ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

COMPREHENSIVE PROJECT REPORT

PROPOSED GRID-TIED SOLAR SYSTEM INSTALLATION FOR MERU CENTRAL DAIRY CO-OPERATIVE UNION LIMITED ON PLOT L.R NO. MERU MUNICIPALITY BLOCK II/306, AT MERU MUNICIPALITY AREA, IMENTI NORTH SUB COUNTY, MERU COUNTY

GPS Coordinates; N0.04175 E37.65945

Proponent	Prepared by:
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February 2026

PROJECT FACT SHEET

Proponent	Meru Central Dairy Co-Operative Union Limited	
Project Name	Proposed Grid-Tied Solar System Installation for Meru Central Dairy Co-Operative Union Limited	
Task	Installation of Grid-Tied Solar System	
Location	Meru Municipality area, Imenti North Sub County, Meru County	
Site Coordinates	N0.04175 E37.65945	
Project Objectives	To install a 932KW grid tied solar system for MCDCU in Meru County with the aim of reducing electricity costs from Ksh.144,000,000 to Ksh.76,320,000 annually, enhancing energy reliability and promoting environmental sustainability in milk cooling and processing operations ultimately improving the livelihoods of dairy farmers.	
Project Components	Solar Panels (605 watts), Grid-tied string inverters, mounting structures (corrosion-resistant aluminum) and cabling.	
Address of the Proponent	P. O. Box 2919 - 60200 - Meru – Kenya Tel: +254 710-901-376 Email: maziwa@merudairy.co.ke Website: www.merudairy.co.ke	
Contact Person	Doris Gatwiri	+254713198102
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Funding Agency	World Bank, National and County Government of Meru and Meru Central Dairy Cooperative Union	
Total project cost	KES: 78,441,550	
Target population	146,450 farmers (Male 80,546 and Females 65,903)	
Date:	Updated February 2026	

CERTIFICATION

This Environmental and Social Impact Assessment (ESIA) was prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental Impact Assessment and Audit Regulations 2003 (revised 2015 & 2019) in order to meet the statutory requirements for the implementation of projects under schedule ii. We, the undersigned, confirm that the contents of this report are a true representation of the ESIA process for the proposed project within Meru Central Dairy Co-Operative Union Limited.

Lead ESIA/ EA Expert details

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4/7/2025

Signature: ..... **Date:** .....

Proponent:

For and on behalf of Meru Central Dairy Co-Operative Union Limited

Representative Name: Doris Gathiri

Designation: Projects Manager

Sign and Stamp..... **Date:** 04/07/2025

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EXPERTS FACT SHEET

This assessment was conducted by a multi-disciplinary team comprising of environmental scientist, engineer, social scientist, agriculturalist and ICT. The details of the experts are presented in table below.

Name of the expert	**Qualification**	**Role in the assignment**
Dickson Kimathi	Environmental Science	ESIA Lead Expert
John Muchiri	Environmental Science (with IT)	OSH
George Gitau	Social Scientist in Environmental Studies	Social Safeguards
Ndia Henry Gituma	Agribusiness/Agri economist	Data and information provider
Patrick Koome	ICT	Document presentation
Roba Diba	Environmental Science and Natural Resources	Compliance and regulation
Purity wanja	Environmental Science and Natural Resources	Environmental safeguards
Rita Murungi	Environmental Science	Environmental safeguards
Florence Gakii	Forestry	Environmental safeguards
Mercy Kangai	Water Engineering	Project designs
Peter Gatobu	Agriculturalist and Social Scientist	Social Safeguards

DISCLAIMER

This ESIA report is strictly confidential to **Meru Central Dairy Co-operative Union Limited**, herein referred to as '**Proponent'** and any use of the materials thereof should strictly be in accordance with the agreement between the client and the ESIA/EA Expert mentioned herein **Lead Expert, Dickson Kimathi, (6235).** It is however, subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations, 2003 under the Kenya Gazette Supplement No. 56 of 13th June 2003 (Amendment 2015). It provides information on the proposed project as per the time of the assessment of the proposed Grid-Tied Solar System. This report as involved use of other secondary data.

EXECUTIVE SUMMARY

Meru Central Dairy Co-operative Union (MCDCU) limited is a major processor and marketer of dairy products in Kenya with a membership of 146,450 dairy farmers from 160 primary cooperative societies and common interest groups/Self Help Groups. The cooperative has significantly expanded its reach, increasing daily milk collection from 408,081 litres in 2023 to the 535,611 litres in 2024. The factory relies heavily on national electricity and diesel generators to power its milk processing equipment, refrigeration units, lighting and other operational systems which are not reliable and cost effective.

The union was mapped and selected as a beneficiary under the NAVCDP component of Climate Smart Value Chain Ecosystem Investments which focuses on investments that will boost market participation of small-scale farmers and enhance vale addition. This is in line with the project development objective which aims at increasing market participation and value addition. A detailed feasibility study was conducted to assess the technical, economic and environmental viability of installing a 932kW grid- tied solar PV system in the factory and cooling plant. The proposed intervention at the factory includes ddesign and installation of a grid-tied solar system that targets a 40% reduction in electrical energy costs used for processing and packaging of milk.

Based on the world bank ESF 1 as well as EIA/EA Regulations 2003(revised 2019), screening of the proposed project was done and ESIA CPR Recommended. Public participation was conducted on 11th April, 2025 with an attendance of 74 participants (29F, 25M). Baseline analysis of the project area, views from the interested and affected parties and the project design formed the basis for impact analysis. The positive environmental and social impacts anticipated during installation and operation of the project include creation of employment, Climate Change mitigation and adaptation, Reduced cost of operation, Increase bonus payout, Reduced cost of milk production and diversification of products.

The anticipated negative environmental and social impacts during the project cycle include High demand of raw materials, Noise pollution, Air pollution, Soil erosion and compaction. Interference with normal daily operations of the factory, Occupational accidents, Gender Based Violence (GBV) and Sexual Exploitation Abuse/Harassment (SEA/H, Increased Spread of Communicable diseases including STD, HIV & AIDS.

Detailed mitigation measures of the anticipated impacts are presented in the ESM&MP of the proposed project.

Based on the assessment, key recommendations to the proponent, contactor and enforcement agencies include:

i) Adopt a grid tied solar Photovoltaic system: The system is ideal due to its ability to supplement existing power from national grid while reducing dependency on expensive electricity or unreliable electricity.

ii) Use of high-quality equipment and certified installer: Select reputable solar panels, inverters and balance of system component with warranties and performance guarantees. Employ certified installers with experience in commercial solar systems to ensure proper safety and compliance with regulatory standard.

iii) Monitoring and maintenance plan: The proponent to establish a robust monitoring system to track solar energy production and system performance. Additionally, schedule a regular maintenance to sustain optimal operation and prolong system lifespan.

iv) Commitment to Mitigation Measures: The proponent should implement all mitigation measures outlined in the Environmental and Social Management & Monitoring Plan (ESM&MP) to address potential negative environmental, safety, health, and social impacts throughout the proposed project lifecycle.

v) Adherence to Standards: Adhere to all relevant national and international environmental, social, health, and safety standards, policies, and regulations governing the establishment and operation of solar power system.

vi) Stakeholder Engagement: Maintain open communication with members and stakeholders to create awareness about the grid tied solar system benefits and address any concerns.

vii) Environmental and Social awareness creation: Create awareness for workers on best practices for waste management, environmental conservation and social protection.

viii) Policy Advocacy: Advocate for supportive government policies and incentives to encourage the adoption of renewable energy solutions by other societies.

Considering the significant socio-economic and environmental benefits and proponent adhering to these recommendations, the project can proceed in an environmentally responsible and socially inclusive manner, contributing positively to sustainable development goals.

ABBREVIATIONS & ACRONYMS

ASTGS	Agricultural Sector Transformation & Growth Strategy
BETA	Bottom-up Economic Transformation Agenda
CPCU	County Project Coordinating Unit
CPR	Comprehensive Project Report
DOSHS	Directorate of Occupational Safety and Health Services
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EPR	Extended Producer Responsibility
ERP	Emergency Response Plan
ESIA	Environmental & Social Impact Assessment
ESM&MP	Environmental and Social Management & Monitoring Plan
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Safeguards
GBV	Gender Based Violence
GPS	Global Positioning System
HIV/AIDs	Human Immunodeficiency Virus & Acquired Immune Deficiency Syndrome
ISWM	Integrated Solid Waste Management
KEBS	Kenya Bureau of Standards
KES	Kenya Shillings
KPCU	Kenya Planters Co-Operative Union
KPLC	Kenya Power and Lighting Company Ltd
kWh/year	Kilo Watt Hour per year
L.R	Land Reference
MCDCU	Meru Central Dairy Cooperative Union
MEWASS	Meru Water and Sewerage Services Company
NAVCDP	National Agricultural Value Chain Development Project
NCCAP	National Climate Change Action Plan
NEMA	National Environmental Management Authority
NPCU	National Project Coordinating Unit

OSHA	Occupational Safety and Health Act, 2007
PMC	Project Management Committee
PPE	Personal Protective Equipment
PV	Photovoltaic
SDG	Sustainable Development Goals
SEA/H	Sexual Exploitation, Abuse & Harassment
SPR	Summary Project Report
VAT	Value Added Tax
WIBA	Work Injury Benefits Act, 2007

DEFINITION OF TERMS

Cooling centre: Refers to aggregation centre where milk is chilled before collection by the cooperative union.

Cooperative: Refers to Meru Central Dairy Cooperative Union

Project: Refers to the proposed Grid - Tied solar system

Proponent: Refers to Meru Central Dairy Cooperative Union

Societies: Refers to dairy farmers cooperative societies

System: Refers to set of connected electrical components suppling power to the facility

Processing plant: Refers to the factory

TABLE OF CONTENTS

PROJECT FACT SHEET 1

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

CHAPTER 1: INTRODUCTION

1.1 Background information

Meru Central Dairy Cooperative Union also known as Mount Kenya Milk is a prominent dairy cooperative in Kenya, established in 1967. It is a key player in Kenya's dairy sector, processing up to 535,611 litres of milk daily as on April 2024. It was founded by three primary dairy cooperatives - Katheri, Naari and Buuri with the aim of assisting farmers in marketing their milk produce. Meru Central Dairy Cooperative Union (MCDCU) is a farmer-owned enterprise uniting 146,450 dairy farmers from 160-member primary cooperatives as well as Community Interest Groups/Self Help Groups (CIGs/SHGs) in Meru and neighbouring counties of Tharaka Nithi, Embu, Nyeri, Nyandarua and Kirinyaga. Following a restructuring process initiated by the Ministry of Co-operative Development and Marketing the union was re-established as Meru Central Dairy Co-operative Union Ltd and registered under the Co-operative Societies Act on 23rd May 2005. The union has evolved significantly over the years both in scale and scope. To streamline milk collection, MCDCU operates six cooling centres where member societies deliver their milk before transportation to the processing facility.

The dairy union collects milk from a total membership of 146,450 of whom 80,546 are Male and 65,903 are Female. The volumes of milk collected increased from a daily average of 408,081 litres in 2023 to the 535,611 litres in 2024. Milk is received twice per day at each of the cooling center where it is chilled to 4-degree centigrade awaiting collection for transportation to the main factory for processing. Approximately 60% of the milk is delivered to the cooling centers in the morning between 6am-12 noon with the rest in the afternoon between 2-5 pm. Apart from very rare emergency cases, no milk is stored overnight in the cooling centers meaning that main electricity usage at the cooling centers is during the day. The union manages the entire dairy value chain from milk collection, processing to marketing and distribution. The main factory however runs and processes the milk into diverse value-added products on a 24-hour basis which includes fresh pasteurized milk, long-life milk, yogurt, mala, ghee, butter and ice cream. Currently, the dairy processes 614,000 litres of milk per day from January to June, 2025, even though its facilities have the capacity to handle up to 710,000 litres. This indicates that it is operating below capacity, but it is projected to reach the full 710,000 litres by December 2025. Achieving this level of production will increase power consumption by an additional 200 kW, bringing the total load to 1,200 kW with existing machinery. As the dairy moves toward a daily processing capacity of 710,000 litres, its

power requirements will continue to grow. In response to rising operational costs and in line with its commitment to farmer prosperity, MCDCU plans to install a 932kW grid-tied solar power system at its main processing factory and six aggregation centers. This initiative is projected to reduce electricity costs by approximately 61%, ensuring long-term savings that will directly benefit the thousands of smallholder farmers who own and supply the Union, minimize environmental impacts, and promote renewable energy adoption within the dairy sector.

The proposed project will be supported by NAVCDP under the component of Climate Smart Value Chain Ecosystem Investments which focuses on investments that will boost market participation of small-scale farmers and enhance vale addition. This is in line with the project development objective which aims at increasing market participation and value addition.

1.2 Sub - Project objective

To install a 932KW grid tied solar system for MCDCU in Meru County with the aim of reducing electricity costs from Ksh.144,000,000 to Ksh.76,320,000 annually, enhancing energy reliability and promoting environmental sustainability in milk cooling and processing operations ultimately improving the livelihoods of dairy farmers.

Specific Objectives

1) Reduce dependence on grid electricity and fossil fuel-powered backup systems by integrating clean, renewable solar energy into the Union's power supply.
2) Lower electricity costs associated with milk processing, chilling, and administrative operations, thereby increasing the Union's profitability and financial resilience.
3) Promote environmental sustainability by reducing greenhouse gas emissions and aligning the Union's operations with national and global climate change mitigation efforts.
4) Improve energy reliability and security to ensure uninterrupted dairy processing and cold chain management, especially during grid outages.
5) Demonstrate a replicable renewable energy model that can be adopted by other cooperatives and agro-processing entities in Kenya.
6) Build technical capacity and awareness among MCDCU staff and cooperative members on solar technology use, maintenance, and energy conservation.

1.3 Sub project justification

High electricity costs represent one of the most pressing challenges within MCDCU's operations. MCDCU is moving towards increasing the processing capacity to 710,000 litres per day. This in turn will grow power need and hence increase electricity cost. The processing plant incurs substantial power bills, eroding the Union's margins. Reducing these costs is essential to sustaining profitability, maintaining stable milk prices to farmers, operational improvements and enhancing service delivery across the value chain. The installation of Grid –Tied Solar system will lead to:

Increase in Farmer Bonus Payout:

The dairy anticipates a 30% increase in the annual bonus payout to the farmer, realized from energy saving, when the grid-tied solar system is installed at the processing plant. In the first phase, a 15% increase in farmer milk bonus is expected. Reliable, clean energy at the coolers ensures better milk quality and reduced spoilage risk, directly benefiting both the dairy and smallholder farmers.

Substantial Energy Savings:

The factory stands to save 40% in power costs by offsetting grid consumption with solar generation. On average, the dairy will reduce its total electricity bill by 47%, as evidenced by sample billing data.

Environmental and Community Impact:

Shifting toward clean, renewable solar power supports environmental sustainability and reinforces the dairy's commitment to responsible resource management. This initiative will serve as a model for other farmer-owned enterprises seeking to lower energy costs and carbon footprints.

Ultimately, this project will strengthen the dairy's competitiveness in the market and enhance the livelihoods of its member societies & CIGs.

1.4 Objectives of the ESIA CPR

The main objective of the Environment and Social Impact Assessment ESIA (CPR) was to identify, evaluate, and propose mitigation measures for potential environmental and social impacts of the proposed project to ensure sustainable and responsible development.

1.5 Terms of reference

i) To highlight environmental and social issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental and social elements within the project area;
ii) To review existing legal, institutional and policy framework relevant to the proposed project;
iii) To assess the relative importance of the impacts of alternative plans, design, technologies and sites;
iv) To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures will be implemented in all phases of the project cycle;
v) Develop an Environmental and Social Management and Monitoring Plan (ESMP) to guide in decision making and for future auditing; including the cost, time frame and responsibility to implement the measures;
vi) Raise stakeholder awareness on the impact of the proposed project on the environment and social aspects with a view of making them understand the implication of the proposed project; and
vii) Develop an ESIA report (CPR) in conformity with the EMCA 1999 (Amendment 2015) and Environmental (Impact Assessment and Audit) Regulations 2003 (Amendment 2019).

1.6 Scope of the ESIA study

The Kenya Government policy on all new projects, programs or activities requires that an environmental impact assessment be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. The scope of this Environmental Impact Assessment, therefore, covered:

- The baseline environmental conditions of the area,
- Description of the proposed project.
- Provisions of the relevant environmental laws.
- Identification of alternative technologies.

- Identification and discuss of any adverse impacts to the environment anticipated from the proposed project.
- Appropriate mitigation measures.
- Provision of an environmental management plan outline

1.7 Assessment Methodology

For the team to achieve the objectives of the study it adapted a participatory approach where key stakeholders were consulted, review and analysis of relevant documents, site visits and socioeconomic survey. The approach and methods used have been described in details below;

1.7.1 E&S Screening

The proposed project was subjected to screening as provided for in Environmental Management and Coordination Act (EMCA) Cap 387 section 58 and the amended regulation 7(4) of the Environmental (Impact Assessment and Audit) regulations, 2003, vide legal notice 32 of 2019 which requires that such a project is preceded by screening to identify the likely negative impacts and risks and propose appropriate mitigation measures at the early stages of project planning. This then determine the appropriate level of environmental assessment (e.g., Full study, CPR, SPR,] or Environmental and Social Management Plan [ESMP]) and enhance the project's sustainability, acceptability, and compliance with applicable laws and policies.

1.7.2 E&S Scoping

An in-depth assessment was done to prioritize the environmental and social aspects in the CPR study as advised by the screening assessment which classified the project as medium risk. This narrowed down the data to be collected to specific environmental and social aspects.

1.7.3 Secondary data review

The study team reviewed data of published literature including but not limited to an earlier developed screening report, feasibility report, project design report, Meru dairy strategic plan, Meru union Profile and concept note to extract key insights, compare across sources and look for patterns or contradictions in the study.

1.7.4 Public consultation

To ensure the community is empowered, foster sense of ownership and responsibilities, better understand their need and priorities and also for successful and sustainable project outcomes a public participation forum was conducted on the 11th April 2025 with an attendance of 74 participants; 29 female and 45 male, from interested and affected parties including Chairperson of the union, board of management, delegates from affiliate societies , Union managers and County Government of Meru staff from relevant departments.

1.7.5 Reporting

A CPR will be developed and submitted to CPCU for review. After approval by CPCU it will be submitted to NPCU for further review before submission to World Bank. After World Bank approval it will be submitted to NEMA for review and appropriate decision.

1.8 ESIA team

The ESIA team comprising of Environmental Scientists, water engineer, agribusiness/economist, ICT specialist, sociologists, occupational safety and health specialist played a key role in the development of the report.

1.9 Project Implementing agency

The implementation of the grid-tied solar power system for Meru Central Dairy Cooperative Union (MCDCU) will be spearheaded by the Union's existing organizational structure, supplemented by technical and advisory support from relevant stakeholders and partners. Lead Agency- MCDCU will oversee the execution of the project from planning to commissioning. This will involve coordination of all project activities, ensure compliance with regulatory requirements, and facilitate engagement with contractors, government agencies, and community stakeholders. Project Management Committee (PMC) will be established to provide strategic oversight and ensure effective coordination and decision-making. Tasked with monitoring project progress, quality assurance, and resolving any implementation challenges in a timely and transparent manner.

MCDCU will engage qualified and licensed solar energy providers through a competitive procurement process. Technical oversight will be supported by relevant government agencies such as: Ministry of Energy and Petroleum, Energy and Petroleum Regulatory Authority (EPRA), Rural

Electrification and Renewable Energy Corporation (REREC). Monitoring and Evaluation will be done regularly to report on progress of the project.

1.10 Structure of the report

The report is organized into nine substantive chapters.

Chapter 1: Introduction - gives the project background, objectives, justification, Terms of reference, method of study and the team involved in CPR development;

Chapter 2: Project description - describes the proposed project by location, design, material to be used in the project, budget, project activities, social and environmental sustainability;

Chapter 3: Policies, Institutions and Legal Framework - gives a review of relevant policies, legal, and administrative frameworks;

Chapter 4: Environmental and Social Baseline Information - gives the characteristics of the proposed project area (Baseline information);

Chapter 5: Public Participation - is about public participation and its outcomes;

Chapter 6: Analysis of Project Alternatives – presents analysis of the proposed project alternatives;

Chapter 7: Assessment of potential Environmental and Social Impacts and Mitigation Measures - identifies the potential environmental and social impacts and their mitigation measures;

Chapter 8: Environmental and Social Management and Monitoring Plan - the ESM&MP; and

Chapter 9: Conclusion and Recommendation - provides the conclusions and recommendation given to improve the project throughout its life cycle.

This is followed by the literature sources consulted (References) and Annexes in the report.

CHAPTER 2: PROJECT DESCRIPTION

2.1 Introduction

This chapter provides a comprehensive description of the project location, project designs, installation activities, materials to be used in the installation, project activities during operational stage, waste to be generated and methods of disposal and the proposed project cost of the proposed installation of a grid-tied solar photovoltaic (PV) power system at the main processing facility of Meru Central Dairy Co-operative Union Ltd (MCDCU), opposite the new KPCU in Meru Town, Meru County, Kenya. The project is part of MCDCU's sustainability initiative to reduce operational costs and transition towards cleaner energy sources.

2.2 Location of the project

The proposed grid-tied solar power system will be installed at the premises of Meru Central Dairy Co-operative Union Limited. The processing factory is located within Meru Municipality along KPCU road in Meru town, Imenti North Sub-County. It is situated within administrative and commercial centre of Meru town. The GPS Coordinates; N0.04175 E37.65945.

Figure 2.1: Google Map showing location of MCDCU milk processing plant

2.3 Project design

The proposed project is a grid-tied solar photovoltaic (PV) system designed primarily for self-consumption ("own use") to offset the energy needs of the main dairy processing facility. The proposed project components entail: Solar mounting structures installed on the rooftop; Solar modules and Smart grid solar PV Inverters; Electrical cabling, DC combiner boxes, isolators, surge protection devices, and monitoring units.

2.3.1 Design of the proposed sub - project

The proposed grid-tier project involves mounting solar modules on the roofs of existing seven (7) structures in a union. These structures include the main dairy processing plant, storage units, utility blocks, and office buildings. Their structural integrity is sound and suitable for PV mounting after site inspection by the project engineers. (Refer to Annex 8).

The roofs are made of corrugated iron sheets with a box profile, which will support the solar mounting structures to fix the solar modules. The design of the roofs is a gentle slope gable roof structure, suitable for holding the modules. These gable roofs with a gentle slope are suitable for the proposed project because they will provide a relatively straightforward surface for mounting the panels. The gentle slope will ensure that the solar panels are angled in a way that optimizes energy production, although the exact angle may depend on the latitude and local solar irradiance.

The grid-tied system will utilize 70% of the solar energy and 30% of grid power during the day. At night, the system will 100% utilize power from the grid. The grid-tied system does not have power storage (batteries), and entirely relies on the grid for operation.

Key features of the design include:

a) **Solar Mounting Structure**s

The proposed project will have provisions for Solar panel mounting structures for roof-mounted and ground-mounted structures. These structures are essential for securing solar panels and optimizing their performance and are designed to withstand various environmental conditions and ensure the longevity of the solar energy system. Aluminium roof top mounts typically consist of roof attachments, mounting rails, and module clamps. The roof attachments secure the racking system to the roof, while the module clamps attach the solar panels to the mounting rails.

- **Solar Modules**:

The proposed project has a provision to install 1,664 high-efficiency monocrystalline or polycrystalline PV panels of 560Wp. These modules have a high-power output making them ideal for installations where space is limited. The dimensions of one 560Wp mono-crystalline solar panels will be averaging at Length: 2,278 mm, Width: 1,134 mm and Depth: 30 mm or 35 mm. The weight of these panels is typically around 27 kg to 28 kg and have a solar power end of life (linear power) warranty of 20 – 25 years.

- **Smart grid solar PV Inverters**

Five (5) 250A 3-Phase Smart Power Sensor DC – AC conversion inverters synchronized with the KPLC grid will be installed in the proposed project with a precision electronic device designed to measure and monitor electrical parameters in three-phase power systems. It will provide real-time data on voltage, current, power (active, reactive, apparent), frequency, and energy consumption. These inverters are suitable for medium- to large-scale electrical loads such as industrial machines, solar inverters, or grid-tied systems.

These sensors are essential components in energy monitoring, load management, and system optimization—especially in renewable energy setups like grid-tied PV systems.

- **Electrical cabling, combiner boxes, isolators, surge protection devices, and monitoring units**.

The proposed project will consist of the following;

Armoured Cables

The specifications include 16mm² and 95mm² solar PV cables, in black and red. These cables are specifically designed for connecting solar panels to inverters and other components within a solar PV system. The size (16mm² and 95mm²) refers to the cross-sectional area of the conductor, which determines the cable's current-carrying capacity. These cables are designed to withstand the harsh environmental conditions often encountered in solar installations, including UV exposure and temperature fluctuations.

Cabling design

The cabling system will be implemented according to the PV system schematic diagram, utilizing string configuration layouts as specified by the engineering team. The cables will be routed through

an underground trench, following the DC/AC single-line diagram. This diagram, informed by the power flow diagram, illustrates the power flow path from the photovoltaic modules to the load or grid connection point.

Earthing System

The list includes 150mm² armoured cables, rated at 600/1000V, with a 3-core configuration. Armoured cables are used for AC (alternating current) connections, particularly for underground or outdoor installations where physical protection is needed. The armouring provides mechanical protection against damage from impact, crushing, and abrasion.

Lightning Arrestors

The project requires 7 earth rods complete with clamps (5/8" x 4FT). An earthing system is crucial for safety in electrical installations. Earth rods provide a low-resistance path to ground, allowing fault currents to flow safely and quickly, which helps to trip circuit breakers and prevent electric shock.

DC/AC Earthing Systems and assorted cables and trays

The inclusion of 7 lightning arrestors indicates a concern for protecting the solar PV system from lightning strikes. They are designed to divert the high-voltage surges caused by lightning strikes away from sensitive equipment, such as inverters and other electrical components. This helps to prevent damage and ensure the continued operation of the system. The number of arrestors needed depends on the size and layout of the system and the local lightning risk.

- **DC combiner boxes**

The proposed project shall have provision for installation of 56 DC combiner boxes to serve as central hubs where multiple solar panel strings will be connected, consolidating their outputs into a single circuit. They will enhance the efficiency and safety of the solar installation by providing a centralized point for monitoring and managing the solar panel arrays

2.3.2 Construction and Installation activities

The major construction and installation activities will include:

- Site preparation - excavation and backfilling in trench for the armoured cable installation
- Mounting of PV modules on rooftops using the solar structure mounting structures
- Installation of inverters, cabling, isolators and protective devices.

- Integration of the system with the main distribution board and KPLC meter.
- System testing, commissioning and staff training

2.3.3 Materials to be used in the installation

The project will utilize the following materials:

i. **Solar Equipment**:
   - Monocrystalline solar modules
   - Smart grid solar inverters
   - Smart power sensors
   - DC combiner boxes
   - PV disconnects
   - AC breakers

ii. **Mounting Structures**:
   - Aluminium roof mounting structures with accessories
   - Galvanized steel ground mounting structures with accessories

iii. **Electrical Components**:
   - Solar PV cables
   - Armoured cables
   - Cable trays and covers
   - Electrical sleeves for underground cabling

iv. **Safety Equipment**:
   - Earth rods with clamps
   - Lightning arrestors
   - DC and AC earthing system components

2.3.4 Project activities during operation phase

The activities will include capacity building of the staff, system monitoring on the expected output versus expected generation, maintenance by cleaning solar panels, inspection of wiring, inverters

and mounting structures. Annual ESA audits will be conducted to ensure continued compliance with regulatory standards and permits.

2.3.5 Wastes to be generated and methods of disposal

Construction Phase Waste:

- Packaging materials from solar panels, inverters, and electrical components
- Excess cable cuttings and conduit pieces
- Excavation soil (to be reused for back filling where possible)
- Metal scraps from mounting structure installation

Disposal Methods

- Cardboard and paper packaging will be collected for recycling
- Plastic packaging will be segregated for appropriate recycling or disposal
- Metal scraps will be collected for recycling
- Excess soil will be used for landscaping or properly disposed of at approved sites

Operational Phase Waste

- Minimal waste generation during normal operation
- Potential electronic waste from component replacements.

End-of-Life Disposal

- PV panels and electrical components will be handled through licensed e-waste recycling channels
- Mounting structures will be dismantled and recycled as scrap metal

The project will implement a comprehensive waste management plan to ensure that all waste materials are handled, stored and disposed of in an environmentally responsible manner, in compliance with national and local regulations.

By installing grid-tied systems in the main factory, the Union expects to reduce operating costs caused by high electricity bills by an approximate average of 61.46%, and sustained profit margins, stabilize milk prices and other services throughout the value chain.

2.4 Estimated Project Cost

The proposed investment is estimated to cost **Ksh. 78,441,550.**

CHAPTER 3: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

This section will review relevant National and International policies and regulations governing ESIA processes as well as other laws relevant for the proposed project for review and eventual approval and licensing before the development commences. In doing so, the section highlights the provisions of the different policies and how they have been or will be complied with during project implementation.

Laws governing environmental and social protection and conservation in Kenya are derived from the constitutional statutes and the ratified international conventions. These laws regulate the establishment and operation of development projects.

The Kenya Government has in place an environmental and social policy for harmonizing conservation with its development plans and has numerous statutes that guide environmental management and conservation, social protection, energy sector and developments in general. Most of these statutes are sector specific and cover a wide range of issues including public health, soil conservation, protected areas conservation, endangered species, public participation, water rights,

water quality, air quality, excessive noise control, vibration control, land use, among others. The relevant legislation's are described in table 3.1.

3.2 National Policy Frameworks

There are several pieces of legislation and policy documents related to this kind of development in Kenya. These include;

Table 3-0-1: National policy framework

Law	Relevant Provisions	Relevance to the project
The Kenya Constitution, 2010	The Constitution of Kenya has taken on board various issues that are related to environmental management. Article 42 of the Bill of Rights contained in the Constitution provides that 'every Kenyan 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. Article 69 in Part 2 provides that the state shall encourage efforts towards sustainability of natural resources. It also provides for environmental and social impact assessment, environmental audit and monitoring of the environment.	The proponent of the proposed project will assist government meet its obligations towards sustainable development to offer potential for electricity cost savings by installation of proposed solar system for these commercial settings through a consultative process provided for. This report undertaken by the proponent is in conformity with the need to ensure mitigation of adverse impacts to protect the environment. In addition, the proponent has consulted the public on this project in line with the requirements to be adhered to during installation phase of the proposed solar system
The Kenya	The development blueprint recognizes Kenya's	The proponent has a vested

Vision 2030 and BETA	electrification as a prerequisite in attaining the different projects for the national development. Kenya's electrification and solarization efforts are critical to achieving the agricultural and economic targets outlined in Vision 2030. Continued investment in energy infrastructure, capacity building, and innovation will ensure a resilient, modern, and climate-smart agricultural sector. This alignment not only ensures regulatory support but also increases the likelihood of funding eligibility, community acceptance, and policy endorsement under Vision 2030-aligned programs like Market Access and Infrastructure Development.	interest in supporting and implementing electrification and solarization initiatives by installation of the proposed solar system to ensure the success as outlined in Kenya Vision 2030 objectives, particularly through: • Energy sector diversification and sustainability • Agricultural value chain strengthening • Environmental sustainability and climate-smart technology adoption.
National Energy Policy, 2018 (draft 2025 -2034)	Kenya's Draft National Energy Policy for the period 2025–2034, which is currently under public review, emphasizes the transformative potential of solar energy in delivering affordable, reliable, and sustainable electricity. The policy outlines immediate milestones to be achieved between 2025 and 2027. A significant focus is placed on enhancing support for solar energy initiatives in both grid-tied and off-grid settings. Specifically, the policy aims to accelerate the development of community solar projects, rooftop solar installations, and mini-grid systems in remote and underserved regions that lack access to the national electricity grid.	The proponent will adhere to the National Energy Policy's guidelines, prioritizing its capacity to enhance energy accessibility, decrease energy expenditures, and foster sustainable advancement by leveraging renewable energy technologies and energy efficiency measures

National Climate Change Action Plan 2023 – 2027	Kenya's National Climate Change Action Plan III (2023–2027) emphasizes the critical role of the energy sector in addressing greenhouse gas emissions and enhancing resilience against climate change. Under Priority Area 7, the plan outlines a strategic approach aimed at reducing reliance on fossil fuels and unsustainable biomass. The primary strategy involves accelerating the transition to renewable energy sources, particularly through the expansion of solar, wind, and geothermal energy generation.	The proponent will be guided by the action plan to embrace green technology by enhancing climate resilient technologies during production within the Union. These obligations will be aligned with the broader goals of the NCCAP to promote low-carbon and climate-resilient development pathways within the agricultural sector.
Sessional Paper No. 10 of 2014 on National Environment Policy	Sessional Paper No. 10 of 2014 provides a framework for integrated approach to planning and sustainable management. Public participation is a guiding principle of the policy.	The Proponent is committed to continuous stakeholder involvement across the project phases.
Agricultural Sector Transformation and Growth Strategy (ASTGS), 2019–2029	This is a comprehensive plan developed by the Kenyan government to transform the country's agricultural sector through commercialization and modernization. The convergence of ASTGS objectives and Kenya's renewable energy initiatives presents a viable pathway for agricultural transformation. Leveraging on solar-tied grid systems can enhance agricultural productivity, ensure food security, and promote sustainable development.	The proponent shall promote investment in energy-efficient technologies and infrastructure for agri-processing through the proposed solar system project.

3.3 National Legal Framework

Table 3-0-2: National legal framework

Key Laws	Relevant Provisions	Obligations of the project
Environmental Management and Coordination 1999 [Cap. 387] and Amendment Act, 2015, 2019	NEMA was established to exercise general supervision and co-ordination over 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 Act prohibits discharge of hazardous substances, chemicals and materials or oil into the environment and outlines basic guidelines on the spiller's liability. Subsidiary EMCA Cap. 387 legislations include: Environmental Management and Coordination (Environmental Impact Assessment and Audit) Regulations, 2003; (Amendment) Regulations, 2016 Environmental Management and Co-ordination (Waste Management) Regulations, 2006 E-Waste Management Draft Regulations, 2013	The proposed project is classified as a medium-risk project and has been written in accordance with the Environmental (Impact Assessment and Audit) regulation, 2019 (legal notice 31 & 32). It will be submitted to NEMA, which has the overall responsibility of enforcing this act. The Act also lists the type of projects which are medium risk thus require development of a CPR. This CPR is prepared in conformity with the Act as a basis for EIA/EPR, environmental licensing and details an ESMP to be implemented during and after installation to ensure the environment is protected. It is expected that NEMA must submit the report to other relevant lead agencies. These shall assess the environmental performance based on key

		parameters with direct and indirect impacts to the environment in accordance with the Act. The proponent will use provisions of this regulation to ensure that waste (e-waste) generated during installation and of the Roof top Solar PV is handled, stored, transported and disposed in the correct manner as described and prescribed in the environment and social management plan.
The Waste Management Regulations, 2006	These regulations provide for the responsible management of all types of waste. They emphasize waste segregation, licensing of waste handlers, and the "polluter pays" principle.	The proponent must ensure to segregate e-waste generated during the installation phase from the general waste stream at the source of generation (e.g., offices, processing plant, laboratories). Additionally, the proponent will ensure that any contractor engaged for e-waste transportation is licensed by NEMA and disposes off the e-waste only at NEMA-licensed disposal facilities.
The National E-Waste Guidelines, 2010	These guidelines provide a detailed framework for the environmentally sound management of e-waste, from	The proponent is required to develop and implement an internal e-waste management

	generation to final disposal, including collection, transportation, sorting, and recycling.	plan based on these guidelines provided for and create awareness among its staff on the importance of proper e-waste management and maintain records of all e-waste generated and disposed off, including types and quantities. Further, the proponent is required to establish clearly marked and secure e-waste collection points at all its facilities (offices, cooling plants, processing units) and ensure collection points are sheltered from weather to prevent leaching of hazardous substances
The Sustainable Waste Management Act, 2022	This Act promotes a circular economy approach to waste management, encouraging waste reduction, reuse, and recycling. It also reinforces the Extended Producer Responsibility (EPR) principle.	The proponent is expected explore options for recycling e-waste through licensed recyclers and comply with any take-back schemes or EPR programs established for specific electronic products including the modules
The Extended Producer Responsibility (EPR) Regulations, 2024	These regulations operationalize the EPR principle, making producers responsible for the entire life cycle of their products, including their post-consumer waste management.	The proponent as a user and potential large-scale purchaser of electronic equipment is expected to cooperate with suppliers and manufacturers who are part of a registered PRO.

		This will facilitate the collection and return of end-of-life equipment to designated collection points or recyclers as per the EPR schemes.
National E-Waste Guidelines	These Guidelines were issued by NEMA (2015) to manage electrical and electronic waste throughout its lifecycle – including collection, storage, transportation, and disposal.	The proponent is obligated to establish an e-waste management plan, register with NEMA as a waste generator, ensure e-waste is handled by licensed service providers, promote awareness on safe disposal, and submit annual waste management reports in compliance with NEMA.
Meru County Solid Waste Management Policy and Plan	This policy provides the local framework for waste management within Meru County, emphasizing source segregation and proper disposal.	The proponent is required to liaise with the Meru County Department of Environment and Natural Resources to ensure its e-waste management plan is aligned with county-level strategies and participate in any county-led initiatives for e-waste collection and management.
ICT Policy	Kenya National ICT Policy (2020) promotes universal access to ICTs, development of e-waste management systems, and environmental sustainability in ICT rollout.	The proponent must ensure ICT installations are inclusive, support digital access for all, and adhere to environmental safeguards by implementing sustainable procurement, promoting green ICT solutions,

		and ensuring lifecycle management including reuse and recycling. Additionally, the proponent is required to develop and implement an e-waste management plan for the disposal of obsolete equipment in collaboration with licensed e-waste handlers and conduct regular energy audits of ICT facilities.
The Energy Act, No. 1 of 2019	This is an Act of Parliament to amend and consolidate the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority, and for connected purposes. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy.	The Act prescribes to the proponent the manner with which licenses shall be obtained for generating electricity and the requirement for contracting licenced technician as guided by the Act. Additionally, it gives guidance to the proponent on the exceptions provided for the installation of solar power generated current of less than 1MW.
The Energy (solar photovoltaic systems) Regulations, 2012 & 2019	These regulations apply to a solar PV system manufacturer, importer, vendor, technician, contractor, system owner, a solar PV system installation and consumer devices	The proponent will not be required to apply for a licensed from the EPRA Commission for the proposed 932 KWV Roof top Solar PV installation within

	and also where alternate current electricity is involved the Electric Power (Electrical Installation Work), Rules, 2006, shall apply. The regulations states that "A person shall not design or install any solar PV system unless he is licensed by the Commission". It continues to state that to be licensed by the Commission as a technician; a person shall be required to have the prescribed qualifications and experience as set out in the First Schedule, and appropriate certification recognized by the Commission. The regulations also require a person not to engage in the business of manufacture of any solar PV system and components unless he applies for and obtains a license from the Commission.	their premise for compliance because its less than legal capping.
The Climate Change Act, 2016	Establishes the National Climate Change Council whose main function is to advise the national and county governments on legislative and other measures necessary for mitigating and adapting to the effects of climate change Provides the legal and institutional framework for the mitigation and adaption to the effects of climate change; to facilitate and	The proponent is guided by the Act of the obligations to align the proposed project specifically aligning operations and integrating climate change considerations into its strategic plans and supporting climate-smart agricultural practices among its members, and other stakeholders.

	enhance response to climate change; to provide for the guidance and measures to achieve low carbon climate resilient development and for connected purposes	
Occupational Health and Safety Act (OSHA 2007)	The Act provides for the OSH Guidelines during all stages of the project.	The proponent must ensure safety during installation and operationalization of the Roof top Solar PV system and register the premise as a workplace with the directorate of occupational safety and health services.
County Government Act No. 17 of 2012	The Act provides for county governments' powers, functions and responsibilities to deliver services and for connected purposes. The Act provides for a wide variety of matters relating to public administration at local level including Citizen Participation principles and stresses protection and promotion of the interest and rights of minorities, marginalized groups and communities such as timely access to information, data, documents, and other information relevant or related to policy formulation and implementation for planning among others.	The proponent shall ensure that this piece of legislation brings everyone on board in planning and execution of this projects at the County level. This was undertaken during the public participation exercise to collect views and disclosure engagement forums of project implementation strategies of the proposed project Rooftop Solar PV system from the proponent
The Standards Act Cap 496	This Act promotes the standardization of the specification	The proponent with guidance from the KEBS will ensure that

	of commodities, and provides for the standardization of commodities and codes of practice to ensure public health and safety. It establishes the Kenya Bureau of Standards (KEBS) and defines its functions as related to: Promotion of standardization in industry and commerce; and Making arrangements or provision of facilities for the testing and calibration of precision instruments, gauges and scientific apparatus, for the determination of their degree of accuracy	contract administration (including but not limited to terms of procurement or contracts made with contractors or suppliers after tender award by the proponent, for the purpose of assuring compliance with obligations such as timely delivery, quality and quantity inspection, acceptance, payment, claims, dispute resolution and completion, among other terms) will be guided by the Act.
WIBA 2007 Work injury Benefit Act. 2007	The Work Injury Benefits Act, 2007 (WIBA) is a significant piece of legislation in Kenya that mandates employers to provide compensation for employees who suffer injuries or diseases arising out of their employment.	Under WIBA, the proponent is required to obtain and maintain an insurance policy that covers the technicians during the proposed installation of Roof top Solar PV against anticipated liabilities that may be incurred due to work-related injuries as guided by the WIBA Act.
Public Health Act (Cap 242)	The Public Health Act aims to safeguard and promote the health of the public. It applies to the solar PV project in aspects such as control of dust and noise during construction, prevention of health hazards associated with handling of solar	The proponent must ensure that specific safety standards are met as indicated in the ESMP for the proposed installation of the rooftop Solar PV system. These mitigation measures will address issues of dust and noise

	components, and management of waste—including e-waste and other solid waste.	pollution during the installation phase and the proper disposal of e-waste during the operationalization phase.
Labour Relations Act (No. 14 of 2007)	This Act governs the relationship between employers and employees. It is particularly relevant to the engagement of workers during the construction, installation, and operational phases of the project.	The proponent shall ensure that workers are treated fairly, provided with safe working conditions, receive appropriate compensation, and are allowed to exercise their rights, including freedom of association. The project must comply with all labour standards as set out in the environmental management plan in this CPR

3.4 World Bank Environmental and Social Standards

ESS	APPLICABILITY	RATIONALE	PROPONENT'S OBLIGATION
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Applicable	The installation of the grid-tied solar PV system may pose potential environmental (e.g., land disturbance, waste) and social (e.g., worker-	The proponent must engage a qualified environmental and social expert to conduct a comprehensive Environmental and Social Impact Assessment (ESIA - CPR) and Environmental and Social Management Plan (ESMP). The ESMP should include clear mitigation measures, monitoring plans, institutional responsibilities, and timelines and should undergo regular audits and monitoring

		community interactions) risks. These must be proactively assessed.	
ESS 2: Labour and Working Conditions	Applicable	Skilled and unskilled labour will be involved in the installation phase. Safe and fair treatment of workers, occupational health and safety, and labour rights compliance are necessary.	The Proponent must prepare and implement a Labour Management Procedure (LMP) that defines terms and conditions of employment, worker grievance redress mechanisms, roles of contractors/subcontractors, and compliance with Kenya's labour laws. All workers must be provided with adequate PPE, site orientation, and training.
ESS 3: Resource Efficiency and Pollution Prevention and Management	Applicable	Installation works will use materials and equipment that may generate dust, noise, solid waste, and e-waste (e.g., packaging, electrical parts).	The proponent should ensure efficient use of energy and water during installation and enforce pollution control measures. A Waste Management Plan (WMP) must be implemented to ensure proper handling, temporary storage, and environmentally sound disposal or recycling of e-waste and construction debris. Noise suppression and dust control (e.g., water spraying) must be enforced.
ESS 4: Community Health and Safety	Applicable	Presence of workers and machinery may pose safety and	The Union must implement Community Health and Safety measures including fencing and signage around the construction area, traffic management

		health risks to local communities, including risks of GBV/SEA, traffic accidents, and unauthorized site access.	plans for equipment delivery, and worker conduct codes. Awareness campaigns on HIV/AIDS, SEA/SH, and general safety must be carried out among workers and local communities.
ESS 10: Stakeholder Engagement and Information Disclosure	Applicable	The project affects various stakeholders including employees, local communities, County Government, and regulatory agencies. Stakeholder support is key for sustainability.	Meru Central Cooperative Dairy Union must implement a Stakeholder Engagement Plan (SEP), conduct meaningful consultations, disclose project information, and maintain a grievance redress mechanism accessible to all stakeholders. Documentation of all engagement activities must be kept for audit and monitoring.

3.5 Institutional Framework

Based on the above national and international legal and regulatory framework, the following institutions have various roles as far as upholding the right to a clean and heathy environment as required by law.

Table 3-3: Institutional Framework

Institution	**Responsibility**
NEMA	The object and purpose for which NEMA is established is to exercise general supervision and co-ordination over all matters relating to the

	environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. Specific NEMA roles related to this project are: • Review (in collaboration with other lead agencies) and prove approval or issuance of improvement comments on the project CPR. • Issue ESIA license and the associated conditions • Routinely monitor the ESMP, ESIA license conditions compliance and issuance of compliance note or stoppage or improvement orders to the project.
DOSHS	DOSHS is an Institution established under OSHA Act 2007 with a mandate of ensuring compliance with the provisions of the Occupational safety and health Act 2007 and promote safety and health of workers. The proponent will register the site as a work place with DOSHS and also engage the directorate in handling work related accidents if any.
Meru County Government	The County Government is responsible for supporting union in implementation Its various departments will inspect the site on regular basis to ensure provisions e.g., on OHS are adhered to by the proponent. The Department of Roads, Transport and Energy in Meru County is responsible for the development and maintenance of the county's infrastructure, including roads, transport systems, and energy supply. The department's mandate is derived from the Constitution of Kenya, 2010, which assigns the functions of county roads, transport, and energy to the county governments.

3.6 International Conventions

3.6.1 Introduction

The integration of rooftop solar photovoltaic (PV) systems in factories is a growing trend globally, driven by environmental, economic, and operational benefits. Several international conventions and best practices guide these installations, ensuring safety, efficiency, and adherence to local regulations.

There are no single binding “international conventions” exclusively dedicated to solar energy, but there are multiple international agreements, frameworks, and standards that promote and guide the deployment of solar energy as part of global efforts to combat climate change, ensure sustainable development, and encourage energy access.

a) **United Nations Framework Convention on Climate Change - Paris Agreement (2015) – UNFCCC:**

This agreement encourages countries to increase the share of renewable energy, including solar, to meet their Nationally Determined Contributions (NDCs) and drives global investment in low-carbon technologies like solar PV and solar thermal.

This CPR report recommends the use of clean green energy saving devices to mitigate the impact of climate change. The project will contribute to building resilience of the beneficiary community against climate change impacts.

b) **United Nations Sustainable Development Goals (SDGs) – 2015 - SDG 7:**

This SDG Goal advocates for increased use of renewable energy, particularly solar energy in off-grid and underserved regions and promotes solar as a tool for achieving energy access, especially in rural areas. Additionally, SDG 13: on Climate Action encourages solar energy as a mitigation tool for GHG emissions reduction.

CHAPTER 4: ENVIRONMENTAL AND SOCIAL BASELINE INFORMATION

4.1 Introduction

The baseline information describes the project's location and the bio-physical, social and economic aspects of the project area. This chapter discusses the environmental and social parameters in the project area to further determine their influence in the implementation of the proposed project. Thus, this chapter provides key environmental and social background data for the identification of affected people, potential impacts, and viable mitigation measures in the next chapters.

4.2 Physical Environment

4.2.1 Climate

Climatic conditions range from humid to semi-humid. Rainfall is bimodal with mean annual rainfall range of 1100-1600 mm and annual temperatures range of 10-30^{0}C. Altitude ranges from 1120-2600m. Short rains are received between October and December (OND) while the long rains are between March and May (MAM). The Sub County has cool warm humid climate with a mean temperature range of 8˚C in higher areas to 32˚C in the lower areas, with cool and warm weather in most days of the year (Mutuma et,al., 2013). The daily average solar irradiance range between 5.5 to 6.5 Kwh/m^2/day.

4.2.2 Agro-ecological Zones

The agro ecological zones of the project area is UM1=Coffee-Tea Zone, UM2= Main coffee Zone and UM3= Marginal coffee zones (Mutuma, et al, 2013).

4.2.3 Floral and Faunal composition of the site

Indigenous trees such as Markamia lutea and shrubs such as Calatropis procera were are evident around the project site. Few insects and other small microorganisms were seen in the project area.

4.2.4 Geology

Geology of the project area comprises of pyrocrasts and the major soils are nitisols which are poorly consolidated hence susceptible to erosion, mass movement and high seepage where water is conveyed in open channels (Mutuma, et al, 2013).

4.2.5 Water and Hydrology

Rivers found in the project site are river kathita and Kinyaritha that drains to R. Tana. These rivers have several tributaries that are also permanent and the area is generally served by several springs.

There are also individual connections and several community water projects, bore holes, water pans and dams. The project site has a seasonal stream that drains to Kathita.

4.3 Physical infrastructure

4.3.1 Crop and livestock production

Most farmers grow coffee, tea and Irish potato as the main cash crop. Other cash crops include bananas, avocadoes, macadamia snow peas and sorghum. Other crops grown both for cash and subsistence purposes include maize, beans, green grams, garden peas, millet, pigeon peas and dolichos among others. Farmers keep mainly indigenous cattle and crosses, with a few rearing exotic breeds (fresians, Aryshires). In addition, production of shoats and local chicken is practiced in most homesteads in free range system. A small percentage of the population also practices apiculture.

Table 4-0-4: Crop Production

Crop type (food crop)	**Current production per unit area(ha)**	**Potential production tons/ha**	**Average mkt price (Kshs)**
Maize	15 bags	2.25tons/Ha	2250/-
Sorghum	8 bags	1.35tons/Ha	2700/-
Beans	8 bags	1.08	4500/-
Dolichos	8 bags	1.08	9000/-
Irish Potato	5.6 Tons	13.5 Tons	3500/-
Crop type(cash crop)	Current production per unit area	Potential production	Average mkt price
Macadamia	980kg	2450Kgs	140/Kg
Avocado	24.5Tons	30 Tons	15/Kg

Table 4-0-5: Livestock production

Livestock type	**Production level**	**Production potential**	**Remarks**
Dairy	4 litres/cow/day	7-12kg/cow/day	Upper zone

Beef	60-80kg/(cow)	80-150(cdw	Lower zone
Dairy goat	1-1.5 litres/goat/day	2-3ltr/goat/day	Upper zone
Meat goat	10-15kg(cdw)	15-20kg(cdw)	Upper zone
Sheep	10-15kg(cdw)	10-15kg(cdw)	Upper and lower zone
Local poultry	30-48 eggs/year	60-80 eggs/year	All the zones

4.3.2 Energy

The Union currently depends on **Kenya Power and Lighting Company (KPLC)** for its energy needs. Electricity powers milk processing machines, pasteurizers, storage refrigeration, automation systems, and quality control equipment. However, frequent outages and high tariffs have prompted the shift toward a **solar PV system** to enhance reliability and reduce operational costs.

4.2.3 Water

Water is supplied by **Meru Water and Sewerage Services Company Limited (MEWASS)**. It plays a crucial role in maintaining hygiene, supporting milk cooling and pasteurization, and performing quality tests in the laboratory. The solar installation is expected to improve water pumping reliability, especially during outages.

4.3.4 Roads and Accessibility

The project area is connected by an extensive network of **all-weather roads**, enabling efficient transportation of milk from farmers to cooling centers and from centers to the processing plant. Good road infrastructure also facilitates the distribution of finished products to markets.

4.3.5 Sanitation Facilities & Waste Management

The proponent already has existing sanitation facilities which can be used during the construction phase. The project proponent and the contractor will develop modalities to ensure safe disposal of the generated solid waste generated during the construction period. The adoption of integrated Solid Waste Management System (ISWMS) will be encouraged during construction and operational phases. In addition, the project's contractor and the proponent will work closely with NEMA for the guidance on the modes and site of the waste disposal.

4.3.6 Communication

The area is well covered by communication facilities, mobile telephone services being sufficiently covered by the two main mobile phone telephone service providers; Safaricom and Airtel.

4.3.7 Institutions

The proposed project site is surrounded by different schools. The primary Schools include Mwiteria, Gikumene and several private academies. The Secondary schools include, Gikumene girls and Mulathankari girls. The nearest health facilities include Gakoromone dispensary, Meru Doctors Plaza, Grace Park, Life care, Meru Nairobi women and Meru Level five hospital.

4.3.8 Labour Force

Labour force comprises of the population aged between 18 to 64 years. The county total labour force is 915,083 persons, which is 55.9 per cent of the total population. This labour force comprises of 462,700 females and 452,383males. This portrays a good image of a light burden on the workforce as every person works for approximately one dependant. The opportunities to engage those willing to work are curtailed by low investment in job creation ventures and lack of resources to start up small businesses as a form of self-employment. The proposed project will create job for youths during excavation and mounting of solar panels.

4.3.9 Public amenities

The project site is within Meru Municipality where the famous Gakoromone market is situated. The nearest police post is Mwiteria police post and Meru central police station.

CHAPTER 5: PUBLIC AND STAKEHOLDER CONSULTATION

5.1 Introduction

Public participation is a critical component in the successful planning, design, and implementation of development projects, especially those with environmental, economic, and social implications such as renewable energy systems. In the context of this project – the installation of a grid-tied solar power system for Meru Central Dairy Cooperative Union – stakeholder engagement ensures that the voices of cooperative members, employees, local community representatives, and relevant authorities are heard and incorporated into the decision-making process. This project recognizes that meaningful public involvement fosters transparency, accountability, and community ownership, while also helping to identify potential risks, address concerns early, and align the project's goals with the needs and expectations of its beneficiaries. In accordance with Article 10 of the Constitution of Kenya 2010, Legal notice of 2003 No. 31 & 32 and EA regulations 2003 states that the proponent shall, with consultation with the authority seek the views of persons who may be affected by the project.

5.2 Public participation

The stakeholder engagement for Meru Central Dairy Cooperative Union's proposed project was held on 11th April, 2025 with an attendance of 74 participants 29 female and 45 male consisting of Chair of the union, board of management, delegates from affiliate societies, Union managers, County Government of Meru staff from relevant department.

This engagement was not merely beneficial but essential because it enhanced transparency, fostered trust, improved decision-making, proposed potential mitigation measures. Engaging stakeholders effectively ensures that their voices are considered, paving the way for a project that meets community needs and builds long-lasting benefits for all parties involved. By prioritizing stakeholder engagement, public participation projects can achieve optimal outcomes that resonate well within the community.

5.3 Purpose for the public and stakeholder consultation

The purpose of conducting a public and stakeholder consultation with Meru Central Dairy Cooperative Union on the proposed grid-tied solar power system was to ensure that the project is inclusive, transparent, and aligned with the interests and concerns of all affected parties.

Below are the key purposes of the consultation:

a) Inform Stakeholders and the Public

Provided detailed information about the proposed solar power system, including its design, location, scale, financing, timeline, and expected outcomes.

Explain the benefits of the system- the team outlined benefits of the project including but not limited to cost savings, energy reliability, environmental sustainability, and operational efficiency for the union.

b) Gather Feedback and Concerns

The team collected input, opinions, and concerns raised by the cooperative members, employees, local community members, government agencies, and other stakeholders.

It also obtained local needs and priorities that might influence the design or implementation of the proposed project.

c) Identify Potential Social and Environmental Impacts

The CESCO discussed possible impacts, both positive and negative, such as: Land use and access, Aesthetic or noise concerns, changes in utility bills or business operations, job creation or loss and together developed strategies to mitigate negative impacts and enhance positive ones.

d) Promote Ownership and Support

Involving the stakeholders in developing mitigation of negative impacts/decision making, strengthened stakeholder buy-in and community support and encouraged a sense of ownership for smooth implementation and maintenance of the proposed project

e) Ensure Compliance and Transparency

Stakeholder engagement was strategically implemented not only to ensure compliance with regulatory frameworks governing environmental and social impact assessments, but also to affirm the project's alignment with internationally recognized standards of good governance, transparency, and sustainable development.

f) Facilitate Collaborative Planning

The public participation facilitated collaborative problem-solving among project developers, cooperative leadership, and stakeholders, thereby laying the foundation for future partnerships and co-investment opportunities, such as carbon credits and corporate social responsibility (CSR) programs.

5.4 Public Consultation process

During the Screening activity the union management was informed that the team required to have a public participation forum for project information disclosure and to comply with the law. The union management invited interested and affected parties including delegates representative from the affiliated Societies, County Government staff from relevant departments, and National Government administration officers from the area of interest.

5.5 Issue raised during the Consultation

Participants raised concerns, views, and observations as tabulated below together with their responses.

Table 5-1: Issues raised and their responses

S/No	Name	Concern/View	Response
Views/concerns raised by Men			
1.	Alexander Gatobu	Inquired on possibility of the solar being vandalized.	It is the responsibility of the proponent to provide security.
2.	Edwin Koome	Highlighted that the union saving on electricity bills could eventually be ploughed back to other projects that are economically impactful to the farmers.	Appreciated by the participants
3.	Boniface Kinyua Kanampiu	Wanted to know what mitigation measures are in	The proponent will use skilled workers and provide proper

		place since the activity is risky	equipment for the work. Additionally, there will be training on material handling
4.	Aleexander M. Gatimbu	Is the funding limited to solar panels.	The solar panels are integrated with KPLC and standby generator where maximum use of solar energy will be utilized and if there is deficit the KPLC takes over.
5.	Gilbert Kiruja	Wanted to know if the solar will be taxed	Yes, indirectly through taxes paid for the products
6.	Njira Muthomi	Applauded the thought	Appreciated by the participants
7.	Imathiu Muriuki	Said that solar will come in handy and saving will benefit the farmers	Appreciated by the participants
8.	Mwebia Julius	He said this is a motivation to the farmers. He wanted to know if such investments will trickle down to	Appreciated by the participants Yes, some of the cooperatives are selected for the investment and the

		satellite cooperative societies	other societies left can also write proposal for consideration later.
9.	Vincent Kirema	He applauded the investment as it will improve the farmers livelihood	Appreciated by the participants
10.	Patrick Kobia	He observed that investment will create employment.	Appreciated by the participants

Views/Concerns raised by Women

1.	Edith Nkatha	Asked if the solarization will in any way affect the environment.	In response, it was explained that solar is a clean source of energy therefore environmentally friendly.
2.	Beatrice Mboroki	Asked what will guarantee for quality assurance of the intended solar panel and its components.	The proponent will ensure that contractor installs quality installation materials as per specification.
3.	Judy Mutuma	Observed that the solar panels will result to increased farmers bonus.	Appreciated by the participants

		She further highlighted that the savings could be used to buy animal feeds for the farmers .	
4.	Joyce Mbiti	Observed that this investment is environmentally friendly, cost effective and will reduce the GHGs which cause cancer.	Appreciated by the participants
5.	Mary Kathambi	She inquired when the implementation of the sub-project would start.	As soon as the necessary stages of the process have been approved.
6.	Rachel Kinyua	Was concerned of the panel security since it's a roof mounted system Inquired if one can benefit individually	The union confirmed of tight security and also, they informed the participants that a report for the structural integrity must be done to ensure that the building can support panel installation She was informed that the funding

			agency does not fund individuals
7.	Moreen Nkirote	Made an observation that the project will lead to reduction in operational cost thereby benefiting the farmer. She also identified that the project will lead to increase in milk production due to farmers motivation in increased earnings from saving on electricity bills.	Appreciated by the participants
8.	Phylis Gatwiri	highlighted that since farmers will eventually earn more, they will be encouraged to rear more cows for eventual milk increase.	Appreciated by the participants
Views/Concerns raised by youth			
1.	Edith Nkatha	Asked if the solarization will in	In response, it was explained that solar is a clean source of

		any way affect the environment.	energy therefore environmentally friendly.
2.	Beatrice Mboroki	Asked what will guarantee for quality assurance of the intended solar panel and its components.	The proponent will ensure that contractor installs quality installation materials as per specification.
3.	Edwin Koome	Highlighted that the union saving on electricity bills could eventually be ploughed back to other projects that are economically impactful to the farmers.	Appreciated by the participants

Plate 5-1: Photo of public participation meeting

5.6 Acceptability of the proposed project

The participants had no objection to implementation of the proposed project within the project area. They unanimously agreed that the project is welcomed in the area since it will be of beneficial to the community.

Plate 5-2: Participants accepting the proposed project by show of hands

5.7 Grievance Management Mechanism

Grievances and internal disputes arising from members currently are handled by the Unions dispute arbitration board as per the union by-laws. The proposed project will require Grievance Management Mechanism to ensure that comments, responses and grievances are handled in a fair and transparent manner in line with and World Bank's requirements.

The union will adopt the supervisory committee during the Annual General Meeting (AGM) to manage the grievances. The role of the Grievance Management Committee (GMC) will include receiving, recording and resolving the grievance related to the proposed project. For unresolved grievance it will be escalated to County Grievance Management Committee (CGMC). If resolution is not met at this level, it will be escalated to National Grievance Management committee (NGMC) and if not resolved it will be escalated to the cooperative tribunal.

CHAPTER 6: ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

This chapter presents an assessment of the viable alternatives considered for the proposed 932 kWp grid-tied solar PV system to be installed at the MCDCU factory. The goal is to demonstrate that the selected project design and location represent the most sustainable, cost-effective, socially acceptable and environmentally appropriate option.

In line with the principles of Environmental Impact Assessment (EIA) under the Environmental Management and Coordination Act (EMCA), 1999 (Revised 2015), project alternatives are evaluated to help decision-makers understand the environmental, technical, economic, and social trade-offs associated with each option.

The project alternatives are based on project feasibility study, project designs, baseline characteristics of the project area and the expertise experience and knowledge of solar power.

6.2 No Project Alternative

The "No Action" alternative refers to a situation where the solar power system is not installed at the MCDCU factory. In this case, the factory would continue relying on electricity from the Kenya Power and backup diesel generators.

Environmentally, this option avoids temporary disturbances from installation activities, such as noise, dust, or minor land alterations. However, it fails to support broader national efforts to shift to clean energy and combat climate change.

MCDCU processes over 535,611 litres of milk daily, requiring a consistent and affordable energy supply for cooling and processing. Continued reliance on grid power and diesel poses challenges due to frequent outages, high energy costs, and greenhouse gas emissions, which risk compromising milk quality and reducing farmers' earnings.

Economically, the factory would miss out on long-term savings from reduced energy bills and job opportunities created during system installation and maintenance. Rooftop and land spaces that are suitable for solar panels would also remain underutilized.

Overall, while this alternative avoids some short-term impacts, it is not sustainable in the long term and does not support clean energy goals. It is therefore the least preferred option.

6.3 Alternative Location

This alternative considers whether the solar system could be installed at a different site other than the MCDCU factory. However, this was found to be neither practical nor economically viable.

The factory site already has essential infrastructure including secure access, a reliable grid connection, and sufficient roof and ground space for solar installations. Installing the system at another location would increase costs due to the need for additional land, cabling, and energy transmission infrastructure. It would also introduce energy losses and logistical inefficiencies.

Additionally, locating the system away from the factory would reduce its direct benefits, such as supplying consistent power for milk cooling and processing operations.

Therefore, the current MCDCU site is considered the most suitable, efficient, and sustainable location for the solar power system.

6.4 Alternative Design and Technology (Including Waste Disposal)

Several system designs were evaluated, including off-grid systems with battery storage, hybrid systems using diesel generators, and a grid-connected system without batteries. The grid-Tied connected design was selected for its lower cost, easier maintenance, higher reliability, and environmental benefits through reduced fossil fuel use.

Monocrystalline solar panels were chosen over polycrystalline and thin-film options due to their high efficiency and suitability for limited space. The system will include smart inverters, power sensors, aluminum and galvanized steel mounting structures, and appropriate electrical safety components.

Construction/installation waste will include packaging materials, cable offcuts, metal scraps, and excavated soil. These will be managed through reduction, reuse, and recycling in line with EMCA Waste Management Regulations (2006). Operational waste is expected to be minimal, mostly limited to periodic replacements of components, which will be handled through licensed e-waste recyclers.

At the system's end of life, used panels and mounting materials will be dismantled and recycled or disposed of through approved waste channels. A comprehensive waste management plan will guide responsible handling, storage, and disposal practices to minimize environmental and social impact and ensure legal compliance.

E-waste will result from damaged or obsolete solar panels, inverters, wiring, and related equipment. If not properly managed, they can pose environmental and health risks due to hazardous substances. Therefore, to properly manage e-waste, the proponent is supposed to undertake the following mitigation measures:

- Engage licensed e-waste handlers for safe disposal and recycling.
- Establish take-back agreements with equipment suppliers.
- Store e-waste in secure, labeled areas before disposal.
- Maintain an inventory of equipment for timely replacement and disposal.
- Sensitize staff on safe handling and reporting of faulty components.

CHAPTER 7: ANALYSIS OF POTENTIAL IMPACTS AND MITIGATION MEASURES

7.1 Introduction

Environmental and Social Impact Assessment (ESIA) is used as a tool to guide in making environmentally and socially sustainable decision during project implementation. The proposed 932 Kwp solar power system installation project is envisaged to generate direct and indirect impacts. The potential impacts discussed in this chapter are also linked to the different stages of the proposed project which are identified as construction, operational and decommissioning. The potential impacts are derived from the proposed project activities discussed in chapter two and baseline information contained in Chapter four.

7.2 Construction/Installation phase

7.2.1 Positive Impacts

a) **Creation of employment:** The project will assist the Government in its policy of employment creation, enhancing and promoting green energy projects in line with Vision 2030.The project through the generation of employment will stimulate other economic activities and also enhance the casuals' skill levels through intensive and well-structured technology transfer.
b) **Provision of market for local construction/installation materials:** The project will require some supply of construction materials such as metals most of which will be sourced locally.
c) **Boost of the surrounding business enterprises:** The enterprises within the project area will benefit from increased customer from installation crew during construction phase.
d) **Gains in the local and national economy:** Through consumption of locally available materials including metals among others. The consumption of these materials will attract taxes including VAT which will be payable to the government.
e) **Technology transfer:** The use of skilled labour in the installation process will lead to transfer of skills to the locals within the project area. The solar system technology can be adopted by the societies affiliated to the union.

7.2.2 Negative Environmental and Social impacts

a) High demand of raw materials

The nature and the magnitude of the proposed project will lead to an increase in demand for raw materials needed for installation. These materials will be sourced locally or if unavailable they will be sourced from the neighbouring counties.

Proposed Mitigation Measures:

- Ordering for what will be required through accurate budgeting and estimation of actual installation requirements.
- Ensuring that wastage, damage or loss of installation materials is kept minimal.
- Considering re-use, reduction and recycling of materials.

b) Noise pollution

During the installation, there is the potential for permissible/acceptable human noise levels that may be temporarily exceeded due to the operation of Lorries, moving machines and equipment in the working zone of the solar power project site. To be affected mostly, are the site workers since noise beyond some level is a nuisance if not maintained within acceptable limits.

Proposed Mitigation Measures:

- Construction work should be carried out during the specified time (i.e. from 0730 hrs to 1700hrs) noise generated during the day is not quite disturbing as compared to it being generated at night hours.
- Sensitize construction vehicles' drivers and machinery operators to switch off engines of vehicles and machinery when not in use.
- Workers should be provided with relevant PPE/materials such as earmuffs and earplugs; when operating noisy machinery and when in noisy environment.
- Machineries should be maintained regularly to reduce noise resulting from friction.
- Manual labour is recommended at this stage to reduce the noise emitted by construction machinery.

c) Air pollution

The construction/installation activities will result to increased dust and gas emissions. Dust particles caused by vibrations of machines and vehicle movement suspends in the air. In addition, vehicles/trucks and machinery used in the construction will produce fumes that will affect the quality of air.

Proposed Mitigation Measures:

- Provide PPEs such as nose masks to the affected workers.
- Regular and prompt maintenance of construction/installation machinery and equipment. This will minimize generation of noxious gases and other suspended particulate matter.
- Control over areas generating dust particles. Such areas should be regularly sprinkled with water to reduce dust.
- Workers should be sensitized on the hazards that may be generated in such work environments.

d) Soil erosion and compaction

The construction/installation phase of the proposed project will involve use of machinery to remove cabro and excavation for ditches. This will result into soil erosion due to loosening of the soil structure and soil compaction in areas where the excavator and other machinery will pass through.

Proposed Mitigation Measure:

- Operate machinery only when the soil is dry enough to support it.
- Limit vehicle movement to designated lane to prevent widespread compaction.
- Loosens compacted soil layers.
- Cover loose soils to minimize soil erosion.

e) Interference with normal daily operations of the factory

The construction/installation activities are likely to have a negative impact to the normal daily operations of the factory if not well coordinated.

Proposed Mitigation measures:

- Contractor should ensure proper co-ordination with the factory management to avoid interference with the factory operations.
- Construction/installation works should be confined within the proposed project site.

f) Occupational Health and Safety

There is possibility of accidents occurring in the process of construction/installation. This is likely to be experienced by the installation staff. Project management will provide first aid and possibly primary health care services to staff and other personnel. Emergency and serious cases can be sent to the most accessible clinics and hospitals.

Proposed Mitigation Measures:

- Capacity building and training of staff/workers with respect to Occupational Health, Safety and Environment.
- Provide a first aid kit fully equipped (as per the First Aid Rules, 1977) at all times and managed by qualified and trained first aider(s).
- Initiate and develop effective Emergency Response Plan (ERP) to cater for various eventualities such as fire outbreaks, oil spills and other incidences that are likely to occur.
- Ensure that the site is accessed by the work crew or authorized personnel only.
- All project participants should have general insurance and a WIBA cover.

g) Gender Based Violence (GBV) and Sexual Exploitation Abuse/Harassment (SEA/H)

- Contractors bring skilled and unskilled workers into rural communities and the interaction between incoming workers and local women/girls may increase: Sexual exploitation (e.g., solicitation of transactional sex), SEA incidents involving minors and Harassment during fetching water, crossing construction sites or walking along irrigation canals.
- Power Imbalances in Water and Land Governance: Water Users Associations (WUAs), irrigation committees, and scheme leaders are often male-dominated. Women farmers may rely on committee members for: Access to irrigation water, Scheduling water turns. This creates an environment where sexual quid-pro-quo ("sex-for-water" may arise.

- Increased Economic Inequalities During Irrigation Scheme Operation: Irrigation increases income potential and so Women/youth without land rights may depend on Male landowners, Male managers, Middlemen/aggregators and this may heighten vulnerability to sexual coercion or exploitation.

Proposed Mitigation Measures:

Strengthen Policies, Codes of Conduct & Accountability

a. Enforceable Code of Conduct (CoC)

- All contractors and supervising engineers' staff must sign a GBV/SEA Code of Conduct before mobilization.
- CoCs displayed publicly in Kiswahili & local language at: Camps, Work sites and Community centres.

b. **Disciplinary mechanisms**

- Immediate sanctions (warning, suspension, dismissal).
- Removal from site within 24 hours for serious violations.

c. **Capacity Building & Training**

Mandatory contractor training, Induction + quarterly refresher training on:

- Sexual exploitation and abuse
- Sexual harassment
- Behavior around communities
- Reporting obligations

d. **Strengthen Women's Participation & Representation**

Women's quotas in Water Users Associations eg Minimum 30–50% women in committees.

Mandatory female membership in: Water allocation committees, Dispute resolution committees.

h) Increased Spread of Communicable diseases including STD, HIV & AIDS

There is likely increase in incidences of health impacts such as sexually transmitted diseases including HIV & AIDS during construction/installation phase. This could be due to interaction of construction/installation crew with the factory workers.

Proposed Mitigation Measures:

- Develop appropriate awareness content and implement awareness sessions for workers on communicable diseases including HIV/AIDs and other STDs.
- Ensure an adequate and accessible provision of condoms to workers both male and female.

Electrical hazards:

- Arc flash incidents due to high voltage connections.
- Electric shock from damaged cables or exposed conductors.
- Improper grounding leading to electrical shock.

Fall hazards:

- Working at heights on rooftops or scaffolding during installation and maintenance.
- Lack of proper fall protection equipment.

Risk of Drowning

- Risk of drowning during installation and maintenance of floating pump stations

UV radiation exposure:

- Direct exposure to sunlight from reflected glare off solar panels, potentially causing sunburn or eye damage.
- Need for appropriate eye protection and sun-protective clothing.

Chemical exposure:

- Potential exposure to chemicals used in solar panel manufacturing during maintenance or repairs.

Ergonomic risks:

- Repetitive motions during leading to musculoskeletal disorders.
- Lifting heavy components without proper lifting techniques.

7.3 Operation Phase

7.3.1 Positive Impacts

a) The primary benefit of this project is the significant reduction in electricity costs, resulting in a strong return on investment (ROI). In addition to the financial gains, the project delivers substantial environmental benefits through reduced greenhouse gas emissions. As of mid-2025, Kenya's national grid emission factor was approximately 0.226 $kgCO_2/kWh$, whereas solar power systems without battery storage emit roughly 0.041 $kgCO_2/kWh$. The

difference between these two values represents the net emissions avoided for every kilowatt-hour of solar energy generated. This reduction directly contributes to a lower carbon footprint and supports Kenya's broader climate action and sustainability goals.

b) **Climate Change mitigation and adaptation:** Contribution to Climate Resilience through enhanced Water Security for Vulnerable Communities, enables multi-season farming and creates a cushion against crop failure.
c) **Reduced cost of operation:** The use of solar power will greatly reduce the cost of operation since a lot money is spent in paying electricity power supplied by KPLC to run machines, lighting and other operational activities.
d) **Increase bonus payout:** Some of savings made on reduced cost of electricity will eventually translate into increased bonus payout.
e) **Reduced cost of milk production:** The bonus payout to union members will enable them buy an animal feeds, vaccines and drugs thus increasing milk production.
f) **Diversification of products:** The saving made by the proponent will be used in milk product diversification such milk power, ghee and butter hence increasing the union market participation and value addition leading to better returns.
g) **Creation of employment:** Increased milk production within Meru Central Dairy Cooperative Union will result into increased job opportunities.

7.3.2 Negative Environmental and Social Impacts

a) **Solid waste generation**

The grid-tied solar system will be maintained regularly, therefore there is some installation materials which will be rendered unusable.

Proposed Mitigation Measures:

- All solid wastes should be taken for disposal to the approved dumpsites and by licenced waste handlers.
- Practice Integrated Solid Waste Management (ISWM). This is a comprehensive waste prevention, recycling, composting and disposal program. An effective ISWM system considers how to prevent, recycle and manage solid waste in ways that most effectively protect human health and the environment.

b) E-waste Generation

E-waste will result from damaged or obsolete solar panels, inverters, wiring, and related equipment. If not properly managed, they can pose environmental and health risks due to hazardous substances.

Proposed Mitigation Measures:

- Engage licensed e-waste handlers for safe disposal and recycling.
- Establish take-back agreements with equipment suppliers.
- Store e-waste in secure, labeled areas before disposal.
- Maintain an inventory of equipment for timely replacement and disposal.
- Sensitize staff on safe handling and reporting of faulty components.

c) Energy Misuse

Energy resources will be utilized by the project during the operational phase to facilitate efficient operations such as lighting and machine operation.

Proposed Mitigation Measures:

- Use of energy-efficient lighting and equipment,
- Working during daylight hours to minimize lighting needs,
- Switching off light when not in use.

d) Storm water

There should be adequate means for handling the small quantities of storm water to be collected from the solar arrays.

Proposed Mitigation Measures:

- A well-planned drainage system for diverting storm water runoff.
- Water harvesting to supplement piped water supplied by water service provider.

e) Occupational Health and Safety Hazards

During operational phase there is a likelihood of injuries if proper safety measures are not in place.

Proposed Mitigation Measures

- Provide appropriate PPEs (Overall, safety boots, leather gloves, helmets, safety goggles).
- Train machine operators on general safety procedures.
- Use designated routes for machinery and personnel.
- Ensure that there are provisions for reporting incidents, accidents and dangerous occurrences.
- Conduct OSH risk assessment
- Obtain certificate of registration of a work place.
- Provide first aid kit
- Registration of place as work place.

7.4 Decommissioning Phase

7.4.1 Positive Impacts

a) Recovery of Valuable Materials

Decommissioning will allow for the recovery, recycling, or resale of valuable materials such as metal frames, cables, and functioning solar components. This promotes resource efficiency, reduces demand for raw materials, and creates a market for used solar equipment.

b) Employment Opportunities

The decommissioning process will generate temporary employment for skilled and unskilled laborers involved in dismantling equipment, transporting materials, and restoring the site. This will provide short-term income-generating opportunities for the local community.

7.4.2 Negative Environmental and Social Impacts

a) Solid waste and E-Waste Generation

Decommissioning activities will produce solid and electronic waste such as dismantled solar panels, inverters, wiring, support structures, and packaging materials. If not properly managed, this waste could pose environmental and health risks.

Proposed Mitigation Measures:

- Segregate and sort waste at the source into recyclable, reusable, and non-recyclable categories.

- Work with licensed e-waste recyclers to safely manage obsolete electrical components in line with Kenya's Sustainable Waste Management Act, 2022.
- Transport all solid waste to authorized disposal facilities using licensed waste handlers.
- Implement an extended producer responsibility (EPR) framework in partnership with suppliers.

b) Occupational Health and Safety Hazards

Workers involved in dismantling, lifting, and handling heavy solar equipment may be exposed to accidents and injuries if health and safety procedures are not observed.

Proposed Mitigation Measures:

- Provide all workers with adequate PPE including gloves, boots, helmets, and safety vests.
- Train workers on safe dismantling techniques and handling of hazardous materials.
- Maintain a first aid kit on-site and ensure medical support is available in case of accidents.
- Supervise activities closely and ensure only authorized and trained personnel access the work site.

c) Air and Noise Pollution

Decommissioning may involve noise from cutting or dismantling metal structures, vehicle movement, and dust emissions from ground disturbance.

Proposed Mitigation Measures:

- Schedule dismantling works during daytime hours (0730 hrs–1700 hrs) to minimize disturbance.
- Suppress dust by regularly sprinkling water on dry surfaces.
- Ensure that equipment used is well-maintained to reduce emissions and noise.
- Use manual tools where feasible to reduce noise.

d) Visual Impacts and Temporary Land Degradation

The removal of infrastructure may leave the site visually unappealing or temporarily degraded if not properly rehabilitated.

Proposed Mitigation Measures:

- Implement a landscape restoration plan including replanting of native vegetation.
- Level and stabilize the ground to prevent erosion.
- Remove all construction debris and restore the visual integrity of the site.

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1 Introduction

This chapter presents the Environmental and Social Management Plan (ESMP) for the proposed 932 kW Solar PV installation at Meru Central Dairy Cooperative Union. The plan provides a clear roadmap for monitoring performance, identifying deviation from plan and taking corrective action. The plan is designed to ensure that all project activities are carried out in a way that protects the environment, promotes community well-being, and complies with relevant laws and best practices. It aligns with the requirements of the Environmental Management and Coordination Act (EMCA), 1999 (Revised 2015) and the Energy Act, 2019**,** along with applicable national and international standards.

Specifically, this ESMP:

- Outlines the likely environmental and social impacts of the project.
- Recommends practical measures to prevent or reduce negative impacts.
- Assigns roles and responsibilities for implementing these measures.
- Sets out how the impacts will be monitored and reported.

Beyond reducing harm, this plan also supports positive outcomes such as the generation of clean energy, reduction of greenhouse gas emissions, and support for local livelihoods. It also helps to build trust and transparency with stakeholders by showing a clear commitment to responsible project management.

The table that follows (Table 8.1) provides a summary of all key impacts, the proposed mitigation measures, indicators for monitoring, responsible parties, frequency of monitoring, who to monitor and estimated costs for implementation.

8.2 Environmental and social Management Plan (ESMP)

Table 8-1: Environmental and Social Management Plan (ESMP)

Potential Environmental/ Social Impacts	Recommended Action	Monitoring Indicator	Responsibility	Monitoring Frequency	Who to Monitor	Estimated Cost (Kshs.)
CONSTRUCTION/ INSTALLATION PHASE						
High demand for Construction materials	• Ordering for what will be required through accurate budgeting and estimation. • Ensuring that wastage, damage or loss of installation materials is kept minimal. • Considering re-use, reduce and recycling of materials.	Quantities of materials ordered. Quantity of re-used and recycles materials used.	Contractor	Monthly.	Proponent	nil
Noise pollution	• Construction work should be carried out during the specified time. • Sensitize construction vehicles' drivers and machinery operators to	No. of sensitization meetings. No of PPEs provided.	Contractor	Monthly	Proponent	10,000

	switch off engines of vehicles and machinery when not in use. • Workers should be provided with relevant PPE/materials such as earmuffs and earplugs. • Machineries should be maintained regularly to reduce noise resulting from friction. • Manual labour is recommended at this stage.	No. of regularly maintained machine. No. of workers providing manual labour.				
Air pollution	• Provide PPEs such as nose masks. • Regular and prompt maintenance of construction/installation machinery and equipment. • Control over areas generating dust particles. • Workers will be sensitized	No. of PPEs provided. No of workers using PPEs. No. of regularly and promptly maintained machinery/equipment.	Contractor	Monthly	Proponent	10,000

	on the hazards that may be generated in such work environments.	No. of sensitization meetings.				
Soil erosion and Compaction	• Operate machinery only when the soil is dry enough to support it. • Limit vehicle movement to designated lane to prevent widespread compaction. • Loosens compacted soil layers. • Cover loose soils to minimize soil erosion.	Presence of designated working area. Presence of loosen soils Presence of covered.	Contractor	Monthly	Proponent	10,000
Interference with normal daily operation of the factory	• Contractor should ensure proper co-ordination with the factory management to avoid interference with the factory operations.	Presence of well-coordinated e-waste management.	Contractor	Monthly	Proponent	nil
Occupational Health and Safety	• Capacity building and training of staff/workers.	No. of capacity building trains	Contractor	Monthly/ As	Proponent	30,000

	• Provide a first aid kit fully equipped. • Initiate and develop effective ERP. • Proper documented possible action plans. • Ensure that the site is accessed by the work crew or authorized personnel only. • All project participants should have general insurance WIBA cover. • Register the site as a work place	conducted. Presence of effective ERP. Presence of a fence and gate to restrict entry of unauthorized people.		needed.		
GBV/SEA Prevention and Response	worker interaction with community: 1. Presence of contractor workers in rural communities. 2. Increased exposure of women, girls, and female traders to harassment and	All contractors must adopt and enforce a GBV/SEA Code of Conduct (CoC). CoC must prohibit sexual exploitation, harassment, and any				

	exploitation. 3. Sexual coercion in exchange for jobs, wages, market access, water allocation, or services.	sexual activity community members CoC must be signed by all project workers and publicly displayed in local languages. Mandatory induction and quarterly refresher training for workers. SEA Sensitive GRM. Monthly Compliance reports to the Supervising Engineer by contractor.				
Labour Influx and	1. Sexual exploitation and abuse of women, adolescent girls, and vulnerable groups. 2. Sexual harassment of women vendors, traders, and female farmers.	Contractor labour management plan. Worker code of conduct. Local lanour hiring and fair treatment of				

	3. Increased transactional sex and risk of early pregnancies. 4. Spread of communicable diseases (STIs, TB, respiratory infections). 5. Increase in petty theft, alcohol/drug abuse, and general insecurity. 6. Conflicts between workers and community members.	workers according to employment Act 2007 which includes non-discrimination and social inclusion in hiring.				
Increased Spread of Communicable diseases including STD, HIV & AIDS	• Develop appropriate awareness content and implement awareness sessions for workers. • Ensure an adequate and accessible provision of condoms to workers both male and female.	No. of awareness meetings conducted.	Contractor	Monthly.	Proponent	10,000
Sub- Total						**70,000**
OPERATIONAL PHASE						
Solid waste	• All solid wastes should be	Presence of ISWM	Factory	Quarterly	Proponent	30,000

generation	taken for disposal. • Practice Integrated Solid Waste Management (ISWM).	plan.	Manager			
E-waste generation	• Engage licensed e-waste handlers for safe disposal and recycling. • Establish take-back agreements with equipment suppliers. • Store e-waste in secure, labeled areas before disposal. • Maintain an inventory of equipment for timely replacement and disposal. • Sensitize staff on safe handling and reporting of faulty components.	No. of e-waste handlers engaged. Presence of take-back agreements. Presence of an inventory of equipment. No. of sensitization meetings.	Factory manager	Quarterly.	Proponent	50,000
Energy Misuse	• Use of energy-efficient lighting and equipment,	No. of energy-efficient lighting and	Factory Manager.	Monthly.	Proponent	10,000

	• Working during daylight hours to minimize lighting needs. • Switching off light when not in use.	equipment. No. of hours spent in the day working.				
Storm water	• A well-planned drainage system for diverting storm water runoff. • Water harvesting to supplement piped water supplied by water service provider.	Presence of well-planned drainage system. Presence of rain water harvesting structures.	Factory manager.	Monthly/ During rainy seasons.	Proponent	10,000
Occupational Health and Safety Hazards	• Provide appropriate PPEs. • Train machine operators on general safety procedures. • Use designated routes for machinery and personnel. • Ensure that there are provisions for reporting incidents, accidents and dangerous occurrences.	No. of PPEs provided. No. of trainings conducted. Presence of designated routes. Presence for provisions for reporting incidences,	Factory manager	Quarterly/ as needed.	Proponent	50,000

	• Conduct OSH risk assessment • Obtain certificate of registration of a work place. • Provide first aid kit	accidents and dangerous occurrences. No. of OSH risk assessment conducted. Presence of certificate of registration of work place. No. of first aid kits provided.				
Sub-Total						**150,000**
DECOMISSIONING PHASE						
Solid waste and E-Waste Generation	• Segregate and sort waste at the source into recyclable, reusable, and non-recyclable categories. • Work with licensed e-waste recyclers. • Transport all solid waste to authorized disposal	Presence of segregated waste. No. of licensed e-waste handlers engaged. Quantity of e-waste disposed off.	Contractor	Monthly	Proponent	To be determined

	facilities. • Implement an extended producer responsibility.					
Air and Noise Pollution	• Schedule dismantling works during daytime hours. • Suppress dust by regularly sprinkling water on dry surfaces. • Ensure that equipment used is well-maintained. • Use manual tools where feasible to reduce noise.	Presence of water sprinkle surfaces. No. of well-maintained equipment. No. of workers providing manual labour	Contractor	Monthly	Proponent	To determined
Visual Impacts and Temporary Land Degradation	• Implement a landscape restoration plan. • Level and stabilize the ground to prevent erosion. • Remove all construction debris and restore the visual integrity of the site.	Presence of a landscaped area. Presence of levelled and stabilized ground. Absence of construction debris	Contractor.	Monthly.	Proponent	To be determined.

Occupational Health and Safety Hazards	• Provide all workers with adequate PPEs. • Train workers on safe dismantling techniques and handling of hazardous materials. • Maintain a first aid kit on-site and ensure medical support is available in case of accidents. • Supervise activities closely and ensure only authorized and trained personnel access the work site.	No. of PPEs provided. No. of workers trained. No. of first aid kits provided. Presence of a gate and a fence to restrict entry into the site.	Contractor	Monthly	Proponent	To be determined.
TOTAL						**220,000**

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusion

The proposed installation of Grid Tied solar system by Meru Central Dairy Cooperative Union on the factory will address issues on reliance on fluctuating electricity and grid reliability leading to reduced cost of operation. The savings will benefit the members in terms of boosted bonus, diversification on milk products, thus increasing market participation and value addition. Integrating environmental friendly source of power to the existing system will promote sustainable development and improve access to economic and social opportunities. The anticipated negative impacts will be mitigated through implementation of the mitigation measures provided.

9.2 Recommendations

Adopt a grid tied solar Photovoltaic system: The system is ideal due to its ability to supplement existing power from national grid while reducing dependency on expensive electricity or unreliable electricity.

Use of high-quality equipment and certified installer: Select reputable solar panels, inverters and balance of system component with warranties and performance guarantees. Employ certified installers with experience in commercial solar systems to ensure proper safety and compliance with regulatory standard.

Monitoring and maintenance plan: The proponent to establish a robust monitoring system to track solar energy production and system performance. Additionally, schedule a regular maintenance to sustain optimal operation and prolong system lifespan.

Commitment to Mitigation Measures: The proponent should implement all mitigation measures outlined in the Environmental and Social Management & Monitoring Plan (ESM&MP) to address potential negative environmental, safety, health, and social impacts throughout the proposed project lifecycle.

Adherence to Standards: Adhere to all relevant national and international environmental, social, health, and safety standards, policies, and regulations governing the establishment and operation of solar power system.

Stakeholder Engagement: Maintain open communication with members and stakeholders to create awareness about the grid tied solar system benefits and address any concerns.

Environmental and Social awareness creation: Create awareness for workers on best practices for waste management, environmental conservation and social protection.

Policy Advocacy: Advocate for supportive government policies and incentives to encourage the adoption of renewable energy solutions by other societies.

Considering the significant socio-economic and environmental benefits and proponent adhering to these recommendations, the project can proceed in an environmentally responsible and socially inclusive manner, contributing positively to sustainable development goals.

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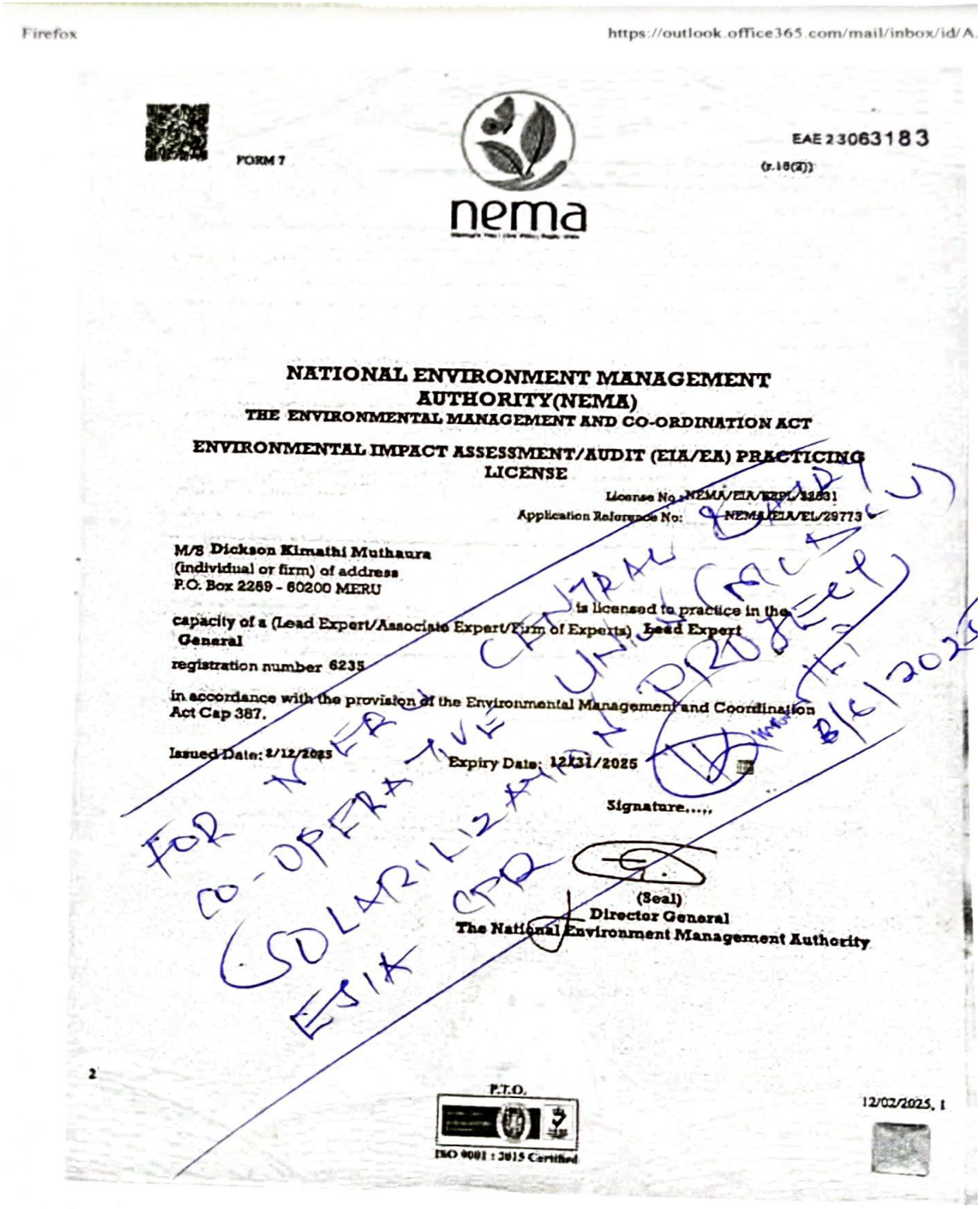
ANNEXES

Annex 1: ESIA/EA Expert practicing licence



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FORM 7

EAE 23063183

(r.18(2))

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

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

License No : NEMA/EIA/EXPL/12681

Application Reference No: NEMA/EIA/EL/29773

M/S Dickson Kimathi Muthaura
(individual or firm) of address
P.O. Box 2259 - 60200 MERU

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) Lead Expert General

registration number 6235

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

Issued Date: 2/12/2025

Expiry Date: 12/31/2025

Signature....,

(Seal)
Director General
The National Environment Management Authority

2

P.T.O.

ISO 9001 : 2015 Certified

12/02/2025, 1

Annex 2: Screening Checklist

ANNEX 3: ENVIRONMENTAL AND SOCIAL SCREENING CHECKLIST BY BENEFICIARY COMMUNITIES FOR COMMUNITY INVESTMENTS (DEMONSTRATIONS, FLID, EDP ETC)

Section A: Background Information

Name of County.....MERU COUNTY.....

Name of CPCU - Environmental /Social Safeguard Compliance Officer

(i) .....Purity Ibanja / Peter Gatobu.....

INVESTMENT LOCATION (Include GPRS Co-ordinates) N 0.04177 E 37.65951

Name of CIG/VMG/Group ...Meru Central Dairy Co-operative Union Ltd

Postal Address: 2919-60200.....

Contact Persons

(i) .....Michael Mutigo.....Cell phone: 0728405597.....

(ii) .....DORIS GATWIRI..... Cell phone .....0713198102.....

Sub -project name....Installation of grid-tied Solar Power system.....

Estimated cost (Kshs.)...~~103,164,620~~ 78,441,550.....

Approximate size of land area available for the sub -project.....

Objectives of the Sub - project

.....To increase operational efficiency by reducing energy cost.....

Activities/enterprises to be undertaken (List)...

(i) .... Mounting of PV modules on rooftops

(ii) .... Installation of inverters, cabling, isolators & protective devices

(iii) .... Integration of the system with the main distribution board & KPLC meter.

Commissioning

Section B: Environmental Issues

Will the Subproject/Investment:	Yes	No	Remarks (If yes, elaborate)
Create a risk of increased soil erosion?	☐	☑	
Create a risk of increased deforestation?	☐	☑	
Create a risk of increasing any other soil degradation?	☐	☑	
Affect soil salinity and alkalinity?	☐	☑	
Divert the water resource from its natural course/location?	☐	☑	
Cause pollution of aquatic ecosystems by sedimentation and agro-chemicals, oil spillage, effluents, etc.?	☐	☑	
Introduce exotic plants or animals?	☐	☑	
Involve drainage of wetlands or other permanently flooded areas?	☐	☑	
Cause poor water drainage and increase the risk of water-related diseases such as malaria?	☐	☑	
Reduce the quantity of water for the downstream users?	☐	☑	
Result in the lowering of groundwater level or depletion of groundwater?	☐	☑	
Create waste that could adversely affect local soils, vegetation, rivers and streams or groundwater?	☐	☑	
Reduce various types of livestock production?	☐	☑	

Be on monoculture cropping?	☐	☑	
Affect any watershed?	☐	☑	
Focus on Biomass/Bio-fuel energy generation?	☐	☑	
Cause accumulation of solid wastes	☐	☑	
Cause accumulation of liquid wastes	☐	☑	

If the answers to any of the above is 'yes', please include an ESMP with Subproject application.

Section C: Socio-economic Issues

Will the subproject/Investment:	**Yes**	**No**	**Remarks** (*If yes, elaborate how)*
Have challenges for women farmers to benefit	☐	☑	
Target vulnerable community members such as physically challenged, Child headed household etc..?	☐	☑	
Interfere with the normal health and safety of the worker/employee?	☐	☑	
Reduce the employment opportunities for the surrounding communities?	☐	☑	
Reduce settlement (*..no further area allocated to settlements)?*	☐	☑	
Reduce income for the local communities?	☐	☑	
Increase insecurity due to introduction of the project?	☐	☑	
Increase exposure of the community to HIV/AIDS?	☑	☐	

Induce conflict?	☐	☑	
Have machinery and/or equipment installed for value addition?	☐	☑	
Introduce new practices and habits?	☐	☑	
Lead to child delinquency (school drop-outs, child abuse, child labour, etc.?	☐	☑	
Lead to gender disparity?	☐	☑	
Lead to poor diets?	☐	☑	
Lead to social evils (drug abuse, excessive alcohol consumption, crime, etc.)?	☐	☑	
Will engage community labour	☐	☑	If yes, Community labor engagement agreement required
Lead to exclusion of disadvantaged and vulnerable groups from participating and benefiting from the investments	☐	☑	
Exacerbate social exclusion of other members of the society	☐	☑	
Lead to increase GBV/SEAH issues	☐	☑	

Section D: Natural Habitats

Will the Subproject:	**Yes**	**No**	**Remarks (If yes, elaborate)**
Be located within or near environmentally sensitive areas (e.g. intact natural forests, mangroves, wetlands) or threatened species?	☐	☑	
Adversely affect environmentally sensitive areas or critical habitats – wetlands, woodlots, natural forests, rivers, etc.)?	☐	☑	
Affect the indigenous biodiversity (Flora and fauna)?	☐	☑	
Cause any loss or degradation of any natural habitats, either directly (through project works) or indirectly?	☐	☑	
Affect the aesthetic quality of the landscape?	☐	☑	
Reduce people's access to the pasture, water, public services or other resources that they depend on?	☐	☑	

Section E: Pesticides and Agricultural Chemicals

Will the subproject.....:	Yes	No	Remarks (If yes, elaborate)
Involve the use of pesticides or other agricultural chemicals, or increase existing use?	☐	☑	
Cause contamination of watercourses by chemicals and pesticides?	☐	☑	
Cause contamination of soil by agrochemicals and pesticides?	☐	☑	
Experience effluent and/or emissions discharge?	☐	☑	
Involve annual inspections of the producers and unannounced inspections for Export produce?	☐	☑	
Require scheduled chemical applications?	☐	☑	
Require chemical application even to areas distant away from the focus?	☐	☑	
Require chemical application to be done by vulnerable group (pregnant mothers, chemically allergic persons, elderly, etc.)?	☐	☑	

*If the answer to the above is 'yes', please consult the **IPMF** that has been prepared for the project to help prepare **IPMP.***

Section F: Indigenous Peoples/VMGs as per ESS7

Are there:	Y	N	Remarks
IP/VMGs living within the boundaries of, or near the project?	☐	☑	Name of the VMG community
Members of VMGs in the area who could benefit from the project?	☐	☑	
IP/VMGs livelihoods to be affected by the subproject?	☐	☑	If yes, How
Unique/specific challenges for VMGs to benefit from the project	☐	☑	Explain
VMGs minority in the community	☐	☑	If yes, Explain/name of minority VMG
Does VMG require to donate land to benefit from the project		✓	If yes, follow Free, prior and informed consent procedure

If the answer to any of the above is 'yes', please consult the VMGF that has been prepared for the project.

Increase human-wildlife conflicts?	☐	☑	
Use irrigation system in its implementation?	☐	☑	

If the answers to any of the above is 'yes', please include an ESMP with Subproject application.

Section G: Land Acquisition and Access to Resources

Will the subproject/Investment:	Yes	No	Remarks
Require that land (public or private) be acquired (temporarily or permanently) for its development?	☐	☑	If yes, elaborate the tenure type
Require that community land be acquired (temporarily or permanently) for its development?	☐	☑	If yes, elaborate the registration status and community claims. Community land agreement required following principles of FPIC.
Require more than 10 percent of the affected private land parcel	☐	☑	If yes, exclude from the project proposal
Use land that is currently occupied or regularly used for productive purposes (e.g. gardening, farming, pasture, fishing locations, forests)	☐	☑	If yes, Elaborate the current use/Prepare IRP
Complete land documents are not available for the sub- project investment?	☐	☑	If yes, what process is needed?
Is the land proposed have encumbrances?	☐	☑	If yes, elaborate the encumbrance
Physically displace individuals, families or businesses?	☐	☑	If yes, exclude from the project proposal
Cause loss of income for more than 30 days	☐	☑	If yes, how many. Exclude from the project proposal
Result in temporary or permanent loss of crops, fruit trees/fencing and pasture land/ loss of income from business activity?	☐	☑	If yes, elaborate and prepare IRP
Adversely affect small communal cultural property such as funeral and burial sites, or sacred groves?	☐	☑	If yes, avoid or exclude from project proposal
Result in involuntary restriction of access by people to legally designated parks and protected areas?	☐	☑	If yes, exclude
Be on monoculture cropping?	☐	☑	

If the answer to any of the above is 'yes', please consult the mitigation measures in the ESMF.

Section H: Proposed action

(i) Summarize the above:	(ii) Guidance
☐ All the above answers are 'No' ☐ There is at least one 'Yes'	• If all the above answers are 'No', there is no need for further action; • If there is at least one 'Yes', please describe your recommended course of action (see below).

(iii) Recommended Course of Action

If there is at least one 'Yes', which course of action do you recommend?

☐ CPCU, Social services officer, labour Officer, Children Officer and NEMA - CDE will provide detailed guidance on mitigation measures as outlined in the ESMF; and

☐ Specific advice is required from CDE[1], Lead Scientist and CPCUs regarding Sub -project specific Assessment (s) and also in the following area(s)

☐ All Subproject applications/proposals MUST include a completed ESMF checklist. The NAVCDP-CPCU will review the subproject applications/proposals and the CDEs will sign off; The input from the NLC, Social Services office, Children's office, labour office and the CSSCO will be sought before the documents are presented to the CPSC.

☐ The proposals will then be submitted to CPSC for clearance for implementation by communities in the proposed Subprojects. The projects that require CPRs will be forwarded to NPCU for further analysis also may be forwarded to the World bank for approval and finally to NEMA for clearance certificate (License).

Expert Advice

☐ The Government of Kenya through the Department of Monuments and Sites of the National Museums of Kenya can assist in identifying and, mapping of monuments and archaeological sites;

☐ Expert guidance will also be provided by the land registrar on all issues related to land tenure, The children department on all issues on children, especially child labour, plus department of social services on IPs/vulnerable groups in the community, and

☐ Subproject specific Environmental and Social impact assessments, if recommended, must be carried out by experts registered with NEMA and be followed by monitoring and review. During the process of conducting an ESIAs the proponent shall seek views of persons who may be affected by the Subproject. The ESS10 requires consultation of Subproject affected groups and disclosure of ESIA's conclusions. In seeking views of the public after the approval of the Subproject, the proponent shall avail the draft ESIA report at a public place accessible to project-affected groups and local NGOs/CSO/SAIC/CDDCs.

Completed by: .....

Name: HALPHA VIBERA

Position / Community: ENG. NCDCU

[1]

Date: 10/04/2025

Field Appraisal Officer (NEMA-CDE): DIBA ROBA

Signature: .....

Date: 10/04/2025

NATIONAL ENVIRONMENT AUTHORITY
NEMA
COUNTY DIRECTOR OF ENVIRONMENT
MERU COUNTY
P.O. Box 703-60200 MERU

Note:

Project category	Characteristics
High impact	Full and extensive ESIA needed- irreversible environmental impacts; impacts not easy to pick or isolate and mitigation cost expensive; EMP design not easily done; Must have the ESIA done and future annual EAs instituted
Medium impact	Site specific environmental impacts envisaged; mitigation measures are easy to pick, not costly and ESMP needed, design readily done; need an ESIA and future EAs
Low impact	Have minimal or occasionally NO adverse environmental & social impacts; exempted from further environmental processes save environmental audits. ESMP required
Land	Land tenure documentation needed and land resolution and consent Form needed with project affected person/community
Loss of income and assets	Income restoration plan needed
Presence of VMG/IP	Additional actions needed
Risk of Child labor/SEAH	Additional actions needed

CamScanner

Annex 3: Attendance list

THE COUNTY GOVERNMENT OF MERU

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT
County Project Coordinating Unit, P.O. Box 120-60200, Meru. Email:navcdpmeru@gmail.com

ATTENDANCE LIST

ACTIVITY: PUBLIC PARTICIPATION DATE(S): 11/04/25 VENUE: MERU DAIRY COOP UNION

No.	Name	M/F	Personal/ ID. No.	Designation	Organization/ Department	Telephone	Email address	Signature
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3	HENREY R. MWAMBA	M	3332868	C/MAN	KANYAKINE DAIRY	0720392331	henreyrianju@gmail.com	[illegible]
4	Elijah Mwiingi	M	14414517	C/MAN	New Nkimbiri	0720234577	elijahmwiingi03@gmail.com	[illegible]
5	JOSHUA MWIRIGI	M	13812455	C/MAN	NTIMA DAIRY	0723509486	JoshuaMwirigi dee@gmail.c	[illegible]
6	Elias Kinyua	M	11259235	H/ Sec	Nkuene dairy	0720902378	Elias kinyua@gmail.com	[illegible]
7	Gilbert Kirinja	M	7208001	Treasurer	Kawery Dairy	0703802597	Gilbert@gmail.com	[illegible]
8	Dorothy Kathure	F	24909113	C/member	ABOGETA	0710839314	Kennedy & Polish	[illegible]
9	Justus Mutuma	M	9294448	C/MAN	KITHIRUNE	0728692902	Justusmutuma44@gmail	[illegible]
10	Kennett Munyua	M	2425386	Chair	Kigakia	0727160593	Kennett munyua92@gm	[illegible]
11	Simon Kiruja	M	2372610	Chairman	Mbwinjeru dairy	0721[illegible]	Simon Kiruja@Gmail	[illegible]
12	Mercy Kangai	F	27296260	KAIO	NAVCDP	0727323312	Mercykathia@gmail.com	[illegible]
13	Joshua M Omunde	M	2016001587	CADO	NAVCDP	0726405370	JMambo40@gmail.com	[illegible]

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT
County Project Coordinating Unit, P.O. Box 120-60200, Meru. Email:navcdpmeru@gmail.com

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No.	Name	M/F	Personal/ ID. No.	Designation	Organization/ Department	Telephone	Email address	Signature
1	ROSEMARY K. MUTEA	F	7457965	V/chair	UKUU D.	0711284126		[signature]
2.	STEPHEN MURIUKI	M	8857217	Tresurer	BUURI DAIRY	0721252600		[signature]
3.	Misheck Mutwiri	M	4873766	Chairman	Athwiri Dairy	0712306359		[signature]
4	CHARLES MAUKU	M	2439367	CHAIRMAN	NKANDONE	0727244686		[signature]
5	JOHN MBAE	M	13176137	TREASURER	ABOGETA	0724159610		[signature]
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7	ALICE MURITHI	F	22261872	COMMITTEE	NGWATANIRO	0724809710		[signature]
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9	NJIRA MUTHOMI	M	22146660	Member	Mwichiune	0721573720	[illegible]@gmail.com	[signature]
10	Mercy Makena	f	20256227	member	Katheri	0729452864		[signature]
11	NAFTALY KIRIMI	M	0730316	Member	Katheri	0722571752		[signature]
12	Rita Murugi	F	14425610	PoE-ESS	Environment	0722556168	ritamurugi62@gmail	[signature]
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NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

County Project Coordinating Unit, P.O. Box 120-60200, Meru. Email:navcdpmeru@gmail.com

ATTENDANCE LIST

ACTIVITY: PUBLIC PARTICIPATION DATE(S): 11/04/25 VENUE: MERU DAIRY COOP - UNION

No.	Name	M/F	Personal/ ID. No.	Designation	Organization/ Department	Telephone	Email address	Signature
1	Alexandar M Gatobu	M	8025578	Chairman	South Imeti Dairy	0722662164	gat55783?@gmail.com	
2	Stellamukwangaga	F	21027381	Chairperson	South imenti dairy	0700280220		
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4	Nicholas mutwiri	M	24805663	b member	Sirimoni	0712864136		
5	Moreen Nkirote	F	30992092	secretary	Naari	0718625087		
6	Purity Kinoti	F	21813648	B member	Ntega	0721884241		
7	Phyllis Gatwiri	F	20080213	B member	Kalungu	0721516280		
8	CHARITY NKUENE	F	5089801	Chairperson	Neighbours	0711779077	charitynkuene147@gm	
9	Piscila Nkirote	F	16051073 ~~0720498473~~	delegate	Mikinduri	0720498473		
10	Alice Mukiri	F	10971047	delegate	Githongo	0717716368		
11	JOYCE MBITI	F	10225316	B.O.M	MUJWA DIGITAL DAIRY	0723856452	mbitijoyce190@gmail.com	
12	Edwin Koome	M	26689862	Staff	Meru dairy	0720714120	koome.edwin@gmail.com	
13.	Peter M. Gatoku	M	1997033002	CSSGMO	NAVCDP	0722226419	petergatoku@yahoo.com	

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

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5	[illegible]	M	7010606	H/sectary	Nkundo D.	0713333470		[signature]
6	Moses Mugambi	M	[illegible]	Member	Chuka D	0721673356		[signature]
7	CHARITY GITONGA	F	16006719	S/chair	Ruiga dairy	0726105273		[signature]
8	Edward Kimathi	M	21602339	Chairman	Mtune hill	0715220025		[signature]
9	GEORGE KARIUKI	M.	21774236	V. Chairman	NEIGHBOUR	0720355014		[signature]
10	Gatobu Rarama	M	4469575	H/Secretary	Katheri dairy	0722344404		[signature]
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12	KENNETH GITONGA	M	12493957	MEMBER	ABOGETA	0722136444		[signature]
13	HALPHA KIRERA	F	12672326	ENG	MERU DAIRY	0726212036		[signature]

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

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12 ~~14~~	EDITH Nkatha	F	14413309	Delegate	BUUKI	0726946500		[signature]
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5	JULIUS MUTHURI	M	24874165	Committee	BUURI	0722569657	[illegible] @.73 .com	[signature]
6	MARTIN MURANGA	M.	13177002	11	NAARI	0726465041	Muremwarumbe@gmail.com	[signature]
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8	BEATRICE K. MBURUGU	F	2466894	V/CHAIR	Ex-LEWA	0721673914	MBURUGU BEATRICE	[signature]
9	Amos Kimathi	M	14412219	Chairman	Magati AFCS	0796791393	amoskimathi448@gmail	[signature]

Annex 4: Minutes

MINUTES OF COMMUNITY AND STAKEHOLDER ENGAGEMENT FOR GRID-TIED SOLAR SYSTEM PROPOSAL BY MERU CENTRAL DAIRY UNION HELD AT THE UNION'S PREMISES.

Members Present
(As per the attached participants list)

Agenda of the Meeting
1. Preliminaries and introduction
2. Disclosure of the project information and anticipated ESS issues
3. Community Feedback
4. AOB and adjournment

MIN: 01/11/04/2025: Preliminaries and Introduction

The Union Chief executive officer Mr Gitonga welcomed all particpants to the engagement and for availing themselves for this important exercise. He also introduced the participants in their categorize which comprised of Chair of the union, board of management, delegates from Buuri, North Imenti, central Imenti, south Imenti Tigania and Igembe regions, Union managers and District cooperative officers (DCO) of South Imenti, North Iment, Buuri and Central Imenti.

Eng. Halpha Kinya gave a brief history of the union and explained to the participants the genesis of the proposal for a grid tied solar system. The high cost of electricity (KPLC) to run the processing facility necessitated search for an alternative source of energy. She informed the participants that this investment will reduce the cost of production hence the saving made will increase the cash in farmers pockets through increased bonus.

Mr. Joshua Malombe informed the participants of the steps NAVCDP had taken to arrive at the point of public participation. The rigorous process of selecting 32 cooperatives in the five value chains. He confirmed that Dairy value chain is one of the value chain being supported by NAVCDP.

MIN: 02/11/04/2025: Disclosure of the project information and anticipated ESS issues
Madam Purity Wanja emphasized the importance of public participation and explained the ESS issues which any development activity can pose. She then welcomed the participants to identify the positive and negative Environmental and Social impacts they thought can be triggered by the proposed investment and how they thought they can be mitigated. The main impacts and risks identified were job creation, drug abuse, GBV, SEA/H, insecurity and safety.

MIN: 03/11/04/2025: Community Feedback
Participants raised very important concerns and they are tabulated as below:

S/No	Name	Concern/Issue/View	Response
1	Boniface Kinyua Kanampiu 0724909403	Wanted to know what mitigation measures are in place since the	The proponent will use skilled workers and

		activity is risky	provide proper equipment for the work. Also there will be training on material handling
2	Gatimbu 0722662164	Is the funding limited to solar panels	The solar panels are integrated with KPLC, where maximum use of solar energy will be utilized and if there is deficit the KPLC takes over.
3	Gilbert Kiruja 0703802597	Wanted to know if the solar will be taxed	Yes, indirectly through taxes paid for the products
4	Njira Muthomi 0721593780	Applauded the thought	Appreciated by the participants
5	Imathiu 0721401543	Said that solar will come in handy and saving will benefit the farmers	Appreciated by the participants
6	Joyce Mbiti 0723856452	Observed that this investment is environmental friendly, cost effective and will reduce the GHGs which cause cancer	Appreciated by the participants
7	Mwebia 0721651755	He said this is a motivation to the framers He wanted to know if such investments will trickle down to satellite cooperative societies	Appreciated by the participants Yes, some of the cooperatives are selected for the investment and if that is what the other cooperatives feel its there major need and they write a proposal and it passes all the required steps
8	Vincent Kirema 0725284981	He applauded the investment as it will improve the farmers livelihood	Appreciated by the participants
9	Mary Kathambi 0720320801	She inquired when the investment will start implementation	As soon as the necessary stages of the process

			have been passed by the relevant authorities
10	Patrick Kobia	He observed that investment will create employment	Appreciated by the participants
11	Rachel 0721449842	Was concerned of the panel security Inqured if one can benefit individually	The union confirmed of tight security and also they informed the participants that a report for the structural integrity must be done to ensure that the building can support panel installation She was informed that the funding agency does not fund individuals
12	Moreen Nkirote 0718625087	made an observation that the project will lead to reduction in operational cost thereby benefiting the farmer She also identified that the project will lead to increase in milk production due to farmers motivation in increased earnings from saving on electricity bills.	Appreciated by the participants
13	Edwin Koome 0720714120	highlighted that the union saving on electricity bills could eventually be ploughed back to other projects that are economically impactful to the farmers.	Appreciated by the participants
14	Judy Mutuma 076824308	observed that the solar panels will increase in	Appreciated by the participants

		farmers bonus. She further highlighted that the savings could be used to sell to the farmers animal feeds at a subsidized price.	
15	Phylis Gatwiri 0721516280	highlighted that since farmers will eventually earn more, they will be encouraged to rear more cows for eventual milk increase.	Appreciated by the participants
16	Alexander Gatobu 0722662164	inquired on possibility of the solar being vandalized.	It is the responsibility of the proponent to provide security
17	Edith Nkatha 0726996500	asked if the solarization will in any way affect the environment.	In response, it was explained that solar is a clean source of energy therefore environmental friendly.
18	Beatrice Mboroki 0721673914	asked what will guarantee for quality assurance of the intended solar panel and its components.	The Contract administration will ensure quality solar panels are procured

MIN: 04/11/04/2025: A.O.B

Chairperson commended the members for their proactive participation and noted that this initiative aligns with the union's sustainability and cost-efficiency goals. The meeting was adjourned at 2.00 pm by a word of prayer from Judy Mutuma.

Minutes Compiled by Peter Gatobu.....

Sign.....Date...11/4/2025.....

Minutes confirmed by Purity wanja jason.....

Sign.....Date...12/4/2025.....

Annex 5: certificate of registration

REPUBLIC OF KENYA

THE CO-OPERATIVE SOCIETIES ACT
(*Cap. 490, Section 6 (3)*)

Certificate of Registration

REGISTRATION No. CS/10786

I hereby certify that the society under the name of

MERU CENTRAL DAIRY CO-OPERATIVE UNION LIMITED

and its by-laws have this day been duly registered by me in the Register of Co-operative Societies, in pursuance of the provisions of the Act and the Rules made thereunder.

Given under my hand at Nairobi

this 23RD *day of* MAY, *20*05

F. F. ODHIAMBO
Commissioner for Co-operative Development

Annex 6: Certificate of lease

REPUBLIC OF KENYA

THE REGISTERED LAND ACT
(Chapter 300)

Certificate of Lease

TITLE NO. — APPROXIMATE AREA

MERU MUNICIPALITY BLOCK II/742 — 0.9940 Ha

LESSOR COUNTY COUNCIL OF MERU

RENT 20,000/

TERM 99 YEARS FROM 1.2.90

This is to certify that MERU CENTRAL DAIRY CO-OPERATIVE UNION LIMITED - - - - -

of Meru Municipality

is (~~are~~) ~~XXX~~now registered as the proprietor~~(s)~~ of the leasehold interest above referred to, subject to the agreements and other matters contained in the registered lease, to the entries in the register relating to the lease and to such of the overriding interests set out in section 30 of the Registered Land Act as may for the time being subsist and affect the land comprised in the lease.

GIVEN under my hand and the seal of the

M E R U District Registry

this 29th day of January, 20 09

Johnson K. Njoroge 142

Land Registrar

Annex 7: KRA Pin

KENYA REVENUE AUTHORITY

www.kra.go.ke

PIN Certificate

For General Tax Questions
Contact KRA Call Centre
Tel: +254 (020) 4999 999
Cell: +254(0711)099 999
Email: callcentre@kra.go.ke

Certificate Date : 18/04/2024

Personal Identification Number
P051175053X

This is to certify that taxpayer shown herein has been registered with Kenya Revenue Authority

Taxpayer Information

Taxpayer Name	MERU CENTRAL DAIRY CO-OP UNION LTD
Email Address	VKIRIMI2022@GMAIL.COM

Registered Address

L.R. Number :	**Building :** MERU CENTRAL DAIRY UNION BUILDING
Street/Road : KPCU ROAD	**City/Town :** MERU
County : Meru	**District :** Imenti North District
Tax Area : Imenti North	**Station :** LTO
P. O. Box : 2919	**Postal Code :** 60200

Tax Obligation(s) Registration Details

Sr. No.	Tax Obligation(s)	Effective From Date	Effective Till Date	Status
1	Income Tax - Company	04/08/2005	N.A.	Active
2	Value Added Tax (VAT)	09/02/2006	N.A.	Active
3	Income Tax - PAYE	01/08/2006	N.A.	Active

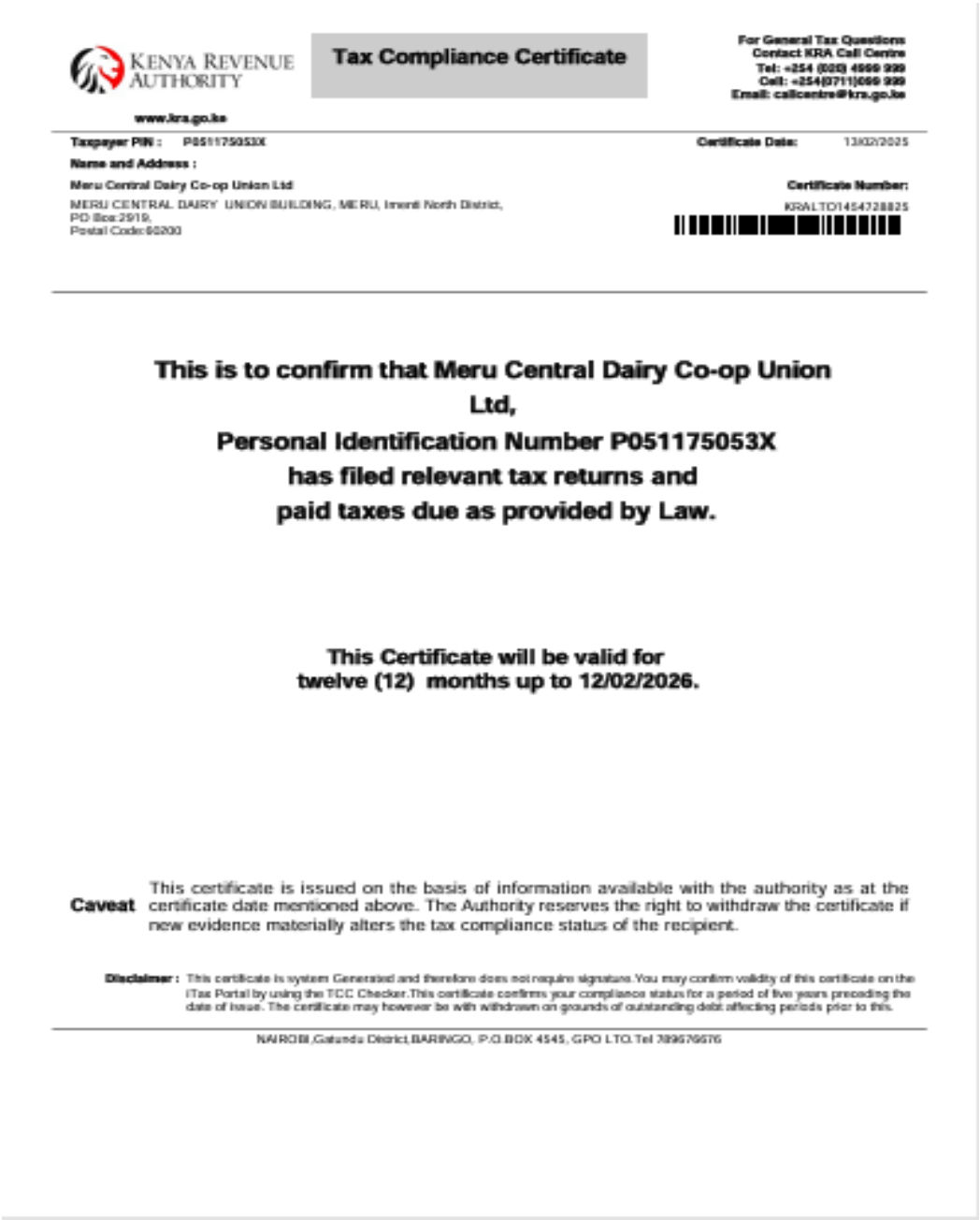
Electronic Tax Invoicing Status

eTims Registration: Active	**Tims Registration:** Active

The above PIN must appear on all your tax invoices and correspondences with Kenya Revenue Authority. Your accounting end month is December unless a change has been approved by the Commissioner-Domestic Taxes Department. The status of Tax Obligation(s) with 'Dormant' status will automatically change to 'Active' on date mentioned in "Effective Till Date" or any transaction done during the period. This certificate shall remain in force till further updated.

Disclaimer : This is a system generated certificate and does not require signature.

Annex 8: Tax compliance Certificate



KENYA REVENUE AUTHORITY

Tax Compliance Certificate

For General Tax Questions
Contact KRA Call Centre
Tel: +254 (020) 4999 999
Cell: +254(0711)099 999
Email: callcentre@kra.go.ke

www.kra.go.ke

Taxpayer PIN : P051175053X

Certificate Date: 13/02/2025

Name and Address :

Meru Central Dairy Co-op Union Ltd

MERU CENTRAL DAIRY UNION BUILDING, MERU, Imenti North District,
PO Box:2919,
Postal Code:60200

Certificate Number:

KRA\TCC\145472882S

This is to confirm that Meru Central Dairy Co-op Union Ltd,
Personal Identification Number P051175053X
has filed relevant tax returns and
paid taxes due as provided by Law.

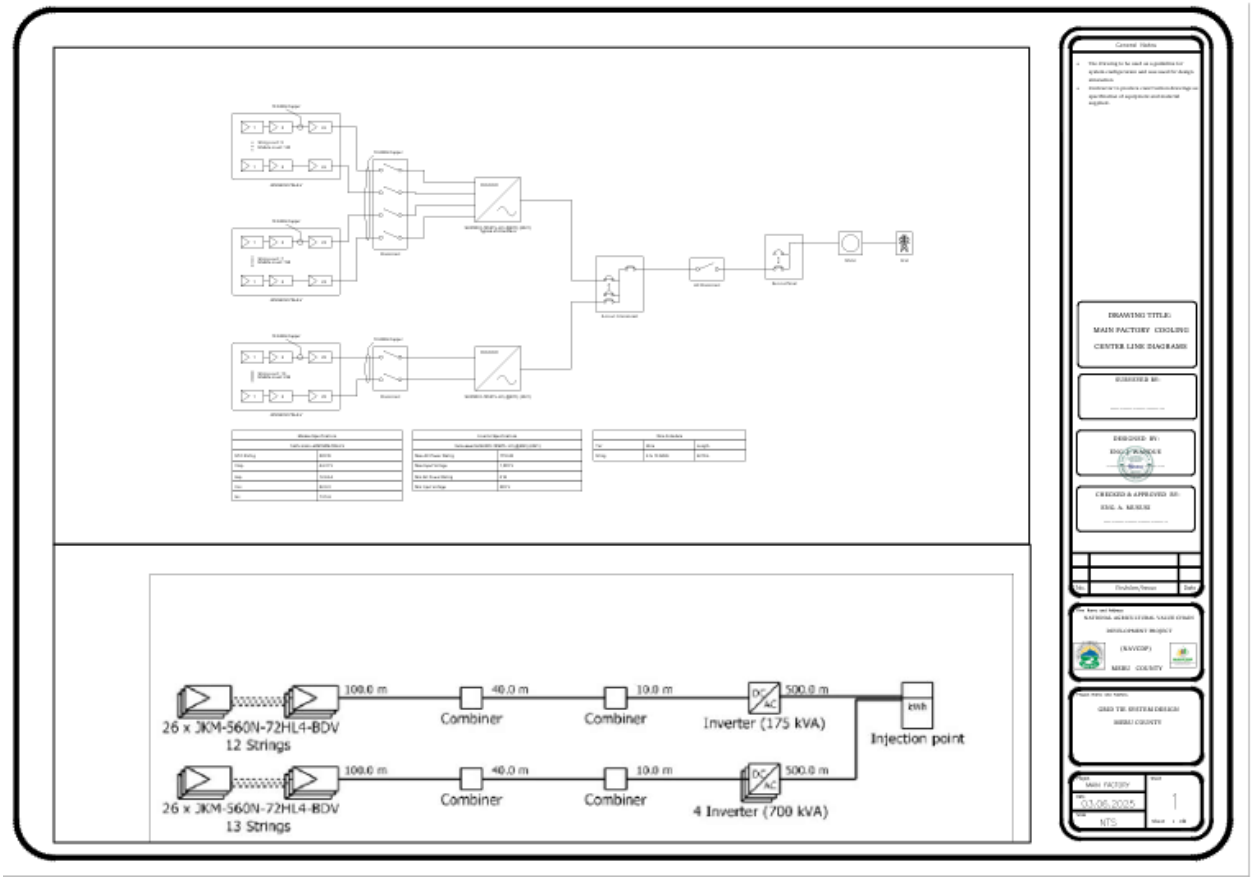
This Certificate will be valid for
twelve (12) months up to 12/02/2026.

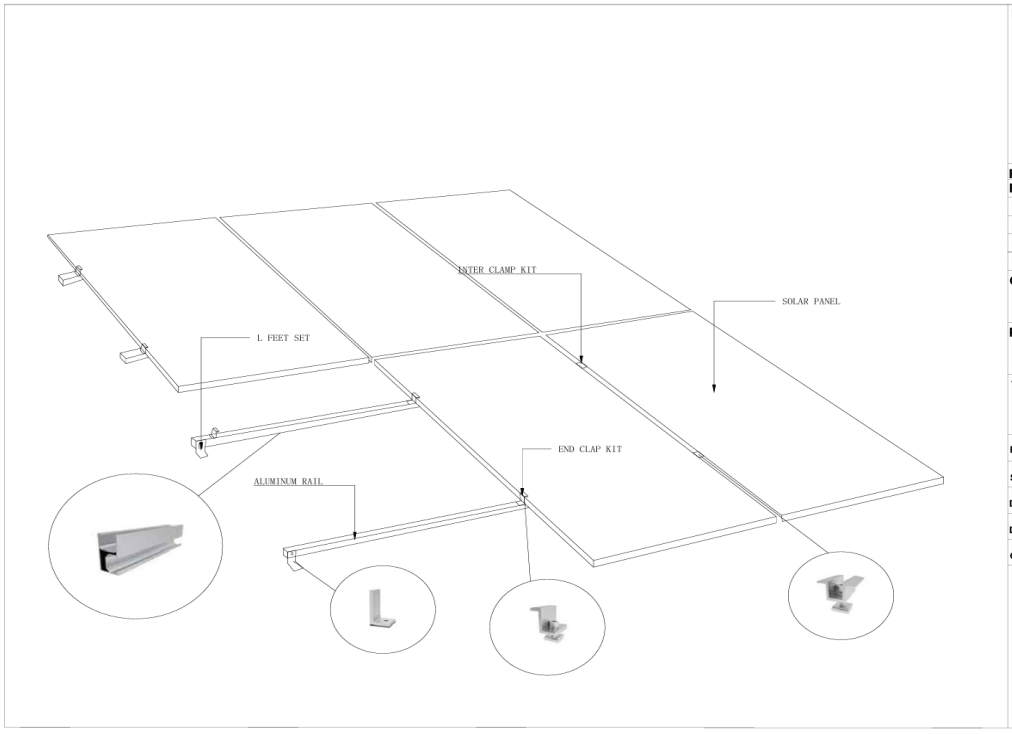
Caveat This certificate is issued on the basis of information available with the authority as at the certificate date mentioned above. The Authority reserves the right to withdraw the certificate if new evidence materially alters the tax compliance status of the recipient.

Disclaimer : This certificate is system Generated and therefore does not require signature.You may confirm validity of this certificate on the iTax Portal by using the TCC Checker.This certificate confirms your compliance status for a period of five years preceding the date of issue. The certificate may however be with withdrawn on grounds of outstanding debt affecting periods prior to this.

NAIROBI,Gatundu District,BARINGO, P.O.BOX 4545, GPO LTO.Tel 709979976

Annex 9: Drawings





NOTES:

1. TYPICAL INSTALLATION ROOF MOUNT

REVISION:

Rev	Description	By	Date

CLIENT: MERU DAIRY COOPERATIVE

PROJECT: GRIE TIE SYSTEM INSTALLATIONS

TITLE: ROOF MOUNT INSTALLATION LAYOUT DETAILS

PART NO:

SCALE: NTS

DRWG NO:

DESIGNED: JKW | **DRAWN:** JKW

CHECKED: | **DATE:**

Annex: 10 Integrity report

STRUCTURAL INTEGRITY REPORT

PROJECT TITLE:

EXISTING DEVELOPMENT GO-DOWNS AND MILK COOLERS

CLIENT:

MERU CENTRAL DAIRY COOPERATIVE UNION LTD
PO BOX 2919-60200 MERU

AUDIT ENGINEER:

FRAJIC ENGINEERING LTD

Nairobi Town, Nairobi County

Ruprani house

1st Floor Room 107b

STRUCTURAL DESIGN REPORT

Introduction

The report has been prepared in accordance with the requirements for Structural Integrity of the structure known as Existing Developments at meru county., by the Meru County Urban Development & Management. The drawings of the existing structure are as in attached Appendix 1.

It comprises two sections; a design report of all critical elements, an analysis of the findings and conclusions and recommendation.

Function of the Structure

The structure is being utilized as **GO-DOWNS AND MILK COOLERS.**

Structural Analysis

The structural members selected have been simplified from a frame to the critical Sub-Frame for ease of analysis. The Sub-Frame has been analyzed for shear forces and bending moments. Both dead load (D.L.) and total load (T.L.) have been calculated to obtain critical moments at supports, spans and at columns. The general loading conditions have been taken to be as follows:-

a) Imposed Loading (Floors) = 2.5 KN/m^2
b) Imposed Loading (Staircase) = 3.0 KN/m^2
c) Imposed Loading (Roof) = 0.75 KN/m^2
d) Basic Wind Speed = 28m/s (Nairobi)

The subsoil conditions have been taken to be **RED Soil** having a bearing capacity of **250KN/m^2**. The exposure conditions have been taken to be moderate (external) and mild (internal).

Structural Design

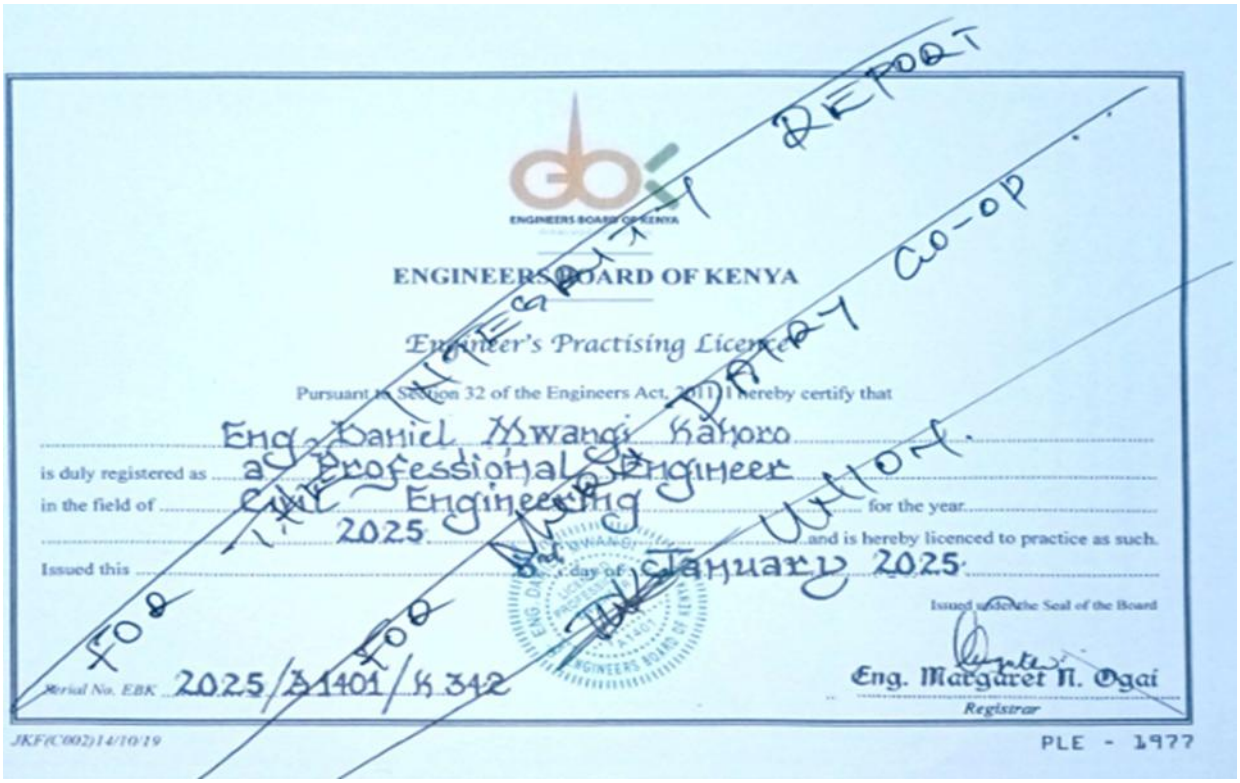
The Ultimate Limit and Serviceability Limit States have been employed in the design of the members as provided for by **BS 8110 Part I: 1997**. The ultimate limit state design has

been utilized to obtain shear forces and bending moment's reinforcement with adequate factor of safety against loads for which the members are designed. The loads selection was based on **BS 6399**. Serviceability Limit State Design has checked against deflection, cracking, durability and fire resistance.

2.3 Structural Integrity Analysis

The attached Analysis and Design Report provides the background to the analysis and design. The summary is as tabulated.

#	Structural Element	Section	Visual Inspection Findings	Design Section Size and Re-bars	Finding	Recommendations
1	Existing Internal Column 01	Main Bars	300x200 4T12 (603 mm^2 on one face)	300x200 4T12 (603 mm^2 on one face)	The existing columns are adequate.	OKAY
		Shear	T8-175 (4 Legs)	T8-175 (2 Legs)	The shear links are adequate	
2	Existing Base 01	Base 01	1200X1200X200 3T12-150B1 (1357 mm^2) 6T12-150B2 (1244 mm^2)	1200X1200X200 3T12-150B1 (1357 mm^2) 6T12-150B2 (1244 mm^2)	The existing bases are adequate.	OKAY is
3	Existing Beam	Mid-span	450x200 4T12 (402 mm^2 at Mid-span tension area)	450x200 4T12 (402 mm^2 at Mid-span tension area)	The existing beams are adequate.	OK .
						re-



ENGINEERS BOARD OF KENYA

ENGINEERS BOARD OF KENYA

Engineer's Practising Licence

Pursuant to Section 32 of the Engineers Act, 2011 I hereby certify that

Eng. Daniel Mwangi Kahoro

is duly registered as a Professional Engineer

in the field of Engineering for the year 2025

and is hereby licenced to practice as such.

Issued this 1st day of January 2025

Issued under the Seal of the Board

Eng. Margaret N. Ogai

Registrar

Serial No. EBK 2025/A1401/K 342

JKF(C002)14/10/19

PLE - 1977

Annex 11: Summary of BoQ

ITEM	DESCRIPTION	UNIT	QTY	RATE (KSh)	AMOUNT (KSh)
2.1	**MAIN FACTORY**				
2.1.1	**Excavation and Backfilling (Provisional)**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Depth of excavation not exceeding 1.0 m unless otherwise specified				
2.1.1.1	Excavation and backfilling in normal material for 150mm² Armoured cables 600/1000V -3 core 6943X as directed by the project manager	m^3	950	460	437,000.00
2.1.2	**Electrical Sleeve Pipe (provisional)**				
2.1.2.1	Provide lay , join electrical sleeve to take cables in 2.1.1.1	LM	950	1,300	1,235,000.00
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				**1,672,000.00**
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	SUB-TOTAL BROUGHT FORWARD FROM PREVIOUS PAGE				**1,672,000.00**
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
2.1.3	**SMART GRID SOLAR PV INVERTER**				

ENG. WANDUE JOSEPH K. LICENSED PROFESSIONAL ENGINEER A4181 ENGINEERS BOARD OF KENYA

2.1.3.1	Supply and install smart grid solar inverter as HUAWEI SUN2000-185KTL-H1 or equivalent with unit nominal power of 175kWac , operating voltage of 550 - 1500V , maximum power of 185 kWac complete with smart logger and smart dongle -WLAN-FE	No.	5	1,913,082	9,565,410.00
2.1.3.2	Supply and install 250A smart power sensor 3PH	No.	5	20,500	102,500.00
2.1.4	**SOLAR MODULES**				
2.1.4.2	Supply and install 560Wp mono crystalline modules as JKM-560N-72HL4-BDV or equivalent	No.	1664	13,300	22,131,200.00
2.1.5	**DC COMBINERS**				
2.1.5.1	Supply and install DC combiner box to handle 13No. strings of 26 No. modules as per 2.1.4.2 connected in series	No.	56	60,000	3,360,000.00
2.1.6	**PV and AC DISCONNECTS**				
2.1.6.1	Supply and install PV disconnects for each supplied inverter in 2.1.3.1	No.	5	72,000	360,000.00
2.1.6.2	Supply and Install AC breakers	No.	5	35,000	175,000.00
2.1.7	**ELECTRICAL CABLING**				
2.1.7.1	Supply and install 16mm^2 x 1 solar PV cable black	LM	1600	480	768,000.00
2.1.7.2	Supply and install 16mm^2 x 1 solar PV cable red	LM	1600	480	768,000.00
2.1.7.3	Supply and install 95mm^2 x 1 solar PV cable black	LM	220	2,000	440,000.00
2.1.7.4	Supply and install 95mm^2 x 1 solar PV cable red	LM	220	2,000	440,000.00
2.1.7.5	Supply and install 150mm^2 Armoured cables 600/1000V -3 core 6943X	LM	1900	10,800	20,520,000.00

ENG. WANDUE JOSEPH K. LICENSED PROFESSIONAL ENGINEER A4181 ENGINEERS BOARD OF KENYA

2.1.7.6	Supply and installation of earth rod complete with clamp 5/8*4FT	No.	7	2,000	14,000.00
2.1.7.7	Supply and installation of lightening arrestor	No.	7	7,200	50,400.00
2.1.7.8	Supply and install DC and AC Earthing Systems	LS	1	250,000	250,000.00
2.1.7.9	Supply and install assorted cable trays and covers	LS	1	250,000	250,000.00
2.1.8	**SOLAR STRUCTURES AND MOUNTING**				
2.1.8.1	Supply and install aluminium roof mount structure complete with all accessories: to be approved by the project manager	WATT	831,600	18	14,968,800.00
2.1.8.2	Supply and install galvanized ground mount structure not less than 3m high with all accessories: to be approved by the project manager	WATT	100,240	26	2,606,240.00
Bill No.2.1	**TOTAL CARRIED TO COLLECTION PAGE**				**78,441,550.00**

ENG. WANDUE JOSEPH K.
LICENSED PROFESSIONAL ENGINEER
A4181
ENGINEERS BOARD OF KENYA

Annex 12: Site plan