**IMPACT ASSESSMENTS FOR A COAL MINING PROJECT IN TANZANIA: SHARING GOOD PRACTICE EXPERIENCE ON RESILIENCE AND ADPTATION TO CLIMATE CHANGE**

**Abstract**

Tanzania is one of the countries in the world with diverse sources for energy production, yet only 36% of the nearly 50 million people are connected with electricity. The government is now planning to increase electricity connectivity to 30%, 50% and 75% by 2015; 2025 and 2033, respectively. The future energy plan relies heavily on coal and natural gas where two-thirds of energy production will come from these two sources. It is argued thatcoal-based power generation has relatively low capital investment and remediation costs. The question however is whether there have been any good practices in the energy related projects for minimising the impact on climate change. This paper presents findings from a coal mining project at Ketawaka-Mchuchuma Tanzania on the impacts of the project on social, environment and climate change. Mitigation measures and adaptation strategies are presented. Both primary and secondary data were collected for the study. It is concluded that coal mining in Tanzania is contributing to climate change. Unfortunately, good practices for addressing these challenges are still minimal although there are considerable efforts in policies and IAs documents to guide good practices for mitigation and adaptation to climate change.

**Introduction**

Tanzania is endowed with diverse energy sources including natural gas, hydropower, biomass, and coal deposits. Yet only 36% of the nearly 50 million Tanzanians are connected with electricity and only 11% in rural areas (URT, 2015). Still biomass dominates energy sector by almost 88%. Other sources are electricity 3%, oil and gas 8%, coal, solar and wind 1% (ECS, 2015). For many years Tanzania has relied on hydropower electricity which currently provides over 65% of the electricity supply in the country. However, hydropower production has been significantly affected by climate change. Annual power demand is expected to increase between 10%-15% over the coming years due to high rate of urbanisation and improved living standards (URT, 2015) from the current consumption of 1,583 MW to at least 3,800MW by 2025 (Edenville Energy PLC, 2012; URT 2015).

The government has now put clean energy at the top priority of the development agenda. In June 2014, the government launched its 2014-2025 Electricity Supply Industry Reform Strategy and Roadmap, under which it aims to increase electricity generation from the current of about 1,600mw to about 11,000mw in 10 years (Makoye, 2014). Key to the strategy is the intensification of power generation from natural gas and coal. The government plans is to increase the connectivity level to 30%, 50% and 75% by 2015, 2015 and 2033, respectively (URT, 2015).

Despite the threat to climate change, Tanzania plan to produce two-thirds of the country’s energy from coal and natural gas (Makoye 2014).Coal-based power is claimed to be scaleable and have a relatively low capital and remediation cost (Edenville Energy PLC, 2012). There is concern that increasing use of coal, could double the country’s emissions of greenhouse gases (Makoye, 2014). In Tanzania, the impact of climate change is real, rivers are drying up, the country is experiencing unreliable and erratic rainfall patterns which has caused frequent droughts and affected agricultural productivity (Mongi *et al* 2010). Climate change has also increased crop diseases and pests. These have necessitated changes in the farming systems whereby irrigation agriculture, invasion of ecologically sensitive areas such as wetlands and rivers and; intensive use of agrochemicals are on increase. Diseases such as malaria are on increase because of the increased temperature (Wandiba *et al* 2010) consequently increasing government expenditure and peoples living standards in terms of farming costs and malaria prevention and treatment.

However, while energy production projects have impact on climate change it is not clear whether there has been any good practices in the sector in Tanzania. This paper presents findings from a coal mining project with the focus of impacts on social, environmental and climate change. Mitigation measures and adaptation strategies are presented. The paper also shares experience on good practices on climate change resilience and adaptation.

**The Coal Energy Development in Tanzania**

Tanzania’s coal reserve is estimated at 5billion tons, with 25% been proven (World Coal, 2015; URT 2015). Production of bituminous coal rose significantly during 2010–2013, from 179t to 128,920t. Currently coal is exploited in small scale at Kiwira Coal Mine in Mbeya Region and Tancoal Energy Limited Mine at Ngaka in Ruvuma Region. At an estimated maximum production rate of 4-5 million tons per annum, the Ngaka Coal Project has sufficient proven coal resources for over 50 years of profitable, low-cost production (TC, 2016).

However, the highest coal deposits have been discovered in the area called Ketawaka-Mchuchuma in the Ruhuhu Basin. It is estimated that Mchuchuma coal deposits have more than 480 million tonnes of coal reserve. In September 2011, China's [Sichuan Hongda Co. Ltd.](http://www.sourcewatch.org/index.php?title=Sichuan_Hongda_Co._Ltd.&action=edit&redlink=1) signed a $3 billion deal with Tanzania government to mine coal and iron ore in a joint-venture deal with a local organisation to form “Tanzania-China International Mineral Resources” Ltd (TCIMR). This investment will involve construction of the [Mchuchuma Coal Mine](http://www.sourcewatch.org/index.php/Mchuchuma_Coal_Mine) and an accompanying 600-megawatt (MW) thermal power station (TCIMR, 2014). The mined coal will be used for generation of coal-fired electricity at Mchuchuma and power the iron and steel works at Liganga as well as to increase the national grid electricity capacity (TCIMR, 2014).

Coal mining at Mchuchuma will originally involve *surface mining* which will be undertaken for 3 to 5 years with a capacity of 1.8 million tons/annum via open-cast technology. Coal will be fed into thermal power plant during the transition to underground mining with a capacity of 3.0 million tons/annum. Surface coal mining will be done via stripping system using heavy equipment and machines. Hole blasting will be used for non-coal material and hence the use of explosives technologies. Some of the coal will be used at Liganga for processing of iron ore and steel works. There will be also construction of roads and the project is likely to consume large quantity of water from Kitewaka and Ruhuhu Rivers during both construction and operation phases.

As part of the Tanzania legal fulfilment (EMA, 2004) the Environmental and Social impact Assessment (ESIA) was conducted in 2014. This study presents key findings that may affect climate change. It also presents EA recommendations in developing and implementing climate resilient coal projects in the country. It should be noted however that, this project in not yet in operation and therefore good practices presented is mainly in papers as proposed by ESIA report and experience brought forward by other mining project in the country.

**Results and Discussion**

The proposed coal mining project will lead to influx of people into the project area seeking for employment, food vending and some even conducting prostitution and robbery/valance behaviour (TCIMR, 2014). This will certainly increase the demand for food and prices. These changes are likely to stimulate more food production by invading virgin and forestry lands clearing for agriculture, fuelwood and charcoal production, turning deforestation into investment opportunity (Angelsen, 1999). But also open-cast mining technology is preceded by removal of all vegetation and surface soil overburden. Removal of vegetation will involve felling down of trees and other biodiversity including wildlife. In addition the proposed coal mining project will use large quantity of fossil fuels for running machine, processing and transporting coal to other areas. Such activities may reduce forest ecological functions such as carbon sequestration and prevention of soil erosion, thus impacting on climate change. In addition, large quantity use of fossil fuel by vehicles and machines has direct impact on climate change in terms of carbon dioxide emissions through mineralization and the reduction of biomass in soils due to vegetation clearance among others (Shrestha and Lal (2006). Also, vegetation clearance and excavations will affect both terrestrial and belowground biodiversity as well as creating disturbance on wildlife which has direct adverse impact on the environment. Noisy created during constructions and transport can affect wild animals which may disappear in the mining localities. The process of transporting material to and from the project area could lead to the introduction of alien species, spillage and dusty production.

Mitigation measures shall include avoidance of interference with wildlife migratory routes, planting indigenous tree species and concentrating mining works in core areas. Also practice regular inspection of vehicles to make sure that do not contain alien species and provide education to workers and local communities on alien species. This shall be a responsibility of the developer under the supervision by the National Environmental Management Council (NEMC) and the Ministry of Natural Resource and Tourism (MNRT). Also coal mining companies should be obliged to integrate mining ecology with environmental protection as well as promotion of green mining (Long *et al* 200). Also provide noise proof facilities and enforce thoroughly monitoring and reporting.

Mitigation measures on climate change shall include planting of trees under professional supervision and promote fuel efficient cooking stoves.  Other mitigation measures shall include application of economic instruments such as polluter pays principle and user pays principle where the developer is involved. NEMC and MNRT shall be involved. The Developer shall also set up drainage pumping facilities, water storage, ditches, drainage pipes and drainage systems in the underground mining

Generally the Government shall promote renewable energy production especially from wind and solar production. Areas of high wind in Tanzania are estimated to be more than 10% of the country’s land (URT, 2016). Tanzania has also high potential of solar energy estimated between 2,800-3,500 hours of sunshine per year (ADBG, 2015). Currently, the country total energy production from renewable energy is insignificant of only 4.9%.

**Social impacts**

As pointed out earlier, the proposed coal mining will lead to influx of people from different parts of the country and beyond. This has direct impact socially through a risk of diseases transmission e.g STD including HIV/AIDS and may also threaten local security (see for example Shandro *et al* 2011). Movement of machines and vehicles will create noise, hazardous products, accidents and dust which will affect human health and social infrastructure like roads, water bodies etc.

Such events will increase government expenditure in terms of disease prevention and treatments and provision of health facilities such as hospitals. The government has to provide and/or improve health services such as voluntary counselling and tests (VCT) facilities and health centres through the Ministry of Health. The government also need to provide education on disease prevention from both local and the incoming population, in collaboration with the developer provide protective gears for diseases control. It may also demand more staff in the health sector by the Ministry of Health. Other mitigation measures come through the Ministry of Home Affairs by increasing number of police force. It will also affect households’ income expenditures in terms of treatment and security enhancement.

Coal mining is also regarded as a destructive activity in the sense that open cast technology creates polluting piles and toxic ash dumps, and threatens basic needs e.g [water to drink](http://www.greenpeace.org/international/en/campaigns/climate-change/coal/Coals-thirst-for-water/), clean and fresh [air](http://www.greenpeace.org/international/en/campaigns/climate-change/coal/Coal-plants-pollute-the-air/), and local climate (WSA 2017). Construction of access roads could lead to noise and dust production. These affect both the environment and human health and; directly impacts on social costs. Mitigation measures by the developer shall include proper management of waste including disposal in properly constructed landfill and incineration: Also implement 3Rs that is reduce, reuse and recycle and provide protective gears for workers. Other mitigation measures include regular servicing of machines and vehicles, wetting of roads, putting signs for speed limit and proving noise proof facilities. The Ministry of Health is responsible for ensuring health mitigation measures are implemented as required.

**Good practices to climate Change Resilience**

Government has been facilitating access to loans for livelihood diversification in project areas e.g promotion of community banks and; saving and credits cooperatives (SACCOS) which have relatively low interest rates. This should be done by the Ministry of Finance and Economic Planning in collaboration with the Ministry of Agriculture, Livestock and Fisheries development (which hosts Cooperatives Department).

At policy level, Tanzania has enacted a number of policies and laws for addressing climate change issues and/or supporting initiatives for climate change management. These include environmental conservation and protection of forest lands in mining areas. These approaches also respond directly to social and economic development goals.

The Tanzania Five Year Development Plan (2012) strongly emphasizes on mitigation, adaptation and creation of a financial framework to combat climate change. A National Climate Change Strategy has formed to pinpoint, mobilise and overseer global climate funding and energy projects where investors are part of the strategy implementation.

The 2006 National Plan outlines risks related to climate change and strategies on environmental education, cooperation and monitoring across sectors and government agencies, central and local governments. The plan also provided guidelines for halting deforestation, desertification and promotion of diverse energy sources. However, this Plan lacks explicit mechanisms for inter-sectoral climate change programmes (GRI, 2015).

Tanzania also released a National Climate Change Strategy in 2012, to address both adaptation and mitigation in line with the country’s vision for sustainable development.

The government has also established the National Environment Management Council (NEMC) under the Vice President’s Office as overseer for environmental management in the country including monitoring of mitigation measures and projects performance.

Promotion of funding for artisanal and small-scale miners: According to the Ministry of Energy and Minerals (MEM) Report (2014), there must be financial assistance to small-scale miners for promoting mining technology and value addition. The report also emphasizes on retaining at least 30% as minimum for female beneficiary. This intends to promote women’s economic participation in the mining sector

Linkages between Mining and the Local Economy have also been emphasized: The government through MEM (2014) promote linkages between mining and the local economy by (i) supporting local budgets where mines operates and mainstreaming mining activities into strategic planning at district levels. Also has been on reviewing and addressing impediments facing local entrepreneurs to provide goods and services in mines as strategy to promote local economies. Such activities include sourcing of goods and services by mining companies from surrounding communities including establishing contractual and interlocking farming.

Human Resource Development for the Mining Industry: Investors are responsible for providing corporate social responsibility for surrounding communities. In Mtwara for example, gas investors volunteered to fund training cost for 150 youth in vocational institutions. Such activities improve livelihoods and reduce pressure on natural resources such as tree felling for economic activities. Also all villages where gas is produced are provided with electricity at a high connection discount.

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