PUBLICATION NOT FOR SALE **R108/2014**

SOUTH AFRICA'S IRON ORE INDUSTRY DEVELOPMENTS, 2004-2013

DIRECTORATE: MINERAL ECONOMICS

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

R108/2014

SOUTH AFRICA'S IRON ORE INDUSTRY DEVELOPMENTS, 2004-2013

DIRECTORATE: MINERAL ECONOMICS

Compiled by: Ms K Ratshomo

Email: (keneilwe.ratshomo@dmr.gov.za)

Picture on front cover

Source: www.dwaf.gov.za (Sishen mine)

Issued by and obtainable free of charge from

The Director: Mineral Economics, Trevenna Campus,

70 Meintjies Street, Arcadia, Pretoria 0001, Private Bag X59, Arcadia 0001

Telephone (012)444-3536, Telefax (012) 444-3134

Website: http://www.dmr.gov.za

DEPARTMENT OF MINERAL RESOURCES

Director-General Dr. T Ramontja

MINERAL POLICY AND PROMOTION BRANCH

Deputy Director-General Mr. M Mabuza

MINERAL PROMOTION CHIEF DIRECTORATE

Chief Director Ms. S Mohale

DIRECTORATE MINERAL ECONOMICS

Director: Mineral Economics Mr. TR Masetlana

Deputy Director: Precious Metals and Minerals and Ferrous Minerals Ms. L Malebo

THIS, THE FIRST EDITION, PUBLISHED IN 2014

ISBN: 978-0-621-42642-7

DISCLAIMER

Whereas the greatest care has been taken in the compilation of the contents of this publication, the Department of Mineral Resources does not hold itself responsible for any errors or omissions.

TABLE OF CONTENTS

CONTENTS **PAGES**

LIST OF FIGURES

1. INTRODUCTION

Iron ore is the world's second largest traded commodity by value and is consumed almost entirely in iron and steel making. As a result, demand for iron ore is directly linked to the production of crude steel, which is in turn, the function of global economic activity. Since 2002, China experienced a significant growth in steel production, reaching a market share of almost 50 percent in 2013. Consequently, that country became the main driver of iron ore consumption globally, positioning it as the largest iron ore importer, as the country does not have sufficient domestic supply to meet its needs. The majority of its imports were shipped from Australia and Brazil, followed by India. However, when India reduced its iron ore supply, as a result of an imposition of a ban on illegal production in that country, South Africa, traditionally the 4th largest exporter globally, became the 3rd largest supplier of iron ore to China. This position emphasises the strategic importance of iron ore deposits in South Africa and the country's importance as a significant iron ore supplier worldwide.

South Africa currently has 1 000 Mt of crude iron ore reserves, and the iron content in the ore reserves accounts for less than 1 percent globally. However, the country is ranked the world's 7th largest iron ore producer, contributing an average of 3 percent per annum to the global output over the last ten years (2004 to 2013). The country's iron ore production grew at an annual rate of 7.2 percent, with exports sales volumes increasing by 10.3 percent per annum from 2004 to 2013. The growth in production and exports indicates the importance of iron ore globally as a critical input in steel production. However, the uncertainty over the Euro-zone economy as well as the slowing economic growth in China affects the local iron ore industry, as a result of weaker demand from the steel industry.

The objective of this report is to determine South Africa's future role in the global iron ore industry by reviewing the local industry's performance from 2004, the year of the promulgation of the Mineral and Petroleum Resources Development Act 2002 (MPRDA). The report covers exploration and mining projects, policy developments as well as infrastructure developments over a ten year period. The report seeks to show the effects that the developments had on the industry and the future impact in terms of production and supply, job creation as well as industry competitiveness.

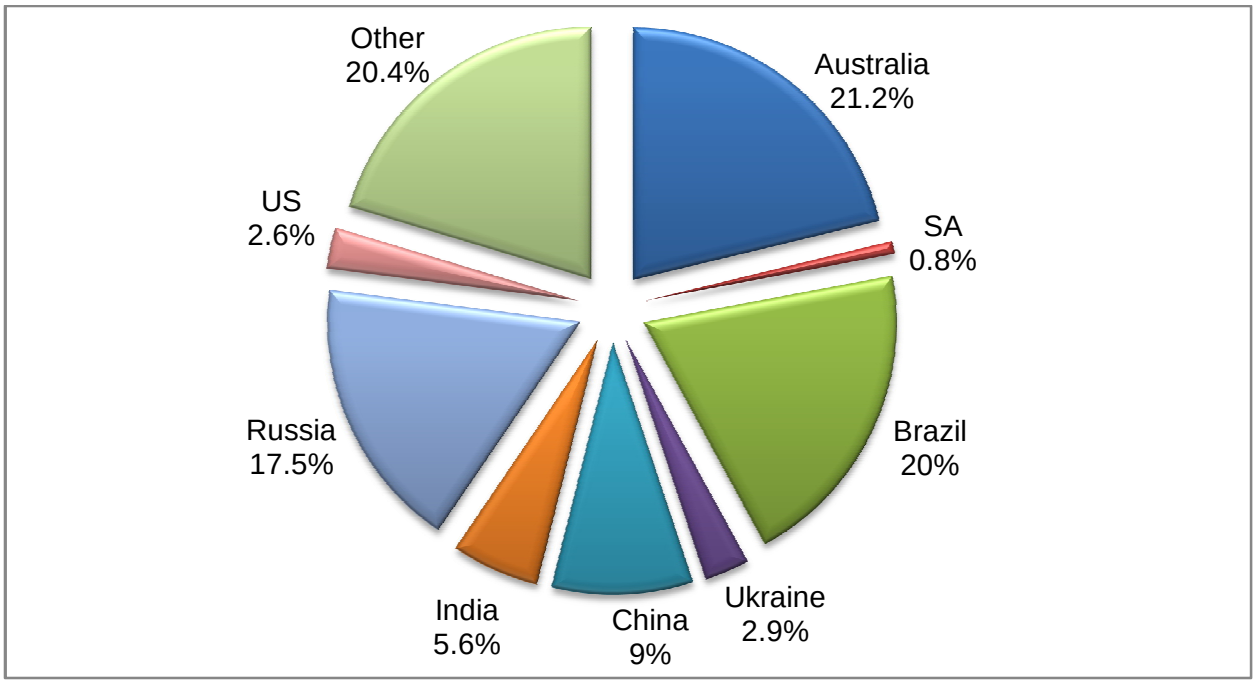
2. THE GLOBAL OVERVIEW OF THE IRON ORE INDUSTRY

2.1. Occurrence

Iron (Fe) rarely occurs as a pure metal in nature because it rapidly reacts with oxygen to form iron oxide. It is one of the most abundant metallic elements and, its oxides comprise about 5 percent of the earth's crust. Most of the world's important iron ore resources occur in iron-rich sedimentary rocks known as banded iron formations (BIFs). BIFs occur on all continents and they are the source for most of the high-grade concentrations of iron ore currently mined throughout the world. However, large economical ore deposits are concentrated in few countries, namely Australia, Brazil, China, India, Russia, Ukraine, South Africa, and the United States.

World resources of iron ore are estimated to exceed 800 billion tonnes (Bt) of crude ore, with more than 230 Bt of iron content. The global reserves amounted to 80 Bt (iron content) in 2012, with Australia accounting for 21.2 percent of the total reserves, followed by Brazil and Russia at 20 percent and 17.5 percent, respectively (Fig. 1).

FIGURE 1: GLOBAL IRON ORE RESERVES



Source: USGS

2.2. Types of iron ore products

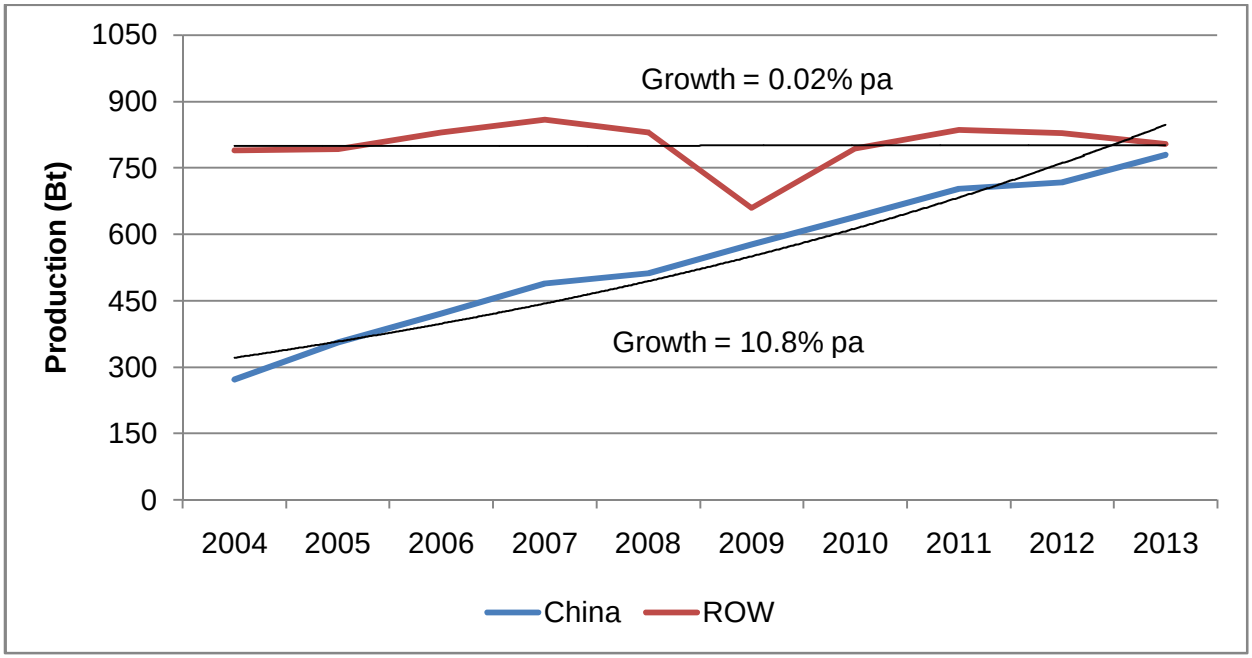
Generally, iron ore is produced from two types of iron ore mineral: haematite (Fe_2O_3) and magnetite (Fe_3O_4). The amount of iron contained in iron ore varies, with haematite ores usually of high grade (>60% Fe) and magnetite lower grade (<60% Fe). Haematite typically produce lumps and fines and magnetite ores require upgrading, and hence are beneficiated into pellets and fine products.

Iron ore products are grouped into different types according to the size of the product. Sinter fines (150µm-6.8mm) are the baseline in the iron ore market, from which other products are priced. Fines are agglomerated into pebble-sized balls of ore called “sinter” at the sinter plant of a steel mill before use in a furnace. Lumps (6.8mm-15mm) are irregularly sized and can be charged directly into a furnace, enabling a steel producer to avoid the cost of sintering iron ore fines. Pellets (10mm) have a uniform size and they provide the most efficient source of iron units to a furnace.

2.3. World demand

The growth in iron ore demand has been concomitant with the rapidly growing steel production from emerging economies, particularly China, recently supported by India. China’s crude steel production grew at a rate of 10.8 percent per year and raised its market share from 25.7 percent in 2004 to 48.5 percent in 2013 (Fig. 2). Consequently, world consumption of iron ore grew by over 5 percent annually, with China representing over 50 percent of the total world consumption, followed by Japan’s 8 percent and India’s 6 percent, respectively.

FIGURE 2: GLOBAL PRODUCTION OF CRUDE STEEL, 2004 - 2013



Source: World Steel Association

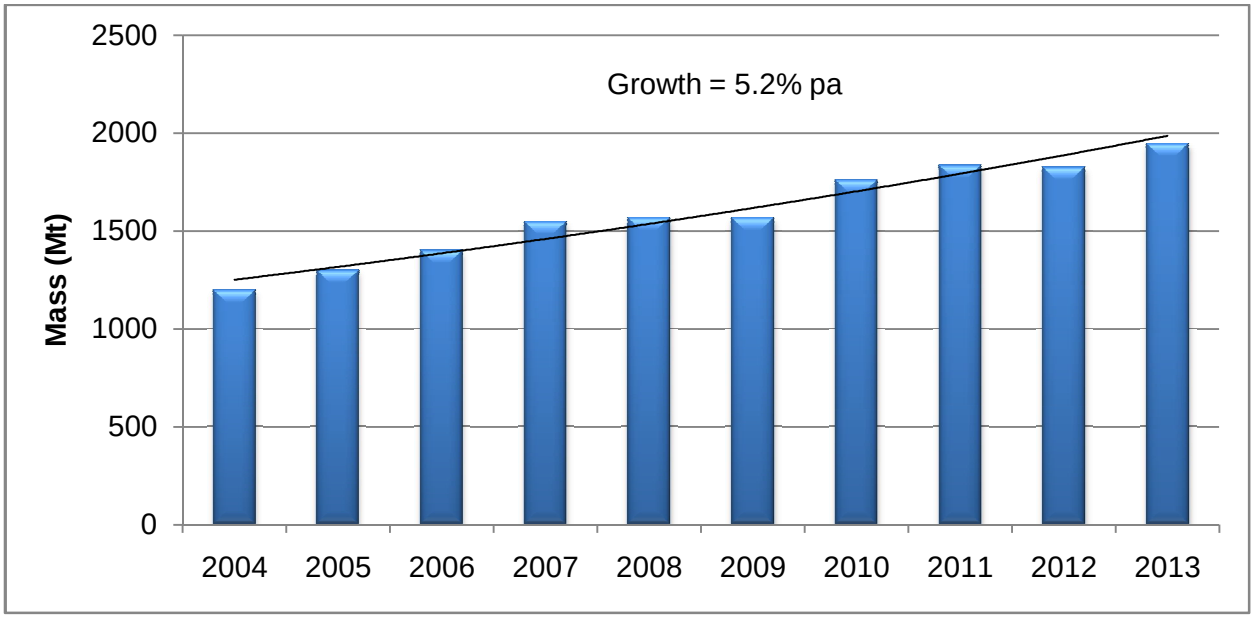
The annual growth rate of crude steel output in the rest of the world (ROW) has been stagnant during the same period, mainly due to poor economic activities in the developed countries. This was evidenced by a 20.5 percent decline in crude steel production in 2009 in the ROW, when the global financial crisis hit commodity markets. In contrast, China’s crude steel production grew by 12.6 percent in 2009 despite the economic crisis, offsetting some of the overall decline. Governments around the world responded rapidly to the crisis by providing large fiscal stimulus, which led to economic recovery in the second half of 2009. Recently, the poor economic situation in the Euro-zone fostered feeble demand for steel from steel intensive industries.

2.4. World Supply

- *Production*

Global iron ore production (including pellets, lump and fines) grew at an annual rate of 5.2 percent, from 1 196 Mt in 2004 to 1 944 Mt in 2013 (Fig. 3). Australia was the leading producer, accounting for about a quarter of the global output, followed by Brazil, China and India, in that order. Together, these countries accounted for about 60 percent of the total output. Iron ore production increased slightly in 2009 despite the global financial crisis. However, it declined for the first time in ten years during 2012 by 1.8 percent, mainly due to a drop in production levels from Brazil, China and India.

FIGURE 3: GLOBAL PRODUCTION OF IRON ORE, 2004 - 2013



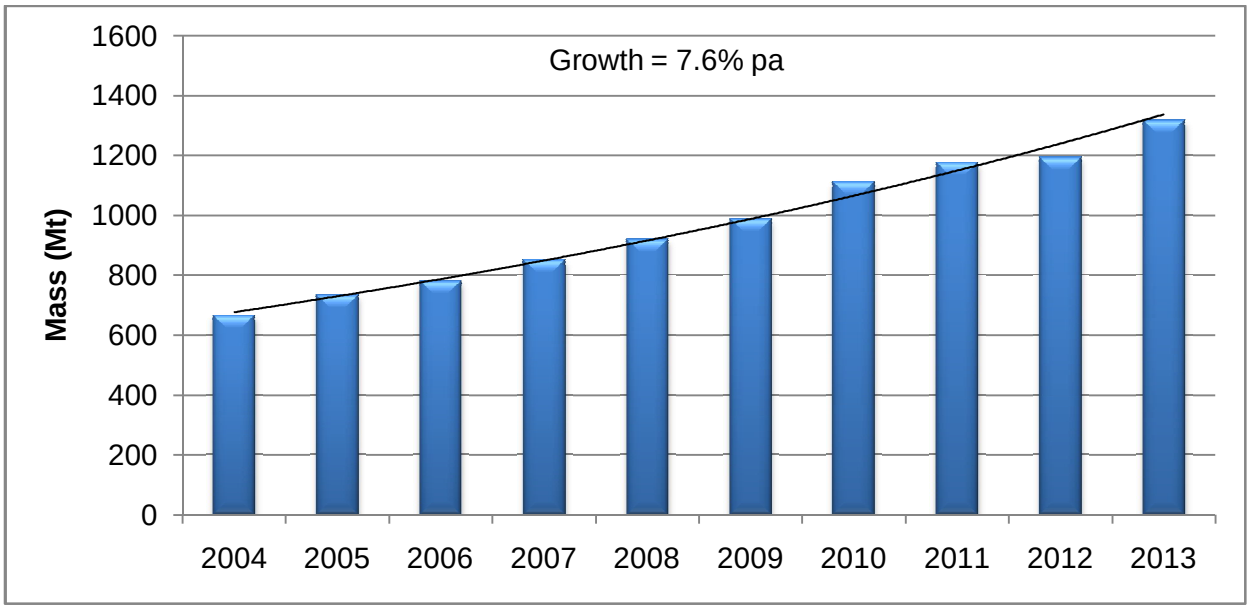
Source: Iron Ore Market Outlook, CRU

The iron ore mining business is generally a lower profit margin and high-volume business. It is highly capital intensive, and requires significant investment in infrastructure such as rail in order to transport the ore from the mines to ports. Consequently, the world's production of iron ore is led by three major companies namely Vale, BHP Billiton and Rio Tinto. Vale is a Brazilian mining corporation while BHP Billiton and Rio Tinto are Anglo-Australian companies. These three companies are known as the "Big Three" and together controlled an average of about 35 percent of world production over the study period.

- Exports

Iron ore exports almost doubled during the past decade from 665 Mt in 2004 to 1 317 Mt in 2013, growing by 7.6 percent annually (Fig.4). Australia and Brazil dominated total exports, with a combined share of just over 70 percent. India's share deteriorated over the past ten years and was surpassed by South Africa as the third largest exporter. The global seaborne iron ore market represented 94 percent of total exports, with Australia dominating the market at 45 percent.

FIGURE 4: GLOBAL EXPORTS OF IRON ORE, 2004 - 2013



Source: Iron Ore Market Outlook, CRU

The exports market share controlled by the "Big Three" has been declining in the past five years, from 60 percent in 2009 to 55 percent in 2013. The declines in market shares are as a result of new production capacity by smaller and mid-sized producers in other countries, particularly in China where most of the small producers restarted their production in late 2009 and early 2010.

New iron ore mining capacity amounted to 125 Mt since May 2012. As of May 2013, the total project pipeline contained 771 Mt of new production capacity, and is expected to come on stream between 2013 and 2015. Of this total, around 306 Mt falls into the category "certain," 230 Mt "probable" and 235 Mt "possible." About 32 percent of the new projects are located in Australia, 29 percent in Latin America, 13 percent in Africa, 11 percent in Europe, 11 percent in Asia and 4 percent in North America.

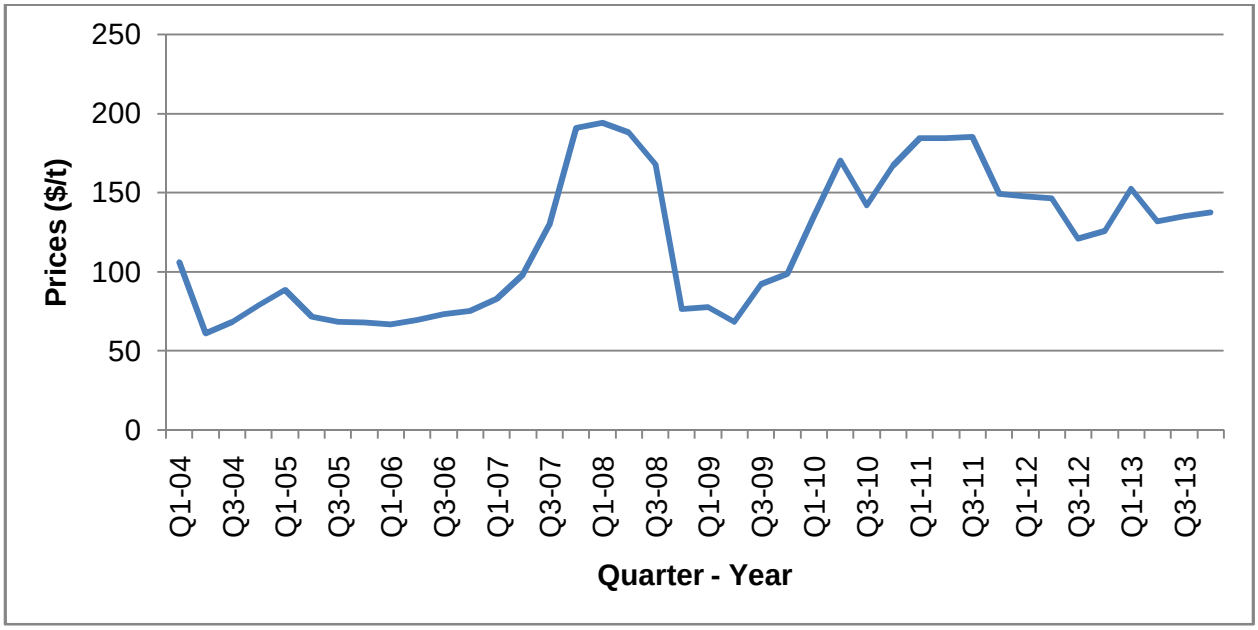
2.5. Prices

Pricing in the iron ore industry has changed dramatically over the last decade. Historically, a yearly iron ore benchmark price was set annually between the major mining firms and steel producers. This benchmark seldom varied year-to-year, and was used as a baseline for annual contracts. After China joined the World Trade Organisation in 2001, its demand for iron ore grew rapidly due to growth in the country's steel industry. Chinese producers gradually demanded larger discounts from the benchmark price, which led miners to abandon the benchmark system in 2010.

Iron ore prices have been immensely affected by the business cycles, evidenced by the steep increase in spot prices during the commodity boom in 2008. Prices reached a peak of $194/t during the first quarter of 2008 due to higher demand and inadequate supply. The contraction in the market led to prices hitting a low of $68/t during the second quarter of 2009. The market recovered thereafter and prices eventually peaked at $185/t during the third quarter of 2011.

Considerable price volatility marked 2012, especially during the third quarter when prices fell by up to 36 percent, as Chinese steel mills depleted stockpiles and reduced raw material inventory levels. The market recovered at the end of 2012, with steel mills returning to the market, which was reflected in a marked increase in iron ore prices. This bullish sentiment and an improvement in iron ore buying activity drove ore prices to above $130/t in 2013 (Fig. 5).

FIGURE 5: IRON ORE QUARTERLY PRICES, 2004-2013



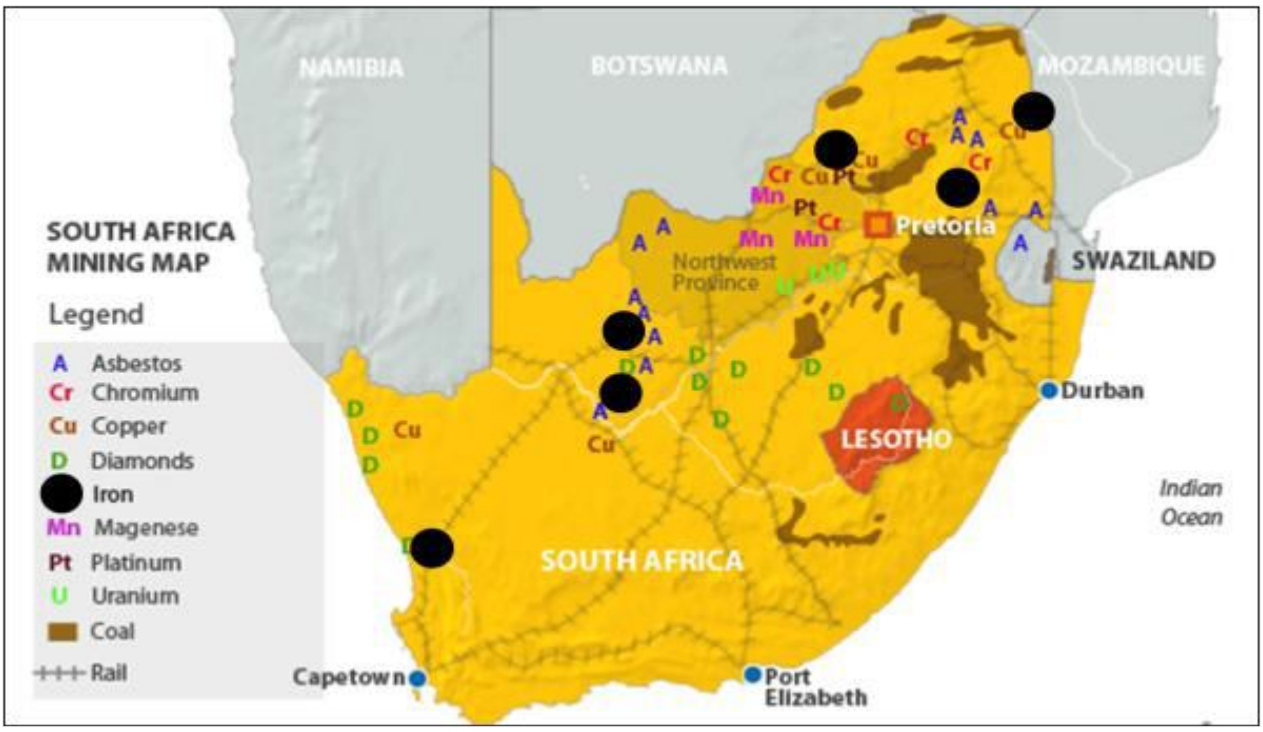
Source: Iron Ore Market Outlook, CRU

3. AN OVERVIEW OF SOUTH AFRICA'S IRON ORE INDUSTRY

3.1. Iron ore Reserves

South Africa's total reserves of iron ore amount to 650 Mt (iron content), the 10th largest in the world while, resources are ranked 9th, estimated at 5 370 Mt. The principal deposits are the superior-type banded iron formations of the Transvaal Super-group located in the Northern Cape Province at Sishen and Postmasburg (Fig. 6). Other high grade haematite deposits occur at Thabazimbi in the Limpopo Province, on the northern rim of the Bushveld Complex (BC). Elsewhere on the BC, are lower grade and vanadium bearing titaniferous magnetite resources, which if included, the reserves would increase by 26 400Mt, ranking South Africa's iron ore resource 6th in the world.

FIGURE 6: SOUTH AFRICA'S IRON ORE DEPOSITS



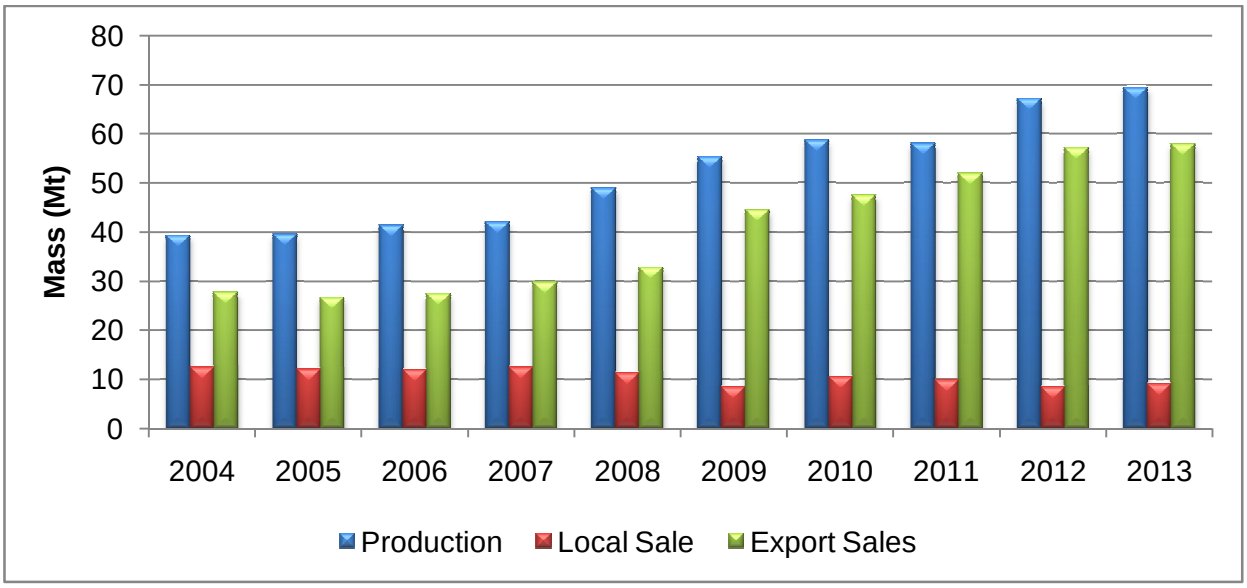
Source: South African Chamber of Mines

3.2. Iron ore Production and Sales

South Africa's iron ore production is dominated by the mining of the high grade haematite ore, which accounts for about 90 percent of the ore produced, with the balance attributed to magnetite ore. Overall iron ore production grew at an average rate of 7.2 percent annually, from 39.3 Mt in 2004 to 71.6 Mt in 2013, partly due to a ramp up in production capacity, responding to increasing demand. The level of production was unaffected by the global economy crisis in 2009, and instead grew by 12.9 percent compared with 2008 (Fig. 7). The start-up of a new mining operation in the country resulted in a 16 percent increase in production in 2012, despite a sluggish overall global market.

Local sales volumes declined at an annual rate of 4.2 percent, from 12.4 Mt in 2004 to 9.3 Mt in 2013 due to lower demand, while local sales volumes contribution to total sales went down by 17.1 percentage points during the ten years. Export sales volumes grew at an annual rate of 10.3 percent, from 27.7 Mt to 58.1 Mt over the same period. Over 50 percent of South African exports were destined for China, while exports to Japan declined by half to 10 percent at the end of the study period and the country's exports to India only started in the past two years.

FIGURE 7: SOUTH AFRICA'S IRON ORE PRODUCTION AND SALES, 2004 - 2013



Source: DMR, Directorate Mineral Economics

4. DEVELOPMENTS IN SOUTH AFRICA'S IRON ORE INDUSTRY

4.1. Role players in South Africa's Iron Ore Industry

South Africa's iron ore industry has been predominantly controlled by two companies, Kumba Iron Ore and Assmang, with most of their operations located in the Northern Cape. Together, these companies produce about 90 percent of the country's iron ore products, with their combined reserves amounting to 1.7 Bt.

- *Kumba Iron Ore*

Kumba Iron Ore Ltd. is a member of the Anglo American plc Group, which manages and holds a 73.9 percent interest in Sishen Iron Ore Company (SIOC). SIOC has three mining operations; Sishen mine, located near the town of Kathu in Northern Cape; Thabazimbi mine, situated in the town of Thabazimbi in Limpopo Province; and Kolomela mine, a new development in the vicinity of Postmasburg in Northern Cape.

Sishen mine is Kumba's flagship operation which accounts for 90 percent of the company's production. The mine produces lumps and fines through open-cast methods and, the ore is transported to an on-site dense medium separation (DMS) and Jig beneficiation plants, where it is further processed and subsequently transported via the iron ore export channel (IOEC) operated by Transnet Freight Rail (TFR) to the port of Saldanha Bay for exports. Sishen's life-of-mine (LoM) is currently estimated at 18 years.

Thabazimbi mine has been operating since 1931 and its nearing the end of its life, which is currently estimated at less than 6 years. The mine produces primarily high-grade haematite ore (>62% iron content) through conventional opencast methods (including blasting, drilling, loading and hauling). The mine's entire run-off-mine (RoM) is further processed through a high-yield

DMS process. Thabazimbi mine operates on a cost-plus basis and is contractually dedicated to supplying ArcelorMittal South Africa (AMSA).

Kolomela mine is Kumba's recent project, which was brought to commercial production in December 2011. The mine is designed to produce 9 Mt per year and has an estimated life of 29 years. Kolomela mine produces a high-grade, conglomeratic and laminated haematite through a highly mechanised open-pit operation. Direct Shipping Ore (DSO) is produced through the processing plant, producing lump and fine ore products. A 36 km rail link has been constructed to connect the mine with the IOEC for exports.

- *Assmang Limited*

Assmang is equally owned by African Rainbow Minerals and Assore Limited and operates two mines; Beeshoek mine situated on the farms Beeshoek and Olynfontein located outside the small town of Postmasburg and Khumani mine situated on the farms Bruce, King, Mokaning and Parsons located near the town of Khatu.

Beeshoek mine has been operating since 1960 and is nearing the end of its economic life. Mining takes place through opencast and, traditionally most of the ore was mined from the Beeshoek North deposits. However, in recent years the Beeshoek South mining area was also developed and detrital mining takes place on the property. All detrital material is processed through the jig plant, processing it further to an On-Grade product. The detrital deposits are found relatively close to the surface and require no blasting. Beeshoek ore is mainly supplied to local customers, with some ore exported via Khumani.

The Khumani Iron Ore mine, which was brought on-stream in 2008, replaces the older Beeshoek mine as the main iron ore producer for Assmang. The Khumani mine has been designed to produce 16 Mt per year with the life of mine in excess of 25 years. The ore mined from the open pits is transported by trucks to the ROM tips where it goes through primary and secondary crushing before it is conveyed to the relevant stockpiles at the beneficiation plant. At the plant, on-grade material is washed, screened and crushed to produce the final product while off-grade material is processed further by the jig plants for the removal of contaminants. Three different products are produced at the beneficiation plant; a blast furnace lump (66% Fe), a direct-reduced (DR) lump (65.5% Fe) and fines (65% Fe). The products are then transported via IOEC to Saldanha Bay for exports.

4.2. Other Producers

- *Palabora Mining Company Limited*

Palabora Mining Company was formerly a member of the Rio Tinto Group, which had 57.7 percent shares in the company, with another major shareholder being Anglo-American (16.8%). The two Groups announced intentions to sell their interest in the company in 2012 and entered in a binding agreement with a consortium consisting of South African and Chinese entities led by the Industrial Development Corporation of South Africa (IDC) and China's Hebei Iron and Steel Group Co. Ltd. The sale was completed by the end of 2013.

Palabora produces refined copper as its main product and magnetite concentrate as a by-product from an underground block cave mine in Phalaborwa in the Limpopo Province. Magnetite consists of two ore streams, one being the magnetite mined as part of the copper-bearing ore and the other, a historic stockpile accumulated during the open cast copper mining period. Magnetite is recovered from the concentrator floatation tails stream by magnetic separation. About 15 percent (by weight) of the magnetite is then removed by cleaning and re-cleaning the magnetic concentrate from the first stage. The re-cleaning results in a 66 percent Fe magnetite, which is subsequently subjected to elutriation to generate medium grade and coarse grade products. The products are transported by rail to the Richards Bay and Maputo ports for exports. Existing mine life ends in 2015 due to ore body (Lift I) depletion. However, a pre-feasibility study for a second level of mining (Lift II), has been undertaken to extend the life of mine to 2030.

- *Sedibeng Iron Ore*

Sedibeng Iron Ore is 64 percent owned by Black Ginger, a subsidiary of India's Tata Steel. A broad-based empowerment (BEE) group, Cape Gannet Properties owns 26 percent with the remainder being held by the Industrial Development Corporation (IDC). The company operates an opencast iron ore mine 20 km north of Postmasburg. Currently, the mine exports 2 Mt per year to companies in the Tata Group in Europe by trucking its ore to Assmang's Khumani mine, and loads its ore using the loading facilities at Khumani mine onto wagons that are railed to Saldanha Bay port.

- *Diro Manganese*

Diro Manganese, which was previously known as Burk Mining, is the first junior BEE miner to enter the seaborne iron-ore market. The company struck an agreement with Kumba Iron Ore to use its infrastructure to load 500kt a year of iron ore destined for the export market. The agreement is expected to remain in place until Diro builds its own facilities at its mine near Kumba's Sishen mine, in the Northern Cape.

4.3. Iron Ore Projects in South Africa

Holding Company	*Project Name*	*Product Type*	*Expected Production Capacity Mt/y*	*Expected First year of Production*	*LoM (estimated)*
Aquila Resources	Thabazimbi	Magnetite	4.0	2015	+15 years
Bushveld Minerals	Bushveld Iron Ore Project	Titano-magnetite	2.0	2016	18 years
Ferrex	Malelane Iron Ore	DSO and Concentrate	1.8	N/A	16 years
Ferrum Crescent	Moonlight Iron Ore Project	Magnetite pellets	6.0	2018	20 years
Ironveld	Pig Iron Ore Project	Magnetite Concentration	2.4	2016	25 years
Kumba Iron Ore	Sishen Expansion Project IB	Haematite DSO	0.75	2031+	+20 years
	Kolomela Expansion	Iron Ore	6.0	2017+	N/A
	Sishen Lower Grade (Jig discard) I	Fine ore	1.7	2019	N/A
	Sishen Lower Grade (C grade) II	Fine ore	4.3	2019	N/A
	Sishen Concentrate	High-grade iron ore - 200 micron fraction or pellet feed	4.0	2018	N/A
	Phoenix	Fines and Lump ore	3.4	2019	+20 years
	Zandrivierspoort I	Magnetite – concentrate or micro pellet or BF pellet	2.5	2015	N/A
	Zandrivierspoort II	Magnetite – concentrate or micro pellet or BF pellet	3.5	2019	N/A
Midwinter Resources	Northern Lights Project	Magnetite	N/A	N/A	N/A

5. INFRASTRUCTURE

Since 2004, South Africa's mining industry has transformed on the back of progressive legislative framework, particularly the Minerals and Petroleum Resources Development Act (MPRDA) 2002, which has resulted in the industry experiencing significant growth. The MPRDA allowed for investments and exploration in the industry and, included the highly concentrated iron ore sector. The growth in the iron ore industry was evidenced by significant increase in production due to expansion projects and the opening of new mines. Exports increased by a rate of 10.3 percent annually, on the back of increased demand from the global steel industry.

However, the limited rail and port capacity is a constraint to the growth in exports of bulk commodities in the country. As such, government committed R800 billion intended to address the infrastructural development requirements in the country as identified in the NGP and NDP. To achieve this, the Presidential Infrastructure Coordinating Commission (PICC) was established. The PICC led to the development of the eighteen Strategic Integrated Projects (SIPs), aimed at supporting economic development. Each SIP comprises of a large number of specific infrastructure components and programmes. Of the eighteen SIPs, there are three SIPs that have a direct impact on the mining sector, namely:

- SIP 1: Unlocking the northern mineral belt with Waterberg

The key objectives of SIP 1 are to

- Invest in exploration of mineral resources
- Develop rail, water pipelines, energy generation and transmission infrastructure
- Create jobs
- Create urban development in Waterberg
- Develop rail capacity to Mpumalanga and Richards Bay
- Shift cargo from road to rail in Mpumalanga
- Develop a logistics corridor to connect Mpumalanga and Gauteng

- SIP 3: South-Eastern node and corridor development

Developments include:

- Development of the N2-Wild Coast Highway, which will improve access to KwaZulu-Natal and national supply chains.
- Strengthen economic development in Port Elizabeth through a manganese rail capacity from Northern Cape.
- Construction of a manganese sinter (Northern Cape) and smelter (Eastern Cape).
- Possible Mthombo refinery (Coega) and trans-shipment hub at Ngqura as well as port and rail upgrades to improve industrial capacity and performance of the automotive sector.

- SIP 5: Saldanha-Northern Cape development corridor

This SIP entails:

- Integrated rail and port expansion.
- Back-of-port industrial capacity (including an industrial development zone).
- Strengthening maritime support capacity for oil and gas along the African West Coast.
- Expansion of iron ore mining production and beneficiation

The expansion in infrastructure could result in a significant increase in iron ore export volumes. The development of the Limpopo export hub will provide an opportunity for magnetite producers in the province to increase exports from the current stockpiles and, enable progress in the developments of new magnetite projects. The upgrade of the IOEC would accommodate additional volumes from Assmang and Sishen expansion projects as well as new BEE miners and in turn, double iron ore export volumes in ten years.

6. BENEFICIATION

South Africa's iron ore consumption declined at an annual rate of 2.6 percent, from 11.2 Mt in 2004 to 9.9 Mt in 2013, corresponding to the country's crude steel production, which declined at a rate of 3.8 percent annually during the same period. This translated into a decline in the country's local sales volumes from 12.4 Mt in 2004 to 9.3 Mt in 2013.

The Beneficiation Strategy for the mineral industry of South Africa is aimed at promoting local downstream value addition of some mineral commodities, in order to enhance the quantity and quality of exports. This strategy ties in with the Industrialisation Policy, particularly Industrial Policy Action Plan (IPAP), which identifies the significance of the country's mineral endowment to economic growth. Iron and steel manufacturing are amongst the identified value chains critical for South Africa's development and, the government is working on creating an enabling environment for the development of these industries. A Consolidated Implementation Framework that covers all the value chains is being developed. This follows a similar approach as the Strategy, of identifying problems and seeking solutions.

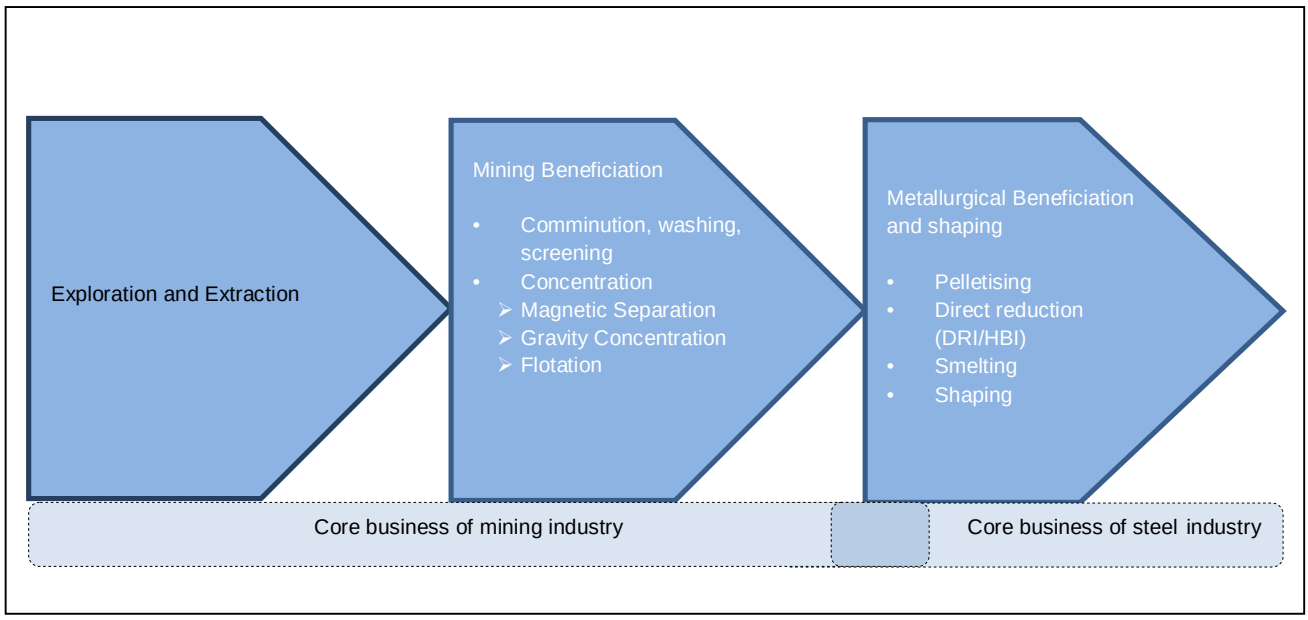
The Infrastructure Development Bill, which intends to strengthen the capacity of government to expedite implementation of infrastructure projects, was passed by the National Assembly in February 2014. Once adopted, the Bill will speed up infrastructure development. The development of the infrastructure projects as well as the mining projects will include massive constructions which could increase local demand for steel. The South African steel industry has approximately 11.1 Mt of steel production capacity with about 5.6 Mt of excess steel capacity of which, about 2.8 Mt is utilised for the production of steel exports. The expected increase in local steel demand from the mentioned infrastructure developments, could lead to steel production reaching full capacity and, further encourage the construction of new steel facilities, which could increase local demand of iron ore.

7. SOUTH AFRICA'S IRON ORE VALUE CHAIN

Typically, South Africa's iron ore value addition starts at the mines where most of the iron ore is processed through capital intensive dense medium separation or jigging at the mine site, in order to convert the mined ore into a saleable product and/or to increase its value in use to local and international steel producers. Some iron ore miners sell their iron ore directly to steel producers, referred to as directly shipped ore (DSO).

Metallurgical beneficiation and shaping is performed by the steelmaking industry and typically involves smelting to convert iron ore into pig-iron (Fig. 8). This is primarily via the blast furnace, which produces a hot metal, then refining it using a basic oxygen furnace (BOF) or alternatively the electric arc furnace (EAF) and shaping it in rolling mills into steel products. The BOF steel making process involves using mainly raw materials, i.e. iron ore and coking coal, and this process constitutes about 60 percent of South Africa's crude steel production. The balance is produced via the EAF steelmaking process, which can use up to 100 percent steel scrap, although producers use a proportion of raw materials for product quality reasons. In South Africa, 1 567 kg of iron ore is fed into the blast furnace to produce 1 t of hot metal.

FIGURE 8: IRON ORE VALUE CHAIN



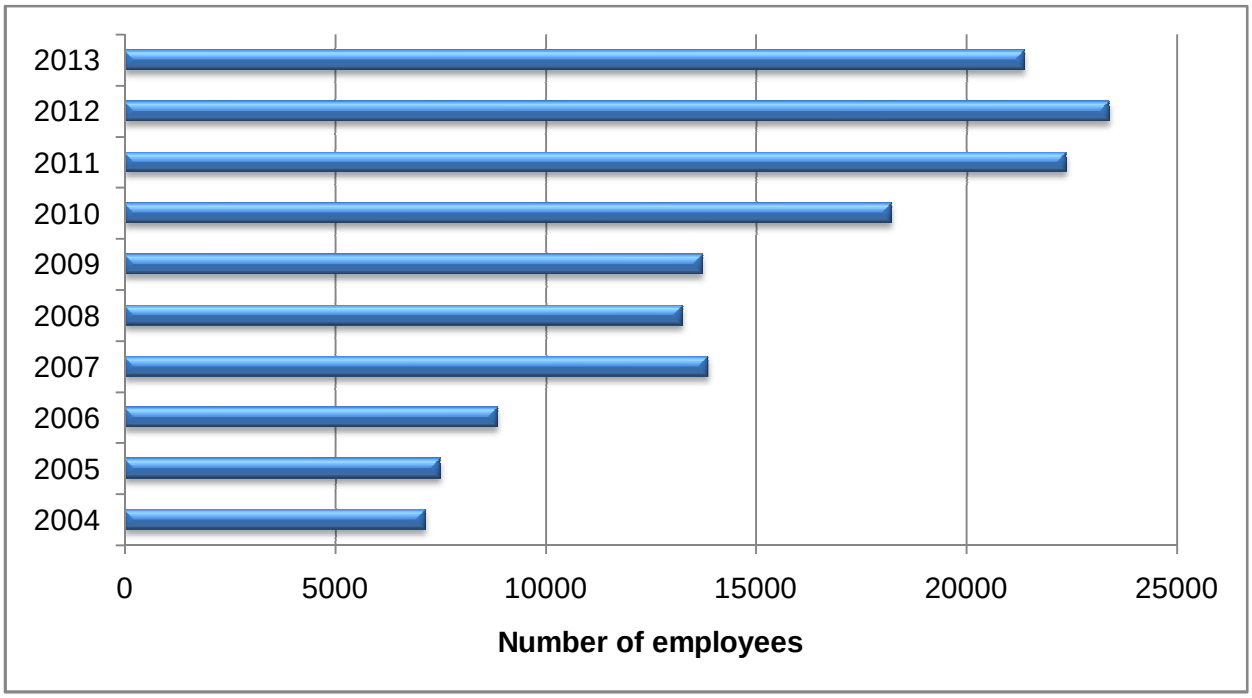
Source: Kumba Iron ore

8. EMPLOYMENT

Employment in South Africa's iron ore industry grew at an average rate of 14.1 percent per year, from 7 142 in 2004 to 21 373 in 2013 (Fig. 9). This was due to the construction of new production capacity and the eventual operation of the new capacity by both pre-existing and new producers. The industry's share of the total mining employment increased from 1.6 percent at the beginning of the study period to 4.2 percent in 2013.

The projects mentioned in the report have a potential for job creation, as well as through side stream (infrastructure, research and development, human resource development as well as inputs such as capital goods, consumables and services) and further into downstream value addition. The country's iron ore industry is reported to have the potential to create about 7 000 direct jobs and about 7 000 indirect jobs through exploration, extraction and mining beneficiation by 2020.

FIGURE 9: EMPLOYMENT IN SOUTH AFRICA'S IRON ORE INDUSTRY, 2004-2013



Source: DMR, Directorate Mineral Economics

9. THE FUTURE ROLE OF SOUTH AFRICA'S IRON ORE INDUSTRY

South Africa's iron ore exports are forecast to grow by 3 percent annually driven by increasing global steel production. However, this could increase on the back of Transnet's expectation to increase the Sishen-Saldanha iron ore rail capacity to 60 Mt and port capacity to 58 Mt, resulting in targeted iron ore export volumes increasing to 59.5 Mt for 2014. Transnet anticipates that the execution of its Market Demand Strategy will result in port capacity eventually increasing to 82.5 Mt by 2020. South Africa's iron ore production is anticipated to also grow by an annual average of 3 percent to 2017, maintaining its 3 percent global market share. The growth in output is expected to come from Kumba's expansion projects and a small amount from junior BEE producers in the Northern Cape.

South Africa's crude steel production is forecast to grow annually by 3.9 percent to 2017. This is likely to raise local iron ore consumption by 2.6 percent per annum during the same period. The country's BOF steel production is projected to increase at an annual rate of 5.5 percent. The EAF steel production, which has been declining in the past ten years, is expected to be stagnant

up to 2017. Global steel production is expected to grow by 3.3 percent per year to reach 1 821 Mt in 2017 from 1 607 Mt in 2013. China will continue to be the primary driver of global growth, followed by emerging markets elsewhere in Asia. Also, domestic iron ore production in China is expected to decline from 2014 due to lack of economically viable domestic iron ore reserves, which will result in an increase in imports. These conditions will continue to boost South Africa's seaborne exports, which is already taking over India's market share in China and globally.

The 0.3 percent increase in the Eurozone's gross domestic product (GDP) during the second quarter of 2013, compared with the previous quarter, pulled the region out of a six quarter recession, which started during the last quarter of 2011. However, a recovery in overall economic activities could take some time to feed into the steel sector. Consequently, regional steel demand is likely to still remain below pre-recession volumes, which could discourage producers from raising production capacity. Iron ore demand in the Eurozone is expected to grow by an average 1.8 percent per year to 2017. The sluggish recovery in the Eurozone, which is South Africa's second largest trading partner, could hinder South Africa's iron ore exports growth.

10. CONCLUSION

The significance of South Africa to the global iron ore industry has been growing over the past decade. The country's exports almost doubled and, those destined to the world's biggest iron ore consumer, China, grew by 18.6 percent per annum. This resulted in South Africa becoming the third largest supplier of iron ore to China. South Africa currently has few potential and possible projects, which if implemented concomitant with the development in infrastructure, could ensure a sustainable growth in the country's iron ore industry. South Africa's iron ore supply is forecast to grow by an average of 3 percent per annum in the next five years.

The government's constant development of policies intended to drive economic growth, will continue encouraging industrialisation through construction, mining and manufacturing. These three industries together, account for over 50 percent of the country's steel consumption and, further development in these sectors could raise the demand for steel and consequently iron ore. Employment is expected to grow further as projects reach operational stages, as well as through side stream and downstream activities.

11. REFERENCES

1. *A Beneficiation Strategy for the Mineral Industry of South Africa, June 2011*
2. *Assmang Limited, Annual Report 2012, www.assmang.com*
3. *CRU, Iron Ore Market Outlook, www.crumonitor.com*
4. *DMR, Directorate Mineral Economics*
5. *Kumba Iron Ore, Integrated Annual Report 2012, www.kumba.co.za*
6. *Kumba Iron Ore, March 2011, Creating a Growing and Sustainable Iron and Steel Value Chain in South Africa, www.kumba.co.za*
7. *Kumba Iron Ore, March 2011, The South African Iron and Steel Value Chain, www.kumba.co.za*

8. *Kumba Iron Ore, Evolution of Iron Ore in South Africa, www.kumba.co.za*
9. *Palabora Mining, Integrated annual report 2012, www.palabora.com*
10. *Presidential Infrastructure Coordinating Commission, A summary of the Infrastructure Plan*
11. *The South African Iron and Steel Institute (SAISI), www.saisi.coza*
12. *Transnet Freight Rail, www.spoornet.co.za*
13. *USGS Mineral Commodity Summaries, Iron Ore, January 2009*
14. *World Steel Association, www.worldsteel.org*