SODA ASH PRODUCTION AND BENEFICIATION

INVESTOR FACTSHEET

INTRODUCTION

The Botswana Investment and Trade Centre (BITC) is an integrated Investment and Trade Promotion Authority with an encompassing mandate of investment promotion and attraction; export development and promotion including management of the Nation Brand.

Among its key responsibilities, BITC is charged with gathering intelligence and conducting research to sustain and enhance the competitiveness of Botswana. This includes publishing information relating to investment in, and exports from Botswana for local and international investors to take advantage of the existing opportunities in the country. We are therefore pleased to share the synopsis of Botswana's Soda Ash Value Proposition.

OVERVIEW OF THE BOTSWANA MINING SECTOR

The Botswana mining sector ranks among the highest in Africa on investment returns and policy perception. Botswana remains at the top of BMI's Mining Risk/Reward Index with a score of 59.6 out of 100 in 2016. The country's high score in the index is due to the difficulties experienced by rival mining markets. The country is expected to remain one of the best regulated and strongest performing in mining in Africa over the coming years as the country's overall position was 13 out of the 122 jurisdictions. This sector is led by the diamond industry, though other metals and minerals are increasing in prominence, including Coal, Soda Ash, Copper and Nickel. The mining sector's attractiveness is demonstrated by the presence of high profile international operators that have invested in Botswana, taking advantage of the conducive mining investment climate in the country.

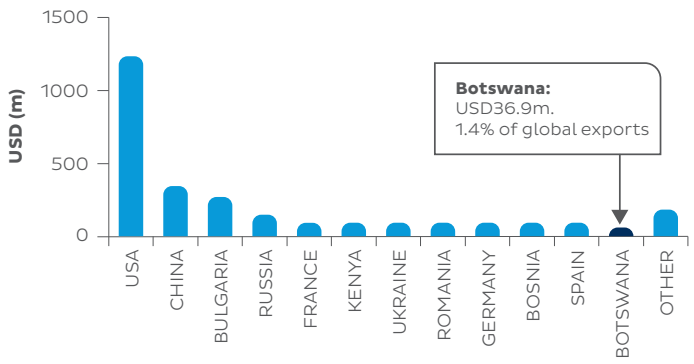
THE GLOBAL SODA ASH MARKET AND BOTSWANA'S POSITIONING

Glass production accounts for 50% of global Soda Ash demand. Northeast Asia, mainly China, accounts for almost half of geographic demand for Soda Ash. The 2013 world Soda Ash demand was 55 million metric tons. The world demand for soda ash for flat glass industry is the highest at 25%, followed by demand for container glass at 19%. The other sources of demand however, include soap / detergents, chemicals, and metals/mining, pulp and paper, and others. The 2013 world Soda Ash demand by region was led by Northeast Asia (mainly China) at 45%. Other import regions for Soda Ash demand included Europe, split into West Europe, Central Europe and the Baltics and North America.

The seven largest producers account for almost 40% of global production

Botswana is one of the largest Soda Ash producers and exporters in Africa. Botswana Soda Ash is produced from naturally occurring brine reserves. China, however is the world largest soda ash producer at close to 20,000,000 tons per annum and consumes a substantial part of that production locally. China uses synthetic process to produce Soda Ash. Other Soda Ash producers include USA, European countries, Middle-east countries and some African countries. Botswana was the 12th largest exporter of Soda Ash in 2013 after Kenya. The world top exporter is United States of America, followed by China and Bulgaria. Botswana has the second most important reserves in the world after the USA.

Top Global Exporters 2016



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THE BOTSWANA SODA ASH SECTOR

Botswana Soda Ash Industry Structure

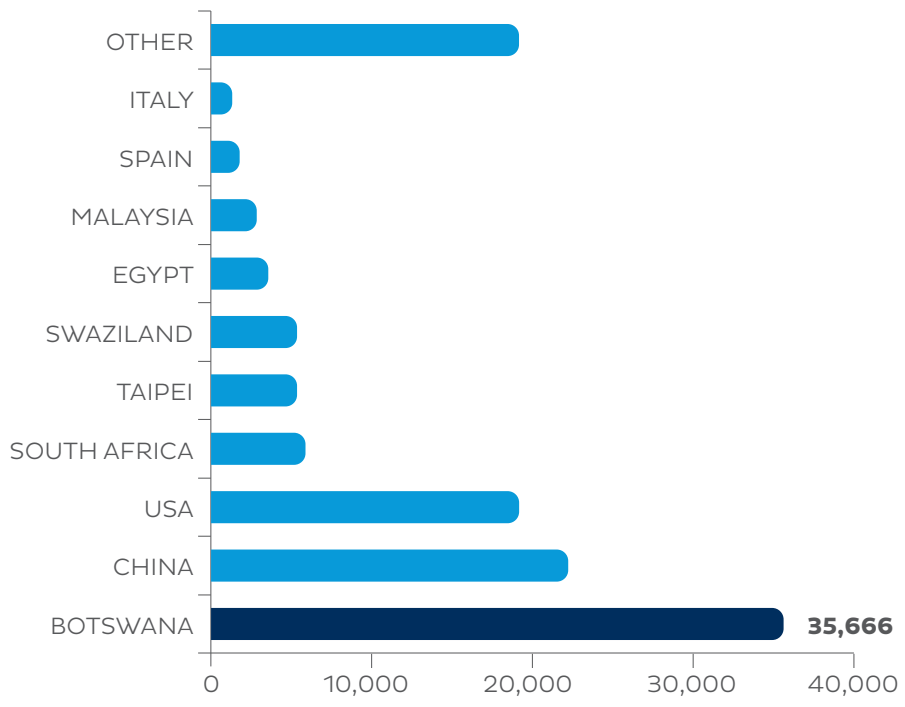
The Botswana Ash (Pty) Ltd (BotAsh), the only extractor of Soda Ash, is a 50/50 partnership between the Government of Botswana and Chlor Alkali Holdings (CAH) Group, a South African based company, which is also the management partner. Botswana Ash has a capacity of 300, 000 tons of Soda Ash per annum and currently produces over 280, 000 tons, making the country one of the largest producers in the world. Bulk Soda Ash is loaded at Sua Pan in Botswana and transported to the Natalspruit depot in South Africa. The railway logistics from Botswana to South Africa is managed by two service providers who are responsible for different legs of the route. Soda Ash trains containing bulk product are offloaded into silos after arrival at the depot. Stock is then either dispatched to customers using bulk road tankers (Tanker Services) or bagged at the on-site bagging facility.

Botswana Soda Ash in the SADC Market

SADC offers an attractive export market for Botswana Soda Ash as these countries are a significant markets for Soda Ash. Prices for Soda Ash vary according to each country and South Africa imports a significant volume compared to other regional countries. This price is over $0.20/kg. Besides Namibia and Zambia, all other SADC countries pay average Soda Ash prices above $0.20/kg.

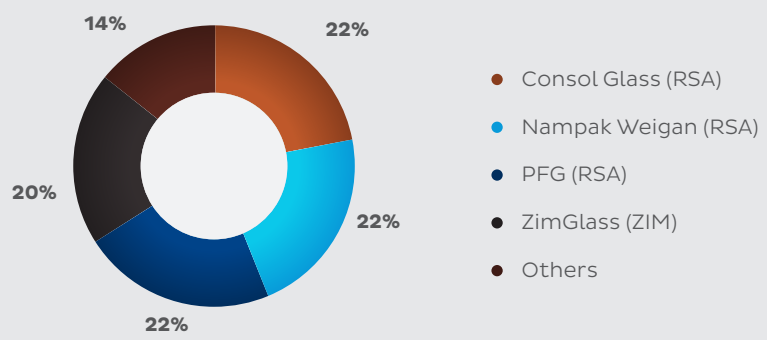
Botswana is already the largest Soda Ash exporter to SADC Region. The country exports over 35, 000 tons to other SADC countries. Other significant exporters of Soda Ash into SADC include:

Soda Ash Exporters to SADC

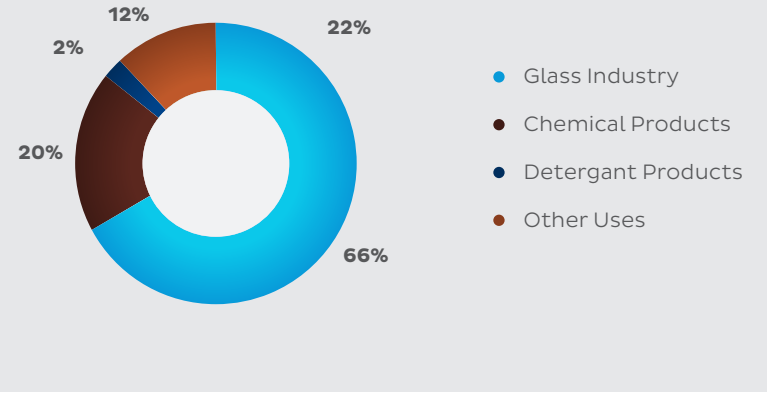


Botswana Soda Ash is principally used by the glass industry. 66% of Soda Ash produced by Botswana Ash is sold to three major glass manufacturers in South Africa: Consol Glass, Nampak Wiegand (both for container glass) and PFG (for flat glass). An additional 20% of then exported to Zimglass, a glass container manufacturer for the beverage industry based in Zimbabwe. Chemical products for which Botswana Soda Ash is used include anti-caking agents and cleaning agents.

Botswana Soda Ash Customers



Uses of Botswana Soda Ash



INVESTMENT OPPORTUNITIES IN THE SODA ASH SECTOR

Opportunity 1: Chromium Production

For the production of pure chromium, the iron has to be separated from the chromium in a two-step roasting and leaching process. The chromite ore is heated with a mixture of calcium carbonate and sodium carbonate in the presence of air. The chromium is oxidized to the hexavalent form used in stainless steel, other alloys and steel plating in the car industry.

Opportunity 2: Chemicals – Applications

a. Sodium Dichromate uses include:

- Main ingredient of chromium chemicals,
- Water softener in laundering,
- Additive to swimming pools to raise the PH and neutralize effects of chlorine,
- Food additive (E500) acidity regulator, anti-caking agent and raising agent.
- Wetting agent, brick industry
- Tannery and fur industry for leather and fur tanning;
- Chemical industry for producing non-organic pigments, catalyzers and other chrome-containing elements;
- Textile industry for fabric pickling;
- Other industries in passive mixtures content, in anti-freeze liquid for engines, acetylene cleaning and chemical reagents

b. Sodium Chromate uses include:

- Corrosion inhibitor in petroleum industry,
- Dyeing auxiliary in textile industry,
- Wood preservative,
- Red blood cell volume diagnostic.

c. **Sodium Silicate uses include:**
   i. Spray dried detergents
   ii. Soap manufacturing
   iii. Water treatment
   iv. Deflocculation of ceramic clays
   v. Foundry - C02 and self set Process
   vi. Soil Consolidation
   vii. Tube Winding Adhesives
   viii. Welding Electrode Manufacture

Opportunity 3: Swimming Pool Care

Soda Ash is widely used for the water treatment in swimming pools to increase swimming pool alkalinity (Increase Ph). The final product requires minimal processing and it is sold to consumers in packs of 500gr – 4kg. There is potentially an opportunity for an investor to proceed with the following:

- Set up operations nearby Sowa Town Production Plant to pack soda ash in consumer ready pack sizes in order to satisfy the domestic and other markets north and west of the borders
- Set up operations nearby Botash's South Africa depot to pack soda ash in consumer-ready pack sizes in order to satisfy the South African market.

The operations could be set up in parallel with salt packing facilities to ensure maximum synergies. There are estimated 170.000 pools in South Africa (3 per 1000 inhabitants) corresponding to 100,000 pools in rest of Southern Africa. Assuming that:

- Swimming pools open 6 months per annum
- 1kg of soda ash is required per swimming per month
- Price of consumer pack is USD 3.00 per kg

Opportunity 4: Potassium Chloride

Potassium chloride is a naturally occurring compound made up of potassium and chlorine, and its uses include:

- Agriculture – fertilisers, animal feeds
- Food processing – salt substitute
- Water softener – Sodium chloride substitute
- "Three drug cocktail" – one of the three active ingredients for lethal injections used in the USA
- Food supplement – against a condition called "Hypokalaemia"
- Industry
- Radiation monitoring equipment
- Common batteries
- To melt ice

Potassium Chloride – Applications

I. Agriculture:

In Agriculture, Potassium fertilizers are commonly used to overcome plant deficiencies. Potassium chloride (KCl), the most commonly used source, is also frequently referred to as muriate of potash or MOP. Potassium chloride is the most widely used K fertilizer.

II. Animal feeds:

Pets and livestock need to be fed potassium to avoid reaching low potassium levels, especially during heavy training, as it is essential to the functioning of many physiological systems, especially to neuro-muscular function that is lost in sweat. It also contributes in improving your pet's appetite under stressful situations and aids in digestion of nutrients for maximum feed efficiency.

III. Medicine:

Potassium is a mineral that is found in many foods and is needed for several functions of your body, especially the beating of your heart. Potassium chloride is used to prevent or to treat low blood levels of potassium (hypokalemia).

Opportunity 5: Detergents/Cleaning products

Detergents production is a more value added business vs soda ash. Exports in 2015 from South Africa were valued around $160 million. Soda Ash (Sodium Bicarbonate) is used as a base or carrier for the following applications:

- Scouring powder
- Powder detergents

Prospective Customers for Detergents/Cleaning products:

- Gaborone Chemicals
- Clover Chemical Industries
- Africa-Chemicals
- Kgalagadi Soap Industries
- Unilever (need to meet quality parameters)
- Procter and Gamble
- Blendwell
- The Soap Factory
- Bliss Brands Chemicals
- Reckitt Benckiser
- Tiger Brands
- Britechem

Opportunity 6: Paper Mills and Pulp

Soda helps increase the pH in the pulping process of fibres. The higher pH of the paper-fibres solution results to fibres smoothen and swell facilitating the grinding process of the fibres. Additional potential uses of soda ash include Flue Gas Desulfurization (FGD) is a technology used to remove sulphur dioxide (SO2) from the exhaust flue gases of fossil fuel power plants. For example, in a typical coal-fired power station, FGD will remove 95-99 percent of the SO2 in the flue gases. Similarly, large amounts of CO2 are released into the atmosphere through power plants and industrial production processes (e.g. steel and cement production). Recent research conducted by Harvard University and the University of Illinois have proved that microcapsules made of soda ash can absorb carbon dioxide. This is future opportunity for implementing technology across Southern Africa.

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