ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) PROJECT REPORT FOR THE PROPOSED 60KW MINI GRID IN MAGETA ISLAND, MITUNDU SUB-LOCATION, MAGETA LOCATION, BONDO SUB-COUNTY SIAYA COUNTY

Updated December, 2019

PROJECT PROPONENT

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DECLARATION

This Report has been prepared in accordance with the provisions of the Environmental Management and Coordination Act (EMCA, 1999) and its subsequent gazetted rules and regulations.

Lead Expert

Mr. Nyamori Steve Onserio is a registered Lead Expert on Environmental Impact Assessment/Audit (EIA/A) by the National Environment Management Authority – NEMA (Reg. Number 2281) confirm that the content of this report is a true representation of the Environmental &Social Impact Assessment of the Proposed 60kw Mini Grid in Mageta Island, Mitundu Sub-Location, Mageta Location, Usigu Division, Bondo Sub-County in Siaya County

Lead Expert Nyamori Steve Onserio

Signature: _____

Date: _____

The Proponent:

Rural Electrification and Renewable Energy Corporation (REREC)
Ministry of Energy

Representative: _____

Position: _____

Signature: _____

Date and Stamp: _____

Contents

ACRONYMS AND ABBREVIATIONS

EHS	Environment, Health and Safety
EA	Environmental Audit
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ETP	Effluent Treatment Plant
ESIA	Environmental and Social Impact Assessment
FD	Forest Department
GEF	Global Environment Facility
GoK	Government of Kenya
KMD	Kenya Meteorological Department
NEMA	National Environment Management Authority
NGO	Non-governmental organization
NIC	Newly Industrialized Country
PPE	Personal Protective Equipment
REA	Rural Electrification and Renewable Energy Corporation (REREC)
USD	United States Dollar

EXECUTIVE SUMMARY

Introduction and study objectives

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.

This proposed project is in line with the commitment of the Government of Kenya to reach 100% electricity access by 2020 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).

This report is for the Mageta Island proposed site.

This Environmental & Social Impact Assessment report was prepared as per the provision of the Environmental Management and Coordination (Amended) Act No. 8 of 2015, and the Environmental Impact Assessment Regulations 2003. It is also in line with the World Bank Environmental and Social safeguards policies, OP4.01 (Environmental Assessment). These safeguards policies are a set of instruments to ensure that the bank supported lending operations minimizes any adverse impacts on local people, their live-hoods, culture and the environment and are a mandatory mechanism for evaluating bank financed projects during design, implementation and completion. The project highlights salient social, economic and environmental issues associated with the design, construction and operational aspect of the Proposed Mini Grid in Mageta Island, Mitundu Sub-Location, Mageta Location, Usigu Division, Bondo Sub-County in Siaya County.

The study process leading to this project report was further designed to address client expectations as stipulated in Terms of Reference

Scope Objective and Criteria of the Environmental Impact Assessment (EIA)

The Government of Kenya 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. The scope of this Environmental and Social Impact Assessment, covers:

- The baseline environmental and social conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Public participation
- Identification and discuss of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Development of an environmental and social management plan outline.

The study process leading to this project report was further designed to address client expectations as stipulated in Terms of Reference

The study objectives were to:

- Conduct an Environmental and Social Impact Assessment to identify both positive and negative impacts of the proposed project and propose most appropriate interventions during construction, operation and decommissioning of the project;
- Collect baseline socio-economic data of the project area and potential impacts expected from project construction, implementation, operation and decommissioning;
- Develop an Environmental and Social Monitoring Program during construction , operation and decommissioning, and present plans to minimize, mitigate, or eliminate negative effects and impacts;
- Describe Environmental and Social Management Plan implementation mechanisms;
- Identify and engage stakeholders to seek their views on the proposed project.

Study Methodology

This study was carried out through desk and field investigations. The experts conducted extensive literature review pertaining to this project. During the field investigation, reconnaissance survey was conducted to gather information on biophysical and socio-economic aspects of the area and its environs.

In order to address these issues, the study team adopted a participatory approach where the client and the immediate surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes, design and relevant project documents. Among the key activities undertaken during the assessment are:

i. Interviews and consultations with the immediate neighboring (project beneficiarie) land users. A questionnaire was circulated to the people in the neighborhood to

obtain their honest opinion regarding the project (samples have been annexed to this report),

ii. Review of documents with necessary information on the proposed project details, the site planning and implementation plan as well as the desired nature building,

iii. Physical inspections of the proposed site and photography,

iv. Evaluation of the activities around the site and the environmental and social setting of the wider area, through review of existing information, literature and physical observations,

v. Reporting, review and submissions.

The Environmental considerations evaluated for the proposed development include: Ecological considerations (biological diversity, sustainable use of ecological resources and ecosystem maintenance), social considerations (economic impacts, social cohesion or disruption, effects on human health, immigration or emigration, communication and effects on culture and objects of cultural value), Landscape considerations (views opened up or closed, visual impacts, compatibility with surrounding areas and amenity opened up or closed) and land use considerations (water sources, effects of proposal on surrounding land use potentials and possibility of multiple uses).

Policy, Legal and Regulatory Framework

This Project Report has been developed to ensure that the proposed construction of the mini grid is in conformity with national policy aspirations towards securing sustainable development. Specifically, this report has been developed to ensure compliance with requirements of the Environmental Management and Coordination Act (EMCA) 2015- Kenya's supreme environmental law and the National Constitution. Section 58 of EMCA requires that all proposed development in Kenya to be subjected to environmental impact assessment and to be conducted in line with the Second Schedule (of EMCA) and the Legal Notice 101 (Regulations for Environmental Assessment and Audit) of June 2003. The entire study process has been designed to conform to the regulatory framework stipulated by the National Environment Management Authority (NEMA)-the body that will review this report and make decisions on grant of an environmental license to the development.

Project description

The proposed project will be implemented in Mageta trading Centre in Siaya 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 developers(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 Source.

Photovoltaics (PV)

The PV generator consists of Silicon Crystalline Photovoltaic modules of capacity at STC of 240 Wp or more. The PV modules should comply with the norms IEC 61215 and IEC 61730. The outside junction box with the positive and negative terminals shall incorporate bypass diodes that have the function of preventing any possibility of the electrical circuit inside the module being broken due to the partial shading of a cell and shall be at least IP 65 and UV resistant.

The module support structure shall be ground-mounted on arid soil. The support shall have a tilt angle between 10° - 15° from the horizontal. No soil test has been performed but from the site inspection, ramming or screw foundations could be used. The support frame shall be of either lightweight aluminum or galvanized steel and it shall be easy for installation, maintenance and disassembly at the end of life cycle.

Cables used within the PV generator shall have a voltage rating of at least 1,2 VOC; have a temperature rating higher than 40 °C above ambient temperature; be UV-resistant; water resistant and it is recommended that they be flexible (multithreaded) to allow for thermal/wind movement of modules. The PV inverter shall be of type current source grid-tied to convert DC to an AC Sinusoidal current. String inverters shall be installed indoors or outdoors with a cover and suitable for desert conditions with high ambient temperatures and dust.

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.

Project Potential Impacts and Mitigation Measures

The following positive and negative impacts that are associated with the proposed medium-sized hybrid mini-grids (PV/Diesel) during the construction phase, operation phase and decommissioning phase were identified.

Positive Impacts

The following are positive impacts associated with the proposed medium-sized hybrid mini-grids (PV-/ Diesel) in Mageta centre :

- Reliable supply of electrical energy.

- Improved electricity supply in support of the Vision 2030 of the Government of Kenya.
- Reduction of carbon emission to the atmosphere.
- Direct and indirect skilled and no-skilled employment opportunities.
- Gains in the local and national economy and increase in revenue.
- Provision of market for supply of building materials.
- Informal sectors benefits.
- Optimal use of land.
- Improvement in security as a result of lighting.
- Improvement in social infrastructures.
- Acceleration of the investment process in the region.
- Reduction in pressure on biomass which comes from forest resources.

Negative Impacts

Against the background of the above positive impacts, there will be negative impacts emanating from the construction and subsequent operation and decommissioning activities of the facility. The negative impacts will include:

Air Emissions: The project will potentially have adverse impacts on air quality during operation mainly from stack gases emitted especially during the night from Diesel Genset. Emissions will be comprised of particulate matter (PM), Sulphur Dioxide (SO2), Oxides of Nitrogen (NOX), Carbon Monoxide (CO), the Greenhouse Gases (GHGs) and Carbon Dioxide (CO2), trace amounts of various metals, and trace amounts of organic and inorganic compounds. The proportions and amounts of pollutants emitted will depend on the fuel quality and condition of combustion. Dust will be generated during construction.

Noise Pollution and increased vibration: The proposed civil works and operation of the facility will bring about an increase in cumulative noise levels. Noise pollution from the operation of the generators is inevitable during night and day time as the plant will run 24 hours non-stop throughout except during maintenance time. There are however no sensitive receptors of noise especially at night. Considering the existing background noise level, the operations activity during daytime is not expected to seriously affect the noise level in areas adjacent to the project site.

Fire Hazards: Potential adverse impacts related to fire hazards remain a main feature of this project. The plant will deal with combustible products, with a large oil storage facility and the risks associated with fire hazards form a significant adverse impact on the human health and environment.

Soil Erosion: There is a likelihood of localized soil erosion during the civil works which entail compacting, earth excavations and moving works. However, these impacts will be largely localized to the project area and will only occur during the construction phase.

Oil Spills: The transferring of fuel Oil from the tankers to the above ground storage tanks and pumping for use to the generator sets could result in accidental oil spills. This may lead to potential contamination of surface and groundwater as well as soil.

Increased Diesel Consumption: The proposed hybrid mini-grids (PV-/ Diesel) especially Diesel Genset shall consume large amount of diesel in the process of generating electricity. Since diesel fuel is produced mainly through non-renewable resources, this will have adverse impacts on these non-renewable resources base and their sustainability.

Liquid Waste Generation: Since the plant will use diesel to generate electricity, sludge and other effluents will be generated. Waste oil is also an output of the project that poses potential environmental hazard in case of poor handling and disposal methods. This may affect the environment through water and soil contamination. The liquid waste to be generated is hazardous hence may cause long-term injurious effects to the environment.

Strain in local resources: The proposed development is likely to strain the resources available like water in the area in the short term. This is as a result of increased population in the project without commensurate services and facilities

Occupational Health and Safety: There will be potential risk of occupational hazards that could lead to occupational accidents and during construction and operation of the project. Adverse impacts on the workers' health and safety is likely to occur especially through worker's interaction with the equipment's and machines during construction and operation of the plant. Accidents, injuries and diseases are likely to occur during project construction and operations and this could potentially harm the health of the employees.

Solid waste generation: Solid waste materials during construction and solid waste during operation are likely to be encountered. The waste will include soil, construction materials and office papers.

Visual Intrusion: The proposed project will change the natural appearance of the project area landscape.

Generation of Dust: Some dust will be generated during construction and demolition works of the proposed mini-grid (PV-/Wind-Diesel). This will affect construction and demolition staff as well as the residents. The impact will be direct, temporary and minor.

Land Take: The process will lead to acquisition of land for the proposed Hybrid Mini-Grid project on the island during the pre-construction and construction phases of the project.

Gender Inequality Impacts: Abuse of women and the minor

The risk of limiting women access to project benefits such as jobs, by giving preference to men, as construction is considered a male industry.

Gender Based Violence**:**

The project may trigger or excercebate violence against women and girls as follows;

a. **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.

b. **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.

c. Other forms of Gender based violence (GBV) at the community level: The project may trigger or exercebate other forms of GBV at the community level through its project activities.

Labor influx in to the project area: 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.

Spread of communicable diseases and HIV/ AIDs impacts: 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.

Proposed Mitigation Measures

Air Emissions Mitigation Measures

- During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions;
- Construction trucks removing soil from the site, delivering sand and cement to the site should be covered to prevent material dust into the surrounding areas;
- During construction, where water is available, sprinkle the construction area with water to keep dust levels down.
- Masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- Drivers of construction vehicles must be supervised so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NOX, SOX and suspended particulate matter;
- Increase generator stack heights (more than 6 metres) high

- No burning of any waste materials whatsoever should be permitted within the site both during construction and operation;
- During operation, Generators will require appropriate maintenance to ensure minimal emissions;
- Use of low Sulphur fuel for SO2 where available or installing desulphurization equipment;
- Nitrogen oxide emission should be controlled through burner management and water injection to the combustion turbines; Smoke treatment (denitrification) Choice of combustion technology; Burners/low-NOx combustion chambers; Water or steam injection.
- Particulate emissions should be reduced through good combustion control to minimize the products of incomplete combustion. Reduction of ash content in fuels: Choice of combustion technology, Electrostatic precipitators, bag filters, CO Control of combustion conditions operating measures (including stack cleaning)
- The Plant operator will be required to install and operate dedicated stack gas samplers or analyzers, and report analytical results.
- Source testing will also routinely require to confirm continued compliance with emission limits.
- To mitigate the effects of flue gas affecting the micro-climate of the area, the stack chimney of the generators should be 6 meters. This will enable plume dispersal high preventing smoke and heat from affecting the surrounding area.

Dust Emission Mitigation Measures

- Fugitive emissions from site work to be eliminated or minimized by applying water on a need to need basis to unpaved surfaces and exposed construction areas during the dry season;
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.

Noise Abatement Measures

- All equipment's and machinery installed must be tested to verify if they are compliant with Kenya and the internationally acceptable standards of noise. Tested noise levels should be recorded as baseline and used for future monitoring.
- Noise emitting equipment should be properly maintained.
- All workers in the project site must be equipped with suitable and adequate Personal Protective Equipment (PPE) for hearing protection.
- Each diesel generator shall be provided with one exhaust silencer.

Soil Erosion Mitigation Measures

- Excavations of the site will be confined only on the sections of the plant where structures and equipment shall be located.
- Excavated earth will be held away from the drains and on locations of the site not susceptible to surface runoff of storm water,

- The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains and where it will not compromise other land use activities in those areas,
- Caution will be required during construction at times of heavy rains.
- Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff.
- The final site grade should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion.
- Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
- Installation of drainage ditches, construction of runoff and retention ponds is necessary. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
- All slopes and working surfaces should be returned to a stable condition.
- Topsoil on the final site would be graded and planted as appropriate.

Oil Spill Mitigation Measures

- To prevent oil spills and environmental contamination, the power plant and pipelines should be designed with spill prevention and detection systems to protect the environment.
- Need to design appropriate protection devices against accidental discharge of oil substances (bases/airtight tanks for machines, reservoirs etc.).
- Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water.
- All the aboveground fuel storage tanks should have secondary containment or retention area (bund wall) with sufficient volume to contain a spill from the largest tank in the containment structure. The containment area should have a means of removing accumulated water.
- The plant operator should provide adequate storage areas for the storage of chemical and lubricating substances.
- Drains should be routed through an oil/water separator.
- Frequent inspection and maintenance of the facility should be done to minimize spilling from the transfer pipeline.
- A written Medium Speed Diesel response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.
- A floating boom should be used to contain spillage during unloading and disconnection procedures.
- Constructing and maintaining facilities should be done so as to enable the easy removal of rainwater from the secondary containment structures and proper removal of oil from the surface of the accumulated storm water.

- The project operator should ensure the proper containment or collection and disposal for the waste oil or used oil. In the Environmental Management Plan (EMP), disposal of used oil will be the responsibility of the project operator.
- All waste oils and lubricants from maintenance of equipment and the containers for the lubricants should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.
- Used oil filters should be segregated in a place where dripping used oil can be accumulated and disposed properly. The plant operator will identify a reputable company to handle disposal of oil filters.

Solid waste generation

- The solid waste would consist primarily of packaging materials for lubricants, used oil filters and used rags.
- Contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the site, recycling programmes for recyclable wastes.
- Solid wastes must be segregated and labelled to separate hazardous from non-hazardous waste. The plant should be provided with an inbuilt solid waste collection bin with compartments for recyclable materials, biodegradable materials and hazardous materials.
- The most appropriate options in waste management are identification of the waste types, segregation into the various categories and establish suitable mechanisms of collection, storage, transfer and final disposal. The ultimate destination for each of the waste categories should also be known.
- The contractor and project operator should engage a refuse handling company to remove the wastes from the site to the recommended waste management site.
- Warning signs against littering and dumping wastes in wrong places within the project site should be erected.
- Earth excavated from the construction site should be used as land fill in quarries or other excavated sites within or outside the project site. It is suggested that the contractors identify suitable land fill sites.
- Solid waste audit should be an integral section of the annual environmental audit of premises upon commissioning.

Hazardous waste

- The amount of hazardous waste generated will be very low and possibly originate from maintenance sources.
- The waste would consist primarily of spent lubricants, used rags and spent clean-up solvents.
- Hazards on the site should be clearly marked and the entire workforce trained to recognize the hazards and familiarize themselves with procedures to be followed before entering hazardous areas.

Fire Prevention Measures

- The project site must have in place appropriate and adequate firefighting equipment's of recommended standards and in key strategic points.
- A fire alarm system should be installed in the plant.
- A fire evacuation plan must be posted in various points of the project site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.
- A fire assembly point must be identified and labeled accordingly.

Public and Workers Health and Safety Mitigation Measures

- All workers entering the construction site must be equipped with Personal Protective Equipment (PPE) such as ear muffs, safety footwear, overalls, gloves, dust masks, among others. The PPE's should be those that meet the international standards.
- Personal protection gear must be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use and care of protective gear and in all relevant safety measures.
- Restricted 'ENTRY' signs should be installed to keep away unauthorized persons from access to restricted areas.
- Machines and Equipment must be operated only by qualified staff and a responsible person should be on site at all times to ensure adherence to safety requirements.
- The contractor and operator must develop a workplace Safety and Health Policy Manual which should be communicated to all persons at the site.
- The contractor and operator should develop a Medium Speed Diesel Response Plan for handling any emergencies arising thereof during the construction.
- During construction, temporary washrooms should be constructed with soak-pits that can be easily exhausted.
- A well-equipped first aid kit and a person who has been trained in first aid should always be available at the site.

Visual Impact

- Structures at the site should be designed in such a way that they will improve the beauty of the surroundings.
- Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers,
- Landscaping and planting of trees at the site would also serve to mitigate any perceived negative visual impacts

Economic and Social Impact

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- The Proponent to invest in community development initiatives where possible as part of their corporate social responsibility.

Local recruitment to be prioritized to boost communities economically and Enhance project ownership.

Minimization of increased Water Demand:

- The proponent of the proposed hybrid mini-grids (PV-/ Diesel) in Mageta shall ensure that water is used efficiently at the site by sensitizing construction staff to minimize wastage through irresponsible water use.

Minimization of Land take Impact

The project proponent (REREC) should ensure that all land acquisition procedures align to the Resettlement Policy Framework prepared under this project.

Mitigation against gender Inequality impacts:

- Ensure equitable distribution of employment opportunities between men and women
- Mainstream Gender Inclusivity in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule and National Gender and Equality Commission Act 2011
- Ensure safe employment for women, including training for all staff, regular consultation with female employees and other measure to ensure physical safety and dignity of female employees

Mitigation of GBV-SEA/SH

To mitigate the risk of sexual exploitation and abuse of community members, as well as sexual harassment at workplace, the following mitigation measures are proposed, at a minimum:

- Develop and implement a GBV-SEA/SH Action Plan with an Accountability and Response Framework as part of the Contractor's C-ESMP. The action plan will include the necessary plans for prevention and response. Contractor/REREC 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.

Mitigation against other forms of Gender Based Violence:

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- The contractor will ensure that the project does not trigger or exercebate other forms of GBV at the community level through;
    - effective and on-going community engagement and consultation, particularly with women and girls;
    - review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.

  ensuring specific plan for mitigating these known risks, e.g. sensitization around gender equitable approaches to compensation and employment; etc

Mitigation against Labor Influx Impacts:

- 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.
- All workers to sign employment contract including Code of Conduct.
- Effective community engagement and strong grievance mechanisms on matters related to labour.
- . Prioritize local employment to reduce labour influx.
- . In addition to code of conduct, induct workers on GBV-SEA/SH.Effective contractual obligations for the contractor to adhere to the mitigation of risks against labour influx, including sexual exploitation and abuse and sexual harassment.
- Proper records of labour force on site while avoiding child and forced labour
- Fair treatment, non-discrimination and equal opportunity for all workers.
- Comply to provisions of Labour Relations Act 2012 and Work Place Injuries and Benefits Act (WIBA 2007)
- The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse and sexual harassment.

Mitigation against Spread of communicable diseases and HIV/ AIDS impacts:

- Sensitize workers and the surrounding communities on, prevention and mitigation of HIV/AIDS through staff training, awareness campaigns, multimedia and workshops and during community *Barazas*.
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Total Cost of the Project

Total cost of the project is approximated to be **KES 108,555,555.00,** the cost of ESMP will be **KES. 521,000.00**.

Consultations and Public Participation

Consultations were also undertaken as part of the EIA in order to obtain the views of project beneficiaries and other stakeholders within the project area. The consultation was done within the project area. A semi-structured public participation form was used to collect views from stakeholders about the project. In general, the project is acceptable and no objections were raised concerning the development as proposed. It was agreed that the community members who will be connected with power willing pay their electricity consumptions monthly.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Project 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 2020 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).

Given the isolated nature of the proposed islands of Lot 1, namely Mageta, Ngodhe and Takawiri and the high cost of underwater grid extension, the electrification of the Lot 1 islands will be done through 100% solar based mini-grids.

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 Nyanza region is Mageta Island, one of the Lake Victoria islands, located in Mitundu Sub-Location, Mageta Location, Usigu Division, Bondo Sub-County in Siaya 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.

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 and community 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).

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 ESIA 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 and social 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, operation and decommissioning.
- Collection of baseline socio-economic data of the proposed project area and potential impact expected from project construction, implementation and operation and decommissioning from existing secondary data sources.
- Development of an environmental and social monitoring program (ESMP) during construction,operation and decommissioning, 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 Impact Assessment is carried out at the planning stages of any proposed undertaking that is likely to harm the environment 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 social aspects, and formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and communitythrough all phases of its implementation.

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).

Specific objectives of the study included the following:

- Present an outline of the project background,
- Establish the environmental and social 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 and commissioning,
- 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 focusing on allied activities relative to the project in question.

(3) Interactive approach was adopted for the immediate neighborhood 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 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 project beneficiaries and other stakeholders in the project area. A public participation form was used to record their opinion regarding the project
- Evaluation of the activities around the site and the environmental 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, county and national government officials, as well as - 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 analyze 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: Mitigation Measures of Potential Impacts of the Project.
Chapter 8: Alternatives to 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 is a 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;

- Project Affected Persons and Interested Parties 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.

2.0 CHAPTER TWO: PROJECT DESCRIPTION

2.1 Introduction and Project Objectives

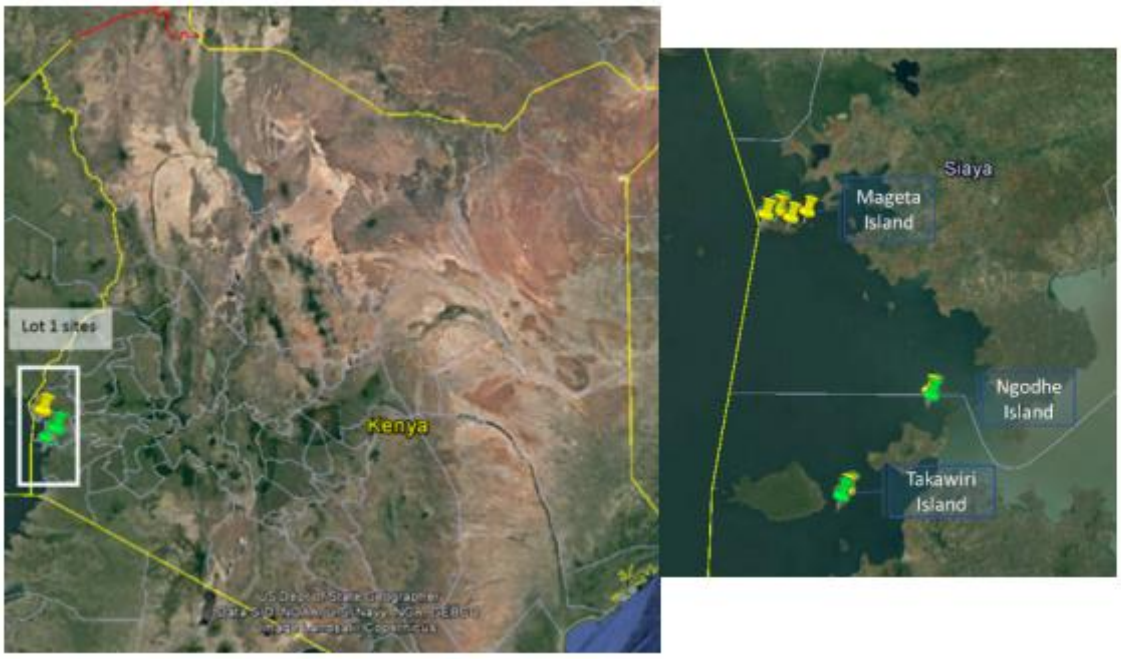
The proposed project has taken into consideration the preparation of Technical design, drawings and Bill of Materials (BOM) as well as the estimates of investments and operating costs of the generation and distribution network components of the hybrid solar PV/ diesel mini- grids for its implementation in each of the selected site.

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

2.2 Project Location

The Mageta site is located in Mageta Island, Mitundu Sub-Location, Mageta Location, Usigu Division, Bondo Sub-County, Siaya County as shown in the *Figure 2.1* below of the selected island sites in Nyanza region within Lake Victoria.

Figure 2.1: Project Location Map of the selected sites



Source: *Google Earth* Image, edited

The Mageta island is approximately 18.7 km from the national grid. The proposed site is located in Mahanga central and covers land of approximately 3,608m^2. It is located 2.4km north of the south-west point and 5.2km from the north-eastern edge of the island as shown in the figure 2.2 below. The GPS coordinates of the proposed site is Latitude: 0° 8' 0.6" (0.1335°) south, Longitude: 34° 0' 37.9" (34.0105°) east.

Figure 2.2: Project Site Map of Mageta Island sites

Source: Google Earth Image, edited

2.3 Nature of the Project

The proposed project will be having two components in one that is Hybrid Mini-Grids i.e. *the PV- generator* and *the Diesel generator* in Mageta Island. The following sections are explanations of the anchor loads expected to create the demand for the proposed project, the design specifications as per the design of the project in Mageta Island and a description for each of the components that will be implemented.

2.3.1 Anchor Loads

The envisioned anchor load for the proposed design of the Hybrid Mini- Grid (PV/ Diesel) in Mageta Island is provided in the *table 2.1* below.

Table 2.1 Anchor loads from Mageta Island as envisioned by the project design

Anchor load	**Description and comments**	**Estimated daily energy consumption (Wh/day*)**	**Estimated daily demand from the grid (Wh/day*)**
Waka waka beach management unit	400 kg of fish is handled daily and 4 bags of ice of 95 kg are used. The beach management unit levy KES5/kg	6,600	6,600
Sika beach management unit	150 kg of fish is handled daily and 2 bags of ice of 95 kg are used	3.300	3,300
Mitundu beach management unit	200 kg of fish is handled daily and almost 3 bags of ice of 95 kg are used	3,300	3,300
Kuoyo beach management unit	1000 kg of fish is handled daily and 10 bags of ice of 95 kg are used. The beach management unit levy KES1/kg. Solar lanterns are used for lighting during early morning business hours	6,600	6,600
Mahanga beach management unit	500 kg of fish is handled daily and 10 bags of ice of 95 kg are used. The beach management unit levy KES3/kg. Fish prices depend on fish weight; from 1-4 kg they cost KES300/kg, from 5-9 kg they are sold for KES350/kg and 10 kg and above cost KES450/kg	6,600	6,600
Posho mills (10)	There are 10 posho mills, from which only 2 were open during the field visit. One mills monthly 10 bags of 90 kg each. The other one mills 10 to 20 bags of 90 kg each.	2,200 and 4,400 It is assumed that half of the mills are basic and half medium	2,200 and 4,400
Sika village water pump	Runs on diesel but was not accessible during the visit.	14,700 It is assumed that it serves 300 households or 6,000 people	14,700
Mageta primary school	Has 66 digital e-learning tablets, 1 projector, 1 media server and 1 Wi-Fi router. It also has a water reservoir. It has a 3 kWp stand-alone PV	3,850	550 The PV plant can produce 6 kWh daily. A minimum demand from

Anchor load	**Description and comments**	**Estimated daily energy consumption (Wh/day*)**	**Estimated daily demand from the grid (Wh/day*)**
			the mini-grid has been considered
Sika primary school	27 digital e-learning tablets, 1 projector, 1 media server and 1 Wi-Fi router to be provided. It has a 2.5 kWp stand-alone PV	3,850	550 The PV plant can produce 6 kWh daily. A minimum demand from the mini-grid has been considered
Mitundu primary school	62 digital e-learning tablets, 1 projector, 1 media server and 1 Wi-Fi router. It has a 2.5 kWp stand-alone PV	3,850	550 The PV plant can produce 6 kWh daily. A minimum demand from the mini-grid has been considered
Mahanga Primary School	It has 79 digital e-learning tablets, 1 projector, 1 media server and 1 Wi-Fi router. It has a 3 kWp stand-alone PV	3,850	550 The PV plant can produce 6 kWh daily. A minimum demand from the mini-grid has been considered
Private primary school	Currently it is connected to the SteamaCo mini-grid. No other information was acquired during the visit	3,850 Considered that will disconnect from the SteamaCo grid	3,850
Secondary school	It is a day school. It has a 1.2 kWp stand- alone PV used for lighting, a photocopying machine, TV and radio. It also has a water distiller which is not in use currently	3,850	1,450 Subtracted the PV production
Video hall	It runs during the day showing movies and football. Football is charged at KES 40 per person while movies and news is charged at KES 30	1,650	1,650
Large retail shop	Located in Mahanga West, it has two fridges with an output of 110 W each. The 2.5 kW generator runs from 10am - 1pm and from 4pm - 6pm	3,850	3,850

Anchor load	Description and comments	Estimated daily energy consumption (Wh/day*)	Estimated daily demand from the grid (Wh/day*)
Resort	It has 12 rooms and a SHS that does not work. It rents solar lanterns for the rooms when there are guests for KES 10 per night.	3,850 To cover the demand of a freezer and other electric appliances	3,850
Telecommunications Tower	Constructed in 2016 and commissioned in 2017. The tower runs on a diesel genset and there is no RE component on the tower	5,500	5,500
Health Center	It has a 4.3 kWp that only supplies a microscope. Other appliances available are an autoclave, computers, etc. There are also staff houses at the facility using private SHS	3,850	1,650 This can cover the demand of a typical autoclave with 1.5 kW power
Country resource center	It is owned by the county government. It is not currently in use. It will have a library and computer lab	550	550
Street lighting	According to REA, streetlights should cover the whole island's surface.	Estimating 90 lights of 18 W each on for 10 hours every night, the total demand would be 16.5 kWh/day.	16,500

*kWh/day - kilowatt hours per day

2.3.2 Technical specifications of the Mageta mini-grid

Following the design demand estimates summarized above, the mini-grid design was done. The summary of the technical specifications of the Mageta grid are shown in *table 2.2* below.

Table 2.2 Summary of technical specifications of the Mageta mini-grid design

General characteristics	
Design demand	1,720 kWh/ day
Maximum peak demand	240kW
Night load demand factor	71%
PV generator	
PV generator size	594 kWp

Types of modules	Crystalline
PV mounting	Ground mounted
Solar inverter	500 kWac
Battery inverter	
Inverter Continuous Power Rating	300 kWac
Inverter set mode	Multi-mode (DC to AC and AC to DC)
Wave type	Sinusoidal
Battery	
Autonomy	2 days
Battery voltage	400 Vac
Battery depth of discharge	80%
Battery capacity	4,200 kWh
Battery type	Lithium-ion
Distribution line	
Distribution type	Low Voltage & Medium voltage, 3- phases
LV distribution line total length (meters)	32,200
MV distribution line total length (meters)	5,500
Number of poles	644
Number of meters year 4	1,744

Source: Feasibility design for Lot 1 (*Nyanza Sites*)

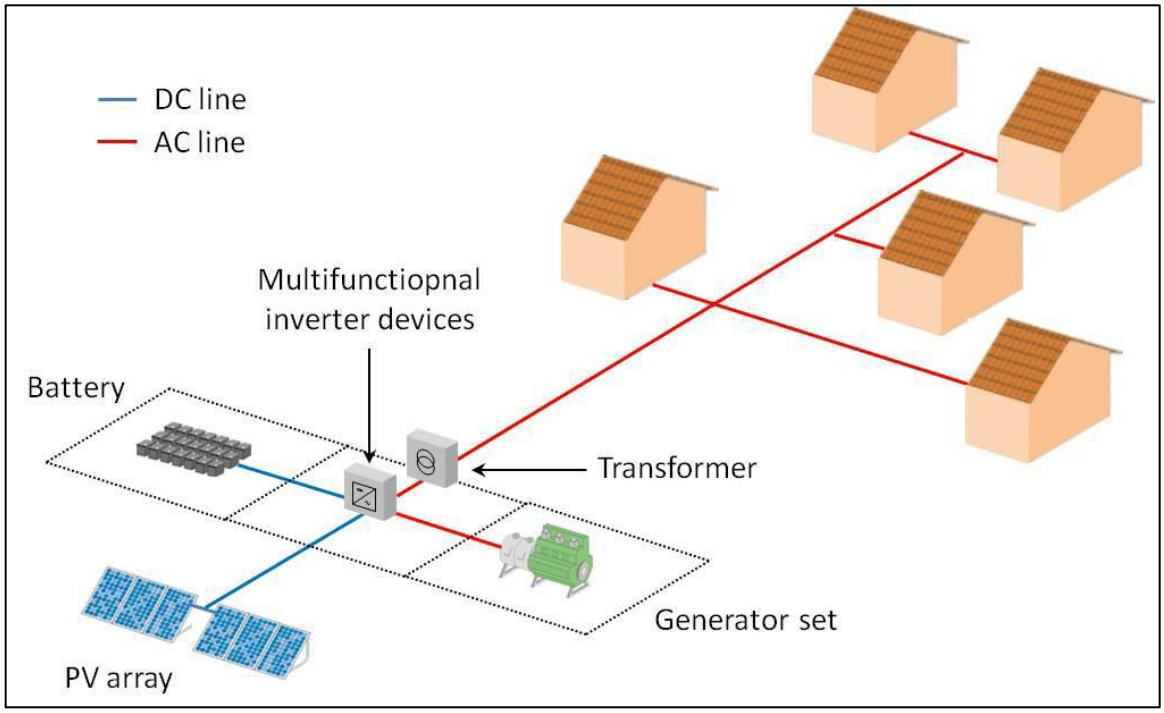
2.3.3 Architecture and basic design specifications

This hybrid power generation site is projected to generate 60 Kw and is meant to serve between 200-300 households (customers). It will have an installation of 240 solar panels of 250 Watts and a battery house for 96 batteries of 800Ah each. The solar panels will have a connection to the batteries. The standby generator will also be connected to the system as a backup. This generator will be 50 KVA with a fuel tank capacity of approximately 200 liters. To optimize this hybrid system HOMER software will be employed. The goal of the hybridization of Diesel systems is to reduce fuel consumption by switching off Diesel generator set(s) for several hours a day, in order to reach a PV energy share in the final mix of at least 60% or more. The power will be distributed to the customers by overhead lines. Mageta site is expected to serve clients within a radius of 1km from the site (generation source). The daily load demand used to size the Solar Mini-grid was the demand at year 5, 1461 kWh/day. The PV plant and the Battery capacity have been sized accordingly to the

daily demand and the solar resources. The PV plant capacity (370 kWp) is sized with 5 Peak Sun.

The *figure 2.3* below illustrates a sketch of the proposed design as it will be set up at the proposed project site.

Figure 2.3: Sketch of the Proposed Project Design



2.3.2.1 The PV Generator

The PV generator consists of Silicon Crystalline Photovoltaic modules of capacity at STC of 250 Wp or more. The PV modules should comply with the norms IEC 61215 and IEC 61730. The outside junction box with the positive and negative terminals shall incorporate bypass diodes that have the function of preventing any possibility of the electrical circuit inside the module being broken due to the partial shading of a cell and shall be at least IP 65 and UV resistant.

The module support structure shall be ground-mounted on arid soil. The support shall have a tilt angle between 10° - 15° from the horizontal. No soil test has been performed but from the site inspection, ramming or screw foundations could be used. The support frame shall be of either lightweight aluminum or galvanized steel and it shall be easy for installation, maintenance and disassembly at the end of life cycle.

Cables used within the PV generator shall have a voltage rating of at least 1,2 VOC; have a temperature rating higher than 40 °C above ambient temperature; be UV-resistant; water resistant and it is recommended that they be flexible (multithreaded) to allow for thermal/wind movement of modules. The PV inverter shall be of type current source grid-tied to convert DC to an AC Sinusoidal current. String inverters shall be installed indoors or outdoors with a cover and suitable for desert conditions with high ambient temperatures and dust.

Multi-mode Inverter

The multi-mode inverter (or inverter set) for this application is a 200 kW (nominal) bidirectional sinusoidal inverter. It can operate in autonomous mode as well as grid-tied mode. The efficiency curve shall be always above 80% in all cases, adjusting it at the load demand curve (base load, partial load or maximum load).

A priority function of the Multi-mode Inverter is to adjust the instantaneous power consumed from the source according to the battery voltage. The operation of the solar priority function shall be done with an automatic adjustment algorithm of the input limit current. The input limit current is decreased, if there is enough energy available at the DC side, from the initial value.

Battery

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".

Battery rating

The battery nominal voltage does not need to be established at this stage and different technology providers may offer different solutions on this issue. Nevertheless, it must be noted that the voltage class, either ELV or LV, will determine the electrical isolation and accessibility requirements of the battery room. The battery shall have at least the rated capacity of 2.16V at the C10 discharge rate according to DIN 43539-9.

Battery Performance

The battery shall have a self-discharge when new of less than 5% per month (at 25oC and fully charged) of its rated capacity and shall have a Coulombic efficiency of at least 85% and energy conversion efficiency of at least 85% when new and charged to more than 50% of capacity. The battery cycle life for discharge/charge regular cycles down to 80% DOD shall be more than 1500 cycles (According to IEC 896-1).

Lifetime

The design lifetime of the batteries shall be of at least 8 years without losing more than 10% of the rated C10 capacity.

Battery cabling and protections

The battery connection point shall be as close as possible to the Multi-mode Inverter. Cables used to connect the battery shall have a temperature rating higher than 20 °C above ambient temperature. It is recommended that they be flexible (multithreaded) to allow for easy installation and maintenance. Fuses in cables that connect components to the battery shall be rated for DC. use, be installed separately as close as possible to the battery terminals and rated to interrupt high fault currents from the battery. The battery tray to contain any electrolyte spills shall be constructed of impact and acid resistant material.

2.3.2.2 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.

Distribution Line and Energy Meters

The electricity distribution from the generation plant to the end consumers will be done by means of a distribution line formed by low voltage (LV) line at 415V for three phase and 240V for single phase. All lines shall be over-head mounted on wood or concrete poles.

2.3.2.3 Power House

The Battery, Multi-mode inverter and all monitoring equipment will be installed indoors with air ventilation accordingly to the manufacturer's recommendations. Thus, a power house or a containerized solution, considering the equipment manufacturer's recommendations shall be installed. All electrical boards and LV protections will also be installed indoors. The batteries will be installed in the power house in a separate room, specifically for their use and meeting the electrical safety requirements according to its voltage class.

2.4 Site Ownership

The proposed site land where the Hybrid Mini-Grids (PV-/ -Diesel) project will be implemented is classified under public land which is under the Ministry of Interior, National Government. REREC approached Mageta location the administrative area chief, sub-chiefs and elders who allocated 5 acres to the project. Legal documentation of the land is ongoing through the consultation of REREC and the county and national administration.

2.5 Project Justification

The Kenya Electricity Modernization Project (KEMP) intends to support the Government initiative of ensuring increased electricity access to Kenyans, particularly among the low-income groups and those in peri- urban and off- grid areas. This proposed project is in line with the commitment of the Government of Kenya to reach 100% electricity access by 2020 through grid extension, stand-alone individual plant and autonomous mini- grids.

REREC aims to develop the solar/diesel hybrid mini- grids to electrify villages that are not economically feasible through national grid extension. The Mageta Island site was proposed as part of this project due to its isolated nature and the high cost of underwater grid extension to islands in the Lake Victoria. Mageta Island has a growing population with 1,244 households in Mahanga sub location and 495 households in Matundu sub location (at a total of 1,739 households as per the feasibility studies); this population has a growing demand for electricity.

Mageta's main electricity need is the fish conservation units. There are five beach management units in the island. Currently, the purchasers bring their own ice with cool boxes. Mageta's fishermen purchase ice from Usenge beach in the main land and can last up to a day in a good cool box.

There are various beach management units and fish *bandas* in the island. Other anchor loads include community water pumps and posho mills.

2.6 Project Activities

It is expected that the proposed site will undergo alteration during the construction process to install the power plant and associated structures. Some of the activities envisaged in this project include: site clearance and leveling, civil works and construction of utilities and structures for the facilities, installation and connection of the power plant as described in the section below.

Safety protocol and established National and International Environmental protection regulations/ standards as well as all management plans proposed under this ESIA report as well as in the ESMF for this project, shall guide the contractor and projector operator during the project cycle. Modest construction procedures will be followed to reduce noise and vibration levels and the production of dust and any form of pollution that may affect the neighboring community within project areas.

2.7 Construction Procedures

All construction activities including ground preparation, earth moving, materials delivery, building, walling, roofing and the installation of amenities (power, water, communication equipment, etc.), fittings (doors, windows, safety provisions, etc.) will be carried out by competent personnel obtained through respectable contractors to ensure consistent high standard of finish and providing superb value for money.

2.7.1 Construction activities Outline

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.

2.7.2 Utilities to be constructed on site

The following utilities are planned to be constructed and operated on site. As per the design report, these utilities will undergo regular operation and maintenance as summaries below.

Utility Section	Maintenance Schedules
Technician Room	• Weekly screen reading and light indicators on the remote display panel, charge control and invertors, • Monthly inventory checks for all materials at the project site, support professional technicians while carrying out bi-monthly

	visits
Battery Room	• Weekly inspection of the top of the battery cell,
Generator Room	• Weekly cleaning, registration of every time genset starts operation
PV Array	• Weekly visual inspection of any possible damage or breakage
Project Site	• Weekly inspections to ensure site is not littered, material properly stored and organized, • Register visitors coming to site
Distribution	• Weekly receipt of complains or lack/ quality of supply of electricity and reporting to the professional technician

Source: Project Design Report

2.7.3 Input Materials

The proposed is a Hybrid Mini-Grids (PV-/ Diesel) power plant will be constructed using common construction materials and construction procedures that are not expected to compromise the safety of the neighboring communities as well as the general environment. The following inputs will be required for construction:

- Raw construction materials e.g. sand, cement, natural building stone blocks, hard core, gravel
- Timber (e.g. doors and frames, fixed furniture, etc.),
- Paints, solvents, white wash, etc.,
- Generator Sets,
- A construction labor force (of both skilled and unskilled workers).

The project proponent should ensure that all material sourcing (either inland or on the island) does not trigger any environmental or social impacts. All hazardous materials should be handled according to the NEMA regulations on hazardous waste. All new unidentified impacts should be mitigated and managed in a responsible manner throughout the project cycle by the contractor and the project operator.

2.7.4 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 Mageta Island is planned to operate within its lifespan of over 20 years.

2.8 Project Budget

The proposed power plant has been sized at 370 kWp of solar energy, 2.2 MWh of battery storage and a 200-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 521,000.00

3.0 CHAPTER TWO: LEGAL AND INSTITUTIONAL FRAMEWORKS

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 0f 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 located in a public land, registered under national government designated for the administrative chief's office building in Mageta.

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 not within community land.

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 Siaya.

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 on the island within the Lake Victoria.

3.8.4 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.*

3.8.5 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 Siaya to the implementation of this project.*

3.8.6 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.*

3.8.7 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 60kw at Mageta Island (*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 of

		the island that may not negatively affect diverse flora, fauna, and avifauna. The island is dependent on fishing.
4.10	Indigenous Peoples	Not applicable.There are no IPs/VMGs on Mageta island
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). The proposed site was observed to host a large number of Egret birds that perch on the trees and vegetation along the beaches in Mageta Island.

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. *This policy is thus not triggered since there is no displacement of people, however the residents of the project area need prior engagements especially during the implementation of the wayleave for the distribution line.*

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. *This policy is thus not triggered as there are no indigenous persons in the project area.*

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 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.

- 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.

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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.

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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.

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3.13 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.

3.14 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.

3.15 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
		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 island
	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

4.0 CHAPTER FOUR: BASELINE INFORMATION

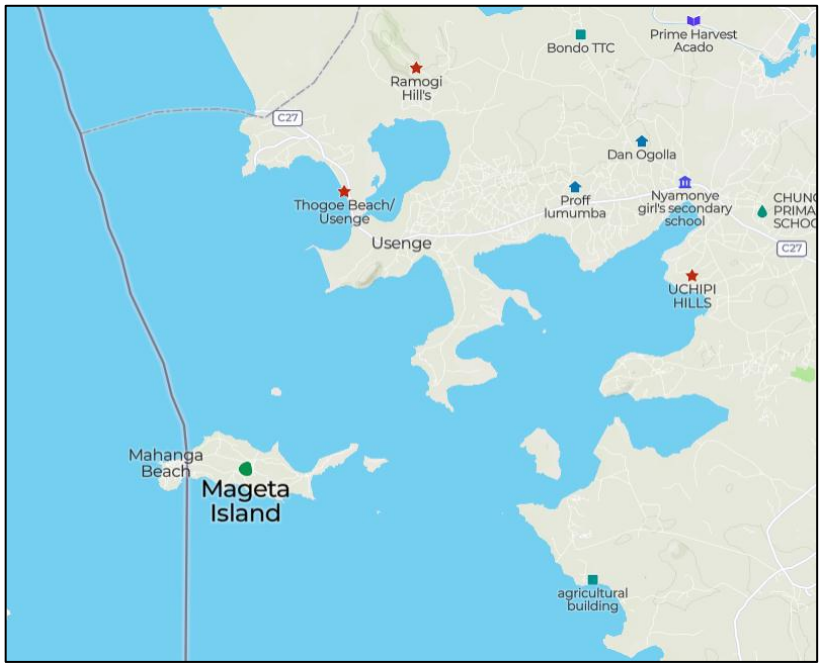
4.1 Physical Environment

4.1.1 Location

Mageta Island Mini-grid proposed site is Mitundu Sub-location, Mageta Location, Usigu Division, Bondo Sub-county in Siaya County. It is politically represented in West Yimbo Ward in Bondo constituency. The island is a 45-minute ride by the water bus from Usenge beach (as shown in the Figure 4.1 below) which is 88 km from Kisumu town. The GPS location of this site is Latitude: 0.13369^0 S and Longitude: 34.0112^0 E.

The proposed site covers a land of around 3,608 m^2. It is located 2.4 km far from the south-west point and 5.2 km from the northern-eastern edge of the island. During the site visit, a second alternative site was identified, in case the electrification of the island could be done through two or more independent mini-grids. A second site was proposed by the island officials at the southern part of the island, which occupies around 1,800 m^2 (*See Figure 2.2 in chapter 2 above*).

Figure 4.1: Project Location Map Mageta Island



4.1.2 Topography and Drainage

The altitude of the County rises from 1,140m on the shores of Lake Victoria to 1,400m above sea level on the North. There are few hills found in the County namely; Mbaga, Odiado, Akala, Regea, Nyambare, Usenge, Ramogi hills, Rambugu, Abiero, Sirafuongo and Naya hills. River Nzoia and Yala traverse the County and enter Lake Victoria through the Yala Swamp. The physical features have a bearing on the overall development potential of the County. The high-altitude areas that form the Ugenya and Ugunja sub-counties have higher rainfall hence suitable for agriculture and livestock keeping. Rivers Nzoia, Yala and Lake Kanyaboli have a great potential for irrigation. The low altitude areas of Boro, Uranga, Uyoma and Wagai receive less rainfall and thus are suitable for cotton growing and drought resistant crop varieties. The topography of the Mageta Island was observed as flat with gentle slopes.

4.1.3 Geology and Soils

The geology of the area is composed of the old Nyanzian system forming exposed rocks in Siaya, Ugenya, Ugunja and Gem Sub-counties. These rocks include basalts, desites and rylites, that consist of coarse and fine aggregates used in the construction industry. The main soil type is ferrasols and its fertility ranges from moderate to low with most soils being unable to produce without the use of either organic, inorganic or in most cases both types of fertilizers. Most of the areas have underlying murram with poor moisture retention.

Bondo sub-county has various soil types ranging from black-cotton, sandy loams to laterite including red volcanic soils. West Sakwa, South Nyang'oma and Usigu locations have

ferrasols, while North Sakwa, East and Central Yimbo have luvisols with low moderate fertility. The soil types in Rarieda ranges from black cotton soil in Madiany Division and sandy loams and red volcanic soils in Rarieda Division. The expansive Yala Swamp around Ramogi Hill has potential for large scale- irrigation using river Yala. Bondo Sub-County also has several islands including Sirigombe, Magari, Yalombo and Mageta, where the proposed project is located.

The county is predominantly covered by sandy loam soils. The distribution and development of soils in the county is influenced by topography, rock types and vegetation cover among other factors. The volcanic hills on Lorroki plateau are covered by shallow dark to dark brown rocky and stony soils especially to the north. In the south west and high-altitude areas where rainfall is above 600mm per annum the soils are comparatively deep. The Mageta Island soils were observed to be loamy as shown in the figure 4.2 below.

Figure 4.2: Loamy soil observed in Mageta Island

4.1.4 Hydrology

Siaya County has to major rivers namely: River Yala and river Nzoia. These two rivers, which form the county's drainage systems of major river basins with numerous tributaries,

drain directly into Lake Victoria. The seven major tributaries (small rivers) are Huro, Akala North, Nyamonye, Woroya, Dande and Seme Awach which have a combined discharge rate of 7.42m3/sec. They are potentially important sources of water needed for both farming and domestic use. There are several swamps, wetlands, dams and pans. The major lakes in the County are: Lake Victoria, Kanyaboli, and Lake Sare. Ground waters are found in Nyanzan rock aquifer system and Kavirondian rock aquifer system. Generally, the county has good potential of ground water. The potential however, diminishes as one approaches the lake. There are also several springs and shallow wells. There are several sampling points for ground and surface water done on quarterly basis for water analysis to determine the quality. There are no rivers within Mageta Island.

4.2 Climate Conditions

The County experiences a bi-modal rainfall, with long rains falling between March and June and short rains between September and December. The relief and the altitude influence its distribution and amount. Siaya County is drier in the western part towards Bondo and Rarieda sub-counties and is wetter towards the higher altitudes in the eastern part particularly Gem, Ugunja and Ugenya sub-counties. On the highlands, the rainfall ranges between 800mm – 2,000mm while lower areas receive rainfall ranging between 800 – 1,600mm.

Temperatures vary with altitude rising from 21° C in the North East to about 22.50° C along the shores of Lake Victoria while in the South, it ranges from mean minimum temperature of 16.3°C and mean maximum temperature of 29.1° C. Humidity is relatively high with mean evaporation being between 1,800mm to 2,200mm per annum within the County. The relative humidity ranges between 73 per cent in the morning and 52 per cent in the afternoon. Climate variations are evident in all these areas due to human activity distorting some of the statistics above.

Mageta Island receives long rains between the month of February and May, while the short rains received between September and November. The weather is observed to be hot and sunny.

4.2 Biological Environment

4.2.1 Vegetation Cover

Most of the natural vegetation is cleared as observed in Mageta Island. Bondo sub- county, in its original setting, was full of trees and shrubs. The bare semi-arid land with few shrubs, which is the picture of Bondo today, was an expansive forest that engulfed the both human and wildlife habitat in the 1960s. The deforestation is due to trees being cut for wood fuel

and construction of human settlements. The community of Bondo sub county have tried to preserve several tree species, such as *Albizia coriaira (ober) and Acacia nilotica (obede)* by enforcing cultural beliefs that restrict their use to specific functions but this has not yielded any preservation cause. Such species are preserved by the community for medicine, construction and firewood purposes. The population increase and the consequent demand for firewood and building posts have threatened preservation. In order to cope with this demand, some individuals have opted for tree planting in order to boost the supply. The residents have information attributed to local non-governmental organizations and agricultural extension workers to the effect that the quick maturing eucalyptus specie also renders the soil infertile and unsuitable for planting other crops. Mageta Island has few trees and shrubs, that are mostly exotic in nature, as shown in figure 4.3 below.

Figure 4.3: Kamongo market showing the various shrubs and few trees

4.3.1 Fauna

The varieties of wild life found in Siaya County include hippopotamus (Lake Victoria, River Yala), crocodiles (Yala Swamp, parts of the Lake Victoria), Sitatunga (Yala Swamp) and

monkeys and leopards. The County has several species of fish, but the most popular ones are Nile perch, Rastrineobola argentea (Locally known as Omena), Hatlochromines (locally known as Fulu or Wiu) and Nile Tilapia. The first species have a very high commercial value and is responsible for the economic break through which has been experienced along the shore of Lake Victoria. Others are bush pig (mainly in Yala Swamp), Hyenas (Got Abiero, Utonga), various species of snakes e.g. pythons, cobras and various species of birds. No wild animals were observed in Mageta Island.

4.3 Socio-economic profile

4.3.1 Demography and Administrative background

The proposed Mageta Island mini-grid site is located in Siaya County and is in Mitundu sub-location within West Yimbo Ward. Mageta island is divided into two sub locations of Mitundu and Mahanga and has a total of 19 villages. Mahanga has 1,244 households and Mitundu 495 households. In total, Mageta has 1,739 households.

4.3.2 Education

In Siaya County the percentage of population with primary education is 70.3%, those with secondary education constitute 10.8% of the population while those who can read and write form 66.2%. The County has a total of 385 Pre-Primary schools, 381 Primary Schools, and 56 Secondary schools. Dropout rates for primary school is 8.8% for females 7.9% for males while in secondary schools it increases to 11.6% and 10.7% respectively. The pupil/teacher ratio is 1:36 in primary schools and 1: 17 in secondary schools. Dropout rates especially for girls will need to be addresses.

Mageta Island has five primary schools namely: Mageta Primary School, Sika Primary School, Mahanga Primary School, Mitundu Primary School and Sir Henry Primary School. There is only one secondary school called Father Joakim Owang Secondary School.

4.3.2 Health and HIV/ AIDS

Human health statistics give indication of the soundness of the environment at a given moment. Malaria is the most prevalent disease in the area followed by diarrhoea and then sexually transmitted diseases. The fact that malaria and diarrhoea were the two most prevalent is expected since malaria is the number one cause of morbidity in Sub Saharan Africa, and most parts of the district are devoid of portable water which is the cause of diarrhoea related ailments. The infant mortality rate is 102/1000 births in the area, mainly due to increased cases of malaria, pneumonia and diarrhoea. The main health facilities in Bondo include Bondo County Hospital and Bondo Medical Centre, which are within the Township. The bed capacity for all health facilities in the District is approximately 101. In

Siaya, the main health facilities include Bama Nursing, Siaya Medical Centre, Siaya County Hospital, and Paula Nursing.

Mageta Island has one health facility i.e. the Mageta Health Dispensary with a capacity of 1 nurse who was reported to handle up to 60 individuals at a given time.

The high prevalence rate of HIV/AIDS at 17.8 per cent is a major hindrance to development. This has led to an increase in the number of children headed households, Orphans and Vulnerable Children (OVC), loss of productive labor force leading to low productivity and increased school drop-out rate as the older children assume the role of taking care of their ailing parents and their younger siblings. In addition, more resources are being diverted to taking care of the infected and affected at the expense of development.

To combat HIV and AIDS, the Government of Kenya and the Civil Society Organizations (CSOs) have stepped up sensitization and support activities on the various ways of avoiding infections and how to live positively. Sensitization posters on HIV/AIDS were observed at the island dispensary to create awareness about HIV/AIDS.

4.4 Land use and settlements

In Siaya County, private land, which forms most of the land in the county, is the category of land owned by private individuals. The rights and interests of this category of land have been fully ascertained through the process of land adjudication and therefore relatively easy to acquire for investment purposes. There however still exist sections whose rights and interest have not been determined and the county government needs to intervene to have the process **finalized**. Approximately 2059 square **kilometers** of land is arable and a major form of land use is peasantry agriculture.

Most of the lands in the rural areas are under general boundaries prone to a lot of boundary disputes, while in Urban **centers** there are fixed surveys which are free from disputes. The average farm size in the County varies from sub-County to sub-County, for instance the average farm size for small scale farmers in Bondo sub-County is approximately 3.0 Ha while in Siaya sub County is 1.02 Ha. The average farm size for large scale farm stands at approximately 7.0 ha. Due to high cost of processing land transactions and succession charges, there are a lot of informal land subdivisions in the County.

Land at the Mageta Island is both private and public land. Land at the island is used for farming, houses and settlements. The typical house will be built by stone, brick and iron sheets. As observed there are both permanent and semi-permanent structures within the island as shown in figure 4.4 below. The island has six market areas, namely: Mahanga, Kuoyo, Kakamongo, Papa Kabarua, Sika, Mitunda and Maagre markets. The two largest markets being Mahanga and Mitundu markets. Markets within Mageta are used for trade, selling and buying of food stuff, vegetables, fish as well as clothes and other consumables brought in from the mainland (mainly from Bondo and Siaya through Usenge beach).

Figure 4.4: Settlements observed in Mageta Island

	
Photo 4.1: A permanent house observed in Mageta Island	*Photo 4.2: A row of semi- permanent houses in Kabarwa Market, Mageta Island*

4.5 Economic Activities

4.5.1 Farming, Fishing and Trading

The main economic activities in Mageta Island are fishing, farming and trading. Subsistence farming, livestock keeping, fishing, rice farming and small-scale farming are practiced as shown in the figure 4.5 below**.** Trading activities were observed in the market areas (mentioned above) where commodities are brought from the main land to be traded in the island.

Figure 4.5: Economic activities observed in Project Area

	
Photo 4.3: Fishing boats observed in the island's Usenge beach	*Photo 4.4: Maize and beans crops grown in the island*

	
Photo 4.5: Livestock keeping observed on the island used for subsistence farming	*Photo 4.6: Some of the trading commodities arriving in the main dock at th Mageta Island*

4.5 Infrastructure Aspects

4.5.1 Transport and Communication

The County had 283.2 Km of bitumen standard roads, 741.3Km of gravel'and 1,161.8 Km of earth roads as at December 2012. The County has witnessed an improvement in the road network with several roads being tarmacked; these include the Rang'ala-Siaya-Bondo road which is 90% complete, Ndori-Owimbi-Luanda Kotieno, and Bondo -Misori –Mituri road, Kisian- Bondo and ngiya- Ndori road. Several roads in the County have also been graveled. There are also three air strips in the County namely: Gombe, Dominion and Sega. These airstrips are currently not in use so there is need for the county government to rehabilitate them.

Mageta island is served with several marram roads and footpaths. The mode of transport within the island is through motor- cycle, speed boats, ferry, water bus and engine boats that transport people and goods from the main land to the island.

Communication in the island is mainly through mobile telephone, with one *Safaricom* booster within the island.

Figure 4.5: Mode of transport in Mageta Island

	
Photo 4.3: Water bus used in Mageta Island for transportation over the Lake	*Photo 4.4: Speed boats used as a mode of transport at the island*

4.5.2 Water and Sanitation

The distribution of water sources, surface and underground in the County are naturally widely spaced and make people walk long distances to fetch water. The Government interventions were intended to reduce the long-distance coverage to about 500m distance. The intervention measures the Ministry of water has put in place so far interns of piped schemes, point water sources like boreholes, shallow wells and spring protection has not met the target. The rural population of the County depends on various types of water sources for their domestic needs. The southern part (Bondo and Rarieda) have less than one water point per 2.5km2, while the north and north-eastern parts have a water point density of more than 3 per km2.

Streams are the widest spread type of water points, but occur mainly in north-eastern part of the County. Other sources of water in the County include; wells, boreholes, roof catchment, rivers, Lake Victoria, water holes, dams, ground catchments and piped supplies.

Water supply at Mageta Island is mainly from the Lake Victoria.

About 34 per cent of the population is using improved sanitation facilities, the most common being pit latrines with slabs (used in 26 per cent of households). Notably, 16 per cent of the households in Siaya County lack conventional sewer facilities whilst 24 per cent use either public or shared sanitation facilities. Stools of children age 0-2 years are disposed of safely in 71 per cent of cases. Only 5 per cent of the households have both improved drinking water sources and improved sanitation. Whilst 3 per cent of households have designated hand washing places, soap is present in only 1 per cent of the households. Poor sanitation could lead to pollution of the lake.

Mageta Island residents mainly have designated pit latrines for each homestead.

4.5.3 Energy

The main sources of lighting in the County include: tin lamps, lantern, electricity, pressure lamps, gas lamps, wood fuel and solar. The main sources of cooking fuel used in the households include firewood constituting 82.5 per cent, charcoal at 13.6 per cent while 1.3 per cent of the households use paraffin. These indicate that the demand for wood fuel is high and continues to rise. This has negatively impacted on the forest cover within the County and there is urgent need for up scaling agro-forestry programmes and also encouraging households to use energy conserving *jikos* and alternative energy sources especially solar energy.

Heavy use of solar home systems and small diesel generators for commercial activities (refrigeration, pumping, milling, etc.) were observed in Mageta Island. The current installed capacity can be estimated at 200 kVA. The main public facilities that use these sources of energy in the area include, police station, primary school, health facilities, churches, among others.

5.0 CHAPTER FIVE: PUBLIC PARTICIPATION

5.1 Public Stakeholder Consultation

Public participation is an essential and legislative requirement for environmental authorization. The ESIA team undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an EIA study stipulated in the EMCA, 1999 and EIA/EA Regulations 2003. The main aim of public stakeholder participation is to identify project affected persons (PAPs) and other stakeholders and to allow such parties the opportunity to provide input and comment on the EIA process, including issues and alternatives that are to be investigated, thereby facilitating informed decision-making. In complying with the public participation process (PPP) for the EIA, consultations were carried out to ensure that issues, concerns and potential impacts identified by all stakeholders from public and government were addressed fully.

Public participation was a key component of the ESIA of the Proposed Medium-Sized Hybrid Mini-Grids (PV-/Wind-Diesel) in Mageta town, Siaya County. Positive and Negative views of the immediate neighbors to the site was sought. The exercise was conducted using Pre-designed questionnaires were administered and interviews conducted for project beneficieriesand other stakeholders. There was a Public Baraza for members of the community where they got a chance to air out their views in regard to the proposed project which will be implemented in their neighborhood.

5.2 Objective of Public Stakeholder Consultation (PSC)

The objectives of public participation in an ESIA are to provide sufficient and accessible information to potentially interested and affected parties/stakeholders in an objective manner to assist them identify issues of concern, and provide suggestions for enhanced benefits and alternatives.

5.3 Approach/methodology used in carrying out the PSC

The approaches of carrying out consultation in this project area were different for each kind of stakeholders identified in Mageta Island. The ESIA consultant identified four categories of stakeholders namely; government officials, political leaders and elders, religious leaders in the island and the public having business and living in Mageta Island. The public (residents and business owners in the center) were consulted through a public *baraza* held at the Kabarwa market on 31st May, 2017 (a total of 70 people marked themselves as having attended, including the County Women Representative of Siaya County). Government officials, such as the location administrative chief as well as elders from the villages within the island were engaged through face to face discussions as well as engagement walks on the proposed site in Mageta.

5.4 Site Visit and Consultation with different stakeholders

The photos below as well as the summary of issues discussed by the various stakeholders are shown below.

Plate 6.1: Participanting for Public Participation and Consultation assemblying

Plate 6.2: One of the participants filling out his details on the attendance list

Plate 6.3: Part of the crowd as they followed the CPP exercise

Plate 6.4: Mitundu Sub-location Assistant Chief Mr. Gabriel Oyoo expressing his views during the CPP exercise

Plate 6.5: Siaya County Women Representative Dr. Christine Ombaka CPP deliberations

Plate 6.6: Mzee Barwa, in whose name the market was named (Kabarwa), gives his views during the CPP

Plate 6.7: The public following the discussions on CPP

The table 5.1 below gives a summary of the issues discussed during the stakeholder engagement exercise.

Table 5.1: Summary of comments from stakeholders

Question/ Comments	**Response/ Remarks**
1. Rev. Romans Magio Ogombo (Deacon – Independent Catholic Church) The risks posed by the proposed construction of the mini grid for power generation on health if not handled well there is the risk of being electrocuted. There will also be dust during construction and noise from the generator. There is possibility of conflict during construction when the poles are being routed and noise from the clubs and bars since electricity will be available The generator will also generate noise when running	**Mr. Nyamori Steve Onserio** Dust emission during construction will be minimized through strict enforcement of on-site speed controls as well as limiting unnecessary traffic within the project site. Traffic routes on site will be sprinkled with water regularly to reduce amount of dust generated by the construction trucks. The contractor will ensure all generators and heavy-duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.
Mr. John Gilbert Mumbo (Chairman – ODM West Ward) Health: If not handled well there is the risk of being electrocuted; there would be dust during construction and noise from the generator. Social: neighbors playing loud music, extended business hours could also pose a risk of bad exposure and increase in children and youth gambling (e.g.	**Mr. Nyamori Steve Onserio** The community and workers will be sensitized on electricity safety procedures. Generators and heavy-duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.

Sportpesa) now that they are likely to have phones Environment: clearing of vegetation for the site preparation for construction and exhaust from the generator could pollute the environment	
Charles Natama Kowade (Chairman – Kabarua Market) Health: people can be electrocuted during construction and operational phases Social: loud music from the neighbors and conflict during the construction of the poles (routing of the poles) Environment: clearing of vegetation during the site preparation for construction	**Mr. Nyamori Steve Onserio** The community and workers will be sensitized on electricity safety procedures.
Gabriel O. Oyoo (Assistant Chief – Mitundu Sub-location) Health: due to the ignorance of the community about electricity there is a high risk of people and animals being electrocuted, during construction there will be dust, and also smoke and noise from the generator Social: conflict during the routing of poles or construction, playing loud music and other activities which may take place at night (crimes) Environment: cutting down of trees (vegetation) during construction, smoke and noise from the generator and mechanical failure (spillage of oil)	**Mr. Nyamori Steve Onserio** Sensitization of workers and community on dos and don'ts in regard to electricity to be carried out before project commencement. Dust emission during construction will be minimized through strict enforcement of on-site speed controls as well as limiting unnecessary traffic within the project site. Traffic routes on site will be sprinkled with water regularly to reduce amount of dust generated by the construction trucks.

5. 5 Summary of the Public Participation and Consultation

The main concern for a majority of the residence is the fear of electrocution owing to the fact that they have never had electricity before. Other concerns include; possibility of pollution of dust (during construction) and noise and smoke (from the generator), conflict during the routing of electricity poles, noise from loud music, increased gambling and immoral behaviour by the youth, environmental degradation by clearing of vegetation, possibility of negative influences from the contractor's staff and possible spillage of oil and fuel. However, the project is being viewed very positively and with a lot of enthusiasm as the locals believe it will bring them a lot of benefits. These benefits include; improved road infrastructure, increased business opportunities, employment, increased security, improved access to information, better trading conditions and exposure to the outside world.

6.0 CHAPTER SIX: IDENTIFICATION OF ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

6.1 Introduction

This Section identifies and discusses both negative and positive Environmental and Social impacts associated with the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island. The impacts are identified according to Phases namely: Construction Phase, Operational Phase and Decommissioning Phase.

The project being a national development agenda in the energy sector has immense benefits that could save the country losses in terms of power rationing due to long drought duration which is affecting the country. However poor planning of the project could also affect the environment that supports millions of Kenyans through the potential hazards that the project could pose to the public like pollution of water and atmospheric resources.

The summary of the main potential impacts of the proposed project are listed in table below and analyzed into different categories based on stakeholder's views and perceptions as well as the consultant's previous experience in undertaking ESIA of similar nature. The project impacts are classified as positive or negative. However, the study goes further to categorize the impacts in terms of direct or indirect, temporary or permanent, major or minor.

Table 6.1: Summary of Project Potential Impacts

Environmental &Social Impact	**Positive/ Negative**	**Direct/ Indirect**	**Temporary/ Permanent**	**Major/ Minor**	**Occurrence**		
					Construction	Operation	Decommissioning
Employment opportunities	Positive	Direct	Permanent/ Temporary	Major	✓	✓	✓
Gains in the Local and National Economy	Positive	Direct	Permanent/ Temporary	Major	✓	✓	x
Provision of Market	Positive	Direct	Temporary	Major	✓	x	x

for Supply of Building Materials							
Informal Sectors Benefits	Positive	Direct	Temporary	Minor	✓	x	x
Environmental Benefits	Positive	Indirect	Permanent	Minor	✓	✓	x
Noise pollution & increases vibration	Negative	Direct	Permanent	Major	✓	✓	✓
Generation of Exhaust Emission	Negative	Direct	Permanent	Minor	✓	✓	✓
Dust emission	Negative	Direct	Temporary	Minor	✓	x	✓
Disposal of excavated soil	Negative	Direct	Temporary	Minor	✓	x	✓
Increased water demand	Negative	Direct	Permanent	Major	✓	✓	x
Workers accident and hazards	Negative	Direct	Permanent	Major	✓	✓	✓
Energy (diesel) consumption	Negative	Direct	Permanent	Major	x	✓	x
Extraction and used of building materials	Negative	Direct	Temporary	Minor	✓	x	x
Solid waste Generation	Negative	Direct	Permanent	Major	✓	✓	✓
Liquid waste Generation	Negative	Direct	Permanent	Major	✓	✓	✓
Possible exposure of workers to diseases	Negative	Direct	Permanent	Major	✓	✓	x
Increased storm water runoff from new impervious areas	Negative	Direct	Permanent	Major	✓	✓	x

Soil erosion	Negative	Direct	Temporary	Minor	✓	x	✓
Oil spills hazard	Negative	Direct	Permanent	Major	✓	✓	✓
Hazardous waste (used oil and absolute batteries	Negative	Direct	Permanent	Major	✓	✓	✓
Destruction of existing vegetation	Negative	Direct	Permanent	Minor	✓	x	x
Fire outbreaks	Negative	Direct	Temporary	Major	✓	✓	✓
Increase in electricity supply	Positive	Direct	Permanent	Major	x	✓	x
Increased population around the project area	Negative	Direct	Permanent/ Temporary	Minor	✓	✓	x
Visual impacts	Negative	Direct	Permanent	Minor	✓	✓	✓

6.2 Positive Impacts during Construction Phase

The positive impacts associated with the proposed Medium-Sized Hybrid Mini-Grids (PV/Diesel) in Mageta centre during construction phase are as discussed below;

6.2.1 Employment Opportunities

During the construction of the proposed a Hybrid Mini-Grids (PV/Diesel) in Mageta centre, there will be employment opportunities especially for casual workers from the local community. Creation of employment opportunities has both economic and social benefit. In the economic benefit, abundant unskilled labour will be used in economic production while socially these young and energetic poor people will be engaged in productive employment other than remaining idle. Employees with diverse skills are expected to work on the site during the construction period like masonries, carpenters electricians, engineers among other professionals.

6.2.2 Gains in the Local and National Economy

There will be gains in the local and national economy as a result of the construction of the proposed a Mini-Grids (PV-/Wind-Diesel) in Mageta Island, through consumption of locally available materials including: timber, metals and cement. The consumption of these materials in addition to fuel oil and others will attract taxes including Value Added Tax (VAT) which will be payable to the government. Some equipment that will be used during construction of the power plant shall be imported from abroad. This will attract foreign exchange

6.2.3 Provision of Market for Supply of Building Materials

The project will require supply of large quantities of building materials most of which will be sourced locally from areas surrounding the project. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

6.2.4 Informal Sectors Benefits

During construction phase of the Mini-Grids in Mageta centre , the informal sector is likely to benefit from the operations. This will involve kiosk operators who will be selling food to the workers on site. This will finally promote Jua Kali entrepreneurs within the centre for the period that the construction will be taking place.

6.2.5 Environmental Benefits

Mini-Grids (PV-/ Diesel) in Mageta centre has a potential for contributing to the good of the environment of the area. The project will utilize more of solar and wind energy while there will be minimal use of the thermal energy which is a non-renewable source of energy. This will be of great benefit to the ecosystem since the emissions will be minimal hence playing a key role in minimizing the effect on climate change.

6.3 Negative Impacts during Construction Phase

The following negative impacts are also associated with the construction of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island .

6.3.1 Noise pollution

The proposed area is relatively is about few meters away from the town and it's not inhabited hence the effect of noise will not affected anyone. The construction works of the proposed Mini-Grids (PV-/ Diesel) in Mageta Island is most likely to be a noisy operation due to the moving machines (mixers, tippers and communicating workers) and incoming vehicles to deliver construction materials to site. The construction workers who will be working in the site will generate some noise through activities on the site. This impact will be direct and temporary.

6.3.2 Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the construction equipment during the construction phase of proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island town. Motor vehicles that will be used to ferry construction materials would impact on air quality by emitting pollutants through exhaust emissions. *The impacts will be direct, permanent but* not significant.

6.3.3 Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, excavation and spreading of the topsoil during construction of proposed Power Plant. There is a very small possibility of PM10 suspended and settleable particles affecting the site workers and even neighbors' health, it is minimal given the construction method of minimum excavation and nil cart away of soil. *The impacts will be direct, temporary and minor.*

6.3.4 Disposal of Excavated Soil

Though little excavation is likely to take place at the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island site, the excavation works to level the site will result in the generation of small amounts of excavated material. *The impact will be direct, temporary and minor.*

6.3.5 Increased water demand

During the construction phase of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island, both the construction workers and the construction works will create additional demand for water in addition to the existing demand. Water will be mostly used in the construction works and for wetting surfaces or cleaning completed structures. It will also be used by the construction workers to wash themselves and even drink. *The impact will be direct, permanent and major.*

6.3.6 Workers accidents and hazards during construction

During construction of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta centre , it is expected that construction workers especially no-skilled casuals are likely to have accidental injuries and hazards. Because of these intensive engineering and construction activities including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp objects. *The impacts will be direct, permanent and minor.*

6.3.7 Energy Consumption

The proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. The impact will be direct, permanent and major.

6.3.8 Extraction and Use of Building Materials

Building materials such as hard core, ballast, cement, construction blocks (stones), rough stone and sand required for the construction of the proposed Medium Speed Power Plant will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Small quantities of these materials will be required for construction of the buildings, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts. The impact will be direct, temporary and minor.

6.3.9 Solid Waste Generation

During construction of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta centre , will generate a substantive amount of solid waste. These include papers used for packing cement, plastics, metal scraps and timber remain among others. Dumping around the site will interfere with the aesthetic status of the area. This has a direct effect to the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic, pest breeding, pollution of physical environment, invasion of scavengers and informal recycling communities.

6.3.10 Increased Storm Water Runoff

From New Impervious Areas Construction of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Centre buildings, solar and wind foundations and pavements within the proposed project site will lead to additional runoff through creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural area, and increased flood peaks are a common occurrence in developed areas especially during the rainy season however the proposed project site falls within the semiarid area. The impact will be direct, permanent and minor.

6.3.11 Soil Erosion

There are possibilities of soil erosion occurring during the construction of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island especially during rainy and windy seasons. The impact will however be minimal as their area to be disturbed is small. The impacts will be direct, temporary and minor.

6.3.12 Oil Spills Hazards

The machines on site may be containing moving parts which will require continuous oiling to minimize the usual corrosion or wear and tear. This will contaminate the soil. Likewise, moving vehicles on site may require oil change. The impact will be direct, permanent and major.

6.3.13 Destruction of existing vegetation

The construction process of the proposed Hybrid Mini-Grids (PV/diesel) foundations for solar panels, wind turbines and buildings will involve clearing of the existing vegetation cover (mainly grass). The developer intends to replace this with some planting of indigenous trees and grass around the project area. The impact will be direct, permanent and minor.

6.3.14 Surface and ground water Hydrology and Water Quality

Degradation Changes in surface hydrology alter the flow of water through the landscape. Construction of impervious surfaces such as parking lots, roads and buildings increase the volume and rate of runoff, resulting in habitat destruction, increased pollutant loads, and flooding. Contaminated soil or ground water in the path of the project could be disturbed by excavation resulting in a potential transfer of the contamination to surface waters. Oil spills during construction could introduce contaminants into subsurface which may end-up into ground water. Development activities such as mini-grid development as well as the spill-over effects of development such as increased demand for water use and increased auto use can impact water quality by contributing sediment, nutrients, and other pollutants to limit water supplies, increasing the temperature of the water, and increasing the rate and volume of runoff. The impact will be direct, permanent and minor.

6.3.15 Fire Outbreaks

Due to various construction activities at the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island project, potential adverse impacts related to fire hazards can occur. The live conductors can cause short-circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire. The impact will be direct, temporary and major.

6.3.17 Occupational Safety and Health Hazards

During construction people will be engaged in activities such as pole and conductor wiring, plant assembling and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles. Workers also face risks associated with inhaling silicon dust emanating from chemicals used to clean semi-conductors in PV solar cells.

At project implementation new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

HIV/AIDS affects both education coverage and quality. It dampens the demand for education as affected households have fewer resources to spend on education either because of reduced income due to morbidity of income earners or diversion of scarce resources for health care. Children in these households are often taken out of school to care for ill parents or have to work to make up for lost household income, and an increasing number are becoming orphans. At the same time, the epidemic affects the supply of educational services at all levels through increased mortality, morbidity and absenteeism among teachers and education personnel. The impact will be direct, temporary and major.

6.3.18 Land take

As discussed in *Chapter 2* of this report, the proposed site in Mageta Island is located in public land that is under discussion between REREC and the County Government of Siaya. The process will lead to acquisition of land for the proposed Hybrid Mini-Grid project on the island during the pre-construction and construction phases of the project. Acquisition of the given land parcel will affect the three groups of people:

- People affected by the acquisition of the land for the project e.g farmers and households
- People affected by the temporary use of land for installation of the project equipment; and
- People whole livelihood is impacted.

6.3.19 Gender Inequality

There is need to promote gender equality in all aspects of economic development and more so in ensuring equitable allocation of project benefits to both men and women. . The Contractor should uphold principles of gender equality through compliance with the following:

Mitigation:

- Ensure equitable distribution of employment opportunities between men and women
- Mainstream Gender Inclusivity in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule and National Gender and Equality Commission Act 2011
- Ensure safe employment for women, including training for all staff, regular consultation with female employees and other measure to ensure physical safety and dignity of female employees

6.3.20 Gender Based Violence

a. Sexual Exploitation and Abuse
   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.

b. **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.

c.Other forms of GBV at the community level

- The contractor will ensure that the project does not trigger other forms of GBV at the community level through;
    - effective and on-going community engagement and consultation, particularly with women and girls;
    - review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.
- ensuring specific plan for mitigating these known risks, e.g. sensitization around gender equitable approaches to compensation and employment; etc

6.3.22 Labor influx in to the project area

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. In addition, labour influx into this project area could be source of conflict between workers and the local population. The impact of conflicts because of influx of labour, though localized, temporary, reversible and noncumulative, can be severe in magnitude.

Mitigation:

- 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.
- All workers to sign employment contract including Code of Conduct.
- Effective community engagement and strong grievance mechanisms on matters related to labour.
- Prioritize local employment to reduce labour influx.
- . In addition to code of conduct, induct workers on GBV-SEA/SH
- Effective contractual obligations for the contractor to adhere to the mitigation of risks against labour influx, including sexual exploitation and abuse and sexual harassment.
- Proper records of labour force on site while avoiding child and forced labour
- Fair treatment, non-discrimination and equal opportunity for all workers.

- Comply to provisions of Labour Relations Act 2012 and Work Place Injuries and Benefits Act (WIBA 2007)
- The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse and sexual harassment.

6.3.23 Spread of communicable diseases and HIV/ AIDs impacts

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.AIDSa

Mitigation:

- Sensitize workers and the surrounding communities on prevention and mitigation of HIV/AIDS and other sexually transmitted diseases, through staff training, awareness campaigns, multimedia and workshops and during community *Barazas*
- Promote use of existing clinics to provide voluntary counselling and testing (VCT) services to construction crew
- Ensure safety of women and girls in provision of VCT services

6.4 Positive Impacts during Operation Phase

Like construction phase, there are positive impacts associated with the proposed Hybrid Mini-Grids (PV-/Diesel) Plant during operation phase. These positive impacts are discussed below.

6.4.1 Increase in electricity supply

In Mageta Island the electricity demand is high since the area isn't connected with power from the national grid. The project aims to provide power to this off-grid town so as to enhance its development. With electricity in Mageta Island, more investors are expected to be attracted due to the reliable supply of electrical energy. The impact will be direct, permanent and major.

6.4.2 Employment Opportunities

Employment opportunities are one of the long-term major positive impacts of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island. This will occur during the operation and

maintenance of the power Plant. These will involve security personnel that will be employed to look after the facility. Other sources of employment will involve direct technical service provision to the Power Plant e.g. electrical engineers, mechanical engineers, drivers among others. The impact will be direct, permanent and major.

6.4.3 Increase in Revenue

There will be positive gain for the revenue system arising from the sale of the electricity power from the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island to Government, the fuel provider and KPLC. This will in turn be supplied to various customers who will be paying taxes to the Government. The impact will be direct, permanent and major.

6.4.4 Improved Security

With the establishment of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island, the level of security will be improved around the project area. This is as a result of more security lights and security personnel being employed to guard the proposed Power Plant. The project site will also be well fenced. Hence if the level of security is increased, the residents will feel more secure than before. The impact will be direct, permanent and minor.

6.4.5 Increased of Business Activities

The proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will attract a number of business activities in Mageta Island which is the second town after Usenge that contributes a lot of revenue to Siaya County

6.4.6 Low Emission of Greenhouse Gases to the Atmosphere

The proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will mostly utilize the use of solar and wind energy which are considered to be renewable sources of energy hence have no impact to the environment at all. This will not have any impact to the environment.

6.5 Negative Impacts during Operation Phase

The following are the negative impacts that are associated with the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island during the operation phase.

6.5.1 Solid Waste Generation

The proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island is expected to generate some amounts of solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of drums, paper, plastic, glass, metal, textile, solar panel breakages and inorganic wastes among others. Such wastes can be injurious to the environment. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-term injurious effects to the environment. The impact will be direct, permanent and major.

6.5.2 Liquid Waste Generation

Since the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will use diesel to generate electricity to substitute the wind and solar energy, sludge and other effluents will be generated. Likewise, waste oil will be generated. The liquid waste to be generated is hazardous hence may cause long-term negative effects to the environment. The impact will be direct, permanent and major.

6.5.3 Increased Diesel Consumption

The proposed Hybrid Mini-Grids (PV-/ Diesel) shall consume diesel in the process of generating electricity. Since diesel fuel is non-renewable resources, this will have adverse impacts on the environment. The impact will be direct, permanent and major.

6.5.4 Increased Population around the project area

The construction and operation of the proposed Hybrid Mini-Grids (PV/Diesel) in Mageta Island it will lead to the establishment of food kiosks within the proposed project area whereby to provide food and refreshments to project workers. Since the proposed project site doesn't have adequate infrastructural facilities, for the migrant population this will put a strain on the existing infrastructure. The impact will be direct, permanent and minor.

6.5.5 Increased water demand

The operation activities during the operation phase of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will involve the use of large quantities of water. These will increase strain water resources in the area which are minimal. The impact will be direct, permanent and major.

6.5.6 Increased Pressure on Infrastructure

The proposed 6 Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will have a potential of increasing pressure on existing infrastructures such as roads among others. This would be due to increased use of volumes on water, human and vehicle traffic in the project area. The impact will be direct, permanent and major.

6.5.7 Air Pollution

Operational phase of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island will have effects of the air emissions on air quality. Particulate emissions represent the main pollutant of concern, with gaseous emissions such as Sulphur dioxide (SO2), oxides of nitrogen (NOx) and carbon monoxide (CO) potentially significant due to combustion of the generator fuel. Under normal operations, the ambient air quality impact will be negligible. The operation of plant might have some impact on the health of the people working or living in the area. The impact will be direct, permanent and minor.

6.5.8 Increased Storm Water Flow

The building roofs and pavements of the proposed Medium-Sized Hybrid Mini-Grids (PV/Wind-Diesel) in Mageta Island will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) during operation phase. This will lead to increased amounts of storm water entering the drainage systems. The impact will be direct, permanent and minor.

6.5.9 Water Pollution

During the operation phase of the proposed Hybrid Mini-Grids (PV-/Diesel) in in Mageta Island, If the sites for dumping solid and hazardous wastes are not well taken care of, they

may cause contamination of ground water sources hence the effects will be witnessed within ecosystem. There is need therefore for the project proponent to put in place an efficient waste management scheme that will prevent the accumulation of uncontrolled waste, as well as an efficient collection system and off-site disposal. The impact will be direct, permanent and minor.

6.5.10 Noise Pollution

Noise pollution from the operation of the generators from the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island is inevitable. However, there are no sensitive receptors of the noise emission as there are very few activities at night. The Generator sets will be covered by muffling materials hence low noise emissions. The impact will be direct, permanent and major.

6.5.11 Increased Vibration

During the operational phase of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island, the generator will create a low-level ground vibration within the surrounding areas. The impact will be direct, permanent and minor.

6.5.12 Oil Spills Hazards

Potential oil spills and accidents during oil transportation, storage and operations of the generators of the proposed hybrid Mini-Grids (PV-/ Diesel) in Mageta Island may occur. In the case of oil spill the relatively lighter, more volatile, mobile, and water-soluble compounds in diesel will tend to evaporate fairly quickly into the atmosphere or migrate to groundwater. When exposed to oxygen and sunlight, most of these compounds will tend to break down relatively quickly. Accidental oil spills can occur due to leakage from the storage tanks or site oil pipelines. Poor maintenance of machines can also lead to oil spills. A small amount of used oil may drip from spent oil filters. The impact will be direct, permanent and minor.

6.5.13 Fire Outbreaks

Due to handling of flammable substances at the proposed Hybrid Mini-Grids (PV-/ Diesel) project, fire outbreaks can occur. Handling of inflammable products increases fire risks. The impact will be direct, temporary and major.

6.5.14 Electrical Shock and Electrocution

Electricity is a hazard and safety precautions must be adhered to and properly used. Within the household electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets. The impact will be direct, temporary and major.

6.5.15 Visual Impacts

The proposed power plant might present unwanted visual impacts, both by its physical presence and profile against the surrounding area, and by visual impacts of the plume (particularly during periods of poor atmospheric dispersion) and secondary formation of aerosols that can reduce visibility on a more regional scale. Large structures such as stacks and fuel tanks towers may also adversely impact the visual quality of the area. The impact will be direct, permanent and minor.

6.6 Positive Impacts during Decommissioning Phase

The following positive impacts are associated with the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island during the decommissioning phase:

6.6.1 Site Rehabilitation

Upon decommissioning of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to restoration of the visual quality of the area.

6.6.2 Employment Opportunities

For demolition to take place properly and in good time, several people will be involved. As a result, temporal job opportunities will be created for the demolition staff during the

demolition phase of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta center. The impact will be direct, temporary and minor.

6.7 Negative Impacts during Decommissioning Phase

The following three negative impacts discussed below are associated with the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island during its decommissioning phase.

6.7.1 Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island. The impact will be direct, temporary and minor.

6.7.2. Solid Waste Generation

Demolition of the proposed Medium-Sized Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island and other related infrastructure will result in generation of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. The impact will be direct, permanent and major.

6.7.3 Generation of Dust

Some dust will be generated during demolition works of the proposed Hybrid Mini-Grids (PV-/ Diesel) in Mageta center. This will affect demolition staff as well as the neighbors. The impact will be direct, temporary and minor.

7.0 CHAPTER SEVEN: MITIGATION MEASURES AND MONITORING PROGRAMMES

7.1 Introduction

This chapter highlights the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental, social, health and safety impacts associated with the project during its construction, operation and decommissioning phases. Allocation of responsibilities, time frame and estimated costs for implementation of these measures are presented in the Environmental and Social Management and Monitoring Plan (EMMP).

7.2 Mitigation of construction phase impacts

7.2.1 Efficient sourcing and use of raw materials

The contractor will source construction materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental and social impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated. To reduce the negative impacts on availability and sustainability of the materials, the contractor will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials. In addition to the above measures, the contractor shall consider reuse of construction materials and use of recycled materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.2.2 Excavations

The existing earth roads will have to be excavated to make for new roads and associated facilities and the removed materials will be taken to licensed sites or reused.

7.2.3 Minimization of run-off and soil erosion

The project design has incorporated construction drainage to avoid instances of standing water and manage run-off. The contractor will put in place some measures aimed at minimizing soil erosion and associated sediment release from the project site during construction. These measures will include silt traps, barriers, vegetation planting, terracing and leveling the project site to reduce runoff velocity and increase infiltration of rainwater into the soil. In addition, construction vehicles will be restricted to designated areas to avoid soil compaction within the project site, while any compacted areas will be ripped to reduce

run-off. This is especially relevant to the area close to the bus station, which is located in a low-lying area likely to have standing water during the rainy season.

7.2.4 Minimization of construction waste

It is recommended that demolition and construction waste is properly collected, stored, recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed off. The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal. Additional recommendations for minimization of solid waste during construction of the project include: -

- 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.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to weather elements
- Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.2.5 Reduction of dust generation and emission

Dust emission during construction will be minimized through strict enforcement of on-site speed controls as well as limiting unnecessary traffic within the project site. Traffic routes on site have to be sprinkled with water regularly to reduce amount of dust generated by the construction trucks.

7.2.6 Minimization of exhaust emissions

This will be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road. In addition, truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off vehicle engines at these points.

7.2.7 Minimization of noise and vibration

Noise and vibration will be minimized in the project site and surrounding areas with strict adherence to NEMA designated working hours; and through sensitization of construction truck drivers to switch off vehicle engines while offloading materials. In addition, they will be instructed to avoid running of vehicle engines or hooting especially when passing through sensitive areas such as residential areas and schools. In addition, construction machinery shall be kept in good condition to reduce noise generation. It is recommended that all generators and heavy-duty equipment be insulated or placed in enclosures to minimize ambient noise levels.

7.2.8 Reduction of risks of accidents and injuries to workers

The contractor will have to be committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act, OSHA 2007. The WBG EHS guidelines will have to be adhered to as a minimum standard to manage, especially, occupational health and safety. In this regard, the contractor is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers and local residents as outlined in the ESMMP and these WBG EHS Guidelines.

7.2.9 Reduction of energy consumption.

The proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used. In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

7.2.10 Minimization of water use

The contractor shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage from Lake Victoria to minimize pressure on the local use of the lake water. Water will be sourced from the lake after obtaining licenses from WRMA.

7.2.11 Minimization of Land take Impact

The project proponent (REREC) should ensure that all land acquisition procedures align to the Resettlement Policy Framework prepared under this project.

7.2.12 Mitigation of GBV-SEA/SH

To mitigate against sexual exploitation and and sexual harassment at the work place, the following mitigation measures are proposed, at a minimum:

- Develop and implement a GBV-SEA/SH Action Plan with an Accountability and Response Framework as part of the Contractor's C-ESMP. The action plan will include the necessary measures for prevention and response. Contractor/REREC 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.
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7.3 Mitigation of operation phase impacts

7.3.1 Management of storm-water runoff

The contractor will ensure that proper drainage is provided and regularly maintained for storm water runoff management within the site. All drainage channels should be installed with oil traps to avoid any contaminants are captured before being drained into the lake shores.

7.3.2 Electric shock and electrocution of people:

Proper public education to the people of Mageta Island on safe use of electricity should be done. Proper wiring in the customers' premises by qualified technicians should be done. Use of danger/ *hatari* signs on the poles and fence should be installed. The mini-grid site should be fenced to avoid accidental crossing and exposure to the electric hazards on site.

7.3.3 Liquid and hazardous waste generation:

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 of diesel fuel and oils.

All waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.

The enclosure for obsolete batteries shall be capable of holding any run-off or spillage- the floor must be cemented, so as to prevent oil contamination by a potential spill acid or lead, and must have a containment system for possible leaks of hazardous substances.

7.3.4 Increased diesel consumption:

The use of diesel should be monitored throughout the operational phase of the proposed project. Use of the genset on site should be kept at a minimum to reduce the use of diesel fuel during operations.

7.3.5 Increased population around project area:

The proponent should monitor activities around the proposed project area, especially mushrooming of informal settlements and small-scale businesses providing services to the workers on site.

7.3.6 Increased vibrations:

The vibrations from the generator set should be kept at a minimum. Installation of the genset should ensure reduced vibration mechanisms are in place or installed within the genset.

7.3.7 Fire outbreaks:

Transformers and the diesel genset will have combustible liquids that has potential fire hazard. The site management should ensure that no burning of vegetation along the distribution lines right-of-way. Timely maintenance of the right-of-way as well as the transformers and diesel genset should be done regularly.

7.3.8 Residual and cumulative impacts:

These include operations and maintenance impacts – solid waste management, maintenance of lighting and drainage – and these will be managed by the county government after project completion and commissioning and during operations.

7.4 Mitigation of decommissioning phase impacts

7.4.1 Efficient solid waste management

Solid waste resulting from demolition or dismantling works will be managed as described above.

7.4.2 Reduction of dust concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described earlier.

7.4.3 Minimization of noise and vibration

Significant impacts on the acoustic environment will be mitigated as described.

7.5 Grievance Redress Mechanism (GRM)

The proposed mini-grid project may lead to some grievances. A Grievance Redress Mechanism (GRM) provides access to remedy and identifies procedures to effectively address grievances arising from project implementation. Persons affected by the project must have an avenue where they can formally lodge their complaints and grievances and have them properly considered and addressed. Potential sources of grievances and conflicts as a result of administration of the mini-grid project include:

- Inadequate or lack of consultation;
- Concern over exclusion in decision-making;
- Poor communication and facilitation;
- Dissatisfaction with levels of representation in the various project committees.
- Discontentment regarding performance of mitigation measures (e.g. support from alternative livelihoods);
- Lack of transparency and accountability through the citizen engagement.

Grievance Procedures

a) *Registration* - Community members can inform the mini-grid project management office about concerns directly and if necessary, through third parties. Once a complaint has been received, it will be recorded in a complaints log or data system. The log will be kept in hardcopy or electronic form. All reported grievances will be categorized, assigned priority, and routed as appropriate.

b) *Sorting and Processing* - This step determines whether a complaint is eligible for the grievance mechanism and its seriousness and complexity. The complaint will be screened however this will not involve judging the substantive merit of the complaint.
The following guide will be used to determine whether a complaint is eligible or not:
Eligible complaints may include those where:

- The complaint pertains to the mini-grid project.
- The issues raised in the complaint fall within the scope of issues the grievance mechanism is authorized to address.
- The complainant has standing to file.

Ineligible complaints may include those where:

- The complaint is clearly not mini-grid project -related.
- The nature of the issue is outside the mandate of the grievance mechanism.
- The complainant has no standing to file.
- Other project or organizational procedures are more appropriate to address the issue.

- c. Closing Out and Escalation: Project-related grievances will be addressed and closed out as appropriate. The GRM will provide a channel for escalation e.g. through legal redress.

7.6 Gender Mainstreaming

Projects usually affect women and men differently, and their roles are highly delienated. The project shall ensure that both men and women are equally consulted about the project and benefit from employment and other opportunities the project will present.

7.7 HIV/AID awareness and prevention

The project will sensitize workers and the surrounding communities on prevention and mitigation of HIV/AIDS and other sexually transmitted diseases, through staff training, awareness campaigns, multimedia and workshops and community *Barazas*

7.8 Social Protection

There will adequate mechanisms in place to protect local vulnerable population especially women and minors from risks associated with influx of workers (harassment, underage sex). This system will ensure having security on site provided by the contractor as well as sensitization and enforcement by the contractor. There will also be a code of conduct established for Contractor employees and contract workers acknowledging a zero-tolerance policy towards child labor and child sexual exploitation. Additionally, the contractor will employ their skilled staff and apply unskilled construction labor from the local population as far as possible to minimize on influx of foreigners into the community. This will ensure project support during the construction process. This being a relatively small localized project, it is unlikely to have any significant labor influx.

8.0 CHAPTER EIGHT: ANALYSIS OF PROJECT ALTERNATIVE

This section analyses the project alternatives in terms of site, technology and waste management options.

8.1 Relocation Option

Relocation option to a different site is not an option available for the project implementation as this project is to improve electrification and accessibility to an already established market center. Several alternatives were considered to improve other areas, but this one was selected because it meets the electrification needs of Mageta island.

8.2 Zero or No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to Mageta Centre and the community as a whole. The centre will continue to have no electricity and this will not help maximize usage and utilization of this centre and its facilities. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of Kenyans and the local people would remain unchanged.
- No employment opportunities will be created for thousands of Kenyans who will work in the project area.
- Increased rural poverty and crime in Kenya.
- Discouragement for investors and loaners

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people and the Government of Kenya.

8.3 Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. These may not be desirable from a cost and durability perspective. The technology to be adopted will be the most economical and one sensitive to the environment.

8.4 Solid waste management alternatives

A lot of solid wastes will be generated from the proposed project. An integrated solid waste management system is recommendable. First, the proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness program in the management and the staff. Recycling and reuse options of the waste will be

the second alternative in priority. This will call for a source separation program to be put in place. The third priority in the hierarchy of options is combustion of the waste that is not recyclable. Finally, the proponent will need to establish agreement with Beach Management Unit to ensure regular waste removal and disposal in an environmentally-friendly manner. In this regard, a NEMA registered solid waste handler would have to be engaged. This is the most practical and feasible option for solid waste management considering the delineated options.

9.0 CHAPTER NINE: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

9.1 Significance of an ESMMP

Environmental and Social Management and Monitoring Plan (ESMMP) for developing projects is used to provide a logical framework within which identified negative environmental impacts can be avoided, mitigated and monitored. In addition, the ESMMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The ESMMP is a vital output of an Environmental and Social Impact Assessment as it provides a checklist for project monitoring and evaluation. The ESMMP outlined below will address the identified potential negative impacts and mitigation measures of the project

9.1.1 Pre-Construction & Construction Phases ESMMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the project are as outlined below:

Environmental and Social Management Plan during Construction Phase of Hybrid Mini-Grids (PV-/ Diesel) in Mageta Island.

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (KES)**
1. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
Demand of Raw material	1. Source building materials from local suppliers who use environmentally friendly processes in their operations.	Resident Project Manager & Contractor	Manager & Contractor Throughout construction period	0.00
	2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Resident Project Manager & Contractor	Manager & Contractor Throughout construction period	5,000.00
	3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Resident Project Manager & Contractor	Manager & Contractor Throughout construction period	0.00
	4. Use at least 5%-10% recycled	Resident Project	Manager &	0.00

	refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Manager & Contractor	Contractor Throughout construction period	
2. Minimize vegetation disturbance at and or around construction site				
Vegetation disturbance	1. Ensure proper demarcation and delineation of the project area to be affected by construction works	Contractor, Resident Project Manager	1 month	3,000.00
	2. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.	Civil Engineer and Resident Project Manager	1 month	1,000.00
	3. Designate access routes and parking within the site.	Civil Engineer and Resident Project Manager	1 month	5,000.00
	4. Introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance	Architect & Landscape specialist	Monthly to Annually	10,000.00
	5. Design and implement an appropriate landscaping programme to help in revegetation of part of the project area after construction.	Architect & Landscape specialist	2 months	10,000.00
3. Reduce storm-water, runoff and soil erosion				
Increased storm water, runoff and soil erosion	1. Surface runoff and roof water shall be harvested and stored in tanks so that it can be used for cooling purposes.	The Civil Engineer, Mechanical Engineer and Resident Project Manager	Manager 2 months	10,000.00
	2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed	The Civil Engineer, Mechanical Engineer and Resident Project Manager	1month	
	3. Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil	The Civil Engineer, Mechanical Engineer and Resident Project Manager	1month	
	4. Ensure that construction vehicles are restricted to use existing graded roads	Contractor	Throughout construction period	5,000 per unit
	5. Ensure that any compacted areas are ripped to reduce run-off.	Contractor	2months	5,000 per unit

	6. Site excavation works to be planned such that a section is completed and rehabilitated before another section begins.	Resident Project Manager	Throughout construction period	
	7. Interconnected open drains will be provided on site	Civil Engineer	Throughout construction period	
	8. Roof catchments will be used to collect the storm water for some office uses.	Civil Engineer	Throughout construction period	
	9. Construction of water storage tanks to collect storm water for office and plant uses.		Throughout construction period	
4. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Reduction at source 2. Recycling 3. Reusing 4. Incineration 5. Sanitary land filling	Resident Project Manager & Contractor	Throughout construction period	10,000.00
	2.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Resident Project Manager & Contractor	One-off	12,000.00
	3. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site	Resident Project Manager, Mechanical Engineer & Contractor	Throughout construction period	
	4. Waste collection bins to be provided at designated points on site	Resident Project Manager, Mechanical Engineer & Contractor	Throughout construction period	40,000.00
5. Air Pollution				
Dust emission	1. Ensure strict enforcement of on-site speed limit regulations	Resident Project Manager & Contractor	Throughout construction period	5,000.00
	2. Personal Protective equipment to be provided to employees and worn	Resident Project Manager	Throughout construction period	10,000.00
Exhaust emission	Vehicle idling time shall be minimized	Resident Project Manager & Contractor	Throughout construction period	
	Sensitize truck drivers to avoid unnecessary revving engines of	Resident Project Manager & Contractor	Throughout construction	

	stationary vehicles and to switch off engines whenever possible		period	
7. Minimization of Noise and Vibration				
Noise and vibration	1. Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used, as per OSHA 2007 requirements.	Resident Project Manager & Contractor	Throughout construction period	Routine site operation
	2. Ensure that construction machinery is kept in good condition to reduce noise generation	Resident Project Manager & Contractor	Throughout construction period	10,000.00
	3. Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.	Resident Project Manager & Contractor	Throughout construction period	
8.Minimize occupational health and safety risks				
Statutory Requirements	Ensure compliance with The OSHA (Building Operations and Works of Engineering Construction Rules), L.N. 40 of 1984	contractor	During the construction period	
Worksite Safety and Health Hazards to employees	Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE	developer	One-off	5,000.00
9. Minimize Oil Spills				
Oil spills Hazards	Install oil trapping equipment in areas when there a likelihood of oil spillage such during the maintenance of construction equipment. Soil in such an area will be well protected from contamination	Resident Project Manager	Continuous	50,000.00
10. Mitigate potential social impacts associated with preparation and construction of the proposed mini-grid project				
Land Take for project implementation	REREC should ensure that all land acquisition procedures are documented and land donation procedures. - align to the Resettlement Policy Framework prepared under this project. REREC to disclose to communities their rights and entitlements to compensation, to enable them choose their most preferred compensation options.	REREC Project Implementation Unit, Contractor	Prior to Construction	To be determined

	- REREC, community and local administration to identify appropriate and accessible land			
Gender Inequality Impacts	The 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, Contractor	Continuous	To be determined
GBV-SEA/SH and other forms of GBV	• • 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	REREC, Contractor	Continuous	To be determined

	heighten the GBV risk, and ensure effective and on-going community engagement and consultation, particularly with women and girls, among others			
	etc	REREC, Contractor	Continuous	To be determined
Labour influx into 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 forced labour and enforce sub-contractor compliance of the same. • .	Contractor	Construction phase	To be determined
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, • Contractor to develop and implement a Child Protection Plan-to mitigate the risk of child labour and employment	Contractor	Construction phase	To be determined

	of school children/forced labout •			
Spread of communicable diseases and HIV/ AIDs	• • Contractor to develop and implement a STD/HIV/AIDS awareness plan on prevention and mitigation	Contractor	Construction phase	To be determined
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 •	Contractor	Construction phase	To be determined
Grievances Redress Mechanism	• Contractor to develop an effective project GRM to ensure every grievance is registered, documented, fully addressed and closed out. GRM to ascertain anonymity and confidentiality.	Contractor	Construction phase	To be determined
Institutional capacity	• Contractor to engage a qualified social specialist to implement and monitor the ESMP	Contractor	Construction phase	To be determined
Contractors Yard Site and Workers camp	- 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 to ensure restoration of contractor's yard and workers site at the end of the	Contractor	Construction phase	To be determined

	construction period • Contractor and community to have a written agreement on the above			

9.2 Operational Phase ESMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of proposed Hybrid Mini-Grids (PV-/ Diesel)

The table below indicates the operational phase ESMP.

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Resident Project Manager & Contractor	Manager & Contractor Throughout construction period	20,000.00
	2. Ensure that solid wastes generated at the plant are regularly disposed of appropriately at authorized disposal site	Resident Project Manager & Contractor	continuous	15,000.00/ per month
	3. Ensure that wastes generated at the plant are efficiently managed through recycling, reuse and proper disposal procedures.	Resident Project Manager & Contractor	continuous	
	4. Install site smokeless incinerator	Resident Project Manager and contractor	During design and construction	To be determined
2. Minimization of health and safety impacts				
Increased health and safety impacts	Implement all necessary measures to ensure health and safety of the plant workers and the general public during operation of the Medium Speed Diesel Power Plant as stipulated in the Occupational Safety and Health Act, 2007	Resident Project Manager, Mechanical Engineer, & Developer	continuous	5,000.00
3.Ensure the general safety and security of the Medium Speed Diesel Power Plant and surrounding areas				
Increased general safety and security impacts	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	security Officer, Resident Project Manager & Police	continuous	5,000.00
Increased Pressure on Infrastructure	1. Coordinate with other planning goals and objectives for region	Architect, Project Manager, and the Developer	continuous	40,000.00
	2. Upgrade existing infrastructure and services, if and where feasible	Architect, Project Manager, and the Developer	continuous	
Air Pollution	1. Suitable wet suppression techniques need to be utilized in all exposed areas	Site Safety Officer	Continuous	20,000.00

	2. Enforce low speed limits for vehicles moving within the site	Site Safety Officer	Continuous	
	3. Ensure that the site is located away from such pollution sources	Site Safety Officer	Continuous	
	4. Use of diesel which is Sulphur free to run the power producing generators to be encouraged	Residents project manager	Continuous	5,000 per mont
	5. The stack chimney of the generators will be increased from its normal height of 3 meters to 6 meters.	Site Safety Officer, Architect, Project Manager, and the Developer	In design and Continuous	
Minimization of fire risks	1.Installation of firefighting equipment	Plant manager and contractors	In design and Continuous	100,000PA
	Development of fire evaluation plan			
	Training of all staff in fire management			
Increased Noise pollution & vibration	1. Installation of silencers on the generators 2. Provision of personal protective equipment for workers in high noise areas of the plant	Site Safety Officer, Architect, Project Manager, and the Developer	In design and Continuous	80,000
Worksite Safety and Health Hazards to employees	Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE	Developer	One-off	5,000

9.3 Decommissioning Phase ESMP

In addition to the mitigation measures provided in the above two tables, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities (The project lifespan will be 25 years) of the proposed Hybrid Mini-Grids have. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the Medium Speed Diesel power plant project are outlined in the table below.

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management				
Demolition waste	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary land filling.	Resident Project Manager & Contractor	One-off	20,000
	2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site	Resident Project Manager & Contractor	One-off	0
2. Rehabilitation of project site				

Vegetation disturbance	1. Implement an appropriate re-vegetation programme to restore the site to its original status	Resident Project Manager & Contractor	One-off	10,000
	2. Consider use of indigenous plant species in re-vegetation	Resident Project Manager & Contractor	One-off	0
	3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.	Resident Project Manager & Contractor	Once-off	0

3.Minimization of Generation of Dust				
Generation of dust	1. Watering all active demolition areas as and when necessary to lay dust.	Resident Project Manager & Contractor	During Decommissioning	To be determined
	2. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.			

	3. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.			
4. Reduction of Noise and vibrations				
Increase noise and vibration	1. Install portable barriers to shield 2. Demolish mainly during the 3. Co-ordinate with relevant	Resident Project Manager & Contractor	During Decommissioning	To be determined

9.4 Duties of the Proponent

It will be the duty of the proponent to ensure that all legal requirements as pertaining to the development are met as specified by the law, including World Bank Safeguards and specifically OP4.01 (Environmental Assessment).

- The proponent shall hand over the site to the contractor for implementation of the project after the social and environmental mitigation measures that are the responsibility of the proponent has been completed, especially compensation matters.
-

- The proponent is also the one to fund the project
- The proponent will ensure that the ESIA is submitted to NEMA and a license is obtained.
- The proponent is also the one who has initiated the project and will also ensure its satisfactory implementation

1.6 Duties of the Contractor

- Implementation of the contractor related aspects of the ESMP and regularly reporting back to the Project proponent.
- Maintaining the required level of stakeholder engagement and communication, including providing project schedule information to the public, accepting and resolving public grievances, advertising and hiring local workers.
- Maintain a working grievance redress mechanism.
- Ensure that the project has children protection champions.
- Prepare and maintain an approved Time and Progress chart, showing clearly the period allowed for each section of the work
- The contractor is to comply with all regulations and by-laws of the local Authority including serving of notices and paying of the fees.
- During the night, public holidays and any other time when no work is being carried out onsite, the contractor shall accommodate only security personnel and never should a labor camp be allowed on-site.
- The proponent shall define the area of the site, which may be occupied by the contractor for use as storage, on the site
- The contractor shall include all recommendations from ESIA into the contract.
- The contractor shall provide at his own risk, and cost all water required for use in connection with the works including the work of subcontractors, and shall provide temporary storage tanks, if required
- The contractor shall make his own arrangements for sanitary conveniences for his workmen.
- Any arrangements so made shall be in conformity with the public health requirements for such facilities and the contractor shall be solely liable for any infringement of the requirements.
- The contractor shall be responsible for all the actions of any subcontractors in the first instance.
- The contractor shall take all possible precautions to prevent nuisance, inconvenience or injury to the neighboring properties and to the public generally, and shall use proper precaution to ensure the safety of wheeled traffic and pedestrian.

- All work operations which may generate noise, dust, vibrations, or any other discomfort to the workers and/or guest of the client and the neighbors must be undertaken with care, with all necessary safety precautions taken.
- The contractor shall take all effort to muffle the noises from his tools, equipment and workmen to not more than 70dBA
- The contractor shall upon completion of working, remove and clear away all plant, rubbish and unused materials and shall leave the whole site in a clean and tidy state to the satisfaction of the Proponent. He shall also remove from the site all rubbish and dirt as it is produced to maintain the tidiness of the premises and its immediate environs.
- No shrubs, trees, bushes or underground thicket shall be removed except with the express approval of the Proponent.
- No blasting shall be permitted without the prior approval of the Proponent and the local authorities.
- Borrow pits will only be allowed to be opened up on receipt of permission from the
- Proponent
- The standard of workmanship shall not be inferior to the Kenya Bureau of Standards where existing. No materials for use in the permanent incorporation into the works shall be used for any temporary works or purpose other than that for which it is provided. Similarly, no material for temporary support may be used for permanent incorporation into the works.
- Disposing of the waste generated during construction activities according to the agreement with the local government.

Environmental and Social concerns need to be part of the planning and development process and not an afterthought, it is therefore advisable to avoid land use conflicts with the surrounding area. To avoid unnecessary conflicts that retard development in the project area, the proponent undertook this ESIA and incorporated environmental and social concerns as advised by the Authority. Finally, a comprehensive Environmental and Social Management and Monitoring Plan (ESMMP) is mandatory for a project of this magnitude and nature because large quantities of solid wastes are likely to be generated with temporary interference to the general public and services during project execution.

10.0 CHAPTER TEN: CONCLUSION AND RECOMMENDATIONS

During the preparation of this report for the development of the proposed development, it is observed and established that most of the negative social and environmental impacts can be mitigated and have potentially short term low significant effects. The positive impacts are highly rated and will benefit all stakeholders and the Mageta Trading Centre residents at large. The project proponents have proposed to adhere to prudent implementation of the social and environmental management and monitoring plan. The contractor should be commit to obtaining all necessary permits and licenses from the relevant authorities and have qualified and adequate personnel to do the project as proposed. The proponent has proposed adequate safety and health mitigation measures as part of the relevant statutory requirements

It is the duty of NEMA to consider licensing the project subject to annual environmental audits once it has been commissioned; in accordance with the Environmental Management and Coordination Act, EMCA of 1999 (Amended, 2015) and the Environmental Impact Assessment and Audit Regulations, Legal Notice No. 101 of 2003.

11.0 REFERENCES

(1) National Environment Management Authority, 2004. State of the Environment (2003). National Environment Management Authority, Nairobi, Kenya.
(2) Government of Kenya, 1997. Sessional Paper No. 2 on Industrialization by the year 2020. Nairobi, Kenya
(3) Government of Kenya, 1999. Sessional Paper No. 6 on Environment and Development. Nairobi, Kenya.
(4) Government of Kenya, 2000. Environmental Management and Co-ordination Act (1999). *Kenya Gazette Supplement No. (Acts No.1).*
(5) Government of Kenya, 2001. Poverty Reduction Strategy Paper. Nairobi, Kenya.
(6) Government of Kenya, 2003. Environmental (Impact Assessment and Audit) Regulations, 2003. *Kenya Gazette Supplement No. 56. Legislative Supplement No. 31. Legal Notice No. 101*
(7) Government of Kenya, 2003. Economic Recovery Strategy for Wealth and Employment Creation Nairobi, Kenya.
(8) Siaya County Report
(9) Siaya County annual development plan 2016/2017.

SURVEY OF LAND IDENTIFIED FOR THE DEVELOPMENT OF A POWER MINIGRID GENERATION STATION BY RURAL ELECTRIFICATION AND RENEWABLE ENERGY CORPORATION (REREC) IN MAGETA ISLAND, SIAYA COUNTY

Introduction

This is the report of the survey exercise conducted by a team of surveyors and land officials from the following Government Agencies:

1. Ministry of Lands and Physical Planning, Department of Land Adjudication/ Settlement
2. County Government of Siaya, Department of Lands
3. National land Commission, Siaya

Other offices that took part in the survey are, Rural Electrification and Renewable Energy Corporation-REREC (Project implementing agency); and the Chief's office representing the County Commissioner's office.

The purpose of the survey was to identify and map out part of land parcel number **Bondo/Mageta/1576** that is to be used for the development of a solar power mini-grid generation station.

This was informed by public participation meetings that had been carried out earlier, where the Mageta Community resolved to set aside between 2 to 5 acres of the above parcel of land for the above development by REREC. (Please see minutes attached).

Findings

Mageta Island is still under adjudication; therefore rights to land are still in the process of being ascertained. Consequently, titles to land have not been issued. However, the adjudication register has been prepared awaiting inspection and lodging of objections.

Land Parcel number **Bondo/Mageta/1576** was originally reserved for the Administration (Chief's Camp).

The above parcel borders the shorelines of Lake Victoria to its Northern side by about 250 meters.

Part of the Parcel, about 1 acre has already been set aside and fenced off for use by the County Government of Siaya as a Museum.

The parcel is abutted by public utilities such as Wakawaka Beach to the West and to the East by Mageta Health Centre and a church.

The land that is set aside for this project measures approximately 1.14 Hectares (2.82 acres) and is bound by the following UTM coordinates:

WGS 1984 UTM ZONE 36M

1. 611403.38 m E 9986391.73 m S
2. 611409.08 m E 9986351.13 m S
3. 611406.68 m E 9986312.91 m S
4. 611394.65 m E 9986265.14 m S
5. 611476.11 m E 9986263.05 m S
6. 611492.65 m E 9986358.29 m S
7. 611488.75 m E 9986398.35 m S
8. 611447.89 m E 9986414.83 m S

Approximately 30 meters separates the shoreline from the northern boundary of the land set aside to remain as the riparian reserve. However, REREC will be able to use this part, as long as no permanent developments are made within this riparian reserve.

Please see Annex 1 for the Map showing the layout of the parcels of land and the part set aside for the project.

Conclusion

1. Since the parcel of land identified is approximately 8 acres, there is enough room to accommodate the 2.8 acres needed for the above project, while leaving room for expansion of the other uses. Therefore, the proposal is acceptable.
2. The community has already expressed their resolve to have the project hosted within this parcel of land and therefore there is no other option but to respect their decision.
3. REREC can start using the part of the land identified for their use as the ownership documents are processed in their favor. This will have to go through the normal process of land adjudication.

4. REREC will have to register their objection at the opportune moment during the adjudication process so that their interest is registered for the part of parcel of land.

THIS REPORT HAS BEEN PREPARED BY

	Signature	Date
Grace Aoko Oima	.....	22/08/2019
Rural Electrification and Renewable Energy Corporation		
Jeconia O. Were	.....	22/08/2019
County Government of Siaya, Department of Lands		
Floice Ochieng	.....	22/8/19
Ministry of Lands and Physical planning, Department of Land Adjudication		

REPUBLIC OF KENYA

MINISTRY OF LAND AND PHYSICAL PLANNING

Tel: "Bondo 0202-233424
When replying please quote

Land Adjudication/Settlement Dept
P. O. Box 453
40601 – BONDO

REF No.LA/BON/25 Vol.1/108

21st August, 2019

DEAR SIR/MADAM:

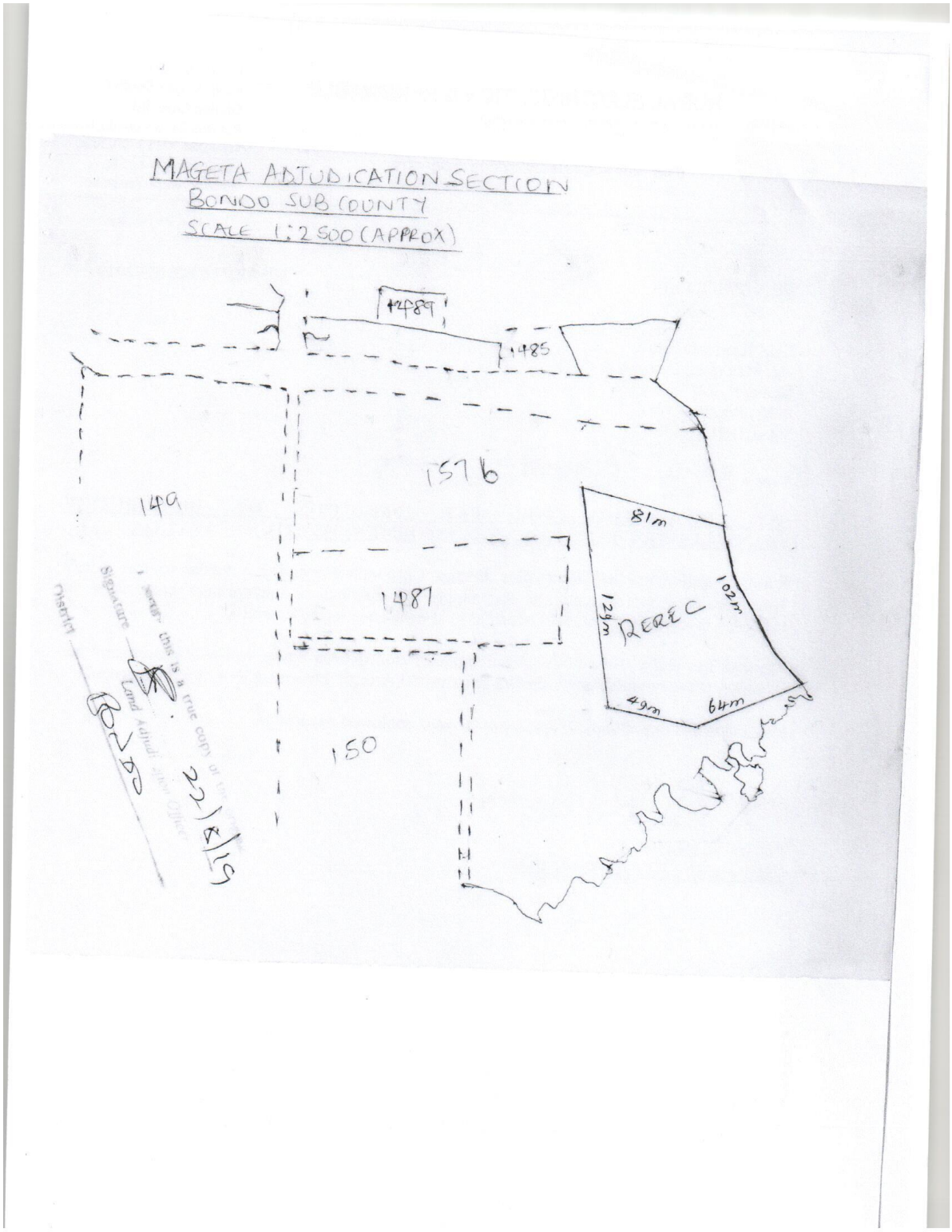
RE: SURVEY OF PARCEL OF LAND IN MAGETA ISLAND P/NO.1576 FOR ESTABLISMENT OF MINI GRID BY REREC

As the subject matter above refers after a series of meetings and field visits: Finally on the 20th August, 2019 in presence of:

1. Floice Ochieng – Land Adjudication & Settlement officer
2. Erick K. Ambani – Land Adjudication & Settlement Assistant(surveyor)
3. Stanley Charles – Surveyor (Attachee)
4. Jeconia O. Were – County Director Survey(Lands Siaya county)
5. Elizabeth Agira – Legal Officer (Lands Siaya County)
6. Abrose Ogemah – Area Chief (Mageta Island)
7. Grace Oima – Cartographer/Surveyor (REREC)

At Mageta Island on P/No.1576 approximately 2.8 acres (Drawn in blue colour on the tracing paper attached) was set aside for use by Rerec as agreed on by the Community of Mageta at large.

FLOICE OCHIENG
SUB- COUNTY LAND ADJUDICATION & SETTLEMENT OFFICER
BONDO SUB COUNTY


MAGETA ADJUDICATION SECTION
BONDO SUB COUNTY
SCALE 1:2500 (APPROX)
1489
1485
1576
149
1487
150
81m
102m
129m
REREC
49m
64m
ROAD

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF SIAYA

OFFICE OF THE COUNTY SECRETARY AND HEAD OF PUBLIC SERVICE

All Correspondence should be addressed to:
The County Secretary
Email: cs@siaya.go.ke
In reply please quote:

Executive Department
P.O. Box 803 - 40600
SIAYA

REF: CGS/OCS/LND/6/VOL. IV(168)

16th May, 2018

The Chief Executive Officer
Rural Electrification Authority
Kawi House – South C
Bellevue (Popo Road) Red Cross Road
P.O. Box 34585 – 00100
NAIROBI

ALLOCATION OF LAND IN MAGETA ISLAND FOR DEVELOPMENT OF SOLAR MINI GRID GENERATION PLANT UNDER THE KENYA ELECTRICITY MORDNIZATION PROJECT (KEMP)

Reference is made to your letter Ref. REA/CEO/DEF/1 dated 2nd May, 2018.

The County Government of Siaya has identified 5 acres in Wakawaka Beach for the establishment of the solar mini grid in Mageta Island.

The process for the allocation of the land to the Rural Electrification Authority (REA) for this project is already underway.

We thank you for your continued support to the County of Siaya and welcome you for your planned visit.

COUNTY GOVERNMENT OF SIAY.
COUNTY SECRETARY
P.O. BOX 803-40600 SIAYA

Dave Anyona Kanundu
COUNTY SECRETARY

Copy to:

- H.E. the Governor, Siaya County
- H.E. the Deputy Governor, Siaya County
- The County Executive Committee Member for Lands