



SOCIAL ASPECTS OF GEOTHERMAL DEVELOPMENT – A CASE OF OLKARIA GEOTHERMAL PROJECT IN KENYA

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1. INTRODUCTION

The Kenya Electricity Generating Company Ltd., KenGen, is the leading electric power generation company in Kenya. It produces about 80% percent of electricity consumed in the country. The Company utilizes various sources to generate electricity that range from hydro, geothermal, thermal and wind. Since energy is one of the infrastructures that will enable the achievement of Kenya Vision 2030, and to meet the Country's rising power demand, KenGen has scaled up plans to develop and generate electricity from geothermal resources. Social change is inherent to and inevitable with any development. Whilst development aims to bring about positive change, it can lead to conflicts as well. In the past, the promotion of economic growth as the driver for increased well being was the main development thrust with little sensitivity to adverse social impacts. The need to ensure long term benefits and avoid adverse impacts led to the concept of sustainable development. This has become widely acceptable as an essential feature of development if the aim of increased well being and greater equity in fulfilling basic needs is to be met for the current and future generations. This paper describes the current and anticipated social aspects that are associated with the development of olkaria geothermal project in Kenya.

2. SOCIAL ASPECTS OF OLKARIA GEOTHERMAL PROJECT

The social aspects of development of Olkaria Geothermal Project are either positive and/or negative.

The main favorable social aspects include but are not limited to stabilization of electricity in Kenya, promotion of economic growth in the country, contribution to the Government revenue, increased employment, extension of corporate social responsibility, increase in tourism and potential for carbon trade.

The main negative social aspects on the other hand include land acquisition and resettlement, loss of Maasai culture, increase in crime levels and spread of contagious diseases among others.

3. POSITIVE ASPECTS

3.1 Increased power supply and subsequent stabilization of electricity

The Kenya Electricity Generating Company Limited (KenGen) is a State Corporation that supplies bulk power to the national electricity grid. The Company's power generation mix comprises of hydro, thermal, geothermal and wind resources (KenGen, 2010). Currently, KenGen operates two geothermal power stations that are located within the Hell's Gate Location of Naivasha District (KenGen, 2011). The two power stations, Olkaria I and Olkaria II, respectively generate 45 and 105 MW of electricity. KenGen is implementing plans to increase geothermal power production within the Greater Olkaria Geothermal Area (GOGA) by optimizing the current potential of the Olkaria Domes area. These plans will lead to establishment of new plants to be named Olkaria IV and Olkaria I Units 4 and 5 Power Stations, with a total generation capacity of 280 MW (KenGen, 2010). This will alleviate power outages especially during the dry seasons and help reduce the Country's heavy reliance of power production from fossil fuels that are subject to very volatile foreign currency. Geothermal power from Olkaria is of strategic national importance especially at the moment when hydro power is very precarious due to the variable hydrological regime along the Tana River catchment.

3.2 Promotion of economic growth

Energy is one of the key infrastructures that will drive the achievement of Kenya's Vision 2030. Geothermal power development plays a significant role in stimulating economic growth in Kenya. The power input will contribute significantly to the Kenya's Rural Electrification Program which has potential to promote spin-off effects on the rural economy in Kenya. On a wider context, the energy situation in Kenya is unsatisfactory as evidenced by the frequent unplanned power outages, a vital phenomenon that slows down the economic development in the country. Geothermal power will to a large extent contribute in the alleviation of the current situation and promote economic growth. Reduction of hydro power production during the dry spells is normally compensated by increasing the power production of the diesel plants and rationing of power. This increases the cost of power production substantially, in addition to a resultant loss of economic production due to rationing. This underscores the need to diversify power sources in Kenya to enhance and especially accelerate geothermal development that is not affected by climatic changes.

3.3 Creation of employment

Olkaria Geothermal Project has created job opportunities in the project area and beyond. Direct job opportunities are available for high caliber of professionals that includes Scientists - Environmentalists, Community Liaison, Geologists, Geochemists, Geophysicists, Human Resource; and Engineers - Electrical, Civil, Drilling and Mechanical among others. The local communities however benefit mostly from unskilled and semi-skilled labour during the construction of the geothermal projects. Such job opportunities include construction of access roads, rehabilitation of disturbed sites, bush clearing for the power transmission lines, driving, masonry, carpentry, loading/off-loading and security work among others. Indirectly, the project will create opportunities for self-employment in the project area. This will spring spin-off activities including trade, accommodation and supply of goods and services to the skilled as well `

3.4 Increased contribution to the Government Revenue

Olkaria Geothermal Project contributes towards boosting of the Government revenue in the form of taxes. Further, the project generates income to the Government through Geothermal, Environmental Impact Assessment (EIA) and Operating license fees, employees' withholding tax from remuneration paid at graduated scale rates as well as in the form of Pay As You Earn (PAYE). The project also pays Value Added Tax (VAT) for most of the items that are procured, as well as Corporation tax at 30% of its net income.



FIGURE 1: A section of the Moi South Lake Road that was constructed and has recently been upgraded by the Olkaria Geothermal Project - KenGen

3.5 Improved infrastructure in the vicinity of the project area

Geothermal Projects are involved in the construction of new roads for accessibility to power plants. A good example is the 27 Km road that was constructed by the project from on to enhance accessibility of the existing Olkaria I and II power plants (Figure 1). Upgrading of the same road has just been completed in preparation for the construction of Olkaria I Units 4 & 5 power station. Further, a 9.9 Km road from the Kenya Wildlife Service Olkaria Gate was constructed by Orpower 4 Limited to access the Olkaria III geothermal field. This enhances access to the Narasha village community. An additional 10 Km road will be constructed for accessibility to the proposed Olkaria IV power plant. These roads once upgraded to bitumen standards, they become all weather roads and improve on communication/movement within the project area and promote economic activities like tourism. Since the projects are situated within Hell's Gate National Park, KenGen regularly upgrades the road network within the Park (Figure 2).

3.6 Opportunity for training and acquisition of skills

Geothermal project activities are numerous and challenging thereby requiring highly specialized skills. Successful implementation of the project activities therefore requires dynamic and multi-disciplinary professionals. Regular short and tailor made training courses and seminars are organized to enhance the capacity of the staff during the entire project implementation period, from construction to operation phases e.g. the annual UNU-GTP, GDC and KenGen Short Course on Exploration of Geothermal Resources and the advanced geothermal courses offered at the UNU-GTP in Iceland.

3.7 Increase in tourism

Kenya is currently the leading geothermal power producer in Africa. Olkaria Geothermal Project is uniquely located within the Hell's Gate National Park, thereby boosting the Park's tourism potential. The project enhances domestic as well as international tourism and generates the foreign exchange, with most visitors attracted to the power station rather than the animals within the park. Further, KenGen is currently constructing a Geothermal Direct-Use and Demonstration Centre near the Olkaria II power plant. This is meant to showcase the various direct uses of geothermal resources besides



FIGURE 2: The road network within Hell's Gate National Park that is maintained by Olkaria Geothermal Project on a regular basis

power generation which is an indirect use. This educational cum recreation centre will attract more local and foreign tourists since it will be the first of its kind in Africa. The main features will include a blue lagoon, spa, sauna, a conference facility and a geothermal museum. Visitors to the lagoon will enjoy therapeutic and balneological effects of the geothermal brine.

3.8 Corporate Social Responsibility (CSR)

KenGen 2010 states that the Kenya Electricity Generating Company (KenGen) is a responsible corporate citizen that believes in adding value to the communities living around its area of operation. The Company recognizes that it is part of its responsibility to build and nurture relationships with these communities and stakeholders. KenGen is guided by a CSR Policy to standardize implementation of the program and to keep focused on its priority areas that include education, provision of water, environmental conservation, support sports, health care provision and peace building activities. The overall objectives of CSR include:

- i) Develop and sustain cordial relationships with the host communities and collaborate to address issues that affect them
- ii) Demonstrate the Company's commitment to carry out business as a corporate citizen
- iii) Encourage support for the Company's business activities
- iv) Cultivate a better understanding of the Company, its plans, achievements and policies by different publics
- v) Enhance visibility and positive image of the Company.

There exists a CSR Committee at Olkaria that deliberates on the activities that will be implemented. Below is a list of some of the activities that have been and are being implemented following approval by the Olkaria CSR Committee:

- i) Educational support - 3 Secondary and University Scholarships awarded annually, daily transport for pupils from Olkaria I to Mvuke Primary School (30 Km), girl-child requirements' supply for 9 months at Mwachiringiri Primary School
- ii) Water provision to the communities for domestic and livestock use at Olo Nongot, Cultural Centre, Olo Sinyat, Olo Mayiana, Narasha and Iseneto (Figure 3)



FIGURE 3: A livestock watering point at Iseneto that was constructed and water
iii) supplied by the Olkaria Geothermal Project, KenGen

- iv) Promotion of social afforestation. Olkaria Tree Nursery issues over 200,000 every year to institutions and individuals, as well as during tree planting events like reforestation of the Mau Complex in the years 2010 and 2011 (Figure 4)



FIGURE 4: Five of the Olkaria Geothermal Project – KenGen staff who participated in the reforestation exercise of the Mau Complex on the 5th of June, 2011



FIGURE 5: Pupils alight a KenGen van to attend Mvuke Primary School that was initially a private school, but converted into a public school to accommodate the local community

- v) Transport provision to the schools for educational tours and participation in Education Days and dancing competitions and to the local community for shopping and visiting medical facilities (Figures 5, 6 and 7)
- vi) Upgrading of village roads e.g. at Inkilonkosi and at Karagita Shopping Centre



FIGURE 6: Members of the local community alight from a KenGen bus after a shopping spree that is normally organized for Saturdays



FIGURE 7: Beneficiaries of the 2011 KenGen University and Secondary Scholarships Pose for group photo on the 15th August, 2011

3.9 Potential for carbon market

KenGen has pursued development of renewable energy projects under the Clean Development Mechanism (CDM) principle. The main objective is to supplement income from the high project costs through sale of Carbon Emission Reductions (CERs) and Verified Emission Reduction (VER) credits. In this regard, KenGen signed Emission Reduction Purchase Agreements (ERPAs) with the World Bank under their Community Development Carbon Fund (CDCF) to fast-track development of Olkaria II Unit 3 Geothermal Expansion CDM project.

Following the registration of the Olkaria II Unit 3 Geothermal Expansion CDM Project in December 2010, KenGen received an advance payment equivalent to 10% of the total proceeds from the sale of CERs, for implementation of the CDCF Community Benefits Plan (CBP) for Olkaria.

Further, KenGen in collaboration with the local community and the World Bank developed detailed projects' implementation plans for Olkaria to benefit from the advance payment. The plans include the Community Development Carbon Fund (CDCF) Committee structure to oversee implementation of the community proposed projects, budgets, monitoring and evaluation criteria for the proposed CBP projects (Table 1).

Below is a summary of the projects that will be covered through the advance payment that has already been approved by the World Bank.

TABLE 1: The CDCF Community Benefits Plan for Olkaria: Projects for the Advance Payment

Project description	Beneficiaries	Implementation committee	Duration (days)	Cost (kshs.)	Monitoring & evaluation
Construction of ten (10) km waterline from Tank Mpya to Maiella within Maiella Location, Naivasha Division of Naivasha District.	20, 000 people	District Officer, Kongoni Division Chief, Maiella Location Division Water and Irrigation Officer Three (3) Village Chairpersons, Women Representative Area Assistant Chief KenGen Olkaria CSR Representatives	30	2,428,850	Monthly, to get data on the number of households/ people and animals benefiting from the water supply line and quarterly reports submitted.
Construction and equipping of three (3) classrooms at Ngambani Nursery School within Maiella Location, Naivasha Division of Naivasha District.	350 pupils per year	District Officer, Kongoni Division Chief, Maiella Location School Head Teacher Division Education Officer PTA Member-Female Representative PTA Member-Male Representative Area Assistant Chief KenGen Olkaria CSR Representatives	60	1,247,450	Monthly, to get records of pupils' enrolment and attendance level and quarterly reports submitted.
Excavation of Olosing'ate water pan for livestock watering within Enoosupukia Location, Mau Division of Narok North District.	40,000 livestock belonging to individuals	District Officer, Mau Division Chief, Enoosupukia Division Water and Irrigation Officer Division Livestock Officer Three (3) Village Chairpersons, Women Representative Area Assistant Chief KenGen Olkaria CSR Representatives	20	8,192,196	Monthly, to get data on the number of households/ People and livestock benefiting from the water pan and quarterly reports submitted.
Construction and equipping of three (3) classrooms at Oloirowua Primary School within Maiella Location, Naivasha Division of Naivasha District.	450 pupils per year	District Officer, Mau Division Chief, Enoosupukia School Head Teacher Division Education Officer PTA Member-Female Representative PTA Member-Male Representative Area Assistant Chief KenGen Olkaria CSR Representatives	60	1,247,450	Monthly, to get records of pupils' enrolment, attendance level and quarterly reports submitted.
			TOTAL	13,115,946	

4. NEGATIVE ASPECTS

4.1 Involuntary Resettlement of Project Affected Persons (PAPs)

KenGen is implementing plans to increase geothermal power production within the Greater Olkaria Geothermal Area (GOGA) by optimizing the current potential of the Olkaria Domes area. These plans will lead to establishment of new plants to be named Olkaria IV and Olkaria I Units 4 and 5 Power Stations, with a total generation capacity of 280 MW (KenGen, 2010).

Establishment of the new power stations requires the resettlement of some Project Affected Persons (PAPs), whose land will be acquired and to ensure health and safety during the operational phase of the project. Studies have shown that geothermal power plants release certain pollutants into the environment (Mwangi, 2007). They include:

- Noise (Figure 8)
- Hydrogen sulphide gas
- Trace metals like boron, arsenic and mercury

Other anticipated impacts include the introduction of new populations into the resettled area and the associated disruption of the social fabric of the community being resettled.



FIGURE 8: Wells discharging at OW- 44 at Olkaria East Field with silencers to abate noise levels

4.2 Loss of the traditional Maasai culture

The PAPs have been influenced by the modern world as they live a mixture of the modern and traditional lifestyles. This comes as a result of intermingling with different people of diverse cultures who visit the project in search of jobs. Many Maasai have moved away from the nomadic life to emerging forms of employment that include farming. Their shelter ranges from the traditional manyattas with polythene roofing to modern housing of corrugated iron sheets. At the proposed resettlement site, they will live in modern houses. A Cultural Centre will be designed and constructed in an effort to preserve the traditional Maasai culture.

4.3 Rise in the levels of crime

Theft of Company property is largely on the increase. This to some extent is attributed to the many job seekers who eventually do not secure employment in the vicinity of the project site. The most common theft involves the removal of aluminium claddings on selected portions of the cross country steam pipes that deliver steam from the production wells to the power plant. This leads to significant power losses due to steam pressure and temperature drops due to the removal of aluminium that insulates the steam pipes. The aluminium claddings are mainly sold as scrap metal.

5. CONCLUSIONS

Social change is inherent to and inevitable with any development. Whilst development aims to bring about positive change, it can lead to conflicts as well. In the past, the promotion of economic growth as the driver for increased well being was the main development thrust with little sensitivity to adverse social impacts. The need to ensure long term benefits and avoid adverse impacts led to the concept of sustainable development. This has become widely acceptable as an essential feature of development if the aim of increased well being and greater equity in fulfilling basic needs is to be met for the current and future generations.

Therefore, provided the recommended social mitigation measures including the Resettlement Action Plan (RAP) are effectively implemented during the construction and operation phases of future power plants, the anticipated social impacts will to a large extent, have low significance (Gibb, 2009).

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