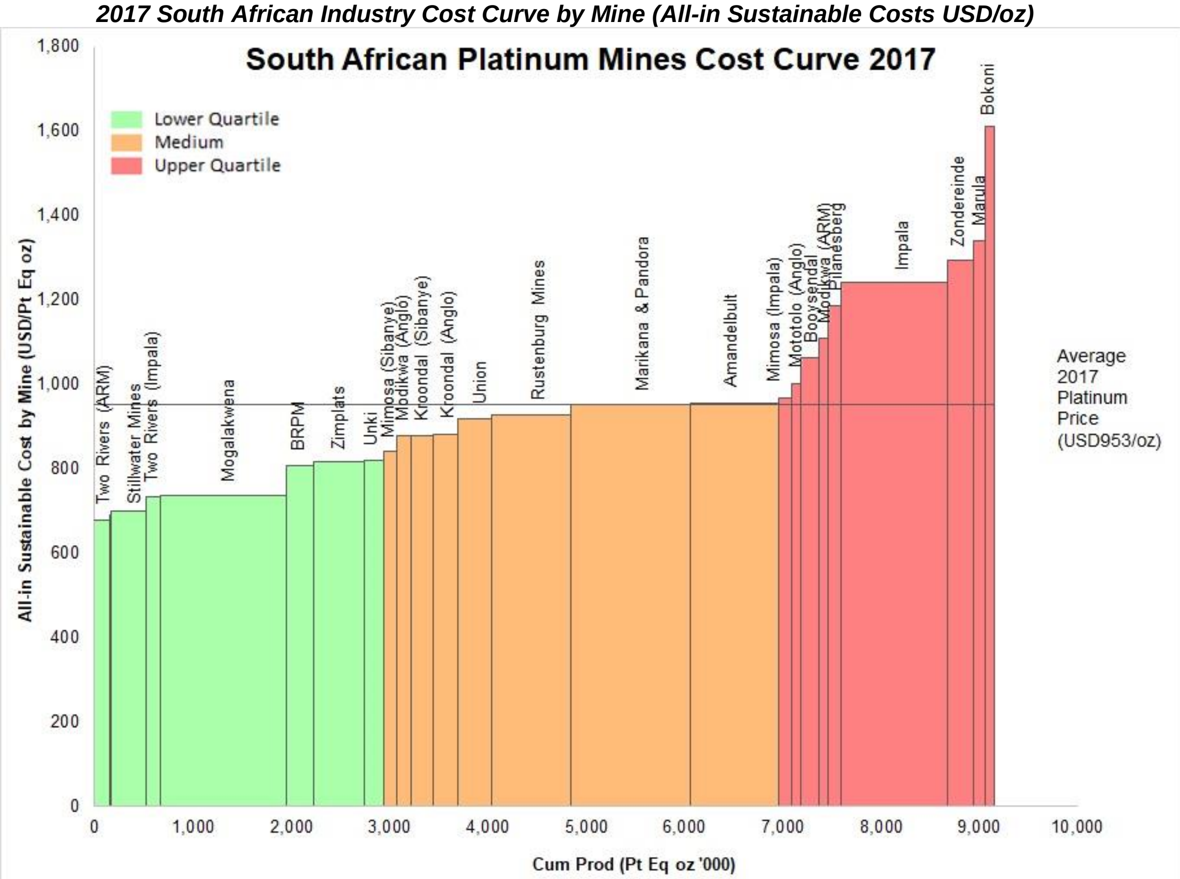
NEWSLETTER
September 2018

EXPLORATION | CONSULTING | PROJECTS

Platinum Cost Curves

In 2017, the total all-in sustainable costs and all-in sustainable costs excluding capital in ZAR terms, decreased by 8.2% and 7.8%, respectively. The total all-in sustaining costs in USD terms increased by 2.0%, while the all-in sustainable costs excluding capital increased by 1.5% year-on-year, much of which is a consequence of the strengthening Rand.

2017 South African Industry Cost Curve by Mine (All-in Sustainable Costs USD/oz)



Disclaimer: Information displayed in graph is based on public information collected from the South African gold mining company's annual reports. There is no guarantee that the interpreted information is 100% accurate.

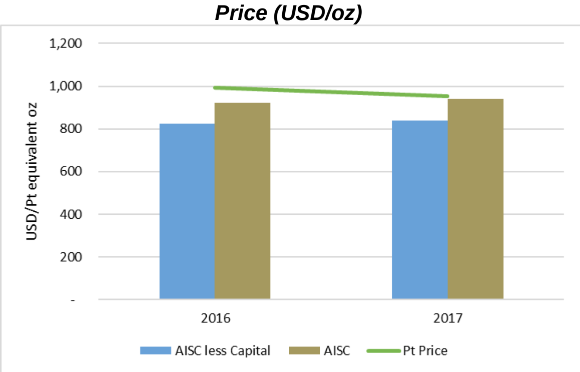
NEWSLETTER SPOTLIGHT

◊ **South African platinum mines accounted for 73% of global platinum production during 2017.**

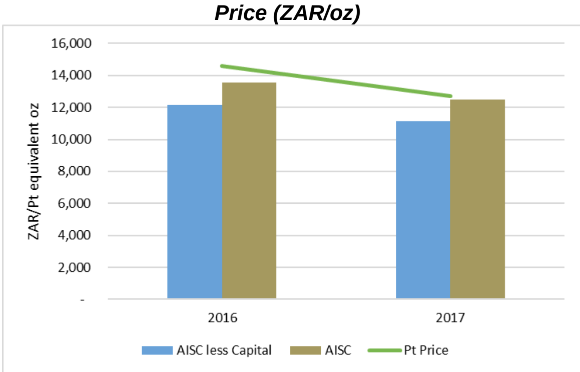
◊ **40% of South African platinum mines all-in sustainable cost was higher than the average 2017 price.**

◊ **USD-denominated all-in sustainable costs and all-in sustainable costs excluding capital increased by 2.0% and 1.5% respectively year-on-year.**

Historic Actual Unit Costs (USD/Pt eq. oz) vs Platinum Price (USD/oz)



Historic Actual Unit Costs (ZAR/Pt eq. oz) vs Platinum Price (ZAR/oz)



***Notes:** All-in Sustainable Cost ("AISC") includes cash cost incurred at each processing stage, from mining through to recoverable metal delivered to market inclusive of royalties and production taxes, sustaining and reserve development capital expenditure, corporate general and administrative costs, reclamation and remediation costs and sustaining exploration and study costs. Minxcon also investigated AISC excluding capital costs incurred (sustaining and reserve development). Platinum producers report costs in a variety of ways. Where platinum producers report costs according to different definitions, Minxcon strives to adjust these costs to conform as close as possible to the above definitions. Pt equivalent ounces were calculated based on the mines' realised revenue divided by the annual average Pt price. By doing this, all companies - those with refineries or those selling concentrates - are directly comparable on a cost basis and against the spot platinum price.*

Industry cost curves are valuable tools to benchmark the operational cost performance of an existing operation or new proposed mine project against industry. The industry cost curve indicates the ability of the existing mines to endure cyclical commodity prices and ensure continuous mining operations over time. This measure of a mine's cash margin per ounce can also be a useful tool for the following:-

- Use as a Comparison tool;
- Use as an Analytical tool:-
  - Shareholders, Management, Industry analysts;
- Use as an Investment decision tool:-
  - Investors, Banks, Equity brokers;
  - Identification of high- and low-cost producing regions, informs company decisions on where to invest;
- Provide a trend in costs as the mine matures; and
- Determine commodity price in times of market oversupply.

The aim should be to remain within the lower 50th percentile of cost producers to ensure profitability even in market downturns. The principle of this logic is based on economic theory that states that the commodity price is a function of the supply-demand balance of the specific commodity. If demand decreases due to weak market conditions and commodity prices subsequently decline, it is likely that the highest cost producers will suspend production first, which reduces supply and ultimately supports higher commodity prices. This has recently been observed with Bokoni Mine recently placed on care and maintenance in response to the lower prices.

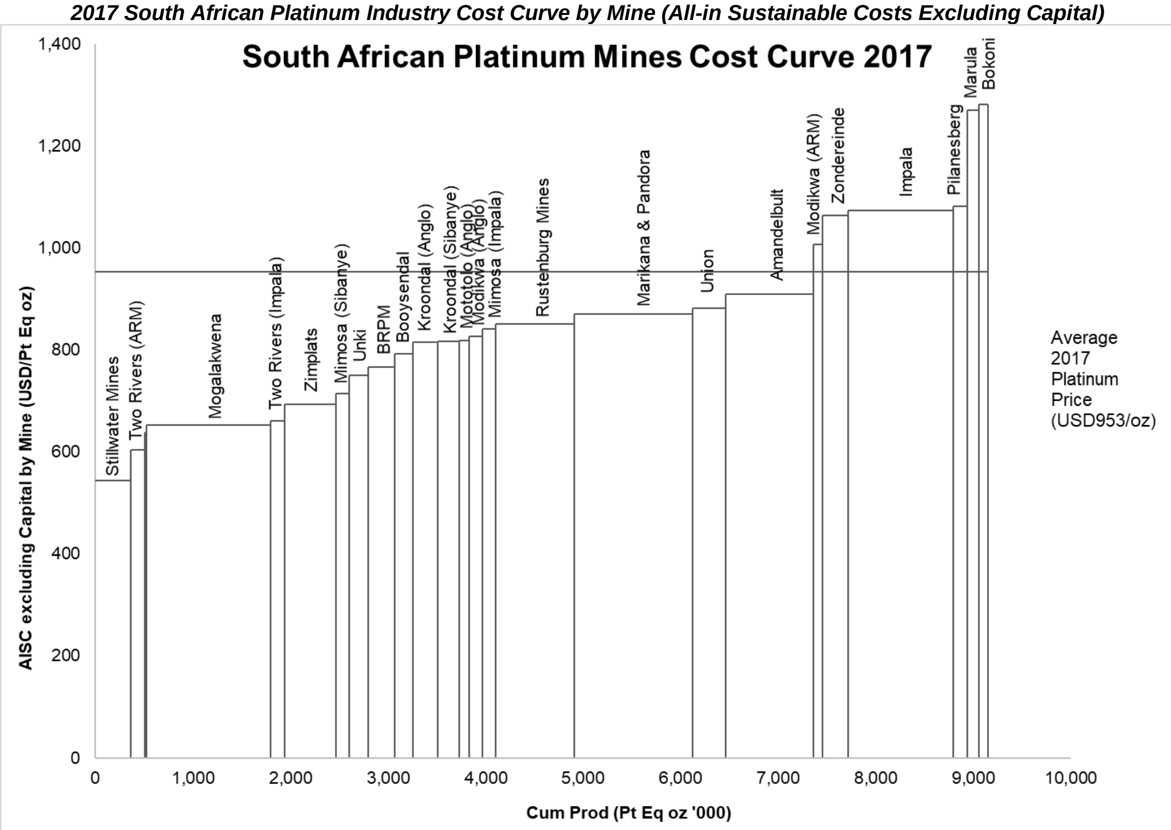
Cost curves can be constructed and analysed at a company or country level to facilitate comparison on a national, regional, or international level. South Africa produced 73% of global platinum during 2017 and is the main constituent of costed mine production. As a whole, the platinum miners had a less than stellar year in 2017 in USD-denominated terms with both the all-in sustainable cost excluding capital and the all-in sustainable cost increasing slightly by 1.5% and 2.0%, respectively. The average annual ZAR:USD exchange rate strengthened from 14.72 in 2016 to 13.32 in 2017. In contrast, the ZAR-denominated all-in sustainable cost excluding capital and the all-in sustainable cost decreased by 8.2% and 7.8%, respectively.

South African platinum mines have made significant strides in reducing operating costs with the average all-in sustainable cost exceeding USD1,200/oz as recently as 2014. This has come at the expense of closing several unprofitable mines and the loss of numerous jobs. The industry has had to adapt to a falling price environment, and is still marginal at best with the platinum price having fallen to an average price of USD951/oz over 2017 from USD991/oz in 2016. Despite the improvement in operating costs, many of South Africa's operations are still operating at costs exceeding the platinum price. Some of the major reasons for the high costs include the fact that a large percentage of the mines have been operating for decades, thus increasing maintenance costs on the shafts and machinery, as well as the fact that the depth of some of the platinum mines in South Africa are the deepest in the world.

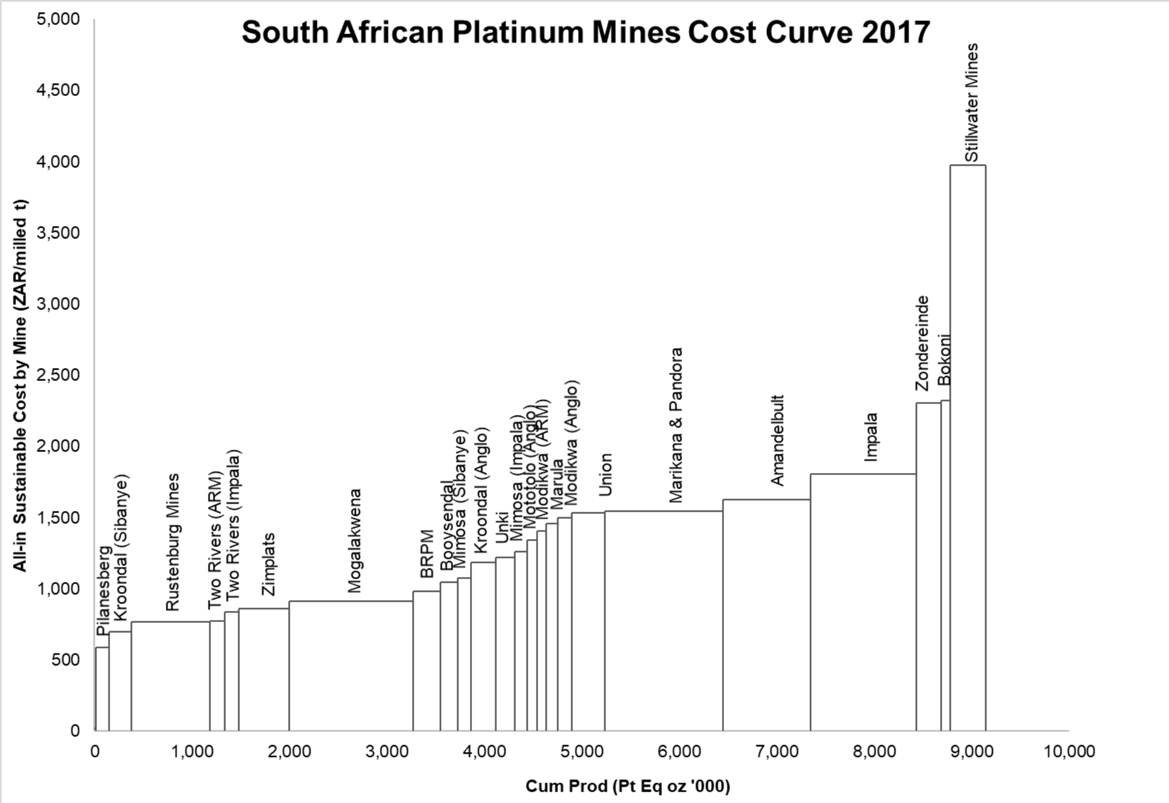
Minxcon used the cost curves to compare the South African operating platinum mines' cost curves to the average platinum price for the year. The figure on the first page and the figures below show the South African platinum industry all-in sustainable cost excluding capital and all-in sustainable cost curve for 2017 at a mine level. From the figure it can be seen that at the average 2017 platinum price of USD951/oz., 40% of the platinum mines were not profitable. These 40% mines accounted for 34% of Southern Africa's platinum equivalent ounces produced during 2017.

The average platinum price for 2018 thus far is USD916/oz, with a low of USD775/oz. Should platinum consolidate below the USD800/oz level, the costs of 60% of South African platinum mines will be above the price line on an operating cash cost basis, and 80% will be above the price line on an all-in sustainable cost basis. With South Africa producing in excess of 70% of global PGMs, these price levels are not sustainable for the industry in the medium to long term.

2017 South African Platinum Industry Cost Curve by Mine (All-in Sustainable Costs Excluding Capital)



2017 South African Platinum Industry Cost Curve by Mine (All-in Sustainable Costs per Milled t)



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