

CHROMIUM INDUSTRY DEVELOPMENTS 1997-2008

DIRECTORATE: MINERAL ECONOMICS



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

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1997-2008**

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1. INTRODUCTION

Historically, South Africa was a source of raw material and a market for goods manufactured outside the country from its raw material. The Mineral and Petroleum Resources Development Act (MPRDA 2002) which regulates the optimal exploration, exploitation, processing and utilisation of mineral resources, seeks to ensure maximum benefit for South Africans from the exploitation of South Africa's mineral resources. The act has as one of its key objectives, local beneficiation of ores.

In this report, the developments in the South African chromium industry are investigated to establish the growth of the industry from 1997 to 2008. Other factors incorporated are South Africa's exports to China as well as chrome output by platinum miners.

The chrome industry is completely subservient to the fortunes of stainless steel manufacturing in which over 90 percent of chrome ore produced is consumed while ferrochrome contribution per ton of stainless steel is 25 percent.

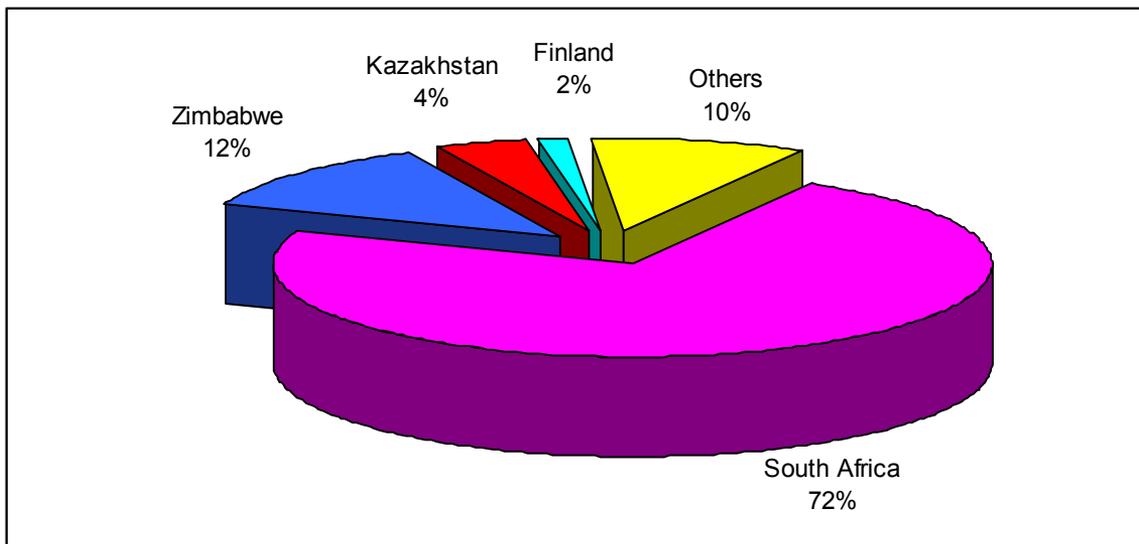
2. OVERVIEW OF THE CHROME INDUSTRY

2.1. WORLD CHROME ORE SUPPLY

➤ Reserves

The World's largest chrome ore reserve base (6430 Mt), which is located in the Southern African region, is associated with the Bushveld Complex and the Great Dyke of Zimbabwe (Figure 1).

FIGURE 1: WORLD CHROME ORE RESERVES, 2008



Source: DMR, Directorate Mineral Economics, SAMI 2008/2009

World chrome ore reserves amount to 7.6 Gt, of which South Africa hosts 72 percent while the Great Dyke of Zimbabwe hosts 12 percent. Kazakhstan, at 4 percent, is the only country with significant reserves outside Africa.

➤ Production

At 5 500 Mt, South Africa is home to 72 percent of the world's chrome ore resources although it only supplied 39.7 percent of world chrome ore output and accounted for 11 percent of global ore exports in 2008 (Table1).

Exports are lower than production because the country concentrates on adding value to the ore, exporting predominantly beneficiated products such as ferrochrome. The bulk of chrome ore production is consumed locally, where 90 percent was consumed in 2008, hence South Africa was ranked number 3 on chrome ore exports.

The second largest chrome ore producing country was India, followed by Kazakhstan in third place. Zimbabwe, which has the second largest chrome ore reserves in the world, was ranked as the 6th largest chrome ore producing country in 2008.

TABLE 1: WORLD CHROME ORE RESERVES, PRODUCTION AND EXPORTS, 2008

COUNTRY	MINERAL RESOURCES			PRODUCTION			EXPORTS		
	Mt	%	Rank	kt	%	Rank	kt	%	Rank
South Africa	5 500	72.4	1	9 683	39.7	1	762	11.0	3
Zimbabwe	930	12.2	2	484	2.0	6	37	0.5	5
Kazakhstan	320	4.2	3	3 629	14.9	3	849	12.2	2
Finland	120	1.6	4	614	2.5	5	-	-	-
India	67	0.9	5	3 900	16.0	2	630	9.1	4
Turkey	20	0.3	6	1 886	7.7	4	1 922	27.6	1
Other countries	643	8.4		4 222	17.2		2 757	39.6	
TOTAL 2008	7 600	100		24 418	100		6 957	100	

Source: DMR, Directorate Mineral Economics, SAMI 2008/2009

2.2. WORLD CHROME ORE DEMAND MARKETS

➤ Chromium usage

Chromium was first isolated as a metal in 1798, but it was not until 1818 that it was put to regular use in pigments for the manufacturing of wallpaper. With the development of the world steel industry during the 20th century, chromium has assumed considerable importance as an alloying element. Chromium usage may be divided into three broad, widely diverse areas of application:

- Metallurgical (91%)
- Chemical (5.5%)
- Refractory and Foundry Sand (3.5%)

The metal's greatest benefit to the metallurgical industry lies in its ability to impart such properties as corrosion resistance, hardness, strength and bright attractive finish. For this reason, metallurgical grade ores are used for the production of ferrochrome which in turn is consumed by the steel making industry in the production of corrosion and heat resistant steel and stainless steel.

Chromium has no substitute in stainless steel, the leading end use, or in super alloys, the major strategic end use. Chromium-bearing scrap can substitute for ferrochrome in other metallurgical applications.

The chemical application of chromium embraces all aspects that involve dissolving ore into aqueous solution by chemical means. Chromium is converted into dichromate for the manufacturing of colouring agents, timber preservatives, and for leather tanning and chromium plating.

Most important to the manufacturing of refractory bricks used in furnace lining are low silica content and the consistency of the ore which is characteristic of the South African chrome ore concentrate.

Chrome foundry sand is a specialised, well-graded product used extensively in the production of steel castings and other foundry practices.

As already stated, ore is produced for different applications; each application requires a specific grade of ore. The following are ore specifications which may differ from one producer to another (Table 2).

TABLE 2: ORE SPECIFICATIONS FOR DIFFERENT APPLICATIONS

APPLICATION	GRADE (CR ₂ O ₃)
Metallurgical	>46%
Chemical	40% - 46%
Foundry Sands	40% - 46%
Refractory	>60%

Source: DMR, Directorate Mineral Economics, South African Ferroalloys Handbook, 2006

➤ **Alloys**

Some 80 percent of ferrochrome is produced by integrated smelters that source ore from their captive operations. Ferrochrome is classified into 3 types, namely: High Carbon, Medium Carbon and Low Carbon. High carbon ferrochrome (3 to 8 percent carbon), also referred to as charge chrome, is used to produce steel in which both chromium and carbon are present. It is made by reducing chrome ore with coke in a submerged arc furnace with the charge being introduced from an open top.

The latest trend in charge chrome production entails the adoption of plasma furnace technology, which involves the injection of pulverized chrome ore into a shaft furnace containing generators that produce high temperature ionized gases. Plasma furnaces allow friable chrome ore fines to be used as the raw material, which results in lower material loss thereby increasing the ferroalloy recovery rate.

Ferrochrome containing less than 3 percent carbon, medium carbon ferrochrome, is produced by adding chrome ore, lime, silica and fluorspar to molten high carbon ferrochrome in a two-stage process.

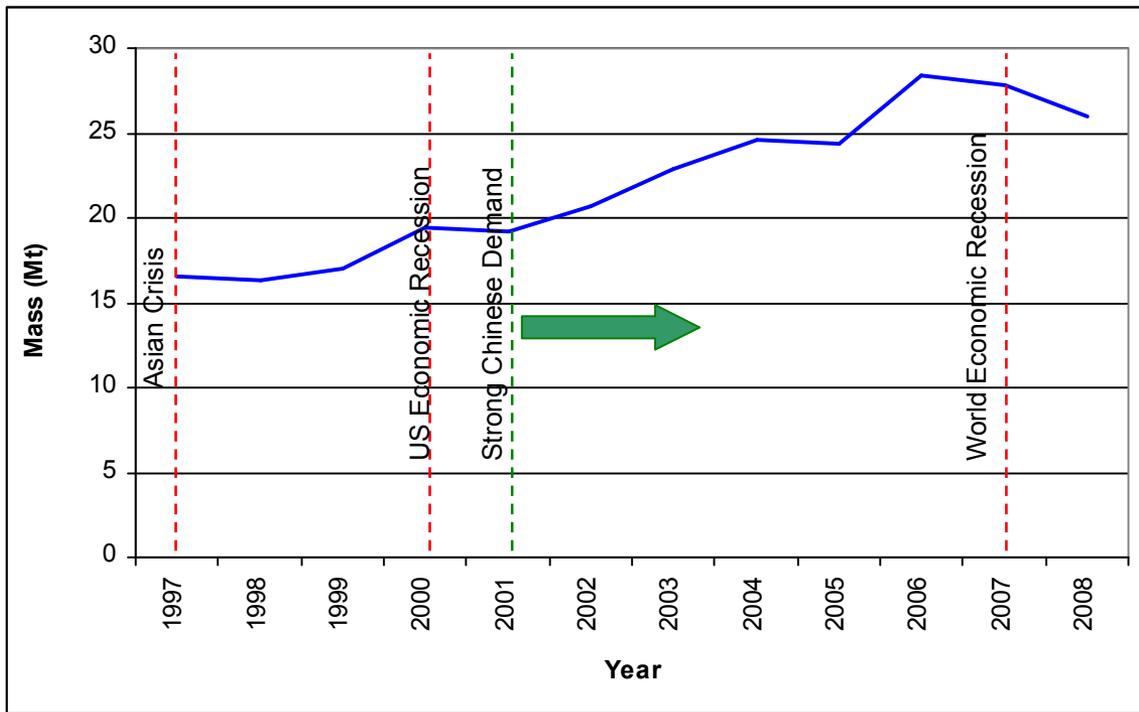
Ferrochrome with an even lower content of carbon (maximum of 0.1 percent) is produced by heating high carbon ferrochrome with ground quartzite in a high vacuum with the removal of carbon as carbon monoxide. Low carbon ferrochrome is used for producing chromium steels in which the presence of carbon is detrimental.

➤ **Stainless Steel**

Since stainless steel is the major end-use for chrome ore, world stainless steel production or anticipated production plays a major role in determining chromium demand and is, therefore, a major influence on chrome ore production and prices. When demand exceeds supply, prices tend to increase (the reverse is also true), and the deficit is likely to lead to over-supply/production in an attempt to bring the market back to the state of equilibrium. The general behaviour of the chrome ore and ferrochrome market has been influenced by four major events in the past 11 years (Figure 2). They are:-

- a) The Asian crisis in 1997, which resulted in lower world demand for stainless steel, exerting further downward pressure on ferrochrome demand and chromium production.
- b) The US recession in 2000 had the same effect as the Asian crisis of 1997.
- c) Strong Chinese demand for chrome ore and ferrochrome from 2001 onwards, due to rapidly rising stainless steel production in China.
- d) The world economic recession, which resulted in lower world demand for stainless steel, exerting further downward pressure on ferrochrome demand and chromium production.

FIGURE 2: WORLD STAINLESS STEEL PRODUCTION, 1997-2008

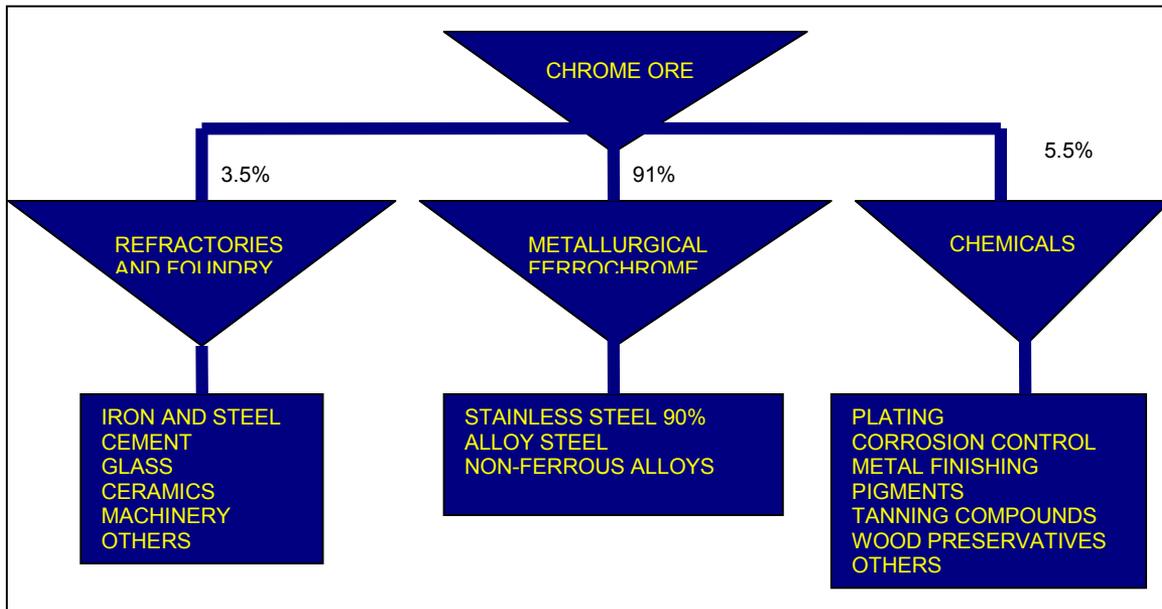


Source: World Metal Statistics, 1997-2008
ISSF, 1997-2008

➤ **Chrome End-use Markets**

Ninety percent of ferrochrome is utilised in the stainless steel industry (Figure 3).

FIGURE 3: CHROME END-USE MARKETS



Source: DME, Directorate Mineral Economics, South African Ferroalloys Handbook, 2006

FIGURE 4: VALUE CHAIN STRUCTURE



Source: Xstrata Alloys

In order to produce one ton of ferrochrome, 2.5 tons of chrome ore is consumed, while one ton of ferrochrome is needed to produce 4 tons of stainless steel (Figure 4).

3. RECENT MARKET DYNAMICS

China is the world's largest chrome ore importer, consuming 6.8 Mt in 2008. The country receives most of the feedstock from South Africa, Kazakhstan and India. However, the recessionary market conditions, which resulted in a 6.8 percent decline in stainless steel production, have had a severe negative impact on chrome ore and ferrochrome demand and, therefore, production.

Consequently, South African producers reduced their capacity utilization by about 70 percent of the installed capacity at their operations. The country's energy supply restrictions put more pressure on local ferrochrome producers, pushing production costs higher. This has driven many companies to look for alternative sources of energy and energy efficient technologies to ameliorate the impact of power shortages on the industry.

These market conditions continued into early 2009. However, the market conditions improved during the course of 2009, buoyed by higher demand resulting from the stimulus packages.

4. SOUTH AFRICAN CHROME ORE INDUSTRY

4.1. SOUTH AFRICA'S CHROME ORE RESERVES

Substantial resources of chrome ore, mined for the production of chromium and its alloys, are found in the Bushveld Complex, which covers large tracts of the North West, Gauteng, Mpumalanga and Limpopo Provinces. This oval-shaped layered complex, which consists of layers of igneous rock, extends over 300km east to west and 100km north to south and the layers dip gently towards the centre of the complex.

The Bushveld Complex consists of five belts or limbs and chrome ore is currently being mined from the eastern and the western limbs of the complex. Stratiform chrome ore reefs occur within layers of mafic to ultramafic rocks which formed as a result of differential crystallisation during the cooling of magma. A remarkable aspect of the chrome ore reefs, is their consistency in grade and thickness over a distance of 200km along strike and down to a depth of over 1km.

Two types of chrome ore are mined in South Africa, classified according to their chromium content, namely; less than 44 percent and 44-48 percent chromium. South African chrome ores are generally of lower grade than those mined in other countries.

4.2. SOUTH AFRICA'S CHROME ORE PRODUCERS

There are 6 major chrome ore producers in South Africa namely: Xstrata-Merafe Chrome Venture, Samancor Chrome, Heric, Assmang, ASA Metals and International Ferro Metals (IFM). Samancor Chrome was the largest producer in 2008 followed by the Xstrata-Merafe Chrome Venture.

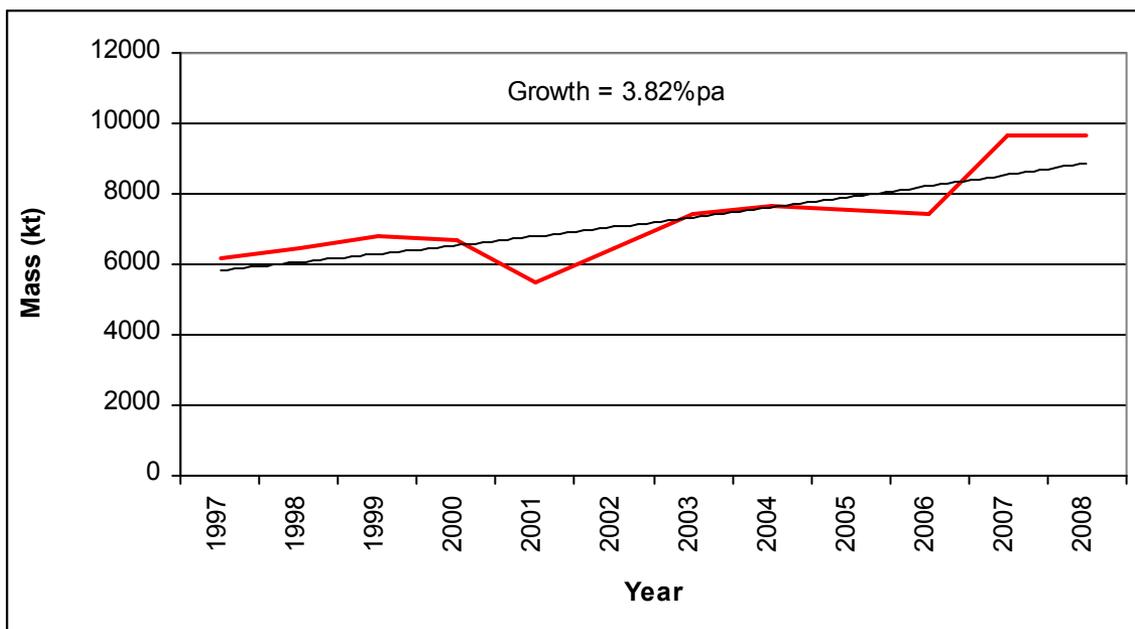
All these mining operations produce primarily metallurgical ore accounting for about 85 percent of the total ore output, while the remaining 15 percent is utilised in the production of chromium chemicals, refractory grade products and foundry sands concentrate.

Vereeniging Refractories is the only operation that produces ore for refractory purposes. The company sources ore through the Marico Chrome Corporation which is based in Nietverdiend in the North West Province.

4.3. SOUTH AFRICA'S CHROME ORE PRODUCTION

South Africa's chrome ore production has grown at an average rate of 3.82 percent per annum from 6 162 kt in 1997 to 9 683 kt in 2008 (Figure 5), with the strongest growth being experienced in the second half of the 12 year period.

FIGURE 5: SOUTH AFRICA'S CHROME ORE PRODUCTION, 1997-2008



Source: DMR, Directorate Mineral Economics

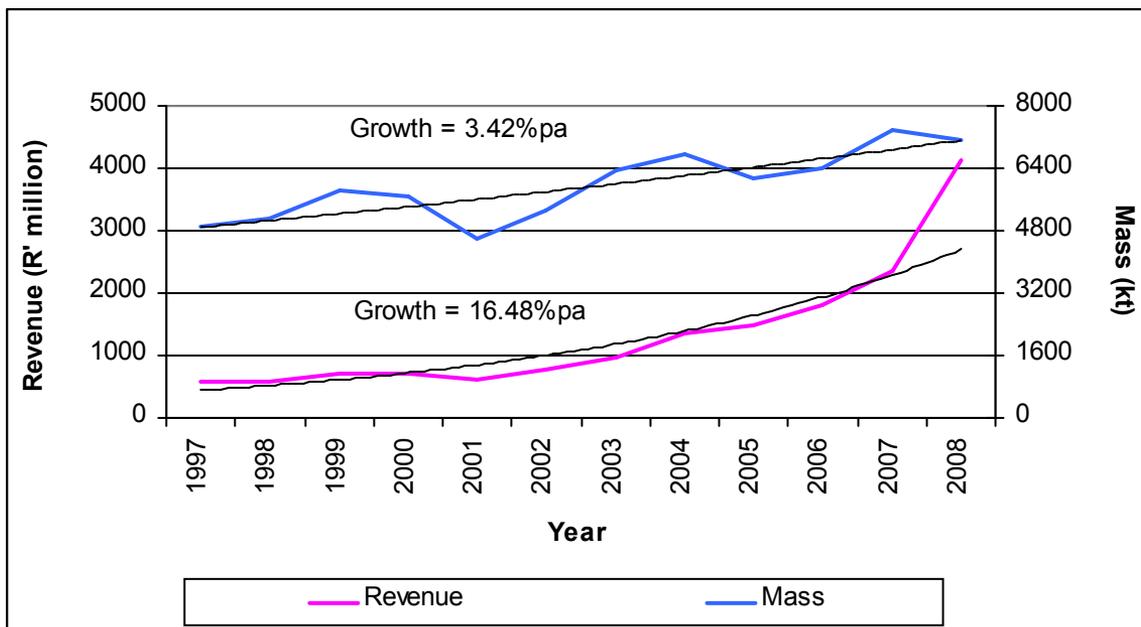
Strong demand for chromium from the international stainless steel market, especially China, resulted in generally increasing production during the second half of the study period. However, significant falls in chrome ore output between 2000 and 2001 reflect a period of reduced stainless steel production on the global markets.

4.4. CHROME ORE SALES

➤ Domestic Sales

Domestic sales volumes show a positive growth trend during the period under review, with an annual growth rate of 3.42 percent per annum from 4 913 kt in 1997 to 7 116 kt in 2008 (Figure 6).

FIGURE 6: SOUTH AFRICA'S CHROME ORE DOMESTIC SALES, 1997-2008



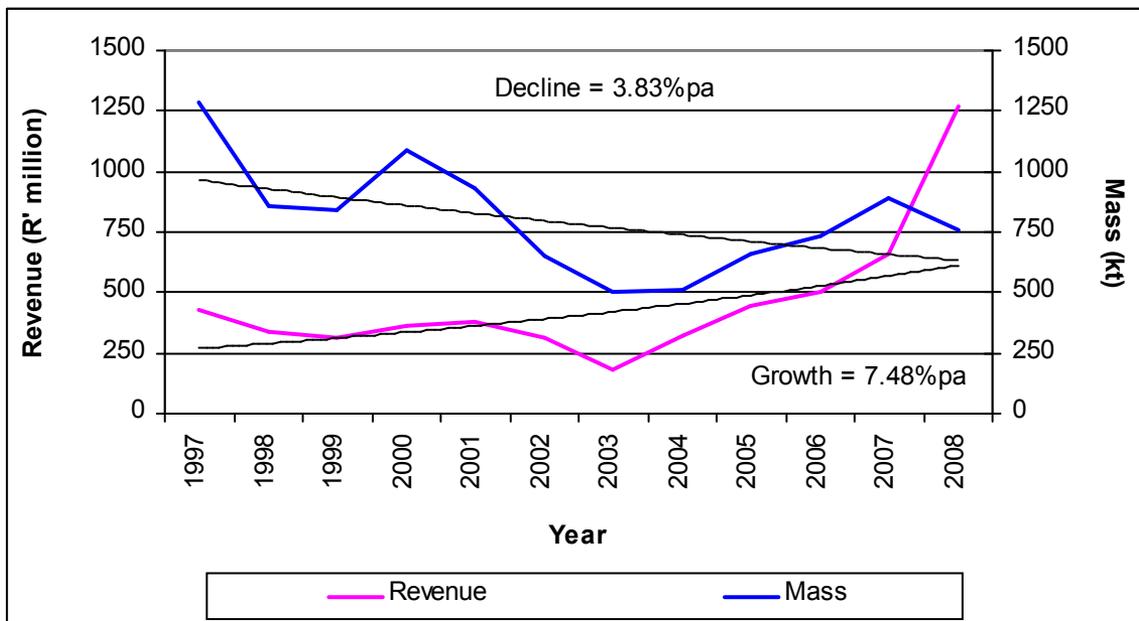
Source: DMR, Directorate Mineral Economics

Corresponding revenues from domestic sales increased at a rate of 16.48 percent per annum from R576 million to R4.1 billion (Figure 6). The accelerated increase in revenue was mainly driven by high unit values.

➤ Export Sales

In contrast with domestic sales, chrome ore export sales tonnages declined at a rate of 3.83 percent per annum, from 1 288 kt in 1997 to 762 kt in 2008 (Figure 7). This decline was due to the growing local investment in an expanding ferrochrome industry which saw less chrome ore being exported and more consumed locally.

FIGURE 7: SOUTH AFRICA'S CHROME ORE EXPORT SALES, 1997-2008



Source: DMR, Directorate Mineral Economics

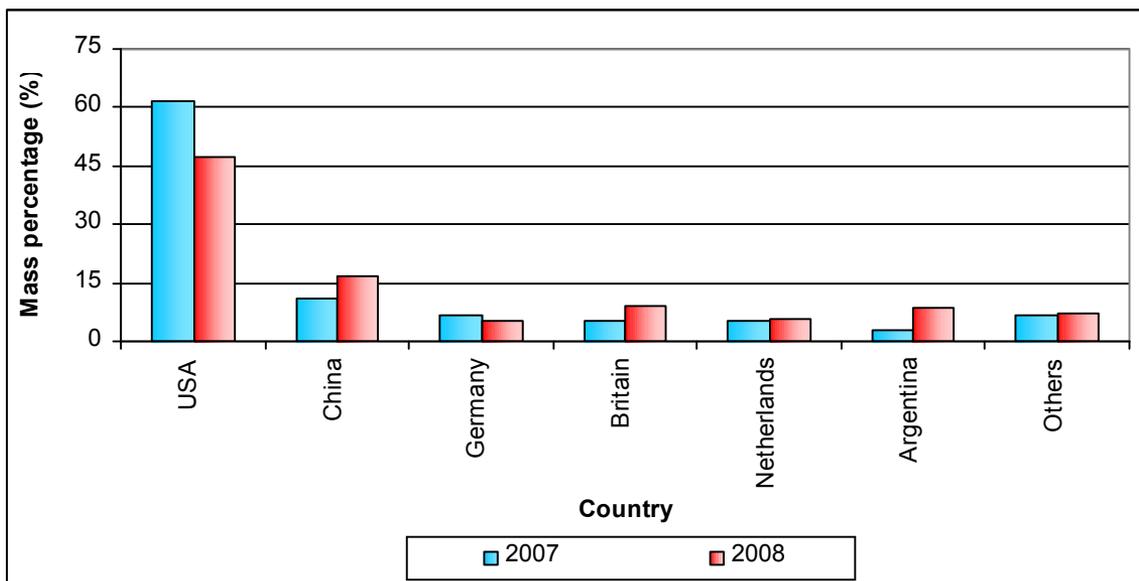
The lowest level of exports was achieved in 2003 when 502 kt were exported, but ore exports increased by 2 percent in 2004 and a further increase of 28 percent was seen in 2005.

Revenue generated from export sales increased by an average rate of 7.48 percent per annum from R425 million in 1997 to R1.3 billion in 2008 on the back of higher unit values, which increased at the rate of 11.3 percent per annum from R330 to R1 664 per ton over the period under study (Figure 11).

✓ **South Africa's Exports by Destination**

The USA is the largest consumer of South African chrome ore, having accounted for 62 percent and 47 percent of chrome ore exported from South Africa in 2007 and 2008, respectively (Figure 8). Imports of chrome ore into the USA are primarily for the foundry and chemical industries' consumption. The second largest consumer in 2008 was China with 17 percent, followed by Argentina and Britain, both in third place, at 7 percent.

FIGURE 8: SOUTH AFRICA'S CHROME ORE EXPORTS BY DESTINATION, 2007-2008

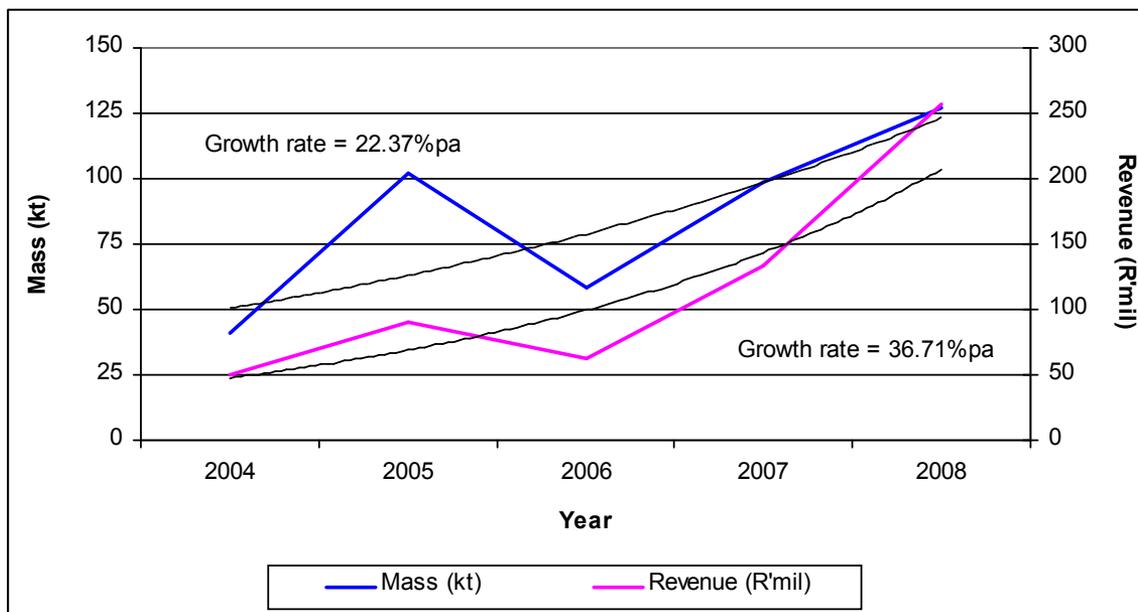


Source: DMR, Directorate Mineral Economics

Since China has insignificant resources of chrome ore, the large increase in ferrochrome production in that country is attributed to increased chrome ore imports from a number of countries, particularly India (number 1 supplier to

China) and South Africa (number 2 supplier to China). China's chrome ore imports from South Africa achieved an annual growth rate of 22.4 percent over the past 5 years (Fig. 9).

FIGURE 9: SOUTH AFRICA'S CHROME ORE EXPORTS TO CHINA, 2004 - 2008

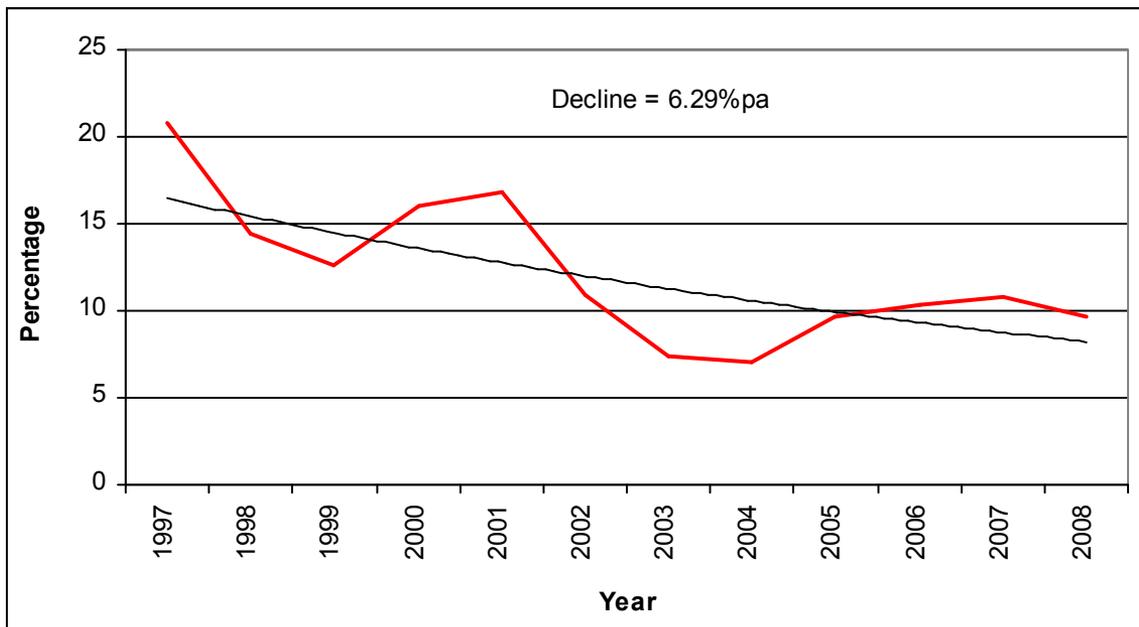


Source: DMR, Directorate Mineral Economics

✓ The Ratio of Exports to Total Sales

The ratio of export mass to total sales mass of chrome ore averaged 12 percent from 1997 to 2008 (Fig 10), declining at the rate of 6.3 percent per annum from 21 percent in 1997 to 10 percent in 2008, with the lowest ratio of 7 percent reached between 2003 and 2004.

FIGURE 10: RATIO OF CHROME ORE EXPORT MASS TO TOTAL SALES MASS, 1997-2008



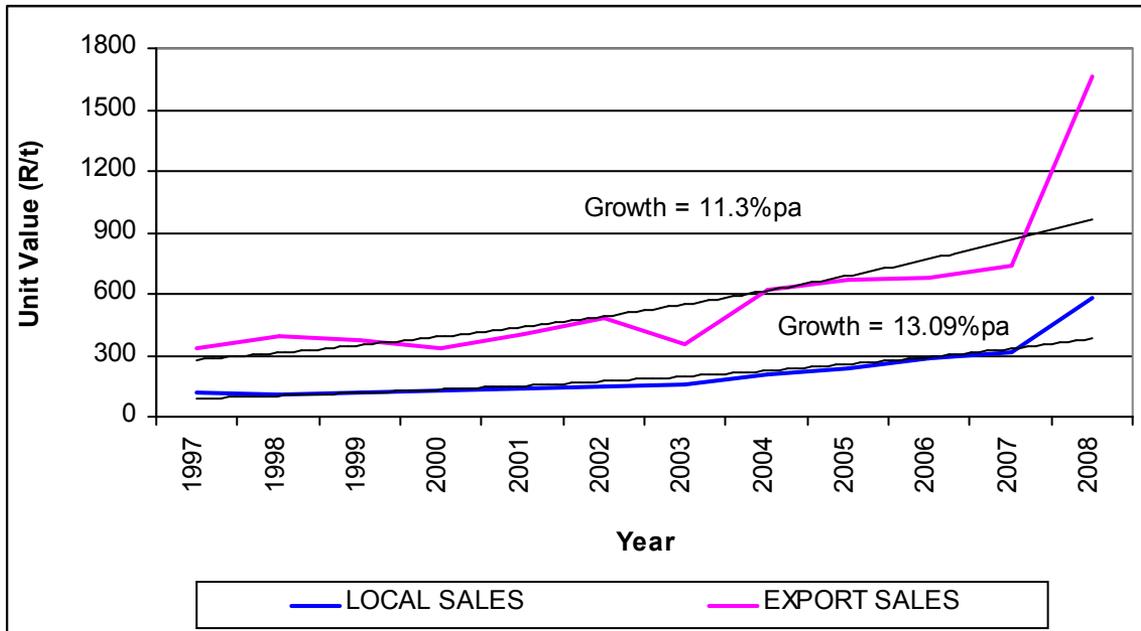
Source: DMR, Directorate Mineral Economics

The general decrease in ratio is due to growth of the local chrome ore beneficiation industry.

➤ **Chrome Ore Unit Values**

Local sales unit values, which at the beginning of the 12 year period were R117 per ton, increased at a rate of 13 percent per annum, to R580 per ton in 2008 (Figure 11). The unit value can serve as a proxy for the average aggregated price in Rand per ton, received by the industry as a whole.

FIGURE 11: CHROME ORE UNIT VALUES, 1997-2008

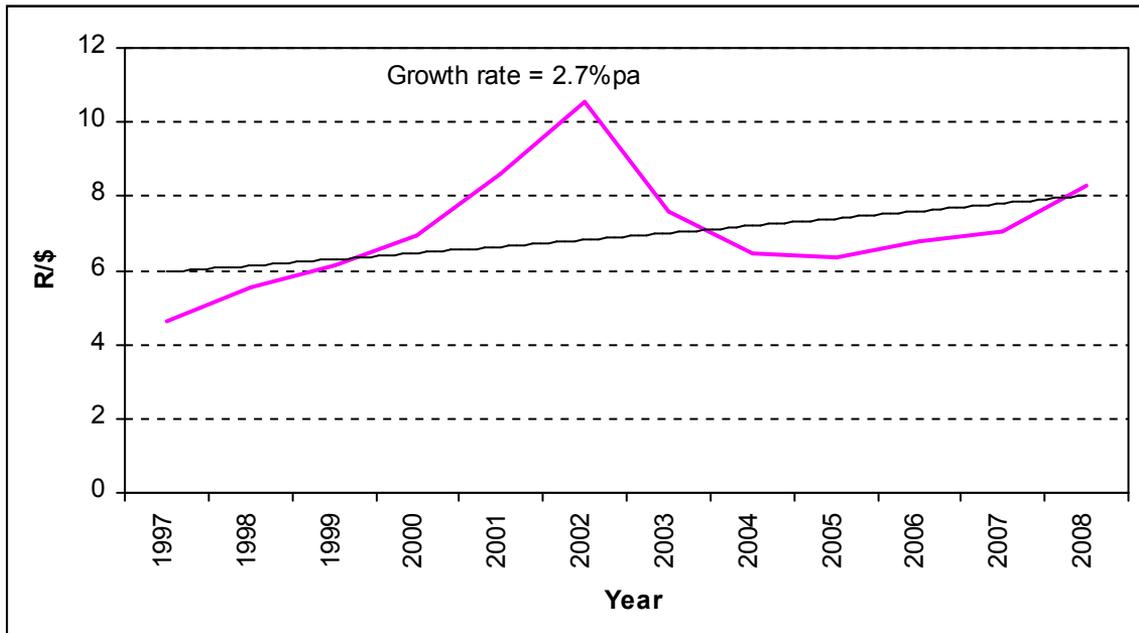


Source: DMR, Directorate Mineral Economics

Export unit values had a growth rate of 11.3 percent per annum from R330 per ton to R1 664 per ton. The increase in unit values seems to have been due to the progressive weakening of the rand (Figure 12) and strong stainless steel demand over the period.

➤ Rand-Dollar Exchange Rates

FIGURE 12: RAND DOLLAR EXCHANGE RATES, 1997-2008



Source: SARB

It appears that the rand systematically weakened at an average rate of 2.7 percent per annum from 1997 to 2008 (Figure 12). This situation helped drive up the revenues generated by local producers.

5. CHROME ORE OUTPUT BY PLATINUM MINERS

South Africa's platinum mines produce the majority of the world's platinum metal that is used in autocatalysts and jewellery. The platinum mines have traditionally exploited the Merensky Reef of the Bushveld Complex. However, the mining of this reef is reaching depths that require significant vertical shaft systems and costly refrigeration for access to the orebodies at deeper levels.

As a result all the producers have begun to mine the less attractive Upper Group two (UG2) reef because of its lower costs. This UG2 reef contains significant quantities of chromite with typically a chromium-to-iron (Cr/Fe) ratio of 1.35. UG2

ores can contain between 10 and 25 percent Cr_2O_3 (chromium) depending upon the reef width and the selected mining method.

It is relatively cheap and easy to extract a portion of the chromite from a platinum concentrator tailings stream at a grade of between 40 and 42 percent Cr_2O_3 . However, it is only in recent years that some ferrochrome producers have begun to source some of their chromite from the tailings of platinum producers.

As the traditional sources of high Cr/Fe ratio ores have been depleted at shallow depths and thus have become more expensive to exploit, technical developments have improved the ability to use fine chromite economically to produce acceptable grades of ferrochrome. Thus UG2 fines are now becoming a potential cheap source of acceptable feed to the ferrochrome industry.

The abundance of this feedstock for ferrochrome production and, consequently, lessening dependence on mined material will impact upon the structure of the ferrochrome industry in South Africa. With continued platinum mining from the UG2 reefs, South Africa is set to remain highly competitive in the world's ferrochrome and stainless steel industry.

6. RECENT DEVELOPMENTS IN THE INDUSTRY

- A consortium of German and South African companies, headed by the majority shareholder **Cronimet Mining GmbH**, acquired the mining rights to a substantial chrome ore deposit in South Africa, which became effective during April 2008.

The area is located on the Western Limb of the Bushveld Complex near the town of Thabazimbi in the Limpopo Province. The South African company is working under the name of Cronimet Chrome South Africa (Pty) Ltd. (CCSA). The company's reserves will ensure a continuous supply of ore for the next 30 years.

CCSA reported that the company fully complies with the legal requirements of the Black Economic Empowerment (BEE) laws through the participation of a Broad Based BEE partner in the company.

- **Helena Chrome Mine** is wholly owned by Xstrata, and located south of Xstrata's Thorncliffe Chrome Mine on the Eastern Limb of the Bushveld Complex.

The initial development of the Helena shaft portal commenced in November 2004. Shaft sinking of the four barrels continued, allowing the first stoping in early 2005. The mine is ramping up to steady state production of 100 kt per month, using a mechanised board-and-pillar method.

Mining the MG1 orebody, the mine consists of a four barrel decline shaft system sunk on reef. Ore is transported to the Helena Plant by means of overland conveyors.

- **Xstrata-Merafe Chrome** venture plans to build a new chrome recovery plant with platinum company Lonmin to treat current UG2 tailings from concentrators at Lonmin's Marikana operations, which would produce 1.5 Mt of low-cost chromite ore per year from 2011.
- **Chrometco (CMO)**, the South African resources company, announced that it had sold its Rooderand Chrome Project to private company DCM Chrome. Chrometco's core focus is to identify, assess, acquire and develop niche mineral and commodity opportunities in exploration, mining, concentration and beneficiation and trading throughout Africa.

Rooderand is situated on the Western Limb of the Bushveld Complex. The farm Rooderand covers an area of 534.6 ha and is underlain by three commercially viable chrome-bearing horizons, the LG6, the LG5 and the MG4

chromitite layers.

Chrometco acquired the Rooderand mining rights in early 2004 and when it listed in August 2005 the intention was to undertake further exploration work on this farm, with the ultimate aim of proving-up chromite mineral tonnage.

Chrometco did not undertake a feasibility study on developing a chrome mine and no further geological work took place during 2007 due to the offer to purchase.

- **Chromex Mining Company** finalised the acquisition of the Stellite chrome project on the Western Limb of the Bushveld Complex and started producing chrome ore from the open pit operation in September 2008.

Chromex Mining is also developing the Mecklenburg chrome project on the Eastern Limb of the Bushveld Complex. Stellite has chrome ore resources of 32 Mt and the Mecklenburg project has resources of about 9 Mt.

Chromex Mining is reported to have paid R14 million and issued just over 6 million new Chromex shares for Mkhombi Stellite, which holds a 51 percent stake in Ilitha Mining, which, in turn, owns the Stellite chrome project.

Chromex Mining Company is 74 percent owned by Chromex Mining and 26 percent owned by their BEE partner Umnotho Wesizwe.

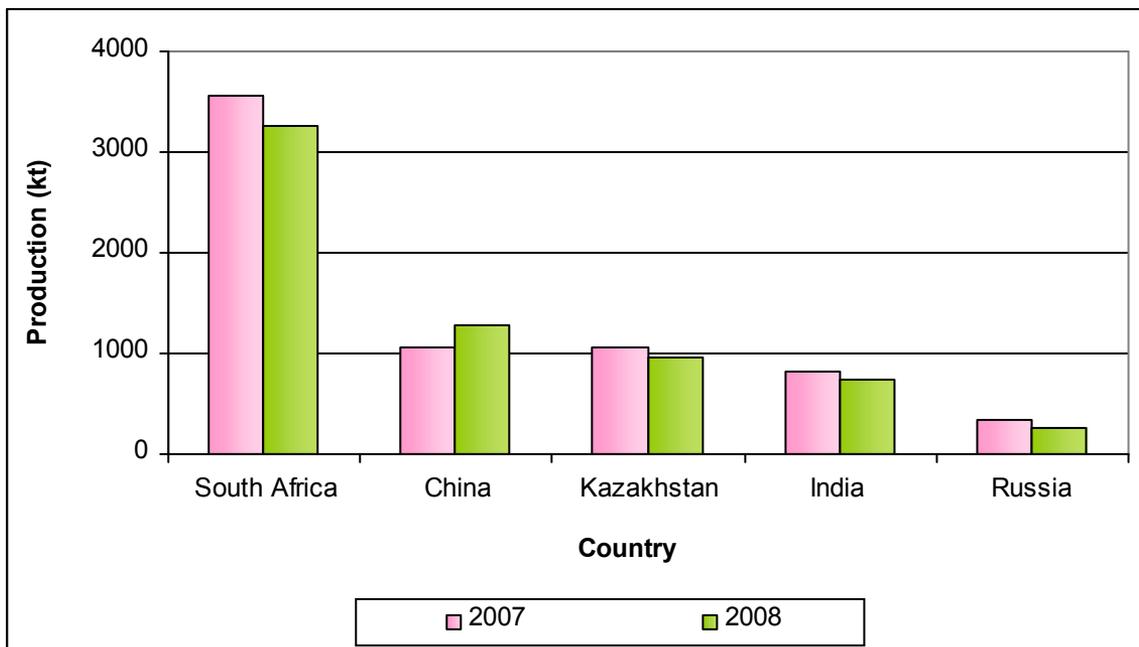
7. WORLD FERROCHROME INDUSTRY

7.1. WORLD FERROCHROME PRODUCTION

World ferrochrome production is dominated by South Africa accounting for 45 percent, followed by China in 2008. Together these countries accounted for 62 percent of all world ferrochrome production.

South Africa's ferrochrome production declined by 8.2 percent from 3562 kt in 2007 to 3269 kt in 2008 (Figure 13). China produced 1060 kt in 2007, which increased by 21 percent to 1284 kt in 2008. Kazakhstan's production declined by 10.7 percent from 1070 kt in 2007 to 955 kt in 2008, while output from India and Russia declined by 8.5 and 24 percent, respectively.

FIGURE 13: WORLD FERROCHROME PRODUCTION, 2007-2008



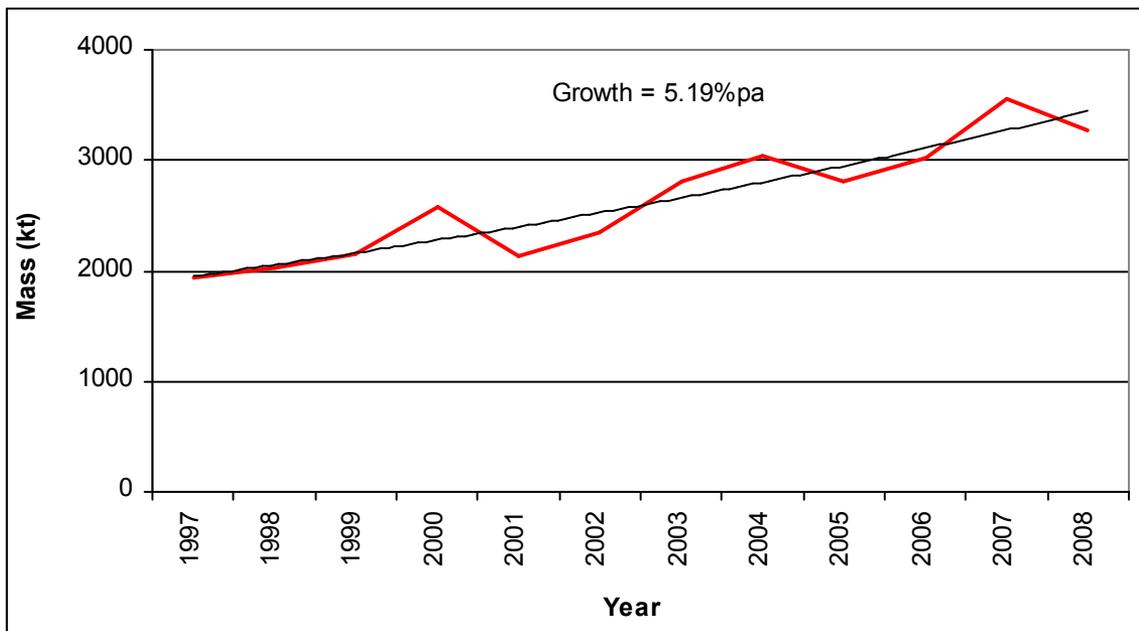
Source: ICDA Statistical Bulletin, 2009 Edition

8. SOUTH AFRICA'S FERROCHROME INDUSTRY

8.1. FERROCHROME PRODUCTION

Growth in South Africa's ferrochrome production has been robust, increasing at a rate of 5.19 percent per annum, from 1 940 kt in 1997 to 3 269 kt in 2008 (Figure 14). The increase in ferrochrome output was consistent with global stainless steel production growth, which increased by an average 5.34 percent per annum during the same period (Figure 19).

FIGURE 14: SOUTH AFRICA'S FERROCHROME PRODUCTION, 1997-2008



Source: DMR, Directorate Mineral Economics

Lower ferrochrome from stainless steel producers pushed prices down leading to significant cutbacks in output between 2000 and 2001, as ferrochrome plants shut down in response to the prevailing weak market conditions, responding to the US recession.

Production recovered in 2002 and maintained an upward trend until 2004 as a result of increased demand from stainless steel producers.

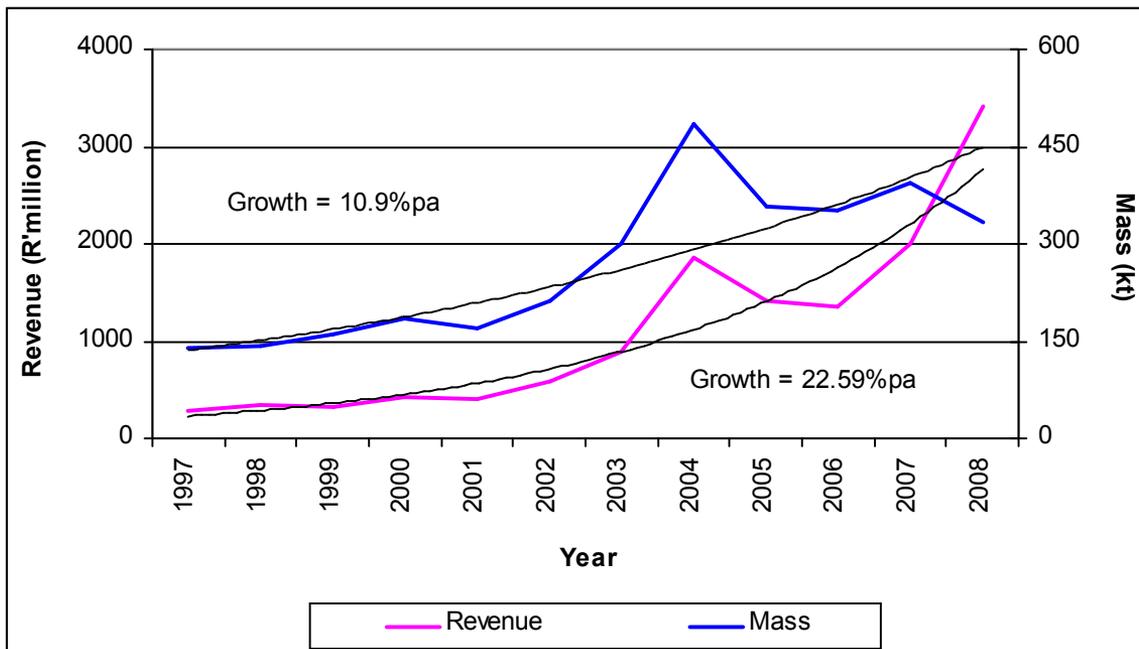
However, production plunged by 7 percent in 2005, which could have been the result of increased ore exports. Production, which reached a peak of 3 552 kt in 2007 decreased by 8 percent in 2008 in response to lower demand from the stainless steel industry.

8.2. FERROCHROME SALES

➤ Domestic Sales

Domestic ferrochrome sales mass rose at an average rate of 10.9 percent per annum from 139 kt in 1997 to 334 kt in 2008, despite an abrupt fall in ferrochrome sales from 2004 to 2005 (Figure 15). Higher consumption by Columbus Stainless Steel, based in Middelburg and the largest stainless steel producer in Africa, was responsible for the local sales volume increase in 2004, while the local sales mass dropped sharply in 2005 due to oversupply of ferrochrome.

FIGURE 15: SOUTH AFRICA'S FERROCHROME DOMESTIC SALES, 1997-2008



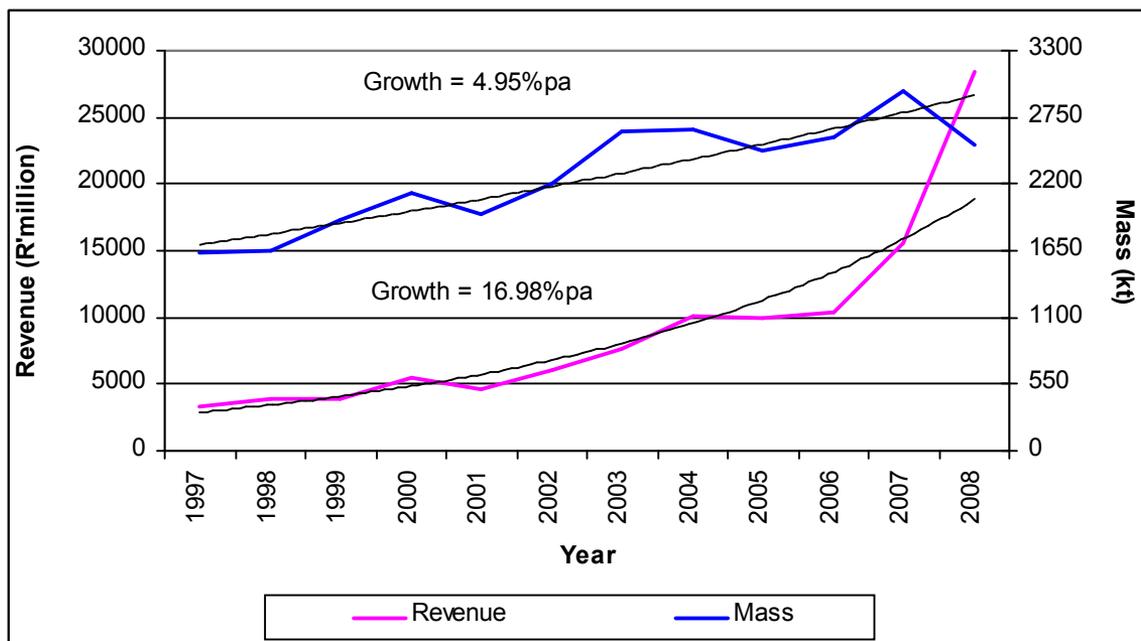
Source: DMR, Directorate Mineral Economics

Likewise domestic sales revenue increased at a rate of 22.59 percent per annum from R279.6 million in 1997 to R3.4 billion in 2008. However, revenues declined by 23 percent from R1.8 billion to R1.4 billion between 2004 and 2005, on the back of the sharp fall in ferrochrome sales.

➤ **Export Sales**

Ferrochrome export sales mass followed a similar trend, climbing at the rate of 4.95 percent per annum from 1 633 kt in 1997 to 2 525 kt in 2008 (Figure 16). However, the two percent decrease recorded in 2005 may have been due to overproduction of the alloy in China, taking advantage of increasing ore exports from major ore producers, particularly South Africa. Corresponding revenues grew by an average rate of 16.98 percent per annum from R3.3 billion to R28 billion.

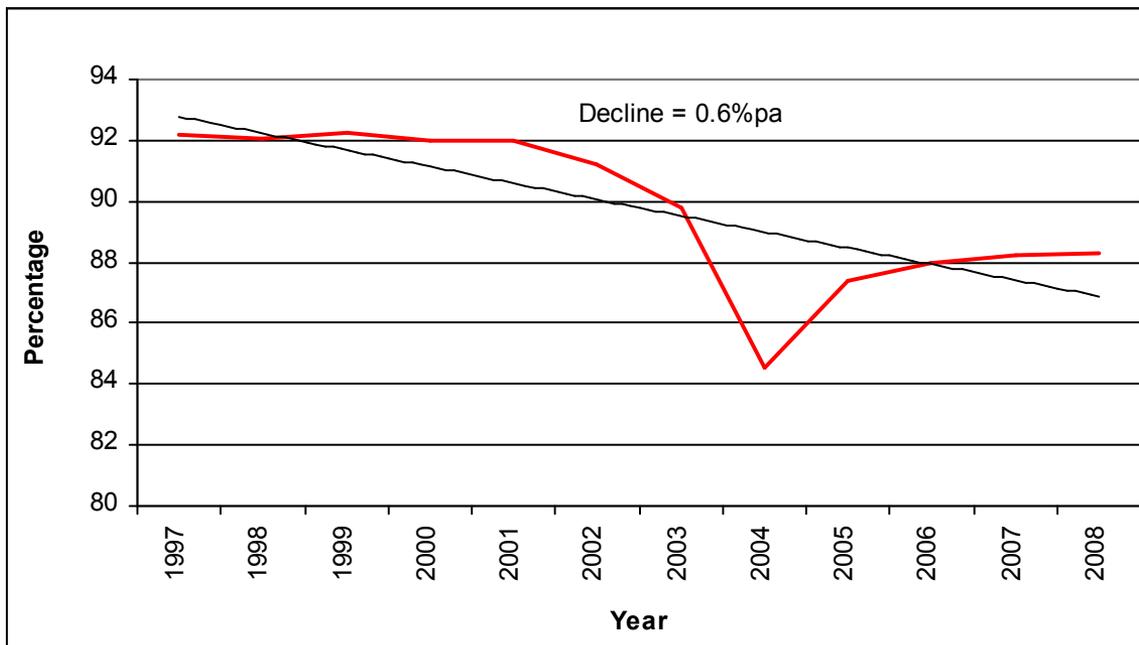
FIGURE 16: SOUTH AFRICA'S FERROCHROME EXPORT SALES, 1997-2008



Source: DMR, Directorate Mineral Economics

Consistent with the ongoing growth in domestic sales, the ratio of export sales mass to total sales mass of ferrochrome has dropped from 92 percent in 1997 to 88 percent in 2008, decreasing at the rate of 0.6 percent per annum. The lowest ratio of 85 percent was recorded in 2004 (Figure 17).

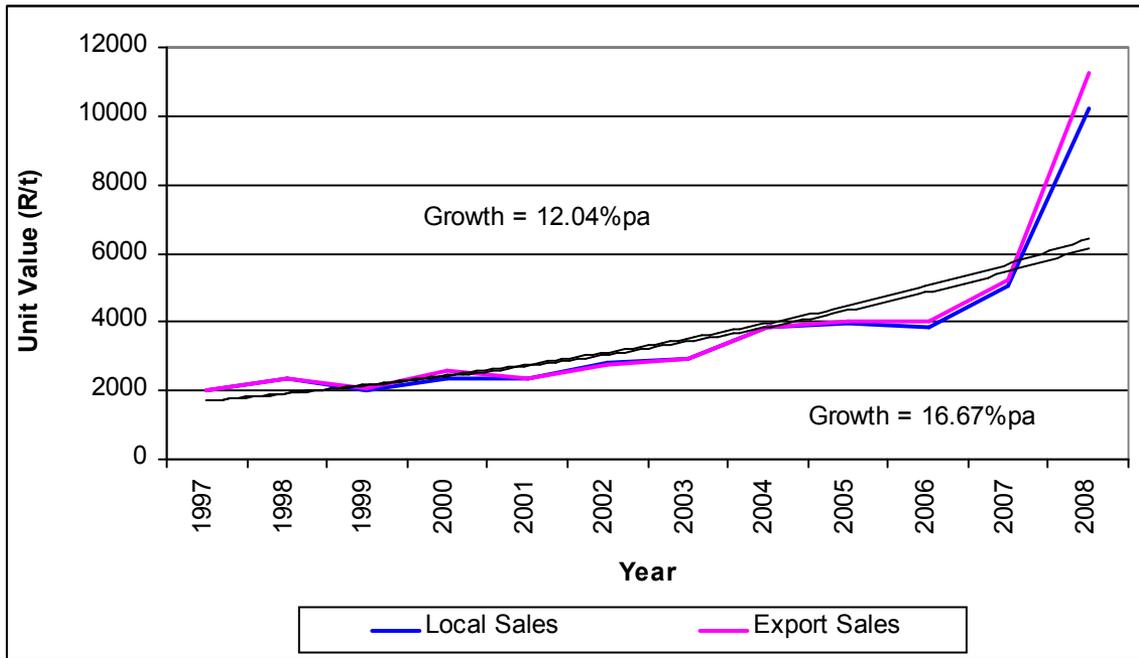
FIGURE 17: RATIO OF FERROCHROME EXPORT MASS TO TOTAL SALES MASS, 1997-2008



Source: DMR, Directorate Mineral Economics

➤ **Ferrochrome Unit Values**

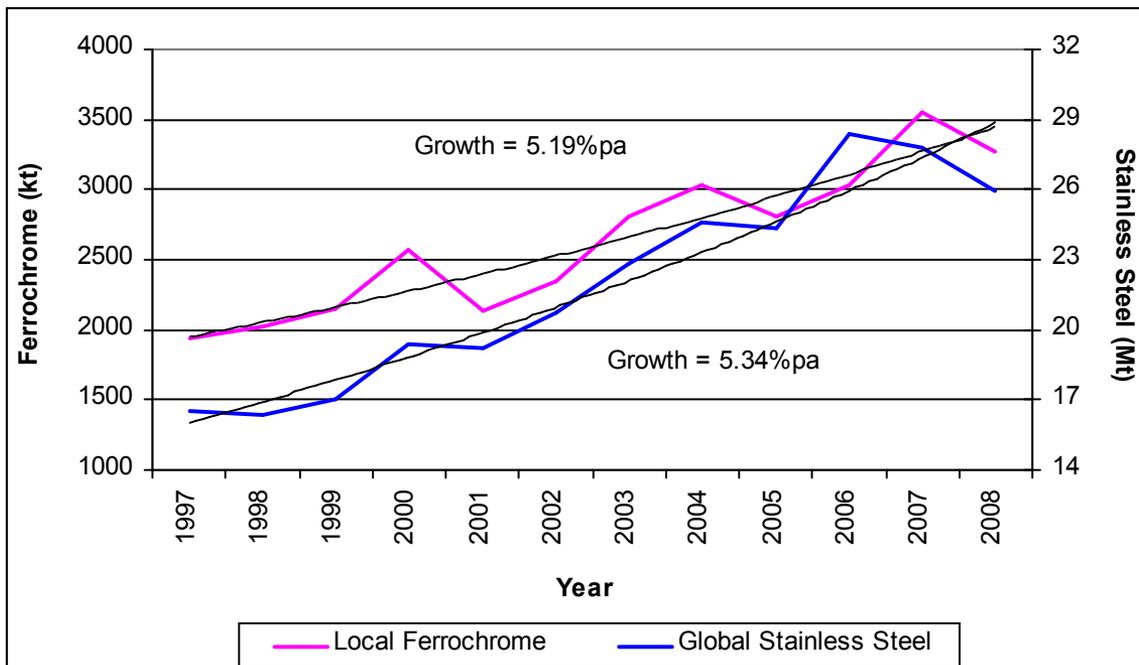
FIGURE 18: FERROCHROME PRICES, 1997-2008



Source: DMR, Directorate Mineral Economics

A combination of higher demand and sharp rises in the costs of freight, energy and exploitation of chromium raw materials exerted upward pressure on the aggregated ferrochrome unit values, which were at their highest levels in 2008 at R11 230 per ton (Figure 18).

FIGURE 19: THE RELATIONSHIP BETWEEN FERROCHROME PRODUCTION AND STAINLESS STEEL PRODUCTION, 1997-2008



Source: DMR, Directorate Mineral Economics

Figure 19 shows that a rise in stainless steel production leads to a rise in ferrochrome demand and therefore influences ferrochrome production.

8.3. CAPACITY EXPANSIONS

It is reported that there will be no additional ferrochrome capacity expansion in South Africa for the next few years due mainly to energy supply challenges.

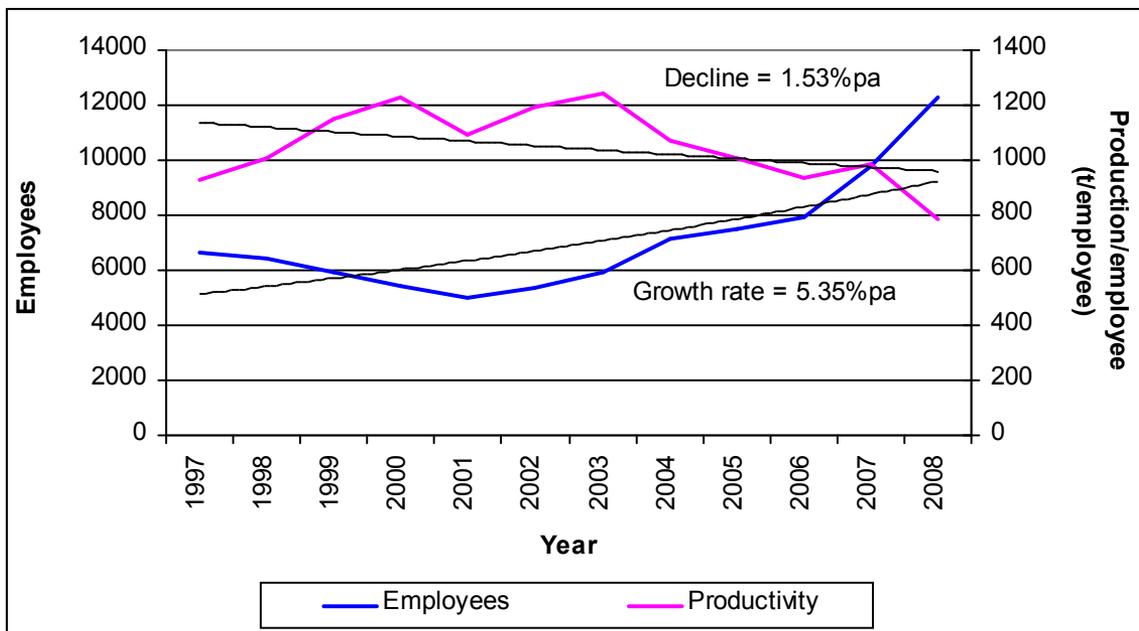
However, there have been reports that International Ferro Metals (IFM) is revisiting its expansion plans which were put on hold during 2008 due to a combination of the power supply constraints and the global economic meltdown.

The current recovering economic conditions and the anticipated electricity supply increase from 2012 from the new power plant are sufficient to justify IFM's renewed interest in expansion. In 2008, IFM was looking at increasing its capacity from 267 kt per year of ferrochrome to 665 kt per year.

9. SOUTH AFRICA'S CHROME MINING INDUSTRY EMPLOYMENT

South Africa's chrome mining industry employment has grown at an annual rate of 5.35 percent during the period under study, while productivity per employee declined by 1.53 percent per annum.

FIGURE 20: SOUTH AFRICA'S CHROME MINING INDUSTRY EMPLOYMENT, 1997-2008



Source: DMR, Directorate Mineral Economics

10. CONCLUSION

South Africa, which hosts 72 percent of the world reserves, has been the number one producer of chrome ore and ferrochrome during the period under study. Chrome ore production grew at an annual rate of 3.82 percent while ferrochrome output achieved an annual growth rate of 5.19 percent.

Chrome ore export sales mass has declined at an annual rate of 3.83 percent due to the growing local investment in an expanding ferrochrome industry, which saw less chrome ore being exported and more being retained for domestic consumption. Domestic sales mass grew at a rate of 3.42 percent per annum.

Chrome ore export sales revenues, though, increased at a rate of 7.48 percent per annum while domestic sales revenues rose by 16.48 percent due to higher unit values. Export unit values increased by 11.3 percent per annum while domestic unit values rose by 13 percent per annum.

South Africa's ferrochrome export sales mass grew at an annual rate of 4.95 percent while its domestic sales mass grew at a rate of 10.9 percent per annum. Export sales revenues grew at a rate of 17 percent per annum while domestic sales revenues grew at an annual rate of 22.6 percent. Export unit values grew by 12 percent per annum while local unit values had an annual growth rate of 16.7 percent.

During this period, the South African chromium industry had generally been growing in terms of production, capacity and sales and the country will continue to remain highly competitive in the world's ferrochrome and stainless steel industry with continued platinum mining from the UG2 reef.

11. RECOMMENDATIONS

- As a major chrome ore and ferrochrome producer, South Africa's producing companies should consider alternative sources of energy supply which include hydro-electricity generation, biomass electricity generation, solar thermal energy collection, solar photovoltaic electricity generation and cogeneration from off-gases. There should be ongoing energy efficiency improvements in the industry.

- South Africa's chrome ore producers should invest in developing mineral value chains and facilitate the expansion of beneficiation in the industry as stipulated by the MPRDA and the Beneficiation Strategy.

12. REFERENCES

1. Andrew Jones, *Feb 2007, Infacon Paper, India, The Market & Cost Environments for Bulk Ferroalloys*
2. Cronimet website, *Press Release, 2008*
3. DME, Directorate Mineral Economics, 2005. *An Overview of the SA Iron, Manganese and Steel Industry pg 10 – 11*
4. DME, Directorate Mineral Economics, *SAMI 1986 - 2005.*
5. DME, Directorate Mineral Economics, 2006. *SA Alloys Production Trends 1995 – 2004*
6. DME, Directorate Mineral Economics, 2007. *The Impact of Chrome Ore Exports on the Local Ferrochrome Industry.*
7. Heinz H. Pariser, 22.01.2007, *Alloy Metals & Steel Market Research Weekly Fax No. 960, pg 25-32*
8. Mining Weekly, *http://www.miningweekly.co.za/article.php?a_id=91605*
9. *World Metal Statistics Year Book, 1986 - 2005*