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## THE MYSTERY OF THE MISSING MILLIONS

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### Abstract

The southern African region has a high concentration of mineral resources and supplies much of the world's platinum demand. As a result, the international community watches South Africa to understand the impact of supply on global markets. An analysis of supply certainty and risk plays a key role in the future of growing demand in various sectors.

The southern African platinum industry experienced substantial growth in the early part of the 21<sup>st</sup> century, resulting in bullish forecasts for growth during the period of 2000–2006. However, southern African platinum producers saw a significant drop in production over the following three years as a result of many dynamic factors in operations and the global economy. Between 2006 and 2009 there was a million-ounce shortfall between forecast and actual production. This was raised as a concern at the Fourth International Platinum Conference in 2010 by Stephen Forrest during his keynote address, specifically regarding the lack of understanding in the market of the causes of this shortfall and any action that was being taken to address them.

This paper reviews publicly available information in the media and corporate reports and communications for the period January 2006 to December 2009. In addition, several interviews were held with key stakeholders in the industry to provide further perspective. The paper then highlights the main reasons that are reported to have affected the loss in production over the period and discusses the possible implications of the information that the mining industry does and does not disclose regarding platinum supply.

### Introduction

The platinum mining industry has become one of the most important mining sectors both locally and globally with the growing motor industry promoting the use of platinum group metals (PGMs) in automotive catalytic converters.

Platinum, unlike many other precious metals such as gold and silver, is a rare commodity with the majority of the world's resources being located in South Africa. The relatively scarce supply of platinum resources, combined with a continuing and increasing demand, has made platinum an important resource in the South African economy. PGMs contributed 29.4 per cent to South Africa's total merchandise exports in 2010 (Chamber of Mines, 2011).

Since platinum remains a vital resource for the South African economy, coupled with the fact that South Africa has by far the greatest concentration of platinum resources in the world, it is important for South Africa to maintain supply to the rest of the world. Figure 1 shows that South African platinum production decreased between 2006 and 2009, in contrast to other platinum-producing regions, which have experienced only marginal changes in platinum production over the same period. More specifically, the difference between forecast and actual production of platinum between 2006 and 2009 amounted to almost one million ounces.

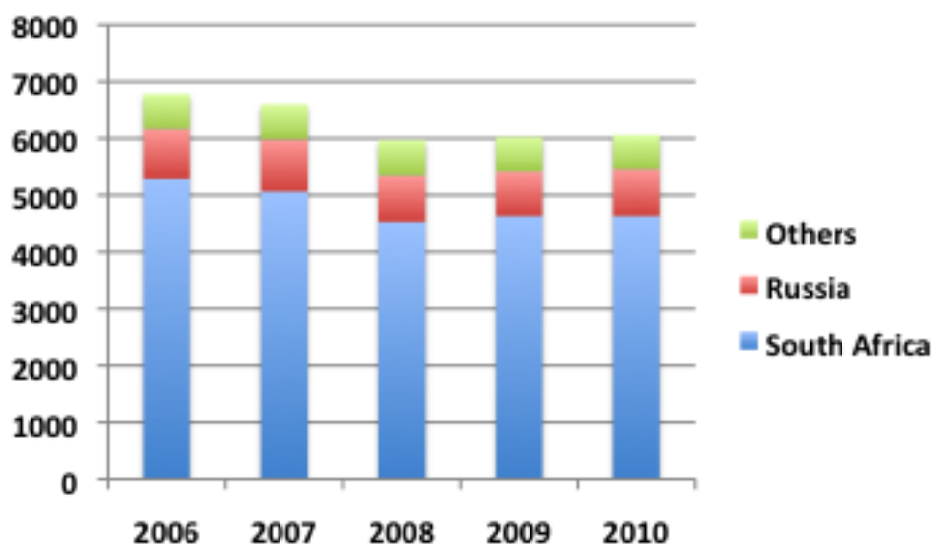


Figure 1-Platinum supply by region - million ounces (Johnson Matthey, 2011)

The disproportionate loss in production experienced by South Africa in comparison to the rest of the world may raise questions about the region's ability to produce platinum in a sustainable manner. The reasons for this loss in production are of great importance to possible investors in the industry, as signs of instability and uncertainty in the country can deter investment.

In the public arena, certain factors such as health and safety downtime, labour disputes, and the power crisis have been blamed for the loss in the country's production. While these reasons certainly affect supply, incorrect perceptions about the actual contribution and their impact affect both investment into the region as well as demand and price patterns.

The purpose of this research paper is to investigate and quantify all contributing factors affecting production loss. The research is based on publicly released articles and reports. Reports include Johnson Matthey Annual Platinum Reviews for the years 2007-2011, corporate annual reports for major platinum suppliers for the years 2007-2009. Articles include over 60 press releases and news articles sourced online from the Johnson Matthey newsroom, Miningmx.com, and MiningWeekly.com.

### Review of production shortfalls

There are two ways in which platinum is supplied to the market. These are either in the form of mined platinum or in the form of recycled platinum, with recycled platinum accounting for about 23 per cent of the global platinum supply, as shown in Figure 2.

South Africa and Zimbabwe collectively produce and supply over 60 per cent of platinum globally in comparison to all mining operations and recycling operations as shown in figure 2.

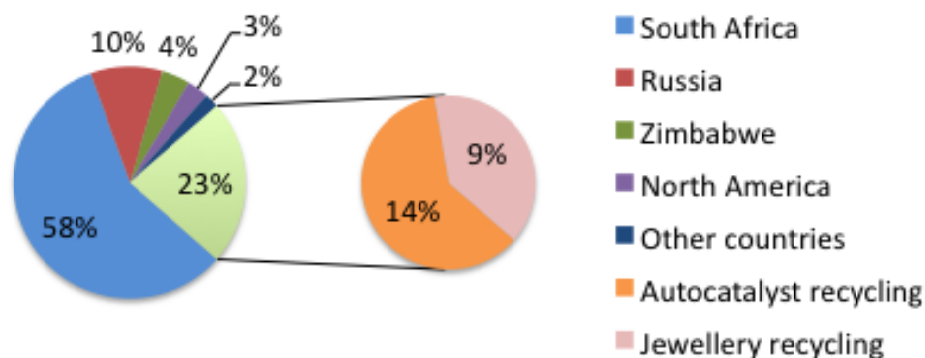


Figure 2-Platinum supply by country (incl. recycling) (Johnson Matthey, 2011. p. 54)

The southern African region plays the biggest role in platinum production in the world and is dominated by four platinum-producing companies, namely Anglo American Platinum, Impala Platinum, Lonmin, and Aquarius Platinum.

These four companies have the greatest impact on supply, and were thus the focus of the investigation into the loss of production in the region.

The reasons stated for the majority of production losses encountered in publicly available articles fall into one of the following categories:

- Health and safety issues
- Power supply shortages
- Labour disputes
- Maintenance (planned and unplanned)
- Unforeseen events/closures
- Macro-economic factors.

As a result, this study investigated and attempted to quantify the losses associated with each of these categories over the 2006–2009 period.

The study looks specifically at the reasons for the loss in production between forecast (or budgeted) production and actual production. This study does not take into account the additional loss in production that occurred as a result of the failure to realize growth or expansion projects beyond existing operations.

### **Health and safety**

Health and safety in the mining industry is possibly one of the most important and challenging aspects affecting all mining companies in the world. All companies involved in the platinum mining industry allocate significant resources to sustainably improve health and safety within their operations.

Health and safety became a very important topic during the 2007 period, with the South African government ordering sector-wide safety inspections in accordance with section 54 of the Mine Health and Safety (MHS) Act in response to 3200 workers being trapped underground at a Harmony gold mine (International Federation of Chemical, Mine and General Workers' Unions, 2007). Platinum mines were equally affected, with Anglo Platinum, Aquarius, and Impala Platinum needing to shut down operations as a result of safety inspections within their mines.

In summary, Section 54 of the MHS Act allows for an inspector to halt production in a mine and take necessary action with both employer and employee to rectify dangerous conditions before production may be resumed (Mine Health and Safety Act, 1996).

Anglo Platinum lost over 20 000 ounces of platinum production as a result of shutdowns due to health and safety during the 2007 period, the most significant incident occurring at their Rustenburg Platinum mine in June (Johnson Matthey, 2007). Both Aquarius Platinum and Impala Platinum also experienced losses to the order of 5 000 ounces and 10 000 ounces respectively over the same period (Johnson Matthey, 2007a, 2007b, 2007c).

Impala Platinum experienced a major incident at their Rustenburg mine on 21 July 2009, in which nine miners lost their lives; the resulting shutdown in operations caused an estimated loss of 50 000 ounces of production (Johnson Matthey, 2008, p 16). Other platinum producers were minimally affected during the 2009 period.

It should be noted that the increased focus on health and safety measures came with the benefit of a 23 per cent decrease in miner deaths over the 2008 period compared to the year before (Johnson Matthey, 2008a).

### **Power supply**

Power supply is important to all sectors, with the mining sector being heavily reliant on power to extract and refine precious metals such as platinum. During the period under review, platinum mines experienced shortages in electricity supply due to the major power producer (Eskom) not being able to meet the needs of the region.

The loss of power makes mining impossible and has a major impact on current and future PGM supply, with unsteady power supply being forecast for the region for the foreseeable future.

Power outages affected all major platinum producers during the course of 2007 as a result of unscheduled Eskom maintenance. The outages during the 2007 period resulted in losses exceeding 30 000 ounces of refined platinum production (Johnson Matthey, 2008. pp. 16, 17).

The 2008 period experienced the worst production shortfalls as a result of power outages. Eskom revealed that it could not cope with demand, and as a result the platinum industry shut down for four days in January due to safety concerns related to the restricted availability of power. The loss of platinum production across the board was in excess of 150 000 ounces of refined platinum production (Johnson Matthey, 2008b).

Eskom's capacity shortfalls were a significant contributing factor during the abovementioned periods, but it should also be noted that electricity demand by the platinum industry has dropped significantly since 2008, resulting in minimal effects on production from 2009 to the present. Platinum mining companies have mitigated the risks of power shortfalls through measures such as alternative power generation, changed work practices, and alternative or new technology.

## **Labour disputes**

The South African mining industry often experiences disputes with the labour unions acting in their sector. Disputes can result in strike action, both legal and illegal, which can slow or even shut down mining operations. Due to the often lengthy strike action, labour disputes can negatively affect production of platinum in the region.

The 2007 period saw strike action affecting all four of the top platinum producers. The most significant strikes included a three-week strike at Anglo Platinum's Modikwa mine in January (Johnson Matthey, 2007d) and a strike involving 26 000 employees at Lonmin in August (Johnson Matthey, 2007e). On 4 December 2007, all mining houses were affected by a sector-wide strike involving 250 000 workers (Johnson Matthey, 2007f).

The year 2008 only had one labour dispute ending in strike action on 2 June, during which time Aquarius Platinum lost 1 300 ounces of production. Similarly, 2009 saw only one dispute resulting in strike action. Impala Platinum lost 50 000 ounces of refined platinum production due to the strike that took place on 28 August.

## **Maintenance and breakdowns**

Maintenance refers to both planned and unplanned maintenance, which can have significant effects on production. Generally, unplanned maintenance affects production as measures are often not in place to compensate for the downtime. Maintenance may be as a result of ageing machinery or due to other causes such as flooding and fall of ground within a mine. Although stoppages at refineries and smelters do not necessarily affect production at associated mines, the overall capacity to supply platinum to the market will be reduced as days lost at a smelter can technically never be recovered.

Lonmin was the worst affected by unplanned maintenance during the 2007 period, as their number one furnace required rebuilding. The same furnace required further work later in the year resulting in an estimated lost production for the year of around 50 000 ounces to 60 000 ounces (Johnson Matthey, 2007g).

Lonmin were affected by another shutdown on their number one furnace in the 2009 period, resulting in a 60000 ounces estimated loss in production (Johnson Matthey, 2009a).

## **Unforeseen closures or events**

Events that cause a mine to close, and which could not be prepared for and forestalled, can significantly affect the production of a mine. Events such as adverse weather conditions or fire can affect not only one mine but an entire region.

The 2008 period saw Anglo Platinum affected by flooding in the beginning of the period and a large fire at a smelter near the end of the period, resulting in an estimated loss of production between 200 000 ounces and 300 000 ounces of platinum (Johnson Matthey, 2009, p. 15).

### Macro-economic factors

There exist many economic factors that can affect production of platinum in the southern African Region. These factors affect the way in which the platinum producing companies plan their annual production and can result in the curtailment of operations, the retrenchment of staff, and feasibility decisions on new projects. Figure 3 shows platinum supply and demand between 2004 and 2010 as well as the platinum price.

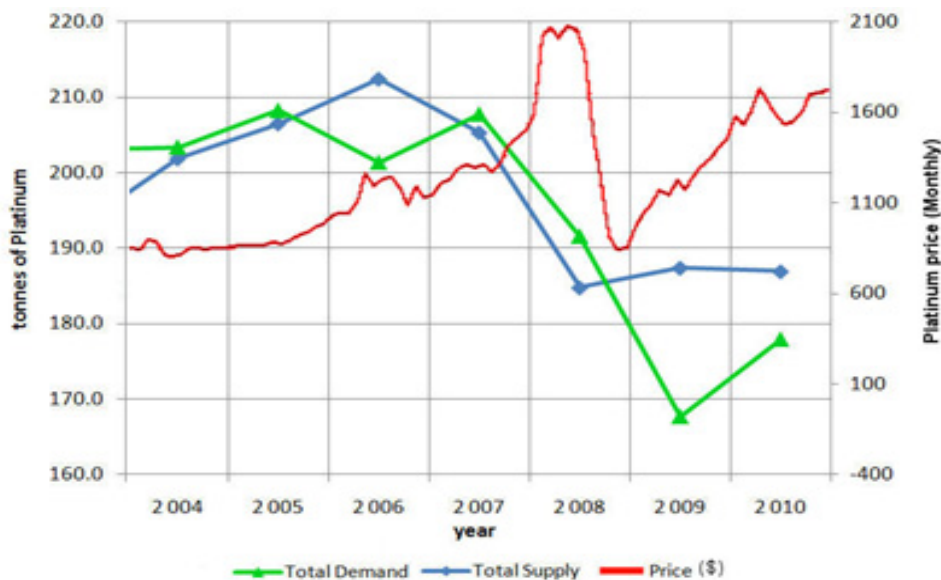


Figure 3-Platinum supply, demand, and price (Johnson Matthey, 2010, pp. 4, 5)

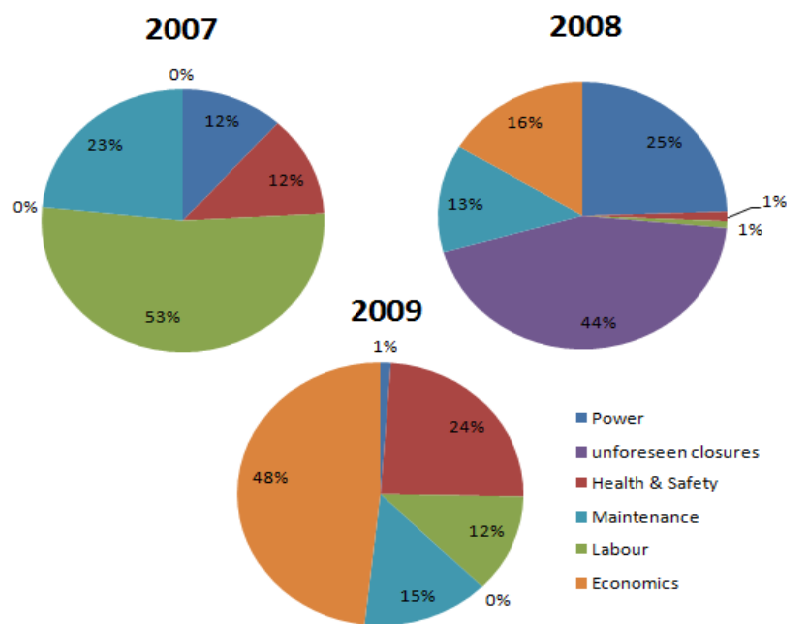
The price of platinum peaked in early 2008 due to global insecurity over platinum supply based on the power crisis affecting the region at that time. This was followed by a steep drop in the platinum price to a four-year low by the end of 2008. The drop in price was due to a number of factors, with one of the biggest being the downturn in global automotive production due to the global recession. With the platinum industry heavily reliant on autocatalyst demand, the dramatic change in demand for the metal was one of the driving factors for platinum producing companies having to assess their production and supply targets. These decisions were also heavily affected by the low platinum price at the end of the 2008 period, resulting in the curtailment of shafts at some of the biggest mining houses as well as job losses throughout the industry.

## Results

Figure 1 shows the global refined platinum production by region, including that of the southern African region, between 2006 and 2010. Production is shown in ounces.

Refined platinum production figures for the region extracted from Johnson Matthey (Johnson Matthey, 2010, p. 5) showed a peak in production for 2006 followed by a decrease in production over both 2007 and 2008 (220 000 ounces and 545 000 ounces respectively). The 2009 period showed a marginal recovery in production, which remained level into 2010.

The peak in refined platinum production in 2006 was backed by a strong world economy with a steady increase in demand. The reasons for the loss in refined production in the years following this peak are quantified based on the information collected and explored above. Comparisons are made between these losses and the actual overall reduction in platinum supply (Figure 4).



**Figure 4-Production losses for individual years (2007-2009)**

The 2007 period saw estimated production losses of around 260 000 ounces. This seems to correlate well with reported data that regional supply decreased by 220 000 ounces during this period. During the same period, several mining facilities were upgraded, which could have contributed to the lower overall impact on platinum supply.



The 2008 period saw estimated production losses of around 560 000 ounces from the previous year which is around 15 000 ounces greater than the recorded drop in supply for the region seen in Figure 1. The difference is attributable to higher grades of ore mined and also higher production in Zimbabwe, which offset lower production in South Africa.

The 2009 period saw estimated production losses of around 415 000 ounces, based on the quantified losses extracted from public articles. This period also showed an increase in regional supply of 170 000 ounces compared to the previous year. This year-on-year increase in 2009 seems to be attributed to losses being smaller than those during 2008.

The breakdown of the reasons for the loss in production over the period of 2007 to 2009 is shown in Figure 5.

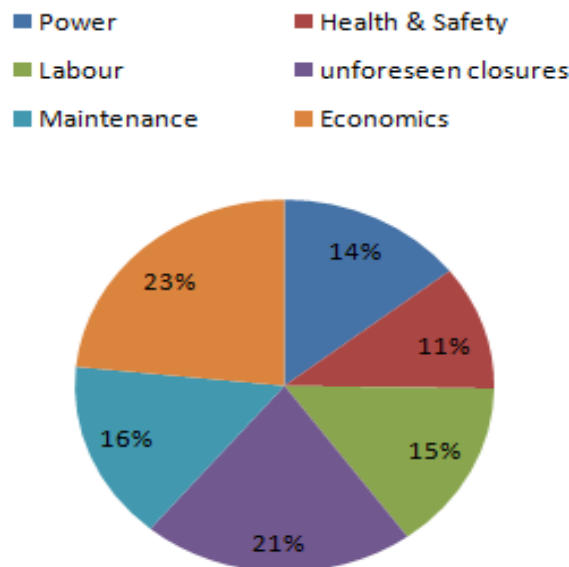


Figure 5-Production losses (2007 – 2009)

### Industry response

Published articles on production losses can at times reflect negatively on the platinum industry as a whole. This can result from negative perceptions based on a lack of knowledge on the decision making processes of the mining houses. It is for this reason that knowledgeable persons in industry were interviewed and asked about their own opinions on the dramatic decrease of platinum supply in the region.

Each of the industry representatives interviewed believed that by far the biggest reason for the decrease in platinum production over the 2007 to 2009 period was macro-economic factors resulting from the concurrent global financial crisis. Gordon Smith mentioned platinum's close links to industrial demand (specifically, the autocatalysis sector) and the resulting drop in demand over the period; he also referred to a 'fundamental shift in market characteristics' in terms of the suppliers' response to demand during 2008 (Smith, 2012).

The increase in mining costs was also indicated as having an adverse effect on the economical operation of mines in the region, with high inflation in steel prices, electricity prices, as well as fuel prices. When comparing some of these costs with the consumer price index (CPI) and the producer price index (PPI) index, it can be seen why some mines/shafts were closed down for economic reasons (Redford, 2012).

Another source of inflating costs was noted in the cost of labour, which had a negative impact on not only the costs of mining companies but also production, as strike action over wages played a significant role for certain companies (Mthenjane, 2012).

While macro-economic factors dominated the interviews within the platinum mining industry, many of the other external factors affecting supply were discussed. Section 54 of the Mining Health and Safety Act (MHS Act) was a prominent topic in the interviews, with all interviewees agreeing that stoppages due to the Act were a significant reason for lost production over the period investigated. Mzila Mthenjane from Royal Bafokeng Platinum spoke about the MHS Act as being 'An important cultural change in the mining sector', referring to the DMR's goal of making the region's mines a safer environment for miners (Mthenjane, 2012).

Stoppages due to the Act are definitely a contributing factor to the loss of platinum production during the period investigated, but the MHS Act has become a requirement for the industry and the losses attributed with it will have to be managed in future.

Another external factor affecting production over the period was the ability to secure power. The loss of power to certain mines in the 2008 period was a major cause of lost production. Gordon Smith emphasised that the loss of power moved from being an external factor affecting production in 2008 to an internal factor which is controlled by each of the mining companies separately through deals with the country's power producer and strategic decisions to mitigate the risks of power losses (Smith, 2012).

Many of the other external factors, such as maintenance and unforeseen closures, were addressed during the interviews, but did not draw as much response about their effect on production over the period investigated.

## Conclusions

South Africa remains the largest supplier of platinum group metals to the global market, with the platinum industry accounting for up to 35 per cent of South Africa's foreign export earnings. When focusing on the southern African supply to the global market (Figure 1), a large downward trend is noticeable for the region over the period of 2007 to 2009. Reasons for this sharp decrease in platinum production in the region have been given both in media reports and in articles. The purpose of this report was to quantify the reasons for the loss in production.

Global perceptions of the stability of southern African supply of platinum are very important to the sustainability of world platinum demand. If platinum supply becomes too unstable, the resulting development of alternatives to platinum may leave demand too low for economic extraction of the metal. It is therefore vital that the southern African region shows maintains a sustainable supply to the global market to protect the platinum industry which plays such an important role in southern African economies.

Economic decisions by the large platinum producing companies resulted in the largest shortfall in platinum production (23 per cent) as a result of curtailment of mining operations in response to the effects of the world economic crisis on both the platinum price and platinum demand.

Unforeseeable closures due to random events accounted for the majority of lost production during the 2008 period (44 per cent), with Anglo Platinum suffering as a result of both flooding and a large smelter fire. These events resulted in unrecoverable production losses, contributing 21 per cent of all production losses over the period investigated.

Maintenance, both planned and unplanned, contributed significantly (16 per cent) to lost production over the 2007 to 2009 period. Ongoing problems experienced by Lonmin with their number one smelter resulted in the majority of the production losses in the region.

Losses due to labour relations and power outages respectively contributed 15 per cent and 14 per cent to production losses over the specified period. Labour relations were difficult during this period as inflation (specifically in the food market) was very high and made living conditions difficult for miners. This period also saw a power crisis in South Africa, with platinum mines having to close operations for up to four days as a result of insufficient power during 2008.

Health- and safety-related production losses due to mine closures contributed only 11 per cent to all lost production over the time period.

While certain external factors played a significant role in the fall of platinum production over the period investigated, the question arises, 'How well were these factors controlled and managed?'

In addition, the significant loss in production between 2006 and 2009 does not appear to be a short-term phenomenon based on issues that have been resolved. Platinum supply is indeed uncertain, and the reasons and actions being taken to address this are not yet resolved.

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Thomas' research into the platinum Industry started when he was completing the 3<sup>rd</sup> year of his Industrial Engineering degree in 2010. This research sparked an interest in platinum production, and further research was conducted once graduated to produce a paper on the causes of lost production during the 2006 to 2009 period. Currently, Thomas is employed at Eskom as an Assistant Engineer and is working in the System Integration department.



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