Minerals industry in the Province of KwaZulu-Natal

Extraction and processing

South Africa

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Introduction

KwaZulu-Natal is located on the Indian Ocean seaboard and is one of South Africa's nine provinces occupying 92,100 square kilometres - equivalent to 7.6% of the total land area of the country. Of all the nine provinces in South Africa, KwaZulu-Natal occupies the third smallest land area.

Part of the east coast of Africa, it stretches from Port Edward in the south to the Swaziland and Mozambique borders to the north.

Mining Industry in the province

Mining and mineral beneficiation contributes around 6.5% of South Africa's GDP and is the country's largest single private employer (500 000 people), with small-scale mining operations making a significant contribution to job creation.

KwaZulu-Natal has mined coal for over one hundred years. However, since 1982, the province's production has steadily decreased from 20Mt to 2.5Mt in 2005,at present production numbers are on the rise due to the number of new collieries being commissioned by junior mining companies in the province.

In comparison to the other South African coal deposits, KwaZulu-Natal coal mining is difficult due to large topographic differences, structural complexities and thin seams. However, KwaZulu-Natal is advantageously positioned with respect to the export markets due to the proximity of the ports of Durban and Richards Bay.

At present, there are exactly about 6 collieries operating in the province at present, mostly mining Anthracite for the domestic market and quite a little bit for the export market. The industry contributes just over 1.5% to the provincial GDP at present, but set to sour given the increased exploration activity across the province.

The KwaZulu-Natal coalfield is produces mostly metallurgical anthracite coal as well as semi coking coal products used as a replacement to hard coking coal for the steel mills. With this wide variety of production in the country and with roughly 66m tons being exported, significant blending is done at the port of export Richards Bay to standardize a product and export an index price for it.

The province also boasts minerals sand mining along the north coast by Richards Bay Minerals that get beneficiated into Titanium for lucrative export market. This project generates in excess of US$1 billion dollars per annum to the province. Work has started in the Maphumulo areas to prospect for the occurrence of Mineral sands which are said to be rich in Titanium, with Many other communities in the north coast also looking at developing their own mineral projects mining Titanium.

Quarrying (Limestone, stones and aggregates) activities across the province are fairly rampant. Limestone mining and process is done mainly on the South Coast, with the major player there being Natal Portland Cement-CIMPOR as well as DWALA Carbonates. A significant amount of the lime being mined get processed into cement and the remainder is utilized for other industrial and commercial applications in the country.

The province has a host of the minerals and metals, spread vastly across. The small town of Phongola on the North-east of the province has a small Gold mining operation, which has been in operation for quite some time. Artisanal copper mining is reported in the areas of Nongoma and Vryheid, Chrome prospecting is expected to commence soon in the Maphumulo areas.

Mining and Rural development

Historically, mining in the province of KZN has been credited with the establishment of 'mining towns' in places such as Vryheid, Dundee, Newcastle, Utrecht. The concentration of easily accessible coal resources, in abundance and at a cheaper rate to extract, ensured that the pioneers of the sector located their investments there and essentially contributed to the development and thriving of a number of these town, with both mining and agriculture forming the core economic backbone of the economy at the time. With the dwindling of the resource and the attractiveness of newer and far cheaper to mine alternatives, many of the bigger companies chose to close shop and look for alternative opportunities elsewhere, leading to

the ghost towns which many of the towns have suddenly become with the withdrawal of these companies.

Mintek in 2007, commissioned by TIKZN conducted a mineral scan of the province to determine the remaining stock of coal resources in the province, using data from known sources and some areas which had previously been drilled by the council of geosciences in its national drilling programme in the 50's. Essentially the key outcome of this is that the provinces coal fields are mainly divided into five and they are namely: KlipRiver, Utrecht, Vryheid, Nongoma and Somkele. A further analysis of this within a Rural development context indicate that almost all of the mentioned areas are found to be in rural areas of the province, with a significant ownership of the land under which the resources are located being directly under the traditional leadership and the Ingonyama trust as the main custodians of the land accordingly.

To decipher this further, KwaNongoma is said to have 2.5bn tons of coal and anthracite in situ, having taken into consideration 40% geological losses. A significant percentage of this calculation reflect the earlier geological analysis work referred above, but does not necessarily reflect the total estimation of the availability of resources in the entire area, To further put this into context, whilst significant exploration work has been done by a number of companies in this coalfield, only one active mine exists there, owned by the Australian company Riversdale mining, extracting not more than 2m tons of coal per year. In KwaNongoma for instance which has seen a sharp increase of artisanal coal mining related incidences in the last three years, people continue to build trenches and mine coal for domestic heating, with a extensive coal stocks being visible to the naked eye.

The Somkele coal field which is to be found in the Mtubatuba area for instance, only has one mine as well, producing a blend of coking coal and anthracite, which is highly sought after in the international markets by the steel industries. The Somkele coal field is estimated to be the biggest coalfield in the province with an estimated resource at 3.7bn tons of coal, this area too is under the tribal authority, controlled by the Mkhwanazi tribe.

The Mkhwanazi tribe in the Port Dunford area, close to Richards Bay has a significant proven reserve of titanium sands which they have recently partnered with Exxaro sands to exploit. It

is said that a new mine would be established in the area in the next 3 years at a cost of atleast R2bn to rival the production of Richards Bay Minerals close by.

In KwaMaphumulo and Nkandla area, shallow deposit of the Chromite occurrences have recently been discovered, already, two companies have submitted prospecting applications with the DMR to determine the economic viability of these 'new discoveries' and significant work would be undertaken as soon as the licences have been awarded.

A number of other communities in the province who know and understand the geology of their areas continue to approach TIKZN for assistance in exploring and determining the extent of the mineralisation of the areas, for many of them have seen the occurrence of certain minerals, but with limited resources and expertise in the field, have not had the opportunity to unlock them economically.

COALFIELD	GROSS TONNAGE IN SITU (GTIS) 2007 (Mt)	GEOLOGICAL LOSSES AT 40%	IN SITU RECCONNAISSANCE COAL RESOURCES (TOTAL TONNES IN SITU) (TTIS) (Mt)	TOTAL 1997 (Mt) (TTIS)	2007-1997 DIFFERENCE
Klip River	4,461	1,784	2,677	1,695	982
Nongoma	4,116	1,646	2,470	257	2,213
Somkele	6,133	2,453	3,680	467	3,213
Utrecht	2,265	906	1,359	950	409
Vryheid	2,084	834	1,250	222	1,028
GRAND TOTAL	**19,059**	**7,623**	**11,436**	**3,591**	**7,845**

Taking stock of the table above which talks to the potential mineable tonnages of coal in the province for instance, indeed taking cognisance of the difficult mining conditions, the high vitality and ash content of the resource, the opportunity presents itself therefore for a new model in the mining industries, whereby communities and tribal leadership can develop projects and attract new investors and actually become meaningful partners.

If one for instance were to calculate the economic value of this resource for the province in today terms, assuming for simplicity that all the coal would go to the export market at the average Richards Bay Index price of US$100, the economic value therefore of the coal industry as lying on the ground is **US$ 11 436 00m**.

It is therefore a matter of time and perhaps a heavy handed provincial intervention that the mining industry in the province be unlocked to the benefit of not big business and investors, but for the business community of KZN and other junior mining companies. A conceited provincial wide exploration drive would begin to set the ground work of attracting investors into the provinces virtually untapped rural opportunities, ultimately ensuring that a significant amount of the benefit remains in the province instead of 'foreign investors' who do not come from within those communities.

Base metals such as copper and bauxite have been said to occur in the rural areas of this province. As a matter of fact, the provincial mineral map has got traces of number of these base metals occurring, perhaps not the best grades in the world, but good enough to stimulate local communities and get them into economical extraction opportunities. The possibility of outside investors coming into such low grade, highly virgin and perhaps limited quantities is fairly minimal, but perhaps that is a blessing in disguise to get communities themselves to exploit these opportunities themselves, with the aid of Government structures.

The issue of both Bauxite and Chromite for instance is particularly interesting given the fact that the industrial town of Richards Bay has both large smelters of Aluminium from Bauxite and Ferro Chrome imported from foreign countries. Perhaps if the grade coming out of the province is not of significant, quality, it can be blended with high quality imports, but we will

never know the true economic value of these assets unless someone takes an initiative and determines the value thereof of these products.

Mineral Beneficiation

As demonstrated above, the province has a relatively small minerals extraction industry in comparison to some of the country's other provinces. Minerals beneficiation is significantly more important to the provincial economy. There are three major reasons for this:

- **Negotiated power supply contracts**
  Guaranteed supply and pricing contracts have been signed between South Africa's major power supply utility Eskom and mineral processors.

- **Proximity to logistics infrastructure**
  The province boasts easy access to road and rail logistical infrastructure. Additionally, the province has two major ports and an international airport. The port of Durban is South Africa's premier port for the import and export of high value goods including automobiles and containerised goods and Richards Bay is the nation's major bulk handling port. Durban is accessed from the hinterland by a rail and motorway and Richards Bay is linked by rail to the coal fields of Mpumalanga.

  The rail line was initially built for the transportation of coal between the major mines and the coal terminal at Richards Bay. Although its primary purpose is coal transportation it is likely in the future to transport other goods and commodities between the hinterland and Richards Bay.

- **Availability of raw materials.**
  A number of KwaZulu-Natal mineral processors source their raw materials from within the province. Cases in point are the heavy mineral processors as well as those that source certain inputs from within the province for example, limestone and anthracite.

Beneficiation projects

Coal processing

Coal is beneficiated by the removal of contaminants mainly, inorganic intrusions. This process is generally known as "washing" and the province of KwaZulu-Natal has a number of such facilities located in different areas. Anthracite Calcining is also another form of processing coal. To calcine anthracite essentially involves 'baking' the anthracite at a particular degree so that it hardens and take coking coal properties for utilization in steel mill furnaces as a substitute for the highly expensive and illusive coking coal. Calcined Anthracite is therefore a substitute to coking coal and is used worldwide.

The provinces coalfields are mostly anthracite and almost all the current collieries productive at present are producing anthracite. Many of the mines currently sell their output semi processed and are therefore at the mercy of the market price at that time. A case in point is the recent GFC whereby prices plummeted to about US$40 per tonne, with production costs averaging at US$60, almost all of the smaller scale mines with no firm long term contracts, were forced to shut down.

The Forbes Coal operation in Dundee is the only operation in the province to have a small battery plant used to process and calcine their own anthracite output, plans are afoot to increase radically the plant and invest in a larger plant.

The Richards Bay Coal Terminal operating out of Richards Bay on the North Coast of the province is the world's largest coal exporting terminal, with a handling capacity of roughly 90m

tons. The terminal is privately owned by the large coal producing companies, which has become a major challenge for the coal mining industry country wide.

The company that has yielded fortunes for Richards Bay, the Richards Bay Coal Terminal (RBCT) was created on 30 December 1973 in the TCOA boardroom. The RBCT was formed to export 12Mt per annum in Phase I. In 1978 it was expanded to 24 Mt/a (Phase II) and in 1984 to 44 Mt/a. In 1991, capacity was upgraded to 53 Mt/a and in 1992, without any major expenditure, throughput was increased again to 63 Mt/a, while in 1997 a further capacity increase to 69 Mt/a was carried out. In early 2000 a Brownfield's expansion (BFE) took the terminal to 72 Mt/a. The latest expansion, Phase V, will give RBCT a total capacity of 91 Mt/a by mid 2009.

Few changes to the terminal's shareholders have been made since its beginning in 1973. Most of the six original companies have remained shareholders, although they have gone through mergers and name changes. The only newcomers are Total Coal, (joined in Phase II) and Sasol (joined during the BFE expansion). The remaining four: BHPB (37%), Anglo Coal (27%), Xstrata Coal (29%), and Kangra (2%) were all part of the first shareholder's group. Eyesizwe Coal was created, from collieries owned by Anglo and BHPB collieries and therefore received portions of their quotas.

Since the advent of the new MPRDA, a number of small BEE coal companies have been launched. In order to improve their revenue, the majority have aspired to become coal exporters. Because of the previously described structure of RBCT, and the high rail and port handling costs attached to exporting from the other two terminals – Durban BC and Maputo TCM – most were left with only one choice; to sell their export coal to a RBCT shareholder or to a coal trader with an RBCT allocation. In both instances, the BEE producer would make only a very small profit from coal that usually sold for four to five times more than its equivalent in the local market.

To put into perspective the economic value of the RBCT, in a very productive year, they export 70m tons of coal pa. At the average price of the Richards Bay Index of say US$100 per ton, the terminal alone handles export material of roughly US$7000 000 000 per annum, which goes to the economic participants of the chain at a given point in time. It must be noted that at this point, KZN companies only export just under half million tons per annum using the RBCT.

The recent announcement by the Southern Africa power Consortium to acquire the Ngangane power station in Newcastle from Eskom and build a new $2.5bn coal fired power station would contribute greatly in resuscitating a number of marginal mines, with lower grades of coal which would not have been feasibility to supply to alternative markets. Estimates indicate that about 13 new coal mines would have to be opened in the greater Newcastle area to feed into this project, creating not less than 10 000 jobs both directly and indirectly.

Chrome and manganese processing

Assmang Limited operates Cato Ridge Alloys near Durban. Manganese ore is sourced from mines in the Northern Cape Province and railed to the plant. Domestically sourced manganese is supplemented by imported very high grade ore. Coking coal and anthracite are sourced from within the province. The Ferro-manganese product is exported through Durban and Richards Bay.

Indian steel giant, Tata Steel, has recently erected a ferrochrome plant in Richards Bay processing ore imported from India and Iran. The stainless steel manufactured is currently being exported to the USA and EU.

Aluminium production

KwaZulu-Natal's major beneficiation project is the production of aluminium from imported alumina. Alumina is shipped from plants in Australia and Indonesia to Richards Bay. Two smelters owned by BHP Billiton reduce the alumina to aluminium metal. The prime reason for the smelters' location is their proximity to the Port of Richard's Bay and the favourable long term supply and pricing contracts with power utility Eskom. Most production is exported although there is increasing manufacturing of aluminium products domestically.

Processing of Heavy Minerals

Richard Bay Minerals Limited and Exxaro Limited mine heavy minerals from ancient beach sands in the north of the province. Minerals mined include ilmenite, rutile, magnesite and iron ore. Processed products include titanium and high purity iron. Processing, like the reduction of alumina, requires large amounts of electricity and, again, as in the case of the aluminium smelters, the supply of cost effective power has been negotiated with Eskom

Processing of Phosphorus

Foskor Limited processes phosphate ore sourced from its mine in Phalaborwa in Limpopo Province to phosphoric acid and fertilisers and both of these are exported through the Port of Richards Bay. Additionally, there is an interest in the manufacture of yellow phosphorus.

Granite dressing

There is a small industry dressing granite mined from both within the province and outside. This is both for domestic consumption as well as export.

Iron and steel manufacturing

Arcelor Mittal manufactures iron ore and steel in Newcastle in the north of the province. Iron ore is railed from mines in the Northern Cape Province. Other inputs including limestone and coal are sourced from within the KwaZulu-Natal province.

Cement manufacturing

Cement is manufactured from limestone sourced in the province; other inputs required such as coal, gypsum and fly ash are also available relatively nearby. NPC-Cimpor is a JV between Portuguese company Cimpor and South Africa's Natal Portland Cement and they are the biggest manufacturer of cement in the Province of KZN. La Farge cement of France has a small grinding unit in Richards Bay with a production capacity of 200 000tons per annum. The plant essentially brings in processed clicker from the company's plants in other parts of the country and processes it for cement in Richards Bay.

Refractory materials

RHI, one of the world's leading refractory materials manufacturers, has established a plant at Isethebe in KwaZulu-Natal and utilises as its chief resource refractory grade chrome mined in Mpumalanga and Limpopo provinces. Production is mainly for export and product is shipped through Durban.

International companies

1. **Richards Bay Minerals** is the trading name for two registered companies, Tisand (Pty) Ltd and Richards Bay Iron and Titanium (Pty) Ltd (RBIT). Tisand is responsible for the dune mining and mineral separations operations, and RBIT the Smelting and beneficiation process. The company is jointly owned by Rio Tinto plc and BHP Billiton plc based in London.

2. **BHP Billiton** owns and operates the Hillside and Bayside Aluminium smelters operating in Richards bay. The Hillside smelter produces at current levels 700 000 tons per annum, making it the largest smelter in the Southern hemisphere and the country's major producer of primary Aluminium.
3. **Tata Steel (India)** has recently commissioned a 1, 35 mt high carbon ferrochrome plant in Richards Bay at a cost of R680 m ($100m).
4. **Cato Ridge Alloys (Pty) Ltd** is a joint venture between Assmang, which holds a 50% interest, Mizushima Ferroalloys Company Limited, which holds a 40% interest and Sumitomo Corporation, which holds 10%. Assmang is responsible for the day-to-day management of the venture. The company was formed during 1996 for the production of refined ferromanganese utilizing high carbon Ferro-manganese from the Cato Ridge Works as the feedstock. The plant has a capacity to produce up to 60 000 tons of refined ferromanganese per annum.
5. **Arcelor Mittal South Africa Limited** is the largest steel producer on the African continent, producing 6.4 million tonnes of liquid steel per annum. Their plant in the province of KwaZulu-Natal is located in Newcastle, is the country's foremost supplier of profile products. The Newcastle plant employs just under 2000 personnel and produces 1.6mn tons of final product.
6. **CIMPOR - Cimentos de** Portugal is the largest Portuguese cement group, operating in Portugal, Spain, Mozambique, Morocco, Brazil, Tunisia, Egypt, Cape Verde, South Africa, Turkey, China, Peru and India involved in manufacturing and marketing cement, hydraulic lime, concrete and aggregates, precast concrete and dry mortars. Cement production capacity with their own clinker is up to 30.3 million tonnes per year. In South Africa, they own 74 % of the NPC Cimpor cement company operating out of Durban, with significant deposits of limestone deposit in the south coast.

Conclusion

The province of KwaZulu-Natal is considered to be the logistics hub of South Africa, boasting the busiest and most efficient sea port in Africa (Port of Durban) and Africa's largest natural sea deep port, the Port of Richards Bay, a new international airport (the King Shaka international), a large skill pool as well as a quality of life unrivalled in Southern Africa, is well positioned as the most cost effective investment destination for mineral beneficiation.

For the communities to begin to develop and participate in the economy, mining offers one of the best vehicles through which they can have a meaningful participation. The province, just like the North West province finds itself in a unique position because the resources are vastly untapped, they are in rural areas, the land is owned by the rural communities and structured tribal authorities, conventional investors would not necessary see themselves taking the risk to venture into these territories at this point before someone else takes that risk, the deposits are close by to the logistics infrastructure for export markets should the need arise, which offers essentially the best model for both rural development and core economic participation of rural communities.

The provincial Government would have ultimately to play a catalytic role in ensuring that this is realized. The biggest pull factor therefore for investment into this space is for the state to begin to crystallize some of these opportunities in these rural communities, assist communities set up community mining companies, apply for prospecting rights and permits, do some initial prospecting work and develop some geological work and from there on, approach investors and developers at the terms best favorable to the developmental needs of the communities.

After a decade of steady economic growth, South Africa, like a number of emerging economies which have had similar experiences of rapid economic growth and

development, is currently experiencing electricity supply challenges. These are being competently addressed by the national electricity utility, Eskom. Additional capacity will come on stream by 2013.

The South Africa policy in the medium-term will increasingly be more biased towards value-addition to minerals within the boundaries of the country. The province of KwaZulu-Natal is therefore the most well-position destination for the following minerals; chrome, gold, platinum, diamonds, coal, lime, manganese and iron ore.