



Supplies

Supplies, Mining and Exploration

South Africa

Total supplies of platinum from South Africa climbed by 5 per cent in 2003 to 4.67 million oz. Refined platinum output at Anglo Platinum grew modestly to 2.3 million oz, less than had been expected at the start of the year; production from Impala was steady, whilst mining rates increased at all the other producers. Palladium shipments grew by almost 7 per cent to 2.31 million oz, whilst rhodium sales climbed to 545,000 oz.

Anglo Platinum

Anglo Platinum's output of refined platinum reached 2.3 million oz in 2003, up from 2.25 million oz in 2002 but 100,000 oz less than anticipated. The shortfall was due to a slower than planned ramp up of operations at developing mines plus a larger than expected increase in pipeline stocks of metal. This was related to the concurrent commissioning of three new metallurgical facilities: a smelter at Polokwane, and the Anglo Platinum Converting Process (ACP) and a slag-cleaning furnace at Rustenburg.

At Anglo Platinum's Rustenburg section (consisting of the West Mine, East Mine, and the developing Waterval Mine), production fell from established mining areas due to a decline in available Merensky Reef ore reserves but this was more than offset by a 51 per cent jump in tonnage milled at Waterval and an improvement in grades under phase 1 of the Rustenburg UG2 project. Total refined platinum output attributable to the Rustenburg mines climbed by almost 7 per cent to 826,000 oz.

At Amandelbult, increased mining of UG2 ore and lower Merensky Reef output resulted in a decline in overall grades and recoveries, and platinum output slipped to 645,000 oz. At Union section, however, increased UG2 concentrator capacity enabled an expansion in production, whilst output at Lebowa was steady. Operations at PPRust improved significantly in 2003 as the Zwartfontein South Pit came into production, giving access to higher grade ore and raising the overall head grade. The developing Bafokeng-Rasimone Platinum Mine achieved a substantial increase in underground mining efficiencies in 2003. With average grades and recoveries also increasing, equivalent refined platinum production climbed by more than 13 per cent to 184,000 oz.

Production at the Modikwa project, a joint venture between Anglo Platinum and a consortium led by African Rainbow Minerals, continued to build in 2003 but failed to meet target due to adverse geological conditions, lower than expected mining efficiencies and poor face availability. Production is expected to expand significantly in 2004, reaching the planned maximum rate equivalent to 162,000 oz of refined platinum by the end of the year. The group's new tailings reprocessing plant near Rustenburg was commissioned towards the end of 2003. Phase 1 of the project is expected to yield an annual average output of 70,000 oz of platinum between 2004 and 2006.

Two new projects were announced by Anglo Platinum during 2003: the Pool and Share Agreement (PSA) with Aquarius Platinum at Kroondal, and the development of a new mine at Unki in Zimbabwe (see *Zimbabwe section on page 23*). Under the PSA, the assets of the Kroondal Platinum mine were combined with contiguous UG2 reserves at Anglo Platinum's Rustenburg section. Production at Kroondal will be doubled to reach a rate of 505,000 oz pgm per annum in 2006 (split equally between the two partners), with Anglo Platinum due to start taking concentrate from the operation in 2005.

The sharply increasing strength of the rand during 2003, coupled with rising local costs and inflation, and relatively weak prices for palladium and rhodium, caused Anglo Platinum to re-evaluate its long-term expansion programme. The group subsequently decided to slow the development of several projects, notably the planned mines at Twickenham and Der Brochen on the eastern limb of the Bushveld Complex, and a planned expansion of the new tailings retreatment plant. The target of producing 3.4 million oz of refined platinum in 2006 was scaled back to 2.9 million oz.

Impala Platinum

Impala Platinum's production of refined platinum from its lease area on the western limb of the Bushveld Complex remained fairly steady in 2003 at a little over 1 million oz. Production from new declines came on stream during the year and the company also exploited shallow Merensky Reef ore reserves via open cast mining, helping to offset the effects of a strike in March. A new tailings scavenging plant, commissioned in December, will boost overall recoveries by 1 per cent (around 10,000 oz platinum per year).

PGM Supplies: South Africa '000 oz		
	2002	2003
Platinum	4,450	4,670
Palladium	2,160	2,310
Rhodium	490	545



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Construction of the concentrator at Impala Platinum's Marula operation on the eastern limb of the Bushveld Complex was completed in late 2003.

Construction of the Marula mine on the eastern Bushveld continued during the year but worse than expected geological conditions meant that development of drives and stopes fell behind schedule. The concentrator at Marula entered commissioning in early January 2004 and will initially process stockpiled ore. The operation is scheduled to reach full capacity in 2005, by which time it is expected to be producing 100,000 oz per year of platinum.

Impala halted mining operations at the Crocodile River UG2 mine in November 2003 after experiencing severe difficulties in trying to move to wholly underground mining. Geological conditions were extremely challenging, leading to a much slower rate of development than anticipated. In addition, profitability was hampered by the strength of the rand and low palladium and rhodium prices.

In March 2004, Impala announced that a consortium headed by Salene Platinum Holdings had agreed to acquire its entire 83 per cent holding in Barplats, the company that controls the Crocodile River operation.

In October 2003, Impala and African Rainbow Minerals approved a small-scale trial mining project at their Two Rivers joint venture on the eastern Bushveld. A final decision on whether to proceed with the full-scale development of a mine is expected in mid-2004.

Impala committed to the sale of its 27 per cent interest in the operations of Eastern Platinum Ltd and Western Platinum Ltd (Lonmin owning the balance) in 2003. Under the deal, which had not been finalised as of April 2004, Lonmin will acquire a further 9 per cent stake in the operations from Impala and the remaining 18 per cent will be vested into a new company (Incwala) to be controlled by Black Economic Empowerment (BEE) shareholders. Impala also raised its stake in Zimbabwe Platinum Mines Ltd (Zimplats) to 82.5 per cent during the year (see Zimbabwe section).

Lonmin

Lonmin's mining operations performed strongly in 2003; the volume of ore milled climbed by 26 per cent during the company's 2003 financial year (to 30th September) to exceed 14 million tonnes. The introduction of open cast mining of UG2 reserves contributed most of the additional ore, and UG2 head grades and recoveries were higher than projected.

There was also a moderate increase in production from underground operations. Production of refined platinum consequently rose by 21 per cent to 916,000 oz, although this total included some 30,000 oz that was sourced from the processing of refinery residues.

The company's new smelter was out of service for almost the whole of 2003 due to an explosion that occurred in December 2002. Concentrate was processed through Lonmin's older pre-existing furnaces and via a toll smelting agreement with Impala. Recommissioning of the repaired and modified smelter began in late December 2003.

The Pandora project, to the east of Lonmin's existing operations, is at an early stage of development. The joint venture between Lonmin and Anglo Platinum originally included Northam Mining and the Bapo Ba Mogale Tribe as minority BEE partners holding a 5 per cent interest each. In March 2004 the Pandora joint venture was restructured to increase the BEE component, with the equity interest to be held by Northam increased to 7.5 per cent and transferred to Mvelaphanda Resources Ltd (a major shareholder in Northam and a recognised BEE entity). The shareholding will be returned to Northam once the company qualifies as meeting the full equity requirements of BEE legislation.

Northam Platinum

Northam Platinum produced a total of 326,000 oz of pgm in concentrate in 2003 (platinum accounting for 206,000 oz), up from 315,000 oz of pgm the previous year and the company's highest annual total to date. The growth was a result of an increase in the volume of ore milled plus an improvement in the overall head grade. The latter was due in part to Northam's focus on prioritising the development and mining of the Merensky Reef ahead of UG2 reserves, which have a lower average pgm grade. Merensky Reef climbed as a proportion of total ore mined from 69 per cent in 2002 to 71 per cent in 2003. Output of pgm in 2004 is expected to be broadly similar to that in 2003.

In February 2004, Mvelaphanda Resources acquired a BEE consortium named Khumama Platinum that held 50 per cent participation rights in the Booyensdal joint venture with Anglo Platinum. Mvela will transfer the Khumama interest in Booyensdal (located on the eastern limb of the Bushveld Complex) to Northam in return for a combination of cash and shares, which will result in Mvela increasing its stake in Northam



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from just over 22 per cent to 34 per cent.

The Booyensdal project itself lies immediately to the south of Anglo Platinum's wholly-owned Der Brochen lease area and contains resources of 47.6 million oz pgm within the Merensky Reef and a further 76.8 million oz of pgm in the UG2 horizon.

Aquarius Platinum

Aquarius Platinum produced a total of 183,000 oz of platinum in concentrate in 2003, up by more than a third compared with 2002. The increase was largely due to the ramp up of production and an increase in recoveries at the new Marikana operation, plus expanded output at the Mimosa joint venture in Zimbabwe. At Marikana, however, face availability in the open pits remained limited and the mine had yet to achieve consistency in the quality of feed supplied to the concentrator.

The Kroondal mine faced a number of geological problems during the first half of 2003 that reduced output but production accelerated during the third and fourth quarters under a continuous improvement programme. Total platinum production in concentrate for the full year increased to almost 133,000 oz.

The Pool and Share Agreement (PSA) between Anglo Platinum and Aquarius at Kroondal began on 1st November 2003, although in the short term concentrate will continue to be sold to Impala for refining. Anglo Platinum will begin to treat concentrate from the project in 2005, and expects to be handling 100 per cent of the expanded mine's output by 2008. A new 250,000 tonne per month concentrator will be constructed, with commissioning due in June 2005, and a third decline will be established to access Anglo Platinum reserves just to the east of the current Kroondal mine.

Aquarius's pgm production will also be lifted by a chromite tailings project, announced in March 2004. A consortium comprising Aquarius (50 per cent), GB Mining & Exploration (25 per cent) and Sylvania South Africa (25 per cent) will construct a new plant to extract pgm from tailings from chromite mines in the Kroondal area. Production from the plant is scheduled to start in October 2004 and it is expected to yield up to 28,000 oz pgm per year.

In December 2003, Aquarius announced a BEE transaction with a group of investors led by Savannah Resources (Pty) Ltd. Under the deal, a 26 per cent share in Aquarius Platinum South Africa will be sold to

the consortium for R860 million, subject to the completion of a financing package. Aquarius will then be fully compliant with the equity ownership component of the South African Mining Charter. Funds raised through the transaction will be used to finance the development of the Everest South project, construction of which is due to start in mid-2004 with production from late 2005.

Aquarius holds a 50 per cent interest in ZCE Platinum (Impala holding the balance), which operates the Mimosa mine in Zimbabwe. A major expansion of the underground mine and concentrator at Mimosa neared completion in 2003, driving a substantial increase in pgm output (*see Zimbabwe section*).

SouthernEra

Production at the Messina project, majority-owned by the Canadian-based SouthernEra Resources, totalled 56,600 oz of pgm plus gold in 2003. Production at the phase 1 (Voorspoed) section built steadily throughout the year, climbing from 72,000 tonnes of ore in the first quarter to over 188,000 tonnes of ore during the fourth quarter. The mine is likely to hit its target ore production rate of 120,000 tonnes per month (equivalent to approximately 160,000 oz pgm per year) during the third quarter of 2004.

A feasibility study on phases 2 and 3 of the Messina project, based on the development of a new 240,000 tonne per month mine producing 340-360,000 oz pgm per year, is due to be completed by mid-2004. In April 2004, SouthernEra announced that it was considering separating its platinum interests from its diamond mining and exploration holdings by forming two separately listed public companies.

Russia

Sales of platinum, palladium and rhodium by Russia in 2003 once again exceeded mine production. At 1.05 million oz, platinum sales were 7 per cent higher than in 2002; palladium sales jumped by 53 per cent to 2.95 million oz as Norilsk Nickel sold all its output, in contrast with 2002 when the company withheld part of its production. Rhodium sales accelerated to 140,000 oz, an increase of 56 per cent.

In November 2003 President Putin approved a bill to relax the severe restrictions that apply to all information about reserves, production and sales of pgm in Russia.



The strength of the rand, and low palladium and rhodium prices, made the economics of the many pgm exploration projects in South Africa less attractive in 2003.

PGM Supplies: Russia '000 oz		
	2002	2003
Platinum	980	1,050
Palladium	1,930	2,950
Rhodium	90	140





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However, in February 2004, when the bill was due to come into effect, it was announced that further approvals would be required. It is not entirely clear what these are, but amendments to regulations published by the Ministries of Finance and Natural Resources have been quoted. It has also been suggested that pgm are still classed as strategic materials and that this too must be amended. It seems clear that publication of pgm data by Norilsk Nickel and others will not occur for some time.

As outlined in the accompanying special feature, we estimate Russian production of platinum in 2003 was around 880,000 oz, palladium around 2.7 million oz and rhodium about 60,000 oz. Sales were somewhat higher than these figures, with the extra metal presumably coming from stocks held by government agency Gokhran or possibly from the Central Bank. There appears to have been particularly aggressive sales of rhodium, with substantial amounts of the metal being shipped to the USA during the year. Some of this metal may have ended up in the hands of consumers, but the heaviest users of rhodium are the auto companies and there were no indications that they were adding to pgm stocks during 2003.

In our 2003 Russian data we have not included any of the 877,169 oz of palladium that were used by Norilsk Nickel as part of the purchase price of the shareholding it acquired in Stillwater Mining in June last year. Although the metal was exported from Russia, Stillwater indicated that none of this metal was sold in 2003 and, therefore, it had no direct impact on the supply/demand balance. The company did report, however, that the majority of this metal will be sold in 2004 and 2005 and we will take this into account in our supply figures for these years.

North America

Shipments of platinum from North American producers dropped by a quarter in 2003 to 295,000 oz. The fall was almost entirely due to much lower production from Inco, which resulted from a three month strike and the depletion of certain pgm-rich ore reserves. Palladium output in the region fell less dramatically, slipping by 5 per cent to 940,000 oz. Reduced production from both Inco and Stillwater Mining was partially offset by higher output at North American Palladium, which mines an ore body that contains a very high proportion of palladium.

PGM Supplies: North America '000 oz		
	2002	2003
Platinum	390	295
Palladium	990	940
Rhodium	25	20



Canada

North American Palladium processed over 5 million tonnes of ore from its Lac des Iles open pit at an average palladium grade of 2.31 grams per tonne in 2003 compared with 4.85 million tonnes of ore at 1.96 grams per tonne in 2002. Production of palladium in concentrate climbed to 289,000 oz, an increase of nearly 32 per cent year-on-year. The substantial growth in output was due to the successful commissioning of a new primary crusher in June, which improved throughput and mill availability, while head grades increased as a result of mining of higher grade ore zones during the second half of the year.

A secondary crushing circuit will be installed during 2004 to help maintain output close to 2003 levels. In March 2004, the company announced that it would proceed with the development of an underground mine at the Lac des Iles mine that will exploit a higher grade sub-vertical ore body located directly beneath the open pit. Construction is due to start by the middle of the year with first ore production in the second half of 2005. The underground mine and the open pit will operate in tandem, yielding around 300,000 oz per year of palladium in total.

Inco's production of 90,000 oz of platinum and 108,000 oz of palladium in 2003 was significantly lower than in recent years because of a three month strike at the company's Sudbury operations during the summer and the depletion of one of the pgm-rich ore zones at its Copper Cliff North mine. Output is expected to recover to around 400,000 oz of pgm in 2004 as the company prioritises the development of other pgm-rich ore bodies at its Sudbury operations.

The quantity of ore mined at Falconbridge's Sudbury operations declined slightly to 2.23 million tonnes in 2003, while nickel grades also declined. However, precious metals production and sales increased, reflecting improved metallurgical recoveries, particularly at the company's smelter. An increasing focus on higher pgm grade areas and changes in the refining pipeline may also have contributed to the increase.

In March 2004, Falconbridge announced its decision to proceed with an underground exploration and development programme at the Nickel Rim South deposit in the Sudbury basin. The deposit contains significant pgm grades: inferred resources of 13.2 million tonnes average 1.7 per cent nickel, 1.9 grams per tonne platinum and 2.2 grams per tonne



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palladium. The development programme will cost around \$400 million and is expected to lead to the start of full-scale production in 2008.

USA

Stillwater Mining Co. produced 450,000 oz of palladium and 134,000 oz of platinum in 2003, around 5 per cent below the level of production projected at the beginning of the year and down from 476,000 oz and 141,000 oz respectively in 2002. Output at the Stillwater Mine declined by 13 per cent following a drive to reduce costs, but this was partly offset by an increase in production from the newer East Boulder mine. Total production in 2004 is expected to be in the range of 610,000 to 625,000 oz pgm.

The acquisition by Norilsk Nickel of a 50.8 per cent shareholding in Stillwater Mining in exchange for \$100 million and 877,169 oz of palladium was completed in June 2003, with Norilsk subsequently raising its stake to 55.5 per cent. In February 2004, Stillwater announced that it had entered into contracts or had reached understandings, under which all of the palladium will be sold, primarily for use in automobile catalytic converters, at close to market prices over a period of two years, commencing in 2004 (*note: this metal will be recorded as Russian supply not North American supply in our figures*).

Zimbabwe

Platinum production in Zimbabwe climbed to 140,000 oz in 2003, almost double the previous year's total as mining at both the Mimosa and Ngezi mines continued to expand. The Zimbabwe government began the process of drafting black economic empowerment legislation but there is considerable uncertainty over the final form the regulations will take.

In 2003, production continued to ramp up from the Ngezi mine (effectively controlled by Impala but operated by Zimplats via Makwiro Platinum Mines (Pvt) Ltd), and it had neared its full operating rate by the end of the year. The operation at Ngezi milled just less than 2 million tonnes of ore, yielding approximately 170,000 oz of pgm and gold, an increase of 43 per cent on 2002. A total of 42 production days were lost at the company's smelter between July to September following a breakout of molten metal but the resulting stockpile of concentrate was processed before the end of the year.



A 42-metre long road train loaded with ore leaving Zimplat's Ngezi mine for the Selous Metallurgical Complex.

Zimplats is undertaking a bankable feasibility study of an expansion that would encompass the construction of an underground mine and a new concentrator at Ngezi (ore is currently trucked to a concentrator plant at Selous for processing). Total mill throughput would rise to 3 million tonnes per year, increasing precious metals production to around 270,000 oz pgm plus gold per year. Trial underground mining began during the first quarter of 2003 and output and grades improved throughout the year.

In September 2003, Zimplats announced that it had entered into a heads of agreement with Needgate Investments (Pty) Ltd, a Zimbabwean empowerment consortium, under which Needgate would acquire up to a 15 per cent shareholding in the company by way of a new share issue. As of April 2004 financing discussions were continuing.

Expansion of the Mimosa mine (a 50:50 joint venture between Aquarius and Impala) continued rapidly during 2003. The operation milled 1.2 million tonnes of ore during the year, a more than three-fold increase compared with 2002. Output of pgm in concentrate totalled 106,000 oz, of which platinum accounted for 59,000 oz. These results reflected the first full year of operation of the company's enlarged concentrator. A feasibility study to assess a further doubling of production is due for completion by December this year.

Anglo Platinum's Unki project, located near Gweru on the Great Dyke, will encompass the development of a mine and concentrator capable of producing 58,000 oz of refined platinum at full capacity but first production is not expected until 2007.

PGM Supplies: Zimbabwe & Others		
	'000 oz	
	2002	2003
Platinum	150	225
Palladium	170	250
Rhodium	10	15