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# PLATINUM QUARTERLY

## Q4 2017

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8th March 2018

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### FOREWORD

I'd like to begin this quarterly report with some very recent reflections from WPIC's latest engagements in Shanghai. I have just returned from an event we organised with the Shanghai Clearing House, NYU in Shanghai and the Shanghai Gold Exchange, as part of our wider drive to support the growth of platinum investment in China, where we recently opened a new office. Here we presented to an audience of over two hundred investors, potential investors and potential partners in platinum.

The platinum market is truly global and the opportunities for the increased use of platinum in China, including as an investment asset, are extensive.

I look forward to updating you during the course of the year on more of our new initiatives in China.

The importance of China to platinum is underlined in today's *Platinum Quarterly* report, with the final quarter of 2017 showing welcome, albeit tentative, signs that jewellery demand in the country is strengthening. China's largest jeweller, Chow Tai Fook, reported same-store sales growth of 5% in the final quarter of 2017, indicating that jewellery demand in China might have improved, outperforming expectations – this a positive sign for China platinum jewellery demand.

An expected rebound in jewellery demand plays a significant role in what is expected to be a tighter 2018 for the platinum market than 2017, showing that the market is moving in the right direction.

In particular, we expect to see continued demand growth for platinum jewellery in India 2018, albeit at a lower absolute level than previously expected. This follows new information from key participants in the jewellery supply chain in India, which is now reflected in our total jewellery demand figures for 2015, 2016, and 2017.

In 2018, global demand is projected to grow marginally to 7,790 koz, as a recovery in industrial demand and an increase in jewellery demand outweigh declines in automotive and investment demand.

Global platinum supply is forecast to be 7,815 koz this year, a contraction of 2% from 2017, despite an anticipated increase in recycling of 60 koz to 1,965 koz. Total mining supply is expected to decline by 4% to 5,850 koz in 2018, mostly owing to reduced output from South Africa following some mine closures in 2017. Autocatalyst recycling is expected to be buoyed by higher PGM prices, encouraging the processing of scrapped catalysts.

On 15 February 2018, Cyril Ramaphosa was elected the fifth democratic President of South Africa. Formerly a director at Lonmin and one of the founders of the National Union of Mineworkers, Mr Ramaphosa's arrival as President is a welcome one. He is a man that understands the importance of mining and platinum to South Africa, and his decision to appoint a new minister of mines shortly after inauguration underlines the weight he attaches to a sustainable mining sector.

Indeed, the positive effects of new leadership are already apparent for South Africa, with the Rand strengthening. This has, in turn, helped to support an increase in the US Dollar price of platinum, giving a welcome short-term lift to investors, though South African platinum producers will need to adapt to a stronger Rand.

Concerns about automotive demand continue to weigh negatively on platinum sentiment. We believe that these concerns are, once again, overdone. Today's *Platinum Quarterly* shows that automotive platinum demand fell by 3% in 2017, with other positive dynamics almost offsetting the drag from declines in Western Europe diesel share.

The policy environment for diesel vehicles remains in flux, especially in Europe. A recent decision by a German High Court, to allow German cities to ban older diesel vehicles is a negative headline. Nevertheless, our broad perspective means we firmly believe clean diesel vehicles will be on the road for years to come.

We believe that regulators' understanding of the environmental damage from missing CO<sub>2</sub> targets, the risk of significant CO<sub>2</sub> fines for automakers, and the consumers' reticence towards electric vehicles (with battery electric vehicle share still only 1%), could lead to sensible actions by automakers and policymakers. Clean diesel vehicles with demonstrably low on-the-road NO<sub>x</sub> emissions could therefore still have a place within German, and European, cities after all. Automakers winning back consumers trust could also necessitate some hardware retrofitting of existing on-the-road diesel cars (with potential for additional demand for platinum).

The transport sector accounted for the majority of fuel cell demand growth last year, with an increase in the production of hydrogen-powered buses, commercial and non-road vehicles lifting platinum requirements, albeit from a low base. Perhaps it is from this sector that fuel cell technology will gain mass adoption first, with the uptick in passenger vehicles (with massive platinum demand upside) materialising in the medium term. Either way, this is a very positive trend, and one that we will further probe as the year continues.

Finally, there is once again growing anecdotal evidence that suggests automakers are switching, or are considering switching, from palladium back to (currently cheaper) platinum in gasoline vehicles.

Since our report and scenarios on this subject were published last quarter, others have looked into this topic, with an increasing number of commentators postulating that switching could be spurred into action by palladium scarcity and the price differential between the two metals. We will continue to monitor the extent of any switching activity as automakers implement their emissions risk mitigation strategies.

On the market development front the year has already started strongly. In January, we were pleased to support the launch of a new low-cost platinum ETF in the US – staying true to our goal of helping to develop new products and channels that make investing in physical platinum easier. We also continue to increase our interactions with investors; using our research and insights to unpack market assumptions and to attract past and new investors to consider allocating to platinum.

Let me finish with a thank-you. We issued our first *Platinum Quarterly* to the market on 3 December 2014 – a date etched in my memory – with the intention of shining more light on the complex workings of the global platinum market.

More than three years later, *Platinum Quarterly* has evolved and grown, and, as many of you have told me and the team here at the World Platinum Investment Council, embedded itself in the schedules of investors and potential investors. It is now a critical piece of insight to assess the workings of this important platinum market.

Your interest is never taken for granted and your continued feedback is warmly welcomed as we seek to evolve and expand our research and thinking in 2018.

**Paul Wilson, CEO**

# PLATINUM QUARTERLY Q4 2017

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

	2016	2017	2018f	2017/2016 Growth %	2018f/2017 Growth %	Q3 2017	Q4 2017
<b>Platinum Supply-demand Balance (koz)</b>							
<b>SUPPLY</b>							
<b>Refined Production</b>	<b>6,035</b>	<b>6,075</b>	<b>5,850</b>	<b>1%</b>	<b>-4%</b>	<b>1,570</b>	<b>1,540</b>
South Africa	4,255	4,370	4,175	3%	-4%	1,140	1,120
Zimbabwe	490	445	450	-9%	1%	100	105
North America	395	365	370	-8%	1%	95	90
Russia	715	715	685	0%	-4%	185	185
Other	180	180	170	0%	-6%	45	45
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+30</b>	<b>+35</b>	<b>+0</b>	<b>17%</b>	<b>-100%</b>	<b>-10</b>	<b>+30</b>
<b>Total Mining Supply</b>	<b>6,065</b>	<b>6,110</b>	<b>5,850</b>	<b>1%</b>	<b>-4%</b>	<b>1,560</b>	<b>1,570</b>
<b>Recycling</b>	<b>1,855</b>	<b>1,905</b>	<b>1,965</b>	<b>3%</b>	<b>3%</b>	<b>480</b>	<b>520</b>
Autocatalyst	1,225	1,340	1,405	9%	5%	330	380
Jewellery	625	560	555	-10%	-1%	150	140
Industrial	5	5	5	0%	0%	0	0
<b>Total Supply</b>	<b>7,920</b>	<b>8,015</b>	<b>7,815</b>	<b>1%</b>	<b>-2%</b>	<b>2,040</b>	<b>2,090</b>
<b>DEMAND</b>							
<b>Automotive</b>	<b>3,490</b>	<b>3,395</b>	<b>3,285</b>	<b>-3%</b>	<b>-3%</b>	<b>810</b>	<b>865</b>
Autocatalyst	3,350	3,255	3,150	-3%	-3%	770	830
Non-road	135	140	145	4%	4%	35	35
<b>Jewellery</b>	<b>2,505</b>	<b>2,460</b>	<b>2,505</b>	<b>-2%</b>	<b>2%</b>	<b>585</b>	<b>675</b>
<b>Industrial</b>	<b>1,790</b>	<b>1,650</b>	<b>1,750</b>	<b>-8%</b>	<b>6%</b>	<b>415</b>	<b>405</b>
Chemical	595	585	600	-2%	3%	165	135
Petroleum	215	100	160	-53%	60%	25	25
Electrical	160	155	150	-3%	-3%	40	40
Glass	205	180	185	-12%	3%	50	20
Medical and Biomedical	235	240	240	2%	0%	45	75
Other	380	390	415	3%	6%	90	110
<b>Investment</b>	<b>535</b>	<b>260</b>	<b>250</b>	<b>-51%</b>	<b>-4%</b>	<b>-10</b>	<b>95</b>
Change in Bars, Coins	460	210				45	65
Change in ETF Holdings	-10	95				-40	50
Change in Stocks Held by Exchanges	85	-45				-15	-20
<b>Total Demand</b>	<b>8,320</b>	<b>7,765</b>	<b>7,790</b>	<b>-7%</b>	<b>0%</b>	<b>1,800</b>	<b>2,040</b>
<b>Balance</b>	<b>-400</b>	<b>250</b>	<b>25</b>	<b>-163%</b>	<b>-90%</b>	<b>240</b>	<b>50</b>
<b>Above Ground Stocks</b>	<b>4,140*</b>	<b>1,905</b>	<b>2,180</b>	<b>-13%</b>	<b>1%</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 2015 are contained in previously published PQs which are freely available on the WPIC website. Quarterly estimates from Q1 2016 and half-yearly estimates from H1 2016 are included in Tables 3 and 4 respectively, on pages 16-17 (supply, demand and above ground stocks).
- The 2017 and 2018 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.

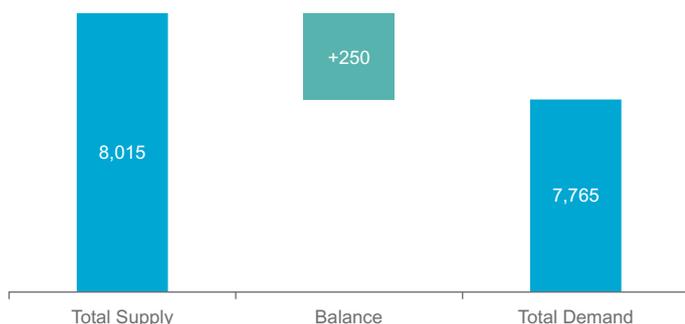
## 2017 FULL YEAR REVIEW

Total platinum supply expanded by 1% to 8,015 koz in 2017 as mining production improved 1% year-on-year to 6,110 koz and recycling increased by 3% to 1,905 koz. A 3% rise in refined production to 4,370 koz (+115 koz) in South Africa outweighed lower output from Zimbabwe (-45 koz) and North America (-30 koz). Secondary supply improved 3% since, despite jewellery recycling falling 10% to 560 koz following a strong 2016, autocatalyst recycling grew by 9% to 1,340 koz.

Global demand was 7,765 koz in 2017, down 7% year-on-year from 8,320 koz, as all the major segments experienced lower demand. Automotive demand fell 3% to 3,395 koz, driven by declining usage in Western Europe, while global jewellery demand slipped 2% to 2,460 koz as the contraction in the Chinese market was only partially offset by gains in other regions. Industrial demand was 8% lower year-on-year at 1,650 koz, mostly owing to lower net petroleum demand. Investment demand was also substantially lower in 2017 at 260 koz, mostly owing to a reduced level of platinum bar purchases in the largest market, Japan.

This resulted in the platinum market being in a surplus of 250 koz in 2017 (Chart 1). The shift in the market balance from the 15 koz deficit forecast in *Platinum Quarterly Q3 2017* was caused by a number of factors. Supply from South Africa was significantly higher than predicted where, despite some mine closures, other operations outperformed expectations. The fourth quarter also saw a jump in recycling volumes which further added to the increase in total platinum supply. In addition, new information on jewellery demand in India resulted in demand there being rebased to a lower level.

**Chart 1: Supply-demand balance, koz, 2017**



Source: SFA (Oxford)

## Mine supply

Global refined supply was expected to contract but ended up rising by 1% to 6,075 koz in 2017. Production from South Africa rose by 115 koz (+3%) to 4,370 koz, driven by operational improvements on the Western Bushveld, including improved stoping efficiencies and mine plan optimisation following changes in ownership and record production on the Northern Limb. As a result, yield from Western Bushveld mines increased by 4% year-on-year, while output from Eastern Bushveld mines fell by 12% owing to community disruption, a tailings dam leak and a mine closure.

Production from Zimbabwe fell by 9% to 445 koz, with processing of pipeline material boosting the total for the previous year. North American supply decreased by 8% to 365 koz as a Canadian producer transitioned to using a single furnace. Output from Russia remained flat at 715 koz in 2017.

A net reduction in producer stocks is expected for 2017, by a similar amount to 2016 (-30-35 koz). Total mine supply is therefore estimated at 6,110 koz for 2017, an increase of 1% on 2016 levels (6,065 koz).

## Recycling

Platinum supply from recycling rose by 3% year-on-year (+50 koz) to 1,905 koz in 2017. Global autocatalyst recycling increased by 115 koz, with North America and Europe the major contributors to the growth. Jewellery recycling in China partially offset the gains from autocatalysts as it returned to previous levels after being elevated by jewellers destocking in an underperforming market during 2016. Japanese jewellery recycling grew marginally but overall the amount of platinum entering the market from jewellery sources declined 65 koz.

## Automotive demand

Automotive platinum demand fell by 3% (95 koz) year-on-year to 3,395 koz in 2017 from 3,490 koz in 2016. Western Europe with its high diesel passenger car share led the decline, but retains nearly half of the market. China saw growth in commercial vehicles, as did the more substantial RoW group, but it was not sufficient to offset the loss from Western Europe.

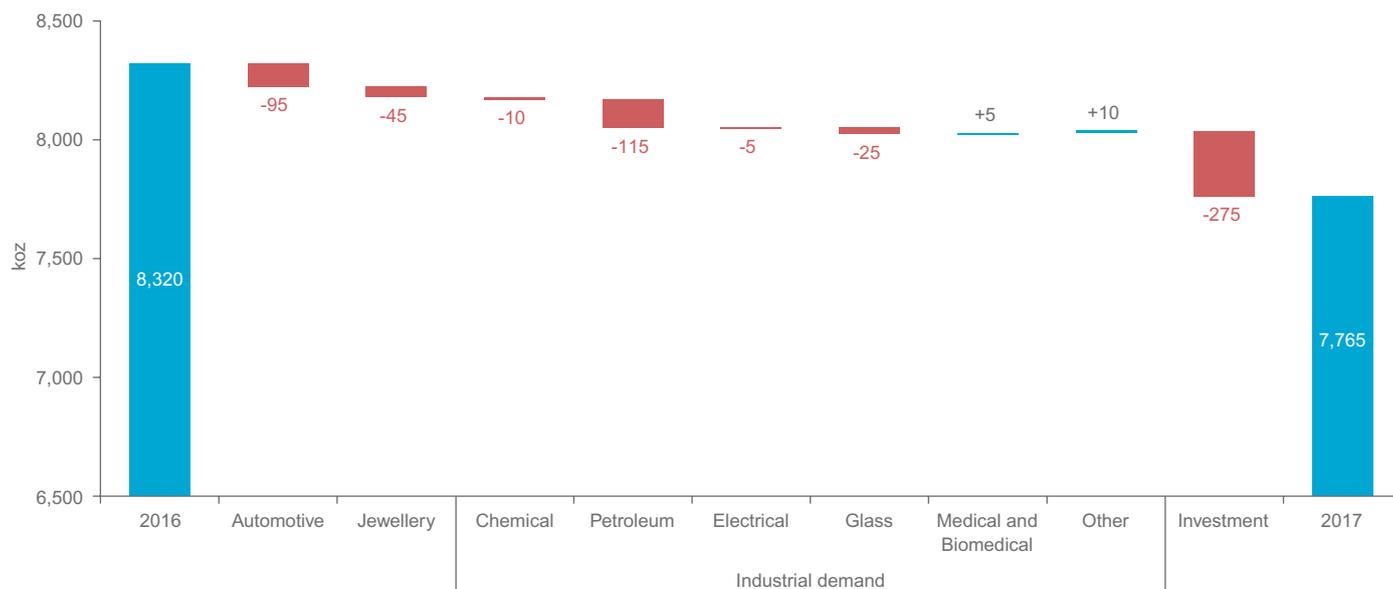
Light-duty diesel powertrain shares have fallen in most of the Western European markets. Diesel shares fell to six-year lows by the end of 2017 in four of the five major markets: Germany, the UK, France and Spain all saw declines, only Italy has been stable. Diesel dropped to 42.0% of UK car registrations in 2017, from 47.7% in 2016. As overall vehicles sales growth moderated, this led to some 220,000 fewer diesel cars being registered in the UK in 2017 than in 2016, with a corresponding lower use of platinum (source: SMMT).

Consumers' choices towards diesel are influenced by decreasing cost competitiveness, fears over bans in some cities and widespread negative views. Over the past few years, most Western European governments have gradually been bringing diesel fuel taxation into line with gasoline, effectively removing the favourable lower tax status long enjoyed by diesel fuel. For higher mileage drivers, the greater fuel efficiency of diesel still outweighs this increased fuel spend, making a diesel car's total cost of ownership competitive for them compared to a gasoline car. But for lower mileage drivers, the increased cost of diesel fuel on top of the higher purchase price of the car may mean that a gasoline car now makes better financial sense for them, further eroding diesel's share.

In India (considered an important diesel market after Western Europe) too, diesel's share of the hatchback and sedan market has fallen to below a quarter, from around a half five years ago (source: SIAM). As in Europe, the narrowing gap between the prices of diesel and gasoline fuel is driving demand away from diesel. While smaller vehicles make up a larger share of the light vehicle market in India than they do in Europe and the US, the rising share of SUVs in India too is supportive of diesel powertrains.

Carbon dioxide tailpipe emissions from UK light vehicles rose in 2017 for the first time since records began in 1997. New cars averaged 121.04 g/km CO<sub>2</sub> in 2017, up 0.8% from 120.11 g/km CO<sub>2</sub> in 2016. Similar trends have been seen in Germany and other major Western European markets where diesel car shares have been falling; diesel cars typically emit some 20% less carbon dioxide than an equivalent gasoline model, contributing to this rise in vehicle carbon dioxide emissions (source: SMMT).

**Chart 2: Changes in demand by category, 2017 vs. 2016**



Source: SFA (Oxford)

### Jewellery demand

Global platinum jewellery demand fell by 2% year-on-year (-45 koz) to 2,460 koz last year. Demand from China decreased substantially and the growth in all other regions was not enough to counter the decline.

In China, younger generations are changing traditional purchasing habits and are spending more on technology and experiences to the detriment of jewellery sales. Additionally, the number of marriages in 2017 continued the decline which started in 2013, as the population of marrying age shrinks and a lower proportion of them are getting married. White gold, or “k-gold” in China, continues to pose a threat to platinum as the lower gold content and easier manufacturing make it cheaper to buy despite the high gold price. However, there were positive signs in 2017 from retail demand, with China’s overall retail sales increasing by 1.9%, and in the second half of the year retailers reported an expansion in jewellery sales, although gold benefited more than platinum.

New information from metal suppliers and organisations in the retail sector has caused us to rebase our India demand to a lower level for 2017 at 175 koz, a reduction of 130 koz from the previous forecast. The growth has been revised down slightly for 2017, but was still very strong at 21% as 2016 was a difficult year with strikes and demonetisation hindering fabricator purchases, which resulted in destocking as retail demand continued to grow.

### Industrial demand

Platinum demand for industrial applications decreased by 8% year-on-year (-140 koz) to 1,650 koz in 2017, predominantly owing to reduced requirements for the petroleum sector (-115 koz), through a combination of capacity cuts in some regions and slower refining capacity expansion elsewhere. Demand for glass fabrication, chemical catalysis and electrical devices also declined last year, although these falls were partly offset by growth in medical applications and other industrial end-uses.

### Chemical

Lower requirements for nitric acid production and new propane dehydrogenation (PDH) plants reduced platinum demand for use in chemical catalysis by 2% year-on-year (-10 koz) to 585 koz in 2017, despite growth in silicone consumption and paraxylene capacity. Widespread underutilisation of existing nitric acid capacity resulted in slower global capacity expansion and therefore lower platinum demand in most regions during 2017, whilst relatively few PDH projects were completed last year compared to 2016, particularly in China, also reducing new metal requirements. Greater silicone consumption in China and paraxylene capacity expansion elsewhere in Asia (RoW) did, however, partly offset platinum demand reductions in the other markets.

### Petroleum

Net petroleum demand declined by 115 koz to 100 koz last year, following the recovery of platinum from refining capacity closed in Japan and Western Europe, as well as slower capacity expansion in North America and China. Following strong growth in 2016, the rate of refining capacity expansion eased in both China and the US last year, reducing platinum requirements, and closures in late 2016 in Western Europe returned metal to market during 2017, also weakening net demand. Total reductions by Japanese refiners last year were ultimately lower than anticipated but still significant enough to push demand in the country into net negative territory, whilst refining capacity growth in the RoW was also lower than previously predicted, resulting in flat demand in this region. The downgrades to demand in the RoW versus those given in *Platinum Quarterly Q3 2017* counterbalanced upgrades elsewhere, meaning global petroleum demand was unchanged.

### Electrical

Platinum use in electrical devices dropped by 3% year-on-year (-5 koz) to 155 koz in 2017, as shrinking demand for hard disk drive (HDD) production in China and the RoW outweighed slight growth in other electrical components. Despite rising demand for enterprise drives (+7%), total HDD shipments decreased by 4% year-on-year to an estimated 406 million units last year, a 12-year low, primarily owing to fewer deliveries of PC drives (-15%). In platinum terms, the growth in enterprise HDDs was not quite enough to compensate for the fall in other segments, despite the rise in the number of platters and therefore platinum content per drive.

## Glass

The construction of fewer new glass fabrication facilities in the US and China helped to reduce platinum requirements by 12% (-25 koz) to 180 koz last year, whilst closures of liquid-crystal display (LCD) plants towards the end of 2016 in Japan returned metal to market during 2017 and maintained net negative demand levels in the country. Expansions in China were concentrated towards the start of last year, meaning some of the metal required was purchased in late 2016, although demand improved slightly in the RoW, with expansions in India, Southeast Asia and the Middle East.

## Other

Platinum usage in other industrial applications increased by 3% year-on-year (+10 koz) to 390 koz in 2017, driven by growth in fuel cells and automotive sensors, whilst other segments remained relatively flat. The transport sector accounted for the majority of fuel cell demand growth last year, with an increase in the production of hydrogen-powered buses, commercial and non-road vehicles lifting platinum requirements, whilst vehicle production growth in China and the RoW raised demand for use in automotive sensors.

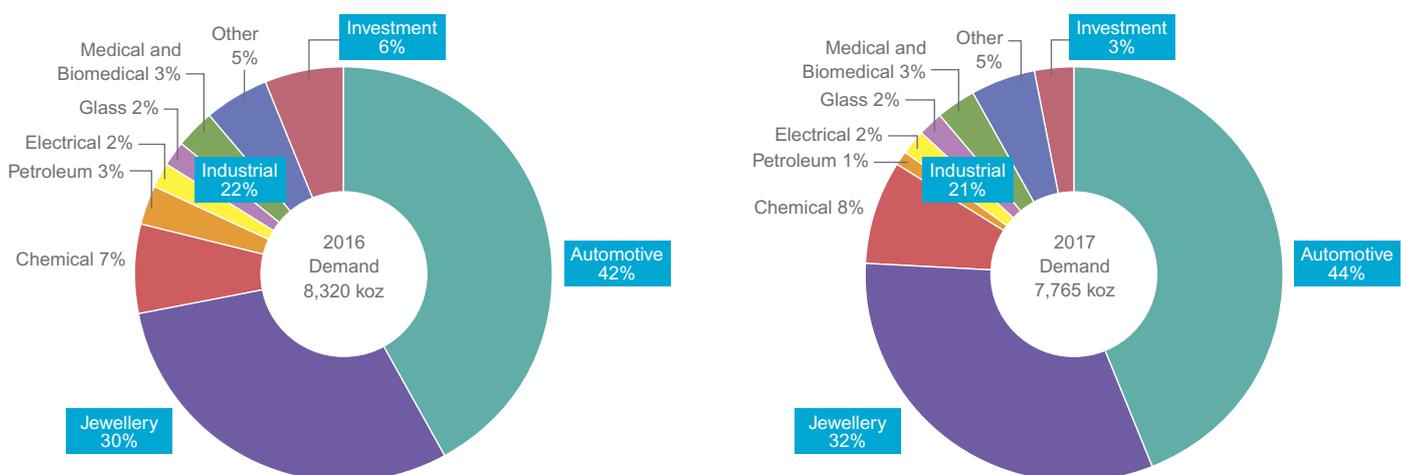
## Investment demand

Global investment demand amounted to 260 koz in 2017. ETF investment rebounded last year with 95 koz being added to global holdings, bar and coin demand was 210 koz which was significantly down on 2016 mostly owing to lower Japanese bar purchases, while exchange stocks declined by 45 koz.

After two years of declines, total ETF investment demand recovered, rising by 95 koz. By far the largest increase in ETF holdings was in the US where investors added 90 koz to their holdings during the year. South African and Swiss investors lifted their holdings moderately, by 13 koz and 6 koz respectively, while in the UK and Japan holdings fell by 10 koz and 4 koz respectively.

Bar and coin demand was 210 koz, with the majority of bar demand coming from Japanese investors. After the surge in bar purchases in Japan in 2015 and 2016, following the decline of the platinum price below ¥4,000/g, net purchases fell back to a more modest level. Japanese investors continued their steady purchases, but the price had to drop to a lower level to stimulate additional buying as occurred in the second quarter and in December, when the price fell to around ¥3,400/g. Coin investment is estimated to have contracted slightly compared to 2016.

**Chart 3: Demand end-use shares, 2017 vs. 2016**

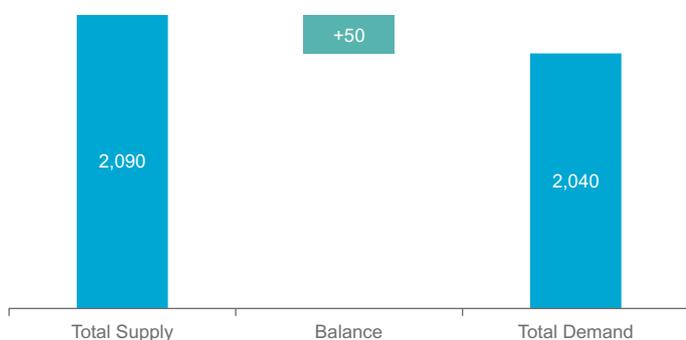


Source: SFA (Oxford)

## 2017 FOURTH QUARTER PLATINUM MARKET REVIEW

Global demand increased 13% quarter-on-quarter to 2,040 koz in Q4'17 despite a dip in industrial usage (-10 koz), as automotive (+55 koz), and jewellery (+90 koz) demand both improved from the previous quarter. Investment demand rebounded after a decline in Q3'17 as investors returned to buying ETFs and bar and coin demand also increased. Total supply increased by 2% (+50 koz) quarter-on-quarter as total mining supply was boosted by a decrease in producer inventory in South Africa and recycling increased as high PGM prices incentivised a strong flow of material to autocatalyst recyclers. With supply and demand closely aligned, the market was essentially balanced (+50 koz) (Chart 4).

**Chart 4: Supply-demand balance, koz, Q4 2017**

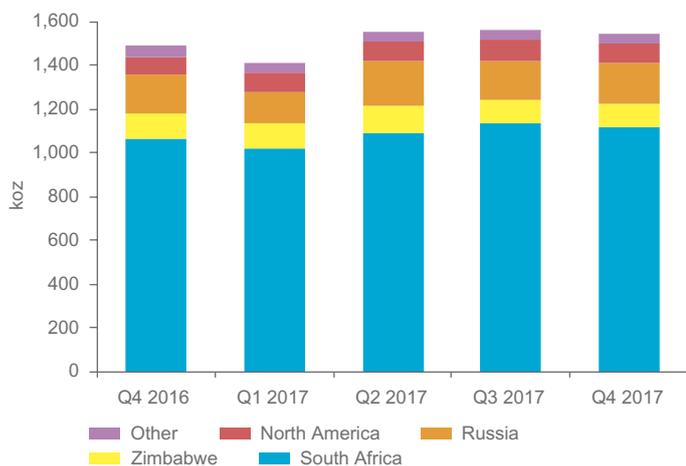


Source: SFA (Oxford)

### Supply

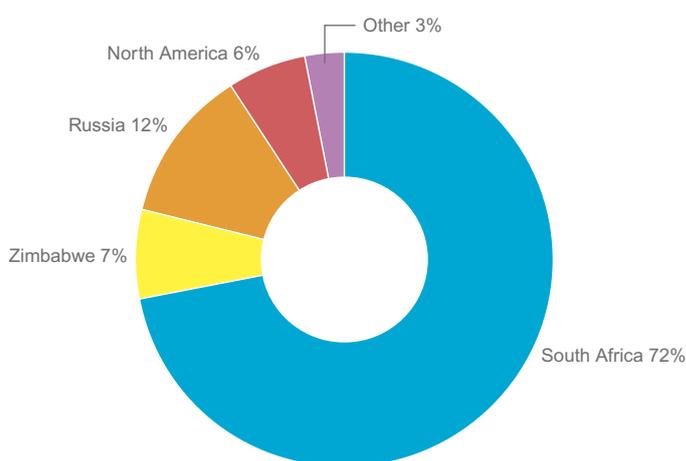
Refined production totalled 1,540 koz in Q4'17 (Chart 5), down 2% quarter-on-quarter (1,570 koz in Q3'17) but 3% higher year-on-year (1,490 koz in Q4'16). South African supply decreased by 20 koz from Q3'17 as a result of the closure of two mines during the previous quarter and lower mined volumes across several shafts at a Western Limb operation. South African production grew by 55 koz relative to Q4'16 owing to fewer safety stoppages and operational improvements (increased development rates underground, higher grade ore mined, concentrator optimisation) at mines on both the Western and Northern Bushveld. Supply from the rest of the world was stable overall, both quarter-on-quarter and year-on-year, at 425 koz. Increased production from Russia (185 koz in Q4'17, +9% year-on-year) following a period of restructuring has offset lower output from Zimbabwe due to furnace maintenance (105 koz in Q4'17, down from 120 koz in the prior year period). Total mine supply is estimated at 1,570 koz for Q4'17, with an expected 30 koz reduction in producer inventory.

**Chart 5: Global refined production**



Source: SFA (Oxford)

**Chart 6: Refined production, 2017**



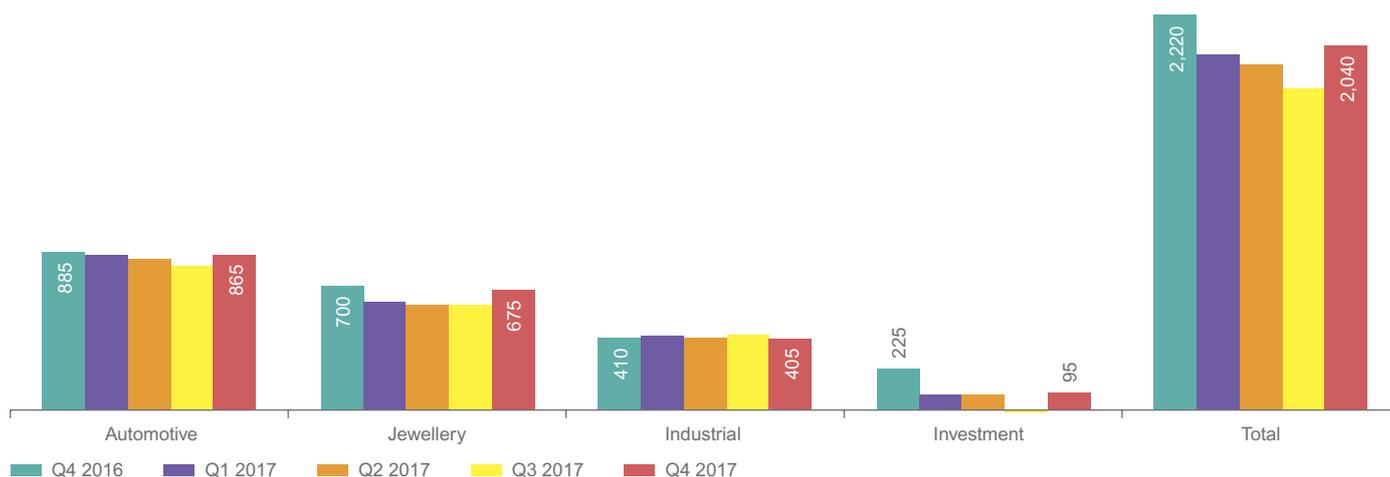
Source: SFA (Oxford)

Platinum supply from recycling saw a robust quarter in Q4'17, reaching 520 koz. Supply from spent autocatalysts was particularly strong, rising 50 koz (+15%) from Q3'17, with the volumes of autocatalysts increasing in Europe and North America as the high palladium price is encouraging elevated collection rates of all catalysts. Jewellery recycling, at 140 koz, was down 22% year-on-year due to platinum jewellery destocking in 2016 which occurred mostly in the second half of the year. The low platinum price gives little incentive for jewellery owners to trade in their items, some of which are reportedly only being returned for scrap alongside more valuable gold jewellery.

## Demand

Fourth-quarter platinum demand declined by 8% year-on-year (-180 koz) to 2,040 koz in Q4'17 (Chart 7), although it was 13% (+240 koz) higher quarter-on-quarter. The largest year-on-year decrease in platinum demand was in the investment sector, which contracted by 130 koz as a result of lower bar and coin purchases and less investment in ETF holdings. Compared to Q3'17, demand for platinum in the investment (+105 koz), jewellery (+90 koz) and automotive (+55 koz) sectors all improved.

Chart 7: Platinum demand, koz



Source: SFA (Oxford)

## Automotive demand

Automotive demand in the fourth quarter was down 2% (-20 koz) year-on-year from 885 koz in Q4'16 to 865 koz in Q4'17, but up 7% (+55 koz from 810 koz) after a typically seasonally weak third quarter.

Western Europe recovered in Q4'17, up on Q3'17 and Q2'17, to finish just slightly down on Q4'16. In the UK, and to an extent in other Western European countries too, confusion and speculation over city and national air quality plans, and taxes and policies towards diesel cars deterred potential buyers. The final month of the quarter, December, saw diesel's share of the UK car market fall to 38%, down from 47% in December 2016 (source: SMMT).

Euro 6d-TEMP emissions legislation was introduced in September 2017; this further tightens NO<sub>x</sub> emissions limits for all new light vehicle models launched from that date. The majority of diesel cars are expected to use SCR rather than LNT aftertreatment to remove NO<sub>x</sub>, so lowering slightly the platinum content of diesel cars, though, of course, platinum is still needed for the oxidation catalyst and particulate filter functions.

India's Union Minister said in September that the country should ban diesel vehicles in order to curb air pollution in the country. Such statements are not confined to India, and do not distinguish between polluting older vehicles and cleaner new vehicles.

## Jewellery demand

Jewellery consumption of platinum decreased 4% year-on-year to 675 koz in Q4'17, but was up 15% quarter-on-quarter.

China's jewellery demand decreased by 8% year-on-year in Q4'17, in line with the annual change. After a relatively weak Q3'17 in terms of fabricator demand, restocking picked up in Q4'17 following Golden Week sales, a strong retail performance in Q3'17 and in preparation for the Chinese New Year. Trading of platinum on the Shanghai Gold Exchange was down 10% in the fourth quarter while imports going directly to jewellery companies increased by 8%. Although China's national retail sales declined 1.9% year-on-year, it seems jewellery might have outperformed, contrary to the trend of recent years, as China's largest jeweller Chow Tai Fook reported same-store sales growth of 5% in Q4'17, with market share shifting towards gem-set pieces (which include platinum settings and jewellery) in Hong Kong but towards gold in Mainland China. Luk Fook reported 1% growth in sales, with gem-set pieces outperforming gold jewellery.

In Japan, Q4'17 retail sales of platinum jewellery were down year-on-year owing to a decline in the popularity of platinum chains, which have an above average per piece platinum content, in favour of gold and white gold chains.

India is still adjusting to the Goods and Services Tax (GST), and although major jewellery chains have been able to adapt since the introduction in July, smaller producers are struggling to cope with the system. The end of 2017 saw reports that the processing of tax refund applications was very slow, with many jewellers struggling with working capital and losing out on business opportunities.

## Industrial demand

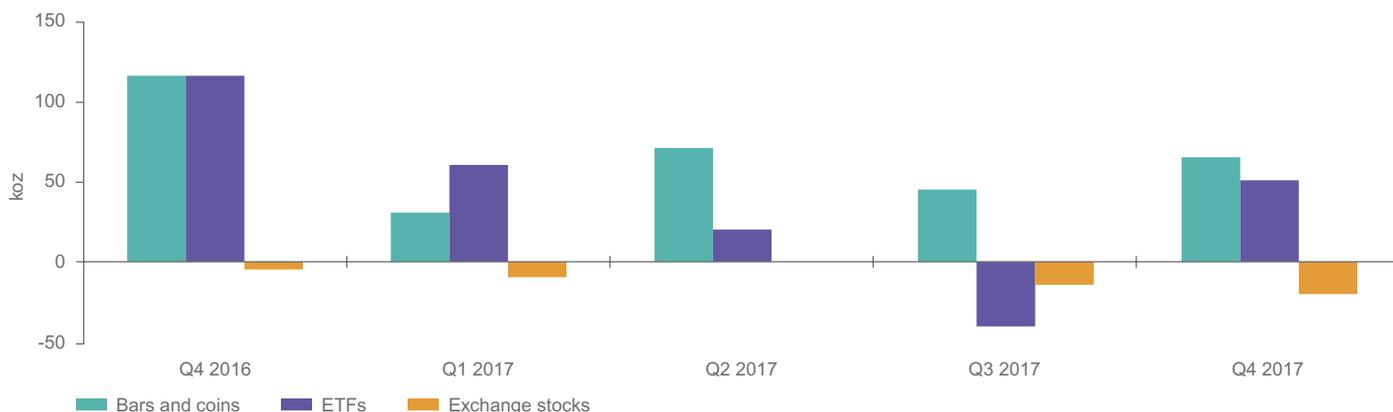
Net platinum requirements for industrial end-uses decreased by 1% year-on-year (-5 koz) and by 2% quarter-on-quarter (-10 koz) to 405 koz in Q4'17, making it the weakest quarter of the year for industrial demand. Metal recovered from recently closed refining capacity in Japan plus reduced purchasing by Chinese and North American refiners for new capacity (slower expansion) weakened net petroleum demand by more than 50% year-on-year in Q4'17. However, greater requirements for new glass fabrication facilities in China and India (RoW), compared to a weak Q4'16, along with minor growth in chemical catalysis and other industrial end-uses, largely offset net demand losses in the petroleum sector.

## Investment demand

The final quarter of 2017 saw a return to net purchases by ETF investors of 52 koz, following the 41 koz decline in Q3'17, which took total global holdings back to 2.6 moz. ETFs in the UK and US saw good gains, while holdings fell in South Africa and Switzerland. In the US investors added 56 koz to their ETF holdings and in the UK holdings increased by 47 koz. South African investors reduced their holdings in October and November, but then made net purchases in December, which resulted in a quarterly drop of 47 koz, while Swiss ETF holdings slipped by 6 koz during the quarter.

Bar and coin demand was 65 koz in the fourth quarter. In Japan, the platinum price dipped below ¥3,400/g in December and this encouraged a pick-up in purchases of platinum bars.

**Chart 8: Platinum investment**



Source: SFA (Oxford)

### 2018 FORECAST

Global platinum supply is forecast to be 7,815 koz this year, a contraction of 2% from 2017, despite an anticipated increase in recycling of 60 koz to 1,965 koz, as total mining supply is expected to decline by 4% to 5,850 koz mostly owing to reduced output from South Africa following some mine closures in 2017 and lower production in Russia. Autocatalyst recycling is expected to be buoyed by high PGM prices encouraging the collection of scrapped catalysts.

Global demand is projected to grow marginally in 2018 to 7,790 koz, as a recovery in industrial demand (+100 koz) and an increase in jewellery demand (+45 koz) outweigh a decline in automotive demand (-110 koz) and slightly lower investment demand (-10 koz).

Platinum supply and demand are closely matched this year, returning the market to equilibrium (+25 koz) (Chart 9).

**Chart 9: Supply-demand balance, koz, 2013-2018f**



Source: SFA (Oxford)

### Mine supply

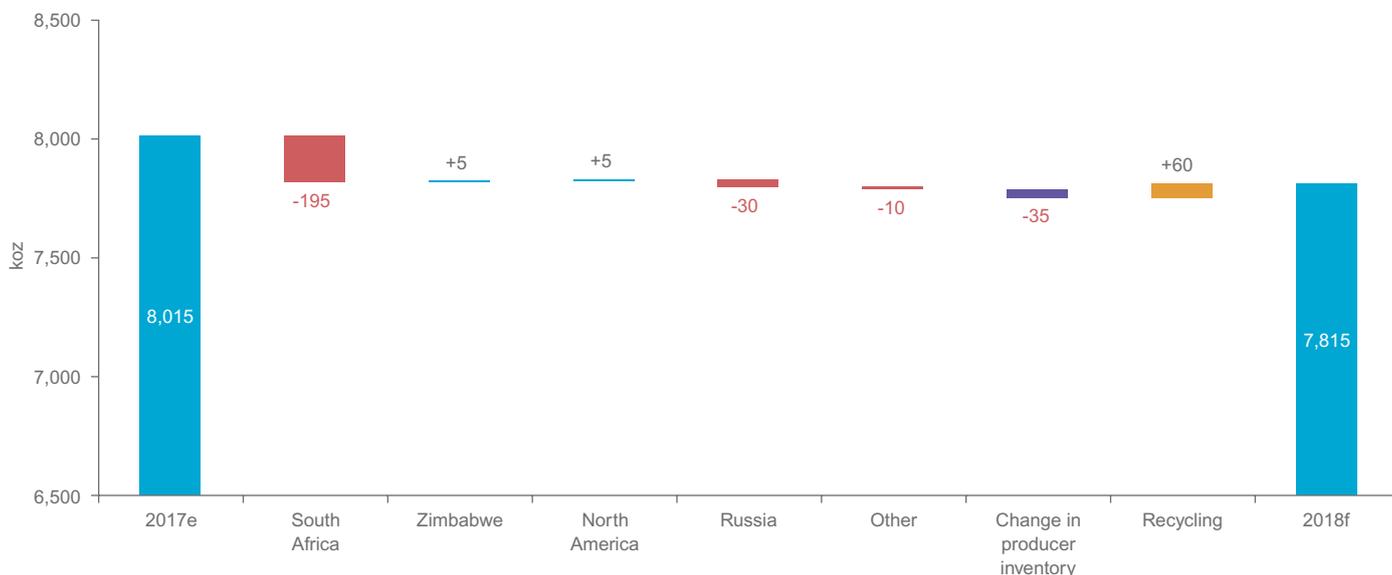
Global refined production is forecast to fall by 4% to 5,850 koz in 2018. South African supply could decrease by 4% to 4,175 koz with last year's mine closures removing a little over 50 koz in 2018, and fewer ounces expected from pipeline releases and smelter clean-up projects which allowed some producers to exceed guidance in 2017. Supply from North America and Zimbabwe should remain stable in 2018, at 370 koz and 450 koz respectively, while production from Russia could fall by around 4% to 685 koz as further refinery upgrade work may result in a small pipeline lock-up.

### Recycling

Recycling supply in 2018 is projected to increase by 3% (+60 koz) to 1,965 koz compared to 2017. This is primarily due to the expectation that autocatalyst recycling will continue to grow in North America and Europe. The continued strength in the palladium price and recovery in the rhodium price have boosted the returns on processing catalysts, and the relatively strong scrap steel price makes the collection and processing of cars at scrapyards more profitable, increasing the supply of catalysts to collectors.

Jewellery recycling is expected to remain largely unchanged in 2018 with a drop of 5 koz (-1%) to 555 koz currently estimated in 2018. The subdued platinum price and forecast of flat jewellery demand in China and Japan for 2018 mean that returns of platinum jewellery are anticipated to be at similar levels to last year.

Chart 10: Changes in total supply, 2018f vs. 2017e



Source: SFA (Oxford)

**Automotive demand**

Platinum autocatalyst demand is forecast to continue the current slow decline, down 3% year-on-year to 3,285 koz in 2018 from 3,395 koz in 2017.

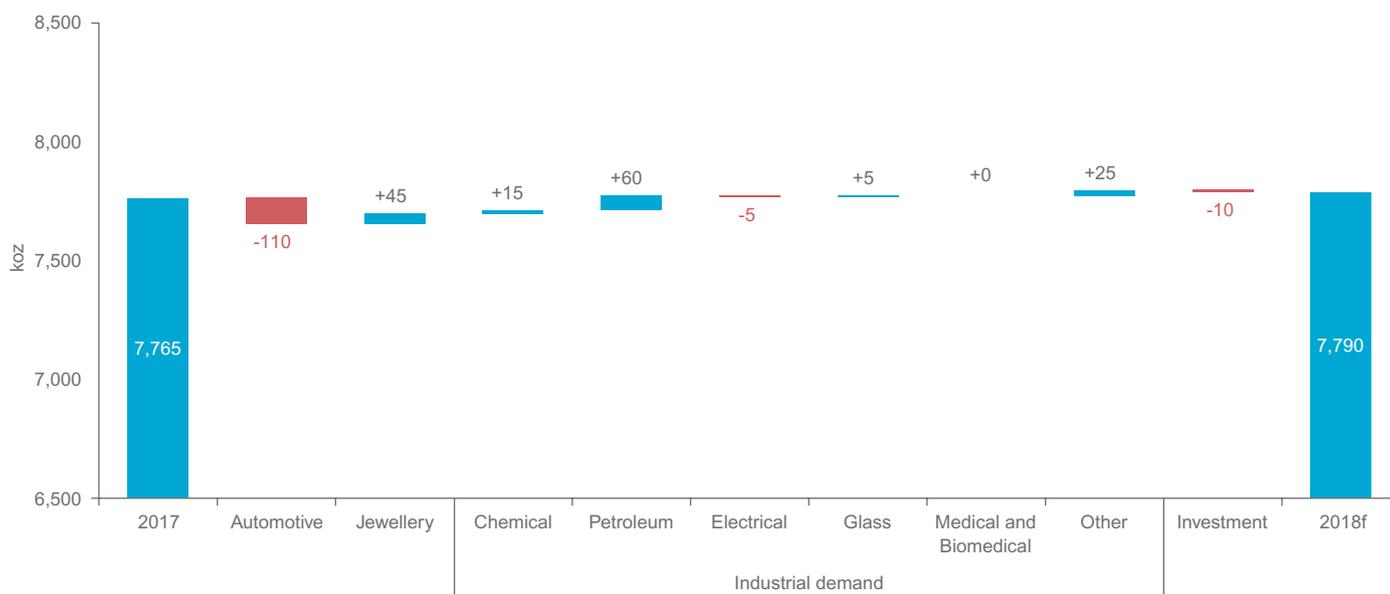
Diesel car shares seem unlikely to recover in Western Europe, though the industry is very clear that diesel engines will continue to offer lower carbon dioxide emissions, particularly for larger and higher mileage vehicles, and hence must remain a significant part of the Western European light vehicle market. Automakers are positioning now to meet the 2021 target of 95 g/km CO<sub>2</sub> emissions or face substantial fines, and the reversal of the year-on-year fall in vehicle CO<sub>2</sub> emissions in 2017 helps to reinforce the importance of diesel in the powertrain mix.

National automotive sector bodies and the individual companies continue to make the point that air quality issues result largely from the existing parc of older diesel vehicles still on the road and not from new vehicles with more efficient combustion and extensive aftertreatment. From 1 September 2018 all new vehicles sold in the EU must be emissions tested under the new Worldwide Harmonized Light Vehicles Test Procedure (WLTP). This is expected to increase transparency and confidence in vehicle emissions data, enabling consumers to see that new diesel vehicles can comply with the most stringent Euro 6 standards under real world conditions. Cities have made it clear that fully Euro 6-compliant diesel vehicles will not be banned.

Automakers continue to introduce diesel powertrains for new models; there appears to be an opportunity as consumers move from smaller cars to crossovers/SUVs but still want good fuel economy. General Motors, Hyundai and other makers plan to launch new diesel models in the previously beleaguered US market, where diesel market share is around 5%, to meet tightening fuel economy standards. Such vehicles are likely to be relatively large, with correspondingly high platinum loadings on their DOCs and DPFs.

However, the additional cost of complying with emissions legislation is curbing demand for smaller diesel models. The Toyota Yaris launched in 2018 for the Indian market is unlikely to include a diesel option, as the cost of making the engine compliant with forthcoming BS-VI emissions legislation is likely to be too high.

**Chart 11: Changes in demand by category, 2018f vs. 2017**



Source: SFA (Oxford)

## Jewellery demand

Jewellery demand in 2018 is estimated to be 45 koz (+2%) higher than in 2017 at 2,505 koz after four years of decline. This is mainly due to a marginal growth forecast for China in 2018 along with growth trends in other regions.

China is seeing a recovery in market conditions: GDP growth accelerated in 2017 for the first time since 2010 and spending in third-tier cities is increasing. Jewellers have been targeting their marketing at lower tier cities and expanding their presence there, and major Chinese jewellers increased the number of points of sale last year. Within the jewellery sector optimism is high that 2017 was the bottom of the curve. There are concerns that the low platinum price has negatively affected its perception as a premium metal but efforts by jewellers to make jewellery a more personal, emotional and design focused purchase, in order to attract millennials, mean that jewellery is increasingly priced per piece rather than by metal content. While the bridal market is expected to decline again next year, self-purchasing by women has demonstrated the potential to replace some of this demand.

Indian producers and consumers have mostly moved past the impacts of demonetisation and the changes of the GST. The anti-money laundering legislation posed a threat to demand growth, but was repealed in Q4'17. The main lingering headache is the implementation of the state services to support the GST, but if the government can solve those communication issues then there is little to prevent 2018 from being a strong year for sales.

Japan is expected to see little change in jewellery demand in 2018, but strong economic growth forecasts in the US and Europe, alongside a reasonably favourable platinum price, should support growth in those regions.

## Industrial demand

Industrial platinum demand is forecast to grow by 6% year-on-year (+100 koz) to 1,750 koz in 2018, supported by a partial recovery in petroleum requirements (+60 koz) plus growth in chemical catalysis (+15 koz), glass fabrication (+5 koz) and other industrial end-uses (+25 koz). Demand for use in medical applications is likely to remain relatively flat, whilst electrical requirements (-5 koz) are anticipated to fall slightly.

### **Chemical**

Continued growth in silicone consumption, predominantly in China and the RoW, is expected to increase platinum use in the chemical sector by 3% (+15 koz) to 600 koz this year. Requirements for new PDH units should also rise in 2018 as the rate of capacity expansion accelerates again in China, although this growth may be negated by softer demand for paraxylene production in the RoW (slower capacity expansion) and a further reduction in nitric acid requirements in Western Europe, North America and the RoW, again as a result of limited capacity growth (overcapacity).

### **Petroleum**

Refining capacity growth in the RoW and fewer curtailments in Japan are anticipated to raise net platinum requirements by 60 koz to 160 koz this year, with demand in Western Europe and North America set to stay relatively stable. Few capacity cuts are expected in Japan for 2018, shifting domestic usage back to net positive levels, whilst capacity expansion in Russia and the Middle East should strengthen demand in the RoW. However, a further slowdown in capacity growth in China is forecast to reduce platinum requirements in the country, as well as partially offsetting growth elsewhere.

### **Electrical**

Platinum demand for use in electrical devices is forecast to fall by 3% year-on-year (-5 koz) to 150 koz in 2018, as HDD demand is set to decline further in the manufacturing hubs of China and the RoW whilst consumption in other electrical components remains flat. Annual HDD deliveries are predicted to continue to decrease this year, dropping by 5% to 387 million units, with the decline in PC shipments (-18%) expected to outpace enterprise sector growth (+9%). The trend of the rising average number of platters (and platinum content) in enterprise drives is likely to continue, but again is not expected to be sufficient to negate platinum demand losses elsewhere.

### **Glass**

Greater expansion of glass fabrication capacity in Western Europe and the RoW, plus fewer closures in Japan, is expected to increase net platinum requirements by 3% (+5 koz) to 185 koz this year, despite a further decrease in China's demand. New glass fibre fabrication facilities in France, India and Turkey should help to boost platinum purchases in Europe and the RoW, whilst a lack of closures in Japan is set to lift demand in the country out of net negative territory. However, usage in China is forecast to fall again, with fewer new plants planned for this year, largely offsetting demand growth in the other regions.

### **Other**

Platinum consumption in other industrial end-uses is predicted to rise by 6% year-on-year (+25 koz) to 415 koz in 2018, primarily owing to greater requirements for fuel cells, with automotive sensor demand also expected to grow slightly in China and the RoW. Increasing demand for both stationary and transport fuel cells is set to lift platinum consumption this year, particularly in some of the main manufacturing regions, such as Japan and the US.

### **Investment demand**

Global investment demand is forecast to be 250 koz this year. ETF holdings are expected to expand modestly, while coin and bar purchases are anticipated to be somewhat lower than last year. A new ETF was launched in January in the US, where it is in competition with a well-established ETF. Japan is the largest market for platinum bars and the yen is forecast to weaken, which will raise the platinum price in yen terms, and this is likely to subdue purchases somewhat.

### **ABOVE GROUND STOCKS**

Indian jewellery demand is under review and adjustments have impacted demand, so above ground stocks are projected to end the year at 2,180 koz.

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

# PLATINUM QUARTERLY Q4 2017

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

	2013	2014	2015	2016	2017	2018f	2017/2016 Growth %	2018f/2017 Growth %
<b>Platinum Supply-demand Balance (koz)</b>								
<b>SUPPLY</b>								
<b>Refined Production</b>	<b>6,070</b>	<b>4,880</b>	<b>6,150</b>	<b>6,035</b>	<b>6,075</b>	<b>5,850</b>	<b>1%</b>	<b>-4%</b>
South Africa	4,355	3,115	4,465	4,255	4,370	4,175	3%	-4%
Zimbabwe	405	405	405	490	445	450	-9%	1%
North America	355	400	385	395	365	370	-8%	1%
Russia	740	740	715	715	715	685	0%	-4%
Other	215	220	180	180	180	170	0%	-6%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>-215</b>	<b>+350</b>	<b>+45</b>	<b>+30</b>	<b>+35</b>	<b>+0</b>	<b>17%</b>	<b>-100%</b>
<b>Total Mining Supply</b>	<b>5,855</b>	<b>5,230</b>	<b>6,195</b>	<b>6,065</b>	<b>6,110</b>	<b>5,850</b>	<b>1%</b>	<b>-4%</b>
<b>Recycling</b>	<b>1,980</b>	<b>2,035</b>	<b>1,710</b>	<b>1,855</b>	<b>1,905</b>	<b>1,965</b>	<b>3%</b>	<b>3%</b>
Autocatalyst	1,120	1,255	1,190	1,225	1,340	1,405	9%	5%
Jewellery	855	775	515	625	560	555	-10%	-1%
Industrial	5	5	5	5	5	5	0%	0%
<b>Total Supply</b>	<b>7,835</b>	<b>7,265</b>	<b>7,905</b>	<b>7,920</b>	<b>8,015</b>	<b>7,815</b>	<b>1%</b>	<b>-2%</b>
<b>DEMAND</b>								
<b>Automotive</b>	<b>3,170</b>	<b>3,310</b>	<b>3,395</b>	<b>3,490</b>	<b>3,395</b>	<b>3,285</b>	<b>-3%</b>	<b>-3%</b>
Autocatalyst	3,030	3,165	3,255	3,350	3,255	3,150	-3%	-3%
Non-road	140	150	140	135	140	145	4%	4%
<b>Jewellery</b>	<b>2,945</b>	<b>3,000</b>	<b>2,840</b>	<b>2,505</b>	<b>2,460</b>	<b>2,505</b>	<b>-2%</b>	<b>2%</b>
<b>Industrial</b>	<b>1,475</b>	<b>1,565</b>	<b>1,750</b>	<b>1,790</b>	<b>1,650</b>	<b>1,750</b>	<b>-8%</b>	<b>6%</b>
Chemical	535	555	605	595	585	600	-2%	3%
Petroleum	50	65	205	215	100	160	-53%	60%
Electrical	185	190	165	160	155	150	-3%	-3%
Glass	145	175	200	205	180	185	-12%	3%
Medical and Biomedical	220	220	230	235	240	240	2%	0%
Other	340	360	345	380	390	415	3%	6%
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>260</b>	<b>250</b>	<b>-51%</b>	<b>-4%</b>
Change in Bars, Coins	-5	50	525	460	210			
Change in ETF Holdings	905	215	-240	-10	95			
Change in Stocks Held by Exchanges	35	-115	20	85	-45			
<b>Total Demand</b>	<b>8,525</b>	<b>8,025</b>	<b>8,290</b>	<b>8,320</b>	<b>7,765</b>	<b>7,790</b>	<b>-7%</b>	<b>0%</b>
<b>Balance</b>	<b>-690</b>	<b>-760</b>	<b>-385</b>	<b>-400</b>	<b>250</b>	<b>25</b>	<b>-163%</b>	<b>-90%</b>
<b>Above Ground Stocks</b>	<b>4,140*</b>	<b>3,450</b>	<b>2,305</b>	<b>1,905</b>	<b>2,155</b>	<b>2,180</b>	<b>13%</b>	<b>1%</b>

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

# PLATINUM QUARTERLY Q4 2017

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

	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q4'17/Q4'16 Growth %	Q4'17/Q3'17 Growth %
<b>Platinum Supply-demand Balance (koz)</b>										
<b>SUPPLY</b>										
<b>Refined Production</b>	<b>1,275</b>	<b>1,650</b>	<b>1,620</b>	<b>1,490</b>	<b>1,415</b>	<b>1,550</b>	<b>1,570</b>	<b>1,540</b>	<b>3%</b>	<b>-2%</b>
South Africa	810	1,200	1,180	1,065	1,020	1,090	1,140	1,120	5%	-2%
Zimbabwe	130	120	120	120	115	125	100	105	-13%	5%
North America	100	105	100	85	95	85	95	90	6%	-5%
Russia	190	180	175	170	140	205	185	185	9%	0%
Other	45	45	45	50	45	45	45	45	-10%	0%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+150</b>	<b>+60</b>	<b>-105</b>	<b>-75</b>	<b>-60</b>	<b>+75</b>	<b>-10</b>	<b>-30</b>	<b>N/M</b>	<b>N/M</b>
<b>Total Mining Supply</b>	<b>1,425</b>	<b>1,710</b>	<b>1,515</b>	<b>1,415</b>	<b>1,355</b>	<b>1,625</b>	<b>1,560</b>	<b>1,570</b>	<b>11%</b>	<b>1%</b>
<b>Recycling</b>	<b>395</b>	<b>480</b>	<b>510</b>	<b>470</b>	<b>420</b>	<b>480</b>	<b>480</b>	<b>520</b>	<b>11%</b>	<b>8%</b>
Autocatalyst	280	340	315	290	300	330	330	380	31%	15%
Jewellery	115	140	195	180	120	150	150	140	-22%	-7%
Industrial	0	0	0	0	0	0	0	0	N/M	N/M
<b>Total Supply</b>	<b>1,820</b>	<b>2,190</b>	<b>2,025</b>	<b>1,885</b>	<b>1,775</b>	<b>2,105</b>	<b>2,040</b>	<b>2,090</b>	<b>11%</b>	<b>2%</b>
<b>DEMAND</b>										
<b>Automotive</b>	<b>890</b>	<b>910</b>	<b>800</b>	<b>885</b>	<b>875</b>	<b>850</b>	<b>810</b>	<b>865</b>	<b>-2%</b>	<b>7%</b>
Autocatalyst	855	875	770	850	840	815	770	830	-2%	8%
Non-road	35	35	30	35	35	35	35	35	0%	0%
<b>Jewellery</b>	<b>580</b>	<b>600</b>	<b>630</b>	<b>700</b>	<b>610</b>	<b>590</b>	<b>585</b>	<b>675</b>	<b>-4%</b>	<b>15%</b>
<b>Industrial</b>	<b>445</b>	<b>480</b>	<b>465</b>	<b>410</b>	<b>420</b>	<b>410</b>	<b>415</b>	<b>405</b>	<b>-1%</b>	<b>-2%</b>
Chemical	150	140	170	130	150	135	165	135	4%	-18%
Petroleum	55	60	55	55	35	15	25	25	-55%	0%
Electrical	40	40	40	40	40	40	40	40	0%	0%
Glass	60	80	60	5	45	55	50	20	N/M	-60%
Medical and Biomedical	50	70	45	75	55	70	45	75	0%	67%
Other	90	90	95	105	95	95	90	110	5%	22%
<b>Investment</b>	<b>165</b>	<b>95</b>	<b>50</b>	<b>225</b>	<b>80</b>	<b>90</b>	<b>-10</b>	<b>95</b>	<b>-58%</b>	<b>N/M</b>
Change in Bars, Coins	150	115	80	115	30	70	45	65	-43%	44%
Change in ETF Holdings	-25	-15	-85	115	60	20	-40	50	-57%	N/M
Change in Stocks Held by Exchanges	40	-5	55	-5	-10	0	-15	-20	N/M	33%
<b>Total Demand</b>	<b>2,080</b>	<b>2,085</b>	<b>1,945</b>	<b>2,220</b>	<b>1,985</b>	<b>1,940</b>	<b>1,800</b>	<b>2,040</b>	<b>-8%</b>	<b>13%</b>
<b>Balance</b>	<b>-260</b>	<b>105</b>	<b>80</b>	<b>-335</b>	<b>-210</b>	<b>165</b>	<b>240</b>	<b>50</b>		

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

# PLATINUM QUARTERLY Q4 2017

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

	H1 2016	H2 2016	H1 2017	H2 2017	H2'17/H2'16 Growth %	H2'17/H1'17 Growth %
<b>Platinum Supply-demand Balance (koz)</b>						
<b>SUPPLY</b>						
<b>Refined Production</b>	<b>2,925</b>	<b>3,110</b>	<b>2,965</b>	<b>3,110</b>	<b>0%</b>	<b>5%</b>
South Africa	2,010	2,245	2,110	2,260	1%	7%
Zimbabwe	250	240	240	205	-15%	-15%
North America	205	185	180	185	0%	3%
Russia	370	345	345	370	7%	7%
Other	90	95	90	90	-5%	0%
<b>Increase (-)/Decrease (+) in Producer Inventory</b>	<b>+210</b>	<b>-180</b>	<b>+15</b>	<b>+20</b>	<b>N/M</b>	<b>33%</b>
<b>Total Mining Supply</b>	<b>3,135</b>	<b>2,930</b>	<b>2,980</b>	<b>3,130</b>	<b>7%</b>	<b>5%</b>
<b>Recycling</b>	<b>875</b>	<b>980</b>	<b>900</b>	<b>1,000</b>	<b>2%</b>	<b>11%</b>
Autocatalyst	620	605	630	710	17%	13%
Jewellery	255	375	270	290	-23%	7%
Industrial	0	0	0	0	N/M	N/M
<b>Total Supply</b>	<b>4,010</b>	<b>3,910</b>	<b>3,880</b>	<b>4,130</b>	<b>6%</b>	<b>5%</b>
<b>DEMAND</b>						
<b>Automotive</b>	<b>1,800</b>	<b>1,685</b>	<b>1,725</b>	<b>1,675</b>	<b>-1%</b>	<b>-3%</b>
Autocatalyst	1,730	1,620	1,655	1,600	-1%	-3%
Non-road	70	65	70	70	8%	0%
<b>Jewellery</b>	<b>1,180</b>	<b>1,330</b>	<b>1,200</b>	<b>1,260</b>	<b>-5%</b>	<b>5%</b>
<b>Industrial</b>	<b>925</b>	<b>875</b>	<b>830</b>	<b>820</b>	<b>-6%</b>	<b>-1%</b>
Chemical	290	300	285	300	0%	5%
Petroleum	115	110	50	50	-55%	0%
Electrical	80	80	80	80	0%	0%
Glass	140	65	100	70	8%	-30%
Medical and Biomedical	120	120	125	120	0%	-4%
Other	180	200	190	200	0%	5%
<b>Investment</b>	<b>260</b>	<b>275</b>	<b>170</b>	<b>85</b>	<b>-69%</b>	<b>-50%</b>
Change in Bars, Coins	265	195	100	110	-44%	10%
Change in ETF Holdings	-40	30	80	10	-67%	-88%
Change in Stocks Held by Exchanges	35	50	-10	-35	N/M	N/M
<b>Total Demand</b>	<b>4,165</b>	<b>4,165</b>	<b>3,925</b>	<b>3,840</b>	<b>-8%</b>	<b>-2%</b>
<b>Balance</b>	<b>-155</b>	<b>-255</b>	<b>-45</b>	<b>290</b>		

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

# PLATINUM QUARTERLY Q4 2017

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

	2013	2014	2015	2016	2017e	2018f	2017e/2016 Growth %	2018f/2017e Growth %	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017
<b>Platinum gross demand (koz)</b>													
<b>Automotive</b>	<b>3,170</b>	<b>3,310</b>	<b>3,395</b>	<b>3,490</b>	<b>3,395</b>	<b>3,285</b>	<b>-3%</b>	<b>-3%</b>	<b>885</b>	<b>875</b>	<b>850</b>	<b>810</b>	<b>865</b>
North America	425	465	470	425	430								
Western Europe	1,350	1,440	1,550	1,700	1,560								
Japan	580	590	530	490	480								
China	130	120	125	170	195								
India	160	160	175	165	165								
Rest of the World	525	535	545	540	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>2,505</b>	<b>-2%</b>	<b>2%</b>	<b>700</b>	<b>610</b>	<b>590</b>	<b>585</b>	<b>675</b>
North America	200	230	250	265	280								
Western Europe	220	220	235	240	250								
Japan	335	335	340	335	340								
China	1,990	1,975	1,765	1,450	1,340								
India	140	175	180	145	175								
Rest of the World	60	65	70	70	75								
<b>Chemical</b>	<b>535</b>	<b>555</b>	<b>605</b>	<b>595</b>	<b>585</b>	<b>600</b>	<b>-2%</b>	<b>3%</b>	<b>130</b>	<b>150</b>	<b>135</b>	<b>165</b>	<b>135</b>
North America	55	55	65	55	55								
Western Europe	110	105	105	120	115								
Japan	15	15	10	15	15								
China	195	215	255	240	235								
Rest of the World	160	165	170	165	165								
<b>Petroleum</b>	<b>50</b>	<b>65</b>	<b>205</b>	<b>215</b>	<b>100</b>	<b>160</b>	<b>-53%</b>	<b>60%</b>	<b>55</b>	<b>35</b>	<b>15</b>	<b>25</b>	<b>25</b>
North America	40	25	-25	90	55								
Western Europe	-45	-15	70	10	5								
Japan	10	-35	5	0	-40								
China	80	-5	45	80	45								
Rest of the World	-35	95	110	35	35								
<b>Electrical</b>	<b>185</b>	<b>190</b>	<b>165</b>	<b>160</b>	<b>155</b>	<b>150</b>	<b>-3%</b>	<b>-3%</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>
North America	10	15	10	10	10								
Western Europe	5	10	10	10	10								
Japan	10	15	15	15	15								
China	75	70	60	60	60								
Rest of the World	85	80	70	65	60								
<b>Glass</b>	<b>145</b>	<b>175</b>	<b>200</b>	<b>205</b>	<b>180</b>	<b>185</b>	<b>-12%</b>	<b>3%</b>	<b>5</b>	<b>45</b>	<b>55</b>	<b>50</b>	<b>20</b>
North America	5	10	0	20	5								
Western Europe	-10	15	10	5	10								
Japan	0	-25	-5	-10	-10								
China	90	85	95	100	80								
Rest of the World	60	90	100	90	95								
<b>Medical and Biomedical</b>	<b>220</b>	<b>220</b>	<b>230</b>	<b>235</b>	<b>240</b>	<b>240</b>	<b>2%</b>	<b>0%</b>	<b>75</b>	<b>55</b>	<b>70</b>	<b>45</b>	<b>75</b>
North America	90	90	90	90	95								
Western Europe	75	75	75	80	80								
Japan	20	20	20	20	20								
China	15	15	20	20	20								
Rest of the World	20	20	25	25	25								
<b>Other industrial</b>	<b>340</b>	<b>360</b>	<b>345</b>	<b>380</b>	<b>390</b>	<b>415</b>	<b>3%</b>	<b>6%</b>	<b>105</b>	<b>95</b>	<b>95</b>	<b>90</b>	<b>110</b>
<b>Investment</b>	<b>935</b>	<b>150</b>	<b>305</b>	<b>535</b>	<b>260</b>	<b>250</b>	<b>-51%</b>	<b>4%</b>	<b>225</b>	<b>80</b>	<b>90</b>	<b>-10</b>	<b>95</b>
<b>Total Demand</b>	<b>8,525</b>	<b>8,025</b>	<b>8,290</b>	<b>8,320</b>	<b>7,765</b>	<b>7,790</b>	<b>-7%</b>	<b>0%</b>	<b>2,220</b>	<b>1,985</b>	<b>1,940</b>	<b>1,800</b>	<b>2,040</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.

### 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.

### **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.

### **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 will be 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.

### **WLTP**

Worldwide Harmonized Light Vehicles Test Procedure is a laboratory test to measure pollutant emissions and fuel consumption. WLTP replaces the New European Drive Cycle (NEDC).

### **WPIC**

The World Platinum Investment Council.

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### **Ounce conversion**

1 million ounces = 31.1 tonnes.

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