Mining as a catalyst for development in under-developed regions: an African perspective

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Abstract

Africa possesses significant human and natural resources but contributes only a very small fraction of international economic activity. The development of natural resources through mining and extractive metallurgical operations is not a panacea due to its non-renewable nature, but if well conceived and managed can serve as a catalyst for sustainable development by providing the means for investment in human capital and infrastructural development. The challenges and means to make minerals development attractive and sustainable for government, local stakeholders and private investors are reviewed in view of recent developments in the consumption of raw materials. The catalytic role of mining and extractive metallurgical operations in the development of South Africa and more recently in Botswana and Mozambique is reviewed and the facilitation of similar developments in the rest of Africa is discussed.

Introduction

Africa is attractive for minerals development as it is relatively unexplored, open to foreign investment and moreover believed to host significant fractions of global reserves of gold (40%), platinum group metals (85%), diamonds (75%), cobalt (60%), manganese (60%), chromium (80%), and titanium (30%) (Mineral resources and development in Africa, 2008). However, historically, with some notable exceptions, too many of these mineral development projects have been a source of wealth for some African elites and multinational corporations rather than a boon to the development of the host country, such that there is indeed presently a debate on whether these resources should be regarded as a blessing or a curse (Iimi, 2006; Baxter, 2006). This perception can be ascribed to the spectacular recent development of natural resource poor countries such Japan, South Korea and Singapore, which out of necessity placed much emphasis on human capital development, as well as the very small trickle down effect to local communities of the exploitation of especially oil and gas (Baxter, 2006). Very few mineral resource rich countries, but notable ones such as Australia, Botswana, Canada, Chile, Norway, South Africa and the USA, have been able to manage the sudden surges of income and economic activity wisely, such that they could successfully weather the boom and bust cycles typical of international commodity markets. Even worse is the use of a high value commodity such as diamonds for the funding of civil wars in Central and West Africa, which is in stark contrast to the very positive influence of diamond extraction in a country like Botswana, which will be discussed in more detail later.

The importance of minerals investment for Africa

It is generally accepted that economic growth is required to achieve long-term income-poverty alleviation and it is proposed that responsible minerals development can act as a catalyst to achieve this. Africa is presently operating from a very low economic base with poor internal linkages as recently highlighted by Malloch-Brown (2009) who mentioned that Africa's contribution to international trade is just above 1% and of that only 5% is spent within Africa, compared to 40% within the European Union. The low level of industrial activity in Africa is confirmed by its copper consumption which accounted for about 1% of the world wide production of copper in 2006 (USGS, 2009). For many African countries their mineral resources are their only chance to attract foreign direct investment as they typically are not attractive to general industrial investment due to poor infrastructure, political and economic instability and a work force lacking the high end qualifications typically sought. Moreover, in the modern economic dispensation the value of a rich natural resource base, plentiful low cost labour and abundant cheap energy, as the basis for industrial development has been overtaken by the value of national entrepreneurial capability (UNIDO, 1995).

Africa's dependence on minerals

How dependent Africa indeed is on mineral and mineral oil exports is illustrated by the fact that in 2005 and 2006 these exports accounted for more than 90% of the export earnings of Algeria, Angola, Congo Brazzaville, Congo Kinshasa, Equatorial Guinea, Libya, Nigeria and Sudan (USGS 2009). It is estimated that in the twelve countries comprising the Southern African Development Community (SADC) some 5.3% or 68 million people, of the region's available work force is employed in the minerals industry

(ECA, 2004). While countries should endeavour to gain the most benefit from natural resources, by for instance promoting value added down stream processing, they are typically not well placed for this in terms of skills availability and a supporting environment for these more interlinked activities. For instance in 2006 only gold, copper and platinum group metals were exported in refined form, while chromium ore was upgraded to ferrochromium. Other commodities such as bauxite, colored gemstones, diamonds, iron ore, petroleum and uranium were exported without significant downstream processing; South Africa, Mozambique and Egypt have significant aluminium smelters but the aluminium produced accounts for less than 4% of the world production, while the bauxite exported accounted for 10% of world production (USGS 2006). Development clusters could go some way to address some of these problems but must then be able to compete internationally with typically long established enterprises that are closely integrated with users of their products.

Infrastructure

A further major obstacle to the development of mineral deposits is the lack of infrastructure that places an often economically unbearable burden on a single project, such as for instance the rail transport infrastructure required for iron ore (Fauconnier, 2004). This clearly calls for stronger regional cooperation in the development of transport and energy infrastructure to make individual projects more attractive and to provide the platform for sustainable economic growth. An excellent example of such a successful development is the coal export terminal at Richards Bay, South Africa, that provided the platform for aluminium smelting operations, not only at that site, but also in adjacent Mozambique. However, it is not unexpected to note that private investment would favour infrastructure lean projects, as indicated by the fact that in 2006 66% of the exploration spend in Africa, totaling US$ 1.1 billion, went to gold (50%) and diamonds (16%) (USGS 2006), which are relatively easy to transport. Although China's investments in minerals is typically framed as somewhat imperialistic, due to the fact that it is perceived that the state rather than private firms is investing in these ventures, some of its latest involvements, such as that for copper and cobalt in the Democratic Republic of Congo, also involves infrastructural developments such as roads, schools and hospitals, which should encourage further development provided that the terms of the agreements are not exclusive (Cropley and Barker, 2009).

Mining as a catalyst for development

Possession of rich mineral resources as such does not guarantee a successful country as conflict over ownership and/or the distribution of rent or other income accruing from their exploitation can lower the quality of government due to the lesser accountability demanded by 'windfall' incomes or in the extreme may lead to outright conflict (Iimi, 2006). However, Baxter (2006) amply illustrates that if liquid petroleum and gas is excluded and the quality of governance is taken into account, then the effect of mineral resources is generally positive to the development of a country. In his study of sub-Saharan African countries he showed that mining dominated winning countries have a faster GDP growth rate per capita, a much larger GDP per capita, much higher Human Development Indices, much better governance scores, are more open to free trade and have better protection of property rights. Under favourable conditions minerals based

industries can thus contribute significantly to economic development by providing the critical mass to catalyze the development of infrastructure, skills development, financial services and manufacturing. Positive reforms to mining laws to attract investment in minerals development may also serve as the catalyst for macroeconomic reforms and institution building.

The distribution of developmental risk, profits and environmental risks between governments, mining companies and stakeholders, at national, regional and local level, poses major challenges to the development of Africa's mineral resources. These negotiations are often highly asymmetrical in terms of the power, know-how and time frame references of the parties involved in terms of risk and benefit, and prone to sectarian and personal interests.

The World Bank Group supported development of extractive industries as significant contributors to sustainable development and poverty alleviation by generating revenue and employment and by acting as a trigger for infrastructure development, education, training and entrepreneurial activity. However, as the bank in the past mainly dealt with the governments and companies involved, they faced a significant backlash from civil society, who in many cases had to deal with the negative aspects of these developments, such as pollution, environmental degradation, resettlement and social dislocation, without prior consultation or adequate compensation. In response a World Bank Group sponsored Extractive Industries Review was undertaken and advised that the World Bank should stay involved provided that enabling conditions for pro-poor public and corporate governance to maximize poverty alleviation through sustainable development, the development of more effective social and environmental policies and respect for human rights are met (World Bank Group, 2003a)

Mineral development projects as employment generator

Minerals industries, like most other industries, tend to employ fewer people as technology develops over time, and as such will not be a panacea for the major job creation challenges facing African countries. However, the effect on employment may be much larger than just the direct employment in the minerals project, provided that a cluster rather than an enclave is formed. This is not the natural tendency and calls for commitment from investors, government and operators to be successful (ECA, 2004).

Artisanal or small scale mining offers the prospect of more direct jobs but can not be regarded as optimal from efficiency, environmental or developmental points of view. Some five to six million people in Africa engage in 'small scale mining' of mineral deposits and accounts for a significant fraction of the production of diamonds (30%) and gold (10%). Although these activities have a positive effect on the rural societies involved the negative effects of smuggling, as highlighted in the 'blood diamonds' film, dangerous mining practices and negative environmental effects, such as deforestation and especially of mercury used for the amalgamation of gold, can more than off set these benefits in the long run (Mineral resources and development in Africa, 2008). The resources are also not optimally utilized due to selective mining and the use of sub-optimal extraction techniques and can thus be viewed as unfair exploitation of a national

resource by a small minority, as little is done to improve infrastructure in such communities. However, the World Bank does see a role for artisanal and small-scale mining to lessen the burden of poverty, provided that these are community based and favour local rather than itinerant miners (Word Bank Group, 2003).

Skills development

Skilled human resources are in minerals development, like in manufacturing, becoming more important in attracting investment to any location. This is especially so if the developments are to have higher local impact by utilizing local sub-contractors and the typically more sophisticated processing required to ensure viability and reduced environmental impact. The pressing challenge to increase participation of especially young people in significant economic activity is starkly illustrated by the fact that in Africa youth in the age group 15 to 24 years numbered 200 million and accounted for more than 20% of the total population, and had an unemployment rate three times higher than for adults; in Sub-Saharan Africa this group accounts for 60% of the total unemployed (World Bank, 2009). It is clear that something has to be done to increase the employability of these people by coordinated skills and employment development initiatives. The minerals industry can play a very important role in this respect as the location of mining and processing plants are typically sited in rural areas, where the need for development is most pressing (World Bank, 2009).

Unfortunately the state of education in Sub-Saharan Africa is poor with by far the lowest primary education completion rate of any region, at 60%, compared to 91% for North Africa and the Middle East, and 98% for East Asia Pacific (World Bank, 2009). It would indeed be unrealistic to expect the minerals industry alone to significantly change this in the short term, but selective actions to build sustainable capacity in geology, mining, minerals processing and extractive metallurgy to support the localization of the minerals industry could do much to enlarge the trickle down effect of mining activities. South Africa stands out as a success in this regard in Sub-Saharan Africa where due to a number of reasons already mentioned, strong service linkages were developed with the minerals industry. However, in absolute terms the training of people at tertiary level even in South Africa is far too low to sustain strong local growth in view of the competition for skills internationally. The French initial training system in geology, mining, minerals processing and environment in which the involvement of French mining schools and universities are coordinated under CESMAT (Training center for raw materials studies) could serve as an example for how to initiate such activities, but will need local support to build a larger knowledge base. The idea to ‘professionalize’ small scale mining could have far reaching implications in terms of providing viable employment to larger numbers of people while negating some of the negative impacts on health and the environment, that small scale mining typically entails (Mineral resources and development in Africa, 2008).

Good Governance and Transparency

Good, stable, transparent and supportive governance is very important for the development of a sustainable and socially beneficial resource base industry, as already indicated. The African Mining Partnership (AMP) was established as an alliance between

African mining ministers as part of the NEPAD initiative with the aim to maximize the economic and social returns of the exploitation of the continent's mineral endowment. There is inter alia consensus that priority should be given to beneficiation with an emphasis on mineral cluster development, local value addition, development of resource technologies, and the promotion of human resource and skills development (ECA, 2004).

The Extractive Industries Transparency Initiative (EITI), launched in 2002, and the Publish What You Pay (PWYP) campaign, are efforts to promote transparency of the income flows generated by the extraction of mineral resources, and if correctly applied should do much to discourage corruption and the inappropriate usage of government income generated by minerals projects. The approach adopted by Botswana could serve as an example of how transparent and ring fenced spending on long term development of the income generated by minerals development could contribute to sustainable development based on a finite minerals resource (Iimi, 2006). Sensitization and training of elected legislators should also contribute to promote the application of revenues flowing from mineral resource projects to spur economic growth and social development (NDI, 2008).

South Africa: A minerals catalysed economy

South Africa's industrial development was catalysed by the discovery of diamonds, soon followed by that of gold and then by a host of other minerals. The localization of industrial development was driven by the nature and scale of the deposits, improvements in technology, the rapid establishment of a critical mass far away from ports and the industrial heartland of Europe, international skills mobility and strong demand for gold (ECA, 2004). Governments also played a critical role in providing port, rail and energy infrastructure and a stable fiscal and legislative environment. The steady growth of gold production for almost century, to be interrupted only by the Anglo-Boer conflict, is a good example of what can be achieved by cooperation between government and the private sector, but also how devastating local conflict can be to mining. Although South Africa's role as a gold producer has declined notably, it still possess significant gold and other resources, and gold was only displaced by platinum, other value added minerals and manufacturing in the 1990's as primary source of national revenue.

The state played a major role in the development of the minerals industry in South Africa through mostly supportive activities such as infrastructure development, financing support, through the Industrial Development Corporation (IDC), and by founding and supporting minerals industry dedicated national institutes like the Council for Geosciences, Miningtek and Mintek. Transport infrastructure is especially important in the development of high volume, low value commodities such as iron ore, coal, manganese and chrome ores, bauxite and phosphate rock. The development of the South African iron ore export business would not have been possible without government backing for the bulk export terminal at Saldanha, which had an initial capacity of 18 million tons per annum in 1976, that was expanded over time to the present 38 million tons per annum, as well as for the 861 km dedicated bulk transport railway line. These facilities are presently also supporting titanium slag, lead and zinc exports and also made the later developed down stream 1.25 million ton per annum steel and galvanizing plants

at Saldanha possible. These developments also ensured a stable supply of iron ore to the other steel producers in the country.

South African coal exports were made possible by the development of a new deep-sea port at Richards Bay fed by the inland coal producers through a 600 km rail link. The initial capacity of the rail and coal terminal facilities was 10 million tons per annum in 1976, but has been expanded in stages to the present 91 million tons per annum. The port infrastructure has also attracted other export oriented industries such as mineral sands mines and titanium slag smelters, aluminium smelters, phosphoric acid production and paper and wood industries. The port also serves as an important conduit for the importation of bulk commodities to industries in Gauteng province. The Waterberg coalfield contains almost half of South Africa's in situ coal reserves (Fauconnier, 2005) and has again served as the catalyst for the development of a rural area with little prior infrastructure. Development in this area only started in 1980 with the establishment of the Grootegeluk coal mine for coking coal, but was soon followed by the Matimba power station, utilizing the lower value coal and using so called dry cooling to reduce water consumption. A second power station is presently being constructed and plans for further power generation and a liquid fuels from coal production facility from this field are presently being developed both in South Africa and Botswana.

Mining today still plays a very significant role in the South African economy, even though direct employment in mining activities has declined due to resource depletion, mechanization, and outsourcing of activities. For example in 2000 the mineral industry contributed just 6.2% of the GDP and 8.8% of jobs, but when the indirect backward and forward linkages and induced effects are taken into consideration these numbers rise to 16.1% of GDP and 26.9% of jobs. Transport services accounted for almost half of the indirect backward GDP linkages, whereas petro-chemicals, iron and steel and electricity together accounted for more than 70% of the indirect forward GDP linkages (ECA, 2004).

Mozambique: Extractive metallurgy catalyzing development

Mozambique emerged from a protracted civil war as one of the poorest countries on earth. The Mozal aluminium smelter in the south of the country was the first major development in the country for decades and was made possible by private investment from international players, the supportive and facilitative role played by the Mozambican government, regionally supported by South Africa, and by earlier successful similar developments in South Africa. Realization of the dangers inherent in using a capital intensive single site project as a driver for development, much emphasis was placed to develop and involve local industry and invest in infrastructure and human resource development. The large electrical energy capacity requirement of the smelter prompted the improvement of the electricity network, while the highway connection to South Africa is opening up more business for the port of Maputo. The success of the development has also boosted confidence in the country as an investment destination and thus indirectly contributed to the viability of the Corridor Sands Project, a major mineral sands project including both mining, minerals processing and smelting to produce minerals and titanium slag. Significant infrastructure in the form of a power line of some

200 km, large scale water supply, housing, the upgrading of roads and the construction of a finger jetty to load products directly into ocean-bound liners, bringing the total estimated cost of the project to approximately US$ 800 million for an envisaged production of one million tons of titanium dioxide slag per year (ECA, 2004). The Corridor Sands Project could have a major impact on the Mozambican economy but sadly the present pre-feasibility study was ceased in March 2009, citing inadequate value in the present circumstances (Feytis, 2009).

Botswana: Diamonds as catalyst for economic development

Botswana is richly endowed with natural resources, which in 2002 accounted for over 80% of its export earnings and 40% of its GDP. However, due to the nature of the mainly opencast mining and the capital intensive and security sensitive nature of the diamond business, it accounted for only 4% of total employment (Iimi, 2006). With this background the natural flow of things would have been enclave behaviour by the minerals industry, sustenance for a rent seeking government prone to corruption and greater inequality, and very little contribution to the development of the country. Botswana was very fortunate in the sense its ruling classes retained some sense of governance and responsibility under limited British colonial rule and were blessed with strong and responsible leadership since independence. Regular and free elections are held and the country scores high on governance efficiency, which is viewed as essential to ensure that long term wise spending of resource rents. Botswana has established a prudent fiscal framework including a Sustainable Budget Index, according to which mineral revenues are used to finance development, education and health expenditure. Under this framework the country achieved remarkable economic growth over a number of years, but has unfortunately not been that successful with the establishment of other industries, partly due to its remoteness and landlocked nature (Iimi, 2006). The present economic down turn, that has hit the local diamond industry particularly hard, together with the high prevalence of HIV/AIDS, will pose a very real challenge to the resolve of the Botswana minerals industry and government to preserve the ability of the minerals industry to serve as a long term economic growth catalyst.

Conclusions

The possession of mineral resources may be a blessing or a curse depending on how it is utilized. Africa possesses extensive and unique mineral resources that may serve as a catalyst for economic development dependent on a number of factors such as good, transparent and stable governance, appreciation for the roles of entrepreneurs, funders, and indigenous people directly affected, and an equitable long term arrangement for the distribution of the risks and benefits of such endeavours. Such arrangements, although never perfect, can provide the platform for successful economic developments based on mineral resources, such as in South Africa and Botswana, and also more recently in Mozambique. Regional cooperation may facilitate infrastructural and human resource development that could further strengthen Africa’s position as an attractive destination for mineral resource developments and cluster development for more sustainable downstream processing and integrated development.

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