Experts Consultation on Minerals Beneficiation

Tuesday 16 October 2012

Hosted by:
United Nations Economic Commission for Africa (UNECA)
Industrial Development Corporation (IDC)
Institute for African Alternatives (IFAA)

Supported the Friedrich Ebert Stiftung South Africa

INTRODUCTION

On Tuesday 16 October 2012, an Experts Consultation on Mineral Beneficiation was hosted by the United Nations Economic Commission for Africa (UNECA), the Industrial Development Corporation (IDC) and the Institute for African Alternatives (IFAA). The aim of the consultation was to determine the extent to which beneficiation can be effected domestically, as well as identify the salient opportunities and key constraints.

Currently Africa is looking beyond the simple extraction of minerals and exporting the raw product. Africa is focusing on utilising its rich mineral resources to industrialize, provide employments and grow its economies. In March 2012, African Finance Ministers, the African Union Commission (AUC) and UNECA reaffirmed the sentiments of the Vision stated below.

> *"For the mining sector to improve its contribution to broad based development, it must be better integrated into the national and regional economic fabric through linkages. To harness linkage opportunities, challenges such as those relating to deficiencies in human capital formation, particularly in knowledge intensive areas, as well as infrastructure inadequacies must be addressed."*
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> *The Africa Mining Vision, 2009*

Beneficiation has been debated in the media the past few months by different spheres of society with conflicting views, rendering debate quite sporadic. There are differing views on the value chain in both the mining industry and between the mining industry and the manufacturing industry. The meeting aimed to explore these differing views with the intention of finding a common position. The meeting also sought to examine the anomaly of a richly resourced country with a relatively small degree of beneficiation in the form of downstream activity.

The debate has been guided by the Department of Mineral Resources' document on "Beneficiation Strategy" that seeks to localise the beneficiation of minerals and thus create jobs and add skills. Consideration may be given to the provisions in the Mineral and Petroleum Resources Development Act (28 of 2002) on all licensing matters, particularly in Section 26 on Mineral Beneficiation which states in (3) "Any person who intends to beneficiate any mineral mined in the Republic outside the Republic may only do so after written notice and in consultation with the Minister."

In addition, a thorough analysis of the role of the state with respect to the industry and indeed the re-industrialization of the economy is required. This would include a critical appraisal of research and development in both private and public institutions, the role of dedicated research institutions, the finance allocated to technology, and the scale of excessive rent-seeking in the industry.

This analysis is informed by the Industrial Policy Action Plan (IPAP) produced by the Department of Trade and Industry. IPAP aims to promote long term industrialisation. "The purpose is to expand production in value-added sectors with high employment and growth multipliers that compete in export markets as well as compete in the domestic market against imports. In so doing, the action plan also places emphasis on more labour absorbing production and services sectors, the increased participation of historically disadvantaged people and regions in our economy and will facilitate, in the medium term, South Africa's contribution to industrial development in the African region." (National Assembly statement on Industrial Policy Action Plan (IPAP2) by Dr Rob Davies, Minister of Trade and Industry, 18 February 2010)

The meeting brought together experts from mining, manufacturing, government, organised labour and academia, among others, in the fields of mining, metallurgy, engineering, financing and economic policy formulation so as to contribute to the development of a systematic and common view based on experience and knowledge. Please see appendix 1 for the participants list.

This consultation was hosted by the United Nations Economic Commission for Africa (UNECA), the Industrial Development Corporation (IDC) and the Institute for African Alternatives (IFAA). The meeting is one aspect of a policy research programme "Reaping the Benefits of Value Addition" that IFAA and UNECA are collaborating on for the UNECA Economic Report on Africa 2013. The study is based on systematic analysis of value addition in each stage of the production process. The object is to assess which stage could be done within Africa. The reason for the project lies in the new interest in these resources by foreign countries which has led to increased extraction and higher world prices. New information is emerging on the scale of these resources which is clearly significant. In addition, there is now wide recognition that Africa's economic performance is much improved, partly due to higher prices for its primary products but also because of improved performance by governments.

The meeting was made possible through the sponsorship of the Friedrich Ebert Stiftung South Africa.

THE PRESENTATIONS

- **"Realities and myths of beneficiation in South Africa" by Dr Molefi Motuku, CSIR.**

Dr Motuku focused on the importance of innovation in these processes[1].

- **"Practical beneficiation strategies for South Africa" by Dr Paul Jourdan**

Dr Jourdan began by setting out the key mineral policy themes that are being advocated in South Africa:

1. That minerals in the ground belong to the people as a whole, which is the policy of the Department of Mineral Resources;
2. The exploitation of minerals must optimise the developmental impact, especially job creation, across the economy;
3. The state must capture the mineral resource rents and deploy them in long-term physical and human infrastructure (inter-generational equity);
4. Mining must catalyse broader industrialisation through the realisation of all the potential backward and forward linkages and;
5. Minerals should not compromise local communities nor the environment;

Dr Jourdan then set out the endowment of South Africa with mineral resources and giving the ranking of South Africa by virtue of production in 2009 and he indicated that South Africa is first in Alumino-silicates, Chromium Ore; Iron Ore, PGMs (Platinum Group Metals), Vanadium and Vermiculite and at the same time there are many other minerals where South Africa had large reserves including gold, and that the potential for the mining industry is a very long life.

He then set out a definition of beneficiation arguing that there's a narrow definition which is the value add above the "base" state namely the (ore, conc, metal) or a broader definition which is the total domestic value-addition (excluding all imported inputs). He argued that beneficiation is the sum of local Value Addition in the exported product and which include backward and forward linkages.

He quoted Justin Lin, formerly of the World Bank, who argued that ""a developing country could change its industrial and economic structure by changing its endowment structure" which means attending to the basic natural resources and human capital but also the physical infrastructure and the soft infrastructure which includes the (institutions, regulations, social capital, value systems, and so on).

[1] Dr Motuku's presentation and all the other presentations are available on request from the organisers.

Dr Jourdan argued that indirect beneficiation in the wider economy would include building the knowledge linkages (i.e. human capital and technology) and the spatial linkages but such measures also require attention to the resource rents which are needed to be reinvested in building the infrastructure. He then identified five kinds of linkages namely,

- Fiscal linkages
- Knowledge linkages which include human resources development and technology development
- Backward linkages which include inputs such as capital goods, services, consumables
- Forward linkages which include beneficiation and
- Spatial linkages which refer to infrastructure and development

He then set out the process in the mining industry which start with exploration; mining; processing; smelting and refining and finally fabrication. He then argued that the resource curse, which has become associated with mining economies, can be avoided and this is by the development of resource inputs and outputs industries and with the associated resources technology capability.

An interesting point he made was that Africa has become the largest market for South Africa's manufactured exports.

Finally, he set out the Principle Mineral-Based Feedstocks for rapid job creation, electricity based on energy, infrastructure, agriculture and producer power. He argued that South Africa has ample resources for the cost-effective production of almost all of these critical feedstocks for downstream job creation.

➢ Case Studies Presentations

"Platinum group metals beneficiation" by Ms Anthea Bath, Mitochondria Energy and Mr Mashudu Ramano, Terracotta Resources

Ms Bath outlined the energy-related beneficiation opportunities presented platinum group metals (PGMs), explaining that PGMs are one of the 10 of strategic metals, it will cost more to mine and needs market development which can create sustainable beneficiation. There is currently very little value addition in South Africa. The situation is unsustainable and there is a need for a fundamental change in thinking with South Africa leading the growth in demand to secure the future of our mines and downstream. She also outlined the PGM value chain; the industry has a number of unique attributes offering both opportunities and challenges to downstream development. There is a need to develop new applications to maintain current mine output, there is a need to focus on research and development and the development of new markets.

Mr Ramano continued with the presentation by stating that his presentation is predicated on the assumption that current global demand for resources, and the "second scramble for Africa's resources, coupled with African energy poverty, the South African energy crisis and the need to stabilise and grow our PGM mining industry, is giving us a unique opportunity and platform to create a new industry in South Africa and Africa. His proposal is for South Africa to take advantage of this changing global energy environment to create a new industry, the hydrogen fuel cell industry. Fuel cell applications include stationary fuel cells, premium power cell fuel cells, transportation fuel cells, residential fuel cells, auxiliary power units and micro fuel cells.

Their vision is to create a Platinum Valley Initiative that would constitute a special economic zone with incentives, for example the provision of high quality infrastructure; exemptions from customs and excise duties on capital goods, raw materials, vat and from certain regulatory requirements; reduced tax/ tax holiday not yet clarified, and so on. There is an expectation that a law will be in place by the end of 2012. Mr Ramano stated that a platinum valley could catalyse a new resource based industrial development, lay the foundation for a hydrogen energy economy, and stimulate innovation and entrepreneurship, develop human capital, diversify the current energy, reduce greenhouse gas emissions and improve carbon footprint status, stimulate regional development and help South Africa conserve, expand and exploit its mining potential.

“Ferrous metals beneficiation” by Mr Kevin Hodges, IDC

Mr Hodges explained the project is an integrated one with focusing on mine to sinter and sinter to smelter. The smelter is to be located in zone 6 of the IDZ at Coega, consisting of 4 x 40MW Closed Submerged Arc Furnaces with state of the art gas cleaning plants. Mr Hodges further explained that the project will require 13mVA of power but Eskom has only made 3mVA available during construction phase. The project has had to build the power lines from Umtu substation to Hoatazel and installed generators at cost of R 50 million for the construction phase. The project is awaiting the completion of the 70Km long 132kV line from Ferrum to Umtu by ESKOM to supply the 13MVa required to carry out hot commissioning of the Sinter plant, expected in March 2013.

The IDC acquired a 20% stake in Kalagadi project by providing R60 million to fund the Bankable Feasibility Study (“BFS”) in February 2007. At this early stage, IDC valued Kalagadi at R300million, the other 80% shareholder at the time was Kalahari Resources (Pty) limited (“Kalahari”) which is a broad based women BEE company. In June 2008, after much of the feasibility study had confirmed the economic potential of the Kalagadi project, ArcelorMittal SA (“Mittal”) acquired 50% of Kalagadi based on a total valuation of USD 630million (ca R 5 billion). New shares were issued to Mittal, IDC diluted to a 10% shareholding and Kalahari to 40%. Other ore projects coming on stream include Tshipi e Ntele, Kudumene, and UMK. The presentation concluded with that fact that South Africa’s manganese story is one of the saddest mining stories in the world. We own 80% of the world’s resource but only produce 20% of the world’s Manganese. The Chinese own 5% of the world’s resources but produce 35% of the world’s Manganese.

“Chrome beneficiation” by Mr Rakesh Harribhai, representing the South African Ferrochrome Industry

Mr Harribhai represented the South African Ferrochrome Producers who represent some 95% of ferrochrome production in South Africa. He explained that there is no formal constitution of this group; the Producers have come together in the national interest seeking a solution for the South African chrome value chain amidst the threat of looming deindustrialisation. His presentation explored the myths associated with the ferrochrome industry and provided facts to substantiate why these myths are false.

- Myth: ferrochrome is insignificant to the South African economy. Fact: industry has one of the most mature beneficiation value chains.
- Myth: only ferrochrome is at risk. Fact: the entire chrome value chain is at risk.
- Myth: industry should find a solution together. Fact: poor industry structure a function of fragmentation.
- Myth: South African ferrochrome is inherently uncompetitive. Fact: South African ferrochrome leads the world in technology.
- Myth: any intervention will create market distortion. Fact: we already have an uneven playing field.
- Myth: ug2 chrome ore adds significant value. Fact: ug2 chrome ore exacerbates poor industry structure.
- Myth: 1 tonne of ug2 = 1 tonne lg6. Fact: ‘all tonnes are not equal’.

- Myth: all chrome ore can be exported to China. Fact: South African ug2 chrome exports forecast to push market into bigger surplus.
- Myth: china ferrochrome a sustainable market. Fact: China will move to a resource-efficient economy.
- Myth: South African ferrochrome wants to ban ore exports. Fact: South African ferrochrome wants South Africa to participate in ore trade responsibly.
- Myth: South African chrome ore exports substitutable. Fact: some 5 million tonnes of ore will not be replaced easily.
- Myth: do nothing and market will correct. Fact: do nothing and there are no winners in South Africa.

"Mineral beneficiation: An integrated economic approach" by Dr Iraj Abedian, Pan-African Holdings Capital Holdings

Dr Abedian began by focusing on the trends in mineral beneficiation and the manufacturing sector. There has been an increase in manufacturing output but a decrease in the contribution of manufacturing to the GDP. He then looked at an integrated economic approach to beneficiation as compared to a narrow mining perspective. The two critical components for maximising the socio-economic impact of mineral beneficiation are the role of the financial sector and the contribution of commodity exchanges. These factors must work within an overlapping generation framework. The vital point to note is that minerals beneficiation and re-industrialisation are inseparable.

He concluded the presentation with an outline of the policy implications:

- Left to the market forces, SA's mineral beneficiation and re-industrialization are unlikely to materialize.
- SA has the potential to re-industrialize at a scale larger than the 1950s and 1960s!
- Successful re-industrialization and mineral beneficiation require inspired and sustained leadership of both business and government
- SA is set to achieve sustainable growth of 10% in its mineral beneficiation and manufacturing output with significant impacts on employment, real wages and other macroeconomic variables. This requires:
    - An urgent removal of much procrastinated infrastructural bottlenecks in energy, water and other regulatory fields.
    - An appropriate framework for financing of the required infrastructure.
    - A "Multi-stakeholder Implementation Coordination Forum" to ensure binding roadmap for synchronized action plan.
- The re-industrialization of SA requires a close integration of mineral beneficiation and manufacturing expansion

GROUP DISCUSSIONS

Group 1: Ferrous Metals – iron ore, magnesium, nickel

Opportunities presented include a second steel producer through the development of a hub in Limpopo; the banning of export of scrap metal; the development of new technologies as the current ones are old; the development of new markets in sub-Sahara Africa; and exploring the introduction of an external producer to come into South Africa, allow access to ore and use their markets to export. Upstream linkages and backward linkages include the opportunity of development of local industry. Issues faced by the industry include import tariff structure not well thought out; there is support from state – alignment of mining licences with beneficiation local content should be coordinated; the

State does not have the funds required to fund infrastructure; there is a problem of lack of funds for infrastructure for bulk commodities; and there needs to be policy coherence and regulatory issues.

Group 2: Platinum Group Minerals

Approximately 70% of locally mined PGMs are beneficiated. The major sections include catalytic converters and jewellery chains. The catalytic converter industry is in decline as it was established on the back of an incentive programme for the automotive incentive programme that no longer exists.

South Africa does not produce fuel cells, new catalytic converters – most products exported, industrial products, platinum ingots. There are also medical uses for platinum. There is a need to attract investment; leverage incentives to drive development of technology; and invest in research and development. There is also a need for government guarantees for funding. The Minerals and Process Development Act speaks to the issue of licences, but there is a need to better protect industry.

Group 3: Chrome

There are challenges in ferrochrome value chain. There is a need for the Government and labour to agree on tax. The industry will agree to upgrade and improve technology. There is also a need to look at energy products. Currently ESKOM pays the industry not to produce during peak periods. A lack of coordination between departments makes it difficult to talk to the government. There are plans to further the stainless steel, these must be re-examined. Industry and labour need to develop long term plans for value chains and these can then be presented to government departments.

Group 4: Coal, Gas, Uranium

There is a need to concentrate on clean coal technologies as South Africa has about 100 years of coal reserves and it seen as dirty. Sasol invested in clean coal technology and clean coal institute and has done lots of research. Coal is the cheapest source of energy in the long run but long run made up of many short runs.
More coal fire plants should be built and Sasol should be supported, despite the high capital cost of clean technology plants but when the capital is paid off, there are good returns. It was also emphasised that South Africa has does not have energy shortage but energy supply shortage.

There is a need to look at gas as South Africa has most amount of gas in Africa. There is gas from domestic gas and sewage used for methane. There is also a great deal of gas in Mozambique and Namibia. Gas can be used for other things not just energy, for example, liquid fuels. A great deal can be done with gas – no need for nuclear. Gas pipelines create industries (ceramic, fertilizer, and small businesses). SASOL has monopoly on Mozambique pipeline so there is a need for another pipeline.

There was a feeling that uranium should not be ignored given the huge capital expenditure. The PBMR technology we were trying to develop that which is already developed.

The group debated carbon tax and a consensus that it should not be imposed, stating that carbon taxes go into general pool and not assisting environment. Policy is needed to deal with environmental issues instead of revenue generation. Carbon taxes are killing industry and beneficiation and will put companies out of business.

Overall, there was a call in government to co-invest with the industries and co-operate with private sector. The African Development Bank should also be involved.

Group 5: Chemicals related minerals

The value chain is advanced in coal through Sasol. Beneficiation from coal includes liquid fuel, organic chemicals, fertilizer, LPG, polymers, plastics, and explosives. Beneficiation of phosphate and chrome are sub optimal while lime is optimal. The critical success factors in this sector have been subsidies from government; research and development especially in Sasol; there is a protected market; the need to ensure food security through Foskor and a stable fuel supply through Sasol.

There are several opportunities including titanium, chrome and sodium silicate. There is also potential to harness waste energy produced to add to the grid or find way for it to be reused by industry. Currently the inhibiting factors include the need to address import price parity, utility cost hindrance, lack of long term thinking, and aging skills. In response to the question of what can government do, was the need for a strategic approach and coordination across the ministries of Education, Mineral Resources, Trade and Industry and Economic Development.

RECOMMENDATIONS

The following recommendations were adopted:

- Beneficiation cannot be seen as purely technical, one cannot ignore the social consequences.

- The term beneficiation is not helpful; value addition and linkages may be better terms as linkages can be measured by differentiating value addition. One can identify which section one wants to be involved in. One will be able to be clear and intervene in a concrete and specific way.

- The following stages were presented as terminology to simplify the discussion:
  1. Exploration
  2. Extraction (e.g. ore)
  3. Processing (e.g. smelting, refining)
  4. Beneficiation (e.g. combining minerals into an alloy)
  5. Semi-fabrication (e.g. long and flat steel)
  6. Fabricated – final product

  The meeting focused on stages 4 and 5 as they need to be seen in tandem.
- The meeting identified a weakness in the official position; there is a lack of government operation, coordination and integration. The modalities of state intervention need to be examined – there is a need to look at each department responsible and coordinate. The private sector raised concerns about the interaction with the state, given the above issues.

- Both the Department of Trade and Industry and the Department of Minerals Resources need to be more strategic in their roles and increase their alignment on the issue of beneficiation.

- The behaviour of the state can constitute a block on beneficiation. The State should never be block to beneficiation.

- There must be an emphasis on research and development. The developmental state should prioritise and upfront research and development.

- MINTEK, the CSIR and DBSA are treated as cost recovery institutions which is a fatal formula as they receive reduced state funding. MINEK has to undertake consultancies in order to expand. Capital equipment is paid for by the private sector when it should be funded by the state.

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- Mining companies take the view that they should not be asked to do beneficiation; this is not good enough. They have a broader responsibility to society and must undertake ventures that may not be commercially viable.

- The manufacturing industry beneficiation lies in the domain of industry not mining, they must interface needs. There must be more analysis and inputs from the manufacturing industry as to how they see their role.

- On the question of capabilities and skills development; there is a need for a document that gives a snapshot of South Africa's capabilities. It is defeatist when people say they cannot beneficiate because there are not skills, rather than look at imperatives in the economy and make it happen. South Africa does have ample skills and innovation.