State of Mining in Africa
Striking A Balance

ICAZ Winter School

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Mineral resource development and related infrastructure investment across Africa is moving forward.

- Currently over 1,800 mining projects across the continent in various stages of development or operation
- Growth in production in areas such as Botswana, DRC, Namibia and Zambia continues; e.g. Zambia copper production forecasted to exceed 1m tonnes in the next few years
- Approximately 330 new infrastructure projects funded with a value of $223Bn

...... but how is it all really going for the mining sector across the region? Are the conditions right to grow fast enough?
In mining, when we consider what success looks like, it is our experience that five key factors set any mining project or operation up for a successful outcome. We use this as a backdrop to take a view on the current conditions.

- A good mineral deposit;
- The deposit is located in an economic region with good governance and consistent application of civil and tax law;
- Infrastructure in the form of roads, rail, ports, electricity and communications to support the mine should be available and functioning;
- A well understood inbound and outbound supply chain supporting the mine and points to market; and
- A competent and cohesive team which safely works together.

We identified the areas of Governance & Policy and Infrastructure still have variation thus making these limiting factors.
Our research team looked at trends in taxation rules and mining policy across Africa in effort to detect any themes of variation or change. Royalty rates, for example, appear to have held stable for the past few years.

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Looking at both tax and mineral development policy, it is clear there is still enough potential variation to keep marginal projects on hold until consistency is maintained.
Looking at a hypothetical impact analysis to a change in royalty rates, it is clear some producers would be impacted more than others from a replacement of revenue perspective.

Consider a surface mine which produces about 250,000 tonnes per year of copper. Stripping ratio is at 3:1 and recovery is about 85%.

Copper price of $6,500 USD per tonne with cost of production at $2.00 per lb Cu.

Looking at a variation in head grades, what is the impact a 1% change in top line royalty rate in terms of waste and ore haulage effort involved to recover the top-line change in revenue?

![Graph showing total additional tonnes waste and ore moved per 1% change in royalty fee (hypothetical)]
When looking at the copper belt region as a whole, it becomes clear that Zambian operations would be more clearly impacted in the first instance by a 1% movement in royalty rates with DRC operations being able to absorb fluctuations somewhat more easily.

Looking at Open Pit operations in preproduction or production the weighted average Head Grade for each country is:

- **Zambia** – 0.7 %
- **DRC** – 2.9%
When looking at infrastructure in terms of power, roads and rail there are multiple projects underway across the region. A good proportion are due for completion in the 2017 to 2020 time frame.
Held against our five success factors, it is clear the areas of governance & policy and infrastructure are in a period of flux with a potential two to three year maturity lead time for the planned projects and initiatives to settle into some level of consistent delivery.

**Predictions:**

• During this dynamic time, investors, miners and governments will be forced together in an effort to achieve mutually successful outcomes.

• In this period we still see the knowledgeable, bold and agile will continue to succeed delivering huge value both at national and investor level.

• Looking forward five-to-ten years on a country basis, once policy and infrastructure development has been established and stabilized, it will be interesting to see who will be the winners in developing their mineral resources in terms of optimising revenue and building wealth for the country.
Extracting Maximum Value From Our Natural Resources

Establishing Value Addition To A Mineral Resource Based Economy
Innovation is the ‘Spark’ setting Value Added Growth on its way

Value Add - *The enhancement an enterprise gives its product or service before offering the product to customers*

Beneficiation - *used broadly to describe the successive processes of adding value to raw materials from their extraction through to the sale of finished products to consumers, covers a wide range of very different activities.*

Understanding the stages of Value Addition

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<th>Stage of Value Addition</th>
<th>Value of Product</th>
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<tr>
<td>1st Stage</td>
<td>Raw Ore</td>
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<td>Concentrate</td>
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<td>2nd</td>
<td>Refined Product</td>
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<td>3rd</td>
<td>Alloys &amp; Mixtures</td>
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<td>4th</td>
<td>Inclusion In Components</td>
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<td>Consumer</td>
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Consider the iPhone

0.034 g Au
16 g Cu
0.35 g Ag
0.00034 g Pt
The basic framework

Establishing an integrated base of Resource, Financial and Human Capital which then supports the development of Government and Physical infrastructure leads to an environment where Innovation & Entrepreneurism creates differential growth.
Role of innovation in material growth

We define Innovation can be defined as: new and improved products and processes, new organisational forms, the application of existing technology to new fields, the discovery of new resources, the opening of new markets, and technology policy – with the emphasis that they are not just “new”, they are beneficial to the country in question.

**Factor Driven**
- Relatively High unemployment
- Atomistic market potentially mostly local
- Low cost and resource based production dominates

**Efficiency**
- Rate of start-ups slowed
- Production factors are used more efficiently
- Firms begin to exploit economies of scale

**Innovation**
- Knowledge as growth driver
- Global market participation

Source: Joint Deloitte & LSE Research
Evaluating innovative capacity

Infrastructure
- Roads, Ports, & Rail
- Power & Electricity
- Communications & Technology

Human Capital
- Education
- Research & Development

Financial Capital
- Availability Of Credit
- Equity Investment

Market
- Business Environment
- Regulatory Environment
- Market Size
- Trade

Institutions
- Government & Governance
- Consistency In Law

Business
- Sophistication
- Innovation Linkages
- Knowledge Absorption
- Knowledge Workers

Innovative Capacity

Source: Joint Deloitte & LSE Research
An examination of beneficiation in De Beers

*World Diamond Production 2012*

Of De Beers production globally, Botswana accounts for 27% of production.

Botswana’s need for Beneficiation is significantly justified by means of its 33.3% contribution to the countries GDP.
An examination of beneficiation in De Beers

20% of total rough diamond sales was sold to sight holders in producing countries, amounting to US$1.14 billion. This considerable given that Botswana constitutes 27% of De Beers global production.

Source: Company Annual Reports
Considering the stages of Value Addition

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Considerations For Zimbabwe
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