

STRUCTURE OF THE SALT INDUSTRY IN THE REPUBLIC OF SOUTH AFRICA, 2011

DIRECTORATE: MINERAL ECONOMICS



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

**STRUCTURE OF THE SALT INDUSTRY IN THE
REPUBLIC OF SOUTH AFRICA, 2011**

DIRECTORATE: MINERAL ECONOMICS

Compiled by:Lerato Ramane
E-mail:sharon.ramane@dmr.gov.za

Picture on cover page by courtesy of: Walvis Bay Salt Refiners

Issued by and obtainable from the
The Director: Mineral Economics, Trevenna Campus,
70 Meintjies Street, Sunnyside / Private Bag X59, Arcadia 0007

Tel: (012) 444 3531 / 3537, Fax (012) 341 4134

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

DEPARTMENT OF MINERAL RESOURCES

Director-General

T Ramontja

MINERAL POLICY AND PROMOTION BRANCH

Acting Deputy Director General

T Nell

**MINERAL PROMOTION AND INTERNATIONAL COORDINATION
CHIEF DIRECTORATE**

Chief Director

S Mohale

DIRECTORATE: MINERAL ECONOMICS

Acting Director

N Dlambulo

Acting Deputy Director: Industrial Minerals

R Motsie

PUBLISHED IN MAY 2012

ISBN: 978-0-621-40892-8

COPYRIGHT RESERVED

TABLE OF CONTENTS

<i>Abstract</i>	i
Table of Contents	ii
List of Figures	iii
1. Introduction	1
2. Occurrence	1
3. World Supply	3
4. World Demand	4
5. South Africa	4
5.1 Salt Production Process	4
5.2 Salt Supply, Demand and Prices	7
5.3 Ownership	10
5.4 Small Scale Mining Opportunities	10
6. Developments in the Salt Industry	11
7. Environmental Impact	12
8. Outlook	13
9. Reference	14

DISCLAIMER AND COPYRIGHT

Whereas the greatest care has been taken in the compilation of the contents of this publication, the department of minerals and energy does not hold itself responsible for any errors or omissions.

ABSTRACT

The aim of this report is to investigate the salt industry of South Africa. This will be achieved by looking at the occurrences of salt and by outlining the salt markets and trends on a local and international scale. The report also incorporates opportunities for small scale miners as well as environmental issues relating to this industry. The report concludes with an outlook on the expected future trends of the global and local salt industries.

LIST OF FIGURES

FIGURES	TITLE	PAGE
1	South Africa's Distribution of Salt Pans	2
2	World Production of Salt, 2002-2011	3
3	World Production of Salt, 2011	3
4	Uses of salt	4
5	Salt Industry Flowchart	6
6	South Africa's Production of Salt, 2002-2011	7
7	South Africa's Local Sales Tonnages of Salt, 2002-2011	8
8	South Africa's Local Sales Values of Salt, 2002-2011	8
9	South Africa's Average Local Prices of Salt, 2002-2011	9

1. INTRODUCTION

Salt, also known as halite has a chemical composition of sodium chloride (NaCl), and is a readily available inexpensive bulk mineral that can be produced by a variety of methods including, but not limited to:

- Solar brine – seawater evaporation in shallow coastal basins or artificial ponds. Lake brine is also used as feed in conventional solar ponds.
- Underground deposits of halite or rock salt, mined by room and pillar, or solution mining which forms a large underground cavity.
- Vacuum evaporation – brine dehydration to crystallise salt in a series of multiple-effect evaporators connected, operated under vacuum to reduce process temperatures.

Salt is widely distributed throughout the world, mainly in brines and rock salt deposits. The most important salt source is the oceans, where the salt is continually being replenished by that leached from the land by rain water.

2. OCCURRENCE

South Africa's salt resources are confined to underground brines associated with inland salt pans, coastal salt pans and seawater. The majority of inland pans lie on rocks of the Karoo Sequence, in a curved belt between 50 and 60 km wide, extending from near Vryburg in the North West Province to Hopetown on the eastern border of the Northern Cape (Fig.1). Most of the pans have formed on shales of the Dwyka and Ecca Groups, which were deposited under marine conditions.

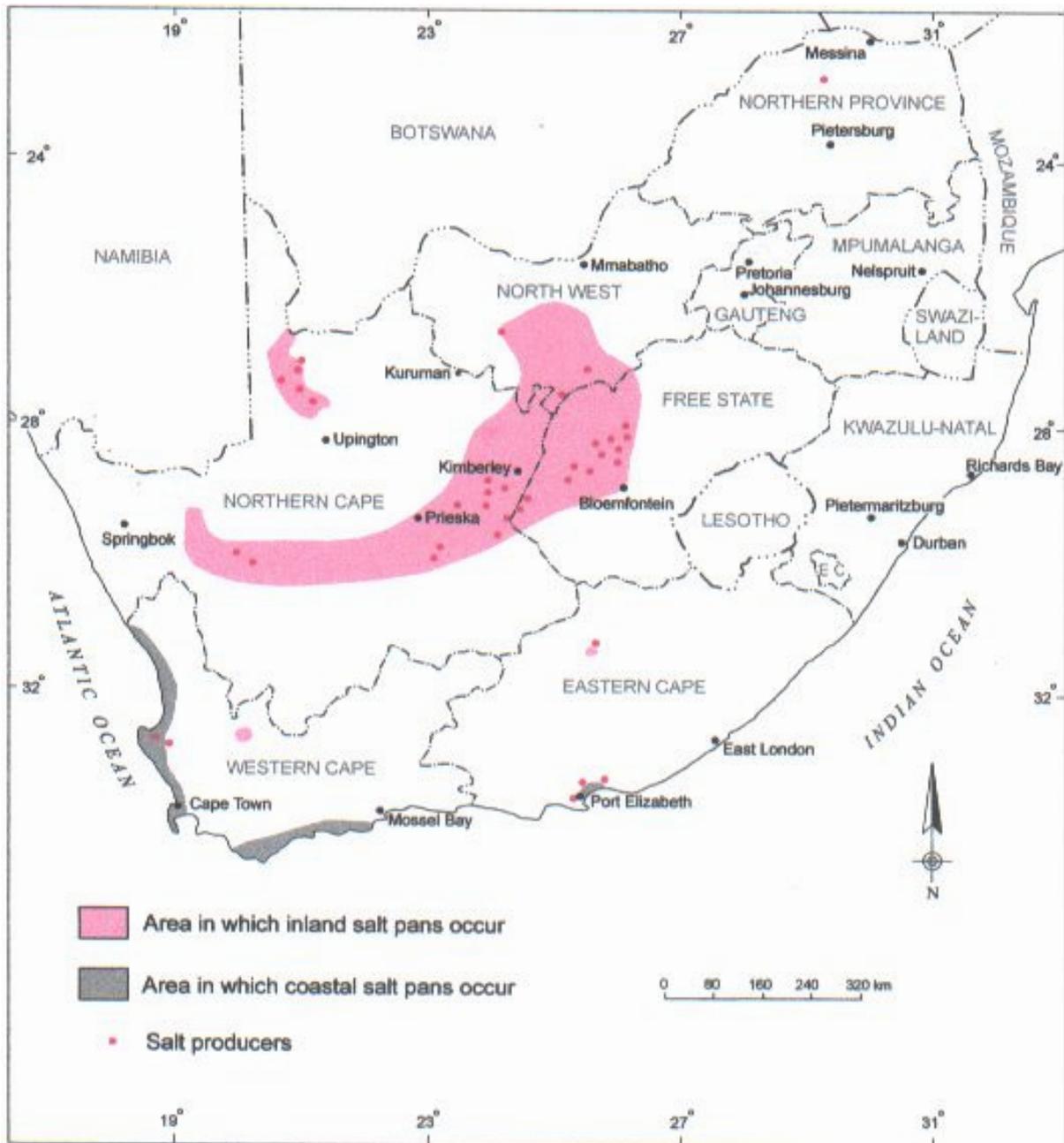
A considerable number of large salt pans are found in the Kalahari region to the north of Upington. These also lie on shales of the Dwyka Group. Near Waterpoort, at the foot of the Soutpansberg in the Northern Province, a salt pan occurs on basalt of the Lebombo Group. The salt pans in the vicinity of Delareyville in the North West Province are mostly underlain by lavas of the Ventersdorp Supergroup.

Along the west and south coast of the country, coastal salt pans, or salt-reaping localities, generally occur within 25 km of the sea. Some of the coastal pans derive their saline constituents directly from the sea by periodic flooding or seepage, and others from underlying marine sediments. All obtain a certain amount of replenishment by rainwater leaching surrounding salt impregnated dunes.

There are various grades of salt available in South Africa namely:

- **Grade I** coarse or milled; >95% NaCl, 1.5% SO₄
- **Grade II** coarse or milled; 85-95% NaCl
- **Grade III** coarse; 75-85% NaCl
- **Grade IV** coarse; < 75% NaCl or contaminated grades I, II, III

FIGURE 1: SOUTH AFRICA'S DISTRIBUTION OF SALT PANS

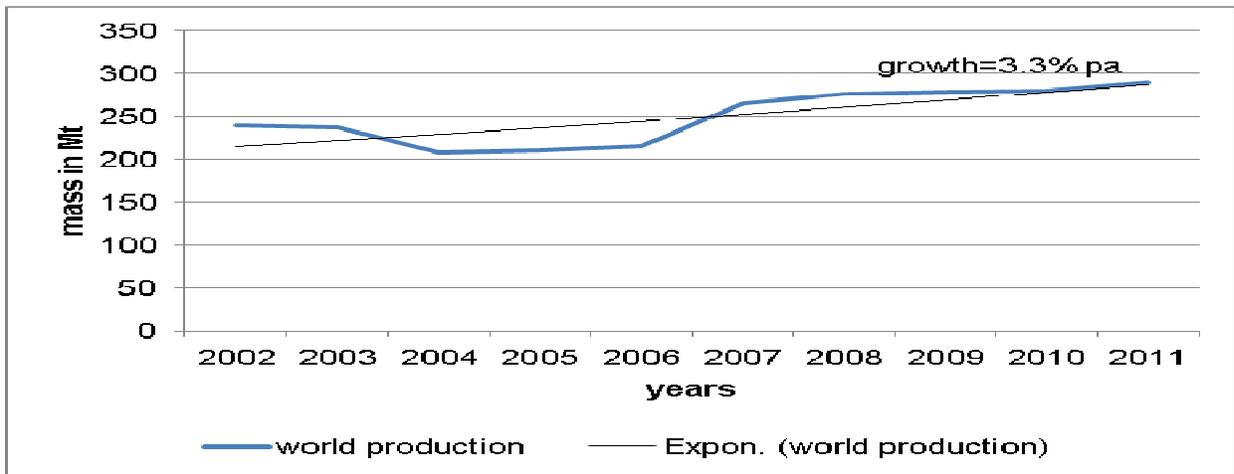


Source: Council for Geoscience

3. WORLD SUPPLY

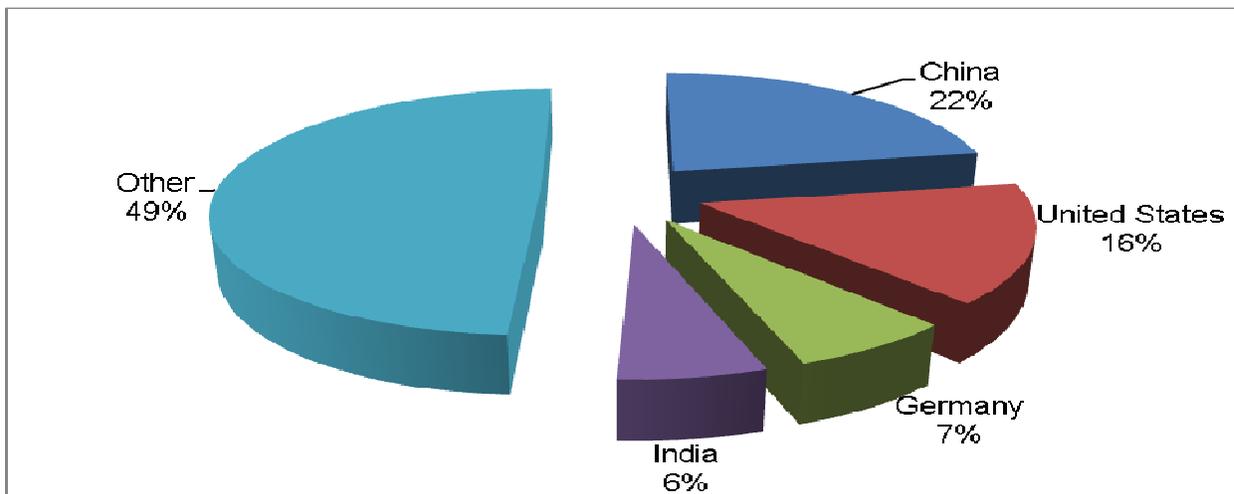
World reserves of salt are simply classified as “large” owing to the substantial deposits that are in existence. The oceans comprise an inexhaustible supply. Over a 100 countries produce a significant amount of salt with many others on a small scale. World production of salt has been increasing by 3.3 percent in the past 10 years (Fig.2). In 2011, production increased to 290 Mt, compared with 280 Mt in 2010. China is the biggest producer of salt in the world, accounting for approximately 22 percent, followed by the United States providing about 16 percent and Germany and India contributing 7 and 6 percent, respectively (Fig.3).

FIGURE 2: WORLD PRODUCTION OF SALT, 2002-2011



Source: USGS commodity summaries, 2012

FIGURE 3: WORLD PRODUCTION OF SALT BY COUNTRY, 2011

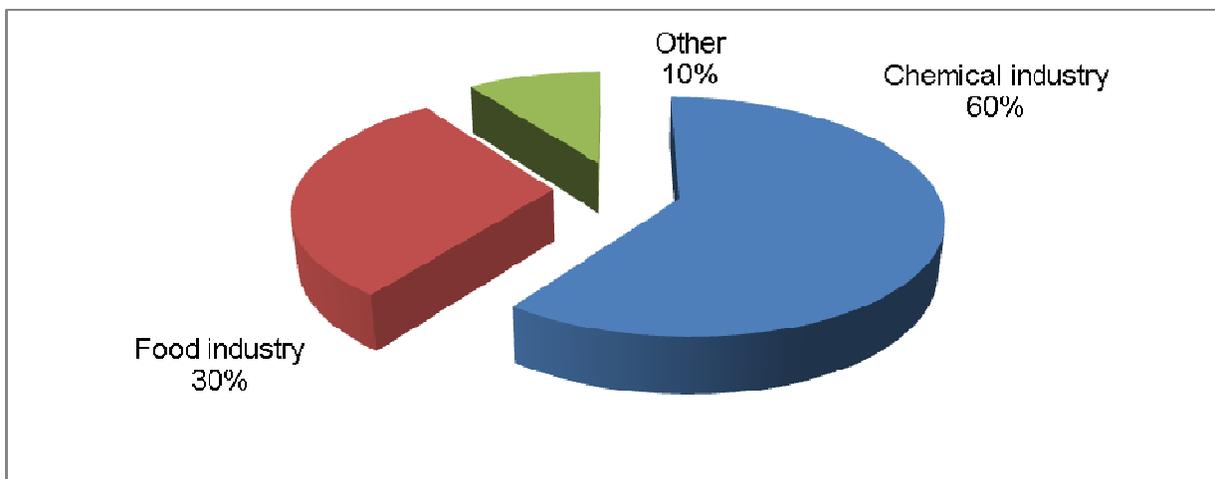


Source: USGS commodity summaries, 2012

4. WORLD DEMAND

The chemical industry is the largest consumer of salt, using more than 60 percent of the total world production mostly producing chlorine, soda ash and caustic soda required for industrial purposes including petroleum refining, petro-chemistry, organic synthesis and glass production. The second largest consumer of salt is the food industries, which use approximately 30 percent. The balance is used for road de-icing, water treatment, production of cooling brines and other smaller applications (Fig.4).

FIGURE 4: USES OF SALT



Source: Industrial Minerals, 2011

5. SOUTH AFRICA

5.1. SALT PRODUCTION PROCESS

In South Africa, salt is obtained by the solar evaporation of brines. In general, the production methods do not differ materially from those implemented elsewhere in the world (Fig.5).

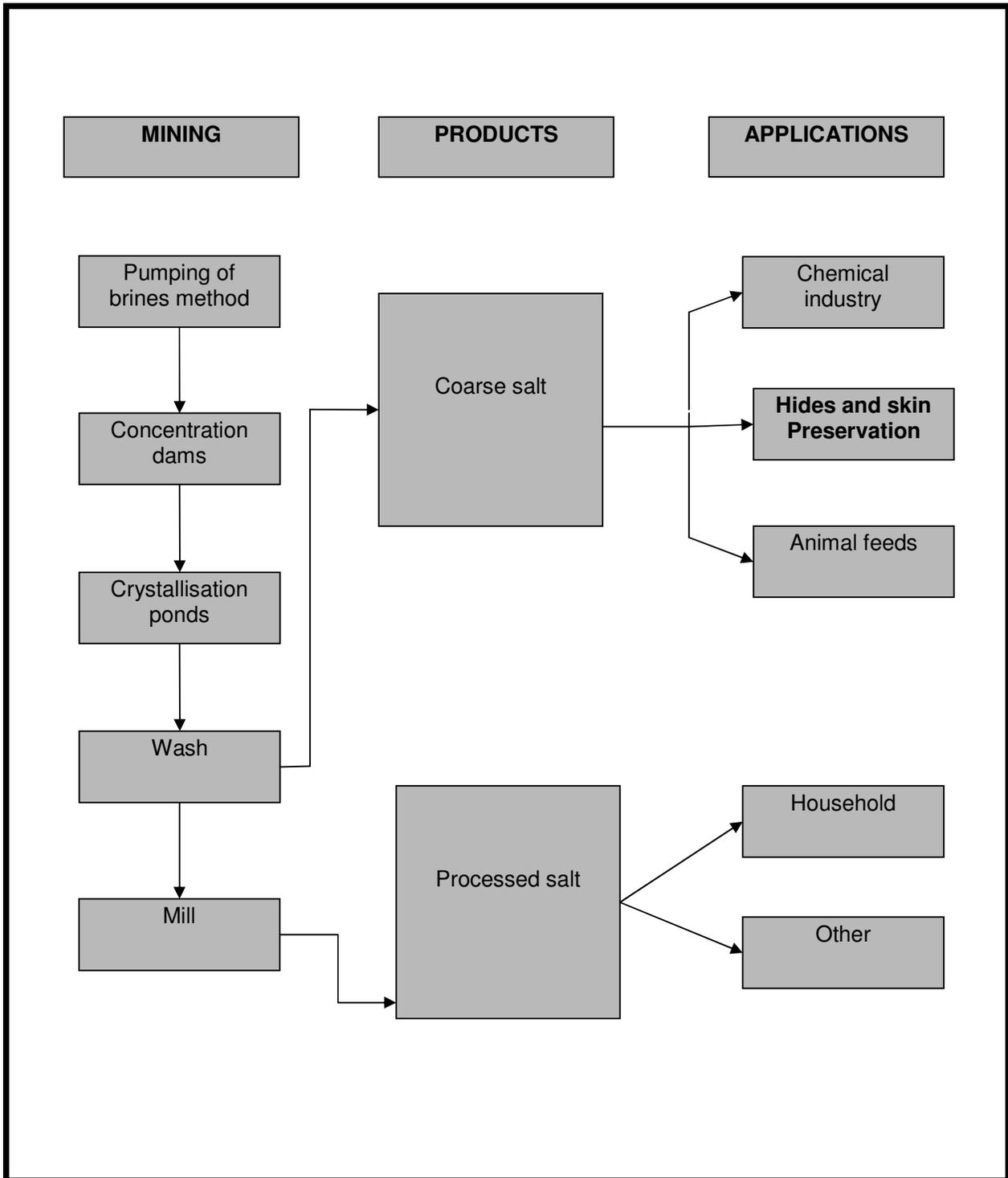
In the case of inland pans, salt production starts with the pumping of brine from suitable openings in the floor of the pan into large, relatively deep dams where some concentration takes place. The brine is then allowed to evaporate in fairly shallow concentration dams until ready for crystallisation. Saturated brine is subsequently transferred to a series of shallow crystallisation pans where further evaporation takes place, resulting in the deposition of salt.

Production techniques at the various coastal pans differ widely. Nearly everywhere, however, the water filling the pans is left to evaporate completely prior to harvesting the salt. Although attempts are made at selective crystallisation, the overall product is of good quality owing to the absence of noteworthy quantities of deleterious impurities in the brine.

Sea salt is produced in Port Elizabeth. Production is based primarily on the evaporation of seawater, which usually contains 3.5 percent of dissolved solids, of this 74.8 percent is sodium chloride. At the salt-works, the seawater is concentrated by solar evaporation in artificial ponds until a relative density of 1,204 is attained. The brine is then fed into crystallisation pans for eventual harvesting.

When mining rock salt, the rock blasts away the solid seam of salt, the explosion leaves pieces ranging from boulders of salt to fine salt dust. As the salt is crushed to the size specified by each customer, further unusable fine salt dust is created. These “fines” are routinely used to fill some of the vast expanse created when the usable salt is hoisted to the surface. In the final production of salt, to prevent the crystallization of other minerals which would degrade the purity of the sodium chloride, the crystallizing pond is drained of the concentrated solution containing salt and other minerals, called “bitterns”. Sometimes, the salt producer further processes the bitterns to extract other saleable materials before discharging the natural remnants to the sea

FIGURE 5: SALT INDUSTRY FLOWCHART



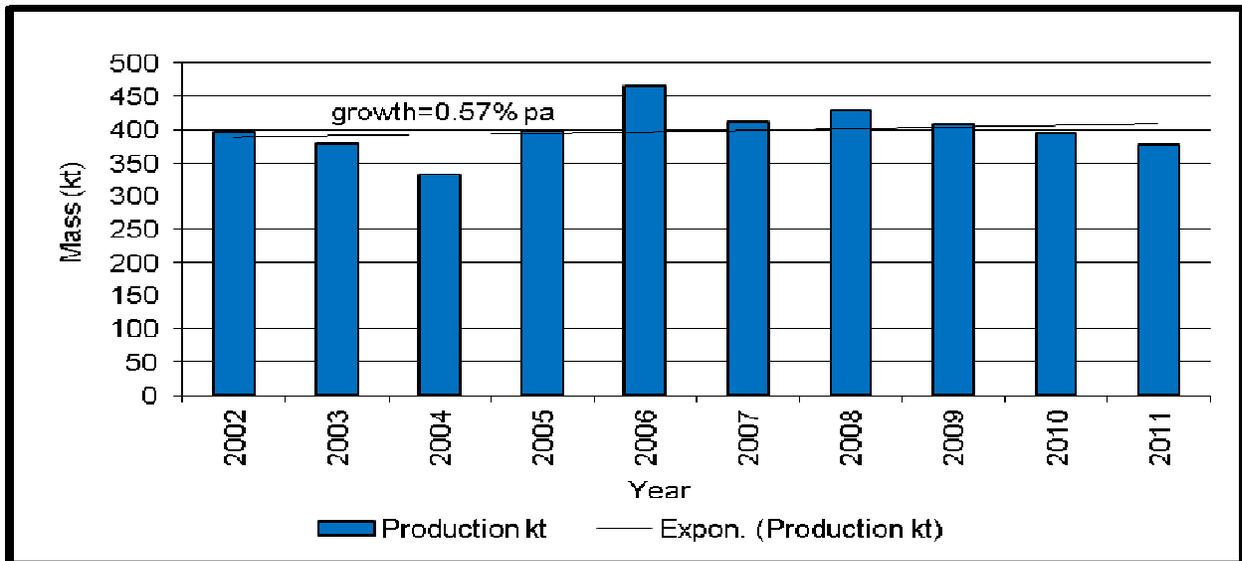
Source: DMR, Mineral Economics

5.2. SALT SUPPLY, DEMAND AND PRICES

Production of salt in South Africa is achieved by solar evaporation of brines from inland and coastal salt pans. The inland salt pans contain estimated salt reserves of 53 Mt.

Production of salt had an annual average growth rate of 0.57 percent from 2002 to 2011. Production has been on the increase from 2004 and reached 465 kt in 2006. The trend was in line with the strong performance of the economy. However, salt production started declining in 2008 due to increased rainfall and the world economic recession (Fig.5).

FIGURE 6: SOUTH AFRICA'S SALT PRODUCTION, 2002-2011

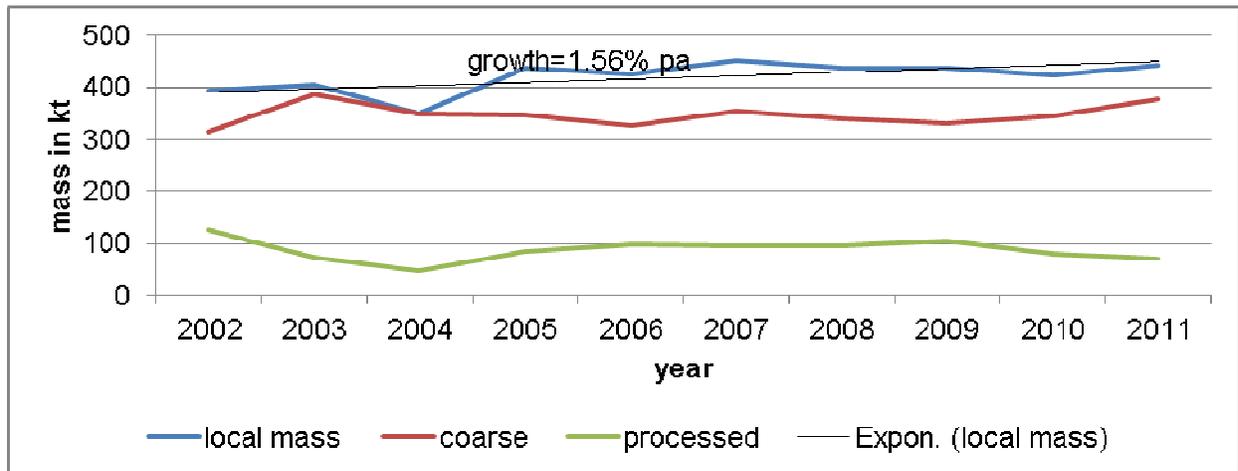


Source: DMR, Directorate Mineral Economics

Local sales tonnages have been increasing at an annual average rate of 1.56 percent in the last decade due to growth in the chemical sector, hence coarse salt is the major contributor to local tonnages (Fig.7). Local sales value has been rising at an average rate of 6.83 percent per year in the same period due to growing demand and increasing salt prices. Processed salt adds more to local sales value due to its higher value (Fig.8).

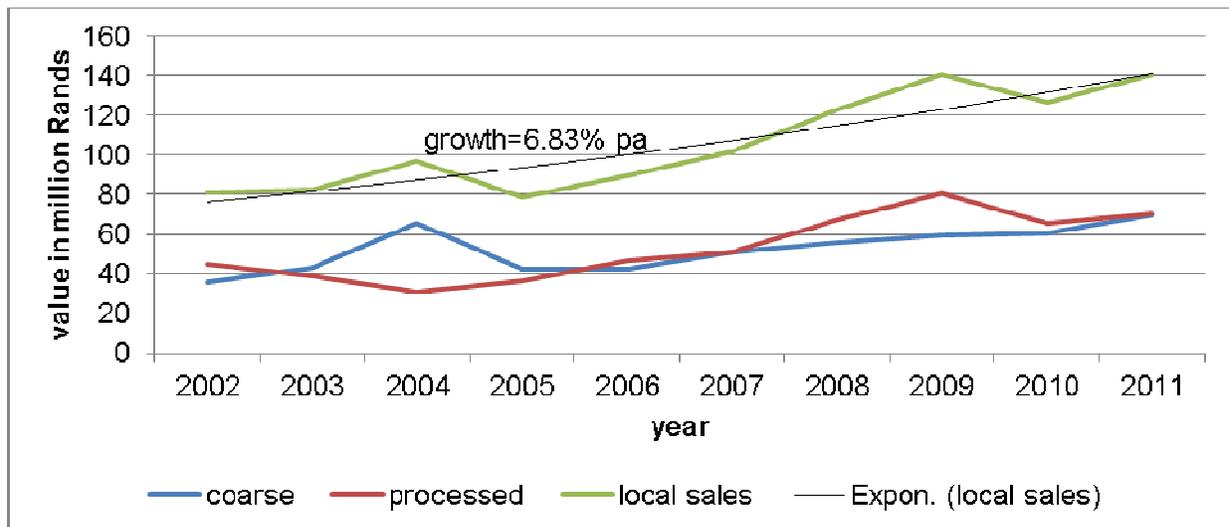
The local market is quite competitive and amounted to R 140.6 million in 2011, compared to R 126.3 million in 2010.

FIGURE 7: SOUTH AFRICA'S LOCAL SALES TONNAGES OF SALT, 2002-2011



Source: DMR, Directorate Mineral Economics

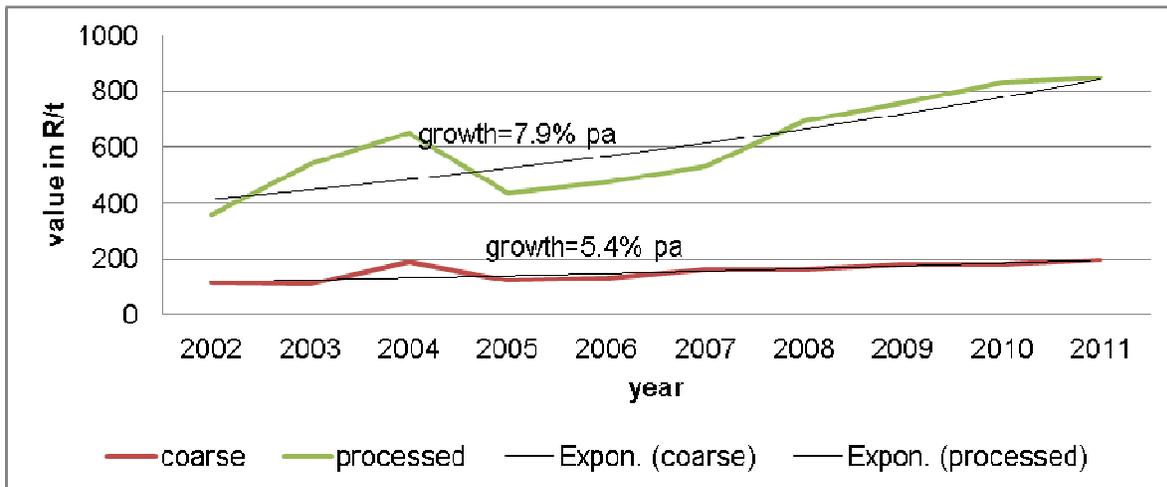
FIGURE 8: SOUTH AFRICA'S LOCAL SALES VALUE OF SALT, 2002-2011



Source: DMR, Directorate Mineral Economics

South African prices for coarse and processed salt have been increasing by 5.4 and 7.9 percent respectively per annum since 2002 (Fig.9). Many South African salt producers are situated in remote locations, where transportation can become an important cost to profitability of companies. Pumping brines is an economic means of transportation but cannot be used for dry salt. Since salt is packaged, handled and shaped in small units, the accompanying cost increases are reflected in higher sales prices.

FIGURE 9: SOUTH AFRICA'S AVERAGE LOCAL PRICES OF SALT, 2002-2011



Source: DMR, Directorate Mineral Economics

South Africa imports more salt than the country produces from countries such as Botswana and Namibia. This is because locally produced salt is of low quality; it is considered to have less than 95 percent NaCl and is used in specific sectors including agriculture and food industries. The chemical industry requires high quality salt, which is imported. Most of the South African imports are from Botswana and Namibia, both of which belong to the common Customs Union (SACU), for that reason no import statistics are available. However, it is estimated that about 290kt passes through the Port of Durban annually, while imports from Botswana are railed into the country.

In line with the world wide trend, the South African chemical industry is the biggest user, accounting for approximately 54 percent of the total South African consumption, followed by industrial and agricultural sectors accounting for 15 percent each, human consumption (12%) and other uses (4%).

The chemical industry utilises imported high grade, coarse marine salt. NCP Chlorchem and Sasol are the two biggest users. NCP manufactures downstream chlorine products whilst Sasol uses chlorine as an intermediate in the manufacture of polymers, the major being polyvinylchloride (PVC). NCP Chlorchem sources its salt requirement from Walvis Bay Salt Holdings in Namibia and Sasol Polymers imports its salt from Botash in Botswana and Walvis Bay.

5.3. OWNERSHIP

South Africa has 26 operating salt companies, of varying size, including one co-operative operation with more than forty small-scale producer members. In 2011, Salt Refiners and Packers was the largest producer, followed by, Swartkops and Dwaggas Salt. Together these three companies accounted for approximately 68 percent of the South African salt production. The aforementioned companies are owned as follows:

- I. **Salt Refiners and Packers** owned by the Sutherland and Krok families.
- II. **Swarkops SeeSout**, owned by G Schombee
- III. **Dwaggas Salt Works** owned by G Nel

Cerebos controls the 'top-end' of the food market i.e. it sells branded salt to the major retailers, while Salt Refiners and Packers is the largest wholesale supplier and in addition it does contract packaging for other producers.

5.4. SMALL SCALE MINING OPPORTUNITIES

The extreme dryness of the Northern Cape makes it ideal for salt production. As the Mineral and Petroleum Resources Development Act (MPRDA), makes provision for both mining rights and mining permits, some salt producers have opted for the latter owing to the scale of their operations. Mining rights require a comprehensive application that should include a geological report, details of the market, social and labour plan, royalty payments and evidence of detailed financial and technical competence and an Environmental Management Plan (EMP). Mining permits, on the other hand, require very basic information on financial and technical competence and EMP's, but more importantly restrict the area mined to 1.5 hectares and proof that the mineral can be mined optimally within two years.

Abundant salt reserves in the country, as well as growing demand, consistent with the levels of economic growth, create further opportunities for increased supply needs for salt. Small scale miners are therefore encouraged to seize the opportunity to enter this market, particularly as South Africa imports approximately 50 percent of salt to meet its chemical industry demand levels.

6. DEVELOPMENTS IN THE SALT INDUSTRY

Salt Investment SA has put on hold its Lake Assal salt project in Djibouti indefinitely due to lack of funds. This project was set to become a major world salt producer, which would have boosted production in the east African country. The construction of the plant was meant to be completed by June 2010. The facility was initially built to produce 4 Mt of salt per annum, and had been designed to expand to up to 6 Mt per year depending on market demand. Lake Assal is considered to be one of the largest undeveloped salt reserves in the world. This project would have placed Salt Investment among the five largest salt producers in the world.

Cerebos's R85-million relocation and expansion project into the Coega Industrial Development Zone (IDZ) came on stream in January 2009. This project uses modern technology that will produce high quality salt. This new facility is expected to produce about 45kt per annum once fully operational. This project created two hundred permanent jobs.

Straits Chemicals R5.8billion desalination plant in Coega was expected to start production in early 2010. The plant will produce 630 kt of salt and 600 kt of chlorine per annum for domestic and export markets, with other products being caustic soda, hydrogen and drinking water. A thousand jobs would be created during construction and a hundred more in the plant. However, the construction of this plant has been delayed due to financial constraints.

South Africa's Competition Tribunal conditionally approved the merger between Chlor Alkali Holdings (CAH) and Botswana Ash (Botash) in March 2010. Initially, the Competition Commission recommended that the Tribunal prohibit the merger, owing to concerns that the change from a duopoly to a monopoly might result in price increases. Currently, CAH supplies chemical grade salt through its subsidiary, Walvis Bay Salt Holdings. The other alternative supplier of chemical grade salt in Southern Africa is Botash, which produces chemical grade salt as a by-product of ash. However, the Commission decided that by implementing certain conditions it could remedy the competition concerns that arose from the merger. Subject to the merger, Botash would supply any inland South African based purchaser of un-bagged and railed chemical grade salt for use in South Africa. Prior to the merger Sasol was the only inland customer getting its chemical salt requirements from Botash. However, it has concluded a long-term supply agreement with the merging parties.

7. ENVIRONMENTAL IMPACT

Salt production essentially entails the pumping of brine onto hardened surfaces where crystal growth occurs by solar evaporation. The salt is formed by the process of evaporation and no waste is created. The coarse salt crystals are then harvested and transported to processing plants where it is refined, packaged and distributed.

Salt mining is characteristically conducted in a natural manner; no rock is broken in the process. The impact on the environment is less than that of any other type of mining, hence minimal rehabilitation is required.

Any extractive industry unavoidably disturbs the natural environment, although removing salt from the sea makes no real change in the volume or salinity levels of the ocean; nor does a rock salt mine or solution mining operation. Significant alterations to the landscape and underground operations must be carefully managed for structural stability. Both solar salt works and solution mine/vacuum pan-refining plants produce a saline waste stream that also requires proper management as does stockpiling and shipping of salt.

Sodium chloride is not classified as dangerous to the environment and the manufacture of salt does not require registration under any environmental Regulations, though, the industry is regulated through a number of Directives governing operating practices, food safety and environmental performance. In South Africa, environmental compliance for manufacturing sites is regulated through the Department of Mineral Resources and Environmental Affairs. These departments' permits cover the control, monitoring and reporting system that each company must have in place, for controlled processes, to demonstrate compliance to standards relating to such matters as dust control, noise levels and air quality. The Department of Water Affairs covers water abstraction requirements, discharges to water and operation of boiler plants. As manufacturing and mining processes continue to evolve, industry develops technology and improves best practice; generally operators seek to meet and often exceed the standards of international best practice.

As a mineral which is not chemically altered in processing, rock salt is covered by Annex III of the Registration, Evaluation and Authorisation of Chemicals (REACH). This means that it is exempted from any obligation to register.

8. OUTLOOK

World demand for salt is expected to rise to 290 Mt by 2015, driven by increasing demand from the production of synthetic soda ash, food processing, de-icing of roads and consistent growth in China. Asian consumption of salt, particularly chemicals in China will lead growth and could reach 137 Mt, which is almost half of total projected salt demand in 2015.

Global salt production could reach 300 Mt in the next 3 years, due to sustained demand growth for chloralkali and synthetic soda ash from China. The Chinese are forecast to account for approximately two-thirds of this total increase in production, with few significant expansions for chemical grade salt planned outside Asia.

Historically, salt prices have increased by 3-4 percent per annum, reflecting rising production costs. Late 2010 saw higher prices as the supply of salt tightened. If Chinese production capacity fails to come on-stream as planned, rising demand from the chemicals sector is likely to exert upward pressure on chemical-grade salt prices through 2012.

In South Africa, the potential investment by Straits Chemicals as well as the recent Cerebos expansion project will increase production of salt and help reduce the country's reliance on imported salt. South Africa's consumption of coarse salt in the chemical industry is expected to grow, as the economy continues to recover.

9. REFERENCES

1. Engineering News, <http://www.engineeringnews.co.za> , accessed January 2011
2. Industrial Minerals, <http://www.indmin.com> , accessed December 2011
3. Kostick, D., (2010) Salt Review 2004, USGS, <http://www.usgs.gov> . Accessed January 2011
4. Oosterhuis, W.R., 1998. Salt in The Mineral Resources of South Africa (M.G.C. Wilson and C.R. Anhaeusser, eds): Handbook, Council for Geoscience, p. 584 – 586
5. Personal communication with Duane Mouton, Coega Industrial Development
6. Personal communication with Vincent Van Heerden, Swarkops SeeSout
7. Producers of Salt in South Africa 2006, Directorate Mineral Economics
8. Review of the South African Salt Industry in 2007, Directorate Mineral Economics.
9. Salt Production: A reference book for the industry, Eu-China Energy and Environment Programme
10. USGS, 2012, Mineral Commodity Summaries 2012