PLATINUM 2013

Johnson Matthey

ACKNOWLEDGEMENTS

Johnson Matthey gratefully acknowledges the contribution of many individuals and companies within the platinum group metal industry in providing information for and assistance with the compilation of Platinum 2013.

In particular, our thanks go to Denise Garwood, Alison Cowley and the members of the Johnson Matthey precious metals market research team and to Tanaka Kikinzoku Kogyo KK for their invaluable assistance in Japan.

Platinum 2013 is based for the most part on information available up to the end of March 2013.

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Design: Wonderberry UK Ltd.

Print: CPI Colour

CarbonNeutral® company

Printed in the United Kingdom on paper from well-managed sources.

Background image: PGM grain.

ISSN 0268-7305

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EXECUTIVE SUMMARY

The platinum market was in deficit by 375,000 oz in 2012 due to a steep decline in output from South Africa. Primary supply of platinum fell by 13% to 5.64 million ounces, the lowest for 12 years. Total demand for platinum in 2012 was down by 0.6% to 8.05 million ounces. Recycling of platinum came to 2.03 million ounces, marginally less than in 2011.

Platinum shipments by South African producers fell by 16% to 4.10 million ounces in 2012. At least 750,000 oz of production were lost to legal and illegal strikes, safety stoppages and closure of some marginal mining operations. Changes to supply from other regions were insignificant by comparison.

Gross demand for platinum in autocatalysts rose by 1.7% to 3.24 million ounces. Weak European demand for platinum, due to depressed light vehicle output and a lower market share for diesel vehicles, was more than offset by higher demand in Asia and North America and by increasing demand for platinum autocatalysts for non-road diesel engines.

Gross world jewellery demand for platinum improved by 12% in 2012 to 2.78 million ounces. It was boosted by expansion of the retail jewellery distribution network in China, allied to a degree of increase in manufacturers' finished jewellery stocks. Investment demand for platinum was steady at 455,000 oz, with strong investor interest in North America and a rise in the minting of platinum coins.

Industrial demand for platinum in 2012 fell by 21% to 1.57 million ounces. It was affected by a slowing of expansion in the glass industry, reduced production of hard disk drives in the electrical industry and the drawdown of inventory in both sectors. Chemical demand was slightly lower than in 2011, while demand for platinum in other applications was stable.

Recycling of platinum from end-of-life autocatalysts fell in Europe and North America. The price of platinum averaged $1,552 in 2012, $169 lower than in 2011, causing collectors of spent autocatalysts to hoard stock awaiting better price opportunities. The decline in recovery from this source was partly offset by greater recycling of platinum jewellery scrap in China.

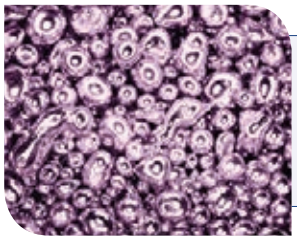
Gross demand for rhodium grew by 6% in 2012 to 966,000 oz. Autocatalyst demand was bolstered by a rebound in vehicle production in Japan after the catastrophic natural disasters of 2011 and by a buoyant market for cars in North America, but there was a fall in buying from the glass industry. Primary supplies, affected by output lost to disruption at South African mines, declined by 43,000 oz to 722,000 oz. With recovery from scrap down slightly to 259,000 oz in 2012, the rhodium market was in surplus by 15,000 oz.

The palladium market moved into a deficit of 1.07 million ounces in 2012 from a surplus of 1.19 million ounces in 2011. This was the result of lower primary and secondary supplies, record demand for palladium autocatalysts from the auto industry and a substantial swing in investment demand from heavily negative in 2011 to strongly positive in 2012.

Palladium supply fell by 11% in 2012 to 6.55 million ounces, the lowest since 2002. Russian newly-mined supply declined by 3% to 2.63 million ounces, while sales from state stocks fell by two-thirds to 250,000 oz as palladium reserves neared depletion. South African palladium supply, affected by strikes and other stoppages, fell by 9% to 2.33 million ounces.

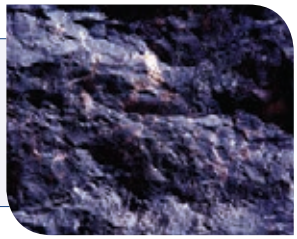
Gross demand for palladium rose by 16% to 9.90 million ounces in 2012. Purchases for autocatalyst manufacturing increased by 7.5% to a new high of 6.62 million ounces, propelled by recovering car output in Japan after the natural disasters of 2011, further growth in China, and a boom in new registrations in North America as consumer confidence and economic activity continued to improve.

Industrial demand for palladium weakened by 4% to 2.37 million ounces in 2012. The metal was less intensively used for chip capacitors, its main electrical application, due to thrifting and to competition from base metal alternatives. Demand for palladium process catalysts improved with the expansion of capacity in Asia for making chemical intermediates for polyesters and plastics.



Lower production in China was the cause of a 12% decline to 445,000 oz in gross world demand for palladium in jewellery. Anaemic consumer demand for palladium jewellery in China has resulted in fewer manufacturers and retailers producing it or carrying stock. Demand for palladium was steady in most other regions and slightly higher in Europe, supported by its use in wedding rings for men.

Net physical investment in palladium in 2012 changed by over one million ounces. It switched from a negative 565,000 oz in 2011 to a positive 470,000 oz last year. Flows of palladium into exchange traded funds (ETFs) were strong in the first half of the year. The launch of a new investment trust in the USA in December 2012 added significantly to demand.



Demand for both ruthenium and iridium fell substantially in 2012 after two exceptionally strong years. Ruthenium demand was down by 32% to 679,000 oz due to sharply reduced buying of metal for the production of hard disks and for use in chemical catalysts. Adequate stocks of iridium crucibles for growing single crystal sapphire meant a pronounced drop in buying from the electrical industry, causing global iridium demand to fall by 46% to 178,000 oz.

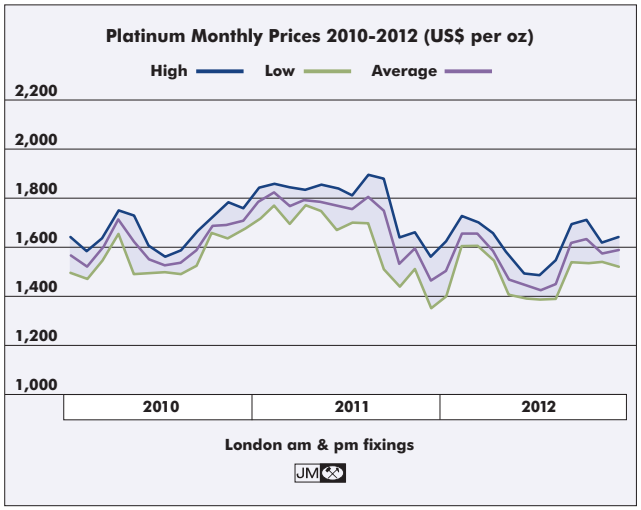
SUMMARY

PLATINUM

- **Platinum was in deficit by 375,000 oz in 2012, largely due to production lost to strikes, stoppages and mine closures in South Africa.**
- **Primary supplies of platinum, at 5.64 million ounces, were at a 12-year low, with South African sales down by 16% to 4.10 million ounces.**
- **Gross demand for platinum fell marginally in 2012 to 8.05 million ounces, with higher jewellery demand but sharply lower industrial buying.**
- **Autocatalyst demand for platinum was poor in Europe but stronger in Asia and North America and for non-road diesel emissions control.**

An unprecedented fall in supplies from South Africa arising from a series of illegal strikes put the platinum market into a deficit in 2012. Through industrial action, safety stoppages and mine closures, producers in South Africa altogether lost at least 750,000 oz of platinum production. Industrial demand in 2012 was hit by a downturn in purchasing by the glass and electrical sectors, while investment demand was steady. Growth in demand for platinum autocatalysts in Asia and North America offset lower requirements from the weak European vehicle market. Only the jewellery trade in China bought significantly more platinum, in order to supply an expanding jewellery retail network. The platinum price in 2012 was on average 10% weaker than in 2011, causing secondary recovery of platinum to decline as collectors of spent autocatalysts hoarded stock, waiting for better price opportunities to arrive.

A series of illegal work stoppages took place during the year at the mines on the western Bushveld operated by Impala Platinum, Lonmin and Anglo American Platinum. The first stoppage of the year started at Impala's Rustenburg lease area in January and resulted ultimately in the loss of a third of the mine's annual output. There was significant disruption in August at Lonmin's Marikana operations, where the strike became violent and led to the loss of many lives, and between September and November at Anglo's Union, Rustenburg and Amandelbult operations.



We estimate that losses from legal and illegal strike action in 2012 came to more than 600,000 oz of platinum, compounding the pressure being felt by South African mining companies from above-inflation labour and energy cost increases, falling productivity and torpid dollar pgm prices. Interruptions due to safety inspections, although less onerous than in 2011, were a further drag on production and accounted for at least 70,000 oz of lost output.

These adverse factors began to make themselves felt in the form of mine closures, with three of the smaller mines in South Africa and one tailings reprocessing plant ceasing to operate, in all taking around a further 60,000 oz out of play in 2012. Even the major producers were not immune to the threat of cutbacks, as Anglo Platinum concluded a year-long review of its operations by announcing in January 2013 its intention to close shafts in order to reduce production capacity by up to 400,000 oz per year.

Changes to supply from other regions were relatively insignificant. Shipments of platinum from Norilsk Nickel's operations declined by 2% to 660,000 oz. Total Russian supply, including production from alluvial platinum mines, fell by 35,000 oz to 800,000 oz. Supplies of platinum from North America in 2012 dropped by 55,000 oz to 295,000 oz, reflecting lower production of metal at Vale's Canadian nickel mines. Shipments from Zimbabwe, at 340,000 oz, were unchanged.

Demand for platinum in autocatalysts rose slightly in 2012 to 3.24 million ounces. Depressed light vehicle output in Europe, combined with a lower market share for diesel vehicles, led to a significant fall in demand for platinum in the region. However, a rebound in output of vehicles in Japan, a

continued surge in the manufacture of diesel vehicles in India and Thailand, and increased production of diesel pickup trucks in North America bolstered demand for platinum. The use of platinum autocatalysts for heavy duty vehicles improved marginally, while purchases of platinum more than doubled for catalysts to control pollution from construction, agricultural and other non-road diesel engines, which we now include in our estimates of overall autocatalyst demand.

Demand for platinum for making jewellery increased by 305,000 oz in 2012 to 2.78 million ounces. There was a surge of buying by manufacturers in China, in order to supply platinum jewellery to a growing number of retail outlets in Chinese cities. Manufacturers also took advantage of the relatively weak platinum price to increase stocks. In India there was wider distribution of platinum jewellery in the retail network. The discount of platinum to gold during most of the year made platinum jewellery more competitive with white gold in all markets.

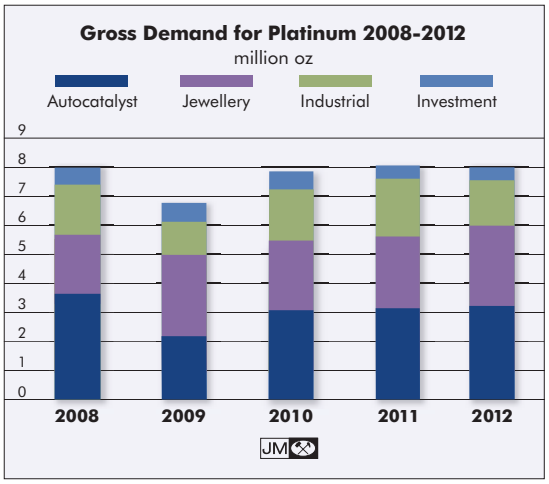
Demand for platinum in industrial applications fell by 405,000 oz in 2012 to 1.57 million ounces. This was largely the effect of changing conditions in the glass industry, where excess production capacity, combined with the use of platinum from decommissioned plants and existing inventories, led to a fall in purchases. In the electrical industry, inventory adjustments and weaker demand for hard disk drives impacted purchases of platinum. Demand from the chemical sector was slightly lower than in 2011, while demand for platinum in medical, petroleum refining and other applications was stable.

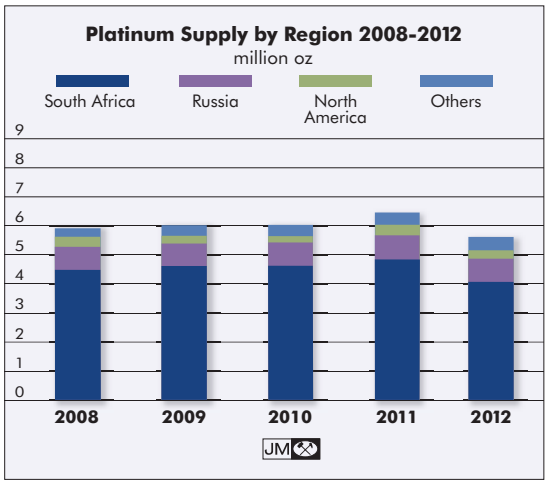
Net identifiable physical demand for platinum in the investment sector reached 455,000 oz in 2012, only 5,000 oz lower than in the previous year. Investment in exchange traded funds (ETFs) tended to fluctuate in accordance with changes in the platinum price, demand for platinum ending the year marginally higher compared to 2011. Significantly lower net purchasing of large bars in Japan was largely offset by a combination of increased demand for coins and small bars and the acquisition of metal for the launch of a new physically-backed product in North America.

The platinum price averaged $1,552 in 2012, $169 per oz lower than in 2011. It began the year brightly and was bolstered when the Impala mines went on strike, reaching a high of $1,729 in February, but then came under pressure from weak demand and Europe's economic problems. It was at a low of $1,390 before the eruption of violence during the Lonmin strike propelled it back over $1,700. Although the price was unable to sustain this level, concern about mine supplies continued to provide support for the remainder of the year.

Platinum Supply and Demand
'000 oz

Supply	2010	2011	2012
South Africa	4,635	4,860	4,095
Russia	825	835	800
Others	590	790	745
Total Supply	**6,050**	**6,485**	**5,640**
Gross Demand			
Autocatalyst	3,075	3,185	3,240
Jewellery	2,420	2,475	2,780
Industrial	1,755	1,975	1,570
Investment	655	460	455
Total Gross Demand	**7,905**	**8,095**	**8,045**
Recycling	**(1,830)**	**(2,060)**	**(2,030)**
Total Net Demand	**6,075**	**6,035**	**6,015**
Movements in Stocks	**(25)**	**450**	**(375)**



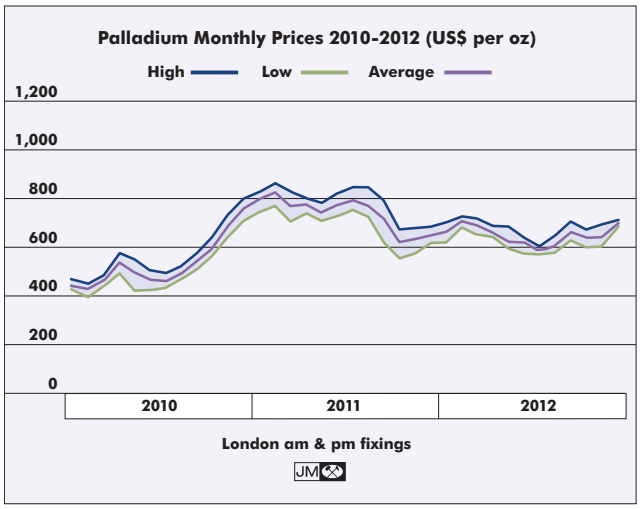


PALLADIUM

- **The palladium market moved into a deficit of 1.07 million ounces in 2012 following a surplus of 1.19 million ounces in 2011.**
- **Palladium supply declined by 11% in 2012 to 6.55 million ounces. Russian mine supplies fell by 3% to 2.63 million ounces, while sales from state stocks fell by two-thirds.**
- **Gross demand for palladium rose by 16% to 9.90 million ounces in 2012, led by record purchases of palladium for autocatalyst manufacturing.**
- **Net physical investment in palladium switched from a negative 565,000 oz in 2011 to a positive 470,000 oz in 2012, a swing of over one million ounces.**

Driven by record autocatalyst demand, a one million ounce swing in investment demand and a fall in primary and secondary supply, the market for palladium in 2012 moved into deficit by 1.07 million ounces. Although South African shipments were badly affected by the loss of production from strikes and other interruptions, the major impact on supply in 2012 was a fall in sales of metal from Russian state stocks to 250,000 oz, a fraction of what the market has been accustomed to seeing in recent years. The strength of demand for palladium was accentuated by the large swing in physical investment from negative to positive. However, excluding investment, demand still grew by 300,000 oz compared to 2011. Demand in the dominant auto sector increased by 460,000 oz, more than compensating for a reduction in electrical and jewellery demand, while chemical and dental demand were stable.

Supply of palladium last year, at 6.55 million ounces, was the lowest since 2002. In South Africa the output of by-product palladium suffered from disruption to platinum mining arising from strikes and other stoppages. PGM grades in the ores at Norilsk Nickel's Russian mines have been declining for some time and in 2012 palladium output in Russia was 3% lower than in 2011. However, the most significant impact on supply last year came from a sharp drop in sales of Russian government stocks due, we believe, to state reserves being almost completely depleted.



In 2012, for the second year running, gross demand for palladium in autocatalysts was at a new all-time high. World demand of 6.62 million ounces represented a 7.5% increase on 2011 and, even more impressively, a rise of nearly two-thirds when compared to the depressed level of 4.05 million ounces during the recession year of 2009. Some of the causes of this demand strength were ongoing, such as increasing production of light duty gasoline vehicles in China and another rise in the ratio of palladium to platinum in autocatalysts for European diesel vehicles. Others were germane to 2012, notably the recovery of vehicle output in Japan after the tsunami of 2011 and, in the USA, growing consumer confidence and economic activity. This, along with a renewed willingness of banks to provide credit, persuaded an increasing number of US buyers to return to car showrooms to replace their ageing vehicles.

Recycling of palladium from end-of-life catalysts did not keep pace with gross demand last year, falling by 35,000 oz to 1.66 million ounces. Weakness in pgm prices caused collectors to hoard stocks of spent converters for a time and only towards the end of the year did recycling volumes begin to strengthen as inventories were released. Consequently, the increase to 4.96 million ounces in net autocatalyst demand for palladium was an 11% advance on the 2011 level.

Gross demand for palladium in jewellery in 2012, at 445,000 oz, was 60,000 oz lower than in 2011. Demand for palladium jewellery in China fell for the fourth consecutive year, while in other markets it was largely unchanged. Anaemic consumer demand for palladium jewellery in China has resulted in fewer manufacturers and retailers producing it or carrying stock. With the amount of palladium recycled from scrapped jewellery falling to 190,000 oz in 2012, net demand

reached 255,000 oz, compared with 295,000 oz in 2011.

The use of palladium in various industrial sectors came to 2.37 million ounces in 2012, 100,000 oz lower than the previous year. The use of palladium in dental restorations, and in several minor applications such as petroleum refining catalysts, stationary source pollution control and industrial alloys, was largely stable. Chemical demand increased due to further expansion of capacity for manufacturing chemical intermediates for polyesters and plastics using palladium catalysts, but these gains were eliminated by sharply lower gross demand in electrical applications.

The metal content of multi-layer ceramic capacitors, an important use for palladium in the electrical sector, is constantly being reduced. At the same time, the improving performance and reliability of base metal capacitors has enabled manufacturers of electronic systems to employ them in applications where previously only the performance of precious metals was acceptable. Palladium capacitors have been displaced from many automotive electronics, for example, and increasingly their use is being confined to extremely demanding applications such as military aircraft systems. Demand for other electrical uses of palladium held up well, especially as the price of palladium remained at a large discount to the price of gold, the alternative material in applications such as electronic plating.

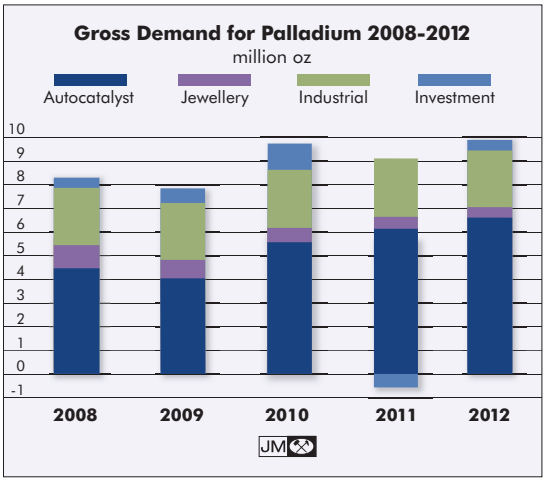
Recovery of palladium from electronic scrap fell by 50,000 oz in 2012 to 430,000 oz due to a decline in the concentration of palladium in electrical waste, the result of years of miniaturisation of components and thrifting of the palladium content. This offset part of the overall decline in gross demand from the electrical sector.

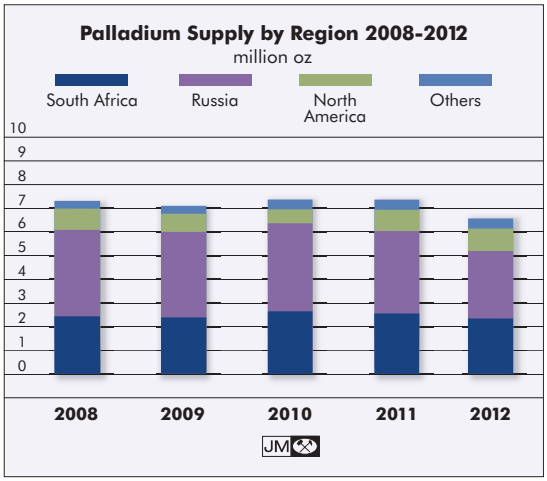
Net physical investment demand for palladium reached 470,000 oz in 2012, compared to liquidation of 565,000 oz in 2011, a swing of over one million ounces. This was due primarily to a return to net investment in the ETF market following heavy profit-taking the previous year, notably by investors in the two largest funds based in London and New York. New demand of 285,000 oz was registered in ETFs and to this was added a further 185,000 oz of palladium bought for the fully-subscribed Sprott Physical Platinum and Palladium Trust when it was launched in December 2012.

Like the platinum price, which it broadly shadowed for most of the year, the palladium price peaked at $722 in February 2012 and reached its nadir of $564 in July before being bolstered by the mine strikes in South Africa. Palladium was more resilient than platinum in the final two months, averaging $643 for the year, $90 per oz lower than in 2011.

Palladium Supply and Demand
'000 oz

Supply	2010	2011	2012
South Africa	2,640	2,560	2,330
Russia	3,720	3,480	2,880
Others	995	1,320	1,335
Total Supply	**7,355**	**7,360**	**6,545**
Gross Demand			
Autocatalyst	5,580	6,155	6,615
Jewellery	595	505	445
Industrial	2,465	2,465	2,365
Investment	1,095	(565)	470
Total Gross Demand	**9,735**	**8,560**	**9,895**
Recycling	**(1,850)**	**(2,385)**	**(2,280)**
Total Net Demand	**7,885**	**6,175**	**7,615**
Movements in Stocks	**(530)**	**1,185**	**(1,070)**





OTHER PGM

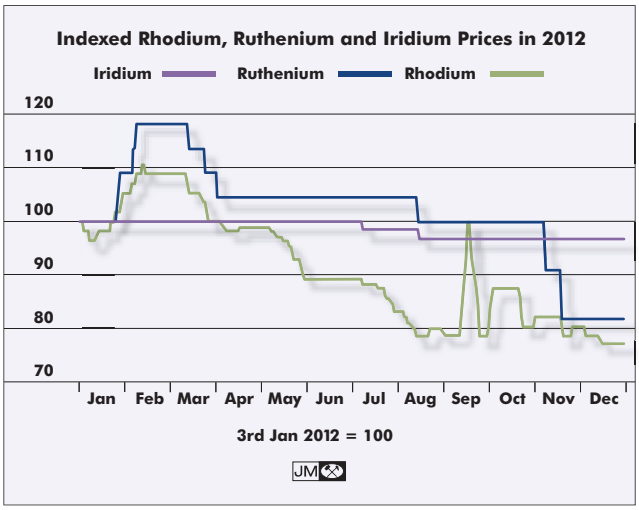
- **Gross demand for rhodium grew by 6% in 2012 to 966,000 oz, largely due to strong demand for rhodium in autocatalysts, especially in North America and Japan.**
- **Primary supplies of rhodium declined by 43,000 oz to 722,000 oz. Weaker South African production was partly offset by a rise in Russian output. Recovery of rhodium from autocatalyst scrap fell by 6.5% to 259,000 oz.**
- **Ruthenium demand in 2012 was 32% down at 679,000 oz due to sharply reduced buying of ruthenium for the production of hard disks and chemical catalysts.**
- **Adequate capacity for growing single crystal sapphire meant a pronounced drop in buying from the electrical industry, causing global iridium demand to fall by 46% to 178,000 oz in 2012.**

Rhodium

Supply and demand for rhodium came close to balance in 2012 after the previous year's substantial surplus. This was the outcome of a reduction in mine supply, principally from South Africa, a smaller amount of rhodium reprocessed from end-of-life autocatalyst scrap and a strong increase in demand for rhodium for new autocatalyst manufacture and for physical investment.

Supplies of rhodium from South Africa fell in 2012 to 576,000 oz, a decline of 65,000 oz. This was due to loss of production during a series of illegal strikes and other interruptions at the operations of all three of the major South African mining companies. The fall in supply was not so pronounced as for platinum because the producers were able to augment their regular production of rhodium by releasing metal from inventories.

Higher shipments of rhodium reached the market from Russia, the result, we believe, of metal being processed from stored mine concentrates to supplement regular newly-mined output at Norilsk Nickel. Russian supply rose by 20,000 oz to 90,000 oz, offsetting the losses from South Africa to some extent and bringing total primary sales of rhodium in 2012 to 722,000 oz – 43,000 oz less than in 2011 and the lowest level of supply for four years.

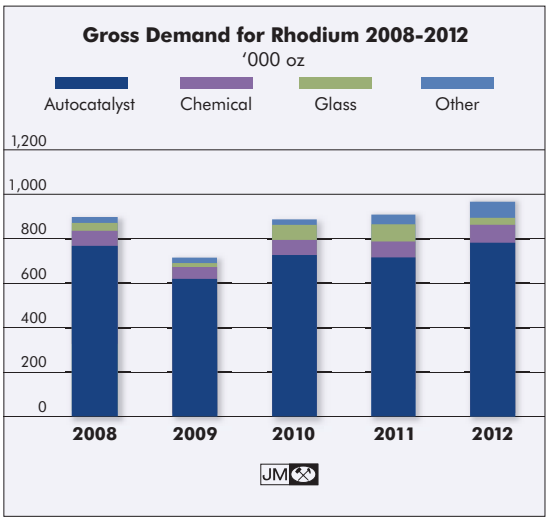


Autocatalyst demand for rhodium rose by 67,000 oz in 2012 to 782,000 oz, bolstered by a rebound in vehicle production in Japan after the catastrophic natural disasters of 2011 and by a buoyant market for cars in North America. A 22% increase in light duty gasoline vehicles made in Japan last year was equivalent to an additional 1.6 million cars and light trucks, while an improving economy brought consumers back to showrooms in North America, prompting a 1.9 million unit rise in the light duty gasoline build. As Japanese auto companies tend to use, on average, more rhodium on autocatalysts than other producers, and also have a large manufacturing base in North America, the recovering production in both regions was significant for rhodium demand.

Industrial demand for rhodium was mixed, with growth in purchasing by the chemical industry outweighed by a fall in demand from the glass sector after two very strong years. Chemical demand was up by 9,000 oz to 81,000 oz, driven by Asian demand for rhodium process catalysts to make acetic acid and oxo-alcohols. Producers of glass fibre reduced their purchases of rhodium in 2012 as they had metal on hand from closures of old plants, while liquid crystal display (LCD) glass manufacturers installed less capacity than in 2011 and had access to rhodium bought in previous years, bringing total glass demand down to 31,000 oz, from 77,000 oz in 2011.

A rise of 28,000 oz in Other demand for rhodium, to 66,000 oz, was entirely due to an increase in holdings of physical rhodium in the Deutsche Bank ETF. In total, gross demand for rhodium in 2012 rose by 58,000 oz to 966,000 oz. With autocatalyst recovery falling by 18,000 oz to 259,000 oz, the rhodium market was oversupplied by 15,000 oz.

The price of rhodium was $1,400 at the start of 2012. It ticked upwards to $1,500 in the first quarter, shadowing the rise in platinum and palladium prices, but then went into decline, reaching $1,100 in August. A characteristic pattern of trading during the period was for buying interest from Asia to be met by sellers in Europe and North America, with the latter having a greater effect on the price. When the Anglo Platinum mines in South Africa went on strike in September the price spiked to $1,400 before relapsing. The average price of rhodium for the year was $1,276, a fall of $746 per oz from 2011.



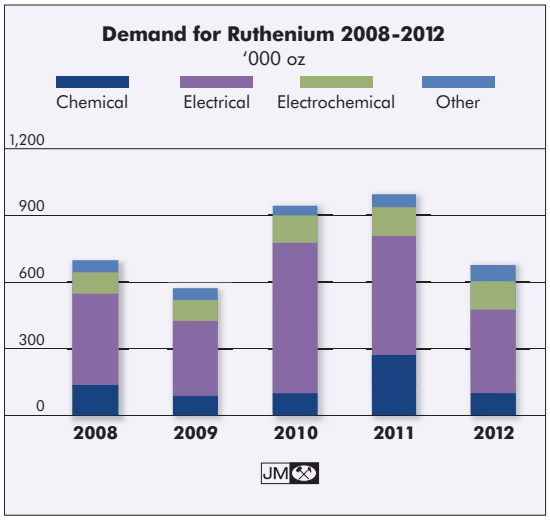
Ruthenium

Demand for ruthenium fell by nearly a third in 2012 after two exceptionally strong years.

Purchases of ruthenium declined in the electrical and chemical sectors. Weaker production of computer disk drives required less ruthenium for coating of hard disks and this, combined with a reduction of inventories and improved manufacturing efficiency, accounted for the bulk of a 30% decline in demand from the electrical industry.

Chemical demand for ruthenium fell by over 60% compared to 2011, when demand was unusually high due to purchases of new catalyst charges for converting natural gas to ammonia. With demand for ruthenium catalysts for the production of chlorine and for other minor applications broadly stable, total demand for ruthenium in 2012, at 679,000 oz, was 318,000 oz lower year-on-year. The price of ruthenium averaged $112 for the year, lower by $54 per oz than in 2011.

Mine production of ruthenium fell in 2012, in line with lower platinum output at strike-hit South African mines.

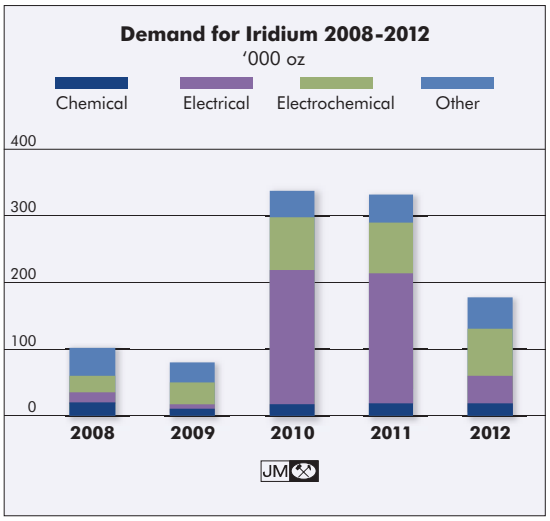


Iridium

Iridium demand fell by almost a half in 2012 because of lower purchasing from the electrical sector.

There was significant change in demand for iridium in electrical applications last year as expansion in the use of iridium crucibles to grow single crystal sapphire, which had driven demand sharply higher in 2010 and 2011, came to an end. Purchasing for other industrial applications was steady. In total, demand for iridium fell to 178,000 oz from 332,000 oz in 2011. The iridium price on average was $34 an ounce higher than in 2011 at $1,070.

Production of iridium was also impacted by disruptions to South African mining operations. However, with industrial buying in decline, there was no lack of availability in the market.



OUTLOOK

- **Platinum supply is likely to be under pressure from weak margins and unstable labour relations in South Africa.**
- **Demand for platinum in autocatalysts is expected to be steady and jewellery demand may decline to an extent, but a rebound in industrial demand will be led by higher purchases of platinum by the glass industry.**
- **If investment demand continues to be positive, the platinum market may be slightly in deficit in 2013.**
- **Palladium supply is likely to decline in 2013 as Russian stock sales dwindle and primary mine output is stable.**
- **Autocatalyst demand will grow due to rising vehicle output while palladium industrial and jewellery demand are expected to diminish slightly. The palladium market is likely to be undersupplied again this year.**
- **Rhodium demand will increase but we forecast that rising supplies and recycling will keep the market in surplus.**

PLATINUM

We expect primary supply of platinum in 2013 to be a little higher than last year, with broadly the same level of sales from South Africa as in 2012 and slightly higher shipments from other regions. Gross demand for autocatalysts is unlikely to grow and jewellery demand may well decline slightly. Demand from industry, notably the glass sector, is expected to rebound from the low 2012 level, while secondary recovery of platinum from autocatalyst scrap should grow. This will leave auto, industrial and jewellery demand more or less matched by supply. If investment demand repeats last year's pattern of net growth, then the market for platinum may be in a slight deficit in 2013.

South African supply of platinum fell to its lowest since 2001 last year as a result of strikes, safety stoppages and mine closures, but there are no definite prospects of significant recovery in output in 2013.

Many of the mines remain under serious cost pressure. Double digit inflation in labour and energy costs has become a norm for South African platinum mines and as rand pgm prices have not been rising enough to compensate, a large part of the industry has lacked the revenue to sustain production in the longer term. Some of the smaller platinum mining operations were closed last year; in 2013 a substantial amount of capacity is due to be shut down.

Anglo Platinum announced in January 2013 a plan to close four shafts at its Rustenburg operations and lay off 14,000 employees, reducing production by 370,000 oz a year. The company expects to supply a similar amount of platinum as in 2012, with the output lost from facilities due to close being offset by recovery of production at mines affected by last year's nine-week strike.

This assumes that the planned closures will go ahead. However, it is difficult, from a social perspective, to make drastic cuts to employment in South Africa even if there are convincing economic arguments for doing so. This has been demonstrated by the strength of the reaction of government and unions to Anglo Platinum's announcement, prompting the company to delay execution of its plans while consultations on the proposed dismissals take place.

Further industrial action in 2013 cannot be ruled out; there has already been a strike this year at Northam Platinum. The disputes at Impala, Lonmin and Angloplats in 2012 were initiated by rock drill operators (RDOs) withdrawing their labour, paralysing all production from underground. Many of the strikers belonged to the Association of Mineworkers and Construction Union (AMCU), which has displaced the National Union of Miners (NUM) as the union with the largest worker representation on the major platinum mines.

As mid-year wage negotiations in the platinum industry loom, further strikes in support of pay rises are possible, especially given the rivalry between the two unions. Even if the bargaining process is uneventful it is likely to result in increased cost pressure on the mines, putting operations further in jeopardy.

As long as there are no major interruptions to output and that Anglo Platinum reduces production according to its plans, South African production in 2013 may not be very different from last year – although sales into the market might be a little higher than production, if South African producers have refined inventory available to supplement output and choose to release it.

Changes in supply from other regions will be slight. Russian output of platinum is likely to decline slightly due to lower pgm grades in the ores being mined at Norilsk Nickel. There should be an increase in output from Zimbabwe where, despite a challenging political environment, there is no sign of any intent by the mines' South African parent companies to alter their production plans in this relatively low-cost mining area.

The platinum market may not need additional supply this year. Gross demand for platinum in autocatalysts does not appear likely to grow in 2013. Purchases of platinum by the auto industry mainly stem from its use in emissions control for diesel engines, with Europe dominating demand because of the high number of diesel light duty vehicles built in the region. In 2013, light duty vehicle production in Europe is forecast to fall by around 5% on the already depressed 2012 level. With a continued squeeze on European household budgets, there may be a further decline in sales of diesel vehicles as consumers favour cheaper gasoline cars.

Growing sales of diesel cars and SUVs in India, supported by a government subsidy on diesel fuel, have become important factors in platinum autocatalyst demand, but slowing vehicle sales in the first quarter of 2013 and a planned reduction in the subsidy threaten to choke short term demand growth. Increased output of diesels in some of the other markets where emissions controls apply is unlikely to outweigh the impact on demand for platinum from declining European production. Meanwhile, no new light duty diesel emissions legislation which would promote the use of platinum on catalysts is due to be applied this year in any of the major diesel auto markets.

Some growth in demand for platinum in the auto industry is likely in the heavy duty and non-road sub-sectors. The former should benefit a little from the introduction of Euro VI legislation for heavy duty trucks in Europe in January 2013 and from tighter legislation for heavy duty vehicles in China which, after two postponements, is now expected in mid-2013. The use of platinum to control emissions from non-road diesel vehicles will also rise as increasing numbers of engines meeting more stringent legislation are produced.

Although gross autocatalyst demand may be stable in 2013, on a net basis it will probably decline. Recycling of platinum from end-of-life catalysts can be expected to increase due to natural growth in the amount of scrap collected and as refiners receive material withheld from the market last year.

We expect industrial demand for platinum to recover in 2013 largely because of a change in levels of purchasing by the glass industry, which after drawing on inventories of metal in 2012 will have less platinum on hand to feed new plant installations. This might be the last year of strong expansion in display glass capacity for a while. Companies in China will soon achieve their ambition to amass enough production to supply their domestic market, leaving the rest of the world with more capacity than can be immediately filled. New chemical plants in Asia and the Middle East and a recovery in output of hard disks will require more platinum this year too.

Investment demand may decide the platinum market balance in 2013.

In China and India, currently the only growth sectors for platinum jewellery, demand for platinum is far from reaching a natural ceiling. Driven by these two markets, we expect gross global demand for platinum in jewellery fabrication to remain firm in 2013, while perhaps not attaining the level of 2012, which was the second highest on record. Most major manufacturers in China reported that demand for platinum jewellery was strong in the first nine months of 2012 but not as good in the next two quarters, most likely a result of firmer platinum prices and high inventories of finished jewellery.

Retail sales were reported to have been weaker in the first three months of 2013, partly because Chinese New Year and Valentine's Day, both good selling occasions for jewellery in China, were coincident this year. Nonetheless, major jewellery brands in Hong Kong are planning to further expand their retail distribution network into lower-tier regional cities in China during 2013 and this is likely to stimulate production of platinum jewellery for building the necessary retail stocks.

Demand in India, although at a far lower level than in China, is growing due to enthusiasm for platinum from retailers and their customers, evidenced by platinum being more and more widely distributed in jewellery stores across the country. Platinum is gaining acceptance as an alternative to gold for jewellery to celebrate relationships, as men's jewellery, or to mark auspicious occasions.

Investment demand might prove to be the balancing factor in the platinum market this year. Assuming that investors in platinum exchange traded funds (ETFs) behave in 2013 as they did in 2012, the direction taken by the platinum price will tend to determine net investment in ETFs, with buying into price increases stronger than selling during price falls.

If our supply and demand assumptions are correct, little price stimulus is likely from fundamental factors. Instead look to broader investor and speculator sentiment, and how this responds to movements in the gold price, economic policy change and the challenging operating environment in South Africa, to produce volatility in platinum in 2013.

PALLADIUM

Of all the platinum group metals palladium has the strongest fundamental outlook, as a result of declining supply and burgeoning autocatalyst demand.

The dynamics of the palladium market are becoming quite distinctive. Supplies of palladium are likely to fall again in 2013 as Russian stock sales diminish further and mine output from Russia and South Africa struggles to grow. Although non-automotive industrial demand may only be stable at best, autocatalyst demand will continue to increase, probably to a greater extent in absolute terms than growth in recycling from autocatalyst, electrical and jewellery scrap.

This is a recipe for an undersupplied market, an outlook which should maintain positive interest in palladium by subscribers to ETFs and other investment vehicles, with potential upward pressure on the palladium price as a result. The major risk to this prognosis is the price reaching a level high enough to initiate release of some of the approximately nine million ounces of surplus palladium which have been absorbed by the market since 2001.

These surpluses were largely created by the sale of the Russian government palladium stockpile. This process of disposal has taken many years to accomplish but appears now to be almost complete. Information about the size of Russia's state reserves is scant, and is officially still a state secret. However, what has been gleaned in the last few years supports a growing consensus (which we share) that sales from stocks in 2013 will be less than half of the 2012 level, which was itself sharply down on earlier years.

If this outlook is correct, the overall supply of primary palladium in 2013 will probably fall, as it is unlikely that new production this year will be able to compensate for the predicted drop in sales of palladium from Russian state inventories. We expect South African supply to be stable, barring more episodes of prolonged disruption to output through wage disputes or any unforeseeable events. Production from Zimbabwe is scheduled to rise, with government pressure on platinum mines in Zimbabwe to transfer share of ownership to local stakeholders being unlikely to affect operations in the short term, in our view.

However, a good portion of this increase in sales to the market from southern Africa could be offset by lower production of palladium in Russia, where declining pgm grades in the orebodies being mined at Norilsk Nickel will have an impact on palladium output. In total, the net increase in newly-mined supply in 2013 may be quite small. A more significant contribution to overall supply of palladium this year is likely to come from increased volumes of scrap from autocatalysts, as additional numbers of vehicles are dismantled and as collectors release material hoarded during periods of low prices in 2012.

Demand for palladium in autocatalysts grew by 7.5% in 2012. There is no reason not to expect another increase in overall demand for palladium in 2013, although not at such a high rate of growth as last year. The regional distribution of demand will vary. It is likely to be slightly down in Europe and Japan and flat in North America, but we expect demand to grow in several key developing auto markets.

The continued weakness of auto sales in Europe will weigh on palladium demand in the region in 2013, although its effect will be offset to some extent by increasing substitution of palladium for platinum in light duty Euro 5 diesel catalysts. Small amounts of palladium are used in European heavy duty catalysts too, and greater uptake of platinum–palladium systems in Europe is expected due to implementation of Euro VI legislation for heavy duty vehicles starting in January 2013. In Japan, most of the palladium used in autocatalyst is for light duty gasoline vehicles. As Japanese production of gasoline cars and light trucks is expected to decline this year following the impressive growth in 2012, a corresponding decrease in palladium demand is probable.

In complete contrast, output of light duty vehicles in China, most of them powered by gasoline engines, is forecast to rise substantially this year and this will raise palladium demand significantly. In addition, China 4 emissions standards for gasoline light duty vehicles, introduced for vehicles driven in Beijing from March 2013 and due to be implemented nationwide in later years, will cause average catalyst loadings to rise slightly.

In Russia, palladium demand should be boosted by higher vehicle production and new air quality legislation. The application of Euro 4 standards to all vehicles sold in the country from January 2013 will lead to an increase in the average loading of palladium per car. The story will be similar in Thailand, where gasoline car production is rising strongly and all vehicles have been required to meet Euro 4 standards

since the beginning of the year, with a consequent sharp increase in palladium catalyst loadings.

Demand for palladium in the once-dominant dental and electrical sectors is likely to continue its decline. The major use of palladium in the electrical industry, as the electrode layers in multi-layer ceramic capacitors, is increasingly being confined to military, aerospace and other sophisticated applications, supplanted in other areas by the improving technical performance and reliability of advanced base metal materials. Meanwhile, alloys using palladium are progressively being displaced in dental treatment by ceramics and other alternatives. Demand for palladium catalysts in the chemical sector may well be stable, but palladium jewellery as a significant application is fading like a comet after its appearance in China in the middle of the last decade.

As a result of these trends, demand for palladium is increasingly becoming focused on the automotive sector. Excluding investment, 70% of the palladium purchased by end-users in 2012 was for autocatalyst manufacture compared to less than half of non-investment demand in 2005. This heavy exposure to a single application is potentially a risk for palladium producers. However, production of light and heavy duty vehicles using palladium catalysts for emissions control is almost certain to increase for some years to come. A more critical fundamental factor in the palladium market will be the weak outlook for growth in mine supply, which is likely to maintain the market in a deficit again in 2013 and keep the palladium price underpinned.

OTHER PGM

Static primary supply and rising demand will keep the market for rhodium tight in 2013, with the rate of growth in recovery from spent autocatalysts playing a major role in deciding the balance between supply and demand.

In every region of production we are expecting supply of rhodium to be flat in 2013. Production of rhodium in South Africa will be dependent on platinum output, which we expect to be fairly stable. It is worth noting that many of the South African shafts which have been closed or are threatened with closure are UG2 operations where the orebody has a relatively high rhodium content. We think Russian supply will be broadly at the same level as in 2012, elevated by further recovery of rhodium from old mine concentrates.

Global production of light duty gasoline vehicles is likely to expand this year, requiring more rhodium for autocatalysts as a result. Although consumer demand for new cars in

Sales of palladium from Russian state stocks are expected to decline again in 2013.

Europe is still weakening due to economic uncertainty in the eurozone, and there is expected to be some contraction in output in Japan after the strong growth of 2012, output of vehicles in China and other Asian countries is forecast to grow and to more than compensate for the decline in other major manufacturing centres.

Buying by the glass industry should recover in 2013, if not quite reaching the 2011 level. Despite overcapacity in the world for producing flat panel display glass, further LCD production plants are scheduled to be added in China to meet domestic self-sufficiency plans. Inventories of rhodium in the glass industry were reduced in 2012 and will have less impact on demand for new metal this year.

Primary supply of rhodium on its own would be swamped by gross demand but the market will be held to a tight balance in our view by an increase in recovery of rhodium from autocatalyst scrap. Additional material is likely to be made available for refining, partly because many collectors accumulated inventories in 2012.

Demand for ruthenium took a dive last year but we foresee some recovery in 2013.

Depleted stocks in the hard disk industry may lead to higher metal requirements, although demand for ruthenium catalysts from the chemical industry could be weaker than in 2012 if metal recovered from spent catalysts is sold back to the market.

There are no immediate prospects for significant change in the level of iridium demand.

Chemical and electrical demand for iridium is unlikely to increase by much and there may be some decline in buying from the electrochemical sector as China's upgrading of its chlorine industry nears completion.

SUPPLIES, MINING & EXPLORATION

- **Global platinum shipments decreased by 13% to 5.64 million ounces, due to a steep decline in output from strike-hit mines in South Africa.**
- **Platinum sales by South African producers fell by 16% to 4.10 million ounces, a 12-year low. Palladium and rhodium supplies were also hit by the stoppages, falling by 9% and 10% respectively.**
- **Norilsk Nickel's Russian operations reported a 3% decline in palladium output, to 2.63 million ounces, while sales from state stocks fell to just 250,000 oz. As a result, palladium shipments from Russia were at their lowest level for a decade.**
- **Shipments of platinum from North American mines declined by 16% to 295,000 oz, but palladium supplies were little changed at 905,000 oz.**
- **Production of pgm from Zimbabwe was affected by smelter outages at Zimplats in 2012. As a result, pgm supplies were unchanged on the previous year.**

SOUTH AFRICA

The South African pgm industry was severely hit by unprotected work stoppages during 2012, with the result that shipments of platinum fell to their lowest level in more than a decade. Supplies would have been even lower were it not for releases of metal from in-process inventories, as refineries drew down their pipeline stocks during periods of mine inactivity. In total, we estimate that the mines lost at least 750,000 oz of platinum production in 2012 due to strikes, both legal and illegal, safety stoppages and mine closures. We discuss the chronology of these events and their impacts on the industry in a special feature on South African production on page 17.

The illegal work stoppages mainly hit the older mines on the western Bushveld operated by Anglo American Platinum, Impala Platinum and Lonmin. Worst hit were Impala's Rustenburg lease area, where refined platinum output contracted by a third, and Anglo's Union mines, where there was a 23% decline. There were smaller reductions from the latter's Rustenburg and Amandelbult groups of mines, while Lonmin reported an 8% fall in output of platinum in concentrate from its Marikana operation.

In contrast, with the exception of Atlatsa Resources' Bokoni mine, which experienced a prolonged illegal stoppage, mining operations on the eastern Bushveld and the Platreef were comparatively unaffected by the turmoil. Indeed, the Two Rivers and Mototolo mines both reported record platinum output in 2012.

Low rand pgm prices also contributed to the reduction in supplies, with three mines and one tailings reprocessing plant ceasing operations during the year, and others rationalising their activities in order to conserve cash. Aquarius Platinum announced that it was mothballing two of its mines, Everest and Marikana (the latter being operated under a pool and share agreement with Anglo American Platinum), and halting processing at its Chrome Tailings Retreatment Plant, a joint venture (JV) with Sylvania and Ivanhoe Platinum. Meanwhile, Platinum Australia, which operated the small Smokey Hills operation on the eastern Bushveld, went into administration, while the Canadian company Eastern Platinum scaled back stoping operations at its Crocodile River mine. Anglo American Platinum has announced a review of its mining strategy, involving the closure of some shafts in the Rustenburg area (see page 15), which is likely to impact supplies in 2013.

Anglo American Platinum

Shipments of platinum by Anglo American Platinum fell by 17% to 2.17 million ounces in 2012, reflecting significant production losses from its western Bushveld operations during unprotected strikes that took place between September and November. This figure includes 62,000 oz of production from the Unki mine, which we classify under Zimbabwe supplies, although the metal is refined at Anglo's facilities in South Africa. Sales fell below the level of refined production, due to the suspension of spot sales during the fourth quarter in response to disruption at the mines. In total, 160,000 oz of platinum were added to Anglo's refined inventories during 2012.

Equivalent refined platinum production, an indicator of

PGM Supplies: South Africa
'000 oz

Supply	2010	2011	2012
Platinum	4,635	4,860	4,095
Palladium	2,640	2,560	2,330
Rhodium	632	641	576

Mechanised drilling underground at Anglo Platinum.

underlying mining output, was down 8% at 2.22 million ounces last year; this figure includes purchases from third parties, such as chrome tailings operations and Xstrata's Eland Platinum mine, plus output from Unki, but excludes metal processed from secondary materials. Refined platinum production totalled 2.33 million ounces, as metal was released from the processing pipeline during the second half.

Production losses were once again concentrated at the older mines on the western Bushveld, and particularly at the Amandelbult (Tumela and Dishaba) and Union (North and South) mines, where output fell by 13% and 23% respectively. These operations were hit by industrial unrest, which propagated from the Rustenburg area in early October and was only resolved in mid-November, and by the depletion of surface sources of pgm, which have been supplementing underground output at Tumela and Union North.

Perhaps surprisingly, production at the company's Rustenburg area operations was comparatively lightly affected, with total annual output dropping only 8%, even though these mines were at the epicentre of the illegal strikes, and experienced prolonged disruption between September and November 2012. This was principally because of a strong first half performance and the production ramp-up at the recently reopened Khuseleka 2 shaft.

Some of Anglo's joint venture and associate mines were also affected by industrial unrest, but to a much lesser degree, and the impact on production was generally limited. The Modikwa mine, a joint venture with African Rainbow Minerals, experienced a 27-day legal wage strike during the first half of 2012, losing an estimated 11,000 oz of platinum output, but nevertheless reported a full year production figure of 120,000 oz, just 4% down on the previous year. At the Bafokeng Rasimone Platinum mine (Royal Bafokeng Resources: 67%), platinum output fell by 5% to 172,000 oz, but the Mototolo joint venture with Xstrata had a record year, with production rising 9% to 119,000 oz. The Kroondal pool and share operation (operated by Anglo's partner Aquarius Platinum) escaped serious interruptions, despite its proximity to the Rustenburg group of mines, and reported a 2% increase in equivalent refined platinum production, to 213,000 oz. However, the neighbouring Marikana pool and share operation fell victim to low rand pgm prices and was mothballed in June.

On 15th January 2013, Anglo American Platinum announced the results of a review of its mining strategy. The company intends to consolidate its Rustenburg assets into three mining operations (currently five), shutting four shafts and reducing production across the Rustenburg mines to between 320,000 oz and 350,000 oz per annum going forward.

The planned implementation of the strategic review will impact production levels this year. Although there is a risk of some further labour disruption, Anglo expects platinum output in 2013 to be little changed on last year, at between 2.1 million and 2.3 million ounces.

Impala Platinum

Output of pgm from Impala's Rustenburg lease area dropped sharply in 2012, reflecting losses incurred during a six-week illegal strike, which halted mining between mid-January and early March, and a slow return to normal operations thereafter. The poor performance was exacerbated by safety stoppages, a lack of ore reserve flexibility and a refinery pipeline lock-up at the year-end. As a result, refined pgm output fell by a third in 2012, to 628,000 oz of platinum, 353,000 oz of palladium and 84,000 oz of rhodium.

Impala continues to focus on the development of major vertical shaft projects at its Rustenburg lease area, the most advanced of which – 20 shaft – began the build-up of underground production in 2012. The board of Impala has approved a R2.1 billion project, planned for completion in 2019 to replace the final metals processing facility at its precious metals refinery.

The company has also reactivated the development of the Leeuwkop mine, which had been mothballed in the wake of the global financial crisis. This R9.8 billion project involves the construction of a vertical shaft to provide access to the reef at depths of between 1,000 and 1,800 metres. On completion, the mine will extract 2.16 million tonnes of UG2 ore annually,

Hauling ore at Anglo Platinum's Mogalakwena mine.

yielding around 145,000 oz of platinum, with first production planned for 2021. This long time lag between project approval and pgm output is typical of deep underground mining projects.

The small Marula operation on the eastern Bushveld saw its fortunes improve in 2012, with output of platinum in concentrate rising by 6% to 69,000 oz. The mine will now seek to optimise its infrastructure, allowing production to rise to around 90,000 oz of platinum annually. It was also a good year for the Two Rivers mine, a joint venture with African Rainbow Minerals, where platinum output rose by 5% to 156,500 oz, an all-time record for this operation.

Impala's Zimbabwe operations, Mimosa and Zimplats, once again reported consistently strong performances. Output from these mines is included in our estimates of Zimbabwe supplies, and is discussed on page 20.

Lonmin

Although illegal stoppages at Impala Platinum and Anglo American Platinum had a larger impact on platinum supplies last year, it was the violent unrest at Lonmin's Marikana mine which hit the world headlines in August 2012. During the dispute there was significant loss of life, and mining at Marikana came to a complete halt for six weeks during August and September. Mining operations did not fully restart until early October.

Lonmin lost 1.8 million tonnes of ore production, equivalent to about 110,000 oz of platinum output, as a direct result of the illegal stoppage. Production of platinum in concentrate from the Marikana mine was down only 8% in the full calendar year, at 643,000 oz, reflecting the mine's relatively good performance in the first half and a rapid resumption of production in the final quarter. Meanwhile, total refined platinum production fell 6%, aided by a release of 31,000 oz of the metal from in-process inventories. Sales of platinum totalled 717,000 oz, a drop of 4%.

Platinum shipments are likely to fall this year, as pipeline restocking offsets an increase in mine output: Lonmin expects to sell 660,000 oz of platinum in the year to September 2013. Thereafter, production and sales are planned to increase to at least 750,000 oz of platinum annually in the 2014 and 2015 financial years.

Northam

In contrast to its larger peers, Northam's mining operations were little affected in 2012 by the volatile labour relations climate. The Zondereinde mine, the deepest pgm operation in South Africa, recorded a 10% increase in mill throughput, to 2.1 million tonnes of ore, while production of pgm in concentrate rose by 8% to 301,000 oz. However, a furnace run-out in May resulted in a four-month interruption to smelting operations; during the rebuild, concentrates containing just over 100,000 oz of pgm were despatched for toll treatment by a third party. The smelter was recommissioned in September.

Northam also refines and markets pgm from the Pilanesberg mine, where production rose by a third in 2012 (see below). However, during the smelter rebuild, Northam temporarily halted purchases of concentrate from this source; as a result, its total pgm shipments fell slightly last year, to 203,000 oz platinum, 96,000 oz palladium and 24,000 oz rhodium.

Sales of pgm by Northam should rise this year, with the commissioning of the Booysendal mine on the eastern Bushveld. Underground mining has commenced, and by early 2013, a surface stockpile containing 320,000 tonnes of ore had been accumulated. This material will be used to commission the concentrator, and the first refined production from Booysendal should be seen during the second half of this year.

Other Producers

In this section we discuss mines which are not owned or part-owned by Anglo American Platinum, Impala Platinum, Lonmin or Northam. Almost all pgm production from these operations is processed in South Africa under concentrate offtake agreements with the major producers.

In the first nine months of 2012, Platmin's Pilanesberg open pit mine reported a 34% increase in pgm output, to 64,000 oz; concentrate from this operation is sold to Northam. The project continued to struggle with low grades and recoveries, with the

SOUTH AFRICAN PRODUCTION IN 2012

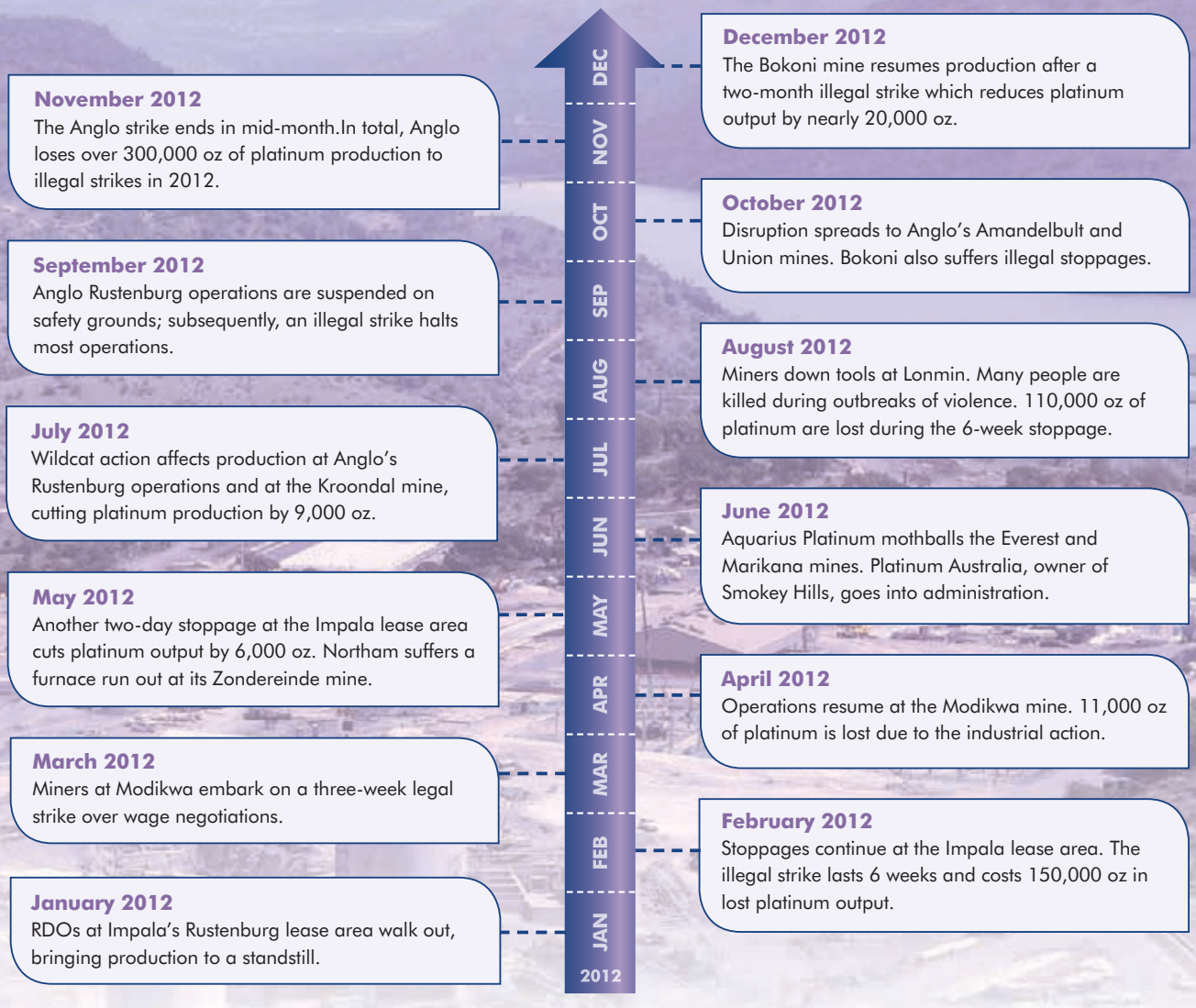
2012 saw exceptional disruption to platinum mining in South Africa. At least 750,000 oz of production was lost to strikes, safety stoppages, and mine closures.

All three major producers saw the shutdown of their main production sites on the western Bushveld for periods of several weeks at a time. Impala Platinum's Rustenburg lease area was the first to be affected, when rock drill operators (RDOs) embarked on an unprotected illegal strike in January, leading to the cessation of mining for six weeks. Although production resumed in early March, by mid year Impala reported that output was still only 85% of pre-strike levels. As a result, the company estimated that it lost 150,000 oz of platinum during the first half of 2012.

Anglo American Platinum was the next to experience an illegal walk-out, with wildcat strikes in the Rustenburg area cutting production by 9,000 oz during July. A month later, an unprotected strike at Lonmin spiraled into violence and bloodshed, culminating in the loss of many lives on 16th August. The Marikana mine remained at a standstill for six weeks, losing an estimated 110,000 oz of platinum output.

In September, Anglo suspended its Rustenburg operations due to concerns about intimidation of mine workers. Although the resumption of mining was announced on the 18th, many miners failed to report for work, and by early October, absenteeism was also affecting the Amandelbult and Union mines to the north. An agreement enabling a return to work was finally signed on 15th November. In total, Anglo estimates that it lost over 300,000 oz of platinum production due to illegal strikes at its managed and joint venture operations in 2012.

Safety stoppages had an impact on the mines in 2012, although at a much reduced level compared to 2011. We estimate that over 70,000 oz of production was lost to Section 54 stoppages. The closure of shafts on economic grounds at Everest, Marikana and Smokey Hills also contributed to the drop in output during the year. In January 2013, Anglo announced the results of a strategic review of its platinum business, which could see production reduced by up to 400,000 oz a year.



Developing the shaft at Royal Bafokeng Platinum's Styldrift I mine.

head grade in the January to September period averaging only 1.8 grams of pgm per tonne, while concentrator recoveries were just over 50%.

In November 2012, Platmin announced the completion of a transaction which will result in the consolidation of its pgm assets, consisting of the existing Pilanesberg Platinum mine, and the neighbouring Sedibelo and Magazynskraal properties. The company is to be renamed Sedibelo Platinum Mines Limited. The South African Industrial Development Corporation has injected R3.24 billion into the new company, in return for 16.2% of the equity.

Output from Xstrata's Eland Platinum mine fell sharply last year, to around 20,000 oz of platinum, as open cast mining ceased and the gradual build-up of mining from underground got underway. In response to weak rand pgm prices, rising cost pressures and challenging geological conditions, the company has decided to defer the planned development of the eastern decline, delaying the build-up in mining volumes. Xstrata now expects Eland to reach steady-state production of 5.4 million tonnes of ore annually in 2018. Platinum group metals from this operation are refined and sold by Anglo American Platinum.

At Aquarius Platinum's Everest mine, labour productivity remained problematic, while geological difficulties continued to plague the operation as it mined the shallower extremities of the orebody, where ground conditions were poor, and the ore lower in grade and more oxidised. As a result, it was decided in June 2012 to mothball the mine until rand pgm prices improve. Output of platinum in concentrate last year fell to just 18,000 oz, from 56,000 oz the previous year. This metal was refined and sold by Impala Refining Services (IRS).

At Eastern Platinum's (Eastplats') Crocodile River mine, which also sends concentrate to IRS, platinum output totalled 43,000 oz, a fall of 7%. Mining volumes were affected by the decision to temporarily suspend stoping at the Zandfontein section, due to low pgm prices, although mining continues at Maroelabult.

Development of Eastplats' assets on the eastern Bushveld has been put on hold. Construction of a concentrator on the Kennedy's Vale property commenced in 2011 and was due to be completed in the first quarter of 2013; this plant was to be used to process ore first from the nearby Mareesburg project, and later from the neighbouring Spitzkop property. However, in mid-2012, economic considerations led to the company suspending funding for both the concentrator and the Mareesburg open pit.

Platinum Australia's Smokey Hills mine was placed on care and maintenance in June 2012 due to low metal prices and difficulties in securing finance. The company's South African assets have been acquired by Jubilee Platinum, which intends to treat chrome tailings through the Smokey Hills concentrator, and will restart underground mining operations in the second half of this year. The aim is to ramp up production to around 60,000 oz of pgm annually from 2014.

Sylvania Platinum operates six chrome tailings retreatment plants located at chrome mines on the eastern and western limbs of the Bushveld. These operations process new tailings arising from current chrome mining activities as well as material from existing dumps, and they were therefore disrupted by the general industrial unrest affecting Bushveld mines in 2012. Nevertheless, the quantity of material processed through the pgm plants rose slightly to 712,000 tonnes. However, a fall in average grades meant that production of pgm in concentrate contracted by 14% to 41,000 oz.

Sylvania also has a 25% interest in the Chrome Tailings Retreatment Plant (CTRP), a joint venture with Aquarius Platinum (50%) and Ivanhoe Platinum (25%), located at the Kroondal platinum mine. Due to low rand pgm prices, this plant ceased operations in mid-2012.

Construction of the Wesizwe Platinum mine, adjacent to Royal Bafokeng Platinum's Styldrift project, is now underway. The first blast at the ventilation shaft took place in June 2012, while sinking of the main shaft begins in 2013. Commissioning of the first of three concentrator modules is due to take place in 2020, and the remaining two modules in 2023, once steady-state mining levels are achieved. At full production, the mine is planned to extract around 230,000 tonnes of ore per month, yielding 350,000 oz of pgm annually.

Wesizwe Platinum is also a partner in the nearby Western Bushveld Joint Venture (WBJV) Project 1, in which it holds a 26% stake. The remaining 74% interest in the project is held by the Canadian company Platinum Group Metals Limited. Mine development is progressing and construction of a concentrator is scheduled to begin in the first half of this year, with commissioning due in late 2014. The mine is planned to produce around 275,000 oz of pgm annually.

Production continues to ramp up at the Nkomati Nickel mine, a JV between African Rainbow Minerals and Norilsk Nickel, which produces pgm as by-products. In 2012, output totalled 24,000 oz of platinum and 64,000 oz of palladium, up by around 30% compared with the previous year.

RUSSIA

Shipments of platinum and palladium from Norilsk Nickel's Russian operations fell slightly in 2012. At 660,000 oz, platinum output was down 2% on the previous year, while palladium production declined by 3% to 2.63 million ounces. We believe that Norilsk also refined large quantities of stored pyrrhotite concentrate, which is relatively enriched in rhodium; as a result, we have increased our estimate of supplies of this metal in 2012, to 90,000 oz.

In view of the depletion of its richest, massive sulphide ore resources, and the consequent decline in average grades across its operations, Norilsk Nickel plans to increase production from disseminated ores going forward. In September 2012, the company announced that it had completed design works aimed at expanding the Zapolyarny mine, which extracts disseminated ore from the Norilsk-I deposit. Mine capacity will be increased gradually from 1.2 to 2.0 million tonnes of ore annually by 2019.

The company's published outlook suggests that there will be another modest decline in platinum and palladium output this year, to around 650,000 oz and 2.6 million ounces respectively.

We believe that shipments of platinum from alluvial mining operations contracted slightly in 2012, to 140,000 oz. In the Russian Far East, output from the largest producer, Kondyor, remained stable but production from the Koryak deposit is thought to be in decline and to have fallen to relatively insignificant levels. Small amounts of platinum are also extracted from alluvial deposits in the Sverdlovsk area of the Urals and from dredging in the area around Norilsk itself.

Our estimate of sales of palladium from government controlled inventories remains unchanged, at 250,000 oz in 2012, down from 775,000 oz the previous year. Going forward, we believe that there may be some residual sales of metal in 2013, but once again at much reduced levels. Our view is that Russian stock sales are unlikely to be of significance to overall palladium supplies in the foreseeable future.

PGM Supplies: Russia
'000 oz

Supply	2010	2011	2012
Platinum	825	835	800
Palladium			
Primary Production	2,720	2,705	2,630
State Sales	1,000	775	250
Rhodium	70	70	90

NORTH AMERICA

Supplies of platinum from North America dropped by 16% to 295,000 oz, reflecting lower production of this metal at Vale's Sudbury operations. However, palladium shipments were up slightly, at 905,000 oz, with a reduction in sales by Stillwater more than offset by increased output from North American Palladium. Rhodium supplies were unchanged, at 23,000 oz.

Canada

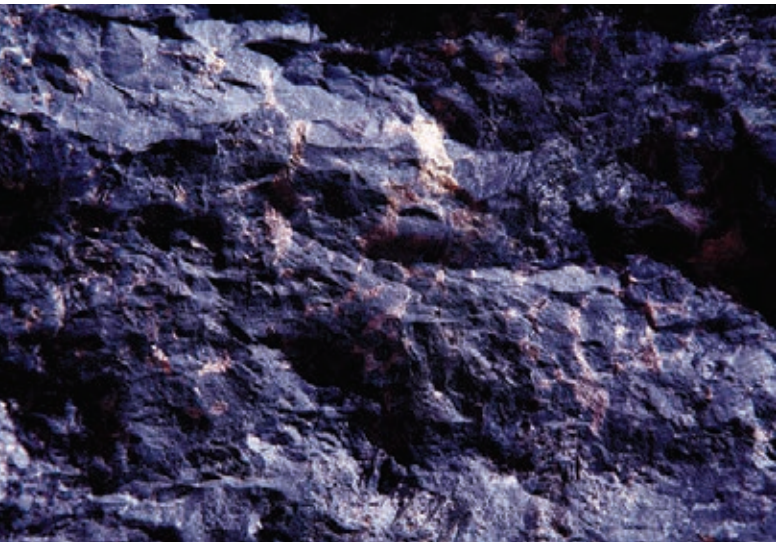
North American Palladium's Lac des Iles (LDI) mine had a positive year, with palladium output rising 12% to 164,000 oz. The LDI plant currently processes a mixture of higher-grade ore from underground operations, and lower-grade ore from surface sources. A new shaft is being developed which will enable the company to increase production of high-grade underground ore, raising production to around 250,000 oz of palladium annually from 2015.

Xstrata and Vale both produce pgm as by-products of nickel mining at their Canadian operations. Vale reported a drop in platinum output from its Sudbury mines in 2012, although

PGM Supplies: North America
'000 oz

Supply	2010	2011	2012
Platinum	200	350	295
Palladium	590	900	905
Rhodium	10	23	23

J-M reef ore mined at Stillwater in Montana, USA.



palladium shipments were stable and nickel output was up by nearly 10%. At Xstrata's Sudbury unit, nickel production rose by 3% to 20,425 tonnes, while output of copper rose by 16% to 57,813 tonnes, reflecting high copper volumes from the company's Nickel Rim South mine and from the Fraser mine, where it is extracting copper-rich ore under an agreement with Vale. Both these mines exploit orebodies containing higher copper and pgm values than is typical of the Sudbury area.

Stillwater Mining Company is undertaking engineering studies and environmental permitting activities at its Marathon pgm and copper project north of Lake Superior in Ontario, Canada. Initial estimates suggest that the planned open cast mine would produce about 200,000 oz of pgm annually over an 11.5-year mine life. In March 2012, it was announced that Mitsubishi Corporation had entered into an agreement under which it will acquire a 25% interest in the Marathon project.

USA

The Stillwater Mining Company operates two mines in Montana which are currently the only significant producers of primary pgm in the USA. In 2012, the company produced 514,000 oz of platinum and palladium combined, similar to the previous year, as a slight decline in mill throughput was offset by modest increases in grades and recoveries. However, sales fell slightly below the level of production, at 386,000 oz of palladium and 114,000 oz of platinum.

Stillwater expects to maintain output at around 500,000 oz of pgm annually until new projects bring a modest expansion of production in 2015 and beyond. The Graham Creek project at the East Boulder mine will add around 30,000 oz of pgm annually starting in late 2014, while the Far West project – an unexploited area within the Stillwater mine – could add a further 45,000 oz per annum by 2017.

ZIMBABWE

Supplies of platinum from Zimbabwe were unchanged in 2012, as outages at the Zimplats smelter resulted in a temporary increase in unprocessed stocks of pgm at the year-end. Underlying production remained strong, with both Mimosa and Unki reporting record pgm output.

Following its commissioning in January 2011, Anglo American Platinum's Unki mine has recorded a swift ramp up to full production levels. In 2012, the mill processed 1.54 million tonnes of ore, up 20% compared with the previous year, and in excess of its nameplate capacity (120,000 tonnes per month). Although the average head grade fell by 6% to 3.43 grams of pgm per tonne, this was offset by an improvement in recoveries, and equivalent refined platinum production rose by 20% to 63,000 oz.

Improvements in capacity utilisation enabled the Mimosa mine (a 50:50 joint venture between Aquarius Platinum and Impala Platinum) to achieve record pgm output in 2012. Mill throughput rose by 2% to 2.37 million tonnes, leading to a small increase in output of platinum in concentrate, to 108,000 oz. The mine is operating at full capacity and production is likely to be flat this year.

Zimplats' Ngezi mine produced 169,000 oz of platinum in matte in 2012, down 9% on the previous year. However, this was entirely due to a build-up in pgm stocks in the processing pipeline, following a furnace run-out in November. At the year-end, the company reported an 18,000 oz inventory of unprocessed platinum, which will be refined in the first half of 2013 and will add to supplies this year.

The company's Phase 2 expansion, planned to increase production to 270,000 oz of platinum annually by 2015, remains on schedule. The project involves the development of a new two million tonne per annum underground mine plus additional concentrator capacity.

PGM Supplies: Zimbabwe
'000 oz

Supply	2010	2011	2012
Platinum	280	340	340
Palladium	220	265	265
Rhodium	19	29	30

RECYCLING

- **Recycling of platinum, palladium and rhodium in 2012 came to 4.57 million ounces, a year-on-year decline of 150,000 oz.**
- **Recovery of platinum in 2012 was marginally down compared to 2011, with a fall in autocatalyst scrap refining in Europe and North America partly offset by greater recycling of jewellery scrap in China.**
- **Palladium recycling fell by 105,000 oz to 2.28 million ounces in 2012, the bulk of the decline coming from the electrical sector.**
- **As with platinum and palladium, refining of rhodium from scrap autocatalysts in 2012 was affected by weak pgm prices and lower collection rates, total recoveries falling by 6% to 259,000 oz.**

AUTOCATALYST

Recovery of pgm from end-of-life vehicle catalysts in 2012 was 3.05 million ounces, lower than in 2011 by 160,000 oz. Low pgm prices, which prompted collectors to hoard scrap, and continued weakness in the European car market were the main causes of the decline. A recovery in prices in the second half of the year and the liquidation of old autocatalyst inventories held by one collector in North America in particular gave a late boost to scrap volumes.

PGM recovered from end-of-life European autocatalysts declined by 21% in 2012 to 720,000 oz. The continued weakness in car sales in the region had a knock-on impact on vehicle scrap rates as motorists held on to their vehicles for longer periods. The average age of cars on the road in Europe has steadily increased since 2009. PGM recoveries were also impacted by falling prices for steel during 2012, which further reduced the throughput of scrap, and by lower average pgm prices in the first half of the year which led to the hoarding of catalysts at many of the smaller scrap yards and collectors. Recoveries picked up in line with pgm prices in August and September and were steady in the final quarter, but ended the year well below 2011 levels. Platinum recoveries fell by a lesser amount than palladium as a result of the year-on-year growth in collection of diesel catalysts stemming from the rapid growth in diesel vehicle registrations during the early part of the last decade.

PGM autocatalyst recovery in Japan in 2012 increased by 5% year-on-year to 205,000 oz. A higher turnover of scrapped vehicles was the result of much improved new and second-hand vehicle sales compared with 2011, when the Japanese auto market was depressed by the disastrous earthquake and tsunami. Used vehicle sales in 2012 rose for the first time in 12 years. Also helping to boost autocatalyst recoveries was the re-introduction of a Government subsidy for fuel efficient vehicles, which encouraged greater movement down the second-hand market chain, and contributed to the increase in the availability of scrap material. However, some of this was lost to the Japanese collection network as de-registered vehicles for export passed the million-unit mark for the first time since 2008.

In North America, pent-up demand for light and heavy vehicles after the long recession helped to propel sales of new vehicles in 2012, which in turn augmented the number of older vehicles scrapped. At the same time, falling pgm prices in the first half of the year encouraged collectors to hold on to material. The higher average prices in the second half drove collectors to release catalysts to refiners. In addition to catalysts collected from end-of-life vehicles, one of the largest collectors in the USA, known to hold large stocks of spent catalytic converters, began processing its inventory in the second half of the year. Consequently, recovery of pgm in North America in 2012 substantially exceeded earlier expectations to reach 1.81 million ounces, only marginally below the 2011 level.

The autocatalyst recycling infrastructure in North America is one of the oldest and most developed: recycling rates have been optimised over the last three decades and are therefore not expected to improve. Future recoveries will depend on the amount of pgm used in catalysts over time and the number of vehicles scrapped each year, as well as short-term holding and release of inventory by collectors.

Recycling of catalytic converters in China and other countries expanded at double digit rates in 2012, although total quantities remain low compared with Europe, Japan and North America. Recycling volumes will continue to increase as

Recycling
'000 oz

	Platinum		Palladium		Rhodium	
	2011	2012	2011	2012	2011	2012
Autocatalyst	(1,240)	(1,130)	(1,695)	(1,660)	(277)	(259)
Electrical	(10)	(10)	(480)	(430)	0	0
Jewellery	(810)	(890)	(210)	(190)	0	0
Total	**(2,060)**	**(2,030)**	**(2,385)**	**(2,280)**	**(277)**	**(259)**

a greater proportion of vehicles originally fitted with catalytic converters are scrapped and as the collection infrastructure improves. In addition to these ongoing trends, from May 2013, new standards will take effect in China requiring most vehicles to be scrapped after being operated for 600,000 kilometres. Small taxis, mid-size taxis and buses will need to be removed from service and dismantled eight, ten and twelve years after their production dates respectively.

ELECTRICAL

Globally, the amount of palladium recovered from electronic waste fell by 10% to 430,000 oz in 2012, despite a rise in the absolute quantity of waste captured for recycling. The concentration of palladium per tonne of waste continues to decline due to the historical trends of miniaturisation of electronic components, thrifting of palladium and substitution of palladium by base metals within the electronics industry.

Recovery rates for electronic scrap remain strongest in Europe, driven by the Waste Electronic Equipment (WEE) directive. 2012 saw a recast of the directive, which tightened legislation and will increase collection rates substantially in the future by setting much more ambitious targets, as well as giving EU member states greater power to clamp down on illegal shipments of waste disguised as used equipment.

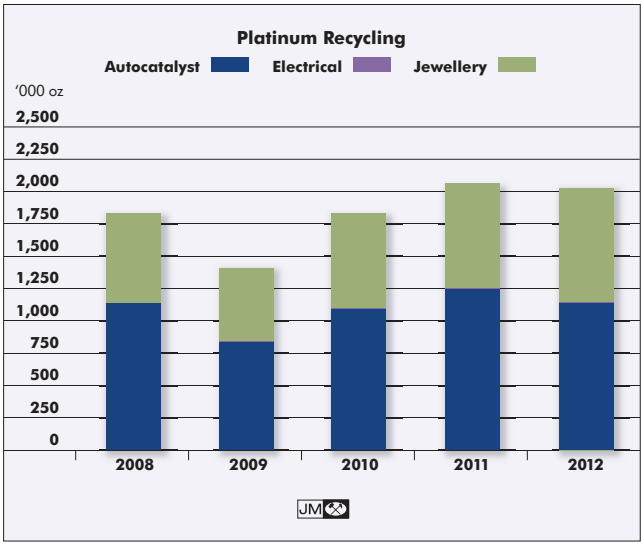
Recycling of platinum from electrical goods is far lower than palladium, due to the only significant potential source being hard disks, in which the minute quantities of platinum make recovery and refining uneconomical. Recycling rates will increase gradually as higher legislation and greater awareness prevail, but only from a low base of 10,000 oz a year at present.

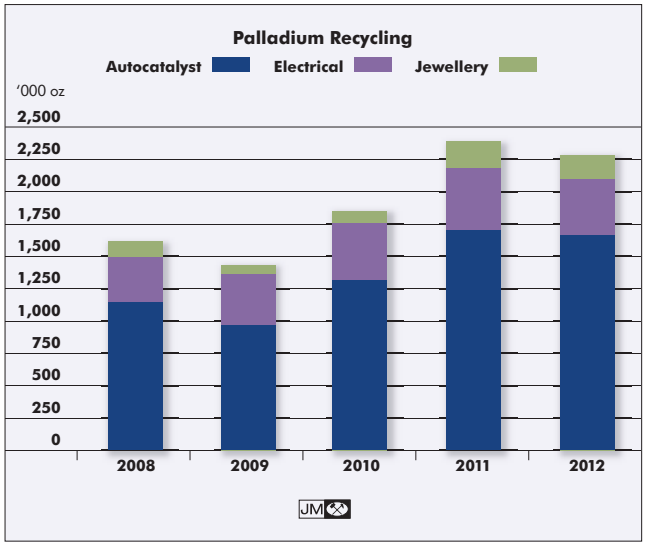
JEWELLERY

Recycling of platinum jewellery in China rose by nearly one-third to 600,000 oz in 2012. The vast majority of this was old consumer jewellery traded in at retail stores in exchange for new, often heavier platinum pieces. The greater level of recycling reflected a generally vibrant end-market – specifically, rising consumer affluence, the relatively high exchange value of platinum jewellery and consumers' desire to own the latest designs. Healthy consumer demand also ensured that relatively little unsold retail stock had to be returned for refining.

Unlike in China, the Japanese market tends to be one based on cash exchange and is therefore more sensitive to the price in local currency terms. As such, an average price in 2012 that was 10% lower in yen terms provided less economic incentive to recycle old jewellery than the previous year, resulting in platinum jewellery recycling dropping to 285,000 oz, almost one-fifth less than in 2011. Lower recycling of gold jewellery also contributed to less precious metal jewellery being returned across the board.

Recovery of palladium from the Chinese jewellery sector contracted by 15,000 oz to 175,000 oz in 2012, though this amount represents an increase to over 70% of gross demand, signalling an ever-diminishing desire to own or retain palladium jewellery. A theoretically large pool of palladium jewellery still exists in China and while the retail exchange value is relatively low compared with gold and platinum, the fact that the majority of Chinese palladium jewellery was purchased at prices significantly lower than seen in the recent past ensures the economic incentive remains for consumers to cash in old palladium items.





PLATINUM

- **Gross demand for platinum in autocatalysts rose by 1.7% in 2012 to 3.24 million ounces. Weak demand from the depressed European vehicle market was largely offset by demand for light vehicle autocatalysts in Japan, India and North America.**
- **Retail expansion and some building of stock in China were mainly responsible for a 12% growth to 2.78 million ounces in gross demand for platinum in jewellery.**
- **Industrial demand for platinum slumped by 21% to 1.57 million ounces, affected by a slowing of expansion in the glass industry, reduced production of hard disk drives in the electrical industry and the drawdown of inventory in both sectors.**
- **Platinum investment demand was steady at 455,000 oz due to strong investor interest in North America and higher production of coins worldwide.**

AUTOCATALYST

The depressed light vehicle market in Europe and a lower market share for diesel vehicles led to a significant fall in demand for platinum in the region. However, a rebound in output of vehicles in Japan, a continued surge in the manufacture of diesel vehicles in India and increased demand for pickup trucks in North America made up for most of this decline. Demand for platinum autocatalysts for heavy duty vehicles also improved marginally. Our estimate of total gross demand, at 3.24 million ounces, now includes platinum required for catalysts to control exhaust emissions from diesel non-road mobile machinery. This number, previously recorded in our Other demand estimates, more than doubled in 2012 to reach 100,000 oz.

Europe

European demand for platinum in autocatalysts, mainly for diesel engine cars, heavy duty vehicles and non-road mobile machinery, fell by 12% in 2012 to 1.33 million ounces.

The principal driver of the lower demand was the pronounced weakness of the European light vehicle market. According to the European automobile manufacturers association, ACEA, new car sales in the EU-27 countries fell by 8.2% in 2012 to 12.05 million units. In an already fragile market this represented the lowest number of registrations since 1995. The United Kingdom, where attractive price discounts drove strong demand from private buyers, was the only major market in the region to demonstrate growth at 5.3%. Car sales in France, Spain and Italy all declined, by 13.9%, 13.4% and 19.9% respectively, Italy posting the lowest new vehicle registrations in over three decades. Even the previously resilient German market was not immune to the weak economic sentiment. After starting the year positively, the rate of German new car registrations progressively deteriorated in the second half, ending the year almost 3% down on 2011.

In line with the much reduced sales levels, total production of light vehicles in the region, including light commercial vehicles, fell by 7% to 17.24 million units, the lowest output since 2009. Several auto manufacturers cut production capacity during 2012, with more reductions expected in 2013.

Diesel vehicle output fell to a greater degree than gasoline vehicle production as the share of diesel vehicles sold in Western Europe contracted slightly in 2012 to around 55% of total light vehicle registrations. While sales of premium diesel vehicles held up relatively well, at the lower end of the market demand for cheap, fuel-efficient cars drove a steady expansion in the production of small cars in the A and B vehicle segments. The proportion of diesel engine vehicles in these small car categories is low relative to the mid-size C and D segment vehicles they have displaced. Consequently, the number of diesel vehicles produced in the region declined to less than half of total European vehicle output. The resulting negative impact on demand for platinum was exacerbated by further substitution of platinum by palladium in diesel catalysts.

In contrast, demand for platinum in the European heavy duty sector rose modestly in 2012. This growth was in spite of an estimated 10% decline in truck output in the region. Euro VI

Platinum Demand: Autocatalyst
'000 oz

	Gross		Recycling		Net	
	2011	2012	2011	2012	2011	2012
Europe	1,505	1,330	(445)	(370)	1,060	960
Japan	500	600	(75)	(80)	425	520
North America	370	405	(635)	(580)	(265)	(175)
China	105	105	(15)	(15)	90	90
Rest of the World	705	800	(70)	(85)	635	715
Total	**3,185**	**3,240**	**(1,240)**	**(1,130)**	**1,945**	**2,110**

Catalysts for controlling pollution from diesel vehicle exhaust.

emissions standards were introduced for heavy duty vehicles sold in the EU from January 2013 and some Euro VI vehicles were released during 2012 ahead of the application of the new rules. Most Euro VI vehicles are fitted with a full aftertreatment system comprising a diesel oxidation catalyst (DOC), pgm-coated diesel particulate filter (DPF), selective catalytic reduction (SCR) and ammonia slip catalyst (ASC), containing significantly more pgm on average than Euro V vehicles.

In the non-road mobile machinery sector, which covers a wide range of vehicles that use internal combustion engines, including agricultural, construction and industrial machines, demand for platinum in diesel emissions control catalysts increased off a low base. To meet European Stage IIIB emissions regulations, pgm-containing catalysts were introduced for diesel engines in the 130-560 kW power band in 2011. In 2012, the regulations were further rolled out to engines of 56-130 kW power, increasing overall catalyst fitment and platinum demand. More details on this component of autocatalyst demand are in our special feature on page 31.

Japan

Demand for platinum for autocatalysts from the Japanese domestic motor industry, including non-road emissions control, increased by 20% to 600,000 oz in 2012.

In Japan, vehicle output in 2012 rebounded strongly from the depressed production levels following the Great East Japan Earthquake of March 2011. Total vehicle manufacturing in 2012 expanded to 9.7 million units, with both light and heavy duty segments recording the highest output since 2008. Total domestic vehicle sales also rallied, recording the strongest annual total for five years.

Whilst light duty output grew by 20%, the production mix altered in 2012, with fewer diesel vehicles being made and the number of gasoline vehicles rising sharply, to account for 95% of all light vehicles manufactured in Japan. This reduction of the diesel share made little difference to demand for platinum, since gasoline cars built in Japan still use platinum in the catalyst mix.

Heavy duty output in Japan in 2012 returned for the first time to pre-recession levels. Most of the heavier vehicles for domestic sales, and for export markets with strict emissions legislation, were fitted with platinum-containing systems that included DOC, DPF and, if SCR was used for the control of nitrogen oxide (NOx) emissions, ASC. Many of the lighter vehicles in the heavy duty sector were fitted with lean NOx traps (LNT) to control NOx emissions, resulting in the additional use of a small amount of rhodium.

As with the rest of the automotive industry in Japan, the non-road sector produces machinery such as tractors and earth movers for a substantial export market. Consequently, Japanese non-road vehicle manufacturers were fitting platinum autocatalysts on vehicles in 2012 to meet tightening emissions legislation in not only the domestic market but in Europe and North America as well.

North America

With most gasoline vehicles built in North America using palladium–rhodium catalysts, demand for platinum in the auto sector is increasingly reliant on diesel vehicle sales in the region. In 2012, pent-up demand for new diesel pickup trucks in the North American automotive market helped propel light duty diesel production up by 25%, to a record high of over half a million vehicles. There is a direct correlation between the number of new housing starts and pickup truck sales and, as building activity increased in 2012, contractors and landscaping companies felt confident enough to invest in new trucks. In addition to improved domestic demand, exports increased last year as some manufacturers consolidated production of specific models in the USA and shipped them elsewhere. This represents a significant shift from automakers' previous strategy of building vehicles where they are sold; since 2009, exports from North America to non-NAFTA countries have more than doubled.

The heavy duty sector in North America also thrived in 2012. The average age of trucks on the road hit a new high in 2010

as fleet managers and truck owners delayed purchases while the economy floundered. Since then, the average truck age has declined but still remains well over the historical average. As construction, housing starts and retail sales picked up last year, so did North American sales of heavy duty diesel trucks, rising by 14.5%.

While production of both light and heavy duty diesel vehicles rose strongly last year, the rate of increase in demand for platinum in road-going vehicles lagged behind, rising by only 1.8%. Platinum's less than stellar performance was due mostly to continued substitution of platinum with palladium by Japanese manufacturers in the light duty gasoline segment. However, demand for platinum received a boost from increased offtake in the burgeoning non-road mobile machinery sector, so that total demand in North America in 2012 was 405,000 oz, up by 9.5% compared to 2011.

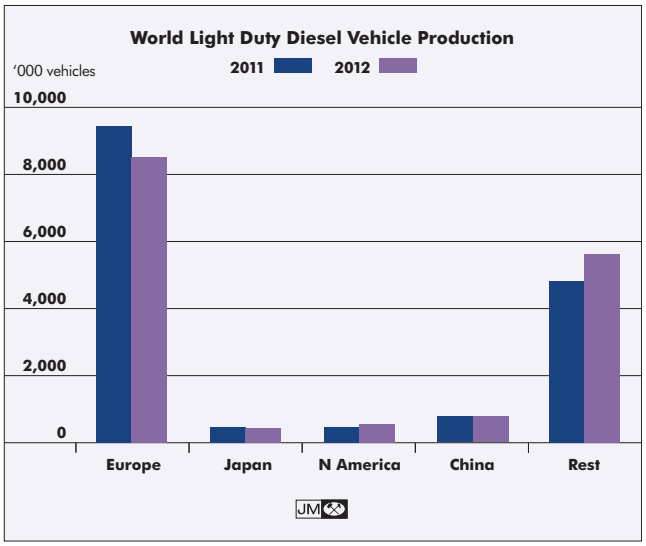
China

Light duty vehicle production in China grew in 2012 to reach 16.8 million units. Fewer than 5% of these were powered by diesel engines, the key users of platinum-rich autocatalysts. However, there was a slight increase in the light duty diesel build in 2012, and despite a further postponement of China 4 emissions regulations for light duty diesels, which had been intended to apply nationwide in 2012, platinum consumption for diesel vehicles enjoyed some year-on-year growth.

Some foreign joint venture manufacturers in China use platinum in their gasoline vehicle catalyst mix, but they made fewer vehicles than in 2011. Chinese domestic manufacturers tend to fit only palladium–rhodium catalysts on their gasoline vehicles. Production of heavy duty diesels also declined, and as a result, overall gross demand for platinum in the Chinese autocatalyst sector remained flat in 2012 at 105,000 oz.

Rest of the World

Platinum autocatalyst demand in other countries rose by 13.5% in 2012 to 800,000 oz. Thailand and India were the two markets registering the largest growth. In Thailand, the increase was due to production of light duty diesel vehicles growing by over 50% to 1.26 million units to meet strong domestic demand for pickup trucks. In India, where the auto market is three times the size of Thailand's, light vehicle output exceeded industry expectations, growing by 12% to just over four million units. Significantly for platinum demand, diesel vehicle production increased even more strongly, expanding



by over a quarter on 2011 levels.

Since the removal of price controls on gasoline fuel in June 2010, the gap between gasoline and diesel pump prices throughout India has widened as gasoline fuel costs have been rising in line with international prices. This has encouraged a growing number of cost-conscious Indian consumers to buy diesel cars, and in response vehicle manufacturers in the country have increased diesel vehicle supply. As part of a series of measures to reduce its fiscal deficit, in September 2012 the Indian government announced a 12% reduction to the subsidy on diesel fuel. However, even with the reduced support in place, diesel prices were substantially lower than gasoline prices for the remainder of the year and into early 2013, thus maintaining the incentive to purchase diesel vehicles. Diesel registrations received a further boost at the top end of the market with strong growth in SUV sales, the majority of which are diesel-fuelled. Almost half of the light vehicles produced in India in 2012 were powered by a diesel engine, a growth of around five percentage points on 2011. The expanding market share of diesel vehicles, combined with the overall growth in Indian vehicle output, resulted in an increase in platinum demand in India of almost 30% on 2011 levels.

JEWELLERY

Gross demand for platinum for manufacturing jewellery increased by 305,000 oz in 2012 to 2.78 million ounces. There was a surge of buying by manufacturers in China, in order to supply platinum jewellery to a growing number of retail outlets in Chinese cities. Manufacturers also took advantage of the relatively weak platinum price to increase

stocks to an extent. In India there was wider distribution of platinum jewellery in the retail network. The discount of platinum to gold during nearly all of 2012 made platinum jewellery more competitive with white gold in all markets.

Europe

Demand for platinum from the European jewellery industry increased by 5,000 oz to 180,000 oz in 2012, marking the first annual rise in demand since 2007 despite a significant slowdown in economic growth in the region. Lower platinum prices, both in absolute terms and relative to gold, have been a factor encouraging consumers to trade up to platinum, often at the expense of white gold, offsetting any retrenchment in consumer spending.

In the UK, where platinum retains a strong position in the bridal sector, the number of British-made hallmarked pieces rose by a modest 1.8%. Exhibiting stronger growth, the number of platinum jewellery pieces hallmarked in Switzerland in 2012 soared by 14% on the previous year, with the hallmarking of platinum watch cases climbing by 5% to just over 9,500 pieces, demonstrating continued recovery in demand for high-end luxury goods.

Japan

Buying of platinum by the Japanese jewellery trade continued to show signs of consolidation in 2012 as year-on-year gross demand remained steady at 310,000 oz, supported by the first annual increase in overall platinum retail sales since 2009. Generally, a lower platinum price, both in absolute terms and relative to gold, helped platinum to gain market share in place of white gold. In some instances it also slowed the trend to save costs by making lighter weight platinum jewellery pieces.

At retail level, in the all-important bridal sector, in which the majority of rings are made in platinum, a decline in the weight per wedding ring matched an increase in the number of rings sold, leaving the market flat on the previous year. Demand in the non-bridal sector grew thanks to the emergence of moderately priced platinum jewellery, with lightweight chains proving popular.

The increase in retail platinum sales was partly met by higher platinum jewellery imports and, as exports of platinum jewellery declined in 2012, domestic manufacturing of platinum was flat overall. With the amount of old jewellery recycled falling by 19% to 285,000 oz, demand net of scrap was positive in 2012 at 25,000 oz.

Platinum Demand: Jewellery
'000 oz

	Gross[1]		Recycling[2]		Net[3]	
	2011	2012	2011	2012	2011	2012
Europe	175	180	(5)	(5)	170	175
Japan	310	310	(350)	(285)	(40)	25
North America	185	185	0	0	185	185
China	1,680	1,950	(455)	(600)	1,225	1,350
Rest of the World	125	155	0	0	125	155
Total	**2,475**	**2,780**	**(810)**	**(890)**	**1,665**	**1,890**

NOTES TO TABLE

[1] Gross demand is equivalent to the sum of platinum jewellery manufacturing volumes and any increases in unfabricated metal stocks within the industry.

[2] Recycling represents the amount of retailer stock and consumer jewellery recycled whether the metal is re-used within the jewellery industry or sold back to the market.

[3] Net demand is the sum of these figures and therefore represents the industry's net requirement for new metal.

North America

Purchasing of platinum by the North American jewellery industry in 2012 was flat at 185,000 oz. The pull-through effect on demand of greater sales of platinum jewellery at retail level was offset by a drawdown of inventory by manufacturers as they sought to operate leaner facilities.

Demand for platinum from the bridal sector remained largely unchanged. Platinum's favourable price relative to gold in 2012 helped to advance its share of the female bridal market, at the expense of white gold, by around 1%. However, this was balanced by a continued decline in the number of marriages. The marriage rate in the USA last year was 6.8 per thousand, compared to 8.2 per thousand ten years earlier, while in Canada the rate was also on a downward trend.

Demand from the non-bridal sector also remained fairly stable. Platinum jewellery continued to be in demand in the high-end market, both domestically and for export, but lower priced alternatives such as 14k white gold provided stiff competition in the mid-range market.

China

Gross demand for platinum jewellery in China increased by 16% in 2012 to 1.95 million ounces, second only to the record 2.08 million ounces bought in 2009. Purchasing by the industry during the first three-quarters of the year was at a very strong rate. This was driven by continued retail expansion, in particular by Hong Kong brands into lower-tier mainland cities, and to a lesser extent by an increase in manufacturers' stocks as they took advantage of the weaker platinum price. Significantly lower purchasing by the trade towards the end of 2012 did not prevent full year purchasing of platinum by the jewellery trade on the Shanghai Gold Exchange from reaching a new record, surpassing the previous high of 2009.

Reflecting the international spot price of platinum, which traded at a discount to gold all year apart from six days in March, the manufacturers' selling prices for platinum jewellery were lower than for gold jewellery throughout 2012.

Conversely, jewellery retailers – who by and large price jewellery by weight rather than per piece – maintained a relatively slender premium in the per gram price of platinum relative to gold. This had multi-fold effects that combined to help boost consumer demand for platinum in 2012.

Principally, it allowed retailers to benefit from even greater relative profit margins in platinum, compared to gold, than would ordinarily have been the case. Naturally, this translated into a retail sales strategy that tended to emphasise platinum jewellery in cases where the consumer was ambivalent towards the two metals.

At the same time the retail price of platinum was historically close to that of gold, making it easier to 'up-sell' platinum to consumers, who were finding for the first time that platinum was not very much more expensive than gold. Platinum jewellery was more affordable, particularly for the more price conscious younger consumers in lower-tier cities, with lighter weight designs also helping to boost sales in some regions. The fact that platinum maintained a retail premium, albeit only marginally, continued to reinforce the perception of platinum's exclusivity in the minds of many consumers.

Consequently, retail sales of platinum jewellery remained robust through the first three-quarters of 2012, if not necessarily keeping pace with the growth in retail stocks. In the final three months of the year the culmination of several successive quarters of deteriorating economic growth, combined with higher average precious metals prices, had an adverse impact on retail platinum jewellery sales.

Poor sales around the Mid-Autumn Festival and National Day in early October, traditionally a vibrant time of year for retailers, signalled the downturn. Accordingly, total new metal acquired by the trade for manufacturing in the fourth quarter declined by close to one-fifth on the previous three months of the year.

Despite this relatively weak end to 2012, the retail market as a whole exhibited strong growth, with platinum continuing to do well in both the bridal and fashion sectors. There was more consistent demand throughout the year for gem-set platinum jewellery: a lower platinum price, allied to a move by manufacturers to set smaller stones in platinum, helped to make diamond-set platinum jewellery more competitive with white gold pieces.

With recycling of scrap platinum jewellery rising by 145,000 oz in 2012 to 600,000 oz, year-on-year growth in net demand was pegged to 10%, reaching 1.35 million ounces for the year as a whole.

Platinum jewellery distribution continued to spread in China last year.

Rest of the World

Demand in the Rest of the World region grew impressively in 2012, rising by 24% on the previous year to 155,000 oz. Most of this was due to continued expansion in the relatively young Indian market, which accounted for more than 70% of Rest of the World region demand.

Demand in India was driven primarily by further growth in the retail network. In a sign that platinum is playing an increasingly important and sustainable role in the Indian market, many large retail chains are incorporating bespoke retail space for platinum into the design of new outlets.

Profit margins on platinum jewellery at retail level in India were already greater than gold prior to 2012, prompting retailers to enter the platinum market. With platinum trading at a discount to gold on the international spot market throughout almost all of 2012, platinum was more competitively priced relative to gold than previously, leading to increased consumer offtake.

Effective marketing has helped to convert increased levels of stock into higher consumer purchases. The Platinum Guild's 'Platinum Day of Love' campaign in particular has been keenly received by the core 20-35 year age group in India. Even niche markets that have yet to benefit from sustained targeted promotion, such as men's jewellery, have shown promising signs of growth.

INDUSTRIAL DEMAND

Demand for platinum in industrial applications fell by 405,000 oz in 2012 to 1.57 million ounces. This was largely the effect of changing conditions in the glass industry, where excess production capacity, combined with the use of platinum from decommissioned plants and existing inventories, led to a fall in purchases of metal. In the electrical industry, inventory adjustments and weaker demand for hard disk drives impacted purchases of platinum. Demand from the chemical sector was slightly lower than in 2011 while demand for platinum in medical, petroleum refining and other applications was stable.

Chemical

Demand for platinum in the global chemical industry fell by 20,000 oz in 2012 to a total of 450,000 oz.

Platinum Demand: Chemical
'000 oz

	2010	2011	2012
Europe	110	120	110
Japan	50	35	35
North America	100	95	105
China	80	100	90
Rest of the World	100	120	110
Total	**440**	**470**	**450**

Platinum curing catalysts used in the manufacture of silicones make up the biggest area of demand for platinum in the chemical sector. Platinum is used in niche applications where fast, low temperature curing is required or where the end product has medical applications and relies on the biocompatibility of platinum. The mature markets of Europe, Japan and North America have previously led the growth in use of platinum cured silicones. Demand in these regions has reached a plateau, but fast growth is now taking place in China and the rest of Asia, although this as yet contributes only a small portion to total platinum demand.

Catalysts containing platinum are used in the synthesis of paraxylene, a raw material in the production of purified terephthalic acid (PTA), which is used to make polyethylene terephthalate (PET), mainly for polyester textile and plastic containers. Over the past few years growth in paraxylene capacity has been driven predominantly by new plant builds and expansions in China. However, the same levels of capacity increases cannot be anticipated going forward.

Demand for platinum as a gauze catalyst for the conversion of ammonia to nitric acid remained solid in 2012, with increased demand for fertilisers and explosives in Asia and South Africa more than offsetting a decline in European demand.

Electrical

Gross demand for platinum in the electrical industry declined by 28% to 165,000 oz in 2012, with 95% of this reduction coming from the hard disk sector. Hard disk drives, which use platinum-containing disks to store data in personal computers, DVD players and other devices, are under increasing threat from solid state storage technologies which do not require pgm, such as those found in tablet computers and smart phones.

Consumer personal computer (PC) sales declined in 2012, due to a combination of economic uncertainty in several key markets and the technology shift to new computing devices, i.e. smart phones and tablets, which are now performing the majority of tasks previously requiring a PC or laptop. Hard disk manufacturers also sought to use existing inventories of platinum wherever possible, further reducing demand for metal last year.

Despite demand for platinum via the mobile and PC sector being under significant threat, growth in demand for hard drives in the business storage sector remains strong, driven by increasing digital content and larger file sizes.

Moving into 2013, demand for platinum is expected to increase as consumer purchasing improves and the trend to install more disks per drive continues in order to meet higher storage requirements.

Hard disks will continue to provide the best value data storage for many years to come and their use in combination with solid state memory as hybrid drives will continue to provide firm demand for platinum in the consumer market. 2013 sees the introduction of a new 5mm form factor hard disk drive, which is thin enough to fit the latest ultra-books.

Platinum Demand: Electrical
'000 oz

	Gross		Recycling		Net	
	2011	2012	2011	2012	2011	2012
Europe	20	15	(5)	(5)	15	10
Japan	25	20	0	0	25	20
North America	25	20	0	0	25	20
China	30	25	(5)	(5)	25	20
Rest of the World	130	85	0	0	130	85
Total	**230**	**165**	**(10)**	**(10)**	**220**	**155**

Hybrid drives will combine the benefits of fast solid state drive (SSD) power-up ability with the large storage capacity of the traditional hard disk.

Glass

Platinum demand in the glass sector fell from 515,000 oz in 2011 to 180,000 oz in 2012, a decline of 65%. Excess production capacity in the glass fibre segment resulted in few new projects added during the year, while sales of platinum back to the market from redundant facilities further affected demand. Except in China, the display glass industry also suffered from overcapacity and experienced a sharp reduction in purchases of platinum, exacerbated by glass producers having stocks of metal to draw on.

Platinum Demand: Glass
'000 oz

	2010	2011	2012
Europe	10	30	5
Japan	90	130	10
North America	10	(5)	10
China	130	10	70
Rest of the World	145	350	85
Total	**385**	**515**	**180**

Compared with 2011, when purchases of platinum for glass were at a record, demand in 2012 fell by 335,000 oz to 180,000 oz. Demand for glass fibre used in lightweight, high-strength reinforcements for construction, transport and consumer goods markets, increased by more than 5% last year to reach 4.5 million tonnes. Despite this rise, average global capacity utilization of only 70% in glass fibre production plants, the result of a surge in new plant construction by Chinese manufacturers in 2007 and 2008, limited the need for platinum. An added negative effect on demand for new metal came from the recycling and reuse of platinum from decommissioned glass fibre plants using the less efficient 'marble melt' process.

Demand for platinum to produce display glass was also weaker last year. Although LCD televisions, which are a key driver of display glass production, continued to gain market share from both CRT and plasma display TVs, global sales of televisions fell by 6% in 2012 and sales of LCD TVs were slightly lower year-on-year. The rate of expansion in flat glass manufacturing capacity slowed in response, growing by only 11% last year compared with 13% annual growth in 2011 and 32% growth in 2010. Much of this demand was met by improvements to manufacturing processes that resulted in higher output rates from existing equipment. However, Chinese manufacturers added seven new flat glass production lines in 2012 in pursuit of their goal to source all components for LCD TV production domestically. No additional capacity was added in Japan and the Rest of the World region.

INVESTMENT

Net identifiable physical demand for platinum reached 455,000 oz in 2012, 5,000 oz lower than in the previous year. Demand for platinum exchange traded funds (ETFs) was marginally higher compared to 2011. Significantly lower net purchasing of large bars in Japan was largely offset by a combination of an increase in demand for coins and small bars and the acquisition of metal for the launch of a new physically-backed product in North America.

ETF investment throughout 2012 was strongly and positively correlated with price, more so than in any previous year. Around three-quarters of all growth in ETFs during the year occurred in a rising price environment, while over 80% of liquidation accompanied a falling price. Greater conviction from investors when the market was rising ensured that net ETF investment remained positive for the year at 195,000 oz, 5,000 oz higher than in 2011.

The year began strongly as ETF investors responded to a surge in the platinum price by buying close to 115,000 oz in the first two months, making up for most of the net disinvestment which had taken place in the final four months of 2011. There followed a three-month period during which the early gains in price were entirely relinquished and investors liquidated positions heavily. This included nearly 45,000 oz of platinum sold in May, the fourth largest monthly liquidation of ETFs on record. After a period of relative inactivity, the strong price response to the mining strikes in South Africa reignited investor interest, leading to over 105,000 oz of additional demand for platinum in August alone, the fourth largest monthly net inflow on record. Further net investment in September drove ETF

Platinum Demand: Investment
'000 oz

	2010	2011	2012
Europe	140	155	135
Japan	45	250	100
North America	465	10	190
China	0	0	0
Rest of the World	5	45	30
Total	**655**	**460**	**455**

platinum holdings to a new peak of over 1.7 million ounces, surpassing the previous record set 12 months earlier. In the fourth quarter, modest profit-taking occurred as the price weakened in response to easing tensions in South Africa, leaving total fund holdings by year-end at 1.65 million ounces.

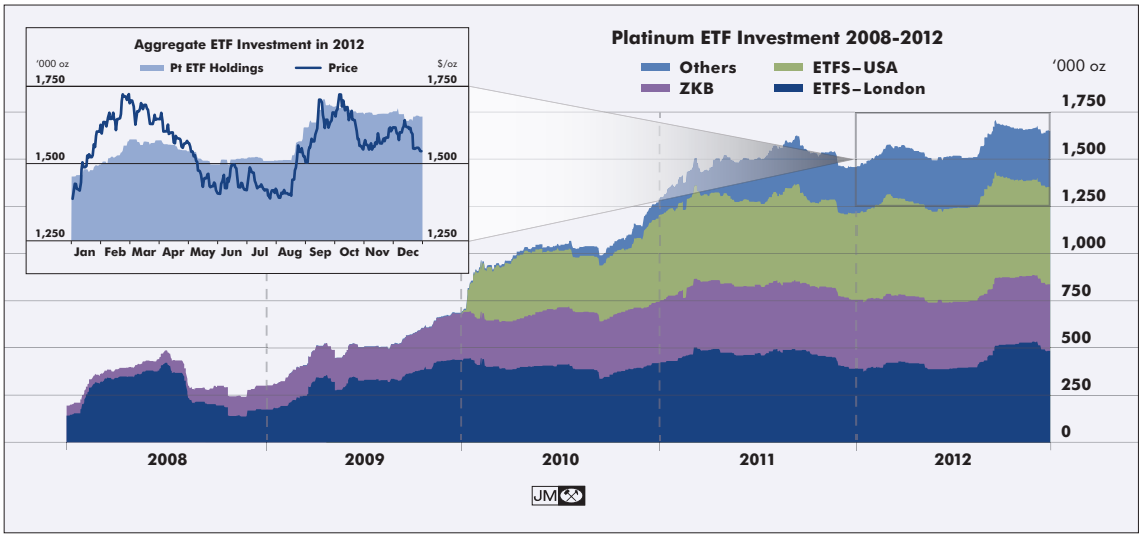
In contrast to 2011, when two-thirds of net ETF demand emanated from the Zurich-based funds, net investment demand in 2012 came mainly from a return to strong growth in the two largest funds, based in London and New York. Net investment of over 95,000 oz in the ETF Securities London product signalled the first annual increase in holdings since 2009, while growth of 60,000 oz in its New York fund represented a four-fold increase on the modest net investment the previous year. November 2012 also marked the launch of a new ETF listed in Hong Kong, although by year-end it had yet to gain any significant momentum, net investment amounting to less than 2,000 oz.

Investors in the Japanese large bar market largely reverted to type in 2012, namely by investing in a falling price environment and selling on price upturns. However, there were three months in the year in which this pattern was reversed. Net investment increased during January and August while the price of platinum was rising, because both months were preceded by a period of sharply falling local prices. Conversely, in November the local platinum price was on the decline, but investors were able to sell at a profit due to the price having increased strongly during the preceding months. In all, the greater conviction of investors during periods of weaker prices ensured that the market recorded net positive investment for the fifth consecutive year although, at 100,000 oz, the total was 135,000 oz lower than in 2011.

Movements in the yen–dollar exchange rate added to price volatility throughout 2012. Starting the year at ¥76.7 to the dollar, close to record lows, the yen weakened during February and March, accentuating the platinum price rise in local currency terms. Several consecutive months of yen appreciation then exacerbated the subsequent reversal in the platinum dollar price. Towards the end of the year, the anticipation and eventual confirmation of the return to government of a Liberal Democratic Party promising stronger action to weaken the currency helped the yen to depreciate significantly, reaching ¥86.6 to the dollar at the end of December. This left the yen price of platinum 24% higher than at the start of the year, whereas the difference in the dollar price was only 10%.

December saw the launch and enthusiastic take-up by investors of the Sprott Physical Platinum and Palladium Trust, a fully-allocated closed-end trust listed on the New York Stock Exchange (NYSE Arca) and Toronto Stock Exchange (TSX). Full allocation of the 28 million units in the initial offering at an opening price of $10 each enabled the fund to amass just over 80,000 oz of physical platinum.

2012 was a relatively strong year for small platinum bar and coin demand. In the most significant development, the Royal Canadian Mint restarted one-ounce Platinum Maple Leaf bullion coins early in the year, adding to the 30,000 limited mintage of one-ounce Platinum Platypus bullion coins from the Perth Mint. The US Mint also issued the fourth American Eagle Proof coin in its six-year annual commemoration of American democracy, adding another 15,000 oz to demand. Including some other numismatic releases, small bar and coin demand grew to 80,000 oz, more than twice the size of demand in the previous year.



THE COMPONENTS OF AUTOCATALYST DEMAND

Control of harmful emissions from vehicle exhaust using catalysts is the largest single application for pgm, in 2012 accounting for 56% of gross world demand for platinum, palladium and rhodium combined. In this special feature we have for the first time split platinum and palladium autocatalyst demand values into their main components of light duty gasoline, light duty diesel and heavy duty diesel vehicles. We have also included in our autocatalyst numbers demand for catalysts for diesel non-road mobile machinery – this was previously reported as part of Other demand. Here we examine the historical long-term drivers and the future opportunities for the use of pgm in each of these automotive applications.

INTRODUCTION

Three fundamental factors determine the amount of platinum group metals (pgm) used in the autocatalyst sector: vehicle production rates, fuel type, and emissions legislation. Use of pgm by the automotive industry has steadily increased as population growth and greater prosperity have raised demand for new vehicles while at the same time legislation has set ever-tighter limits on exhaust emissions. Generally, as emission controls become increasingly strict, more pgm are needed per vehicle to lower the pollutant content of the exhaust gas. Emissions standards are tightest in North America, Europe and Japan, which are the most developed markets with the highest ownership of vehicles per capita. These three regions, therefore, account for the majority of autocatalyst pgm demand today, with the major emerging markets of China, Brazil and India steadily increasing their global share. China is now the world's largest vehicle producing nation and although Chinese demand for pgm in autocatalysts currently lags behind that of North America and Europe, it will rise in importance in coming years due to continuing growth in vehicle production in the country and increasingly tighter emissions limits proposed there.

In line with emissions standards, our light duty gasoline (LDG) and light duty diesel (LDD) categories include all on-road vehicles of gross vehicle weight (GVW) less than 3.5 tonnes (less than 4.54 tonnes in the USA and under 6.35 tonnes in California) and the heavy duty (HDV) category consists of vehicles of GVW above these weights.

LIGHT DUTY GASOLINE

The light duty gasoline sector comprises passenger cars and light commercial vehicles as well as two and three-wheeled vehicles. Light duty gasoline (LDG) vehicles make up the biggest share of the global vehicle fleet.

Since being introduced in the USA as a result of the 1970 Clean Air Act, emissions legislation for LDG vehicles has been progressively tightened and extended around the world. Initially, simple platinum–palladium oxidation catalysts were used to convert carbon monoxide (CO) and unburnt hydrocarbons (HC) from gasoline engines during lean (excess oxygen) conditions to form carbon dioxide (CO_2) and water. The three-way catalyst (TWC) was developed to meet the US–1983 emissions limits which now included oxides of nitrogen (NOx). TWCs allow the oxidation of CO and HC using platinum or palladium catalysts while a rhodium catalyst performs the reduction of NOx to nitrogen and oxygen under rich (oxygen depleted) conditions. This technology relies on the engine operating around the stoichiometric point (air to fuel ratio of 14.7:1) at which the optimal simultaneous reduction of NOx and oxidation of CO and HC take place.

Although platinum was originally used in TWCs for the oxidation reactions, during the 1990s the relatively high cost of platinum compared to palladium encouraged autocatalyst manufacturers to develop advanced washcoat technologies that allowed the substitution of platinum by palladium, leading to the development of Pt–Pd–Rh and Pd–Rh formulations. Most auto companies now use Pd–Rh TWCs in gasoline vehicles, though some continue to employ Pt–Pd–Rh systems.

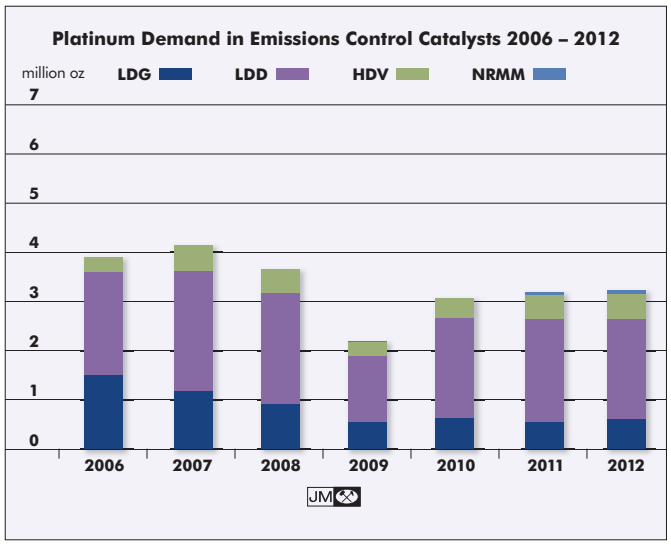
Since palladium is the dominant component in gasoline exhaust aftertreatment, LDG vehicles are responsible for the majority of palladium demand in autocatalysts. Today, LDG catalysts account for just under 20% of autocatalyst demand for platinum but close to 90% of autocatalyst demand for palladium. As the global LDG fleet expands and more stringent emissions legislation is implemented, demand for pgm, and for palladium in particular, can be expected to grow.

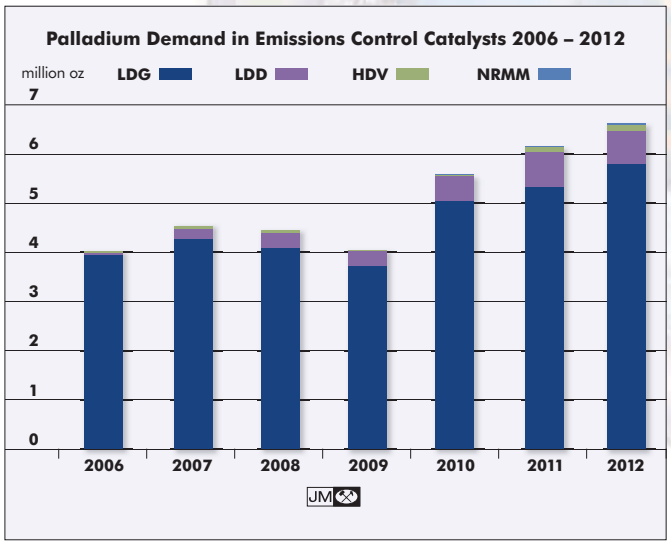
LIGHT DUTY DIESEL

Our light duty diesel (LDD) category consists of passenger cars, pickup trucks and light commercial vehicles. LDD vehicles are today responsible for the majority of platinum demand in the autocatalyst sector and so the use of platinum is high in markets where LDDs make up a large proportion of the vehicle fleet, principally in Europe, India, Thailand and Korea.

Emissions legislation forcing the use of aftertreatment on LDDs was first implemented in 2000 with the introduction of Euro 3 standards in Europe. Platinum diesel oxidation catalysts (DOCs) were initially used to convert CO and HC in the exhaust stream, but as catalyst technology advanced and diesel fuel quality was improved manufacturers were able to thrift platinum from DOCs and substitute some of the platinum with palladium, producing a lower cost system.

The addition of particulate matter (PM) as a regulated pollutant in many of the developed markets provided a further opportunity for using pgm. PM, or soot, is trapped by a diesel particulate filter (DPF) downstream of the DOC. The DPF is then periodically regenerated with platinum and palladium catalysing the oxidation of soot into CO_2 and water. Adding palladium has improved the overall thermal durability of the system, allowing high-temperature regeneration events to take place without damaging the catalyst. However, platinum is more catalytically active in the oxidising environment of a diesel exhaust and for this reason palladium is unable to entirely replace platinum in diesel aftertreatment.





Stricter NOx emissions regulations to be introduced in the near future will provide an opportunity to increase the use of platinum and to introduce the use of rhodium in diesel catalysts. Diesel vehicles sold in North America and in Japan already require some additional form of NOx aftertreatment, and European diesels will face tighter NOx emissions limits at Euro 6, starting in 2014.

As in all lean burn engines, the chemical reduction of NOx is made difficult by the highly-oxidising conditions in the exhaust stream. Although vehicle manufacturers can, in some cases, calibrate a diesel engine to emit sufficiently low NOx to meet standards, most LDD vehicles will use either a pgm-containing lean NOx trap (LNT) or selective catalytic reduction (SCR), using a base metal catalyst. As a general rule, smaller diesels will employ LNTs, while larger vehicles which produce higher levels of engine-out NOx will use SCR.

LNTs contain relatively high amounts of platinum, along with palladium and rhodium. The SCR catalyst itself does not contain pgm. However, in systems being developed for the European market, the associated DOC and DPF components in the aftertreatment system benefit from a slightly higher ratio of platinum in their washcoat formulation in order to ensure optimum SCR activity at low temperature. These factors should together continue to boost pgm demand in the LDD sector in the medium term, and will later impact pgm demand in other regions as they gradually adopt tighter diesel emissions standards.

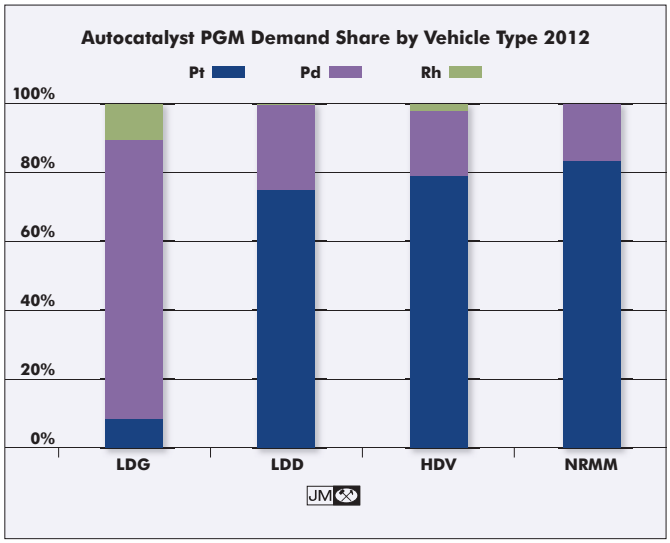
HEAVY DUTY VEHICLES

Heavy duty vehicles (HDVs) range from delivery vans to buses and large trucks. The majority of the 4.6 million HDVs produced in 2012 were powered by diesel engines. However, some larger gasoline or gaseous fuel vehicles are heavy enough to be classed as heavy duty and we include these vehicles in our pgm estimates.

The use of pgm-containing aftertreatment on diesel HDVs has a shorter history than light duty vehicles. Although emissions legislation for HDVs has been in place since 1987, the limits have not always necessitated the use of pgm catalysts.

The first national rules which forced the use of catalysts were the US 2007 standards, which were met by the addition of DOCs and DPFs to the engine to control PM emissions. The US limits were further tightened in 2010 leading to the use of SCR catalysts to reduce NOx emissions and a platinum-containing ammonia slip catalyst (ASC) downstream of the SCR to oxidise excess ammonia to nitrogen and water. The North American market, therefore, represents a major portion of current pgm demand in the heavy duty diesel (HDD) sector.

Japan, a major exporter of both light and heavy duty vehicles, produces more HDVs annually than North America, and accounts for the largest pgm demand in this sector. A range of aftertreatment configurations are used on Japanese-produced HDVs depending on the regulations in force in the end use market. For larger vehicles sold in the domestic market, aftertreatment



systems with DOCs, DPFs, SCR catalysts and ASCs are used. Almost half of the HDV vehicles assembled in Japan are diesel mini vans. For domestic sales and certain export destinations these vehicles are fitted with NOx traps containing platinum, palladium and rhodium, in order to meet the local emissions limits.

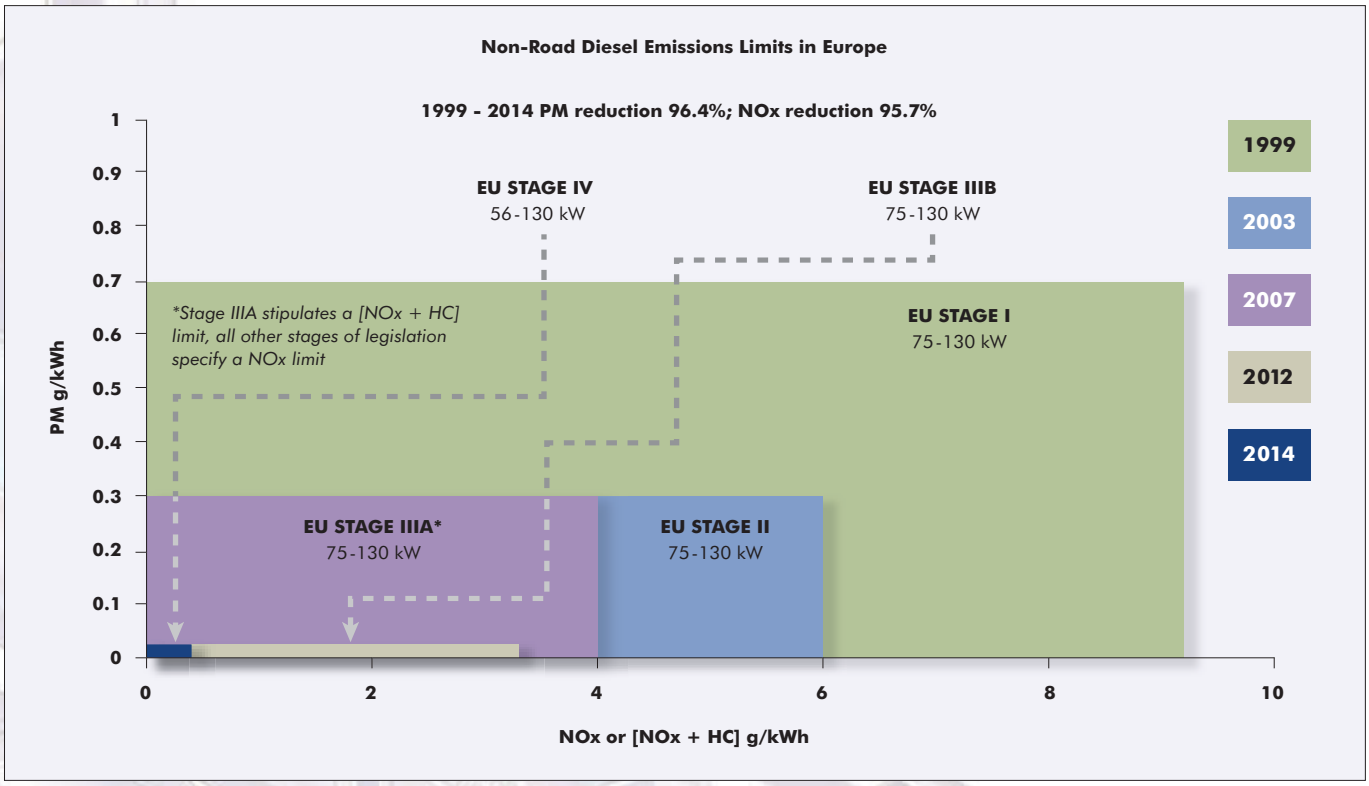
The next area for growth in HDV pgm demand will be Europe. Euro VI legislation, introduced in January 2013, will apply to all vehicles sold in the region from January 2014. European vehicle manufacturers already employ SCR to meet Euro V standards, but only a small proportion of vehicles are fitted with pgm-containing catalysts. Euro VI will in almost all cases force the addition of DOCs, DPFs and ASCs to the SCR system. Platinum will benefit most from the transition to Euro VI as its use ensures good passive filter regeneration and promotes low temperature activity of the SCR.

HDV legislation in most of the emerging markets is not yet tight enough to require fitment of pgm-containing catalysts, though some 'low emission' vehicles in cities are fitted (or retro-fitted) with DOCs and/or DPFs. As in the light duty sector, most countries follow the European legislation, with China IV (equivalent to Euro IV) expected to be implemented in China later this year and Euro V in Indian cities in 2015.

NON-ROAD MOBILE MACHINERY

Non-Road Mobile Machinery (NRMM) is defined as any mobile equipment or vehicle in which an internal combustion engine is installed, but which is not intended for the transport of passengers or goods on the road.

The category encompasses a wide range of machinery including agricultural, construction and industrial vehicles, lawn and garden equipment, inland marine vessels, mobile generator sets and rail locomotives. Our NRMM category comprises diesel engines only. There are a number of small gasoline and gaseous fuel engines that are covered by NRMM legislation and the relatively small pgm demand from these sources is included in our Other demand category.



NRMM legislation is more coordinated globally than on-road emissions regulations. Due to the global nature of the NRMM industry, in which engines may be manufactured in one location, installed on vehicles or equipment in another country, and then sold around the world, emissions legislation for non-road engines is broadly harmonised across the three mature markets of Japan, North America and Europe. Other countries are expected to adopt these regulations over time; China, India and Brazil all have emissions legislation in place for NRMM but these are not yet tight enough to require catalysts.

Harmonised catalyst-forcing legislation was introduced for NRMM in Japan, the USA and Europe in 2011 and is being progressively phased in for engines of different power bands, starting with the largest engines. Manufacturers are able to make use of flexibility schemes to produce a certain number of engines meeting the previous stage of emissions limits in the first few years after the new legislation has been introduced. A tighter stage of legislation, Tier 4 final / Stage IV, will be implemented from 2014. In very general terms, current Tier 4 interim / Stage IIIB emissions limits highlight reductions in particulate matter (PM), whereas Tier 4 final / Stage IV limits are focused on NOx emissions abatement.

Due to the diverse number of equipment types and end applications, a wide variety of aftertreatment and catalyst configurations are used, but they generally resemble those used in the on-road diesel sector. Platinum and palladium can both be used in NRMM aftertreatment, though platinum should retain the dominant role.

PGM demand from the non-road sector is currently small in comparison with that in on-road emissions control, representing just 3% of total autocatalyst platinum demand in 2012. However, NRMM is a promising future area of growth for pgm demand, as engine production in the mature markets increases from the currently depressed levels, and as catalyst-forcing legislation is progressively rolled out in other markets.

Platinum Demand: Autocatalyst
'000 oz

Vehicle Type	2010	2011	2012
Light Duty Gasoline	640	545	620
Light Duty Diesel	2,025	2,105	2,020
Heavy Duty	400	490	500
Non-Road Mobile Machinery	10	45	100
Total	**3,075**	**3,185**	**3,240**

Palladium Demand: Autocatalyst
'000 oz

Vehicle Type	2010	2011	2012
Light Duty Gasoline	5,040	5,335	5,805
Light Duty Diesel	495	710	670
Heavy Duty	40	100	120
Non-Road Mobile Machinery	5	10	20
Total	**5,580**	**6,155**	**6,615**

PALLADIUM

- **Gross demand for palladium in autocatalysts reached a new record of 6.62 million ounces in 2012, propelled by recovering car output in Japan, further growth in China and a rebound in new registrations in North America.**
- **Industrial demand for palladium weakened in 2012 to 2.37 million ounces due to less intensive use of palladium in the electrical industry.**
- **Falling production in China was the cause of a decline to 445,000 oz in gross world demand for palladium for jewellery manufacturing.**
- **Net physical investment in palladium was positive in 2012 at 470,000 oz. ETF inflows were strong in the first half and the launch of a new investment trust in December added significantly to demand.**

AUTOCATALYST

In 2012, for the second year running, gross demand for palladium was at a new all-time high. World demand of 6.62 million ounces represented a 7.5% increase on 2011 and, even more impressively, a rise of nearly two-thirds when compared to the depressed level of 4.05 million ounces during the recession year of 2009. Some of the reasons behind this demand strength were familiar ones, like the continuing increase in gasoline vehicle production in China and the gradual rise in the average ratio of palladium to platinum in autocatalysts for diesel vehicles. Others were germane to 2012. There was a recovery in Japanese vehicle output after so much production capacity was put out of commission by the earthquake and tsunami of March 2011; in the USA, production of light duty cars and trucks soared as consumer confidence increased and buyers finally returned to the showrooms to replace their ageing vehicles. However, recycling of palladium from end-of-life catalysts did not keep pace with gross demand last year, falling by 2% to 1.66 million ounces as weakness in pgm prices caused collectors to hoard stocks of spent converters for a time. Consequently, the increase in net autocatalyst demand to 4.96 million ounces was an 11% advance on the 2011 level.

Europe

Despite a very weak European vehicle market, demand for palladium in European emissions control catalysts held up well, falling by just 2% in 2012 to 1.46 million ounces.

European light duty vehicle sales in 2012 were the worst in 13 years, with new car and light commercial registrations falling by 8.2% year-on-year to 14.8 million units. However, the effect on demand for palladium was alleviated by several factors: a rise in production of gasoline-powered cars by manufacturers of premium vehicles; an increase in the market share of gasoline vehicles produced in Europe; and the further part substitution of palladium for platinum in diesel-powered vehicles.

Mass market producers, which are highly dependent on demand for cars in their domestic markets, were the most heavily impacted by the continued weakness in the European economy in 2012 and the declining level of vehicle sales. In contrast, output at most of the premium producers increased thanks to sustained growth in sales of their vehicles outside Europe, with the result that European vehicle exports rose for the third successive year.

Demand in Europe's largest export market, North America, was fuelled by rebounding consumer demand for vehicles in the USA, where German brands have been steadily gaining popularity and accounted for one in eight cars sold in the country last year. Vehicle exports to Asia grew to an all-time high, driven by a seemingly insatiable appetite for top-end luxury models in China. As premium vehicles typically contain a higher amount of pgm on their aftertreatment systems than mass market models, the increasing market share of these vehicles partly offset the decline in palladium demand caused by the overall lower vehicle production.

In addition to the higher number of predominantly gasoline vehicle exports, 2012 also saw an increase in the

Palladium Demand: Autocatalyst
'000 oz

	Gross		Recycling		Net	
	2011	2012	2011	2012	2011	2012
Europe	1,485	1,455	(390)	(295)	1,095	1,160
Japan	680	785	(100)	(105)	580	680
North America	1,545	1,815	(1,055)	(1,080)	490	735
China	1,155	1,255	(35)	(45)	1,120	1,210
Rest of the World	1,290	1,305	(115)	(135)	1,175	1,170
Total	**6,155**	**6,615**	**(1,695)**	**(1,660)**	**4,460**	**4,955**

Palladium autocatalyst demand in North America was up in 2012.

popularity of gasoline-powered vehicles in home markets, as cash-strapped consumers opted for smaller, cheaper cars, and tax schemes in some markets incentivised the purchase of more fuel-efficient downsized engines. The growing share of gasoline vehicles in an overall declining market provided a further cushion to palladium demand.

In the light duty diesel sector, palladium now represents 30% of the pgm used in emissions control catalysts. 2011 was the first full year of Euro 5 emissions standards for cars sold in Europe, which forced the fitment of diesel particulate filters (DPFs) to meet the new tighter nitrogen oxide (NOx) and particulate matter limits. These systems contained higher levels of palladium than Euro 4 catalysts, partly to offer cost savings to vehicle manufacturers by replacing a portion of the platinum on the catalyst, but also to benefit from the increased thermal durability of palladium–platinum catalysts during high-temperature regeneration of the filter.

Following the strong increase in palladium substitution for platinum in 2011, last year witnessed a more steady expansion in palladium use as automakers and catalyst manufacturers continued to look for further cost savings in emissions aftertreatment. Even so, due to the 10% decline in European diesel vehicle production in 2012, the use of palladium in light duty diesel catalyst systems was lower year-on-year.

For heavy duty diesel vehicles, palladium is used along with platinum in the limited number of Euro V vehicles that contain diesel oxidiation catalysts (DOCs) and/or DPFs, and also in newer Euro VI aftertreatment systems. Palladium use in the European heavy duty sector remains small at present but demonstrated some growth last year as a result of the introduction of Euro VI trucks onto the European market.

Japan

Demand for palladium in the Japanese autocatalyst sector grew by 15% in 2012 to reach 785,000 oz. The growth in demand has been driven by a 22% increase in light duty gasoline vehicle output in Japan. This was supported by an expansion of 27% in domestic light duty sales in 2012, and together these were significant contributors to the turnaround from a depressed 2011, which was greatly affected by the March earthquake.

A reduction in light duty diesel production in 2012 allowed gasoline vehicles to take a greater share of output. Nonetheless, the increase in pgm demand has not kept pace with the growth in vehicle production. Thrifting in the pgm mix has resulted in a reduction in average loadings for gasoline catalysts, including a 5% reduction in the average palladium content.

Palladium demand in heavy duty vehicles grew in line with output in 2012, despite some adverse export trade. Over half of trucks manufactured in Japan are sold overseas, and in 2012, fewer were exported to those destinations where the tightest emissions standards are in place. Truck exports to Europe, for example, were 53% fewer than in 2011, even though in that year vehicle output was adversely affected by the March disaster. However, exports to regions in which emissions legislation was being tightened, from a lower base than in Europe, were sufficient to maintain a steady growth in palladium demand. The use of palladium in non-road applications in Japan is not significant at present.

North America

Purchases of palladium in the North American automotive sector increased by 17.5% in 2012 to 1.82 million ounces as a result of strong growth in the production of cars and light trucks as well as continued substitution of platinum by palladium in light duty gasoline vehicles.

Improving economic conditions and access to credit were two of the reasons consumers flocked to vehicle showrooms last year. In addition to new car loans being easily obtainable, the average interest rate dropped to new lows during 2012 and high-risk lending expanded to 25% of all loans in the third quarter of 2012, up from 22% during the same period of 2011. Another underlying factor driving sales was the need to replace older vehicles as the average age of cars and light trucks hit a record 11 years.

High gasoline prices did little to deter sales, but rather encouraged consumers to trade in their inefficient old vehicles for new fuel-saving models. Sales of passenger cars increased

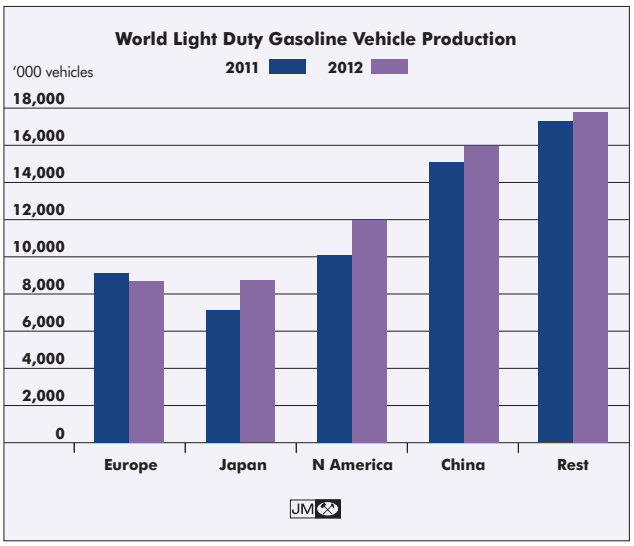
at twice the rate of truck sales and consumers strongly favoured the smallest vehicles in both categories. For all of 2012, sales of compact cars and trucks increased by over 16% and represented 42.5% of all vehicles sold. While this had some negative impact on palladium demand, soaring production more than made up for it.

All told, in 2012 consumers in North America purchased 12.6% more light duty vehicles while production surged by 18.9% to 12.6 million units, only half a million shy of the pre-recession total of 13.1 million vehicles. In addition to strong domestic sales, a combination of a weaker dollar and free trade pacts have made the USA a more attractive place to build vehicles, resulting in foreign manufacturers moving production capacity there for both domestic sales and exports.

China

The growth in light duty output in China raised the production of gasoline vehicles there in 2012 to 16 million vehicles, meaning that one in four new gasoline vehicles manufactured globally was made in China. This growth in production added 100,000 oz of palladium to demand, an increase of 8.7% year-on-year, taking Chinese purchases of palladium for autocatalysts to 1.26 million ounces. Whilst this was an improvement on the previous year, the anticipated introduction of the Euro 5 equivalent emissions legislation for gasoline light duty vehicles, China 5, in Beijing during 2012, did not materialise, thus dampening the full effect on demand that the implementation of those standards might have had.

Some manufacturers, nevertheless, did supply the market with China 5 compliant gasoline passenger cars, which resulted in either significantly higher average palladium loadings than China 4 equivalent models or the introduction of new, more clean and efficient engines.



Rest of the World

Korea, Mexico and India are substantial buyers of palladium for autocatalysts, each country using well over 100,000 oz of palladium a year. Russia is a growing vehicle manufacturing base which is fast catching up with this group and is likely to join it in 2013. Russian vehicle production continued on a strong growth path in 2012, with light vehicle output expanding by a healthy 11.6% to a new record of 2.1 million units. Following a collapse in vehicle sales in 2009, the Russian auto market has recorded three consecutive years of robust growth. In 2012, buoyed by falling unemployment and an increase in consumer spending, light vehicle registrations grew by 11% to over 2.9 million units, reaching a par with the 2008 peak.

In the last few years, vehicle assembly in Russia has grown at a stronger rate than new car sales as foreign automakers have expanded their production capacity in the country to meet ambitious government targets that allow them to qualify for incentives. As a predominantly gasoline market, palladium demand has benefited from the growth in vehicle output, climbing by nearly a quarter in 2012. Demand was boosted by the increased production of vehicles meeting Euro 4 emissions legislation. Euro 4 rules were introduced in 2010 for new models sold in Russia, but apply to all new vehicles sold in the country from January 2013.

JEWELLERY

Gross demand for palladium in jewellery in 2012, at 445,000 oz, was 60,000 oz below the 2011 level. Demand in China fell for the fourth consecutive year, while in other major markets it was largely unchanged. With the amount of palladium recycled from scrapped jewellery falling to 190,000 oz in 2012, net demand reached 255,000 oz, compared with 295,000 oz in 2011.

In a sign of further retrenchment in the Chinese palladium jewellery industry, gross demand declined by 65,000 oz in 2012 to 240,000 oz. Despite the relatively high margins that continue to be available throughout the palladium jewellery supply chain, anaemic consumer demand for the end-product has led to a larger number of manufacturers and retailers deciding to no longer work with or carry a stock of palladium jewellery. Many of those who remain active are doing so only as an

See notes to table on page 26.

Palladium Demand: Jewellery
'000 oz

	Gross[1]		Recycling[2]		Net[3]	
	2011	2012	2011	2012	2011	2012
Europe	60	65	0	0	60	65
Japan	70	70	(20)	(15)	50	55
North America	45	45	0	0	45	45
China	305	240	(190)	(175)	115	65
Rest of the World	25	25	0	0	25	25
Total	**505**	**445**	**(210)**	**(190)**	**295**	**255**

after-sales service to facilitate the exchange of unsold stock or consumer returns, although there does remain some latent demand for palladium jewellery in lower tier cities.

The failure of palladium jewellery to establish a secure market position in China has largely been due to the absence of effective and sustained marketing, a lack of perceived value and quality and a particularly volatile price in recent years. Manufacturers have also been focusing on meeting strong consumer demand for gold and platinum jewellery items.

In Japan, palladium's use as an alloy in white gold and platinum jewellery pieces remained steady overall, while growth in the diminutive plain palladium jewellery market was limited, leaving gross demand in 2012 stationary at 70,000 oz.

Demand in North America was likewise steady at 45,000 oz, with the latest wave of market promotion that began in 2011 having limited success to date. One challenge for the industry is that palladium jewellery tends to be bracketed with non-precious alternatives like titanium and stainless steel jewellery, marking it out as a relatively expensive option in this segment.

The only major market to exhibit growth in 2012 was Europe, where demand rose by 5,000 oz to 65,000 oz. In the UK, where palladium retains a strong position in the male wedding band market, the number of British-made hallmarked pieces soared by 14.3% in 2012, while the popularity of lower fineness Pd500 jewellery, which has a palladium content of 50% compared to the 95% of the standard alloy, continued to grow.

INDUSTRIAL DEMAND

The use of palladium in various industrial sectors came to 2.37 million ounces in 2012, 100,000 oz lower than the previous year. The use of palladium in dental restorations, and in several minor applications such as petroleum refining catalysts, stationary source pollution control and industrial alloys, was largely stable. Chemical demand increased due to another year of expansion in capacity in China for manufacturing chemical intermediates using palladium catalysts, but these gains were offset by demand lost in the electrical sector, where base metals continued to replace palladium in capacitor electrodes. On a net basis, a fall in the recovery of palladium from electronic scrap by 10% to 430,000 oz in 2012 made up for some of the decline.

Chemical

Demand for palladium in the chemical industry in 2012 grew by 20% to 530,000 oz. The largest chemical sector use of palladium is in catalysts for the production of purified terephthalic acid (PTA). PTA is an intermediate in the manufacture of polyethylene terephthalate (PET), which is used predominantly to make polyester textile and plastic containers. China remains the key country for PTA production and, despite moving towards over-capacity, has continued to expand existing plants and to build new ones. However, China may now be near to the peak in its construction cycle.

Demand for palladium as a catchment gauze in the production of nitric acid grew by close to 5% in 2012. Palladium is used to capture platinum and rhodium lost from the main burner, typically in low and medium pressure nitric acid plants. Demand for hydrogen peroxide, which is produced using a palladium catalyst, also grew steadily in 2012, driven by demand for paper bleaching, oxidation of chemical products and environmental effluent treatment.

Palladium Demand: Chemical
'000 oz

	2010	2011	2012
Europe	105	80	85
Japan	20	20	15
North America	65	80	85
China	65	145	215
Rest of the World	115	115	130
Total	**370**	**440**	**530**

Dental

Demand for palladium in dental applications fell by 2% to 530,000 oz in 2012, largely due to the continuing overall global downward trend in the use of dental alloys. This decline is a consequence of improved dental care, reducing the need for restorative treatments, and the increasing use and popularity of non-precious materials. Ceramic treatments utilising the latest dental technology such as laser sintering and 3D

printing techniques, or, alternatively, cheaper base metals, are continuing to eat into the pgm share at opposite ends of the dental alloy market spectrum. As a result, in 2012 demand for palladium alloys fell slightly in two of the three largest markets, North America and Europe, whilst demand in Japan was flat.

In Japan, demand for the state-subsidised Kinpala palladium–gold alloy appears to have reached a plateau at the same time that recovery of scrap material has increased, resulting in broadly stable use last year. In North America, up until 2008 the market share of palladium dental alloys was increasing due to the rising cost of gold alloys. However, since that time demand for palladium has been in steady decline despite gold prices continuing to be significantly higher than palladium prices. As in Japan and Europe, both gold and palladium alloys are facing competition from base metals and ceramics. Most of the switch from gold to palladium has already occurred, and to further reduce costs, dental laboratories are changing to alloys with lower or no palladium content.

Palladium Demand: Dental
'000 oz

	2010	2011	2012
Europe	80	80	75
Japan	250	220	220
North America	250	225	220
China	0	0	0
Rest of the World	15	15	15
Total	**595**	**540**	**530**

Electrical

The electrical sector experienced a tough year in 2012, with many electronic component markets posting a decline in sales and production on the previous year. The evidence for this comes from data on production of silicon for making semiconductors, which are used in most electronic applications. Silicon output grew only marginally last year.

Palladium demand for electronic plating and components declined by 13% to 1.20 million ounces in 2012. For several years multi-layer ceramic capacitors (MLCCs), which are one of the fundamental passive components of electronic circuitry, have accounted for the largest use of palladium in the sector.

The number of MLCCs produced increases annually, driven by the ever-growing complexity of electronic devices such as smart phones, tablets and automotive electronics. However, this growth is no longer able to offset the effects of substitution of palladium in MLCC electrodes by nickel and copper, as well as thrifting of palladium in remaining products, which are powerful trends affecting palladium demand at present. Smaller chip capacitors require electronic pastes with reduced particle size and thus greater surface area, with the result that consistent performance and reliability can be obtained using less metal. Due to improvements in base metals technology, palladium-containing MLCCs have become increasingly confined to niche areas like military and aerospace applications, in which the high reliability of precious metals is of paramount concern.

Palladium capacitors are increasingly being confined to military and aerospace applications.

Palladium demand for electronic plating, on the other hand, remained robust in 2012, with the metal continuing to benefit from its substantial discount to gold, which palladium can replace as a material for connectors and circuit boards. Palladium plating in the lead-frame market profited from the international move away from lead (Pb) solder. Manufacturers used Pb solder for a long time and trusted its reliability and alternatives are difficult to find. Pre-plating with palladium allows the lead-frames to maintain reliability at the high temperature required for Pb-free plating and soldering.

Palladium Demand: Electrical
'000 oz

	Gross		Recycling		Net	
	2011	2012	2011	2012	2011	2012
Europe	190	185	(190)	(160)	0	25
Japan	300	310	(55)	(55)	245	255
North America	145	140	(85)	(80)	60	60
China	270	185	(45)	(40)	225	145
Rest of the World	470	380	(105)	(95)	365	285
Total	**1,375**	**1,200**	**(480)**	**(430)**	**895**	**770**

INVESTMENT

Net physical investment demand for palladium reached a positive 470,000 oz in 2012, compared to liquidation of 565,000 oz in 2011. This was due primarily to a return to net investment in the ETF market following heavy profit-taking the previous year, as well as new demand from the Sprott Physical Platinum and Palladium Trust.

Net demand from ETF investors amounted to 285,000 oz in 2012, effectively recovering just over half of the 530,000 oz liquidated the previous year. A return to investment growth in the two largest funds, based in London and New York, as well as a more moderate swing in the London-based Deutsche Bank ETF, were responsible for the positive demand. Net investment in the ETF Securities London fund marked the first annual increase in holdings in the fund since 2009.

ETF investment at the beginning of 2012 started strongly. Net investment of over 200,000 oz in the first two months, 140,000 oz of which occurred in February alone, traced a strong price recovery. Growth in net holdings extended for a further three months, albeit at a somewhat more modest pace, despite a retracement in the price to below $600. Over the first five months net investment amounted to an impressive 350,000 oz.

Further net investment in early June took total holdings up to the 2012 high of 2.10 million ounces, but later in June and throughout July net disinvestment accompanied a plunge in the price to a low of $564. The violence that accompanied the illegal strikes in South Africa in August sharply boosted the palladium price but the response from investors was muted. A relatively modest 15,000 oz was added to the palladium ETFs, just 15% of the volume added to platinum holdings during the same month.

Palladium Demand: Investment
'000 oz

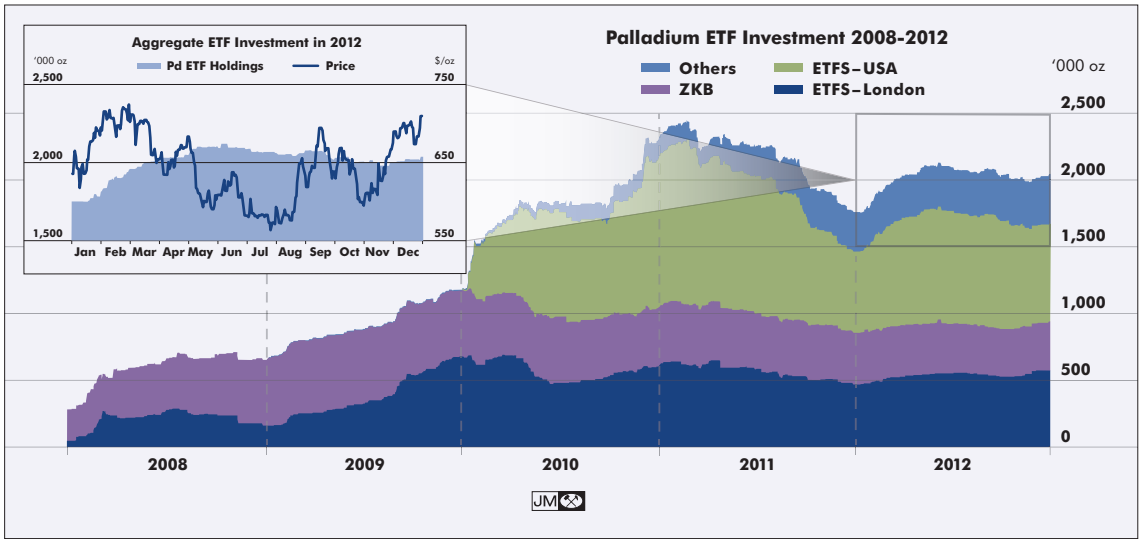
	2010	2011	2012
Europe	(5)	(35)	(165)
Japan	10	5	0
North America	1,090	(535)	305
China	0	0	0
Rest of the World	0	0	0
Total	**1,095**	**(565)**	**470**

Investors were still inactive in early September, remaining on the sidelines despite the price of palladium continuing to increase strongly. A correction during the second half of the month resulted in net liquidation of more than 45,000 oz.

It was not until the price sustained a recovery to above $675 at the end of November 2012 that any significant appetite for investment returned. In December investors added 35,000 oz to holdings, the largest increment since May, for total fund holdings by the end of the year to stand at just over two million ounces.

The new Sprott Physical Platinum and Palladium Trust used the $280 million raised in the process of the initial offering to purchase equal dollar amounts of platinum and palladium. The trust acquired just over 185,000 oz of palladium in 2012, more than double the amount of platinum held in the product.

As there was no primary production of palladium coins in 2012, selling by investors in the secondary market led to metal being returned to fabricators, resulting in marginally negative palladium coin demand.



OTHER PLATINUM GROUP METALS

- **Gross demand for rhodium grew by 6% to 966,000 oz in 2012, largely the result of strong demand for rhodium in autocatalysts, especially in North America and Japan.**
- **Primary supplies of rhodium declined by 43,000 oz to 722,000 oz. Weaker South African production was partly offset by a rise in output from Russia. Recovery of rhodium from autocatalyst scrap fell to 259,000 oz.**
- **Ruthenium demand in 2012 fell by 32% to 679,000 oz due to sharply reduced buying of ruthenium for the production of hard disks and for use in chemical catalysts.**
- **Adequate stocks of iridium crucibles for growing single crystal sapphire meant a sharp drop in buying from the electrical industry, causing global iridium demand to fall by 46% to 178,000 oz in 2012.**

RHODIUM

The market for rhodium was very close to balance in 2012 after the large surplus of the previous year. Supplies from South Africa were significantly reduced due to loss of production through mining strikes and other stoppages; however, some extra shipments were made from Russia in the form of metal recovered from stored mine concentrates at Norilsk. Industrial demand for rhodium was mixed, with growth in purchasing by the chemical industry outweighed by a fall in demand from the glass sector after two very strong years. Autocatalyst demand was boosted by a recovery in vehicle production in Japan from the disruption caused by the 2011 tsunami, plus a buoyant market for cars in North America. In total, gross demand for rhodium rose to 966,000 oz.

Autocatalyst Demand

Demand for rhodium by the automotive industry worldwide rose by 9% in 2012 to 782,000 oz, the highest for five years, with almost all the growth coming from Japan and North America. A 22% increase in light duty gasoline vehicle output in Japan reflected the industry returning to normal after production was seriously interrupted by the 2011 earthquake and tsunami. Japanese auto manufacturers are the heaviest users of rhodium in the autocatalyst sector, and in 2012 a quarter of all rhodium in light duty gasoline vehicles worldwide was used in cars and light trucks produced in Japan.

Japanese automotive factories outside Japan are also relatively high consumers of rhodium. In North America, there was an increase in light duty vehicle output of nearly 19% in response to vibrant demand for cars and trucks from consumers and industrial companies. This led to higher purchases of rhodium for autocatalysts, especially by Japanese auto companies operating in the USA as their share of light vehicle production increased in 2012.

Other Demand

Purchasing of rhodium by the chemical industry remained robust in 2012, with an increase of 13% to 81,000 oz. Demand for rhodium catalysts for the production of acetic acid and oxo-alcohols is being driven by growth in Asian manufacturing capacity. Acetic acid is used to make vinyl acetate monomer, purified terephthalic acid and ethyl acetate. Demand for these chemicals is increasing from downstream paint, solvent and polymer industries. Growth in oxo-alcohol capacity in China is being stimulated by the automotive and construction sectors, which use oxo-alcohols as plasticisers.

Demand for rhodium for platinum–rhodium alloys in the glass industry fell from 77,000 oz in 2011 to 31,000 oz in 2012 as excess capacity for LCD glass production resulted in a delay in new capacity additions by flat glass manufacturers. In addition, glassmakers have been focusing on increasing output from glass melting tanks already installed. Despite the global over-capacity, new tanks were added in China to meet the goal of domestic panel manufacturers to acquire glass from domestic sources. However, of the seven new tanks installed in China in 2012, three were funded with rhodium purchased in 2011.

Excess capacity in the glass fibre manufacturing sector resulted in at least one large project being delayed until 2013. In addition, rhodium coming back from the closure of

Rhodium Demand by Application
'000 oz

	2010	2011	2012
Autocatalyst	727	715	782
Chemical	67	72	81
Electrical	4	6	6
Glass	68	77	31
Other	21	38	66
Total Gross Demand	**887**	**908**	**966**
Autocatalyst Recycling	**(241)**	**(277)**	**(259)**
Total Net Demand	**646**	**631**	**707**

less-efficient glass fibre manufacturing plants and old CRT plants in China dampened demand in the glass industry.

Other demand for rhodium grew by 74% in 2012 to 66,000 oz. Most of the increase was due to investment in the Deutsche Bank rhodium ETF, launched in 2011. Steady incremental buying resulted in the fund's holdings growing by 36,400 oz in 2012. Minting of rhodium bars in Europe added a further 6,000 oz to rhodium investment demand.

Supplies

In 2012, shipments of rhodium by primary producers fell by 5.6% to 722,000 oz, reflecting lower output from South Africa. However, the decline in rhodium supplies was significantly smaller than that in platinum and palladium shipments. South African sales were supported by releases from the refining pipeline, especially at Lonmin, which shipped more rhodium in 2012 than it had the previous year. We also allow for an increase in supplies from Russia, where we believe the treatment of large quantities of stored pyrrhotite concentrate has added to rhodium output at Norilsk Nickel.

RUTHENIUM & IRIDIUM

Demand for the minor pgm has been volatile in recent years and 2012 was no exception. Ruthenium demand fell by nearly a third and iridium demand by almost a half after two years of strong demand for both metals.

Demand

Ruthenium demand in the chemical sector returned to a more normal level of 101,000 oz in 2012, a sharp decrease of 172,000 oz year-on-year. There had been an exceptional amount of purchasing in 2011, when replacement and back-up charges of ruthenium catalyst were bought for several plants producing ammonia from natural gas.

Demand for ruthenium for sputtering targets, used in the coating of computer hard disks, fell by just over 9% to 137,000 oz in 2012. Lower consumer sales, combined with a technology shift towards tablets and smart phones rather than the more traditional PC and laptop computers, negatively affected hard disk media manufacturing. A reduction of inventories and the increasing ability of hard disk media producers to get more product out of each ruthenium target compounded the effect of poor hard drive sales.

The use of ruthenium as the resistive element in thick-film hybrid integrated circuits and chip products fell by 5,000 oz last year, with growth in the number of chips produced being countered by progressive downsizing of components. Purchases of iridium by the electronics industry fell in 2012 by 153,000 oz to a total of 42,000 oz, signalling an abrupt end to the expansion in the use of iridium crucibles to manufacture single crystal sapphire. As demand in this application stabilised, the majority of metal bought in 2012 was to replace losses from existing operations rather than for new crucible installations.

Ruthenium Demand by Application
'000 oz

	2010	2011	2012
Chemical	100	273	101
Electrical	679	536	377
Electrochemical	124	130	127
Other	42	58	74
Total Demand	**945**	**997**	**679**

Ruthenium and iridium are used in the electrolysis of sodium chloride solution (brine) to chlorine and sodium hydroxide. China is coming towards the end of a massive project to expand and upgrade its chloralkali industry, moving from the older mercury and diaphragm technologies to more efficient, environmentally acceptable membrane cells.

Overall, electrochemical demand for ruthenium fell by 2%, with growth in North America and the Rest of the World region going some way to offset a 28% drop in China. Iridium demand in the electrochemical sector was similarly hurt by reduced Chinese demand, decreasing by 8% in 2012.

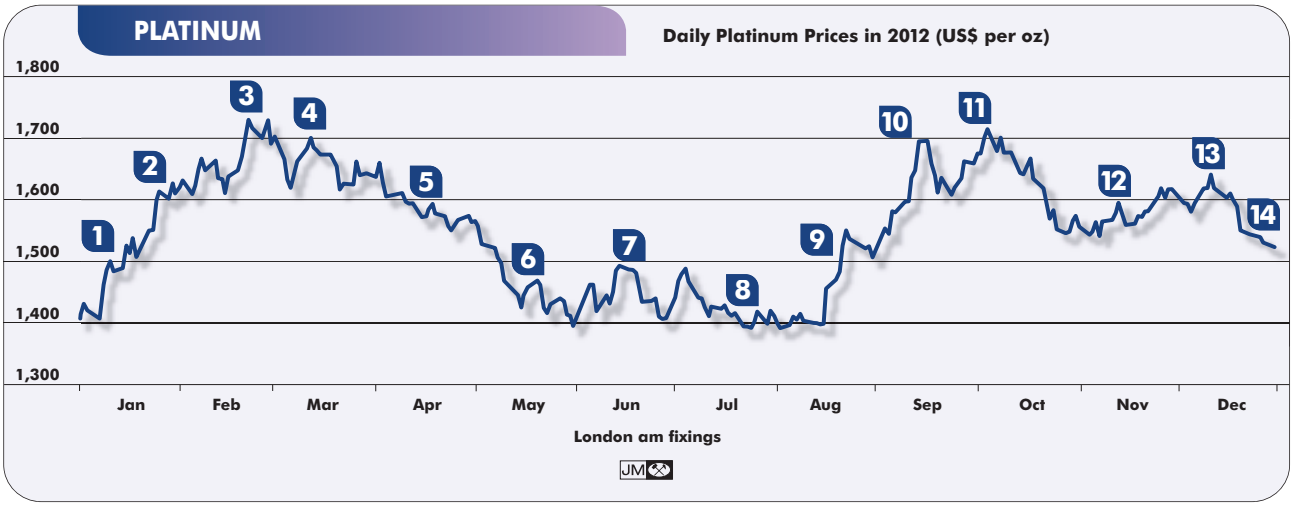
Supplies

Mine production of ruthenium and iridium fell in 2012 in line with lower platinum output at strike-hit South African mines. However, with industrial purchasing down on the previous year, there was no shortage of primary metal. We believe that some additions were made to above-ground stockpiles, indicating that both metals were in fundamental surplus.

Iridium Demand by Application
'000 oz

	2010	2011	2012
Chemical	18	19	19
Electrical	201	195	42
Electrochemical	79	76	70
Other	40	42	47
Total Demand	**338**	**332**	**178**

PRICES



Platinum made a strong start to the year after opening at $1,408, reaching the 2012 high of $1,729 by late February. These gains were eroded over the next three months by a combination of perceived weak demand, oversupply, a falling gold price and macroeconomic anxiety surrounding the eurozone. The price was rangebound between May and mid-August, finding support at $1,400 and resistance at $1,500, with a price of $1,390 in early August marking the 2012 low. Prices staged a swift recovery on the back of labour disruption in South Africa, regaining the $1,700 level in early October. For the rest of the year, platinum was supported by supply concerns and expectations of additional monetary easing, but undermined by a weakening gold price. With investors worrying about the USA going over the 'fiscal cliff', platinum closed the year on a weak note at $1,523.

1 Platinum fixed at $1,408 on the morning of 3rd **January**, the lowest opening New Year price since 2009. Better than expected European and Chinese manufacturing data and improved US jobs numbers gave investors the confidence that had proved elusive in the final quarter of 2011, and platinum's price quickly rose. It was further bolstered by warnings from South African electricity provider Eskom of possible power shortages during routine maintenance. Speculative buying and a short-covering rally boosted the price to $1,500 on the 12th, the highest in over a month.

Average PGM Prices
in $ per oz

	2011	2012	Change
Platinum	1,721	1,552	(10%)
Palladium	733	643	(12%)
Rhodium	2,022	1,276	(37%)
Ruthenium	166	112	(33%)
Iridium	1,036	1,070	3%

Platinum and palladium prices are averages of London am and pm fixings. Other pgm prices are averages of Johnson Matthey European Base Prices.

2 A surprise announcement by the US Federal Reserve that interest rates would be kept on hold until late 2014 helped commodities to gain ground at the expense of the dollar. Platinum's price appreciated further late in January as an illegal strike began at Impala Platinum's Rustenburg operations. Investors bought heavily into the rising price, adding 380,000 oz to combined NYMEX and TOCOM net long positions.

3 Supply concerns intensified in **February** as over 17,000 illegally striking workers at Impala were dismissed and operations were suspended. Anticipating lower supplies, investors drove the price higher in the first half of the month. A loosening of Chinese monetary policy and a $130 billion bailout for Greece, the eurozone's weakest economy, further stimulated risk appetite among investors. Platinum rose to $1,729 on the 23rd, the peak price for the year and the highest price since September 2011.

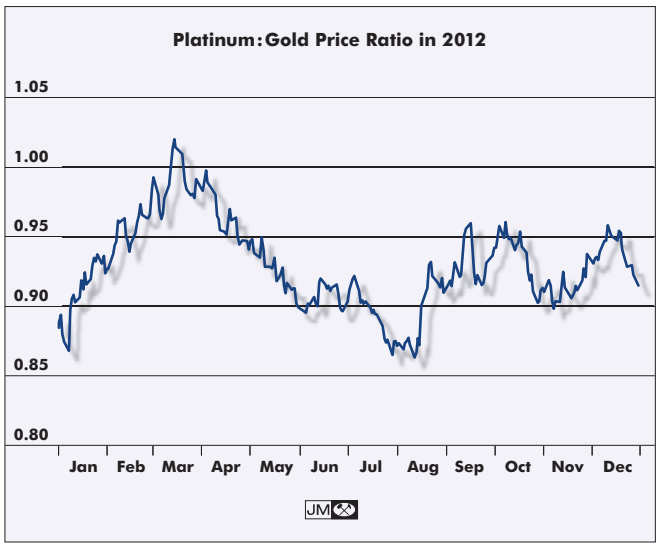
4 Profit-taking and the end of the illegal strike at Impala sent the platinum price sharply lower in early **March**, wiping off over $100 in the week to the 7th. Strong physical buying re-emerged at this level, boosting the price briefly. Comments from the US Federal Reserve were widely interpreted as ruling out a further round of quantitative easing – the gold price plunged and the dollar soared in response. Platinum also lost ground in

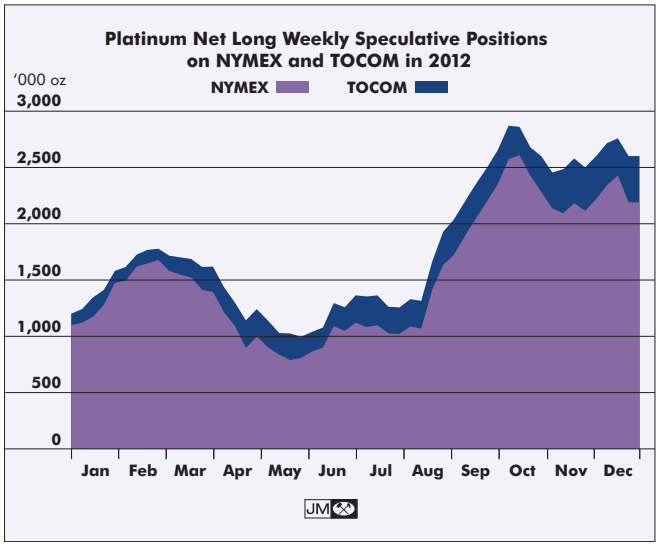
mid-March but at a slower rate than gold, allowing the white metal to briefly recapture a price premium over gold.

5 Fresh concerns regarding the financial stability of the eurozone put pressure on risk assets in **April** as Spain missed targets to reduce its budget deficit. New passenger car registrations in the EU were reported to have fallen by 8% year-on-year in the first quarter of 2012, adding further to the gloom. Platinum slid below $1,600 on 11th April and continued its downward trajectory for the remainder of the month. Combined net long positioning also fell, shedding over a third of a million ounces during April.

6 In **May**, reports of unemployment in the eurozone at record highs of almost 11% were sufficient to weaken the euro and trigger heavy falls in the precious metal complex. Platinum fell beneath $1,500 for the first time since January on 9th May amid the general gloom. London Platinum Week saw a distinctly sombre mood prevail as South African producers weighed up the prospects of high costs and inadequate revenues against a backdrop of lower supplies and tapering demand. Liquidation in the ETF market saw cumulative platinum holdings trimmed to just under 1.5 million ounces by late May, leaving year-to-date net investment at around 37,000 oz. Combined net long futures positions, having declined in April and May, dropped below a million ounces for the first time since August 2009.

7 Prevailing weak platinum prices and rising costs for producers finally began to prompt action on the supply side in **June**. Aquarius put its Marikana mine on care and maintenance, while Eastern Platinum said it was suspending





the development of its eastern limb assets pending better prices. These announcements appeared to be welcomed by the market and the price jumped to $1,485 on the 14th.

8 Platinum was at the mercy of macroeconomic factors for much of **July**. Prices drifted downwards amid a risk-off backdrop as the full extent of bad loans in the Spanish banking sector became clear, adding further pressure to the ailing eurozone economy. Slack industrial demand and nervous anticipation of further downside led the price to reach a low for the year of $1,390 on the afternoon of 3rd August, wiping out all of the gains in the year to date. With platinum cowed, the spread with gold widened to 0.86:1, a ratio not seen since 1985.

9 There were echoes of the earlier strike at Impala as an illegal walkout began at Lonmin's Marikana mine on 10th **August**. The dispute spilled over into violence between rival union factions, causing Lonmin to halt production at the mine. In unprecedented and shocking scenes, 34 striking miners were shot dead by the South African Police Service on the 16th. This tragic loss of life had an immediate effect on the platinum price as investors feared a prolonged disruption to operations and a spread of the conflict to other mines. Gaining over $150 in the space of a few days, platinum reached $1,549 on the 23rd. Futures markets rallied, with net long positioning increasing by over 600,000 oz in the last two weeks of August.

10 Platinum prices were underpinned by a volatile and highly fluid situation in the South African pgm mining industry during **September**, while also benefitting from a risk rally that followed the US Federal Reserve's announcement of a third

round of quantitative easing (QE3). As the strike continued at Lonmin, Anglo American Platinum suspended its Rustenburg operations in order to protect the workforce from intimidation. Driven by speculative investment rather than any physical shortages, platinum rose to a six-month high of $1,697 on the 14th and net long platinum futures positions escalated to 2.5 million ounces by late September. Wage agreements at Lonmin and Impala and the re-opening of Anglo's' operations saw prices soften somewhat, although further disruption continued to be anticipated by investors.

11 When Anglo initiated disciplinary action against 12,000 striking workers at its Rustenburg operations, the market reacted by bidding platinum up to $1,714 on 5th **October**. With supply concerns by now fairly well discounted, the price strength was undermined by a progressively weak demand picture. In the European auto market Volkswagen reported a drop in profit and Ford announced the closure of three of its European vehicle plants in response to a deepening slump in vehicle sales. In addition, better-than-expected US economic data strengthened the dollar, weakening the precious metals. ETF investors sold into the falling price, liquidating 25,000 oz of platinum during the month, while futures market investors, after setting a new record-high of just under 2.9 million ounces net long postions, also became net sellers.

12 Platinum began **November** by weakening in line with gold in response to a positive non-farm payrolls report in the USA and a subsequently stronger dollar, although ongoing supply challenges in South Africa provided support at around $1,540. Mining concerns continued to provide positive motivation for investors, but this was tempered by weak end-user demand. Platinum edged up to $1,594 by the 14th in response to the re-election of US President Obama, more in favour of monetary easing than his Republican opponent, Mitt Romney. This was followed by a price correction when Anglo announced it had reached agreement with striking workers, bringing to an end the two-month hiatus at the world's largest producer, and by the 16th platinum had fallen to $1,554. In the same week, Johnson Matthey forecast that the platinum market in 2012 would be in deficit by the largest amount in a decade and this supported a steady rise in the price to $1,617 at the month-end.

13 Another release of better than expected US employment data in early **December** boosted the dollar, pressuring platinum into a retreat to $1,580 by the 6th. News of additional asset purchases by the Federal Reserve, a new bank bailout package for Spain and a debt management plan for Greece, then combined to weaken the dollar and strengthen the euro, boosting platinum to a month high of $1,640 on the 12th.

14 Despite bullish signals, including higher than expected US third quarter growth, and sub-optimal production in South Africa, the platinum price began to decline. Concerns over the impending US 'fiscal cliff' that, by automatically invoking spending cuts and tax increases, threatened to tip the USA into recession, were dominant in investors' minds and contributed to year-end profit-taking and a closing platinum price of $1,523.

Platinum Prices in 2012
London am and pm fixings, $ per oz

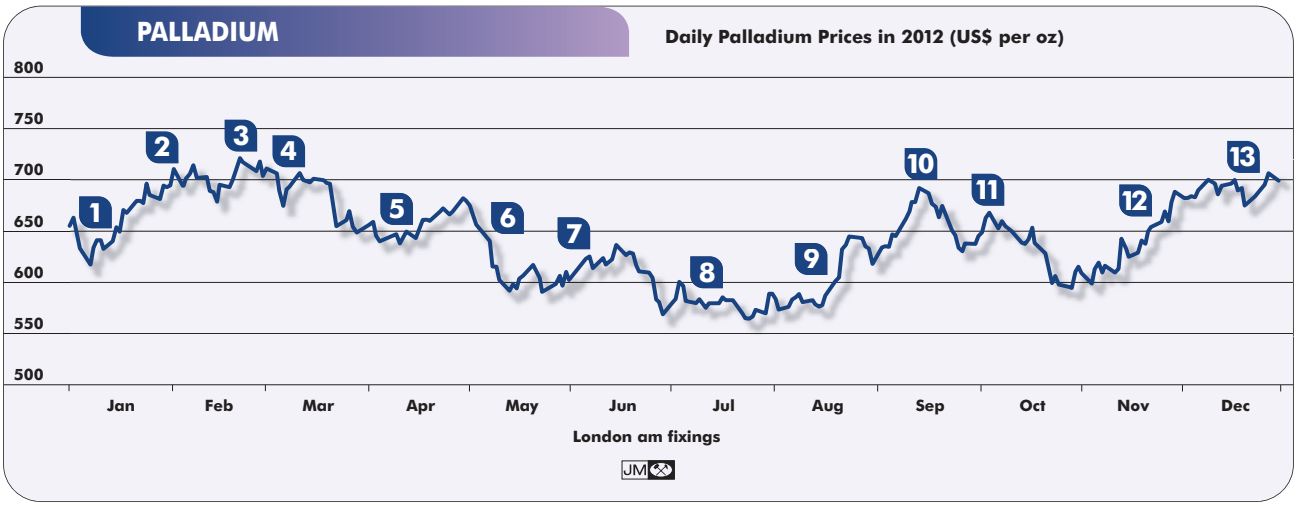
	High	Low	Average
January	1,626.00	1,403.00	1,506.83
February	1,729.00	1,609.00	1,658.07
March	1,704.00	1,607.00	1,656.66
April	1,659.00	1,550.00	1,587.21
May	1,566.00	1,405.00	1,468.73
June	1,493.00	1,396.00	1,447.13
July	1,487.00	1,391.00	1,426.41
August	1,549.00	1,390.00	1,450.14
September	1,697.00	1,543.00	1,620.78
October	1,714.00	1,539.00	1,636.00
November	1,620.00	1,541.00	1,576.52
December	1,640.00	1,523.00	1,588.86
Annual	**1,729.00**	**1,390.00**	**1,551.73**

Palladium Prices in 2012
London am and pm fixings, $ per oz

	High	Low	Average
January	698.00	616.00	658.94
February	722.00	679.00	702.67
March	713.00	648.00	684.89
April	682.00	635.00	656.21
May	681.00	590.00	617.33
June	634.00	568.00	612.72
July	601.00	564.00	579.34
August	645.00	573.00	600.14
September	702.00	624.00	657.53
October	668.00	593.00	633.55
November	688.00	598.00	635.64
December	706.00	675.00	691.19
Annual	**722.00**	**564.00**	**643.22**

Rhodium Prices in 2012
Johnson Matthey Base Prices, $ per oz

	High	Low	Average
January	1,450.00	1,350.00	1,385.71
February	1,550.00	1,475.00	1,514.29
March	1,525.00	1,400.00	1,487.50
April	1,400.00	1,375.00	1,384.47
May	1,385.00	1,260.00	1,348.48
June	1,250.00	1,250.00	1,250.00
July	1,250.00	1,165.00	1,227.95
August	1,165.00	1,100.00	1,125.65
September	1,400.00	1,100.00	1,175.00
October	1,225.00	1,100.00	1,185.87
November	1,150.00	1,100.00	1,134.09
December	1,125.00	1,080.00	1,094.47
Annual	**1,550.00**	**1,080.00**	**1,275.86**



The palladium price opened the year at $655 in London and echoed the early price strength of platinum, reaching a high for the year of $722 in February before positive market sentiment gave way to risk aversion and concerns about industrial demand. The price was briefly lifted by disruption to South African mining during August and into September, although this had a naturally greater impact on the platinum price, causing the price ratio between the two metals to widen to 2.62:1 in October 2012. This trend was reversed in the final two months of 2012, during which palladium posted gains of 15% compared to a loss of 3% in platinum, narrowing the ratio to 2.18:1 by the year end. The divergence was driven by palladium's more favourable fundamentals – good growth in demand for palladium in 2012, allied with disruption to primary supply from South Africa and declining output from Russia. As a result palladium closed the year on an upward trend at $699.

1 Palladium opened the year at $655, slightly up on the end of 2011 as the gloom that had enveloped the pgm markets in the final quarter began to lift. An estimated 10% rise in US new car and light truck sales in 2011, the fastest since the 1980s, helped give some upward momentum to the palladium price, although it quickly retreated to $616 on 9th **January**.

2 Electricity supply concerns in South Africa, together with firm physical demand, helped put the palladium price on a rising trend for much of January and into early **February**. Comments from the CEO of Norilsk Nickel, the world's biggest palladium miner, confirmed that its pgm production would be flat or lower in 2012. Together with another rise in US car sales in January, this helped palladium to regain the $700 level for the first time in five months on 3rd February. Combined net long speculative positions increased by over 740,000 oz to 1.2 million ounces in the four weeks to 7th February, while ETF investment for the year to date rose to over 100,000 oz, reflecting a return of investor appetite for palladium.

3 The price dipped sharply in mid-February as investors reduced their exposure to industrial commodities in the wake of a credit rating downgrade for six European countries, including Italy, Spain and Portugal. Palladium proved relatively resilient, however, due to tightness in the availability of the metal in sponge form, and the price quickly recovered to reach $721 on 23rd February. This was to mark the high point for the calendar year. Palladium was supported by lingering supply concerns, a weaker dollar and stronger platinum and gold prices.

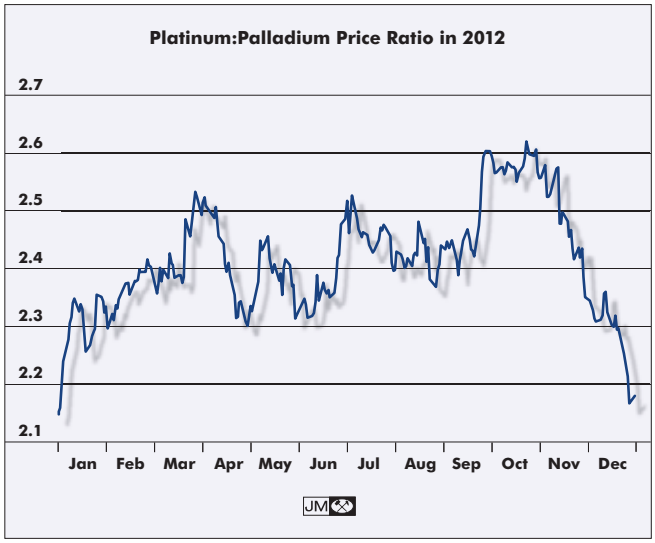
4 With palladium looking overbought, investors liquidated positions, bringing the price down. A fall in platinum as the Impala strike came to an end also affected palladium, which briefly reached $675 on 7th **March**. This was despite positive news from the auto sector, in particular an 11% year-on-year rise in US auto sales for February which beat analysts' expectations, and rising sales in Japan aided by government subsidies. Unusually, as the palladium price was falling in March, ETF holdings continued to grow, suggesting investors still had confidence in the underlying market fundamentals.

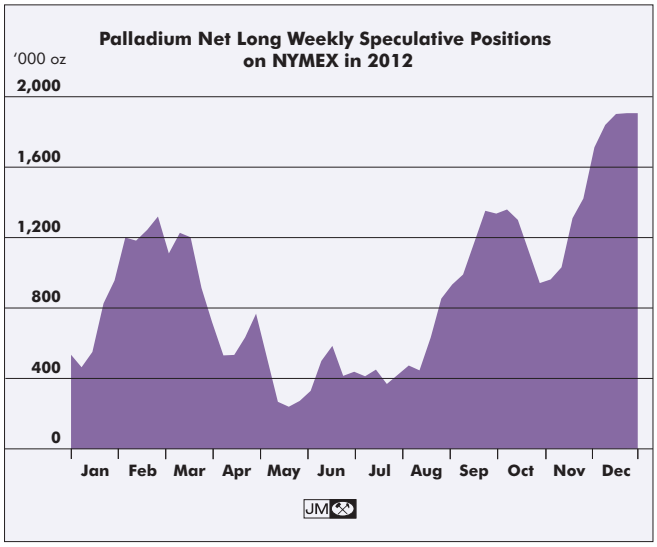
5 Thin trading conditions in Europe around the Easter holiday meant that the palladium price behaved rather erratically, before settling on an upward trend. In contrast to platinum, which lost value in **April**, the palladium price was lifted by

news of a return to growth in the Chinese car market as well as generally positive investor sentiment, reflecting strong physical demand. Net long futures positions grew in line with price rises, adding 100,000 oz in the week to 24th April while ETF holdings were steady, unlike those of platinum, which declined.

6 Palladium saw its year-to-date gains wiped out in a sharp downward price correction in the first two weeks of **May**. Palladium's peak-to-trough decline was more severe than that for platinum, losing 13% of its value between 30th April and 14th May, in contrast to a 9% fall for platinum between 30th April and 16th May. The trigger for the fall in both metals was investor concerns over eurozone debt levels as well as dimmer prospects for growth in China and the USA. Risk aversion and a falling price triggered a steep sell-off in palladium futures, with combined net long positions shedding over half a million ounces in the first three weeks of May to leave palladium long futures positions at an historic low level of just under 250,000 oz. Illustrating the divergent behaviour of the futures and physical investment markets, investors in ETFs continued to add to positions as the price fell during May.

7 Johnson Matthey's 'Platinum 2012' publication, launched on 14th May, forecast a market deficit for palladium in 2012, due in part to lower Russian state stock sales and healthy autocatalyst demand. With the fundamentals in the palladium market remaining strong, the price clambered higher in the second half of May and into **June**. Palladium gained some support from a rising platinum price in early June, itself boosted by reports of mine closures in South Africa. Rising to





$636 on 15th June, palladium once again came under pressure alongside the other precious metals as the US Federal Reserve slashed its growth forecasts and embarked on an extension of 'Operation Twist', designed to boost bank lending.

8 The price recovered in late June and into early **July**, as investors regained confidence in palladium following a loosening of monetary policy in China and the eurozone. Reports of improved domestic sales for US automakers and better sales in China also helped. Palladium was becalmed in mid-July before a sell-off in gold and platinum caused palladium to lose ground, dipping to a low for the year of $564 on July 24th. Total physical investment in palladium ETFs continued to hold up relatively steadily at just over two million ounces in July, despite some light selling, perhaps reflecting some positions being out of the money at prevailing prices and also that some investors were seeing long-term upside for palladium.

9 After a somewhat quiet start to **August**, prices moved up rapidly in response to renewed supply concerns as a labour dispute at Lonmin developed into a violent confrontation between rival union factions. Between 14th and 24th August, the palladium price increased by 12%. News of a strike at Royal Bafokeng Platinum and fears of contagion further unsettled the market.

10 Early in **September** palladium made further gains as a double-digit rise in August US auto sales helped investor sentiment towards the metal. Palladium rose along with platinum as the South African supply situation deteriorated.

With operations shuttered at Lonmin due to inter-union violence and intimidation, Anglo Platinum's Rustenburg mines suspended and workers at Impala agitating for another wage increase, investors moved in. Following announcements of monetary stimulus in the eurozone, Japan and the USA, the price soared as part of a broad-based risk rally, rising to $702 on the 14th, the highest level since March. It subsequently dropped back under pressure from speculative liquidation and technical selling late in the month.

11 Positive news from the North American automotive market helped the palladium price to regain some upward momentum in early **October**, with the price reaching a month high of $668 on the 5th. Offsetting negative news from the European and Japanese auto markets, cheap credit in the USA supported growth in new light vehicle sales of 9.5% in September, the highest rate of expansion since the 'cash for clunkers' programme in 2009. As with platinum, there was a correction but it was relatively limited, palladium ending the month at $606.

12 Although the palladium price moved in tandem with that of platinum on all but one of the 22 trading days in **November**, palladium's upward price movements were relatively more pronounced, ensuring that over the month as a whole palladium posted a gain of 13% compared to 3% for platinum. The palladium price was boosted early in the month by an announcement from Norilsk Nickel, the world's largest palladium miner, that its third quarter output was 4% lower than in the previous three months. Palladium rose to $643 by the 14th and although the price dipped over the next couple of days on news that striking workers at Anglo Platinum were to resume mining, the anticipation of a market close to one million ounces in deficit in 2012, as forecast in Johnson Matthey's Interim Review, gave palladium a boost for the second half of the month. During the last two weeks in November the price rose by more than 10% (compared to 2% for platinum) to reach $688 by the 30th, further supported by an increase of nearly half a million ounces in net long futures positions.

13 **December** marked only the second month of 2012 in which the direction of the palladium and platinum prices diverged, with palladium posting a 2% gain compared to a 6% fall in platinum. Price action during the month was nonetheless rather choppy, but ultimately the strong fundamental outlook for palladium stimulated a positive reaction from investors. ETF investors added 36,000 oz to holdings, while NYMEX speculators added close to half a million more ounces to net long positions. Dollar depreciation towards the end of the month helped palladium to finish the year strongly, rising from a month low of $675 on the 21st to $706 on the 28th. This narrowed the Pt:Pd price spread to just 2.18:1, close to where it had begun the year, and significantly lower than its 2012 peak of 2.62:1 in October. A palladium price of $699 brought 2012 to a close, marking a 7% gain over the year.

OTHER PGM

Beginning the year at the lowest level since 2009, the rhodium price gained some momentum in the initial two months of the year before succumbing to the prevailing weak market sentiment that also dragged down platinum and palladium. There was a brief price spike in mid-September, when the price jumped by $300, and a short period of strength in October, when the price climbed by $125. Apart from these episodes, rhodium was seemingly at the mercy of negative news while experiencing little of the periodic upside seen in the platinum and palladium markets. Overall, rhodium traded on average at $1,276, 37% lower than in 2011.

Rhodium came under light selling pressure early in the New Year, resulting in the price falling from an opening Johnson Matthey Base Price of $1,400 on 3rd **January** to $1,350 on the 10th – the lowest price for 32 months. At this level, it attracted steady buying interest from Europe and Asia. This, together with supply side pressure coming from the prolonged strike taking place at Impala, helped rhodium to make gains, reaching a high for the year of $1,550 on 14th **February**. At this point, Asian investors held back and light selling in Europe saw the rhodium price soften to $1,525, where it remained until 15th **March**.

A year on from the earthquake and tsunami disaster in Japan, recovery in automotive production by Japanese manufacturers, the biggest users of rhodium in emissions control catalysts, failed to have much impact on the rhodium price, which continued to shed value under the pressure of selling in the market. Wiping out its gains for the year to date, the rhodium price declined to $1,375 by mid-**April** before appreciating by $10 in steady two-way trade.

Rhodium was not immune to the negative market conditions in **May**. With weak prospects for economic growth in the eurozone, the USA and China dominating the news wires, rhodium succumbed to selling pressure and dropped by 10% between 9th May and 1st **June** to reach $1,250.

Rhodium remained unchanged at this level until 10th **July** with quiet trading. The price then softened for the remainder of the month as the weight of European selling overwhelmed Asian buying.

Subdued trading flows in **August** saw the price come under further pressure, reaching a new low for the nine-month period of $1,100. Prices showed almost no reaction initially to the disruptions at Lonmin's mines in South Africa, rhodium gaining merely $20 on Asian buying interest, before softening once again to $1,100.

After remaining becalmed for the first half of **September**, speculators and industrial buyers moved to cover their rhodium requirements in the light of the disruption to South African pgm supplies. In the space of three days, the price gained $300, briefly spiking at a five-month high of $1,400 on the 18th. At this level, investors liquidated speculative holdings and the price dropped almost as quickly as it had risen, coming to rest at $1,100 once again.

Rhodium gained $125 in early **October**, reaching a month high of $1,225 before selling by investors led to a $100 retreat by month-end.

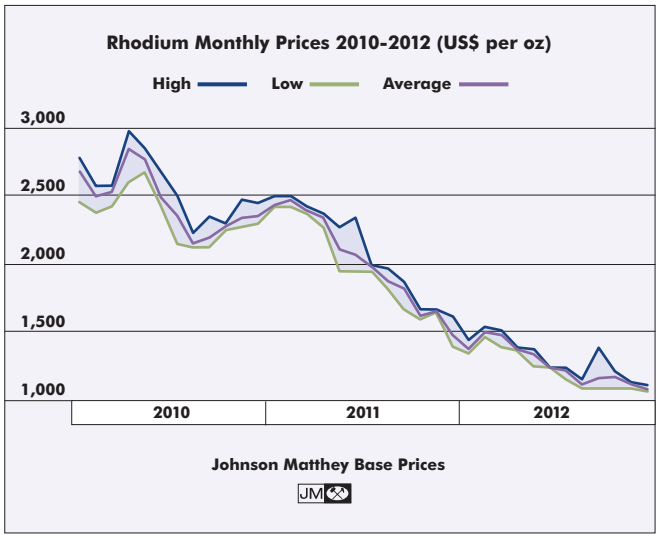
Price action during **November** and **December** was particularly subdued, despite Johnson Matthey's forecast of a market in deficit. By the end of 2012 the price had fixed at a new low of $1,080 for the year, signalling a 23% decline since the start of 2012.

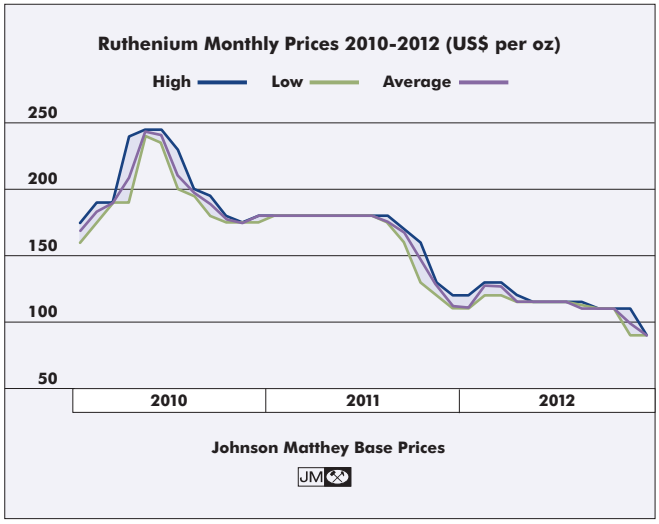
The price of ruthenium was on a declining trend in 2012, with the average at $112, down from $166 in 2011.

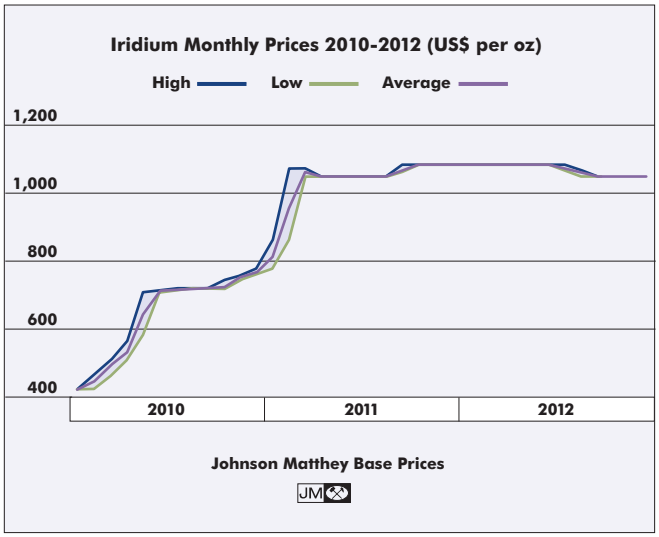
Ruthenium made gains in **January** and **February** on the back of industrial purchasing, increasing by 18% to $130. The price weakened in **March** and early **April** amid a surfeit of sellers in the market to reach $115, where it remained until mid-**August**. Immune from the wider price movements in the other precious metals markets, ruthenium then softened to $110, where it remained until a further decline to $90 occurred in **November**, marking the final price action of the year as well as a three-year low.

Price movements in iridium were infrequent in 2012, the price averaging $1,070 compared to $1,036 in 2011.

There was very limited activity in iridium between **January** and **July**, with the price having remained at $1,085 since September 2011. The market finally succumbed to some selling pressure and a lack of buyers on 10th **July** to reach a new Johnson Matthey Base Price of $1,070. Iridium fell by a further $20 in **August** amid light selling and subdued buying, ending **September** at $1,050, where it remained for the rest of the year.







SUPPLY AND DEMAND TABLES

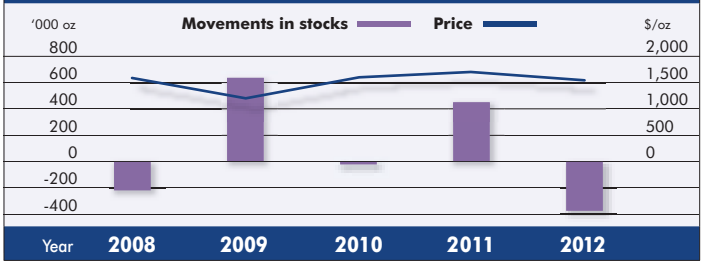
Platinum Supply and Demand

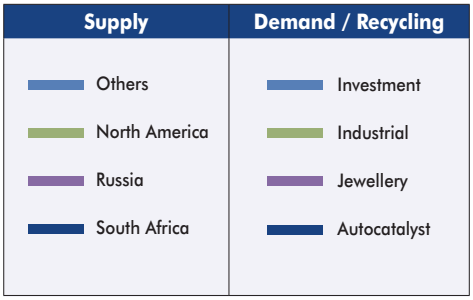
	'000 oz	2008	2009	2010	2011	2012
Supply[1]	South Africa	4,515	4,635	4,635	4,860	4,095
	Russia[2]	805	785	825	835	800
	North America	325	260	200	350	295
	Zimbabwe[3]	180	230	280	340	340
	Others[3]	115	115	110	100	110
	Total Supply	**5,940**	**6,025**	**6,050**	**6,485**	**5,640**
Gross Demand by Application[4]	Autocatalyst[4]	3,655	2,185	3,075	3,185	3,240
	Chemical	400	290	440	470	450
	Electrical[4]	230	190	230	230	165
	Glass	315	10	385	515	180
	Investment	555	660	655	460	455
	Jewellery[4]	2,060	2,810	2,420	2,475	2,780
	Medical & Biomedical[5]	245	250	230	230	235
	Petroleum	240	210	170	210	200
	Other	290	190	300	320	340
	Total Gross Demand	**7,990**	**6,795**	**7,905**	**8,095**	**8,045**
Recycling[6]	Autocatalyst	(1,130)	(830)	(1,085)	(1,240)	(1,130)
	Electrical	(5)	(10)	(10)	(10)	(10)
	Jewellery	(695)	(565)	(735)	(810)	(890)
	Total Recycling	**(1,830)**	**(1,405)**	**(1,830)**	**(2,060)**	**(2,030)**
	Total Net Demand[7]	**6,160**	**5,390**	**6,075**	**6,035**	**6,015**
	Movements in Stocks[8]	**(220)**	**635**	**(25)**	**450**	**(375)**

At a glance

million oz

Prices and Movements in Stocks





Average Price (US$ per oz)[9]

2008	2009	2010	2011	2012
1,576	1,205	1,611	1,721	1,552

Gross Platinum Demand by Region

	'000 oz	2008	2009	2010	2011	2012
Europe	Autocatalyst	1,970	970	1,495	1,505	1,330
	Chemical	105	70	110	120	110
	Electrical	20	20	15	20	15
	Glass	(25)	5	10	30	5
	Investment	105	385	140	155	135
	Jewellery	205	185	175	175	180
	Medical & Biomedical	115	115	90	90	90
	Petroleum	30	25	20	35	20
	Other	85	55	100	95	95
	Total	**2,610**	**1,830**	**2,155**	**2,225**	**1,980**
Japan	Autocatalyst	610	395	550	500	600
	Chemical	55	45	50	35	35
	Electrical	35	30	30	25	20
	Glass	65	40	90	130	10
	Investment	385	160	45	250	100
	Jewellery	530	335	325	310	310
	Medical & Biomedical	20	20	20	20	20
	Petroleum	10	10	5	5	5
	Other	25	15	40	40	40
	Total	**1,735**	**1,050**	**1,155**	**1,315**	**1,140**
North America	Autocatalyst	505	370	405	370	405
	Chemical	95	65	100	95	105
	Electrical	30	25	25	25	20
	Glass	(5)	(35)	10	(5)	10
	Investment	60	105	465	10	190
	Jewellery	200	135	175	185	185
	Medical & Biomedical	85	90	90	90	90
	Petroleum	25	15	25	50	60
	Other	150	90	105	110	115
	Total	**1,145**	**860**	**1,400**	**930**	**1,180**
China	Autocatalyst	145	85	100	105	105
	Chemical	60	40	80	100	90
	Electrical	30	20	30	30	25
	Glass	85	(90)	130	10	70
	Investment	0	0	0	0	0
	Jewellery	1,060	2,080	1,650	1,680	1,950
	Medical & Biomedical	10	10	10	10	15
	Petroleum	10	10	15	15	10
	Other	10	10	25	30	40
	Total	**1,410**	**2,165**	**2,040**	**1,980**	**2,305**
Rest of the World	Autocatalyst	425	365	525	705	800
	Chemical	85	70	100	120	110
	Electrical	115	95	130	130	85
	Glass	195	90	145	350	85
	Investment	5	10	5	45	30
	Jewellery	65	75	95	125	155
	Medical & Biomedical	15	15	20	20	20
	Petroleum	165	150	105	105	105
	Other	20	20	30	45	50
	Total	**1,090**	**890**	**1,155**	**1,645**	**1,440**
	Total Gross Demand	**7,990**	**6,795**	**7,905**	**8,095**	**8,045**

At a glance

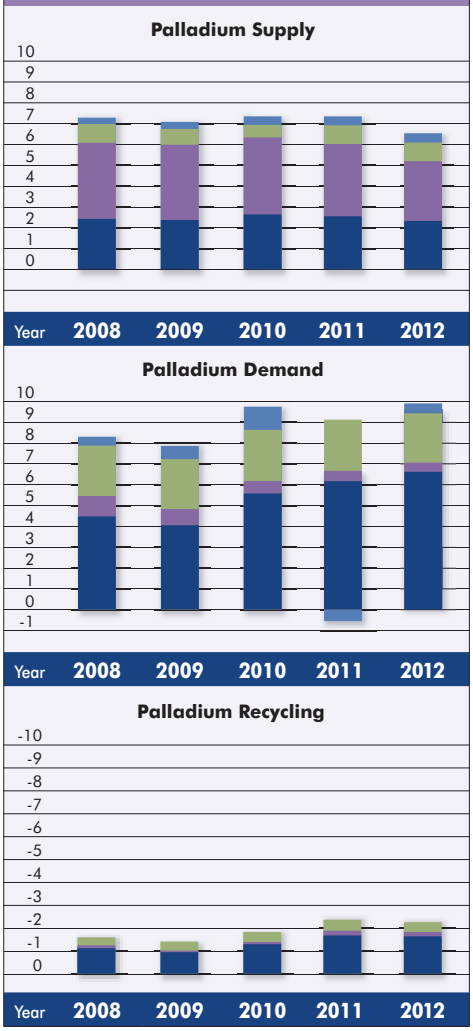
million oz

Palladium Supply and Demand

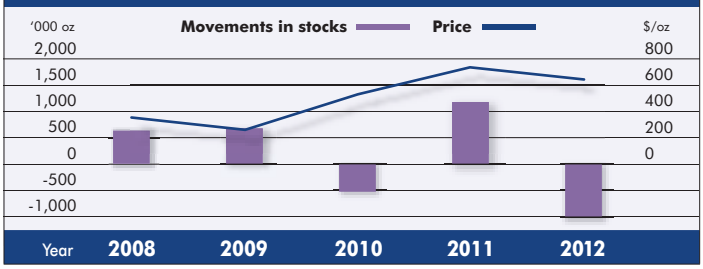
	'000 oz	2008	2009	2010	2011	2012
Supply[1]	South Africa	2,430	2,370	2,640	2,560	2,330
	Russia[2]					
	Primary	2,700	2,675	2,720	2,705	2,630
	Stock Sales	960	960	1,000	775	250
	North America	910	755	590	900	905
	Zimbabwe[3]	140	180	220	265	265
	Others[3]	170	160	185	155	165
	Total Supply	**7,310**	**7,100**	**7,355**	**7,360**	**6,545**
Gross Demand by Application[4]	Autocatalyst[4]	4,465	4,050	5,580	6,155	6,615
	Chemical	350	325	370	440	530
	Dental	625	635	595	540	530
	Electrical[4]	1,370	1,370	1,410	1,375	1,200
	Investment	420	625	1,095	(565)	470
	Jewellery[4]	985	775	595	505	445
	Other	75	70	90	110	105
	Total Gross Demand	**8,290**	**7,850**	**9,735**	**8,560**	**9,895**
Recycling[6]	Autocatalyst	(1,140)	(965)	(1,310)	(1,695)	(1,660)
	Electrical	(345)	(395)	(440)	(480)	(430)
	Jewellery	(130)	(70)	(100)	(210)	(190)
	Total Recycling	**(1,615)**	**(1,430)**	**(1,850)**	**(2,385)**	**(2,280)**
	Total Net Demand[7]	**6,675**	**6,420**	**7,885**	**6,175**	**7,615**
	Movements in Stocks[8]	**635**	**680**	**(530)**	**1,185**	**(1,070)**

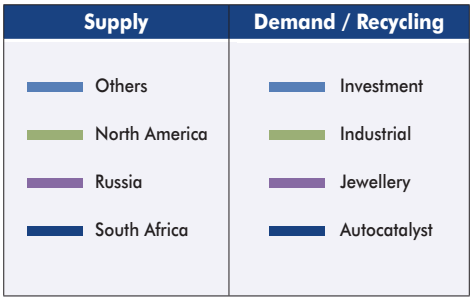
At a glance

million oz



Prices and Movements in Stocks





Average Price (US$ per oz)[9]

2008	2009	2010	2011	2012
352	264	526	733	643

Gross Palladium Demand by Region

	'000 oz	2008	2009	2010	2011	2012
Europe	Autocatalyst	1,005	995	1,330	1,485	1,455
	Chemical	100	85	105	80	85
	Dental	65	65	80	80	75
	Electrical	190	195	195	190	185
	Investment	370	525	(5)	(35)	165
	Jewellery	45	50	65	60	65
	Other	20	20	30	25	25
	Total	**1,795**	**1,935**	**1,800**	**1,885**	**2,055**
Japan	Autocatalyst	885	590	820	680	785
	Chemical	20	20	20	20	15
	Dental	275	295	250	220	220
	Electrical	320	270	295	300	310
	Investment	0	0	10	5	0
	Jewellery	115	80	75	70	70
	Other	10	10	10	10	10
	Total	**1,625**	**1,265**	**1,480**	**1,305**	**1,410**
North America	Autocatalyst	1,290	1,020	1,355	1,545	1,815
	Chemical	55	50	65	80	85
	Dental	270	260	250	225	220
	Electrical	170	170	160	145	140
	Investment	50	95	1,090	(535)	305
	Jewellery	60	60	65	45	45
	Other	20	15	25	45	40
	Total	**1,915**	**1,670**	**3,010**	**1,550**	**2,650**
China	Autocatalyst	390	685	1,005	1,155	1,255
	Chemical	55	75	65	145	215
	Dental	0	0	0	0	0
	Electrical	255	335	360	270	185
	Investment	0	0	0	0	0
	Jewellery	740	560	360	305	240
	Other	10	10	10	10	10
	Total	**1,450**	**1,665**	**1,800**	**1,885**	**1,905**
Rest of the World	Autocatalyst	895	760	1,070	1,290	1,305
	Chemical	120	95	115	115	130
	Dental	15	15	15	15	15
	Electrical	435	400	400	470	380
	Investment	0	5	0	0	0
	Jewellery	25	25	30	25	25
	Other	15	15	15	20	20
	Total	**1,505**	**1,315**	**1,645**	**1,935**	**1,875**
	Total Gross Demand	**8,290**	**7,850**	**9,735**	**8,560**	**9,895**

At a glance

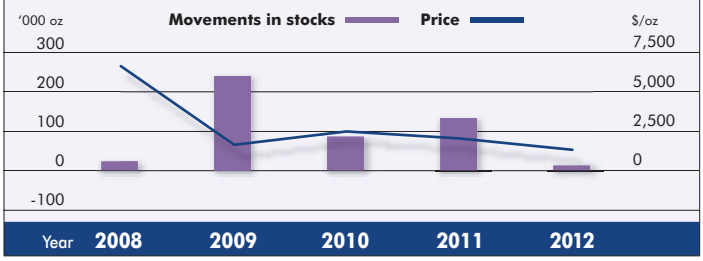
Rhodium Supply and Demand

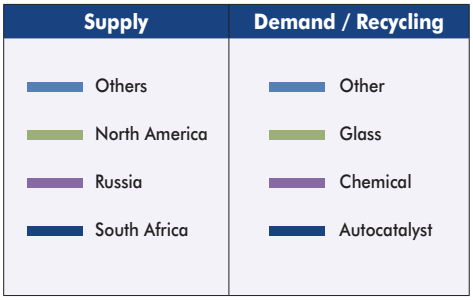
	'000 oz	2008	2009	2010	2011	2012
Supply[1]	South Africa	574	663	632	641	576
	Russia[2]	85	70	70	70	90
	North America	18	15	10	23	23
	Zimbabwe[3]	15	19	19	29	30
	Others[3]	3	3	3	2	3
	Total Supply	**695**	**770**	**734**	**765**	**722**
Gross Demand by Application[4]	Autocatalyst[4]	768	619	727	715	782
	Chemical	68	54	67	72	81
	Electrical[4]	3	3	4	6	6
	Glass	34	19	68	77	31
	Other	24	21	21	38	66
	Total Gross Demand	**897**	**716**	**887**	**908**	**966**
Recycling[6]	Autocatalyst	(227)	(187)	(241)	(277)	(259)
	Total Recycling	**(227)**	**(187)**	**(241)**	**(277)**	**(259)**
	Total Net Demand[7]	**670**	**529**	**646**	**631**	**707**
	Movements in Stocks[8]	**25**	**241**	**88**	**134**	**15**

At a glance

'000 oz

Prices and Movements in Stocks





Average Price (US$ per oz)[9]

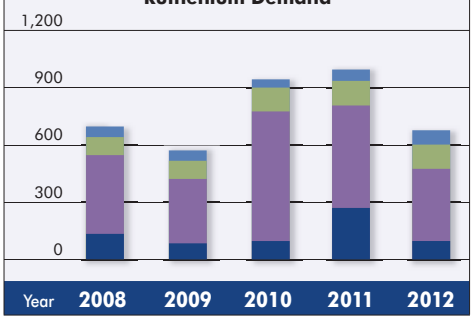
2008	2009	2010	2011	2012
6,564	1,592	2,458	2,022	1,276

Ruthenium Demand

	'000 oz	2008	2009	2010	2011	2012
Demand by Application	Chemical	139	89	100	273	101
	Electrical	410	336	679	536	377
	Electrochemical	95	95	124	130	127
	Other	55	54	42	58	74
	Total Demand	**699**	**574**	**945**	**997**	**679**

At a glance

'000 oz



Average Price (US$ per oz)[9]

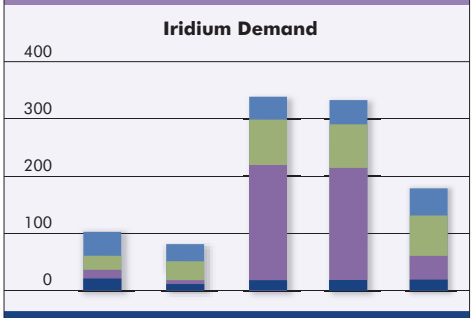
2008	2009	2010	2011	2012
323	95	197	166	112

Iridium Demand

	'000 oz	2008	2009	2010	2011	2012
Demand by Application	Chemical	21	11	18	19	19
	Electrical	15	7	201	195	42
	Electrochemical	25	33	79	76	70
	Other	41	30	40	42	47
	Total Demand	**102**	**81**	**338**	**332**	**178**

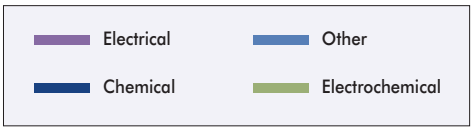
At a glance

'000 oz



Average Price (US$ per oz)[9]

2008	2009	2010	2011	2012
450	425	642	1,036	1,070



NOTES TO TABLES

[1]**Supply** figures represent estimates of sales by the mines of primary pgm and are allocated to where the initial mining took place rather than the location of refining. Additionally, we continue to report sales of metal which we believe has not previously been priced, principally sales of Russian state stocks, as supplies.

[2]Our **Russian supply** figures represent the total pgm sold in all regions, including Russia and the ex-CIS. Demand in Russia and the ex-CIS states is included in the Rest of the World region. **Russian supply** figures for palladium have been split into sales from primary mining and sales of stocks.

[3]Supplies from **Zimbabwe** have been split from **Others' supplies**. Platinum group metals mined in Zimbabwe are currently refined in South Africa, and our supply figures represent shipments of pgm in concentrate or matte, adjusted for typical refining recoveries.

[4]**Gross demand** figures for any given application represent the sum of manufacturer demand for metal in that application and any changes in unrefined metal stocks in that sector. Increases in unrefined stocks lead to additional demand, reductions in stock lead to a lower demand figure.

[5]Our **Medical and Biomedical** category represents combined metal demand in the medical, biomedical and dental sectors.

[6]**Recycling** figures represent estimates of the quantity of metal recovered from open loop recycling (i.e. where the original purchaser does not retain control of the metal throughout). For instance, autocatalyst recycling represents the weight of metal recovered from end-of-life vehicles and aftermarket scrap in an individual region, allocated to where the car is scrapped rather than where the metal is finally recovered. These figures do not include warranty or production scrap. Where no recycling figures are given, open loop recycling is negligible. In our recycling charts, we label recovery of electrical scrap as 'industrial' recycling.

[7]**Net demand** figures are equivalent to the sum of gross demand in an application less any metal recovery from open loop scrap in that application, whether the recycled metal is reused in that industry or sold into another application. Where no recycling figure is given for an application, gross and net demand are identical.

[8]**Movements in stocks** in any given year reflect changes in stocks held by fabricators, dealers, banks and depositories but excluding stocks held by primary refiners and final consumers. A positive figure (sometimes referred to as a 'surplus') reflects an increase in market stocks. A negative value (or 'deficit') indicates a decrease in market stocks.

[9]**Average price** figures for platinum and palladium are the mean of all daily fixing values in a given year. Average price figures for rhodium, ruthenium and iridium are based on Johnson Matthey European Base Prices.

GLOSSARY

AMCU	*Association of Mineworkers & Construction Union*
ASC	*Ammonia Slip Catalyst*
CO	*Carbon Monoxide*
CO_2	*Carbon Dioxide*
CRT	*Cathode Ray Tube*
DOC	*Diesel Oxidation Catalyst*
DPF	*Diesel Particulate Filter*
ETF	*Exchange Traded Fund*
g	*Gram*
HC	*Hydrocarbons*
HDV	*Heavy Duty Vehicle*
JV	*Joint Venture*
kg	*Kilograms*
LCD	*Liquid Crystal Display*
LDD	*Light Duty Diesel*
LDG	*Light Duty Gasoline*
LNT	*Lean NOx Trap*
Merensky	*A platiniferous orebody in South Africa*
MLCC	*Multi-Layer Ceramic Capacitor*
NOx	*Oxides of Nitrogen*
NRMM	*Non-Road Mobile Machinery*
NUM	*National Union of Mineworkers*
NYMEX	*New York Mercantile Exchange*
oz	*Ounces Troy*
PC	*Personal Computer*
PET	*Polyethylene Terephthalate*
pgm	*Platinum Group Metal(s)*
Platreef	*A platiniferous orebody in South Africa*
PM	*Particulate Matter*
ppm	*Parts Per Million*
ppt	*Parts Per Thousand*
PTA	*Purified Terephthalic Acid*
RDO	*Rock Drill Operator*
SCR	*Selective Catalytic Reduction*
SGE	*Shanghai Gold Exchange*
SUV	*Sports Utility Vehicle*
TOCOM	*Tokyo Commodity Exchange*
tonne	*1,000 kg*
TWC	*Three-Way Catalyst*
UG2	*A platiniferous orebody in South Africa*
WEE	*Waste Electronic Equipment*

NOTE ON PRICES

All prices are quoted per oz unless otherwise stated.

R	*South African Rand*
£	*UK Pound*
$	*US Dollar*
¥	*Japanese Yen*
€	*Euro*
RMB	*Chinese Renminbi*

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