

## IMPALA PLATINUM HOLDINGS

METALS &amp; MINING

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## COMPANY REPORT

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## Mining in a difficult environment

*A deep discount on value*

Although operating environment is far from ideal, the intrinsic value of the group presents a strong buying opportunity when considering numerical simulations for the mining real basket price per 4E refined Oz (with 20% probability of a maximum of 1575 USD, 40% probability of a medium of 879 USD and 40% probability of a minimum of 556 USD), the USD/ZAR exchange rate (with a 35% probability of a high exchange rate differential of 6,49%, a 40% probability of a medium exchange rate differential of 5,48% and a 25% probability of a low exchange rate differential of 4,50%), operational scenarios (with a 20% probability of success in ongoing cost reduction initiatives in South Africa and in Zimbabwe) and institutional scenarios (with a 15% probability of expropriation without compensation in South Africa and 55% in Zimbabwe).

Metal prices have been depressed from a high of a 4E refined oz basket price of 1555 USD in February of 2011 to a low of 754 USD in December of 2015 due to changes in economic expectations of growth in advanced economies (predicting in 2011 a 2016 real GDP growth of 2,4% and 1,90% in 2016<sup>1</sup>) and China (predicting in 2011 a 2016 real GDP growth of 9,5% and 6,50% in 2016<sup>2</sup>) and the build-up of significant above ground inventories (causing an increase of 1,082 kOz in refined platinum stocks and a surplus of 375 kOz of refined platinum in the market and a decrease of 299 kOz in refined palladium stocks and a deficit of 1572 kOz of refined palladium in the market) during the 5 months long South African mining strike of 2014 and are rising again at a 4E refined oz basket price of 888 USD while the USD/ZAR exchange rate has been artificially higher than anticipated (at a realized 15,20 USD/ZAR vs 11,95 USD/ZAR).

<sup>1</sup> IMF predictions in 2011 and 2016<sup>2</sup> IMF predictions in 2011 and 2016**Recommendation:** BUY

Vs Previous Recommendation HOLD

**Price Target FY16:** 137.13 ZAR

Price appreciation (149%)

**Price (as of 23-May-16)** 55.00 ZAR

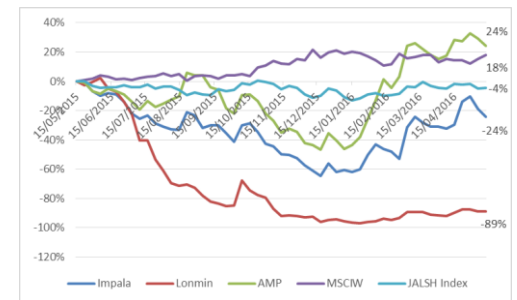
Bloomberg: IMP SJ

52-week range (ZAR) 22.27-72.15

Market Cap (ZARb) 41.787

Outstanding Shares (m) 734.778

Source: Bloomberg

**Impala Platinum Zar 12 months returns**

Source: Bloomberg

(Values in Zar millions)	2015A	2016E	2017F
Revenues	31301	33160	40129
EBITDA	534	4751	9669
Net Profit	-3243	-1658	-42
EPS	-5.07	-1.78	0.41
P/E	-283	1070	77
P/B	5.84	7.46	7.05
EV/EBITDA	8,83	68.05	36.36
Equity (as % of EV)	81,1%	95,5%	95,9%

Source: Company's reports, Analyst's estimates

THIS REPORT WAS PREPARED BY PEDRO DE OLIVEIRA ARAÚJO, A MASTERS IN FINANCE STUDENT OF THE NOVA SCHOOL OF BUSINESS AND ECONOMICS, EXCLUSIVELY FOR ACADEMIC PURPOSES. THIS REPORT WAS SUPERVISED BY ROSÁRIO ANDRÉ WHO REVIEWED THE VALUATION METHODOLOGY AND THE FINANCIAL MODEL. (SEE DISCLOSURES AND DISCLAIMERS AT END OF DOCUMENT)

- The success of anticipated cost reduction initiatives (5,3% in operating expenditures year over year and 47,6% in capital expenditure year over year) and especially the risks of expropriation in both South Africa and Zimbabwe are crucial to the evolution of the group value – with a 0% probability of expropriation the group would be priced at 275,54 against 0,00 with a 100% probability of expropriation and with a 0% probability of success of cost reduction the group value would be 102,16 against a value of 275,54 with a 100% probability of success of cost reduction.
- Management plan and implementation of production build up to 1628 kOz of refined platinum in FY2020 (from 1300 kOz of refined platinum in FY2015), closure of Impala's unprofitable 8 shaft and 12 shaft mechanized section, small reductions in the workforce (around 3% of employees and 15% of contractors) and increases in productivity is a positive development in operations
- The group has robust resources and reserves (2.662.600 tonnes as resources and 465.950 tonnes as reserves) and a long life of mine (136 years with current production levels), indicating that a significant amount of value is derived from long-term key drivers.
- The recent RBK transaction implies an Impala HDSA ownership of 18%, below the 26% South African government requirement, and increases the probability of expropriation (without compensation) of operations in South Africa to 15%.
- Policy directions on Zimbabwean indigenization law continue to change as Mugabe instructs that at least 75% of existing mining gross value is maintained inside the country in substitution for the 51% ownership for Zimbabweans in existing mining projects. This policy direction decreases the probability of expropriation (without compensation) of operations in Zimbabwe to 55%.

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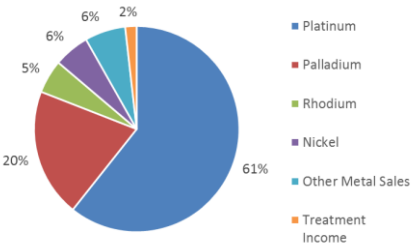
# Company overview

## Company description

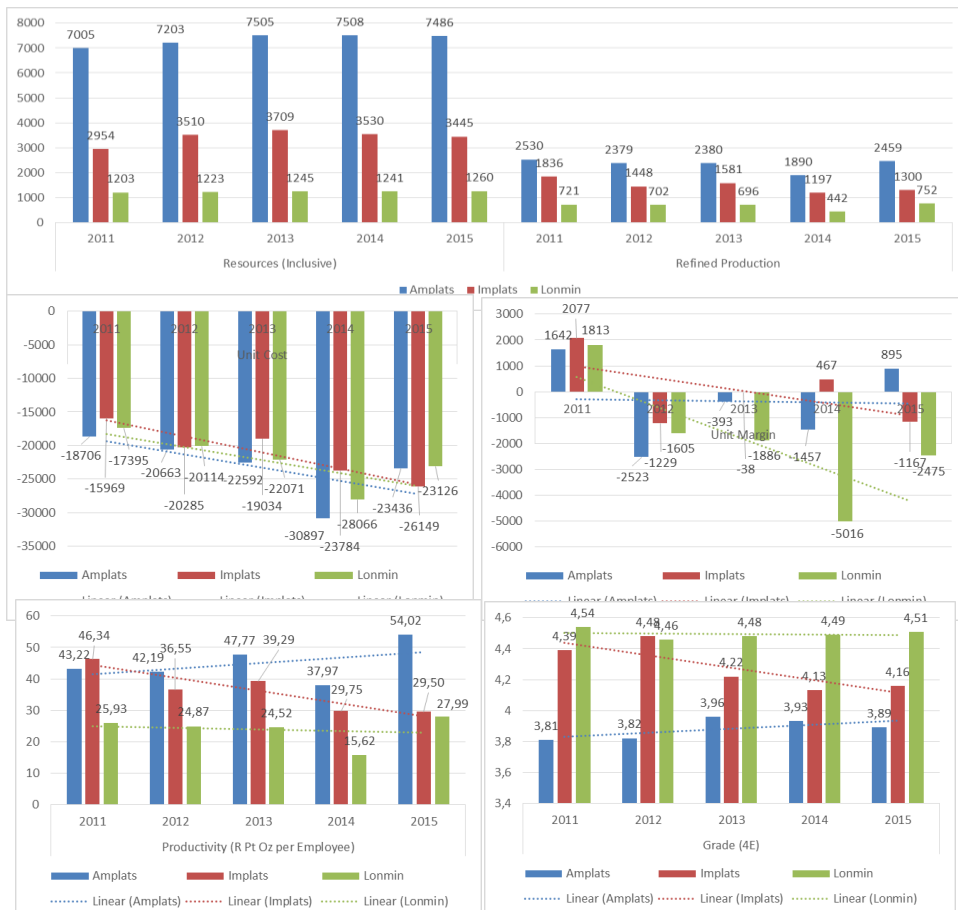
Impala Platinum Holdings (Implats) is a multinational group involved in the business of mining, refining and marketing Platinum Group Metals (PGMs) as well as nickel, copper and cobalt. Exhibit 1 shows the revenue decomposition per metal, with Platinum having a major role in the company sales as well as Palladium, Rhodium and Nickel.

Mining began in 1969 with a 100 kOz platinum operation at Implats flagship mine, Impala Platinum. Implats is currently the world's second largest player in platinum mining, selling approximately 22% of the world's supply of primary platinum and 1.300 refined platinum mOz in FY2015 with operations in South Africa and Zimbabwe. The other major industry players include Anglo American Platinum (selling 2,459 mOz of refined platinum in FY2015) and Lonmin Platinum (selling 0,752 mOz of refined platinum in FY2015). An historical comparison about the industry production, resources (inclusive of reserves), total unit cost, unit margin and productivity is provided in exhibit 2.

**Exhibit 1: Revenue decomposition per metal in FY2015 (Zar)**



**Exhibit 2: Industry Historical Comparison**



The industry has been facing decreasing margins due to a high total unit cost inflation, reductions in production, a decrease in unit revenues and lower productivity per employee.

The Impala group includes 3 mines in South Africa: Impala Platinum, Marula Platinum and Two Rivers (JV) and 2 mines in Zimbabwe: Zimplats and Mimosa (JV). Implats has also other interests in South Africa: a mining project (Afplats) and prospecting rights (Imbasa and Inkosi). Exhibit 3 compares the FY2015 production and resources (inclusive of reserves), total unit cost and unit margins of the above mentioned operating mining units.

Exhibit 3: Segment Comparison (FY2015)



Although Impala Platinum Holdings can be disaggregated in several business segments, each segment can be quite different from another, differing in the mining method<sup>3</sup>, in the ore composition<sup>4</sup> and in the completion of the refining

<sup>3</sup> Several operations use conventional methods while others are mechanized

<sup>4</sup> Some operations have a higher % of platinum (which has a higher selling price) or a higher nickel to platinum ratio than others

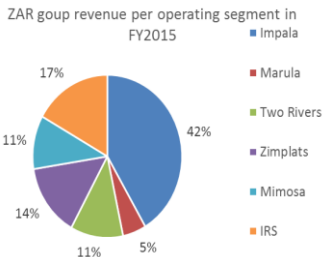
process – and thus displaying significant differences in total unit costs, productivity and unit revenue.

In addition to extract, process, smelt and refine its own metals, the group uses existent excess capacity to process, smelt and refine metals for third parties through the group refinery, Impala Refining Services (IRS), which has an installed capacity to refine 2.3 mOz of platinum. Exhibit 4 presents a revenue breakdown per operating unit, with South Africa generating 75% of the group’s revenue and Zimbabwe 25%.

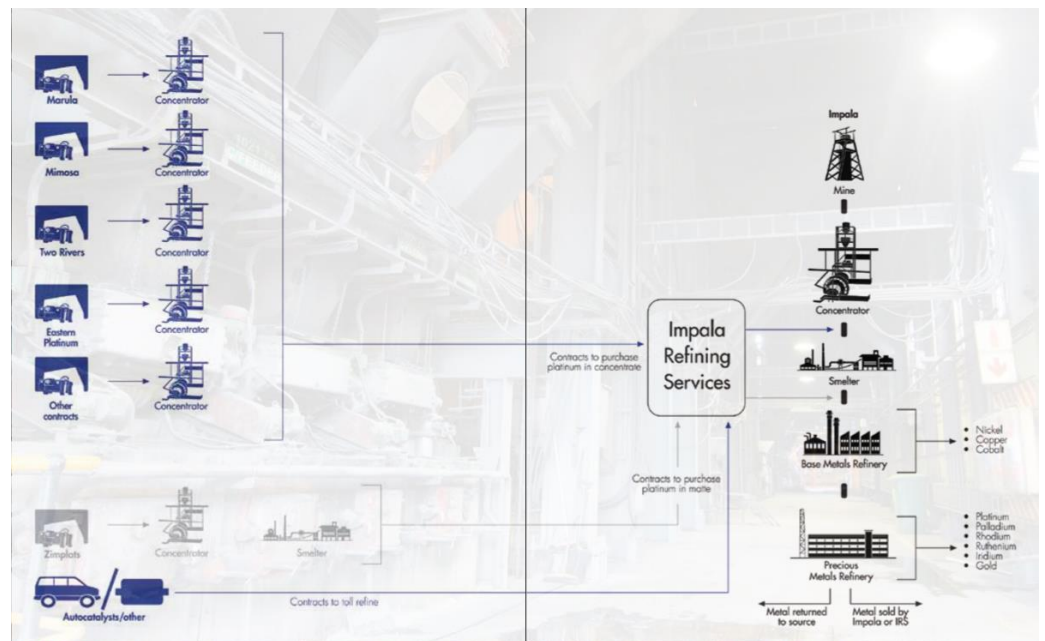
### Group Operations

As a producer of refined PGMs, Implats uses a number of complex processes that include extraction, conveying, crushing and milling<sup>5</sup> the ore in each mine to produce a concentrate<sup>6</sup> that will be subsequently smelted<sup>7</sup>, refined<sup>8</sup> and marketed to PGM consumers in the Automotive, Jewellery, Industrial and Investment sectors.

Marula, Two Rivers and Mimosa produce metal in concentrate and sell it to IRS. Zimplats produces metal in concentrate and also smelts it before selling it to IRS



Revenue per



for refining. IRS completes the refining process for the metal it receives from the

<sup>5</sup> The process of crushing mined ore in order to produce particles of different concentrations of metal and separate metallic particles from waste rock.

<sup>6</sup> The set of metallic particles separated from waste rock.

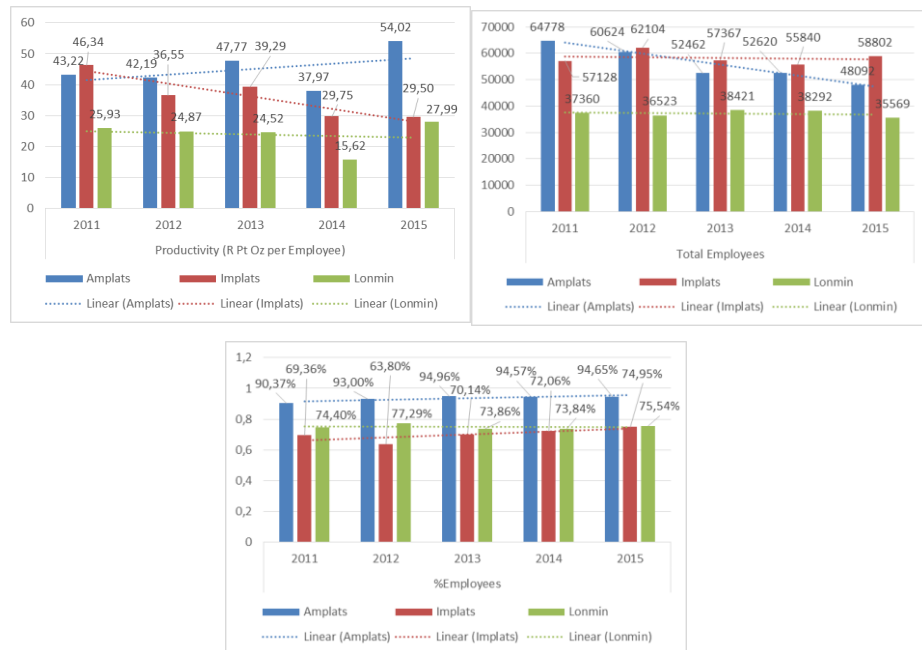
<sup>7</sup> The process in which the ore is heated beyond the melting point to obtain the fraction containing valuable minerals.

<sup>8</sup> The process of further purifying metals.

South African and Zimbabwean mines (and also external customers) and resells it to Impala, where it is sold along with Impala’s refined metal to the market.

In FY 2015, the group mined 22997 kT of ore, refined 1167 kOz of platinum from the mining segment and refined 133 kOz of platinum from external sources, in a total of 1300 kOz of platinum. Group concentrator recoveries<sup>9</sup> were 84.9% while smelting and refining recoveries<sup>10</sup> were 99.0% each. Implats had 44073 employees and 16626 contractors, with an associated productivity of 29 refined Oz of platinum per employee.

Exhibit 5: Industry Productivity Historical Comparison

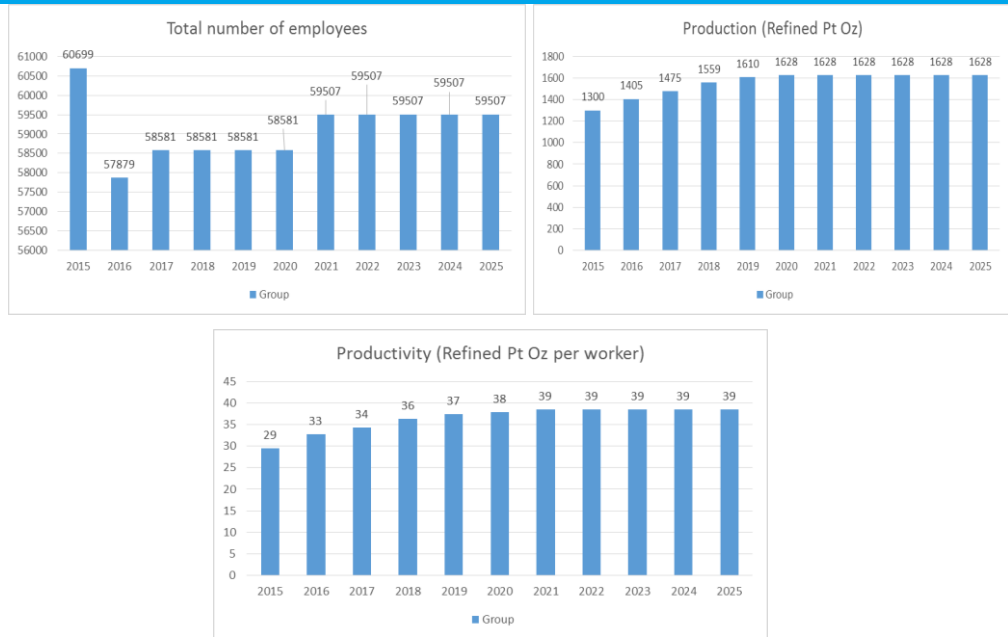


Production in FY2016 is expected to increase to 25237 tonnes of ore milled and 1405 kOz of platinum, with steady state being attained in FY2020, with 27761 tonnes of ore milled and 1628 kOz of platinum. Productivity per employee is anticipated to increase in FY2016 to 33 platinum ounces due to the simultaneous effect of the increase in production and decrease in the workforce to 42994 employees (and 14885 contractors) and will continue to increase to 38 platinum ounces per employee once the steady state is in FY2020.

<sup>9</sup> The percentage of mineral concentrate in the ore that is recovered by metallurgical treatment.

<sup>10</sup> The percentage of metal in matte in the concentrate that is recovered by smelting and the percentage of refined metal in the metal in matte that is recovered by refining.

**Exhibit 6: Industry Productivity Historical Comparison**

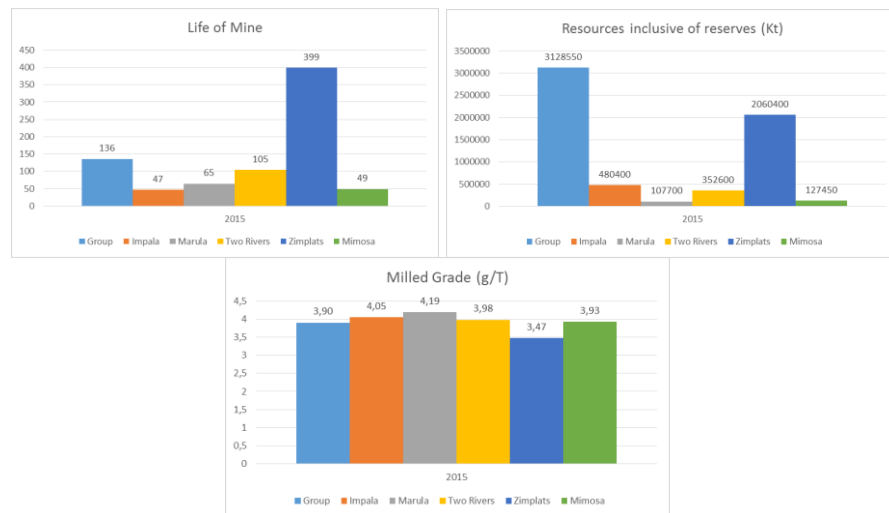


### Reserves and Resources Overview

The group has resources (inclusive of reserves)<sup>11</sup> of 3.128.550 tonnes, with 2.662.600 classified as a resource<sup>12</sup> with an overall 3,94 g/T 4E grade<sup>13</sup> and 465.950 tonnes as reserve<sup>14</sup> with a 3,75 g/T 4E grade.

Nevertheless, as shown in exhibit 7, if mining operations proceed at the current pace, the group reserves and resources will be depleted in 136 years.

**Exhibit 7: Mineralogical comparison of operating segments**



<sup>11</sup> Amount of resources (including the resources that can be classified as reserves)

<sup>12</sup> A mineral concentration or occurrence of an economically valuable material in or on the earth’s crust for which there are reasonable and realistic prospects for economic extraction and geological characteristic known or estimated

<sup>13</sup> A unit of measurement of metal content, expressed in grams per tonne. In this case Platinum, Palladium, Rhodium and Gold metal content per tonne of rock.

<sup>14</sup> The economically mineable material that can be extracted from resources including mining losses (diluting, contaminating, uneconomic and waste materials).

## Financial Analysis

Group total costs were 27345 rands per refined platinum ounce in FY 2015, which included 22933 rands per refined platinum ounce and capital expenditure of 4412 rands per refined platinum ounce, against a revenue of 24076 rands per refined platinum ounce. Profitability in FY2015 has improved to an operating margin<sup>15</sup> of -8.5% and a profit margin<sup>16</sup> of -10.36% and the group liquidity also improved to a current ratio<sup>17</sup> of 2.0 in FY2015. The group efficiency revealed an asset turnover<sup>18</sup> of 0.4 in FY2015 and solvability improved to display an interest coverage<sup>19</sup> of -8.9 and equity as 81,06% of the enterprise value at market value. Exhibit 8 displays a comparison between Impala Platinum Holdings and its peers.

**Exhibit 8: Industry Financial Analysis**



<sup>15</sup> Operating margin= Operating income/Revenues

<sup>16</sup> Profit margin=Net income/Revenues

<sup>17</sup> Current ratio=Current Assets/Current Liabilities

<sup>18</sup> Asset turnover=Revenues/Total assets

<sup>19</sup> Interest coverage ratio=EBIT/Interest expense

Group total unit costs are expected to decrease in FY2016, to 24085 rands per platinum ounce (with an unit operating cost of 21773 and an unit capital expenditure of 2311 rands per platinum ounce), before stabilizing in FY2020, to 27710 rands per platinum ounce (with an unit operating cost of 25141 rands per platinum ounce and unit capital expenditure of 2569 rands per platinum ounce). Profitability will continue to improve in FY2016, to an operating margin of 3.1% and a profit margin of -5.0% and in FY2020 the group is expected to show an operating margin of 26.5% and a profit margin of 16.5%. Liquidity will also increase in FY 2016, with a group current ratio of 2.6 and the improvement will continue until FY2020, to display a current ratio of 2.6. The group efficiency will decrease in FY2016 to 0.3, before increase gradually to 0.5 in FY2020 and solvability will improve to display an interest coverage of 3.6 in FY2016 and 4.7 in FY2020 and equity will decrease to 96.8% of enterprise value in FY2016 before stabilize as 97.1% in FY2020. Exhibit 9 presents the forecasted evolution of the groups' financial description in the short-term.

Exhibit 9: Group Financial Analysis and Forecast



## Shareholder structure

Impala Platinum Holdings is a mining group incorporated in South Africa and quoted in the Johannesburg Stock Exchange (JSE) and in the United States OTC markets through American Depositary Receipts (ADR) with an overall 57.9% free float. The remaining is privately owned, with three major shareholders, Coronation Fund Managers (18.8%), Public Investment Corporation (13%) and Royal Bafokeng Holdings (6.3%). The group also holds 2.6% in treasury shares as a result of a share buy-back program in prior years and the group employees hold 1.4% through the Morokotso Trust, an Employee Share Ownership Program (ESOP).

Impala Platinum Holdings has several subsidiaries, associates and joint ventures. In South Africa, Implats owns 96% of Impala Platinum Limited (Impala), with Impala's employees owning the other 4%; 100% of Impala Refining Services Limited (IRS; 74% of Afplats Proprietary Limited (Afplats), with the Bakwena community owning the other 26%; 73% of Marula Platinum Proprietary Limited (Marula), with Mmakau Mining, the Marula Community Trust and Tubatse Platinum holding a 9% interest each; and 50% of Two Rivers Platinum Proprietary Limited (Two Rivers), in a joint venture with Africa Rainbow Minerals (ARM) Platinum. In Zimbabwe, Implats owns 86.9% of Zimplats Holdings Limited (Zimplats) and 50% of Mimosa Investments Limited (Mimosa) in a joint venture with Aquarius Platinum Limited (Aquarius).

## Business Units

As previously explained, the group operating segments display considerable differences regarding the mining method, production targets and the degree of ore beneficiation they complete. A producer that refines metal will have higher costs and receive a higher price per ounce than a producer that only sells concentrate. Likewise, a producer that has mechanized operations will display a higher productivity per employee than a producer that has labour intensive operations and if production targets increase and the average productivity per worker conforms to its average, the same number of workers can mine more tonnes of ore and the producer will benefit from economies of scale.

A common misconception is that all mines are frequently seen as the typical example of real options in finance, although in reality mines do not always have the flexibility to adjust production in the short and medium term. Placing operations in care and maintenance can cause the termination of mining permits in several countries (including South Africa and Zimbabwe) and the cost of closing an operation and rehabilitating the land is very high. Therefore, at least in

the short to medium term, the objective of miners that do not have the desirable flexibility is to cover fixed costs with their operations.

- **Impala**

Impala currently mines 13 shafts in Rustenburg, using conventional breast methods, except for a section of one of the shafts in which mechanized board and pillar is employed. The mining complex extracts both UG2 ore<sup>20</sup> and Merinsky ore<sup>21</sup>, with most operations occurring at an average depth of 800 meters. In FY2015, production was 10223 tonnes of ore milled and 575 kOz of refined platinum, with concentrator recoveries of 87.4% and smelting and refining recoveries of 99.0% each. Average productivity increased to 18 Oz of platinum per employee and it employed 32536 employees (and 11302 contractors). Resources were 224600 tonnes, with an average 4E grade of 6.77 g/t and reserves were 255800 tonnes, with an average 4E grade of 4.02 g/t. Assuming planned production, the time to depletion was 25 years for reserves and 22 years for resources in a total of 47 years. The average total cost per platinum ounce was 29301 rands with an operating cost of 23574 rands and a capital expenditure per refined platinum ounce of 5727 rands, against average revenue per platinum ounce of 23250 rands.

Impala is recovering from a long lasting 5 month strike in 2014, unprecedented in the industry history that led to a full stop in operations. Build-up of production is expected to continue from 11244 tonnes of ore milled and 640 kOz of platinum in FY2016 to steady state of 13620 tonnes of ore milled and 830 kOz of platinum in FY2020. Total unit costs are also expected to adjust due, decreasing to 25702 rands per platinum ounce in FY2016 (following a lower unit operating cost of 22750 rands and a lower unit capex of 2952 rands) and stabilizing to 26129 rands per platinum ounce in FY2020 (with a unit operating cost of 22759 rands per platinum ounce and a unit capital expenditure of 3370 rands per platinum ounce). From FY2016 to FY2020 average productivity per employee will increase from 20 refined platinum ounces to 26 refined platinum ounces, reflecting the planned build up in production and reduction in the number of employees to (to a workforce composing 31562 workers and 9586 contractors). Exhibit 10 displays the forecasted evolution of the key operational and financial parameters for the Rustenburg operations.

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<sup>20</sup> A specific geological kind of ore present in South Africa

<sup>21</sup> A specific geological kind of ore present in South Africa

Exhibit 10: Impala Analysis



- Marula

Marula currently mines 2 decline shafts using conventional and hybrid methods that extract UG2 ore (although Merinsky ore is also present). Production in FY2015 was 1662 tonnes of ore milled and 74 kOz of platinum in concentrate, with concentrator recoveries of 86.4% and concentrate transported by road to IRS. Average productivity in FY2015 was 21 Oz of platinum per employee and it employed 3568 employees (and 811 contractors). Resources were 92300 tonnes, with an average 4E grade of 6.62 g/t and reserves were 15400 tonnes, with an average grade of 3.87 g/t. Assuming planned production, the current time to depletion was 9 years for reserves and 56 years for resources in a total of 65 years. The average total cost per platinum ounce was 24470 rands with an operating cost of 22459 rands and a capital expenditure per refined platinum ounce of 2011 rands, against average revenue per platinum ounce of 22228 rands.

Production is expected to increase to 1560 tonnes of ore milled and 85 kOz of platinum for FY2016 in steady state and total unit costs will decrease to 20501 rands per refined platinum ounce (with unit operating costs of 19971 rands per platinum ounce and unit capital expenditure of 529 rands per platinum ounce) while productivity per employee will increase to 24 ounces of platinum, which also reflects a minor decrease in the workforce with 3529 employees (and an increase in the number of contractors to 1149). Exhibit 11 presents the forecasted evolution of the key financial and operational parameters for Marula.

Exhibit 11: Marula Analysis



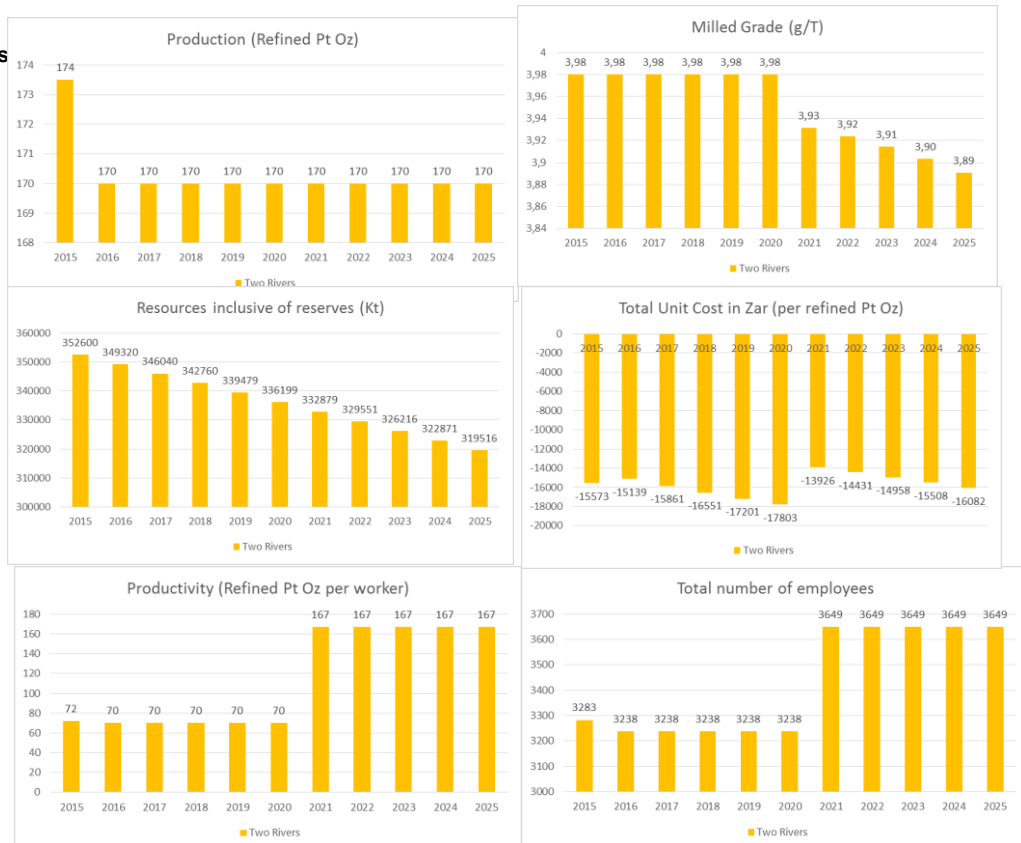
- Two Rivers

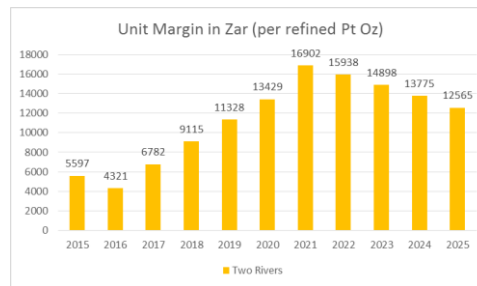
Two Rivers currently mines 2 decline shafts using fully mechanized board and pillar methods and extracts UG2 ore (although Merinsky ore is also present). Production in FY2015 was 3362 tonnes of ore milled and 174 kOz of refined platinum, with concentrator recoveries of 86.5% and concentrate transported by road to IRS. Average productivity has decreased to 72 Oz of platinum per employee and it

employs 2404 employees (and 879 contractors). Resources were 306900 tonnes, with an average 4E grade of 4.04 g/t and reserves were 45700 tonnes, with an average grade of 3.01 g/t. Assuming planned production, the current time to depletion was 14 years for reserves and 91 years for resources in a total of 105 years. The average total cost per platinum ounce was 15574 rands with an operating cost of 13280 rands and a capital expenditure per refined platinum ounce of 2294 rands, against average revenue per platinum ounce of 21170 rands.

Production in FY2016 is expected to reach steady state and decrease to 3280 tonnes of ore milled and 170 kOz of platinum for FY2016 and total unit costs are anticipated to decrease to 15139 rands per platinum ounce, comprising an unit operating cost of 12775 rands per platinum ounce and unit capex of 2364 rands per platinum ounce. Productivity per employee will also face a slight fall to 70 ounces of platinum, reflecting the minor decrease in production and the minor increase in the workforce to 2422 employees (and a decrease to 816 contractors). Exhibit 12 displays the forecasted evolution of the key financial and operational parameters for Two Rivers.

Exhibit 12: Two Rivers Analysis





▪ Zimplats

Zimplats currently explores 4 mines using mechanized board and pillar methods and the mining complex extracts MSZ ore to a depth of 240 meters. Production was 5164 tonnes of ore milled and 240 kOz of platinum, following the precautionary collapse of the Bimha mine and reopening of the open pit, with concentrator recoveries of 81.7% and smelting recoveries of 99.0%, with platinum in matte being transported to IRS. Average productivity was 75 Oz of platinum per employee and it employed 3214 employees (and 2605 contractors). Resources were 1956700 tonnes, with an average 4E grade of 3.36 g/t and reserves were 103700 tonnes, with an average 4E grade of 3.36 g/t. Assuming planned production, the current time to depletion was 20 years for reserves and 379 years for resources in a total of 399 years. The average total cost per platinum ounce was 24535 rands with an operating cost of 15236 rands and a capital expenditure per refined platinum ounce of 9299 rands, against average revenue per platinum ounce of 19445 rands.

Production on FY2016 is expected to reach steady state and increase to 6688 tonnes of ore milled and 280 kOz of platinum and total unit costs will decrease to 22174 rands, comprising operating unit costs of 19141 rands and unit capital expenditure of 3032 rands per platinum ounce. Productivity per employee will increase to 89 ounces of platinum following the increase in production and a slight decrease in the workforce to 3136 employees (and 2307 contractors).

Exhibit 13 presents the forecasted evolution of the key financial and operational parameters for Zimplats.

Exhibit 13: Zimplats Analysis



■ **Mimosa**

Mimosa currently mines a decline shaft using mechanized board and pillar methods and extracts MSZ ore<sup>22</sup> to a depth of 200 meters. Production in FY2015 was 2586 tonnes of ore milled and 117 kOz of refined platinum, with concentrator recoveries of 78.0% and concentrate transported by road to IRS. Average productivity was 85 Oz of platinum per employee and it employed 1394

<sup>22</sup> A specific geological kind of ore present in Zimbabwe

employees (and 8 contractors). Resources were 82100 tonnes, with an average 4E grade of 3.62 g/t and reserves were 45350 tonnes, with an average grade of 3.59 g/t. Assuming planned production, the current time to depletion was 18 years for reserves and 32 years for resources in a total of 49 years. The average total cost per platinum ounce was 22751 rands with an operating cost of 19336 rands and a capital expenditure per refined platinum ounce of 3416 rands, against average revenue per platinum ounce of 29174 rands.

Production is currently planned at 2465 tonnes of ore milled and 110 kOz of platinum for FY2016, with steady state from FY2018 onwards of 3205 tonnes of ore milled and 143 kOz of platinum. The workforce will face a minor reduction to 1388 employees (and 6 contractors) and productivity will decrease in FY2016 to 79 platinum ounces per employee, as a consequence to the decrease in production and increase to 103 ounces per employee at steady state. Exhibit 14 displays the forecasted evolution of the key financial and operational parameters in Mimosa.

Exhibit 14: Mimosa Analysis



▪ Impala Refining Services

IRS refines 725 kOz of platinum, 133 kOz of platinum from external sources and 592 kOz of platinum from Marula, Two Rivers, Zimplats and Mimosa, with smelting and refining recoveries of 99% each. The refining branch of the group has an unit operating cost of 23793 rands per platinum ounce against a revenue of 25961 rands per platinum ounce and employed 957 employees (and 1021 contractors), displaying a productivity per employee of 758 platinum ounces.

As the other mines are adjusting production, IRS will refine 765 kOz of platinum in FY2016 and reach steady state in FY2018 with 798 kOz of platinum refined. Unit costs will express a minor decrease to 23126 rands per platinum ounce and increase to 29873 rands in FY2018, against a projected revenue of 24489 rands per platinum ounce in FY2016 and 31993 rands per platinum ounce in FY2018. Exhibit 15 presents the forecasted evolution of the key financial and operational parameters in Impala Refining Services.

Exhibit 15: IRS Analysis



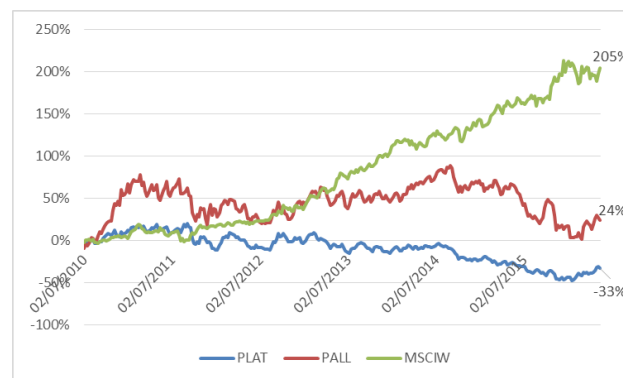
## PGM Mining Sector

The PGM mining sector faces a challenging environment that will continue to shape the industry in the short to medium future. Prices will remain lower for longer in the medium term and necessary cost reductions will create tension between an industry desperately needing to adapt in an environment of historical depressed commodity markets, workers demanding better compensation, prolonged constrains in energy supply, governments with empowerment and political agendas and unions calling for higher employment.

### Low Commodity Prices

All major commodities have been experiencing cumulative historical nominal lows for the past two years and prices are being depressed because of several micro and macroeconomic factors.

**Exhibit 16: 5 Year returns on Platinum, Palladium and the MSCI World**



As supply remained uninterrupted during the 2014's South Africa historically long strike and expectations about world economic growth decreased, particularly in areas that account for large segments of PGM demand such as China (jewellery) and the EU (auto catalyst), the market realised that there were significantly higher than expected above ground inventories. Above ground inventories have since decrease and were also impacted by prospects of higher real interest rates in the US (as low real interest rates provide an incentive to hold inventories of real assets<sup>23</sup>).

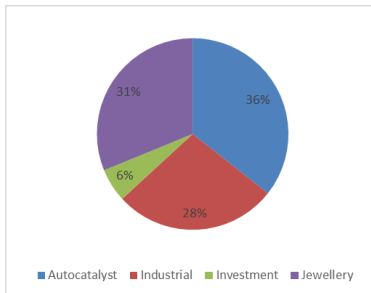
In the medium to long run however, projections show a prolonged deficit in demand that is expected to positively impact prices as macroeconomic growth stabilizes, demand for the major PGM segments picks up and supply remains

<sup>23</sup> See the mechanisms presented in <https://www.hks.harvard.edu/fs/jfrankel/CP.htm>

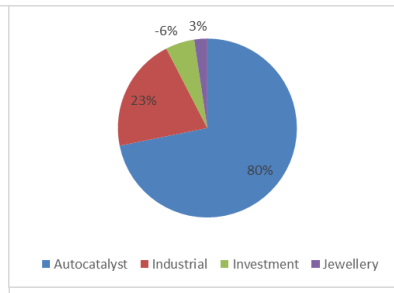
stable due to closures in high cost shafts/mines, reductions in capex and replacement production of new shafts/mines.

The platinum group metals (PGM's) include platinum, palladium, rhodium, osmium, ruthenium and iridium and occur together in nature alongside with nickel and copper. Although other metals have some similar properties, PGM's have a unique combination of physical and chemical characteristics<sup>24</sup> that make them particularly useful in several automotive, jewellery and industrial applications. Exhibits 17 to 19 show the relative importance of these industries in PGM global demand, where the automotive industry and to a lesser extent industrial applications play a major role in all PGM's and jewellery and investment are also significant but more specific to Platinum and Palladium.

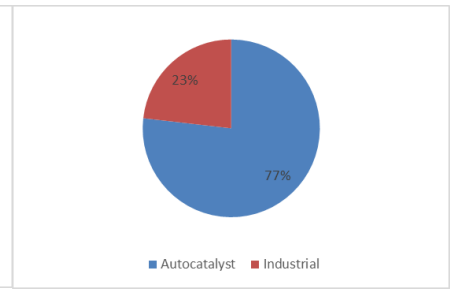
**Exhibit 17: Platinum net demand in FY2015 (%)**



**Exhibit 18: Palladium net demand in FY2015 (%)**

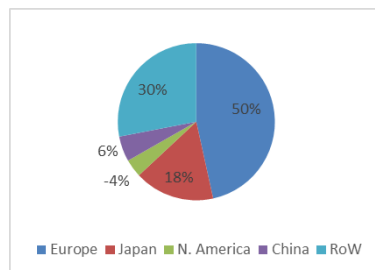


**Exhibit 19: Rhodium net demand in FY2015 (%)**

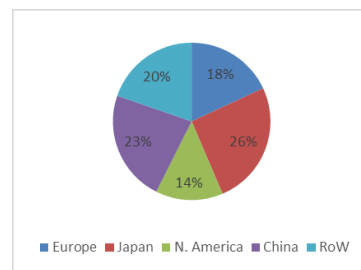


As the major source of demand for PGM's, the automotive industry uses platinum, palladium and rhodium in catalytic converters, devices fitted to motorcycles, cars and trucks that reduce levels of carbon monoxide, hydrocarbons and oxides of nitrogen to legislated levels. Developed economies and many emergent economies are and have been adopting higher standards in order to reduce

**Exhibit 20: Automotive Platinum demand in FY2015 (%)**



**Exhibit 21: Automotive Palladium demand in FY2015 (%)**



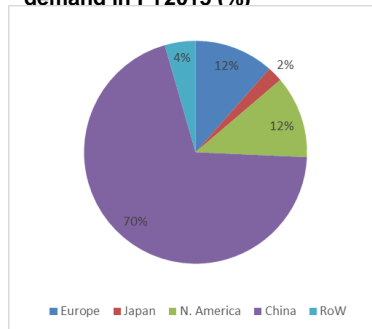
pollution since the US and Japan first applied clean air legislation in 1975. Exhibits 20 and 21 present a breakdown of automotive demand per geographic segment, in which is clear that Platinum is highly concentrated in Europe due to the high

<sup>24</sup> PGM's have a high and specific catalytic activity, high thermal resistance, are chemically inert, biocompatible and are hard but malleable for forming into shapes.

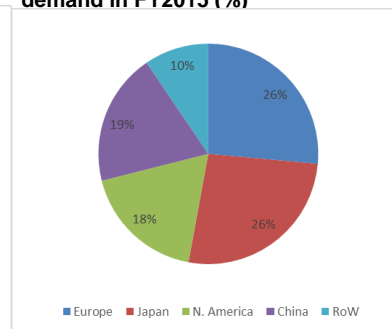
popularity of Diesel vehicles that use higher loads of Platinum while Palladium is more diversified geographically, although with a high concentration of net demand in Asian segments<sup>25</sup>.

The jewellery industry is the second major source of demand for PGM's as these metals are strong and permanently retain their shape, do not fade or tarnish and are anti-allergic. Modern platinum jewellery emerged in Japan in the 1960's, with Europe and the US following in later decades. Palladium is also used as an alternative to platinum jewellery and rhodium is occasionally used on white gold as a plating material. Exhibit 22 and 23 shows the importance of each geographic segment in platinum jewellery demand, where China plays the dominant role, and palladium jewellery demand, a market considerably smaller and more concentrated around Japan and Europe.

**Exhibit 22: Jewellery Platinum demand in FY2015 (%)**

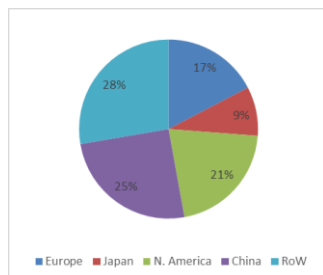


**Exhibit 23: Jewellery Palladium demand in FY2015 (%)**

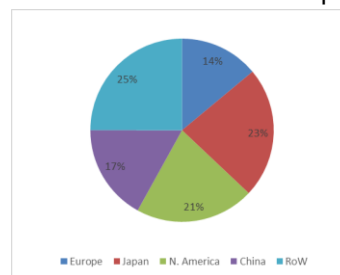


The industrial demand for PGM's is composed by chemical, petroleum, electrical, glass and medical applications, with PGM's used as industrial catalysts, containers or biocompatible materials. Exhibit 24 and 25 present a breakdown of industrial demand per geographic segment, with Platinum more concentrated in China and North America while Palladium is more concentrated in Japan and North America.

**Exhibit 24: Industrial Platinum demand in FY2015 (%)**



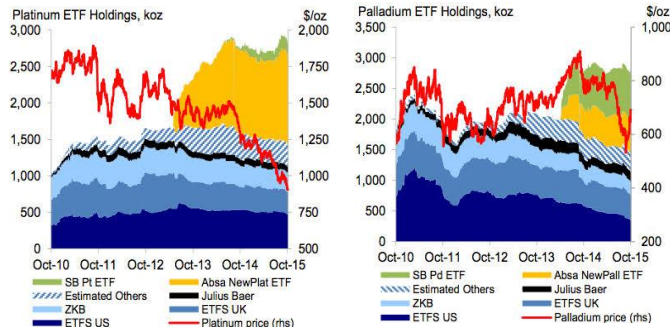
**Exhibit 25: Industrial Palladium demand in FY2015 (%)**



The investment demand for PGM's is more volatile and moves according to PGM prices and investor strategies. The investment segment is also factored in price

<sup>25</sup> The most recent data for Rhodium net demand per geographic segment (2013) shows figures similar to the palladium autocatalytic segment

determination along with global stocks. Although it is not absorbed as an end-use it can return to the market acting as a bridge between demand and supply and is thus considered as an above ground stock. According to estimates from SFA (Oxford), global ETF holdings are around 2,8 mOz for platinum, 2,9 mOz for palladium and 105 kOz for rhodium.<sup>26</sup>



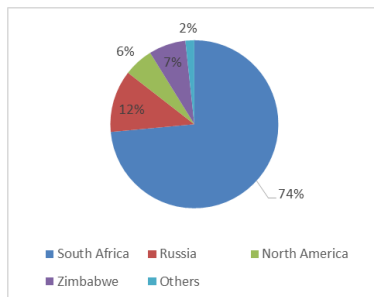
**Exhibit 26: Global Platinum ETF holdings in FY2015**

**Exhibit 27: Global Palladium ETF holdings in FY2015**

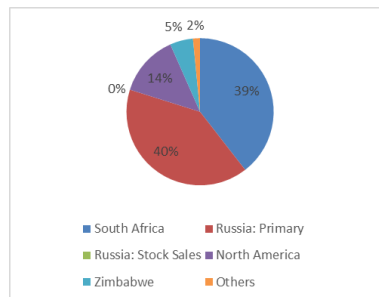
PGM can be found in mineral resources of dedicated producers and in mineral resources of copper and nickel producers. The global PGM mineral resources (inclusive of mineral reserves) are highly concentrated in South Africa (75% of global PGM resources) with Russia and Zimbabwe also having significant resources (12% of global PGM resources each).

Nevertheless only South Africa and Zimbabwe mine PGM as a main product – Russia mines Nickel as the main product and therefore the economies of both mining industries cannot be directly compared. Exhibits 28 to 30 present the 2015 global supply for platinum, palladium and rhodium, in which is clear that production is strongly concentrated in South Africa, with Russia also having an important role in palladium.

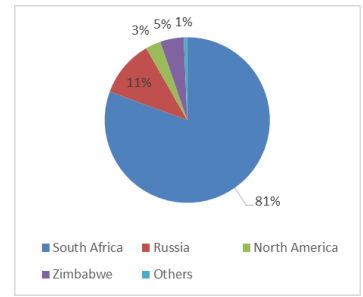
**Exhibit 28: Global Platinum Supply in FY2015 (%)**



**Exhibit 29: Global Palladium Supply in FY2015 (%)**

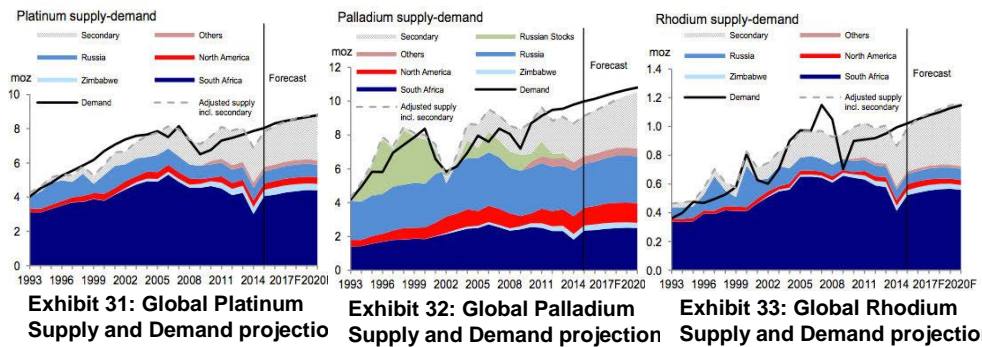


**Exhibit 30: Global Rhodium Supply in FY2015 (%)**



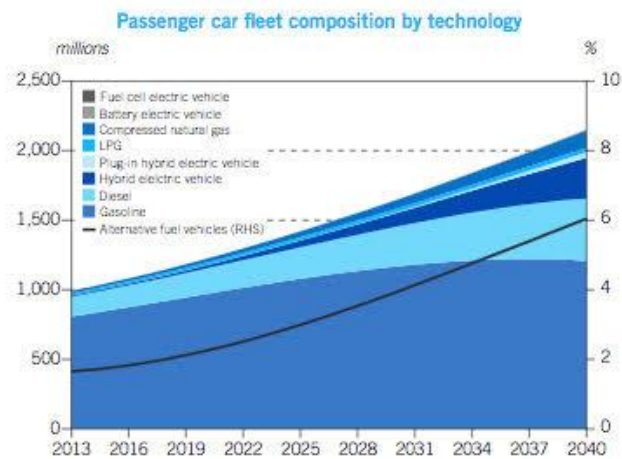
<sup>26</sup>Data in October of 2015 for Platinum and Palladium and August of 2015 for Rhodium

A global supply and demand outlook forecasted from SFA (Oxford) is present in exhibits 31 to 33 and suggests that the market for platinum and rhodium will be in equilibrium while palladium will display excess demand.



### Demand risks

As all commodities, PGM’s face demand risks such as being substituted for other materials because of differences in price or changes in the underlying markets of industries that use PGM’s. Nonetheless, the combination of their unique characteristics makes price substitution relatively imperfect (the closest substitutes to PGM’s are actually other PGM’s) and not only changes in existing industries are improbable in jewellery, investment and industrial applications (while demand is expected to grow due to demographic and macroeconomic factors) but even in the automotive industry, which is expected to experience significant changes in advanced economies (with an anticipated moderate substitution of conventional energy vehicles that use PGM’s to electric vehicles, currently seen as the stronger option, that do not use PGM’s or fuel cell powered vehicles that need PGM’s to operate), significant growth in developing markets (especially due to a rise in market penetration and an increased focus on environmental concerns) will balance PGM demand for the automotive segment.



**Exhibit 34: Passenger Car fleet composition by technology**

## Supply risks

PGM's also face supply risks as short and long-term production can be erratic and even unreliable either because of unsustainable changes in metal prices or constrains in the quantities of inputs necessary to operate a mine (such as the availability, quality and cost of employees, materials, utilities, ore deposits and capital) as well as the institutional environment of the countries and communities where the mines operate (with the government managing and ensuring mining legislation and unions commanding industrial action).

Workers are generally low qualified and many workers are foreign migrants, often having to provide for several people in their families, while living in difficult conditions (especially regarding housing and financial stability) and facing both non work related health risks (such as HIV and Tuberculosis) and occupational health risks (such as noise induced hearing loss). In recent years wages and compensation have been increasing at a consistently higher rate than the South African CPI while productivity has been decreasing (although the cause of this decrease is mainly associated with lower volumes and changes in the composition of the mined ore). This is especially problematic as the prices of other inputs necessary to mining have been increasing and commodities prices decreasing and questions the sustainability of the industry.

Utilities can become under stress as both South African and Zimbabwean electricity supply is sometimes erratic and curtailments can occur sporadically as demand surpassed supply and created insufficient generating capabilities. The problem is exacerbated because existing power plants and the power grid are old and in need of scheduled and unscheduled maintenance and the supply of energy sources (coal, diesel and water) is sometimes interrupted and its inventory damaged, thus further decreasing the existing supply capabilities. The energy crisis will continue to be solved at least until 2020 in South Africa and 2030 in Zimbabwe. In both countries, the electricity suppliers are requiring above CPI increases in prices to cover the required maintenance and construction of new facilities and major industrial customers can be asked to decrease consumption to up to 20% in South Africa and 25% in Zimbabwe. This can not only constrain production but also increase the cost of extraction as mines will have to use backup generators to produce electricity while the power is down.

Ore deposits have been consistently mined in South Africa and as the best deposits (shallow mines and high grade ore) became or are becoming depleted, new mines keep getting deeper and presenting lower grades, becoming more utility and labour intensive and further increasing mining costs. In Zimbabwe there

is also an extensive resource base, nevertheless the political environment constrains current mining operations and blocks further investments. Furthermore, as mining companies have been aggressively reducing capital expenditures in order to protect their balance sheets, the transformation of resources in reserves is being delayed.

The capital has become costlier to raise, as the industry credit risk has been increasing and the industry still faces a challenging environment. Nevertheless, existing mines have been able to raise capital (issuing equity and improving debt facilities) and protect their balance sheets and in the event of capital needs unfulfilled by the market there is the belief that the state or state related corporations will supply the necessary capital (as long as the fundamentals remain stable).

South Africa is ruled by a socialist party since the end of the apartheid in 1994 and legislation has been passed to ensure better living conditions and safety standards for employees and minimize and limit environmental damages caused by the mining industry. The government also pushed for positive discrimination of historically disadvantaged South Africans (HDSA, regarding race and gender) through compliance with specified levels of ownership and management participation in mining operations, involvement in the supply chain, human resources development (regarding skills and health), employment equity and integrated socio-economic development for host and labour sending communities (with an emphasis on infrastructure) at all times. The legislation that covers mining licenses has also been changed, converting indefinite-term licenses into 30 years renewable licenses subject to continued operations and compliance with community development, environmental protection and employee safety and employment (which makes it harder to fire employees and place operations in care and maintenance).

Zimbabwe has been ruled by a nationalist autocrat since its independence in 1980 and legislation has been passed to compensate indigenous Zimbabweans through compliance with a 51% target ownership in mining and a 50% procurement to local suppliers. Recent clarifications of the law stated that if no indigenous Zimbabweans were available the ownership would be transferred to government-designated entities and that noncompliance would be subject to a 10% levy on the business revenues (suggesting that if no levy is paid 51% of ownership will be ceded). Nevertheless the Zimbabwean president stated that if existing mining projects complied with maintaining at least 75% of gross value inside the country an exemption would be granted. Further clarification remains necessary as the law is silent on the ownership structure in case of a new capital injection. Existing

legislation outlines indefinite-term licenses and the expropriation of mining locations not being worked or developed. The law also imposes a 15% levy on unbeneficiated metal exports, however the implementation of this levy was delayed until 2017. The leader of the ruling party is anticipated to remain in power until he dies (he is currently 92 years old). His succession is undecided and he has the habit of letting several factions battle each other and ousting the winner when he is weakened. In the moment Zimbabwe is trying to become closer to the international community in order to recover its failing economy, nevertheless it is unclear as if the country will eventually become more mining friendly or if the succession will increase the difficulties for miners operating in the country.

In South Africa, labour relations can become difficult, especially in years of wage negotiations. In past years, the mining community has evolved from a single major union (with links to the ruling party) to two unions with major expression in the work force. This has led the unions to a more aggressive competition for workers and stronger demands and industrial actions when negotiating with mines (for instance, the 5 month strike of 2014). Unions typically struggle to maintain employment and attain better wage and compensation conditions but as mines are closing unprofitable shafts and cutting capital expenditure, unions will be more focused on employment and will probably settle for a moderately lower employment with a moderately higher remuneration. In Zimbabwe labour disputes are calmer as the government is authoritarian, the unemployment is abnormally higher than in South Africa and the economy is collapsing under the unrealistic economic policies of the regime.

These risks are exacerbated with low commodity prices, as producers have an increased necessity to reduce operating costs in order to stay profitable, diminish capital expenditures (reducing production in the medium term) and close lossmaking shafts (reducing production in the short term) or erode their balance sheets and wait for the market fundamentals to be incorporated in commodity prices.

## Competitive Strategy

On one hand there are senior miners who set large production targets with the aim of benefitting from economies of scale (producing at lower unit costs) and economies of scope with the purpose of capturing value from the whole beneficiation process (from extracting the ore to refining the metal), forgoing some flexibility to adjust operations when basket prices change. These miners have a high upside and thrive in environments of high basket prices nevertheless face high fixed costs and high pressure from the government and unions to maintain

high production targets and employment, so when basket prices decrease adjust their production and costs at a slower pace that desirable.

Among senior miners, there is Anglo American Platinum (the world largest PGM producer), Lonmin (the third largest PGM producer), Impala Platinum Holdings (the second largest PGM producer) and Sibanye Gold (a new player in the industry) and their differences reside in the flexibility and speed of adjustment and in the quality of their assets. Anglo American Platinum decided to sell or place high cost mines in care and maintenance programs, Lonmin is under a heavy restructuring program in order to continue operations and lower its leverage to healthier levels and had to close or place unprofitable shafts in care and maintenance and dismiss 6000 employees while raising equity in an unfulfilled rights issue that was only completed through the intervention of the South African sovereign fund and Impala Platinum Holdings also raised equity in order to complete several key capital expenditure initiatives, closed several unprofitable shafts, reallocated 1600 employees to perform contractor jobs that were terminated and is implementing several operating cost reduction initiatives targeting a mining inflation of CPI -2%. Sibanye Gold who has a reputation of being capable to consistently lower operating costs in old gold labour intensive mines and is in the process of completing several acquisitions of Anglo American Platinum mines (and a refinery) and Aquarius Platinum, as an opportunity to enter the PGM industry in a low price environment and building a significant production capacity in the PGM mining industry.

## Macroeconomic Environment

South Africa and Zimbabwe are impoverished countries with a lot of potential to improve. Nevertheless they are packed with structural bottlenecks in the supply of energy, health and education services. Living conditions can be low in both countries and unemployment is high, as well as inequality.

### South Africa

South Africa has a population of 53.6 million people<sup>27</sup> (growing at a rate of 1.33%<sup>28</sup> per year) with a life expectancy at birth of 62.34 years<sup>29</sup>. Real GDP growth is forecasted to be 1.3%<sup>30</sup> with an inflation of 5.9%<sup>31</sup> (converging into a

<sup>27</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>28</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>29</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>30</sup> IMF

<sup>31</sup> IMF

real GDP growth of 2.6%<sup>32</sup> and an inflation of 5.5%<sup>33</sup> in 2020) and while government revenue is 29.5%<sup>34</sup> of GDP, the overall deficit is 3.7%<sup>35</sup> (converging to 3.1%<sup>36</sup> in 2020), gross debt is 49.8%<sup>37</sup> (forecasted to rise to 54.3%<sup>38</sup> in 2020) and the current account is expected to be -4.5%<sup>39</sup> (-4.0%<sup>40</sup> in 2020).

South Africa has an unemployment of 25.9%<sup>41</sup> and a total dependency ratio of 52.1%<sup>42</sup> (with a youth dependency ratio of 44.5%<sup>43</sup> and an elderly dependency ratio of 7.7%<sup>44</sup>). The country has a Gini index of 62.5<sup>45</sup> (the lowest 10% hold 1.2% of wealth while the highest 10% hold 51.7%<sup>46</sup>) and 35.9% of its population live below the poverty line<sup>47</sup>. 64.8% of South Africans live in urban areas<sup>48</sup> and while 93.2% have access to improved drinking water sources<sup>49</sup>, 66.4% have access to improved sanitation facilities<sup>50</sup>.

South Africa expends 8.9%<sup>51</sup> of GDP in healthcare and 6.2%<sup>52</sup> in education. While the maternal mortality rate is 138 deaths per 100000 live births<sup>53</sup> and the country has 8.7% underweight children under 5 years old<sup>54</sup>, the literacy rate is 94.3%. There are 0.78 physicians per 1000 people<sup>55</sup> and the HIV adult prevalence rate is 18.92%<sup>56</sup>. While 1.2% of GDP is expended with the military<sup>57</sup>, there is freedom of press, 150 mobile cellular subscriptions per 100 habitants<sup>58</sup> and 46.9% of the population is an internet user<sup>59</sup>.

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<sup>32</sup> IMF

<sup>33</sup> IMF

<sup>34</sup> IMF

<sup>35</sup> IMF

<sup>36</sup> IMF

<sup>37</sup> IMF

<sup>38</sup> IMF

<sup>39</sup> IMF

<sup>40</sup> IMF

<sup>41</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>42</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>43</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>44</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>45</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>46</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>47</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>48</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>49</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>50</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>51</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>52</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>53</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>54</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>55</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>56</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>57</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>58</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>59</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

Although South Africa is seen as one of the most important industrial countries in Africa, it is still an emergent market and is subject to emergent market risks such as expropriation without compensation, problems with infrastructure and energy. Furthermore, as living and health conditions are low and unemployment and inequality are both high, the social and political structure of society can sometimes be unstable.

## Zimbabwe

Zimbabwe has a population of 14.2 million people<sup>60</sup> (growing at a rate of 2.21%<sup>61</sup> per year) with a life expectancy at birth of 57.05 years<sup>62</sup>. Real GDP growth is expected to be 2.4%<sup>63</sup> with an inflation of 0.0%<sup>64</sup> (converging into a real GDP growth of 3.4%<sup>65</sup> and a 2.2%<sup>66</sup> inflation in 2020) and while government revenue is 27.0%<sup>67</sup> of GDP, the overall deficit is 0.5%<sup>68</sup> (converging to -0.5%<sup>69</sup> in 2020), gross debt is 57.5%<sup>70</sup> (forecasted to decrease to 55.0%<sup>71</sup> in 2020) and the current account is expected to be -21.8%<sup>72</sup> (-2.6%<sup>73</sup> in 2020).

Zimbabwe has an unemployment of 95%<sup>74</sup> and a total dependency ratio of 80.4%<sup>75</sup> (with a youth dependency ratio of 75.0%<sup>76</sup> and an elderly dependency ratio of 5.3%<sup>77</sup>). The country has a Gini index of 50.1<sup>78</sup> (the lowest 10% hold 2.0% of wealth while the highest 10% hold 40.4%<sup>79</sup>) and 72.3% of its population live below the poverty line<sup>80</sup>. 32.4% of Zimbabweans live in urban areas<sup>81</sup> and

<sup>60</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>61</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>62</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>63</sup> IMF

<sup>64</sup> IMF

<sup>65</sup> IMF

<sup>66</sup> IMF

<sup>67</sup> IMF

<sup>68</sup> IMF

<sup>69</sup> IMF

<sup>70</sup> IMF

<sup>71</sup> IMF

<sup>72</sup> IMF

<sup>73</sup> IMF

<sup>74</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>75</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>76</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>77</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>78</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>79</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>80</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>81</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

while 76.9% have access to improved drinking water sources<sup>82</sup>, 36.8% have access to improved sanitation facilities<sup>83</sup>.

Zimbabwe expends 2.0% in education<sup>84</sup> and the literacy rate is 86.5%<sup>85</sup>. While the maternal mortality rate is 443 deaths per 100000 live births<sup>86</sup> and the country has 11.2% underweight children under 5 years old<sup>87</sup>, there are 0.08 physicians per 1000 people<sup>88</sup> and the HIV adult prevalence rate is 16.74%<sup>89</sup>. In Zimbabwe there are 86 mobile cellular subscriptions per 100 habitants<sup>90</sup> and 19.5% of the population is an internet user<sup>91</sup>. 2.79% of GDP is expended with the military<sup>92</sup> and the government owns all local media players. There is political repression and frequent occurrences of electoral violence.

The question of Mugabe's succession is a major unknown in the political, social and economic situation of Zimbabwe. The economic policies of the regime have frequently been confusing and erratic. Under his rule the country became isolated and in a desperate economic state with a colossal unemployment and significant infrastructure and energy problems.

## Valuation

### Methodology

Impala Platinum Holdings was valued using a sum of the parts nominal valuation in South African rands. Impala, Marula, Two Rivers, Zimplats and Mimosa (the operating segments) were valued using an explicit<sup>93</sup> nominal DCF approach (with foreign operations valued using the forward rate method) and Afplats, Inbasa and Inkosi (the non-operating segments) were valued using a multiple approach based on the former explicit valuation of existing mines and the segment resources (inclusive of reserves).

All mining projects were valued using an adjusted quantity of reserves and resources (as there are differences in the probability of existence ore in each

<sup>82</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>83</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>84</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>85</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>86</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>87</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>88</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>89</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>90</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>91</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

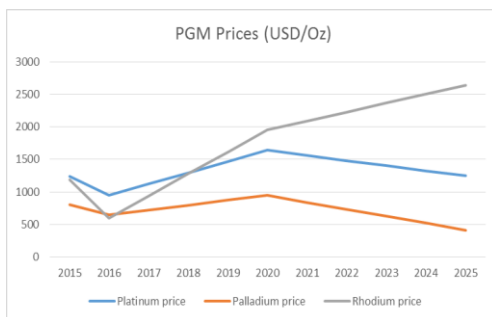
<sup>92</sup> CIA factbook - [https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region\\_afr.html](https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_afr.html)

<sup>93</sup> As mining operations are considered projects, each segment must be valued until it becomes worthless or until its resources (inclusive of reserves) cease to exist.

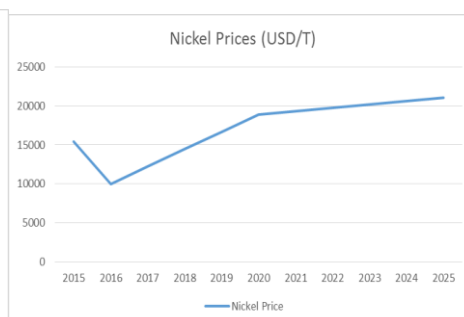
class of resources and reserves)<sup>94</sup>. Resources were also converted into mineable production estimates using the implied modifying factors present in reserves<sup>95</sup>.

Commodity prices were modelled as the average analyst price forecast present in Bloomberg until 2020, converging in 2025 to the average real long-term price<sup>96</sup> (as we believe that the analysts forecasts are higher than sustainable in the long-term) and the exchange rate was modelled assuming relative purchasing power parity from 2014 (as since 2015 the rand had an abnormally higher depreciation against the dollar).

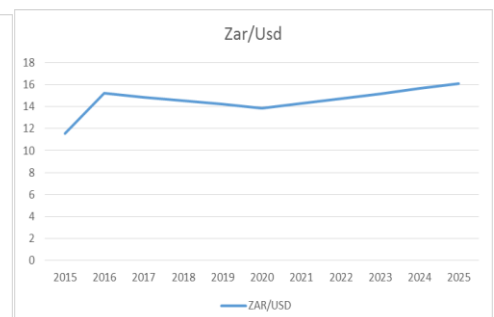
Exhibits 35 to 37 show the base case projections for the major PGM prices and the Dollar Rand exchange rate.



**Exhibit 35: PGM nominal price forecasts FY2015 to FY2025**



**Exhibit 36: Nickel nominal price forecasts FY2015 to FY2025**



**Exhibit 37: Zar/Usd forecast FY2015 to FY2025**

<sup>94</sup> Each category of reserves and resources will be minimized to reflect the minimum probability existence of each category of reserves and resources – the adjustment is 10% for inferred resources, 50% for indicated resources and probable reserves and 90% for measured resources and proved reserves.

<sup>95</sup> Resources values are discriminated in situ (as ore) and need to be converted to economically mineable estimates in order to reflect the losses in uneconomic ore and in the mining and beneficiation process necessary to extract the ore and refine it.

<sup>96</sup> Inflation adjusted metal prices in usd

## Scenarios

A numerical simulation was performed for the main financial and operational variables that have an impact in the intrinsic value of the group in the South African and in the Zimbabwe segments (the risk of expropriation without compensation, the prolonged success or failure of cost reduction initiatives, the value of the dollar PGM basket price and changes in the evolution of the dollar rand exchange rate). A base scenario was constructed assuming the success of cost reduction initiatives in South African and Zimbabwean operations and other scenarios were considered assuming possible combinations of expropriation of South African and/or Zimbabwean mines and/or the success of cost reduction initiatives for three states of dollar PGM basket price and of changes in the evolution of the dollar rand exchange rate, computing the state of the parameters using an uniform distribution in each state as an approximation of the empirical distribution<sup>97</sup>. A list of the considered scenarios, probabilities assigned for each variable state and the respective values are presented in the exhibit 38.

Exhibit 38:  
Operational and  
Financial States  
considered in  
the valuation

	Explanation	South Africa	Zimbabwe
<b>Expropriation</b>	Equity value is considered to be null	15%	55%
<b>Business as usual</b>	Equity value is computed	85%	45%
<b>Success of cost reduction initiatives (Base case)</b>	Short-term cost containment and long-term costs increase at inflation minus 2% (only applicable to non-expropriation scenarios)	20%	20%
<b>Failure of cost reduction initiatives</b>	Long-term costs increase at local inflation	80%	80%

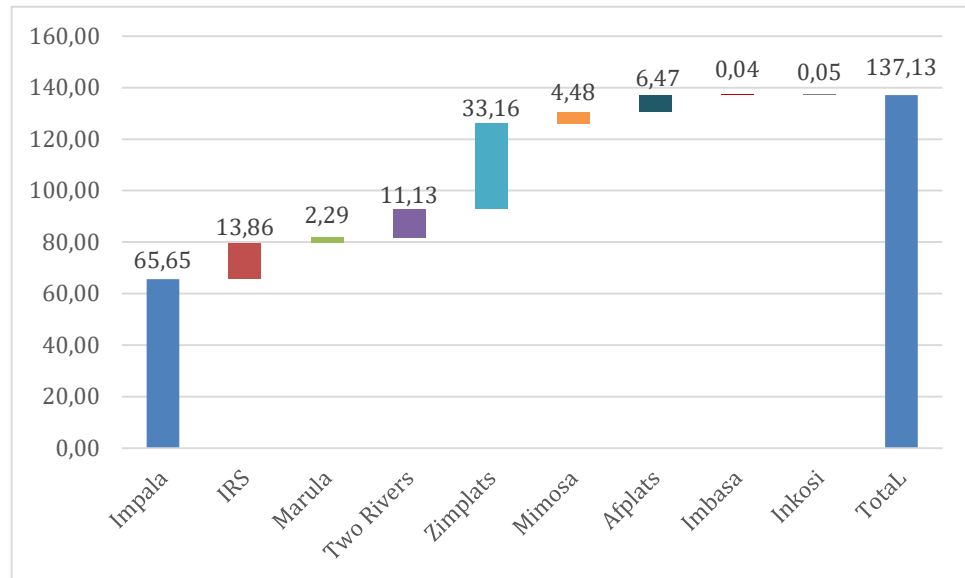
	Metal Prices		Exchange Rate	
	Probability	2025 basket value	Probability	2025 Exchange rate
<b>High</b>	20%	1939	35%	15,33
<b>Medium</b>	40%	1065	40%	16,11
<b>Low</b>	40%	743	25%	16,94

### Sum of the parts

Based on the aforementioned analysis, Impala Platinum Holding is valued at 137,13 rands, with the bulk of value derived from Impala (48%) and also Zimplats (24, with IRS (10%) and Two Rivers (8%) accounting for a smaller but considerable amount of value.

<sup>97</sup> The empirical distribution was computed with existing data on past real prices and past inflation differentials and variable states considered in the simulation were approximated using uniform distributions on segments of the empirical distribution. Each segment was created to have the above designated probability.

**Exhibit 39: Sum of the parts valuation for shares in Impala Platinum Holdings (Rands)**



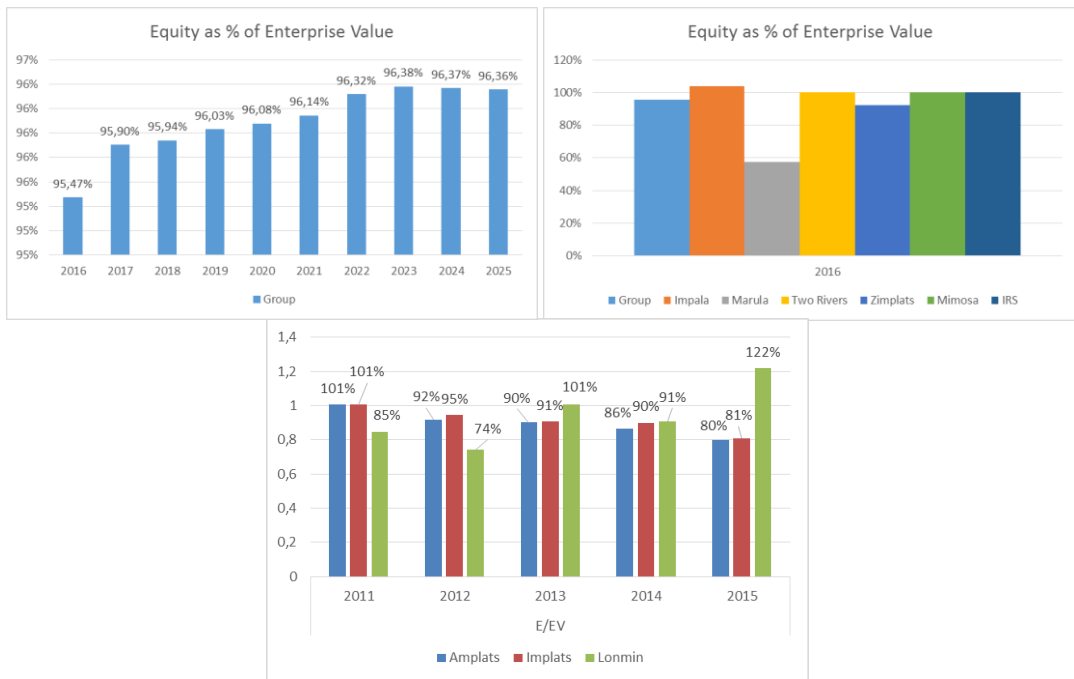
The probabilities of expropriation are very important to the valuation analysis as not only declare states were operating segments are worthless but also constrain the sensibility of the group value to changes in PGM prices and the exchange rate. Likewise, the probabilities of success of cost reduction initiatives are important because highly improve the value of each operating segment in each considered state.

In fact although when considering the best possible scenario Zimplats presents a higher value than Impala, the weighted average value of scenarios is higher for Impala, mainly due to differences in the expropriation risk.

### Financial Structure

The financial structure of each operating segment was considered as the average percentage of the segment net debt in the segment invested capital (in accounting value), in order to incorporate the management financial preferences and strategy into the model. Nevertheless, when considering the industry 5 years average of net debt to enterprise value in market value the evolution of the group financial structure is similar. The financial structure of the group and an historical analysis of the industry is delineated in exhibit 40.

**Exhibit 40: Financial Structure of Impala Platinum Holdings and historical comparison with its peers**



### Cost of Capital

Each segment was valued using an annual segment weighted average cost of capital, using an annual segment synthetic cost of debt<sup>98</sup> (computed through historical spreads to the risk-free rate in businesses with a similar size and interest coverage ratio), the existing statutory corporate tax rate for the segment, the previous medium term average financial structure (if the enterprise value was positive<sup>99</sup>), the industry asset beta and a segment equity beta (leveraged to incorporate the segment financial structure and computed cost of debt).

The combination of segment specific weighted average cost of capital implies a group weighted average cost of capital and all weighted average cost of capital can be expected to change from a year to another as changes in the interest coverage ratio and in the relative value of segments also occur (segments become more credit worthy and as a mines gets depleted other mines with longer life of mine are accounted for a greater weight in the group value).

<sup>98</sup> The company debt is not traded on the market and therefore the cost of debt had to be estimated with resource to the interest coverage ratio

<sup>99</sup> If the enterprise value was negative the segment would be considered as worthless

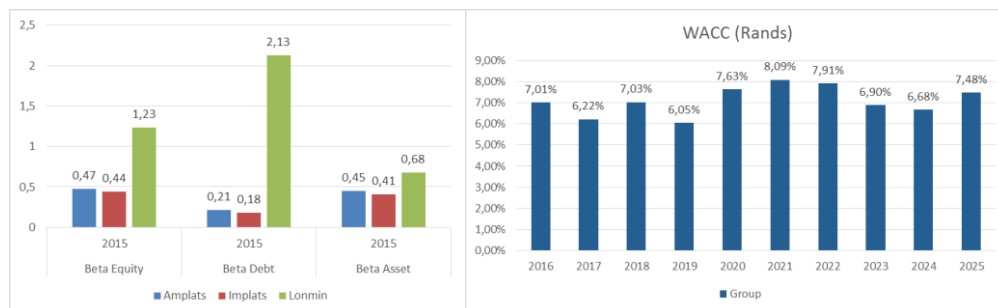
The risk-free rates were considered as the 10-year USD t-bond yields adjusted to the inflation differentials between the United States and the country in analysis (South Africa or Zimbabwe). The market risk premium was computed as the difference between the discount rate implied in the MSCI World price level using a perpetuity with a growth considered as the implied inflation (using the differential between 30 year tips and 30 year us t-bonds) and real GDP growth projection for the United States, the considered risk-free rate and the MSCI World P/E ratio and dividend payout<sup>100</sup>.

Exhibit 41: Summary of implied group WACC

Cost of Capital	FY2016	FY2017	FY2018	FY2019	FY2020
Rf SA (Rands)	4,81%	4,81%	4,81%	4,81%	4,81%
Rf ZIM (Usd)	1,59%	1,59%	1,59%	1,59%	1,59%
MRP	5,64%	5,64%	5,64%	5,64%	5,64%
βa	0,51	0,51	0,51	0,51	0,51
Tc SA	28,00%	28,00%	28,00%	28,00%	28,00%
Tc ZIM	25,75%	25,75%	25,75%	25,75%	25,75%
E/EV	95,47%	95,90%	95,94%	96,03%	96,08%
<b>Implied Group WACC</b>	<b>7,01%</b>	<b>6,22%</b>	<b>7,03%</b>	<b>6,05%</b>	<b>7,63%</b>

The average unlevered industry beta was computed through unlevering the (statistically significant) levered betas of each industry player using the equity to enterprise value (in market prices) and a debt beta computed using the synthetic cost of debt, the risk-free rate and the market risk premium. The risk of the tax shields was considered to be equal to the risk of the assets.

Exhibit 42: Summary of implied group WACC and comparison of industry betas



<sup>100</sup> Market return = Dividend/Price + growth, or in this case, Market return = Dividend Payout x Earnings/Price + growth

## Sensitivity

A sensitivity analysis was performed to changes in the dollar PGM basket price and in the dollar exchange rate evolution, with the results presented in the next exhibit 43.

**Exhibit 43: Sensitivity Analysis of Group value per share concerning the metal basket price and the exchange rate**

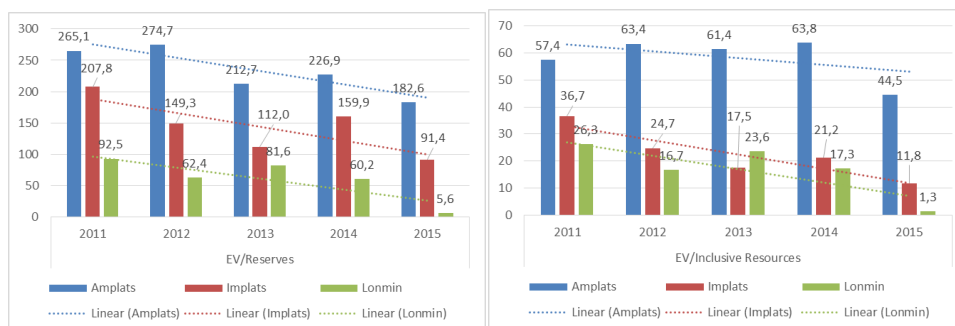
	Group value per share in Rands	Basket price in USD 2025		
		1939	1065	743
ZAR/USD	16,94	423,40	84,05	33,04
Exchange rate in 2025	16,11	470,49	75,76	28,09
	15,33	427,69	65,83	23,51

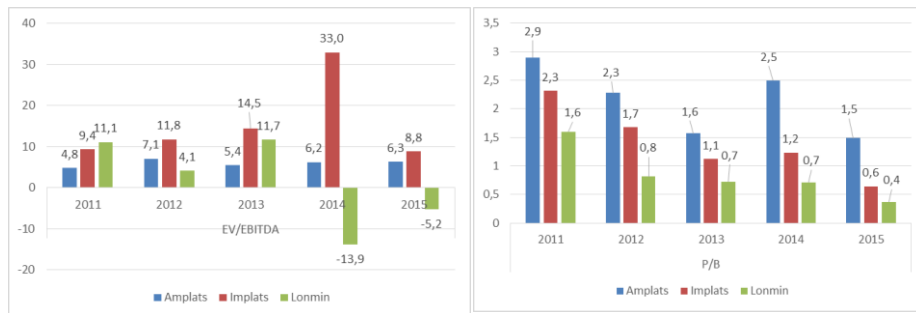
As expected, the value of the Impala Platinum Holding shares increases as the basket price of PGM increases. Nevertheless it important to recall that a significant portion of the value per share is derived from long-run PGM prices. Concerning the Zar/Usd exchange rate evolution, its impact on the value per share is mixed – on one hand Zimbabwean operations have dollar denominated costs and revenues and the other hand South African operations have rand denominated expenses and dollar denominated revenues. As metal prices rise, the valuation of Zimbabwean operations increases more than the valuation of South African operations so in a lower price environment, the higher the exchange rate the better for Impala Platinum, nevertheless when prices are high it can reduce the value of Zimbabwean operations.

## Comparables

The group main peers are Anglo American Platinum and Lonmin. Exhibit 44 displays an historical comparison of the price to book ratio, the enterprise value to EBITDA ratio, the enterprise value per resource (inclusive of reserves) and the enterprise value per reserve of Impala and its peers. Impala is usually between Anglo American Platinum and Lonmin.

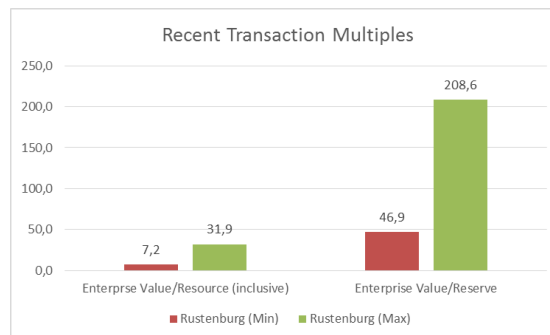
**Exhibit 44: Historical comparison of several multiples among Impala Platinum Holdings' peer group**





The recent transaction of Anglo American Rustenburg assets also provides a good opportunity to benchmark the group valuation, nevertheless the transaction price is conditional to future cash flows, so exhibit 45 displays the minimum and maximum values for the transaction multiples. As with the other ratios, the group is in the middle.

**Exhibit 45: Possible transaction multiples in the Rustenburg sale**



## Final Remarks

Overall the group appears to have a strong value proposition structured around economies of scale and scope has several quality assets and is under-priced when considering the possible states for the key valuation drivers. A strong buy is thus recommended.

## Appendix

<b>P&amp;L</b>	<b>FY 2015 (A)</b>	<b>FY 2016 (E)</b>	<b>FY 2017 (E)</b>	<b>FY 2018 (E)</b>	<b>FY 2019 (E)</b>	<b>FY 2020 (E)</b>
<b>Revenue</b>	31301	33160	40194	48142	55052	60609
<b>COGS</b>	-29815	-30602	-33355	-37001	-39391	-41046
<b>EBITDA</b>	534	4752	9529	14386	18649	22352
<b>EBIT</b>	-2526	1015	5546	10155	14221	17886
<b>PBT</b>	-2799	731	2765	7157	11025	14505
<b>Net Income</b>	-3243	-1657	211	5107	7787	10302

<b>BS</b>	<b>FY 2015 (A)</b>	<b>FY 2016 (E)</b>	<b>FY 2017 (E)</b>	<b>FY 2018 (E)</b>	<b>FY 2019 (E)</b>	<b>FY 2020 (E)</b>
<b>NWC</b>	6024	7355	8463	10333	10828	11066
<b>PPE</b>	47248	52410	54780	58054	60129	62400
<b>EA</b>	385	385	385	385	385	385
<b>ONNOA</b>	4444	6298	8324	8754	9199	9610
<b>IC</b>	58101	66448	71952	77525	80541	83461
<b>ND</b>	5690	16018	16730	17337	17861	18369
<b>E</b>	52411	50430	55222	60189	62680	65093

<b>CF</b>	<b>FY 2015 (A)</b>	<b>FY 2016 (E)</b>	<b>FY 2017 (E)</b>	<b>FY 2018 (E)</b>	<b>FY 2019 (E)</b>	<b>FY 2020 (E)</b>
<b>OCF</b>	-1646	-2676	-1119	2101	7795	10704
<b>GCF</b>	3078	1882	4313	9133	12443	15197
<b>CAPEX</b>	5736	3248	4374	5281	4111	4209
<b>Var NWC</b>	138	1310	1058	1751	537	285
<b>NOCF</b>	-1322	-2514	-1996	-670	-721	-714
<b>FCF</b>	-2968	-5190	-3155	1431	7074	9990

## Disclosures and Disclaimer

### Research Recommendations

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<b>Buy</b>	Expected total return (including dividends) of more than 15% over a 12-month period.
<b>Hold</b>	Expected total return (including dividends) between 0% and 15% over a 12-month period.
<b>Sell</b>	Expected negative total return (including dividends) over a 12-month period.

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**This report was prepared by “Pedro de Oliveira Araújo”, a student of the NOVA School of Business and Economics, following the Masters in Finance Equity Research – Field Lab Work Project, exclusively for academic purposes. Thus, the author, which is a Masters in Finance student, is the sole responsible for the information and estimates contained herein and for the opinions expressed, which reflect exclusively his/her own personal judgement. This report was supervised by professor Rosário André (registered with Comissão do Mercado de Valores Mobiliários as financial analyst) who revised the valuation methodology and the financial model. All opinions and estimates are subject to change without notice. NOVA SBE or its faculty accepts no responsibility whatsoever for the content of this report nor for any consequences of its use.**

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