KenGen

KENYA ELECTRICITY GENERATING COMPANY PLC

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTRE AND CORPORATE ARCHIVE BUILDING IN MURANG'A SOUTH SUB-COUNTY, MURANG'A COUNTY

Project Location: 0° 47' 2" S, 37° 15' 36"E

PREPARED BY: CORNELIUS NDETEI
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PROPONENT:
Kenya Electricity Generating Company PLC
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JULY, 2020

PROJECT DETAILS

Proponent: **Kenya Electricity Generating Company (KenGen) PLC**

Assignment: **Environmental & Social Impact Assessment Report for the Proposed Energy Research & Development Centre and Corporate Archive Building In Murang'a South Sub-County, Murang'a County**

ESIA Team Members

No.	Name	Qualifications	NEMA Reg. No.
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2.	Hussein A. Somow	Bachelor of Environment Studies (Planning & Management)	Lead Expert No.2493
3.	Domitila W. Waititu	BSc Environmental & Biosystems Engineering	Associate Expert No. 8947
4.	Rolex A. Rang'ang'ah	Bachelor of Environmental Studies (Science)	Associate Expert No. 10545
5.	Lincoln Mweu	Bachelor of Technology in Civil Engineering	Not Registered
6.	Peninah Mbuthi	MSc (Education Management) Bachelor of Arts	Not Registered
7.	John Omindo	BSc Civil Engineering	Not Registered

DECLARATION

I, **Cornelius Joseph Ndetei**, Lead EIA/EA Expert NEMA Reg. No. 2237, hereby confirm that this report represents the findings of the Environmental & Social Impact Assessment Report for the Proposed Energy Research & Development Centre and Corporate Archive Building in Murang'a South Sub-County, Murang'a County.

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EIA/EA Lead Expert **Date**
NEMA Reg. No: 2237

Name and Address of Project Proponent

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Signed: _____ 28/7/2020

Joshua Were **Date**
Environment & Sust. Dev. Manager

ACRONYMS

°C	Degrees Celsius
AU	Additional Unit
CSR	Corporate Social Responsibility
DBH	Diameter at Breast Height
DCC	Deputy County Commissioner
E	East
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HIV	Human Immunodeficiency Virus
KCC	Kenya Cooperative Creameries
KenGen	Kenya Electricity Generating Company
km^2	Kilometre square
KWS	Kenya Wildlife Service
m	Metres
M^2	Metres Square
MUWASCO	Murang'a Water and Sanitation Company
MWe	Megawatt of electricity
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
PLC	Public Limited Company
R&D	Research & Development
S	South
SCC	Stakeholder Coordination Committee
STDs	Sexually Transmitted Diseases
WRA	Water Resources Authority
WRUA	Water Resource Users Association

EXECUTIVE SUMMARY

1. Introduction

Kenya Electricity Generating Company (KenGen) PLC is the leading electric power generation company in Kenya, generating about 80% of electricity consumed in the Country. As at June 2018, the Company had an installed capacity of 1631MWe produced using various generation mix comprising of Hydro (818MWe – 50%), Geothermal (534MWe – 32%), Thermal (254MWe – 16%) and Wind (25.5MWe – 2%).

KenGen has envisioned to be the market leader in Eastern Africa Region not only in the generation of renewable energy but also in Energy Research and Development. The Company produces large number of records and documents. This has necessitated the desire for the Company to build an ultra-modern Energy Research & Development Centre (R&D) and Corporate Archive building, to be located at Tana Hydro Power Station area. The Company commissioned a multidisciplinary team of EIA/EA NEMA registered experts to undertake ESIA for the proposed development.

2. Project Proponent

The project proponent is Kenya Electricity Generating Company (KenGen) PLC and the registered office and contact addresses are:

Stima Plaza, Phase III,
Kolobot Road, Parklands
P.O. Box 47936 – 00100 Nairobi, Kenya
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3. Project Justification

KenGen generates a large number of records and documents therefore the company wishes to build an ultra-modern Energy Research & Development Centre and Corporate Archive in Tana Station. KenGen R&D Centre has been conceived to be the most advanced research and development facility devoted for enhancement of innovation and energy development. The objective of the facility is to create a good environment for leading scientists & engineers in company to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services.

4. Study Objectives

The overall objective of carrying out the ESIA is to ensure that the anticipated environmental and/or social concerns are integrated in the activities encompassing the proposed project hence contributing to sustainable development.

The specific objectives of conducting the ESIA are to:

i. To ensure that all potential environmental, social and economic impacts of the proposed project are identified
ii. Recommend appropriate mitigation measures for the potential adverse impacts
iii. Develop an Environmental Management and Monitoring Plan for the proposed project during construction, operation and decommissioning phases, with an aim of promoting environmentally sustainable development.

5. Project Location

Administratively, the proposed project will be located in Kambiti Sub- location, Kambiti Location, Murang'a South Sub County, Murang'a County at Tana Power Station housing area. The project location is at GPS coordinates 0° 47' 2" S, 37° 15' 36"E.

6. Project Description

The project activities shall comprise design, construction and commissioning of the Energy Research & Development Centre and Corporate Archive Building. The building will consists of the following floor areas: Ground Floor–1,370m^2, First Floor–1,507m^2, Second Floor–1,507m^2 and Attic Floor–234m^2.

The building will comprise of;

- Energy R&D Wing that will hold the dry laboratory space, wet laboratory space, overhead service carriers, mobile casework stations, light industry space, conference/classroom and general storage
- Corporate Archive that will hold the electronic media storage, exhibit studio, general storage, receiving room, archival storage, offices and museum collection space
- Common facilities including the conference room, lobby, child care, refreshment, corner and the sanitary facilities

7. Analysis of Project Alternatives

Under the proposed Development Alternative, the project would create more business opportunities while providing livelihood to the locals who will be engaged in the project during the construction and operation phases. Under the "No Action" Alternative, the status quo would remain, and the project proponent, locals and the Country as a whole would lose anticipated

benefits from this development. The proposed development under the current site location is the most appropriate.

8. Stakeholder's Engagement

Public consultation and participation were achieved through stakeholder's identification and mapping, holding public baraza and administering questionnaires. Notices and letters inviting the local communities to the public baraza/ consultative meeting were translated to Kiswahili and/or English languages. They were then conspicuously displayed at strategic positions and announced in the local churches by the community representatives that were identified by the ESIA team.

Questionnaires were administered to the local neighborhood to give their comments/views regarding the proposed Energy Research & Development Centre and Corporate project report. Copies of filled in questionnaires have been appended at the end of this report.

This being a report, one public baraza/Consultative Meeting was held at Kiambaa Primary School on 10th March 2020. The views of the public have been incorporated in the ESIA report. The Stakeholders wholly accepted the proposed development, so long as the proponent implements the mitigation measures for the anticipated adverse impacts.

9. Anticipated Impacts & Mitigation Measures

The **positive impacts** of the proposed project include: Job creation, boost to the local economy, improved living standards of the local community, engaging youths hence less idleness, providing attachments and internship opportunity, enhanced CSR benefits to the local community, improved security and maintenance of local infrastructure. The proponent will enhance the positive impacts.

A summary of the key anticipated negative impacts and their proposed mitigation measures include;

Sources	Potential Impact	Mitigation Measures
Hydrology and Drainage	The site and the surrounding areas were observed to be of moderate gradient, storm water and general surface runoff that may result from hard surfaces around the site has the potential to flow through the plot to the river. The proposed project will not only introduce additional hard surfaces but will occupy part of the remaining open space for	Provide appropriate drainage structures within the site for the passage of excess storm water runoff into the main drainage system along the main access road. Sewer lines and drains from the kitchens and washrooms blocks should **NOT** be channeled into the open drains. This

Sources	Potential Impact	Mitigation Measures
	absorption of the surface water. With decreasing open spaces, proper planning of site drainage is very important especially during the rain seasons.	waste may be challenged to the septic tank system to ensure proper treatment and discharge with no adverse impact on the environment.
Soil Erosion	No significant soil erosion is anticipated from the activities of the project. However, the construction activities are expected to loosen top soil as a result of the excavations and earth moving activities as well as from the delivery vehicles. The effects are mainly localized.	• Excavations of the site will be confined only within the section where construction is to take place, • Excavated earth will be held away from existing drainage channels around the site and on locations of the site not susceptible to surface runoff of storm water, • The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas, • Re-vegetate exposed areas on the site so as to mitigate further erosion of soil. • Landscaping will help to mitigate soil erosion even during the post-commissioning phase of the project. In particular, a ring of trees around the compound would greatly minimize sand storms and erosions.
Noise and Vibrations	Noise and vibrations are expected to occur mainly during the construction phase with the major receptors being the immediate residential neighbours. Sources of noise would include the earth moving equipment: materials delivery trucks, cranes, concrete mixers, steel bars and wood work activities, as well as noise generated by the work force.	• Ensure that construction equipment's are maintained at the best operating conditions and avoid unnecessary noise, • Construction activities should ONLY be undertaken during the day (preferable between 7.00am

Sources	Potential Impact	Mitigation Measures
	Earth moving activities are also likely to cause vibrations to the neighbouring structures. Upon occupation, vehicles accessing the commissioned buildings could also introduce additional noise to the immediate neighbouring developments, though this is envisioned to be minimal.	and 6.00pm) when most facilities in the project vicinity are all undertaking their normal activities thus there is no noise nuisances generated above their daily threshold operating level, • Ensure workers are provided with the necessary personal protective equipment including earplugs or earmuffs when operating or working with noisy equipment,
Air Quality	Dust (from excavations and earth moving as well as materials delivery), particulate matter from dry materials (sand, cement, gravel, murram, etc.) and emissions (smoke, hydrocarbons and nitrogenous gases – NO_x among others from machinery exhaust emissions) will be expected to increase slightly during construction. This will, however, be a much localized effect to be felt mainly within the site and its immediate vicinity. Emissions from vehicles accessing the site after commissioning are not likely to have significant effects on air quality at a global scale. However, depending on the number of vehicles, effects of such emissions could have an impact at a localised level.	• During construction sprinkle the construction area with water to keep dust levels down. • During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions. • Construction trucks delivering soil, sand, and cement or removing soil from the site should be covered to prevent material dust into the surrounding areas. • Personal protective equipment (PPE) that includes dust/organic respirator masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction. • Drivers of construction vehicles must be supervised so that they do not leave vehicles idling, • Enforce a speed limit within the construction site at 10Km/h so that

Sources	Potential Impact	Mitigation Measures
		dust levels and accidents potential are lowered. • Maintain all machinery and equipment, including the boiler and generators at the Dining Hall, in good working order to ensure minimum emissions including carbon monoxide, NO_X, SO_X and suspended particulate matter; • No burning of any waste materials whatsoever should be permitted within the site both during construction and operation, • Plant new trees within open spaces on the site, as these act as carbon sinks and help to improve the ambient air quality.
Solid Waste	Different types of solid wastes will be generated during construction as well as on occupation. It is anticipated that effects of these wastes would be felt away from the site, most likely the disposal sites. The construction phase will generate among others, debris, earth, vegetation remains, plastics, steel metal residuals, wrappers and papers. Other solid waste materials will include glass, wood, ceramics and plastics. Upon commissioning, the most common solid wastes will be typical of office refuse including papers, electronic wastes, plastics, glass, wrapping gunny bags from warehouse.	• Construction debris resulting from the project should be disposed-off in a sustainable manner such as reuse in road gravelling, reuse of timber and steel bars, as well as disposal in appropriate waste sites. It is suggested that the contractor identify suitable disposal areas with the necessary consultations of local camp leaders, • Minimising storage times for raw solid waste and biomass and unloading waste only in the waste reception hall to contain odours, • The Proponent should ensure proper waste disposal
Water Quality & Quantity	-During construction, potential pollutants of water might include oil/grease spills from the machinery, lime, paints and solvents, solid wastes and waste water.	• The Contractor should avoid unnecessary wastage of water during construction,

Sources	Potential Impact	Mitigation Measures
	- Water supply shall be from a local borehole and the centre has a reservoir tank installed to ensure surplus water storage.	• The contractor will make use an existing water supply for water use during construction and operations of the line,
Flora and Fauna	The area is fully urban and no animals are found apart from some species of velvet monkeys, birds and insects. Notable presence of plants including trees (*Terminalia brownii*, *Siena siamea* and a few indigenous species), ornamental shrubs and grass are found at the site and will most likely to be destroyed during the construction.	The most viable option for the impacts associated with loss of vegetation is replanting trees, shrubs and grass after completion of the construction. This would be part of the landscaping and premises beatification activities. It is highly recommended that the site layout considers the avoidance of cutting down of mature trees on the site as much as is practically possible.
Public Intrusion, Disturbance and Security	This is a social impact involving loss of privacy in sections of the neighbouring premises and residents of already existing houses. During the construction, intrusion would be attributed to the construction workers, some of who would be tempted to either physically venture into the neighbouring compounds or engage with the employees in other premises. This has the potential to affect the privacy of neighbouring properties. Upon commissioning of the building, social intrusion would cease to be a significant impact in view of the fact that the proposed land use and nature of the project is consistent with the existing surroundings.	• Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to improve visual impact and to re-introduce visual barriers that enhance privacy. • The site should be fenced during construction to ensure construction workers are isolated from the neighboring premises and also to minimize intrusion and loss of privacy, • During construction the Contractor should enhance security by vetting the construction workers and avoid excessive numbers of employment seekers directly approaching the site, • The buildings should be designed such as to blend in well with the

Sources	Potential Impact	Mitigation Measures
		surrounding environment and with minimum reflective surfaces, • Construction should only be undertaken during the day to ensure minimum disruption of the neighbours' comfort.
Public Health, Safety and Awareness	The construction phase has the most significant safety impacts that ranges from accidents related to construction vehicles and trucks, residents falling into the construction sites, falling objects and occupational dangers to the construction workers. Dust, emissions and noise are notable health hazard to the neighbours as well as the construction workers. There is tendency of informal food vendors selling food to construction workers at the work sites and this has a potential health implication to the workers. Construction workers are normally drawn away from the construction site. They are, therefore, likely to interact with the residents whose lifestyles are different, creating grounds for social problems including insecurity, immorality, conflicts, to mention a few.	• The contractor should provide a small section of the construction site complete with a shed and a water stand pipe where the food vendors can serve the construction workers to promote hygiene and health of the employees, • Workers should be provided with suitable personal protective equipment's (such as nose masks, ear plugs/muffs, helmets, overalls, safety boots, etc.) and ensure they are used at all times while at their place of work. A fully equipped first aid kit should also be provided at site, • The contractor must have Workmen's Compensation cover as required by law (The Workmen's Compensation Act), as well as other relevant Ordinances, Regulations and Union Agreements, • The contractor should ensure there is a temporary toilet/pit latrine and a stand pipe for water on site for use by the construction workforce, • The workers, immediate neighbors and other stakeholders will be sensitized of the dangers and risks associated with construction

Sources	Potential Impact	Mitigation Measures
		works for enhanced self-responsibility on personal safety at all times during the construction. Appropriate signage could be posted at strategic locations around the construction site to convey such information, • The compound should be equipped with safety facilities provided including; firefighting equipment, fire exits, adequate access and disabled access features, safety signage placed strategically around and within the building.

10. Conclusion & Recommendations

All the potential positive impacts will be enhanced while negative impacts will be adequately mitigated, thus the project should be considered for approval by NEMA. The project proponent has committed to implement the Environmental and Social Management Plan (ESMP) during the construction, operation and decommissioning phases of the proposed project, in order to promote environmentally sustainable development. The ESMP will form part of the selected contractor's obligation as shall be specified under the contract for construction and commissioning of the proposed Energy Research and Development Centre and Corporate Archive Building project.

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CHAPTER 1

1. INTRODUCTION

1.1 Project Background

Kenya Electricity Generating Company (KenGen) PLC is the leading electric power generation company in Kenya, generating about 80% of electricity consumed in the Country. As at June 2018, the Company had an installed capacity of 1631MWe produced using various generation mix comprising of Hydro (818MWe – 50%), Geothermal (534MWe – 32%), Thermal (254MWe – 16%) and Wind (25.5MWe – 2%). KenGen has an ambitious strategy to inject into the national grid an additional 721MWe of renewable energy by 2025 in line with Kenya's Vision 2030 of attaining a green energy economy. Olkaria V (172MWe name plate) Geothermal Power Plant is planned for commissioning in 2020 while Olkaria 1AU 6 (83.3MWe) Geothermal Power Plant is expected to be commissioned in 2021. KenGen generates a large number of records and documents therefore the company wishes to build an ultra-modern Energy Research & Development Centre and Corporate Archive in Upper Tana Station. KenGen R&D Centre has been conceived to be the most advanced research and development facility devoted for enhancement of innovation and energy development. The objective of the facility is to create a good environment for leading scientists & engineers in company to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services.

KenGen commissioned a team of EIA/EA experts to undertake Environmental and Social Impact Assessment report on the proposed Energy Research and Development Centre and Corporate Archive Building, as required under Regulation No. 34(1) of the Environmental (Impact Assessment and Audit) Regulations 2003. The ESIA was undertaken in February 2020. The overall objective of carrying out the ESIA report is to ensure that the anticipated environmental and/or social concerns are integrated in the activities encompassing the proposed project hence contributing to sustainable development. The ESIA was conducted in accordance with the Environmental Management and Coordination Act (EMCA), 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003. The report methodology comprised of literature review, site assessment, physical examination & observations to aid in the collection of baseline data, public consultative meeting/public baraza, formulation and administering semi-structured questionnaires and peer review meeting.

The ESIA report provides the findings of the proposed Energy Research and Development Centre and Corporate Archive Building project. The proposed project will be located in Kambiti Sub-location, Kambiti Location, Murang'a South Sub County, Murang'a County at Tana Power Station housing area. The proposed building will comprise of R&D Centre (Dry Laboratory space, Wet

Laboratory space, overhead service carriers, and Mobile Casework stations, Light Industry Space, Conference/Classroom and General Storage); Corporate Archive (Electronic Media Storage, Exhibit Studio, General Storage, Receiving Room, Archival Storage, Offices and Museum collection space) and; Common facilities (Conference room, Lobby, Child care, Refreshment, Corner, Sanitary facilities, and Visitor support Space). The block will consists of the following floor areas: Ground Floor–1,370m^2, First Floor–1,507m^2, Second Floor–1,507m^2 and Attic Floor–234m^2.

1.2 Project Proponent

The project proponent is Kenya Electricity Generating Public Limited Company (KenGen Plc) and the registered office and contact addresses are:

Stima Plaza, Phase III,
Kolobot Road, Parklands
P.O. Box 47936 – 00100 Nairobi, Kenya
Tel : +254 20 3666000
Mobile: 0711036000/0732116000/203666000
Web : www.kengen.co.ke
E-mail: jwere@kengen.co.ke

1.3 Project Location

Administratively, the proposed project is located in Kambiti Sub- location, Kambiti Location, Murang'a South Sub County in Murang'a County. It is located at GPS Coordinates 0° 472" S, 37° 15'36'E in Upper Tana Power station housing area (Plate 1).

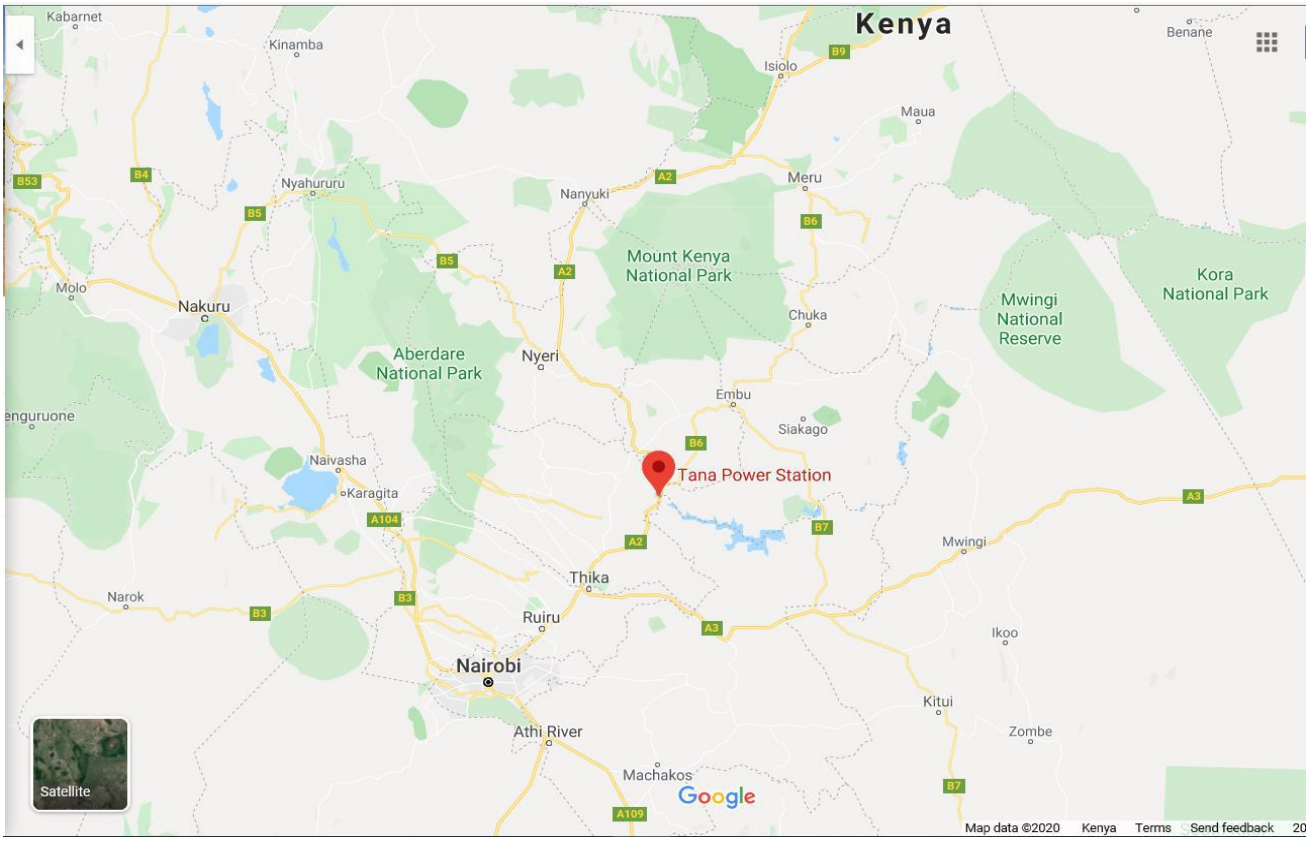

Figure 1: Location Map

1.4 Justification of the Proposed Project

KenGen generates a large number of records and documents therefore the company wishes to build an ultra-modern Energy Research & Development Centre and Corporate Archive in upper Tana Station. KenGen R&D Centre has been conceived to be the most advanced research and development facility devoted for enhancement of innovation and energy development. The objective of the facility is to create a good environment for leading scientists & engineers in company to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services.

1.5 Objectives

1.5.1 Overall objective

The overall objective of carrying out the ESIA report is to ensure that the anticipated environmental and/or social concerns are integrated in the activities encompassing the proposed project hence contributing to sustainable development.

1.5.2 Specific objectives

The specific objectives of conducting the ESIA report for the proposed Energy Research & Development Centre and Corporate Archive Building project are to:

iv. To ensure that all potential environmental, social and economic impacts of the proposed project are identified and recommend mitigation measures;
v. Collect baseline socio-economic data of the project area and potential impact expected from the project during construction, commissioning, and operation;
vi. To collect baseline data on biodiversity in the proposed project area
vii. Develop an Environmental Monitoring Program during construction and operation and present plans to minimize, mitigate or eliminate negative effects and impacts;
viii. Identify and contact stakeholders to seek their views on the proposed project;
ix. To prepare an Environmental Impact Assessment report compliant to the Environmental Management and Coordination Act (1999) and detailing findings and recommendations
x. To prepare an Environmental and Social Management Plan for the project is prepared with an aim of promoting environmentally sustainable development.

1.6 Screening of the Project

Pursuant to section 58 of the Environmental Management and Coordination Act (EMCA), 1999 proponents are required to carry out an Environmental and Social Impact Assessment (ESIA) report for projects listed under the second schedule.

1.7 Structure of the ESIA Report

The ESIA report comprises of a summary of the proposed project and the ESIA findings. The following are the chapters that form the body of the report.

- Chapter 1: Introduction: This chapter provides project background, location, purpose of the study, project objectives, scope, and justification of the project, approach and methodology.
- Chapter 2: Project Components and Process Activities: This chapter describes the proposed project in terms of inputs, outputs, and design and implementation strategies.
- Chapter 3: Description of the Project Environment: The chapter examines the biological, physical and socio-economic baseline environment of the proposed project location and the surrounding areas. The salient features include; climate, topography, soils, geology, flora, fauna, demography, land use, source of livelihood, education and health profiles among others.
- Chapter 4: Legal and Regulatory Framework: This chapter examines the national and international legal and regulatory framework applicable to this project and the institution framework that govern these laws.
- Chapter 5: Analysis of Project Alternatives: This chapter provides information on the various alternatives considered for the proposed project in terms of location, technology and design compared against key environmental indicators.
- Chapter 6: Public Consultations and Disclosure: This chapter describes the public consultation approach and the outcome of the stakeholder forums held.
- Chapter 7: Potential Environmental and Socio-Economic Impacts and Mitigation Measures: The chapter analyses the anticipated positive and negative impacts associated with the proposed project. It further provides mitigation measures for the anticipated negative impacts.
- Chapter 8: Environmental & Social Management and Monitoring Plan: This chapter provides the Environmental and Social Management Plan (ESMP) and the Environmental and Social Monitoring Plan arising from the negative impacts associated with the proposed project.
- Chapter 9: Conclusion and Recommendations: The chapter provides information on the conclusions and recommendations based on the findings of the ESIA study.
- Chapter 10: References: All literature materials and secondary data used for this study have been acknowledged in the references.

1.8 ESIA Team Members

Details of the NEMA registered EIA/EA Experts that participated in the preparation of ESIA Report for the proposed Energy Research & Development Centre and Corporate Archive Building Project in Murang'a South Sub-County, Murang'a County.

Table 1: ESIA Team Members

No.	Name	Qualifications	NEMA Reg. No.
1.	Cornelius J. Ndetei	Master of Science (Meteorology) Bachelor of Science (Meteorology) Postgraduate diploma in Environmental Studies	Lead Expert No.2237
2.	Hussein A. Somow	Bachelor of Environment Studies (Planning & Management)	Lead Expert No.2493
3.	Domitila W. Waititu	BSc Environmental & Biosystems Engineering	Associate Expert No. 8947
4.	Rolex A. Rang'ang'ah	Bachelor of Environmental Studies (Science)	Associate Expert No. 10545
5.	Lincoln Mweu	Bachelor of Technology in Civil Engineering	Not Registered
6.	Peninah Mbuthi	MSc (Education Management) Bachelor of Arts	Not Registered
7.	John Omindo	BSc Civil Engineering	Not Registered

1.9 Approach And Methodology

1.9.1 General Approach

The ESIA Report was carried out through desktop studies, field visits, administration of semi-structured questionnaires and public Consultative meeting.

1.9.2 Methodology

The ESIA Reporting was conducted in accordance with the provisions of the Environment (Impact Assessment and Audit) Regulations, 2003. The methodology employed to collect, analyse and present the findings is as detailed below.

i. **Desk Review:** This involved indoor review of the documented baseline information on the project area, project design documents and relevant legislations and guidelines among others.

ii. **Field visit and Data Collection:** This involved collection of primary data from the area surrounding the proposed project area. The information comprised of; flora, fauna, soil and vegetation. Interviews were conducted with relevant line ministries to collect information on the socio-economic profile. Ecological assessment was carried out using the belt transect sampling technique. Hand held global positioning system (GPS) devices, were used for

navigation to and from the centre point. The terrain, habitat condition, natural and man-made features were physically observed and described. Flora and fauna species were identified through taxonomic suitable reference sources. Digital cameras were used to take photos of the major features and species for desktop identification at a later stage. Vegetation structure and density was estimated based on percentage canopy cover and Diameter at Breast Height (DBH). This data was used for control and comparison purposes.

iii. **Stakeholders Consultative Meeting/ Baraza:** This meeting was held on 10th March, 2020 at Kiambaa Primary School in Kambiti.

iv. Data analysis and presentation: Data was analysed using scientifically proven methods with the help of the various applicable software. Presentation of the synthesized information was in the form of graphs, maps and tables.

v. Compilation of the ESIA report: The report was compiled in line with the Environmental Impact (Assessment/Audit) Regulations of 2003.

CHAPTER 2

2 PROJECT DESCRIPTION

2.1 Project Justification

Due to a large number of records and documents generated by KenGen, the Company wishes to build an ultra-modern Research & Development Laboratory and Corporate Archive in Tana Station. KenGen R&D Centre has been conceived to be the most advanced research and development facility devoted for enhancement of innovation and energy development. The objective of the facility is to create a conducive environment for leading Scientists & Engineers in KenGen to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services.

2.2 Project Design

The proposed project will comprise the following;

A. R&D LAB includes

- Dry Laboratory space
- Wet Laboratory space
- Overhead service carriers
- Mobile Casework stations
- Light Industry Space
- Conference/Classroom
- General Storage

B. Corporate Archive

- Electronic Media Storage
- Exhibit Studio
- General Storage
- Receiving Room
- Archival Storage
- Offices
- Museum collection space

C. Common facilities

- Conference room
- Lobby
- Child care

- Refreshment
- Corner
- Sanitary facilities
- Visitor support Space

The block consists of the following floor areas:

- Ground Floor – 1,370m^2
- First Floor – 1,507m^2
- Second Floor – 1,507m^2
- Attic Floor – 234m^2

The buildings and amenities are typical in design, structure and details. The design of the project has been executed with due consideration of the existing topography of the proposed project site. In general, the design of the project will optimize the use of the best available technology (BET) to prevent or minimize potentially significant environmental impacts associated with the project and to incorporate efficient operational controls together with trained staff, to ensure high level business and environmental performances.

2.2.1 Infrastructure

The development will have a comprehensive and robust infrastructure including access and exit to and from the existing road to the Staff camp, parking areas, water storage, electricity distribution and waste disposal mechanism.

2.2.2 Electrical System

There will be connection to the existing electricity mains supply of the Kenya Power and Lighting Company, which will be used in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.2.3 Water Reticulation System

The water used at the site and its environs is obtained from Murang'a Water and Sanitation Company (MUWASCO). During the construction phase, water bowsers will be used to supplement water to the proposed site on need basis. More over there will be water storage tanks to increase water supply to various components of the building during the occupation phase.

2.2.4 Sewerage and Solid Waste management

The area is not covered by the County sewer line therefore the building will be connected to a septic tank. The same will be desludged on a regular basis by licenced waste handlers.

2.2.5 Security

The gate house will be located next to the main entrance for easy security operations around the compound. A boundary wall will be erected and connected with security alarms, entry control, and quick response systems will be used within the project area. Modern security systems including CCTV and electrical fences shall be installed.

2.2.6 Fire Safety

The development provides for firefighting facilities such as fire extinguishers in the form of hydrants and carbon dioxide gas extinguishers.

2.2.7 Parking Area

The drive way and parking area, which will be paved, will be spacious and provided with facilities such as lights, and signs for easy entry and exit to allow free flow of traffic.

2.2.8 Perimeter Fence

A stone perimeter wall will be erected around the project site.

2.2.9 Landscaping

The remaining open spaces will be landscaped after construction, using plant species and shrubs available locally. This will include establishment of flower gardens and lush grass lawns to improve the visual quality of the site where pavements will not have taken space.

2.3 Project Site

The proposed project will be located in Murang'a County, Murang'a South Sub County, Kambiti Location and Kambiti Sub- location at housing area in Tana Power station as Shown in Plate 1. The proposed building sketches and plans are indicated in plate 2 and 3.

Table 2: Proposed Building Sketches

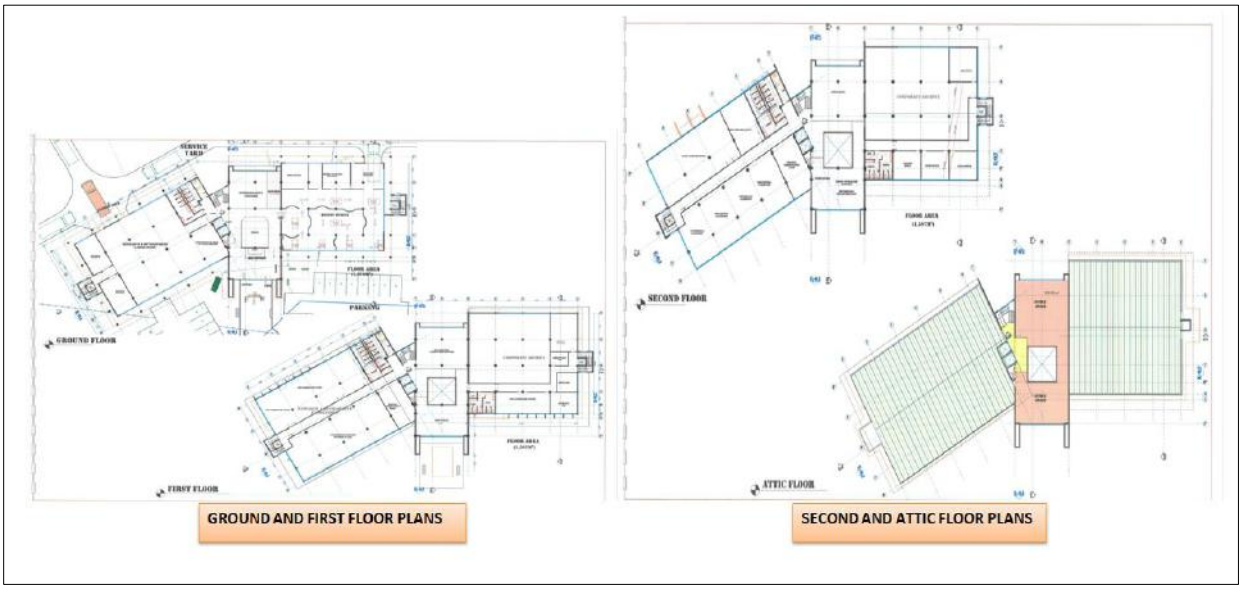

Table 3: Proposed Building Plans

2.4 Construction Materials and Technology

The building materials will consist of natural stones, sand, ballast and cement. Also steel pipes, ribbed bars, Square hollow sections, Rectangular hollow section, Zed purlins, aluminum, roofing sheets, wall tiles, PVC pipes, steel rods and glass will be used. Other materials that will be used on site include timber. The building will be constructed as per the respective structural engineer's

detail as provided for in the approved construction drawings. Basically, the building structure will consist of concrete appropriately reinforced with ribbed bars. The building will be provided with facilities for drainage of storm water from the roof through peripheral drainage systems into the storm water drainage system. Drainage pipes will be of the PVC type and will be laid under the buildings and the driveway encased in concrete. The buildings will have adequate natural ventilation through provision of permanent vents in all habitable rooms, adequate natural and artificial light, piped water stored in tanks and above ground water tanks provided with water pumps to feed overhead tanks.

The technology used in the design and the construction of the commercial building will be based on national and international standards which have been customized in Kenya. These include building standards including the Local Building Code and the British Building Standards BS 8110 and BS 5950, BS4449 and BS4461.

It is important to note that the constructions will incorporate;

- Environmental Protection and Resource Conservation guidelines
- Occupational Health and Safety measures.

2.5 Project Construction Activities

The expected activities for the construction phase of the project are as follows:

2.5.1 Pre-construction Investigations

The implementation of the project's design and construction phase will start with thorough investigation of the site's biological and physical resources in order to minimize on any unforeseen adverse impacts during the project cycle.

2.5.2 Sourcing and transportation of Building Materials

Building materials will be transported to the project site from the approved extraction, manufacture, or storage sites using transport trucks compliant with the traffic regulations. The building materials to be used in the construction of the project will be sourced from approved dealers. Greater emphasis will be laid on procurement of building materials from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials to the project site through reduced distance of travel by the materials transport vehicles.

2.5.3 Storage of Materials

Building materials will be stored on site. Bulky materials such as rough stones/aggregate blocks, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities on site, the proponent will order bulky materials such as sand, gravel and stones in bits. Materials such as

cement, paints and glasses among others will be stored in the already completed rooms on the ground floor.

2.5.4 Excavation and Foundation works

Excavation will be carried out to prepare the site for construction of the perimeter wall foundations, pavements and drainage systems. This will involve both the use of heavy earthmoving machinery (such as tractors and bulldozers) and manual excavation. Care shall be taken to control dust emanating from such activities.

2.5.5 Masonry, Concrete works and related activities

General masonry and related activities will include plastering and other finishing works on the building.

2.5.6 Roofing and Sheet metal works

The construction of the building foundations, walls, floors, pavements, drainage systems and parking area, among other components of the project. General masonry and related activities will include stone shaping, concrete mixing, plastering, and slab construction, construction of foundations and erections of building walls and curing of fresh concrete surfaces.

2.5.7 Electrical works

Electrical work during the construction of the premises will include installation of electrical gadgets and appliances, electrical cables, lighting apparatus, sockets etc. in addition, there will be other activities involving the use of electricity such as welding and metal cutting.

2.5.8 Plumbing works

Installation of pipe work for water supply and distribution will be carried out within the unit and associated facilities. In addition, pipe work will be done to connect drainage of storm water from the rooftop into the peripheral storm water drainage system. Plumbing activities will include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

2.5.9 Proposed Activities during Construction Phase

The construction phase of the proposed project will entail:

- Hiring of skilled and unskilled Labour
- Site clearing and construction of a site office, pit latrines and stores
- Demarcation of the construction site and enclosure with three metre high iron sheets
- Mobilization of construction equipment to the site
- Demolition of adjacent building to create space for new building
- Excavation, levelling, grading and compaction of the ground
- Delivery of construction materials to the site
- Concrete mixing and construction of the building, parking area and septic tank

- Connection of the building the septic tank and the existing water and power supply networks
- Installation of the generator and the lift
- Landscaping and re-vegetating with indigenous, shrubs and trees
- Commissioning of the building

2.6 Decommissioning Activities

2.6.1 Dismantling of Equipment and Fixtures

All equipment and fixtures including form wood will be dismantled and removed from the site on decommissioning of the project. The contractor will ensure safe dismantling of the scaffolding, formwork used for reinforced concrete beams and columns, temporary store and site office.

2.6.2 Removal of waste

Waste from construction of the proposed development project will be carted away and disposed of at the designated approved sites.

Anticipated waste streams will include:

- The remainder of non-re-usable construction materials from:
    - Masonry works/building works, (cement bags, broken building blocks, etc.)
    - Roofing (broken roofing sheets, timber pieces, etc.)
    - Painting, (paint cans, reject paints, masking tapes, etc.)
    - Carpentry and joinery works (timber, nails, glue, etc.)
    - Plumbing (pipe fittings and off cuts, etc.)
    - Electrical works (residual cables and connectors, damaged electrical fittings, etc.)
- Wastes generated from dismantling of fixtures and construction equipment.
- Wastes generated from wrappers and packaging material

2.6.3 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the open earth sites will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

2.7 Operational Activities

2.7.1 Solid waste generation on occupancy

Various activities such as use of sanitary facilities and occupation of the house will result in the production of a lot of solid waste including food wastes as well as papers.

2.7.2 Solid waste and waste water management

The proponent will provide facilities for handling solid waste generated within the facility. These will include dustbin, a central waste collection for temporarily holding waste within the premises before segregation and final collection for transportation. Sewage generated from the building will be discharged into the septic tank, while storm water from the project area will be channeled into the storm water drainage system as per approved drawings.

2.7.3 Cleaning

Proponent will engage NEMA licensed cleaning service provider who will be responsible for regular washing and cleaning of the building. The Cleaning Service Provider will be responsible for collecting and appropriately disposing waste from the central collection place provided within the building. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

2.7.4 General Repairs and Maintenance

The rooms and associated facilities will be repaired and maintained regularly during the occupational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of electrical fittings and equipment, repairs of leaking water pipes, painting and replacement of worn out materials among others.

2.7.5 Research and consultancy

The building will be a hub for Research and shall therefore involve office operations including typing, printing, photocopying and filing of documents. The solid waste generated out of these activities shall be disposed of by providing bins at designated points.

2.8 Project Cost

The total cost for the proposed project is estimated to be KES. 470,963,450 (Four Hundred and Seventy Million Nine hundred and Sixty Three Thousand Four Hundred and Fifty Shillings Only)

2.9 Project Alternatives

An alternative site was considered for the proposed development. However the site's topography was found to be unsuitable for this type of development owing to the rugged terrain and presence of valleys.

CHAPTER 3

3 DESCRIPTION OF THE PROJECT ENVIRONMENT

3.1 Physical Baseline Information

3.1.1 Rainfall

The climate of Murang'a is very varied as the county extends from the cold highlands of Aberdares (Nyandarua Ranges) where tea is the main cash crop to the dry and hot lowlands bordering Machakos County. Rainfall ranges between 700-1000 mm per annum and daily temperatures range from 14 -280 C. Kambiti location is on the lower part of Murang'a County that borders with Machakos but the land is much more fertile with a mixture of red loam soils that support a number of perennial crops like coffee, bananas, and peas and a number of fruit crops like oranges, mangoes and papaws.

The climate that preludes over Kambiti town and the surrounding areas can be classified as Aw under the Köppen and Geiger classification system. This climate can be described as tropical wet and dry or savanna climate. The long rains fall in the months of March, April and May with the highest amount recorded in the month of April, during which reliability of rainfall is high. The short rains are during the months of October and November. The climate is characterized by an average annual rainfall of 983 mm. The driest month is July, with 9 mm of rainfall. The difference in precipitation between the driest month and the wettest month is 247 mm. The area lies on 1202m above sea level, while the proposed site location lies at 1128m above sea level. It is generally wet and relatively humid due to the influence of the Aberdares to the north and Mt. Kenya to the east.

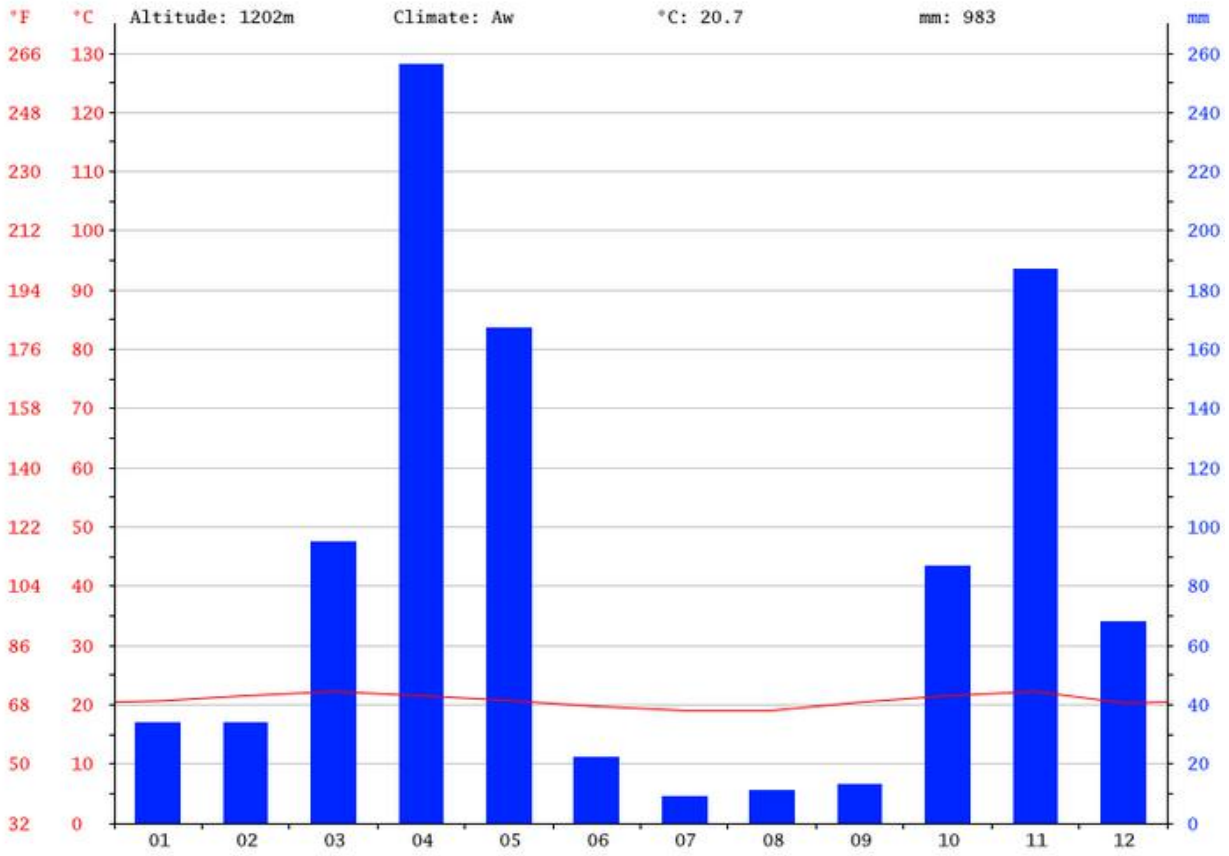

Figure 2: A graphical description of the rainfall patterns in Kambiti, 2019

3.1.2 Temperature and Humidity

Kambiti has an average annual temperature of 20.7°C. The warmest month of the year is March, with an average temperature of 22.2°C while July has the lowest average temperature at 19.0°C. During the year, the average temperatures vary by 3.2°C.

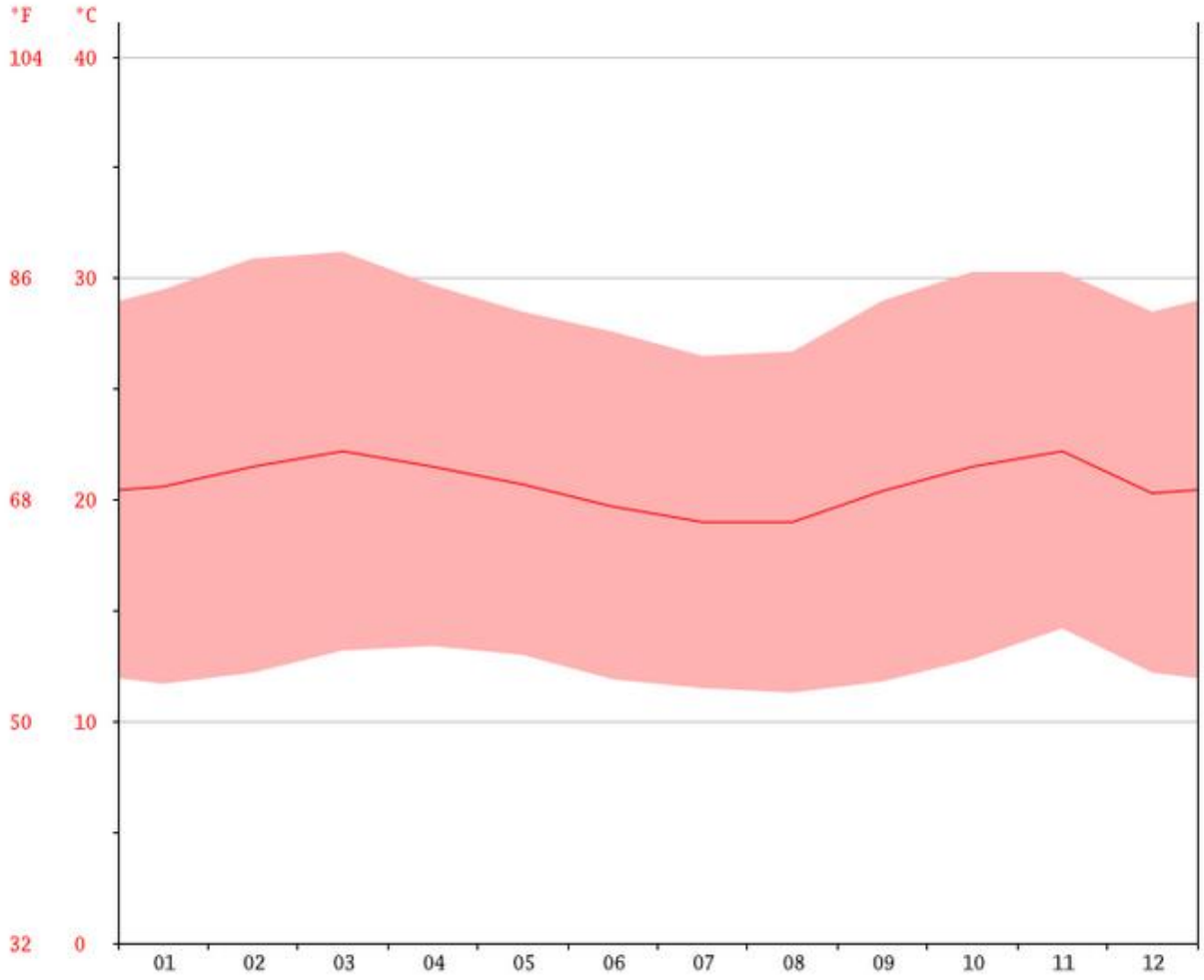

Figure 3: Temperature variations in Kambiti, 2019

3.1.3 Sunshine hours

The average annual amount of sun hours in the lower Murang'a area is 2492 hours. On average, January has the most hours of sunshine averaging about 280 hours. July and August recorded the lowest values of about 120 hours. This corresponds with the climatic patterns as July and August are the coolest months. .

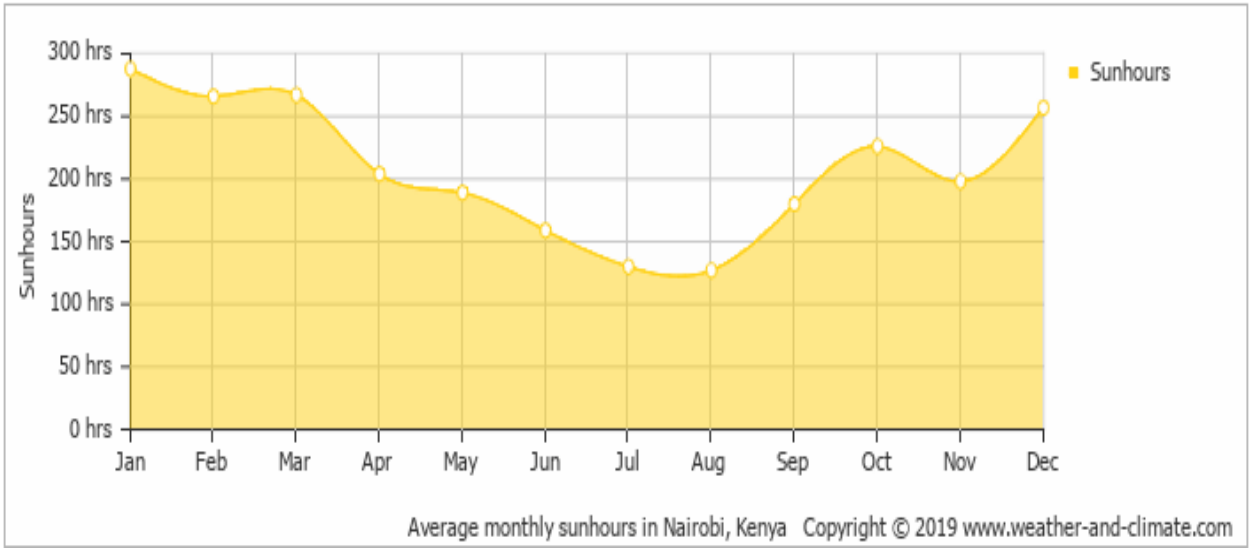

Figure 4: Sunshine hours in Murang'a County, 2019

3.1.4 Winds

The wind patterns in Kambiti area fall are as captured from the nearest station in Makuyu. The highest wind speeds are recorded in the month of February, while the lowest are recorded in May.

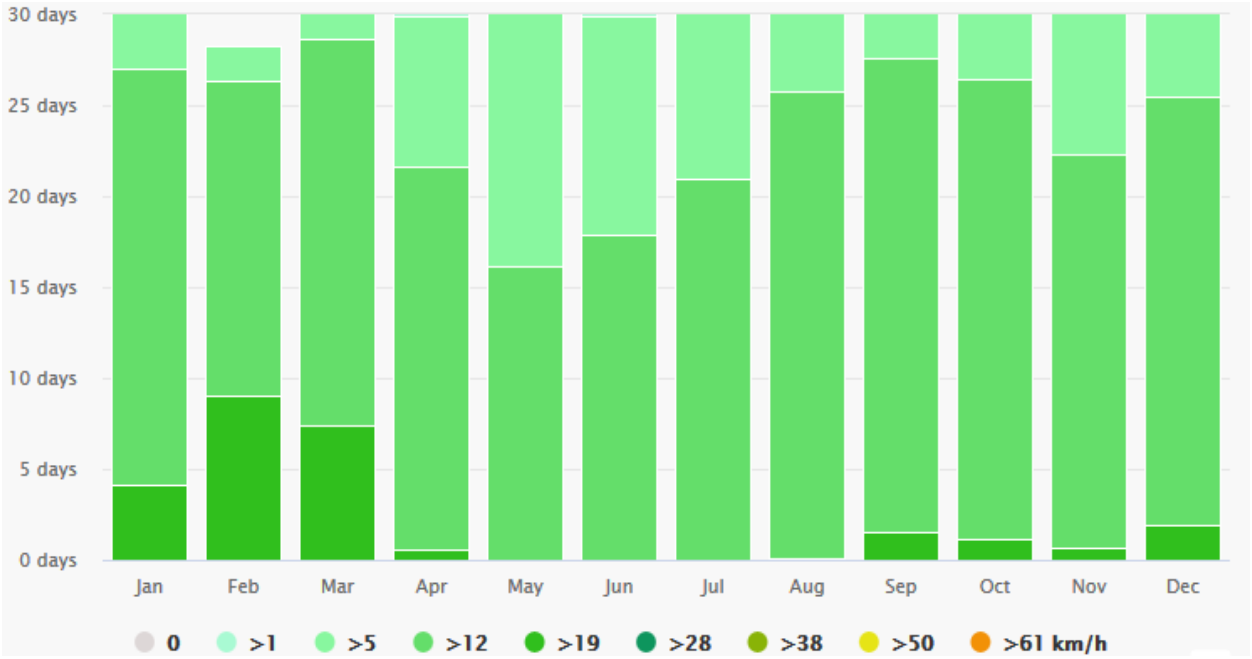

Figure 5: Wind speeds from Makuyu station, 2019

3.1.5 Topography and Drainage

The proposed project site which is at an altitude of about 1200m lies in an area in which the only prominent physical features visible are the hills. At an altitude of about 1100m, the land rolls out into dry plains. The land project area is well drained by several rivers with the major ones being Sagana River and Maragua River that run north of the proposed site location.

Figure 6: Proposed project site

All the rivers flow from the Aberdare range to the West, South eastward to join Tana River. The cultivated hillslopes of the Mathioya and Sagana basins have mean gradients of 0.24 and 0.27

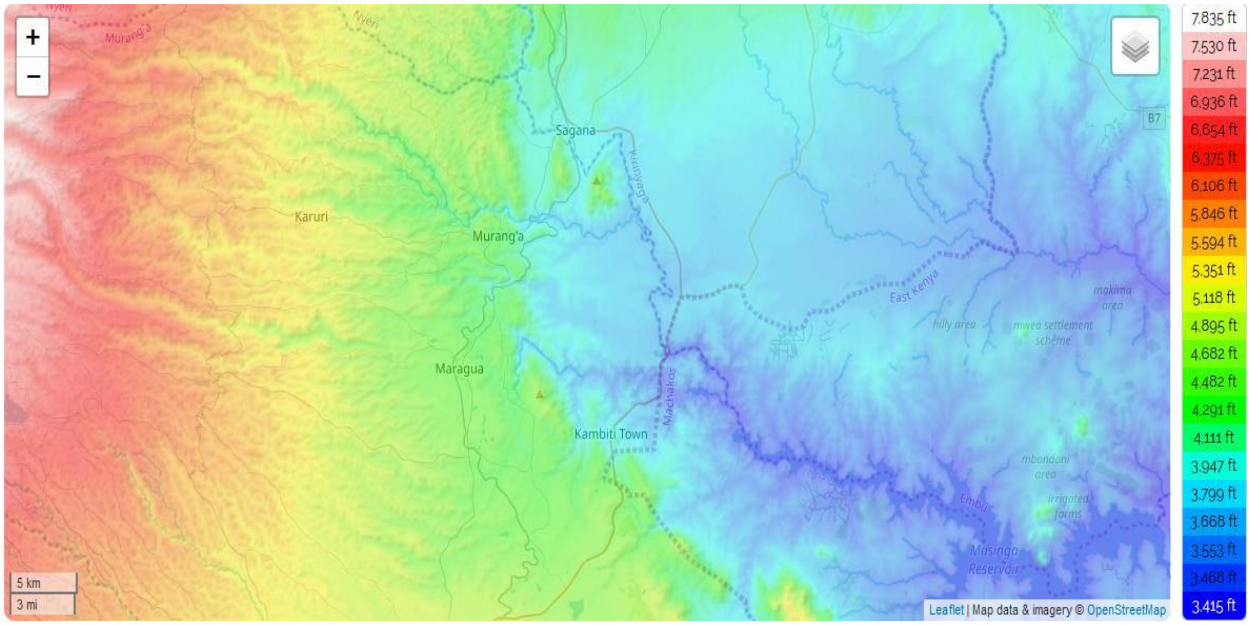

Figure 7: Topographical variation of Kambiti and surrounding areas

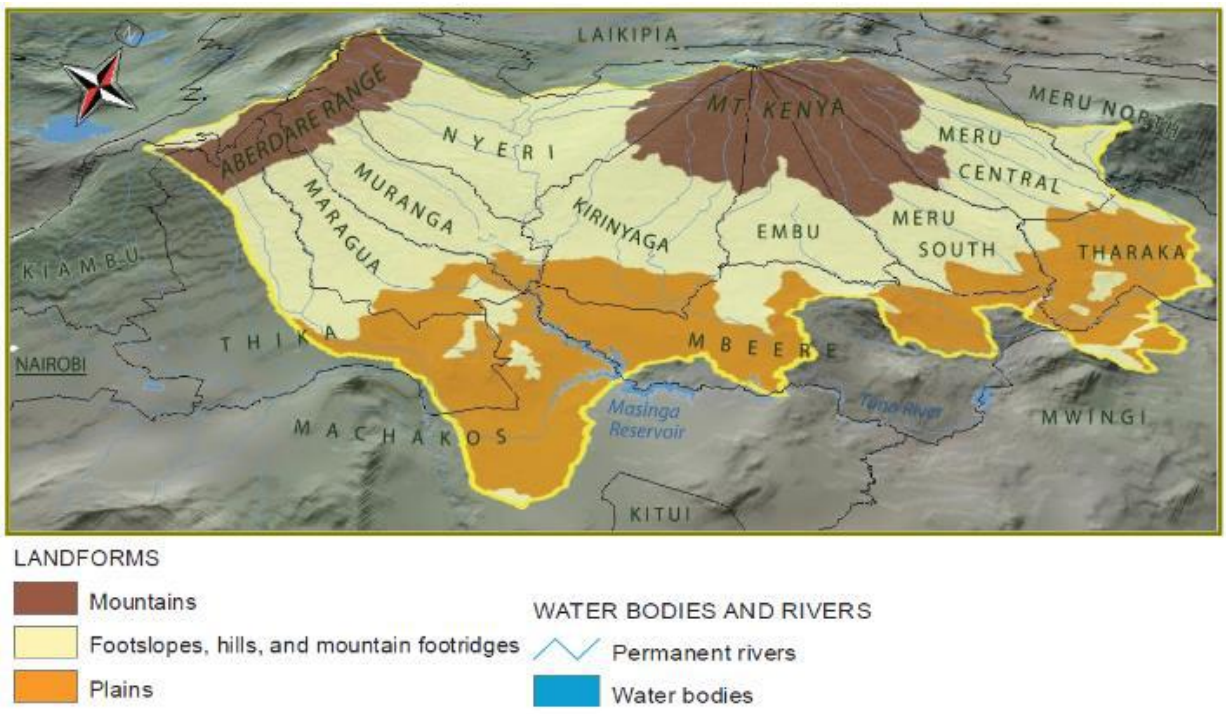

Figure 8: Topographical variation of Kambiti and surrounding areas

3.1.6 Geology

The geology of the Kambiti area and its surroundings consists of basement system rocks of Archean type. The crystalline rocks of the Basement System cover the majority of the area surrounding the proposed site location. They comprise principally various types of sediments/ grits sandstones, limestones and shales that have been metamorphosed into gneisses, schists and marbles by heat and pressure or by impregnation by pervading fluids.

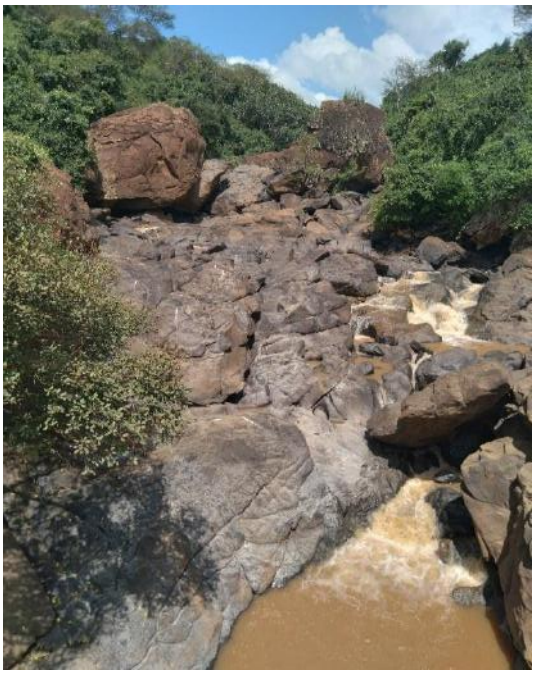

Figure 9: Geology structure surrounding the proposed site location

3.1.7 Water Resources and key uses

The proposed project site is located within the Upper Tana catchment area. The main rivers of the catchment are the Sagana and Thiba. Important tributaries include the Chania, Mathioya, Maragua, Nyamidi, Rupingazi, Ena, Tunga and the Gura.

Figure 10: Tana Catchment Basin

The land rises gradually from an altitude of 914m in the East to 3,353m above sea level along the slopes of the Aberdare. The surface water and sub-surface water resources in the area are adequate. A substantial percentage of households in the division harness rain water through roof catchment. Underground water resources are greatly exploited and boreholes drilled.

The proposed project site is located south of Maragua River and river Sagana. Water is used for multiple purposes among them being domestic, livestock, agriculture (irrigation minor) and industrial. The impacts of water use and demand have affected the water quality through pollution and siltation due to poor farming methods. The inhabitants of Kambiti are engaged mainly in subsistence agriculture, growing maize and a variety of horticultural crops and rearing of livestock. However there are several medium to large scale farms with Kakuzi located near the project site as the largest farm.

Figure 11: Land use around the project area

In the Upper Tana, the most important problems concerning surface and groundwater are (WRA 2007):

- Poor water quality (concentration of fluoride is too high), which leads to health issues
- (Local) over-abstraction of water. Swamps and wetlands have also been encroached on especially for growing food for domestic consumption during drought. This affects the volumes especially during drought.

3.1.8 Soil, Erosion & Sedimentation

Variations in altitude, rainfall and temperature between the highland and lowland coupled with the differences in the underlying geology of both volcanic and basement system rocks give rise to a variety of soil types. The proposed site is located in an area of medium potential. The predominant soils are the deep and well-drained red/brown soils. These soils are loose and combined with the hilly terrain are easily eroded and sometimes are responsible for the landslides which are common in the district.

Figure 12: Soil type at the proposed site location

Some of the areas surrounding the proposed project site have gabions constructed to prevent risk of soil erosion.

Figure 13: Gabions constructed to control soil erosion

3.1.9 Air Quality

Majority of the activities in the area comprise of subsistence agriculture and small scale commercial activities. The air quality is relatively clean and unpolluted.

3.1.10 Noise

The area is mostly rural with little activity. It is a relatively quiet and serene place.

3.2 Biodiversity Assessment

3.2.1 Methodology

Data collection methods on biodiversity included GPS recording, plant sample collection, photography, observation, identification of *flora* and *fauna* with aid of field guide books. Biodiversity data, anthropogenic activities and environmental features were captured. Data collected were in form of photographs, GPS coordinates, animal tracks, animal droppings, plant parts, filled questionnaires and general observation notes.

3.2.2 Fauna

Wild animals are found in the protected areas, forests, rivers and farmlands. Velvet monkeys for example are very common in farm land and cause a lot of damage to crops. Occasionally, elephants from the forests neighboring the community break into the farmlands especially in the unprotected areas without game fence. Other animals found in the neighboring forests include the Bongo, buffaloes, Antelopes and Leopards. Outside the forests, there are few wild animals that are found in the rivers, such as Hippopotamus and crocodiles. These are found in the two major rivers – Mathioya and Sagana. There are a lot of birds in the county.

Different animal species are found in a variety of places such as on trees, rocks, rivers, swamps, caves, and other microhabitats situated in the region. They are comprised of mammals, birds, reptiles, insects, amphibians and mollusks.

Direct and indirect methods were used to identify the presence of fauna species utilizing the area. These includes: live sighting, droppings, pellets, tracks, foot prints, vocalization, burrows, dens etc. The central region has several wildlife parks including the Aberdares and Mt Kenya national parks but these are outside the proposed project area.

Table 4: Animal Species Identified

Species	**Common Name**	**Evidence**
Syncerus caffer	Cape Buffalo	KWS Report
Colobus guereza	Colobus monkey	Sighting

Species	Common Name	Evidence
Hippopotamus amphibius	Hippopotamus	Sighted/KWS Report
Papio anubis	Olive baboon	Sighted
Cyprinus carpio	Common carp	Sighted
Clarias gariepinus	African cat fish	Sighted
Oreochromis niloticus	Nile tilapia	Sighted
Chlorocebus pygerythrus	Vervet monkey	Sighted
Crocuta crocuta	Hyena	KWS Report
Loxodonta africana	Elephant	KWS report
Lepus microtis	African hare	Droppings
Crocodylus niloticus	Nile crocodile	KWS report
Agama agama	Agama lizard	Sighted
Hemidactylus frenatus	House lizard	Sighted
BIRDS		
Halcyon leucocephala	Grey-headed kingfisher	sighted
Cinnyris chalybeus	Double collared sunbird	Sighted
Melierax poliopterus	Eastern chanting goshawk	Sighted
Lamprotornis superbus	Super starling	Sighted
Ploceus cucullatus	Village weaver	Sighted

There are not so many wild animals outside the park and virtually none around the project. Other wildlife and human conflicts outside the park are mainly with crocodile and hippos along the rivers and damming points. Both these animals are desirable as they recycle nutrients into the water and contribute to a balanced aquatic ecosystem, which can ensure good fish production (Payne, 1986).

Downstream of the project site on Masinga reservoir a valuable habitat supports a great variety of water birds (see table 5). Large numbers of duck and storks can be seen on the sediments below the Tana Bridge. Masinga is notable mainly for its water birds, with breeding colonies of cormorants and Anhinga rufa. The terrestrial avifauna is not particularly diverse, but the threatened and restricted-range Turdoides hindei has been recorded in Acacia thickets 100–200 m from the eastern shores of the reservoir. Regionally threatened species include Anhinga rufa (Masinga is one of the few known Kenyan nesting sites; 94 birds were counted in February 1999, with 228 altogether on the five Upper Tana dams); Casmerodius albus (260 in March 1995); and Polemaetus bellicosus (status unknown). (Bird life international, 2005).

Table 5: Masinga Reservoir Key Wetland Bird Species

Species	Scientific name	Season
Yellow –necked spur fowl	*Francolinus leucoscepus*	Resident

Great Cormorant	*Phalacrocorax carbo*	Nonresident (Breeding season)
White –winged Tern	*Chlidonias leucopterus*	Nonresident (Breeding season)
White – bellied Go –away-bird	*Corythaixoides leucogaster*	Resident
Donaldson-Smiths Nightjar	*Caprimulgus donaldsoni*	Resident
Abyssinian Scimitar-bill	*Rhinopomastus minor*	Resident
Hinde's Pied-babbler	*Turdoides hindei*	Resident

3.2.3 Flora

Biodiversity of the project location is highly influenced by the Mt. Kenya Forest Ecosystem with respect to indigenous plant cover species. However, due to human activities, the indigenous plant species have been interspersed by exotic species that have also acquired economic values among the communities. Such plant species include tea, mango, coffee, Eucalyptus spp, Cypress ssp., Caussurina spp. and Grevillea ssp and wattle trees species. Other plant features include grass species, ferns, nippier grass, avocado, banana, yams (mainly in the river flood plains), cassava, sugar cane, pineapple and arrowroots). Table 6, shows the inventory of the vegetation species while Plate 1 shows photographs of some of the flora and fauna around and within the project area.

The woodland community is composed of several indigenous trees including Croton spp, Bridelia micrantha, Erythrina abyssinica, Cussonia holstii, Markhamia lutea and Ekebergia capensis. In this zone there is also a large percentage of introduced species of which the most dominant is the Senna siamea. Other exotic species include Grevillea robusta, Cuppressus lusitanica, Eucalyptus saligna, Eucalyptus camaldulensis, senna spectabilis and Leucaena leucocephala. The dominant grass is Themeda triandra.

Inventory of the vegetation species is summarized below.

Table 6: Inventory of the Vegetation Species

Vegetation species	
Scientific Name	**Common Name**
Acacia brevispica	
Acacia mearnsii	black wattle
Acacia polyacantha	White Thorn
Agave americana	Sisal
Agave sisalana	Sisal
Albizia gumnifera	

Anemone thomsonii	
Azadirachta indica	Neem
Balanites aegyptiaca	
Bidens pilosa	Black jack
Brassiciformis	
Calodedrum capense	
Carissa edulis	Simple spined num
Casuarina equisetifolia	Whistling pine
Catharanthus roseus	Madagascar periwinkle
Caussurina spp.	
Commelina africana	Ferns
Commelina benghalensis	Wandering jew
Commiphora eminii	
Cordia abbysinica	Moringa
Croton megalocarpus	Croton
Croton spp	
Cuppressus lusitanica	Cedar
Cussonia holstii	Cabbage tree
Dovyalis caffra	Kei apple
Ekebergia capensia	
Eucalyptus spp	
Euphorbia burseii	
Euphorbia candelabrum	Candelabra tree
Euphorbia hirta	Asthma herb
Euphorbia tirucalli	Naked lady
Ficus sycomorus	Sycamore fig
Gloria-die ssp.	
Grevillea robusta	Silk oak
Grewia mollis	
Helichrysum Sattimae	
Jacaranda mimosifolia	Jacaranda
Juniperus procera	Junipers
Lannea schweinfurthii	False marula
Lantana camara	
Leucaena leucocephala	White lead tree
Mangifera indica	Mango
Melia azedarach	
Musa spp	Banana

Neboutonia macrocalyx	
Nuxia congesta	Brittle-wood
Octea usambararensis	
Olea europaea	Olive tree
Podocarpus latifolius	Yellow wood
Prunus africana	African cherry
Psidium guajava	Guava
Rucinus communis	Castor oil
Saccharum officinarum	Sugar cane
Senna siamea	Siamese senna
Senna spectabilis	
Solanum incanum	Sodom apple
Spathodea campanulata	African Tulip Tree
Teclea nobilis	
Vitex keniensis	Meru oak
Ximenia americana	Tallow wood
Yushania alpina	Bamboo
Grasses	
Cynodon dactylon	*Star grass*
Elmus repens	Couch grass
Pennisetum clandestinum	Kikuyu grass

Plate 1a: Euphorbia Burseii

Plate 1b: Tithonia Diversifolia

Plate 1c: Mangifera indica

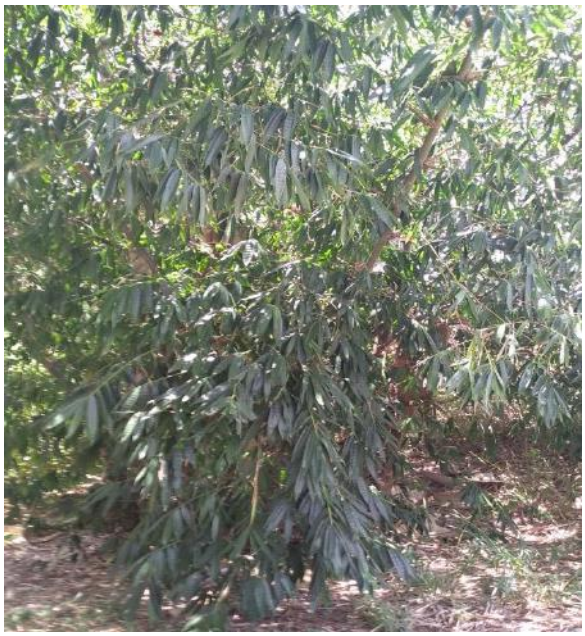

Plate 1d: Yushania alpina

Plate 1f: Grewia mollis

Plate 1g: Natural vegetation around the project area

Plate 1h: Baboons roaming around the proposed project site

Plate 1i: Super starling in the neighbourhood of the project site

Plate 1: Flora, Fauna and Avifauna within the project site

3.3 Infrastructure Development And Economic Activities- Muranga County

3.3.1 Population

Murang'a County is one of the created under the Kenya Constitution 2010. It is one of the five counties in Central region of the Republic of Kenya and occupies a total area of 2,558.8 km^2. It is bordered to the North by Nyeri, to the South by Kiambu, to the West by Nyandarua and to the East by Kirinyaga, Embu and Machakos counties. It lies between latitudes 0o 34' South and 10 7' South and Longitudes 36o East and 37o 27' East. The county lies between 914m above sea level (ASL) in the East and 3,353m above sea level (ASL) along the slopes of the Aberdare Mountains in the West.

The 2019 Population and Housing Census recorded a population of 1,056,640 persons for Murang'a County consisting of 523,940 males and 532,669 females and an intersex population of 31 persons. In Murang'a South sub-county where Upper Tana power station lies, the 2019 census recorded 184,824 persons consisting of 91,732 males, 93,087 females and 5 intersex persons as shown in the table below:

Table 7: Distribution of Population by Sex and Sub-County. (2019 Kenya Population and Housing Census

MURANG'A COUNTY	**MALES**	**FEMALES**	**INTERSEX**	**TOTAL**
	523,940	**532,669**	**31**	**1,056,640**
SUB-COUNTY				
MURANG'A EAST	54,665	55,645	1	110,311
KANGEMA	39,582	40,862	3	80,447
MATHIOYA	45,454	47,359	1	92,814
KAHURO	43,352	44,834	7	88,193
MURANGA SOUTH	91,732	93,087	5	184,824
GATANGA	94,437	93,548	4	187,989
KIGUMO	67,989	68,929	3	136,921
KANDARA	86,698	88,393	7	175,098
ABERDARE FOREST	31	12	0	43

3.3.2 Agriculture

i. Main Crops Produced

The major cash crops in the County include tea, coffee, avocado, mangoes, paw-paw, macadamia and horticulture crops, among others. Horticultural crops include tomatoes, cabbages, kales, spinach and French beans while food crops include maize, beans, bananas, sweet potatoes, french beans, pigeon peas, chillies, cowpeas, baby corn, green grams, Irish and sweet potatoes while the fruits include, avocado, paw-paw, Mango and water melon

ii. Acreage under Food Crops and Cash Crops

According to Murang'a County Development plan, the acreage under food crops and cash crops are 329,234 and 177,636 respectively. The acreage under food crop is almost twice that of cash crop. Food crop farming is practiced in all parts of the county but cash crop farming is practiced in upper zones and in some lower zones of the county. What is prevalent in the area around the project are food crops, a bit of fruit trees prevalently mangoes.

Plate 2: Mango and Orange plantation near Tana Power Station

iii. Main Storage Facilities

The storage facilities range from granaries to grain stores and milk coolers. Grain stores are found in NCPB outlets in Maragwa town. Milk coolers are found in milk collection centres in Kigumo, Kangema and Maragwa. Granaries are found at household level due to small quantities of produce. Tea leaves and coffee berries are stored in their respective factories.

iv. Main Livestock Bred

The main livestock bred in the county are cattle, pigs, goat, sheep, rabbits and chicken. Exotic cattle breeds are found in the upper parts of the county while indigenous cattle breeds are found in the lower parts of the county, including the areas around the project. Dairy and indigenous goats are spread all over the county but they thrive well in the lower parts. Pigs are of different varieties and reared all over the county due to readily available market offered by Farmers' Choice. Rabbits and chicken are reared in response to demand for white meat.

Plate 3: Livestock farming within the project area

v. Main Fishing Activities

There are no large water masses in the county and therefore fishing is practiced in a few farms. Small scale farming is also practiced around the project area in River Sagana, which is a factor in the upcoming of Kwa Samaki trading centre a few meters from the project area. The main fish species traded are Tilapia and Mud fish.

vi. Livestock development

Livestock farming is found in most parts of the district with the main animals being sheep, goat, pig, poultry and bees. Livestock products include milk, eggs, hides & skins and honey. Milk production is substantially low in the lower areas due to dryness. The production of milk has also been faced with challenges resulting from liberalization and collapse of KCC. Meat production is mainly in form of beef chevron, mutton and chicken. Production of mutton is however low and most of the meat consumed is from the neighboring districts. Most of the chickens grown in the area are indigenous with very low egg laying capacity. Pig production is also on the decline due to lack of market and as a result of the collapse of the uplands factory.

3.3.3 Energy

Just like in any other part of Kenya, about 90% of the population is dependent of fuel wood. The main source of biomass is agricultural residues, charcoal, and fuel wood. Since harvesting of wood fuel in Aberdare was banned, people came back to the farm forest and agricultural residues. The other source of energy in the rural area is paraffin. There are three mini-hydroelectric power stations run by KenGen in the area i.e. Wanjii which is being upgraded currently, Mesco and Tana. The total number of households with access to electricity in the district is over 5000 distributed in12 trading centres. The use of solar energy has not been embraced with only below 5% of the district population using solar energy.

3.3.4 Road Networks

Access and transport to Murang'a County is only by road. It takes approximately one hour by road from Nairobi, one and half hours from Nyeri, 40 minutes from Thika town and two hours from Embu town. The poor road network in some areas has proved to be a challenge in marketing produce and access to farm inputs. Marketing of perishable foods has been hampered by poor road network leading to high transport costs and losses to the farmers.

The road network within Kambiti location is mainly rural access roads with no much of public transport. The most important tarmac road is the one connecting Tana and Wanjii power stations which was upgraded recently, and which reduces the overall distance to Murang'a town. Other access roads are to Merira barrage and other river crossing points to Makutano market. The nearest tarmac road is the Nairobi-Nyeri highway. In 2016, Murang'a County had 2,934.95 Km of road. Of these, 387.5 Km were bituminized, 1313.1 Km were graveled and 1234.3 Km was earth surface.

3.3.5 Education

There are 739 primary schools and 271 secondary schools both public and private. Some of the top high schools in Murang'a County include Kahuhia Girls Secondary School, Mugoiri Girls High School, Kahuhia Girls High School and Njiiris Boys Secondary School. Murang'a County hosts several renowned colleges among them Murang'a Teacher's College, Murang'a Technical Institute and Kenya Medical Training College (KMTC) - Murang'a.

Other top colleges include Michuki Technical Training Institute, Murang'a College of Technology and Mbiiri Institute of Professional Studies. There's also a Kenya National Library Service in Murang'a town. In the area near the project, there are three primary schools and 2 secondary schools within a radius of 5 kilometers. These are Kiambaa primary school, Merira primary school, Makutano primary school on the Embu County side, Muchagara secondary school and Wachoro Boys Secondary School on the Embu County side also. There is also one private school near the station called St Mary's school, Maragua Ridge. In Kambiti shopping centre, there is also an upcoming vocational Training Centre.

Plate 4: Kambiti Polytechnic

3.3.6 Health

Murang'a County has about 271 health facilities which include 112 centers run by government, 125 that are privately owned and 31 run by faith based organizations. A few centers are managed by community based organizations. Among the government-managed is Murang'a District Hospital in Murang'a Town, Maragua District Hospital, Kangema and Muriranjas Sub-District Hospitals. Church-run health facilities include Kiria-ini Mission and Githumu Hospital. Private hospitals include the Kangari Dental Clinic and Marie Stopes Nursing Home at Mbiiri among others. The health centers closest to the project area are Kambiti health Centre which is 7 kms away and Makutano Health centre which is 5 kms from the station.

3.3.7 Water Use and Supply

Murang'a County's water resources are rivers, shallow wells, springs, dams, boreholes and roof catchment. There are 10 permanent rivers, 400 shallow wells, 75 springs, 30 dams and 100 bore holes that supply water for domestic and agricultural use in the county. All these sources supply 60 per cent of the county population with clean and safe drinking water.

The county has 27 water supply schemes and about 16 irrigation schemes. Water supply schemes are managed by three different entities. There are some which are managed by the water companies, the department of water and others by the community members through water project committee. The irrigation schemes managed by the community members get funding from community's own initiatives as well as through government and development partners' support.

In the county, the mean distance to the nearest water point is 3 Km with about 29.4 per cent of the households taking five to 14 minutes. Water supply schemes such as the Gatanga community water schemes supply water directly to households at reasonable cost. The county will expand

the capacity of water schemes to ensure a minimum of 40per cent of the households are directly supplied with water. Organized community groupings are partially funded through WRUAs, FUAs, and others, to conserve the wetlands especially on the upper catchment areas of River Tana. About 99.78 per cent of the households in the County use toilet facilities. Out of these, 4.97per cent use flush toilets, 3.97per cent use VIP latrines while the others use ordinary pit latrines. The majority of people living in the market and trading centres use ordinary pit latrines.

Plate 5: One of the earth dams near the project area under DEKA plantations

3.3.8 Industries

Most of the industries in the district are agri-based e.g. tea and coffee factories, milk and fruit processing industries. Other commercial activities include retail and wholesale trading, jua kali and trade in horticultural crops etc.

There are at least four tea factories in the sub-county in the highlands neighboring Aberdare forest. These are Githambo, Gatunguru, Kanyenya-ini and Kiru. Coffee factories in the area include Kanyenyaini, Mihuti, Gathima and Kiharu coffee factories among others. Kiharu coffee factory is closest to the project being around 15 kilometers away. The coffee factories cause most nuisance in-terms of upstream water pollution. There are other factories that are coming up close to the project area which mainly deal with mango fruits and juice. The area around Tana Power Station has in the recent past of less than 5 years practiced a lot of mango farming. Such upcoming factories include Sun Mango Processing Ltd and DEKA plantations that also process not only Mango juice but also orange juice.

Other agricultural activities that support the county's economy include Macadamia farming. Among main farms for Macadamia is Farmnut Macadamia in Murang'a and Maragua town. Murang'a County has several agro-processing factories as shown in the table below;

Table 8: Agro-processing factories in Murang'a County

	Industry/ factory by Type						
	Tea	**Coffee**	**Pesticides**	**Fruits**	**Nuts**	**Animal feeds**	**Mango/Oranges**
Kangema	1	15					
Mathioya	2	16			1		
Murang'a East	3	6			1		
Murang'a South		8	1	1	1	3	1
Gatanga	2	21		2			
Kandara	1	34					
Kigumo	3	38					
Kahuro	1	23					
TOTAL	13	161	1	3	3	3	1

Plate 6: SUN-MANGO company ltd- One of the Mango/ Orange juice factories in Kambiti location

3.3.9 Trading Centers

Several trading centers are found all over the County. The main trading centre is Murang'a town, which is 30 km from site. The nearest trading centers to the project site are Merira which is around 3 kilometers from the project site and Makutano which is about 5km from site along the Thika-Embu highway. Makutano is the main centre for the community around the project. There are other upcoming small markets that include Kwa Samaki along Thika Nyeri highway and Kiambaa along Tana Murang'a road.

Plate 7:: A section of the Kambiti market

Plate 8:: Makutano Market

3.3.10 Archaeological, Historical and culturally sensitive areas

There are no records of any archaeological, historical, or culturally sensitive resources associated with the Tana Power Station and so the project area being inside the station area has no culturally sensitive area either.

3.3.11 Telecommunication

Though telecommunication services are fairly developed in Murang'a town and to some extent some trading centres, there is still poor access to postal services, phone and email in the rural areas and indeed most parts of the Murang'a south Sub-county. Some of the reasons attributed to inadequate communication facilities include GSM networks, lack of telecommunication lines which hampers use of landlines and Internet facilities and generally lack of exposure of the local community this notwithstanding, more than ¾ of the adult population own mobile phones.

3.3.12 Tourism and recreational facilities

Tourism is not well developed in the County. The poor road infrastructure has not encouraged tourists due to their inaccessibility and hilly terrain. There are several good hotels in Murang'a town but are not up to tourist standards. Other campsites are found in the sport fishing areas neighboring the Aberdare forest while the ones outside the county are found in Embu, Meru, Mt. Kenya area less than 200km from the proposed site. Close to Masinga Dam there are facilities for camping and fishing but photographing, is prohibited. Proper meals and accommodation can be found at the Masinga Tourist Lodge operated by Tana River Development Authority.

- **Main tourist attractions and activities**

The main tourist attraction sites in the county are the Aberdare National Park and the cultural heritage sites that have a rich history on the origins of the Agikuyu people. Such sites are at Mukurwe WA Nyagathanga and Karia Ka Mbari ya Ngware. Moreover, there are ideal natural sites for hiking and camping at Rapids Camp, Aberdare cottages and sport and leisure fishing sites at Kimakia fishing grounds and Ndakaini Dam.

- **Classified / major hotels (numbers, bed capacity and distribution by Sub County)**

The County has a number of major hotels which include Nokras Riverine, Hotel Nokras, Fortune Green, Stanley's Haven, Murang'a Mukawa, and Sagana Getaway in Kiharu Sub County; Golden Palm Hotel in Kandara Sub-County; Trotters Hotel in Maragua Sub-County; Ranges View Lodge, Goshen Farm Hotel, and Green Coral in Mathioya Sub-County; Muchiris Resort Ndakaini in Gatanga Sub-County. Most of them are unclassified. However, tourism potential in the county is untapped; there are no tourist class hotels or restaurants. This is because the available tourism packages are often irregular and the tourists usually visit the county during the day and then go to reside in hotels outside the county. The hotel closest to the project is Tetura which is near the upcoming Kiambaa market, which is also not up to tourist standard.

- **Main wildlife**

The main wildlife in the county is elephants. Other wildlife in the county is Columbus monkeys and their related species. Elephants are the major source of human-wildlife conflicts especially in Mathioya and Kigumo constituencies. This is due to the constituencies' proximity to the Aberdare forest which forms the wildlife habitat. Vervet species of monkeys have also created conflicts with humans especially in Gatanga Sub County and in Murang'a South where the project is situated.

- **Sports, Culture and Creative Arts**

The county has various cultural sites among them; Mukurwe-wa-Nyagathanga in Kiharu, Tuthu Cultural Site (Karuri WA Gakure) in Kangema, and Mugo (Chege) WA Kibiru Cultural Centre in Gatanga. There are various sports grounds in the county which include Rurii in Mathioya, Gen Kago in Kangema, Ihura and Mumbi grounds in Kiharu, Matenjagwo in Kandara, Kimorori in Maragua, and Gachibi grounds. There are other private health clubs spread across the county.

3.3.13 Land and Land Use

a. Land ownership categories/ classification

Land in Murang'a County is classified into freehold or leasehold land. Freehold land is held by an individual for an unspecified period of time while leasehold land is given by the government to an

individual or organization over a specified period of time and is expected to remit rent to the government.

b. Mean holding size

The county has a total area of 2,558.9 km^2, of which 11.2 km^2 is water mass. The arable land is, 2,135 km^2 while non-arable land is 163.3 km^2. The gazetted forest covers an area of 254.4 km^2 while approximately 20 km^2 is urban area. The average farm size under large-scale holdings is 6.4 ha. Total acreage under food crop farming is 180,225 ha while that under cash crop farming is 42,980 ha. The land under soil conservation is 55,780 ha; farm forestry is 108,352 ha while area under organic farming is 11,156 ha. The main land use activities in the county are cash crop farming, subsistence farming, livestock keeping, fish farming, housing and forestry.

c. Percentage of land with title deeds

Murang'a County is predominantly agricultural therefore, land holding is considered important. It is estimated that about 33,000 farmers have title deeds with a population of about 250,000 farmers.

d. Incidence of landlessness

Majority of the county population own land. Incidence of landlessness is approximately 0.2per cent. This is as a result of concerted efforts by the government to resettle the landless at Maranjau area in Kambiti Location of Maragua constituency.

e. Settlement patterns (Urban centres, informal settlement, etc.)

Human settlement patterns in Murang'a vary from town to town due to various reasons, which include socio-cultural basis, topographic characteristics, and economic output of the areas. Linear Settlements are settlements along lines i.e. major roads and rivers. 80% of service centres in Murang'a County are located along roads. Linear settlement are majorly located on suburban areas of the county Scattered settlements are settlements where household are located at a distance from each other. This is mainly experienced in the semi-arid parts of the county. Nuclear settlements are settlements that are characterized by a concentration of households in a specific area i.e. around towns.

Plate 9: A section of a small town upcoming along Tana-Murang'a tarmac road

f. Type and size of land In Murang'a County

Land is classified as public, community, or private. According to the constitution, public land is Land which at the effective date was alienated government land as defined by an Act of Parliament in force at the effective date, land lawfully held, used or occupied by any State organ, land transferred to the State by way of sale, reversion or surrender, land in respect of which no individual or community ownership can be established by any legal process or land in respect of which no heir can be identified. Public land shall vest in and be held by a county government in trust for the people resident in the county, and shall be administered on their behalf by the National Land Commission. Community land is land held by communities identified on the basis of ethnicity, culture or similar community of interest. It consists of: land lawfully registered in the name of group representatives under the provisions of any law, land lawfully transferred to a specific community by any process of law, any other land declared to be community land by an Act of Parliament; and land that is used by the community as community forests, grazing areas or shrines, ancestral lands or land lawfully held as trust land by the county governments. Private land is registered land held by any person under any freehold tenure or any other land declared private land under an Act of Parliament.

CHAPTER 4

4 LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

4.1.1 The Constitution of Kenya, 2010

Article 42 (1) provision of that every person has the right to a clean and healthy environment which includes the right to:

a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in article 69; and

b) To have obligations relating to the environment fulfilled under article 70

Measures of Compliance by KenGen

The management of KenGen has put in place various measures that ensures compliance with the above provision including:

- Conducting ESIAs for projects that have significant impact to the environment and conducting periodic audits for existing facilities
- Embracing the ISO 14001 standard as an essential part of the company's growth strategy hence establishing the minimum requirements for the protection of environment and prevention of pollution.

4.1.2 Environmental Management and Coordination Act, 1999

The Act entitles every person in Kenya to a clean and healthy environment and aims to safeguard and enhance the environment. Though there are other sectoral laws on environmental conservation, this is the supreme legislation. It provision of guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. According to Section 58(2), the Act also lists the type of projects, which must be subjected to the EIA process and establishes NEMA as the statutory body responsible for the implementation of the act. Pursuant to section 63, the Authority may, after being satisfied as to the adequacy of an EIA study, evaluation or review report, issue an EIA license on such terms and conditions as may be appropriate and necessary to facilitate sustainable development and sound environmental management.

Section 68(2) dictates that the owner of the premises or the operator of a project for which an environmental impact assessment study report has been made shall keep accurate records and make annual reports to the Authority describing how far the project conforms in operation

with the statements made in the environmental impact assessment study report submitted under section 58(2). According to Section 68 (3), the owner of premises or the operator of a project shall take all reasonable measures to mitigate any undesirable effects not contemplated in the environmental impact assessment study report submitted under section 58(2) and shall prepare and submit an environmental audit report on those measures to the Authority annually or as the Authority may, in writing, require.

Measures of Compliance by KenGen

In compliance to the requirements of the act, the proponent was appointed an expert to conduct the EIA study project report in order to seek approval before implementation of the proposed project.

4.1.3 EIA and Audits Regulation, 2003

In 2003, The National Environmental management Authority (NEMA) through the ministry for Environment and Natural Resource gazette the Environment impact assessment and Audits Regulation. The regulation provision of the guidelines for environmental audits and environment impact assessment. The project proponent is required assess their impact on the environment develop a plan for continuous environmental improvement and to implement an environmental management system (Including environmental auditing). Institutions will demonstrate continuous improvement of environmental performance with a view to reducing impacts. Internal audits should be carried out and availed to NEMA on an annual basis as stated in part vii sect. 68 (4)

Measures of compliance by KenGen

According to this regulation, the proponent has undertaken an ESIA in accordance with the regulations, and on completion of the project, will be carrying out annual audits in accordance with the regulations

4.1.4 The Environmental Management and Co-ordination (Waste Management) Regulations, 2006

The regulations provision of details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- Domestic waste
- Industrial waste,
- Hazardous and toxic waste
- Pesticides and toxic substances
- Biomedical wastes and
- Radioactive waste

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Regulation 5 (1) provision of categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 14 (1) requires every trade or industrial undertaking to install at its premises anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking. Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment. Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA. Regulation 40 requires all waste transporters to obtain a license from NEMA for the transportation of waste.

Measures of Compliance by KenGen

According to this regulation the following measures will be implemented:

- Provision of waste bins for biodegradable and non-biodegradable waste
- Segregation of waste at source though not 100%
- Contracted firm to collect and dispose solid waste at licensed disposal sites.
- Contracted NEMA Approved firm and licensed waste handler to collect and dispose hazardous waste including asbestos sheets and used oil.

4.1.5 The Environmental Management and Co-ordination (Water Quality) Regulation, 2006

The Regulations provision of for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources. It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radio-active waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

Measures of Compliance by KenGen

According to this regulation, KenGen will implement the following measures:

- Discharge domestic sewage into septic tanks
- Monitor and exhaust sewage from the septic tanks to prevent overflow onto the ground surface

4.1.6 The Environmental Management and Co-ordination (Noise and Excessive Vibrations Pollution Control) Regulations, 2009

These regulations provision of information on the following:

i. Prohibition of excessive noise and vibration
ii. Provisions relating to noise from certain sources
iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
iv. Noise and excessive vibrations mapping

Measures of Compliance by KenGen

In order to comply with the above mentioned regulation, KenGen will implement the following measures:

- Ensure construction operations are undertaken during the day
- Ensure regular servicing and inspection of equipment and machinery during the construction phase of the project

4.1.7 The Factories and Other Places of Work (Fire Risk Reduction) Rules, 2007

The Occupational Safety and Health Act 2007 (replacement of CAP 514) recommends the implementation of this subsidiary legislation. The rules provision of for fire safety measures with specific focus on the following critical requirements:

- Safe handling and storage of flammable substances
- Provision of fire escape exits
- Formation of firefighting team
- Functions of a fire fighting team
- Fire safety training
- Conducting fire drills
- Installation, maintenance, inspection and testing of fire equipment
- Documentation of a fire safety policy and
- Annual fire safety audits

Measures of Compliance by KenGen

In line with the Fire Risk Reduction, rules 2007, the management of the Company will implement the following measures:

- Appointing and training of fire marshals
- Provision of fire protection systems comprising of portable fire extinguishers, fire hydrants, installation of fire detection systems and fire alarms
- Designated emergency assembling points
- Provision of emergency exits where necessary
- Conducting regular fire drills

4.1.8 The Factories and Other Places of Work (Hazardous Substances) Rules, 2007

These rules provision of for safety measures in handling of hazardous substances at work places including:

- Occupational exposure limits
- Control measures
- Provision and use of personal protective equipment
- Sound disposal of hazardous materials
- Provision of training and information to employees and
- Air monitoring and measurement
- Medical examination
- Duties of employees

Measures of Compliance by KenGen

Under these rules, the management will implement the following measures:

- Hazardous waste handled by licensed waste handler and disposed in a licensed disposal site
- Tracking of waste through the use of waste tracking sheets
- Inventory of hazardous chemicals
- Provision of suitable personal protective equipment to employees including coveralls, helmets, safety boots, gloves etc.
- Provision of first aid boxes at strategic points

4.1.9 The Work Injury Benefits Act, 2007

This is an Act of Parliament to provision of for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The salient features addressed by the act include the following:

i. Obligations of employers
ii. Right to compensation
iii. Reporting of accidents
iv. Compensation
v. Occupational diseases
vi. Medical aid and
vii. Appeals

According to section 7 (1) of the act, every employer is required to obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under the act to any of his employees. In addition, every employer carrying on business in Kenya shall within the prescribed period and in the prescribed manner register with the Director - section 8 (1). Pursuant to section 10 (2) of the act, it is the duty of every employee to ensure his/her safety at the place of work and hence where an accident, not resulting in serious disablement or death, is caused by the deliberate and willful misconduct of the employee, such an employee is not entitled to compensation. However, according to section 12 if an employee is injured in an occupational accident or contracts an occupational disease while the employee, with the consent of the employer, is engaged in any organized first aid, ambulance or rescue work, fire-fighting or other emergency service, the accident or disease is for the purposes of this Act, deemed to have arisen out of and in the course of the employee's employment.

In a circumstance where an accident occurs in the course of employment, section 21 makes it a requirement for a written or verbal notice of such an accident to be given by or on behalf of the employee concerned to the employer who shall send a copy of the notice to the Director within twenty four hours of its occurrence in the case of a fatal accident. In line with section 22 (1), an accident that has occurred should be reported to the Director by the employer in the prescribed manner within seven days from the date of receiving a notice of the accident or having learned that an employee has been injured in an accident. Similarly, it is the responsibility of the employee to report to his/her employer the occurrence of an accident not later than 12 months from the date of such an accident or else the right to benefits, in accordance with section 27 (1), shall lapse if the accident is not reported within such a period of time (12 months). According to section 46 (1), the employer shall be responsible for availing necessary means of transport where an employee is injured in an accident, which necessitates his conveyance to a hospital medical facility and from a hospital or medical facility to his residence.

Measures of Compliance by KenGen

Under the above act, the management of KenGen will implement the following measures:

- Maintain an insurance policy cover for its employees
- Maintain a record of accidents/incidences

4.1.10 The Occupational Safety and Health Act, 2007

This is an act of Parliament to provision of for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provision of for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The key areas addressed by the Act include:

- General duties including duties of occupiers, self-employed persons and employees
- Enforcement of the act including powers of an occupational safety and health officer
- Registration of workplaces
- Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences
- Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
- Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas
- Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials
- Welfare general provisions including supply of drinking water, washing facilities, and first aid
- Offences, penalties and legal proceedings

Under section 6 of this act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning

which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21).

According to section 44, potential occupiers are required to obtain a registration certificate from the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

In relation to fire safety, section 81 requires necessary precautions for dealing with fire incidents to be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

Measures of Compliance by KenGen

Under the above Act, the management of KenGen will implement the following measures:

- Provision of wholesome drinking water to employees
- Provision of personal protective equipment (PPEs)
- Provision of first aid boxes are available and accessible
- Provision of fire-fighting equipment
- Enhanced fire-fighting skills through trainings and occasional drills
- Registration of work places with DOSHS
- Conducts fire audits for the building

4.1.11 KenGen Environmental Sustainability Policy

KenGen has a corporate environmental sustainability policy statement which states that "KenGen is fully committed to long-term environmentally sustainable development that is consistent with national and international standards in the generation of safe and reliable electric energy in the Eastern Africa region".

To achieve this commitment, KenGen shall:

- Provision of resources to maintain and continually improve its Environmental Management System (EMS) based on the ISO 14001:2015 and its supporting standards.
- Identify risks and opportunities, implement, pollution control measures and mitigate negative environmental impacts, while at the same time enhancing positive environmental activities

resulting from its activities, products and services

- Endeavour to comply with and exceed the requirements of all applicable environmental laws, regulations, permit licenses conditions and other requirements to which the organization subscribes to.
- Establish environmental objectives, targets, continually review environmental and sustainability and management programs
- Strive to enhance the ecosystems through partnership and engagement with its stakeholders including the local community living around KenGen's installations.
- Purpose to train employees on environmental sustainability, significant environmental aspects and responsibilities associated with their jobs.
- Contribute to global sustainable development through mainstreaming of climate change mitigation and adaptation in the business process
- Effectively communicate its environmental sustainability policy and performance to employees and key stakeholders.

Capacity to Implement the Environmental Sustainability Policy

To ensure implementation of the policy, the management has put in place the following measures: The documented policy statement is reviewed on a regular basis. The current version of the policy was reviewed and endorsed by the Managing Director On 18th May 2018.

- Establishing a full-fledged Environment and Sustainable Development Department. The Department is charged with the overall mandate of implementing the policy.
- The company has established a health and safety committee comprising of the safety representatives drawn from the various departments within the organization.
- The written environmental policy statement is conspicuously posted at strategic points in all work areas in order to ensure that all employees and visitors are aware of the policy and their obligations as far as its implementation is concerned.
- The company was certified in 2009 with respect to ISO 14001:2008 and recertified in 2017 with ISO 14001:2015, Environmental Management Systems and thus it has documented an EMS manual comprising of the policy, roles and responsibilities, environmental aspects, procedures and targets and objectives.

4.2 International Laws

Kenya is a signatory to various international guidelines, agreed conventions and treaties that have environment implications/provisions and as such cannot be contravened during project implementation or operational phases. These guidelines, agreements, conventions and treaties and provision which are generally respected in Kenya and some of which Kenya is a signatory include:

- The convention on Trade Endangered species (CITES)
- The United Nations Framework Convention on Climate Change (1992)
- World Health Organization air quality and emission guidelines
- The convention concerning the protection of workers against occupational hazards
- Word Bank Environmental and Social Standards (ESS) and IFC Standards
- World health organization drinking water quality guidelines (1993)

CHAPTER 5

5 ANALYSIS OF PROJECT ALTERNATIVES

5.1 The "No Action" Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. The No Project Option is the least preferred from the socio-economic and partly environmental perspectives since if the project is not done; the positive impacts identified under Chapter 7 of this report will not be realized. The benefits accruing from increased business activities and the employment opportunities to the skilled and semi-skilled locals shall not be realized if the No action alternative is adopted.

Therefore, the "No Action" alternative is not a feasible alternative for this project.

5.2 The Proposed Development Alternative

The impacts and mitigation measures for this alternative are discussed in detail throughout this report. The positive impacts have been identified. This alternative has anticipated positive and negative impacts to the environment, and we have provided mitigation measures for the potential impacts. The alternative is likely to have the greatest positive implications on socio-economic environment of the area and surrounding communities.

The Merits of this alternative are as follows:

- ✓ Employment opportunities during construction and upon commissioning,
- ✓ New business opportunities for suppliers of goods and services,
- ✓ Potential contribution to the housing sector growth in the locality.

5.3 The Relocation Alternative

The proposed site location has been found to be the most appropriate due to existing infrastructure and relatively flat terrain with minimal environmental impacts anticipated. Relocation option to a different site is an option that is not feasible for the project implementation. An alternative site was considered for the proposed development. However, the site's topography was found to be unsuitable for this type of development owing to the rugged terrain and presence of valleys.

5.4 The Comparison of Alternatives

Under the proposed Development Alternative, the project would create more business opportunities while providing livelihood to the locals who will be engaged in the project during the construction and operation phases. Under the "No Action" Alternative, the status quo would

remain, and the project proponent, locals and the Country as a whole would lose anticipated benefits from this development. The proposed development under the current site location is the most appropriate.

CHAPTER 6

6 PUBLIC CONSULTATION AND PARTICIPATION

6.1 General Overview

The need for public consultation and participation when carrying out ESIA report is underscored by the Kenyan Constitution, 2010 and EMCA, 1999. Regulation 7 of the Environmental (Impact Assessment and Audit) Regulations, 2003 requires project proponents to seek the views of the public pertaining to the ESIA study being conducted for projects listed under the second schedule of EMCA, 1999. Public Consultation and participation was undertaken in compliance with EMCA 1999 and Environmental (Impact Assessment & Audit) Regulations, 2003 for the proposed Energy R&D and Corporate Archive Building. This included:

i. Conspicuously display notices informing the affected parties and the local community about the proposed
ii. Hold at least one public meetings with the affected parties and local communities to explain the proposed project
iii. Administer structured questionnaires to relevant stakeholders
iv. Ensure that appropriate notices, inviting the affected parties and local communities, are sent out at least two weeks before the meeting
v. Ensure that a suitably qualified coordinator is appointed to receive and record both oral and written comments during the public meetings.

6.2 Objectives of the Public Consultation and Participation Exercise

The ESIA team conducted the public consultation and participation, with respect to the proposed Energy Research & Development Centre and Corporate Archive Building project, to fulfil the following objectives:

- To inform the potentially affected parties and local communities about the proposed project;
- To disclose the findings of the ESIA study to the potentially affected parties and local communities and
- To provide an opportunity for the potentially affected parties and local communities to provide their oral and/or written views about the proposed project thereby contributing positively to the decision-making process

6.3 Public Consultation and Participation Approach

Public consultation and participation were achieved through stakeholder's identification and mapping, holding public baraza and administering questionnaires. This is as detailed below.

6.3.1 Stakeholder Mapping

The potentially affected parties and local communities were identified through stakeholder mapping process that was conducted during scoping phase of the ESIA reporting. The output of this process was the list of villages and key stakeholders that were to be consulted. The stakeholders identified for the ESIA reporting are shown below;

Table 9: List of Stakeholders Identified for the ESIA study

Stakeholders Identified	
Fisheries Office- Murang'a South Sub-County	Member of county assembly-Kambiti ward
Deputy County Commissioner –Murang'a South	Assistant County Commissioner- Makuyu Division
Sub-County Administrator- Murang'a South Sub-county	Ward Administrator- Kambiti ward
NEMA Office – Murang'a County	Divisional Agricultural Extension Officer
The Chief – Kambiti Location	The Assistant Chief- Kambiti Sub-location
The Assistant Chief- Karia-ini Sub-location	The Assistant Chief-Mihang'o Sub-location
WRA Office- Murang'a South Sub-County	WRUA Chairperson-Kambiti-
Head teacher- Kiambaa Primary school	Head teacher –Merira Primary School
The Principal-St Mary's School- Maragua Ridge	The Principal- Machagara Secondary school
Head teacher- Kambiti primary School	Head teacher Matheng'eta Primary School
Vice Chairman- Kiambaa ACK Church	Vice Chairman- Kambiti Catholic Church
Chair Person-Anglican Development Services	Chair Person-One Acre Fund
Chair Person- Kambiti Business Community	Chair Person - Kambiti Farmers
Chair Person- Kambiti footballers	Chair Person- Kambiti Women Group
Chair Person- Kambiti CBO	Kambiti Community Health workers
Manager- DEKA plantations	Manager- Kenya Biologics- Kambiti branch

6.3.2 Public Baraza

This being a report, one public baraza/Consultative Meeting was held at Kiambaa Primary School on 10th March 2020. Notices and letters inviting the local communities to the public baraza/ consultative meeting were translated to Kiswahili and/or English languages as shown in **appendix 1**. They were then conspicuously displayed at strategic positions and announced in the local churches by the community representatives that were identified by the ESIA team. The minutes and attendance sheet of the public barazas are attached in **appendix 2 and 3** consecutively**.** The

public baraza was chaired by the Assistant Chief, Kambiti location. Photos of the public barazas are shown in the plate below.

Plate 10: Photos of the public baraza held on 10th March 2020 at Kiambaa Primary School

6.3.2.1 Summary of Public Consultation and Participation Results

The summary of comments recorded during the Public Baraza/ Stakeholders' Consultative Meeting is provided below;

Table 10: Comments received during the Public Baraza/ Consultative Meeting

Comments by	Comments/Questions/Issues raised/Clarifications	Responses from KenGen Representatives
Boniface Gitaru (Mirira Primary school)	He appreciated KenGen for the CSR projects delivered at Mirira Primary such renovation of classrooms and Education Scholarship	KenGen will continue providing support to stakeholders in accordance with the laid down procedures.
	Requested clarification on whether the community will be secured jobs.	KenGen in liaison with the Stakeholders Coordination Committee will share out employment opportunities during the construction period.
	Qualification and documentation for the jobs which are likely to be realized during the construction phase of the project	KenGen clarified to the community that the semi-skilled laborer required the Certificate for Great Test, unskilled workers do not need any certificate to be employed except national identification card.
Paul Karanja	KenGen was requested to consider constructing a playground for Kiambaa Primary School	The school was advised to write a proposal on the same and submit to KenGen Headquarters in Nairobi for consideration
Nahason Mutuko	He requested KenGen to consider erecting street-lights along Ndisi Road	The community was advised to consider writing a proposal to KenGen to help the company in assessing the viability of the project
	He further requested the company to help distribution of electricity to the neighborhood	The community was informed that KenGen is not mandated by law to connect power to the consumers. The community was advised to make application to KPLC which is mandated to supply electricity
Nancy Wangui	She requested KenGen to build an ICT Class for Kiambaa Primary School	The Head Teacher for the school responded by telling the parents that they were tasked by the ministry of Education

Comments by	Comments/Questions/Issues raised/Clarifications	Responses from KenGen Representatives
		to come together, build an ICT Class after which the Ministry of Education will furnish the building with the required ICT Equipment and accessories
David Njuguna	He raised complain about flood of their farms	KenGen will consider the matter and find a lasting solution to the problem experienced especially during rainy seasons
	Footbridge in dilapidated state near the intake	KenGen to look into the matter and offer the necessary support towards the renovation of the said foot bridge
Francis Mburu (D/Pricipal Mwachagara Sec. School)	He raised concerns on whether Guidance and Counselling on Communicable diseases such as HIV & Aids prevalence due influx of people during constriction stage will be conducted	A sensitization program, aimed at raising awareness of the local community and contractors' workforce on communicable diseases, will be developed and rolled out. Portable toilets, and or permanent washrooms and provision of condoms will be provided by contractors.
		Parents were advised to always instill discipline into their children to prevent early pregnancies and contracting of diseases

6.3.3 Questionnaire

A number of Questionnaires were administered to the local neighborhood to give their comments/views regarding the proposed Energy Research & Development Centre and Corporate project report. Copies of filled in questionnaires have been appended (**Appendix 2**). A summary of the responses has been analyzed in the table below;

Table 11: Summary of responses from questionnaires administered

Potential positive impacts associated with implementation of the proposed Energy Research & Development Centre and Corporate project
✓ Job creation ✓ Boost to the local economy

- ✓ Improved living standards of the local community
- ✓ Engaging youths hence less idleness
- ✓ Providing attachments and internship opportunity
- ✓ No displacement of the local community
- ✓ Benefits to the local community like CSR
- ✓ Improved security
- ✓ Maintenance of local infrastructure

potential negative environmental and/or social impacts associated with implementation of the proposed Energy Research & Development Centre and Corporate project

Insecurity

- ✓ Cases of insecurity may rise in the area due to the influx of people from different places for different reasons as a result of attraction by the project.

Social conflicts

- ✓ As a result of expected influx of workers, including immigrant workers from other areas, social conflicts may arise especially due to competition for job and business opportunities, conflicting cultures and traditions. This may also raise levels of promiscuity within the area causing erosion of moral/family values thus causing family tensions and possible break up of family units

Environmental pollution

- ✓ As a result of generation of solid waste during construction and operation phase; noise pollution, air pollution and probably water pollution.

Minimizing or avoiding potential environmental and/or social negative impacts associated with the proposed project.

- ✓ **Insecurity:** KenGen will continue to provide necessary security (through contracted firms). It is also expected that the contractors will provide security in their areas of operation.
- ✓ **Social conflicts**: On immoral behaviour, the best thing, however, is for the community members to discuss moral issues candidly amongst themselves in order to avoid detrimental behaviour. And sensitization program, aimed at raising awareness of the local community and contractors' workforce on communicable diseases, will be developed and rolled out. Portable toilets, and or permanent washrooms and provision of condoms will be provided by contractors.
- ✓ **Environmental pollution:** *Solid waste:* will be handled in the most appropriate way by the contractor. All refuse disposal will temporarily be stored in refuse bins before being transported away for proper disposal by waste management firms as is the case with KenGen waste management currently; *noise pollution:* Considering the distance of construction activities from settlement areas, vibration is not expected to have impacts

beyond site boundaries; and all machines that exceed acceptable noise limits will be equipped with silencers or lagging materials or specially designed acoustic enclosures; *air pollution:* The main access roads to the project construction sites have asphalt surfaces. Therefore the production of dust is likely to be small from transportation of materials except on un-surfaced roads within the construction site area where spraying will be implemented regularly to reduce dust and; *sewage and drainage:* All sewage and drainage works will be designed, constructed, equipped, operated and maintained to collect, treat and dispose of sewage from the camps areas and construction facilities in a controlled manner. Sewage disposal shall be through septic tanks, which will be constructed according to the existing national standards to ensure no health or safety risks arise.

- ✓ **Employment of non-locals**: KenGen clarified by telling the community that the semi-skilled labourer and unskilled workers will come from the local community. Consider employing permanent workers from the community.

Any other comments that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Centre and Corporate Building project.

- ✓ Help out the local institution with their development agenda
- ✓ Assist persons living with disability to achieve their dreams
- ✓ Appreciated KenGen for establishing a research and development Centre nearby
- ✓ The project will bring KenGen closer to the people
- ✓ Ensure there is no discrimination during employment
- ✓ Organize seminars to advice the youths
- ✓ Provide one street lighting
- ✓ Provide clean water to the nearby schools
- ✓ Alert the community on when the project start through the area assistant Chief
- ✓ KenGen is advised to give the community tree saplings to plant in their pieces of land to compensate for the few that will be fell to pave way for construction
- ✓ Emphasis on usage of local materials

6.4 Social Acceptance of the Proposed Development

The stakeholders who participated in the ESIA public baraza for the proposed Energy R&D and Corporate Archive Building held on 10th March 2020 at Kiambaa primary school fully accepted the proposed development. The input from the stakeholders have been incorporated in the ESIA report.

CHAPTER 7

7 ANTICIPATED IMPACTS AND MITIGATION MEASURES

7.1 Introduction

This chapter focuses on the anticipated impacts from the construction works of the proposed building infrastructure that will include site preparation, building works, commissioning and occupation. Along the identified impacts, related mitigation measures have also been presented in the subsequent sections.

Impacts to the environment could be positive or negative, direct or indirect, reversible or irreversible. The extent of environmental impact is determined by its significance, adversity, temporary or permanent, long-term or short-term, localised or widespread. Some impact mitigation has already been proactively addressed in the design while others would be undertaken through considered incorporation in the implementation of the project and guided by the Environmental Management Plan (EMP) developed under this report.

7.2 List of anticipated impacts

The impacts listed in the table below are qualified through parameters summarized in the table below:

Table 12: List of Impacts

Key	Type of Impact	Key	Type of Impact
++	major positive impact	+	minor positive impact
--	major negative impact	-	minor negative impact
0	negligible/zero impact	nc	no change
sp	specific/localized	w	widespread
r	reversible	ir	irreversible
sh	short term	L	long term
t	temporary	p	permanent

On the basis of information gathered during the study, the potential environmental impacts identified with respect to the project are tabulated below.

7.3 Analysis of Anticipated Impacts

Table 13: Analysis of Anticipated Impacts

Impacts Description	Construction Phase	Occupation Phase	Decommissioning Phase	Remarks
Changes in land use extent	- ncspir	-/0	-- shspir	Change from open space to building block area. However, there is negligible change to biodiversity as minimal flora and fauna species are affected. Construction could cause a temporary but disruption of lifestyles in the immediate neighborhood, Permanent visual impact possible upon occupation of the building, Value of land could fluctuate (not predicted at this stage).
Soil Erosion	-- spir	++ L	-- spir	Earthworks and delivery trucks during construction could loosen topsoil and hence loss through surface runoff and wind erosion. Less soil will be lost during occupation (storm drains will be lined), Landscaping and vegetation cover will mitigate soil erosion.
Environmental Pollution:	- t r st	- p	- p r sp	During construction works, air, dust and noise pollution could increase slightly as a result of

Impacts Description	Construction Phase	Occupation Phase	Decommissioning Phase	Remarks
air/dust and noise				activities e.g.(earth works, concrete mixers and from increased construction traffic), After commissioning and occupation, emission from traffic is also likely to slightly increase though minimal.
Changes in the existing drainage	--/0	+ p L	--	Increase in paved surfaces would increase storm water flow. Storm water drains will however be installed around the site ensuring controlled discharge and flow from the area.
Sources of water and water quality	-- sh r w	- 0 w	-- r w	Site to rely on water from local boreholes for the construction works, and after commissioning.
Public health and safety	-- t r sp	-- p r w	-- r t	Increased dust, noise and general air pollution levels could impact on public health, particularly in the direct impact zone, Increased traffic around the facility during all phases of the project Effects on occupation to be dependent on the activities in the building.
Disturbance to the public	- t r sp	-/0	-- t r sp	Increased noise and dust during construction, Traffic based emissions and noise could also be source of disturbance, On occupation, noise levels not likely to significantly impact the surrounding community.

Impacts Description	Construction Phase	Occupation Phase	Decommissioning Phase	Remarks
Road safety	- t sp r	+	nc	During construction there will be some danger to the traffic users along main access route to the compound. Road safety can be enhanced by awareness campaigns, introducing deceleration and acceleration lanes into the property, as well as the erection of warning signs. Construction site to be manned to minimize unauthorized access.
Social and visual intrusion	- t/p r	-- p irsp	+ sp r	Social intrusion attributed to workers, operators and clients at the commissioned block of warehouse. Workers to be inducted into local resident/community sensitivities to minimize conflicts.
Workmen's camp	++ sh	++ 0	--	Some benefits are expected from increased business opportunities for retail traders especially food vending kiosks. Solid waste disposal and sanitation problems may arise. Potential spread of diseases through workers engaging in sexual activities .Sensitization of the workforce is essential to minimize such risks.
Income generating opportunities	++ t sh	++ p L	+/- sh	Employment opportunities during construction and upon commissioning,

Impacts Description	Construction Phase	Occupation Phase	Decommissioning Phase	Remarks
				New business opportunities for suppliers of goods and services, Potential contribution to the housing sector growth in the locality.
Construction materials	+/- t sh	0	0	Building materials will only be a problem during construction, otherwise none to be found at site during occupation. All materials must be sourced from bonafide NEMA approved commercial suppliers, and undesirable, hazardous, or otherwise banned materials should not be used.
Construction solid waste materials	-- t sh w	0	-- w L	Demolition/construction waste will be significant, Proper and guided disposal of wastes is necessary.
Clean up on completion	- t sp	0	-- sh t	The contractor should ensure that when works are completed, the site is left clean and tidy. Institute landscaping for restoration of the area.

7.4 Specific Impact and Mitigation Measures

Table 14: Specific Impact and Mitigation Measures

Sources	Potential Impact	Mitigation Measures
Hydrology and Drainage	The site and the surrounding areas were observed to be of moderate gradient, storm water and general surface runoff that may result from hard surfaces around the site has the potential to flow through the plot to the river. The proposed project will not only introduce additional hard surfaces but will occupy part of the remaining open space for absorption of the surface water. With decreasing open spaces, proper planning of site drainage is very important especially during the rain seasons.	Provide appropriate drainage structures within the site for the passage of excess storm water runoff into the main drainage system along the main access road. Sewer lines and drains from the kitchens and washrooms blocks should **NOT** be channeled into the open drains. This waste may be channeled to the septic tank system to ensure proper treatment and discharge with no adverse impact on the environment.
Soil Erosion	No significant soil erosion is anticipated from the activities of the project. However, the construction activities are expected to loosen top soil as a result of the excavations and earth moving activities as well as from the delivery vehicles. The effects are mainly localized.	• Excavations of the site will be confined only within the section where construction is to take place, • Excavated earth will be held away from existing drainage channels around the site and on locations of the site not susceptible to surface runoff of storm water, • The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas, • Re-vegetate exposed areas on the site so as to mitigate further erosion of soil.

Sources	Potential Impact	Mitigation Measures
		• Landscaping will help to mitigate soil erosion even during the post-commissioning phase of the project. In particular, a ring of trees around the compound would greatly minimize sand storms and erosions.
Noise and Vibrations	Noise and vibrations are expected to occur mainly during the construction phase with the major receptors being the immediate residential neighbours and children home residents. Sources of noise would include the earth moving equipment: materials delivery trucks, cranes, concrete mixers, steel bars and wood work activities, as well as noise generated by the work force. Earth moving activities are also likely to cause vibrations to the neighbouring structures. Upon occupation, vehicles accessing the commissioned buildings could also introduce additional noise to the immediate neighbouring developments, though this is envisioned to be minimal.	• Ensure that construction equipment's are maintained at the best operating conditions and avoid unnecessary noise, • Construction activities should ONLY be undertaken during the day (preferable between 7.00am and 6.00pm) when most facilities in the project vicinity are all undertaking their normal activities thus there is no noise nuisances generated above their daily threshold operating level, • Ensure workers are provided with the necessary personal protective equipment including earplugs or earmuffs when operating or working with noisy equipment,
Air Quality	Currently, the site and its surrounding is dominated by residential and offices interspersed with trees and ornamental shrubs as well as grass on open spaces. There will be temporary disruption of this status during the construction through site clearance and excavation activities. Dust (from excavations and earth moving as well as materials	• During construction sprinkle the construction area with water to keep dust levels down. • During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions.

Sources	Potential Impact	Mitigation Measures
	delivery), particulate matter from dry materials (sand, cement, gravel, murram, etc.) and emissions (smoke, hydrocarbons and nitrogenous gases – NO_x among others from machinery exhaust emissions) will be expected to increase slightly. This will, however, be a much localized effect to be felt mainly within the site and its immediate vicinity. It is not anticipated that the average number of vehicles in the area will be much different from the existing traffic flow. Emissions from vehicles accessing the site after commissioning are not likely to have significant effects on air quality at a global scale. However, depending on the number of vehicles, effects of such emissions could have an impact at a localised level.	• Construction trucks delivering soil, sand, and cement or removing soil from the site should be covered to prevent material dust into the surrounding areas. • Personal protective equipment (PPE) that includes dust/organic respirator masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction. • Drivers of construction vehicles must be supervised so that they do not leave vehicles idling, • Enforce a speed limit within the school compound at 10km/h so that dust levels and accidents potential are lowered. • Maintain all machinery and equipment, including the boiler and generators at the Dining Hall, in good working order to ensure minimum emissions including carbon monoxide, NO_X, SO_X and suspended particulate matter; • No burning of any waste materials whatsoever should be permitted within the site both during construction and operation, • Plant new trees within open spaces on the site, as these act as carbon sinks and help to improve the ambient air quality.
Solid Waste	The most appropriate options in waste management are identification of the waste types, segregation into the various categories and establish suitable mechanisms of collection, storage, transfer and final disposal. Ultimate destination for each of	• Construction debris resulting from the project should be disposed-off in a sustainable manner such as reuse in road gravelling, reuse of timber and steel bars, as well as disposal in appropriate waste sites. It is suggested that the contractor

Sources	Potential Impact	Mitigation Measures
	the waste categories should also be known. The following options are proposed for wastes associated with this project through to the occupation period: Different types of solid wastes will be generated during construction as well as on occupation. It is anticipated that effects of these wastes would be felt away from the site, most likely the disposal sites. The construction phase will generate among others, debris, earth, vegetation remains, plastics, steel metal residuals, wrappers and papers. Other solid waste materials will include glass, wood, ceramics and plastics. Upon commissioning, the most common solid wastes will be typical of office refuse including papers, electronic wastes, plastics, glass, wrapping gunny bags from warehouse.	identify suitable disposal areas with the necessary consultations of local camp leaders, • Minimising storage times for raw solid waste and biomass and unloading waste only in the waste reception hall to contain odours, • The Proponent should ensure proper waste disposal
Water Quality	During construction, potential pollutants of water might include oil/grease spills from the machinery, lime, paints and solvents, solid wastes and waste water. On commissioning, the site shall have sufficient sewerage and drainage systems to abate water pollution. Water supply shall be froma local borehole and the centre has a reservoir tank installed to ensure surplus water storage. Below are	• The Contractor should avoid unnecessary wastage of water during construction, • The contractor will make use an existing water supply for water use during construction and operations of the line,

Sources	Potential Impact	Mitigation Measures
	some of the recommendations to ensure water quantity and quality are protected:	
Flora and Fauna	The area is fully urban and no animals are found apart from some species of velvet monkeys, birds and insects. Notable presence of plants including trees (*Terminalia brownii*, *Siena siamea* and a few indigenous species), ornamental shrubs and grass are found at the site and will most likely to be destroyed during the construction. The plants provide a buffer from winds, trap for dust, shade and micro-weather moderation, ambient air purification, as well as a habitat for certain species of birds and insects. In addition, the plants also help in checking flooding during rains periods through evapo-transpiration process.	The most viable option for the impacts associated with loss of vegetation is replanting trees, shrubs and grass after completion of the construction. This would be part of the landscaping and premises beatification activities. It is highly recommended that the site layout considers the avoidance of cutting down of mature trees on the site as much as is practically possible.
Public Intrusion, Disturbance and Security	This is a social impact involving loss of privacy in sections of the neighbouring premises and residents of already existing houses. During the construction, intrusion would be attributed to the construction workers, some of who would be tempted to either physically venture into the neighbouring compounds or engage with the employees in other premises. This has the potential to affect the privacy of neighbouring properties. Other effects would be from dust and noise generation during construction as discussed earlier in the report. Upon commissioning of the building, social intrusion	• Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to improve visual impact and to re-introduce visual barriers that enhance privacy. • The site should be fenced during construction to ensure construction workers are isolated from the neighboring premises and also to minimize intrusion and loss of privacy, • During construction the Contractor should enhance security by vetting the construction workers and avoid excessive numbers of employment seekers directly approaching the site,

Sources	Potential Impact	Mitigation Measures
	would cease to be a significant impact in view of the fact that the proposed land use and nature of the project is consistent with the existing surroundings.	• The buildings should be designed such as to blend in well with the surrounding environment and with minimum reflective surfaces, • Construction should only be undertaken during the day to ensure minimum disruption of the neighbours' comfort.
Public Health, Safety and Awareness	The construction phase has the most significant safety impacts that ranges from accidents related to construction vehicles and trucks, residents falling into the construction sites, falling objects and occupational dangers to the construction workers. Dust, emissions and noise are notable health hazard to the neighbours as well as the construction workers. There is tendency of informal food vendors selling food to construction workers at the work sites and this has a potential health implication to the workers. Construction workers are normally drawn away from the construction site. They are, therefore, likely to interact with the residents whose lifestyles are different, creating grounds for social problems including insecurity, immorality, conflicts, to mention a few.	• The contractor should provide a small section of the construction site complete with a shed and a water stand pipe where the food vendors can serve the construction workers to promote hygiene and health of the employees, • Workers should be provided with suitable personal protective equipment's (such as nose masks, ear plugs/muffs, helmets, overalls, safety boots, etc.) and ensure they are used at all times while at their place of work. A fully equipped first aid kit should also be provided at site, • The contractor must have Workmen's Compensation cover as required by law (The Workmen's Compensation Act), as well as other relevant Ordinances, Regulations and Union Agreements, • The contractor should ensure there is a temporary toilet/pit latrine and a stand pipe for water on site for use by the construction workforce, • The workers, immediate neighbors and other stakeholders will be sensitized of the dangers and risks associated with construction works for enhanced self-responsibility on personal safety at all times during the construction.

Sources	Potential Impact	Mitigation Measures
		Appropriate signage could be posted at strategic locations around the construction site to convey such information, • The compound should be equipped with safety facilities provided including; firefighting equipment, fire exits, adequate access and disabled access features, safety signage placed strategically around and within the building.
Social Impact Assessment	It has been mentioned earlier in the report that the site area is basically urban with a mixed land use with residential use featuring prominently. In keeping with the Environmental (Impact Assessment and Audit) Regulations (2003) and the Environmental Management and Co-ordination Act (1999), the views of all stakeholders have been taken into account and included as part of the assessment report. Three approaches were used for the public consultation; • Informal interviews with members of the immediate community, • Questionnaires issued to members of the interested and affected stakeholders, • A public baraza moderated by local administration at Kiambaa primary school	In view of the comments received from the residents and other interviewees, the following recommendations should be incorporated in the project design, construction and occupation: • The contractor should communicate (through signage) the commencement and construction plan through erection of a board. • Upon commencement of construction, work will only be undertaken during the day from 7.00am to 6.00pm to avoid disturbance of the residents and to ensure security and safety of the workers, • The contractor will be required to sensitize the workers including drivers of trucks and delivery vehicles on certain work ethics particularly those including taking the safety interests of the area residents and those on transit, • To enhance security, the contractor will provide adequate security personnel, lighting and initiate a collaborative mechanism on the security with the existing structures in the area,

Sources	Potential Impact	Mitigation Measures
		• The construction site should be fenced off to prevent unauthorized access and enhance safety (particularly of children), as well as to ensure the site does not become a security threat especially at night, • The project implementation should be required to adhere to the proposed timeframe in order to ensure there is no extended inconvenience to the residents and the service providers in general, • The project design should incorporate appropriate safety and security features.

CHAPTER 8

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Overview

An Environmental Management and Monitoring Plan outline has been developed to ensure sustainability of the project from construction through to decommissioning. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitor-able indicators. Implementation timeframes and responsibilities are also defined. It is recommended that a detailed decommissioning audit be undertaken at the appropriate time.

The responsibility for the integration of the mitigation measures for the proposed development lies with the contractor during the construction stage while the proponent takes over the duty upon commissioning of the project.

At every stage, the objective would be to ensure that the specified mitigation measures are implemented. The table overleaf summarizes the EMP for the proposed project. It describes parameters that should be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action. Among the key components of the EMP include:

8.2 Construction

i. Safety (road safety, accidental falls within the construction site, material delivery trucks, security, workers safety, etc.),
ii. Physical environmental degradation (solid debris management, stream siltation, vegetation removal, workers hygiene, drainage, etc.).
iii. Public amenities (water and power supply, access roads and communication),
iv. Disturbance of the residents (intrusion, noise/vibrations, operation hours, etc.),
v. Health (dusts and emissions, waste disposal, social interactions),

8.3 Operations and Maintenance

i. Safety (security of the residents, fire accidents, acts of criminal/sabotage, intrusion by outsiders into the area, etc.),
ii. Sanitation and hygiene (water supply, waste management mechanisms, drainage, awareness, infrastructure, etc.)
iii. Public amenities (water and power supply, sanitation systems, communication network and parking),

iv. Social issues (mainly intrusion to privacy, social interaction, conflict of interest with the neighbors),

8.4 Decommissioning

The proponent shall prepare and submit to NEMA a decommissioning plan for approval at least three months prior to decommissioning of the building.

Table 15: Environmental Management and Monitoring Plan Matrix

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
i) Construction Phase					
Changes in hydrology and drainage	Soil erosion Siltation in nearby water bodies	Direct storm water and surface runoff into the appropriate storm drainage channels away from the site,	Site Engineer & Foreman	Install drainage channels on commencement of the works	Internal cost
		Install screens on drainage structures to prevent siltation of the drainage channels ✓ Control the earthworks and contain excavated soils on site, ✓ Soil removal process not to deposit residuals in the drains, ✓ Efficiency of erosion control measures, ✓ Landscaping to create contours towards the drainage systems,	Supervising Foreman and Contractor	Regular monitoring through construction period	Internal cost
Community Engagement	Lack of peaceful coexistence with the community	✓ Develop a grievance mechanism which should outline how the Proponent will address any complaints or grievances raised by the communities. ✓ All communication with the community should be documented, ✓ Develop an environmental and social responsibility programme	KenGen	Inspection, records, reports	Internal cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
Air Pollution (dust, emissions and particulate matter)	• Public nuisance • Negative health effects • Soiling of property	✓ Maintain construction machinery in working order at all times, ✓ Control speed of construction vehicles around the site, ✓ Keep the loose soils and dry materials at the construction site moist at all times, ✓ Delivery vehicles with dry materials be covered, ✓ Sensitise construction workers on aerial emissions.	Supervising Foreman and Contractor	Continuous throughout the construction phase	
Noise pollution	• Hearing impairment • Public nuisance • Physical and psychological stress • Reduced productivity • Interference with communication • Disruption of animal behaviours • Contribution to accidents and injuries by making it difficult for the workers to hear warning signals.	✓ Sensitise the workforce and truck drivers on equipment maintenance, ✓ Supervise construction traffic, ✓ Maintain plant and equipment, ✓ Undertake construction only during the daytime for peace of the neighbours, ✓ Workers to wear ear plugs/muffs as part of the personal protective gear.	Supervising Foreman and Contractor	Continuously Spot checks of noise levels every month	Maintenance: internal cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
Water Pollution (Oil spills, silt, leachate from solid wastes, suspended matter, infiltration into water supply pipes, sewage discharge, etc.)	• Loss of biodiversity in the nearby water bodies • Increased turbidity in the water sources	✓ Proper storage, handling and disposal of oil and oil wastes from machinery, ✓ Discourage servicing of machinery and vehicles on site	Supervising Foreman and Contractor	Continuous through the construction period	No cost estimates
Waste Management, Sanitation and Hygiene	• Contamination of soil • Contamination of water resources • Aesthetic degradation	✓ Special attention on the site sanitary facilities, ✓ Construction concrete debris be disposed-off safely preferably re-used on road graveling, ✓ Earth excavate be dumped on pre-identified and approved land fill sites, ✓ Other inert materials (wood, steel bars, nails, papers, glass, etc. be recycled off site OR dumped in dumping sites approved by the County government, ✓ Plan materials (logs and branches) may be used offsite for building or firewood	Contractor, Supervising Foreman	Appropriate waste management expected throughout the construction phase	Internal Cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
		while leaves and lesser be dumped in approved dumping sites, ✓ Provide segregated waste holding units on every floor as temporary storage bins,			
Health and Safety	• Injuries to workers or visitors • Penalties as a result of non-compliance • Adverse health impacts	✓ Provide appropriate sanitation facilities for the construction workers, ✓ The construction site shall not hold stagnant water at any given time (mosquitoes could breed), ✓ Provide and enforce application of personal protective equipment, ✓ Maintain a first aid box on site for the workers, ✓ Provide adequate security personnel and collaborate with existing arrangement around the site, ✓ Consult the neighbourhood on regular basis for enhanced safety and security issues.	Contractor, Supervising Foreman	Observance will be an all-time requirement	Internal Cost
Vegetation	• Loss of ecosystem services	✓ Remove only the plants standing on the way of the construction	Contractor	To be accomplished within the	Internal cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
	• Increased soil erosion and sedimentation	✓ Replant open spaces with appropriate trees and shrubs after landscaping.		commissioning period	
Road Safety	• Accidents • Deaths • Loss of property	✓ Enforce speed limits for construction vehicles during construction to 10Km/h, ✓ Streamline traffic flow into and out of the premises, ✓ Initiate changes in traffic flow in the micro-area upon commissioning, ✓ Install appropriate cautionary signage for motorists entering the premises.	The Architect, Contractor and the Care Taker	Initiate action upon commissioning of works and a transition onto operation of the building	Internal cost
ii) Operation Phase					
Changes in hydrology and drainage	Soil erosion Siltation in nearby water bodies	✓ Maintain drains free of solid matter or oil residuals, ✓ Install cascades to break the impact of storm water flow in the drains, ✓ Minimise hard surfaces around the premises, ✓ Sewage and foul water from the building shall NOT enter into the drainage system	Engineer in Charge	Daily inspection of drains	Internal cost
Air Pollution (dust, emissions and	• Public nuisance • Negative health effects • Soiling of property	✓ No burning materials (plastics, papers or fabrics) on site,	KenGen	Continuous	No cost estimates

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
particulate matter)		✓ No (emitting) operations other than office use in the building.			
Noise pollution	• Hearing impairment • Public nuisance • Physical and psychological stress • Reduced productivity • Interference with communication • Disruption of animal behaviours • Contribution to accidents and injuries by making it difficult for the workers to hear warning signals.	✓ No workshops and noise intensive activities shall be operated at the site	KenGen	Continuous	Internal cost
Water Pollution (Oil spills, silt, leachate from solid wastes, suspended matter, infiltration into	• Loss of biodiversity in the nearby water bodies • Increased turbidity in the water sources	✓ Avoid unnecessary wastage and spillage of water, ✓ Sewer pipes not to discharge into drainage systems, ✓ Solid waste holding bin be connected to the sewer lines.	Engineer in Charge	Continuous monitoring	Internal Cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
water supply pipes, sewage discharge, etc.)					
Waste Management, Sanitation and Hygiene	• Contamination of soil • Contamination of water resources • Aesthetic degradation	✓ Solid waste holding bins (segregated into different compartments), ✓ Obtain NEMA licensing for an Incinerator for disposal of various waste types generated onsite , ✓ Carry out an annual waste audit to determine quantities and characterization of wastes and hence mode of disposal, ✓ Identify hazardous medical wastes for specialized disposal.	Service Providers & & KenGen	Facilities and mechanisms to be in place upon commissioning	Internal cost
Health and Safety	• Injuries to workers or visitors • Penalties as a result of non-compliance • Adverse health impacts	✓ Train the security personnel and other staff under the Care Taker on safety matters (fire safety included), ✓ Extend safety awareness to all centre users ✓ Provide a first aid box on in all the centre and ensure at least two first aiders with valid certificates are always onsite and aware of the kits location and use,	Service Provider and KenGen	Required all time Annual health and safety would be necessary	Internal cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
		✓ Comply with all requirements on buildings as outlined under the Public Health Acts as well the Local Government Acts, ✓ Install visible and readable signage on safety throughout the premises for enhanced safety awareness,			
Road Safety	• Accidents • Deaths • Loss of property	✓ Streamline traffic flow into and out of the premises, ✓ Initiate changes in traffic flow in the micro-area upon commissioning, ✓ Install appropriate cautionary signage for motorists entering the premises.	Contractor and KenGen	Initiate action upon commissioning of works and a transition onto operation of the building	Internal cost
Vegetation	• Loss of ecosystem services • Increased soil erosion and sedimentation	✓ Remove only the plants standing on the way of the construction ✓ Replant open spaces with appropriate trees and shrubs after landscaping.	Contractor	To be accomplished within the commissioning period	Internal cost
iii) Decommissioning Phase					
Changes in hydrology and drainage	Soil erosion Siltation in nearby water bodies	✓ Indicate intentions to decommission on years in advance, ✓ Undertake a decommissioning audit at least six months before decommissioning process begins.	KenGen	Building designed for a lifespan of >30 years.	Internal cost Internal cost

Environmental &/or Social Aspect	Potential Impacts	Mitigation Measures	Responsibility	Monitoring Frequency	Estimate Cost (Ksh)
Air Pollution (dust, emissions and particulate matter)	• Public nuisance • Negative health effects • Soiling of property	✓ As per the decommissioning report	KenGen	> 30 years	No cost estimates
Noise pollution	• Hearing impairment • Public nuisance • Physical and psychological stress • Reduced productivity • Interference with communication • Disruption of animal behaviours • Contribution to accidents and injuries by making it difficult for the workers to hear warning signals.	✓ As per the decommissioning report	Contractor & KenGen	> 30 years	Internal Cost
Waste Management, Sanitation and Hygiene	• Contamination of soil • Contamination of water resources • Aesthetic degradation	Ensure safe disposal of the waste generated during the decommissioning process	Contractor & KenGen	> 50 years	Internal cost

CHAPTER 9

9 CONCLUSIONS AND RECOMMENDATIONS

KenGen generates a large number of records and documents therefore the company wishes to build an ultra-modern Energy Research & Development Centre and Corporate Archive in Tana Station. KenGen R&D Centre has been conceived to be the most advanced research and development facility devoted for enhancement of innovation and energy development. The objective of the facility is to create a good environment for leading scientists & engineers in company to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services.

This ESIA report has been prepared in compliance to EMCA 1999 and Environmental (Impact Assessment and Audit Regulations, 2003. The findings of the ESIA report indicate that the proposed project has the potential of generating positive and negative impacts. The positive impacts include: Job creation, Boost to the local economy, Improved living standards of the local community, Engaging youths hence less idleness, Providing attachments and internship opportunity, zero displacement of the local community, Benefits to the local community like CSR, Improved security and Maintenance of local infrastructure. The potential negative impacts will be associated with vegetation clearing, handling of hazardous materials, waste management, and influx of workers to the proposed project site, insecurity, and dust emissions. The potential impacts will include; contamination of soil and surface water, spread of communicable diseases, soil erosion, loss of animal habitat, adverse health of workers, public nuisance, and climate change.

All the potential positive impacts will be enhanced while negative impacts will be adequately mitigated. Thus the project should be considered for approval by NEMA. The project proponent has committed to implement the Environmental and Social Management Plan (ESMP) during the construction, operation and decommissioning phases of the proposed project, in order to promote environmentally sustainable development. The ESMP will form part of the selected contractor's obligation as shall be specified under the contract for construction and commissioning pf the proposed Energy Research and Development Centre and Corporate Archive Building project.

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APPENDIX I: PRACTICING LICENSES FOR THE EXPERTS

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/11883

Application Reference No: NEMA/EIA/EL/15979

M/S **Cornelius Ndetei**
(individual or firm) of address

P.O. Box 47936-00100, Nairobi

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **2237**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/19/2020** Expiry Date: **12/31/2020**

Signature…..

(Seal)
Director General
The National Environment Management Authority

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/12391

Application Reference No: NEMA/EIA/EL/16547

M/S **Hussein Ali Somow**
(individual or firm) of address

P.O. Box 104286-00101, Nairobi

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **2493**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/11/2020** Expiry Date: **12/31/2020**

Signature…..

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/12162

Application Reference No: NEMA/EIA/EL/16299

M/S **DOMITILA WANJIKU WAITITU**
(individual or firm) of address

P.O. Box 38152-00100, Nairobi

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capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Associate Expert**
registration number **8947**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/25/2020**

Expiry Date: **12/31/2020**

Signature.....

(Seal)
Director General
The National Environment Management Authority

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/12312

Application Reference No: NEMA/EIA/EL/16000

M/S **Rang'ang'ah A. Rolex**
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in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/10/2020**

Expiry Date: **12/31/2020**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

APPENDIX 2: PUBLIC NOTICE

KenGen

PUBLIC NOTICE

PUBLIC BARAZA FOR ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED UPPER TANA RESEARCH $ DEVELOPMENT AND CORPORATE ARCHIVE

KenGen is currently undertaking Environmental and Social Impact Assessment (ESIA) Study for the **proposed Upper Tana Research & Development and Corporate Archive**. The purpose of this notice is to invite you to a public baraza detailed below.

Venue: Kiambaa Primary school

Day: Tuesday

Date: 10th March, 2020

Time: 10:00am

The aim of the public baraza is to disclose information about the proposed projects and to discuss mitigation measures for the potential environmental & social impacts.

Courtesy of:
KENGEN PLC

APPENDIX 3: MINUTES OF PUBLIC CONSULTATIVE MEETING

THE MINUTES OF PUBLIC PARTICIPATION ON ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVES BUILDING MURANG'A SOUTH SUB COUNTY, MURANG'A COUNTY (KAMBITI LOCATION) HELD AT KIAMBAA PRIMARY SCHOOL 10TH MARCH, 2020 AT 1030HRS

Attendance sheet attached

AGENDA:

1. Preliminaries
2. Presentation by KenGen PLC
3. Plenary Session
4. Resolution
5. A.O.B

<table>
<tr><th>Min.</th><th>Agenda</th><th>Discussions/ Issues/ Resolutions</th></tr>
<tr><td>1.</td><td>Preliminaries</td><td>The meeting was called to order by the local area Assistant Chief at 1030hrs followed by opening prayers from Stephen Musyoka Vundi. The local area Assistant Chief welcomed all present where he appreciated everyone for their time and thanked those in attendance. Self-introduction by the local administration and the KenGen team to the stakeholders. A representative from KenGen was invited to give a brief overview of the proposed project and the purpose of the public baraza/consultative meeting.</td></tr>
<tr><td>2.</td><td>Presentation by KenGen</td><td>The ESIA team led by the lead expert, Hussein Ali Somow informed the public that KenGen has proposed to build R & D Centre & Corporate Archive Building within Tana Power Station. He explained to the meeting that the Environmental Management and Coordination Act, 1999 (EMCA), requires that Environmental and Social Impact Assessment (ESIA) must be undertaken for the proposed project likely to have impacts on the environment. The report is then submitted to National Environment Authority (NEMA) for review and decision making. Therefore, public participation and consultation is an integral process in the exercise to get views and concerns from the general public.
The proposed R & D Centre & Corporate Archive Building will create a conducive environment for scientists & engineers in KenGen to offer their expertise and innovative ideas for development, testing and prototyping leading to commercialization of products and services. He further presented the potential impacts and mitigation measures as follows:
<table>
<tr><th>Nature of Impacts</th><th>Description</th><th>Mitigation</th></tr>
<tr><td>Positive impacts</td><td>i. Employment & economic opportunities to the local community</td><td></td></tr>
</table>
</td></tr>
</table>

			ii. KenGen corporate social responsibility benefits iii. Improved infrastructure such as road networks iv. Enhanced eco-tourism v. Skills transfer to the local communities vi. Improved living standards of the local community vii. Improved security viii. No displacement of the local community	
		Negative impacts	i. Air pollution due dust emissions from vehicle movements and construction works	Speed limits will be enforced and regular watering of pathways
			ii. Noise pollution	Considering the distance of construction activities from settlement areas, vibration is not expected to have impacts beyond site boundaries; and all machines that exceed acceptable noise limits will be equipped with silencers or lagging materials or specially designed acoustic enclosures
			iii. Solid waste	All generated solid waste will be disposed appropriately. Reduce, reuse, recycle system to be used and waste segregation
			iv. Clearing of vegetation and trees	Minimal vegetation and trees clearing and rehabilitation of disturbed sites/areas with indigenous species
			v. Health and safety	KenGen will ensure safety of residents, workers and visitors in line with OSHA 2007.

			vi. Insecurity	KenGen will provide necessary security (through contracted firms). It is also expected that the contractors will provide security in their areas of operation.
			vii. Social conflicts	Sensitization program, aimed at raising awareness of the local community and contractors' workforce on communicable diseases
3.	CSR Support	Members of the community were informed that KenGen had done many good things for them, including; i. Scholarships – KenGen offers four (4) scholarship slots annually; 2 for secondary level and 2 for university level. ii. Projects - Construction of classrooms at Kiambaa Primary School iii. Renovation of classrooms at Mirira Primary School iv. Casual jobs- These are also given to them 100%		
4.	Plenary session	Name of stakeholder	Question/comment/ clarification	Response from ESIA team
		i. Boniface Gitaru (Mirira Primary school)	• He appreciated KenGen for the CSR projects had delivered at Mirira Primary such renovation of classrooms and Education Scholarship • Requested clarification on whether the community will be secured jobs. • Qualification and documentation for the jobs which are likely to be realized during the construction phase of the project	• KenGen will continue providing support to stakeholders in accordance with the laid down procedures. • KenGen in liaison with the Stakeholders Co-ordination Committee will share out employment opportunities during the construction period. • KenGen clarified by telling the community that the semi-skilled labourer required the Certificate for Grade Test, unskilled workers do not need any certificate to be employed except national identification card.
		ii. Paul Karanja	• KenGen was requested to consider constructing a playground for Kiambaa Primary School	• The school was advised to write a proposal on the same and submit to KenGen Headquarters in Nairobi for consideration

		iii. Nahason Mutuko	• He requested KenGen to consider erecting street-lights along Ndisi Road • He further requested the company to help distribution of electricity to the neighbourhood	• The community was advised to consider writing a proposal to KenGen to help the company in assessing the viability of the project • The community was informed that KenGen is not mandated by law to connect power to the consumers. The community was advised to make application to KPLC which is mandated to supply electricity
		iv. Nancy Wangui	• She requested KenGen to build an ICT Class for Kiambaa Primary School	• The Head Teacher for the school responded by telling the parents that they were tasked by the ministry of Education to come together, build an ICT Class after which the Ministry of Education will furnish the building with the required ICT Equipment and accessories
		v. David Njuguna	• He raised a complain about flooding of their farms from the canal • Footbridge in a dilapidated state near the intake • The road at the headpond is damaged and KenGen has also been using the road	• KenGen will consider the matter and find a lasting solution to the problem experienced especially during rainy seasons • KenGen to look into the matter and offer the necessary support towards the renovation of the said foot bridge and the road to the head pond
		vi. Francis Mburu (D/Pricipal Mwachagara Sec. School)	• He raised concerns on whether Guidance and Counselling on Communicable diseases such as HIV & Aids prevalence due to influx of people during constriction stage will be conducted	• A sensitization program, aimed at raising awareness of the local community and contractors' workforce on communicable diseases, will be developed and rolled out. Portable toilets, and or permanent washrooms and provision of condoms will be provided by contractors. • Parents were advised to always instill discipline into their children to prevent early pregnancies and contracting of

				diseases
5.	**Resolution**	The community fully agreed to support the project but asked KenGen to continue doing more CSR projects for the community.		
6.	**Adjournment**	There being no AOB, the local area Assistant Chief thanked all the participants for their contributions and asked KenGen to take the views and concerns of residents seriously. The meeting ended at 1200hrs with a word of prayer from Josephine W. Mambo.		
Adoption		Chairperson FRANCIS W. MUKUMBWA....Sign..... Date 24/03/2020..... KenGen Rep...ELIJAH KIRATH ASSISTANT MANAGER....Sign..... Date....24/3/2020.....UPPER TANA POWER STATIONS		

APPENDIX 4: ATTENDANCE SHEET FOR PUBLIC CONSULTATIVE MEETING

KenGen	Project Title	Environmental & Social Impact Assessment for the Proposed Energy Research & Development Centre and Corporate Archive Building at Tana Power Station, Murang'a South Sub-County, Murang'a County		
	Subject	Public Baraza on ESIA for the Energy Research & Development and Corporate Archive		
	Date	10th March, 2020.	Time	10:30 A.M.
	Venue	Kiambaa Primary School		

ATTENDANCE SHEET

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
1.	PETER .N. MAINA	24304775	0721159220	ASS CHIEF KARIANI	
2.	JAMES MUCHUNU	9346167	0726914277	ELDER KIAMBAA	
3.	FRANCIS W. MUKUMBWA	13460597	0727062501	ACTING ASS CHIEF. KAMBITI	
4.	MORRIS MWANGI	26404721	0712570748	One Acre Fund	
5.	MBURU F KARIUKI	9947563	0723854500	PRINCIPAL MUCHAGARA SEC.	
6.	AGNES MUTONO		0723486870	KIAMBA	
7.	PATRICK SILA KITHEKA	3505807	0722970929	KAMBITI	
8.	STEPHEN MUSYOKA VUNDI	0583260	0701 746529	KAMBITI	
9.	JOSPHINE W. MAMBO	6695415	0727624188	KAMBITI	

PUBLIC CONSULTATIONS-ESIA FOR TANA R&D CENTRE AND CORPORATE ARCHIVE

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
10.	BONIFACE GITAU MWANGI	12992348	0721201134	HEADTEACHER MIRIRA PRY	
11.	BETH WANJIRU KINENE	9384485	0724317111	HEADTEACHER KIAMBAA	
12.	JOHN CHEGE KIRAKA	10787788	0725121680	KIAMBAA VILLAGE	
13.	BENSON MAINA NGUGI	22023387	0721867526	Business Community	
14.	MOSES KAMAU MWANGI	22052675	0720380266	GAKINDU	
15.	JOSEPH KIRUGA MWANGI	13651402	0700112184	KIAMBAA	
16.	DANIEL KUNGU MUINDI	33890754	0703566132	muthanga farm	
17.	LUCY WAMBUI NGANGA	22446087	0756656346	GAKINDU	
18.	ALICE NYAMBURA WAMBUA	9231376	0714549336	KIAMBAA	
19.	Viringira munyiva kungu	29600724	0718805733	KIAMBAA	
20.	HANNA Wangari	36007061	0743995770	KIAMBAA	
21.	NDIU NAKA MUSKILI	22264721	0720247124	KIAMBAA	
22.	JOEL MAINA GATHUMA	25888[illegible]	0712[illegible]	MUCHAGARA	
23.	DAVID NJUGUNA MWANGI	22460572	0726 777345	GAKINDU	
24.					

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
25.	Erick Mwangi	11067045	0743418279	Gakindu	
26.	Duncan Ndegwa	36672548	0745434479	Kiambaa	
27.	Paul Kimani	23657249	0760228368	Kiambaa	
28.	Pauline Wanjiku	34022686	0701128902	KIAMBAA	
29.	Esther Nyagi	26276606	0726734229	Kiambaa	
30.	Nancy Wangui	25276821	0710 534331	Kiambaa	
31.	Kesther Njoki	12665212	0705509937	Kiambaa	
32.	Catherine Muthoni	28846712	0722921618	Muchatha	
33.	Beatrice Wanjiru	29431865	0757 380 965	Kiambaa	
34.	Alice Waithera	32248087	0714 704 674	Kiambaa	
35.	Monicah Wairimu	13278747	0716364266	KIAMBAA	
36.	Josphine Njoki	29466683	0795539403	Gakindu	
37.	Samson Chigubo	9274721	0717891839	Kiambaa	
38.	Josphat Njoroge M	25874256	0712 988 653	GITHINGU	

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
39.	JOYCE WANJIRU	29810703	0716313414	Gakindu	
40.	Hellen Wangari	34DA7337	0759430180	Gakindu	
41.	Pauline Nyambura	3258700	0742294716	Kiambaa	
42.	Paul Karanja Kimemia	14400670	0728267879	Kiambaa	
43.	Winnie Dorothy Wanjiru	24550489	0729671927	Kiambaa	
44.	STEPHEN KANG'ETHE MUHUGA	10932822	0720081128	Kiambaa	
45.	DAVID MUIDURI	28301620	0724857607	Kiamboa	
46.	Joseph maina	"	0714543834	Kiambaa	
47.	Esther syombua	27784827	0717 433 956	Kiambaa	
48.	MARGARET WANJAU	24398474	0728956487	Kiambaa	
49.	IRENE MUTHONI	27078542	0727337779	Kiambaa	
50.	JANE NJERI	25201738	0721651884	Kiambaa	
51.	GRACE MUTHONI	94485738	0794 238 010	Kiambaa	
52.	Judy Wanjiru	32587535	0790256859	Kiambaa	
53.	Rosemary Muthoni	24338854	0712248824	Kiambaa	

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
54.	Rolex A. Kangiwangeh	28335798	0725540589	RO	[signature]
55.	DOMITILA K. NJAITITU	28093414	0723739827	KENGEN ENG II, ENV.	[signature]
56.	JOHN ONINDO	14666617	0712131874	KENGEN-SPE	[signature]
57.	ELIJAH KIBATHI	6414898	0722661297	KenGen Am. UT	[signature]
58.	PENINAH MBUTHI	10496172	0716516238	Kenken-Cho	[signature]
59.	HUSSEIN ALI SOMOW	22408574	0721514071	KenGen	[signature]
60.	PETER M. MASUNI	4591859	0727005940	Kengen	[signature]
61.	John Ngari Thiga	0	0719878781	KenGen	[signature]
62.	Lincoln Mwore Mwa	23620889	0720889207	Kenhen	[signature]
63.					
64.					
65.					
66.					
67.					

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
68.	Hannah Njoroge	3576772	0721440954	Kiambaa	
69.	Nancy Njeri	13272349	0743908374	Kiambaa	
70.	Agnes Athenya				
71.	Jane wathira	+			
72.	Jane Muthoni	13277884	0703944926	Mirira	
73.	Lucy Njeri	5920743	0713541807	Mirira	
74.	Virginia Wanja	3404627	0796655078	Mirira	
75.	Margaret Njeri		0718725118	Mirira	
76.	Margaret Wamaitha	38462145	0799203682	Kiambaa	
77.	Nancy Wanja	38462115	0746041627	Kiambaa	
78.	MOREEN ANYANGU	32418225	0701695646	KWAMUTAHA	
79.	Eunice Njoki	32247436	0791849192	Mirira	
80.	Nahashon Mutuku Mutiso	9551436	0715088742	Kitune	
81.	Beth Wambui Wanyaga	11622196	0720059836	Kiambaa	
82.					

PUBLIC CONSULTATIONS-ESIA FOR TANA R&D CENTRE AND CORPORATE ARCHIVE

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
83.	AGNES KABAIA MWANGI	29995596	0705 328 627	Gakindu	
84.	MARY NTAMBURA MUTUKU	33984080	07 10 11 63 71	Gakindu	
85.	John mwangi KAMAU	27385797	0759206800	GAKindu	
86.	BEATRICE WAITHERERO	21311861	0713564994	Kiambaa	
87.	TERESIAH KAMAU		0791986667	GAKindu	
88.	Margaret Mudeva	34559618	0705052158	Gakindu	
89.	Lucy Kamau	9589167	0707921024	Gakindu	
90.	Teresiah Wangira Mwangi	25419678	0716570186	Kiambaa	
91.	Jacinta Nkeri	25743227	0796598813	Kiambaa	
92.	Hannah wangeci maina	9587489	0710985974	Kiambaa	
93.	DENIS maina kimani	23636639	0726650315	Muthanga Farm	
94.	Vincent kagume	34922778	0794609351	Kiambaa	
95.	zakayo MUTUKU		0728070952	Kiambaa	
96.	Agnes mutio	21864964	0703537215	Kiambaa	

PUBLIC CONSULTATIONS-ESIA FOR TANA R&D CENTRE AND CORPORATE ARCHIVE

No.	NAME	ID NO	MOBILE NO	DESIGNATION OR VILLAGE	SIGNATURE
97.	BEATRICE MUTHUKU	29595936	0701082739	Kiambaa	
98.	Mary Muthoni	11777108	0799133645	Kiamba	
99.	Mukal Aberi	25695278	0719578372	Kiamba	
100.	Jane NJERI	26438338	0723053141	Kiambaa	
101.	UNIUCE Wairimu	—	—	Kiambaa	
102.	Agnes Wanjiru	— — —	0724647740	Gakindu	
103.	Jecinta Njoki	29936615	0729432353	Gakindu	
104.	Gladys Wanjiru	— — —	— — —	Gakindu	
105.					
106.					
107.					
108.					
109.					
110.					

APPENDIX 5: QUESTIONNAIRES

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

Kenya Electricity Generating Public Limited Company (KenGen PLC) proposes to build a four-storey Energy Research & Development Center and Corporate Archive building with an area of 4,618 square meters. The project will be implemented at Tana Power Station, Kambiti location in Murang'a County (GPS Coordinates 0° 47'2'' S, 37° 15'36'' E).

In compliance to the requirements of section 58 of the Environmental Management and Coordination Act (EMCA), 1999 (Cap. 387) KenGen is carrying out an Environmental and Social Impact Assessment (ESIA) for a four-storey Energy Research & Development Center and Corporate Archive building. Stakeholders' consultation is an integral part of ESIA process; therefore we are seeking for your comments/views on the proposed project.

Name: PETER N. NJAMA **I.D No.** 24304775

Organization: MINISTRY OF INTERIOR **Mobile No:** 0721159220

Area of Residence: KAMBITI

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

→ Job creation to local people
→ Development to the surrounding area
→

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

- Insecurity
-

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

- Increase More Patrol and Security Personnels - Guiding and Coaching to the Local

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

To help the Local Institutions with Their development
To help the PWSD to achieve their dreams

Signature of Respondent: ..... **Date:** 10/03/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: DANIEL KUNGU MUINY **I.D No.** 33870754

Organization: ..... **Mobile No:** 0703566132

Area of Residence: KIAMBAA

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

It will assist the number of community. It can be improve at our community

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No {✓}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

The no workers will attack our Community

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

It will be minimized by providing security

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Signature of Respondent: ..... **Date:** .....

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No**. 0711036074

Thank you for participating in this exercise.

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Kenya Electricity Generating Company Ltd.

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ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: JOSPHINE W. MAMBO **I.D No.** 66954415

Organization: KAMBITI CATHOLIC CHURCH **Mobile No:** 0727624188

Area of Residence: KAMBITI

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Egeneer is responsible of this building it is his work to know where this building will be

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No{ }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

This project will creat jobs to our community members especialy youth.-
Some community members will aply for tenders, so there will be a change to our people.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

The research will be near our community, well done Ken gen.

Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

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ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: STEPHEN M. VUNDI **I.D No.** 0583260

Organization: KAMBITI EAST MAMA **Mobile No:** 0701 746 529

Area of Residence: KITUNE, KAMBITI

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Engineer is the accurate person to know whether the proposed building can be build in the area according to the environmental condition of the area

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No {✓}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

Allowing the positive impact to build the Building. This will increase the Economy within the Community and increase Employment within the area.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

This will also bring Kengen closer to the people. They workers for The research will be closer to the people

Signature of Respondent: ..... **Date:** 10.03.2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity
Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: [illegible] Tabitha W. **I.D No.** 24550459

Organization: ………… **Mobile No:** 0729671927

Area of Residence: Kiambara

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

1. It will boost the economy of the local area.
2. It will create employment for the people.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

1. It may polute the environment due to heavy trucks spreading the soil.

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2. It may lead to some of this employees impregnating our girls
3.

4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

ensure that our pollution is very low by paving water given to the affected roads that are not tarmac

ensure counselling is done to this employees and action taken upon such bad behaviours

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Please ensure that there will be no discrimination upon employment

Signature of Respondent: ..... **Date:** .....

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

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Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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In compliance to the requirements of section 58 of the Environmental Management and Coordination Act (EMCA), 1999 (Cap. 387) KenGen is carrying out an Environmental and Social Impact Assessment (ESIA) for a four-storey Energy Research & Development Center and Corporate Archive building. Stakeholders' consultation is an integral part of ESIA process; therefore we are seeking for your comments/views on the proposed project.

Name: Mary Nyamburu ..... **I.D No.** 33 95 40 80 .....

Organization: Farmer ..... **Mobile No:** 07 10 11 63 71 .....

Area of Residence: Gakindu .....

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

1. It can help people of this areas
2. It can help youth Jobs opportunity
3.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

because it can help us at community
it can growth the areas

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

- We have to join together the community & KenGen, to help another
- to have seminar meeting to talk with youths

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: Nahason Mutuku Mutiso **I.D No.** 9557436

Organization: ..... **Mobile No:** 0715008742

Area of Residence: Kiambaa

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Renovation of Kiambaa and Mivira Primary School. They give free treated water to the people within the area.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

.....

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

They should employ permanent workers within the area

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

- They should provide with one street light
- They should provide our area by school with clean water

Signature of Respondent: ..... **Date:** 10/03/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: Benson Nduchi **I.D No.** 22023381

Organization: Business Community **Mobile No:** 0721867526

Area of Residence: Kambiti Sub location

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Improve the economy of business

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No {✓}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

Nil

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....

4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

Nil

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Its good when contract start let member of community know through the office of area ass chief

Signature of Respondent: [signature] **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

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Name: Joel Maina **I.D No.** 9588841

Organization: Kamuer **Mobile No:** 0712484880

Area of Residence: Naraqua Ridge.

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

i. Job opportunities.
ii. Raising the living standards for the neighbourhood.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

* Social conflict - Spread of diseases & eating pregnancies

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

- Creation of Health awareness
- Offering guidance & counselling

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Signature of Respondent: ..... **Date:** 10/03/20

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

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Name: BETH W. KIWENE ..... **I.D No.** 9384485 .....

Organization: KIAMBAA PRIMARY ..... **Mobile No:** 0724317111 .....

Area of Residence: KIAMBAA .....

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

The local Community will benefit will jobs and Vacancies

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No {}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

(1). It might bring effects like

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- drug abuse
- teenage pregnancies
- pollution

4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

- Do proper guidance to the local community
- There should be proper disposal of refuse.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

- Kengen to try and involve the local man-power and other available services

Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: BONIFACE GITAU **I.D No.** 12952348

Organization: MIRIRA PRIMARY **Mobile No:** 0721201134

Area of Residence: MIRIRA

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

The Local Community will benefit from the wages they get as labourers.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No {~~✓~~}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

The Labourers from elsewhere may have ~~HIV~~ antisocial behaviours especially

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to the local girl child just as it has been to many projects under contracts

4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

- Proper guidance and Counselling both to the laborers and the girl child.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

I propose once the project is underway the Company to provide trees to the locals to plant in their shambas to compensate the ones that will be cut.

Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

KenGen
Kenya Electricity Generating Company Ltd.

QUESTIONNAIRE FOR PUBLIC CONSULTATION

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

Kenya Electricity Generating Public Limited Company (KenGen PLC) proposes to build a four-storey Energy Research & Development Center and Corporate Archive building with an area of 4,618 square meters. The project will be implemented at Tana Power Station, Kambiti location in Murang'a County (GPS Coordinates 0° 47'2'' S, 37° 15'36'' E).

In compliance to the requirements of section 58 of the Environmental Management and Coordination Act (EMCA), 1999 (Cap. 387) KenGen is carrying out an Environmental and Social Impact Assessment (ESIA) for a four-storey Energy Research & Development Center and Corporate Archive building. Stakeholders' consultation is an integral part of ESIA process; therefore we are seeking for your comments/views on the proposed project.

Name: FRANCIS MBURU **I.D No.** 9947563

Organization: MUCHAGARA SEC **Mobile No:** 0723854550

Area of Residence: KENOL.

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

- Improved ~~ma~~ local community economy due to local labour.
- By product may be used later in local institutions.
- Engagement of the youth thus less idleness.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

Due to influx of persons with different Cultural norms, there could be interference with the societal norms.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

Sensitization of the
→ local community
→ labourers

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Emphasis on local labour and
local materials where possible to
boost the local economy.

Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

Thank you for participating in this exercise.

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ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ENERGY RESEARCH & DEVELOPMENT CENTER AND CORPORATE ARCHIVE BUILDING AT TANA POWER STATION, MURANG'A COUNTY

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Name: MORRIS MWANGI ..... **I.D No.** 26404721 .....

Organization: ONE ACRE FUND ..... **Mobile No:** 0712570748 .....

Area of Residence: KAMBITI .....

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

(i) By providing attachment / internship to locals .....

(ii) By employing locals casually or permanent. .....

(iii) Assisting on completion of public projects .....

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2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

(i) Encroachment of arable land. .....

(ii) Environmental hazards. .....

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

(i) By use of green friendly Materials in Construction.
(ii) Providing employment opportunities to locals

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

(i) Must provide employment opportunities to qualified personnel within the locals

Signature of Respondent: ..... **Date:** 10/03/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

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Name: Naomi Wanjiru ..... **I.D No.** 28306120 .....

Organization: ..... **Mobile No:** 0724857607 .....

Area of Residence: Kiambaa .....

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

The Project will not cause and displacement of local people will not result into direct loss of land
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2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

The contractor will treat and restore
all areas that are open during contraction

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Work before demobilizing under taken to prevent soil erosion

4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

replanting trees and grassing will however be done were necessary after project completion as long as it does not affect the structure that will be contructed

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Contractor must be careful for there workers;

Signature of Respondent: .... **Date:** ....

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

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Name: ERIC MWANGI **I.D No.** 11067045

Organization: Casual worker **Mobile No:** 0743418275

Area of Residence: Gakindu

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

   - Job Vacancies

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

   Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

   Noise pollution when the work is on progress

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

=> by using free noise construction mechanizations.

=> High maintanance progress to be taken up on.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Development of the negotiation btwn kengen and the communists will be simple.

Signature of Respondent: ..... **Date:** 10/3/2020.

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

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Name: BEATRICE WANJIRU **I.D No.** 29431665

Organization: ..... **Mobile No:** 0757 380 965

Area of Residence: KAMBITI

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

The proposed corporate archive building will Not cause any displacement of local people and will not result into any loss of land.

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

Compliance with regulations regarding the transport storage and handling of flammable and explosive substances will be adhered to.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

Due to health and safety measures the contractor shall ensure that all the employees will be provided with training on health and safety issues at work and enforcement of the requirements done.

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Signature of Respondent: BEATRICE WANJIRU **Date:** 10/03/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

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Name: CATHERINE MUTHONI **I.D No.** 28847672

Organization: ..... **Mobile No:** 0722 921618

Area of Residence: KIAMBAA

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Creation of employment ⇒ This will be due to construction of Corporate Archive in upper Tana. And from this will have there will be business opportunities as a result of increased of goods and services

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

Air Pollution ⇒ As a result of dust

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

The specifications technical measures for construction of the works will be considered to control dust associated with traffic on unsurfaced roads and excavation activities

5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

Signature of Respondent: CATHERINE MUTHONI **Date:** 10th/03/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

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Name: JOSPHAT NJOROGE M. **I.D No.** 25874256

Organization: Casual LABOUR **Mobile No:** 0712 988 653

Area of Residence: GAKINDU

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

JOB OPPotunity

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes {✓} No { }

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

DISEASE

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Kenya Electricity Generating Company Ltd.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

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5. Please provide any other comment that might be useful to KenGen with regards to implementation of the proposed Energy Research & Development Center and Corporate Archive building

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Signature of Respondent: ..... **Date:** 10/3/2020

For any further information or clarifications, please contact the Lead EIA/Audit Expert for the proposed project:

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Name: Judy Wanjiru **I.D No.** 325 875 35

Organization: member of Community **Mobile No:** 0790 256 859

Area of Residence: Kiambaa

1. What are some of the potential positive impacts associated with implementation of the proposed energy research & development center and corporate archive building?

- Job opportunities
- Maintaing Infrastures
- Value of Security
- Improvement of community

2. Are there any potential negative environmental and/or social impacts associated with implementation of the proposed energy research & development center and corporate archive building?

Yes { } No {✓}

3. If the answer to Q2 above is yes, please specify the potential negative impacts.

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Kenya Electricity Generating Company Ltd.

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4. How should the potential negative impacts highlighted above be avoided or minimized during the project implementation?

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Signature of Respondent: ..... **Date:** .....

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Name: Cornelius Ndetei **NEMA Reg. No.** 2237 **Mobile No.** 0711036074

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