

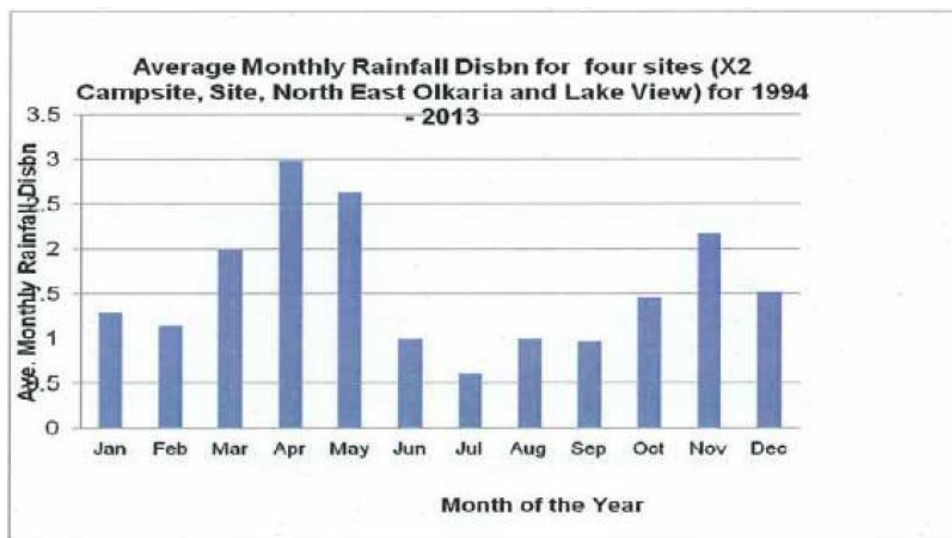
II. ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

1. NATURAL ENVIRONMENT

1.1 CLIMATE

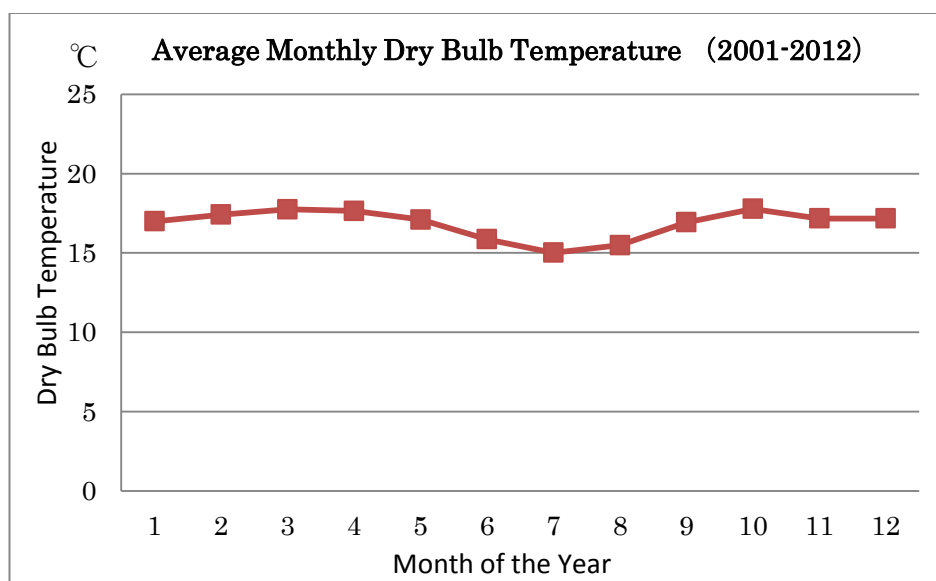
The Olkaria area and other surrounding areas around Lake Naivasha are classified as semi-arid areas. The monthly distribution of rainfall borrows largely from the national bimodal pattern of rainfall distribution with long rains in March, April and May while the short rains are received in the months of October and November. Rainfall in the project area and its environs is generally low, recording an average of 634mm annually. Evaporation exceeds precipitation almost throughout the year. It ranges from approximately 1,700mm per year in areas around the lake to approximately 1,000mm per year on higher ground, with variations from year to year.

Lake Naivasha maintains its water levels by receiving inflow from the Malewa River in the east, as well as from the Karati River, Gilgil River and groundwater during the rainy season.



Source: Environmental and Social Impact Assessment Study Report (KenGen, 2014)

Fig. 1.1-1 The mean monthly rainfall values in the area surrounding Olkaria(1994-2013)



Source: The revision to the materials provided by KenGen

Fig. 1.1-2 The mean monthly temperature values in the area surrounding Olkaria (2001-2012)

At Naivasha Municipality (1829 m asl) the mean monthly temperature has been recorded to range from 15.9 to 17.8°C with a mean of 16.8°C while the mean monthly maximum temperatures in the above towns range from 24.6 to 28.3°C.

1.2 GEOLOGY AND TOPOLOGY

The Olkaria area is located on the floor of the Great Rift Valley. The geology of the Lake Naivasha area is dominated by the formation of the Great Rift Valley, which was created when the volcanic material of Pleistocene Age was extruded forming the base material. Subsequent sedimentation and additional volcanic activity have resulted in a mixture of sedimentary material consisting of sands, clays, and pyroclasts including pumice in the project area and surroundings. To the north is Mau Escarpment (3080 m asl) and the Eburru volcanic pile. To the east is Longonot Mountain, while to the northeast lies the Kinangop Plateau and the Nyandarua (Aberdare) Range (3900 m asl). The area surrounding the location of Olkaria V comprises volcanic features that consist of steep sided domes formed from pyroclastic rock and lava flows.



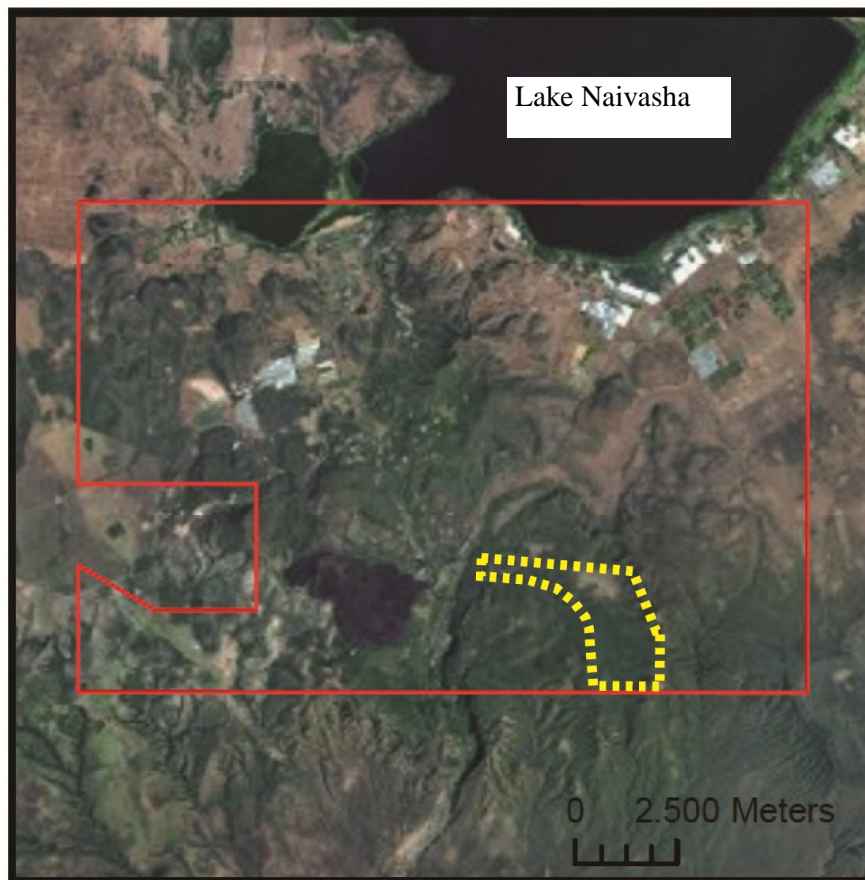
Fig. 1.2-1 The Vulture Cliff in the Hell's Gate National Park

1.3 RIVER AND LAKE

Lake Naivasha(2,378 km²) is about 5km north of the project area. The wetland associated with the lake is a suitable habitat for a wide range of aquatic flora and fauna and is one of the Ramsar sites in Kenya. The Malewa River (catchments of 1730 km²) provides 90% of the inflow to Lake Naivasha. Lake Naivasha also receives water inflow from the seasonal rivers of which the most important rivers are the Karati and Gilgil. Ground water seepage, particularly along the north and north eastern shores, contribute a significant influx into Lake Naivasha. The lake level undergoes variations in response to river inflow, rainfall over the catchments area and ground water inflows.

The water level of Lake Naivasha in August 2014 was 1,889 m asl.

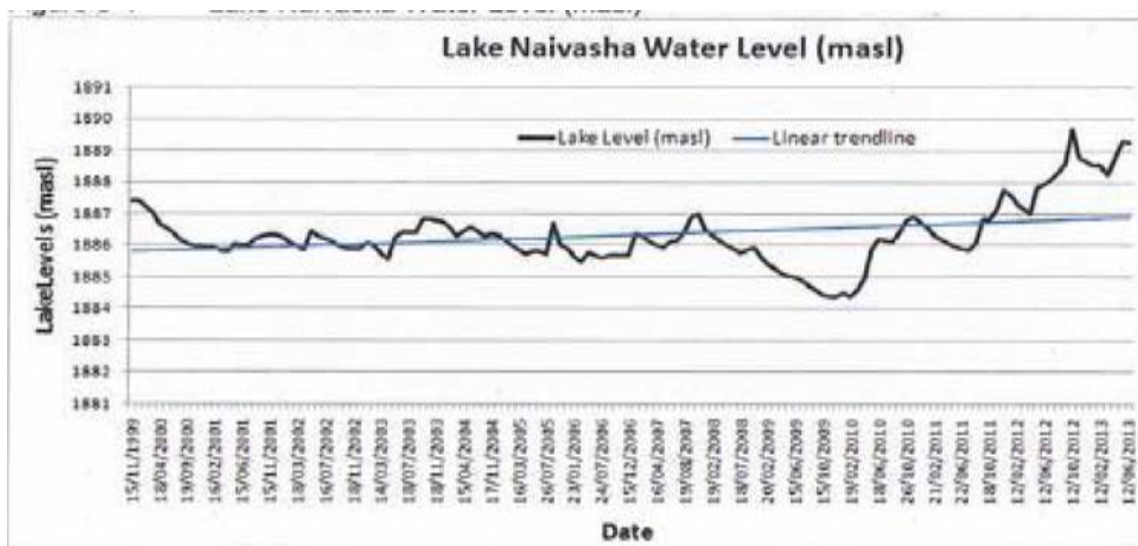
The maximum recorded water level stands at 1891m asl while the minimum level recorded is reported to be 1882m asl.



Legend :Geothermal License Area :OlkariaV Project Area

Strategic Environmental Assessment for the Olkaria Geothermal Field Development Programme Draft SEA Report (KenGen, 2014)

Fig. 1.3-1 Positional relationship of the project area and Lake Naivasha



Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014)

Fig. 1.3-2 Lake Naivasha Water Level (masl)(1999-2013)

1.4 PROTECTED AREA

(1) Power generation methods

Close to the location of Olkaria V, is Hell's Gate National Park, a unique conservation area of great scenic beauty. The Park covers 68.25 km² and was registered in 1984 for the protection of wildlife and scenic landscape of the area. Hell's Gate National Park contains significant wildlife populations including the buffalos, giraffes, zebra, Grant's and Thomson's gazelles, warthogs, etc.

It has been confirmed through interviews with the Kenya Wildlife Service (KWS) that rare animal species listed on the IUCN Red List that are living in the park consist of leopards (*Panthera pardus*, IUCN: Near Threatened) among mammals, and Rüppell's vulture (*Gyps rueppellii*, IUCN: Endangered) and the grey crested helmet shrike (*Prinops poliophus*, IUCN: Near Threatened) among aves.

It is one of the two Kenyan National Parks where climbing, walking and biking are allowed.

(2) Establishment of the national park

Before the establishment of the national park, this area was used mainly for cattle grazing and sisal hemp cultivation. With the development permit granted, KenGen has been conducting geothermal development in the Olkaria geothermal field since 1973, before the establishment of a national park in this area. The Olkaria I power plant has been operating in the western part of the area since 1981.

Hell's Gate National Park was established in 1984 under the Wildlife Conservation and Management Act. The purpose of its establishment was to protect and conserve the landscape, which features volcanic topography, wildlife species and their habitats, for the present and future. Currently the park is managed by the Kenya Wildlife Service (KWS).

Under the Wildlife Conservation and Management Act, KenGen and KWS signed a memorandum of understanding (MoU, 2008) covering geothermal development in the national park, including environmental considerations and measures. This MoU was executed to ensure environmental conservation, to mitigate the negative impact of geothermal development, and to promote harmonized use of the diverse resources in the area. Based on this MoU, all geothermal development activities by KenGen within the park are conducted, only after consent is given through prior consultation with KWS.

(3) Ecosystem Management Plan

To manage Hell's Gate National Park and nearby Mt. Longonot National Park, KWS formulated the Ecosystem Management Plan. The Ecosystem Management Plan for 2010 to 2015 defines areas where geothermal development can be conducted.

The table below outlines policies regarding the protection of nature, including flora and fauna, and the balance between the ecosystem and power development needs.

<p><Policies regarding the protection of nature, including flora and fauna></p> <ul style="list-style-type: none"> • The HE/LE Management Plan was formulated in accordance with Standard Operating Procedure (SOP), and is meant to balance conservation of the protected area with development needs. • The Ecological Management Programme, contained in the HE/LE Management Plan, defines the purpose of the protection of nature, including flora and fauna, as ensuring “that habitat and species diversity is maintained and ecological processes that sustain this diversity are well documented and understood to facilitate effective biodiversity conservation and management.” To achieve this goal, the following three management objectives have been set forth: <ul style="list-style-type: none"> (i) Conservation and restoration of habitats in HG/LE (ii) Strengthening management of wildlife species (iii) Strengthening and improving ecological monitoring
<p><Balance with power development needs></p> <ul style="list-style-type: none"> • The plan points out the expansion of geothermal exploration as one of the major areas of concern. It then states that, although construction and operation of geothermal power stations may involve a decrease in wildlife habitats, a potential cause of air pollution, noise, and ground subsidence, as well as an impact on geysers, installation of geothermal power plants should be facilitated by taking effective measures to mitigate any negative impact, as they have advantages over other generation methods that use fossil or other conventional fuels. • Hell's Gate National Park promotes a balance between conservation of the protected area and development, which is the purpose of this plan, by implementing power development based on the Ecological Management Programme.

In formulating the 2015-2025 plan, KWS is playing the central role in coordinating consultations with multiple stakeholders, participated in by parties engaged in activities in the Olkaria geothermal field, including KenGen and botanical business operators. The plan is being studied to include not only the parks, but also areas surrounding the parks, so that it will lead to the harmonized coexistence of geothermal development, the conservation of the natural environment and tourism. It is expected that KenGen and KWS will be able to facilitate participation of other stakeholders, through their partnership and networking strengthened in Olkaria in the past.

1.5 FLORA AND FAUNA

The prominent vegetation of the project area and other areas around Lake Naivasha including the Hell's Gate National Park is bush. The bush land community is dominated by the *Tarchonanthus camphorates*, locally referred to as “leleshwa”. Common grasses in the bush land community of the project area include *Cymbopogon nardus*, *Setaria sphacelata*, *Themeda triandra*, *Eragrostis cilianensis*, *Hyparrhenia hirta*, *Cynodon dactylon*, *Pennisetum clandestinum*, and *Digitaria*

abyssinica among other grasses. The impact of the project on vegetation will be checked by the survey. According to KWS, no rare plant species listed on the IUCN Red List have been confirmed around the project area.



Fig. 1.5-1 Leleshwa Bush land in Olkaria area

The most common animals include the zebra (*Equus burchelli*), Kongoni (*Aelaphus buselaphus*), gazelles (*Gazella thomsonii* and *Gazella grantii*), Impala (*Aepyceros melampus*), dik (*Rhyncotragus kirkii*), giraffe (*Giraffa camelopardis*) and buffaloe (*Syncerus caffer*) among other herbivores. The project area has a wide diversity of avifauna.

According to KWS and field survey for ESIA, the following six rare species (three species are listed on the IUCN Red List and six species are listed in the Wildlife conservation and management act) are confirmed to be around the project area, but they are not endemic (Table 1.5-1).

Table 1.5-1 Rare animal species confirmed to be around the project area

No.	Taxon	Species Names	Scientific Names	IUCN Category	Wildlife Act
1	Mammal	Spotted Hyena	<i>Crocuta crocuta</i>	—	Vulnerable
2		Leopard	<i>Panthera pardus</i>	Near Threatened	Endangered
3	Avifauna	Rüppell's Vulture	<i>Gyps rueppellii</i>	Endangered	Near Threatened
4		White-Backed Vulture	<i>Gyps africanus</i>	Endangered	Near Threatened
5		Kenya Rufous Sparrow	<i>Passer rufocinctus</i>	—	Protected Species
6	Reptiles	African Rock Python	<i>Python sebae</i>	—	Endangered

2. SOCIAL ENVIRONMENT

The land acquisition and resettlement of the Olkaria V Project area was done by KenGen while working on the Olkaria IV Project. The land for Project area was acquired in 2010 and an agreement was reached for the acquisition of the land for the resettlement site with the legal rights holder in 2012.

RAP was established and compensation for Project Affected Persons (PAPs) was conducted based upon it. Although the PAPs do not have legal rights to the land, it was planned that legal rights for the resettlement sites was to be given to the Community. This process was planned to be conducted within 6 months after the resettlement. Payment of moving allowance to 150 PAPs (46 of the 150 PAPs are from the Olkaria V area) started on August 18, 2014, and finished on the same date. Moving to the resettlement site started on August 20, 2014 and was completed on September 5, 2014. The payment of moving allowances and moving to the resettlement site was completed on September 5, 2014.

In this survey, a Due Diligence Report (DDR) was established, which consists of a review of the status of the resettled PAPs including implementation status of compensation, livelihood restoration programs, and resettlement of the PAPs. If the results of the survey show any gaps with JICA's Environmental and Social Considerations Guidelines (JICA Guidelines), a Corrective Action Plan will be developed.

Social-environment of the Project is discussed below.

Kenya sets the following administrative districts from biggest to smallest; county, sub-county¹, ward (location, sub-location in Olkaria V ESIA), and Village. ESIA's social environment survey covers the Hell's Gate location and Olkaria sub-location, and RAP covers the 4 affected villages; Olonongot, Oloosinyat, Olomayiana-ndogo, and Masai Cultural Centre. This survey will focus on the project area of Olkaria V, where the Olonongot village was located.

2.1 POPULATION

The table below gives the prediction of Hells Gate's population. According to the survey which was conducted in February 2014, 44.5% represents the percentage of people from 0 to 14 years of age, while 37.2% represents the percentage of people from 15 to 35 years of age. Additionally, since the system of patriarchy strongly remains in the region, 86 % of heads of households are male in the Hells Gate Location. In cases where the head of household is a female, in most cases the female head of household was a widow.

【Population in Hells gate Location】 (Unit/Count)

Male	37,930
Female	37,336
Total	75,266

2.2 EDUCATION

There are six neighbouring primary schools and one private school. The closest school is Olonongot primary school which has 85 students. The closest secondary school is 35 km away from the project site, which is attributed to low enrollment in secondary school. In the resettlement site for the Project, a primary school has been established. The table below gives the numbers of students from primary to tertiary education.

¹ COUNTY GOVERNMENTS ACT. No.17 of 2012, section 48.

【School Enrollment in Olkaria Villages Area (where PAPs are living)】

Unit	Count	%
None	301	80.9
Primary	62	16.7
Secondary	9	2.4
Tertiary	0	0

2.3 RELIGION

More than 89% of the population within the Olkaria sub-location are Christians. On the other hand, there are a small population of Traditional religion, Irreligion and Muslim people in the sub-location.

	Unit	Irreligion	Catholic	Protestant	Muslim	Traditional religion	Total
Olkaria Villages (8 villages including PAPs living areas)	Count	30	9	332	1	11	373
	%	5.4%	2.4%	89.0%	0.3%	2.9%	100

2.4 ECONOMIC CHARACTERISTIC

The local community living within the Olkaria villages, which is composed of Maasai people, are pastoralists and mainly practice livestock rearing. There are four trading centers in the Olkaria sub-location and the main source of income is selling livestock products such as meat and dairy products. There is also a cultural center that generates income to the community by charging an entrance fee and selling cultural items. In addition, flowers for export are cultivated in the neighboring regions. Large-scale horticulture is also an important economic activity in the region.

2.5 EMPLOYMENT STATUS

According to ESIA (February 2014) the unemployment level is 41.9% in the 8 affected villages (PAPs living areas). According to KenGen, this is because respondents to the survey were mainly housewives, since the survey was conducted in daytime. Although KenGen has no information regarding people who have no income, personnel in charge of the resettlement in KenGen explained that 80% of the population of Ologonot village are employed, also some people sell their livestock and other dairy products and there are no people without income.

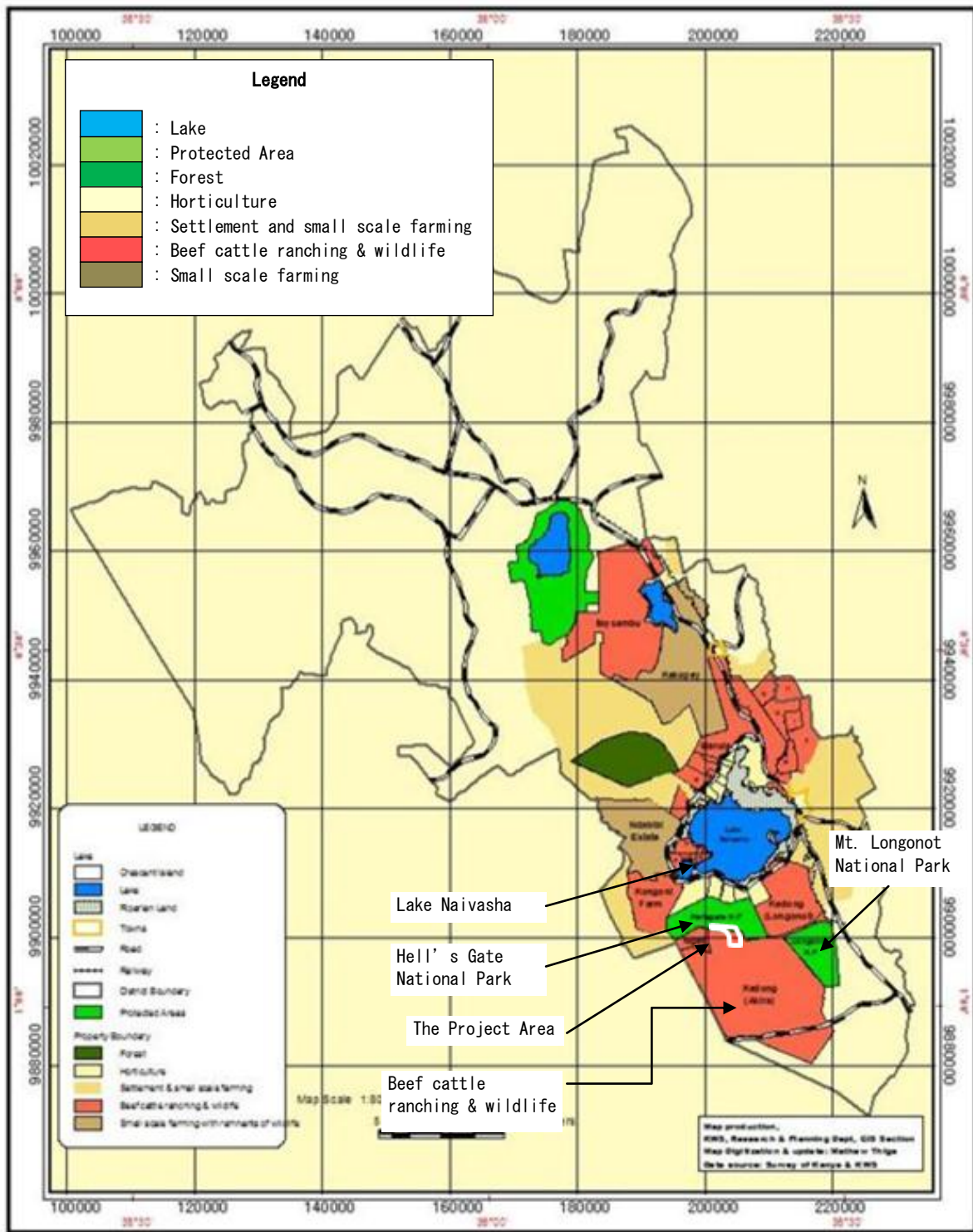
The majority of the populations living in the neighboring area are migrant workers who have come in search for employment and business. Migrant workers are working at large-scale horticulture and the construction site of the geothermal power plant. 'Unemployed people' include people who have livestock as well. In relation to the identification of vulnerable people within the PAPs the poverty group was not included in the ESIA. The poverty group is defined as those who have less than 100 of livestock and less than 10 acres of land in RAP. However, in the Maasai culture, since it is believed that counting livestock would bring misfortune, this is never exercised, thus making it difficult to establish the poor individuals within the community. This might be the reason why there was no poor group established or detected in the affected group in the RAP. Monitoring of this situation will be exercised regarding the poverty groups within the area.

Within this survey it was confirmed that identification of vulnerable people, including poor individuals, is conducted by the RAPIC (RAP Implementation Committee) and CAC

(Community Advisory Council) while considering the PAP's overall living conditions. As a result there were no poor individuals in Olonongot village. (Refer to section 15 "Poverty groups" for the result of survey.)

2.6 LAND USE/ FOREST DISTRIBUTION

Large-scale grazing has been carried out around the Project area and the north side of the project site is adjacent to the National Park. The boundary of the national park has no fence, so the Maasai community are grazing their cattle in the National Park and this practice was observed during the site survey.



Source : Hell's Gate - Mt Longonot Ecosystem Management Plan - 2010 - 2015

Fig. 2.6-1 Land Use

2.7 CULTURAL ASSETS/ LAND SCAPE

Hell's Gate National Park was registered to UNESCO's tentative world heritage candidate list by the Kenyan Government in February 2010, based on selection criteria number (viii). The park is beautiful and unique for its geological phenomenon (i.e. hot water geysers and hot springs), land formations and on-going geological processes; also there are plants which can make their habitat around high-temperature hot water. This is the reason for the registration to UNESCO's tentative world heritage candidate list. The detailed registration status of the world heritage candidate list will be updated in this survey.

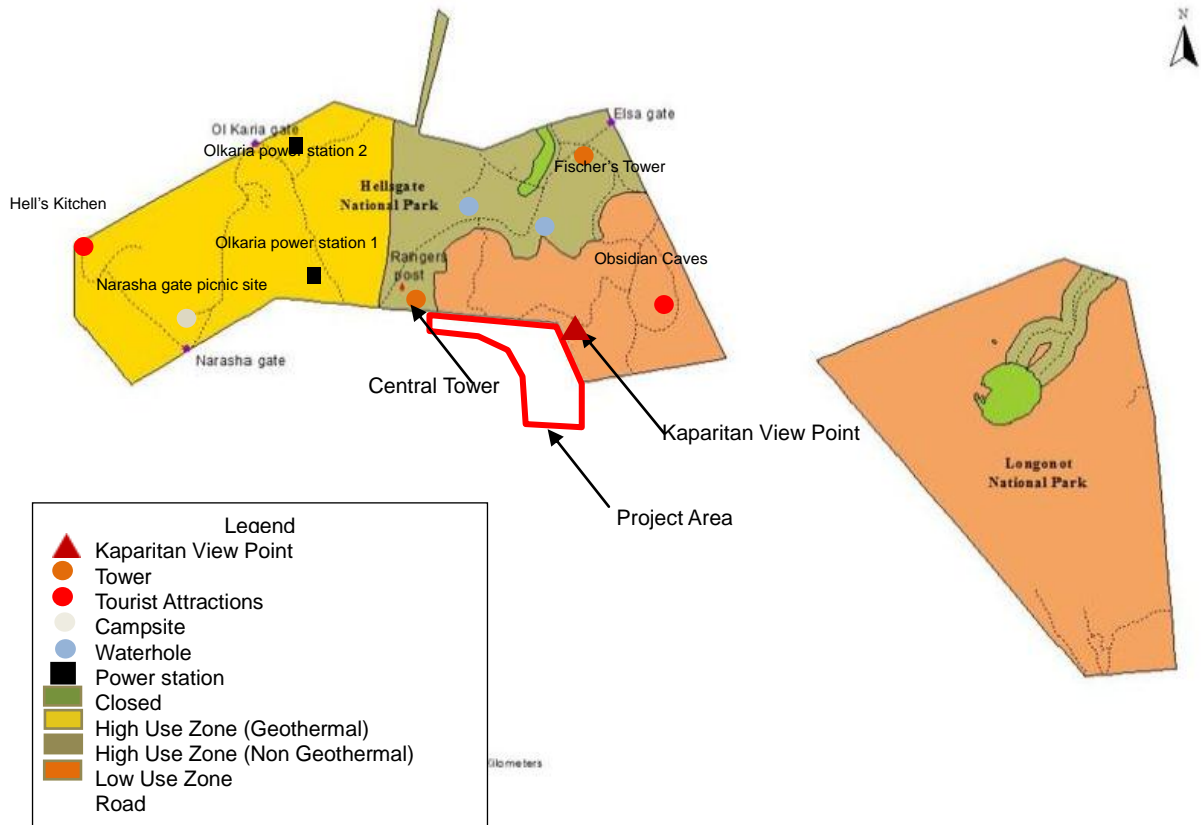
There are no registered national cultural heritage or world heritage sites in the Olkaria sub – location other than the Hell's Gate National Park. According to the Hell's Gate-Mt. Longonot Ecosystem Management Plan, 2010-2015, published by KWS, the following points are considered important to maintain the characteristics of the region:

Fischer's Tower, Central Tower, The Jorowa Gorge, Obsidian Caves, Hell's Kitchen, Hogley's Volcano, The Crater, Parasitic Cone



Source : Hell's Gate - Mt Longonot Ecosystem Management Plan - 2010 - 2015

Fig. 2.7-1 Central Tower



Source : Hell's Gate - Mt Longonot Ecosystem Management Plan - 2010 - 2015

Fig. 2.7-2 Important scenery points in Hell's Gate National Park and the Project Area

2.8 AREAL FEATURE

Most of the people living in the Project area are Maasai. They are one of the ethnic groups of semi-nomadic people located in Kenya. They have a distinctive customs and dress. They are pastoralists and they practice a traditional semi-nomadic lifestyle and practice age-old customs. They are no longer termed as an indigenous ethnic group in Kenya. This is because their traditional lifestyle has been influenced by the modern lifestyle such as education, and their population is large. In addition, it should be noted that the World Bank (WB) supported the process of creating the RAP of the Olkaria IV Project, and WB considered the Maasai as normal PAPs in the framework of RAP. It seems that there were no objections from the Maasai in the stakeholder meetings regarding this WB consideration.

3. LOCAL LEGAL SYSTEMS IN ACCORDANCE WITH THE ENVIRONMENTAL CONSIDERATIONS

3.1 The main law

The key legal instruments which provide the framework for environmental protection and management in Kenya include:

- Constitution of Kenya
- Kenya Vision 2030, Session Paper No. 6 of 1999 on Environment and Development
- Environmental Management and Coordination Act (1999)
- The Wildlife Conservation and Management Act (2013)

3.2 SEA process

The Strategic Environmental Assessment (SEA) identifies, explains, evaluates and reports policies, plans and programs (PPP) that may have a significant impact on the environment.

A SEA will be conducted on those PPP that NEMA deems to require it, after screening the submitted briefs.

The SEA undergoes a four-stage review process overseen by NEMA, stakeholders (governmental agencies, including those for health, agriculture and transportation, and non-governmental stakeholders), the public (Kenyan citizens), and committees (Technical Advisory Committee (TAC) for plan and program level SEA, Standards and Enforcement Review Committee (SERC) for policy level SEA, Independent Expert Commission (IEC) for SEAs that may have international impact). The final decision for a policy level SEA is determined by the National Environment Council (NEC), while that for a plan and program level SEA is determined by NEMA through issuance of approval with conditions.

KenGen conducted a SEA for its geothermal expansion programme for the period 2012-2020 and submitted the draft report to NEMA in July 2014. Olkaria V was one of the projects under the expansion programme.

- Public notice inviting stakeholders to provide comments on the draft SEA report were advertised in the Daily Nation newspaper and the Kenya Gazette in October and November 2014 respectively.
- EMA uploaded the SEA draft report on its website and the process of receiving comments from the public is ongoing.
- Validation workshop to disclose and discuss the draft SEA report with stakeholders is expected in mid-January 2014.

3.3 CHANGES OF EIA SYSTEM AND RELEVANT LEGISLATION AND REGULATION

The EIA procedures in Kenya are carried out in accordance to the Environmental Management and Coordination Act (EMCA) of 1999. The EMCA main objective is to provide a legal framework for integrating environmental considerations into the country's overall economic and social development. The major institution established to implement and operationalize the objectives of EMCA is the National Environment Management Authority (NEMA). Under section 147 of the EMCA, the Minister responsible for matters relating to environment on the recommendation of NEMA and upon consultation with relevant lead agencies makes regulations for giving full effect to the provisions of the EMCA. The most relevant regulations that relate to the proposed Olkaria V project include:

- Environmental (Impact Assessment and Audit) Regulations, 2003. Kenya Gazette Supplement No. 56 (Legislative Supplement No. 31), Legal Notice No. 101

- Environmental Management and Coordination (Waste Management) Regulations, 2006. Kenya Gazette Supplement No. 69 (Legislative Supplement No. 37), Legal Notice No. 121
- Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations, 2006. Kenya Gazette Supplement No. 74 (Legislative Supplement No. 41), Legal Notice No. 131
- Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006. Kenya Gazette Supplement No. 84, Legislative Supplement No. 47, Legal Notice No. 160
- Environmental Management and Co-ordination (Water Quality) Regulations, 2006. Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, Legal Notice No. 120
- Environmental Management and Coordination (Controlled Substances) Regulations, 2007. Kenya Gazette Supplement No. 57 (Legislative Supplement No. 33), Legal Notice No. 73
- Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009. Kenya Gazette Supplement No. 31. Legislative Supplement No. 21), Legal Notice No. 61
- Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009. Kenya Gazette' Supplement No.9, Legislative Supplement No. 6, Legal Notice No. 19.

3.4 ENVIRONMENTAL IMPACT ASSESSMENT SYSTEM IN KENYA

The environmental impact assessment system is defined in the Environmental Management and Coordination Act (1999), and concrete procedures and required contents of an environmental and social impact assessment (ESIA) are stipulated in Environmental (Impact Assessment and Audit) Regulations (2003).

On the basis of these laws, the Olkaria V geothermal power plant construction project has been determined to be a project for which an environment impact assessment is required before the commencement of construction work.

For geothermal development, the construction of electricity generation stations, electrical transmission lines and electrical substations, as well as drilling for the purpose of utilizing groundwater resources including geothermal energy, are all projects subject to an environmental impact assessment.

3.5 STATUS OF APPROVALS

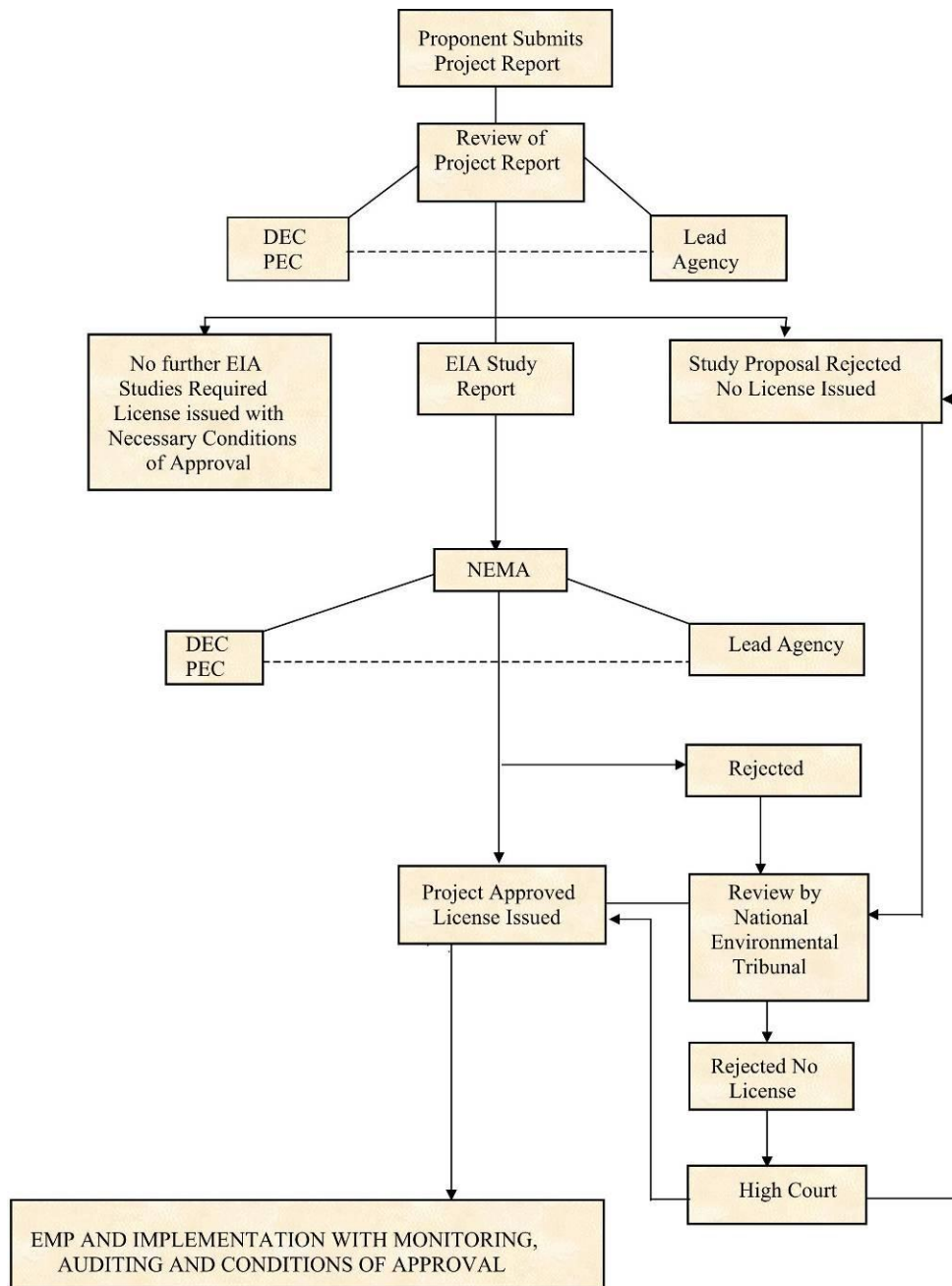
The environmental and social impact assessment (ESIA) for the proposed construction of the 140MWe Olkaria V geothermal power plant was completed on 24th February, 2014 and thereafter submitted to NEMA for review. It received conditional approval by NEMA in August, 2014. The EIA license for Olkaria V was granted by NEMA on 12th September, 2014.

3.6 APPROVAL PROCEDURE OF EIA REPORT AND PERMIT

The environmental impact assessment review procedure is a two-stage process. The proponent of a project submits the project report to NEMA for screening so as to determine the level of Environmental Impact Assessment required. NEMA reviews the project report and issues an EIA license or makes a recommendation for a full ESIA study for which a report must be prepared and submitted to NEMA for further review and decision making. The Olkaria V project was subjected to a full ESIA study hence it underwent the stage review process.

In reviewing an ESIA report, NEMA seeks the opinions of the ministries and agencies governing such projects, as well as the local government. NEMA issues an environmental impact assessment license to the proponent if the review concludes that the project will not impose a significant

impact on the environment. The ESIA must be prepared by professionals who satisfy NEMA's qualification standards and who are registered with NEMA. Figure 3.6-1 shows the procedure for the environmental impact assessment.



Source : Environment Impact Assessment Guidelines and Administrative Procedures (NEMA, 2002)

Fig. 3.6-1 Procedures for EIA

3.7 INFORMATION DISCLOSURE AND STAKEHOLDER CONSULTATIONS

(1) Information disclosure

The ESIA and other relevant documents submitted to NEMA will be opened to public viewing. However, proponents may keep some information undisclosed (with the approval of NEMA) because of commercial confidentiality and national security implications.

The ESIA submitted to NEMA will be sent to concerned ministries and agencies as well as to the environmental committee (consisting of individuals, groups, organizations and other entities that may be affected by the project) organized by the local government, for their opinions.

KenGen submitted the ESIA report on the Olkaria V project to NEMA, which opened it to public viewing by posting it on the NEMA website, and by publishing a summary in newspapers.

All ESIA's are available for inspection at NEMA's library.

(2) Environmental and social considerations related procedures

Consultations with stakeholders relevant to the EIA procedures will be held, in principle, during the project planning, operation, and decommission stages. Participants in these consultations should include individuals and private companies that may be affected by the project, as well as concerned ministries and agencies.

Consultations with stakeholders will be conducted in various ways, including technical workshops, discussions and exchange meetings with affected communities, dialogues with community leaders, questionnaires, interviews, and local evaluations with resident participation.

Formal consultations with stakeholders (including local community residents) will be announced by means of posters, newspapers, and radio broadcasts in both the official and local languages (English and Swahili). Consultations with stakeholders specifically involving local community residents must be held at least three times, to explain the project overview and impact, and to obtain verbal or written comments from the participants.

4. SYSTEM OF LAND ACQUISITION AND RESETTLEMENT

4.1 Law of Land Acquisition and Resettlement.

(1) Constitution of Kenya

The Constitution of Kenya, 2010, chapter five, article 60 (1), outlines the principles for land use and management which includes compensation of the land and elimination of gender discrimination. Article 64 and article 63 recognize the ownership of private and community land respectively. According to article 40 (4), compensation is paid to occupants in good faith, who may not have a legal right.

(2) Land Act, 2012

This act is for the management and usage of public land, private and community land as well as the easement of land. Section 111. (1) requires just and full compensation to be paid promptly by the National Land Commission for compulsorily land acquisition for public purpose. According to the Land Act Section 125. (1) to obtain temporary occupation of land, full and just compensation shall be paid before taking possession. Section 134 (1) requires the National Land Commission to implement settlement programmes to provide access to land for shelter and livelihood, on behalf of the national and county governments.

(3) The Land Registration Act, 2012

Registration of the title of land and establishment of relevant governmental organization will be

based on this act. The Ministry of Land has a role for management of the land registration.

(4) The Environmental and Land Court Act, 2011

The Act enables the Parliament to hear and determine disputes relating to the environment and the use and occupation of and title to land.

4.2 RELEVANT ORGANIZATION FOR LAND ACQUISITION AND RESETTLEMENT

(1) District Land Board

The Ministry of Lands delegates the management of land in the districts to the District Land Boards Committee. One of the roles of the District Land Board is to make a list of the compensation rate for loss or damage of crops, houses and other property and update the list annually.

On the other hand, lands owned by the Kenyan government are managed by the National Land Commission, not by the District Land Board.

5. GAP ANALYSIS WITH JICA GUIDELINES

Gap analysis has been conducted between JICA Guidelines and Kenyan EIA Regulation and the actions to be taken were discussed. Thereafter, field surveys and other investigations were carried out to confirm the facts. Table 5-1 describes results of the analysis.

Also, gap analysis has been conducted between JICA Guidelines and the actual implementation of RAP. Thereafter, a corrective action plan was discussed with KenGen. Table 5-2 below describes results of the analysis.

Table 5-1 Differences between JICA Guidelines and EIA laws of Kenya

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
1.	Categorization	<p>Projects are categorized (except for Category FI) according to the extent of environmental and social impact, considering the project outline, scale, site conditions, etc.</p> <p>Category A: Projects that are likely to have significant adverse impact on the environment and society.</p> <p>Category B: Cooperation projects whose potential adverse impacts on the environment and society are less significant than those of Category A.</p> <p>Category C: Cooperation projects that are likely to have minimal or little adverse impact on the environment and society.</p>	<p>Proponents will submit project plans to NEMA for screening to determine whether an environmental impact assessment needs to be conducted. As a result, projects will be classified into one of the following two categories:</p> <ul style="list-style-type: none"> • Projects for which an ESIA is not required: Projects that are unlikely to have significant adverse impact on the environment, or for which adequate measures to mitigate environmental impact have been presented • Projects for which an ESIA is required: Projects other than the above. 	<p>There are no remarkable differences as to how projects are categorized, even though there are fewer categories in Kenyan law than in JICA Guidelines.</p>	—	—

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
2.	Development in an area susceptible to adverse environmental impact	(1) Sectors that are likely to cause, (2) characteristics that are likely to have and (3) areas that are susceptible to adverse environmental impact are shown on an illustrative list, and all projects that involve any of these are classified as category “A”. Specifically, they include (1) power transmission and distribution lines (involving large-scale involuntary resettlement, large-scale logging, or submarine electrical cables), (2) large-scale involuntary resettlement, and (3) primary forests, natural forests in tropical areas, and ecologically significant habitats (coral reefs, mangrove wetlands, tidal flats, etc.).	Sectors that are likely to cause, characteristics that are likely to have environmental impact and areas that are susceptible to adverse environmental impact are not illustrated in Kenya’s Environmental (Impact Assessment and Audit) Regulations.	Rules on development in areas susceptible to adverse environmental impact are not stipulated in Kenyan law.	The ESIA and planned project area will be checked, and a survey will be conducted in accordance with JICA Guidelines.	Interviews and field reconnaissance have confirmed that the project site is not an area susceptible to adverse environmental impact as defined by JICA Guidelines. A part of the fluid collection and reinjection system is slated to be installed inside the national park boundaries. However, as it will be installed alongside an existing road, it has been confirmed to have less environmental impact than newly clearing and adjusting land for installation would have.

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
3.	Critical natural habitats, etc.	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	<p>The Minister may, in consultation with the relevant lead agencies, by notice in the Gazette, declare any area of land, sea, lake or river to be a protected natural environment for the purpose of promoting and preserving specific ecological processes, natural environment systems, natural beauty or species of indigenous wildlife or the preservation of biological diversity in general.</p> <p>The Authority may, in consultation with the relevant lead agencies, issue guidelines and prescribe measures for the management and protection of any area of environmental significance declared to be a protected natural environment area.</p>	No major discrepancies	—	—

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
4.	Protected areas for the conservation of nature, etc.	Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas.	<p>The Minister may, in consultation with the relevant lead agencies, by notice in the Gazette, declare any area of land, sea, lake or river to be a protected natural environment for the purpose of promoting and preserving specific ecological processes, natural environment systems, natural beauty or species of indigenous wildlife or the preservation of biological diversity in general.</p> <p>The Authority may, in consultation with the relevant lead agencies, issue guidelines and prescribe measures for the management and protection of any area of environmental significance declared to be a protected natural environment area.</p>	No major discrepancies	—	—
5.	Analysis of alternative plans	Multiple alternatives must be examined in order to avoid or minimize adverse impacts and to choose better project options in terms of environmental and social considerations.	Alternative plans will be examined in terms of perspectives that include project location, design and technical factors. Advantages of each alternative plan will be covered.	No discrepancies.	—	—

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
6.	Screening	In accordance with project characteristics and the site description, proposed projects will be categorized as stated in 1 above, and a decision will be made as to whether an environmental and social consideration study is required.	Proponents will submit project plans to NEMA for screening to determine whether an environmental impact assessment needs to be conducted (scoping). As a result, the proposed project will be classified into either of the following two categories: <ul style="list-style-type: none"> • Projects for which an ESIA is not required • Projects for which an ESIA is required For projects for which an ESIA is required, the terms of reference (TOR) presented by NEMA at the time of scoping must be satisfied during preparation of the ESIA.	Although the categories are not exactly the same, there are no major discrepancies in the screening process.	—	—
7.	Scoping and formulation of TOR	Alternative plans to be analyzed, the range of significant and potentially significant impact to be assessed, and study methods will be chosen.	Project proponents will submit project plans to NEMA for screening to determine whether an environmental impact assessment is required (scoping). TOR will be presented by NEMA to the proponent.	No major discrepancies, as NEMA's screening process is provided for in Kenyan law	—	—

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
8.	Environmental impact to be assessed	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	Impacts to be assessed for environmental and social considerations are those that affect society, culture and the environment. The environment includes both the natural environment and construction environment, encompassing land, water, air, climate, noise, odor, fauna, flora and landscape.	Some items are not specifically provided for in the ESIA requirements as described by Kenyan law.	The ESIA will be checked for the necessary items. If there is an insufficiency in the items, an additional survey will be conducted in accordance with JICA Guidelines. (Noted accordingly in the ESIA.)	The ESIA report was found to have covered items required in JICA Guidelines. Therefore, without adding new items, field reconnaissance and interviews were conducted to investigate the facts described in the ESIA report, and to find more detailed information.

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
9.	Impact to be examined and considered	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	Direct, indirect, cumulative, irreversible, short-term and long-term impact (Article 18 of the Environmental (Impact Assessment and Audit) Regulations)	The impact of projects that are integral to the project are not covered by Kenyan law.	If there is any impact that is not addressed, an additional survey will be conducted in accordance with JICA Guidelines.	For activities that are integral to this project (such as well drilling conducted independently by the proponent), it has been confirmed that an ESIA report has been separately prepared and that environmental and social considerations have been implemented properly.

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
10.	Items to be included in the EIA report	The EIA report should include the following items (not necessarily in the order shown) : Executive summary Policy, legal, and administrative framework, Project description, Baseline data, Environmental impacts, Analysis of alternatives, Environmental Management Plan, Consultation	The following items should be included in the EIA reports: (1) Outline, (2) Applicable laws and regulations, and baseline data, (3) Other relevant information, and purposes, (4) Technical information and procedures during the operation period, (5) Materials to be used during the construction and operation periods, (6) Waste and waste disposal methods (7) Description of potential impact on the environment, (8) Impact on the environment, including the impact on society and culture, (9) Technological alternatives and reasons for selection, (10) Analysis of alternative plans, (11) Environmental management plans, (12) Plans to prevent possible accidents and disasters, (13) Methods to mitigate workers' health hazards and to ensure safety and security in working environments, (14) Understanding of gaps in knowledge and uncertainties, (15) Economic and social analyses, (16) Other environmental items, and (17) Items required by NEMA. (Article 18 of the Environmental (Impact Assessment and Audit) Regulations).	There is no requirement to include consultations in the ESIA under Kenyan law.	As the implementation of consultations is stipulated in EIA procedures, inclusion in the ESIA report will be coped with in accordance with JICA Guidelines. (Noted accordingly in the ESIA.)	It has been confirmed that consultations were implemented in the ESIA procedures.

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
11.	Environmental management plan and monitoring plan	<p>(1) Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial methods to fund such costs, must be determined. Plans for projects with particularly large potential adverse impacts must be accompanied by detailed environmental management plans.</p> <p>(2) During the implementation period of a project, monitoring must be conducted to identify whether any unforeseeable situations have occurred, and to determine whether mitigation measures have been implemented as planned and are as effective as expected. Appropriate measures must then be taken in response to the results of this monitoring.</p>	<p>(1) The formulation of environmental management plans, including monitoring systems, is stipulated. In addition, the law requires that the environmental management plan for eliminating or mitigating environmental impact includes costs, terms, and responsible persons.</p> <p>(2) Environmental monitoring is provided for in Article 35 of the Environmental (Impact Assessment and Audit) Regulations. The same article stipulates that monitoring items, parameters and procedures, as well as the corrective action to be taken in case of a hazard must be studied during monitoring. There also are provisions regarding the examination of the appropriateness of environmental management plans.</p>	No major discrepancies	—	—

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
12.	Information disclosure and participation of residents	<p>(1) Information disclosure: For projects likely to have a large adverse impact on the environment, sufficient consultations with stakeholders, including local community residents, must be conducted after the information has been disclosed. This must be done at an early stage, such as when alternatives for project plans are being examined. The outcome of these consultations must be incorporated in the contents of the project plans.</p> <p>(2) Participation of residents: To implement environmental and social considerations in a way most suitable to the local situation, as well as to establish an appropriate consensus, meaningful stakeholder participation must be ensured and stakeholders' opinions must be incorporated in any decisions that are made.</p> <p>(3) When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.</p>	<p>Public participation, public hearings, and information disclosure are defined respectively in Article 17, Article 22 and Article 29 of the Environmental (Impact Assessment and Audit) Regulations.</p> <p>(1) The ESIA and relevant documents submitted to NEMA will be opened to the public for viewing. However, proponents may keep some information undisclosed (with the approval of NEMA) for reasons of commercial confidentiality and national security implications.</p> <p>(2) After consultations with NEMA, proponents must locate people who may be affected by the project. The manner of notifying people of consultations with stakeholders and some other relevant details are specifically described.</p> <p>(3) In response to comments from third parties, NEMA may have the proponents open public hearings. Opinions expressed in the hearings must be compiled and submitted to the agency head.</p>	No requirement to incorporate stakeholders' opinions in planned projects is explicitly referred to in Kenyan law.	The extent of opinions expressed in stakeholders' consultations that will be incorporated in the planned project will be checked. Discussions with KenGen will be held with as needed, and discrepancies will be handled in accordance with JICA Guidelines.	In the interview with KenGen, it was confirmed that, among opinions expressed in the stakeholders' and local residents' consultations, those that needed to be responded to were incorporated in the mitigation measures, environmental management plan and environmental monitoring plan, included in the ESIA report. The ESIA report was checked to confirm that incorporation had been made to the extent viable.

No.	Item	Outline of JICA Guidelines	Outline of Kenyan EIA Law	Differences	How to Address Differences (Draft)	Contents of correspondence by field survey
13.	Consideration to the vulnerable people	Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities, all members of which are susceptible to environmental and social impacts and may have little access to decision-making processes within society.	The Environmental (Impact Assessment and Audit) 2003, Regulations Section 17 mentions about public participation and, Section 22 mentions about public hearing, but it does not describe the consideration of the vulnerable people.	Kenyan Laws do not mention of consideration of the vulnerable people.	Check the consideration of the vulnerable people of the Project. Carried out action based on JICA GL with consultation with KenGen, if necessary.	During the census and disclosure of the draft RAP, meeting with selected vulnerable groups (women and youth) was held. Special assistance will be provided by KenGen when requested. (RPA8-18.)
14.	Indigenous peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.	The Environmental (Impact Assessment and Audit) Regulations Section 17 mentions about public participation and, Section 22 mentions about public hearing, but it does not describe the consideration of indigenous peoples.	Kenyan Laws do not mention of consideration of indigenous peoples.	In the Project, the affected Maasai are considered as normal PAPs. Carried out action based on JICA GL with consultation, if necessary.	Affected Maasai people were consider as normal PAPs.

Source : The Environmental (Impact Assessment and Audit) Regulations (Legal Notice No.1, 2003)

Table 5-2 GAP Analysis with JICA Guidelines (RAP)

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	No specific provisions on avoiding involuntary resettlement and loss of means of livelihood.	Avoiding involuntary resettlement is not mentioned in Kenyan land laws	KenGen has considered alternatives to avoid and minimize involuntary resettlement.	Same as RAP.	No significant gap with JICA GL.	—
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	The Land Act Section 111. (1) requires just and full compensation to be paid promptly to the land owner for compulsorily land acquisition for public purpose.	Measures to minimize impact and to compensate for losses for certain case are mentioned in the law	Compensation will be provided based on WB O.P.4.12 Para.15. (RAPp2-2) People who lived at the site when the census was conducted, including squatters, are eligible for compensation (RAPp8-1 and 2 nd site survey)	Same as RAP.	No significant gap with JICA GL.	—
3.	People who must be resettled involuntarily and people whose means of	The Land Act Section 134. (1) requires the Commission to implement	Livelihood restoration is mentioned in Kenyan law.	Livelihood restoration will be provided. (RAPp4-2)	In resettlement site, schools, church, public hall, clinic, access road, cattle dip, water work for	No significant gap with JICA GL.	No significant gap with JICA GL. Since the road improvement and electricity

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
	livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	settlement programmes to provide access to land for shelter and livelihood, on behalf of the national and county governments.			cattle, fish pond, and bus are supplied by KenGen (MoU p13-15) Also electricity and fences for cattle are supplied for each household. Connection of electricity and transfer of legal rights to Community will be conducted after resettlement. Regarding those matters above, 1 st revised MoU was signed in October 2014. (1 st & 2 nd site survey)		connection, which is written in MoU, is not completed. KenGen should report the status of these infrastructures to JICA at proper timing.
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	According to The Land Act Section 113. (2), an award shall be based on (i) the size of the land; (ii) the value	Not mentioned about full replacement cost.	There is no information of the compensation in RAP. Regarding land	Land acquisition of the Project site (14.61million m ²) and relocation site is based on Market Value. (1 st & 2 nd	There is no significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
		(opinion of the Commission); (iii) the amount of the compensation payable.		plots in the resettlement site, agreement has been obtained on 16 Dec., 2011 from those who have the legal right. In the agreed document, it is written that a transaction price is agreed.(Short Term Assistance to KenGen p99) Compensation in kind for loss of land is conducted to PAPs. (RAPp8-4 ,8-15)	site survey) Regarding resettlement site, same as RAP. Although PAPs do not have legal rights for their lands, community land (6.88 million km ²) 3km away from original lands is offered to the PAPs. Productively as grazing ground is the same as the original land. Landlords of houses were compensated in replacement cost for their assets. (1 st & 2 nd site survey)		
5.	Compensation and other kinds of assistance must be provided prior to	The Constitution of Kenya requires prompt payment in full, of just	Kenyan Land Act stipulates that compensation is required to be paid	There is no information of the Project site in RAP.	The Project area has been acquired in 2010. Compensation	No significant GAP with JICA GL.	No significant gap with JICA GL. Since transferring the title deed of the

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
	displacement. (JICA GL)	compensation to the person (Article 40(3)) According to The Land Act Section 125. (1) , to obtain to temporary occupation of land., (1) The Commission shall, as soon as is practicable, before taking possession, pay full and just compensation to all persons interested in the land.	promptly.	Housing schedule will be determined after the tender award.(Part1p85)	payment for PAPs started on 18 Aug., 2014. Relocation to resettlement site started on 20 Aug., 2014 and completed on 5 Sep., 2014. Legal right for land will be transferred from KenGen to the Community 6 months after the resettlement. (1 st site survey)		resettlement site from KenGen to the Community is not completed. Should report to JICA upon completion.
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	The second schedule of EMCA, 1999, identifies projects that are supposed to be subjected to EIAs including Large-scale involuntary resettlement.	Kenyan Law does consider preparation of the Resettlement Action Plan as approval condition of EIA.	Draft RAP is disclosed and explained in stakeholder meetings in 4 villages. (RAPp6-5)	Draft RAP was disclosed at KenGen's website. Also the draft RAP was explained and disclosed by using 3 languages (English, Swahili and Maasai) in stakeholder	No significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
		Development of RAP is one of the EIA approval conditions.			meetings in 4 villages. (1 st site survey)		
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	The Land Act Section 112. (1) requires the Commission to appoint a date for an inquiry to hear issues of propriety and claims for compensation by persons interested in the land, at least thirty days after establishing the notice of intention to acquire land.	Kenyan Land Law stipulates contents of meetings with PAPs, but the level is not as detailed as in others including JICA GL and WB There is no Kenyan Law which mentions about disclosure of RAP.	Disclosure of RAP will be conducted based on WB O.P.4.12 Para.2 (b). (2 nd site survey) Questionnaires and meetings were conducted as tools for census. (RAPp2-5) Public consultation was held after the disclosure of Draft RAP (RAP6-5)	Same as RAP.	No significant GAP with JICA GL.	—
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	The Land Act Section 112. (1) requires that date accepting public inquiry regarding land acquisition should be noticed to (National) official gazette.	Kenyan Land Law stipulates ways of meeting with PAPs, but the level is not as detailed as in others including JICA GL and WB	Questionnaire for census was translated from English to Swahili and Maasai language. (RAPp2-5)	Stakeholder meeting is conducted in two languages (English and Swahili) with translator. Meetings are decided at RAPIC meeting, then letters and	No significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
					telephones are used to inform the head of community.		
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	The Land Act Section 134. (4) requires that committee members for compensation entitlements include women, young people, and people who necessary require special needs.	Kenyan Land Law stipulates public participation for making process of RAP, but The level is not as detailed as in others including JICA GL and WB	<p>-Planning stage Questionnaires and meetings held at several locations were used as a tool for census. (RAPp2-5) Public consultation was conducted at several locations after the disclosure of Draft RAP (RAP6-5)</p> <p>-Implementation stage A draft action plan has been prepared by KenGen and will be finalized by receiving green light from NEMA. (Part IIp65)</p> <p>-Monitoring stage</p>	<p>-Planning stage Same as RAP.</p> <p>-Implementation stage Stakeholder meeting is held on monthly basis. (1st site survey)</p> <p>-Monitoring stage Monitoring shortly after the replacement was conducted at the resettlement site. Survey by external consultant will be conducted in end of Feb, 2015 (6 months after resettlement). Monitoring by lenders such as WB is conducted. (1st</p>	No significant GAP with JICA GL.	No significant gap with JICA GL. It is recommended that KenGen conduct monitoring for livelihood restoration status until livelihood return to at least the original level. Since it is important to share the information of livelihood restoration, It is recommend that KenGen share the monitoring results in resettlement sites with stakeholders, such as JICA and PAPs.

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
				KenGen (the lead) and RAPIC will conduct monitoring. (RAPp11-4)	site survey)		
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	The Land Act provides a mechanism for dealing with grievances including lodging complaints to the Environment and Land Court (Section 150)	Kenyan Land Law provides grievance mechanisms, but the level is not as detailed as in others including JICA GL and WB.	Grievance and Conflict Handling Mechanism is established. (RAPp9-1)	Grievance and Conflict Handling Mechanism has been established and used. (1 st site survey.)	No significant GAP with JICA GL.	—
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic	Based on the Land Act section 134 (1), resettlement program is required, but no description of census and cut-off-date.	No census and cut-off date requirement in Kenyan Laws.	In the RAP, census was conducted and the methods and the results are described. Cut-off date of compensation is 16 Sep. 2009, which is the first day of census.	Same as RAP.	No significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
	survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)						
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land	According to the constitution, compensation to be paid to occupants in good faith who may not hold title to the land (Constitution Article 40 (4)) Based on the Land Act section 134 (2), legal rights identified in resettlement program are included.	Kenyan Law recognizes eligibility to squatters who do not have legal rights, but the level is not as detailed as in others including JICA GL and WB.	Eligibility criteria for compensation are based on WB O.P.4.12 Para.15. (RAPp2-2)	Same as RAP.	No significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
	they are occupying. (WB OP4.12 Para.15)						
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	No specific provisions on The Kenyan Law.	There is no preference to land based resettlement strategies.	There is no information of the Project site in RAP. Land for resettlement site was acquired from legal land owner in Dec. 2012, after agreement to provide cash compensation to the owner. (Short Term Assistance to KenGen p100) Land to land compensation will be conducted for squatters. (RAP p8-8)	Land for the Project was bought from legal land owner in 2010. (1 st site survey) Regarding compensations for those who do not have legal rights to lands, same as RAP. Legal right for resettlement site is transferred from KenGen to the Community 6 months after the resettlement. (1 st site survey)	No significant GAP with JICA GL.	—
14.	Provide support for the transition period (between displacement and	No specific provisions on The Land Act.	The Kenyan law does not mention provision of support during	Moving allowance is provided to land owner, tenant, teacher going back	Moving allowance was provided to land owner, land tenant, and	No significant GAP with JICA GL.	—

No.	JICA Guidelines	Laws of Kenya	Gap between JICA Guidelines and Laws of Kenya	Resettlement Policy for this project in the RAP June 2012.	Actual Implementation MoU of July, 2013 and 1st & 2nd site survey	Gap between JICA Guidelines and Actual Implementation	Recommended Action
	livelihood restoration). (WB OP4.12 Para.6)		transition.	to home (RAPp8-15)	vulnerable people (MoUp8-18, 2 nd site survey) Housing owners and housing tenants receive cash equivalent to 3 month rent. (MoUp9) (Teachers were provided housing in the school at the resettlement site. (MoUp12))		
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	According to The Land Act Section 134.(4), women, youths and vulnerable people are members of the committee which identifies beneficiaries of resettlement.	The Kenyan Land Act provides particular attention to women and youth, but the level is not as detailed as in others including JICA GL and WB.	During the census and disclosure of draft RAP, meeting with selected vulnerable groups (women and youth) was held. Special assistance will be provided by KenGen when requested. (RPA8-18.)	Same as RAP	No significant GAP with JICA GL.	—

6. ALTERNATIVE ANALYSIS

For the location of the power plants, the power generation systems and the transmission line routes, alternative analysis was conducted in order to reduce negative environmental and social impacts, including impacts to land acquisition and resettlement, and the Project cost, as well as to maximize the achievement of the Project. Alternatives may affect the fluid collection and reinjection system, but there will be no major changes to the steam source selection or powerhouse design. Therefore, these unaffected factors are excluded from analysis.

6.1 Location of the power plants

- Alternative 1: The Olkaria V Project location proposed in Manvit Optimization Study Report (2012)
- Alternative 2: The Olkaria V Project location decided by Olkaria Well Siting Committee in KenGen.
- Alternative 3: No Project (Zero option)

Alternative 3 (Zero option) has no negative environmental and social impact, but at the same time no positive impact for improvement of the electric power supply. In Alternative 1, the Project lies within Hell's Gate National Park, hence impacts for natural environment are expected and the additional mitigations would be necessary. In addition, consultation with the KWS and paying the rent for the use of land may cause delays of the construction and increased costs. On the other hand, Alternative 2, decided by the Olkaria Well Siting Committee in KenGen, seems to have smaller impact on the natural environment compared with Alternative 1, as the power plant lies outside the National Park. Also land acquisition and resettlement has already conducted by the Olkaria IV Project, so that additional consultations and land renting cost are not required. In consideration of the above, Alternative 2 is the most recommended option.

Table 6.1-1 Alternative Options

Item	Alt-1	Alt-2	Alt-3 (Zero option)
Location of the power plant	Power plant is located within Hell's Gate National Park.	Power plant is located outside Hell's Gate National Park.	N/A
Summary	Power plant (70MW x2), Steam collection system, Transmission line, etc.	Same as Alt-1.	N/A
Technical aspect	Improve tight demand and supply of electric power and contribute to stability of electric power supply.	Same as Alt-1.	Not improve tight demand and supply of electric power and unstable electric power supply.
Land Acquisition	Consultations with KWS about land use of Project area are required.	No additional land acquisition is required since the Project area was already acquired in Olkaria IV.	No impact
Economic aspect	Alt-1 Facilities is the same as Alt-2. However, cost for renting land and additional mitigation measures for natural environment are necessary in Alt-1 since Alt-1 is located within the Natural park.		N/A

Environment & Social Impact	Social environment	<p>Consultations with KWS about land use in Project area are required.</p> <p>-Impact to landscape in the National park is predicted since the Project is within the National Park.</p>	<p>Land acquisition and resettlement (56 households) has been conducted by the Olkaria IV project.</p> <p>Impact to landscape around the National Park is predicted.</p>	<p>As land acquisition and resettlement (56 households) has been conducted by the Olkaria IV project, the impact to those relocated households still remains even if the Project is abandoned.</p>
	Natural Environment	<p>Impact to natural environment such as rare species and habitat is expected since the site lies in the Hell's Gate National Park which is hardly artificially altered.</p>	<p>- No direct impact on Hell's Gate National Park by the Project</p> <p>- Minimal impact on the natural environment since the site is already disturbed (i.e. the site was occupied by Olonongot Primary School, pasture area & residential area.)</p>	<p>No impact</p>

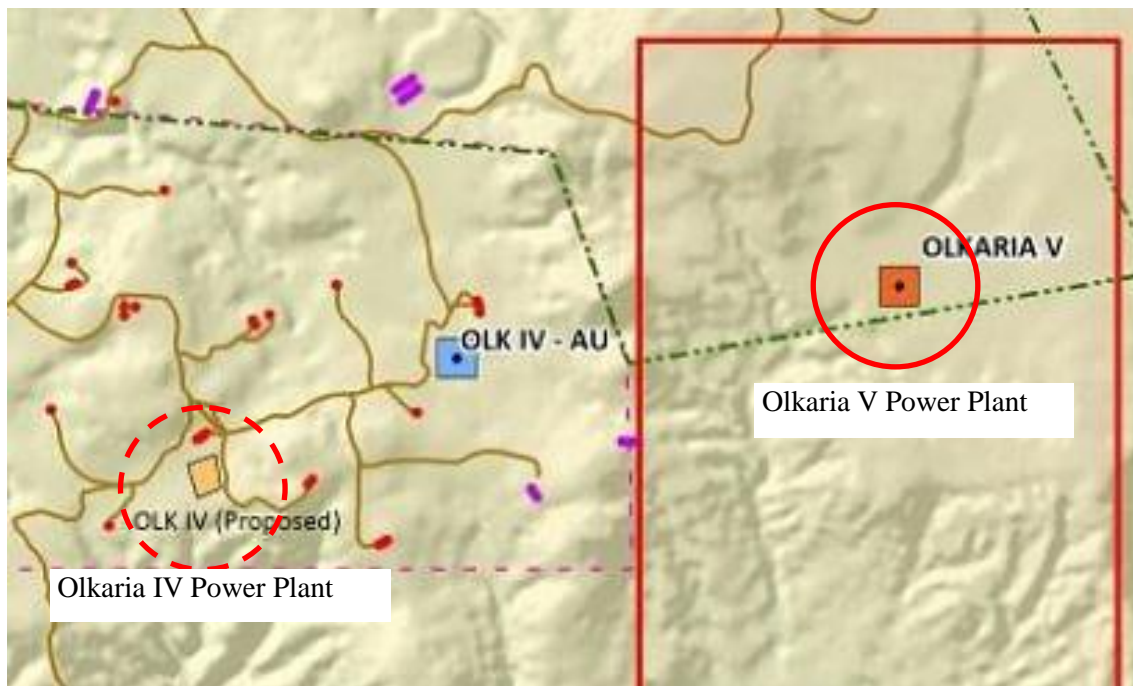


Fig. 6.1-1 Project Location in Alternative 1
 (○ : Location of power plant)

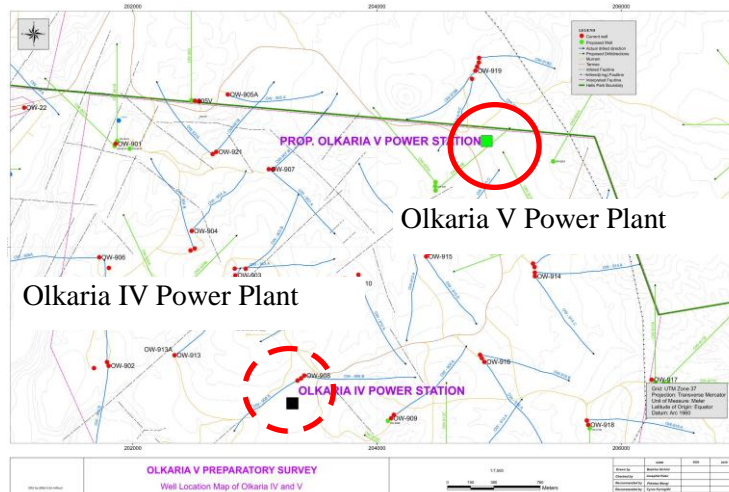


Fig. 6.1-2 Project Location in Alternative 2
(○ : Location of power plant)

6.2 Alternative power generation systems

The amount and components of non-condensable gas (NCG) contained in geothermal steam depend on the characteristics of each well, and do not vary between different types of power generation systems. Regardless of the type of power generation system chosen, the entire amount of NCG contained in geothermal steam will be released into the atmosphere.

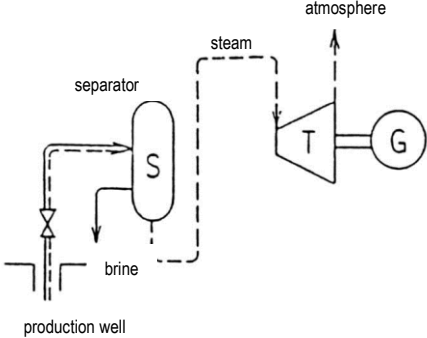
Power generation systems can be divided into six types, as shown in Table 6.2-1.

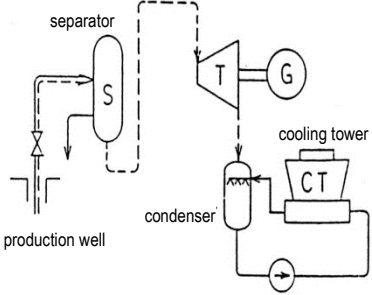
Of the three flash-cycle types, the single flash back-pressure type uses about twice as much steam as the single flash condensing type. In addition, as more production wells are added, it entails higher drilling cost and requires more altered land areas for construction of drilling pads and pipelines. The double flash condensing type runs with 15% to 25% greater efficiency than the single flash condensing type, as it generates low-pressure steam from separated hot water for use in power generation. However, since the hot water temperature then declines to around 110 degrees Celsius, there are concerns about it having an adverse effect on the geothermal reservoirs. In addition, hot water pipelines and reinjection wells tend to suffer blockage problems caused by silica scale. For the reasons stated above, these two types are not recommended for the Olkaria V project.

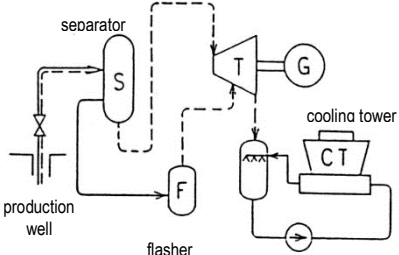
Of the three binary cycle types, the type that uses both steam and hot water and the combined cycle type come with concerns about their negative impact on geothermal reservoirs (as with the double flash condensing type). With these two types, attention needs to be paid to the potential problems that silica scale may cause. With the hybrid type, there also are concerns over a negative impact on geothermal reservoirs, and silica scale problems tending to occur easily. Moreover, in addition to the increased construction costs incurred by constructing two plants separately, this type is likely to incur greater environmental impact due to the transmission lines, because complicated transmission and substation facilities are required. For the reasons stated above, the three binary cycle types are not recommended for the Olkaria V project.

Among the flash cycle types, the single flash condensing type is relatively efficient, and many have been used in Kenya and other countries. Based on these facts, the single flash condensing type is recommended for the Olkaria V power plant.

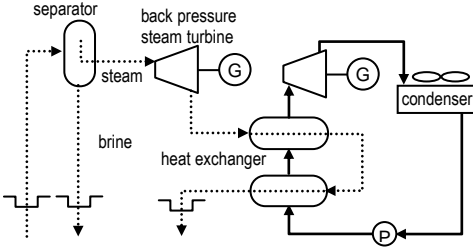
Table 6.2-1 Power generation system

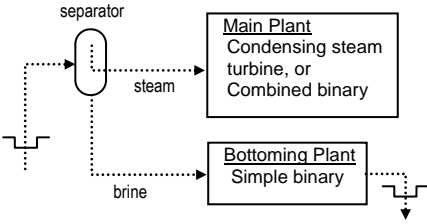
Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
Flash cycle	Alt-1 Single flash back pressure		<ul style="list-style-type: none"> • The entire amount of NCG contained in steam is discharged into the atmosphere along with the exhaust gas from turbine. • Although a cooling tower and condenser are not needed, a turbine exhaust silencer is instead required. For this reason, almost the same site area as that needed for a condensing type system is required. 	<ul style="list-style-type: none"> • Due to poor efficiency (steam consumption is about double that used by the condensing type), gas emissions are about double those of the single flash condensing system (Alt-2). It also emits more H₂S than any of the other types. Therefore, the possibility of generating offensive odour is the highest.. • Not recommended because the system requires more production wells, which entails increased drilling costs as well as more land alterations for the construction of drilling pads and pipelines. • If this system is used for distributed wellhead power generation, it requires complicated substation facilities. It is also likely to incur greater environmental impact due to the transmission lines than other types. 	High	Not recommended for Olkaria V

Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
	Alt-2 Single flash condensing (recommended for this project)		<ul style="list-style-type: none"> • Recommended system for this project • Relatively efficient, and has been used in many power plants in Kenya and other countries. • The entire amount of NCG contained in the steam is sent from the condenser to the cooling tower fan via the gas extracting device, and dispersed into the atmosphere after being diluted with air. 	<ul style="list-style-type: none"> • Since the system uses slightly more steam than Alt-3 to Alt-6, H₂S emissions increase accordingly. Therefore, the possibility of generating offensive odour is slightly higher than Alt-3 to Alt-6. 	Low	Recommended for Olkaria V

Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
	Alt-3 Double flash condensing		<ul style="list-style-type: none"> The entire amount of NCG is sent from the condenser to the cooling tower fan via the gas extracting device, and then dispersed into the atmosphere after being diluted with air. The system is 15% to 25% more efficient than the single flash condensing type (Alt-2), as it generates low-pressure steam from separated hot water and uses it in power generation. Hot water temperature declines to around 110 degrees Celsius, which raises concerns over adverse effects on the geothermal reservoirs. In addition, the silica scale tends to cause blockages in hot water pipelines and reinjection wells. 	<ul style="list-style-type: none"> This system has the advantage of greater efficiency than the single flash condensing system (Alt-2). However, as a larger cooling tower is required to accommodate the low-pressure steam, the required site area is no smaller than the single flash condensing type (Alt-2). As fewer production wells are used, fewer geothermal well pads may be needed. However, a larger number of reinjection wells may be required due to the lower reinjection pressure, which may result in an increase in the number of geothermal well pads. This means the required site area is identical to that needed for a single flash condensing system. 	Medium	Not recommended for Olkaria V

Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
Binary cycle	Alt-4 Steam and hot water combined use		<ul style="list-style-type: none"> • The entire amount of NCG contained in the steam is released into the atmosphere from the heat exchanger. • Using heat energy of separated hot water, the system has slightly greater efficiency than the single flash condensing type (Alt-2). However, output declines during the daytime as thermal efficiency is affected by atmospheric temperatures. • As with the double flash condensing system, there are concerns over its adverse impact on the geothermal reservoirs. In addition, attention needs to be paid to the problems that may be caused by silica scale. 	<ul style="list-style-type: none"> • If an air-cooled condenser is to be used, the system may require a larger site area than the single flash condensing type (Alt-2). • If a wet cooling tower (the same type used with the single flash condensing system) is to be used, the required site area will be identical to that needed for a single flash condensing system. • Depending on design conditions, H₂S emissions may be less than that of Alt-2. 	Me- dium	Not recom- mended for Olkaria V

Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
	Alt-5 Combined cycle		<ul style="list-style-type: none"> The entire amount of NCG contained in the steam is released into the atmosphere from the heat exchanger. If separated hot water is reinjected as is, the efficiency is equal to that of the single flash condensing type (Alt-2). However, output declines during the daytime, as thermal efficiency is affected by atmospheric temperatures. 	<ul style="list-style-type: none"> Same as above 	High	Same as above

Category	Generation system type	Schematic diagram	Technical features	Environmental impact	Cost	Evaluation
	Alt-6 Hybrid		<ul style="list-style-type: none"> • The entire amount of NCG contained in the steam is released into the atmosphere from the main plant. • The system offers greater total output than the single flash condensing type (Alt-2). However, output of the bottoming plant (hot water binary cycle generation) declines during the daytime, as thermal efficiency is affected by atmospheric temperatures. • As with the double flash condensing type, there are concerns over adverse impact on the geothermal reservoirs. In addition, silica scale problems tend to easily occur. • As two plants must be constructed separately, construction costs are higher. 	<ul style="list-style-type: none"> • As complicated transmission and substation facilities are required, the environmental impact of transmission lines is likely to be greater than with other system types. • The required power plant site area, including the main and bottoming plants, is larger than that needed for a single flash condensing system. 	High	Not recommended for Olkaria V

6.3 Alternative the transmission line routes

- Alternative 1: The transmission lines will be installed on the east side of the powerhouse, outside the boundaries of Hell's Gate National Park area.
- Alternative 2: The transmission lines will be installed on the west side of the powerhouse, outside the boundaries of Hell's Gate National Park area.
- Alternative 3: No transmission lines will be installed (zero option).

Alternative 3 (zero option) imposes no negative impact on the natural or social environment. With this alternative, however, generated electricity cannot be delivered to the sources of demand, nor can it help solve the current problems of power supply-demand conditions with insufficient supply capacity.

There are no major differences between Alternatives 1 and 2 in terms of environmental and social impacts. Therefore, the two plans were analyzed in terms of their economic and technical aspects, and Alternative 1 was determined to be preferable.

Table 6.3-1 Alternative options

Item	Alt-1	Alt-2	Alt-3 (Zero option)
Transmission line location	Transmission line route is outside the Hell's Gate National Park boundaries.	Same as Alt-1	N/A
Outline of each alternative	Two 220-kV lines (joint use of the same transmission towers) connecting the Olkaria V and IV power plants.	Same as Alt-1	N/A
Reason for route selection	The transmission lines from the Olkaria V power plant cannot take a straight route to connect to the switchyard of the Olkaria IV power plant, as the Olkaria IV main building is in the way. Therefore, a route that runs along the mountainside east of the power plant was selected in a way that avoids excessive height differences, passing near wells (as much as possible) and interfering with existing transmission lines.	The transmission lines from the Olkaria V power plant cannot take a straight route to connect to the switchyard of the Olkaria IV power plant, as the Olkaria IV main building is in the way. Therefore, a route that runs along the west side of the power plant west of the power plant was selected in a way that avoids excessive height differences, passing near wells (as much as possible) and interfering with existing transmission lines.	N/A
Technical comparison	The transmission lines have the capacity to safely transmit electric energy generated in the Olkaria V power plant. The overall length of the	The transmission lines have the capacity to safely transmit electric energy generated in the Olkaria V power plant. The overall length of the	The tight supply-and-demand conditions of electric power and the stability of supply cannot be improved.

Item	Alt-1	Alt-2	Alt-3 (Zero option)
	transmission line route is approx. 5 km. Switchgears for the two lines will be installed in a space that has been kept empty for future use on the east side of the Olkaria IV switchyard.	transmission line route is approx. 4.5 km. The space that has been kept empty for future use on the west side of the Olkaria IV switchyard is insufficient for two lines. Therefore, the switchgears for the existing two lines will be moved toward the empty space on the east side, so that the west-side empty space can accommodate switchgears for the two new lines. (Moving and switching the existing transmission lines will involve service interruption.)	
Economic comparison	For the transmission lines, Alt-1 will cost slightly more, as they run several hundred meters longer than Alt-2. Both Alt-1 and Alt-2 need new switchgear units for two lines, for which both plans cost the same. However, Alt-2 requires moving and switching the existing transmission line switching facilities, which will necessitate material, construction and testing costs. Therefore, Alt-1 costs less overall.		N/A
Land acquisition	Since the project area was already acquired during the Olkaria IV power plant project, there is no need to acquire additional land.		No impact
Environmental & social aspects	Social environment	Land acquisition and resettlement (56 households) were implemented in the Olkaria IV power plant project. The presence of the transmission lines may affect the landscape around Hell's Gate National Park.	Since land acquisition and resettlement were implemented during the Olkaria IV power plant project, the 56 resettled households will remain affected even if the project is cancelled at this time.
	Natural environment	Both Alt-1 and Alt-2 routes pass through bush or pasture for grazing, and do not cause alterations to ecologically significant sites.	No impact on the natural environment is expected.

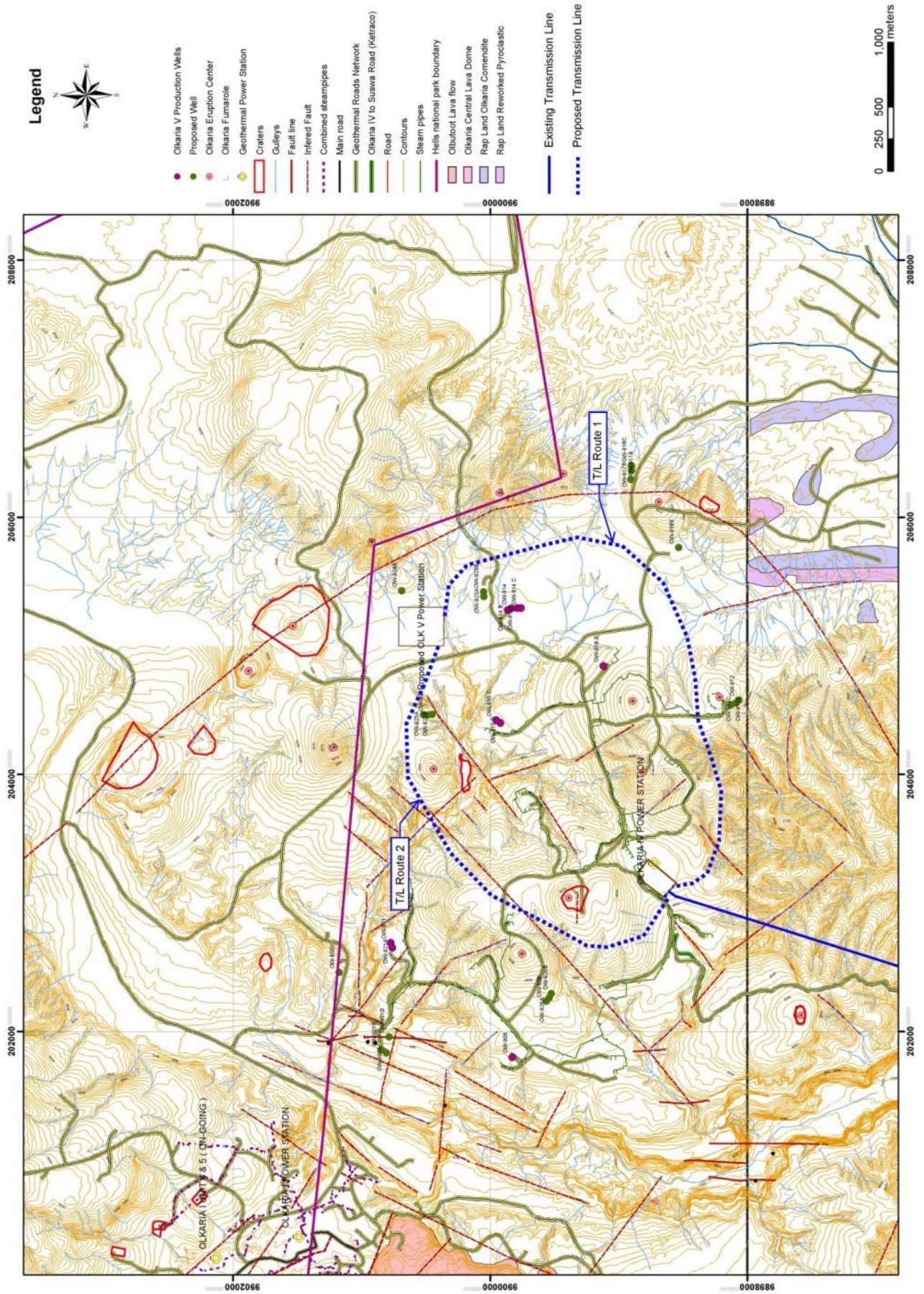


Fig. 6.3-1 Location map of Power transmission Line

7. SCOPING

A (draft) scoping of items that are presumed at present to have or not have an impact on the environment is shown in Table 7-1.

Table 7-1 Scoping

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
1. Pollution			
Air pollution	H ₂ S	B-	A- <p>Construction stage: The production testing conducted to evaluate the geothermal fluid reservoir will generate NCG that contains H₂S. This H₂S is likely to have a temporary impact on air quality in the neighboring areas. No impact is assumed by construction of the powerhouse, the fluid collection and reinjection systems, the transmission line, and the small road.</p> <p>Operation period: Since NCG containing H₂S will be constantly emitted from the cooling tower of the power plant, there may be an impact on air quality in the neighborhood of the power plant.</p> <p>There may also be cumulative impact, including the H₂S emitted from the existing power plant. No impact is assumed by operation of the fluid collection and reinjection systems, the geothermal wells, the transmission line, and the small road.</p>
	Dust	B-	D <p>Construction stage: Existing paved roads will be used to transport materials to and from the construction sites. This will create dust, and private homes or other such structures near the transport route may be affected to some degree.</p> <p>Operation period: There will be little or no particular impact in terms of dust, as vehicular traffic will be quite limited.</p>
Water contamination		D	D <p>Construction stage: Only storm water will be drained into gullies via natural process but effluent will be disposed of in an environmental sound manner e.g. use of septic tanks and brine containment ponds. As the volume will be insignificant, they will disappear via evaporation, etc. before they reach any rivers or lakes. There are no rivers in the project area. Impact is thus unlikely.</p> <p>Operation period: Only storm water will be drained into gullies via natural process but effluent will be disposed of in an environmental sound manner e.g. use of septic tanks and brine containment ponds. As the volume will be insignificant, they will disappear via evaporation, etc. before they reach any rivers or lakes. There are no rivers in the project area. Impact is thus unlikely.</p>
Waste		A-	B- <p>Construction stage: Industrial waste is likely to be generated by construction of the powerhouse, the fluid collection and reinjection system, geothermal wells, transmission lines, and small roads. During excavation work, waste soil from civil work is likely to be generated as well.</p> <p>Operation period: Industrial waste (sludge generated from cleaning of the cooling tower pit during inspection, and waste oil from turbines, etc.) is likely to be generated during the maintenance of the power plant, the small road.</p>

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
Soil contamination	B-	B-	<p>Construction stage: General effluents will be drained into gullies, which may contaminate the soil around the gullies.</p> <p>Operation period: For hot geothermal water, the entire volume will be reinjected deep underground, and soil contamination is unlikely. However, general effluents will be drained into gullies, which may contaminate the soil around the gullies. In addition, contamination may occur through continuous exposure to H₂S.</p>
Noise and vibration	B-	B-	<p>Construction stage: Noise generated by the testing of production wells, as well as noise and vibration created by the operation of construction machinery used for construction of the power station, the fluid collection and reinjection systems, the geothermal wells, the transmission line, and the small road, are likely to have some impact on the environment. In addition, the traffic of vehicles transporting materials to and from the construction sites may also have some impact if there are private homes or other such structures along the transport route.</p> <p>Operation period: Noise and vibration generated by the cooling towers, steam turbines, generators and other power plant equipment are likely to have some impact on the neighboring area.</p> <p>The planned project site is roughly 2.5 km from the nearest existing power plant, so a cumulative impact is unlikely.</p> <p>As noise and vibration from the fluid collection and reinjection system, the geothermal wells, the transmission lines and the small road will be extremely minor, no impact is expected.</p>
Ground subsidence	D	D	<p>Construction stage: No impact that could cause ground subsidence is likely during the study phase, because the emission of geothermal fluids is very brief. Construction of the powerhouse, the fluid collection and reinjection system, the transmission lines, and the small road is not expected to have any impact that could cause ground subsistence, either.</p> <p>Operation period: Although geothermal fluids will be extracted from deep underground, the entire volume will be reinjected. According to KenGen, ground subsidence has not occurred at the existing power plants and no reports or complaints regarding ground subsidence have been received. Therefore, impact is unlikely. The powerhouse, the fluid collection and reinjection system, the transmission lines and the small road operation are not expected to have any impact.</p>
Offensive odors	B-	B-	<p>Construction stage: H₂S generated during production testing may temporarily have some impact, in the form of offensive odors, on the neighboring area.</p> <p>Construction of the powerhouse, the fluid collection and reinjection system, the transmission lines, and the small road is not expected to have any impact.</p> <p>Operation period: The offensive odor of H₂S released from the cooling towers may have some impact on the neighborhood of the power plant.</p>

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
			There may also be cumulative impact, including the H ₂ S emitted from the existing power plant. The fluid collection and reinjection system, geothermal wells, transmission lines and the small road operation are not expected to have any impact.
Substratum	D	D	Construction stage/ Operation period: There are no rivers in the project area.
2. Natural Environment			
Protected area (National park)	B-	B-	<p>Construction stage: The powerhouse, geothermal wells, transmission lines and small roads will all be constructed outside the national park, and geothermal wells within the national park will not be used. Therefore, there will be no direct alteration to the national park. However, as the power plant is planned near the national park, impact from H₂S, noise, etc. is likely. The fluid collection and reinjection system will partly be constructed along the existing road in the national park. However, the impact on nature will be minimal, as the side of the road that was secured and readjusted for construction of the existing road will be used.</p> <p>Operation period: Impact from H₂S, noise, etc. from the power plants (including existing ones) is likely. The presence of the powerhouse, the fluid collection and reinjection system, the geothermal wells, the transmission lines and the small road may have some impact on the animals and landscape.</p>
Fauna, flora, and biological diversity	B-	B-	<p>Construction stage: Grasslands and bush are distributed throughout the project area, where felling of trees and land alterations for construction of the powerhouse, the fluid collection and reinjection system, geothermal wells, transmission lines and small roads may have some impact. H₂S generated by geothermal well drilling may also have some impact on animals and plants.</p> <p>Operation period: Presence of the existing and new powerhouses, the fluid collection and reinjection systems, geothermal wells, transmission lines and small roads may affect the distribution of animals and plants, as well as their breeding and living environments. H₂S released from the cooling tower may also have some impact on animals and plants.</p>
Hydrology	D	D	<p>Construction stage: Saline water generated from existing power plant operations will be recycled for well drilling, intake of cooling water for powerhouse construction will be only temporary and in very small amounts, and no large-scale water intake from Lake Naivasha will take place. Thus, there will be no impact. Even if a need for water intake arises for use in construction of the fluid collection and reinjection system, the transmission lines, and the small road, the required amount will be minimal, and there will be no impact on the hydrology.</p> <p>Operation period: Non-operational water will be drawn from</p>

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
			Lake Naivasha. As the volume is quite small, there will be no impact.
Groundwater	D	D	<p>Construction stage: No intake of groundwater for construction work is planned. Thus, impact on groundwater is unlikely.</p> <p>Operation period: No intake of groundwater for use in the power plant is expected. In addition, as reinjection wells and production wells will have steel casing pipes (water shielding pipes) inserted deep underground below an impervious stratum, gaps between well walls and pipes will be filled with cement, and collection and reinjection of geothermal fluid will be conducted deep underground, impact on groundwater is unlikely. The powerhouse, the fluid collection and reinjection system, the transmission lines and the small road operation will have no impact on the groundwater. If a hole is opened on the casing, cement will be poured from the ground into the well to close it.</p>
Soil erosion	B-	B-	<p>Construction stage: Construction of the powerhouse, the fluid collection and reinjection system, geothermal wells, transmission lines and small roads will produce exposed ground, and rainfall may cause this exposed ground to erode.</p> <p>Operation period: Soil erosion by rainfall is likely to occur if exposed ground remains bare for a prolonged period of time.</p>
Topographical and geological features	D	D	<p>Construction stage: Studies, construction of the powerhouse, the fluid collection and reinjection system, the transmission line, the small road, and well drilling will involve some topographical alteration of the land. However, no impact is likely as there are no significant topographical or geological features needing to be preserved in the area.</p> <p>Operation period: No impact is likely as there will be no construction that will cause alteration to topographical or geological features.</p>
Global warming/ climatic variation	D	B+	<p>Construction stage: Greenhouse gases generated by the construction of the powerhouse, the fluid collection and reinjection system, the geothermal well, the transmission line, and the small road will be minimal, and the impact of these emissions is expected to be temporary and minor.</p> <p>The construction site is in bush or grassland, and no felling of trees in forests will be needed. Therefore, the removal of plants will barely have any impact on greenhouse gas levels.</p> <p>Operation period: CO₂ and other components of non-condensable gas (NCG) will be released from the cooling tower.</p> <p>Compared with other steam power generation methods, greenhouse gas emissions from geothermal power generation are considerably small, which should contribute to reductions in CO₂ emissions in Kenya. There will be no direct release of CO₂ from the fluid collection and reinjection system, the geothermal wells, the transmission lines or the small road.</p>

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
3. Social Environment			
Land acquisition and resettlement	A-	D	<p>Before Construction: Land acquisition for the power plant, the pipelines and the power transmission lines has been conducted by Olkaria IV.</p> <p>During Construction: Resettlement has been conducted in Olkaria V project area.</p> <p>During Operation: Land acquisition and resettlement will be completed before construction. No land acquisition and resettlement will be expected during operation phase.</p>
Living and livelihood	B+	B+	<p>During Construction and Operation: Some reduction of grazing land is expected but alternation of living and livelihood is not expected. Also employment opportunity seems to increase during construction and operation phase.</p>
Heritage	D	D	<p>During Construction and Operation: No heritage or cultural assets are expected in the Project site.</p>
Landscape	B-	B-	<p>During Construction and Operation: The Project may have impact to landscape from observation deck in the National Park, which is neighboring the Project site. Also impacts by the pipeline and the power transmission line to the landscape are expected.</p>
Ethnic minorities and indigenous peoples	D	D	<p>During Construction and Operation: In the Project, the Maasai are not considered Ethnic Minorities or Indigenous Peoples. They are considered and treated as normal PAPs in the Project. (During the Olkaria IV Project, WB supported the process of making RAP, and WB considered the Maasai as normal PAPs in the RAP.)</p>
Poverty groups	C	C	<p>During Construction and Operation: Inhabitation status of poverty groups in the Project site is unknown.</p>
Land use / Natural resource	B-	D	<p>During Construction: Acquisition and alternation of some grazing lands owned by a private company are required by the Project construction. In other parts of the Project site, alternation of land use is not expected.</p> <p>During Operation: alternation of land use is not expected during operation phase.</p>
Water Use	C	C	<p>During Construction and Operation: No large scaled water use is expected, but KenGen and horticulture activities using water from Lake Naivasha may have impacts on other water uses.</p>
Existing social Infrastructures and social services	D	D	<p>During Construction and Operation: Construction and operation activities are expected to have no impact on social infrastructures and social services.</p>
Social institutions and local decision making institutions	D	D	<p>During Construction and Operation: Geothermal power plants have been operated since 1981 in the area, and also construction of other power plants were conducted in the area. Thus significant impact to the local society by the Project is not expected.</p>

Item	Evaluation		Reason
	Const- ruction stage	Opera- tion period	
Misdistribution with unfair distribution of benefits and damages	B-	D	During Construction: When the Project employs local laborers, there might be misdistribution with unfair distribution of benefits and damages. To avoid the misdistribution, appropriate measures will be considered. During Operation: Since the project provides power supply as public service, no misdistribution with unfair distribution of benefits and damages is expected.
Gender	C-	C-	During Construction and Operation: The Project might have impact on women who are making their living selling local crafts. Also men, as a head of household, might not distribute compensation to women.
Children's rights	D	B+/C	During Construction and Operation: A school will be established in the resettlement site so that the opportunity for children to study will increase. Children might be affected by resettlement as they have less opportunity to state their opinions in the society. NB/ In this case as we observed, there is positive impact on children because of the establishment of the school which will be well equipped with the teaching and learning materials. According to Kenyan Constitution every child has a right to education.
Local conflicts of interest	D	D	During Construction and Operation: Since the project provides power supply as public service, no Local conflicts of interest are expected during operation phase. However, in the construction phase, appropriate measures should be considered during compensation payment.
Health / Public health	B-	B-	During Construction and Operation: There might be risks that H ₂ S and noise cause health damage to local people.
Infectious disease such as HIV/AIDS	B-	B-	During Construction and Operation: Because the scale of construction and operation are large, influx of labor is expected. There might be risks that the influx of labor causes diffusion of infectious disease such as HIV/AIDS.
Working condition	B-	B-	During Construction: Accidents during construction and disease occurrence risk are expected. During Operation: Accidents during operation are expected.
4. Others			
Accidents	C	B-	During Construction: With insufficient safety management, ejection of geothermal fluid during survey, accident during construction and traffic accident may increase. During Operation: With insufficient safety management, leakage of high concentration H ₂ S gas, blowout high temperature steam and shatter of hot water can be expected.

* A: Significant impact is likely.

B: Some degree of impact is likely

C: The degree of impact is unidentified, and future investigation for clarification is needed.

D: As the impact will be minimal, future investigation is unnecessary.

+: Positive impact

-: Negative impact

8. TOR OF EIA SURVEY

Based on the scoping results, the TOR of the EIA survey was considered as given below. The baseline data was obtained by KenGen through the ESIA and other surveys, and no additional surveys will be required.

Table 8-1 TOR of EIA survey

Item		Survey item	Surveying technique
1.Pollution			
Air pollution	H ₂ S	Simulation results of H ₂ S around the power plant, emitted from the cooling towers during the operation period	<ul style="list-style-type: none"> • Site survey, survey of existing data • Hearings for the records of existing power plants
	Dust	Impact of dust on private homes or other such structures along the route used to transport materials, and mitigating measures to be taken	<ul style="list-style-type: none"> • Site survey, survey of existing data
Waste		Disposal method for waste soil from civil work and industrial waste	<ul style="list-style-type: none"> • Survey of existing data
Soil contamination		Disposal method for general effluents	<ul style="list-style-type: none"> • Site survey, survey of existing data
Noise and vibration		Noise simulation, and impact of noise on surrounding private homes and other such structures, as well as mitigating measures to be taken	<ul style="list-style-type: none"> • Site survey, survey of existing data
Offensive odors		Simulation results of H ₂ S around the power plant emitted from the cooling towers during the operation period	<ul style="list-style-type: none"> • Site survey, survey of existing data
2.Natural Environment			
Protected area (National park)		Simulation results of H ₂ S and noise from the power plant. Impact on animals from the noise of the existing power plants and the presence of facilities	<ul style="list-style-type: none"> • Site survey, survey of existing data • Confirmation of regulations, etc. covering geothermal development around the national park • Site survey, survey of existing data • Confirmation of background to consensus with the national park administrator (KWS) regarding the Olkaria V Project • Implementation of hearings with the responsible official at KWS
Fauna, flora, and biological diversity		Impact of tree felling and land alterations, and presence of the existing power plant facilities on the distribution of animals and plants and on their breeding and living environments, as well as mitigating measures.	<ul style="list-style-type: none"> • Site survey, survey of existing data • Hearing of KWS • Survey of monitoring plan
Soil erosion		Preventive measures for soil erosion	<ul style="list-style-type: none"> • Site survey, survey of existing data
3.Social Environment			
Land acquisition		Monitoring in resettlement site and study of mitigation measures against resettlement impact	<ul style="list-style-type: none"> • Site survey & existing document study • PAPs Survey and RAP

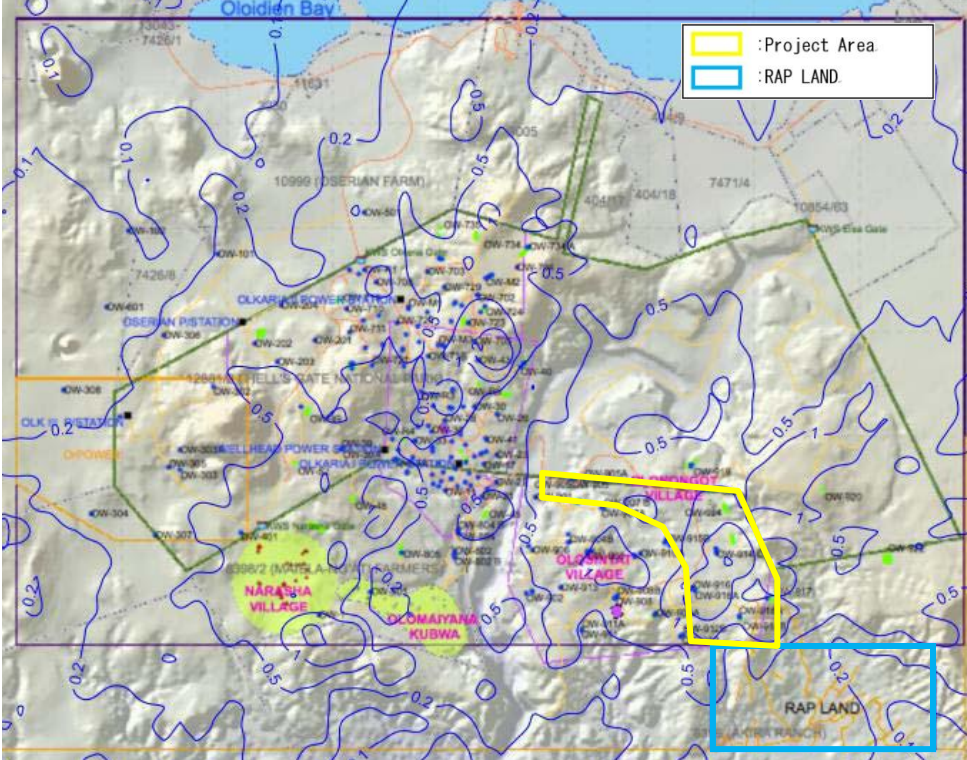
Item	Survey item	Surveying technique
and resettlement		development (Conducted by sub-contractor) <ul style="list-style-type: none"> • Due Diligence Report • Corrective Action Plan development if there are any significant gaps with JICA GL
Landscape	Study of mitigation measures against impact to landscape	<ul style="list-style-type: none"> • Site survey & existing document study • Study of mitigation measures against impact to landscape • Hearing survey to KWS about the Project area
Poverty groups	Impact assess to poverty groups by the Project, and study of the mitigation measures	<ul style="list-style-type: none"> • Site survey & existing document study • Ensuring participation of stakeholder at meetings and opportunity for their remarks.
Land use / Natural resource	Impact assessment to land use / natural resource by the Project, and study of the mitigation measures	<ul style="list-style-type: none"> • Site survey & existing document study • Consideration of compensation to the people affected by alternation of land use.
Water use	Impact assessment to water use / water resource by the Project	<ul style="list-style-type: none"> • Site survey & existing document study • Information collection and analysis of water resources • Information collection and analysis of water use
Misdistribution with unfair distribution of benefits and damages	Study of employment opportunity and employment of local laborers	<ul style="list-style-type: none"> • Site survey & existing document study • Study of employment strategy for local laborers
Gender	Impact assessment to women by the Project, and study of the mitigation measure	<ul style="list-style-type: none"> • Site survey & existing document study • Ensuring participation of stakeholder at meetings and opportunity for their remarks.
Children's rights	Impact assessment to children by the Project, and study of the mitigation measure	<ul style="list-style-type: none"> • Site survey & existing document study • Ensuring participation of stakeholder at meetings and opportunity for their remarks.
Health / Public health	Impact assessment to neighborhood resident's health by the Project, and study of the mitigation measure	<ul style="list-style-type: none"> • Site survey & existing document study • Ensuring participation of stakeholder at meetings and opportunity for their remarks. • Air pollution and noise impact assessment to neighborhood residents and study of the mitigation measure
Infectious disease such	Study of HIV prevalence in the Project neighboring area.	<ul style="list-style-type: none"> • Site survey & existing document study

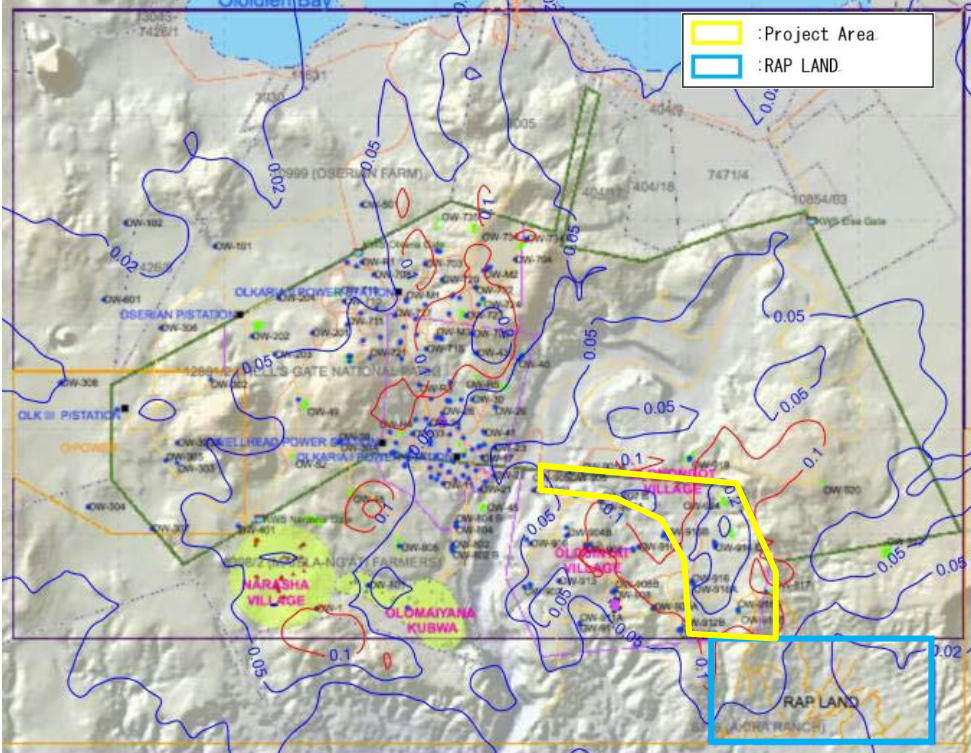
Item	Survey item	Surveying technique
as HIV/AIDS	Information collection of Relevant organizations	<ul style="list-style-type: none"> • Study of the mitigation measure against infectious disease such as HIV/AIDS • Development of HIV prevention plan before detail design stage
Working condition	Industrial health and safety measures	<ul style="list-style-type: none"> • Site survey & existing document study • Confirmations of regulations and efforts for Health and Safety in KenGen
4.Others		
Accidents	Accident risks around the project sites during construction and operation, and mitigation measures to reduce risk.	<ul style="list-style-type: none"> • Site survey (check status of the surround of the Project area) • Development of accident prevention plan (H₂S accident prevention plan and traffic management plan) before detail design stage

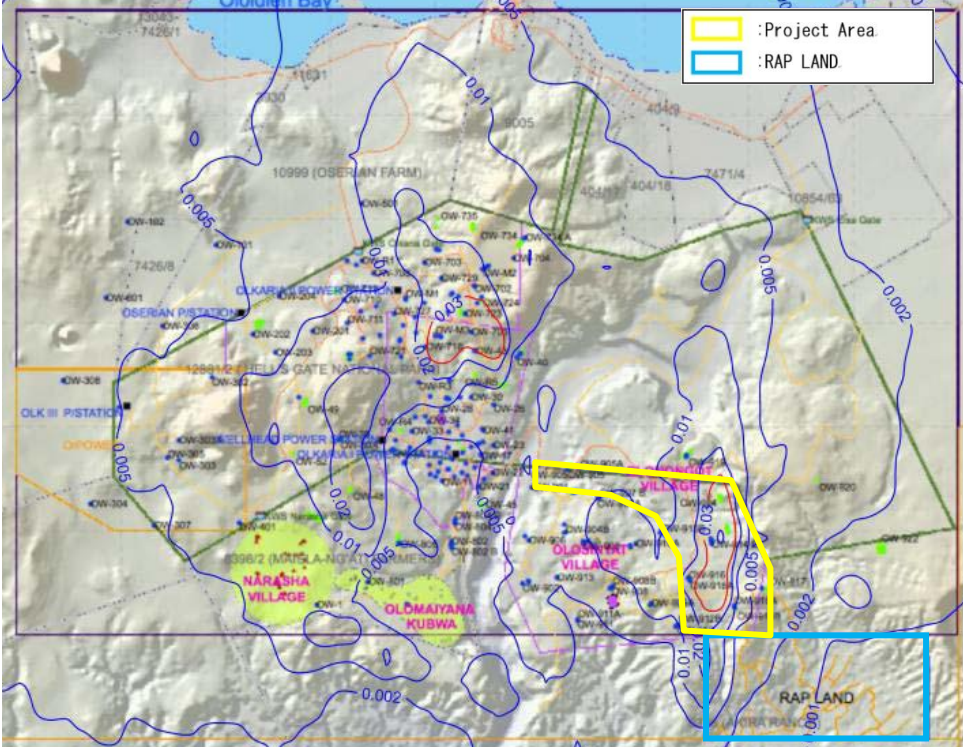
9. RESULT OF SURVEY ON ENVIRONMENTAL AND SOCIAL CONSIDERATION

Based on the TOR of the environmental and social consideration survey, the Team conducted the survey and the result is shown below.


Item	Result of survey																							
1.Pollution																								
Air pollution	H ₂ S	<p>a) Environmental criteria, etc.</p> <p>Since environmental standards for H₂S have not been established in Kenya, criteria in guidelines established by the World Health Organization (WHO) will be applied (Table 9-1). As for the density per hour, 0.03ppm of the criteria in California are recommended.</p> <p>Effects of H₂S on humans are shown in Table 9-2.</p> <div style="text-align: center;"> <p>Table 9-1 WHO guideline values for H₂S</p> <table border="1" data-bbox="584 763 1217 927"> <thead> <tr> <th data-bbox="584 763 815 842">Item</th> <th data-bbox="815 763 967 842">Averaging time</th> <th data-bbox="967 763 1217 842">Guideline values</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 842 815 927">Hydrogen sulfide (H₂S)</td> <td data-bbox="815 842 967 927">24 hours</td> <td data-bbox="967 842 1217 927">0.1 ppm</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin-top: 10px;"> <p>Table 9-2 Human health effects of H₂S (Sinclair Knight and Partners, 1994)</p> <table border="1" data-bbox="528 994 1270 1738"> <thead> <tr> <th data-bbox="528 994 751 1066">Concentration (ppm)</th> <th data-bbox="751 994 1270 1066">Effect</th> </tr> </thead> <tbody> <tr> <td data-bbox="528 1066 751 1111">Below 1</td> <td data-bbox="751 1066 1270 1111">Odorous.</td> </tr> <tr> <td data-bbox="528 1111 751 1211">1-10</td> <td data-bbox="751 1111 1270 1211">Allowable exposure level for work performance. The use of protective gear for respiration is recommended.</td> </tr> <tr> <td data-bbox="528 1211 751 1312">10-20</td> <td data-bbox="751 1211 1270 1312">Maximum exposure level for work performance. The use of protective gear for respiration is essential.</td> </tr> <tr> <td data-bbox="528 1312 751 1447">20-100</td> <td data-bbox="751 1312 1270 1447">Olfactory senses are lost in 2 to 15 minutes. Headaches, nausea, cough, and skin irritation may develop. Eyes and throat may hurt.</td> </tr> <tr> <td data-bbox="528 1447 751 1525">100-200</td> <td data-bbox="751 1447 1270 1525">Olfactory senses are lost immediately. Eyes and throat may hurt.</td> </tr> <tr> <td data-bbox="528 1525 751 1626">200-500</td> <td data-bbox="751 1525 1270 1626">The capacity to think and the sense of balance are lost. Respiratory impairment develops in 2 to 5 minutes.</td> </tr> <tr> <td data-bbox="528 1626 751 1738">500-700</td> <td data-bbox="751 1626 1270 1738">Consciousness is lost. Breathing stops, and will result in death if resuscitation is not performed.</td> </tr> </tbody> </table> </div> <p>b) Impact during construction</p> <p>The ESIA report for Olkaria V contains no reference to the impact of H₂S during construction. The ESIA report for well drilling states that there will be impact if H₂S is discharged at levels of concentration beyond the recommendable range, but this can occur even in natural conditions in the Olkaria geothermal field.</p>	Item	Averaging time	Guideline values	Hydrogen sulfide (H ₂ S)	24 hours	0.1 ppm	Concentration (ppm)	Effect	Below 1	Odorous.	1-10	Allowable exposure level for work performance. The use of protective gear for respiration is recommended.	10-20	Maximum exposure level for work performance. The use of protective gear for respiration is essential.	20-100	Olfactory senses are lost in 2 to 15 minutes. Headaches, nausea, cough, and skin irritation may develop. Eyes and throat may hurt.	100-200	Olfactory senses are lost immediately. Eyes and throat may hurt.	200-500	The capacity to think and the sense of balance are lost. Respiratory impairment develops in 2 to 5 minutes.	500-700	Consciousness is lost. Breathing stops, and will result in death if resuscitation is not performed.
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Item	Result of survey
	<p>H₂S will be released into the atmosphere along with steam through the silencer provided on the well head during production testing, but the testing continues only for a short period of time. The landing distance of H₂S released during production testing is, in general, within the range of several meters to several tens of meters, while the nearest residences are more than 2 km away. During production testing, KenGen monitors H₂S.</p> <p>c) Predicted diffusion during operation</p> <p>Predictions of H₂S diffusion during the operation period were conducted in the ESIA. Figures 9-1 to 9-3 show the predicted H₂S diffusion during plant operation. H₂S emissions from the existing power plants are included in the predictions.</p> <p>The predicted maximum one-hour mean of H₂S concentrations (Figure 9-1) is less than 1 ppm in the nearest residential area in RAP LAND, so no significant impact on human health is foreseen, though some odor will be detectible.</p>  <p>Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014) (to which some amendments were added)</p> <p>Fig. 9-1 Predicted maximum one-hour mean of H₂S concentrations</p>

Item	Result of survey
	<p data-bbox="464 315 1390 412">The predicted maximum 24-hour mean of H₂S concentrations (Figure 9-2) is less than 0.1 ppm in the nearest residential area of RAP LAND, and falls within WHO guidelines.</p>  <p data-bbox="411 1216 1347 1267">Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014) (to which some amendments were added)</p> <p data-bbox="512 1305 1302 1339">Fig. 9-2 Predicted maximum 24-hour mean of H₂S concentration</p>

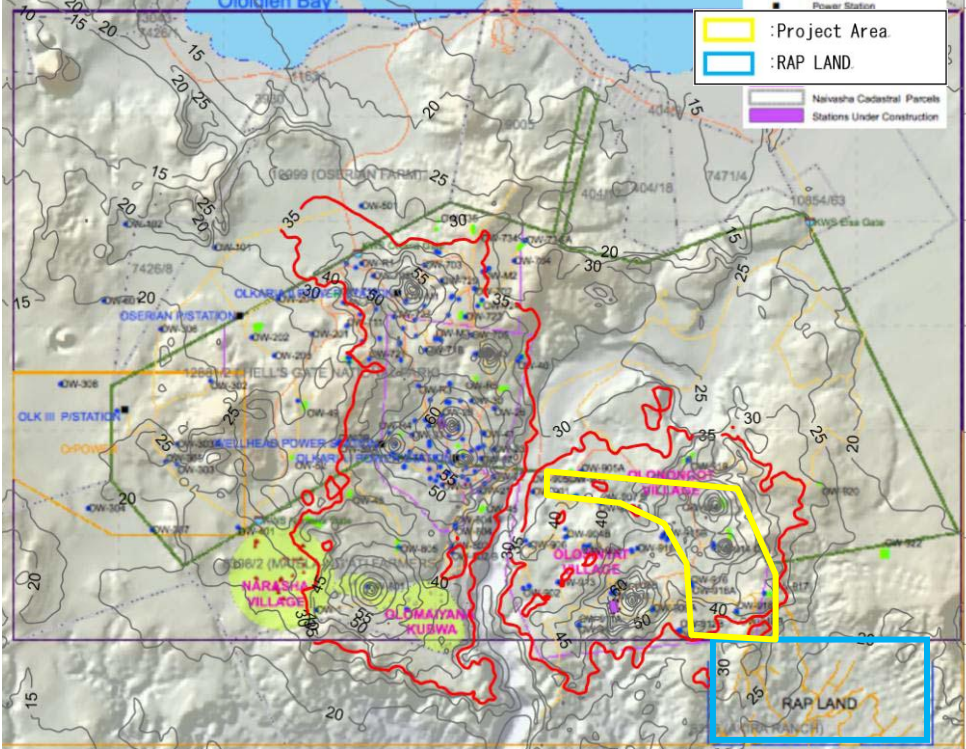
Item	Result of survey
	<p data-bbox="464 315 1390 409">The annual mean of H₂S concentrations (Figure 9-3) in the nearest residential area of RAP LAND is less than 0.03 ppm, which falls within the recommended criteria.</p>  <p data-bbox="413 1211 1345 1261">Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014) (to which some amendments were added)</p> <p data-bbox="632 1301 1187 1328">Fig. 9-3 Annual means of H₂S concentrations</p> <p data-bbox="464 1397 1390 1491">Based on the results of H₂S diffusion predictions, including the cumulative effects of existing power plants, H₂S from the Olkaria V project is expected to have no impact on residents in the neighboring area.</p> <p data-bbox="464 1516 1390 1610">As seen above, H₂S concentrations in RAP LAND fall within WHO guidelines, and therefore the employment of hazardous gas removal equipment, such as scrubbers, will basically be unnecessary.</p>

Item	Result of survey																																																																																																														
	<p>d) Monitoring in and around the existing power plants WHO guidelines stipulate exposure limits at 10 ppm or less for staff working 5 days a week, 8 hours a day. KenGen has been monitoring current H₂S concentrations at roughly 40 points in and around the existing power plants 3 days or more per week (basically every day) since 1997 (Figure 9-4).</p> <div data-bbox="493 519 1302 907" data-label="Image"> </div> <p>Fig. 9-4 H₂S monitoring device used in an existing power plant and records</p> <p>KenGen has been monitoring H₂S concentrations in the Olkaria geothermal project area since 1997. The monitored H₂S concentration values are shown in Table 9-3. The concentration levels of H₂S emissions confirmed so far have been less than the WHO limit of 10 ppm.</p> <p>Table 9-3 Monitored H₂S concentration values in the Olkaria geothermal project area</p> <table border="1" data-bbox="438 1189 1358 1975"> <thead> <tr> <th colspan="11">In and around Olkaria II (2003—2014)</th> </tr> <tr> <th>Monitoring point</th> <th>Compressor room</th> <th>Administrative office</th> <th>Thermal unit 2</th> <th>Cooling tower 3</th> <th>Olkaria 2 power plant</th> <th>Operation block</th> <th>Administrative room</th> <th>Main oil transfer pump</th> <th>Turbine</th> <th>KWS gate</th> </tr> </thead> <tbody> <tr> <td>Mean</td> <td>0.05</td> <td>0.04</td> <td>0.09</td> <td>0.07</td> <td>0.07</td> <td>0.07</td> <td>0.03</td> <td>0.05</td> <td>0.03</td> <td>0.02</td> </tr> <tr> <td>Max.</td> <td>2.5</td> <td>1.3</td> <td>5.1</td> <td>3.7</td> <td>2.1</td> <td>1.5</td> <td>1.7</td> <td>5.2</td> <td>2.7</td> <td>3.7</td> </tr> <tr> <td>Min.</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <th colspan="11">In and around Olkaria I (1997—2012)</th> </tr> <tr> <th>Monitoring point</th> <th>Excavation work site</th> <th>Olkaria 1 power plant</th> <th>GIS room</th> <th>Seal pit 1</th> <th>OW10 pad</th> <th>Science laboratory</th> <th>Near the lake</th> <th>Lakeside</th> <th>Ejector 1</th> <th>Turbine 1</th> </tr> <tr> <td>Mean</td> <td>0.02</td> <td>0.31</td> <td>0.02</td> <td>0.35</td> <td>0.07</td> <td>0.09</td> <td>0.00</td> <td>0.00</td> <td>0.19</td> <td>0.03</td> </tr> <tr> <td>Max.</td> <td>2.0</td> <td>4.4</td> <td>1.4</td> <td>6.1</td> <td>2.5</td> <td>3.1</td> <td>0.1</td> <td>0.0</td> <td>1.4</td> <td>1.2</td> </tr> <tr> <td>Min.</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> </tbody> </table> <p>Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014)</p>	In and around Olkaria II (2003—2014)											Monitoring point	Compressor room	Administrative office	Thermal unit 2	Cooling tower 3	Olkaria 2 power plant	Operation block	Administrative room	Main oil transfer pump	Turbine	KWS gate	Mean	0.05	0.04	0.09	0.07	0.07	0.07	0.03	0.05	0.03	0.02	Max.	2.5	1.3	5.1	3.7	2.1	1.5	1.7	5.2	2.7	3.7	Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	In and around Olkaria I (1997—2012)											Monitoring point	Excavation work site	Olkaria 1 power plant	GIS room	Seal pit 1	OW10 pad	Science laboratory	Near the lake	Lakeside	Ejector 1	Turbine 1	Mean	0.02	0.31	0.02	0.35	0.07	0.09	0.00	0.00	0.19	0.03	Max.	2.0	4.4	1.4	6.1	2.5	3.1	0.1	0.0	1.4	1.2	Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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Item	Result of survey
	<p>As suggested by monitor records for the existing power plants, H₂S levels in the Olkaria V power plant are expected to be less than 10 ppm. In fact, as the Olkaria V project employs newer technology than the existing Olkaria I and other plants, the impact of H₂S on workers and the surrounding environment is expected to be even less.</p> <p>In case of H₂S leakage accident, worker will evacuate based on Emergency Response Plan.</p>
Dust	<p>As the existing paved access roads will be used for transportation, dust will not be disturbed by material transportation.</p>  <p>Fig. 9-5 Access road to be used as transportation route (within the Olkaria V project area)</p> <p>Although dust may be disturbed during construction of the powerhouse, the fluid collection and reinjection system, geothermal well pads and transmission line stations, no impact on residents in the neighboring area is likely, as the nearest residences are more than 2 km away.</p>
Waste	<p>According to the ESIA report, waste such as construction materials, concrete, paper, wood, scrap metal and plastics will be generated during construction of the power plant and the fluid collection and reinjection system. Aside from these, soil, spoil (debris, etc.) and other such waste will also be produced during well drilling.</p> <p>During the operation period, sludge from cleaning of the cooling tower pits for inspection and waste oil from turbines and other machinery will be produced.</p> <p>Therefore, without mitigation measures, industrial waste may have major impact.</p> <p>Industrial waste, such as waste material from construction of the power plant and other work, as well as non-industrial waste, must be collected and disposed of by waste disposal companies licensed by NEMA. NEMA supervises these licensed waste disposal companies with inspections and, if</p>

Item	Result of survey																		
	<p>improper treatment or disposal by these companies is revealed, KenGen must take corrective measures immediately.</p>																		
<p>Soil contamination</p>	<p>Of general waste effluents generated in relation to this project, non-operational effluents do not contain heavy metals, organic solvents or other such substances, but may cause minor contamination with organic and other substances.</p> <p>Storm water will be drained into gullies, and will not affect the soil, as it does not contain any soil contaminants.</p> <p>In interviews with the person in charge at KenGen and the supervisor from KWS, they stated that there was no known case in which soil had been contaminated by continuous exposure to H₂S generated from the existing power plants.</p> <p>KenGen has been monitoring substances in the soil around the geothermal wells of the existing power plants.</p> <p>According to the ESIA report and interview with KenGen, there are some spots where high heavy metal concentrations have been detected. However, this is considered to be a natural occurrence in geothermal fields.</p>																		
<p>Noise and Vibration</p>	<p>a) Environmental criteria, etc.</p> <p>In Kenya, noise and vibrations are regulated by a law (2009) concerning environmental management and coordination (control of noise and excessive vibrations). The maximum permissible noise levels are shown in Table 9-4, and those for construction sites in Table 9-5.</p> <p style="text-align: center;">Table 9-4 Maximum permissible noise levels</p> <table border="1" data-bbox="555 1294 1241 1724"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone</th> <th colspan="2" style="text-align: center;">Max. permissible noise level (dBA)</th> </tr> <tr> <th style="text-align: center;">Day (6:01-20:00)</th> <th style="text-align: center;">Night (20:01-6:00)</th> </tr> </thead> <tbody> <tr> <td>Silent zone</td> <td rowspan="5" style="text-align: center; vertical-align: middle;">35</td> <td rowspan="5"></td> </tr> <tr> <td>Places of worship</td> </tr> <tr> <td rowspan="2">Residential</td> <td style="text-align: center;">Indoor</td> <td style="text-align: center;">45</td> </tr> <tr> <td style="text-align: center;">Outdoor</td> <td style="text-align: center;">50</td> </tr> <tr> <td>Mixed residential area (with commercial and entertainment facilities)</td> <td style="text-align: center;">55</td> </tr> <tr> <td>Commercial area</td> <td style="text-align: center;">60</td> </tr> </tbody> </table>	Zone	Max. permissible noise level (dBA)		Day (6:01-20:00)	Night (20:01-6:00)	Silent zone	35		Places of worship	Residential	Indoor	45	Outdoor	50	Mixed residential area (with commercial and entertainment facilities)	55	Commercial area	60
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Commercial area	60																		



Item	Result of survey												
	<p data-bbox="550 315 1270 344">Table 9-5 Maximum permissible noise levels for construction sites</p> <table border="1" data-bbox="555 347 1241 739"> <thead> <tr> <th data-bbox="560 349 898 510" rowspan="2">Facility</th> <th colspan="2" data-bbox="901 349 1236 414">Max. permissible noise level (dBA)</th> </tr> <tr> <th data-bbox="901 418 1070 510">Day (6:01-20:00)</th> <th data-bbox="1074 418 1236 510">Night (20:01-6:00)</th> </tr> </thead> <tbody> <tr> <td data-bbox="560 515 898 638">Health facilities, educational institutions and homes for the disabled</td> <td data-bbox="901 515 1070 638" rowspan="2">60</td> <td data-bbox="1074 515 1236 638" rowspan="2">35</td> </tr> <tr> <td data-bbox="560 642 898 672">Residential</td> </tr> <tr> <td data-bbox="560 676 898 739">Areas other than above categories</td> <td data-bbox="901 676 1070 739">75</td> <td data-bbox="1074 676 1236 739">65</td> </tr> </tbody> </table> <p data-bbox="411 801 766 831">b) Impact during construction</p> <p data-bbox="467 835 1390 999">Major noise and vibration sources during construction of the powerhouse, the fluid collection and reinjection system, geothermal wells and transmission lines would be from blasting, heavy machinery, generators, production testing, and transport vehicles. Areas around these sources are likely to sustain some impact from noise and vibrations.</p> <p data-bbox="467 1019 1390 1084">The nearest residences (RAP LAND) may sustain some impact from noise resulting from production testing that may be conducted near RAP LAND.</p> <p data-bbox="467 1104 1390 1234">Noise levels during the production testing of geothermal wells connected to the existing power plants vary by well, and are monitored during testing. The levels roughly 1 meter from wellhead are generally around 90 dB to 100 dB, and the maximum recorded level is 111.1 dB.</p> <p data-bbox="467 1254 1390 1417">A simplified prediction of noise was made based on the hypothesis that the maximum recorded level at existing power plants of 111.1 dB would occur during production testing at the geothermal well (OW-918), which is the nearest to RAP LAND of all wells to be connected. The results show that the noise level at the RAP LAND boundaries would be 57.1 dB.</p> <p data-bbox="467 1438 1390 1704">The most likely source of vibrations nearest to RAP LAND would be from geothermal well drilling. A simplified prediction was made assuming that the level of vibrations during drilling would be 68 dB, in consideration of the machinery used. The results show that the vibration level at 50 meters away from the source would be less than 55 dB, which is the threshold at which people would not feel the vibrations. No impact from vibrations is expected, as the nearest geothermal well to RAP LAND is approximately 500 meters away.</p> <p data-bbox="411 1787 906 1816">c) Predictions during the operation period</p> <p data-bbox="467 1821 1390 1951">The major source of noise during the operation period is noise produced in the powerhouse. Since the Olkaria V power plant is more than 2 km away from the nearest residences in RAP LAND, noise and vibrations generated at the powerhouse are not expected to have any impact on these residences.</p> <p data-bbox="467 1971 1390 2029">The cumulative impact of noise during the operation period was examined in the ESIA. The simulation results of noise levels during operation of the</p>	Facility	Max. permissible noise level (dBA)		Day (6:01-20:00)	Night (20:01-6:00)	Health facilities, educational institutions and homes for the disabled	60	35	Residential	Areas other than above categories	75	65
Facility	Max. permissible noise level (dBA)												
	Day (6:01-20:00)	Night (20:01-6:00)											
Health facilities, educational institutions and homes for the disabled	60	35											
Residential													
Areas other than above categories	75	65											


Item	Result of survey
	<p>Olkaria V power plant and existing power plants are shown in Figure 9-6. The Olkaria IV power plant is located near RAP LAND, where the noise levels do not exceed the maximum permissible level of 35 dB in residential areas. Therefore, the impact of noise during the operation period of the Olkaria V power plant is expected to be minor.</p> <p>No impact from vibrations is conceivable, as no source of vibration will exist within a 1-kilometer radius from RAP LAND during the operation period of the power plant.</p>  <p>Source: Environmental and Social Impact Assessment (ESIA) Study Report (KenGen, 2014) (to which some amendments were added)</p> <p>Fig. 9-6 Simulated cumulative noise impact</p> <p>d) Monitoring in and around the existing power plants KenGen monitors current noise levels every day, along with H₂S concentrations, at roughly 40 points in and around the existing power plants.</p>
Offensive odors	<p>a) Current conditions The area around the existing power plants in Olkaria is a geothermal field, where there are offensive odors of H₂S to some extent, including that emitted from power generation facilities and that occurring naturally.</p> <p>While the Olkaria I power plant releases ejector exhaust (including NCG) into the atmosphere from the stacks installed on the side wall of the turbine building, the Olkaria II and IV power plants send NCG to fan stacks of the cooling tower, where it is mixed with warm air before being emitted up into the atmosphere. For this reason, gases released from the Olkaria II and IV power plants tend to be more widely diffused in the sky. As a result,</p>


Item	Result of survey
	<p>compared to the area around the Olkaria I power plant, which uses older technology, the areas around the Olkaria II and IV power plants using new technology have less offensive odors.</p> <p>b) Impact during construction During production testing, H₂S will be released into the atmosphere along with steam through the silencer provided on the wellhead. The production testing period is limited, usually lasting from a few days to three months, and the landing distance of H₂S is, in general, within the range of several to several tens of meters. Since no drilling of geothermal wells is planned within this H₂S landing range from residences, there will be no impact of offensive odors during construction.</p> <p>c) Impact during the operation period The yearly mean H₂S concentrations generated by operations of power plants, including existing plants (Fig. 9-3), indicate that the levels in the nearest residential area in RAP LAND are less than 0.02 ppm. As the threshold of human olfactory awareness is roughly 0.02 ppm, there will be little impact from offensive odors.</p> <p>There will a little impact caused by offensive odors around the cooling tower, but with regard to impact of H₂S from existing power plants on animals, the KWS supervisor confirmed in the interview that no observable impact has been noted.</p>
2.Natural Environment	
Protected area (National park)	<p>a) Overview of Hell’s Gate National Park Hell’s Gate National Park was established in 1984 under the Wildlife (Conservation and Management) Act to protect and conserve a landscape featuring volcanic topography, wildlife species and their habitats for the present and future.</p> <p>Before the establishment of the national park, this area was used for cattle grazing and sisal hemp cultivation. In the western part of the area, the Olkaria I power plant has been operating since 1981, before the establishment of the national park. The park is currently managed by the Kenya Wildlife Service.</p> <p>KenGen and KWS signed, under the Wildlife Conservation and Management Act, a memorandum of understanding (MoU, 2008) in which matters concerning environmental consideration measures are included. This MoU was executed for the purposes of ensuring environmental conservation, to mitigate the negative impact of geothermal development, and for the harmonized use of diverse resources in the area. Specifically, the MoU provides for environmental conservation, tourism planning and landscape, land management, security, easements, passages and entrances, a joint committee, review and termination, and dispute resolution. Among these, the major contents related to environmental conservation are shown below.</p>

Item	Result of survey
	<div style="border: 1px solid black; padding: 5px;"> <p>[Flora]</p> <ul style="list-style-type: none"> • KenGen shall not alter the natural vegetation in the park unless absolutely necessary for construction work, etc. Alterations shall be kept to a bare minimum. • KenGen shall, in cooperation with KWS, exterminate any alien species brought in by construction work. • KenGen shall, in cooperation with KWS, rehabilitate, using native plant species, all areas cleared of vegetation. KenGen shall submit a rehabilitation schedule. • Both KenGen and KWS shall continuously monitor the natural vegetation. </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>[Fauna]</p> <ul style="list-style-type: none"> • For construction work, such as pipeline installation, that may affect animal movement, KenGen shall consult with KWS to study design. Fence installations shall be limited to places necessary for the protection of visitors. • Speed bumps shall be installed on roads where animals are likely to cross. • KenGen and KWS shall not use vehicles to move within the park at night except when it is necessary for power plant operations, patrols in the park, or other such purposes. </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>[Soil]</p> <ul style="list-style-type: none"> • KenGen shall keep topographic alterations to a bare minimum. • KenGen shall maintain and manage roads constructed for the power plants. • Both KenGen and KWS shall monitor the effects of erosion control measures. If any measures are found to be inadequate, the contents shall be reviewed. Both parties shall share information. </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>[Air quality]</p> <ul style="list-style-type: none"> • KenGen shall continuously carry out meteorological monitoring (including H₂S concentrations), and share the data with KWS. </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>[Noise]</p> <ul style="list-style-type: none"> • KenGen shall regularly monitor noise levels. Data of noise levels within the park shall be shared, and if a large level of noise is expected temporarily, visitors to the park shall be informed. </div> <p style="margin-top: 20px;">Based on this MoU, all activities of KenGen within the park may be conducted only after consent is given through prior consultation with KWS.</p> <p>b) Impact of the Olkaria V project</p> <p>The ESIA report does not have any particular comments on the impact of the Olkaria V project on Hell’s Gate National Park.</p> <p>There will be no direct alterations to the national park, as the powerhouse, geothermal wells, and transmission lines will all be constructed outside the park, and the existing geothermal wells inside the park will not be used. Although only a part of the fluid collection and reinjection system is slated to be installed alongside the existing road inside the national park, the impact on the environment will be minimal. The impact will be much less than that of installing it outside the national park and then constructing a new administrative road. KenGen acquired the license for geothermal resource development in the entire project area in September 2008, so partial installation of the pipeline inside the park imposes no legal problem.</p>


Item	Result of survey
	<div data-bbox="536 309 1323 840" data-label="Image"> </div> <div data-bbox="523 842 1294 875" data-label="Caption"> <p>Fig. 9-7 Existing Access road within the Olkaria V project area</p> </div> <div data-bbox="466 909 1390 1173" data-label="Text"> <p>Due to the proximity of the power plant to the national park, the project may have an H₂S and noise impact on the park. For impact on flora and fauna from H₂S from the existing power plants, the KWS supervisor confirmed by interview that no observable impact had been noted. For the impact of noise on the national park, the same supervisor said that levels of noise in the national park from the Olkaria V power plant (which uses advanced technology) were expected to be extremely small, and that no impact was expected.</p> </div> <div data-bbox="466 1196 1390 1323" data-label="Text"> <p>Impact on the landscape as viewed from the National Park is expected to be minor, as the Olkaria V power plant facilities, including the powerhouse and transmission lines, are behind the mountain and cannot be seen from the viewpoints, as shown in Fig. 9-14.</p> </div> <div data-bbox="466 1346 1390 1576" data-label="Text"> <p>Slant with directional may be conducted to use geothermal resources lying deep underground within the national park premises. The utilization of underground resources in the national park through slant with directional is allowed under the agreement of both KenGen and KWS under Geothermal Resources Regulations (1990). Slant with directional, even if conducted, will not have any impact on the park above ground, as the well shaft runs deep underground.</p> </div> <div data-bbox="466 1599 1390 1760" data-label="Text"> <p>According to the KWS supervisor’s perspective, the impact of vibrations and noise involved in slant with directional will be minimal, and impact on flora and fauna is unlikely. The supervisor also stated that no impact of slant with directional conducted for the existing geothermal development projects in Olkaria had been confirmed.</p> </div>

Item	Result of survey
	 <p data-bbox="440 846 1390 913">Fig. 9-8 Existing access road in the National Park and proposed pipeline route (red dashed line denotes the proposed pipeline route)</p> <p data-bbox="507 976 1313 1010">Fig. 9-9 Aboveground area where slant with directional is planned</p>  <p data-bbox="475 1615 1326 1648">(Red circle denotes well pad, and red dashed line denotes drilling trace)</p>
<p data-bbox="204 1682 379 1783">Fauna, flora, and biological diversity</p>	<p data-bbox="411 1682 639 1715">a) Impact on fauna</p> <p data-bbox="464 1715 1390 1877">For the ESIA, a field survey was conducted in the project area in January and February 2014. The number of species confirmed in the project area by field survey, and those documented in literature as living in the areas around the project area (including inside the Hell’s Gate National Park boundary), are shown in Table 9-6.</p>

Item	Result of survey		
	Table 9-6 Fauna in and around the project area		
		Field survey (Project area)	Literature-based information (Around project area)
	Mammal	13 species	28 species
	Avifauna	71 species	105 species
	Reptile	8 species	23 species
	Amphibian	2 species	7 species
	Insect (including Araneae)	30 species	-
	<p>The KWS supervisor confirmed in an interview that there were no animals using the project area as their habitat, because the Maasai tribe were widely running cattle grazing operations in the area.</p>		
			
	<p>Fig. 9-10 The environment around the planned power plant site and cattle grazing</p>		
	<p>The project area consists of grassland, mainly used for grazing, and roughly 5-meter high bush. Similar environments are widely distributed over the surrounding areas. No particularly unique environment exists in the project area. Therefore, any impact on animals from the presence of a powerhouse, geothermal wells and pipelines, as well as from noise and light pollution, will be insignificant.</p>		
	<p>To a question regarding the impact of pollution with disturbance, the KWS supervisor responded that there was no solid information suggesting any impact on animals. To the same question, KenGen’s person in charge of the project also responded that no major impact of light pollution was noted because, at night, as many animals were seen near the existing power plants as in areas far from the power plants.</p>		
	<p>The transmission lines during operation period may have an impact on birds.</p>		


Item	Result of survey
	<p>With regard to the impact of H₂S from existing power plants on animals, it was learned through the interview with the KWS supervisor that no observable impact has been confirmed.</p> <p>Although the transmission lines during operation period may have some impact on birds, including migratory birds, the lines are considered to be highly visible to them on the grounds that no heavy fog occurs in this area (confirmed in the interview with the person in charge at KenGen) and no high tree forests that would conceal the transmission lines exist in the project area (as bush is the usual vegetation there).</p> <p>b) Impact on flora</p> <p>In the ESIA, a field survey of flora was conducted in the project area in February 2014, where 53 species of vascular plants were confirmed. There were no important species listed on the IUCN Red List.</p> <p>The vegetation in the project area consists of grass that used to be used for grazing, and bush, predominantly composed of roughly 5-meter high leleshwa (<i>Tarchonanthus camphoratus</i>), with few other species or varieties.</p> <p>Most of the project area soil is formed by volcanic ejecta. Because of this oligotrophic soil, bush is the climax vegetation in this area, with leleshwa, the pioneer tree, predominating.</p> <p>Construction of the powerhouse, the fluid collection and reinjection system, geothermal well and transmission lines involve tree felling. However, an environment identical to that before tree-felling is expected to be restored soon, as bush with leleshwa as the main species can regrow naturally in a short period of time. Therefore, any impact of the project on flora is considered to be minor.</p> <p>With regard to impact of H₂S from existing power plants on plants, the KWS supervisor confirmed in the interview that no observable impact has been noted.</p>  <p>Fig. 9-11 Leleshwa near the planned Olkaria V power plant site</p>



Item	Result of survey																																							
	<p data-bbox="411 309 708 342">c) Impact on rare species</p> <p data-bbox="467 376 1390 510">According to KWS and field survey for ESIA, the following six rare species (three species are listed on the IUCN Red List and six species are listed in the Wildlife conservation and management act) are confirmed to be around the project area, but they are not endemic (Table 9-13).</p> <p data-bbox="531 562 1289 595" style="text-align: center;">Table 9-7 Rare animal species confirmed to be around the project area</p> <table border="1" data-bbox="440 591 1350 1048"> <thead> <tr> <th data-bbox="440 591 491 658">No</th> <th data-bbox="491 591 628 658">Taxon</th> <th data-bbox="628 591 836 658">Species Names</th> <th data-bbox="836 591 1043 658">Scientific Names</th> <th data-bbox="1043 591 1195 658">IUCN Category</th> <th data-bbox="1195 591 1350 658">Wildlife Act</th> </tr> </thead> <tbody> <tr> <td data-bbox="440 658 491 703">1</td> <td data-bbox="491 658 628 703" rowspan="2">Mammal</td> <td data-bbox="628 658 836 703">Spotted Hyena</td> <td data-bbox="836 658 1043 703"><i>Crocuta crocuta</i></td> <td data-bbox="1043 658 1195 703">—</td> <td data-bbox="1195 658 1350 703">Vulnerable</td> </tr> <tr> <td data-bbox="440 703 491 770">2</td> <td data-bbox="628 703 836 770">Leopard</td> <td data-bbox="836 703 1043 770"><i>Panthera pardus</i></td> <td data-bbox="1043 703 1195 770">Near Threatened</td> <td data-bbox="1195 703 1350 770">Endangered</td> </tr> <tr> <td data-bbox="440 770 491 837">3</td> <td data-bbox="491 770 628 837" rowspan="3">Avifauna</td> <td data-bbox="628 770 836 837">Rüppell's Vulture</td> <td data-bbox="836 770 1043 837"><i>Gyps rueppellii</i></td> <td data-bbox="1043 770 1195 837">Endangered</td> <td data-bbox="1195 770 1350 837">Near Threatened</td> </tr> <tr> <td data-bbox="440 837 491 904">4</td> <td data-bbox="628 837 836 904">White-Backed Vulture</td> <td data-bbox="836 837 1043 904"><i>Gyps africanus</i></td> <td data-bbox="1043 837 1195 904">Endangered</td> <td data-bbox="1195 837 1350 904">Near Threatened</td> </tr> <tr> <td data-bbox="440 904 491 972">5</td> <td data-bbox="628 904 836 972">Kenya Rufous Sparrow</td> <td data-bbox="836 904 1043 972"><i>Passer rufocinctus</i></td> <td data-bbox="1043 904 1195 972">—</td> <td data-bbox="1195 904 1350 972">Protected Species</td> </tr> <tr> <td data-bbox="440 972 491 1048">6</td> <td data-bbox="491 972 628 1048">Reptiles</td> <td data-bbox="628 972 836 1048">African Rock Python</td> <td data-bbox="836 972 1043 1048"><i>Python sebae</i></td> <td data-bbox="1043 972 1195 1048">—</td> <td data-bbox="1195 972 1350 1048">Endangered</td> </tr> </tbody> </table> <p data-bbox="411 1115 751 1149">(i) Impact on spotted hyenas</p> <p data-bbox="467 1149 1390 1350">Spotted hyenas can live in savannas as well as in other diverse environments. They are assumed to appear in areas with populations of herbivorous animals. Many herbivorous animals live in the northeastern part of Hell's National Park. As the planned Olkaria V project site is topographically separated from that part of the national park by cliffs, the project is expected to have little impact on the habitat of spotted hyenas.</p> <p data-bbox="411 1395 692 1429">(ii) Impact on leopards</p> <p data-bbox="467 1429 1390 1529">It was learned during an interview with KWS that leopards have a wide home range, of which the main habitat is an area in the northeastern part of Hell's National Park, where many herbivorous animals live.</p> <p data-bbox="467 1552 1390 1641">The Olkaria V project area is topographically separated by cliffs from the main habitat of the leopards in the northeastern part of the park. Therefore, the Olkaria V project will have little impact on the leopard habitat.</p> <p data-bbox="411 1686 1129 1720">(iii) Impact on Rüppell's vultures and white-backed vultures</p> <p data-bbox="467 1720 1390 1955">KWS and KenGen's persons in charge of the project were interviewed about the habitats of these animals, and an on-site confirmation was conducted. Rüppell's vultures and white-backed vultures (vultures) had a colony on the cliff within Hell's Gate National Park, roughly 4 km west-northwest of the planned Olkaria V power plant site. As the colony is far from the sites where Olkaria V-related construction work will take place, no impact from noise, vibrations, etc. during construction is conceivable.</p> <p data-bbox="467 1977 1390 2045">Even during the operation period of the power plant, impacts from noise, vibrations, etc. on the colony are unlikely in view of its distance from the</p>	No	Taxon	Species Names	Scientific Names	IUCN Category	Wildlife Act	1	Mammal	Spotted Hyena	<i>Crocuta crocuta</i>	—	Vulnerable	2	Leopard	<i>Panthera pardus</i>	Near Threatened	Endangered	3	Avifauna	Rüppell's Vulture	<i>Gyps rueppellii</i>	Endangered	Near Threatened	4	White-Backed Vulture	<i>Gyps africanus</i>	Endangered	Near Threatened	5	Kenya Rufous Sparrow	<i>Passer rufocinctus</i>	—	Protected Species	6	Reptiles	African Rock Python	<i>Python sebae</i>	—	Endangered
No	Taxon	Species Names	Scientific Names	IUCN Category	Wildlife Act																																			
1	Mammal	Spotted Hyena	<i>Crocuta crocuta</i>	—	Vulnerable																																			
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5		Kenya Rufous Sparrow	<i>Passer rufocinctus</i>	—	Protected Species																																			
6	Reptiles	African Rock Python	<i>Python sebae</i>	—	Endangered																																			

Item	Result of survey
	<p>project area. However, the project area may have been used as a part of their feeding ground, and presence of the power plant, pipelines and other relevant facilities may cause some changes to the feeding ground function of the project area. However, vultures usually scavenge on carcasses of dead animals, and the project area cannot be considered as an environment where dead animals are particularly frequently produced, because identical environments are widely distributed in the surrounding areas. Therefore, the project area is unlikely to have been a significant feeding ground for the vultures. Even if some changes occur in the function of the project area as a feeding ground, it will have little impact on the vultures.</p> <p>If vultures use the transmission towers for perching, the intervals between the lines are insufficient, and they may receive electric shocks when they take off if they perch in the wrong position. However, as vultures are diurnal, they are unlikely to hit any transmission lines when flying.</p>  <p style="text-align: center;">Fig. 9-12 Vulture colony in Hell's Gate National Park</p> <p>(iv) Impact on Kenya rufous sparrows Kenya rufous sparrows live in dry savannas, agricultural lands, villages and towns, usually in pairs, and sometimes in a flock of 10 at most. They feed on grains, small seeds, and insects.</p> <p>The herbaceous layer of bush and grasslands in the project area abounds with the gramineous plants that are considered to be sources of food for Kenya rufous sparrows. As this environment is widely distributed in this region, the project will have little impact on Kenya rufous sparrows.</p> <p>(v) Impact on African rock python African rock pythons live mainly in evergreen woodlands and savannas, especially near water. Their habitats are rocky areas and the abandoned burrows of mammals. They are carnivorous, and mainly prey on terrestrial vertebrates.</p> <p>Since environments similar to that of the project area are widely distributed</p>

Item	Result of survey
	<p>outside the project area, any impact on the pythons' feeding habits is expected to be insignificant. However, there may be some impact if alterations are made in rocky areas where they live.</p>
<p>Soil erosion</p>	<p>The soil of the project area consists mainly of volcanic ejecta, including acidic and basic lava mixtures. On-site confirmation found that soil erosion tends to occur easily, as the soil is dry and soil particles are non-cohesive. In the region including the project area, soil erosion occurs naturally and many gullies can be observed.</p> <div data-bbox="517 645 1283 1214" data-label="Image"> </div> <p data-bbox="555 1218 1262 1249">Fig. 9-13 Soil near the planned Olkaria V power plant site</p> <div data-bbox="517 1281 1283 1809" data-label="Image"> </div> <p data-bbox="576 1814 1241 1845">Fig. 9-14 Gully occurring naturally in the Olkaria area</p> <p data-bbox="467 1883 1385 2011">Site development for the powerhouse, pipelines, geothermal pads, transmission tower footing, small roads and other structures will produce exposed ground. If this ground remains bare over a prolonged period of time, soil is likely to be eroded by rainfall.</p>

Item	Result of survey
Global warming/ climatic variation	<p>When the securing of 140 MW of electric power generation in the proposed project area is studied, based on the goal of a stable electric power supply as prescribed in Vision 2030 (the development plan for Kenya), the selectable power generation methods are either geothermal or coal-fired thermal.</p> <p>When the mean CO₂ concentration in steam erupting from production wells is assumed to be 1.5 weight percent (based on the existing feasibility study), and the steam needed to obtain a 140-MW output is assumed to be 1,000 t/h, annual CO₂ emissions generated by geothermal power generation are estimated to be roughly 131,400 tons. Meanwhile, the ESIA report estimates that the generation of 140 MW of electric power using a coal-fired thermal method will produce 964,027 tons of CO₂ emissions. In other words, selection of the geothermal generation system can reduce CO₂ emissions by 832,627 tons per year.</p>
3.Social Environment	
Land acquisition and resettlement	<p>There is no land acquisition and resettlement due to this project. Olonongot village is located at the project area of Olkaria V power plant. Land acquisition and resettlement of Olonongot village was conducted under Olkaria IV with 56 households of relocated people. KenGen established RAP in 2012 and achieved agreement for compensation PAPs in 2013. (MoU between KenGen and PAPs was signed in 2013.) Based on the RAP and MoU, land, houses, a church and a school has been provided by KenGen. After payment of cash compensation, such as moving allowance, amongst others, the relocation was implemented.</p> <p>The Project area was acquired in 2010. The land owner of the resettlement site agreed to the acquisition in 2012. The land is planned to be acquired at the end of 2014 or beginning of 2015. Payment of cash compensation, such as moving allowance and cash compensation finished in August, 2014 and relocation finished in September, 2014.</p> <p>The main income source in the Olkaria V Project area is generated by selling livestock and by employment by neighboring private companies. The Maasai traditionally graze their livestock by moving over long distances. The resettlement site is located only 3 km away from the original site. Productivity of the relocation site is equivalent to the original site and it located in a place where PAPs have already been grazing. In addition, the relocation site is closer to markets where they usually trade their livestock. Therefore, it is assumed they can continue grazing as their livelihood.</p> <p>The fact that sufficient compensation, such as of land, houses, a church and a school, has been provided and the project site was acquired at replacement cost, it is considered that the resettlement was conducted in line with JICA ECS guideline without significant gap and without issues. Refer to Due Diligent Report Study (DDR) for detailed information.</p>
Landscape	<p>In the ESIA report, impact to landscape is expected from the power plant and pipelines.</p> <p>In addition to this, impact from the transmission line (from Olkaria IV to V power plant: approximately 5km) and view from Kaporitan View Point in the National Park adjacent to the project area is also expected.</p>

Item	Result of survey
	<p>According to KenGen, the power plant of Olkaria V will be built on a flat area, hence impact to the landscape regarding vegetation clearing and change of topography is expected to be minimal.</p> <p>As a result of the site survey, it was confirmed that the transmission line will be built in an area where structures already exist. It was also confirmed that the Olkaria V power plant and transmission line to Olkaria IV is planned to be hidden by the hill and cannot be seen from the Kaparitan View Point.</p>  <p style="text-align: center;">Fig. 9-15 Area of Olkaria V Power Plant</p>

Item	Result of survey
	 <p data-bbox="464 1003 1385 1066">Fig. 9-16 Planned Area for transmission line from Olkaria V Power Plant to Olkaria IV Power Plant</p>  <p data-bbox="464 1854 1385 1883">Fig. 9-17 View from Kaparitan View Point inside Hell's Gate National Park</p> <p data-bbox="464 1951 1385 2018">Hell's Gate National park is beautiful and unique for its geological phenomenon (i.e. hot water geysers and hot springs), land formations and on-</p>

Item	Result of survey																																																																																																						
	<p>going geological processes; also there are plants which can make their habitat around high-temperature hot water. This is the reason for its registration to UNESCO's tentative world heritage candidate list.</p> <p>Impact on the landscape by the geothermal utilization was assessed during the survey. According to KenGen, Olkaria Geothermal field experiences very meager drawdown which has insignificant impact on the extinction of the geothermal phenomenon. In addition, various monitoring of the field, such as measurements of drawdown, precision elevation changes and gravity changes, is conducted biannually, and considering those results no impact to landscape of Hell's Gate National Park is expected.</p> <p>According to the interview with KWS, KenGen was been developing Olkaria Geothermal field by avoiding the areas which are important in order to maintain the characteristic landscape of the Park.</p> <p style="text-align: center;">Table 9-8 Utilization of Geothermal in Olkaria</p> <table border="1" data-bbox="472 869 1410 1736"> <thead> <tr> <th>Plant</th> <th>Status</th> <th>Capacity (MWe)</th> <th>Units</th> <th>Commissioning / Due date</th> <th>Owned by</th> </tr> </thead> <tbody> <tr> <td>Olkaria I</td> <td>Operational</td> <td>45 MWe</td> <td>3 (15MW)</td> <td>1981-1985</td> <td>KenGen</td> </tr> <tr> <td>Olkaria II</td> <td>Operational</td> <td>105 MWe</td> <td>3 (35MW)</td> <td>2003-2010</td> <td>KenGen</td> </tr> <tr> <td>Olkaria III</td> <td>Operational</td> <td>110 MWe</td> <td></td> <td>2000-2014</td> <td>Orpower4 Inc</td> </tr> <tr> <td>Oserian back pressure unit</td> <td>Operational</td> <td>1.5 MWe</td> <td>1</td> <td></td> <td>Oserian</td> </tr> <tr> <td>Oserian Binary Unit</td> <td>Operational</td> <td>1.5 MWe</td> <td>1</td> <td></td> <td>Oserian</td> </tr> <tr> <td>Olkaria Wellhead Unit (OW-37)</td> <td>Operational</td> <td>5 MWe</td> <td>1</td> <td>2012</td> <td>KenGen</td> </tr> <tr> <td>Olkaria I u.4&5</td> <td>Construction</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2014</td> <td>KenGen</td> </tr> <tr> <td>Olkaria IV u. 1&2</td> <td>Construction</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2014</td> <td>KenGen</td> </tr> <tr> <td>Olkaria Wellhead Unit (OW-43)</td> <td>Operational</td> <td>12.8 MWe</td> <td>1</td> <td>2014</td> <td>KenGen</td> </tr> <tr> <td>Olkaria I u.6</td> <td>Projected</td> <td>70 MWe</td> <td>1 (70MW)</td> <td>2016</td> <td>KenGen</td> </tr> <tr> <td>Olkaria Wellheads</td> <td>Projected</td> <td>62.8 MWe</td> <td></td> <td></td> <td>KenGen</td> </tr> <tr> <td>Olkaria V</td> <td>Projected</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2017</td> <td>KenGen</td> </tr> <tr> <td>Olkaria VI</td> <td>Projected</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2017</td> <td>KenGen</td> </tr> <tr> <td>Olkaria VII</td> <td>Projected</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2019</td> <td>KenGen</td> </tr> <tr> <td>Olkaria VIII</td> <td>Projected</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2020</td> <td>KenGen</td> </tr> <tr> <td>Olkaria IX</td> <td>Projected</td> <td>140 MWe</td> <td>2 (70MW)</td> <td>2020</td> <td>KenGen</td> </tr> </tbody> </table> <p>Source : Strategic Environmental Assessment for the Olkaria Geothermal Field Development Programme Draft SEA Report,2014</p>	Plant	Status	Capacity (MWe)	Units	Commissioning / Due date	Owned by	Olkaria I	Operational	45 MWe	3 (15MW)	1981-1985	KenGen	Olkaria II	Operational	105 MWe	3 (35MW)	2003-2010	KenGen	Olkaria III	Operational	110 MWe		2000-2014	Orpower4 Inc	Oserian back pressure unit	Operational	1.5 MWe	1		Oserian	Oserian Binary Unit	Operational	1.5 MWe	1		Oserian	Olkaria Wellhead Unit (OW-37)	Operational	5 MWe	1	2012	KenGen	Olkaria I u.4&5	Construction	140 MWe	2 (70MW)	2014	KenGen	Olkaria IV u. 1&2	Construction	140 MWe	2 (70MW)	2014	KenGen	Olkaria Wellhead Unit (OW-43)	Operational	12.8 MWe	1	2014	KenGen	Olkaria I u.6	Projected	70 MWe	1 (70MW)	2016	KenGen	Olkaria Wellheads	Projected	62.8 MWe			KenGen	Olkaria V	Projected	140 MWe	2 (70MW)	2017	KenGen	Olkaria VI	Projected	140 MWe	2 (70MW)	2017	KenGen	Olkaria VII	Projected	140 MWe	2 (70MW)	2019	KenGen	Olkaria VIII	Projected	140 MWe	2 (70MW)	2020	KenGen	Olkaria IX	Projected	140 MWe	2 (70MW)	2020	KenGen
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Poverty groups	RAP Implementation process, identified the vulnerable people in the PAPs, who were categorized as women, youth and disabled people. The RAP process identified no poor people. In RAP, poor individuals are defined as those who have less than 100 livestock and less than 10 acres of land.																																																																																																						

Item	Result of survey																		
	<p>However, since in the Maasai culture it is believed that counting livestock would bring misfortune, there was possibility that animals were never counted, thereby making it difficult to establish the poor individuals within the community. This might be the reason that there was no poor group established or detected within the affected group in the RAP.</p> <p>Within this survey it was confirmed that the identification of vulnerable people, including poor individuals, is conducted by RAPIC (RAP Implementation Committee)² and CAC (Community Advisory Council)³ while considering the overall living environment of the PAPs. As a result there were no poor individuals in Olonongot village.</p> <p>There were five vulnerable people identified in the Olkaria V project area (Olonongot village) as below. There were no people identified as vulnerable due to poverty.</p> <p>Table 9-9 Vulnerable People Identified in Olkaria V project area (Olonongot village)</p> <table border="1" data-bbox="523 831 1278 1077"> <thead> <tr> <th>Category of Vulnerable People</th> <th>Counts (people)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>Women</td> <td>2</td> <td>widows</td> </tr> <tr> <td>Youth</td> <td>1</td> <td>orphan</td> </tr> <tr> <td>Disable</td> <td>2</td> <td></td> </tr> <tr> <td>Poor</td> <td>—</td> <td></td> </tr> <tr> <td>Total</td> <td>5</td> <td></td> </tr> </tbody> </table>	Category of Vulnerable People	Counts (people)	Remarks	Women	2	widows	Youth	1	orphan	Disable	2		Poor	—		Total	5	
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Land use / Natural resource	<p>Maasai people conduct traditional grazing which moves over long distances. The resettlement site is located in an area where they have already been grazing and the productivity of the land is equivalent to the original land. In addition, there is no limitation of grazing within the Nation Park due to this project.</p> <p>Hence the impact associated with land use change is considered to be limited even though there is land use change due to the construction of power plant and other parts of the project.</p>																		
Water use	<p>KenGen is extracting water from Lake Naibasaha according to two permits, (industrial and domestic usage) from WRMA (Water Resources Management Authority.)</p> <p>a) Current water usage Water extraction for industrial usage includes water usage of power plants in Olkaria and the resettlement site. Current amount of the water permit for industrial usage is 3660.91 m³/day. Maximum water abstraction in 2013, was approximately 7,500 m³/day. KenGen applied for an increase of water abstraction to 8,000 m³/day to WRMA in 2012.</p>																		

² RAPIC oversees the RAP Implementation schedule and address issues which were not able to be solved at the 1st level of GCHM. RAPIC consists of 24 representatives from PAPS, KenGen's representatives, 8 Head Officers from District Level Ministries, and the District level Provincial Administration Officer.

³ CAC is the first focal point in GCHM. It is consist of 8 elders and 2 representatives from each of the 4 villages.

Item	Result of survey																					
	<p>According to the interview of WRMA, permits for water abstraction are issued based on the Water Allocation Plan of Lake Naivasha. WRMA indicates that it is not a problem to increase the water use of KenGen to 8,000 m³/day; however it is taking time to issue the permit.</p> <p>Water abstraction for domestic usage was 300-400 m³/day in September, 2013. As the meter has been broken several times, KenGen is currently not measuring the water usage. KenGen is now paying the maximum amount of the water permit to WRMA based on consultation with WRMA.</p> <p style="text-align: center;">Table 9-10 Permit Amount of Water Abstraction and Water Usage</p> <table border="1" data-bbox="411 645 1385 887"> <thead> <tr> <th></th> <th>Current Permit</th> <th>Permit Applied in 2012</th> <th>Maximum Water Abstraction in 2013</th> </tr> </thead> <tbody> <tr> <td>Industrial Water Usage</td> <td>3660.91 m³/day</td> <td>8,000 m³/day</td> <td>Approx. 7,500m³/day</td> </tr> <tr> <td>Domestic Water Usage</td> <td>795.40m³/day</td> <td>—</td> <td>300- 400 m³/day</td> </tr> </tbody> </table> <p>b) Water usage for Olkarai V</p> <p>According to ESIA, Olkaria V will connect pipeline from the existing pipeline to reach the project site. 2,500m³ of water is required during construction and for the cooling system. Water will be stored in a water tank and then used. KenGen will reduce water usage by using brine⁴ for well drilling.</p> <p>Information of water usage during operation was not found in ESIA.</p> <p>According to KenGen, the main water usage during operation is the water usage for start up. The amount is approximately 3,000m³/ time which is expected to occur once a year. Domestic water usage during operation is expected to be 750 liter per day (0.00075m³/day) . Estimation includes water for cleaning, and watering plants. During operation, the steam will be cooled and condensate at the cooling tower. Hence water usage for cooling is not expected.</p> <p>Water usage at the operational stage is summarize in the table below. The water usage is not expected to be large.</p> <p style="text-align: center;">Table 9-11 Planned Water Usage for Olkaria V</p> <table border="1" data-bbox="501 1639 1295 1814"> <thead> <tr> <th></th> <th>Construction Phase</th> <th>Operational Phase</th> </tr> </thead> <tbody> <tr> <td>Industrial Water Usage</td> <td>2,500m³</td> <td>3000m³/year</td> </tr> <tr> <td>Domestic Water Usage</td> <td></td> <td>0.00075m³/day</td> </tr> </tbody> </table>		Current Permit	Permit Applied in 2012	Maximum Water Abstraction in 2013	Industrial Water Usage	3660.91 m ³ /day	8,000 m ³ /day	Approx. 7,500m ³ /day	Domestic Water Usage	795.40m ³ /day	—	300- 400 m ³ /day		Construction Phase	Operational Phase	Industrial Water Usage	2,500m ³	3000m ³ /year	Domestic Water Usage		0.00075m ³ /day
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⁴ Mixed fluid of steam and hot water from the production well is sent to the separator and the separated steam will be sent to power plant. Hot water is typically sent for reinjection and returned underground, however it can also be used for well drilling.

Item	Result of survey
	<p>c) Impact to Lake Naivashia</p> <p>WRMA provided information regarding the water volume of Lake Naivasha (1,200 million m³) and permits issued by WRMA, including the permits for horticulture and others (70,000m³/day). If these two figures are compared, the permits issued are approximately 0.01% of the volume of lake. Hence the impact is considered to be limited.</p> <p>KenGen is measuring the water level of Lake Naivasha. Data shows the water level of the lake is increasing the past few years.</p> <p>The Project is not associated with large scale water extraction. Water usage by KenGen, including Olkaria V and horticulture is small when compared to the total water in Lake Naivasha. From this information, the impact of water usage is almost negligible.</p> <p>In addition, waste water from the geothermal power plants will not flow into Lake Naivasha, hence no impact on the lake expected.</p>
Misdistribution with unfair distribution of benefits and damages	<p>Information of misdistribution of benefits and damages was not found in the ESIA. Construction will last for 2-3 years with several 100s of workers on site. Hence there is a risk of misdistribution with unfair distribution of benefits and damages.</p> <p>KenGen plans to hire half of the unskilled work from Olkaria villages and hire the remaining from the surrounding area.</p> <p>According to KenGen, information regarding unskilled jobs at ongoing construction sites is shared by the contractor and that job opportunities are shared and discussed at the Employment sub-committee, which is under SCC (Stakeholders Coordination Committee)⁵. The same is planned for Olkaria V.</p> <p>If the jobs which are available for local people during construction of Olkaria V will be discussed at the Employment sub-committee, no impact will be expected for misdistribution with unfair distribution of benefits and damages.</p>
Gender	<p>According to the RAP, there is a tradition to respect male elders' opinions in Maasai villages. Hence it is difficult for women and the youth to express their opinion. In order to overcome such situations, consultation with groups of women and youth has been conducted as vulnerable people. In addition, representatives of the women are also included in the RAPIC.</p> <p>KenGen decided to keep the Cultural Centre, where women PAPs sell local crafts, at the current location and enable them to continue with the business during the daytime. KenGen will also give the community the ownership of 14 acres of land for the Culture Centre.</p> <p>PAPs are basically compensated by land for loss of land and house for the loss of the house, and not by cash. Hence there is small risk that men, as a head of the household, will not share the compensation with the women in the same household. In addition, vocational training is planned for women who were identified as vulnerable people.</p>

⁵ SCC established the Employment sub-committee to address concerns from stakeholders.

Item	Result of survey
	Considering these points, impact to women due to resettlement is not expected.
Children's rights	<p>According to the RAP, there is a tradition to respect male elders' opinion in Maasai villages. Hence it is difficult for women and the youth to express their opinion. In order to overcome such situations, consultation with groups of women and youths have been conducted as vulnerable people.</p> <p>It has been described in the MOU that up to 6 scholarships will be offered by KenGen to students with good grades. Next year 4 scholarships are planned to be given out. Currently priority is given to local people when allocating unskilled work. The scholarships reflect KenGen's intention to hire skilled workers from the local people in the future. Vocational training is also planned for youths who were identified as vulnerable people.</p> <p>In addition, KenGen decided not to interfere with the gorge and caves of religious importance, about which youth groups raised concerns during consultation.</p> <p>Considering these points, impact to children's rights due to resettlement is not expected.</p>
Health / Public health	<p>Modeling of noise and H₂S was performed in the ESIA, and villages which are located in areas which would exceed the standard were relocated. Hence no impact to surrounding residents is expected.</p> <p>a) Hydrogen sulfide ESIA performed modeling of H₂S emissions. There were no villages which exceeded the recommended concentrations⁶ for annual average hydrogen sulphide concentrations of 0.03 ppm for Case 4. Case 4 is considered to have maximum cumulative impact with operation of Olkaria I, II, IV's unit 1&2, V's unit 1&2 and VI's unit 1&2 which total to 825.3 MWe.</p> <p>A village which exceeded the WHO guidelines for 24 hours average hydrogen Sulphide concentrations for Case 4, has been relocated.</p> <p>The yearly mean H₂S concentrations generated by operations of power plants, including existing plants, indicate that the levels in the nearest residential area in RAP LAND are less than 0.02 ppm. As the threshold of human olfactory awareness is roughly 0.02 ppm, there will be little impact from offensive odors.</p> <p>b) Noise ESIA performed modeling of noise. There was a village which exceed the standard for NEMA's Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations (2009) noise standard for night time which is 35 dBA. The village has been relocated.</p> <p>(The power plant operates 24-hours a day and the impact during night time is considered to be larger.)</p>

⁶ WHO Guideline and the criteria in California is referred, because there is no Kenyan Standards for H₂S concentrations.

Item	Result of survey
Infectious disease such as HIV/AIDS	<p>According to the ESIA, infection rate of STI (Sexually Transmitted Infections and HIV /AIDS at Olkaria villages is 4.9%. During construction, the influx of workers will increase. Considering the fact that those workers will have income, there is a risk that infection of STI and HIV /AIDS will increase. (Kenya's infection rate was 6.8% in 2003 and decreased to 5.6% in 2012⁷.)</p> <p>Local people will be given priority for unskilled work. However an influx of workers for skilled work is expected. Hence there is a risk that infection of HIV/AIDS etc. will increase during construction. The risk during operation is expected to be not so large, because the workers only number approximately 5 people, with 3 shifts.</p> <p>KenGen has its own HIV/AIDS policy and it will be applied to Olkaria V. The policy will be written in tender documents and will be applicable to contractors as well.</p> <p>KenGen's HIV/AIDS policy covers the establishment of a Voluntary Counseling and Testing center, provides for Anti-Retro-Viral drugs, non-discrimination for hiring, regular education sessions regarding HIV, counselling with nurses and clinical officers, provision of condoms in clinics and facility of KenGen, and confidentially.</p>
Working condition	<p>Risks of accidents in the power plant during operation and maintenance have been considered in the ESIA. In addition, based on the fact that construction will last for 2-3 years with several hundred workers, there is a risk of accident during construction.</p> <p>Also in this study, the risk of accidents during the operation and maintenance of wells and places outside of the power plant have been identified. There is no Kenyan standard for H₂S concentration in the work place. Hence WHO's standard for allowable concentration (Threshold limit value (TLV)) is applied to this project. The WHO allowable concentration is set to 10ppm for working 5 days a week, 8hours per day. According to the feasibility study, H₂S gas concentrations are at their maximum at Olkaria I unit 1 &5, at 6.5 ppm. Since the H₂S concentrations of the steam from production wells which have been already drilled for Olkaria V are lower than the steam of some of the existing power plants, it is expected that the WHO standard will be met.</p> <p>In case of H₂S leakage accident, worker will evacuate based on Emergency Response Plan.</p>
4.Other	
Accidents	<p>According to the ESIA, there is a risk of fire for the power plant and transmission line. In addition, there is risk of accident during operation due to usage of hydrocarbons such as solvents, coolant, an acid, or an alkali.</p> <p>Considering the fact that PAPs can continue grazing in the vicinity of the power plant and the traffic volume will increase during construction and operation, risk of traffic accident was identified during the survey. KenGen has its own Traffic Management Plan. In the Traffic Management Plan, it is written that animals have the right of way and speed limit in the Park is set to</p>

⁷ Kenya AIDS Response Progress Report2014, Progress towards Zero, March 2014

Item	Result of survey
	<p>40 km per hour maximum. KenGen has a reporting system for accidents and no record of traffic accidents was found.</p> <p>In addition to this, a risk of geothermal fluid blow out was considered due to insufficient safety management during construction. Risk of high H₂S gas leakage, blow out of high temperature steam and scatter of hot water was considered due to insufficient safety management during operation.</p> <p>There is no description of H₂S leakage accidents in the ESIA. As a result of the survey, it was found that KenGen has its own Hydrogen Sulphide Gas Casualty Rescue and Emergency Response Plan. Action and responsibility in case of serious injury/ death, well blow out, fire, flood, leakage, severe weather conditions, earthquake, and geothermal gas is written in the Emergency Response Plan. Hydrogen Sulphide Gas Casualty Rescue describes the procedure to rescue people who are affected by high H₂S.</p>

10. EVALUATION OF POTENTIAL IMPACT

Based on the results of the environmental and social consideration survey, the Team evaluated the potential impact of the Project as shown in Table 10-1.

Table 10-1 Evaluation of Potential Impact

Item	Provisional Scoping of Impact		Scoping after the survey and the review		Reason	
	Construction stage	Operation period	Construction stage	Operation period		
1. Pollution						
Air pollution	H ₂ S	B-	A-	D	D	<p>Construction stage: The production testing conducted to evaluate the geothermal fluid reservoir will generate NCG that contains H₂S. However, no impact is likely as there are no houses within the area where H₂S may settle.</p> <p>Operation period: H₂S contained in the NCG will be constantly emitted from the cooling towers during the operation period. The prediction results of the cumulative impact that include operation of existing power plants show H₂S concentration levels in the residential area that fall well within WHO reference values. Therefore, there will be little impact.</p>
	Dust	B-	D	B-	D	<p>Construction stage: Dust is likely to be created in the project area during construction of the powerhouse, the fluid collection and reinjection system (FCRS), geothermal wells, transmission lines and small roads. However, as the nearest houses are 2 km or farther from the project area, there will be no impact on the local residents.</p> <p>Operation period: Same as at the time of scoping.</p>
Water contamination	D	D	D	D	Same at the time of scoping.	
Waste	A-	B-	B-	B-	<p>Construction stage: Industrial waste, such as construction materials, concrete, paper, wood, scrap metal, plastic, soil from well drilling, excavated spoil (debris, etc.) is likely to be generated.</p> <p>Operation period: Industrial waste (sludge generated from cleaning the cooling tower pits during inspection, waste oil of turbines and other machinery) is likely to be generated.</p>	
Soil contamination	B-	B-	B-	B-	Construction stage/ Operation period: Of the general waste effluents generated in relation to this project, non-operational effluents do not contain substances such as heavy metals or	

Item	Provisional Scoping of Impact		Scoping after the survey and the review		Reason
	Construction stage	Operation period	Construction stage	Operation period	
					organic solvents. However, minor contamination may be caused by organic and other substances.
Noise and vibration	B-	B-	B-	B-	<p>Construction stage: Major sources of noise and vibration during construction of the powerhouse, the fluid collection and reinjection system (FCRS), geothermal wells and transmission lines include noise from blasting, heavy machinery, generators, production testing and transport vehicles. Impact from noise and vibration is likely around the sources. Noise and vibration impact in the RAP LAND area is possible from production testing that may be carried out in the area.</p> <p>Operation period: Noise and vibrations will be generated by the cooling towers, steam turbines, generators, etc. According to the simulation results of cumulative impact, the noise in the nearest residential area (RAP LAND) will remain within the allowable value, and the impact is expected to be insignificant.</p>
Ground subsidence	D	D	D	D	Same at the time of scoping.
Offensive odors	B-	B-	D	D	<p>Construction stage: The production testing conducted to evaluate the geothermal fluid reservoir will generate NCG that contains H₂S. However, impact is unlikely as there are no houses within the area where H₂S may settle.</p> <p>Operation period: Yearly mean H₂S concentration levels during the operation period of power plants, including existing plants, are below the threshold of the human sense of smell in the nearest residential area of RAP LAND. Therefore, there will barely be any impact caused by offensive odors.</p>
Substratum	D	D	D	D	Same at the time of scoping.
2. Natural Environment					
Protected area (National park)	B-	B-	D	B-	<p>Construction stage: According to plans, the construction of the powerhouse and related facilities (excluding a portion of FCRS) will be carried out outside the national park, and the geothermal wells within the national park will not be used. Therefore, no impact from noise, H₂S, or other causes is likely.</p>

Item	Provisional Scoping of Impact		Scoping after the survey and the review		Reason
	Construction stage	Operation period	Construction stage	Operation period	
					Operation period: Impact on the landscape as viewed from scenic overlooks in the national park is unlikely. However, views from some locations on the national park premises are likely to sustain some impact.
Fauna, flora, and biological diversity	B-	B-	B-	B-	Construction stage: Bush and grass fields are distributed in the project area. Therefore, the felling of trees and land alterations may have some impact on plants, and noise and vibration may impact animals. Operation period: The presence of powerhouses, pipelines and other facilities (including existing facilities) may affect the distribution of animals and plants to some extent, as well as their breeding and living environments. Transmission lines operation are likely to have an impact on birds, including the important vulture species. There also may be some impact if African rock pythons have their nests in the altered land.
Hydrology	D	D	D	D	Same at the time of scoping.
Groundwater	D	D	D	D	Same at the time of scoping.
Soil erosion	B-	B-	B-	B-	Construction stage: Due to the exposed ground created during development for the powerhouse site, pipelines, geothermal well pads, transmission tower footing, small roads, etc., rainfall may cause this ground to erode. Operation period: When exposed ground remains bare for a prolonged period of time, rainfall may cause soil erosion.
Topographical and geological features	D	D	D	D	Same at the time of scoping.
Global warming/ climatic variation	D	B+	D	B+	Construction stage: Same at the time of scoping. Operation period: CO ₂ and other components contained in NCG will be released. However, greenhouse gas emissions will be considerably less than with other steam power generation methods. It is estimated that CO ₂ emissions will be 832,627 tons less per year than with coal-fired power generation. Thus, the project is expected to contribute to reductions in CO ₂ emissions in Kenya.

Item	Provisional Scoping of Impact		Scoping after the survey and the review		Reason
	Construction stage	Operation period	Construction stage	Operation period	
3. Social Environment					
Land acquisition and resettlement	A-	D	A-	D	Same as exploratory scoping.
Living and livelihood	B+	B+	B+	B+	Same as exploratory scoping.
Heritage	D	D	D	D	-
Landscape	B-	B-	B-	B-	Same as exploratory scoping.
Ethnic minorities and indigenous peoples	D	D	D	D	Same as exploratory scoping.
Poverty groups	C	C	D	D	During Construction and Operation: Identification of vulnerable people, including poor individuals, was conducted with consideration of overall living environment. As a result, there were no poor individuals in Olonongot village.
Land use / Natural resource	B-	D	D	D	During Construction and Operation: Land use change will occur due to construction of the power plant. This impact is expected to be limited because PAPs will still be able to graze in the area where they are currently grazing, at their own risk.
Water Use	C	C	D	D	During Construction and Operation: Project is not associated with large scale water abstraction. Total water usage of KenGen including Olkaria V and horticulture industry is small compared to the water amount in Lake Naivasha. Hence an impact on water usage is not expected.
Existing social Infrastructures and social services	D	D	D	D	-
Social institutions and local decision making institutions	D	D	D	D	-
Misdistribution with unfair distribution of benefits and damages	B-	D	D	D	During Construction and Operation: Job availability for local people during construction of Olkaria V is planned to be discussed at Employment sub-committee. Therefore, misdistribution with unfair distribution of benefits and damages is expected to be almost none.

Item	Provisional Scoping of Impact		Scoping after the survey and the review		Reason
	Construction stage	Operation period	Construction stage	Operation period	
Gender	C-	C-	D	D	During Construction and Operation: The Cultural Centre will continue business at the current location and women of PAPs will be able to sell local crafts. Women will move to the resettlement site, however impact is considered to be small because a bus will be provided as means of transportation. PAPs are basically compensated by land for loss of land and house for the loss of the house, and not by cash. Hence the risk is small that a man, as a head of the household, does not distribute compensation to women in the same household. Considering these points, impact to gender is not expected.
Children's rights	D	B+ /C	D	D	During Construction and Operation: Consultation with vulnerable people, include groups of youths has been conducted and their opinion is reflected in the RAP. Hence, the impact is expected to be minimum.
Local conflicts of interest	D	D	D	D	-
Health / Public health	B-	B-	D	D	During Construction and Operation: A village which exceed the WHO standard for 24 -hours average hydrogen sulphide concentrations and the NEMA standard for night time noise was relocated based on the results of modeling. There is no impact expected for local people.
Infectious disease such as HIV/AIDS	B-	B-	B-	B-	Same as exploratory scoping.
Working condition	B-	B-	B-	B-	Same as exploratory scoping.
4. Others					
Accidents	C	B-	C	B-	Same at the time of scoping.

* A: Significant impact is likely.

B: Some degree of impact is likely

C: The degree of impact is unidentified, and future investigation for clarification is needed.

D: As the impact will be minimal, future investigation is unnecessary.

+: Positive impact

-: Negative impact

11. MITIGATION MEASURES

To mitigate potential negative impact by the project, following mitigation measures should be taken.

Impact			Mitigation measures	Cost	Implementing Organization	Responsible Organization
Construction stage						
POLLUTION						
1	Air pollution	H ₂ S Dust	— In ESIA, it says as follows: <ul style="list-style-type: none"> • Olkaria is a fragile ecosystem; thus mobile machinery or vehicle maintenance and services should be undertaken away from project site in a yard set aside for this or by an approved garage or service station to prevent any incident of oil and fuel spills that could contaminate soils and possibly ground water quality. • Daily monitoring of air quality standards; • All construction machinery shall be maintained and serviced in accordance with the manufacturer's specifications; • Workers shall be trained / sensitized on dust minimization techniques and management of air pollution from vehicles and machinery; • The removal of vegetation shall be avoided until such time as clearance is required and exposed surfaces shall be revegetated or stabilized as soon as practically possible; • Frequent watering of exposed surfaces and piles of soil to prevent airborne dust emissions; • Unless inevitable, vehicles shall avoid earth roads susceptible to fugitive dust until dust management routines are done. • Incorporate dust and fume arrestors in the batching plant, e.g use of dust nets • Provision of appropriate protective personal equipment including respirators and aprons to reduce pollution of ambient air 	— 500,000.00 Annually for air and dust sampling; 2,000,000.00 Annually for watering	— KenGen/ Contractor	— KenGen
2	Waste		In ESIA, it says as follows: <ul style="list-style-type: none"> • Identifying environmentally acceptable spoil sites for spoil materials and approval by the Resident Engineer. Mitigate noise and vibration pollution. Solid waste disposal management • Encourage segregation by providing labelled collection and separation bins • Encourage recycle and reuse measures for some of the spoils generated such as woody spoils generated from construction work will be stock piled to manageable 	Part of the project	KenGen/ Contractor	KenGen

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization
	<p>size, valued and given to surrounding community as fuel wood as a cost effective measure. Other reusable materials are scrap metal and paper.</p> <ul style="list-style-type: none"> - Waste disposal should be done by licensed collectors and handlers. <p>According to the person in charge at KenGen, waste soil generated from geothermal well drilling will be handled as follows.</p> <ul style="list-style-type: none"> • Soil from the upper layers will be temporarily placed and reused as surface soil for greening. • Rocks from lower layers will be reused for construction within the powerhouse and other related facilities, such as for graveling around the reservoirs. • When oil or other substances adhere to rocks, disposal will be contracted out to a NEMA-licensed industrial waste disposal company for appropriate treatment. 			
3	<p>Soil contamination</p> <p>According to the interview with the person in charge at KenGen, non-operational effluents will be treated as follows:</p> <ul style="list-style-type: none"> • Non-operational effluents will be collected in non-flush tanks, and then picked up and properly treated by a NEMA-licensed company. 	Part of the project	KenGen/ Contractor	KenGen
4	<p>Noise and Vibration</p> <p>In ESIA, it says as follows:</p> <ul style="list-style-type: none"> • Keep machines and vehicles in good working condition as per manufacturer's instructions; • Site and other operational workforce be provided with personal protective equipments (PPEs). The same should undergo audio metric screening on prescribed bases. • Provide signage on high noise levels and adequate notice to any local community to be potentially affected. • Daily monitoring of noise levels will need to be made during operation as per current practice. <p>In addition to the above, the following mitigation measures are recommended.</p> <ul style="list-style-type: none"> • If geothermal wells are drilled and production testing is carried out at a location adjacent to RAP LAND in the future, the use of silencers, soundproof walls, or other measures will be studied. • If well drilling and production testing are to continue into the night, nighttime noise will be monitored in addition to daytime noise. 	500,000 KES annually	Contractor Supervising KenGen	KenGen
	<p>In addition to the above, the following mitigation measures are recommended.</p> <ul style="list-style-type: none"> • If geothermal wells are drilled and production testing is carried out at a location adjacent to RAP LAND in the future, the use of silencers, soundproof walls, or other measures will be studied. • If well drilling and production testing are to continue into the night, nighttime noise will be monitored in addition to daytime noise. 	Part of the project	KenGen	KenGen

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization	
5	Offensive odors	—	—	—	
NATURAL ENVIRONMENT					
6	Protected area (National park)	<ul style="list-style-type: none"> Regarding the impact on landscape as seen from the national park, mitigation measures as described in “10 Landscape” will be taken. No mitigation measures for impact on the national park have been studied in ESIA. 	Described in “10 Landscape”	Described in “10 Landscape”	Described in “10 Landscape”
		<p>The following mitigation measures are recommended.</p> <ul style="list-style-type: none"> In accordance with the agreement on environmental protection in the project area stipulated in MoU, KWS and KenGen will work closely together. Ecological monitoring will be implemented. When impact on the national park caused by the project implementation is noted, specific mitigation measures will be discussed. Special attention should be paid for construction around National Park boundary. Besides, the mitigation measures and the monitoring plans should be implemented. 	Part of the project	contractor/ KenGen/ KWS	KenGen/ KWS
7	Fauna, flora, and biological diversity	<p>In ESIA, it says as follows:</p> <p>-Flora</p> <ul style="list-style-type: none"> Map out ecologically sensitive area at the site and make them known to the engineers and contractor e.g. valley thicket, hills, and gorges Ensure there is selective clearing of the vegetation as this allows future re-growth and regeneration. This will ensure minimal disruption of wild fauna's natural movement, territoriality, and other ecological processes; It is desirable to re-vegetate disturbed areas along roads, pipelines and steam lines and other construction sites. While <i>Nicotianum glauca</i> will rapidly colonize the disturbed bare grounds and still act as surrogate habitat for some faun species, it is still desirable to minimize/discourage its dominance by planting native trees such as <i>Tarconunthus</i> and <i>A. drepanolobium</i>. Additionally, <i>Hyparrhenia dregeana</i>, a native tussocks grass commonly growing at the site, can be used in checking soil erosion, especially on loose soil dumps or bare slopes created during construction. The water and steam pipe lines should be laid across (perpendicular to) the valleys rather than running along them as this will mean destroying large patch of this 	<p>-Flora 20,000,000.00 KES for re-vegetation of approximately 2 million trees.</p> <p>-Fauna 1,000,000 KES annually</p>	contractor/ KenGen/ KWS	contractor/ KenGen/ KWS

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization
	<p>ecologically sensitive keystone habitat. For many species this will reduce loss of habitat.</p> <ul style="list-style-type: none"> • There is need to create awareness among the local communities and discourage them from engaging in charcoal burning which is evidently on the increase in this area. • KenGen GRD Environmental and community liaison section should monitor regeneration of natural vegetation as well as the appearance/spread of invasive or opportunistic species within the disturbed areas. Monitoring should include spotting and uprooting of unwanted germinating plants. <p>-Fauna</p> <ul style="list-style-type: none"> • KWS and KenGen should monitor wildlife abundance, distribution and movement in relation to this infrastructural development during construction and operation stages to aid in decision making. • Erect bumps in wildlife crossing zones; • Vehicular disturbances such as hooting should be discouraged accordingly; • Incident records (of poaching, accidents and other human wildlife conflicts etc.) should be kept by monitoring and taking of corrective measures; • Roads feeding into the park area should be maintained as routes for tourist's activities and wildlife management; • Access for earthmoving machines should be regulated; • Park rules should be enforced within the park; • Brine ponds should be located close to the source. Distant flow should be piped to prevent animal or vegetation contact; • At known animal migration corridors, pipes should be elevated or buried under the ground surface. Modify pipe loop designs to minimize hindrance to wildlife movement as well as scaring them away. Other design options like pipe burying, wider loops or concave ones should be explored for habitat suitability and to ensure big game can still move along their routine corridors and routes. <p>-Avifauna</p> <ul style="list-style-type: none"> • KenGen together with KWS should develop and implement an avifauna monitoring scheme; assessing bird population trends and direct hazards relating to the project; • The project site has gorges, valleys and hillsides which form some of the keystone habitat features for raptors (Vultures and Eagles) as they enable them to soar high 			

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization
	<p>using thermal currents while in search of prey. These should therefore be retained as intact as possible;</p> <ul style="list-style-type: none"> • High voltage transmission lines should be fitted with wire markers and flappers to alert birds on flight; • High heat points and emission vents within the project area should be sheltered or fitted with inhibitors to deter birds which may get killed as a result of using such areas; • As the project will draw much water from Lake Naivasha, KenGen should join hands with other stakeholders in supporting the ongoing bi-annual waterbird counts which is a long term monitoring activity aimed at assessing the effects of various activities around the lake. <p>-Herpetofauna</p> <ul style="list-style-type: none"> • KenGen should liaise with KWS to capture reptiles such as Pythons and House snakes hiding under rocks and sheltered terrains and safely release them in suitable habitats. 			
	<p>In addition to the above, the following mitigation measures are recommended.</p> <ul style="list-style-type: none"> • Sufficient intervals between transmission lines should be secured so that birds will not be electrocuted. • For the installation of speed bumps on roads in zones where wild animals cross, proper installation locations will be determined by consulting with KWS before the start of construction and by studying the likely movement routes of wild animals. 	Part of the Project	KenGen / KETRACO / KWS	KenGen / KETRACO / KWS
8	<p>Soil erosion</p> <p>In ESIA, it says as follows:</p> <ul style="list-style-type: none"> • Proper planning of site clearing or disturbance of the natural vegetation. • Isolated sites with installations and frequent human presence that require re-vegetation will be surrounded by less palatable native species to act as plant screens and reduce pressure from wildlife foraging. • No grey water runoff or uncontrolled discharges from the site/working areas (including wash down areas) 	Part of the project	contractor/ KenGen/ KWS	KenGen
	<p>In addition to the above, the following mitigation measures are recommended.</p> <ul style="list-style-type: none"> • When soil erosion is observed, sediment removal devices should be installed in order to reduce the load caused by sludge directly flowing into gullies. 	Part of the project	contractor/ KenGen	KenGen

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization															
SOCIAL ENVIRONMENT																			
9	Land acquisition and resettlement	House, church and school will be established and provided with land before construction.	Included in RAP's budget.	KenGen	KenGen														
		Half of unskilled work is planned to be given to willing local people in Olkaria. Information sharing and discussion about the jobs available will be conducted at Employment sub-committee.	No cost is required.	Employment sub-committee	KenGen														
		Conduct monitoring after relocation to monitor impact to livelihood and take measures, if necessary.	Included in monitoring	KenGen/ external consultan/IEP	KenGen														
10	Landscape	– Power plant and pipeline Following mitigation is written in ESIA.	Included in construction cost.	KenGen	KenGen														
		<table border="1" data-bbox="465 751 1431 959"> <thead> <tr> <th data-bbox="465 751 790 791">Impact</th> <th data-bbox="790 751 1431 791">Mitigation</th> </tr> </thead> <tbody> <tr> <td data-bbox="465 791 790 959">Loss of vegetation</td> <td data-bbox="790 791 1431 959">Clearing of vegetation to be limited to construction area. Plan re-vegetation of 2 million trees per year. When planning re-vegetation 75% should be indigenous species and exclude invasive species.</td> </tr> <tr> <td data-bbox="465 959 790 999">Topography change</td> <td data-bbox="790 959 1431 999">Earthwork to be limited to construction area.</td> </tr> <tr> <td data-bbox="465 999 790 1098">Soil disturbance</td> <td data-bbox="790 999 1431 1098">Preserve topsoil and reuse for landscaping. Plant vegetation or stone pitch all embankments to prevent soil erosion.</td> </tr> <tr> <td data-bbox="465 1098 790 1197">Visual intrusion by pipeline from well to power plant</td> <td data-bbox="790 1098 1431 1197">Plant trees along the pipeline and use it as screen. Use color which matches with surrounding environment to reduce impact of pipeline.</td> </tr> <tr> <td data-bbox="465 1197 790 1295">Visual intrusion by power plant</td> <td data-bbox="790 1197 1431 1295">Use color which matches with surrounding environment to reduce impact of power plant and pipeline.</td> </tr> <tr> <td data-bbox="465 1295 790 1369">Lighting</td> <td data-bbox="790 1295 1431 1369">Turn off light when not necessary. Minimize lighting during night time.</td> </tr> </tbody> </table>				Impact	Mitigation	Loss of vegetation	Clearing of vegetation to be limited to construction area. Plan re-vegetation of 2 million trees per year. When planning re-vegetation 75% should be indigenous species and exclude invasive species.	Topography change	Earthwork to be limited to construction area.	Soil disturbance	Preserve topsoil and reuse for landscaping. Plant vegetation or stone pitch all embankments to prevent soil erosion.	Visual intrusion by pipeline from well to power plant	Plant trees along the pipeline and use it as screen. Use color which matches with surrounding environment to reduce impact of pipeline.	Visual intrusion by power plant	Use color which matches with surrounding environment to reduce impact of power plant and pipeline.	Lighting	Turn off light when not necessary. Minimize lighting during night time.
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		Topography change				Earthwork to be limited to construction area.													
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Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
		<p>— Transmission Line</p> <p>Impact of transmission line is not found in ESIA.</p> <p>According to KenGen, they are planning to carry out an internal EIA; even though it is not required by Kenyan law. KenGen is planning to consider mitigation measures for the landscape with consultation of KETRACO and KWS while establishing the EIA.</p> <p>According to KenGen, mitigation measures are expected to be similar with the ones in ESIA of Olkaria IV. Below are the mitigation measures written in the ESIA of Olkaria IV.</p> <ul style="list-style-type: none"> • Review existing tower's impact to the landscape and design an environmentally friendly tower. • In order to reduce tension towers, make the transmission line straight as possible. • Located transmission line adjacent and parallel to the existing line. • Where two lines are parallel, 2nd line should be adjacent to the existing line. • Use existing road for construction, as much as possible. • Restore temporary work yard after completion. 	5,000,000 KES	KenGen	KenGen
11	Poverty groups	—	—	—	—
12	Land use / Natural resource	—	—	—	—
13	Water use	No impact is expected for water use. However KenGen will conduct monitoring of water usage and water level of Lake Naivasha.	Included in the project cost.	KenGen	KenGen
14	Misdistribution with unfair distribution of benefits and damages	Information sharing and discussion about the jobs available will be conducted at Employment sub- committee.	No cost is required.	Employment sub- committee	KenGen
15	Gender	—	—	—	—
16	Children's rights	—	—	—	—
17	Health / Public	Since resettlement has been carried out, specific mitigation measure is not required. However monitoring of air quality and noise will be conducted at the project site.	Included in environmental	KenGen	KenGen

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
	health		monitoring.		
18	Infectious disease such as HIV/AIDS	<p>In ESIA, the following mitigation measures are written for Infectious disease such as HIV/AIDS.</p> <ul style="list-style-type: none"> • Locate construction camp away from nearby settlements. • Educate workers and local people about STI and HIV/AIDS. • Provide condoms to workers, project team and local people. • Conduct regular campaign, monitor and evaluate the implementation. • Form peer groups among staff for raising awareness. • Contractor will raise awareness by using posters, and prevention campaign during construction. • Contractor will make sure that worker will be informed about local culture and risk of STI. 	More than 2,000,000 Ksh per year	KenGen	KenGen
		As a result of this survey, it is recommended that KenGen will establish an HIV Prevention Program based on their HIV/AIDS policy and included in the tender document.	Carried out in the detailed design.	KenGen	KenGen
		As a result of this survey, it is recommended that Contractor will establish an HIV Prevention Program based on ESIA and HIV Prevention Program and implement it.	Included in the construction cost.	Contractor	KenGen
19	Working condition	<p>In ESIA, the following mitigation measures are written.</p> <ul style="list-style-type: none"> • Provide and enforce wearing PPEs (Personal Protective Equipments). • Comply with H&S related regulations and laws. • Employ full time H&S staff. • Apply strict CoC for vehicle drivers, such as speed and goods loaded • Implement H&S program during construction. • Establish Emergency Response Procedure and display at work areas. • Conduct audit by H&S committee. • Provide induction and regular H&S training. • Provide first aid kit. • Contractors to establish their Occupational Health and Safety policy in line with KenGen's Occupational Health and Safety policy. • Inspect machinery and equipment quarterly, etc. • Install safety related signage. 	Inspection of machinery and equipment: 500,000 Ksh per year	Contractor	KenGen

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
		<p>According to KenGen, following actions will be carried out.</p> <ul style="list-style-type: none"> • Provide Health and safety training to KenGen employee, Contractor, and local people in accordance with Occupational Safety and Health Act (OSHA) 2007. • Monitor noise and H₂S daily. 			
OTHERS					
20	Accidents	<p>Below are mitigation measures for expected accidents.</p> <p>— Fire In ESIA, the following mitigation measures are written.</p> <ul style="list-style-type: none"> • Provide induction and regular H&S training. • Prepare sand bag, sawdust, absorbent material approved by NEMA. • Install impermeable floor for fuel filling area and drums storage area. • Prepare water tank, fire extinguishers, sprinkler. • Establish Emergency Response Plan <p>— Traffic accident No information was found for traffic accident in ESIA. As a result of this survey, it was found that KenGen is planning following mitigation measures.</p> <ul style="list-style-type: none"> • Raise awareness of local people by using posters etc. • Apply KenGen's Traffic management plan and accident reporting system to this project. • Install appropriate traffic signage. • Install speed bumps. • Provide training to vehicle driver. • Conduct traffic flow monitoring. Based on the result, construct a road which is acceptable for the traffic increase due to Olkaria V. <p>— H₂S leakage No information of H₂S leakage is found in ESIA. As a result of this survey, it was found the KenGen is planning the following mitigation measures.</p> <ul style="list-style-type: none"> • Apply their Hydrogen Sulphide Gas Casualty Rescue and Emergency Response Plan to this project. 	Included in the construction cost.	Contractor	KenGen

Impact			Mitigation measures	Cost	Implementing Organization	Responsible Organization
Operation period						
POLLUTION						
1	Air pollution	H ₂ S	—	—	—	—
		Dust	—	—	—	—
2	Waste	<p>In ESIA, it says as follows:</p> <ul style="list-style-type: none"> • Discharge sewage into septic tanks with maintenance ensuring the sewage doesn't flow to the surface. • For solid waste collection and disposal from the plant ensure a NEMA licensed company is used. • When cleaning equipment for maintenance, the use of trays should be ensured to prevent any leakage. A response plan should be formulated should leakage occur. • A storage house should be constructed for secondary storage of oils and chemicals. • Oil separators should be used within the powerhouse. 	Part of the project	contractor/KenGen	KenGen	
3	Soil contamination	<p>From the interview with the person in charge at KenGen, non-operational effluents will be treated as follows:</p> <ul style="list-style-type: none"> • Non-operational effluents will be collected in non-flush tanks, and then picked up and properly treated by a NEMA-licensed company. 	Part of the project	contractor/KenGen	KenGen	
4	Noise and Vibration	<p>In ESIA, it says as follows:</p> <ul style="list-style-type: none"> • Appropriate signage in sensitive areas • Provide PPE for operational staff and visitors • Annual audio metric test for operational staff • Monitoring of noise quality and abiding by NEMA quality guidelines. • Monitor changes in geothermal development technology and adopt if necessary. 	Part of the project	KenGen	KenGen	

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
5	Offensive odors	—	—	—	—
NATURAL ENVIRONMENT					
6	Protected area (National park)	<ul style="list-style-type: none"> Regarding the impact on landscape as seen from the national park, mitigation measures as described in “10 Landscape” will be taken. No mitigation measures for impact on the national park have been studied in ESIA.	Described in “10 Landscape”	Described in “10 Landscape”	Described in “10 Landscape”
		The following mitigation measures are recommended. <ul style="list-style-type: none"> In accordance with the agreement on environmental protection in the project area stipulated in MoU, KWS and KenGen will work closely together. Ecological monitoring will be implemented. When impact on the national park caused by project implementation is noted, specific mitigation measures will be discussed. Special attention should be paid for the operation of the power plant and the other institutions around National Park boundary. Besides, the mitigation measures and the monitoring plans should be implemented. 	Part of the project	contractor/KenGen/KWS	KenGen/KWS
7	Fauna, flora, and biological diversity	In ESIA, it says as follows: -Flora <ul style="list-style-type: none"> Monitor invasive plant species at the project area and uproot unwanted germinating plants; Assess concentration geothermal gaseous effluents such as H₂S, SO₂, NH₃ and CO₂ (e.g. by use of automatic sensors) and continually test for any evidence of acid rain Plant soil-erosion preventing grass species such as Cynodon dactylon, Digitaria abyssinica, Pennisetum clandestinum and Hyparrhenia dregeana at bare sloppy grounds or loose soil dumps; Steam pipe insulations should have a well camouflaged colours that are maintained so that animals don't perceive pipelines as barriers Brine flows and ponds should be located close to the source. Distant flow should be transmitted through closed pipes Rehabilitate disturbed areas along roads, pipelines and abandoned campsites 	-Flora 5years target of 100,000 trees -Fauna Part of the project	KenGen KenGen/KE TRACO/Contractor/KWS	KenGen KenGen/KE TRACO/Contractor/KWS

Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization
	<p>planting native plant species such Tarconunthus and A. drepanolobium – this should be done as soon as practicable to avoid colonization by invasive and opportunistic pioneer species;</p> <ul style="list-style-type: none"> • Exotic plants species should not be introduced into this area; • Create awareness among the local communities on the importance of vegetation cover and discourage them from engaging' in charcoal burning. <p>-Fauna</p> <ul style="list-style-type: none"> • KWS and KenGen should monitor wildlife abundance, distribution and movement in relation to this infrastructural development during construction and operation stages to aid in decision making; • Erect bumps in wildlife crossing zones; • Vehicular disturbances such as hooting should be discouraged accordingly; • Incident records (of poaching, accidents and other human wildlife conflicts etc.) should be kept by monitoring and taking of corrective measures; • Roads feeding into the park area should be maintained as routes for tourist's activities and wildlife management; • Access for earthmoving machines should be regulated; • Park rules should be enforced within the park; • Brine ponds should be located close to the source. Distant flow should be piped to prevent animal or vegetation contact; • At known animal migration corridors, pipes should be elevated or buried under the ground surface. Modify pipe loop designs to minimize hindrance to wildlife movement as well as scaring them away. Other design options like pipe burying, wider loops or concave ones should be explored for habitat suitability and to ensure big game can still move along their routine corridors and routes. 			
	<p>The following mitigation measures are recommended in addition to those described above:</p> <ul style="list-style-type: none"> • For the installation of speed bumps on roads in zones where wild animals cross, proper installation locations will be determined by consulting with KWS and by studying likely movement routes of wild animals. 	Part of the project	KenGen / KWS	KenGen / KWS

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization	
8	Soil erosion	In ESIA, it says as follows: <ul style="list-style-type: none"> • The design should considered appropriate terracing due to the nature of topography of the area; • Planting of trees along the gullies and areas susceptible to erosion is proposed; • Re-forestation or re vegetation of areas cleared during construction should be done. 	Part of the project	contractor/KenGen/KWS	KenGen	
		In addition to the above, the following mitigation measures are recommended. <ul style="list-style-type: none"> • When soil erosion is observed, sediment removal devices should be installed in order to reduce the load caused by sludge directly flowing into gullies. 	Part of the project	contractor/KenGen	KenGen	
SOCIAL ENVIRONMENT						
9	Land acquisition and resettlement	—	—	—	—	
10	Landscape	— Power plant and pipeline Following mitigation is written in ESIA.	Included in the project cost.	KenGen	KenGen	
		<table border="1"> <thead> <tr> <th>Impact</th> <th>Mitigation</th> </tr> </thead> <tbody> <tr> <td>Loss of vegetation</td> <td>Plan re-vegetation of 2 million trees per year.</td> </tr> <tr> <td>Lighting</td> <td>Turn off light when not necessary. Minimize lighting during night time.</td> </tr> </tbody> </table>				Impact
Impact	Mitigation					
Loss of vegetation	Plan re-vegetation of 2 million trees per year.					
Lighting	Turn off light when not necessary. Minimize lighting during night time.					
		— Transmission Line Impact of transmission line is not found in ESIA. According to KenGen, they are planning to carry out EIA; even it is not required by Kenyan law. KenGen is planning to consider mitigation measures for the landscape with consultation of KETRACO and KWS while establishing the EIA. According to KenGen, mitigation measures are expected to be similar with the ones in the ESIA of Olkaria IV. It is written that existing road should be used as much as possible during operation.	No cost is required.	KenGen	KenGen	
11	Poverty groups	—	—	—	—	

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
12	Land use / Natural resource	—	—	—	—
13	Water use	No impact is expected for water use. However KenGen will conduct monitoring of water usage and water level of Lake Naivasha.	Included in the project cost.	KenGen	KenGen
14	Misdistribution with unfair distribution of benefits and damages	—	—	—	—
15	Gender	—	—	—	—
16	Children's rights	—	—	—	—
17	Health / Public health	Since resettlement has been carried out, specific mitigation measure is not required. However monitoring of air quality and noise will be conducted at the project site.	Included in environmental monitoring.	KenGen	KenGen
18	Infectious disease such as HIV/AIDS	In ESIA, the following mitigation measures are written for Infectious disease such as HIV/AIDS. <ul style="list-style-type: none"> • Provide training and awareness rising about HIV/AIDS annually. • Provide condoms • Conduct counselling as necessary. 	More than 2,000,000 Ksh per year	KenGen	KenGen
19	Working condition	In ESIA, the following mitigation measures are written. <ul style="list-style-type: none"> • Provide and enforce wearing PPEs (Personal Protective Equipment). • Comply with H&S related regulations and laws. • Employ full time H&S staff. • Apply strict CoC for vehicle drivers, such as speed and goods loaded • Establish Emergency Response Procedure and display at work areas. • Conduct audit by H&S committee. • Provide induction and regular H&S training. 	Inspect machinery and equipment quarterly, audit 500,000 Ksh per year	KenGen	KenGen

Impact		Mitigation measures	Cost	Implementing Organization	Responsible Organization
		<ul style="list-style-type: none"> • Provide first aid kit. • Inspect machinery and equipment quarterly, etc. <p>KenGen's Occupational Health and Safety policy was provided and checked during this survey and the below information was written.</p> <ul style="list-style-type: none"> • Roles and responsibility for H&S. • Reporting of accident and incidents. • General regulations for chemical and hazardous material. • General regulations for noise, lighting, ventilation and fire prevention and protection etc. <p>According to KenGen, the following actions will be carried out.</p> <ul style="list-style-type: none"> • Provide Health and safety training to KenGen employees, Contractors, and local people in accordance with Occupational Safety and Health Act (OSHA) 2007. • Monitor noise and H₂S daily. 			
OTHERS					
20	Accidents	<p>Below are mitigation measures for expected accidents.</p> <p>— Fire</p> <p>In ESIA, the following mitigation measures are written.</p> <ul style="list-style-type: none"> • Provide induction and regular H&S training. • Prepare sand bag, sawdust, absorbent material approved by NEMA for leakage. • Install impermeable floor for fuel filling area and drums storage area. • Prepare water tank, fire extinguishers, sprinkler. • Establish Emergency Response Plan • Carry out fire drills. • Inspect firefighting equipment. • Establish Leakage Response Plan since hydro carbon such as solvent, acid and alkali is going to be used. • Provide secured compound for storage area/ • Installation of secondary containment. 	Included in the project cost.	KenGen	KenGen

	Impact	Mitigation measures	Cost	Implementing Organization	Responsible Organization
		<p>–Traffic accident No information was found for traffic accident in ESIA. As a result of this survey, it was found that KenGen is planning following mitigation measures.</p> <ul style="list-style-type: none"> • Raise awareness of local people by using posters etc. • Apply KenGen’s Traffic management plan and accident reporting system to this project. <p>–H₂S leakage No information of H₂S leakage is found in ESIA. As a result of this survey, it was found the KenGen is planning the following mitigation measures.</p> <ul style="list-style-type: none"> • Apply their Hydrogen Sulphide Gas Casualty Rescue and Emergency Response Plan to this project. 			

12. ENVIRONMENTAL MONITORING PLAN

Based on the above mentioned mitigation measures, the Team developed the draft Environmental Monitoring Plan which contains the whole items needed monitoring as shown in Table 12-1, such as monitoring items, location and frequency, and responsible body. Environmental Management Plan was developed aiming to prevent impacts on Hell's Gate National Park both in construction and operation stages. But, it is required that the draft Environmental Monitoring Plan is to be implemented properly, since the project area is next to the boundaries of the National Park.

Table 12-1 Draft Environmental Monitoring Plan

Environmental Item	Item	Location	Frequency	Responsible body
Construction Stage				
Air pollution	TSP, SO ₂ , CO, H ₂ S, CO ₂ , CH ₄	Populated areas	Daily	Contractor/ KenGen
Surface water	TSS, COD, BOD, DO, pH, oil, phenol	Effluent outlets; local drinking water supply sources; important water bodies	Monthly for 3 consecutive days	Contractor/ KenGen
Noise	dB	Sensitive spots	Daily (Daytime and nighttime noise will be monitored in case well drilling and production testing generate noise even at night)	Contractor/ KenGen
Waste	Slag, domestic refuse, metallic scraps, sludge	Disposal sites	Quarterly	Contractor/ KenGen
Soil erosion	Visual inspection	Entire site	Biweekly	Contractor/ KenGen
Protected area (National park)	Regular monitoring of wildlife numbers, visual inspection of changes in vegetation	Entire site	Biweekly	KWS/KenGen ¹
Fauna and Flora	Regular monitoring of wildlife numbers and situation of vegetation	Project area and environs	Quarterly	KenGen/ NEMA/ KWS ²
Land acquisition and resettlement	Status of livelihood restoration after resettlement	Relocation site	Right after resettlement, 3months and 6months later. Thereafter depends on the status of livelihood restoration.	KenGen

Environmental Item	Item	Location	Frequency	Responsible body
Water use	Industrial and domestic water usage of KenGen Water level of Lake Naivasha	Water abstraction point Lake Naivashia	Daily/ report quarterly	KenGen
Misdistribution with unfair distribution of benefits and damages	Jobs available for local people and hired number by area.	Construction site	Quarterly	Employment sub-committee /KenGen
Infectious disease such as HIV/AIDS	Implementation status of mitigation measures for HIV/AIDS	Construction site	Quarterly	Contractor/ KenGen
Working condition	Monitoring of H ₂ S and noise	Construction site	Daily	KenGen
	Audit by Health and Safety Committee	Construction	Quarterly	Contractor/ KenGen
	Construction of worker's camp	Construction site of worker's camp	Monthly	KenGen
Accidents	Occurred accidents and its handling.	Construction site	Occurrence Basis	Contractor/ KenGen
Operation Period				
Air pollution	TSP, SO ₂ , CO, H ₂ S, CO ₂ , CH ₄	Populated areas	Daily	Contractor/ KenGen
Surface water	TSS, COD, BOD, DO, pH, oil, phenol	Effluent outlets; local drinking water supply sources; important water bodies	Monthly	Contractor/ KenGen
Noise	dB	Sensitive spots	Daily	Contractor/ KenGen
Waste	Slag, domestic refuse, metallic scraps, sludge	Disposal sites	Daily	Contractor/ KenGen
Soil erosion	Visual inspection	Entire site	Monthly	Contractor/ KenGen
Protected area (National park)	Regular monitoring of wildlife numbers, visual inspection of changes in vegetation	Entire site	Monthly	KWS/KenGen ¹
Fauna	Regular monitoring of wildlife numbers and situation of vegetation	Project area and environs	Quarterly	KenGen/ NEMA/ KWS ²
Water use	Industrial and domestic water usage of KenGen	Water abstraction point Lake Naivashia	Daily/ report quarterly	KenGen

Environmental Item	Item	Location	Frequency	Responsible body
	Water level of Lake Naivasha			
Working condition	Monitoring of H ₂ S and noise	Power plant	Daily	KenGen
	Inspection of machinery and equipment and Audit by Health and Safety Committee	Power plant	Quarterly	KenGen
Accidents	Conduct fire drills, and inspection of firefighting equipment	Power plant	Quarterly	KenGen
	Inspection of leakage prevention measures, such are secondary containment.	Power plant	Quarterly	KenGen
	Occurred accidents and its handling.	Power plant	Occurrence Basis	KenGen

1 KenGen adopts the monitoring data carried out by KWS.

2 KenGen adopts the monitoring data carried out by KWS and NEMA, respectively.

13. STAKEHOLDER CONSULTATION AND PUBLIC HEARINGS

13.1 Items related to environmental and social considerations

(1) Completed consultations with stakeholders

Stakeholder consultations for the Olkaria V project were carried out between January and February, 2014. Two broad categories of stake holders including the primary and secondary stakeholders were identified and involved in the consultations. The former are beneficiaries of the project or the stakeholders directly affected by the project, commonly referred to as project affected persons (PAPs). The latter were stakeholders who influence the development or are indirectly affected by the project including implementing agency, relevant government officers and local administration. The key stakeholders consulted were as follows:

- Kenya Wildlife Service
- Chairmen of the villages in the project area
- Local community through public meetings
- Chief, Hells Gate Location
- Sub-county commissioner
- Oserian Development Company
- OrPower
- Lake Naivasha Riparian Association
- World Wide Fund for Nature
- Water Resources Management Authority
- Imarisha, Naivasha
- County Government Officers (Public Health Officer, Gender and Social Development Officer, Development Officer, Water Officer, Education Officer)

The items discussed during the consultations with stakeholders are in Table 13.1-1.

Regarding issues and concerns raised by stakeholders, KenGen will address them as described in 17 MITIGATION MEASURES.

Table 13-1 A Summary of the issues raised by the consulted stakeholders

Impacts	Cluster of stakeholders	Issues and Concern
Air pollution	Sub-county Administration	Noted pollution of air, dust.
	Sub-county Social Development Office	Increase in pollution to the environment such as air, dust.
	Sub-County Public Health Officer	Hydrogen sulphide emission and dust.
	Kenya Wildlife Service(KWS)	Air pollution during construction and from the production wells during generation.
	NGO	Noise and dust pollution. The stakeholder proposed dust suppression measures to be taken into account.
	Oserian Development	Project increase in the levels of hydrogen sulphide emissions which has had impacts such as acidic dew and rain with corrosive tendencies on property such as fencing lines, Iron sheets and quality of flower leaves.

Impacts	Cluster of stakeholders	Issues and Concern
Waste	Oserian Development	Proposed that KenGen and contacted companies need to find a suitable location to dump their waste. Secondly adopt better methods of transporting waste such as use of closed trucks.
Noise and vibration	Sub-county Administration	Noted pollution of noise.
	Kenya Wildlife Service(KWS)	Noise pollution during construction and from the production wells during generation.
Fauna, flora, and biological diversity	Sub-county Administration	Noted that the construction of the plant and its auxiliary facilities will lead to displacement of animals.
	Kenya Wildlife Service (KWS)	The KWS representative noted that the proposed project activities will have negative visual impact with regard to animals hence reducing their mobility.
	NGO	Disturbance of wildlife through modification of their habitats and landscapes. This will include construction of alien infrastructure that will hinder mobility. Proposed that the steam pipes should be located under the ground.
	Sub-County Public Health Officer	Noted that there shall be loss of vegetative cover during construction
	Sub-county Social Development Office	Destruction of vegetative cover.
	Kenya Wildlife Service (KWS)	Impact of vegetation which will result in displacement of animals in search for new pasture. Increased human and vehicular traffic in the park area thus interfering with animals. The stakeholder also recommended the introduction of speed bumps in all the roads to regulated vehicle speeds.
Land Acquisition and Resettlement	Sub-county Administration	Noted that the project will force displacement of communities.
	NGO	There will be increase in residential housing prices and increase of informal settlements
Landscape	NGO	Noted that there will be modification of the physical environment that will lead to aesthetic impacts.
	Oserian Development	Increased quarrying activities will result in the loss of the parks naturalness therefore proposed camouflaging of the installed infrastructure and rehabilitation of work sites.
HIV/AIDS	Sub-county Administration	Noted that with the inception of the project HIV/AIDS is bound to increase.
	Sub-County Public Health Officer	Spread of HIV/AIDS therefore calling for community sensitization and training of workers on HIV/AIDS
	Sub-county Social Development Office	Noted that increase in population is bound to increase spread of HIV/AIDS and thus proposed for community sensitization drives to mitigate this.
	NGO	Increase in the spread of HIV/AIDS therefore proposed that there should be awareness creation within the construction site and its environs. Secondly proposed provision of condoms.

Impacts	Cluster of stakeholders	Issues and Concern
Accident	NGO	Noted that with the commencement of development of a new power plant there will be increase of traffic both within Hells gate National Park and its environs. Therefore there should be subscription on speed limits.
	Oserian Development	Increase in traffic of heavy machinery and high speeds which will lead to: study report. <ul style="list-style-type: none"> • Increased accidents and subsequent loss of lives; • Degradation of the road infrastructure as the installed capacity is not for current operations; • Impact on the wildlife game corridor. • The stakeholder proposed the following: <ul style="list-style-type: none"> • Installation of speed bumps; • Accessing and projection of traffic and carrying capacity on the road to facilitate re-designing and construction of a better road.

Public consultations with stakeholders, including local residents, were held six times at six venues. To attract attendees, promotional measures were taken in advance. These included introducing the project together with the village head, assisting with community mobilization and delivering notifications via the chiefs of the project area and elders of the local communities, and selecting venues that made it easy for many local residents to attend.

Public consultations with stakeholders were held as shown below.

Name	Date	Time	Place
Olonongot	2014/1/31	10:00am	Olonongot grounds
Olo Sinyat	2014/1/31	3:44pm	Olo Sinyat grounds
Cultural Center, Olo Mayiana Ndogo and Olo Mayiana Kubwa	2014/2/2	3:00pm	Cultural Center grounds
Narasha & Olo Munyak	2014/2/6	11:00am	Narasha grounds
Inkorienito	2014/2/6	3:00pm	Inkorienito Church
Kamere	2014/2/7	3:00pm	Kamere Market

The major topics discussed at public consultations with stakeholders were as described below.

(a) Olo Nongot

Attendees (34 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Officer	KenGen
Ruth Kinyanjui	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Hussein Guyo	Assistant Chief	Hells Gate
Local Resident	30 people	

Employment

-Mr. Moses

Mr. Moses noted that there are many local youth who are educated and qualified for employment in the project. He therefore requested that the project implementation team be made to consist of a large number of local youth. This, he said, would ensure a sense of ownership of the locals to the project and promote sustainability. He lastly stressed that the employment should be on permanent basis not contractual.

-Response

It was communicated to the meeting that this issue was going to be taken into consideration once the project implementation starts but adequate proposals will be put in place to facilitate inclusion of the community in the project.

Community Request

-Mr. Mumbassoi Nkamasia

Mr Mumbassoi Nkamasiai thanked the project proponent for the assistance they have continually offered to the community in the previous projects and requested that the same be replicated to the newly proposed Olkaria V project.

- He requested for an establishment of a new school for the community especially a Primary and a Secondary boarding school.;
- He also requested that KenGen facilitate connection of power to their houses;
- He requested that the community be supplied with water tanks to assist in water storage especially during dry seasons.

-Mr. Joyce

Joyce thanked and welcomed the study team for involving them in the project at these initial stages. She stressed on the need to facilitate with the community.

-Mr. Jeremiah Kakimon

Jeremiah Kakimon requested that the project assist in paving of the road to the resettlement land for the community that is to be relocated under Olkaria IV project.

(b)Olo sinyat

Attendees (59 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Scientist	KenGen
Ruth Kinyanjui	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Moses Mulwa	Environmentalist	GIBB Africa Limited
Hussein Guyo	Assistant Chief	Hells Gate
Local resident	51 people	
Staff	3 people	

Missing Persons during Resettlement Study

-Ms. Tatiye Parikire (the community chairlady)

The community Chairlady Tatiye Parikire thanked the Chief and the consulting team for taking time to sensitize the community on the on the proposed project. The community member noted that there were persons who were not present during the initial resettlement studies conducted in the area. She went ahead to suggest that these persons be involved and their details be taken before any activity commences on the site.

-Response

It was communicated to the meeting that the study referred to here was conducted for another project which was not related to the study that was currently underway. All in all the initial study was conducted in 2009 and a Census repeated in 2013 to factor in natural growth. This

was followed by verification exercise which captured all that were lawfully in the area.

Resettlement before commencement of construction

-Mr. Karani (Pastor)

Pastor Karani requested that the community be resettled before the proposed Olkaria V projects construction commences. This request came on the backdrop of the negative impacts the community was facing following the commencement construction of Olkaria IV while they are present at the project site.

-Response

It was communicated to the meeting by KenGen's representative that resettlement will be conducted before construction commences.

Noise and air pollution

The community noted that from experience, the waste products from the geothermal power plants such as water have had negative impacts on vegetative cover thus harming the livestock and destroying the green cover. The community also noted that the noise emanating from the existing power plants affect the members community and requested that during planning of the proposed project this should be factored in.

-Response

The community was informed that their concerns were noted and adequate mitigation measures were going to be put in place.

Employment

-Ms. Naomi Karani

Naomi Karani requested that women in the project area be accorded employment opportunities. She also requested that once the proposed project commences the project proponent should employ the community members on permanent basis not contract basis.

-Response

The members of the community in the meeting were communicated to that their concerns and proposals were noted and were going to be adequately addressed in the report.

Loss of medicinal trees

The community noted that they will lose trees with medicinal values through proposed project at the construction stage and also during displacement of persons.

-Response

- Ecologically vulnerable areas within the site will be thoroughly identified. The data will be provided to engineers and the contractor, and the recovery of natural vegetation and removal of invasive or other species will be carried out.

(c) Cultural Center, Olo Mayiana Ndogo and Olo Mayiana Kubwa

Attendees (71 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Scientist	KenGen
Simon Kisotu	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Godfery Chege	Assistant Chief	Hells Gate
Local Resident	67 people	

Positive impacts of the by-products coming from geothermal drilling

-Mr. Johnstone Lamara

Johnstone Lamara noted that he has been a resident of the project area since the development of Olkaria I and he had never seen negative impacts of the geothermal development to human beings in the area.

Medicinal value of water from the plant**-A member of the community**

A member of the community noted that the community have used the water coming from the production wells for a long time to treat skin infections and thereby cannot project any negative aspects of the proposed development and requested that it be developed.

-Response

It was communicated to the meeting that it was good that there are no negative impacts from the existing plants. The community was also told that studies to ascertain cumulative impacts of the existing and the proposed developments were being carried and any negative outcome will be mitigated accordingly.

Noise and air pollution**-The community**

The community requested to know if noise emanating from the proposed power plant will affect the members' community at the proposed relocation sites.

-Response

The community was informed that studies had been done on the air and noise pollution and the results showed that the resettlers were not going to be affected by the proposed development.

Employment**-A member of the community**

A member of the community requested that they be accorded employment opportunities during the proposed construction.

-Response

The members of the community in the meeting were communicated to that their concerns and proposals were noted and were going to be adequately addressed in the report.

(d)Narasha and Olo Munyak

Attendees (16 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Scientist	KenGen
Simon Kisotu	Community Liaison	KenGen
Ruth Kinyanjui	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Hussein Guyo	Chief	Hells Gate
Godfery Chege	Assistant Chief	Hells Gate
Local resident	8 people	
Staff	2 people	

Employment**-Mr. Panin (Chairman Olo Munyak)**

Chairman Olo Munyak Panin noted that members of the community had been left out of by not being accorded employment opportunities in the existing plants and requested that during the development and operation of Olkaria V power plant the community be accorded the first opportunity for employment

-Response

The members of the community in the meeting were communicated to that their concerns and proposals were noted and were going to be adequately addressed in the report.

Hospital**-Mr. Panin**

Panin requested KenGen to develop for the community a hospital at Narasha location as this is what the community needs the most.

-Response

It was noted to the meeting that their concern had been not and adequate proposals were going to be put in place to assist them.

STIs and family issues due to promiscuity

The village noted that due to an increase in the population of unaccompanied men in the area, STIs have been on the rise and family breakdowns/divorce have also been witnessed. In addition, school-going children have also been impregnated by the working population coming into the area.

-Response

- Educational and prevention-oriented activities will be provided, and will include education on STI and HIV/AIDS for construction workers and local residents.

Air pollution

-A member of the community

A member of the community noted that there has been an increase in air pollution and that in the event that the proposed project is commissioned they are afraid that levels of pollution are bound to increase.

.-Response

Studies in relation to air and noise pollution for the proposed project have been done and the experts found that the emissions cannot affect Narasha or Olo Munyak. But in the areas where they can cause an impact, the community will be moved by another project (Olkaria IV) and construction at the sites for the relocation are just about to be completed. The community proposed that awareness creation exercises be conducted in the project area and this should entail education of the community on the dangers of the ongoing projects and how to protect themselves.

Water Pollution

The community noted that the existing plants have been causing environmental degradation through water that they emit to the environment. This has caused loss of livestock and loss of vegetative cover in some areas.

-Response

It was communicated to the community that the existing known environmental impact related to water has been mitigated and in future measures are going to be put in place to prevent such from happening.

Community requests

The community requested the following:

- Development of schools in Inkorienito and Olo Munyak;
- Requested that they be accorded permanent jobs in the proposed power plant;
- Sponsorship of students in the community with regard to education;
- The community requested that they be provided with a water tank as the one located in Narasha Primary school is dilapidated.

-Response

KenGen noted to the community that water was going to be provided

(e)Inkorienito

Attendees (21 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Scientist	KenGen
Simon Kisotu	Community Liaison	KenGen
Ruth Kinyanjui	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Hussein Guyo	Chief	Hells Gate
Godfery Chege	Assistant Chief	Hells Gate
Local resident	15 people	

Employment**-Chairman of the village**

Chairman of the village requested that during construction and operations of the project the members of the community be accorded employment opportunities as for quite some time they have been left out. The meeting also noted that youth unemployment is also high and that the proposed project should facilitate employing the youths.

-Response

The members of the community in the meeting were communicated to that their concerns and proposals were noted and were going to be adequately addressed in the report.

Hospital**-A member of the community**

A member of the community noted that the population in the area has been constantly increasing due to the geothermal projects and requested that a hospital be constructed nearby to facilitate access to affordable and quality health care.

-Response

It was noted to the meeting that their concern had been noted and adequate proposals were going to be put in place to assist them.

(f)Kamere

Attendees (51 people in total)

Name	Designation	Contact
Cornelius Ndetei	Snr. Environmental Officer	KenGen
Ruth Kinyanjui	Community Liaison	KenGen
Jacob Omondi	Sociologist	GIBB Africa Limited
Godfery Chege	Assistant Chief	Hells Gate
Local resident	46 people (male 15, female 32)	

Increase of pressure on social amenities**-A member of the community**

A member of the community noted that the population in the area is on a steady increase and this has caused a strain in the existing social amenities such as hospitals, market, water supply and the schools. The community hence requested that they be allowed to use the medical facility owned by KenGen and located at their housing quarters.

-Response (The area chief)

The area chief noted that the government had put in a plan to develop a hospital in the area but consultations will be done to facilitate access of KenGen facility.

Water

The community noted that water is a big problem to the residents as the only water source is the lake which is very dirty and cannot be used for domestic purposes.

-Response (The chief)

The chief noted that there is a project that is supposed to be initiated by world bank in the area and the water problems were going to be a thing of the past.

Food kiosks**-The community members**

The community members who supply food to the workers in the camps requested that they be provided with sheds that are hygienic enough for them to work in.

-Response

It was explained to the community that their comment was noted and that proposals were going to be put in place to facilitate this.

Employment**-The members of the community**

The members of the community requested that they be accorded employment opportunities during the construction of Olkaria V.

-Response

It was noted to the community that employment is done by quota allocation and Kamere and other locations surrounding Olkaria were allocated 20% of the job allocations. The Chairman therefore noted that the community members need to register themselves and their skills with him so that he can forward this to their information to relevant persons to facilitate employment when a position arises.

(2) Scheduled Stakeholder Meetings

Stakeholder meetings on ESIA for the Olkaria V project have already been held. KenGen has been holding stakeholder meetings roughly once a month, and regular meetings with KWS every quarter.

13.2 Land Acquisition and Resettlement

(1) Completed Stakeholder Meetings

RAP for the Project has been made. Census was done as the PAPs baseline survey; meetings with PAPs were conducted as part of census survey.

Draft RAP was disclosed at KenGen's website. Also the draft RAP was used, explained and disclosed in 3 languages (English, Swahili and Maasai) during stakeholder meetings in the 4 villages. In the meetings, since there was an opinion from PAPs that the amount of resettlement assistance was insufficient, KenGen provided additional assistance for resettlement. Also, meetings with vulnerable people such as women and youth were held in November 2009. Activities regarding the cultural center and the provision of student scholarships, which is required in the meetings, are included in RAP.

In process of RAP implementation, stakeholder meetings were held on a monthly basis. The meetings were held in two languages (English and Swahili) through the use of interpreters. The RAP Implementation Committee (RAPIC) decided on the stakeholder meetings, then letters and phone call to each head of village were used to widely inform PAPs about the meetings.

Hearing surveys about PAP's life condition after resettlement from PAPs was conducted in public consultation in September, 2014, shortly after the resettlement.

Planned Stakeholder Meetings

As for the PAPs additional follow-up study, KenGen will make the study six months after the resettlement's completion, which is scheduled in the end of February 2015. KenGen will inform PAPs about the study in monthly basis stakeholder meetings. The survey team requested that KenGen share the study results with PAPs in the stakeholder meetings, as well as JICA.

Land price in the Project site is now under investigation. In case of any gaps identified with JICA Guidelines in terms of compensation price, additional stakeholder meetings, might be held if necessary.

14. CONCLUSION AND RECOMMENDATIONS

14.1 Conclusion

For this project, KenGen prepared and submitted the ESIA report to NEMA for review, and a conditional license was granted after review, on September 12, 2014.

The H₂S concentration levels fall well within WHO guideline values, and thus it assumes that there will be little impacts on human beings and natural environment. Impact from waste on the environment will be reduced, as waste will be properly handled by recycling, or by contracting out disposal to a NEMA-licensed industrial waste disposal company.

According to the KWS supervisor, there were no wild animals using the project area as their habitat, as the Masaai were running cattle grazing operations throughout the area. There will be little impact on the habitats of rare species during construction and operation stages, as their habitats are mainly within the national park.

The project area mostly consists of grassland that was formerly used for grazing, and bush predominantly composed of 5-meter high leleshwa (*Tarchonanthus camphoratus*), with few other species or varieties. Bush will regrow naturally in a short period of time after tree felling, and areas cleared of vegetation will be rehabilitated using native plant species. Therefore, there will be little impact from the project on flora.

During the construction period, noise from the drilling of geothermal wells may have some impact. In addition to the mitigation measures proposed by KenGen, the use of silencers, soundproofing walls, or other measures should be considered as the need arises when geothermal well drilling and production testing is carried out near the resettlement locations.

KenGen conducted land acquisition and resettlement, which included the area of Olkaria V, when they conducted the Olkaria IV construction project. The Project area was acquired in 2010. The agreement letter for land acquisition was exchanged between KenGen and the legal land owner of the resettlement site in 2012 and development of the resettlement site and resettlement proceeded. Transfer of title deed is planned in the end of 2014 or beginning of 2015. Payment of compensation and physical resettlement of PAPs has been completed respectively in August 2014 and in September 2014.

The main income source in the Olkaria V Project area is by selling livestock and by employment by neighboring private companies. The Maasai traditionally graze their livestock with moving for long distance. The resettlement site locates only 3 km away from the original site, and it is a place where PAPs have been grazing before their relocation. According to KenGen and the result of site survey, productivity of the relocation site is equivalent to that of original site. In addition, the relocation site is closer to markets where they usually trade their livestock. Therefore, it is expected that they can continue grazing as their livelihood.

Sufficient compensation has been provided to PAPs such as land, houses and schools, based on the MOU. The project site has been purchased at full replacement cost from the land owner. Considering the above, resettlement and land acquisition was based on JICA Guidelines and no significant gaps with the guidelines was found.

14.2 Recommendations

For items that are likely to have some impact, the following measures are recommended in addition to the mitigation measures proposed by KenGen.

Item	Additional mitigation measures
Noise	<ul style="list-style-type: none"> • If geothermal wells are drilled and production testing is carried out at a location adjacent to RAP LAND in the future, the use of silencers, soundproof walls, or other measures will be studied. • Noise will be monitored not only during the day but also at night if well drilling and production testing continue into the night.
Protected area (National park)	<ul style="list-style-type: none"> • In accordance with the agreement on environmental protection in the project area stipulated in the MoU, KWS and KenGen will work closely together. • Ecological monitoring will be implemented. When impact on the national park caused by the project implementation is noted, specific mitigation measures will be discussed. • Special attention should be paid for the construction and operation of the power plant and the other institutions around National Park boundary. Besides, the mitigation measures and the monitoring plans should be implemented.
Fauna	<ul style="list-style-type: none"> • Sufficient intervals between transmission lines should be secured so that birds will not be electrocuted. • For the installation of speed bumps on roads in zones where wild animals cross, proper installation locations will be determined by consulting with KWS before the start of construction and studying the likely movement routes of wild animals.
Soil Erosion	<ul style="list-style-type: none"> • When soil erosion is observed, sediment removal devices should be installed in order to reduce the load caused by sludge directly flowing into gullies.
Land acquisition and resettlement	<ul style="list-style-type: none"> • Since the road improvement and electricity connection, which is written in MoU, is not completed. KenGen should report the status of these infrastructures to JICA at proper timing. According to KenGen electricity connection was made to all houses and social amenities in October 2014. • Transfer of the title deed of the resettlement site from KenGen to the Community is not completed. JICA will request KenGen to ensure the transfer of the title deed as soon as it is ready and should report to JICA upon completion. • To ensure the status of livelihood restoration, it is recommended that KenGen conduct monitoring for livelihood restoration status until livelihood returns to at least the original level. • Share the monitoring results in resettlement sites with stakeholders, such as JICA and PAPs.