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

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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 the 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 prolonged droughts and unreliable rainfall. Annual power demand is expected to increase from the current consumption of 1,583 MW to at least 3,800 MW by 2025 (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 aimed to increase electricity generation from the current of about 1,600 MW to about 11,000 MW in 10 years (Makoye, 2014) for both local consumption and export. 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, 2025 and 2033, respectively (URT, 2015).

Despite the threat of climate change, Tanzania plans to produce two-thirds of the country's energy to come from coal and natural gas (Makoye 2014). Coal-based power is claimed to be scalable and have a relatively low capital although one of the anonymous reviewers (2017 argue that the capital cost is high compared to other sources of power with exception to nuclear. Another reason in favour of coal based energy is low 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 and consequently necessitated changes in the farming systems whereby irrigation agriculture, invasion of wetlands and rivers and intensive use of agrochemicals are on increase. Also diseases such as malaria are on increase because of the raised temperatures (Wandiba *et al* 2010). All these have increased government expenditure and cost of living in.

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 5 billion tons, with 25% being proven (World Coal, 2015; URT 2015). Production of bituminous coal rose significantly during 2010–2013, from 179 tons to 128,920 tons. 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. signed a $3 billion deal with Tanzania government to mine coal and iron ore in a joint-venture with a local organisation to form "Tanzania-China International Mineral Resources" Ltd (TCIMR). This investment will involve construction of the 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.

Results and Discussion

The proposed coal mining project will lead to influx of people at an estimated rate of 5000 into the project area seeking employment, food vending and some even conducting prostitution and robbery/violence behaviour (TCIMR, 2014). This will certainly increase the demand for food and increase 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. 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. Vegetation clearance will 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). Noise 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 dust 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 they do not contain alien species and provide education to workers and local communities on alien species. This shall be a responsibility of the coal mining company (the developer) under the supervision of the National Environmental Management Council (NEMC) and the Ministry of Natural Resource and Tourism (MNRT). They should 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. 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 private investment in renewable energy production especially from wind and solar production through conducive investment policies. Areas of high wind in Tanzania are estimated to be more than 10% of the country's land (URT, 2015). 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 resources 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, 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 needs to provide education on disease prevention from both local and the incoming population, in collaboration with the developer providing 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 drinking water, clean and fresh air (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. 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; saving and credits cooperatives (SACCOS) which enables low income communities access credits with relatively low interest rates.

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.

The Tanzania Five Year Development Plan (2012) strongly emphasizes mitigation, adaptation and creation of a financial framework to combat climate change. A National Climate Change Strategy has been formed to pinpoint, mobilise and oversee 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 provides guidelines for halting deforestation, desertification and promotion of diverse energy sources. However, the 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 to oversee environmental management in the country including monitoring projects performance.

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 is intended 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) promotes linkages between mining and the local

economy through (i) supporting local budgets where mines operates and mainstreaming mining activities into districts strategic plans.

Investors are responsible for providing corporate social responsibility for surrounding communities. In Mtwara Region for example, natural gas investors volunteered to vocational trainings for 150 youth. Such activities improve livelihoods and reduce pressure on natural resources such as tree felling for economic activities. Also all villages where natural gas is produced are provided with electricity at a high connection discount.

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