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The South African metal recycling industry in focus

Globally the scrap metals industry is responsible for the recovery and processing of metals no longer in use. Recycling of metals is critical to society as it has large environmental, economic and sustainability benefits.

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1 Introduction

Metals, as non-renewable resources, are expensive to extract and even more costly to process. However, after ores have been extracted and processed, the resultant metal product can be recycled for reuse at much lower costs than raw, virgin ores. Since less energy is used there is a major environmental bonus. Therefore, a well-functioning domestic metals recycling industry is a cost effective, environmentally friendly component of the metals and downstream production value chains.

More information on the role and function of the scrap metals industry in the broader metals value chain can be found in the [value chain diagram](#).

2 What metals are scrapped

The annexed value chain diagram (Figure 8) gives a broad understanding of the role and position of the scrap metals industry in the metals value chain, however this is a very high-level generic picture. In reality the scrap metals industry is as diverse and complicated as the products used for recycling. The Institute of Scrap Recycling Industries (ISRI), a global recycling industry representative, catalogues and classifies the various scrap types with standard specifications in order to regulate the trading of materials and products. Their latest *Scrap Specifications Circular* catalogues 158 different nonferrous scrap metal classifications and 125 different ferrous scrap classifications.

2.1 Nonferrous metals¹

Nonferrous metals comprise base metals or alloys thereof. In SA and globally nonferrous scrap metal account for less than 10% of the total recycled metal volume in circulation and on average, nonferrous scrap metal unit value is 10 times that of ferrous scrap.

2.2 Ferrous Metals²

Ferrous metals are iron / steel based products and constitute more than 90% of scrap metal volumes generated in South Africa, and globally. However, they are relatively low value in comparison with nonferrous metals.

3 Sources of scrap

Scrap metals can be divided into two broad categories. The first, **production scrap**, is a result of waste metals generated during the production / manufacturing of metal products. This type of scrap metal can be found in the manufacturing sector in the form of turnings / shavings, off-cuts, trimmings and stampings. Additionally, foundries, mini-mills and mills generate “home scrap” from their melting processes and this is usually reused or recycled in-house, without being sold to the recycling sector. Production scrap is usually sold to *Recyclers* where the scrap metals will be processed and grouped according to their ISRI classification.

¹ Includes scrap and waste of Aluminium, Copper, Brass and Bronze, Zinc, Lead, Magnesium, Tin, Cadmium, Antimony, Tantalum, Manganese, Germanium, Vanadium, Gallium, Indium, Niobium/Columbium, Zirconium/Hafnium, Molybdenum.

² Includes scrap and waste of Cast iron, Stainless steel, tinned iron or steel, iron and steel turnings, shavings, chips, milling waste, dust, filings, trimmings and stampings.

The second category, **obsolete scrap**, refers to metal products that have reached the end of their life span or utility. This includes a wide range of metal products and products containing metal. It is predominantly collected by *Dealers* or *Recyclers* who process them from waste to a commoditised raw material. Whilst some recyclers specialize, most will target both ferrous and non-ferrous metal products. Metal recyclers collect the obsolete scrap metals, working with a network of *collectors*³ to source scrap and waste metals from its economically viable “catchment area”, and collect industrial scrap from the demolition and scrapping of buildings, rail and electrical infrastructure, and transportation equipment.

4 Regulation of scrap metals sales

The purchase and sale of scrap metals in South Africa is regulated, inter alia, by the Second-Hand Goods act of 2009 (SHGA), under the purview of the South African Police Service (SAPS). The act regulates the business of

“dealers in second-hand goods and pawnbrokers, in order to combat trade in stolen goods; to promote ethical standards in the second-hand goods trade; and to provide for matters connected therewith”.

It requires that every person who carries on a business as a buyer or seller of scrap metal be certified on an ongoing basis. Similarly, Second-Hand Goods Dealers' Associations must be registered to establish and maintain minimum legal and ethical standards with regard to their members⁴ - and to maintain a database of their members - and association visits to members, as well as make such information available to SAPS upon request.

The Metal Recycling Association of South Africa (MRA), established in 1942, is a SAPS accredited association. As such it regulates and enforces members in terms of general conduct and SHGA compliance. MRA members comprise the majority of the country’s formal metal recycling sector, with current membership of approximately 100 companies with 250 production yards.

4.1.1 Controlled goods

The SHGA refers to nonferrous metals⁵ as “controlled goods”, which as the name suggests are subject to stringent levels of control. The trade of stolen items in the metals recycling value chain, especially controlled goods, remains a source of concern for legitimate metal recyclers globally. Compliant recyclers see the theft and purchase of these goods as a blight that erodes trust in the industry, in their companies, and can result in stricter regulation of scrap metals sales, further increasing their compliance burdens. As recycling operations rely on fairly quick turnover of stock any additional compliance obligations could have a detrimental impact on their supply and should any additional compliance cost be levied it could also further erode operating margins. In other words, companies complying with the SHGA have every incentive to ensure that the industry as a

³ Scrap metal collectors include a large number of informal labourers -in several studies estimated to be as high as 400 000 people- bakkie collectors and bucket shops. Very little sorting or value addition is done by this group, rather they provide a collection services with the aim of selling their haul to metal recyclers.

⁴ This is understood to be the associations’ constitution and associated code of conduct.

⁵ Copper, aluminium, zinc, chrome, lead, white metal, nickel, tungsten, tin, ferrovanadium, ferrosilicon, ferrochrome, brass, bronze, cobalt and precious metals as defined in the Precious Metals Act, 2005 (act 27 of 2005), or any article consisting wholly or principally of any of those metals.

whole operates ethically. However, non-compliant, unscrupulous operators are often left to operate in a mostly unregulated space. This creates reputational challenges for compliant, operators.

5 How does the metals recycling industry add value to the economy?

Once metal waste is collected, it is transported to a scrap yard where it is sorted for further processing. This is where the most value is added as waste metals are processed to usable commodities. Processing the scrap metals involves sorting, cutting, resizing, baling, shearing, granulating, briquetting and / or shredding, depending on product types and consumer demand and preferences. Metal recyclers must work on a very quick scrap demand turnover basis.

Looking at the generic cost structure of a metal recycling operation we get an idea of the economic value addition of metal recyclers.

Table 1

Designation	Operating expenses	% of total expenses
	Non-current assets	% of non-current assets
<i>Operating Expenses</i>	Employee Cost	44%
<i>Operating Expenses</i>	Yard Expenses	14%
<i>Operating Expenses</i>	Logistics cost	12%
<i>Operating Expenses</i>	Fleet cost	12%
<i>Operating Expenses</i>	Municipal services	2%
<i>Asset</i>	Land & buildings	50%
<i>Asset</i>	Plant & machinery	39%
<i>Asset</i>	Motor vehicles	9%

From the above Table 1 we see that much of the generic metal recycling company's expenses go to employee remuneration. This indicates that metal recycling companies are labour intensive. In addition Table 1 shows that only a small fraction of total expenses falls under municipal services, which indicates that metal recyclers put minimal strain on municipal resources (water and electricity) and, by proxy, the environment.

In terms of plant, property and equipment, rather unsurprisingly most non-current assets lie in land & buildings and plant & equipment, with motor vehicles constituting a much smaller contribution. A cursory search reveals that the most basic scrap processing equipment, metal shredders and grapples, range in price from R130 000 for small grapples to as much as R100 million for large scale metal shredders.

What the financial analyses show is that the scrap metals recyclers play an important role in employment and investment into capital equipment to improve productivity and competitiveness. These companies also pay substantial amounts in tax on company income, capital gains, and employment tax. It's also important to note that the cash flow margins from operating activities of scrap metal recyclers, depending on the value of the metal and quality of the scrap, falls within the 4% range before tax and interest, declining to about 2.8% after tax and interest.

Plant property and equipment in metal recycling operations can result in rather substantial investment into capital goods and machinery used to process waste and scrap metals. Other

processing and value adding expenses, beyond capital, labour, water and electricity, include gas for cutting torches. All of these expenses are incurred to process the collected waste and scrap metals into intermediate commodities that *consumers* can use.

6 The international trade of scrap metals, and the crisis of the local primary metals fabrication industry

Much of the narrative around the scrap metals industry’s exposure to exports is negative, with a small group of stakeholders arguing that these exports are a primary source of the domestic foundries’ problems in respect of competing with imported products. This has resulted in onerous government regulation of scrap metals exports through the Price Preference System (PPS), administered by the International Trade Administration Commission (ITAC). However, these arguments are based on simplistic views, and need to be disentangled.

There is **massive global demand for scrap metals**. On average 102 million tonnes of ferrous and non-ferrous⁶ scrap metals were traded globally in 2013 to 2015, at an average value of \$77,8 billion. Some countries are net importers, others, particularly where there are domestic surpluses, are net exporters. South Africa is a net exporter.

As shown in Figure 1, total South African scrap metals exports account for only a very small percentage of total global exports⁷.

Figure 1: Share of global scrap metal exports, 2014-2016, Volume and Value



SOURCE: UN COMTRADE DATA, 2017

At an aggregated HS 6-digit level, waste and scrap metals imported from South Africa accounts for less than 2%⁸ of total scrap metals imported globally, an average of 1.8 million tonnes.

⁶ Not including Manganese due to HS aggregation.

⁷ Note that trade data for 2014 is the most complete year in the sample. UNCTAD Comtrade notes the [Annual Merchandise Trade Data Availability](#) of country record for each year:

2014 = 153 country records

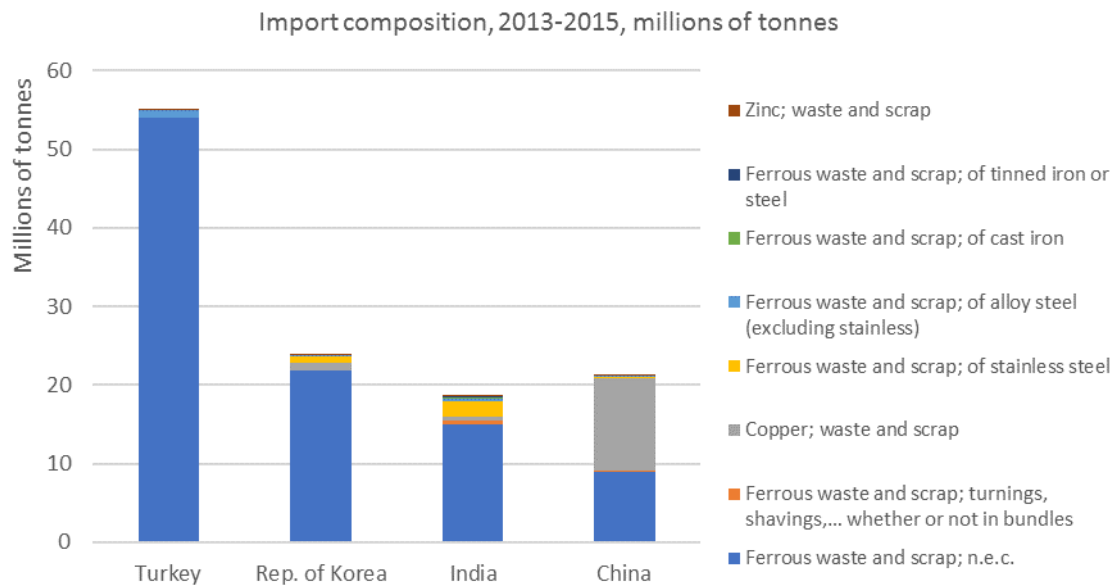
2015 = 148 country records

2016 = 31 country records

⁸ Due to rounding the share displayed in the chart is 2%.

Figure 2 shows that globally by far the largest importer of waste and scrap metals over the past three years has been Turkey, at more than 53 million tonnes, followed by South Korea (14.4 million tonnes), India (12.8 million tonnes) and China (12.4 million tonnes). However, in terms of value (US dollars) China imported the most waste and scrap metals over the past three years, more than \$22 billion, followed by Turkey (\$15.6 billion), Germany (\$9.6 billion) and South Korea (\$8.8 billion).

Figure 2: Global scrap metal import composition, 2013-2015, millions of tonnes



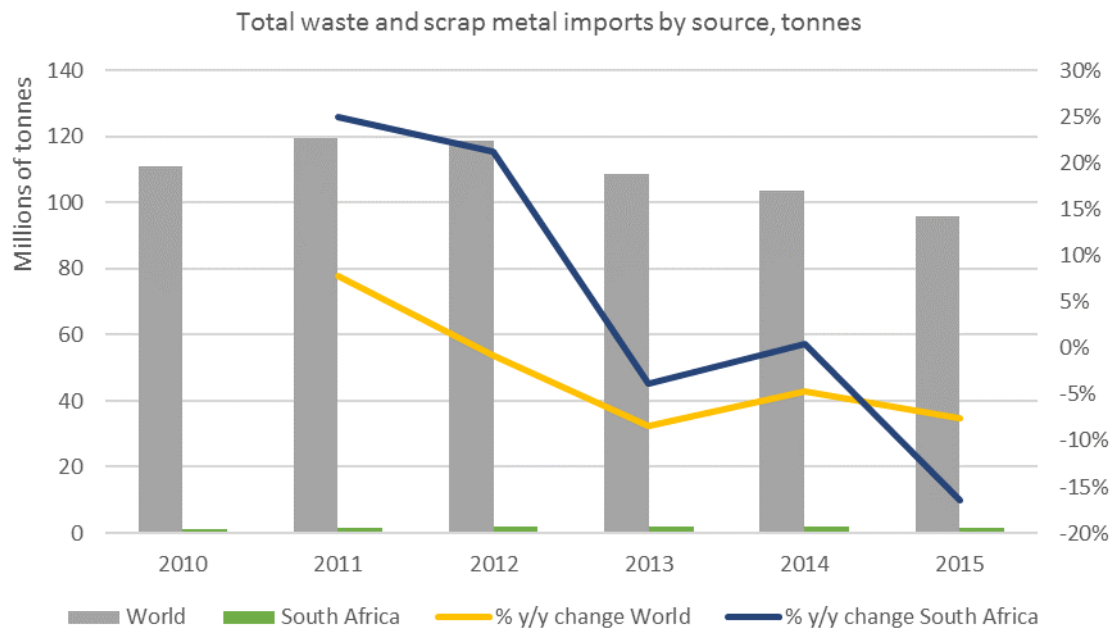
SOURCE: UN COMTRADE DATA, 2017

This **vast difference in terms of value and volume** can be explained by the difference in price of the various waste and scrap metals. As Figure 2 shows, the vast majority of waste and scrap metals imported by Turkey are ferrous, compared to Korea, India, and especially China which has a much more diverse basket of imports that include nonferrous alloys, especially (nickel based) stainless steel and copper.

Aggregate waste and scrap metal import trends over the past six years (**Error! Reference source not found.**) show that since 2011 there has been a global decline in demand for waste and scrap metals as reflected in the decline in imports. Waste and scrap metals sourced from South Africa also follow this trend. From 2011 to 2014 global demand for South African waste and scrap metals was slightly higher than the global average, as seen in **Error! Reference source not found.**(% y/y change), but a sharp decline occurred in 2015. The **decline in global imports of South African waste and scrap metals** can be partially explained by the global decline in imports of waste and scrap metals, coinciding with the PPS. However, the continuing decline in 2015 can point to other, possibly domestic, factors.

To determine the causes of this decline, beyond directly measuring domestic industry factors like consumption and collection, we can use proxies to look at the up and downstream industries' performance, particularly production trends of basic iron and steel, non-ferrous metal products, and the upstream ore extraction industry.

Figure 3: Global aggregate waste and scrap metal imports by source, 2010-2015, millions of tonnes



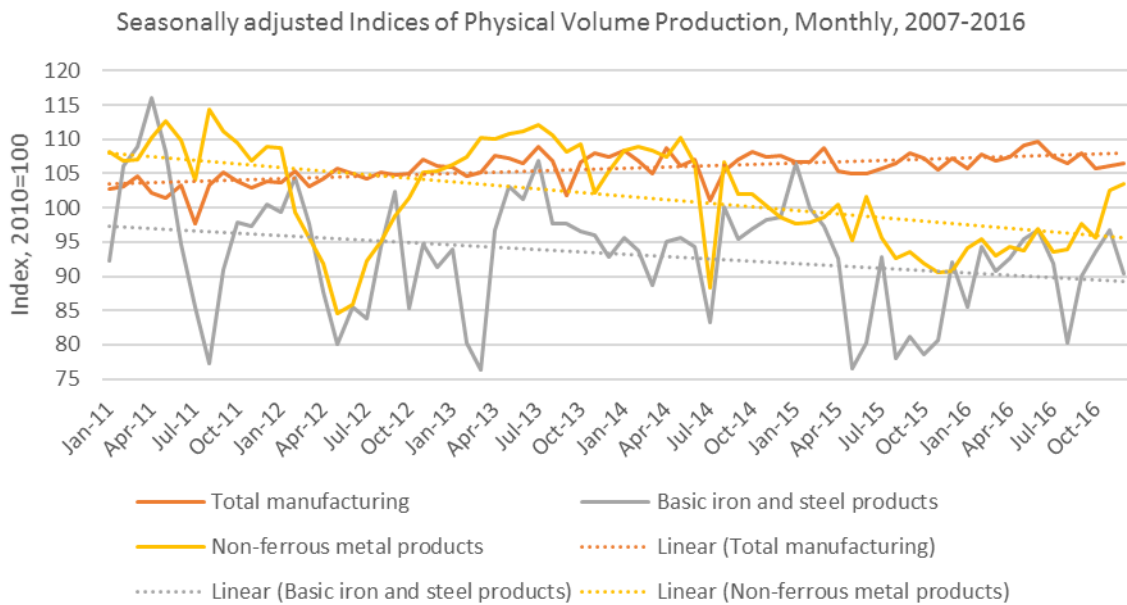
SOURCE: UN COMTRADE DATA, 2017

The centrepiece of the scrap and ore industries is metals manufacturing and associated fabrication (see the *consumer works* sector in the [value chain diagram](#)). These industries consume both scrap metals and ores, and their productivity and competitiveness has a direct impact on both (scrap and ore) input supplying industries. Their output can therefore be used as a proxy for the health of the domestic input industries. Considering the metals manufacturing output statistics (Figure 4), as well as the export trends of the input industries (**Error! Reference source not found.**), we can get an approximate idea of the economic wellbeing of each section of the scrap metals value chain. This yields important insights into the regulatory conditions governing the value chain.

Figure 4 shows that total South African manufacturing output seems to be increasing, as shown by the total manufacturing linear trend line, while Basic Iron and Steel (ferrous metals) and Non-ferrous Metal production trend lines are showing declines. These declines imply that **domestic demand for scrap and ore inputs is also declining**, since fewer products are being produced and so fewer inputs are required. Furthermore, South Africa’s large integrated mills are much less dependent on scrap metal inputs, and so their inputs could come substantially from virgin ores. This conclusion is supported by estimates of domestic ferrous scrap metal demand from a previous study by the Centre for Strategic Industrial Development (CSID)⁹ on the South African scrap metals industry, which show a downward trend: from 1.6 million tons in 2003 up to 2 million tons in 2006 then down to the lowest unpublished estimate, 1.5 million tonnes in 2015.

⁹ CSID, Study of the Scrap Industry and Proposed Measures to Maximise the Beneficiation of Scrap Metal in South Africa, 2006.

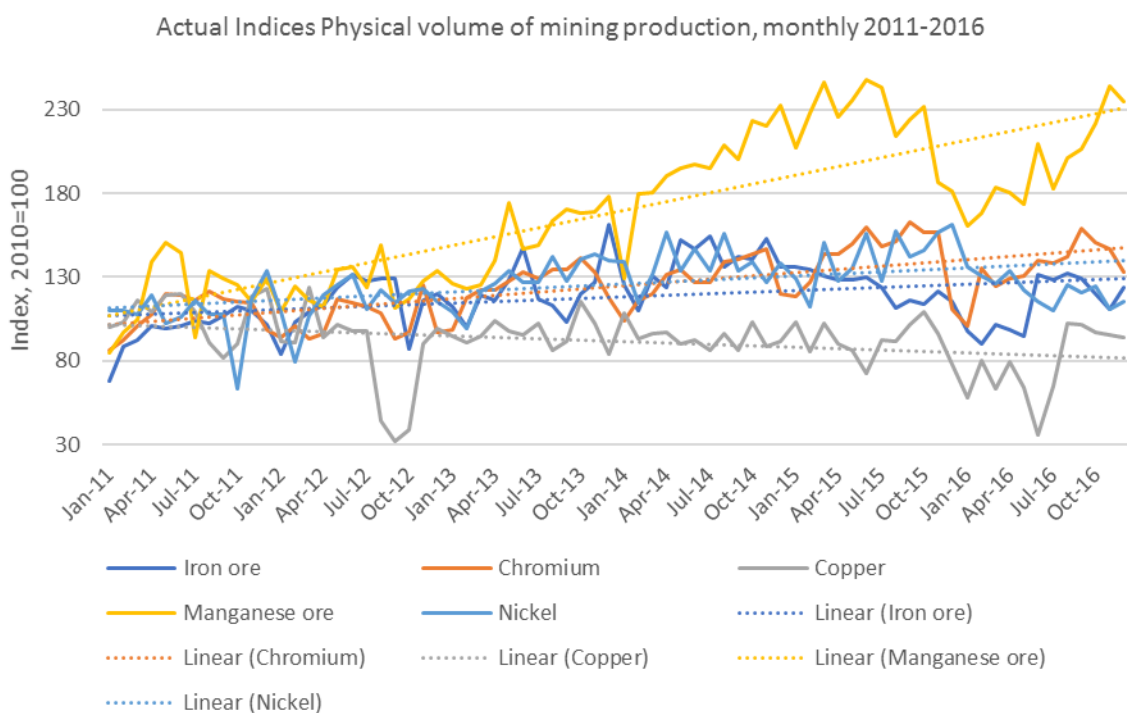
Figure 4: Seasonally adjusted indices of physical volume production, 2007-2016



SOURCE: STATSSA, 2017

By contrast, Figure 5 shows that the physical volume of mining production of most metal ores increased over the 2011 to 2016 period, barring copper, which shows a clear decline. However, the Producer Price Index, from StatsSA, shows **price increases for Basic Iron and Steel, Non-ferrous Metals, and Mining of Non-Precious Metals**, meaning the domestic prices of these commodities increased. This seems curious, given the context of declining output and implied decreasing demand for inputs.

Figure 5: Actual indices physical volume of mining production, 2011-2016



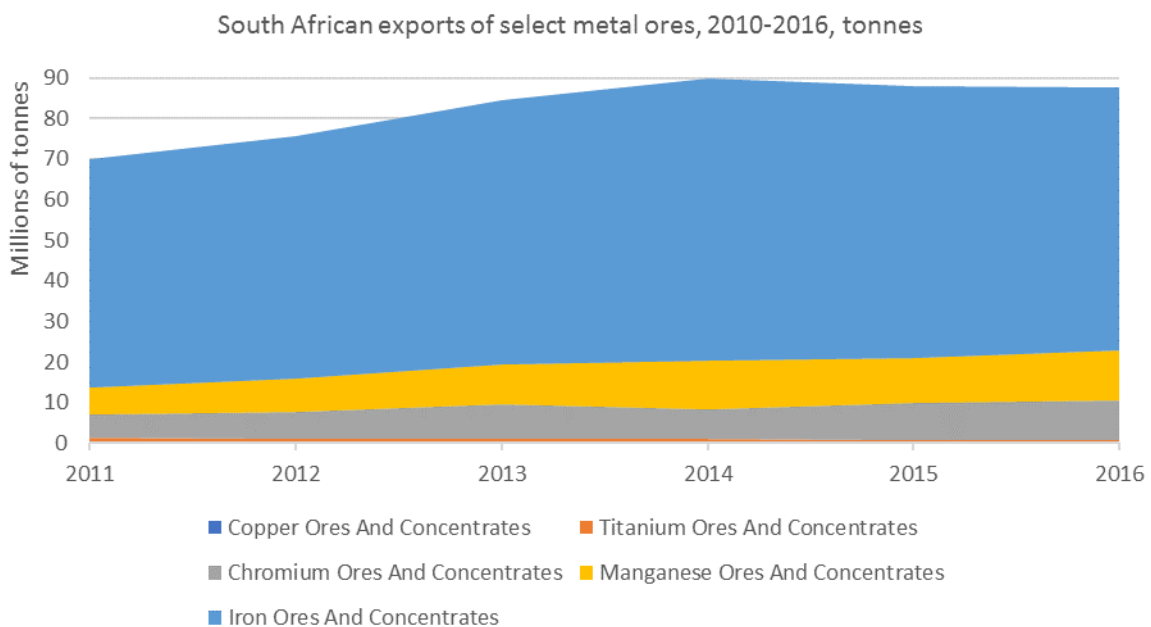
SOURCE: STATSSA, 2017

Not all economies have a competitive *consumer works* sector, as is the case with South Africa. Given that the South African metals recycling industry is predominantly demand driven by the domestic *consumer works* sector, even more so under the PPS, **South African metal recyclers face systemic pressure**, owing to a combination of factors arising from the upstream resources suppliers, or mining industry, and downstream *consumer works* and *industry* sectors.

It's important to note that South Africa is a price taker in the global commodities market and as such changes in the domestic prices for these commodities is, in part, a reflection of the changes in the global prices. By further regulating scrap metals market via the PPS, domestic scrap metal suppliers have almost no negotiating power and are price takers.

For the mining industry, supply dynamics are different. South Africa has a large mining industry that supplies ores to the upstream, integrated mills. These integrated mills can be extensively fed by ores but since ores are comparatively cheap, and only occur in some countries, the international demand for ore is high. In this light, the increase in mining output (Figure 5) and the decrease in the metals manufacturing output (Figure 4) is also, perhaps unsurprisingly, accompanied by increasing exports of metal ores as seen in **Error! Reference source not found.**. Perhaps the domestic price increases recorded for Mining of Non-Precious Metals are the result of increased global demand for these inputs. In other words, the large mining companies can secure better prices through exports than they can through supplying the domestic market, which is essentially captive. Since the large integrated mills rely on ore inputs, primarily, ore price increases are probably simply passed on down the chain.

Figure 6: South African exports of select metal ores, 2010-2016, tonnes



SOURCE: SARS, TRADE DATA, 2017

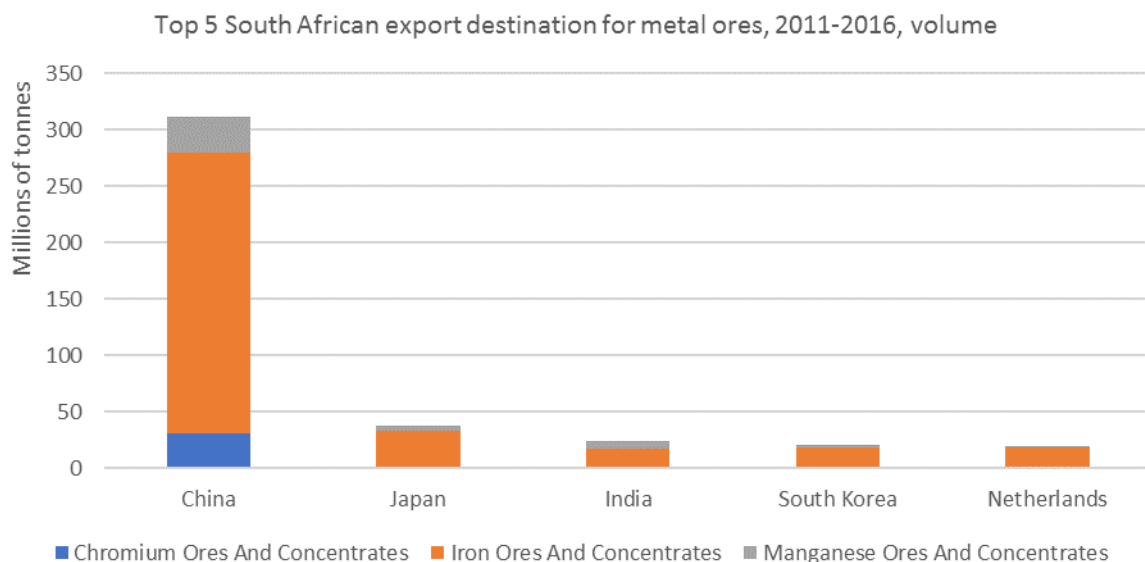
The **Secondary Smelters** - under *consumer works* - on the other hand, primarily constitute mini-mills and foundries and act as intermediaries between the mines and Industry. Foundries and mini-mills do not generally have the capacity to process ores, and so are dependent on scrap metals inputs. Consequently, their performance, which in recent years has generally been negative (for reasons we elaborate below), leaves South Africa with surplus stock of scrap metal. Normally this would not be a

problem as excess stock can be sold on the international market, but South Africa’s tightly regulated market curtails scrap metals exports, while simultaneously domestic demand is declining. This has negative implications for the continued collection of scrap metals, and particularly for the large pool of informal collectors who supply the formal recycling sector and who rely on this activity for their livelihoods.

The key question, then, is which is cause of which? Are increased exports of ores leading to increased domestic prices of those ores, causing metals manufacturing output to suffer? Or, is the decline in metals manufacturing output causing reduced demand for ores, resulting in greater ores exports? Either way, it is rather unlikely that developments in the scrap metals sector are the primary cause of developments in the Consumer Works sector.

More likely is that the decline in the metals Industries is caused by the increasing competition all manufacturers around the world face, particularly from **China**. Massive overcapacity in the Chinese steel industry is both a source of demand for South African iron (and other) ore exports (Figure 7), and a source of import problems for the primary metals manufacturing industry.

Figure 7: Top 5 South African export destinations for metal ores, 2011-2016, millions of tonnes



SOURCE: SARS, TRADE DATA, 2017

It is a well-known fact that China has during the last few years flooded the new steel market with cheap product, which has put the global steel manufacturing industry under pressure and has also been the single biggest factor **driving down ferrous scrap prices**.

The declining profitability of primary and secondary smelters as a result of these factors would naturally mean that the supplying industries would shift their products to markets with higher demand. Critically, while the **metal ores producers still have the option to export under free market conditions, scrap metal recyclers do not**, given the PPS.

Relative to this, the supply and price of scrap metals, particularly in the highly competitive scrap metals sector, is marginal. Clearly problems in the iron and steel production sector are a major determinant of domestic demand for scrap metals. With domestic primary metal production structurally repressed, scrap metals exporters naturally turn to export markets. The fact that South Africa is, structurally, a scrap metals surplus country, and that the costs of international transport

provide a natural price advantage to domestic consumers wishing to purchase scrap, means that **placing the blame on scrap metals exporters is misplaced.**

In this light, it is important to consider the broader implications of the PPS. To do, and since the PPS is, as the name suggests, a pricing tool, we consider price elasticity issues using data from the United States (US) as a proxy, and focusing on the **price elasticity of supply and demand¹⁰ for ferrous scrap.** In terms of ferrous scrap metal supply, it was found that:

- There is a strong positive correlation between the recovery of obsolete scrap and the price of scrap;
- with a lower positive correlation between the recovery of scrap as a result from manufacturing (production scrap) and price.
- There's also a positive correlation between apparent steel consumption¹¹, and the quantity of scrap supplied.
- A strong negative correlation was also found between the cost of scrap processing and transportation and the quantities supplied, more so for obsolete scrap than production scrap.

Overall, this means that the price of ferrous scrap, the costs of transportation and its processing have a correlating effect on the supply and recovery of scrap, more prominently on the recovery of obsolete scrap. Therefore, the higher the price for scrap metals and the lower the cost of transportation and processing the more scrap will be collected and supplied to consumers. In relation to this, consider that **the PPS** imposes lower domestic prices on scrap metal producers, while not addressing the costs of transportation – in other words it is a **strong negative disincentive to collect, process, and sell scrap domestically.** It is, in essence, self-defeating.

It is also important to note that the **recovery of obsolete scrap metal is the livelihood for a large pool of informal employees** in South Africa, with estimates varying from 100 000 to 450 000. Some 10,000 people are directly employed in the formal SA metal recycling sector. Considering the employment footprint of the metal recycling industry the overall effects of a declining metals manufacturing industry needs to be considered as well as the possible detrimental effect of the PPS.

Putting all this together, it is evident that **the scrap recycling industry is an integral but relatively vulnerable link in the metals manufacturing value chain.** Facing pressure from government and a declining metals manufacturing industry, scrap recyclers, and the vast number of people who depend on them must adjust to an unfavorable domestic market. Those metal manufacturers (especially mini mills and foundries) that depend on the scrap metal recycling industry are imperiled by this, since if the scrap metals recycling industry buckles it will impact most directly on them, with attendant ripple effects through the downstream value chain.

Finally, increasing pressure on the metals recycling industry has a much wider impact than securing inputs for the downstream metal production industry, particularly direct **environmental impacts** if

¹⁰ Robert J. Damuth, 2011, Estimating the Price Elasticity of Ferrous Scrap Supply, Economist and Principal Consultant Nathan Associates Inc. accessed 10 February 2017 at [http://www.isri.org/docs/default-source/recycling-analysis-\(reports-studies\)/estimating-the-price-of-elasticity-of-ferrous-scrap-supply.pdf](http://www.isri.org/docs/default-source/recycling-analysis-(reports-studies)/estimating-the-price-of-elasticity-of-ferrous-scrap-supply.pdf) Price elasticity simply refers to the effects of price on either the quantity supplied or the quantity demanded.

¹¹ Apparent steel consumption refers to domestic steel production plus imports minus exports. It is used as a measure for domestic iron and steel scrap demand, since the consumption of iron and steel products to produce final steel products is likely to result in some scrap. Therefore, consumption of steel products is likely to affect the supply of total purchased scrap.

input demand shifts to energy-hungry ores (which will bring national energy security into focus), and less domestic scrap is collected. Furthermore, considering the positive environmental impact of metal recycling, and the negative environmental impact of large-scale landfills, it's no surprise that so much waste and scrap metals are traded globally each year. Rather than having scrap metals pileup in landfills, and relying more on the environmentally taxing extraction and refinement of mineral ores, the upstream metal manufacturing sector can use scrap metals as a primary input.

Figure 8: South African Scrap Metals Value Chain Diagram

