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EIA Considerations for geothermal drilling: a case study of Ngozi geothermal project

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ABSTRACT

Ngozi geothermal prospect is located in Mbeya region south western Tanzania, where various studies have been carried out in the area mainly focusing on geology and tectonic evolution for geothermal exploration to prove the viable existence of the geothermal resource. Thus far, detailed surface studies have been carried out and three wells locations have been cited for exploration drilling. Exploration drilling involve infrastructure development, construction of drilling pads, water ponds and may need resettlement. According to the law, such energy development projects requires EIA study.

The Environmental and Social Impact Assessment (ESIA) for Ngozi test drilling involved the following stages: 1. Project registration and submission of project brief to National Environment Management Council, 2. Carrying out Scoping Study and preparation of ToR, 3. Carrying out detailed ESIA study after National Environmental Management Council (NEMC) approve scoping report and ToR for the proposed project and its components. iv. NEMC site visiting for verification, Technical Advisory Committee (TAC) and Review process. Finally, comments from TAC incorporated in the report and re-submitted. EIA certificate is then issued. NEMC requires 135 days from the first EIA stage to issuance of EIA certificate.

This paper focuses on the anticipated effects on the environment that comes from drilling and related infrastructures. In analysing the impacts, the most environmental factors that the project is expected to have on the environment, i.e. noise, land use and socio economic issues are described. Measures are provided to ensure the activities are implemented in environmentally sustainable manner. As subject to national and international requirement, Environmental Impact Assessment (EIA) is important before project implementation. The key important national act, regulation and policy used in this ESIA are the Environmental management Act of 2004 cap 191, EIA and Audit regulations of 2005 and National Environmental Policy of 1997. All EIA projects are being administered at the national level by National Environment Management Council (NEMC).

1. INTRODUCTION

Ngozi geothermal project is located at the southern triple junction of the East African Rift System (EARS) where the Nyasa rift splits into the eastern and western branches around the stable Tanzanian Craton, about 820 km from Dar es Salaam, southwestern part of Tanzania. The area lies between 32 and 35 E longitude and between 7 and 9 30' S latitude. To prove the existence of the resource, Tanzania Geothermal Development Company (TGDC) will drill and test three exploration wells.

The drilling project approach will involve, firstly, procuring a consultant for designing infrastructure and drilling operations, supervision for construction of infrastructures in supporting drilling works such as access roads and water supply systems, and drilling works. A contractor for drilling and infrastructure construction will then be procured to implement the drilling project and infrastructures.

Before project implementation, an ESIA study has been carried out to address both positive and negative environmental impacts that may arise from the project. The ESIA study has been prepared to satisfy the requirements of Part III of the Environmental Impact Assessment a nd Audit Regulations G.N. No.349 of 2005 as one step toward application of Environmental Impact Assessment Certificate to the National Environmental Management Council (NEMC).

1.1 Environmental Laws and Regulations in Tanzania

Tanzania responded to international environmental needs through the enactment of the National Environment Management Act 1983, creating an Environmental Council (known as National Environment Management Council-NEMC) which became operational in 1986, the formulation and approval of the National Environmental Policy 1997 and the recent Environmental Management Act (EMA) of 2004. Additionally, Tanzania has ratified several Multilateral Environmental Agreements.

2. ENVIRONMENTAL IMPACT ASSESSMENT PRACTICE IN TANZANIA

Environmental Impact Assessment is defined as a systematic examination to determine whether or not a policy, program, plan or a project will have any adverse impacts on the environment, nature or society. It is also an important management tool for improving the long-term viability of projects. The role of EIA for sustainable development was highlighted at the United Nations Conference on Environment and Development (UNCED) in 1992, as principle 17 of the Rio Declaration states;

"EIA, as a national instrument, shall be undertaken for proposed activities that are likely to have significant adverse impact on the environment and are subject to a decision of a competent national authority".

Tanzania is a signatory of the Rio Declaration. In 1996, African environment ministers, including Tanzania, reaffirmed this commitment and pledged to formalize the use of EIA within legislative frameworks at the project, program and policy levels. The

Environmental Management Act Cap 191 from 2004 and the Environmental Impact Assessment and Audit Regulations from 2005 emphasize the importance of conducting an EIA before any development project is implemented (Mwalyosi et al., 1999). The EIA projects are being administered at the National level by NEMC. In Figure 1 below, the EIA process in Tanzania is better explained to ease its understanding for different stakeholders and their responsibilities in the EIA process.

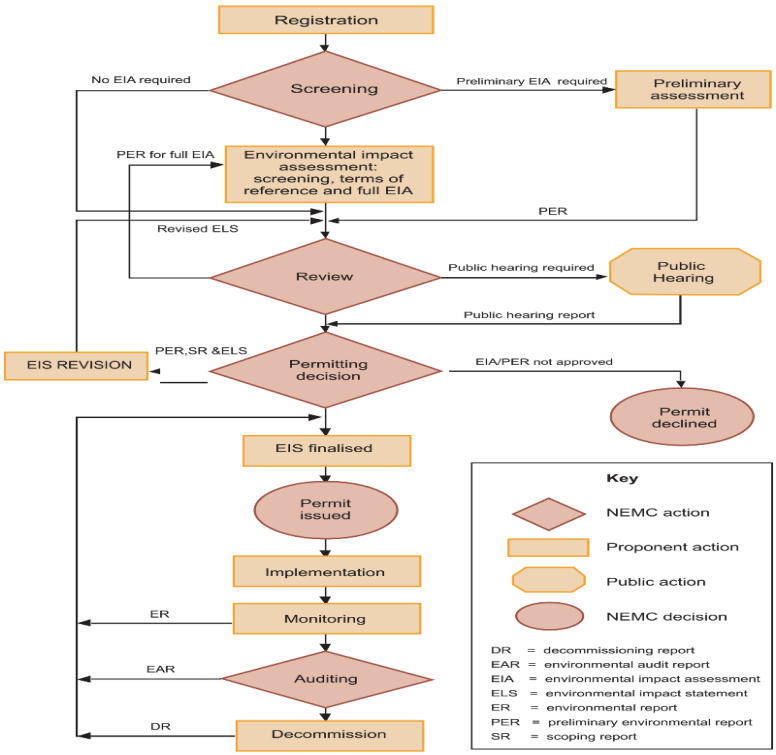

Figure 1: EIA administration (MEM, 2014b).

3. ENVIRONMENTAL IMPACTS

The project will involve drilling of three slim wells and the construction of associated project components such as access roads, water pipelines and storage tanks. The EIA report has been prepared to satisfy the requirements of Part III of the Environmental Impact Assessment and Audit Regulations G.N. No.349 of 2005 as one step toward application of Environmental Impact Assessment Certificate to the National Environmental Management Council (NEMC) and align with the requirements of international standards.

Part IV of the ESIA Regulations G.N. No. 349 of 2005 provides the general objectives for carrying out an ESIA, among them are the following main objectives:

1. To ensure that environmental considerations are clearly addressed and incorporated into the development of the project.
2. To anticipate and avoid, minimize or offset the adverse significant biophysical, social and relevant effects of developmental proposal.
3. To protect the productivity and carrying capacity of natural systems and ecological processes.
4. To promote development that is sustainable and optimizes resources use and management opportunities.
5. To establish impacts that are likely to affect the environment before a decision is made to authorize the project.
6. To enable information exchange, notification and consultations between stakeholders.

The EIA process included:

1. Project registration and submission of project brief to National Environment Management Council (1 – 2 weeks). 3-4 weeks for NEMC to review;
2. Carried out scoping study and preparation of ToR, (2 weeks field work and report writing).
3. Scoping report and TOR submission to NEMC for approval. (3-4 weeks NEMC to review and approve);

4. Carried out detailed ESIA study after NEMC approved scoping report and ToR for the proposed project and its components.

5. NEMC site visiting and conducted Technical Advisory Committee and Review process, (5 weeks for NEMC for site visit and review process).

6. TGDC Incorporating comments from NEMC and re-submission of ESIA, (1-2 weeks for to incorporate NEMC comments).

7. EIA certificate issued (5 weeks for NEMC and VPO).

Baseline data on physical, biological and socio economic for the proposed project provided an important background for a well-organized EIA. The information is based on data collected from secondary and primary sources including documentary review, interviews with key informants, household questionnaires, community meetings and researchers' observations and measurements.

3.1 Land Use

The major part of Mbeya Region lies within the Great Rift Valley. Most of the total land area is arable and used for agriculture while the remaining land constitutes forest, mountainous and residential areas. Pressure on land caused by the human population has caused serious ecological effects in the Mbeya highlands and the surrounding lowlands.

The potential geothermal sites are located on the foot slopes of these forested hills. The dominant land use in all sites visited is agriculture i.e. crop cultivation and livestock keeping. The intensity of crop cultivation is more prominent around Ngozi area which is flat. The livestock keeping in the area include cattle, goat, sheep, pigs, and indigenous chicken. Land is privately owned, and most of the land affected by the project is agricultural land. It is very important to consider this during valuation for land compensation as the community use agriculture as their main economic activity in daily living.

Figure 2: Pareto plantation in NB-1 Nsongwi Juu village.

Figure 3: Maize plantation along the road to NB-3 in Nsenga village.

3.2 Social and Economic Impact

Developing a new geothermal project in an area may cause some changes in the daily life and habits and even future settlement of the people. Despite the benefits of the project to the community it may still become difficult to get social acceptance in the short run. The area where the proposed drilling of exploration wells will take place is agricultural land with different type of food and cash crops, maize, Irish potatoes, coffee, rice etc. The ethnic groups found in the area are Safwa and Nyakyusa. Livestock keeping is also part of the activity in the area, the main animals kept being cattle, goats and sheep, mostly grazed in an open grassland. The

roads to the drill sites need improvement, which will have direct impact on the people living close to them. The best option could be to divert the road, but a detail analysis is required to come up with the best option.

The impacts can then be divided into short and long term, positive and negative impacts and dealt with in the text. Creation of jobs during drilling, e.g. opportunity for catering services to workers around the drill rig can be grouped as positive impact of the project. Short term negative impacts could be because grazing and agriculture areas will be fenced off for security but will be opened after the drilling. A drilling project spanning several months, may result in small temporary increase in the local population.

Long term positive impacts could be food production for the workers, Improvement of roads could improve local living conditions as it can help farmers to transport and sell their agricultural products and even national depending on how many people are involved. Roads improvement can also increase tourism in the area both those who like to see the geothermal areas and come to hike in the mountains.

An example of long-term negative impacts could be displacement of people, land acquisition and resettlement of evacuated people.

Figure 4: Examples of houses along the proposed access road to the drilling site.

3.3 Noise

The project is in a rural area and the background noise level can be considered very low in general. Therefore, the drilling activities will have a significant impact to the residents and livestock, as they are the potential receptors. Monitoring of existing noise levels Establishment of sampling points was based on the norms prescribed by local standards (TBS and National Environmental Air Quality regulations) and International guidelines.

Generally, the main activities identified as noise sources in the project area correspond to rural settlement living, low to moderate traffic, and commercial activities within the rural trading centers. No industrial noise generating sources or large settlements are present in the project area.

To characterize the baseline acoustic environment along the access roads to drilling sites noise measurements were recorded during the day (06:00 am – 10:00 pm) and night (10:00 pm – 06:00 am). Data collected were analysed by using Sound Level Meter Software Version 3.2 which can indicate the maximum and minimum noise levels, as well as their averages. A data logger sound level meter DT- 8852 monitor and method used were in accordance to ISO 1996 -1:2003. The sound level meter meets the International Electro-technical Commission (IEC) standards (61672, class 2). The results during baseline noise monitoring were all within the acceptable limits. It is important for the developer best selection of low noise plant and equipment for drilling works to avoid noise impact to the surrounding communities.

Figure 5: Baseline noise monitoring along the project site.

4. CONCLUSIONS

The development of the Ngozi exploration drilling project is expected to have limited adverse impacts to the environment compared to other energy development. Furthermore, the known environmental impacts resulting from this geothermal development can be adequately mitigated. In developing geothermal projects, it is recommended that developer factor the costs of environmental and social mitigation measures into the total project cost. The community welcomes the project and perceives the proposed project as beneficiary to different sectors at both the national and local community levels due to the positive impacts, such as road improvement and creation of employment opportunities.

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