b>425</b>	<b>430</b>	<b>475</b>	<b>485</b>	<b>475</b>	<b>460</b>	<b>7%</b>	<b>-3%</b>
Chemical	150	140	165	135	145	140	160	135	0%	-16%
Petroleum	35	15	25	25	55	55	55	55	120%	0%
Electrical	55	45	50	60	55	50	50	50	-17%	0%
Glass	40	50	45	35	60	65	70	40	14%	-43%
Medical and Biomedical	55	70	45	70	55	70	45	70	0%	56%
Other	100	95	95	105	105	105	95	110	5%	16%
<b>Investment</b>	<b>80</b>	<b>105</b>	<b>-10</b>	<b>100</b>	<b>60</b>	<b>-55</b>	<b>65</b>	<b>-65</b>	<b>N/M</b>	<b>N/M</b>
Change in Bars, Coins	30	75	45	65	85	70	70	50	-23%	-29%
Change in ETF Holdings	60	30	-40	55	-15	-125	5	-115	N/M	N/M
Change in Stocks Held by Exchanges	-10	0	-15	-20	-10	0	-10	0	N/M	N/M
<b>Total Demand</b>	<b>1,985</b>	<b>1,945</b>	<b>1,780</b>	<b>2,055</b>	<b>1,945</b>	<b>1,830</b>	<b>1,825</b>	<b>1,775</b>	<b>-14%</b>	<b>-3%</b>
<b>Balance</b>	<b>-210</b>	<b>160</b>	<b>270</b>	<b>65</b>	<b>-205</b>	<b>300</b>	<b>320</b>	<b>245</b>		

Source: SFA (Oxford). NB: Numbers have been independently rounded. N/M means not meaningful.

# PLATINUM QUARTERLY Q4 2018

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

	H1 2017	H2 2017	H1 2018	H2 2018	H2'18/H2'17 Growth %	H2'18/H1'18 Growth %
<b>Platinum Supply-demand Balance (koz)</b>						
<b>SUPPLY</b>						
<b>Refined Production</b>	<b>2,965</b>	<b>3,170</b>	<b>2,900</b>	<b>3,215</b>	<b>1%</b>	<b>11%</b>
South Africa	2,110	2,275	2,060	2,370	4%	15%
Zimbabwe	240	240	230	240	0%	4%
North America	180	190	175	190	0%	9%
Russia	345	375	350	330	-12%	-6%
Other	90	90	85	85	-6%	0%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+15</b>	<b>+15</b>	<b>+45</b>	<b>-25</b>	<b>N/M</b>	<b>N/M</b>
<b>Total Mining Supply</b>	<b>2,980</b>	<b>3,185</b>	<b>2,945</b>	<b>3,190</b>	<b>0%</b>	<b>8%</b>
<b>Recycling</b>	<b>900</b>	<b>985</b>	<b>925</b>	<b>975</b>	<b>-1%</b>	<b>5%</b>
Autocatalyst	630	695	675	745	7%	10%
Jewellery	270	290	250	230	-21%	-8%
Industrial	0	0	0	0	N/M	N/M
<b>Total Supply</b>	<b>3,880</b>	<b>4,170</b>	<b>3,870</b>	<b>4,165</b>	<b>0%</b>	<b>8%</b>
<b>DEMAND</b>						
<b>Automotive</b>	<b>1,695</b>	<b>1,630</b>	<b>1,615</b>	<b>1,490</b>	<b>-9%</b>	<b>-8%</b>
Autocatalyst	1,620	1,560	1,545	1,415	-9%	-8%
Non-road	70	70	75	75	7%	0%
<b>Jewellery</b>	<b>1,200</b>	<b>1,260</b>	<b>1,195</b>	<b>1,175</b>	<b>-7%</b>	<b>-2%</b>
<b>Industrial</b>	<b>850</b>	<b>855</b>	<b>960</b>	<b>935</b>	<b>9%</b>	<b>-3%</b>
Chemical	290	300	285	295	-2%	4%
Petroleum	50	50	110	110	120%	0%
Electrical	100	110	105	100	-9%	-5%
Glass	90	80	125	110	38%	-12%
Medical and Biomedical	125	115	125	115	0%	-8%
Other	195	200	210	205	3%	-2%
<b>Investment</b>	<b>185</b>	<b>90</b>	<b>5</b>	<b>0</b>	<b>-100%</b>	<b>-100%</b>
Change in Bars, Coins	105	110	155	120	9%	-23%
Change in ETF Holdings	90	15	-140	-110	N/M	-21%
Change in Stocks Held by Exchanges	-10	-35	-10	-10	-71%	0%
<b>Total Demand</b>	<b>3,930</b>	<b>3,835</b>	<b>3,775</b>	<b>3,600</b>	<b>-6%</b>	<b>-5%</b>
<b>Balance</b>	<b>-50</b>	<b>335</b>	<b>95</b>	<b>565</b>		

Source: SFA (Oxford). NB: Numbers have been independently rounded. N/M means not meaningful.

# PLATINUM QUARTERLY Q4 2018

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

	2013	2014	2015	2016	2017	2018	2019f	2018/2017 Growth %	2019f/2018 Growth %	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018
<b>Platinum gross demand (koz)</b>														
<b>Automotive</b>	<b>3,170</b>	<b>3,310</b>	<b>3,380</b>	<b>3,465</b>	<b>3,325</b>	<b>3,100</b>	<b>3,000</b>	<b>-7%</b>	<b>-3%</b>	<b>845</b>	<b>805</b>	<b>810</b>	<b>710</b>	<b>780</b>
North America	425	465	485	445	415	430								
Western Europe	1,350	1,440	1,550	1,705	1,560	1,305								
Japan	580	590	510	455	440	420								
China	130	120	125	165	195	190								
India	160	160	175	165	165	190								
Rest of the World	525	535	535	530	550	565								
<b>Jewellery</b>	<b>2,945</b>	<b>3,000</b>	<b>2,840</b>	<b>2,505</b>	<b>2,460</b>	<b>2,355</b>	<b>2,325</b>	<b>-4%</b>	<b>-1%</b>	<b>680</b>	<b>605</b>	<b>590</b>	<b>575</b>	<b>600</b>
North America	200	230	250	265	280	305								
Western Europe	220	220	235	240	250	255								
Japan	335	335	340	335	340	345								
China	1,990	1,975	1,765	1,450	1,340	1,175								
India	140	175	180	145	175	200								
Rest of the World	60	65	70	70	75	75								
<b>Chemical</b>	<b>535</b>	<b>540</b>	<b>595</b>	<b>560</b>	<b>590</b>	<b>575</b>	<b>610</b>	<b>-3%</b>	<b>6%</b>	<b>135</b>	<b>145</b>	<b>140</b>	<b>160</b>	<b>135</b>
North America	55	55	65	50	55	50								
Western Europe	110	105	100	110	120	110								
Japan	10	10	10	15	15	15								
China	195	215	255	225	225	215								
Rest of the World	165	155	165	160	175	185								
<b>Petroleum</b>	<b>50</b>	<b>65</b>	<b>205</b>	<b>215</b>	<b>100</b>	<b>240</b>	<b>240</b>	<b>140%</b>	<b>0%</b>	<b>25</b>	<b>55</b>	<b>55</b>	<b>55</b>	<b>55</b>
North America	40	25	-25	90	55	55								
Western Europe	-45	-15	70	10	5	25								
Japan	10	-35	5	0	-40	5								
China	80	-5	45	80	45	10								
Rest of the World	-35	95	110	35	35	145								
<b>Electrical</b>	<b>195</b>	<b>205</b>	<b>190</b>	<b>185</b>	<b>195</b>	<b>190</b>	<b>190</b>	<b>-3%</b>	<b>0%</b>	<b>60</b>	<b>55</b>	<b>50</b>	<b>50</b>	<b>50</b>
North America	10	15	15	10	15	15								
Western Europe	5	10	10	10	10	10								
Japan	15	15	15	15	15	15								
China	75	70	65	75	80	75								
Rest of the World	90	95	85	75	75	75								
<b>Glass</b>	<b>145</b>	<b>175</b>	<b>200</b>	<b>205</b>	<b>185</b>	<b>235</b>	<b>210</b>	<b>27%</b>	<b>-11%</b>	<b>35</b>	<b>60</b>	<b>65</b>	<b>70</b>	<b>40</b>
North America	5	10	0	20	5	5								
Western Europe	-10	15	10	5	10	30								
Japan	0	-25	-5	-10	-10	0								
China	90	85	95	100	85	75								
Rest of the World	60	90	100	90	95	125								
<b>Medical and Biomedical</b>	<b>220</b>	<b>220</b>	<b>225</b>	<b>230</b>	<b>235</b>	<b>240</b>	<b>240</b>	<b>2%</b>	<b>0%</b>	<b>70</b>	<b>55</b>	<b>70</b>	<b>45</b>	<b>70</b>
North America	90	90	90	90	95	95								
Western Europe	75	75	75	80	80	80								
Japan	20	20	20	20	20	20								
China	15	15	20	20	20	20								
Rest of the World	20	20	20	20	20	25								
<b>Other industrial</b>	<b>340</b>	<b>360</b>	<b>345</b>	<b>385</b>	<b>395</b>	<b>415</b>	<b>395</b>	<b>5%</b>	<b>-5%</b>	<b>105</b>	<b>105</b>	<b>105</b>	<b>95</b>	<b>110</b>
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>275</b>	<b>15</b>	<b>530</b>	<b>-95%</b>	<b>N/M</b>	<b>100</b>	<b>60</b>	<b>-55</b>	<b>65</b>	<b>-65</b>
<b>Total Demand</b>	<b>8,535</b>	<b>8,025</b>	<b>8,285</b>	<b>8,285</b>	<b>7,760</b>	<b>7,365</b>	<b>7,740</b>	<b>-5%</b>	<b>5%</b>	<b>2,055</b>	<b>1,945</b>	<b>1,830</b>	<b>1,825</b>	<b>1,775</b>

Source: SFA (Oxford). NB: Numbers have been independently rounded.

## 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.

### BDH

Butane dehydrogenation; catalytic conversion of isobutane to isobutylene.

### Bharat Stage III/IV standards (BS-III, BS-IV)

Bharat Stage III is equivalent to Euro 3 emissions legislation. Introduced in 2005 in 12 major cities across India and enforced nationwide from April 2010. Bharat Stage IV is equivalent to Euro 4 emissions legislation. Introduced in 2010 in 14 major cities across India and set to be enforced nationwide from April 2017.

### 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.

### Conformity factor (CF)

The EU is to allow automakers to exceed current Euro 6 NO<sub>x</sub> limits, giving time to adapt to new real-world driving emissions rules. From September 2017 for new models and from September 2019 for new vehicles, a CF of up to 2.1 (110%) will be allowed over the 80 mg/km NO<sub>x</sub> limit. This CF will be phased out at the latest in 2021, then from January 2020 (new models) and January 2021 (new vehicles) a lower CF of 1.5 will be allowed, reflecting statistical and technical uncertainty of the tests.

### Diesel oxidation catalyst (DOC)

A DOC oxidises harmful carbon monoxide and unburnt hydrocarbons, produced by incomplete combustion of diesel fuel, to harmless 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.

### Emissions legislation

Tailpipe regulations covering emissions of particulate matter, hydrocarbons and oxides of nitrogen.

### 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.

### Euro V/VI emission standards

EU emission standards for heavy-duty vehicles. Euro V legislation was introduced in 2009 and Euro VI in 2013/2014; will be widely adopted later in other regions.

### Euro 5/6 emission standards

EU emission standards for light-duty vehicles. Euro 5 legislation was introduced in 2009 and Euro 6 in 2014/2015; will be widely adopted later in other regions.

### Form factor

The size of a hard disk drive (e.g. 2.5-inch or 3.5-inch) which varies depending on the device the drive is used in.

### GTL

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

### HDD

Hard disk drive.

### HDV

Heavy-duty vehicle.

### koz

Thousand ounces.

### LCD

Liquid-crystal display used for video display.

### LCV

Light commercial vehicle.

### Lean NO<sub>x</sub> traps (LNT)

Rhodium-based, catalyses the chemical reduction of NO<sub>x</sub> in diesel engine exhaust to harmless nitrogen.

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.

### moz

Million ounces.

### **NEDC**

New European Driving Cycle vehicle emissions test.

### **Net demand**

A measure of the theoretical 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, using engine and emissions technology similar to on-road heavy-duty diesel vehicles.

### **NO<sub>x</sub> storage catalyst (NSC)**

Used in light duty diesel aftertreatment to convert harmful oxides of nitrogen to harmless nitrogen and carbon dioxide. The PGM content is mainly platinum, with some rhodium. NSCs may be used in conjunction with SCR technology to minimise NO<sub>x</sub> emissions.

### **OECD**

Organisation for Economic Co-operation and Development, consisting of 34 developed countries.

### **oz**

A unit of weight commonly used for precious metals.  
1 troy ounce = 1.1 ounces.

### **Paraxylene**

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.

### **PDH**

Propane dehydrogenation, where propane is converted to propylene.

### **PGMs**

Platinum-group metals.

### **PMR**

Precious metals refinery.

### **Producer inventory**

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

### **RDE**

Real Driving Emissions – the term used by the EU to define the testing protocol that will measure pollutants emitted from cars, including NO<sub>x</sub>, 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 will apply to all registrations from September 2019.

### **Refined production**

Processed platinum output from refineries.

### **Secondary supply**

Recycling output.

### **Selective catalytic reduction (SCR)**

PGM-free, converts harmful NO<sub>x</sub> in diesel exhaust to harmless nitrogen, via a tank of urea solution. Used in heavy-duty diesel vehicles, increasingly competes with LNT in light-duty diesel vehicles. Contained within an aftertreatment system which normally requires a platinum-containing oxidation catalyst ahead of the SCR unit.

### **SGE**

Shanghai Gold Exchange.

### **SSD**

Solid-state drive.

### **Stage 4 regulations**

European emission standards implemented in 2014 for non-road diesel engines.

### **Three-way catalyst**

Used in gasoline cars to remove hydrocarbons, carbon monoxide and NO<sub>x</sub>. Largely palladium-based now, some rhodium.

### **Tier 4 stage**

Emissions standards phased in between 2008 and 2015 in the US for non-road vehicles.

### **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).

### **WPIC**

The World Platinum Investment Council.

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### **Ounce conversion**

1 million ounces = 31.1 tonnes.

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