ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

FOR

THE PROPOSED DEVELOPMENT OF SOLAR, MINI GRID IN KERIO TRADING CENTER, TURKANA CENTRAL CONSTITUENCY WITHIN TURKANA COUNTY.

Updated December 2019

This Environmental and Social Impact Assessment (ESIA) Project Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003.

Proponent:

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CERTIFICATION

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PROJECT TITLE: Environmental and Social Impact Assessment Project Report

SITE NAME: Kerio Trading Center

LOCATION: Kerio Trading Center, Turkana Central Constituency, Turkana County

PROPONENT:

Rural Electrification and Renewable Energy Corporation (REREC),
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For **Rural Electrification and Renewable Energy Corporation (REREC)**

EXECUTIVE SUMMARY

Project:
Development of the 50kw AC Mini-Grid in Selected Un-Electrified Areas – Kerio Trading Center

Proponent: Rural Electrification and Renewable Energy Corporation (REREC)

Location: Kerio Trading Center, Kerio sub location, Turkana Central Constituency in Turkana County, Kenya.

Project Background
Rural Electrification and Renewable Energy Corporation (REREC), mandated by the Government of Kenya to accelerate the pace of rural electrification, through a partnership with the World Bank, wishes to develop a hybrid mini-grid (solar/ thermal) powered 50 Kv AC station, to supply electricity to Lodwar town and its environs.

The project site is located at the Kerio Trading Center, behind the Kerio Primary School. The project site will be on a piece of land measuring 2 acres; however, acquisition will be done for the 5-acre plot to have room for expansion.

Project Description
The proposed project will be implemented in Kerio trading Centre in Turkana County. The proposed project will be a Hybrid Mini-Grids (PV-/Diesel). The proposed hybrid systems for electricity supply to the mini grids will combine renewable resource (solar) along with thermal generation. The construction and operation of the hybrid generation systems of the mini-grid will be carried out by private agents (independent power producers (IPPs), who will own the thermal plants, and operate the solar power facilities (which will be public investments to be financed under the Scaling-Up Renewable Energy (SREP) project) under power purchase agreements (PPAs) to be signed with the national utility Kenya Power (KPLC). PPAs will be procured competitively by REREC. It is proposed that the solar PV system will be the preferred mode of generation with the diesel generator set acting as a backup.

Photovoltaics (PV)

The project will use 300W polycrystalline silicon module with three strings connected in series. Each string will have five sets of panels connected in series, with output converged at the six-way combiners. The life expectancy of the PV modules is estimated at 25-30 years.

The tracking type will be the Game Changer Fixed Tilt. These will allow PV modules to be securely attached to the ground at a fixed tilt angle. The mounting panel is recommended to be fixed at 5metres high for security reasons and to avoid any casting of shadows on the panels by trees, thereby reducing the number of trees to be cut off.

Solar Batteries

The battery considered is lead-acid, deep discharge type with a permissible repeated deep discharge without damage. Automotive or starting type batteries are not acceptable. It shall be of the open "vented" OPzS type with recombination caps and transparent enclosure for easy inspection of electrolyte level. The batteries must be manufactured according DIN 40736-1: "Stationary batteries with tubular positive plates. Capacities, measurements and weights".

The grid will be composed of 24 solar batteries with two parallel strings, with each string containing 12 batteries connected in series. The solar batteries are rated at 2v 1500Ah and will have a life span of half of the solar PV panels hence requiring replacement once in a life span of 30years. This calls for mitigation measures to be put in place for the disposed batteries.

Diesel Genset

The Diesel Generator Set shall have a capacity of 250 kVA (200 kW) with an output of 400 V / 230 V @ 50 Hz and 1500 r.p.m. The rated consumption will follow a 0.25 L/h/kW curve at stand-by power. It should include a highly corrosion resistant enclosure, control panel and monitoring, fuel tank and circuit breaker protections. The Diesel Genset shall be suitable for indoor or outdoor installation and shall perform accordingly with Multi-mode Inverter and the mentioned architecture model. The Diesel Genset shall be working in a fully automatic manner with the above stated components.

Distribution

Electricity generated at the power plant will be connected to 33Kv overhead lines that will cover the total length of the distribution lines as illustrated in the distribution designs.

The project activities are divided into three phases will include: site preparation and Construction (commissioning), operation (including maintenance and repair), and decommissioning phase.

Environmental and Social Impact Assessment (ESIA)

The ESIA was conducted by Dorothy Muli, a NEMA-registered consultant (Registration Number 6295) specialized in conducting Environmental and Social Impact Assessments (ESIAs). This study was undertaken in line with procedures set by Kenyan legislations, World Bank (WB) Environmental and Social safeguards policies and relevant international agreements and conventions. This study was also conducted in accordance with the Environmental and Social Management Framework (ESMF) for Kenya Electricity Modernization Project (KEMP) Off Grid Component, World Bank's General Environment, Health and Safety Guidelines, the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability 2012, Equator Principles III 2013, and IFC Utility-Scale Solar PV Power Plants: A Project Developers Guide.

Kenya Environment Management and Coordination Act (EMCA, 1999-amendment 2015) through the Environmental and Impact Assessment (EIA) regulations as stipulated in the Gazette Notice No. 56 of 13th June 2003. Under Schedule II of the Act, such projects are required to develop an ESIA to avert the potential adverse impacts of the proposed project and propose recommended mitigation measures.

ESIA Methodology

The consultants used screening, scoping and detail analysis methodology for the ESIA study. The approach and methodology applied during the study enabled collection of both primary and secondary data. Following the screening done as part of the KEMP ESMF, the proposed project is categorized as Category B.

The key activities undertaken during the assessment included the following:

- Undertaking public and stakeholder consultations in the process through interviews and meetings with stakeholders and the affected members of public,
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Identification of anticipated environmental and social impacts with particular focus on social, economic and natural resources aspect,
- Identify suitable mitigation and preventive measures appropriate for impacts
- Development of a comprehensive environment and social management plan for integration into the project implementation
- Report writing, review and submissions.

Legal Framework

All activities were carried out according to Kenyan legal and regulatory frameworks and International Best Practices/Standards. The legal frameworks and guidelines used include the following:

1. World bank safeguard policies
2. World Bank Group EHS Standards
3. National legislations
4. National policies and plans
5. National institutional framework and permits
6. International agreements and conventions
7. IFC Performance Standards
8. Equator Principles

Public and Stakeholder Consultation

Stakeholders were identified and engaged as part of this ESIA. Public/stakeholder consultation and participation ensures that the views of the affected and interested parties are incorporated as early as possible in the project development, thereby minimizing the potential for unexpected opposition of the proposed development, and potential for adverse effects to the environment and community. It is also very beneficial to incorporate the views of the public into the design process for the adoption of the best workable models and systems.

Identified Stakeholders were grouped into two broad categories:

- **Primary Stakeholders** - Those directly affected by the project such as members of the public and various surrounding institutions.
- **Secondary Stakeholders** – Those indirectly affected by the project but influence the project development during project implementation. These include the responsible agencies of both the County and National Governments and civil organizations.

The stakeholder engagement revealed that the local community members are supportive of the project. Below are some of the key issues, concerns, and comments raised during the stakeholder consultation exercise:

Human Resource /Employment Opportunities

The community members from Kerio location would like that the locals be considered for employment opportunities. The consultants supported the opinion of the community members and added that the proponent is known to have always given local communities in project area employment consideration.

Project Benefits

The community members requested the proponent to come up with programmes that will ensure they benefit from the project. Some benefit proposals made by community members in the Kerio included generating enough power and supply of power to large number of people, institutions in the area with reliable power not only people or intuitions close to the site. They stated if supplied with adequate power the community members will benefit by electrifying their homes and businesses.

Opinion on Project implementation

It is clear from the questionnaires received back that electricity is a vital ingredient for economic development of Kerio area. All the residents unanimously admitted that they are interested in this project and in so doing pointed to the benefit that will accrue to them.

Overall outcome of consultation

Overally, the stakeholders consider this project a positive venture and will like to see the implementation take off.

The project is viewed positively in the sense that with electricity in the area, new business opportunities will emerge such as computer and photocopying and refrigeration services/ ice making, pupils will have prolonged study time, improved health services as drugs that require refrigeration will be available, improved security through street lighting and charging mobile phones will not be a problem and hence calling during emergency times will not be a problem anymore.

Project Impacts and Mitigation Measures

Possible impacts both positive and negative that will be associated with the proposed development were identified from their sources. These sources included: project activities, equipment and processes.

The sources were thereafter linked to their main receptors such as baseline environmental and social condition with respect to the four phases of the project implementation cycle which includes the design phase, construction phase, operation phase and the decommissioning phase.

Assessment of the identified potential impact was done by developing a criterion based on World Bank safeguard policies which was used to determine the severity of the identified impact in terms of significance, duration, reversibility, likelihood of occurrence, and geographical extent.

Most of the project impacts will occur during pre-construction and construction phases, such as clearing of vegetation, preparation of foundation, air pollution from traffic, Occupational Safety and Health (OSH) risks. The proposed project will also have several positive economic impacts during its different implementation phases that include creation of employment, development stimulation through revenue generation, taxes and income, creation of a market for goods and services, procurement opportunities and, business creation opportunities for various companies and individuals.

The triggered World Bank Safeguard Policies and identified negative impacts affecting both the environment and social well-being of the project's surrounding will need to be mitigated to a level of no significance throughout the project implementation cycle. Some of the recommendations the report has provided include, but not are limited to:

- Use of a Grievance Redress Mechanism to record any complaints from surrounding community members, and procedures to respond to them.
- Impose and enforce speed limits and provide driving guidelines for vehicle operators.
- Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of any activities.
- Employing an OSH plan that will outline all OSH risks and provide a strategy for their management.
- Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance to areas outside the development footprint.
- Provision of suitable facilities for the collection, segregation, and safe waste disposal. Waste should be segregated in terms of recyclable, reusable, biodegradable, non-biodegradable and waste handling equipment provided.

Environmental and Social Management Plan and Monitoring Plan (ESM and MP)

An ESMP and MP has been developed to manage identified potential impacts that are harmonized with World Bank's General Environment, Health and Safety Guidelines and world bank safeguard policies to keep the impacts at an acceptable level throughout the project lifecycle. The ESMP and MP set a standard for successful implementation of the project as well as for respect and conservation of both social and environmental set up within which the project will exist and operate. Some aspects of the ESM and MP recommend training and re-training of the responsible persons to ensure that they have the capacity to implement the mitigation

measures recommended. This implies that training and capacity building form a key pillar in the implementation of the ESMP and MP.

Rural Electrification and Renewable Energy Corporation (REREC) must also establish and maintain an organizational structure that defines roles, responsibility, and authority to implement the ESMP and MP described in this ESIA. They will ensure monitoring of the project development and operational activities to ensure that any adverse impacts that were unforeseen are identified and addressed in a timely fashion.

Project Alternative

With the implementation of the proposed mitigation measures, including sound construction management practices, the triggered world bank safeguard policies and anticipated impacts on soils and drainage, air and water quality, flora, fauna, and avifauna will be reduced to levels of insignificance and where possible avoided.

Under the "No Project" alternative, there would be no development whatsoever. There would be no increased benefits from the site, neither would there be insignificant environmental impacts.

Conclusion and Recommendation

An ESIA process facilitates decision making and environmental accountability thereby safeguarding sustainable development. The ESIA was conducted in accordance with set guidelines in the Environmental & Social Management Framework (ESMF) for Kenya Electricity Modernization Project (KEMP) Off Grid Component World Bank Environment and Social Management Framework; safeguard policies, IFC Utility-Scale Solar PV Power Plants: A Project Developers Guide; and Kenyan legislations. The WB policy on environmental and social sustainability and Kenyan legislation require that all new developments incorporate assessment to identify the environmental and social impacts, risks, and opportunities of projects. The assessment encompasses effective community engagement through disclosure of project related information, consultation with local communities on matters that directly affect them, and the proponent's management plan of environmental and social performance throughout the life of the project.

The stakeholders consulted are in support of the project stating that it will bring positive economic development such as employment and development in the area. The proposed project will trigger several World Bank safeguard policies moreover have several positive economic impacts during its different phases including:

- Employment creation
- Economy stimulation through increased income
- Creation of a business and procurement opportunities for organizations and local business people
- Improved security, with use of security lighting at the project site
- Improved water quality through introduction of water filtration equipment to remove excess salts and balances mineral contents
- Technology access, leading to setting up of ICT facilities and purchase of computers in Kerio
- Improved medical facilities, especially the governmental dispensary through introduction of electricity-operated machines into the facility

- Education enhancement through introduction of extended learning hours for learners as a result of electricity availability
- Displacement of CO_X that would otherwise be produced if other sources of non-renewable energy were to be used
- Climate change mitigation

However, the project will present environmental, social and OSH risks like most Mini hybrid (solar/ diesel) grid development projects. These include:

- Socio-cultural issues - land acquisition and land use
- Visual impacts
- Disposal of the modules and batteries at the end of their lifetime
- Impacts related to the construction of ancillary facilities including access roads and power transmission lines
- Impacts related to labor influx during the construction and operation phases

The study found that the project would be sustainable if the required environmental and social management plans and practices are implemented accordingly, enabling the project to meet the requirements of WB ESF and Kenyan legal frameworks, these being:

The ESIA also recommended appropriate monitoring of the project development, operational and decommissioning activities, to ensure that adverse impacts that were unforeseen are identified and addressed in a timely manner.

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LIST OF ACRONYMS

EA	Environmental Audit
EAP	Environmental Action Plan
EMCA	Environment Management and Coordination Act
EMP	Environmental Management Plan
ERC	Energy Regulatory Commission
ERM	Environmental Resources Management
ESIA	Environmental and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and social management framework
ESMPs	Environmental and Social Management Plans
ESMS	Environmental and Social Management System
FGDs	Focus Group Discussions
FSA	Fuel Supply Agreement
KEMP	Kenya Electricity Modernization project
KPLC	Kenya Power and Lighting Company
NEMA	National Environment Management Authority
REA	Rural Electrification Authority
W	Watts
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background

The national economic growth for Kenya is on upward trajectory as exemplified by the economic performance during the first quarter of 2009 that recorded an economic growth of 3.6%. It is anticipated that the economic growth pattern will surpass the economic growth pattern witnessed before December 2007 of 7.1% as the country gears towards the realization of vision 2030. Significant effects of this growth are notable in agriculture, tourism and construction among others. Considering that electricity demand is derived demand that is heavily influenced by the economic performance of the country, there is need to plan for sufficient electricity capacity additions to meet the growth aspirations of the Vision 2030.

The Government of Kenya through the Ministry of Energy and Rural Electrification and Renewable Energy Corporation (REREC) have a plan to boost the country's electricity generation capacity at the off grid and remote areas through the proposed "Mini- grid to power generation plants in selected un-electrified areas Project" or otherwise referred to as Medium-Sized Hybrid Mini-Grids (PV-/ Diesel project.

This proposed project is in line with the commitment of the Government of Kenya to reach 100% electricity access by 2022 through grid extension, stand-alone individual plant and autonomous mini- grids. The selected area for the mini- grids are Mageta Island, Siaya County; Ngodhe and Takawiri Islands in Homa Bay County; Mkwiro and Wasini, Kwale County, Kadaina Island in Kilifi County; Kaeris and Kerio Market in Turkana County and Nana and Dabel Markets in Marsabit County. The sites have been grouped into three lots; Lot 1- (3 sites in Nyanza region); Lot 2- (3 sites in coast region); and Lot 3- (4 sites in northern Kenya region).

1.2 Rural Electrification and Renewable Energy Corporation (REREC)

The project Proponent is the Rural Electrification and Renewable Energy Corporation (REREC) - a State Corporation established under the Energy Act, 2019 (for purposes of accelerating the pace of rural electrification and promotion of renewable energy technologies in Kenya.

1.3 Project Description

The Government of Kenya through the Ministry of Energy and Rural Electrification and Renewable Energy Corporation (REREC) have a plan to boost the country's electricity generation capacity at the off grid and remote areas of Nyanza, Coastal and North Eastern Regions Country by putting up a Hybrid Mini-Grids (PV-/Diesel) in a project named "The proposed "Mini- grid to power generation plants in selected un-electrified areas Project" or otherwise referred to as Medium-Sized Hybrid Mini-Grids (PV-/ Diesel project (*here in referred to as the Project*).

One of the project site areas chosen in the Northern Kenya region is in Kerio Trading Center, Kerio Location, Turkana County. The proposed project is aimed at generating electrical energy that could be used for domestic, commercial, communications sectors and social institutions within the project locality in Kerio center and the environs of Lodwar town.

1.4 The ESIA Report

1.4.1 ESIA Justification

This Environmental and Social Impact Assessment study was commissioned to ensure that significant impacts on the environment are taken into consideration at the construction and operation stages. The ESIA is further conducted in accordance with Section 58 of Environmental Legislation, Environment Management and Coordination Act (EMCA) 1999 and its subsidiary legislation, including the Environmental Impact Assessment and Auditing Regulations (EIA/EA) of 2003. Other international environmental and social assessment standards adhered to in this report include the World Bank OP4.01 (Environmental assessment) and the IFC Environment Performance Standards, policies.

This Environmental and Social Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and community, and propose mitigation measures in the Environmental and Social Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental and social sustainability.

The EIA study report includes the following sections:

- A review of the policy, legal and administrative framework
- Description of the proposed project
- Baseline information (Biophysical and Socio-Economic environment)
- Assessment of the potential environmental impacts of the proposed project on the biophysical, socio-economic and cultural aspects.
- Development of the mitigation measures and future monitoring plans
- Occupational Health and Safety –OHS.

1.4.2 Terms of Reference (ToR) for the ESIA Process

The following terms of reference for the proposed Hybrid Mini-Grids (PV-/ Diesel) Power plant in selected un-electrified areas Project were used by the ESIA expert team.

- Identification of both positive and negative impacts and the most appropriate interventions during construction and operation.
- Collection of baseline socio-economic data of the proposed project area and potential impact expected from project construction, implementation and operation from existing secondary data sources.

- Development of an environmental and social monitoring program (ESMP) during construction and operation and presentation of plans to minimize, mitigate, or eliminate negative effects and impacts.
- Description of implementation of ESMP.
- Identification and consultation with key stakeholders, facilitation of public consultation and conducting interviews with the proposed project beneficiaries.
- Maintenance of all correspondences with NEMA relating to the ESIA including improvement orders in close consultation with the client.
- Acquisition of an Environmental and Social Impact Assessment License from NEMA.

1.5 Objectives and scope of the Study

The Kenyan Government Policy on all new projects, programs or activities requires that an Environmental and Social Impact Assessment is carried out at the planning stages of any proposed undertaking that is likely to harm the environment and community, to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility.

1.5.1 Objectives

The main objective of this assessment was to identify significant potential impacts of the project to environmental and, and community, and formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts throughout the project cycle.The assessment was undertaken in full compliance with the Environmental Management and Coordination (amended) Act 2015 and also the Environmental Impact Assessment and Audit Regulations, 2003. In addition, appropriate sectoral legal provisions touching on such projects have also been referred to for the necessary considerations during the construction, commissioning and operation of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel), such as the one proposed in Kerio Trading Centre.

Specific objectives of the study included the following:

- Present an outline of the project background,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,
- Identify key areas for environmental, social, health and safety concerns as well as the anticipated impacts associated with the proposed project implementation, operation and decommissioning,
- Establish a comprehensive environmental and social management plan covering the construction, operation and decommissioning phases of the project,

- Preparation of a comprehensive Project Report in accordance with the local environmental legislation and submission to NEMA for further instructions and/or approval.

1.5.2 Scope

The EIA scope largely covered the following areas:

(1) Baseline Conditions:

- Environmental setting (climate, topography, geology, hydrology, ecology, water resources, sensitive areas, baseline information etc.),
- Socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
- Infrastructural issues (roads, water supplies, drainage systems, power supplies, etc.).

(2) Legal and policy framework:

- Focusing on the relevant national environmental laws, regulations and by-laws and other laws and policies, including World Bank Group policy guidelines and standards focusing on allied activities relative to the project in question.

(3) Interactive approach was adopted for the immediate neighborhood to the site in discussing relevant issues including among others:

- Land use aspects,
- Neighborhood issues,
- Project acceptability,
- Social, cultural and economic aspects,

(4) Environmental impacts:

- Physical impacts,
- Biological impacts,
- Legal Compliance.

1.6 EIA Approach and Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 (and the Amended 2015 Act) as well as the Environmental Impact Assessment and Audit Regulations, 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning.

In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, informal interviews with a random sample of people from the surrounding

community, use of public participation forms, site checklist, photography, and discussions with other stakeholders.

The key activities undertaken during the assessment were:

- Continuous discussions with the stakeholders and accessing other sources of information on the proposed project details, the site planning and implementation plan,
- Physical inspection of the proposed site, photography, and interviews with people in the immediate neighborhood to the site and community members at large. A public participation form was used to record their opinion regarding the project
- Evaluation of the activities around the site and the environmental and social setting of the wider area.
- This was achieved through existing information, literature and physical observations,
- Review of available documentation,
- Reporting, review and submissions

Below is an outline of the basic ESIA steps that were followed during this assessment:
Step 1: Screening

This was the first stage when the proposed project was evaluated, guided by EMCA (1999), the EMCA (amended) Act of 2015 and the Environmental and Social Management Framework (ESMF) of 2015. Electricity development activities are listed under schedule 2 of EMCA, 1999 among projects requiring EIA before commencement. In addition, other considerations taken during the screening process included the physical site location, zoning, nature of the immediate neighborhood, sensitivity of the areas surrounding the site and socio-economic activities in the area, among others. Once this screening was conducted and based on the project category, the project was subjected to the scoping (to produce this Project report) as part of the ESIA process.

Step 2: Desk Study

Documentation review was a continuous exercise that involved a study of available documents on the project including the project set-up plans and architect's statement, land ownership documentation, environmental legislation and regulations, integrated county development plans, location maps, etc.

Step 3: Site Assessment and Consultations

With the background obtained from the site investigation, discussions held, and the documentation review, the proposed project was evaluated and an assessment made on the potential environmental and social impacts. Consultations were made with the Proponent

(REREC Engineers), county and national government officials, as well as selected members of the community.

Step 4: Establishment of Baseline Conditions

Physical inspections and observations constituted the main baseline survey activities. It was considered unnecessary to carry out environmental sampling and analysis (e.g. air, water, noise, soil) because the proposed development will not have hazardous emissions or residuals from the anticipated activities after commissioning; it will therefore not have any economic benefit to the client neither would it add any value to the report to analyses environmental parameters that are not expected to be adversely impacted by project activities.

Step 5: Reporting

The report is presented as outlined below:

Chapter 1: Introduction of the project which include project Background, Scope of the ESIA Study, Study Methodology and Presentation of the report.

Chapter 2: Project Description.

Chapter 3: Gives the Policy, Legal and Regulatory Framework Policy, Legal, Institutional and Administrative Framework.

Chapter 4: Baseline Information of the Study Area.

Chapter 5: Outcome of the Public Participation and Consultation process.

Chapter 6: Identification of Potential Impacts and mitigation measures of the project.

Chapter 7:. Alternatives to the Project

Chapter 8:. Mitigation Measures of Potential Impacts of the Project

Chapter 9: Environmental and Social Management and Monitoring Plan (ESMMP)

Chapter 10: Concludes the Project and recoups the core recommendations.

1.7 Target Group for the ESIA Report

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction and operation of the proposed Hybrid Mini-Grids (PV-/ Diesel) Power plant. This report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of project activities. The information will be useful in planning, implementation, management and maintenance of the plant.

In this regard, the report is useful to the following stakeholders:

- Funding agencies and donors;
- Relevant government ministries and agencies;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the is Medium-Sized Hybrid Mini-Grids (PV-/Diesel) power plant;
- Contractors to be engaged in the construction works for the is Medium-Sized Hybrid Mini-Grids (PV-/Diesel) power plant;

- People to be involved in the management and operation of this Medium-Sized Hybrid Mini-Grids (PV-/Diesel) power plant.

CHAPTER TWO: PROJECT DESCRIPTION

2.1 Nature of the Project

The proposed project has taken into consideration the details as described in the *Final Design Report for Preparation of Mini- Grids in Selected un- Electrified Areas in Marsabit and Turkana Counties, Kenya*., a report by REREC prepared by the University of Southampton, August 2017.

The main inputs and assumptions used during project reporting have been taken from project final designs conducted in 2015 and partly the feasibility studies conducted in June 2017.

2.2 The project Site

The specific project site in Kerio is the5 acre piece of land behind the Kerio primary school, Kerio trading Center, Turkana Central Constituency in Turkana County as seen in the map and photograph herein. The GPS coordinates for the piece of land is *2°59'49.6"N 36° 3'19.6"E* as shown in the figure 2.1 below.

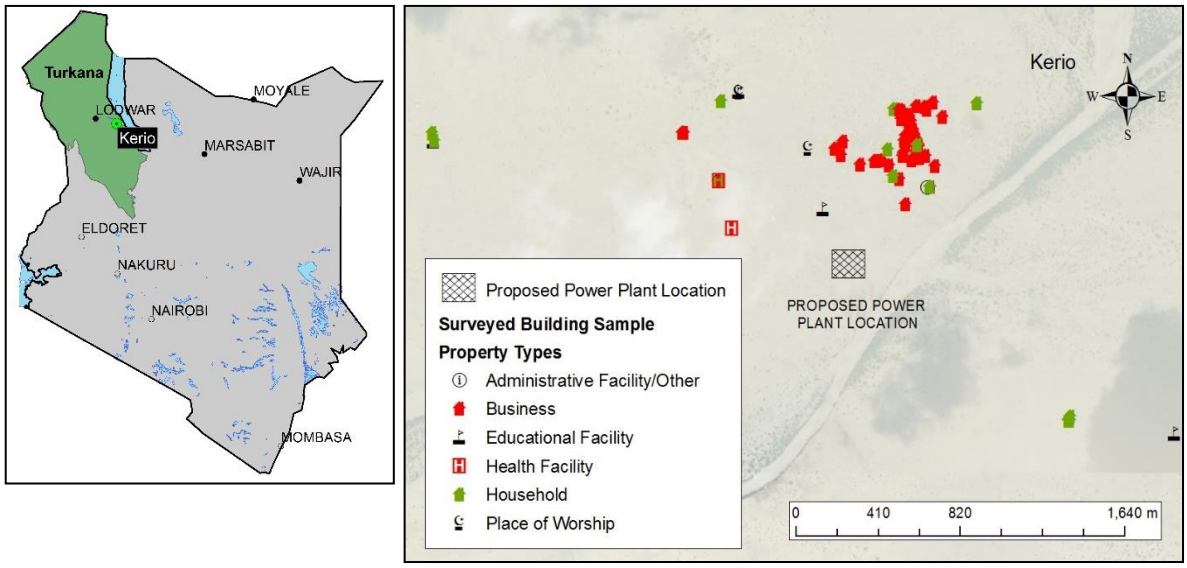

Fig. 2.1 – Location of Kerio within Kenya and location of settlements surveyed within the area.

2.4 Site Ownership and Land Use

The site for the proposed solar/ diesel hybrid power project has good access and land is available for mini-grid installation. The proposed land area is communally owned. The 5acre piece of land was identified and donated to REREC after consultations between REREC representatives and various Turkana county departments representatives which included; Land Administrators, Land

Surveyor, Ward administrators, Sub County Administrators and Representatives from the Turkana County ministry of Energy.

Kerio trading center was observed as barren land, with very few vegetation. The village is situated in a semiarid landscape which can be accessed by a 4x4 vehicle using the sand road from Lodwar town to the village. This is the nearest electrified town located approximately 60 km from Kerio, taking 1 hour to drive.

2.5 Project Layout and Components

2.5.1 Design Layout

Design/drawings

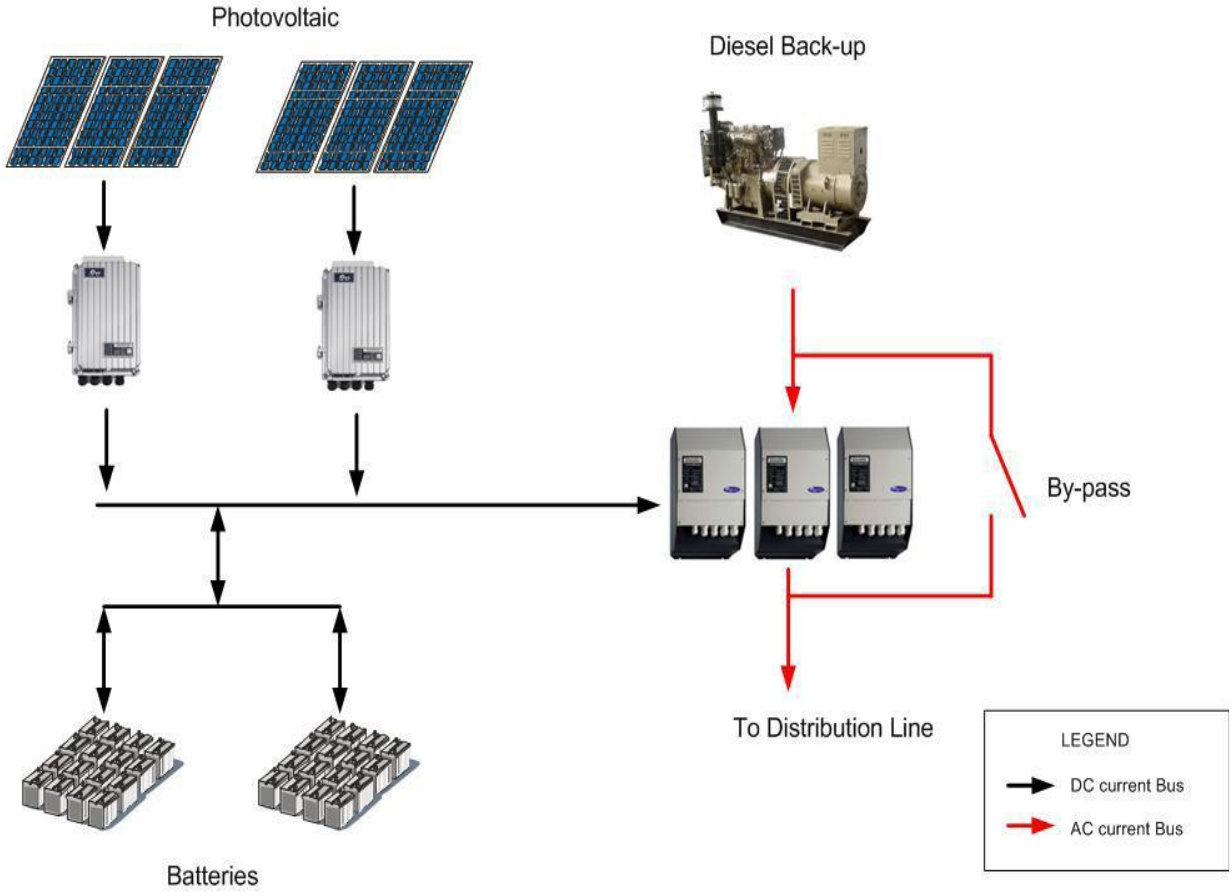

Fig. 2.2 – Photovoltaic (PV) Power Generation) Design (above)

2.5.2 Project Design Components

The components required for the design in Kerio Site are illustrated below.

2.5.2.1 Transformer Locations

50kVA transformers were chosen as it is the lowest size for three phase transformers in the system. The system is designed to allow for low voltage extensions in the short time for new developments especially by the County Government as they set up the facilities. At one end we have the Livestock market and water pump and is most likely to grow as the government builds facilities.

i. Kerio Primary and Secondary School,
ii. Kerio Market, and
iii. Kerio Village.

2.5.2.2 Step-up Transformers

The yield from the inverters will be 0.433kv which will be stepped-up to 33Kv using a step-up transformer rated at 250Kva, 0.433/33kv. It will then be channeled through the grid connections to the local community loads at 33Kv. There will be one step-up transformer located close to the power plant.

This transformers' life expectancy will be variant to the temperature of the project location which are very high, hence their life expectancy will reduce drastically form the expected 20-25 years

2.5.2.3 Step down transformers

They will be three in number, all located in Kerio at specific points due to demand as illustrated in the distribution designs. They will be used to step down the current to a value that can be used by the load at the consumption point. They will be rated at 50kVA 33kv/0.433kv.
This transformers life expectancy will be variant to the temperature of the project location which are very high, hence their life expectancy will reduce drastically form the expected 20-25 years.

2.5.2.4 Solar PV modules

The project will use 300W polycrystalline silicon module with three strings connected in series. Each string will have five sets of panels connected in series, with output converged at the six-way combiners. The life expectancy of the PV modules is estimated at 25-30 years.

2.5.2.5 Module mounting

The tracking type will be the Game Changer Fixed Tilt. These will allow PV modules to be securely attached to the ground at a fixed tilt angle. The mounting panel is recommended to be

fixed at 5metres high for security reasons and to avoid any casting of shadows on the panels by trees, thereby reducing the number of trees to be cut off.

2.5.2.6 Charge controllers

The seven strings of solar panels will use seven 85A charge controllers to regulate power going into the solar batteries.

2.5.2.7 Solar batteries

The battery considered is lead-acid, deep discharge type with a permissible repeated deep discharge without damage. Automotive or starting type batteries are not acceptable. It shall be of the open "vented" OPzS type with recombination caps and transparent enclosure for easy inspection of electrolyte level. The batteries must be manufactured according DIN 40736-1: "Stationary batteries with tubular positive plates. Capacities, measurements and weights".

The grid will be composed of 24 solar batteries with two parallel strings, with each string containing 12 batteries connected in series. The solar batteries are rated at 2v 1500Ah and will have a life span of half of the solar PV panels hence requiring replacement once in a life span of 30years. This calls for mitigation measures to be put in place for the disposed batteries.

The life expectancy of solar power batteries is function of the depth of discharge which affects the electrolyte used in the respective batteries. For optimum function of the batteries for solar power grid connection a 50% is usually recommended which implies the life span of the batteries is reduced to period of 3 to 5 years, however the proponent will decide on the make of battery in terms of cycles and depth of discharge deems optimum for the intended purpose of the batteries.

2.5.2.8 Inverters

Inverters with a rating of 8 KVA will be utilized to convert DC power to alternating current (AC) for association with the utility framework. There will be three inverters for the entire grid.

The life expectancy of solar inverters will range from 10 to 20 years depending on the regular scheduled maintenance or the normal tear and wear of faults in the connection.

2.5.2.9 Grid Connection Interface

Electricity generated at the power plant will be connected to 33Kv overhead lines that will cover the total length of the distribution lines as illustrated in the distribution designs.

2.5.2.10 Distribution lines

The proposed site is located in a semi-arid area with many ants and ant hills evident. Wooden poles are not sustainable in these areas as they are eaten by termites leading to collapse. Most of the installed wooden poles in these areas are now rotten and being replaced by concrete poles. Eco and concrete poles should therefore be considered for these projects. The fittings used should be Aluminum and Steel as per national grid.

A total of 9.5 km high voltage cables as well as a total of 14.3km low voltage cables will be installed in the Kerio project area.

2.5.2.11 The Diesel Genset

The Diesel Generator Set shall have a capacity of 250 kVA (200 kW) with an output of 400 V / 230 V @ 50 Hz and 1500 r.p.m. The rated consumption will follow a 0.25 L/h/kW curve at stand-by power. It should include a highly corrosion resistant enclosure, control panel and monitoring, fuel tank and circuit breaker protections. The Diesel Genset shall be suitable for indoor or outdoor installation and shall perform accordingly with Multi-mode Inverter and the mentioned architecture model. The Diesel Genset shall be working in a fully automatic manner with the above stated components.

2.6 Project Activities

The project activities are divided into three phases as listed below:

- Site preparation and Construction (commissioning)
- Operation (including maintenance and repair)
- Decommissioning

During implementation of the project cycle from the commissioning to decommissioning stage there will be a strong focus on managing the occupational health and safety risks of the workers. The project developer/contractor is mandated to ensure that all reasonable precautionary measures are always considered to safeguard the health and safety of workers. Protective and preventive measures that will require implementation include the following, in order of priority:

- Elimination of the hazard by removing the activity from the work process.
- Controlling the hazard at its source through use of engineering controls.
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures.
- Providing appropriate personal protective equipment incorporating training, use and maintenance of PPE.

Work risk assessments should be carried out preceding any project activity as a method for identifying occupation hazards, assessing risks, and developing appropriate risk-reduction measures to protect the health and safety of workers. The core activities that will be completed as a component of project development and that must incorporate occupational health and safety measures during implementation are outlined below:

2.7 Pre-Construction Activities

Prior to construction activities of the solar power farm, the site will be prepared. Site preparation will include involve erection of a perimeter fence, vegetation clearance, leveling and grading areas, construction of access roads, decommissioning of structures on site and setting up site security. The project location is in the Kerio Market/ trading center with an access road running

through houses and trading structures. Speed should be limited to 20Km/h due to the presence of children and random human traffic.

2.8 Construction activities

Construction activities will involve the following:

- Site preparation (clearance of vegetation, preparation of a site office and stores, fencing to avoid intrusion).
- Disposal of any soil that could is not required, excavations/earth moving, filling and foundation laying,
- Procurement of construction materials and delivery of the same to the site,
- Civil, mechanical, and electrical works,
- Building works, trampling and removal of construction wastes,
- Storage and utilization of materials,
- Construction of fuel storage tank farm
- Installing of containerized generators
- Installation of transformers
- Piping of fuel lines
- Cabling
- Running the generators
- Completion of the plant,
- Solid waste collection and commissioning of the plant.

2.9 Construction and Operation Period

The construction period for the proposed project is 18 months. It is estimated that a total of 14 technical/ skilled staff and between 30- 40 unskilled staff will be employed throughout the construction and operational phases of this project. The Hybrid Mini-Grids (PV-/ Diesel) Power plant in Kerio center is planned to operate within its lifespan of over 20- 25 years.

2.10 Project Budget

The proposed power plant has been sized at 50kWp of solar energy, 3000 Ah of battery storage and a 20-kW diesel genset. The budgeted investment for the project (including the distribution costs) is of KES 108,555,555.00 and the cost of ESMP will be KES 520, 000.00.

CHAPTER THREE: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter outlines the policy, legal, regulatory and institutional framework in Kenya particularly for environmental management, protection and assessment applicable to the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel Project. The Project will be subject to laws, regulations, guidelines and standards of the Government of Kenya and international institutions (IFC/World Bank). Note that wherever any of the laws contradict each other, the Environmental Management and Coordination Act (EMCA) prevail.

3.1 Constitution of Kenya

The Constitution of Kenya, promulgated into law in 2010, is the supreme law of the Republic: It provides the broad framework regulating present and future development aspects of Kenya and along which all national and sectoral legislative documents are drawn.

With regard to environment, Section 42 inside the Bill of Rights of the Constitution, states that: every person has the right to a clean and healthy environment, which includes the right 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 to have obligations relating to the environment fulfilled under Article 70.

Chapter 5 of the new constitution provides the main pillars on which the 77 environmental statutes are hinged and covers "Land and Environment" and includes the aforementioned articles 69 and 70. Part 1 of the Chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. Part 2 of the Chapter directs focus on the environment and natural resources. It provides for a clear outline of the state's obligation with respect to the environment. The Chapter seeks to eliminate processes & activities likely to endanger the environment.

Article 69 states that the State shall:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems on environmental impact assessment, environmental audit and monitoring of the environment;

- Eliminate processes and activities that are likely to endanger the environment; and,
- Utilize the environment and natural resources for the benefit of the people of Kenya.

There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this Chapter.

In conformity with the Constitution of Kenya 2010, every activity or project undertaken within the Republic of Kenya must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment.

Section 70 provides for enforcement of environmental rights thus: -:

- If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

- On application under clause (1), the court may make any order, or give any directions, it considers appropriate —
    (a) to prevent, stop or discontinue any act or omission that is harmful to the environment; (b) to compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or
    (b) To provide compensation for any victim of a violation of the right to a clean and healthy environment.
- For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Essentially, the Constitution has embraced and provided further anchorage to the spirit and letter of the Environmental Management and Co-ordination Act (EMCA), 1999, whose requirements for environmental protection and management have largely informed Sections 69 through to 71 of the Document. In Section 72 however, the new constitution allows for enactment of laws towards enforcement of any new provisions of the Supreme Law.

The proposed project complies with the Constitution by proposing a framework in its ESIA on Social, Health, safety and environmental protection.

3.2 Government of Kenya Policy Framework

Applications of national statutes and regulations on environmental conservation suggest that the owner of any project has a legal duty and responsibility to discharge wastes of acceptable quality to the receiving environment without compromising public health and safety. This position enhances the importance of an EIA for the proposed extension project to provide a benchmark for its sustainable operation when it is finally commissioned. The proposed Medium-Sized

Hybrid Mini-Grids (PV-/ Diesel project complies with government policy framework by the act of the proponent conducting ESIA study before initiating any civil works on the project.

3.3 National Policy Framework

Several policies have been developed over the years to guide the development and management of proposed projects to ensure both economic and social sustainability these policies are discussed below.

3.3.1 The National Poverty Eradication Plan (NPEP)

The objective of the NPEP is to reduce the incidences of poverty in both rural and urban areas by 50 percent by the year 2015, as well as to strengthen the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better-educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of poverty eradication; reduction of unemployment; social integration of the disadvantage people and creation of an enabling economic, political, and cultural environment which can be achieved through developing the transport and communication sector. The plan will be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government ministries, Community Based Organization (CBO), private sector, Non-Governmental Organization (NGO), bilateral and multilateral donors.

3.3.2 The Poverty Reduction Strategy Paper (PRSP)

The PRSP has the twin objectives of poverty reduction and enhancing economic growth. The paper articulates Kenya's commitment and approach to fighting poverty; with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves. The proposed project through improving transport in the area will, contribute towards economic growth, as well as relieve the daily pressure of poverty for sustainable number of people by enabling them reach the markets and suppliers on time.

The proponent will work in collaboration with various stakeholders within the project area in line with the objective to reduce incidences of poverty in the project area.

3.3.3 National Environmental Action Plan (NEAP)

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy whose main effort is to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources forms an integral part of societal decision-making.

The application of this plan is widening as the government through NEMA does not approve a development project unless the impacts of the proposed project are evaluated and mitigation

measures proposed for incorporation in the project's development plan which is in line with the requirements of the NEAP.

This project is subjected to NEMA review and approval to meet the NEAP application.

3.3.4 Environmental and Development Policy (Session Paper No.6 1999)

As a follow-up to the foregoing, the goal of this policy is to harmonize environmental and developmental goals so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding environment and development. It is recommended that the requirements of this policy are observed, as much by:

- Taking measures to enhance the water catchment by replanting trees, using clean energy to reduce deforestation;
- Undertaking environment friendly practices during project implementation;
- Take measures to reduce pollutants leading to eutrophication of water bodies both above- and underground water bodies; and
- Rehabilitate project affected areas and public infrastructure among other

The proposed project will ensure that the recommended requirements under this policy are adhered to, following the ESMPs provided in this report.

3.3.5 International Policy Framework

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment which aims at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Kenya. The country is a signatory to 16 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere. The agreements are both regional and international and became legally binding on Kenya upon ratification thereof by the rightfully designated Kenyan Authority. The agreements of interest to Kenya can be categorized as those for protecting natural resources, atmosphere and social wellbeing of man.

The proposed project will consider the laws regulating natural resources, atmosphere, and the wellbeing of the communities within the project site.

3.3.6 Kenya Electricity Modernization Project (KEMP) Environmental & Social Management Framework, 2015

The Environmental & Social Management Framework (ESMF) was prepared by Environment & Social Unit, Safety, Health & Environment (SHE) Department, Kenya Power at the request of the Rural Electrification and Renewable Energy Corporation (REREC). The ESMF has been prepared based on an overall Environmental & Social Assessment, which includes:

- The general baseline at project areas.

- Evaluation of potential Environmental & Social impacts of different project components and subcomponents, and
- Assessment of environmental practices in different ongoing and completed projects

The ESMF provides the guidelines for the preparation of all mitigation plans (Environmental & Social Management Plans and Construction Management Plan) to respond to the anticipated project impacts, once the solar panels and/or wind turbines installation sites, extension of low voltage power line routes and specific household metering locations are definitively identified.

The proposed project will consider all relevant guidelines as provided by the KEMP- ESMF.

3.3.7 The National Energy and Petroleum Policy 2015

The overall objective of the energy and petroleum policy is to ensure affordable, competitive, sustainable and reliable supply of energy to meet national and county development needs at least cost, while protecting and conserving the environment. This policy stipulates the transformation of the Rural Electrification Authority (REA) into Rural Electrification and Renewable Energy Corporation (REREC) to be the lead agency for development of renewable energy resources other than geothermal and large hydros.

3.3.8 The Gender Policy 2011

The overall goal of this Policy Framework is to mainstream gender concerns in the national development process in order to improve the social, legal/civic, economic and cultural conditions of women, men, girls and boys in Kenya.

The policy provides direction for setting priorities. An important priority is to ensure that all ministerial strategies and their performance frameworks integrate gender equality objectives and indicators and identify actions for tackling inequality. In addition, each program will develop integrated gender equality strategies at the initiative level in priority areas. Within selected interventions, the policy will also scale-up specific initiatives to advance gender equality.

This policy will be referred to during Project implementation especially during hiring of staff to be involved in the project, procuring of suppliers and sub consultants and sub-contractors to the project.

3.3.9 The HIV/ AIDS Policy 2009

The proposed project is to be implemented in the rural area, these areas have high freelance cases of HIV and Aids. This policy shall provide a framework to both the project proponent and contractor to address issues related to HIV and Aids. In summary, the policy provides a mechanism for:

- Setting Minimum Internal Requirements (MIR) for managing HIV and AIDS

- Establishing and promoting programmes to ensure non-discrimination and non-stigmatization of the infected;
- Contributing to national efforts to minimize the spread and mitigate against the impact of HIV and AIDS;
- Ensuring adequate allocation of resources to HIV and AIDS interventions;
- Guiding human resource managers and employees on their rights and obligations regarding HIV and AIDS.

The Policy will be complied with during implementation of the Project, the Contract will in cooperate in tender document and implement HIV awareness initiatives during construction of the Project.

3.4 Environmental Management and Coordination Act of 2015 (Amended)

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) regulation 2003, which operationalize the environment management and coordination act 1999. The report is prepared in conformity with the requirements stipulated in the environmental management and coordination act no 8 of 1999 (EMCA) and the Environmental Impact Assessment and audit regulations 2003 regulation7 (1) and the second schedule. Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Section 58 of EMCA No 8 of 1999 shall undergo an Environmental Impact Assessment. This includes development activities such as this new project. In additional to the legal compliance above, the following legal aspects have also have been taken into consideration or will be taken into consideration before commencement of construction:

3.5 Occupational Health and Safety, 2007

The Occupational Safety and Health Act, 2007, is an Act of Parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act applies to all workplaces and workers associated with it; whether temporary or permanent. The main aim of the Act is to safeguard the safety, health and welfare of workers and non-workers. Part 9 states that the occupier or employer shall establish a health and safety committee where twenty or more people are employed and such an employee shall prepare a written statement of his general policy with respect to the safety and health at the work place. Further, the occupier shall prepare annual safety and health audits by a qualified person.

The contractor shall adhere to all Sections of the Act as it relates to this project, such as observing safety guidelines, provision of protective clothing, clean water, and insurance cover are observed so as to protect all from work related injuries or other health hazards.

3.6 Public Health Act Cap 242

Part IX section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that local authorities shall take all lawful necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. This will have to be provided for this project.

3.7 Land in the Kenyan Constitution 2010

The issue of land has informed major constitutional and administrative changes in the country and it is this fact that necessitated its inclusion in the Constitution of Kenya (2010) with it being given prominence in an entire chapter. Article 40 of the constitution is fundamental part of as far as the issue of land ownership is concerned. It guarantees the protection of the right to property; persons are entitled to acquire and own property of any description and in any part of the country16. It also delimits the powers of the legislature by prohibiting any legislation that would arbitrarily deprive a person of property of any description or of any interest in, or right over, any property of any description or to limit, or in any way restrict the enjoyment of any right under this Article17 on the basis of any of the grounds specified or contemplated in Article 27 (4)18. This chapter therefore lays and important foundation for vesting of any rights attached to rights and the enjoyment of any such rights.

Chapter Five of the Constitution specifically addresses the land issue. It provides for both the institutional and legislative changes are now being felt. Article 60 starts by outlining the principle of land policy 19. These policies are to be implemented by a national land policy that is to be developed and reviewed regularly by the national government and then through legislation20. This is reflected in the Ministry of Lands Sessional Paper No. 3 of 2009 on National Land Policy21 as to the principles that guided the formulation of the Policy document. It should be noted, however, that the land policy document was enacted before the Constitution of Kenya (2010) and thus the guiding principles were included in the Constitution of Kenya (2010) to give them a legal force Article 61(1) and (2) entrenches the fact that all land in Kenya belong to the people of Kenya and goes further to give a classification of Land as public, community and private.

Public land under Article 62 is defined to include those from sub Article (a) to (n). Both the Land Act22 and the Land Registration Act23 refers to the definition given under the Constitution of Kenya (2010) to be the one to apply in each of the respective statutes. Public land is to be vested in the County Government and to be administered by the National Land Commission24. It shall not be disposed of except in an Act of Parliament25. Such disposition can be done through conversion26 where public land can be converted to private land by alienation27, for instance. The Act of Parliament mentioned in the Constitution of Kenya (2010) is seen to be the Land Act. Community Land as defined in Article 63(2) of the Constitution of Kenya (2010) cuts across the four legislations as the definition given the Constitution of Kenya (2010) is standard. It is

therefore noteworthy that all the three land laws do not address the Community Land in depth for the Constitution provides that that Parliament shall enact legislation to give effect to the provision on community land which has not yet been fulfilled. The lacuna in this legislation may end up paralyzing any transactions concerning this though. Private land, defined under Article 64 of the Constitution of Kenya (2010), forms the bulk of most of the legislations on land and the administration and registration is by far the most addressed in each of them. The constitution 2010 has categorized land into three namely:

3.7.1 Public land

This is created under Article 62 of the constitution. Public land includes land previously held under the Government Lands Act; government forests, all minerals, lands transferred to the state by way of sale, reversion or surrender, land that is without claimants, continental shelf and exclusive economic zones inter alia. Section 42 of the Land Act gives the National Land Commission powers to on behalf of National and County governments allocate public by way of: public auction to the highest bidder, public notice of tenders, application confined to a targeted group of persons or groups, public drawing of lots, public requests for proposals, public exchanges of equal value.

The proposed project is not located in a public land.

3.7.2 Private Land

Established under Article 64, this includes any land that is vested in a natural or artificial person, and any other land declared through an Act of Parliament. However, the constitution limits the extent of landholding by non-citizens, including corporation. Non-citizens are barred from owning freehold land, and can only own leasehold land with a maximum term of 99 years. The Constitution 2010 has emphatically stated that: freehold land cannot be owned by a non- citizen of Kenya; and a leasehold interest of over 99 years cannot be held by a non-Kenyan citizen. Thus, any freehold land owned by a non-Kenyan citizen is converted into a 99-year leasehold interest commencing from 27/8/2010 and any leasehold interest with an unexpired term of over 99 years is deemed to be converted into a 99-year leasehold interest commencing from 27/8/2010. However, no procedure is in place for conversion of freehold title to leasehold so, for example, if prior to the coming into effect of the new Constitution a non-Kenyan citizen owned freehold land and you conduct a land registry search today the result will still show the non-Kenyan citizen as owning the land on freehold tenure. The Constitution deems a body corporate/company is to be a Kenyan citizen only if it is fully owned by Kenyan citizens. Section 13(1) of the Land Act states: “Where any land reverts to the national or county government after expiry of the leasehold tenure the Commission shall offer to the immediate past holder of the leasehold interest pre-emptive rights to allocation of the land provided that such lessee is a Kenyan citizen and that the land is not required by the national or the county government for public purposes.

Section 12(6) of the Land Act states that on expiry or extinction of a lease granted to a non-citizen, reversion of interests or rights in or over land shall vest in the national or county government. Where any land reverts back to the national or county governments after the expiry of the leasehold the commission shall offer to the immediate past holder of the leasehold interest.

The proposed project is not within private land.

3.7.3 Community land

Established under Article 63 of the constitution, Community land includes land currently under the Land (Group Representatives) Act; land currently classified as trust lands, community forests, land that is transferred to the community by any process of law, ancestral land and lands traditionally occupied by hunter-gather communities inter alia. Community land is a new category of land explicitly created by new constitution 2010. The term "community" would require a legal definition to allow transfer of land that is currently forest, protected areas or other public land to such communities. Ethnicity may determine the community land however; Article 27 is prohibiting discrimination on the basis of ethnicity. Ancestral land too is not defined, nevertheless, it may be applied to any group or community which identifies itself as traditionally holding a specific area and which it has legal claim as its own.

The proposed project is located within community land, as such all land compensation procedures should be followed before the implementation of the proposed project. The proponent and the contractor should adhere to all cultural norms in relation to land matters during the project cycle.

3.7.4 The Land Act 2012

Land Act is the substantive law governing land in Kenya. The preamble of the Act gives effect to Article 68 of the constitution. Section 3(1) of the states that Act shall apply to all land as categorized in the constitution. The Act provides among others the management and administration of both private and public land, compulsory acquisition, easement, leases, charges, contracts over land and other related rights. Section 5 of the Act recognizes the freehold, leasehold, such forms of partial interest as may be defined in the Act or other law, including but not limited to easement, and customary land rights consistent with the constitution. Section 7 enumerates ways in which titles may be acquired to land. National Land Commission is established under the constitution; Section 8 of the Land Act however enlist various ways in the administration of administration of Public land. Section 9 provides how conversion of land from one category to another; from private to public and vice versa. Section 12 stipulates various ways of allocation of Public land by the National Land Commission. Part V of the Act is on the administration and management of private land. Section 38(1) of the Land Act should be read alongside section 44 and 45 of the Land Registration Act which sets out the manner in which instruments affecting the disposition of land should be executed.

Section 12(9) provides that any land allocated by the Commission that is not developed in accordance with the purpose for which it was allocated and within the time stipulated shall automatically revert back to government.

Article 152(2) give the president powers to nominate with the approval of the national assembly a Cabinet Secretary. However, office of the Cabinet Secretary shall be in place after the next general election (2013), since Article 152(2) is currently suspended. But still the functions of the Cabinet Secretary as conferred in the Land Act can be performed by the Minister for Lands.

The proposed project will work with the institutions under this Act.

3.7.5 Land Registration Act 2012

Section 42 of the Land Registration Act (LRA) No part of the land comprised in a register shall be transferred unless the proprietor has first subdivided the land and duly registered each new subdivision.

Section 107 of the Land Registration Act provides that the instruments that were previously used for dispositions of interests in land shall continue to be used and the laws applicable continue to be applied until the cabinet secretary makes the regulations contemplated under Section 110 of the Land Registration Act. As mentioned in *Section 3.5.1* above, the Land Act gives the National Land Commission powers to on behalf of National and County governments. This is done through the County Land Registrar, under the Ministry of Lands- National Government.

The project proponent will adhere to this act while implement the proposed project. The land is registered in Turkana County.

3.8 Other Relevant Laws

3.8.1 EMCA (Waste Management) Regulations, 2006

These Regulations guides on the appropriate waste handling procedures and practices. It is anticipated that, the proposed project will generate large quantity of solid waste (mostly excavated top soil) during construction which will need to be managed through reuse, appropriate disposal. This regulation requires that: -

- Waste should be segregated and grouped according to their similarity for example plastics, toxic, organic etc.;
- All waste should be deposited in a designated dumping are approved by the local authority;
- All waste handlers engaged by the proponent should be licensed by NEMA and possess all relevant waste handling documents such as waste transport license, tracking documents, license to operate a waste yard, insurance cover, vehicle inspection documents among others;

- Contractor should implement cleaner production principles of waste management strategy namely reduce, reuse and recycle;
- All hazardous wastes are labeled as specified in section 24 (1-3) of the regulation.
- The fourth schedule lists wastes considered as hazardous and solvents, emulsifiers/emulsion, waste oil/water and hydrocarbon/water mixtures.

This law requires that all wastes generated by this project in all its phases are managed in an environmentally friendly manner.

3.8.2 EMCA (Noise and Vibrations Control) Regulations, 2009

These Regulations provides guidelines for acceptable levels of noise and vibration for different environments during the construction and operation phase. Section 5 of the regulation warns on operating beyond the permissible noise levels while section 6 gives guidelines on the control measures for managing excessive noises and copy of the first schedule indicating the permissible noise levels for different noise sources and zones. The project team should observe the noise regimes for the different zones especially when working in areas termed as silent zones which are areas with institutions and worship places. These areas are permitted exposure to sound level limits of not exceeding 40 dB (A) during the day and 35 dB (A) at night. The regulation states that a day starts from 6.01 a.m. to 8.00 p.m. while night starts from 8.01 p.m. – 6.00 a.m. Construction sites near the silent zones are allowed maximum noise level of 60 dB (A) during the day and night levels are maintained at 35 dB (A). The time frame for construction sites is adjusted and the day is considered to start at 6.01 a.m. and ends at 6.00 pm while night duration from 6.01 p.m. to 6.00 a.m. Part III of the regulation gives guidelines on noise and vibration management from different sources. Sections 11, 12 and 13 of the stated part give guidelines on noise and vibration management from machines, motor vehicles and night time construction respectively. Section 15 requires owners of activities likely to generate excessive noise to conduct an ESIA to be reviewed and approved by NEMA. *The project proponent has developed mitigation measures to reduce noise propagation in the project area and such as to ensure that the project works are only conducted during the day.*

3.8.3 EMCA (Air Regulations), 2014

This Act is meant to ensure that all activities at least maintain ambient quality standards of air and any pollution to air (in particulate matter, dust or obnoxious and poisonous gases) needs to be sufficiently mitigated. *The project proponent has proposed regular watering of the construction site to minimize dust during the construction period. This will be done in accordance with the environmental management plan under this project.*

3.8.4 EMCA (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009

The Objectives of these Regulations include: -

a) to provide for the conservation and sustainable use of wetlands and their resources in Kenya;

b) to promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development;
c) to ensure the conservation of water catchments and the control of floods;
d) to ensure the sustainable use of wetlands for ecological and aesthetic purposes for the common good o all citizens;
e) to ensure the protection of wetlands as habitats for species of fauna and flora;
f) provide a framework for public participation in the management of wetlands;
g) to enhance education research and related activities; and
h) to prevent and control pollution and siltation.

The Proponent and the contractor shall comply with the provisions of these regulations as the project is implemented close to the Lake Turkana.

3.8.5 Way Leave Act Cap 292

Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever, provided it shall not interfere with any existing building or structure of an ongoing activity. Notice, however, should be given one month before carrying out any such works (section 4) with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per Section 8 of the Act that states that any person whom without consent causes any building to be newly erected on a way leave, or cause hindrance along the way leave shall be guilty of an offence and any alterations will be done at his/her costs. *The project will comply with this provision by ensuring that there will be minimal disruption of utilities in the area and along the distribution lines.*

3.8.6 County Governments Act, 2012

This Act delineates the roles and responsibilities of county governments with their administrations as well as the role of county citizens in public participation and consultations regarding projects at the county level. *The proposed project proponent will work in collaboration with the County Government of Turkana to the implementation of this project.*

3.8.7 HIV Aids Prevention and Control (Cap 246A)

This Act is to promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS. It also seeks to positively address and seek to address conditions that aggravate the spread of HIV infection. In the proposed mini-grid, there will be awareness creation and sensitization on the workers and other persons on the risks of infections to foster prevention and control. *As per the ESMP of this report, the project proponent through the contractor will need to promote public awareness within the project camps about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS.*

3.8.8 The Physical Planning Act, 1996

This act of parliament provides for controls on the use and development of land and buildings in the interest of proper and orderly development of an area. Requires that development permission be sought through a development application. REA will be required under this law to apply for the change of land use for the proposed site.

3.9 Administrative/Institutional Framework.

3.9.1 The National Environment Management Authority

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and, co-ordination of all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment. The Authority shall review the project report for the proposed project, visit the project site to verify information provided in the report and issue an ESIA license if it considers that all the issues relevant to the project have been identified and mitigation measures to manage them proposed.

3.9.2 The Rural Electrification & Renewable Energy Corporation

The project Proponent is the Rural Electrification & Renewable Energy Corporation (REREC) a State Corporation established under the Energy Act, 2019 for purposes of accelerating the pace of rural electrification and promoting the use of renewable energy technologies including: biomass (biodiesel, bio-ethanol, charcoal, fuel-wood, bio- gas) municipal waste, solar, wind, tidal waves, small hydropower and co-generation but excluding geothermal in Kenya. REREC will be mandated to ensure all environmental issues and concerns under this report as well as those that come up during the project phases are managed as per the KEMP- ESMF of this project.

3.9.3 The County Executive Committees

According to EMCA (Amendment) Act 2015, The Governor shall, by notice in the Gazette, constitute a County Environment Committee of the County of the Authority in respect of every County respectively. The County Environment Committees is responsible for the proper management of the Environment within the County in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them. REA are required to work closely with the relevant CEC of the county the proposed project is located in, especially on environmental and social impacts from this project.

3.10 World Bank Environmental and Social Safeguard Policies

Like in any project financed by, or with financial participation of, the World Bank, the environmental and social safeguards as defined in the Bank's Operational Procedures (OPs) will be adhered to during the project implementation. WB classifies its projects into four

Environmental and Social Assessment categories according to the likely impacts on the environment and community they will have. This classification is as summarized below:

a) *Category A*: A proposed project is classified as Category A if it is likely to have significant adverse environmental and social impacts.
b) *Category B*: A proposed project is classified as Category B if it's potential adverse environmental and social impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects.
c) *Category C*: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental and social impacts. Beyond screening, no further environmental assessment action is required for a Category C project.
d) *Category FI*: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental and social impacts.

The proposed mini grid power generation of 50kw at Kerio (*the Project*) is categorized as a Category B and thus prompting this project report.

The table below shows the applicability of World Bank Operational Safeguards as it applies to the proposed mini-grid.

Table 3.1: Applicability of WB OPs

OP	**Title**	**Comments**
4.01	Environmental	Applicable: The proposed mini-grid project is likely to have potential environmental and social impacts. The objective of OP 4.01 is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate environmental and social screening, analysis of actions and mitigation of their likely environmental and social impacts and monitoring. Therefore, OP 4.01 has been triggered, and in line with this operational policy, the environmental and social screening process for the mini-grid project.

4.04	Natural Habitats	Applicable: The proposed mini-grid project may be located in or close to areas with natural unique flora and fauna though the component is unlikely to have significant negative impacts on natural habitat. Works will nevertheless be implemented in areas that may not negatively affect diverse flora, fauna, and avifauna.
4.10	Indigenous Peoples	Applicable: Project may be located in areas with vulnerable and marginalized groups/people. Kerio is inhabited by Turkana community which is a community included among people who meet the OP 4.10 criteria and to whom the policy requirements would apply.
4.12	Involuntary Resettlement	Applicable: The proposed mini-grid project will involve land take for construction purposes including, solar panels; generator rooms and distribution lines, as well as contractor yard and workers camp site
4.36	Forests	Not applicable
4.37	Safety of Dams	Not applicable
4.09	Pest Management	Not applicable
4.11	Physical Cultural Resources	Applicable: Given that the works will take place in areas of archaeological and cultural importance, OP 4.11 has been triggered as a precaution. Therefore, the precautionary measures will be taken to minimize environmental and social impacts.
7.60	Project in Dispute Area	Not applicable

7.50	Projects in International Waterways	Not applicable

3.10.1 OP/BP 4.01 (Environmental Assessment)

The World Bank has well-established environmental assessment procedures, which apply to its lending activities and to the projects undertaken by borrowing countries, in order to ensure that development projects are sustainable and environmentally sound. Although its operational policies and requirements vary in certain respects, the World Bank follows a relatively standard procedure for the preparation and approval of an environmental assessment study, which;

(i) Identifies and assesses potential risks and benefits based on proposed activities, relevant site features, consideration of natural/human environment, social and trans-boundary issues

(ii) Compares environmental pros and cons of feasible alternatives

(iii) Recommends measures to eliminate, offset, or reduce adverse environmental impacts to acceptable levels (sitting, design, technology offsets)

(iv) Proposes monitoring indicators to implement mitigation measures

(v) Describes institutional framework for environmental management and proposes relevant capacity building needs.

The assessment considers: the natural environment (air, water, and land); human health and safety) social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and transboundary and global environmental aspects.

OP4.01 is triggered because the project is likely to have adverse environmental and social impacts that are considered in this ESIA report.

3.10.2 OP/BP 4.04 (Natural Habitats)

The policy is designed to promote environmentally sustainable development by supporting the protection, conservation, maintenance and rehabilitation of natural habitats and their functions. The policy seeks to ensure that World Bank-supported infrastructure and other development projects considers the conservation of biodiversity, as well as the numerous environmental services and products that natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water area where most of the native plant and animal species are still present).

This project will have an interaction with natural habitats observed on site, this policy will be triggered since the project will be implemented in a rural and remote area of the country that is home to diverse flora, fauna, and avifauna.

3.10.3 OP/BP 4.12 (Involuntary Resettlement)

The policy states that "where large-scale of population displacement is unavoidable, a detailed resettlement plan, timetable, and budget are required. Resettlement plans should be built around a development strategy and package aimed at improving or at least restoring the economic base for those relocated.

Experience indicates that cash compensation alone is normally inadequate. Voluntary settlement may form part of a resettlement plan, provided measures to address the special circumstances of involuntary resettled people are included. Preference should be given to land-based resettlement strategies for people dislocated from agricultural settings. If suitable land is unavailable, non-land-based strategies built around opportunities for employment or self-employment may be used".

Involuntary resettlement is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The objective of this policy is to avoid or minimize involuntary resettlement, though participation in resettlement planning and implementation and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects. The project site is located within public land that has been allocated for the public health facility. Currently part of the land is occupied by the dispensary; the community of the area are in consultations with REREC as they are looking to donate the land for the proposed project. *This policy is triggered since there is land take for project purposes. Land take procedures will align to the RPF prepared under this project.*

3.10.4 OP/BP 4.10 (Indigenous Peoples)

This policy contributes to the Bank's mission of poverty and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies and cultures of indigenous peoples. For all projects that are proposed for Bank financing and affect indigenous peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation.

In Kerio, the village is inhabited by Turkana community which is a community included among people who meet the OP 4.10 criteria and to whom the policy requirements would apply.

Therefore, the proponent will ensue that local communities are consulted, engaged, and benefit fully from project opportunities including local recruitment.

OP/BP 4.11 (Physical Cultural Resources)

Given that the works will take place in areas of archaeological and cultural importance, OP 4.11 has been triggered as a precaution. Therefore, the precautionary measures will be taken to minimize environmental and social impacts.

3.11 Alignment of WB and GOK Policies to this Project

a. Both the World Bank safeguards policies and GoK laws are generally aligned in principle and objective: Both require Environmental and Social Assessment before project design and implementation (which also includes an assessment of social impacts).
b. Both require public disclosure of ESIA reports and stakeholder consultation during preparation.
c. While OP 4.01 of World Bank stipulates different scales of ESIA for different category of projects, Kenya's EMCA requires environmental screening to be undertaken for new projects. In the event that notable environmental impacts will occur as a consequence of the sub- project, then an EIA will be undertaken for those sub-projects. If there would only be minimal impacts for a sub-project then the results of the environmental screening will be prepared and submitted to NEMA and the World Bank.
d. Where EMCA requires Strategic Environmental and Social Assessments, OP 4.01 requires that an Environmental Assessment be conducted, the complexity and nature of which depends on the project category.
e. EMCA recognizes other sectoral laws while WB has safeguards for specific interests.
f. The Bank requires that stakeholder consultations be undertaken during planning, implementation and operation phases of the project which is equivalent to the EMCA requirements. Additionally, statutory annual environmental audits are required by EMCA.

In Kenya, it is a mandatory requirement under EMCA 1999 for all development projects (Schedule Two) to be preceded by an EIA study. Thus, under the Laws of Kenya, environmental assessment is fully mainstreamed in all development process consistent with World Bank safeguard policies on EA. This project does not fall under schedule II of EMCA and thus may not require a full-scale EIA process. Further, in order to fully insure against triggers to WB safeguard policies, individual investments will be screened against each policy as part of the EIA project report requirements.

3.12 IFC Performance Standards on Environmental and Social Sustainability

The IFC Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives. The Performance Standards may also be applied by other financial institutions.

The following are eight IFC Performance Standards which this proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Kerio Trading Centre is supposed to meet throughout the life of this investment:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labor and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

3.12.1 Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

This Performance Standard establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project. It applies to all projects that have environmental and social risks and impacts. Depending on project circumstances, other Performance Standards may apply as well. The client, in coordination with other responsible government agencies and third parties as appropriate, will conduct a process of environmental and social assessment, and establish and maintain an ESMS appropriate to the nature and scale of

the project and commensurate with the level of its environmental and social risks and impacts. The ESMS will incorporate the following elements: (i) Policy; (ii) Identification of risks and impacts; (iii) Management programs; (iv) Organizational capacity and competency; (v) Emergency preparedness and response; (vi) Stakeholder engagement; and (vii) Monitoring and review.

3.12.2 Performance Standard 2: Labor and Working Conditions

This standard recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental 1 right of workers. For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize a project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly and providing them with safe and healthy working conditions, clients may create tangible benefits, such as enhancement of the efficiency and productivity of their operations. The requirements set out in this Performance Standard have been in part guided by a number of international conventions and instruments, including those of the International Labor Organization (ILO) and the United Nations (UN). The objectives of this standard are;

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

3.12.3 Performance Standard 3: Resource Efficiency and Pollution Prevention

Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.1 There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention2 and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. These are often implemented through continuous improvement methodologies similar to those used to enhance quality or productivity, which are generally well known to most industrial, agricultural, and service sector companies. The objectives of this standard are;

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions.

This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, this Performance Standard promotes the ability of private sector companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources.

3.12.4 Performance Standard 4: Community Health, Safety, and Security

Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

In conflict and post-conflict areas, the level of risks and impacts described in this Performance Standard may be greater. The risks that a project could exacerbate an already sensitive local situation and stress scarce local resources should not be overlooked as it may lead to further conflict. The main objectives of this standard include;

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

3.12.5 Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood1) as a result of project-related land acquisition and/or restrictions on land use. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. This occurs in cases of (i) lawful expropriation or temporary or permanent

restrictions on land use and (ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.

The main objectives of this standard include;

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

3.12.6 Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems."

Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services. Ecosystem services valued by humans are often underpinned by biodiversity. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle. The main objectives of this standard include;

- To protect and conserve biodiversity.

- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.

3.12.7 Performance Standard 7: Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.

Private sector projects can create opportunities for Indigenous Peoples to participate in, and benefit from project-related activities that may help them fulfill their aspiration for economic and social development. Furthermore, Indigenous Peoples may play a role in sustainable development by promoting and managing activities and enterprises as partners in development. Government often plays a central role in the management of Indigenous Peoples' issues, and clients should collaborate with the responsible authorities in managing the risks and impacts of their activities. The main objectives of this standard include;

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an on-going relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

3.12.8 Performance Standard 8: Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

The purposes of this Performance Standard, cultural heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles. The main objectives of this standard include;

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

3.12.9 International Conventions and Treaties Ratified by Kenya

Kenya has ratified a number of international conventions pertinent to land administration, environmental protection and human rights. Some of these conventions are:

- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) 2001;
- United Nations (UN) Convention on Biological Diversity 1994 UN Framework Convention on Climate Change, 1992;
- Kyoto Protocol to the United Nations Framework Convention on Climate Change
- Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (Basel Convention) 1989;
- Montreal Protocol on Substances that Deplete the Ozone Layer Vienna Convention on the Ozone Layer 1985;
- UN Convention on the Law of the Sea (UNCLOS), Montego Bay, 1982;
- Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Abidjan Convention) 1981;
- Convention Concerning the Protection of the World Cultural and National Heritage (World Heritage Convention), Paris, 1975;
- Convention on the Conservation of Migratory Species of Wildlife Animals, 1979

- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (amended 1992);
- African Convention on Conservation of Nature and Natural Resources, 1968 Convention on International Trade in Endangered Species of Wild Fauna and Flora

The proposed project will adhere to the agreements under this conventions and treaties as signed by the Government of Kenya.

3.12.10 ESIA requirements for public disclosure

This ESIA will be disclosed in line with the World Bank requirements through posting on the websites of REREC and Ministry of Energy. The final version will be publicly disclosed through the Bank's Info shop. Further, the ESIA/ESMP will be disclosed to local communities/beneficiaries in culturally appropriate languages and in accessible locations, as well as the RPF and VMGF as appropriate.

3.13 Relevant Permits and Licenses Required by the Project

The table 3.2 below shows the relevant permits and licenses that the project proponent will require for the proposed project.

Table 3.2 Relevant Permits and Licenses

	Sector	Legislation	Authority	Permit/License	Comments
Construction Phase	Environment	EMCA	NEMA	EIA License	The EIA license will give the decision criteria for NEMA
		Environmental Management and Coordination (Waste Management) Regulations, 2006	NEMA	Ensure that the contracted waste handlers (transport and disposal) are licensed by NEMA	When disposing waste
	Land	Land Act 2012, National Land Commissions Act, 2012	National Land Commission	Title Deeds	Applicable to the Project Site

	Sector	Legislation	Authority	Permit/License	Comments
		Physical Planning Act, 1996	Planning Department (Ministry of Lands)	Change of Land Use	Change of land use approval is given at the County level
		Physical Planning Act, 1996	Planning Department (Ministry of Lands)	Development Approval	Relates to building planning on the project area
	Occupational Health and Safety	Occupational Health and Safety, 2007	Directorate of Occupational Health and Safety (DOSH)	Registration of workplace	Prior to construction and during operation
Operation Phase	Environment	EMCA	NEMA	Initial Environmental Audit Acknowledgement Letter and Self-Audit Acknowledgement thereafter	Annual, throughout the operations phase
		Environmental Management and Coordination (Waste Management) Regulations, 2006	NEMA	Ensure that the contracted waste handlers (transport and disposal) are licensed by NEMA	When disposing waste

3.14 World bank EHS guidelines

The World Bank environmental health and safety guidelines are core technical reference documents which are occasionally applied whenever two members of the World Bank are joined in a project and they are used hand in hand with relevant industry sector EHS guidelines. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered. The EHS guidelines have been grouped into four main sections;

3.14.1 Environmental

This guideline applies to facilities or projects that generate emissions to air at any stage of the project life-cycle. It complements the industry-specific emissions guidance presented in the Industry Sector Environmental, Health, and Safety (EHS) Guidelines by providing information about common techniques for emissions management that may be applied to a range of industry sectors.

3.14.2 Occupational Health and safety

This section provides guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety. Although the focus is placed on the operational phase of projects, much of the guidance also applies to construction and decommissioning activities. Companies should hire contractors that have the technical capability to manage the occupational health and safety issues of their employees, extending the application of the hazard management activities through formal procurement agreements.

3.14.3 Community Health and safety

This section complements the guidance provided in the preceding environmental and occupational health and safety sections, specifically addressing some aspects of project activities taking place outside of the traditional project boundaries, but nonetheless related to the project operations, as may be applicable on a project basis. These issues may arise at any stage of a project life cycle and can have an impact beyond the life of the project

3.14.4 Construction and decommissioning

This section provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities. It is inclusive as it refers to other sections of the Guidelines when need be.

The proposed project will incorporate all the sections and emphasis will be on all of them as they are equally important to the project.

CHAPTER FOUR: BASELINE INFORMATION

This section describes the overall baseline condition of Kerio Trading Center in terms of biophysical environment, as well as the socio-economic.

In this section, a description of the current natural and human environment conditions of the project site and its environs was provided. The chapter also provided a detailed analysis of how the Mini Hybrid Power Plant may affect these facets. Baseline data collected focused on acquiring information to support the assessment of any potential impact of the proposed project. Collection of information took place at the following levels:

- *National level*: Secondary information has been collected at national level to provide a contextual overview within the Country.
- *County level:* Secondary information was collected at the County level to provide a contextual overview within the County.
- *Study Area:* Secondary and Primary information was collected within the study area specifically within Kerio location in Turkana County where the proposed project is to be implemented. This included a zone of Project Area of Influence (PAI), the neighboring existing institutions and neighboring communities who were interviewed. Majority of the information captured was utilized for the socio-economic environment of the baseline chapter.
- *PAI:* Primary information was collected within the project area where the project will be located. This included information captured on the parcel of land.

In order to capture information at the above levels mentioned, the following methodology was used:

- Desktop Study: A desktop study was carried out of publicly available scientific publication to investigate the natural environment that exists in the study area.
- The desktop study was complimented with a site visit conducted from 4th December to 8th December 2017.

During the transect walks, information pertaining to natural environment particularly existing flora, fauna, soils and hydrology within the Study and Project area was captured in photography and Global Positioning System (GPS).

Stakeholder Engagement: A stakeholder Engagement exercise was taken as part of the ESIA. Most of the stakeholders consulted were found within the Study and Project Area. The information collected was utilized in the socio-economic section of this baseline chapter.

A household socio-economic questionnaire was administered with the help of enumerators. The exercise Attracted 40 respondents living within the project area however within the Kerio trading center.

4.1 The Natural Environment

4.1.1 Geographical Context and Administrative Location

Administratively Kerio is within Kerio ward, Turkana central constituency, Turkana County.

Kerio Trading Center is situated in eastern Turkana on the Lake Turkana coast line, characterized by a semiarid landscape which can be accessed by a 4x4 vehicle using the sand road from Lodwar town to the village as shown in figure 2.1 in *Chapter 2* above. This is the nearest electrified town located approximately 60 km from Kerio, taking one hour to drive. Mobile phone network coverage in the village is good with a Safaricom network tower located less than 5km from the Center of the village.

The Kerio village itself consists of various permanent and semi-permanent traditional structures as shown in figure 2.1 in *Section 2.2* above. The main building materials used are corrugated iron sheets, bricks, mud, timber and local trees called Makuti. There is a main trading area consisting off market stalls and permanent buildings. There is a total of 400 buildings located in the village which is entirely situated within a 4.5 km^2 area. The village has an estimated population of 4000 people.

4.2 Bio-Physical Environment

4.2.1 Climate and Meteorology

4.2.1.1 Precipitation

Turkana County is situated in the arid region of Kenya and receives between 150mm and 400mm of rainfall annually. The rainfall pattern is unpredictable and at times Turkana receives no rain in a whole year. As a result, the residents of Turkana County are faced with a persistent threat of starvation.

Despite Kerio being in this region it does not receive any rainfall throughout the year. The lack of rain has negatively reduced the precipitation in Kerio however with the surrounding natural phenomena such as the seasonal Kerio River that runs approximately 150m from the trading center has influenced growth of trees which contribute an insignificant amount of precipitation to the immediate environment, which has not influenced to a large extent the climate in around the trading center.

4.2.1.2 Temperature

Turkana is one of the hottest counties of Kenya. It experiences very high temperatures during the day and moderate temperatures during the night all year round. The temperatures are estimated to be 25-35°C.

Kerio temperature is influenced by the lack of cloud cover and lack of substantial vegetation and cloud cover which has rendered it a hot region which receives temperatures ranging from 22^{o}C to 35^{o}C with an average of 27^{o}C annually.

4.2.1.3 Solar Radiation/ Sunshine

According to local engagement and informants, the skies in Turkana is always clear 98% of the times. The county receives 12 hours of sunshine during the day, an ideal condition for the mini hybrid solar PV/ diesel project. Kerio is no exception of this due to lack of cloud cover, the radiation received ranges from

4.2.1.4 Ambient Air Quality

Turkana county's urban centers and towns do not have good solid waste management systems which has given rise to open burning of solid waste, that withstanding other sources for air pollution in resonance with Turkana county is the dusty rough roads which when driven on, release fine dust particles in the air which has overall has led to deterioration of air quality in the county.

The air quality in Kerio is a factor of the dusty roads and solid waste burning. The dusty roads contribute to highest percentage of air pollution in the trading center by releasing fine soil particles in the air. Solid waste disposal and open burning contributes to a small percentage in air pollution because of small volumes of waste and controlled collection point.

4.2.1.5 Ambient Noise Levels

Turkana County is sparsely populated. Most of the population lives in clusters close to water sources or in urban centers. In big towns like Lodwar, noise levels are high during the day due to influx of locals to the town and high vehicle traffic.

Kerio on the other hand lacks high traffic and the people do not engage in activities that would produce a lot of noise. Noise levels at the location at the time of site visit ranged from 45.5 to 46.0 decibel within the national (NEMA) recommended levels for a residential/ commercial set up.

4.2.2 Topography and soil

The topography of the area in Kerio is generally flat with a low gradient, towards the Kerio River to the east of the site. The area has a shallow soil profile with a bed rock very close to the surface, hence minor civil works will be conducted at the project site for the foundation, but a deeper analysis is needed to determine the precise depth for the foundation. The soil formation on the project site is poor has there is small top soil layer profile as rock outcrops are evident across the field.

4.2.2.1 Site Landscape Character

Landscape character is defined by the U.K Institute of Environmental Management and Assessment (IEMA) as the 'distinct and recognizable pattern of elements that occur consistently in a landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use, and human settlement.' It creates a specific sense of place or essential character and 'spirit of the place'.

Kerio landscape is composed of mushrooming homesteads which are closely located to each other on either side of the seasonal river, however minority are located close to the project site. The depth of topsoil cover reduces as the distance from the banks of the river increases. The terrain at the project site is nearly flat which would be ideal for the mounting of the solar panels supporting structures.

4.2.3 Hydrology

Turkana is an arid region with most of water resources being underground. It is predominantly covered by seasonal rivers and one river (Turkwel River) which flows during the dry season.

In Kerio there are two sources of water. One of them is surface water, where a sand dam has been constructed 1 to 2 km from the project site in the true north direction. This water source is mainly used by the animals while the population depend on the subsurface water. The people living Kerio have dug shallow wells on the river bed- of the Kerio river that traverses the trading center. The river is 150 meters from the project site as shown in figure 4.2 below. The local population depends on bore holes drilled close to the river bed for fresh water which is mainly used for consumption.

4.2.4 Biodiversity and ecosystem services

Kerio trading center supports animals and plant life in different diversities. The plant life is narrowed down to *Acacia Totilis* species and *Commiphora* species. These species of plant life are predominant in Kerio trading center with sparse grass patches. The two species are sparsely populated across the trading center which is evidenced at the project site where there are less than 4 trees in area of more than 8100 square meters. Kerio trading supports scores of animals however they rarely reside within the trading center vicinity unless they are being slaughtered or sold. The Animal life Kerio, the other animals located there are birds and insects.

4.2.4.1 Fauna/ Avifauna

All of animals in Kerio center are domesticated, the area lacks prominent mammalian wildlife due to absence of an ecosystem that can support them. The wildlife observed in the area are mainly wild birds which have been accustomed to the local habitat. No endangered bird species were observed nor reported at the proposed project area.

4.2.4.2 Flora

Plant life in the area is mainly characterized by *Acacia Totilis* species and *Commiphora* species, some cactus species were also observed distributed scarcely in Kerio. The project site has several trees and shrubs.

4.2.4.3 Protected Areas

Turkana has one protected area –a Central reserve, which is rich with wildlife ranging from lions, cheetah, antelopes, and elephants. The location of the protected area is more than 500 kilometers from the reserve hence the proposed project location will not pose a danger to the protected area.

4.3 Socio-Economic Baseline

4.3.1 Demography

The Kerio village has an estimated population of 4000 people. The main types of businesses in the village include basketry, general groceries and retail shops, hair cutting, livestock and fisheries (due to close proximity to the lake). There are 100 businesses in total, 300 households, 3 educational facilities, 4 places of worship, 6 administrative facilities and 1 hospital provided by UNICEF. The village gets its water from manually dug wells in the nearby riverbed.

4.3.1.1 Vulnerable groups

Vulnerable groups include people who, by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantages or social status, may be more adversely affected by the project than others and who may be limited in their ability to claim or take advantage of other development benefits. Groups of people identified as being potentially vulnerable include: As observed and as per the engagement conducted in Kerio, those living below the poverty line, unemployed population, unskilled population, female headed households, elderly and those who don't own the lands they live in are present in Kerio.

4.3.1.2 Community safety and security

Security in Kerio is provided by the national government through the local chiefs and community elders. incidences of insecurity occur 5 to 10 km from project site where commercial activities are handled, which is a result of cattle-raiding perpetrated by the jobless youth. The local community pointed out the Kerio trading center lacked security incidences.

4.3.1.3 Religion and Cultural Tradition

Turkana County is home to both Christians and Muslims especially in major towns like Lodwar. Kerio is an exception to this since it is predominantly Christian. This is evidenced by the presence of a catholic parish at the Kerio trading center.

4.3.1.4 Indigenous People

OP 4.10 and PS 7 on Indigenous Peoples are not triggered because of the presence of Turkana people in the project area, as they are the majority in the area and they will have direct benefit to the proposed project. The policy states that any development process under World Bank and IFC financing should fully respect the dignity, human rights, economies, and cultures of Indigenous Peoples (IPs). Kerio trading center however hosts a number of cultures, no indigenous or traditional customs were observed at the trading center, unique to the trading center. The project should engage in a process of free, prior, and informed consultation (FPIC) with IPs that should result in broad community support to the project by the affected Indigenous Peoples.

OP 4.10 on Indigenous Peoples is triggered because of the presence of Turkana people in the project area, who are also the main beneficiaries of the proposed project. The project should therefore engage and consult with locals, as well as ensure that they fully benefit from all opportunities presented by the project.

4.3.2 Education

Literacy level in Kerio is very low less than 30% of the local attended at least one level of education while the 70% have never attended school. The level of education in Kerio in terms of individual excellence is up to university level, with two graduates featuring among the respondents. Educational institutions in Kerio are Kerio Nursery, Kerio Primary, and Kerio Secondary Schools. It lacks technical colleges for secondary school graduates who fail to qualify for university or college admission.

4.3.3 Land

4.3.3.1 Land Tenure

Land in Turkana is communally owned; any purchase/lease/rent of land must pass through the local leaders-chiefs and village elders-who must be informed as well authorize the land acquisition process.

Kerio project site land was authorized by the local chief who identified the project site in the company of the proponent, and thereafter agreed on land use for the proposed project. The project site identified was barren, there wasn’t any archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance as well as is not located within the vicinity of recognized cultural heritage sites and the land Kerio is communally owned despite

that here were no disputes over the land because it was identified after conclusive deliberation between the chief, community elders and local community.

4.3.3.2 Land use

Land in Kerio trading center has several uses which are but not limited to construction of houses, economic activities and subsistence activities. The major economic activity of the resident community in Kerio trading center is animal husbandry with a few commercial entrepreneurs hence land is used to source food for the animals. The livestock are usually fed from fields located away from the trading center and they are brought to the center at times of selling or slaughtering.

The land on project site does not and cannot support growth of pasture hence it is rarely used as feeding ground for cattle. The most common animals that are domesticated include camels, sheep, and goats. The project site lacks animal feed but still, animals can be found grazing on the field on their way to grazing fields on the hills.

The proponent should build a perimeter wall around the project site to deter livestock from accessing the site, or to prevent injury to animals which may result in animal deaths.

4.3.3.3 Housing

As described in figure 4.3 below, there are all the three types of housing in the area. – permanent, Traditional semi-permanent building, normally a household (left) and image of a permanent structure made from timber, cladding and iron sheets, normally containing a business (right). The temporary units are mainly constructed by the nomads who are the majority in the area because of their constant movement with animals for pasture and water all over the county. The Semi-Permanent houses are mainly mud walled and roofed with *makuti* or *mabati* in trading center for business. Permanent houses include; school, dispensary, chief's office, church and padre house.

Fig.4.2 – Traditional semi-permanent building, normally a household (left) and image of a permanent structure made from timber, cladding and iron sheets, normally containing a business (right).

4.3.4 Economic setting

Turkana County is a drought-stricken region characterized by human and animal deaths occurring every year. The climate does not favor farming or any activity that involves intensive water use, this has forced the Kerio residents who are financially-advantaged to invest in livestock keeping, while the poor invest in charcoal burning as source of income. At times when there is detrimental droughts the less fortunate members receive a helping hand from NGOs in form of stipends or maize donations. Of the respondents engaged 90% of them were livestock keepers while the other percentage comprised of business owners and people who rely on donations from Non-Governmental Organizations.

4.3.4 Energy

Kerio center was observed to have solar power as the main source of energy for use. Solar energy is tapped using small scale (rooftop) PV units by individuals who thereafter utilize it for commercial purposes. Other energy sources include generators for commercial purposes and lantern lamps for lighting at night.

The trading center Global Horizontal Irradiance (GHI) and Daily Normal Irradiance (DNI) data collected over three years indicate its potential for PV developments which lies between 4-6 Kwh/m^2 of daily solar radiation and therefore has vast potential for solar energy generation.

4.3.5 Water

Turkana County is deprived of surface water sources but is rich in underground water sources due to its geological characteristics-metamorphic basement and igneous rocks of both volcanic and plutonic nature that support formation of underground water sources.

Kerio benefits from this good geological feature and has a water outlet at the trading center, a borehole 1 kilometer from the town center. The quantity and quality of the water is low and should be analyzed by the proponent, as well as the contractor, to determine if it meets the threshold for any civil works and if it is suitable for consumption by employees. This is to avoid any resource competition with the local community.

4.3.6 Sanitation

Turkana County lacks a sewerage system in the town and residents use natural wet land to dispose waste after first disinfecting it. The establishments coming up in the town center (80% of which are new infrastructural developments) use septic tanks to manage waste water.

Kerio residents generate insubstantial waste water. volumes which are disposed of opening to the environment without being treated. The community in Kerio lacks a waste management system: the proponent and contractor should therefore devise ways to manage waste during the project cycle.

90% of establishments (hotels, NGO offices, government offices) in Turkana County towns like Lodwar and Kakuma use pit latrines while 6 percent have sceptic tanks and 4% have cesspools.

Sanitation in villages is different from the more developed town centers with 20% of local community members using pit latrines and 80% using the bush. Out of the 20%, 15% are hotels, schools, churches, and the more economically-advantaged community members.

In Kerio, the number of respondents who use the bush stands at 75% while 10% of respondents use neighbors' pit latrines and 15% using their own pit latrines. There are communal pit latrines close to the project site, however all this lack the essentials for sanitation. They lack wash basins and are rarely washed.

4.3.6.1 Solid waste management

Turkana County has one designated dumping site for solid waste which is 9 kilometers from Lodwar town. The county was observed to have a poor policy to regulate waste dumping since most establishments practice opening burning within the town.

The community in Kerio practices open burning according to the respondent's data. The main stream of solid waste in Kerio is food wraps. All construction waste should be managed in a manner as required by the all legal and regulatory requirements.

4.3.7 Health

Turkana County is committed to reducing cases of communicable diseases, reducing health risks, providing quality health care, and strengthening collaboration in the health sector.
Kerio has a functional dispensary which serves residents within a 5-kilometer radius from Kerio trading center. The most common diseases affecting residents in Kerio according to the respondents were Malaria with 80% of reported cases, while communicable diseases account for 15% of cases, and common colds accounting for 5%.

4.3.8 Transport and access to the site

The project site is located in Kerio village in Kerio location. The road to Kerio is only accessible using four-wheel drive vehicles. The project site is only accessible on foot from Kerio dispensary which is 150 meters from the site.

4.3.9 Post and telecommunication

In Turkana, there are three post offices in Lodwar, Kakuma and Lokichogio which serve administrative and personal purposes. Introduction of mobile phones has reduced the use of personal postal services. Majority of households have mobile phones, with 9 in ten households owning mobile phones according to data collected during stakeholder engagement meetings.

Safaricom is the most present provider, with Safaricom network boosters in Lodwar and Lokichogio towns.

The residents of Kerio have been utilizing this service to communicate to their loved ones in other regions of the county and country as well keep in touch with the current affairs of the trading center and country.

CHAPTER FIVE: PUBLIC AND STAKEHOLDER CONSULTATION

Public consultation and discussions were held between 10th November and 30th December 2016.The Forums were attended by participants and stakeholders across the country representing different institutions, government agencies, NGOs, indigenous people's organizations, the private sector, the Office of the President, contractors, county governments, and investors and other players in the energy sector, among others. A list of the participants is included in the minutes of the Stakeholder Forum consultations appended to this report.

The Forums began with an introduction and description of the KEMP Project, and an explanation of the reporting and management requirements with regard to social and environmental issues. This was followed by specific presentations on the environmental and social safeguard documents under the project, including an explanation of the grievance redress mechanism. It was emphasized that more consultations will be held with communities that are proposed as targeted beneficiaries, before the project implementation. Thus, consultation was a continuous process by which opinion from public will be sought on matters affecting them. Public consultation is generally a continuous process aimed at engaging the stakeholder efforts throughout the planning, design, construction, and operation a project.

The objectives of consultation and access to information will be to generate public awareness by providing information about a sub-project to all stakeholders, particularly the sub-projects affected persons (PAPs) in a timely manner, and to provide opportunity to the stakeholders to voice their opinions and concerns on different aspects of the project. The opinions and suggestions of the stakeholders would assist in taking appropriate decisions for effective environmental management of the sub-projects. It would help facilitate and streamline decision making whilst fostering an atmosphere of understanding among individuals, groups and organizations, who could affect or be affected by the sub-projects. As a part of Environmental Screening and EIA, an effective public consultation and access to information plan (PCAIP) needs to be developed. The specific objectives of Public Consultation were:

- To keep stakeholders informed about the sub-projects at different stages of implementation,
- To address the environmental and social concerns/ impacts, and devise mitigation measures considering the opinion/ suggestions of the stakeholders,
- To generate and document broad community support for the sub-projects,
- To improve communications among project affected persons and interested parties, and
- To establish formal complaint submittal / resolution mechanisms.
- To discuss about KEMP project and document its issues, concerns and mitigation measures.

Consultation were undertaken with reference to the updated World Bank's ESIA Guidance Notes on consultation, participation and broad community support, which also provide guidance on

affected communities' involvement in the process of project planning, implementation and monitoring. Consultation was mainly be based on stakeholder analysis and was preceded by disclosure of adequate project information and environmental and social information to ensure that participants are fully informed. The consultation and public participation are a continuous process during project cycle. The results of the consultation are adequately reflected in the project design and in the project documentation.

5.1 Response of Local Community on the Proposed Project

This section gives the responses the community members gave during the public forum held for discussing the proposed project on 31st December 2016 at Kerio trading Center, Turkana central constituency, Turkana County.

5.2 Major Environmental and Social Concerns Raised

In general, the response from stakeholders on the proposed project was positive since the community members and their representatives stated that the overall project objectives are good for the economic development of the area. Despite that the stakeholders raised some issues that they would like the proponents to incorporate in the project during project design and planning.

i. Human Resource /Employment Opportunities

The community members would like that the locals be considered for employment opportunities. The consultants supported the opinion of the community members and added that the proponent is known to have always given local communities in project area employment consideration.

ii. Project Benefits

The community members requested the proponent to come up with programmes that will ensure they benefit from the project. Some benefit proposals made by community members in the project area included generating enough power and supply of power to large number of people, institutions in the area with reliable power not only people or intuitions close to the site. They stated if supplied with adequate power the community members will benefit by electrifying their homes and businesses.

5.3 Opinion on Project implementation

It is clear from the questionnaires received back that electricity is a vital ingredient for economic development of the area. All the residents unanimously admitted that they are interested in this project and in so doing pointed to the benefit that will accrue to them.

5.4 Overall outcome of consultation

Overally, the stakeholders consider this project a positive venture and will like to see the implementation take off.

The project is viewed positively in the sense that with electricity in the area, new business opportunities will emerge such as computer and photocopying and refrigeration services/ ice

making, pupils will have prolonged study time, improved health services as drugs that require refrigeration will be available, improved security through street lighting and charging mobile phones will not be a problem and hence calling during emergency times will not be a problem anymore.

5.5 Public Meeting Summary

The objective of the public consultation was to ensure that stakeholder and community interests are identified during the ESIA process and that stakeholder and community views, are considered.

The key objectives of such consultations were to inform the community /stakeholders on the project activities and progress and receive community comments/ feedbacks/ questions about the project. This ought to firstly ensure that the community appreciates the project's impacts on them. It also seeks to explain how it is intended for the project to be sustained and optimally benefit them. It further goes on to gauge the acceptability of the project to the community**.**

Open-ended and pre-coded questionnaires: - These questionnaires were administered to target groups in order to obtain their views on the proposed project and its perceived impacts.

Public Meeting Summary Comments

Solar Mini Grid in Kerio trading center, in Turkana County.

31st December, 2016

Meeting Called By	EISA Experts
Type Of Meeting	**Public Consultation Meeting**
List of Attendees	1. Vincent Chuma - Ag. Chief Kerio Location 2. Sospeter Lotuko - Rep. Turkana County Ministry of energy and natural resources 3. Duncan Ochiri- Assoc. Expert (Environment & Social Considerations) 4. Community members/stakeholders - beneficiaries
Agenda	1. Highlight on the nature and scope of the project 2. Overview on Environmental and social considerations aspects of the project 3. Any relevant information regarding environmental and social considerations within the County.

SUMMARY OF DISCUSSION

1. **Overview of Sub-component C 2: Off-Grid Electrification;** after self-introduction, Sospeter Lotuko (County representative) gave an overview of the project since it was incepted and where it has reached.
   Then introduced environmental expert to talk about Environmental and social considerations aspects of the project; EMCA law and the world Bank safeguard policies requirements before such project implementation.
   They were also taken through the world bank safe guard policies, since the project is funded by world bank and all investment project funded by the world bank must meet the requirements of the world Bank's safe guard policies

2. **Environmental and social considerations aspects;** the environmental expert explained that all the pieces of legislations on environment and social considerations had been reviewed and emphasized on commitment to comply with all relevant laws and policies; especially EMCA, Cap 387 and regulations of 2003 and the world Bank policies which have been triggered as a result of this project: OP 4.01(Environmental Assessment), OP 4.10 (Indigenous Peoples), OP 4.12 (Involuntary Resettlement), OP. 4.04 (Natural Habitats) and OP. 4.11 (Physical Cultural Resources).

   The community members present were asked to give their concerns/views and suggestions concerning the proposed project especially on how it will be sustained and optimally benefit them.

   The environmental expert informed community members present about the project nature and details, they were told the project have no direct negative impact on the area fauna and flora; communities around the project site and incase of unforeseen negative impacts occurs appropriate actions will be taken to mitigate the impacts.
   The concerns for waste disposal especially the obsolete batteries and other project components were discussed with regard to the nearby river and all agreed that REA and other implementing agencies (institutions) should be monitoring the project components and ensure safe disposal of E- waste/ hazardous waste. On security, members suggested that implementing agencies (institutions) to Work together with local leadership to ensure project security.
   There was also a general concern about the type of structures to be connected as most people in the area have traditional houses – Manyattas and the connection fee. Also, the Catholic father raised issues of whether the choice of the site has consideration of future area development plans especially in regards to school which is close to the proposed site.

   It was felt that this requires further explanation by the relevant implementing agencies (institutions) to community members before the project implementation so as to address any

misconceptions and expectations that might fail the project.

3. **Adjournment of the meeting;** after deliberations on every aspect of the project, the meeting came to an end with Sospeter Lotuko - county Ministry of energy and natural resources representative urging community members to support the project to ensure the smooth implementation of the project.

CHAPTER SIX: ANTICIPATED IMPACTS AND ASSESSMENT

This chapter sets to highlight both positive and negative impacts the project may bring to the physical, biological, as well as socio-economic environments and overall trigger World Bank safeguard policies.

Mini grids development just like any other development project has the potential to create a range of impacts on the environment, both negative and positive. In this chapter the potential proposed project's impacts are identified, assessed, outlined, rated and analyzed. The impacts are assessed according to each project phase, namely:

- Design Phase
- Construction Phase
- Operation Phase
- Decommissioning phase

The purpose of the Impact Assessment and Mitigation is to identify and evaluate the significance of potential impacts on identified receptors and resources according to defined assessment criteria which include but not limited to world bank safeguard policies, and to develop and describe measures that will be taken to avoid or minimize any potential adverse effects and enhance potential benefits.

6.1 Project ESMF

The Environmental and Social management Framework provided the guidelines for the preparation of all mitigation plans to respond to the anticipated project impacts.
To address the adverse environmental and social impacts that may arise from the project an ESMF was recommended. The purpose of the ESMF as to outline procedures for the ESIA. The ESIA acted as a guide for determining the appropriate level of environmental and social assessment required for the project.

The ESMF clarified environmental and social impacts/enhancements, mitigation measures to be undertaken and the institutional responsibilities for;

- implementing the sub projects.
- mitigation measures.
- monitoring the mitigation measures.
- capacity building to ensure the responsibilities will be carried out effectively.

Preparation of the ESMF was prepared in line with the local policies and legislation and the relevant World Bank safeguards on social and environmental management. The project ESMF was useful in ensuring that the project was screened for potential adverse effects and that the

appropriate mitigation measures were identified and implemented. The ESMF also sought to establish clear procedures and methodologies for screening, reviewing and managing the environmental and social safeguards for components to be financed under KEMP provide a framework for information disclosure and consultation and minimize all impacts to the extent possible.

6.2 Methodology in Identification of Potential Impacts

To identify the potential project impacts, the ESIA team depended on but not limited to Environmental & Social Management Framework (ESMF) for Kenya Electricity Modernization Project (KEMP) Off Grid Component, internationally applied methodology that included lessons learnt from previous studies, best practices in the Infrastructure sector, and the World Bank's Environmental and social policy.

An impact is any change on a resource or receptor brought about by the presence of a project component or by execution of a project related activity. The evaluation process will consist of identification of general potential receptors and impacts associated with the proposed development. To assess the significance of the proposed project's impacts, the impacts were first identified depending on the project's activities: equipment, processes, materials, and impact receptors which include the baseline environmental and social conditions.

Table 6.1: Impact Nature and Type

Nature or Type	Definition
Positive	Impact that is beneficial to the receiving environment
Neutral	Impact that has No Cost or benefit to the receiving environment
Negative	Impact that is considered to represent an adverse change or introduce a new undesirable factor; A cost to the receiving environment
Direct	Impact that results from direct interaction between a planned project activity and the receiving environment
Indirect	Impact that results from other activities that are encouraged to happen as a consequence of the project activity

Impacts are described in terms of "significance", a function of the **magnitude** of impact and the **likelihood** of the impact occurring. Magnitude (severity) is a function of the **extent, duration, and intensity** of the impact. The criteria used to determine significance are summarized in table below

Table 6.2: Significance Criteria

Impact Magnitude

Extent	**Site-Specific:** Impacts that are limited to the boundaries of the project site **Local**: Impacts that extend beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5km from Project Site Boundary) **Regional**: Impact that extends far beyond the site boundary; widespread effect (i.e. 5km and more from the Project Site Boundary) **National and/or international**: Impact that extends far beyond the site boundary; widespread effect
Duration	**Short-term**: Impact that is quickly reversible; 0-5 years **Medium term**: Impact that is reversible over time; 5-15 years **Long-term**: Impact that lasts approximate lifespan of the project; 16-30 years **Permanent**: Impacts that last over 30 years and resulting in a permanent and
Intensity	**None:** The impact on the environment is not detectable **Low**: The impact affects the environment in such a way that natural functions and processes are not affected **Medium**: Where the affected environment is altered but natural functions and processes continue, albeit in a modified way **High:** Where natural functions or processes are altered to the extent that they will temporarily or permanently cease **Very High:** Where affected environment is permanently altered
Probability	**Improbable:** Possibility of the impact materializing is negligible; chance of occurrence <10% **Probable:** Possibility that the impact will materialize is likely; chance of occurrence 10-49% **Highly Probable:** It is expected that the impact will occur, chance of occurrence 50-90% **Definite:** Impact will occur regardless of any prevention measures, chance of occurrence >90%

Once an assessment has been done on the magnitude and likelihood, the impact significance is rated through a matrix as shown in table 6.3 and table 6.4. Significance of an impact is qualified through classification of the degree of confidence. Confidence in the prediction is a function of uncertainty. The degree of confidence is expressed as low, medium or high. Once rating is determined for magnitude and likelihood, the following matrix is used to determine the impact significance.

Table 6.3: Significance Rating Matrix

Significance			
	LIKELIHOOD		
	Probable	Highly Probable	Definite
None	Negligible	Negligible	Minor

Low	Negligible	Minor	Minor
Medium	Minor	Moderate	Moderate
High	Moderate	Major	Major

Table 6.4: Significance Color Scale

Negative Ratings	**Positive Ratings**
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

To identify the potential project impacts, the ESIA team depended on the internationally applied methodology that included lessons learnt from previous studies, best practices in the Infrastructure sector, and the world bank safeguard policies

Table 6.5: Impact Assessment Matrix

		Likelihood Rating		
CONSEQUENCE RATING		A	B	C
	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5A	5B	5C
	6	6A	6B	6C

KEY			
Consequence		Likelihood	Acceptability
1-Negligible	4-Significant	A-Low	Negligible with minor mitigation
2-Minor	5-Catastropic	B-Medium	Minimize Impacts
3-Moderate	6-Beneficial	C-High	Unacceptable

An ESIA is needed for activities with significant impacts.

6.3 Impact Identification and Assessment

6.3.1 Positive Impacts

6.3.1.1 Design Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature / Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions Employment Act, 2007	Socio-Economic; Economic Setting	Employment	The proposed development will result in a positive economic impact in Turkana County and Kenya as whole by impacting the national, County and local economies.	Direct and indirect Positive	National and/or international	Short-term	Medium	Definite	Moderate
Indigenous People (OP/BP 4.10) Performance Standards 4: Community Health, safety and Security.Physical Planning Act Cap 286 The Trade Licensing Act, Cap. 497	Socio-Economic; Economic Setting Transport and access to the site Post and telecom	Market for goods, services and procurement	To facilitate the construction activities, goods and services including specialized industrial materials, building and construction industries that supply raw materials will derive benefits. This offers a market for these goods and services promoting the primary and secondary sectors involved in their procurement such as: quarrying and brick production, furniture and carpentry, glass production, plant and gardening, tarmac, asphalt and bitumen, chemicals, building contractors, electric fittings, plumbing fittings, and water infrastructure etc. Local procurement will primarily benefit the civil and construction industry, hospitality and service industries (e.g.	Direct and indirect Positive	National and/ or international	Short-term	Medium	Definite	minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature / Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
	munication		accommodation, catering, cleaning, transport, vehicle servicing and security services) The highly-specialized nature of the machinery required for the project will require that most of the technical components be imported from specialist suppliers. Renewable energy sector is still under-developed in Kenya and as such, appropriate suppliers and service providers are not all available in the country; this may however change over time. The majority of the project spend will be on PV modules, trackers inverters, transformers and cells, monitoring and surveillance system which will be imported, the rest of the balance of plant (control building, warehouse, civil works, electric wires and cables						

6.3.1.2 Construction Phase.

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2: Labor and working conditions. Employment Act, 2007	Socio-Economic;	Employment	The proposed development will result in a positive economic impact in Turkana County and Kenya as whole by impacting the national, County and local economies. **Direct impacts include:** Employment opportunities for both skilled, semi-skilled, and unskilled workers. Some of the roles include but are not limited to: site clearance, road construction, general construction, assembly, and security. Approxiamately 400-500 people at the peak during a construction period of 8 - 12 months; about 30 permanent jobs during operation for 20-25 years); positive sector impact, and corporate social responsibility donation benefits. Procurements of local contractors, suppliers, workers	Direct and indirect Positive	National and/or international	Short-term long term	High	Definite	Major

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4: Community health, safety and security. Physical Planning Act Cap 286	Economic Setting	Market for goods, services and procurement	To facilitate the construction activities goods and services including specialized industrial materials, building and construction industries that supply raw materials will derive benefits. This offers a market for these goods and services promoting the primary and secondary sectors involved in their procurement such as: quarrying and brick production; furniture and carpentry; glass production; plant and gardening; tarmac, asphalt and bitumen; chemicals; building contractors; electric fittings; plumbing fittings and water infrastructure etc. Local procurement will primarily benefit the civil and construction industry, hospitality and service industries (e.g. accommodation, catering, cleaning, transport, vehicle servicing and security services)	Direct and indirect Positive	National and/ or international	Short-term	High	Definite	Major
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap286	Socio-Economic	Increased revenue generation	The construction phase of the project will also spur the economic activities in the region and generate revenue for the central government in form of taxes.	Direct and indirect Positive	National and/ or international	Short-term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286	Socio-Economic	HIV/AIDS Education and Awareness	The contactors will be expected to disseminate information to the workers as part of their daily toolbox talks, as well as local communities. REREC will liaise with NACC to get materials (if they are available at the time) on HIV/AIDS that can be distributed by the contractors during the toolbox talk.	Direct and indirect Positive	Local	Short-term	Medium	Probable	Minor

6.3.1.3 Operation Phase.

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS.4 Community Health, Safety, and Security Employment Act, 2007	Socio-Economic;	Employment and Wealth Creation 3	Operation of the PV-hybrid mini-grid will be automated with routine scheduled services and maintenance. Most of the operations team will be semi-skilled and electric skilled. Unskilled labor will potentially be sourced locally; some of the expected jobs include security, mechanical maintenance, and cleaning. It is envisaged that operations personnel will be	Direct Indirect Positive	National and/or international	long term	Medium	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
PS. 2. Labor and Working Conditions			increasingly trained up and qualified to high levels over the operational period, consistent with demonstrated capability and ambition.						
Indigenous People (OP/BP 4.10) PS.2 Community Health, Safety, and Security	Socio-economic; Health	Health benefits-respiration problem	The health risks posed by this indoor air pollution mainly include acute lower respiratory infections, but also low birth weight, infant mortality, and pulmonary tuberculosis. Additionally, available data suggest that insufficient illumination (low light) conditions can cause some degree of eyestrain and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults.	Direct or indirect	National and/or international	long term	Medium	Definite	Moderate
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286	Socio-Economic;	Increased economic activity and Government revenue	The project will also increase the economic activities that will be carried in the area primarily as a result of: the project's internal and ancillary activities; its supply chain and its value chain. Locally procured services will include maintenance work for management of plant facilities, 24-hour security, and cleaning resulting in an on-going investment injection.	Indirect Positive	National and/or international	Long-term	Medium	Highly Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security **The Public Health Act (Cap 242)**	Socio-economic;	HIV/AIDS Education and Awareness	Direct beneficiaries of the project i.e. those who will be connected will have the benefit of health education messages through use of radios and TV as using electricity to power these gadgets is more reliable. Benefits are higher because the beneficiaries will be able to access HIV/AIDs information that is reliable, and which comes from time to time as they can use the T.V and radios at will.	Indirect Positive	National and/or international	Long-term	Medium	Highly Probable	Moderate
Indigenous People (OP/BP 4.10) PS 2 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic;	Increased commercial viability	The establishment of the project in the area will increase the commercial viability of the area and will consequently increase the land value in the surrounding area due to the construction of the highly-valued project. This will attract more high-income investors in the area.	Indirect Positive	Regional	Long-term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats OP/BP 4.04 PS 3. Resource Efficiency and Pollution Prevention The Climate Change Act, 2016 Energy Act 2006	Bio-Physical Environment; Climate and Meteorology	Environment conservation	The PV solar power mini-grid will achieve carbon dioxide emission reductions by replacing electricity generated by grid-connected fossil fuel and diesel generation plants in Kenya. The project will apply for carbon credits. Reliance on wood fuel will reduce. C02 emission will reduce.	Indirect positive impact	International Local and national	Long term	Medium	Definite	Major
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic;	Improved Services Delivery	Access to energy services for the public facilities in health, education agriculture leading to quality service delivery and the immediate population living in the Kerio trading center.	Indirect positive impact	International Local and national	Long term	Medium	Definite	Major

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic;	Poverty Reduction	The access to electricity the economic activity in Kerio will be boosted as losses from expired goods will reduce.	Direct and indirect	Local and national	Long term	medium	definitely	Major
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic;	Improved education	Access to electricity at the household level and schools will create opportunities for children to study. The electricity will increase time for study and doing Additionally, children in households with electricity can also access T.V. which gives them an advantage of benefiting from education programs	Direct	Local and/ or national	Long term	medium	definitely	Major

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security **Occupation Health and Safety Act, 2007** **The Local Government Act, Cap. 265**	Socio-Economic;	Improved Security	There will be enhanced security in the off-grid areas arising from well-lit social, commercial and individual premises	Direct	Local and /or national	Long term	medium	definitely	Minor
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Occupation Health and Safety Act, 2007	Socio-economic;	Social perception on gender roles	relief of women from the burden of searching for energy, especially fire wood and to sensitize them on the environmental concerns involved. Lighting and television will improve access to information. The women will also benefit more due to access of information especially on health and nutrition.	Direct or indirect	Local and /or national	Long term	medium	Probable	minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic	Improved telecommunications	Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information.	Direct or indirect	Local and /or national	Long term	medium	definitely	Major
Indigenous People (OP/BP 4.10) PS 4 Community Health, Safety, and Security Physical Planning Act Cap 286 The Land Control Act, Cap. 302	Socio-Economic;	Improved Standard of Living	The implementation of this project will result in connecting about 400 beneficiaries to electricity in off Grid areas. Access to electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridges, television sets, washing machines to mention but a few.	Direct	local	Long term	medium	definitely	Major

6.3.1.4 Decommissioning phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions Employment Act, 2007 **Occupation Health and Safety Act, 2007** **The Local Government Act, Cap. 265**	Economic Setting	Employment	The decommissioning phase and its activities will create business for the contracting company that will be tasked with pulling down the structures and transporting the resultant materials/debris. Additionally, the decommissioning activities will create employment and job opportunities for the different professionals involved in them. It is expected that skilled, semiskilled, and unskilled personnel will all be involved during this phase. In addition.	Direct Indirect Positive	National and/or international	short term	High	Definite	Major

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats OP/BP 4.04 PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources The Kenyan Constitution EMCA amendment 2015	Bio-physical environment	Conservation.	Decommissioning the project will create recyclable materials and equipment such as panels, metals, etc. This in turn reduces the potential impact to the environment that would have been felt if the demand of the raw materials hadn't reduced	Direct and indirect Positive	National and/ or international	Long-term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security Physical Planning Act Cap 286 **Occupation Health and Safety Act, 2007** **The Local Government Act, Cap. 265**	Economic Setting	Increased economic activity and government revenue	Economic activities such as employment and creation of business opportunities and provision of cheaper materials will generate income, which can then be taxed and generate income for the central government. .	Direct and indirect Positive	National and/ or international	Long-term	Medium	Probable	Minor

6.3.2 Negative Impacts

6.3.2.1 Design Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security Employment, 2007	Socio-economic;	Community Perception	**Employment opportunities** High levels of unemployment in the area have forced most of the population into self-employment Lack of opportunities from the project may result in conflict.	Direct/Indirect	Regional	long term	low	probable	Negligible
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security Physical Planning Act Cap 286 The Trade Licensing Act, Cap. 497	Economic		**Enhancing benefits to the local community** Lack of implementation of CSR would lead to conflicts especially if the community expects the same.	Direct and Indirect	Regional	Long-term	Low	Probable	Negligible

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) OP/BP 4.12. Involuntary Resettlement PS 8. Cultural Heritage EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves Act Cap 292	Bio-physical	Land use change (Land take for project implementation, contractor's yard and workers camp site)	. The Project area is in a rural setting which is sparsely populated, and predominantly pastoralist. The project may disrupt grazing and reduce the amount of pasture available to livestock. .	Negative Direct	Site-specific	Long-term	Medium	Definite	Moderate

6.3.3 Construction phase

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Natural Habitats (OP 4.04) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves Act Cap 292	Bio-physical; Biodiversity and ecosystem	Natural Vegetation and Biodiversity Disturbance and damage to Flora, Fauna and avifauna, and their habitats;	Vegetation has a great effect on the general and localized environment and normally can modify microclimate in consequence, de-vegetation during construction may result in negative effects on the fauna by creating disturbance. Disturbance may be due to site clearing, construction and laying.	Negative Direct	Local	Long-term	Low	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act	Ambient Noise Levels Public Health	Noise and vibration	Heavy construction machinery will cause vibrations and noise disturbances in the village within Kerio as they move around the project area.	Negative Direct	Local	Short-term	Medium	Definite	Moderate
2017 Work injury Benefits Act 2007 The Public Health Act Cap 242			and safety risks to employees on site (more under Occupational, Safety and Health (OSH).						

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife Conservation and Management Act of 2013 The Kenya Water Act of 2002	Bio-physical;	Soil characteristics, surface water/ground water	Compacting the soil and vegetation clearance to lay the foundation can reduce the soil's percolation ability and thereby increase run-off hence reduce recharge. Vegetation clearance will also lead to erosion. Fuel and oil spillage from machinery and trucks/vehicles may contaminate top soil. Unsustainable water extraction may also lead to dropping of the water table.	Negative Direct	Local	Long-term	Medium	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Natural Habitats (OP 4.04) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242 The Kenyan Constitution The Climate Change Act 2016 The Traffic Act Cap 403	Ambient Air Quality	Air quality (Dust and Emissions)	Exhaust emissions are likely to be generated by the construction vehicles and equipment as well as diesel generators. Movement of trucks on dirt roads and construction activities such as clearing o will disturb the top soil causing erosion and increase in dust. The impact of dust will depend receptors i.e. the proximity to Kerio villages, the schools and health facility in Kerio. Emissions from exhausts of heavy vehicles and machinery on-site as well as the formation of dust will also lead to air pollution and pose risks to human health (respiratory issues).	Negative Direct	Local	Short-term	Medium	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security The Kenyan Constitution EMCA amendment 2015 The Climate Change Act 2011 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Traffic Act Cap 403 The Penal Code Cap 63	Public Health Transport and access to site Ambient Air Quality Ambient Noise Levels	Traffic Impact	There will be an increase in vehicle movement to and from the project area, to deliver construction equipment to the site. Those likely to be affected by this impact are other road users i.e. other drivers and pedestrians. Increased traffic may result in noise creation, dust generation, and safety impacts for other road users and the locals living and working within proximity to the access roads of the site.	Negative Direct	Regional	Short-term	Medium	Highly Probable	Moderate
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention The Kenyan Constitution EMCA 2015 The Kenya Water Act of 2002 The Public Health Act Cap	Socio-economic;	Waste and effluents	The construction phase will also lead to generation of construction wastes from civil works. These non-hazardous wastes include: waste from vegetation clearing and soil excavation, plastics, metal shavings, packaging material wastes etc. There will also be wastes generated by personnel.	Negative Direct	Local	Short-term	Medium	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
242 Occupational Health and Safety Act 2007 Physical Planning Act Cap 286 The Penal Code Cap 63			Waste storage on-site increases the potential of wastes and effluents to be leached into the soil leading to contamination of nearby surface and ground water. Accumulated waste also reduces aesthetics , key factors are to ensure that appropriate safety guidelines are adopted, and that obsolete equipment and construction waste is disposed of in an environmentally sustainable manner.	Negative Direct	Local	Short-term	Medium	Definite	Moderate
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA The Public Health Act (Cap 242) Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34 Work Injury Benefits Act, 2007	socio-economic Public Health	OSH	Several Health and Safety risks may occur from the activities, processes, materials and equipment involved in the construction phase of the project. Some of the risks may occur from the following sources, but not limited to: fire hazards, accidents, fumes inhalation, sharp objects, etc.	Negative Direct	Regional	Short-term	Medium	High	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Indigenous People (OP/BP 4.10) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	Socio-economic; Public Health, Demography, Security	LLabour influx and resulting impacts	The project will attract labour into the project area. Like any other project with significant recruitment, the influx of labour heightens the risks associated with sexual exploitation and abuse of community members by project workers, and sexual harassment at the work place, as well as HIV/AIDS	Direct and Indirect Negative	Regional	Short-term	Low	Probable	Negligible

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
Natural Habitats (OP 4.04) OP 4.12. Land Acquisition and Involuntary Resettlement	Bio-physical environment and socio-	, land use change (Land take for project implementation, contractor's yard and workers camp site	The Project area is in a predominantly rural setting, majority of the surrounding land is grazing land. Though there is no involuntary resettlement proposed as part of the project, it is expected that land will be donated by the community. All land donation protocols should be followed keenly to avoid any coercion or forceful involuntary resettlement due to the proposed project. The proposed development will have an impact in that it will disrupt grazing activities on the proposed land site as a result of fencing the proposed site. The Project area is in a rural setting, And predominantly pastoralist. Land take will reduce the amount of pasture area available for grazing, as a result of fencing the proposed site.	Negative Direct	Site-specific	Long-term	Medium	Definite	Moderate
PS 4. Community Health, Safety, and Security PS 2: Labour and working conditions The Kenyan Constitution,	Socio-economic	Gender Inequality	The risk of limiting women access to project benefits such as jobs, by giving preference to men, as construction is considered a male industry.	Indirect Negative	Local	Long-term	Low	Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
PS 4. Community Health, Safety, and Security PS 2: Labour and Working Conditions The Kenyan Constitution,	Socio-economic	Gender based Violence-Sexual exploitation and abuse (SEA) of community members by project workers	This impact refers to exploitation of the vulnerable position, differential power or trust for sexual purposes, and may be committed by project workers against community members, and represents a risk at all stages of the project, especially when. the project does not implement and monitor the appropriate mitigation measures.	Indirect Negative	Local	Long-term	Low	Probable	Moderate
PS 4. Community Health, Safety, and Security PS 2: Labour and Working Conditions The Kenyan Constitution,	Socio-Economic	Gender-Based Violence-Sexual harassment at the workplace:	This impact refers to unwanted sexual advances, requests for sexual favours and sexual physical contact at the work place. Sexual harassment may be committed against all workers.	Indirect Negative	Local	Long-term	Low	Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
PS 4. Community Health, Safety, and Security PS 2: Labour and Working Conditions The Kenyan Constitution,	Socio-economic	Gender Based Violence (GBV) - Other Forms of GBV	The project may trigger or exercebate other forms of GBV at the community level through its project activities, e.g. increase in intimate partner violence due to compensation schemes that share funds equally among men and women.	Indirect Negative	Local	Long-term	Low	Probable	Moderate
PS 4. Community Health, Safety, and Security PS 2: Labour and working Conditions The Kenyan Constitution,	Socio-economic	Spread of communicable diseases and HIV/ AIDs and other Sexually transmitted diseases	In migration of people from different regions may lead to behavioral influences which may increase the spread of HIV/AIDS and other sexually transmitted diseases	Indirect Negative	Local	Long-term	Low	Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
PS 4. Community Health, Safety, and Security The Kenyan Constitution,	Bio-physical and socio-economic	Visual Impact	Minimal visual impacts on the surrounding project area. Cars, trucks, machinery and construction material will be visible in an area predominantly occupied by shrubs, vegetation and livestock. Security lighting will also change the outlook at night.	Direct negative	Local	Long-term	Low	Definite	Moderate
				Indirect Negative	Local	Long-	Low	Probable	Moderate
				Indirect Negative	Local	Long-	Low	Probable	Moderate
				Indirect Negative	Local	Long-	Low	Probable	Moderate
				Indirect Negative	Local	Long-	Low	Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-**
				Indirect Negative	Local	Long-	Low	Probable	Moderate

6.3.3.1 Operation Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013	Biodiversity and ecosystem	Disturbance and damage to Flora, Fauna and avifauna, and their habitats	The operation phase is characterized by routine operation and maintenance activities of the facility. Such activities that impact flora may include periodic trimming of the vegetation as well as disturbance when vehicles leave the roads during maintenance. Disturbance of vegetation is caused by vehicle movement. Effects of this disturbance is minimal.	Negative Direct	Local	Long-term	Low	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017	Ambient Noise Levels Public Health	Noise and vibration	The potential noise impacts during operational phase will likely be from transformers, inverters and maintenance activities. Solar power grid also emits a low humming sound	Negative Direct	Local	Long-term	Low	Probable	Negligible
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention	Topography and Soil, water	Soil characteristics, surface	Soil erosion around the cleared areas, roads and at the foot of the PV panels. Soil erosion caused by storm water or surface water runoff may occur during the operational phase as a result of increase in the sediment load of onsite drainage channels. loss of top soil may continue during the operational phase of the project though no top soil clearing is expected in this phase. The panels will act as wind breakers hence abate wind erosion. The PV panels will also cover most of the land surface hence reduce recharge to groundwater from rainfall. Fuel spills may result in water contamination.	Negative Direct	Local	Long-term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242 The Kenyan Constitution The Climate Change Act 2016	Ambient Air Quality	Air quality (Dust and Emissions)	Minimal dust generation is expected to occur during the operational phase of the project by maintenance vehicles along the access roads, which will be infrequent. Those likely to be affected by air pollution are the residents, personnel on construction site and vegetation by blanketing plant surfaces.	Negative Direct	Local	Short-term	Low	Probable	Negligible

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) ESS 4. Community Health, Safety, and Security OP 4.12. Land Acquisition and Involuntary Resettlement PS 8. Cultural Heritage The Kenyan Constitution	Land	Visual Impact	The proposed project will present visual impacts to the landscape. The visual impacts on the landscape will result from the installation of the solar PV panels. There will also be potential visual impact emanating from security lighting to be used in the proposed project site.	Direct negative	Local	Long-term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 The Climate Change Act 2011 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Traffic Act Cap 403 The Penal Code Cap 63	Public Health Transport and access to site Ambient Air Quality Ambient Noise Levels	Traffic Impact	Operational personnel commuting to and from the site. Preventive maintenance will be conducted continuously, and general maintenance approximately monthly and the site will be accessed by several vehicles carrying equipment if need be. Deliveries of replacement parts will also be made occasionally during the lifespan of the facility. However, traffic associated with the operation phase will be largely localized and limited to the site. Those likely to be affected by this impact are other road users i.e. other drivers and pedestrians	Negative Direct	Local	Long-term	Low	Probable	Negligible

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	Socio-economic; Public Health, Demography, Security	Increased social disturbance	A limited number of workers or contractors will be on-site during the operational phase of the project. Such a small number reduces the likelihood of there being any social ills linked to the project activities.	Direct and Indirect negative	Regional	Short-term	Low	Improbable	Negligible

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA amendment 2015 The Penal Code (Cap. 63) The Public Health Act (Cap 242) Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34 Work Injury Benefits Act, 2007 The National Construction Authority Act, 2011 The Standards Act, Cap. 496	Socio-economic; Public Health	OSH	Potential health and safety impacts during the operations are expected to be minimal. However, some of the risks may occur from accidents, fire hazards, injuries, electrocution and inhalation.	Negative Direct	Site-specific	Short-term	Moderate	Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/ Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention EMCA 2015 The Water Act of 2002 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Physical Planning Act Cap 286 The Penal Code Cap 63	Health	Waste and effluent	Waste will be generated from general maintenance activities, general office waste, eating packaging and waste, effluent from toilets and oil leaks from transformers. Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil. However, impacts during operational phase will be minimal since only a very small number of personnel will be permanently stationed at the site and a small team will conduct periodic maintenance activities. Photovoltaic modules are typically made from monocrystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride, and copper indium selenide/sulfide. While cadmium present in the cadmium telluride cells would be toxic if released, the quantity of cadmium present in the cells is typically small, stable and poses little threat; however, cadmium does pose some risk issues with disposal of the units at the end of their lifetime.	Negative Direct	Site-specific	Long-term	Moderate	High	High

6.3.3.2 Decommissioning Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources MCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves Act Cap 292	Bio-physical; Biodiversity and ecosystem	Disturbance and damage to Flora, Fauna and avifauna; and their habitats and visual impact	Activities such as removing solar panels, and movement of vehicles may cause disturbance. Movement and noise disturbances may affect distribution of fauna. Disruptive activities during decommissioning will be minimal. Flora on-site will be rehabilitated.	Negative Direct	Local	Medium term	Medium	Highly Probable	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242	Bio-Physical and socio-economic; Health	Heavy metals poisoning	Obsolete batteries as well as electrical equipment such as transformers, circuits and cables will impact on natural vegetation and Biodiversity if not properly disposed of. The batteries are made of lead compounds which are toxic to humans and the environment. safety guidelines are adopted, and that obsolete equipment and construction waste is disposed of in an environmentally sustainable manner.	Negative direct and indirect	Local and/or national	Long term	medium	probable	moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017	Bio-physical and Socio economic ; Ambient Noise Levels Public Health	Noise and vibration	Decommissioning activities will also result in noise disturbance through demolitions/ civil works, machinery operations, and heavy truck movements along the roads on-site and access roads to the site. Those likely to be affected include on-site employees and surrounding residents.	Negative Direct	Local	Short Term	Medium	Definite	Moderate
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015	Bio-physical; Topography and Soil, water	Soil characteristics, surface water/ground water	Increased wind erosion due to removal of solar buffers. Movement of trucks will also cause soil disturbance. Increased erosion may lead to sedimentation in nearby water channels	Negative Direct	Local	Short term	Medium	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and	Bio-physical; Ambient Air Quality	Air quality (Dust and Emissions)	Emissions from exhausts of heavy vehicles and machinery on-site will lead to air pollution. Dust generated during activities such as premises demolition	Negative Direct	Local	Short term	Medium	Definite	Moderate
Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242 The Kenyan Constitution	Socio economic: community	Social disruption	PV panel removal, and heavy vehicles on-site moving along unpaved surfaces will also lead to emission of dust resulting to air pollution. Some of the health impacts include: diseases, skin disorders, and irritations.						

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security EMCA amendment 2015 Traffic Act Cap 403 The Penal Code Cap 63	Socio economic; transport	Traffic Impact	Increased traffic is expected as a result of vehicles ferrying premises' debris, demolition wastes, solar panels, and equipment away from site.	Negative Direct	Regional	Short term	Medium	Probable	Moderate
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention The Kenyan Constitution EMCA 2015 The Kenya Water Act of 2002 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Physical Planning Act Cap 286 The Penal Code Cap 63	Socio economic; Health	Waste and effluent	Decommissioning activities will generate excavation waste, debris and demolition waste. Soil and water pollution due to unsafe disposal of concrete poles may occur. Decommission activities may also result in effluents from removal of toilet facilities and solid wastes as a result of on-site decommissioning project exercise. Cadmium may pose risks if solar units are not disposed-off properly.	Negative Direct	Local	Short term	High	Definite	Moderate

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA amendment 2015 The Penal Code (Cap. 63) Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34 Work Injury Benefits Act, 2007 The National Construction Authority Act, 2011 The Standards Act, Cap. 496	Socio economic ; Health	OSH	The decommissioning phase will have several OSH risks from the civil works involved, equipment, materials and processes. Some of the risks may occur from accidents, fire hazards, inhalation, sharp objects. .	Negative Direct	Regional	Short term	Medium	Probable	Minor

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK ESS & IFC PSs) and Applicable Kenyan Legislation	**Baseline**	**Impact**	**Project Activities**	**Nature/Type of Impact**	**Extent**	**Duration**	**Intensity**	**Likelihood**	**Significance rating (Pre-Mitigation)**
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	Socio economic; Public Health, Demography, Security	Increased social disturbance	The impacts of population influx will be minimal during decommissioning due to the limited number of workers involved.	Direct and Indirect negative	Regional	Short term	Low	Probable	Negligible
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security PS 5. Land Acquisition and Involuntary Resettlement PS 8. Cultural Heritage The Kenyan Constitution	Bio-physical; Land	Visual Impact	Visual aesthetics of the area may be altered. Moving trucks, solar panels and cleared tracts of land will be visible in an area previously dominated by vegetation and animals. Vegetation cover will be expected to re-establish itself naturally.	Direct negative	Local	Long term	Medium	Probable	Minor

CHAPTER SEVEN: ANALYSIS OF PROJECT ALTERNATIVES

7.1 Project Alternatives

The ESIA also involved the consideration of the alternatives to the proposed solar power project. This was essential as it allowed the project proponent to make an informed decision regarding not only the location of the project, but also technologies that will be applied during the construction phase. This process also ensured that the project activities are in suitable locations and are cost effective. The following sections provide the analysis of alternatives considered in the case of the proposed project.

The alternative consists of the proponent's/applicant's final proposal with the inclusion of the legal guidelines, regulations, and procedures as stipulated in the EMCA, 1999 (amendment 2015) which aims at reducing environmental impacts to the maximum extent practicable. This section analyzed the project alternatives in terms of site location, technology options, and project input.

7.2 Alternatives Locations

In determining the most appropriate site for the establishment of the solar power plant, several options were explored. This site selection process considered the following criteria:

i. The availability of primary resources required for the operation of the power plant, such as Sun
ii. Availability of land to locate the site and associated infrastructure;
iii. The availability and accessibility of infrastructure for the provision of services, manpower and social structure for the construction and operation of the power plant;
iv. General environmental acceptability in terms of social impacts, water utilization, general ecology, etc.

Normally, the layout of solar panels is dependent on maximization of energy emissions from the sun during the solar irradiance hour period. This, together with topographical, geographical, and environmental factors, has been the main factor in selecting the proposed lay-out. Such layout can be modified to a limited extent in order to optimize those variables.

Kerio was identified as the most suitable area for the establishment of the proposed Solar Power Plant based on the following factors:

Location: The Project area is in a predominantly rural setting, and due to the hilly terrain, the population density is low, and majority of the surrounding land is grazing land. There is enough grazing land for the community and use of the site to construct the mini grid will not significantly impact grazing land.

Proximity: Most houses in Kerio are clustered, thus making distribution direct; this will facilitate supply of power to the village.

Grid Connection: A grid connection with enough capacity and material was recommended due to the anticipated increasing demand in solar energy. This eliminates the need to overhaul the grid connection when the population increases in Kerio location.

Capacity: The nature of the project is standalone hence the capacity of infrastructure will be subject to the expected load over 30 years and the projected exportation of electricity to Lodwar town. The contractor should adhere to the designs provided by the proponent.

7.3 Analysis of Alternative Energy Sources

This was analyzed based on the clean development mechanism structures that call for no or minimal emission of greenhouse gases during project execution. Environmental benefits of the solar PV power plant can be measured by emission reduction, see table 7.1 below. The emissions of traditional coal-fired thermal power plant, in addition to carbon dioxide, including CH_6, SO_2, N_2O and other greenhouse gases, have worse greenhouse effects than CO_2.

Table 7.1: Annual energy saving and emission reduction of the PV power plant

Item	The 1st year (tons)	Cumulative value over 25 years (tons)
Saving of standard coal	22,920.58	522,443.47
CO_2 reduction	58,594.42	1,335,579.85
SO_2 reduction	1,763.12	40,187.96
NO_x reduction	881.56	20,093.98

Different types of fuels emit different amounts of Carbon Oxides (CO_x) in relation to the amount of energy they produce. In Comparison to these electricity fuels, it shows that coal and diesel lead in the emission of CO_X while solar is the least emitting agent. Solar panels are a clean electricity generator with very minimal emissions often arising from the plant life cycle materials such as PVCs. The table below shows grams of CO_2 emitted per million British thermal units (Btu) of energy for various fuels.

Table 7.2: Amount of carbon emissions (emitted per million British thermal units (Btu)) in different electricity generation methods

Methodology	CO_2 (g/mbtu)
Coal (anthracite)	0.103
Coal (bituminous)	0.093
Coal (lignite)	0.097
Coal (subbituminous)	0.097
Diesel fuel & heating oil	0.073
Gasoline	0.071
Propane	0.063
Natural gas	0.053
Photovoltaic	0.00056

The statistics indicate that solar power electricity generation is the best alternative method of generating electricity as it ensures there is sustainability with regards to the environment.
Kenya generates power from hydro, wind, geothermal, as well as thermal energy. All these sources have both beneficial and adverse impacts on the environment. **Table 7.3** below illustrates the comparative analysis of generation technologies of different alternatives.

Table 7.3: Comparative Analysis of generation technologies

Technology	Feasibility in the project area	Advantages	Disadvantages
Hydroelectric	NO There are no permanent rivers in the project area for a viable HEP project	Renewable energy	Site specific High initial capital investment Long lead time of between 7-10 years Vulnerable to large variations in rainfall and climate change.
Geothermal	NO Paucity of geothermal resources in the area therefore not a suitable alternative.	Renewable energy Cheap to operate	Air pollution Heavy initial capital investment Site specific Long lead time of between 7-10 years
Wind	YES Wind power is plentiful, renewable, widely distributed	Renewable energy Cheap source of energy in the long run Clean source of energy	Site specific Requires high capital investment for transmission lines. High set-up costs.
Thermal	YES	Short turnaround Not site specific Short lead time	Expensive to run due to high fuel prices Air pollution from burning of fossil fuels
Solar	YES On Average only 3 months a year experience sunshine hour of below 200 hrs a month in the project area.	Renewable Minimal impacts on environment Low turnaround Clean energy	Requires large areas Weather controlled

Some of these sources are site specific, require heavy financial investment, and take a longer implementation period before power can be sourced. Solar is the most environmentally friendly and is considered the most suitable renewable energy technology for this site, based on the site location, ambient conditions, and energy resource availability.

In addition, the selected technology is associated with very low noise levels and ease of installation. With regards to solar PV systems, the grid-connected PV power plants and the off-grid and mini grid systems are relevant to Kenya (IFC, 2014). Other solar technologies include fixed PV plants, tracking PV plants (with solar panels that rotate following the sun), concentrated solar panels and concentrated PV plants.

7.4 Analysis of Alternative Technology

The solar power generation technologies considered include PV flat plate technologies, which use Global Horizontal Irradiance (GHI) and Global Tilted Irradiation/Irradiance (GTI), Concentrating Photovoltaic (CPV), and Solar Thermal Power Plants also referred to as Concentrating Solar Power (CSP) plants, which use Direct Normal Irradiance (DNI) (IFC, 2014).

CPV is a photovoltaic technology that generates electricity from sunlight, a large area of sunlight is focused onto the solar cell with the help of an optical device. CSP systems generate solar power by using mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. CSP is not to be confused with CPV. In CPV, the concentrated sunlight is converted directly to electricity via the photovoltaic effect.
GHI is the total amount of shortwave radiation received from above by a surface horizontal to the ground. GTI or total radiation is received on a surface with defined tilt and azimuth, fixed or sun-tracked. This is the sum of the scattered radiation, both direct and reflected. DNI is the amount of solar radiation received per unit area by a surface that is always held perpendicular (or normal) to the rays that come in a straight line from the direction of the sun at its current position in the sky.

GHI and GTI are the solar resources used for assessment of PV technology while DNI is a solar resource for CSP and CPV technologies. DNI is involved in thermal (concentrating solar power, CSP) and photovoltaic concentration technologies (concentrated photovoltaic, CPV). Solar modelling results show that Kenya has very high potential for PV power generation (IFC, 2014). For the proposed solar power Plant project in Kerio, Turkana, Solar powered PV technology was therefore the preferred option due to the favorable climate.

Financial, technical, and environmental factors were considered when choosing the type of solar power technology for the site, including the local solar resource and its likely generation output, the economics of the proposed facility, availability of government feed-in tariffs and energy production licenses, and the requirement for other development inputs such as water resource requirements. PV was the most environmentally sensitive technology for the preferred site, as large volumes of water are not needed for power generation purposes compared to the CSP option. CSP requires large volumes of water for cooling purposes. PV was also preferred when compared to CSP technology because of the lower visual impact.
PV modules must be mounted on a structure to keep them oriented in the correct direction and to provide them with structural support and protection. Mounting structures may be fixed or tracked.

Fixed tilt arrays are typically tilted away from the horizontal plane in order to maximize the annual irradiation they receive. The optimum tilt angle is dependent on the latitude of the site location. The ideal azimuth for a system in the northern hemisphere is geographic south, and in the southern hemisphere, geographic north. Fixed tilt mounting systems are simpler, cheaper, and have lower maintenance requirements compared to tracking systems.

In locations with high proportions of direct irradiation, single- or dual-axis tracking systems can be used to increase the average total annual irradiation. Tracking systems follow the sun as it moves across the sky. These are generally the only moving parts employed in a solar PV power plant. Single-axis trackers alter either the orientation or tilt angle only, while dual-axis tracking systems alter both orientation and tilt angle. Modules orientation optimizes the total annual energy yield depending on the location. The location being north of the Equator, the tilt Angle for the modules will be at latitude degrees of 610. The Azimuth (direction) will be 0 considering that the project site is on the North.

7.5 No Project Option

Under the "No Projective Option", any potential adverse environmental and social impact associated with the project would not occur. However, preliminary assessment indicates that the disadvantages with the no project scenario include the following:

- Increased power deficit and load shedding
- Lost opportunity to promote renewable energy, which leads to not achieving the Vision 2030 target toward clean energy production
- Loss of employment opportunities for the local people who could have been employed during the construction and operation phases of the project
- Loss of government revenue through reduced taxes
- Loss of business for suppliers and contractors
- No added value to the proposed project site and no development to surrounding sites
- No benefit by the proponent from revenue expected from the solar power facility
- Unchanged economic status of Kenyans and the local community
- Underutilization of local skills
- Reduced interaction both at local, national, and international levels
- Increased urban and rural poverty and crime in Kenya
- Discouragement for investors to produce this level of affordable facility to the public
- Development of infrastructural facilities (roads, electrical etc. will not be undertaken)

From the analysis above, it became apparent that the *No Project Option* is no alternative to the Proponent, local people, Kenyans, and the government of Kenya.

7.6 Proposed/Selected Development Option

Under the *Proposed Development Option*, IPPs would progress with the project, provided all environmental measures are complied with during the construction and operation phases.

Under the proposed project alternative, IPPs would fully develop the proposed Kerio Mini grids Project. This would provide employment directly and indirectly to the people of Kerio location. It would provide jobs for the workers during construction. After completion, technical and security jobs would be generated for management of the project. More energy would also be generated for the market thus giving consumers a wider range of products as well as reduced prices. The project would also increase government revenue through payment of various fees by the occupier before engaging in any business.

Under the "No Project Alternative", there would be no development whatsoever. There would be no increased benefits from the site neither would there be insignificant environmental impacts. With the implementation of the proposed mitigation measures, including sound construction management practices, the anticipated impacts on soil and drainage, air and water quality, flora, fauna, and avifauna would be reduced and where possible avoided. Commitment associated with this alternative would ensure that potential negative impacts are avoided or reduced to levels of insignificance.

CHAPTER EIGHT: ENVIRONMENTAL MITIGATION MEASURES

This section details the mitigation measures that will be undertaken by the proponent for the negative impacts arising from the project which will be towards reducing the impact of the triggered world bank safeguard policies.

Table 8.1: Impact Assessment Matrix (Reference to Table 6.5 above)

		Likelihood Rating		
CONSEQUENCE RATING		A	B	C
	1	1A	1B	1C
	2	2A	2B	2C
	3	3A	3B	3C
	4	4A	4B	4C
	5	5A	5B	5C
	6	6A	6B	6C
KEY				
Consequence		Likelihood	Acceptability	
1-Negligible	4-Significant	A-Low	Negligible with minor mitigation	
2-Minor	5-Catastropic	B-Medium	Minimize Impacts	
3-Moderate	6-Beneficial	C-High	Unacceptable	

8.1 Negative Impacts and Mitigation Measures

8.1.1. Design Phase Negative Impacts

Receptor	Design Phase Impacts	Impact Rating	Mitigation Measures	Residual Impact
Socio-economic; Economic Setting Transport and access to the site Post and telecommunication	Land use change; The proposed development will have an impact in that it will disrupt grazing activities on the proposed land site as a result of the construction and operational phases of the project. The proposed site will be donated by the community of the area. .	2A	**Enhancing benefits to the local community** Potential CSR projects will be identified in collaboration with Turkana County Government and community representatives to ensure alignment with the key needs identified through the socio-economic baseline survey Projects will be identified in collaboration with the land owners as well as other local stakeholders to improve general living conditions and access to better living standards. The project proponent (REREC) should ensure that all land acquisition procedures are documented and land donation procedures are followed keenly, including holding regular stakeholder engagement forums giving prior information regarding the land take procedures. In the case of unavoidable land take, that land in question shall be acquired in accordance with the applicable law and the previously done resettlement action plan report .	2A
Socio-economic; Economic Setting	Community Perception on the project	2A	**Employment Opportunities and other benefits** Creating equal employment opportunities for locals. All contractors will be required to prioritize local employment.	2A

			Educating the locals on the objectives and benefits of the project.	

8.1.2. Construction phase negative impacts

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
Air quality	**Emissions of air pollutants** Dust and Exhaust emission from vehicle movement. Welding operation will also emit gases and fumes such as ozone, chromium particularly in its hexavalent state (Cr+6) carcinogens, cadmium and lead. All these emissions are harmful to human health and cumulative impacts may lead to death.,	4B	• using clean fuels, efficient machines and regular maintenance of equipment. • Avoiding equipment and vehicles running unnecessarily to reduce emission. • Sprinkling water on soil before excavation and periodically when operations are underway to prevent raising of dust. • Covering of all haulage vehicles carrying sand, aggregate, and cement • Controlling the speed and operation of construction vehicles, especially over unpaved roads • Avoiding open burning of solid waste through segregation and recycling, and through disposal according to a solid waste management plan • Stock piles of fine materials for example sand and ballast should be wetted or covered with tarpaulin during windy conditions. • Material handling should be done by a competent person, especially when handling hazardous materials during welding	3C

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			• Ensure waste equipment with identified hazardous materials are properly disposed of during construction. Material handling should be done by a certified waste handler, registered under the NEMA, Kenya • Educate and raise awareness of construction workers on emission reduction techniques. • Workers in dusty areas on the site should be issued with appropriate PPE such as, dust masks during dry and windy conditions.	
Biodiversity (Flora, Fauna)	Loss to habitat and damage to vegetation due to land clearing for construction. Majority of these service lines are constructed using wooden poles. This would impact on the environment as close to a one hundred concrete poles will be needed according to the preliminary estimates.	3C	Supply seedlings to local and encourage afforestation. Limiting vehicular transport to undefined roads to prevent unnecessary damage to habitats. Routine checking of trenches, escape routes to minimize and prevent entrapment of fauna. minimize hazards to native flora/fauna. Maintaining of landscaped gardens, terraces, conservation, and management of the vegetation and gardens. Clear limited areas only where the panels foundations will be erected. Select alternative site locations to avoid sensitive natural features. Compensation for loss of trees to the owners(community).	2C

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
Soil characteristics	**Soil Disturbance, soil compaction and soil erosion** Loss of top soil, accumulated carbon, increased erosion and run-off may result due to compaction, trenching and excavation of the project site. **Soil Contamination** Leaks from transformers, batteries with heavy metals, vehicles and machinery may result in soil contamination.	3C	Clearing vegetation only in construction areas and demarcating areas where no clearing will happen, walking paths and access roads. Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and placing onto areas where the reestablishment of plant cover is desirable to prevent erosion if it is necessary. Rehabilitation of excavated areas. Control plan for evasive weeds/plants. Need to design appropriate protection devices against accidental discharge of transformer oil substances and frequent inspection of transformers for leaks Segregation of wastes. Proper containment of obsolete batteries to prevent run-off leaching. Efficient drainage systems. Erosion control structures. Designate areas for repairs and maintenance to minimize areas contaminated. Keep vehicles on defined tracks. Rehabilitate cleared areas. Implementation of a storm water management plan.	2C
Soil Properties	**Risk of oil spill or chemical spillage**	2C	Set up measures for spill prevention and measures to prevent seeping of contaminants i.e. designated concrete impervious areas for repairs, refueling and	2C

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	Machinery and vehicles contain moving parts which need oiling. Oil spills from such activity may lead to soil pollution and possible groundwater contamination.		oiling. Products such as lubricants and oils should also be well labelled and stored appropriately at their designated storage areas. Prepare and display on site spill response procedures and train all the workers on response management. Maintain spill response kits at the site office. Use of water-based fluids including non-toxic chemicals Ensure that no sanitary or waste water is discharged irrationally and ensure compliance with the set legislation.	
Land use and Visual Impact	The visual impact of the construction site might not be appealing to some of the nearby residents. Also, the site will be affected by the general construction activities and temporary worker accommodation facilities Aesthetics Design and Work Plan Impacts	2A	• Use of physical barriers such as walls and netting Ensure that the contractor only clears vegetation in areas where construction will occur and improving the aesthetics of areas cleared through landscaping. Avoid tourism sites and consider ways of visual intrusion. No use of gravel or sand from the onsite or surrounding areas. Consider possible alternatives for construction materials (aggregates) from the certified suppliers. The use of concrete for stabilization is to be avoided as much as possible. Choice of the location that gives the best economy in terms of excavation and fill in order to avoid or minimize soil erosion during excavation works for	2A

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			the construction of the stand-alone PVS structures. In case of usage of free-standing structure, a proper structural design that is environmentally friendly and requires less maintenance is suggested. Driven piers and screws are recommended in order to minimize the environmental impact of the facility.	
Solid waste generation	Construction will lead to generation of wastes from the civil works and operations on the materials. These wastes include metal cuttings, rejected materials, wire pieces, food wastes and surplus materials, obsolete batteries, tree cuttings. etc. Impacts range from risk of injury to reducing aesthetics of the environment.	3C	Following EMCA regulations on Waste Management, 2006 Legal Notice 121. Establish a working waste management plan. Reducing material residual wastes through accurate estimation of size and quantity. Recycle of construction materials. Use of durable long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. Proper storage and handling of materials to prevent damage. Reuse of materials and packaging material to reduce waste. Disposal of waste should be done by a licensed waste handler. All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal. Manage storage, transfer, and disposal of transformer oils, acid and other hazardous materials according to industry standards	2C

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			Put up well protected mobile collection units/storage for obsolete batteries before collection by a licensed waste handler by NEMA, which should be properly equipped and shall be protected from solar radiation, humidity and temperature	
Waste water Generation	If the project does not have well designed storm water drains, and once the soil is saturated with water and has no proper gradient to allow water flow, it will form pools of water; the rain water may end up stagnating thereby creating conducive breeding areas for mosquitoes and other water-based vectors which may lead to human diseases like malaria and bilharzia.	2C	Proponent will make sure that storm water channels are maintained regularly, and lawn gradient is in place to assist in water flow. Clearance of all tall grasses that may harbor vectors. Regular spraying and treatment of green areas in the site to control vectors such as mosquitoes. Waste water generated at the site should be handled, managed and disposed according to the water quality regulation that require the proponent to treat waste water prior to releasing it to the natural environment.	2B
Ecosystem disturbance	Construction activities and movement may cause habitat disturbance to available wild animals such as birds and	2C	Ensure proper demarcation and delineation of the project area for construction works, trailer locations, equipment and storage. Designate access routes and parking within the site. Design and implement an appropriate landscaping	2B

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	dominant plant species. This may cause migration of species from the area.		program to help in re-vegetation of parts of the project area after construction.	
Ground water hydrology	Site dewatering may lower the water table in the surrounding areas. Compact surfaces may reduce recharge.	2C	Ensure that projected use of groundwater is within the capacity of natural system to replenish itself. Use indigenous vegetation that requires less water, drip irrigation or shaded plantings. Design storm water management systems as suggested above, use vegetation to retain recharge and purify storm water.	2B
Ground water quality	Site dewatering may cause increase of contaminated ground water to the surrounding areas	2C	Proponent will make sure that storm water channels are maintained regularly, and lawn gradient is in place to assist in water flow Solid waste generated at the site should be handled, managed and disposed of according to the EMCA Waste Management Regulations, 2006, that require waste to be collected and transported for disposal by a licensed waste handler.	2B
Generation of noise	During the construction phase of the proposed project, there is expected to be an increase in the noise levels within the area due to machinery/	4C	Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machines when not in use. Safety awareness creation to the workers Sensitize construction drivers to avoid gunning of vehicles engines or hooting especially when passing	3B

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	equipment including generators, vehicular traffic, and other construction activities. Elevated noise levels within the site can affect project workers and the residents, passers-by and other persons residing around the project site.		through sensitive areas such as schools, hospitals and residential areas. Ensure that construction machinery is kept in good condition to reduce noise generation. Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels. Use of signs, barriers and education/ public outreach to prevent public contact with potentially dangerous equipment Erect signs and notify other users of noisy activities. Conduct all noisy activities during the day when permissible levels are higher. Provide of recommended PPEs for various assessed risks such as ear plugs for employees working in noisy conditions or with noisy equipment. Use equipment with low noise ratings or noise reduction technologies, e.g. the generators. Erect a perimeter fence to reduce noise propagation. Monitor noise levels at sensitive receptors (residential areas, schools, hospital's) Work through community liaison officers to agree on working hours and to respond promptly to complaints	
Occupational Safety and Health (OSH) risks	**Health and safety risk** Construction activities may expose workers to	4C	Safeguard welfare of workers as outlined in OSHA. Employing an OSH plan that will outline all OSH risks and provide a strategy for their management	3B

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	risks of accidents and injuries from accidents, fire hazards, electrical faults, building collapse, risks of sharp objects, fall from heights among others. Public health risks may be due to interaction of new workers with the locals leading increase in STDs.		and maintain an on-site record of incidents and accidents that occur throughout the project cycle. Ensuring all potential hazards such as movable machine parts and chemicals are labelled. Provide workers with PPEs and training them on equipment use and risks. Placing visible and readable signs around where there are risks; control the movement of vehicles, motorists and pedestrians around the site. Conduct regular health and safety audits, by a competent safety and health advisor and ensure records of such audits. Provide safe and secure storage for equipment and materials at the site and maintain MSDSs. Maintain a fully stocked and accessible first aid kit and fire-fighting equipment. Proper public education to the people on safe use of electricity Proper wiring in the customers' premises by qualified technicians Creating safe and adequate fire escape and emergency assembly points and making sure they are well labelled. Establish emergency response procedures. The site must be organized to accord ease of movement during emergencies e.g. fire outbreak. Post "NO Smoking signs throughout the site	

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			Construction materials should meet minimum standards applicable in the Country by Kenya Bureau of Standards (KeBS) Ensuring that work standards are observed and that there is no compromise, site specifications are observed strictly. Complying with the EMCA noise regulation of 2009 that requires work activities to be done during the specified time of day as per the notice issued by the proponent during construction. Public awareness of the public health issues identified. Provision/Distribution of condoms. Distribution of HIV & AIDS awareness materials in collaboration NACC	
Infrastructure and Traffic	**Increased Traffic.** The main road leading to the site will serve the additional vehicles used for the transportation of materials and machinery at the site leading to interference with traffic. Heavy trucks, when used will only have the effect of destroying the operational road network	3B	A well-structured Traffic Management Plan will need to be implemented e.g. efficient scheduling of deliveries to reduce traffic load. Placing signs around the site notifying other vehicles about the heavy traffic and to set the speed limit around the site during construction phase. Ensuring all drivers for the project comply with speed regulations. Flagmen should be employed to control traffic and assist construction vehicles as they enter and exit the project site. Use off-peak hours to transport materials to reduce	2B

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	especially near the site area and turning points. This will also lead to increase in traffic congestion near the project site. This may also cause risk to public safety i.e. road accidents.		traffic. Keeping construction material away from road reserves.	
Social Environment	**Increased Pressure on available utilities** Influx of people into the project area will lead to pressure on the existing utilities. The project uses water for construction and this also places pressure on such resources. Services disruption is also likely.	4B	Employing water conservation techniques and only using the required amounts of water to prevent wastage, for example, ensuring roofing designs that maximize rainwater harvesting. Providing adequate water storage reservoirs at the construction site to meet project needs during periods of high demands externally and refill tanks during the periods of low demands, for example during late nights. Harnessing of solar energy to subsidize electricity and other sources of energy used in water heating. Adopt or develop building designs that necessitate maximum use of natural light and effective circulation of air in the building. Employing power saving techniques such as switching off equipment when not in use, using natural light whenever possible Proper planning of transportation of materials to minimize unnecessary trips by trucks	3B

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			Using machines with power saving technologies i.e. high efficiency equipment Providing proper sanitary facilities for construction workers Inspecting the drainage facilities regularly to ensure they are free of debris that may reduce their efficiency	
	Increased social strife's and cultural conflicts Population influx may also bring with it social strife due to clash of cultural ideals, security and safety concerns, risk of GBV-SEA/SH, , and competition for job opportunities	3B	Encourage timely and continuous public participation with the locals throughout the project cycle Proper induction of workers, contractors and sub-contractors on code of conduct, local cultural behavior, and responsible community interaction Proper implementation of security, fencing and signage around the project site Prioritize local employment Immediately repairing and maintaining any damage caused by the project operations on public or private properties. Have an Emergency Response Plan and a Traffic Management Plan in place and ensure employees always comply with them. Ensure an effective GRM Avoid child and force labour	2A
Social Environment	Gender Inequality Impacts	3B	• • The Contractor should uphold principles of gender equality through compliance on equitable distribution of employment	3A

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			opportunities, safe employment of women, including training opportunities, regular consultation with female employees and employ other measures that ensure physical safety and dignity of female workers.	
Social Environment	Gender-Based Violence-Sexual Exploitation and abuse (SEA) of community members by project workers, Sexual Harassment at Work Place and Other forms of GBV	3B	○ • Contractor to develop and implement a GBV-SEA (Sexual Exploitation and Abuse and workplace Sexual Harassment (SH) management plan, (including plans for prevention, response and GRM) -Contractor to ensure that a code of conduct is developed and signed by all with physical presence on site -Contractor to train and create awareness to local communities and workers on GBV ○ -Contractor to ensure that the project GRM provides confidential reporting, safe and ethical documenting of GBV cases. Contractor to ensure that the project does not trigger or exacerbate other forms of GBV at the community level by reviewing specific project components that are known to heighten the GBV risk, and ensure	3A

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
			effective and on-going community engagement and consultation, particularly with women and girls, among others. Contractor can refer to the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018) for further guidance.	
Social Environment		3B	○	3A
Social Environment	Labour influx into the project area	3B	• The contractor to develop & implement a Labour Influx Management Plan and Workers' Camp & Accommodation Management Plans as part of C-ESMP and monitor all mitigation measures, including codes of conduct signed by all with physical presence on site, prioritization of local recruitment, induction of workers on GBV-SEA/SH, GRM for staff., avoid child and forced labour and enforce sub-contractor compliance of the same. •	3A
Social Environment	Spread of communicable diseases, HIV/ AIDs and other sexually	3B	• Contractor to develop and implement a STD/HIV/AIDS awareness plan on prevention and mitigation	3A

Receptor	Construction Phase Impacts	Impact Rating	Mitigation Measure	Residual Impact
	transmitted diseases		•	

8.1.3. Operation phase negative impacts

Receptor	Operation phase impacts	Impact Rating	Mitigation measures	Residual Impacts
Pressure on existing infrastructure and utilities	Influx of people into the project area will lead to pressure on the existing utilities. The project uses water for construction and this also places pressure on such resources. Services disruption is also likely. The project uses roads and may cause traffic, strain demand for electricity etc.	3C	Explore and Initiate water conservation programs such as roof catchments and rainwater harvesting systems and using dead man taps Sensitize all the stakeholders on the need to conserve water and energy resources. Using only the required amounts of water during normal operations. Using natural light during the day for lighting purposes. Using power efficient tools. Using project vehicles to supply locals with water	2B
Increase in land values and land use changes	The project will turn the area into a commercial one thereby raising the value per acre. Land use change may also occur, from agricultural to commercial impacting vegetation and emission of GHGs due to increase access to energy and power.	3C	Complying with zoning bylaws Collaborating with public and planning officials on the development and future developments Aligning the project's objectives with those of national, county and County development policies.	2B
Climate modification	Change in land surface from natural vegetation to manmade built landscape will lead to reduction in the amount of evapotranspiration from the	3B	Paving should only be carried out where necessary to reduce the reflection of the solar radiations. Landscaping the site with indigenous species of plants Using sustainable drainage systems that mimic the natural percolation of water into the soil, and green roofs where	2B

	vegetation in the area which is also a GHG sink.		possible.	
Security concerns	The diversity of people may attract thieves to the area since they may target either the businesses or the people themselves and their belongings. The creation of a hub may also be a target for terrorists as has been experienced in the past where malls have been put on high alert due to terror threats. Vandalism will also arise where parts of the mini grids may be tampered with.	2B	Employing of security guards/competent security firm who are to hire from the local population at the site and searching all vehicles and people entering the project Use of CCTV cameras to monitor security within the site Collaborating with the national police on security matters Placing alarms around the project and establishing emergency preparedness and response procedures (EPRP)	2A
Increased surface run off	The paved surfaces and the project structures created from the construction phase of the project can lead to increased run-off by preventing the natural percolation of water through soil. This will also aggregate to the changes in the surface and subsurface hydrology as a result of the project. The increased run-off may lead to soil erosion in the areas where the water drains off to or drainage blockages.	3A	Using materials that mimic natural percolation of water. Landscaping to ensure there are areas where water will percolate underground. Constructing proper drains and regular inspections and monitoring them to ensure there are no blockages. All forecourt surface areas with likelihood of receiving contaminated water should be contained by peripheral surface drainage channels leading to the oil-water separator. Drainage channels should be installed in all areas that generate and receive runoff. The channels should be covered with gratings or other suitable and approved materials to prevent occurrence of accidents and dirt entry that may compromise flow of run-off.	2A

			Create embankments to reduce runoff speed and re-vegetate the area to increase water infiltration into the soil. The service station management should seek to Assess and Adopt opportunities for rain water harvesting and storage reducing the surface runoff.	
Generation of noise	Noise will be generated from different sources such as diesel generators without silencers or motor running. Vehicles visiting the project site during maintenance periods will also generate noise.	3B	Erecting signs and notifying other users of noisy activities. Conducting all noisy activities during the day when permissible levels are higher. Provision of PPEs such as ear plugs for employees Using equipment with low noise ratings Sensitize vehicle drivers to avoid unnecessary hooting.	2A
Generation of hazardous waste	Contamination of soil and ground water may be caused by leaching of battery chemicals and oil spills.	4C	Separation of wastes Disposal of the wastes will be done by licensed entities based on proper waste regulations Proper record keeping of the wastes on its storage and handling by the licensed entities for disposal Store waste batteries at a designated lockable area on site awaiting collection and transportation to a waste disposal facilities by a licensed waste handler that specialize in hazardous materials Need to design appropriate protection devices against accidental discharge of transformer oil substances. Frequent inspection and maintenance of the transformers should be done to minimize spilling. All electronic waste should be collated and stored in a safe area, awaiting collection by the licensed waste handler, hired by the proponent.	3C
Social	Social strife arising from	2B	Integrating and implementing Equal Opportunity	1 A

cultural	population influx. New population comes with new cultures that may result in disregard for local culture. Richer middle class may also displace lower middle class. Influx may also result in public health risks.		Principles in procurement and human resource policies. Promoting social cohesion and integration among people in the area. Creating awareness towards the diversity of cultures among project staff and locals through sensitization. Enabling locals to form social groups and networks that build social capital. Targeting social investment programs towards the local communities and region. Respecting the cultures and upholding the dignity of the local communities through ongoing consultations (as defined in the SEP) and taking their views into consideration at all stages of the project implementation	
Occupation Health and safety	**Potential OSH Risks** The various project components pose significant OSH risks to the working population, where these risks are associated to the various equipment used and/ or project activities. Potential risks include flammable and volatile fumes, insecurity, fire hazards, electric faults, and electrocution.	4B	Emergency preparedness and awareness and training workers on security drills. Formation of HS committees from the site staff across as per the OSHA and Factories Act regulations. Signage to control movement. Placing warning signs in languages understood by locals. Creating safe and adequate fire and emergency assembly points and making sure they are well labelled. Ensuring there is security in and around the site to control movement of unauthorized personnel. Sensitize the local community on the know-how of electricity. Ensuring all potential hazards such as movable machine parts are labelled. Providing safe and secure storage for equipment and	2C

			materials in the site and maintaining Material Safety Data Sheets (MSDSs) All workers should be provided with PPE and trained on how to use them. Providing firefighting equipment in easily accessible areas and training personnel on how to use them. Proper insulation of power cables. No burning of vegetation along the distribution lines along the rights-of way and maintenance of right of way. Time maintenance of transformers	

8.1.4. Decommissioning phase

Receptor	Decommissioning phase impacts	Impact Rating	Mitigation measures	Residual Impact
Generation of noise	The main sources of noise will include: cars and trucks, civil works of pulling down the project's-built structures and mechanized equipment.	3B	Decommissioning works during hours when high noise levels are permitted. Machineries should be maintained regularly to reduce noise resulting from friction. Provide workers with PPEs for noisy environments. Provision of billboards at the construction site gates notifying people of the activities and timings. Shielding the area to reduce noise propagation	2A
Demolition waste generation	Waste in form of debris and pieces of metal and wood will arise, creating the need for disposing off waste; all the disadvantages associated with waste mismanagement will arise such as spread of diseases. It is	4B	Following all specified EMCA regulations on Waste Management, Legal Notice 121, including watering all dust emitting materials to reduce air pollution during demolition activities. Employing a waste management plan. Reducing wastes through recycling re-usable materials. Allocating responsibilities for waste management and	2B

	hoped that this phase will be implemented only under unavoidable circumstances, for instance, aging of the building and/or pertinent rights arising.		identifying all sources of wastes, and ensuring wastes are handled by personnel licensed to do so. Making available suitable facilities for the collection, segregation and safe disposal of the wastes. Ensuring all wastes are dumped in their designated areas and through legally acceptable methods	
Emission of air pollutants	Gases such as oxides of C, N and S from the burning of fossil fuels in engines, or particulate matter from cuttings and breakages of steel, glass, shavings, bricks and movement of soil. These pollutants will pose risks to both human and environmental health through air pollution, water pollution, soil contamination, respiratory diseases, skin disorders and irritations. Air Pollution through improper disposal which leads to release of toxic, hazardous and carcinogenic gaseous,	3A	Use efficient equipment with low emissions. Using clean fuels such as de-sulphurized diesel and unleaded fuels. Using Dust screens. Removing components with potential of emitting hazardous gases or particulates separately and under caution to prevent emissions. Recycle all E-waste; Transport all E-wastes using a licensed waste transportation company to a licensed e-waste handler. Conduct awareness and sensitization targeting the users of the electronic devices to ensure that they engage in best practice for E-waste management.	2B
Generation of hazardous waste	Battery lead acids are hazardous and may pose health risks. Pollution of landfills and water bodies may occur.	4C	Segregation of wastes prior to treatment. Disposal of the wastes will be done by licensed entities. Proper record keeping of the wastes on its storage and handling by the licensed entities for disposal Store safely waste batteries at a designated area on site prior to collection by a licensed hazardous waste handler for transport to a recycling or waste disposal facilities that	3C

			specialize in hazardous materials.	
Occupational health and safety risk	**Risk of Respiratory Illnesses due to Air Pollution** Inhalation of fumes, dust from decommissioning activities may lead to respiratory infections. Fire risks and electrocution may occur from electrical cables. Electronic equipment may also contain hazardous material harmful to human health.	3B	Employing an OSH plan that will outline all OSH risks and provide a strategy for their management. Ensuring all hazards such as movable parts are labelled. Educating workers on equipment risks and training them on use. Providing and maintaining proper PPEs. Placing warning signs in risky areas. Ensuring there is security in and around the site to control movement of people. Providing safe and secure storage for the waste and materials in the site. Signs to control movement and notify pedestrians and workers on-site. Providing firefighting equipment and easily accessible escape routes, fire assembly points and ensure site personnel are well trained. Labelling chemicals and materials according to the risks they pose. Establishing emergency procedures against hazards and ensuring the workers stay aware/educated. Purchasing optimum and efficient electronics to reduce E-wastes. Recycle all E-waste and educate users on best practices for e-waste management.	2B

8.2 Cumulative impacts

Cumulative impacts can be characterized as impacts on the environment which are caused by the combined results of past, current, and future activities. Over time, direct and indirect human activities combine to collectively impact the environment.

Kerio lacks any development that generates electricity hence the project will be vital to the improvement of the social and economic life of the local community. The closest development is in Lodwar town which operates on diesel and can't meet the increasing demand in the town which is occasioned by blackouts in some areas. Impacts related to the project include discharge of low recurrence electromagnetic radiation (EMR) which makes Electromagnetic fields (EMF). This EMF has two parts, an electric field and an attractive field. An attractive field comes about because of the stream of current through wires or electrical gadgets and increments in quality as the present increments. The strength of a magnetic field decreases rapidly with increasing distance from its source. Electric fields are produced whether a device is turned on, whereas magnetic fields are produced only when current is flowing, which usually requires a device to be turned on. Power lines produce magnetic fields continuously because current is always flowing through them. Electric fields are easily shielded or weakened by walls and other objects, whereas magnetic fields can pass through buildings, living things, and most other materials. Electric and magnetic fields together are referred to as EMF. Impacts from EMF are negligible. EMF produced by electricity is nonionizing radiation, meaning the radiation has enough energy to move atoms in a molecule around (experienced as heat), but not enough energy to remove electrons from an atom or molecule (ionize) or to damage DNA. Modern humans are all exposed to EMF throughout their daily lives without negative health impacts.

During the public and stakeholder exercise, there were no other planned developments identified in the area. The construction of the PV solar mini grid in the area will expand business opportunities due to the increased access to energy and power sources in the area. It is envisioned that security lights will be working at night and thus increase security in the area. Future potential developments in the area around the Project site will require a variety of permits, including an EIA approval and a "change of use" clearance.
All in all, there are no significant future developments for which this ESIA should consider cumulative effects with the Project.

CHAPTER NINE: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

This section of the ESIA provides environmental, health & safety, and community-related management controls that Rural Electrification Authority herein the proponent (and its contractors) will implement to avoid, minimize, and manage the triggered World Bank safeguard policies moreover the potentially adverse environmental, and health & safety-related risks and impacts identified as part of this ESIA. In addition, the ESMP ensures that the project implementation process conforms to set laws and regulations both nationally and internationally.

After successful implementation of the ESMP, the project and the ecosystem will co-exist together with social systems within the project area of influence. However, to ensure that the staff responsible for implementing the plan has the capacity to do so, training will be a fundamental requirement and staff will be made aware of the project's aspects and risks and empowered with the knowledge of reducing these risks.

We therefore recommend that the proponent develops a training program on EHS and all the aspects of the ESMP. The main aim is to ensure the project's employees can also respond or be proactive towards risks. Such trainings must be documented for subsequent evaluation of their effectiveness, productivity, and efficiency in Mini grids development towards EHS management. The ESMP is applicable throughout the project lifecycle and will continue to evolve in scope and depth during the different stages project development.

The proponent must establish and maintain an organizational structure that defines roles, responsibility, and authority to implement the ESMP described in this ESIA. This will include the following aspects:

Designation of a Senior Manager with overall responsibility and one or more Managers with day-to-day responsibility for specific areas or stages of the ESMP, including management of the various contractors

Statement of commitment by Senior Management to devote the necessary human and financial resources on an on-going basis throughout the Project to achieve effective and continuous conformity with the ESMP

Communication of the commitment, roles, and related responsibility to REA Project teams and public/stakeholders; awareness and training of employees involved with the project with respect to the social and environmental aspects of the Project and the Specific relevant obligations under ESMP.

Oil spills during the life cycle of the project will be mitigated according to the point source and use reduction/elimination measures for the respective point source. While Rural Electrification Authority will have the overall obligation regarding the project and execution of the ESMP,

various contractors engaged will do much of the work: this includes the main Contractor, Quality Health Safety Environment (QHSE) Officer. Thus, it is important for REA to implement procedures in a Contractor Management Plan to ensure that the contractors are fully aware of the relevant ESMP issues and successful implementation of it.

Other than the EIA, EMCA Act requires yearly audits of the proposed project, to confirm the efficacy and adequacy of the Environment Management and Monitoring Plan.

REREC, the contractor (during construction) and the IPP (during operations) should build up a Grievance Redress System (GRS) to address grievances raised by stakeholders. Such GRS should be made available to staff on recruitment and to members of the public either through government agencies/offices through grievance application forms, and internally by establishing procedures for investigation and quick redress that will be recorded and tracked.

9.1 Design Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline Reference**	**Impact**	**Mitigation Measures**	**Responsible person/ Function**	**Performance indicator**	**Timing/ Frequency**

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline Reference**	**Impact**	**Mitigation Measures**	**Responsible person/ Function**	**Performance indicator**	**Timing/ Frequency**
Performance Standard 7, PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security Employment, 2007	**Socio-economic;**	Community Perception	**Employment Opportunities** Preparing and implementing a Community Engagement and Communication Plan in consultation with the project affected persons/communities and other stakeholders Establishing a recruitment and procurement policy prioritizing local and balanced and inclusive employment (youth, women, vulnerable groups, IPs). Recruitment and procurement will be in line with national regulations. . The local recruitment plan to ensure that jobs are advertised transparently, using culturally acceptable mediums and in accessible locations.	REREC/ Community Liaison Officer (CLO) Contractor Local, County and National Government	Grievance from public	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs & IFC PSs) and Applicable Kenyan Legislation	**Baseline Reference**	**Impact**	**Mitigation Measures**	**Responsible person/ Function**	**Performance indicator**	**Timing/ Frequency**
Indigenous People (OP/BP 4.10), Performance Standard 7 PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security Planning Act Cap 286 The Trade Licensing Act, Cap. 497	**Socio-economic;** Economic Setting Transport and access to the site Post and telecommunication		**Enhancing benefits to the local community** Potential CSR projects will be identified in collaboration with Turkana County government and local community to ensure alignment with the key needs identified through the socio-economic baseline survey Preparing and implementing an accessible GRM in consultations with the project affected persons/communities and sensitizing all the PAPs and other stakeholders on its practical usage and implications	REREC/ CLO Contractor Local, County and National Government	Grievance from public	Weekly

9.2 Construction Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Natural Habitats (OP 4.04) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act	**Bio-Physical;** Biodiversity and ecosystem	Disturbance and damage to flora, fauna and avifauna; and their habitats	Clearing of vegetation should only occur within the area of construction of solar PV power plant and transmission lines; and along identified access roads. The contractor and Environmental, Health and Safety (EHS) Officer should demarcate areas where no clearing will occur Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic and equipment Design and implement an appropriate landscaping program to help in re-vegetation of parts of the project area after construction. Vehicle movement, parking and human traffic should be limited to designated roads and paths. Education on the importance biodiversity of flora and fauna. Rehabilitation of cleared areas by planting indigenous species.	REREC/ CLO Contractor/ QHSE Local, County and National Government	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Cap. 302The Wayleaves Act Cap 292			Rehabilitating soils cover to control erosion. A control and monitoring program must be developed starting from construction phase and carried over to the operational phase. Compensation for where there is loss of trees. Contractor should allocate a temporary construction lay-down or assembly area. Plant more trees and provide seedlings to counter tree loss. Ensure accurate budgeting to ensure only necessary material is ordered Proper storage to ensure minimal loss Limiting vehicular transport to undefined roads to prevent unnecessary damage to habitats. Routine checking of trenches, escape routes to minimize and prevent entrapment of fauna Minimize sources of hazards to flora and fauna. Clear limited areas only where the			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			panels foundations will be erected. Select alternative site locations to avoid sensitive natural features.			
Natural Habitats (OP 4.04) and Indigenous People (OP/BP 4.10), Performance Standard 7 PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242	**Socio-economic and Bio-physical environment;** Ambient Noise Levels Public Health	Noise and vibration	Unnecessary running of machines and vehicles to be discouraged. Safety awareness creation to the worker Sensitize construction drivers to avoid unnecessary hooting, Keep machinery in good conditions. Insulate equipment to reduce noise. Use of signs, barriers and education/ public outreach to prevent public contact with potentially dangerous equipment Erect signs and notify other users of noisy activities. Conduct all noisy activities during the day. Provide workers with PPEs. Issuance of work permit to all workers on the site conducting works that require knowledge and experience. Only trained & certified workers to	REREC/ CLO Contractor/QHSE NEMA	Workers in noisy conditions Quality of PPEs (ear muffs, ear plugs)	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			install, maintain or repair electrical equipment Use equipment with low noise ratings or noise reduction technologies, e.g. the generators. Erect a perimeter fence to reduce noise propagation. Proper servicing of vehicles Maintain all work equipment at optimal operating condition Monitor noise levels at sensitive receptors (residential areas, schools, hospital's) Work through community liaison officers to agree on working hours and to respond promptly to complaints			
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention PS 4: Community Health, Safety, and Security	**Bio-physical;** Topography and Soil, water	Soil characteristics, surface water/ground water quality	Construct impervious surfaces in oil spill risk areas to avoid soil and ground water contamination. Appropriate labelling and storage of oil and lubricants. Prepare and display on site spill response procedures and train all the workers on response management. Maintain spill response kits at the site	REREC/ CLO Contractor/QHSE NEMA	Size of landscaped Areas Number of erosion control structures Presence of	Entire Construction Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife Conservation and Management Act of 2013 The Kenya Water Act of 2002			office. Use of water-based fluids including non-toxic chemicals Ensure that no sanitary or waste water is discharged irrationally and ensure compliance with the set legislation. Designate areas for machinery maintenance. Refueling, servicing and maintenance of large vehicles to take place at designated site. Proponent will make sure that storm water channels are maintained regularly, and lawn gradient is in place to assist in water flow Handle and manage solid wastes as outlined in the waste management regulations. . The drainage channels should ensure safe final disposal of run-off /surface water and should be self-cleaning which means they should have a suitable gradient. Proper drainage controls such as culverts, cut-off trenches should be		drainage channels Number of designated access roads for the vehicles	

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			used to ensure proper management of surface water runoff to prevent erosion Soil stockpiles should be protected from wind or water erosion through placement, vegetation or appropriate covering if necessary. Ensure proper storage and labelling of fuel and oil. Proper servicing of machinery to reduce leaks. Sprinkling water on the soil to prevent dust from rising Vehicle movement and human traffic should be limited to designated roads and paths. Contractor should allocate a temporary construction lay-down or assembly area Compacting areas with loose soil Drill a borehole to generate water to avoid using water pan located at the project boundary			
Natural Habitats (OP 4.04) PS 3. Resource	**Bio-physical;** Ambient Air	Air quality (Dust and emissions	Using efficient machines and fuels with low emission Regular maintenance and services of	REREC/ CLO Contractor/QHSE NEMA	Amount of gaseous emissions per	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242 The Kenyan Constitution PS 2. Labor and Working Conditions	Quality	)	machinery and engines Sensitize truck drivers to avoid unnecessary racing of machinery at loading, offloading, and parking areas Avoiding equipment left running unnecessarily Sprinkling water on soil before excavation and periodically when operations are underway to prevent raising of dust Efficient scheduling of deliveries to reduce traffic load Covering of all haulage vehicles carrying sand, aggregate, and cement Controlling the speed and operation of construction vehicles, especially over unpaved roads Avoiding open burning of solid waste through segregation and recycling, and through disposal according to a solid waste management plan Stock piles of fine materials for example sand and ballast should be wetted or covered with tarpaulin during windy conditions and enclose		day: ppm in air per day Amount of particulate emission per day: ppm in air per day	

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			structures under construction with dust proof covers Create awareness of emission reduction techniques. Issue workers with PPEs.			
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention ESS 4. Community Health, Safety, and Security The Kenyan Constitution EMCA amendment 2015 The Climate Change Act 2011 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Traffic Act Cap 403	**Socio-economic;** Public Health Transport and access to site Ambient Air Quality Ambient Noise Levels	Traffic impact	Placing signs around the site notifying other vehicles about heavy traffic and setting the speed limit around the site Ensuring all project drivers comply with speed regulations. /h Designate paths and roads for vehicle and human traffic. Maintaining vehicles at optimum conditions. Establish a working GRM. Traffic control at site entry and exit points. Ease congestion by limiting transport of materials to off peak hours. Comply with traffic and land demarcation rules. Restrict construction to outside road reserves.	REREC/ CLO Contractor/QHSE Traffic Police	No accident/incident Reported Availability of warning signs for heavy traffic and trucks on site Availability of speed limit signage on site Frequency of engine maintenance	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
The Penal Code Cap 63					and servicing	
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention The Kenyan Constitution EMCA 2015 The Kenya Water Act of 2002 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Physical Planning Act Cap 286 The Penal Code Cap 63	**Socio-economic;** Water and Sanitation	Waste and effluent	Development and establishing a Waste Management Plan (WMP) following the principles of waste minimization at source, segregation for re-use, recycling as well as treatment and disposal of waste. Accurate estimation of materials to minimize residue. Recycle construction materials and residue. Use of durable material to reduce replacement residue. Reduce waste caused by damage through proper storage. Use materials with less packaging and re-use packaging to reduce wastes generated by packaging material. All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal Manage storage, transfer, and disposal	REREC/ CLO Contractor/QHSE NEMA	Amount of wastes generated per day i.e. kg/day per and type Frequency of waste collection, segregation, transportation, and disposal	Daily and Weekly collection

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			of transformer oils, acid and other hazardous materials according to industry standards. Put up mobile collection units/storage for obsolete batteries which should be properly equipped and shall be protected from solar radiation, humidity and temperature Vegetative material will be kept on site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation Maintain storm water channels. Lawn gradient to assist water flow. Clearance and treatment of all tall grasses to control vectors. manage and control waste water in line with EMCA regulations.			
ESS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security	**Socio-economic;** Public Health	OSH Health and safety risk	Observe all precautionary and regulatory rules set out in OSHA Employing an OSH plan that will outline all OSH risks and provide a strategy for their management and	REREC/ CLO Contractor/QHSE NEMA	Incident report Availability of PPE Availability	Daily, weekly, monthly statistics

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
EMCA amendment 2015 Traffic Act Cap 403 The Penal Code (Cap. 63) The Public Health Act (Cap 242) Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34 Work Injury Benefits Act, 2007 The National Construction Authority Act, 2011 The Standards Act, Cap. 496		Fire outbreak (environmental disaster) risks Risk of building Collapse Public health risk	maintain an on-site record of incidents and accidents that occur throughout the project cycle. Ensuring all potential hazards such as chemicals and movable machine parts are labelled. Provide adequate PPEs and train staff on equipment risks. Placing visible and readable warning signs around where there are risks; control the movement of vehicles, motorists and pedestrians around the site Conduct regular health and safety audits Provide safe and secure storage for equipment and materials at the site and maintain MSDSs Follow safe work procedures Maintain a fully stocked and accessible first aid kit Observe OSHA 2007 regulations maintain stock of firefighting equipment and train staff on using them.		of warning signs in areas with occupational, safety and health risks on site Number of drills per quarter Efficiency of Equipment such as firefighting Equipment Number of escape routes and assembly points	

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			The equipment may only be used if a certificate of examination has been issued. Public awareness on safe electricity use. Proper wiring in the customers' premises by qualified technicians Creating safe and adequate fire escape and emergency assembly points and making sure they are well labelled Establishing emergency procedures against hazards and ensuring the workers stay aware/educated on them and the magnitude and type of emergency, by conducting regular drills and involving the neighbors Post "NO Smoking signs throughout the site Construction materials to meet minimum KEBS standards. Ensuring that work standards are observed. Complying with the EMCA noise regulation of 2009 Legal Notice 61 Public awareness of the public health			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			issues identified. Provision/Distribution of condoms Distribution of HIV & AIDS awareness materials in collaboration NACC			
Natural Habitats (OP 4.04) Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	**Socio-economic;** Public Health, Demography, Security	Increased social disturbance Increased Pressure on available utilities Increased social strife's and cultural conflicts	Development of an induction program, including a Code of Conduct, for all workers. Each worker will sign the code of conduct which addresses respect for local culture and religion, zero tolerance for illegal activities and compliance to EMP requirements. Contravening the CoC may result in disciplinary action and even dismissal. Develop and implement a working GRM through which complaints may be received and addressed. Employing water conservation techniques and using available water sustainably. Encourage rain water harvesting. Provide adequate water storage facilities and refill tanks during off-peak demand times. Use solar to supplement electricity. Employing power saving techniques	REREC/ CLO Contractor/ QHSE	Grievance from public	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			such as switching off equipment when not in use, using natural light whenever possible Proper planning of transportation of materials to minimize unnecessary trips by trucks Use power efficient technologies. Providing proper sanitary facilities for construction workers Inspecting the drainage facilities regularly to ensure they are free of debris that may reduce their efficiency Encourage public participation with the locals. Training of crew members on code of conduct, local cultural behavior, and responsible community interaction Proper implementation of security, fencing and signage around the project site Communicate availability of job opportunities to the locals Immediate response to any damage caused by the project operations on public or private properties. Have an			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			Emergency Response Plan and a Traffic Management Plan in place and ensure employees always comply with them The proponent and the Contractor to develop an Indigenous People's Development Plan to accommodate any culture specific impacts for the Turkana People in the Project Area.			
Natural Habitats (OP 4.04) PS 5. Land Acquisition and Involuntary Resettlement PS 8. Cultural Heritage EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and	**Bio-physical environment**; (Topography, soil, biodiversity and ecosystem Land	Land use change	Use of physical barriers such as walls and netting Limit vegetation clearing to project site only. Landscaping to improve aesthetics of the site. Avoid sites with aesthetic values for tourism. No use of gravel or sand from the onsite or surrounding areas. Consider possible alternatives for construction materials (aggregates) from the certified suppliers. The use of concrete for stabilization is to be	REREC/ CLO Contractor/ QHSE NEMA Local, County and National Government	Amount of landscaped areas or vegetated areas Grievance from the public	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves			avoided as far as possible. Choice of the location that gives the best economy in terms of excavation and fill in order to avoid or minimize soil erosion during excavation works for the construction of the stand-alone PVS structures In case of usage of free-standing structure, a proper structural design that is environmentally friendly and requires less maintenance is suggested. Driven piers and screws are recommended in order to minimize the environmental impact of the facility			
Natural Habitats (OP 4.04) PS 4. Community Health, Safety, and Security The Kenyan Constitution	**Bio-physical environment**; Land	Visual Impact	Minimize movement to only when necessary. Minimize visual impacts of lighting by installing motion detection lighting and using short light poles to only serve the project site. Store materials and equipment in enclosures and away from road users. Rehabilitation of cleared areas by planting indigenous trees to offset tree loss.	REREC/ CLO Contractor/ QHSE NEMA	Grievance from the public	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			Implement a GRM for receiving and addressing complaints.			
OP 4.12	**Social Environment**	Land Take for Project Implementation	- REREC should ensure that all land acquisition procedures are documented and align to the RPF developed under this project. REREC to disclose to communities their rights and entitlements to compensation, to enable them choose their most preferred compensation options. REREC, community and local administration to identify appropriate and accessible land administration to identify appropriate and accessible land	REREC/ CLO Contractor/ QHSE NEMA	Grievance from the public	Weekly
0P 4.12	**Social Environment**	Land Take for Contractors yard and workers	- Liaison with local administration for identification of possible sites for Contractor's Yard. - Contractor to consult with community and if required pay compensation for temporal use of site	Contractor		

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
		camp site	- Contractor to ensure restoration of contractor's yard and workers site at the end of the construction period - Contractor and community to have a written agreement on the above			
OP 4.01		Stakeholder engagement and information disclosure	Contractor to develop and implement the Stakeholder Engagement Plan to guide consultations and information disclosure to stakeholders Contractor to ensure that community engagement and disclosure is done prior to project mobilization Contractor to ensure full disclosure to communities on positive and negative impacts as well as opportunities -			
OP 4.01		Grievances Redress Mechanis	Contractor to develop an effective project GRM to ensure every grievance is registered, documented, fully addressed and closed out. GRM to	Contractor		

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
		m	ascertain anonymity and confidentiality.			
OP 4.01	**Social Environment**	Institutional capacity	Contractor to engage a qualified social and environmental specialist to implement and monitor the ESMP	Contractor		
PS2. Labor and Working Conditions, PS 4. Community Health, Safety, and Security	**Social Environment**	Gender Inequality Impacts	Contractor should uphold principles of gender equality through compliance on equitable distribution of employment opportunities, safe employment of women, including training opportunities, regular consultation with female employees and employ other measures that ensure physical safety and dignity of female workers.	REREC/ CLO/ Contractor	Grievance from community	Weekly
PS2. Labor and Working Conditions, PS 4. Community Health, Safety, and Security	**Social Environment**	Gender Based Violence-Sexual Exploitation and abuse	○ • Contractor to develop and implement a GBV-SEA (Sexual Exploitation and Abuse and workplace Sexual Harassment (SH) management plan, (including plans	REREC/ CLO/ Contractor	Grievance from community	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
		(SEA) of community members by project workers, Sexual Harassment at the Work place and other forms of GBV	for prevention, response and GRM) -Contractor to ensure that a code of conduct is developed and signed by all with physical presence on site Contractor to train and create awareness to local communities and workers on GBV -Contractor to ensure that the project GRM provides confidential reporting, safe and ethical documenting of GBV cases. Contractor to ensure that the project does not trigger or exacerbate other forms of GBV at the community level by reviewing specific project components that are known to heighten the GBV risk, and ensure effective and on-going community engagement and consultation, particularly with women and girls, among others. Contractor can refer to the World Bank's Good Practice Note for Addressing Gender-			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			based Violence in Investment Project Financing involving Major Civil Works (Sept 2018) for further guidance.			
PS2. Labor and Working Conditions, PS 4. Community Health, Safety, and Security	**Social Environment**		○ ,	REREC/ CLO/ Contractor	Grievance from community	Weekly
PS2. Labor and Working Conditions, PS 4. Community Health, Safety, and Security	**Social Environment**	Social Impact Labour influx into the project area	• The contractor to develop & implement a Labour Influx Management Plan and Workers' Camp & Accommodation Management Plans as part of C-ESMP and monitor all mitigation measures, including codes of conduct signed by all with physical presence on site, prioritization of local recruitment, induction of workers on GBV-SEA/SH, GRM for staff., avoid child and	REREC/ CLO/ Contractor	Grievance from community	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			forced labour and enforce sub-contractor compliance of the same.			
PS2. Labor and Working Conditions, PS 4. Community Health, Safety, and Security	**Social Environment**	Spread of communicable diseases and HIV/ AIDs, and other sexually transmitted diseases	Contractor to develop and implement a STD/HIV/AIDS awareness plan on prevention and mitigation	REREC/ CLO/ Contractor	Grievance from community	Weekly
OP 4.01; OP 4.02		Local Employment	- Contractor to develop and implement a labour management plan, including a recruitment plan to address: Priority given to local communities - Ensure an inclusive recruitment i.e. gender, tribal balance, VMGs,			

9.3 Operation Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Natural Habitats (OP 4.04) PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves Act Cap 292	**Bio-physical environment**; Biodiversity and ecosystem	Disturbance and damage to Flora, Fauna and avifauna; and their habitats	Planting indigenous trees in disturbed areas. Education on the importance of flora and fauna in the areas, including the appropriate regulatory requirements Avoid unnecessary destruction by restricting paths for human and vehicle movement. Develop and implement a control and monitoring program during operation phase.	REREC/ CLO Contractor Local, County and National Government	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Weekly
		Climate modification	Paving should only be carried out where necessary to reduce the reflection of the solar radiations. Landscaping the site with indigenous species of plants Using sustainable drainage systems that mimic the natural percolation of water into the soil, and green roofs where possible.			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Indigenous People (OP/BP 4.10) EP 2. Labor and Working Conditions ESS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act	**Bio-physical environment and socio-economic**; Ambient Noise Levels Public Health	Noise and vibration	Keep equipment in a sound-proofed box. A grievance process will be established whereby noise complaints by neighbors are recorded and responded to.	REREC/ CLO Contractor/QHSE NEMA	Workers working in noisy conditions or with noise generating equipment Quality of PPEs (ear muffs, ear plugs)	Weekly
Natural Habitats (OP 4.04) PS 3. Resource	**Bio-physical environme**	Soil characteristics, surface	Cleared or disturbed areas should be rehabilitated with indigenous vegetation as soon as possible to prevent erosion and loss of bio-diversity if necessary	REREC/ CLO Contracto	Size of landscaped	Entire Construction

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife Conservation and Management Act of 2013 The Kenya Water Act of 2002	**nt**; Topography and Soil, water	water/ground water	Recycling water to prevent unnecessary abstraction. Identify and control erosion in vicinity of internal roads during rainy seasons. Ensure proper storage and labelling of fuel and oil. Service and maintain vehicles and machinery to limit spills. Drill boreholes for water to avoid using the water pan.	r/QHSE NEMA	Areas Number of erosion control structures Presence of drainage channels Number of designated access roads for the vehicles	Phase
		Increased surface run off	Using materials that mimic natural percolation of water. Landscaping to ensure there are areas where water will percolate underground. Construct proper drains and inspect them regularly to check for blockage. Drains should be covered to			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			prevent accidents. All forecourt surface areas with likelihood of receiving contaminated water should be contained by peripheral surface drainage channels leading to the oil-water separator. Create embankments to reduce runoff speed and re-vegetate the area to increase water infiltration into the soil. The service station management should seek to Assess and Adopt opportunities for rain water harvesting and storage reducing the surface runoff.			
Natural Habitats (OP 4.04) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015	**Bio-physical environment**; Ambient Air Quality	Air quality (Dust and emissions)	Vehicle movement and human traffic should be limited to designated roads and paths. Vehicles should adhere to the recommended speed limit of 20km/hr. Use of clean fuels e.g. unleaded and de-sulphurized fuels if clean fuel is available	REREC/ CLO Contractor/QHSE NEMA	Amount of gaseous emissions per day: ppm in air per day Amount of	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242 The Kenyan Constitution The Climate Change Act 2016					particulate emission per day: ppm in air per day	
Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 The Climate Change Act 2011 The Public Health Act	**Socio-economic;** Public Health Transport and access to site Ambient Air Quality Ambient Noise Levels	Traffic impact	A grievance process will be established whereby any complaints by the project neighbors are recorded and responded to Vehicle movement and human traffic should be limited to designated roads and paths. Vehicles should adhere to the recommended speed limit of 20km/hr.	REREC/ CLO Contractor/QHSE Traffic Police	Few incidents Signage for traffic, speed and heavy trucks Frequency of engine maintenance and	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Cap 242 Occupational Health and Safety Act 2007 Traffic Act Cap 403 The Penal Code Cap 63					servicing	
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention The Kenyan Constitution EMCA 2015 The Kenya Water Act of 2002 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Physical Planning Act Cap 286 The Penal Code Cap	**Socio-economic;** Water and Sanitation	Waste management	Adhering to the EMCA waste management regulations on waste management, collection and segregation of wastes, recycling wastes and storage. Ensuring bins are protected from rain and animals Lighting fire on site must not be allowed. In addition, fire-fighting equipment must be available on site in case of an accidental fire	REREC/ CLO Contractor/QHSE NEMA	Amount of wastes generated per day i.e. kg/day per and type Frequency of waste collection, segregation, transport	Daily and Weekly collection
		Generation of hazardous waste; Oil Leaks/spills	Waste segregation at source to separate hazardous and non-hazardous wastes on-site prior to storage and disposal or treatment Disposal of wastes by licensed entities. Incineration of biological wastes. Proper record keeping of the wastes on its storage and handling by the licensed entities for disposal Store or drop waste batteries at recycling or waste disposal facilities that specialize in hazardous materials			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
63			Need to design appropriate protection devices against accidental discharge of transformer oil substances. Maintenance of transformers to minimize spills. Segregation of wastes and proper disposal by reputable handlers.		ation, and disposal	
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA amendment 2015 Traffic Act Cap 403 The Penal Code (Cap. 63) The Public Health Act (Cap 242) Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34	**Socio-economic;** Public Health	OSH related non-Compliance and OSH risks	Employing an OSH plan that will outline all OSH risks and provide a strategy for their management. This plan must be adhered to by the appointed construction contractors and meet OSHA 2007 requirements. Establishing contingency plans, OSH plans, and emergency procedures against hazards and ensuring that workers stay aware/educated on following them and commensurate to the magnitude and type of emergency, by conducting regular drills Visible signs to warn motorists and control movement on site. Warning signs that can be understood around risk areas. Adequate emergency assembly points. Security around the site to control movement of personnel. Sensitize community on safe electricity use/precaution. Label potential hazards such as chemicals and	REREC/ CLO Contractor/QHSE NEMA	Incident reports PPE Availability Signage in areas with OSH risks Number of drills per quarter. Efficiency of Equipme	Daily, weekly, monthly statistics

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Work Injury Benefits Act, 2007 The National Construction Authority Act, 2011 The Standards Act, Cap. 496			moving parts. Providing safe and secure storage for equipment and materials in the site and maintaining Material Safety Data Sheets (MSDSs) Provide workers with and train them on PPE use. Education and awareness on equipment use and risks. Provide easily accessible firefighting equipment and train workers on handling them. Proper insulation of power cables and labelling paths. No burning of vegetation along the distribution lines along the rights-of way Timely maintenance of the right of way Time maintenance of transformers Lighting fire on site must not be allowed. In addition, fire-fighting equipment must be available on site in case of an accidental fire Ensure that the project site is properly fenced and employ guards to prevent children from tampering with the heavy machinery. A grievance process will be established whereby any complaint by the project neighbors is recorded and responded to		nt Escape routes and assembly points	

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Indigenous People (OP/BP 4.10) and Natural Habitats (OP 4.04) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	**Socio-economic;** Social cultural Public Health, Demography, Security	Increased social disturbance Pressure on existing infrastructure and utilities	Development of an induction program, including a Code of Conduct, for all the workers directly related to the project. A copy of the Code of Conduct will then be presented to all workers and signed by each person. The Code of Conduct must address respect for local religion and culture, zero tolerance to illegal activities and other EMP requirements. Contravening the code will lead to disciplinary action and even dismissal. Implement a GRM easily accessible for complaints. Approvals for the water and electricity supply and use should be sought from relevant authorities to avoid unnecessary conflicts Sensitize all the stakeholders on the need to conserve water and energy resources Using only the required amounts of water during normal operations. Using natural light during the day for lighting purposes. Using power efficient machinery to reduce wastage.	REREC/ CLO Contractor/QHSE	Grievance from public	Weekly
		Social insecurity	Employing of security guards/competent security firm at the site and searching all vehicles and people entering the project			

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			Use of CCTV cameras to monitor security within the site Collaborating with the national police on security matters Placing alarms around the project and establishing emergency preparedness and response procedures (EPRP)			
		Influx of different cultures to the project site	Integrating and implementing Equal Opportunity Principles in procurement and human resource policies. Promote social cohesion and integration. Creating awareness towards the diversity of cultures and different economic backgrounds of workers. Allowing the residents and businesses to form social groups and networks that build social capital. Targeting social investment programs towards the local communities and region.			
Natural Habitats (OP 4.04) PS 4: Community Health, Safety, and Security PS 8. Cultural Heritage	**Bio-physical environment**; Land	Visual Impact	It is important to select cutting of trees along the boundary of the project site to those which will provide shadow to the panels and thus interfere with the operation. This will enhance the originality of the area and surroundings and further act as a buffer against potential visual impacts Minimize visual disturbance by restricting	REREC/ CLO Contractor/QHSE	Grievance from public	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline Reference	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
The Kenyan Constitution			movement to only when and where necessary. Use motion detection lightning and short light pole to restrict lighting to just the project site. Materials to be used within the project site should be kept from the vicinity of the road users preferably in an enclosed site rehabilitate cleared areas by planting indigenous trees.			
		Increase in land values and land use changes	Complying with zoning bylaws Collaborating with public and planning officials on the development and future developments Aligning the project's objectives with those of national, county and County development policies			

9.4 Decommissioning Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Natural Habitats (OP 4.04) and Indigenous People (OP/BP 4.10) PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife and Conservation and Management Act of 2013 Physical Planning Act Cap 286 The Land Control Act Cap. 302 The Wayleaves Act Cap 292	**Bio-physical environment**; Biodiversity and ecosystem	Disturbance and damage to Flora, Fauna and avifauna; and their habitats	Rehabilitation of the site will be undertaken with locally indigenous plants Education on the importance of flora and fauna, including the appropriate regulatory requirements Vehicle and human movement to be restricted to designated roads.	REREC/ CLO Contractor NEMA/KWS/ KFS	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Weekly
Indigenous People (OP/BP	**Socio-**	Noise	Decommission works during the day when	REREC/	Workers	Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
4.10) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242	**economic;** Ambient Noise Levels Public Health	and vibration	permissible noise limits are high. Provision of billboards at the construction site gates notifying people of the activities and timings. Shielding the area to reduce noise propagation Maintaining equipment to reduce friction. Providing workers with PPE such as earmuffs when operating noisy machinery. t A grievance process will be established whereby noise complaints by neighbors are recorded and responded to. Comply with the EMCA noise regulation Legal Notice 61 on permissible vibration and noise levels and duration.	CLO Contractor /QHSE NEMA	working in noisy conditions or with noise generating equipment Quality of PPEs (ear muffs, ear plugs)	
Natural Habitats (OP 4.04) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security PS 6. Biodiversity Conservation and Sustainable	**Bio-physical environment**; Topography and Soil, water	Soil characteristics, surface water/ground water	Ensure proper storage and labelling of fuel and oil. Vehicles and machines will be properly serviced and well maintained to reduce risk of potential oil and fuel spills and leakages Rehabilitation of project site to reduce the impact of soil compaction and soil erosion	REREC/ CLO Contractor /QHSE NEMA	Size of landscaped Areas Number of erosion control structures	Entire Construction Phase

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Management of Living Natural Resources EMCA amendment 2015 The Forests Conservation and Management Act of 2016 The Wildlife Conservation and Management Act of 2013 The Kenya Water Act of 2002			and prevent loss of top soil		Presence of drainage channels Number of designated access roads for the vehicles	
Natural Habitats (OP 4.04) PS 2. Labor and Working Conditions PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 Occupational Health and Safety Act 2017 Work injury Benefits Act 2007 The Public Health Act Cap 242	**Bio-physical environment**; Ambient Air Quality	Air quality (Dust and Emissions)	Using efficient equipment and machines with low emission. Using clean fuels such as de-sulphurized diesel and unleaded fuels. Using Dust enclosures and screens. Removing components with potential of emitting hazardous gases or particulates separately and under caution to prevent emissions. Reducing E-wastes by purchasing optimum electronics. Conduct awareness and sensitization targeting the users of the electronic devices	REREC/ CLO Contractor /QHSE NEMA	Amount of gaseous emissions per day: ppm in air per day Amount of particulate emission per day: ppm in air per day	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
The Kenyan Constitution The Climate Change Act 2016 The Traffic Act Cap 403			to ensure that they engage in best practice for E-waste management and recycling. Sprinkling water on soil before excavation and periodically to prevent raising of dusts. Vehicle movement and human traffic should be limited to designated roads and paths. A grievance process will be established whereby noise complaints by neighbors are recorded and responded to			
Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention PS 4. Community Health, Safety, and Security EMCA amendment 2015 The Climate Change Act 2011 The Public Health Act Cap 242 Occupational Health and Safety Act 2007	**Socio-economic;** Public Health Transport and access to site Ambient Air Quality Ambient Noise Levels	Traffic	A grievance process will be established whereby any complaints by the project neighbors are recorded and responded to Vehicle movement and human traffic should be limited to designated roads and paths. Vehicles should adhere to the recommended speed limit of 20km/hr. Placing signs around the site notifying other vehicles about the heavy traffic and to set the speed limit around the site	REREC/ CLO Contractor /QHSE Traffic police	No accident/incident Reported Availability of warning signs for heavy traffic and trucks on site Availability	Daily

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Traffic Act Cap 403 The Penal Code Cap 63					of speed limit signage on site Frequency of engine maintenance and servicing	
Indigenous People (OP/BP 4.10) PS 3. Resource Efficiency and Pollution Prevention The Kenyan Constitution EMCA 2015 The Kenya Water Act of 2002 The Public Health Act Cap 242 Occupational Health and Safety Act 2007 Physical Planning Act Cap	**Socio-economic;** Water and Sanitation	Waste management;	Following EMCA regulations on Waste Management, Legal Notice 121 on waste disposal, allocation of responsibilities for waste management and suitable facilities for collection and segregation of waste as well as adequate facilities for storage of materials and controlling access to these facilities. Ensuring bins are protected from rain and animals Vegetative material will be kept on site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation	REREC/ CLO Contractor /QHSE NEMA	Amount of wastes generated per day i.e. kg/day per and type Frequency of waste collection, segregation, transportation, and	Daily and Weekly collection

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
286 The Penal Code Cap 63			of the natural vegetation Lighting fire on site must not be allowed. In addition, fire-fighting equipment must be available on site in case of an accidental fires		disposal	
		Generation of hazardous waste	Segregation of wastes at source before disposal by a licensed entity. Proper record keeping of the wastes on its storage and handling by the licensed entities for disposal. Store or drop waste batteries at recycling or waste disposal facilities that specialize in hazardous materials			
PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security EMCA amendment 2015 Traffic Act Cap 403 The Penal Code (Cap. 63) The Public Health Act (Cap 242)	**Socio-economic;** Public Health	OSH Risk of Respiratory Illnesses due to Air Pollution Human	Employing an OSH plan that will outline all OSH risks and provide a strategy for their management. This plan must be adhered to by the appointed construction contractors and meet OSHA 2007 requirements Ensuring all hazards such as movable parts are labelled. Training of use and awareness of risks of equipment.	REREC/ CLO Contractor /QHSE NEMA	Incident report Availability of PPE Availability of warning signs in areas with	Daily, weekly, monthly statistics

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Occupational Health and Safety Act, 2007 Occupier liability Act Cap.34 Work Injury Benefits Act, 2007 The National Construction Authority Act, 2011 The Standards Act, Cap. 496		Health Impacts due to poor disposal	provide workers with PPEs and replace them frequently. Placing visible signs around risk prone areas Ensuring there is security in and around the site to control movement of people. Safe and secure storage for wastes. Visible signs to control movement and notify motorists. Provide firefighting equipment and train personnel on their use. Labelling chemicals and materials according to the risks they pose. Create adequate, labelled emergency assembly points. Establishing emergency procedures against hazards and ensuring the workers stay aware/educated. Reduce E-waste by purchasing optimum condition electronics. Recycle all E-waste; Transport all E-wastes to the East African Compliant Recycling Company in Nairobi.		occupational, safety and health risks on site Number of drills per quarter Efficiency of Equipment such as firefighting Equipment Number of escape routes and assembly points	

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
			Awareness and sensitization on E-waste management. OSHA 2007 requirements			
Indigenous People (OP/BP 4.10) PS 2. Labor and Working Conditions PS 4. Community Health, Safety, and Security PS 8. Cultural Heritage The Public Health Act (Cap 242) The Penal Code (Cap. 63) The Kenyan Constitution	**Socio-economic;** Public Health, Demography, Security	Increased social disturbance	Development of an induction program, including a Code of Conduct, for all the workers directly related to the project. A copy of the Code of Conduct will then be presented to all workers and signed by each person. The Code of Conduct developed must address respect for local religion and culture, zero tolerance to illegal activities and other EMP requirements. Contravening of the code will result in disciplinary action and even dismissal. Implement a GRM for receiving and addressing complaints.	REREC/ CLO Contractor /QHSE	Grievance from public	Weekly
Natural Habitats (OP 4.04) PS 4: Community Health, Safety, and Security PS 5. Land Acquisition and	**Bio-physical environment**; Land	Visual Impact	Restrict movement of vehicles in and out of the site to when necessary to minimize visual disturbances. Motion detected lighting and use of short			Weekly

Triggered world bank social safeguard policies, International Best Practice (reference to WORLD BANK OPs) and Applicable Kenyan Legislation	Baseline	Impact	Mitigation Measures	Responsible person/ Function	Performance indicator	Timing/ Frequency
Involuntary Resettlement PS 8. Cultural Heritage The Kenyan Constitution			lighting poles to restrict the visual disturbance of light to the project site. Keep materials and machinery in an enclosure away from road users. Rehabilitation of the cleared areas by planting indigenous tree to offset tree loss. Establish a GRM for easy redressal of complaints.			

CHAPTER TEN: MONITORING PLAN

10.1 Introduction

Monitoring identifies actual or potential successes or failures as early as possible and facilitates timely adjustments to the operations, the project will have a several negative impacts inclusive of the triggered safeguard policies which will be resolved through the listed mitigation measures and thereafter monitored with the stipulated monitoring guidelines. The monitoring plan will be impact based hence every impact expected will have a set monitoring guideline.

The monitoring plan will cover the following phases of the project; construction and operation.

10.2 Construction Phase

IMPACT	**Performance indicator**	**Monitoring means**	**Checking Frequency**	**Person Responsible**	**Estimated cost of implementing the monitoring plan in USD**		
					Capital	**Operational**	**Training/ Institutional**
Disturbance and damage to flora, fauna and avifauna; and their habitats	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Evaluating the hoarding of the project area does not cross to land that was not designated for the project. Presence of traffic marshals Presence of	monthly	REREC/ CLO Contractor/ QHSE MOEP/KP LC Local, County and National Governmen	Personnel; One environmental associate expert /biologist expert 1000USD per month	Provision of consumables Totaling to less than 2000USD one of use and thereafter 200USD	Environmental and social governance expert Forestry

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
		reforestation land close to the project site		t	One OSH officer on site 500USD per month	per month	
Noise and vibration	Workers working in noisy conditions or with noise generating equipment Quality of PPEs (ear muffs, ear plugs	Noise insulators for machinery. Service sheets indicating service times. PPEs for high noise levels. Caution signs indicating noise and for PPE use. Calibrated noise meters on site and trained personnel to take readings.	Commencement of activity with high noise levels 80 decibels and above	REREC/ CLO Contractor/ QHSE MOEP/KPLC NEMA	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to less than 1000USD one of use	Environmental and social governance expert

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
Soil characteristics, surface water/ground water	Size of landscaped Areas Number of erosion control structures Presence of drainage channels Number of designated access roads for the vehicles	Evidence of surveys points marching to the hoarding wall perimeter Presence of plans for landscaping purposes. presence of approved drainage designs by an engineer presence of signages of hazardous material on site. Presence of service sheet of all vehicles on site Presence of a	daily	REREC/ CLO MOEP/KPLC Contractor/ QHSE NEMA	Personnel; One environmental expert and biosystems graduate engineer associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to 1000USD	biosystems engineering Environmental and social governance expert

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
		sprinkling schedule					
Traffic impact	No accident/incident Reported Warning signs for traffic and heavy vehicles. Speed limit signage. Frequent maintenance and servicing. Amount of wastes generated per day i.e. kg/day per and type	Presence relevant caution traffic signages at the site presence of an informed traffic marshal on site as well as speed limits signages Presence of an approved grievance system that been approved by the management. presence of grievance system that is convenient to the local	Daily	REREC/ CLO Contractor/ QHSE MOEP/KPLC Traffic Police	Personnel; One environmental expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to less than 1000USD	Environmental and social governance expert

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
		community. presence of clearly demarcated vehicle routes and footpaths for the workers.					
Air quality (Dust and emissions)	Amount of gaseous emissions per day: ppm in air per day Amount of particulate emission per day: ppm in air per day	Dust screens on perimeter walls. Presence of water source near project site Sprinkling machinery on site Presence of clean fuel pump station or stored fuel. Service sheets for machinery.	Daily	REREC/ CLO MOEP/KPLC Contractor/ QHSE NEMA	Personnel; One environmental associate expert 1000USD per month One OSH officer on site 50USD per month	Provision of consumables Totaling to 2000USD for one of use and thereafter 100USD per month	Environmental and social governance expert
Waste and	Amount of	Presence of	Daily	REREC/	Personnel;	Provision	biosystems

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	Operational	Training/ Institutional
effluent	wastes generated per day i.e. kg/day per and type Frequency of waste collection, segregation, transportation, and disposal	waste management consultant presence of segregation compartments and contract of a approved solid waste handler availability of storage containers such as freight shipping containers. Presence of prohibiting signages against fire on site.	and weekly collection	CLO MOEP/KPLC Contractor/ QHSE NEMA	One environmental expert and biosystems graduate engineer associate expert 1000USD per month One OSH officer on site 500USD per month	of consumables Totaling to 1000USD	engineering Environmental and social governance expert
Occupational Safety and	Incident report Availability of PPE	Employ OSH consultants with at least 1yr	Daily, weekly, monthly	REREC/ CLO Contractor/	Personnel; One environme	Provision of consumabl	Environmental and social governance

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
Health (OSH)	Availability of warning signs in areas with occupational, safety and health risks on site Number of drills per quarter Efficiency of Equipment such as firefighting Equipment Number of escape routes and assembly points	experience. Availability of a method statement for all foreseeable risks on site. availability PPEs on site . Adherence to OSH regulations and guidelines Presence of well-defined training plans for all workers on site. Presence of functional work to permit system to all activities on site that require a certain set of skills or	statistics	QHSE MOEP/KPLC NEMA	ntal and biosystems associate expert 1000USD per month One OSH officer on site 500USD per month One induction personnel 200USD per month	es Totaling to 2000USD one of Thereafter 100USD per month	expert DOSH approved Emergency preparedness training

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
		the nature of activity is dangerous.					
Increased social disturbance	Grievance from public	Presence of OSH officers Availability of induction plan and personnel that cannot effectively relay the information Enforcement to maintain law and order Availability of ESH tools. A functional and collaboratively approved GRM.	weekly	REREC/ CLO MOEP/KP LC Contractor/ QHSE	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month Security personnel	Provision of consumables Totaling to less than 2000 USD for one of use then 100USD per month	Environmental and social governance expert
Land use change	Amount of landscaped areas or vegetated areas	Availability of the functional and approved by	weekly	REREC/ CLO MOEP/KP	Personnel; One environme	Provision of consumabl	Environmental and social governance

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	Operational	Training/ Institutional
	Grievance from the public	both the management and the community grievance mechanism system		LC Contractor/ QHSE NEMA Local, County and National Government	ntalist associate expert 1000USD per month One OSH officer on site 500USD per month	es Totals to	expert
Land take for project implementation	GRM log-land complaints	Land consent		REREC			
Land take for contractor's yard and workers camp site)	GRM log-land complaints	Minutes of consultation meetings, Letter of approval from authorities Written agreement with		Contractor			

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	Operational	Training/ Institutional
		communities					
Local Employment	% of workforce from local communities, women, men, VMGs composition, skilled and unskilled	GRM log-employment complaints, employment statistics		Contractor			
Stakeholder engagement and Information disclosure	No. and type of stakeholders engaged. No. of engagements undertaken. Type of information disclosed to stakeholders	Minutes of engagements held, GRM log-issues raised		Contractor			
Grievances Redress Mechanism	No. of cases reported, closed-out, pending, escalated	GRM log-concerns, grievances		Contractor			
Institutiona	No. of progress	Progress reports		Contractor			

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	Operational	Training/ Institutional
l Capacity	reports submitted (frequency of reporting), quality of progress reports aligned to ESMP	submitted					
HIV/AIDS Awareness	No. of reported incidence rates	Incidence rates		Contractor			
GBV-SEA/SH	No. of GBV cases, processed and closed out	GRM log-GBV cases reported Mitigation measures implemented		Contractor			
Labour influx	No. of locals employed.	GRM log-					
Gender Inequality	No. of women employed. No. of women employed in skilled and unskilled positions.	GRM-log-gender related complaints,					
Visual Impact	Grievance from the public	Presence of a trained traffic	Weekly	REREC/ CLO	Personnel; One	Provision of	Environmental and

IMPACT	Performance indicator	Monitoring means	Checking Frequency	Person Responsible	Estimated cost of implementing the monitoring plan in USD		
					Capital	**Operational**	**Training/ Institutional**
		marshal on site. Presence of project plan that runs only during the daytime Presence of hoarding wall that is at least 2 meters high Availability of the functional and approved by both the management and the community grievance mechanism system		Contractor/ QHSE MOEP/KPLC NEMA	environmental associate expert 1000USD per month One OSH officer on site 500USD per month	consumables Totaling to 3000USD for one of use and thereafter 100USD per month	biosystems engineer Environmental and social governance expert

10.3 Operation Phase

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
Disturbance and damage to flora, fauna and avifauna; and their habitats	Rehabilitation by planting indigenous vegetation. Education on importance of biodiversity. Restrict vehicle movement to minimize disturbance of vegetation. Implement a control and monitoring program.	No harm to Species and Habitat Amount of landscaped areas or vegetated areas	Availability of reforestation programs Availability of training programs for the local community	weekly	REREC/ CLO Contractor/ QHSE Local, County and National Government	Personnel; One environmental associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to 2000USD for one of use and thereafter 200usd per month	Environmental and biosystems engineer Environmental and social governance expert
Noise and vibration	Keep equipment in a sound-proofed rooms. A grievance process will be established whereby noise complaints by neighbors are	Noisy equipment or conditions. Quality of PPEs	Sound proofing in noisy areas. Availability of a collaboratively implemented GRM.	Commencement of activity with high noise levels 80 decibels and above	REREC/ CLO Contractor/QHSE NEMA	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per	Provision of consumables Totaling to less than 1000USD one of use	Environmental and social governance expert

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
	recorded and responded to.					month		
Soil characteristics, surface water/ground water	Rehabilitation to minimize biodiversity loss. Recycling water to minimize abstraction. Monitor soil erosion during rainy seasons. Proper labelling and storage of fuels. Servicing of machinery to reduce spills. Drill a borehole for source of water to avoid using water from the community-	Size of landscaped Areas Number of erosion control structures Presence of drainage channels Number of designated access roads for the vehicles	Rehabilitation program for cleared land. Recycling systems for water. Service sheets for machinery and vehicles. availability of borehole that does not affect the water recharge of the already existing borehole	daily	REREC/ CLO Contractor/QHSE NEMA	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totals to	Environmental and Biosystems engineering, Environmental and social governance expert, DOSH approved officer

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	Operational	Training/ Institutional
	based borehole source of drinking water.							
Traffic impact	Set up GRM for addressing complaints. Movement to be restricted to designated areas and adhere to speed limits.	No accident/incident Reported Availability of warning signs for heavy traffic and trucks on site Availability of speed limit signage on site	Functional and collaboratively implemented GRM Demarcation of access routes. Availability of traffic marshal	Daily	REREC/ CLO Contractor/QHSE Traffic Police	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month One traffic marshal 170USD per month	Provision of consumables Totaling to less 1000 USD	Environmental and social governance expert
Air quality (Dust and emissions)	Limit movement to designated roads and paths Use of clean fuels.	Amount of gaseous emissions per day: ppm in air per day Amount of particulate emission per day: ppm in	Paved and tarmacked access routes on site. Availability of pumping station which sells clean fuels.	Daily	REREC/ CLO Contractor/QHSE NEMA	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site	Provision of consumables Totaling to less than 1000USD	Environmental and social governance expert Environmental and biosystems engineer

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
		air per day	Availability of laboratory Test results for the fuel being used in the site.			500USD per month		
Waste effluent and sanitation	Adhering to EMCA regulations on Waste Management, Legal Notice 121; on disposal, responsibilities of waste management, suitable facilities for collection and segregation of wastes, dumping of wastes in segregated areas, recycling wastes,	Amount of wastes generated per day i.e. kg/day per and type Frequency of waste collection, segregation, transportation, and disposal	Waste management Plan availability of contract of NEMA approved waste handler Waste segregation. Availability of prohibition signages for any assessed hazards on site	Daily and weekly collection	REA/ CLO Contractor/QHSE NEMA	Personnel; One environmental expert and biosystems graduate engineer associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to 1000USD	biosystems engineering Environmental and social governance expert

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
	cleaning and protecting receptacles and restricting burning of wastes on site.							
Occupational Safety and Health (OSH)	Employing an OSH plan that will outline all OSH risks and provide a strategy for their management. This plan must be adhered to by the appointed construction contractors and meet OSHA 2007 requirements on provision of information, instruction and training as necessary,	Incident report Availability of PPE Availability of warning signs in areas with occupational, safety and health risks on site Number of drills per quarter Efficiency of Equipment such as firefighting Equipment Number of escape routes and assembly	Availability of a detailed OSH plan for the intended activities on site. Availability of regular assessment report of activities to be conducted on site. availability of a method statement for the activities conducted onsite. Availability of an induction training for the	Daily, weekly, monthly statistics	REREC/ CLO Contractor/QHSE NEMA	Personnel; One environmental and biosystems associate expert 1000USD per month One OSH officer on site 500USD per month One induction personnel 200USD per month	Provision of consumables Totaling to 2000USD one of Thereafter 100USD per month	Environmental and social governance expert DOSH approved Emergency preparedness training

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	Operational	Training/ Institutional
	preparing and revising written policies on health and safety of workers, issue permits to work for employees who might be exposed to risks, provide employees with PPEs and avail lines for employees to complain and report on concerns and accidents. There should be a clearly defined code of conduct. The work place should be clean and	points	workers stationed onsite. Availability if audit reports for the compliance with the OSH act and best practices.					

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	Operational	Training/ Institutional
	sanitary Record and analyze OHS statistics. Use machinery for intended purposes. Maintain portable supply of drinking water. Dangerous parts of machinery should be fenced. Label chemicals and store flammable materials properly. Provide firefighting equipment and fire escape routes and							

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	Operational	Training/ Institutional
	assembly points and train employees on escaping fire hazards. Restrict smoking to zoned areas. Provide measures for dealing with emergencies. Set up a GRM. Security around the site and control of movement. Signage on risk areas and dangerous moving machine parts. Signage to control movement and notify motorists.							

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
Increased social disturbance	Develop an induction program, including a Code of Conduct, for all workers. A copy of the Code of Conduct will then be presented to all workers and signed by each person. The conduct must address respect for local religion and culture, zero tolerance for illegal activities and compliance with the EMP. Contravening	Grievance from public	Availability of the functional and approved by both the management and the community grievance mechanism system Availability of violation registers	weekly	REREC/ CLO Contractor/ QHSE	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling to less than 1000USD	Environmental and social governance expert

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
	the CoC will result in disciplinary action and even dismissal. Implement an easily accessible GRM for resolving and resolving complaints.							
Land use change	A grievance procedure will be established whereby any complaints by the project neighbors are recorded and responded to	Amount of landscaped areas or vegetated areas Grievance from the public	Availability of the functional and approved by both the management and the community grievance mechanism system Availability of layout of the project about the size of land.	weekly	REREC/ CLO Contractor/ QHSE NEMA Local, County and National Government	Personnel; One environmentalist associate expert 1000USD per month One OSH officer on site 500USD per month	Provision of consumables Totaling less than 1000USD	Environmental and social governance expert

Name of the Measure	Mitigation measure	Purpose of mitigating	Monitoring guidelines	Checking Frequency	Person Responsible	Estimated cost of implementing the mitigation measures		
						Capital	**Operational**	**Training/ Institutional**
Visual Impact	Selective cutting of trees to minimize the impact of cutting. Restrict movement of vehicles to when necessary to minimize disturbances. Use motion detected lighting and short lighting poles to restrict lighting to the project site. Rehabilitate the cleared areas to offset tree loss.	Grievance from the public	availability of reforestation program availability of regular sensitization records on the glares of the solar panels and electricity distribution components.	Weekly	REREC/ CLO Contractor/ QHSE NEMA	Personnel; One environmentalist associate expert and biosystems graduate engineer 1000USD per month Five sensitization personnel 150USD each five-day workshop	Provision of consumables Totals to 2000USD one of use	Environmental and social governance expert

CHAPTER 11: CONCLUSION

The implementation of Proposed Mini grids project will present opportunities to the local communities to improve their livelihood, to Turkana County in terms of development, and to Kenya as a Nation in the wider context. Despite anticipation of possible environmental and social impacts, both positive and negative, the study team undertook an initiative to arrive at the best possible position taking into consideration the various possible options open for adoption. While doing this, it was imperative to engage all the relevant stakeholders in order to ensure that significant impacts and concerns were considered during the evaluation.

The triggered world bank safeguard policies will be mitigated to acceptable levels using the EMSP and thereafter adhering diligently to the monitoring plan provided by this ESIA. The findings conclude that negative impacts are majorly short-term and manageable to acceptable standards. The ESIA study therefore finds the project acceptable and provides an outline of mitigation measures that address adverse effects of implementation of the project. Furthermore, continuous inspections should be scheduled to monitor implementation of the Environmental and Social Management Plan together with mechanisms used in identifying unexpected encounters and impacts, alongside implementation of appropriate mitigation measures.

Development of this project with integration of the Environmental and social Management Plan will ensure proper control of any impacts generated during the project's lifecycle. This will provide an ideal avenue for sustainable development.
The study finds that the project is environmentally and socially sustainable if the identified mitigation measures are implemented accordingly to achieve the requirements of world bank safeguard policies, IFC PSs, EP and Kenyan legal frameworks.

CHAPTER 12: RECOMMENDATION

It also recommends appropriate monitoring of the project development ,operational and decommissioning activities to ensure that any adverse impacts that were unforeseen are identified and addressed in a timely fashion so that the triggered safeguard policies are kept within manageable levels. Specifically, the following, but not limited to, recommendations are made:

- Panel and electrical equipment Disposal: While solar modules can last up to thirty years, a significant quantity of material needs to be disposed of at the end of the life of the modules. Because modules can contain potentially hazardous materials and since Kenya lacks adequate disposal facilities, consideration should be given at the start of the solar PV project as to how units will be disposed of at the end of their useful life. Hence, the decommissioned panels should not be disposed on site but be managed by external electronic waste management contractors with capability to handle hazardous waste.
- Rural Electrification Authority should consider ultimate disposal options at the start of the Project and devise implementation plans. Many components of photovoltaic modules are recyclable and some solar module manufacturers provide recycling of the panels with purchase.
- Structures such as fencing and on-site roads should be minimized, steep slopes avoided, erosion control measures, and revegetation procedures implemented.
- Provision of suitable facilities for the collection, segregation, and safe disposal of wastes should be factored. Waste should be segregated in terms of recyclable, reusable, biodegradable, and non- biodegradable waste, and waste handling equipment provided.
- Rural Electrification Authority should provide an alternative source of water for use in the plant to avoid competing with existing natural spring.
- Land acquisition should be done as provided for in the Resettlement Policy Framework, prepared under this project, Community land Act 2016, and follow the safety procedures and guidelines set out in the world Bank operational procedures and performance standards. Resettlement, compensation, and community consultation processes and agreements must be clearly documented.
- Employ a Grievance Redress Mechanism to record any complaints made by surrounding community members, and procedures to respond to the same.
- Impose and enforce speed limits and provide driving guidelines for vehicle operators.
- Inform local beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of any activities.
- Use an OSH plan that will outline all OSH risks and provide a strategy for their management.
- Work areas should be clearly defined and demarcated, where necessary to avoid unnecessary disturbance to areas outside the development footprint.

- The project will meet theWorld Bank OP requirements that apply to this project, IFC PSs, and applicable Kenya legal framework standards if all the recommendations and supporting plans are fully implemented.

The project will meet the world bank safeguard policies if the recommended ESMP and MP are actioned.

ANNEX I: Introduction letter from REA (now REREC)

Rural Electrification Authority

Head Office
Kawi House - South C
Bellevue (Popo Rd), Red Cross Rd
Behind Boma Hotel.
P.O. Box 34585-00100, NAIROBI
Tel: +254 20 4953000 / 4953600
Email: info@rea.co.ke
Website: www.rea.co.ke

Our Ref: REA1/16/12/02/pk

23rd December, 2016

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

REF: ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT OF THE PROPOSED DEVELOPMENT OF SOLAR MINI GRIDS IN TURKANA COUNTY, TURKANA CENTRAL CONSTITUENCY, KERIO TRADING CENTRE

This is to certify that M/s Creek side Enterprises Limited has been commissioned by Rural Electrification Authority to undertake Environmental and Social Impact Assessment (ESIA) of the above project in the proposed site.

Turkana County, Turkana Central Constituency, **Site - Kerio Trading Centre**

As an important component of this study, interested and affected parties, stakeholders and members of the local communities within and around the proposed project area will be consulted in order to enable the Consultant team carry out the ESIA.

This exercise is crucial as it will identify any Environmental and Social Impacts of the project. We kindly request that you assist the representative of M/s Creek side Enterprises Limited in any way possible so as to make this exercises a success.

Yours faithfully,

ENG. JAMES MURIITHI
MANAGER, RENEWABLE ENERGY
For: RURAL ELECTRIFICATION AUTHORITY

CHIEF KERIO LOCATION DATE 31-12-16 VINCENT 0715410443

ANNEX II: Public Consultation Attendants list

LIST OF ATTENDANTS.

PUBLIC CONSULTATION OF ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROPOSED DEVELOPMENT OF SOLAR MINI GRIDS IN TURKANA COUNTY.

SITE NAME: KERIO TRADING CENTRE, TURKANA CENTRAL CONSTITUENCY.

Date: 31/12/2016 Venue: KERIO T. CENTRE

Sr.	Name	DESIGNATION	Organization/Location	Email	Telephone	Signature
1	CHUMA VINCENT	Agriculture	OOP. KERIO	Kamaischuma@gmail.com	0715440443	
2	LOJUKO SOSPETER	ELECTRICAL ENGINEER	MINISTRY OF ENERGY, TURKANA COUNTY	soslokko@gmail.c	0719202654	
3	LUCAS CONYIKO	YOUTH			0796004339	
4	MIKE LENGO	YOUTH			0795887500	
5	JACKSON ERON	YOUTH	Kerio	Jacksoneron56@gmail	0717608491	
6	NARO LOUWA	YOUTH			—	
7	MICHAEL	ELDER			0701543619	
8	EMMANUEL KAMAS	PASTOR	Kerio	-	0726006115	
9	MARAKA CHARLES	PASTOR	NANYANGAKI P.		0717603424	
10	PAULO EKARU	YOUTH	KERIO		0700329003	
11	SAMWELI IKAI					
12	NACHORO					
13	NAKICNA	MZEE MAA				
14	IMONG.	PASTOR				
15	LELE JACKSON	YOUTH			0717612564	
16	EKENO LOCHAKAP	YOUTH				
17	LOGILAE NAMWAR	YOUTH				
18	BOSCO NAWOTO	PASTOR			0724800315	
19	LONGOLI JEREMY	YOUTH			0790459883	
20	FRANCIS [illegible]	YOUTH			0712492[illegible]	
21	LOSIKIRIA BEN	YOUTH			0706149213	
22	EMANNAN	YOUTH			0714166970	
23	ESINYEN TITUS	YOUTH			0714286576	
24	ACHUKULE MARIA	Fishman.	Kerio		0795340592	
25	EBOLO JAMES	YOUTH.	Kerio		0795340592	

26.	LOSAGAM	LOREN	0713242909	
27.	MARCY	AKUUTA		
28.	VERONICA	AKUOM		
29	REBECCA	AKAL	0700725675	
30.	MOURINE	AKAI		
31	MARY	LONYE		
32.	MICHAEL	ERON		
33.	JOSEPH	EWALAN		
34	EDAAN	LOKIRION		
35	LONYEIT	LOURIEN		
36.	ALEX	LOBOIN		
37	KORODI	GABRIEL		
38	IMOJONG	LUCAS		
39	NANGOR	EWEET	0710964481	
40	REUBEN	LOTOYA	0790651597	
41	MUSA	LOKOLONYOI	0708767971	
42	PAUL	EGANAE		
43.	SIKEY	WIAHAN	0796257779	
44.	ESIWEIN	JOSEPH	0702587824	
45.	NATOI	ABRAHAM	0725903277	
46.	Akonijah	EKIRU	0728343957	

47.	PAUL	LORE	0715522781	youth
48.	BENSON	EKWANG	0713743324	Youth
49.	John	TODAN	0719165838	Youth
50.	James	Ekamais	0798172809	Youth
51	Ambrose	Chichi	0796004370	Youth Elder
52.	MAXWEL	ERTON	0721970514	
53.	EKAI	TERRON	0776127755	Youth
54.	DAVID	IMOJONG	0783367351	Youth
55.	LONYOR	JACKSON	0703428903	Youth

ANNEX II: Sample Public Consultation Forms/questionnaires

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) OF THE PROPOSED DEVELOPMENT OF SOLAR MINI GRID IN KERIO TRADING CENTER, TURKANA CENTRAL CONSTITUENCY; TURKANA COUNTY

QUESTIONNAIRE FOR LOCAL COMMUNITY MEMBERS/AND ANY OTHER WOULD BE AFFECTED/INTERESTED PARTY

Pursuant to the provisions of the Environmental Management and Coordination Amended Act (EMCA), 2015 and the Environmental (Impact Assessment and Audit) regulations 2003, it is a requirement that projects conduct annual Environmental Impact Assessment. In conducting EIA, a social site assessment is a requirement whereby the area neighbors/residents or stakeholders are consulted for their views, opinions/comments and recommendations regarding the proposed project for the purposes of integrating all concerns to avoid conflicts and to enable NEMA to make an informed decision. Besides, it is an important tool for information generation. In compliance with this, the project **proponent- REA** has contracted Creek side enterprises Ltd to carry out an Environmental and Social Impact Assessment (ESIA) for the proposed solar mini grid in Kerio trading Center, Turkana central constituency; Turkana county. Therefore, as an interested /affected party, we would like to get your opinions/ views on the solar project.

Please fill in the following questionnaire giving in your comments, opinions or suggestions where necessary.

Date……..

…….

SITE DETAILS:

Site Name:……..……
……..
Plot No…….……
……..
Coordinates:……
……
Name of Village/Location/Trading center/Organization/Institution……
Sub - County:…….
County:…….

Respondent's details:

Name of contact person (Respondent)……
……

Occupation…….....…….
……

Telephone……..……Email:……
……

Distance from the proposed project site……..

1. General concerns

Please indicate your view about the solar power project
……
……
……
……
……
……
……..……

In your view, what are benefits of the project to the general local community?

……
……
……
……
……
……

In your view, are there disadvantages on the proposed solar power project during construction and operation phases?

……
……
……
……
……

2. Environmental Concerns

In your opinion, do you think there are negative environmental impacts resulting from the project activities/operations? ☐ No

If yes, list/explain how

……
……
……
……
……
……

3. Social-Economic concerns

a) What is the current source of energy in area and how reliable is it?.....

b) What are the main uses of power in this area?.....

c) Are there alternative energy sources? ☐ Yes ☐ No

If yes list them……

……

……

……

4. Any Additional concerns

Please comment if there are any other additional concerns or considerations relating to the proposed development project and propose specific mitigation measures to prevent or minimize any negative impacts resulting from the project activities or operations and for betterment of surrounding environment?

……

……

……

Final remarks:

I/we approv☐ disapprove the pro☐ject

Signature:…….…… I.D

No…….

1.0 APPENDIX F: SAMPLE COMMUNITY LAND DONATION FORM

Item	Brief Description
Sub-Project name	Kerio Mini Grid Power Project
Expected Output:	50 kW
Sub-Project Location:	Kerio, Turkana County
GPS coordinates	KERIO-1A1-172210E 332650N, B-172333E 332537N, C-172213E 332541N, D-172312E 332641N
Estimated cost of the investment	
Source of Funding	KEMP Financing
Financial Year	2019/2020

TERMS OF THE AGREEMENT

1. As discussed in our community baraza on 28th August 2019 at Kerio Location at the Community Meeting Location (date, location, venue) to which all residents and regular users of the land in Kerio village, in Kerio sublocation, Kerio location, Turkana Central subcounty, Turkana county) were invited, and chaired by Mr. Vlincent Chuma who is the Area Chief (name of the person who chaired the meeting) and attended by REREC representatives Mulgal Nicholas & George Kospey (name them).
2. We the nominated representatives at that meeting confirm that the following issues were discussed on The electrification of Kerio village and the land to be used for the project as well as a Community project to be done to benefit the Community of Kerio (specify the agenda of the meeting) and the residents and regular users of this land are in unanimous agreement that:
    a. The land measuring 5 acres (specify the amount of land required) which is located in Kerio Centre towards kerio Boys secondary (specify the location of the site) shall be site of the proposed mini grid subproject;

b. We all are aware that the land we have set aside for the investment is community land and no one is claiming individual ownership because it belongs to all of us collectively through:
    i. registration no.... (indicate registration number if applicable);
    ii. customary/ancestry land rights
    iii. other... (specify)
c. The land to be donated was identified in consultation with all residents and users of the land, witnessed by the Area Chief, (specify who witnessed the choice and agreement e.g. Chief, Assistant Chief, Ward Administrator)
d. The land being donated will not reduce the remaining land area to a level below that required to maintain the livelihoods of occupiers and users of land at current levels and will not require the relocation of any household
e. We were all informed about our right to compensation for the parcel of land and the compensation options which include land for land, in-kind or cash compensation.
f. We all understand that the community could have refused this investment.
g. We have however unanimously agreed to DONATE the land
h. We all agreed to this subproject and donation of the land without coercion, manipulation, or any form of pressure on us by REREC/KPLC/County Government or traditional authorities.
i. We all agreed that (delete whichever is not applicable):
    i. we will not require any monetary or non-monetary benefits or incentives as a condition for the donation; or;
    ii. we are donating the land on condition that (specify the conditions for the donation if any):
        1. .....
        2. .....
        3. .....

j. The land is free of encumbrances or encroachment and is not claimed by any individual and its ownership is not contested.

3. We have discussed with REREC/KPLC and understand the negative impacts of the project and:
    a. As a community we have agreed that:
        i. if any structure (residential, business or any other structure) will be moved or any access to land be limited as a result of the sub-project, we, the Kerio (specify the name of the community) community will compensate the affected

individual/household in a manner that is acceptable to them to enable them restore their livelihood.

ii. If any negative impacts should fall disproportionately on any individual/household(s) who may currently be using the land for income or other livelihood activities (specify the current use of land – if any - that will be impacted by the project). Such negative impacts that these will be addressed by the community, through ----(specify the mitigation measure agreed to) which has been accepted by the affected individuals

b. No compensation claims for the land will be made from the project by the affected individuals.

4. We have all agreed unanimously that the project implementation should continue.
5. Together with REREC/KPLC, we have established a GRM (Grievances Redress Mechanism) and we shall strive to peacefully resolve any conflicts that may arise among, between us and REREC/KPLC/Contractor or between us and other communities concerning the mini grid through this mechanism.
6. Any conflicts related to the subproject that we will not be able to solve through the agreed mechanism will be resolved through due process provided by the laws of Kenya.

We, the undersigned, have been designated by the community of .... (specify the name of the community) to sign this form on their behalf and we confirm the above information to be true and that we have resolved to abide by ALL terms of this agreement.

(Please attach: minutes of the community meeting that resolved to donate land, including the issues discussed, names of individuals who asked questions, answers provided by REREC/KPLC, signed attendance sheet and photos of the meeting).

S/No.	Name	Village/Location	ID/No.	Signature	Photo
1.	SARAH WANJIRU MUIRU	KERIO	47608805		
2.	CHRISTINE AUMA MWANGI	KERIO	26786127		

3.	LOBUN ECHWER EBOT	KE-R.O	9537855		
4.	FRANCIS EGRON LOBUN	KE-R.O	31202378		
5.	EBOKO AKUTA KENNEDY	KE-R.O	31069013		

Witnessed on this 13TH Day of DECEMBER In the Year 2019 by:

1. AREA Chief

Name	ID/No.	Signature & R/Stamp
Vincent Chuma	10/24087	CHIEF KEEKO LOCATION

2. Ward Administrator

Name	ID/No.	Signature & R/Stamp
LAWRENCE EKAALE 0711845528	21350321	ADMIN WARD ADMIN YURUKANA COUNTY GOVT P. O. Box 11, LOKICHAR

3. Community Land Registrar

Name	ID/No.	Signature & R/Stamp

4. County Government (Physical Planning Department)

Name	ID/No.	Signature & R/Stamp
DAVIES MUNIALO	22794644	APPROVED 18 DEC 2019

5. County Ministry Relevant to the project e.g. Energy etc.

Name	ID/No.	Designation	Signature & R/Stamp
Caleb Ewol	28058415	County Renewable Energy officer	

6. REREC/KPLC Project Team Leader

Name	ID/No.	Signature & R/Stamp
Mulgai Kariu	14421675	

RURAL ELECTRIFICATION AUTHORITY
P.O. Box 34585 – 00100
NAIROBI, KENYA
TEL: +254 – 20 – 2710965 / 2341409