Presented at SDG Short Course IV on Exploration and Development of Geothermal Resources,
organized by UNU-GTP and KenGen, at Lake Bogoria and Lake Naivasha, Kenya, Nov. 13 – Dec. 3, 2019.

SOCIO-ECONOMIC ASPECTS OF GEOTHERMAL DEVELOPMENT – A CASE STUDY OF OLKARIA GEOTHERMAL PROJECT IN KENYA

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ABSTRACT

Kenya Electricity Generating Company Ltd. (KenGen) is the leading electric power generator in Kenya producing about 75% of the total installed capacity. The government of Kenya has in the recent past supported geothermal development in the country owing to its renewal nature and not affected by the vagaries of climate change. The development of geothermal energy presents both positive and negative socio-economic impacts like any other project development. Some of the positive impacts include employment creation, infrastructure development and knowledge transfer among others. Some of the negative impacts include disruption of social networks arising from resettlement of projects affected persons, increase of crime, erosion of culture and HIV and AIDS prevalence. In line with the sustainable development goals, this paper discusses socio-economic impacts associated with geothermal energy utilization in Kenya using Olkaria geothermal project as a case study.

1. INTRODUCTION

Geothermal energy exploitation in Kenya dates back to 1958. Its utilization has gained momentum due to the government's commitment of promoting renewable sources of energy. The indigenous nature of geothermal energy and the fact that it is not affected by the vagaries of climate change provides an impetus for this momentum. In Kenya, geothermal energy is utilized widely for electricity generation as opposed to direct uses. Examples of direct use applications include the Olkaria geothermal spa, greenhouse heating at Oserian Development Company and pyrethrum drying at Eburru.

Geothermal energy production is an effective reliable and environmentally friendly, source of electricity. It is well positioned to play an important role in mitigating global climate change, increasing national energy security, and safeguarding public health (Holm et al., 2012).

There are three primary ways geothermal energy can be used: For electricity production, for direct use applications, and for heating and cooling buildings with geothermal heat pumps (US Department of Energy, 2004). Each geothermal project is different, and the exact steps to be taken at any stage in a given project are dependent on specific conditions (IGA, 2013). However, geothermal projects generally go through the same overall process of exploration, development and operation as summarized in Figure 1.

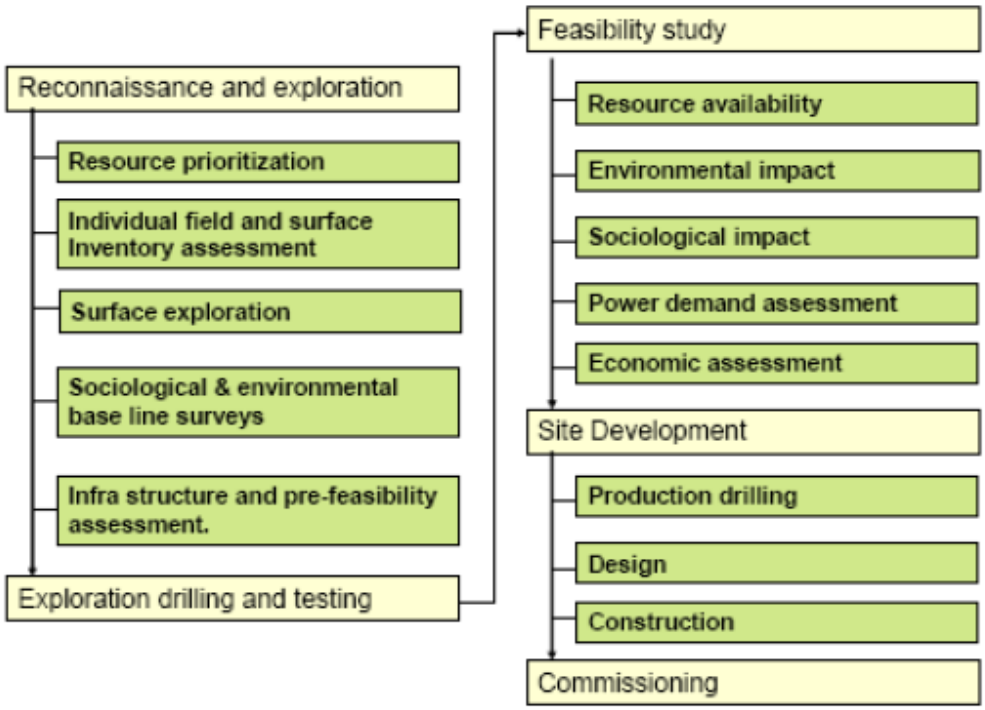

FIGURE 1: Schematic flow diagram for geothermal energy development (Steingrímsson, 2009)

Geothermal development like any other energy project generates both positive and negative socio-economic impacts. These impacts often draw the attention of different stakeholders within and outside the project area. Kenya electricity generating company (KenGen) has put in place mechanisms to mitigate and manage the impacts. This paper attempts to discuss the socio-economic impacts of geothermal energy utilization in Kenya using Olkaria geothermal project as a case study.

2. SOCIAL ECONOMIC ASPECTS OF OLKARIA GEOTHERMAL PROJECT

The social aspects of development of Olkaria geothermal project are both positive and negative. The main favourable social aspects include but not limited to stabilization of electricity in Kenya, promotion of economic growth in the county country, contribution to the government revenue, increased employment, enhancement of the company social corporate responsibility, increase in tourism and the potential for carbon trade. Some of the negative social aspects include displacement/resettlement of communities, erosion of culture, increase in crime levels and prevalence of HIV and AIDS.

2.1 Positive socio-economic aspects associated with geothermal development

The positive socio-economic aspects associated with geothermal resource development and utilization are as follows:

2.1.1 Employment creation

The geothermal power industry provides a wide range of employment opportunities – from exploration and drilling jobs; to high-tech manufacturing of generator, turbine, and power conditioning components; to maintenance jobs at geothermal power plants (US Department of Energy, 2004) as shown in Figure 2.

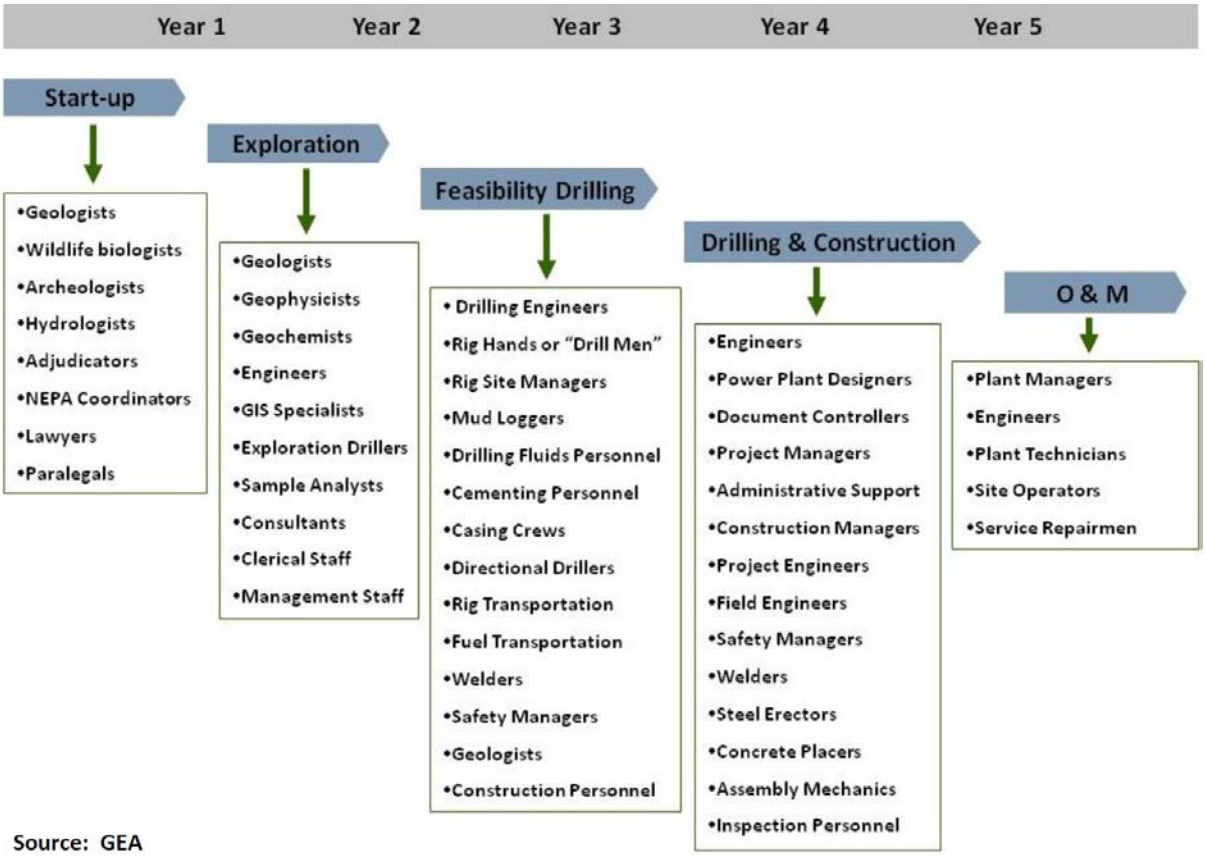

FIGURE 2: Job types through the project timeline (GEA, 2012)

For every megawatt (MW) of geothermal power plant construction, twenty six (26) direct, indirect, and induced jobs are created (US Department of Energy, 2004). Through the economic multiplier effect, wages and salaries earned by industry employees generate additional income and jobs in the local and regional economy. Olkaria geothermal projects have contributed towards creation of both permanent and contract employment. Currently, about one thousand (1000) staff are employed in various departments under the geothermal development division. KenGen has made it a mandatory requirement for contractors to source unskilled labour from the local communities neighbouring Olkaria geothermal field. This has contributed immensely to job creation for the local youths and even women. Employment of the locals is coordinated by the community liaison officers. During construction of Olkaria IV and Olkaria I unit 4 and 5 more than two thousand (2000) locals benefited from temporary employment.

2.1.2 Skills and knowledge transfer

KenGen being a government organization, it provides an opportunity for building capacity in geothermal industry through various programmes. Some of these programmes include the United Nations University Geothermal Training Programme, apprenticeship and attachment of university and college students. In 2016, the company has provided more than three hundred (300) placements to students on attachment in geothermal development division.

2.1.3 Enhancement of local development

Expansion of geothermal energy projects has the potential of promoting local development via provision of affordable energy. KenGen's installed capacity for geothermal energy currently stands at 533.8 MWe. The Olkaria geothermal projects to some extent have improved the living standards of the Maasai community. Mariita (2002), in his study of socio-economic impacts of geothermal energy

development, noted that to a large extent the projects had opened up the Maasai community "to the outside world" via construction of infrastructure such as roads and telecommunication, making access to markets and other facilities possible.

2.1.4 Enhancement of business opportunities

Business opportunities comprise of various consultancy jobs, hotel industry, supply of equipment, spare parts and materials, cleaning services, contracting jobs and provision of transportation and logistics services. Under section 157 (10) of the Public Procurement and Asset Disposal Act, 2015 every procuring entity in Kenya is required to ensure that at least thirty percent (30%) of its procurement value in every financial year is allocated to the youth, women and persons with disability. Some of the contracts that have been awarded to such vulnerable groups by KenGen include rehabilitation of disturbed sites at Olkaria and renovation of the geothermal club and staff houses.

2.1.5 Promotion of local tourism

Geothermal projects provide an opportunity for promoting local tourism. Various schools, universities and tertiary institutions frequent Olkaria geothermal projects for academic tours as shown in Figure 3. The local community benefit from such visits since they act as tour guides whereas Kenya Wildlife Service generate revenue via the park entry fees. On average, three (3) institutions visit the power projects in a day.

FIGURE 3: One of the local schools on academic tour at Olkaria

2.1.6 Promotion of direct use of geothermal energy

Direct use geothermal energy projects include the geothermal spa operated by KenGen (Figure 4), Eburru pyrethrum drying plant and greenhouse heating at Oserian Development Company (ODC). These projects provide an opportunity for KenGen to show case direct uses of geothermal energy. Pyrethrum drying project makes use a geothermal well that was drilled by KenGen in early 1990s. This has encouraged Eburru farmers to grow pyrethrum thus diversifying their sources of income. The steam used for greenhouse heating is bought from KenGen by ODC and the revenue generated is remitted to the treasury to support other development projects.

FIGURE 4**:** Olkaria geothermal spa

2.1.7 Promotion of social afforestation

KenGen owns and operates four tree nurseries at Olkaria, Karigita, Naivasha GK prisons and Eburru as shown in Figure 5. The purpose of the tree nurseries is to contribute towards the government's target of increasing tree coverage in Kenya by at least 10% by the year 2030. The tree seedlings are raised and issued out to the public for free of charge. However, to ensure value for money, a team of environmental officers and technicians visit the beneficiaries of the tree seedlings to evaluate their survival rates and offer appropriate advice with regards to good tree husbandry.

FIGURE 5: The Karagita tree nursery

2.1.8 Community Development Carbon Fund (CDCF) projects

By using the geothermal resources of Olkaria to generate electricity, part of the carbon revenues received from the sale of Carbon Emission Reduction (CERs) associated with Implementation of Olkaria II unit 3 power plant was used to implement Community Benefits Plan (CBP). The CBP comprised excavation of Olosingáte water pan for livestock watering, construction and equipping of 3 classrooms at Ngambani Nursery school, construction and equipping of 3 classrooms at Oloirouwa primary school (Figure 6) and construction of a 10km waterline from Tank Mpya to Maiella (World Bank, 2011). Olkaria II unit 3 geothermal power plant was registered under the World Bank Community Development Carbon Fund (CDCF). Upon consultations with the local communities, KenGen via the CDCF, implemented the four community projects. The projects have contributed positively towards enhancement of the local development and improvement of the learning environment.

FIGURE 6: New classrooms constructed at Oloirouwa primary school

2.1.9 Corporate Social Responsibility (CSR) projects

KenGen recognizes the role of CSR in creating a conducive environment for business sustainability. The Company maintains a policy on CSR which provides guidelines for implementing in a systematic manner, activities that bring about meaningful improvements in the society. The core CSR programmes supported by the company include education scholarships at secondary school and university level and environmental protection and improvement. Olkaria Geothermal Division has a CSR committee whose role is to:

i) Work with local communities, identify and propose CSR activities in the area;
ii) Coordinate the implementation of local activities;
iii) Act as a liaison point for addressing community/stakeholder issues; and
iv) Propose to Central CSR Committee (at KenGen headquarters) activities that are beyond the area level mandate.

The committee is chaired by the operations manager and the secretary is one of the community liaison officers based at Olkaria. Meetings are held on a monthly basis to discuss requests submitted by stakeholders and provide written feedback on their approval status as provided for by the CSR policy. Continuous monitoring of performance of the CSR activities is undertaken with a view to using lessons learnt to improve future programs. Some of the CSR projects implemented include installation of water condensing units at Eburru (Figure 7), provision of water storage tanks at Kamere, construction of classrooms at Iseneto primary school (Figure 8) and installation of high mast security

lights at Kamere, Maai mahiu and Kihoto in Naivasha sub-county. The scholarship programme was launched in 2005 and up to date we have had over 500 beneficiaries.

FIGURE 7**:** Water condensing units at Eburru

FIGURE 8**:** Classrooms constructed at Iseneto

2.2 Negative impacts associated with geothermal energy and mitigation measures in place

The negative impacts associated with geothermal development are as follows:

2.2.1 HIV/AIDS prevalence

During construction phase of geothermal power projects, there is usually an influx of workers at Olkaria. As a result, a high risk for infection of HIV/AIDS and other communicable diseases exists. KenGen has put in place necessary measures to mitigate against this risk. These measures include provision of condoms at strategic places within the workplaces, arranging for mobile Voluntary Counselling and Testing (VCT) services and creation of awareness among the local community, contractors and staff. The mandatory safety induction programme for contractors, students on attachment and consultants has a component on HIV/AIDs prevention.

2.2.2 Involuntary resettlement of project affected persons

A total of one hundred and fifty (150) households from the local community (maasais) were resettled in the year 2014 due to the predicted high levels of noise and hydrogen sulphide gas emissions from Olkaria IV and Olkaria I unit 4 and 5 geothermal power plants. KenGen contracted GIBB Africa to prepare the Resettlement Action Plan (RAP) for the project affected persons (GIBB Africa, 2012). The RAP was prepared in a participatory and transparent manner. The entitlements for the Project Affected Persons (PAPs) comprised of 150 permanent residential houses, a primary school (Figure 9), common water supply points, early childhood centre, a cattle dip, a dispensary, three churches, a bus, two fish ponds and a community social hall. Monitoring of livelihood restoration is currently ongoing. A Resettlement Action Plan Implementation Committee (RAPIC) was established to oversee implementation of the RAP. Meetings are held on a monthly and need basis.

2.2.3 Community complaints and negative perceptions

Awareness of the local communities on the environmental impacts of geothermal power plants is generally low. As a result, sometimes the communities raise complaints from uniformed point of view. A complaints log is maintained by the community liaison officers. Any concerns raised by stakeholders identified by KenGen are recorded in the complaints log, investigated and appropriate feedback provided within a stipulated period of time to avert the potential for conflicts. Complaints touching on geothermal emissions are subjected to joint scientific research studies so as to ascertain

the facts. A good example was Eburru geothermal project where a crop research study was undertaken jointly by KenGen, the local farmers and the Ministry of Agriculture, Livestock and Fisheries in 2014. The objective was to find out whether geothermal emissions were impacting negatively on the crops grown in the vicinity of the well head power plant by the local community.

FIGURE 9: A primary school constructed as part of entitlement for the PAPs

2.2.4 KenGen stakeholder management in relation negative perceptions and sharing of project benefits

The company has put in place mechanisms of engaging and managing stakeholders within the Olkaria geothermal project area. A structured committee comprising of community representatives, government representatives, NGOs, KWS, and other interest groups manages community grievances and help share accrued projects benefits (Figure 10).

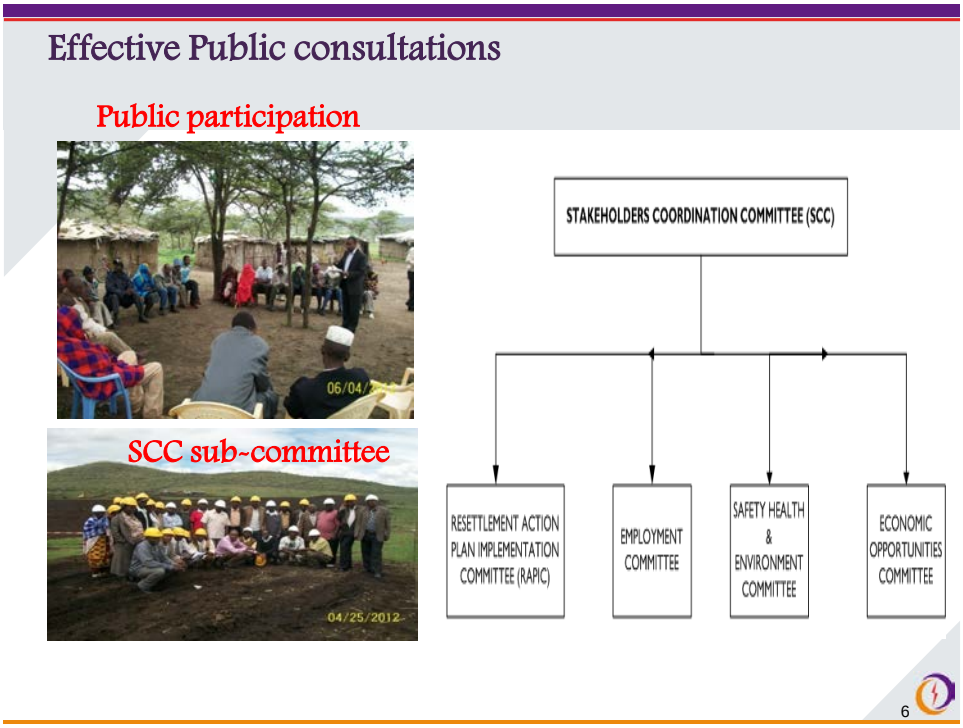

FIGURE 10: SCC structure

3. CONCLUSIONS

The development of geothermal like any other development can lead to both positive and negative changes. The need for long term benefits and avoiding adverse impacts led to the concept of sustainable development. This has widely been acceptable as an essential feature of development if the aim of increased well being and greater equality 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 are effectively implemented during the construction and operations phases of future power plants, the anticipated impacts will to a larger extent, be of low significance.

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